

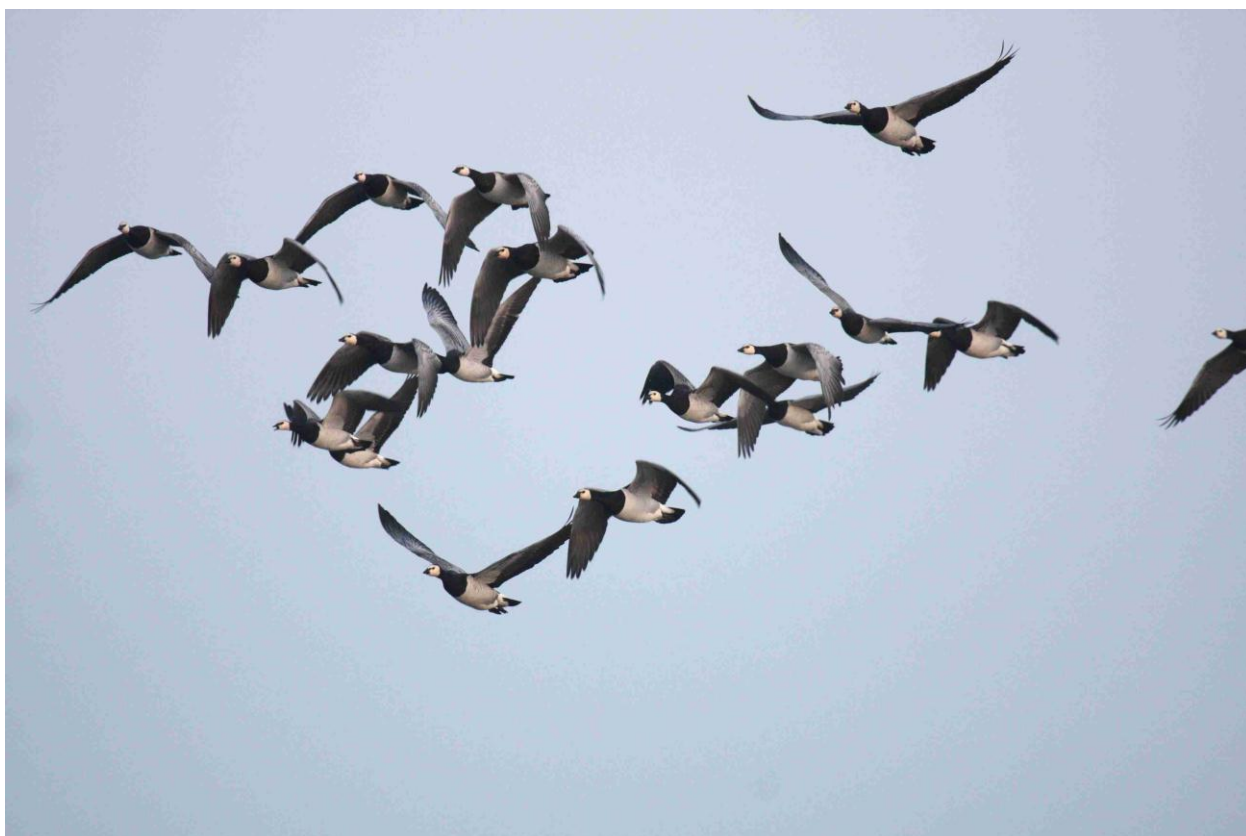
Final Report

**FEHMARNBELT FIXED LINK
BIRD SERVICES (FEBI)**

Bird Investigations in Fehmarnbelt - Baseline

Bird Migration

E3TR0011 Volume III – Appendices



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Note to the reader:

In this report the time for start of construction is artificially set to 1 October 2014 for the tunnel and 1 January 2015 for the bridge alternative. In the Danish EIA (VVM) and the German EIA (UVS/LBP) absolute year references are not used. Instead the time references are relative to start of construction works. In the VVM the same time reference is used for tunnel and bridge, i.e. year 0 corresponds to 2014/start of tunnel construction; year 1 corresponds to 2015/start of bridge construction etc. In the UVS/LBP individual time references are used for tunnel and bridge, i.e. for tunnel construction year 1 is equivalent to 2014 (construction starts 1 October in year 1) and for bridge construction year 1 is equivalent to 2015 (construction starts 1st January).

A. APPENDIX – BIRD MIGRATION

A.1 Species lists for all field stations, all methods

A.1.1 Season 2009

Table A.1 Species list for all field stations 2009, all methods.

Species	Puttgarden (Fehmarn) Land Station							Rødbyhavn (Lolland) Land Station							Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals									species group		
	Spring 2009			Autumn 2009				Spring 2009			Autumn 2009				Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census					
	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn				
Red-throated Diver	40	0	0	126	0	0	0	436	0	0	32	0	0	0	126	0	20	0	14	0	602	192	794	0	0	0	0	0	Divers			
Black-throated Diver	12	0	0	126	0	0	0	242	0	0	22	0	0	0	332	0	30	0	22	0	586	200	786	0	0	0	0	0	Divers			
Great Northern Diver	4	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	8	0	8	0	0	0	0	0	Divers			
Diver sp.	59	0	0	278	0	0	0	1,076	0	0	46	0	0	0	314	0	54	0	14	0	1,449	392	1,841	0	0	0	0	0	Divers			
Little Grebe	0	0	0	0	0	0	0	0	26	0	0	4	0	0	0	0	0	0	0	0	0	0	26	4	30	0	0	0	Grebes			
Great Crested Grebe	894	0	0	159	0	0	0	116	0	0	40	0	0	0	36	0	36	0	24	0	1,046	259	1,305	0	0	0	0	0	0	Grebes		
Red-necked Grebe	87	0	0	110	0	0	0	66	0	3	168	0	0	0	0	14	0	40	0	153	332	485	0	0	0	3	0	0	Grebes			
Slavonian Grebe	12	0	0	2	0	0	0	28	0	0	2	0	0	0	0	0	0	2	0	40	6	46	0	0	0	0	0	0	0	Grebes		
Grebe sp.	14	0	0	6	0	0	0	48	0	0	0	0	0	6	0	18	0	20	0	68	44	112	0	0	0	0	0	0	0	Grebes		
Sooty Shearwater	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	8	2	10	0	0	0	0	0	0	0	Pelagic species		
Northern Gannet	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	Pelagic species		
Great Cormorant	3,002	0	0	4,900	0	0	0	1,448	0	0	4,814	0	0	2,500	0	6,584	0	10,156	0	6,950	26,454	33,404	0	0	0	0	0	0	0	Cormorants		
Eurasian Bittern	0	0	0	0	0	0	0	0	1	0	0	30	2	0	0	0	0	0	0	0	0	0	0	1	32	33	0	0	0	Hérons		
Great White Egret	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	2	2	4	0	0	0	0	0	0	0	Hérons		
Common Heron	75	32	1	68	32	50	0	73	60	1	114	930	96	18	40	0	84	0	32	4	188	298	486	92	1,108	1,200	2	18	0	Hérons		
White Stork	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6	2	8	0	0	0	0	0	0	0	0	Storks	
Mute Swan	460	0	0	416	2	8	0	1,103	1	0	1,003	36	0	270	222	0	192	0	264	0	1,785	1,875	3,660	1	46	47	0	270	0	Swans		
Bewick's Swan	0	0	0	16	0	0	0	80	0	0	8	0	0	0	0	4	0	6	0	80	34	114	0	0	0	0	0	0	0	0	Swans	
Whooper Swan	147	0	0	8	0	0	0	75	1	0	46	14	0	0	2	0	12	0	0	0	224	66	290	1	14	15	0	0	0	0	Swans	
Yellow-billed Swans	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0	Swans	
Swan sp.	34	0	0	8	0	0	0	0	0	0	8	0	0	0	10	0	152	0	40	0	44	208	252	0	0	0	0	0	0	0	Swans	
Bean Goose	0	0	0	100	124	0	0	234	0	0	86	0	0	0	0	0	0	40	0	234	226	460	0	124	124	0	0	0	0	0	Geese	
Greater White-fronted Goose	1,076	0	0	836	2	636	0	29	8	0	508	160	142	0	32	100	100	0	492	0	1,137	1,936	3,073	108	1,040	1,148	0	0	0	0	Geese	
Greylag Goose	1,314	0	12	4,370	252	422	0	1,069	0	0	6,154	6,212	476	0	286	0	806	0	844	6	2,669	12,174	14,843	0	7,362	7,362	12	0	0	0	Geese	
Canada Goose	8	0	0	2	0	0	0	16	0	0	0	0	0	2	0	0	0	0	0	24	2	26	0	0	0	0	0	2	0	0	Geese	
Barnacle Goose	3,034	606	0	10,376	228	262	0	46,447	421	0	22,686	2,322	1,826	1	1,458	0	568	0	1,420	246	50,939	35,050	85,989	1,027	4,638	5,665	0	1	0	0	Geese	
Brent Goose	26	0	0	2,692	18	84	0	41,129	1	0	1,366	144	184	0	792	0	488	0	1,124	20	41,947	5,670	47,617	1	430	431	0	0	0	0	Geese	
Goose sp.	100	0	0	2,086	0	0	0	364	0	0	8,980	260	0	0	272	2	4,522	0	8,682	50	736	24,270	25,006	2	262	264	0	0	0	0	Geese	
Egyptian Goose	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	2	0	2	0	0	0	0	0	Geese	
Shelduck	439	0	0	246	24	0	0	281	3	0	40	0	0	0	32	0	0	0	0	0	752	286	1,038	3	24	27	0	0	0	0	0	Geese
Eurasian Wigeon	488	272	0	5,305	676	52	0	650	261	0	4,497	320	42	6,233	102	334	272	0	3,576	2	1,240	13,650	14,890	867	1,424	2,291	0	6,233	0	0	Ducks	
Gadwall	51	2	0	32	0	0	0	32	0	8	56	50	0	27	0	0	8	0	0	0	83	96	179	2	50	52	8	27	0	0	Ducks	

Species	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals								
	Spring 2009			Autumn 2009					Spring 2009			Autumn 2009					Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census		species group
	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn			
Falcon sp.	0	0	0	8	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	Birds of prey		
Grey Partridge	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	Game birds		
Quail	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	6	2	8	0	0	Game birds		
Pheasant	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	26	26	0	0	0	0	0	Game birds		
Water Rail	0	0	1	0	0	4	0	0	82	0	0	2	0	2	0	0	0	0	0	0	0	0	0	82	6	88	1	2	Rails		
Spotted Crane	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	Rails		
Moorhen	0	60	1	0	216	94	0	0	281	0	0	56	10	0	0	0	0	0	0	0	0	0	341	376	717	1	0	Rails			
Common Coot	0	0	0	0	0	0	0	0	262	0	0	60	0	0	0	0	0	0	0	0	0	0	262	60	322	0	0	Rails			
Crane	1,128	0	0	74	0	0	0	766	0	0	252	0	0	0	22	0	2	0	0	0	1,916	328	2,244	0	0	0	0	0	Cranes		
Oystercatcher	117	546	0	262	286	0	0	70	67	6	156	288	0	0	0	58	6	0	2	0	187	426	613	671	632	1,303	6	0	Waders		
Avocet	32	14	0	6	0	0	0	26	101	0	0	0	0	0	4	0	0	0	0	0	62	6	68	115	0	115	0	0	Waders		
Little Ringed Plover	0	0	0	0	18	0	0	2	10	12	0	490	0	0	0	0	8	0	0	0	2	8	10	10	508	518	12	0	Waders		
Ringed Plover	80	80	0	126	432	2	0	40	10	2	48	1,358	0	0	0	0	0	0	0	0	120	174	294	90	1,792	1,882	2	0	Waders		
Golden Plover	64	4	0	182	102	5,354	0	30	11	0	840	48	260	0	0	0	68	0	70	0	94	1,160	1,254	15	5,764	5,779	0	0	Waders		
Grey Plover	0	6	0	118	38	0	0	2,190	0	0	214	12	0	0	0	0	24	8	90	0	2,190	446	2,636	6	66	72	0	0	Waders		
Golden / Grey Plover	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	Waders	
Lapwing	334	4	0	194	8	412	0	124	3	3	144	140	88	10	0	0	540	0	1,000	0	458	1,878	2,336	7	648	655	3	10	Waders		
Knot	0	0	0	36	0	0	0	14,020	0	16	18	0	0	0	0	0	0	0	4	0	14,020	58	14,078	0	0	0	16	0	Waders		
Sanderling	0	0	0	58	0	0	0	34	0	0	22	66	0	0	0	0	26	0	0	0	34	106	140	0	66	66	0	0	Waders		
Little Stint	0	0	0	6	10	0	0	0	0	0	0	78	0	0	0	0	0	0	0	0	0	6	6	0	88	88	0	0	Waders		
Temminck's Stint	0	0	0	0	0	0	0	0	0	10	2	170	0	0	0	0	0	0	0	0	0	2	2	0	170	170	10	0	Waders		
Curlew Sandpiper	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	0	0	Waders		
Dunlin	20	0	0	1,046	912	4	0	22,962	5	0	710	234	6	0	60	0	572	8	62	282	23,042	2,390	25,432	5	1,172	1,177	0	0	Waders		
Stint sp.	24	0	0	146	0	0	0	0	0	0	2	0	0	0	0	0	260	0	260	0	24	668	692	0	0	0	0	0	0	Waders	
Ruff	22	0	0	0	0	0	0	6	0	1	18	0	0	2	0	0	2	0	0	0	28	20	48	0	0	0	1	2	Waders		
Jack Snipe	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Waders	
Snipe	18	6	0	60	18	10	0	0	15	0	128	230	38	3	0	6	28	0	58	10	18	274	292	27	302	329	0	3	Waders		
Woodcock	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6	0	6	1	0	1	0	0	Waders		
Bar-tailed Godwit	0	0	0	102	34	0	0	14,314	0	0	96	0	0	0	0	30	60	0	4	0	14,314	262	14,576	30	64	94	0	0	Waders		
Whimbrel	12	0	0	30	0	0	0	50	16	2	18	4	2	1	0	0	14	0	10	0	62	72	134	16	6	22	2	1	Waders		
Curlew	551	84	0	216	154	16	0	1,077	139	0	552	0	8	1	56	18	84	2	10	0	1,684	862	2,546	241	200	441	0	1	Waders		
Spotted Redshank	8	18	0	0	0	0	0	0	0	2	38	0	0	0	0	0	0	0	0	0	8	38	46	18	0	18	2	0	Waders		
Redshank	14	26	0	4	98	0	0	2	34	6	16	22	2	0	6	0	10	4	10	0	22	40	62	60	130	190	6	0	Waders		
Greenshank	6	8	0	28	94	0	0	0	78	8	42	58	0	3	0	4	0	0	0	0	6	70	76	90	156	246	8	3	Waders		
Green Sandpiper	6	8	0	0	42	12	0	2	11	5	8	206	0	2	0	0	0	12	2	0	8	10	18	19	284	303	5	2	Waders		
Wood Sandpiper	14	0	0	0	26	46	0	0	36	0	4	550	0	0	0	0	0	32	2	0	14	6	20	36	686	722	0	0	Waders		
Common Sandpiper	16	62	0	50	1,346	0	0	0	43	7	18	2,354	6	2	0	42	0	90	0	66	16	68	84	147	3,928	4,075	7	2	Waders		
Turnstone	0	0	0	22	56	0	0	2	0	0	8	0	0	0	0	0	0	0	0	0	2	30	32	0	56	56	0	0	Waders		
Wader sp.	132	0	0	59	108	0	0	20,791	0	0	122	0	0	0	82	0	346	2	436	0	21,005	963	21,968	0	112	112	0	0	Waders		
Pomarine Skua	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	0	0	0	8	0	8	0	0	0	0	0	0	Skuas	
Arctic Skua	4	0	0	20	0	0	0	50	0	0	6	0	0	0	6	0	0	0	6	0	60	32	92	0	0	0	0	0	0	Skuas	
Long-tailed Skua	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	6	0	0	0	0	8	8	0	0	0	0	0	0	Skuas	
Arctic/Pomarine Skua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	2	4	6	0	0	0	0	0	0	Skuas	

Species	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals								
	Spring 2009			Autumn 2009					Spring 2009			Autumn 2009					Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census		species group
	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn			
Arctic / Pomarine Skua	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	Skuas			
Skua sp.	2	0	0	10	0	0	0	2	0	0	0	0	0	0	0	6	0	10	0	4	26	30	0	0	0	0	0	Skuas			
Mediterranean Gull	18	0	0	2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	18	4	22	0	0	0	2	0	Gulls			
Little Gull	282	0	0	401	0	0	0	4,119	0	0	106	0	0	0	3,306	0	214	0	362	0	7,707	1,083	8,790	0	0	0	0	0	Gulls		
Black-headed Gull	4,247	0	0	3,841	2	2	0	2,768	2	6	1,373	0	0	0	534	2	1,162	0	420	30	7,549	6,796	14,345	4	6	10	6	0	Gulls		
Common Gull	384	0	0	2,752	0	6	0	667	0	0	402	0	0	0	758	14	936	0	432	0	1,809	4,522	6,331	14	20	34	0	0	Gulls		
Lesser gull sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	390	0	164	0	6	554	560	0	0	0	0	0	0	Gulls		
Lesser Black-backed Gull	15	0	0	6	0	0	0	2	0	0	6	0	0	0	26	0	10	0	0	0	43	22	65	0	0	0	0	0	Gulls		
Herring Gull	2,061	0	0	160	0	0	148	160	0	0	343	0	0	0	2,348	4	3,102	0	1,338	0	4,569	4,943	9,512	4	4	8	0	148	Gulls		
Yellow-legged Gull	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Gulls		
Herring/Common Gull	300	0	0	14	0	0	0	0	0	0	0	0	0	22	0	200	0	80	0	322	294	616	0	0	0	0	0	0	Gulls		
Glaucous Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	0	Gulls		
Great Black-backed Gull	543	0	0	20	0	0	20	6	0	0	18	0	0	0	78	0	310	0	328	0	627	676	1,303	0	0	0	0	20	Gulls		
Large gull sp.	44	0	0	0	0	0	0	0	0	0	0	0	0	100	0	952	0	454	0	144	1,406	1,550	0	0	0	0	0	0	Gulls		
Great/Lesser Black-backed Gull	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	Gulls		
Kittiwake	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	Gulls		
Gull sp.	36	0	0	0	0	0	0	0	0	0	0	0	0	66	0	402	0	432	0	102	834	936	0	0	0	0	0	0	Gulls		
Caspian Tern	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	Terns		
Sandwich Tern	184	0	0	1,659	50	0	0	222	0	0	444	0	0	0	48	0	150	4	194	14	454	2,447	2,901	0	58	58	0	0	Terns		
Common Tern	198	0	0	1,206	0	0	0	486	0	1	60	0	0	0	48	0	90	0	10	0	732	1,366	2,098	0	0	0	1	0	Terns		
Arctic Tern	6	0	0	48	0	0	0	2,395	0	0	48	0	0	0	0	50	0	2	0	2,401	148	2,549	0	0	0	0	0	0	Terns		
Common/Arctic Tern	56	0	0	534	0	0	0	428	0	0	50	0	0	0	174	0	346	0	196	26	658	1,126	1,784	0	0	0	0	0	Terns		
Little Tern	50	0	0	60	0	0	0	22	0	0	10	0	0	0	0	4	0	0	0	72	74	146	0	0	0	0	0	0	Terns		
Black Tern	6	0	0	14	0	0	0	36	0	2	2	0	0	0	18	0	82	0	2	0	60	100	160	0	0	0	2	0	Terns		
Tern sp.	6	0	0	2	0	0	0	0	0	0	0	0	0	46	0	218	0	138	0	52	358	410	0	0	0	0	0	0	Terns		
Guillemot	0	0	0	4	0	0	0	0	0	0	2	0	0	0	4	0	24	0	10	0	4	40	44	0	0	0	0	0	Pelagic species		
Common Guillemot/Razorbill	12	0	0	16	0	0	0	12	0	0	26	0	0	0	4	0	14	0	14	0	28	70	98	0	0	0	0	0	Pelagic species		
Razorbill	18	0	0	18	0	0	0	12	0	0	8	0	0	0	14	0	46	0	20	0	44	92	136	0	0	0	0	0	Pelagic species		
Black Guillemot	0	0	0	2	0	0	0	4	0	0	2	0	0	0	4	0	0	0	4	0	8	8	16	0	0	0	0	0	Pelagic species		
Puffin	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	2	0	0	0	0	0	0	Pelagic species		
Alcids spec.	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	4	0	4	0	0	14	14	0	0	0	0	0	0	Pelagic species		
Feral Pigeon	52	0	0	0	0	0	0	0	0	0	0	0	0	132	0	0	0	0	0	184	0	184	0	0	0	0	0	0	Pigeons		
Stock Dove	1,470	0	0	20	0	0	0	38	0	1	4,356	0	0	34	0	96	0	262	0	1,508	4,734	6,242	0	0	0	1	34	Pigeons			
Woodpigeon	40,920	0	1,197	121,100	0	0	99	4,166	0	334	246,670	0	0	348	24	5,288	0	8,410	0	45,110	381,468	426,578	0	0	0	1,531	447	Pigeons			
Collared Dove	26	0	0	10	0	0	0	0	0	2	12	0	0	5	0	0	0	0	0	26	22	48	0	0	0	2	5	Pigeons			
Dove sp.	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	40	0	414	50	464	0	0	0	0	0	0	Pigeons		
Cuckoo	0	0	1	4	0	0	0	8	0	64	2	0	0	0	0	0	0	0	0	8	6	14	0	0	0	65	0	Cuckoos			
Tawny Owl	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	30	30	0	0	0	Owls		
Long-eared Owl	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	Owls		
Short-eared Owl	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	Owls		
Swift	401	0	0	997	0	0	0	173	0	2	1,318	0	0	3	40	0	60	0	28	0	614	2,403	3,017	0	0	0	2	3	Swifts		
Kingfisher	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2	4	Kingfishers			
Beeeater	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	Passerines		

	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals									
	Spring 2009			Autumn 2009					Spring 2009			Autumn 2009					Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census			
Species	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn	species group			
Wryneck	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	Passerines			
Great Spotted Woodpecker	6	0	2	0	0	0	0	0	0	19	6	0	0	3	0	0	0	0	0	0	6	6	12	0	0	0	21	3	Woodpeckers			
Woodlark	46	0	0	14	0	0	0	3	0	0	184	0	0	4	0	0	0	0	6	0	49	204	253	0	0	0	0	4	Passerines			
Skylark	1,699	8	0	368	24	278	7	555	13	219	7,062	60	736	32	10	734	534	8	214	0	2,264	8,178	10,442	755	1,848	2,603	219	39	Passerines			
Horned Lark	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	6	0	0	0	0	8	8	0	0	0	0	0	Passerines			
Sand Martin	76	0	0	376	0	0	0	30	0	1	142	0	0	9	0	0	20	0	4	0	106	542	648	0	0	0	1	9	Passerines			
Swallow	2,322	20	0	3,327	0	0	2	407	0	156	7,670	18	0	426	104	14	224	0	252	0	2,833	11,473	14,306	34	32	66	156	428	Passerines			
House Martin	288	0	0	1,864	0	0	0	18	0	62	972	0	0	44	10	0	20	0	12	0	316	2,868	3,184	0	0	0	62	44	Passerines			
Swallow spec.	0	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	0	0	48	48	0	0	0	0	0	Passerines			
Australasian Pipit	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	Passerines			
Richard's Pipit	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	Passerines			
Tawny Pipit	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	Passerines			
Tree Pipit	149	32	3	148	2,900	112	2	18	94	9	15,802	7,866	1,806	169	0	0	104	928	294	820	167	16,348	16,515	126	14,540	14,666	12	171	Passerines			
Meadow Pipit	1,888	24	0	4,178	158	120	37	275	5	112	14,500	670	20	1,028	82	62	1,082	16,274	1,688	20	2,245	21,448	23,693	91	33,578	33,669	112	1,065	Passerines			
Red-throated Pipit	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	Passerines			
Scandinavian Rock Pipit	10	0	1	58	4	0	0	2	0	0	84	8	0	9	0	0	0	0	2	0	12	144	156	0	12	12	1	9	Passerines			
Pipit sp.	14	0	0	64	2	4	0	0	0	0	0	2	0	3	12	0	254	0	58	0	26	376	402	0	8	8	0	3	Passerines			
Yellow Wagtail	1,387	0	0	2,036	266	72	412	16	0	3	10,376	114	116	324	0	12	1,290	22	706	82	1,403	14,408	15,811	12	624	636	3	736	Passerines			
Grey Wagtail	12	0	0	16	2	0	0	8	0	0	238	32	0	11	0	0	0	0	12	0	20	266	286	0	34	34	0	11	Passerines			
White Wagtail	981	8	144	802	280	4	154	70	0	124	1,520	84	12	246	52	4	68	18	286	10	1,103	2,676	3,779	12	420	432	268	400	Passerines			
Waxwing	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	Passerines			
Winter Wren	2	0	0	0	34	0	23	0	0	64	0	0	2	249	2	0	0	0	0	0	4	0	4	0	36	36	64	272	Passerines			
Dunnock	91	166	0	60	970	8	20	0	86	121	212	2,458	254	80	2	28	0	0	0	0	93	272	365	280	3,718	3,998	121	100	Passerines			
Robin	2	200	111	0	1,042	1,806	88	0	262	56	0	5,116	378	356	66	1,140	0	140	0	248	68	0	68	1,602	9,762	11,364	167	444	Passerines			
Thrush Nightingale	0	0	1	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	Passerines			
Black Redstart	0	0	10	0	0	0	31	0	0	14	2	0	0	17	0	0	0	0	2	0	0	4	4	0	0	0	24	48	Passerines			
Redstart	0	0	4	0	0	0	13	0	0	4	2	0	0	39	0	0	0	0	0	0	0	2	2	0	0	0	8	52	Passerines			
Whinchat	2	0	1	0	0	0	1	0	0	3	0	0	0	54	0	0	0	0	0	0	2	0	2	0	0	0	4	55	Passerines			
Stonechat	10	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	10	0	10	0	0	0	2	2	Passerines			
Wheatear	2	0	1	4	0	0	6	0	0	29	4	0	0	10	0	0	0	0	0	0	2	8	10	0	0	0	30	16	Passerines			
Ring Ouzel	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	Passerines			
Blackbird	51	1,481	402	20	3,236	2,424	132	8	828	150	18	4,620	326	128	0	640	4	780	0	196	59	42	101	2,949	12,806	15,755	552	260	Passerines			
Fieldfare	28	14	0	0	104	14	0	0	14	4	764	176	52	0	0	224	0	2	0	4	28	764	792	252	574	826	4	0	Passerines			
Song Thrush	20	1,848	76	0	4,790	1,300	4	0	1,414	93	190	9,154	2,144	283	0	3,794	0	1,064	200	1,626	20	390	410	7,056	23,310	30,366	169	287	Passerines			
Redwing	18	2,709	22	0	6,388	710	10	0	1,207	27	160	23,580	4,616	15	2	4,886	0	1,346	0	1,274	20	160	180	8,802	42,872	51,674	49	25	Passerines			
Mistle Thrush	32	8	0	2	6	0	0	0	0	4	252	14	0	1	0	132	0	0	0	0	32	254	286	140	152	292	4	1	Passerines			
Thrush sp.	0	0	0	0	2	0	0	0	2	0	46	0	0	0	0	0	0	0	0	2	0	46	46	2	2	4	0	0	Passerines			
Sedge Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	Passerines			
Marsh Warbler	0	0	1	0	0	0	0	0	0	52	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	53	2	Passerines			
Reed Warbler	0	0	3	0	0	0	2	0	0	94	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	97	20	Passerines			
Reed-warblers	0	0	1	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	1	11	Passerines			
Icterine Warbler	0	0	8	0	0	0	1	0	0	88	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	96	9	Passerines			
Lesser Whitethroat	0	0	55	0	0	0	2	0	0	167	0	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	222	55	Passerines			

Species	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals									species group
	Spring 2009			Autumn 2009					Spring 2009			Autumn 2009					Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census			
	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn				
Whitethroat	0	0	102	0	0	0	14	0	0	0	261	0	0	0	88	0	0	0	0	0	0	0	0	0	0	0	363	102	Passerines			
Garden Warbler	0	0	14	0	0	0	9	0	0	0	33	0	0	0	24	0	0	24	0	0	0	0	0	24	24	0	0	0	47	33	Passerines	
Blackcap	0	0	0	0	0	0	13	0	0	0	140	0	0	0	31	0	0	0	0	0	0	0	0	0	0	0	140	44	Passerines			
Green Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Passerines		
Wood Warbler	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	1	0	Passerines	
Chiffchaff	9	0	0	0	4	0	34	0	0	0	196	8	12	0	348	4	56	0	0	0	0	13	8	21	56	72	128	196	382	Passerines		
Willow Warbler	2	0	0	0	0	0	28	0	0	0	322	6	0	0	100	2	0	0	0	0	0	4	6	10	0	0	0	322	128	Passerines		
Warbler spec.	0	0	0	4	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	4	4	4	0	0	0	0	12	0	Passerines	
Goldcrest	0	0	6	0	0	0	13	0	0	0	16	0	0	0	50	0	0	0	4	0	0	0	0	0	0	8	8	22	63	Passerines		
Firecrest	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	Passerines		
Spotted Flycatcher	2	0	1	0	0	0	1	0	0	0	4	0	0	0	11	0	0	0	0	0	0	2	0	2	0	0	0	5	12	Passerines		
Pied Flycatcher	4	0	0	0	0	0	0	0	0	0	4	0	0	0	11	0	0	0	0	0	0	4	0	4	0	0	0	4	11	Passerines		
Bearded Tit	0	0	0	0	0	0	0	0	0	0	0	4	0	0	31	0	0	2	0	0	0	0	6	6	0	0	0	0	31	0	Passerines	
Long-tailed Tit	0	0	0	0	0	0	18	0	0	0	13	4	0	0	36	0	0	0	0	0	0	0	4	4	4	0	0	0	13	54	Passerines	
Marsh Tit	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	1	0	Passerines		
Coal Tit	80	0	17	0	0	0	0	0	0	0	4	0	0	0	8	0	0	0	0	0	0	80	0	80	0	0	0	21	8	Passerines		
Blue Tit	1,296	0	248	6	0	0	30	2	0	0	86	8	0	0	177	2	0	0	0	0	0	1,300	14	1,314	0	0	0	334	207	Passerines		
Great Tit	386	52	240	8	0	0	77	0	0	0	133	0	0	0	73	0	0	0	0	0	0	386	8	394	52	0	52	373	150	Passerines		
Treecreeper	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	Passerines		
Short-toed Treecreeper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Passerines	
Penduline Tit	8	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	8	4	12	0	0	0	0	1	0	Passerines	
Red-backed Shrike	0	0	1	0	0	0	0	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	2	7	0	Passerines	
Northern Shrike	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	2	2	0	0	0	0	1	0	Passerines	
Eurasian Jay	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	Passerines	
Black-billed Magpie	92	0	0	4	0	0	3	0	0	0	0	10	0	0	3	0	0	8	0	2	0	92	24	116	0	0	0	0	6	0	Passerines	
Eurasian Jackdaw	5,463	0	25	44	0	0	0	954	0	0	65	5,616	2,000	800	69	0	0	48	0	0	0	6,417	5,708	12,125	0	2,800	2,800	90	69	Passerines		
Rook	307	0	0	3,510	0	0	0	230	0	0	0	3,474	200	0	444	0	0	1,924	0	70	0	537	8,978	9,515	0	200	200	0	444	0	Passerines	
Hooded Crow	19	0	0	4	0	0	0	0	0	0	0	4	0	0	20	4	0	0	0	0	0	23	8	31	0	0	0	0	20	0	Passerines	
Common Raven	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	2	0	0	Passerines	
Crow spec.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	600	0	0	0	722	722	0	0	0	0	0	0	Passerines	
Common Starling	6,336	44	146	1,472	0	2	819	172	0	0	77	16,860	12	0	88	8	0	2	18	0	8	6,516	18,334	24,850	44	50	94	223	907	0	Passerines	
House Sparrow	4	0	0	82	0	0	0	36	0	0	0	2	0	0	0	0	16	0	0	0	0	4	84	88	16	16	32	0	36	0	Passerines	
Tree Sparrow	18	0	0	18	0	0	0	61	0	0	0	84	0	0	35	0	0	2	0	50	0	18	154	172	0	0	0	0	96	0	Passerines	
Chaffinch	17,438	80	273	2,154	0	44	99	920	4	0	323	43,588	1,486	786	459	222	6	0	0	11,418	0	18,580	57,160	75,740	90	2,322	2,412	596	558	0	Passerines	
Brambling	228	2	21	38	70	28	3	0	0	0	1	134	1,182	52	18	0	222	0	0	246	0	228	418	646	224	1,554	1,778	22	21	0	Passerines	
Chaffinch sp.	1,104	0	0	152	0	0	0	0	0	0	0	98,370	0	0	290	0	0	48	0	72	0	1,104	98,642	99,746	0	0	0	0	290	0	Passerines	
European Serin	37	0	1	0	0	0	25	0	0	0	1	0	0	0	1	0	0	0	0	0	0	37	0	37	0	0	0	2	26	0	Passerines	
Greenfinch	2,591	0	129	172	0	0	64	174	0	0	273	5,248	0	0	1,056	10	0	0	0	0	0	2,775	5,420	8,195	0	0	0	402	1,120	0	Passerines	
Goldfinch	215	0	16	68	0	92	3	12	0	0	21	404	0	0	270	2	0	0	0	4	0	229	476	705	0	92	92	37	273	0	Passerines	
Siskin	742	0	44	652	0	0	1	2	0	0	16	22,410	0	2	144	2	0	22	0	660	0	746	23,744	24,490	0	2	2	60	145	0	Passerines	
Linnet	2,973	0	0	404	10	0	17	233	0	0	203	3,256	0	0	538	40	0	30	22	364	0	3,246	4,054	7,300	0	54	54	203	555	0	Passerines	
Twite	64	0	0	170	12	0	0	0	0	0	0	582	54	0	1	0	0	2	0	0	0	64	754	818	0	66	66	0	1	0	Passerines	
Common Redpoll	554	0	21	32	4	0	0	0	0	0	1	40	22	0	2	0	0	0	0	22	0	554	94	648	0	26	26	22	2	0	Passerines	

Species	Puttgarden (Fehmarn) Land Station							Rødbyhavn (Lolland) Land Station							Offshore Fehmarnbelt				Hyllekrog Offshore		Overall Totals									species group		
	Spring 2009			Autumn 2009				Spring 2009			Autumn 2009				Spring 2009		Autumn 2009		Autumn 2009		vis. obs.			calls			morning census					
	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	transects	calls shore	morn. census	transects	calls shore	calls inland	morn. census	vis. obs.	calls	vis. obs.	calls	vis. obs.	calls	spring	autumn	all	spring	autumn	all	spring	autumn				
Common Redpoll	554	0	21	32	4	0	0	0	0	0	0	0	1	40	22	0	2	0	0	0	0	22	0	554	94	648	0	26	26	22	2	Passerines
Common Crossbill	0	0	0	12	0	0	0	0	0	0	1,258	0	0	49	0	0	0	0	0	0	0	0	0	1,270	1,270	0	0	0	0	49	Passerines	
Parrot Crossbill	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	30	30	0	0	0	0	0	Passerines	
Common Rosefinch	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	3	0	Passerines	
Bullfinch	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	1	0	Passerines	
Hawfinch	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4	0	4	1	0	Passerines	
Lapland Bunting	0	0	0	0	0	0	0	0	0	0	2	14	0	0	0	0	0	0	0	0	0	0	0	2	2	0	14	14	0	0	Passerines	
Snow Bunting	2	0	0	0	36	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	2	4	6	0	36	36	0	1	Passerines	
Yellowhammer	53	0	2	0	30	0	3	2	0	220	48	68	2	132	4	0	0	0	0	0	0	0	59	48	107	0	100	100	222	135	Passerines	
Ortolan Bunting	0	0	0	0	0	0	0	0	0	0	2	8	10	0	0	0	0	0	0	0	0	0	0	2	2	0	18	18	0	0	Passerines	
Reed Bunting	197	34	11	86	88	100	13	62	15	269	3,826	414	6	165	8	186	0	6	12	2	267	3,924	4,191	235	806	1,041	280	178	Passerines			
Corn Bunting	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	1	0	Passerines	
Corn Bunting	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	1	0	Passerines	
Passerine sp.	362	0	0	2,136	0	0	0	2	8	0	9,144	0	0	0	110	60	1,354	202	16,818	326	474	29,452	29,926	68	464	532	0	0	Passerines			
Overall total	177,370	8,646	3,405	364,831	26,404	15,606	2,615	484,329	7,894	4,932	668,812	76,548	15,566	15,458	29,222	13,044	81,470	20,998	110,658	5,378	690,921	1,225,771	1,916,692	29,584	189,164	218,748	8,337	18,073				

A.1.2 Season 2010

Table A.2 Species list for all field stations 2010, all methods.

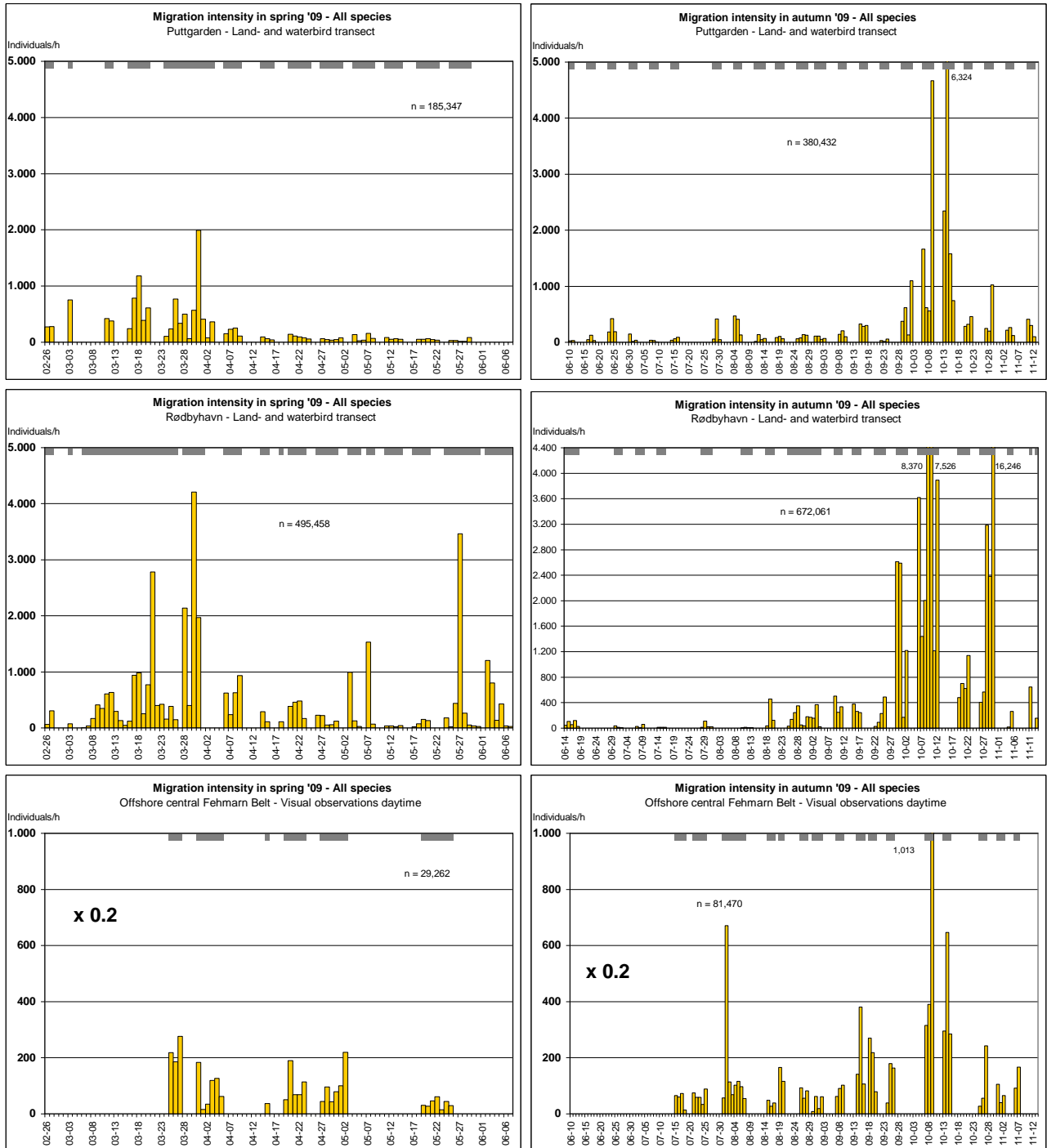
species	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Overall Totals							species group		
	Spring 2010				Autumn 2010				Spring 2010				Autumn 2010				Spring 2010		Autumn 2010		visual observations			calls			morning census			
	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls	tran-sects	calls	spring	autumn	all	spring	autumn	all	spring		autumn	
Red-throated Diver	54	0	0	0	76	0	0	0	0	0	0	0	40	0	0	0	288	0	50	0	342	166	508	0	0	0	0	0	0	Divers
Black-throated Diver	30	0	0	0	112	0	0	0	0	0	0	0	38	0	0	0	144	0	16	0	174	166	340	0	0	0	0	0	0	Divers
Great Northern Diver	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	Divers
Diver sp,	226	0	0	0	180	0	0	0	1,658	0	0	0	86	0	0	0	516	0	60	0	2,400	326	2,726	0	0	0	0	0	0	Divers
Little Grebe	0	0	0	0	0	0	0	0	0	16	2	0	0	0	0	0	0	0	0	0	0	0	0	18	0	18	0	0	0	Grebes
Great Crested Grebe	774	0	0	0	200	0	0	0	0	0	0	0	68	0	0	3	246	0	28	0	1,020	296	1,316	0	0	0	0	0	3	Grebes
Red-necked Grebe	186	0	0	0	118	0	0	0	0	0	0	0	320	0	0	0	36	0	12	0	222	450	672	0	0	0	0	0	0	Grebes
Slavonian Grebe	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	Grebes
Grebe sp,	14	0	0	0	28	0	0	0	12	0	0	0	10	0	0	0	80	0	26	0	106	64	170	0	0	0	0	0	0	Grebes
Northern Gannet	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	24	0	0	0	0	0	0	0	Pelagic species
Great Cormorant	1,676	0	0	0	6,824	0	0	0	1,122	0	0	0	5,442	0	0	0	2,460	0	2,884	0	5,258	15,150	20,408	0	0	0	0	0	0	Cormorants
Eurasian Bittern	0	0	0	0	0	0	0	0	2	0	0	0	0	2	14	1	0	0	0	0	2	0	2	0	16	16	0	1	Herons	
Great White Egret	16	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	16	2	18	0	0	0	0	0	0	Herons
Common Heron	46	20	22	0	134	74	234	0	0	92	4	0	204	602	50	16	16	2	90	0	62	428	490	140	960	1,100	0	16	Herons	
White Stork	0	0	0	0	42	0	0	0	4	0	0	0	64	0	0	0	0	0	0	0	4	106	110	0	0	0	0	0	0	Storks
Mute Swan	388	0	136	0	284	0	126	0	1,220	0	0	0	1,674	0	0	2,345	146	0	236	0	1,754	2,194	3,948	136	126	262	0	2,345	Swans	
Bewick's Swan	22	0	0	0	0	0	316	0	0	0	0	0	94	2	0	0	2	0	2	0	24	96	120	0	318	318	0	0	Swans	
Whooper Swan	122	96	228	0	28	0	18	0	0	372	80	0	0	50	0	0	0	32	0	0	154	78	232	776	18	794	0	0	Swans	
Swan sp,	30	0	0	0	90	0	0	0	0	0	0	0	56	0	0	0	146	2	32	0	176	178	354	2	0	2	0	0	Swans	
Bean Goose	78	0	34	0	188	2	570	0	0	0	0	0	954	400	0	0	0	0	0	0	78	1,142	1,220	34	972	1,006	0	0	Geese	
Pink-footed Goose	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	Geese
Greater White-fronted Goose	634	124	1,370	0	44	0	1,058	0	1,386	806	652	0	680	4	10	0	30	0	0	0	2,050	724	2,774	2,952	1,072	4,024	0	0	Geese	
Grey Goose	1,650	2	354	0	3,402	248	1,366	0	1,732	200	162	0	11,022	952	412	0	656	0	1,310	0	4,038	15,734	19,772	718	2,978	3,696	0	0	Geese	
Canada Goose	88	0	52	0	90	0	8	0	28	0	0	0	14	0	0	0	20	0	0	0	136	104	240	52	8	60	0	0	Geese	
Barnacle Goose	2,146	426	456	0	46,574	1,482	5,422	0	24,966	11,850	11,284	2	33,940	5,124	4,578	0	1,448	150	1,404	0	28,560	81,918	110,478	24,166	16,606	40,772	2	0	Geese	
Brent Goose	74	0	0	0	4,504	0	0	0	19,812	170	900	0	462	82	0	0	0	0	278	0	19,886	5,244	25,130	1,070	82	1,152	0	0	Geese	
Goose sp,	5,348	0	6	0	10,752	0	26	0	1,550	60	600	0	24,320	86	38	0	2,878	1,000	2,570	0	9,776	37,642	47,418	1,666	150	1,816	0	0	Geese	
Egyptian Goose	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	0	0	0	0	0	0	0	Geese
Shelduck	294	0	52	0	384	0	0	0	390	0	0	0	270	0	0	1	34	0	52	0	718	706	1,424	52	0	52	0	1	Geese	
Eurasian Wigeon	356	900	798	0	5,758	1,056	252	0	2,174	1,288	2,754	5	2,278	320	106	6,790	26	6	1,626	0	2,556	9,662	12,218	5,746	1,734	7,480	5	6,790	Ducks	
Gadwall	48	0	90	0	62	0	0	0	20	0	0	11	122	0	0	0	67	0	0	0	68	184	252	90	0	90	11	67	Ducks	
Green-winged Teal	88	56	526	0	1,400	6	0	0	342	490	824	18	176	0	0	22	0	0	262	0	430	1,838	2,268	1,896	6	1,902	18	22	Ducks	
Mallard	90	0	0	6	1,282	4	60	0	0	0	0	0	1,426	0	0	0	8	2	52	0	98	2,760	2,858	2	64	66	6	0	Ducks	
Northern Pintail	32	0	0	0	254	0	220	0	0	12	10	0	744	0	0	9	2	0	60	0	34	1,058	1,092	22	220	242	0	9	Ducks	
Garganey	0	0	0	0	6	0	0	0	6	0	0	1	0	0	0	0	0	0	0	6	6	12	0	0	0	0	1	0	Ducks	
Northern Shoveler	50	0	30	0	86	0	0	0	0	0	56	11	114	0	0	11	8	0	2	0	58	202	260	86	0	86	11	11	Ducks	
Common Pochard	0	0	0	0	50	0	0	0	14	0	0	0	12	0	0	22	0	0	0	0	14	62	76	0	0	0	0	22	Ducks	
Tufted Duck	364	0	34	0	190	4	0	0	0	0	0	0	132	0	0	0	40	0	20	0	404	342	746	34	4	38	0	0	Ducks	
Greater Scaup	936	0	0	0	252	0	0	0	0	0	0	0	306	0	0	0	0	0	230	0	936	788	1,724	0	0	0	0	0	0	Ducks
Common Eider	24,654	0	0	0	210,742	0	0	0	245,422	0	0	0	75,600	0	0	0	8,110	0	24,432	0	278,186	311,774	589,960	0	0	0	0	0	0	Sea ducks
Long-tailed Duck	1,916	0	72	0	366	0	2	0	0	8	208	0	124	0	0	0	568	6	46	0	2,484	536	3,020	294	2	296	0	0	Sea ducks	
Common Scoter	16,664	624	2,258	0	29,402	1,302	918	0	17,464	4,838	3,680	0	3,004	1,036	254	0	13,924	92	3,878	0	48,052	36,284	84,336	11,492	3,510	15,002	0	0	Sea ducks	
Black/Velvet Scoter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	0	6	0	0	0	0	0	0	Sea ducks
Velvet Scoter	112	0	0	0	112	0	0	0	0	0	0	0	170	0	0	0	80	0	46	0	192	328	520	0	0	0	0	0	0	Sea ducks
Common Goldeneye	210	6	40	0	78	0	4	0	348	10	16	0	322	6	16	0	4	0	26	0	562	426	988	72	26	98	0	0	Sea ducks	
Smew (merganser)	2	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	4	2	6	0	0	0	0	0	0	Mergansers
Red-breasted Merganser	1,136	0	0	0	570	0	0	0	2,054	0	0	0	1,650	0	0	0	230	0	44	0	3,420	2,264	5,684	0	0	0	0	0	0	Mergansers
Goosander	118	0	0	0	20	0	0	0	0	0	0	0	50	0	0	1	10	0	36	0	128	106	234	0	0	0	0	1	Mergansers	

species	Puttgarden (Fehmarn) Land Station								Rødbyhavn (Lolland) Land Station								Offshore Fehmarnbelt				Overall Totals							species group		
	Spring 2010				Autumn 2010				Spring 2010				Autumn 2010				Spring 2010		Autumn 2010		visual observations			calls			morning census			
	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls shore	calls inland	morn, census	tran-sects	calls	tran-sects	calls	spring	autumn	all	spring	autumn	all	spring		autumn	
Marsh Tit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	Songbirds	
Coal Tit	0	0	0	0	2	0	0	0	0	0	0	0	12	0	0	1	0	0	0	0	0	14	14	0	0	0	0	1	Songbirds	
Blue Tit	104	0	0	7	22	0	0	75	0	0	0	35	4,330	0	0	865	0	0	0	0	104	4,352	4,456	0	0	0	42	940	Songbirds	
Great Tit	50	30	0	24	2	4	0	137	0	0	0	101	386	0	0	184	0	0	0	0	50	388	438	30	4	34	125	321	Songbirds	
Nuthatch	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	Songbirds	
Treecreeper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	8	Songbirds	
Penduline Tit	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	Songbirds	
Red-backed Shrike	0	0	0	3	0	0	0	0	0	0	0	2	0	0	0	15	0	0	0	0	0	0	0	0	0	0	5	15	Songbirds	
Jay	0	0	0	0	0	0	0	0	0	0	0	0	240	0	0	6	0	0	0	0	0	240	240	0	0	0	0	6	Songbirds	
Black-billed Magpie	56	0	0	0	140	0	0	0	0	0	0	2	0	0	0	0	0	0	0	56	142	198	0	0	0	0	0	0	Songbirds	
Eurasian Jackdaw	5,532	0	0	0	232	0	0	0	650	0	0	0	3,176	0	0	0	80	0	46	0	6,262	3,454	9,716	0	0	0	0	0	Songbirds	
Rook	376	0	0	0	4,320	0	0	0	0	0	0	0	1,630	0	0	0	16	0	748	0	392	6,698	7,090	0	0	0	0	0	0	Songbirds
Hooded Crow	6	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	2	0	0	0	8	14	22	0	0	0	0	0	Songbirds	
Common Raven	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	Songbirds	
Crow sp,	6	0	0	0	0	0	0	0	16	0	0	0	0	0	0	6	0	760	0	28	760	788	0	0	0	0	0	0	Songbirds	
Common Starling	5,300	24	0	205	1,170	0	0	3,272	0	0	0	894	18,060	0	0	261	4	0	14	8	5,304	19,244	24,548	24	8	32	1,099	3,533	Songbirds	
House Sparrow	2	0	0	0	20	0	0	196	0	0	0	1	2	0	0	0	0	0	0	2	22	24	0	0	0	0	1	196	Songbirds	
Tree Sparrow	136	0	0	1	58	0	0	29	4	0	0	0	558	0	0	34	0	0	0	140	616	756	0	0	0	1	63	Songbirds		
Chaffinch	4,002	70	0	36	2,388	786	1,234	198	0	0	0	168	9,288	2,206	570	480	8	0	242	16	4,010	11,918	15,928	70	4,812	4,882	204	678	Songbirds	
Brambling	14	20	6	2	34	628	162	12	2	0	0	1	0	1,818	224	78	0	0	118	2	16	152	168	26	2,834	2,860	3	90	Songbirds	
Chaffinch sp,	188	2	0	0	548	0	0	0	524	0	0	0	301,472	0	0	1,987	0	0	0	0	712	302,020	302,732	2	0	2	0	1,987	Songbirds	
European Serin	4	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	4	2	6	0	0	0	0	1	Songbirds	
Greenfinch	426	0	0	0	196	206	360	97	0	0	0	312	6,708	0	0	548	2	0	62	0	428	6,966	7,394	0	566	566	312	645	Songbirds	
Goldfinch	86	0	0	3	50	0	0	24	26	0	0	53	2,286	0	0	377	0	0	0	0	112	2,336	2,448	0	0	0	56	401	Songbirds	
Siskin	616	0	0	5	3,630	0	0	13	346	0	0	12	65,416	224	0	287	0	0	320	24	962	69,366	70,328	0	248	248	17	300	Songbirds	
Linnet	1,762	0	0	18	292	0	2	84	710	0	0	250	4,506	0	0	171	64	0	848	0	2,536	5,646	8,182	0	2	2	268	255	Songbirds	
Twite	8	0	0	0	20	0	0	0	0	8	0	0	758	0	0	7	0	0	0	0	8	778	786	8	0	8	0	7	Songbirds	
Common Redpoll	56	0	0	0	6	410	132	42	4	0	0	1	5,972	52	0	156	0	0	0	0	60	5,978	6,038	0	594	594	1	198	Songbirds	
Common Crossbill	130	0	0	11	8	0	0	12	0	0	0	3	314	0	0	0	0	0	8	0	130	330	460	0	0	0	14	12	Songbirds	
Common Rosefinch	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	Songbirds	
Bullfinch	0	0	0	0	0	8	0	0	0	0	0	0	312	0	8	34	0	0	0	0	312	312	0	16	16	0	34	Songbirds		
Hawfinch	12	0	0	0	0	0	0	0	0	0	0	0	44	0	0	0	0	0	0	12	44	56	0	0	0	0	0	0	Songbirds	
Lapland Bunting	2	0	0	0	4	0	0	0	0	0	0	0	6	0	0	0	0	0	0	2	10	12	0	0	0	0	0	0	Songbirds	
Snow Bunting	0	0	0	0	0	170	36	0	0	0	0	0	6	0	0	0	0	0	0	0	6	6	0	206	206	0	0	0	Songbirds	
Yellowhammer	12	14	0	0	4	2	54	0	16	8	0	124	484	186	16	150	0	0	0	28	488	516	22	258	280	124	150	Songbirds		
Ortolan Bunting	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	Songbirds	
Reed Bunting	356	112	54	4	22	494	90	7	0	14	6	156	2,684	154	12	105	0	2	2	0	356	2,708	3,064	188	750	938	160	112	Songbirds	
Passerine sp,	2,494	38	0	0	5,918	32	28	0	514	0	0	0	4,776	0	0	0	558	10	4,498	10	3,566	15,192	18,758	48	70	118	0	0	Songbirds	
Overall total	144,906	45,838	14,412	1,759	458,684	85,388	25,808	6,073	436,246	33,294	27,488	4,621	986,180	96,904	17,644	19,038	44,686	4,650	67,594	11,240	625,838	1,512,458	2,138,296	125,682	236,984	362,666	6,380	25,111		

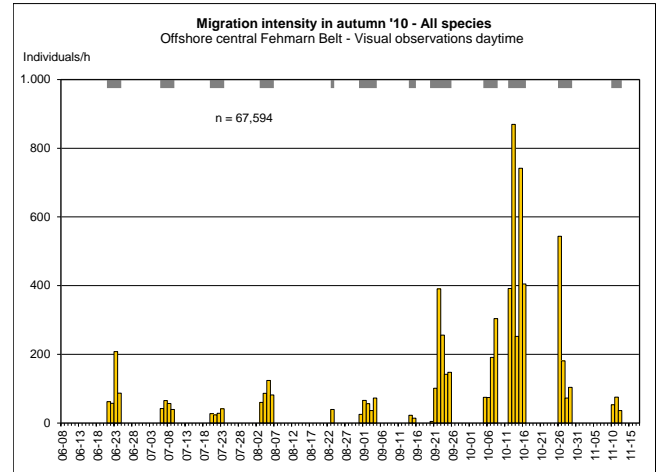
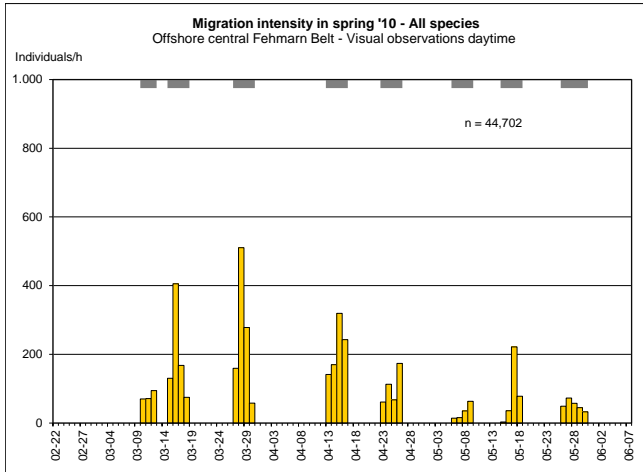
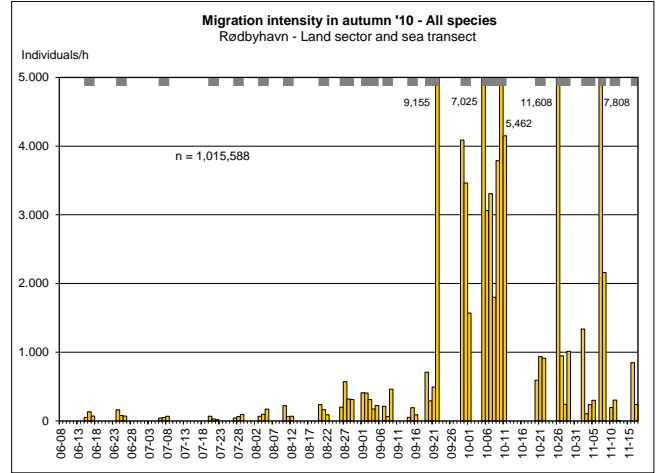
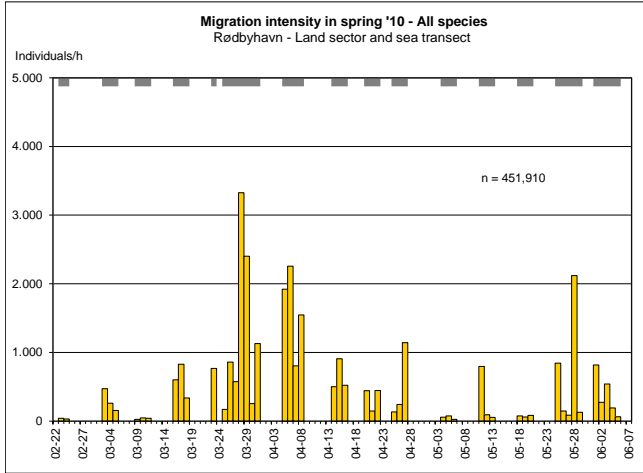
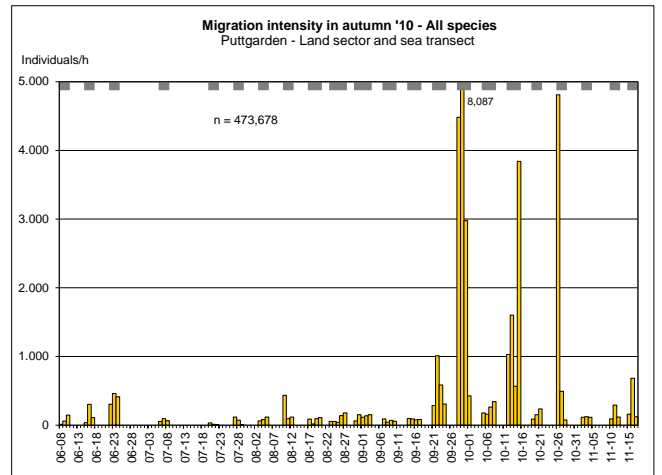
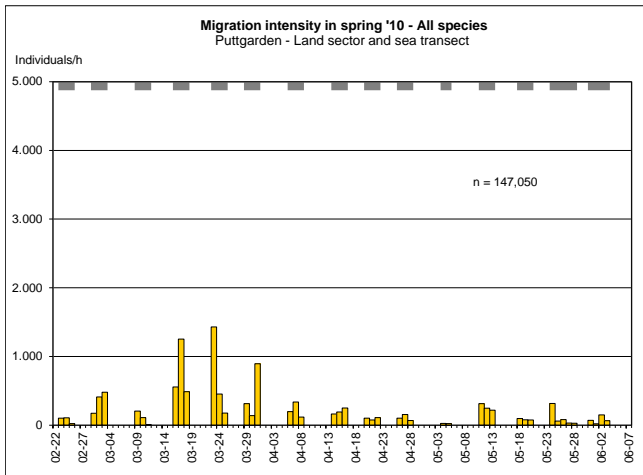
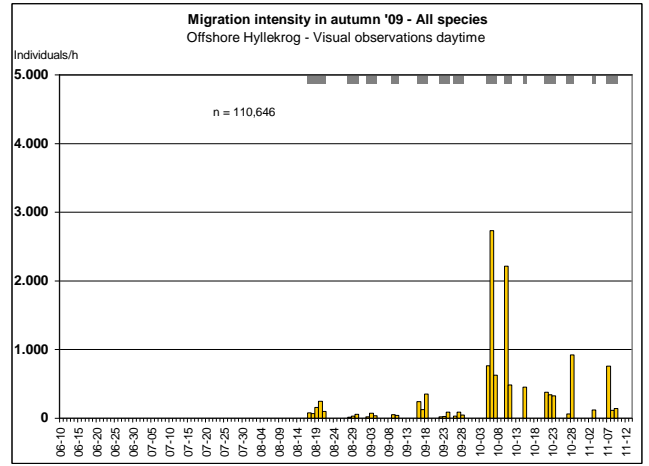
A.2 Migration intensities – visual daytime observations

Figures are placed such that – if possible – 2009 the cover the left and 2010 the right page. On each page, spring data will be on the left side and autumn data on the right side. The stations placements will be Puttgarden (top), Rødbyhavn (middle), offshore Fehmarnbelt (bottom) and offshore Hyllekrog below it. If data did not suffice to make a figure, the space has been left blank.

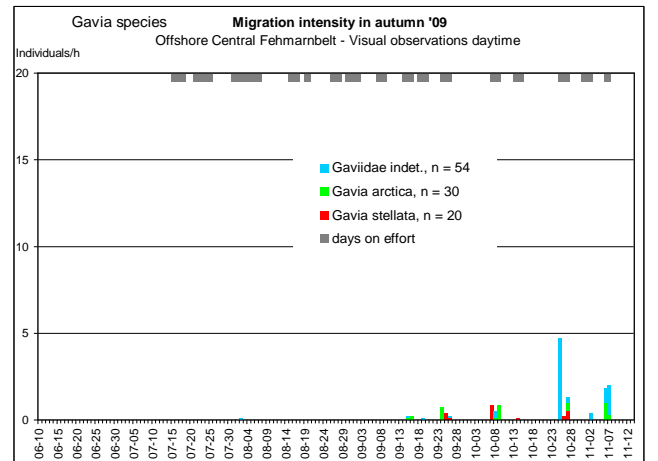
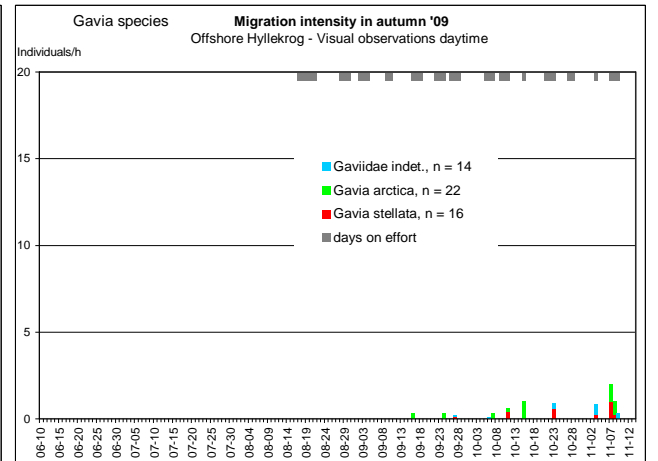
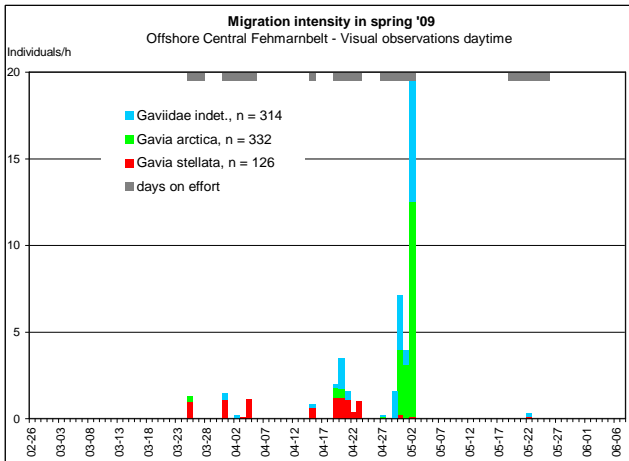
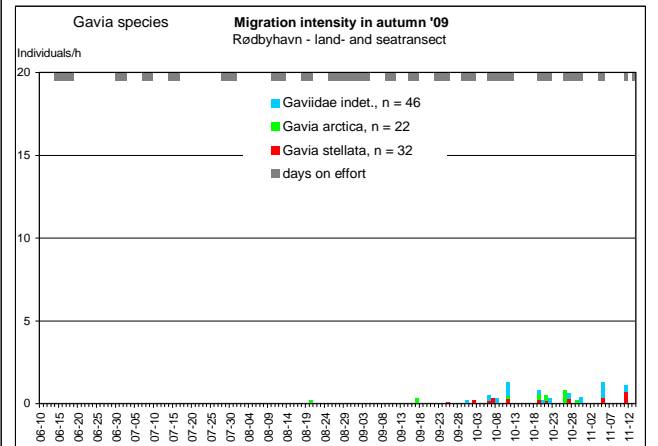
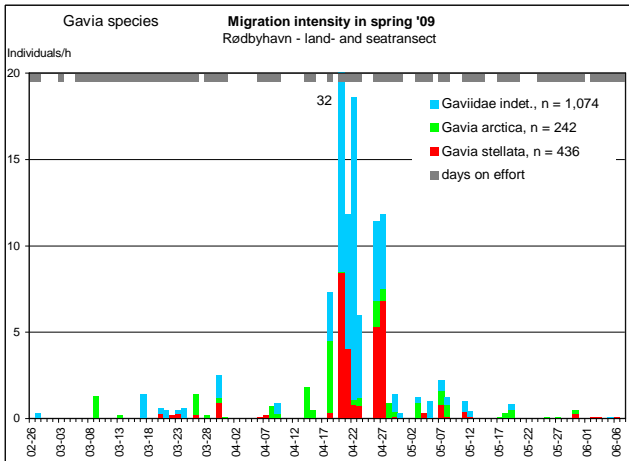
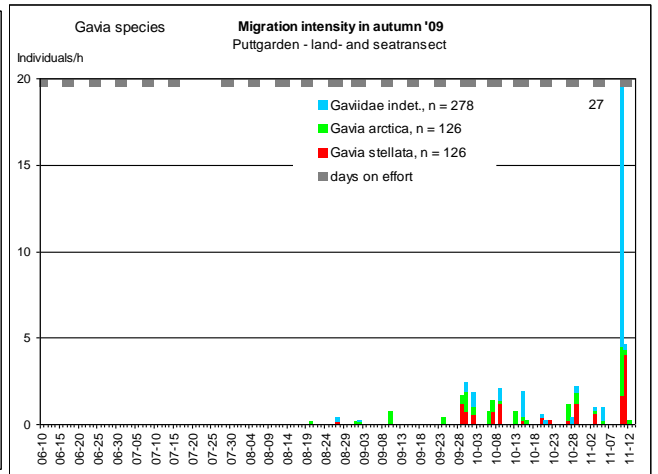
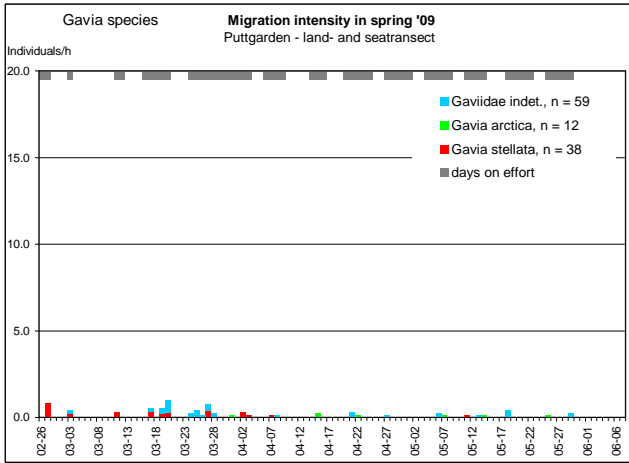
A.2.1 All species



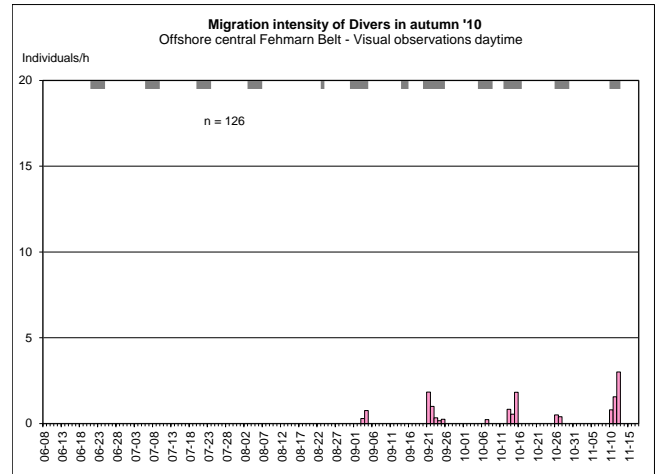
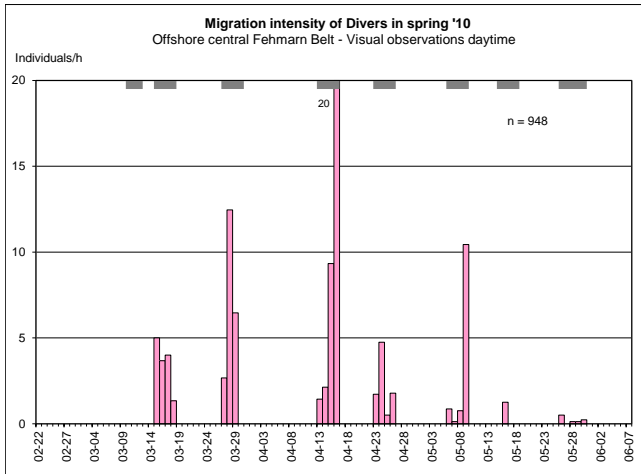
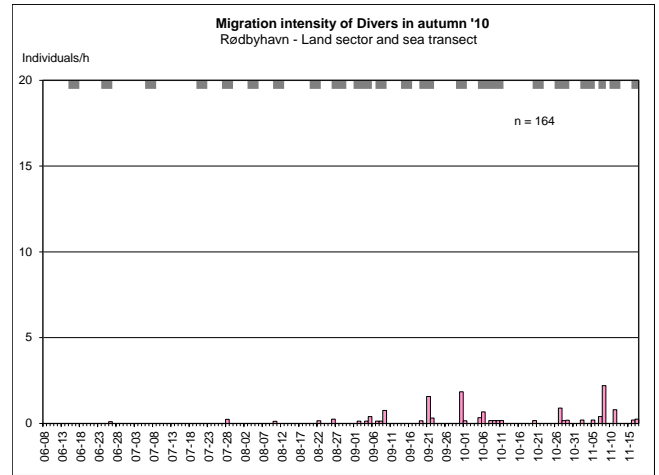
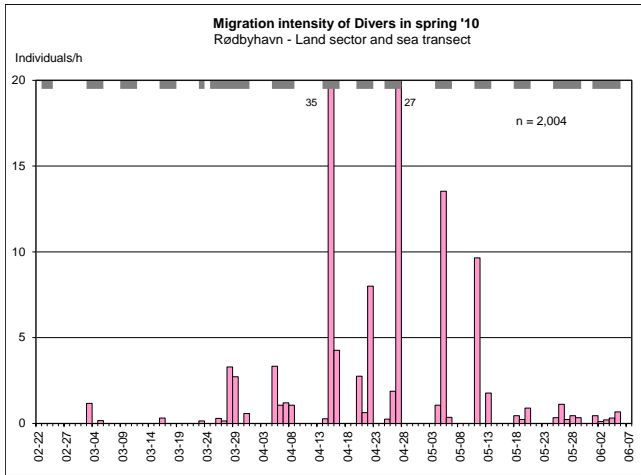
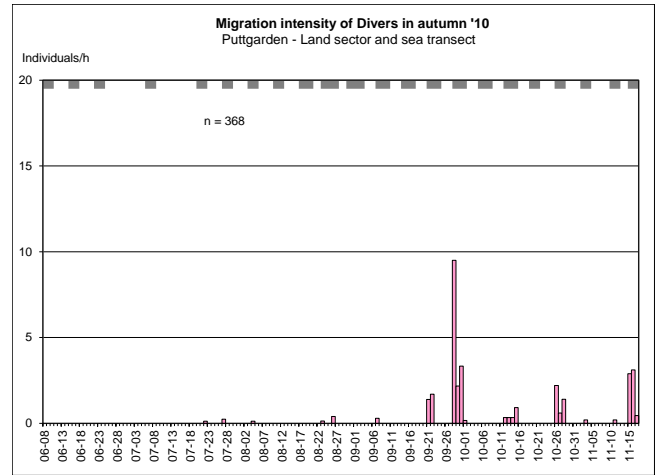
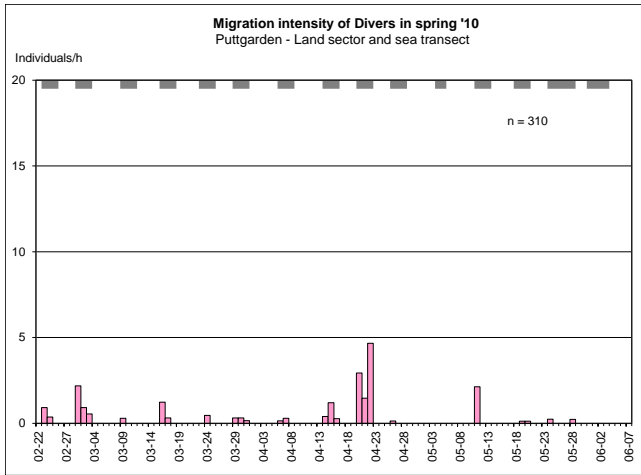
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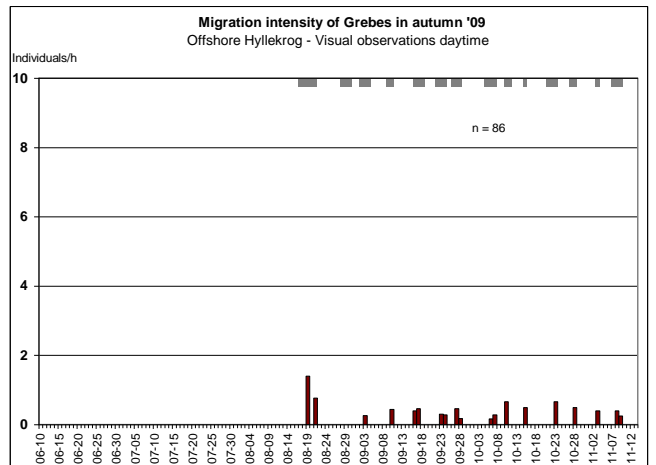
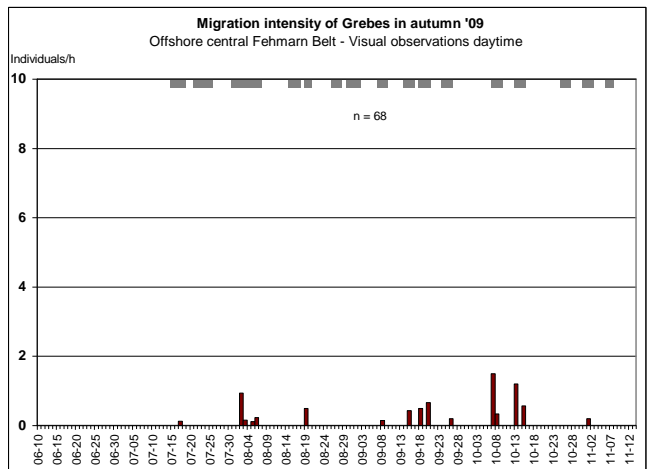
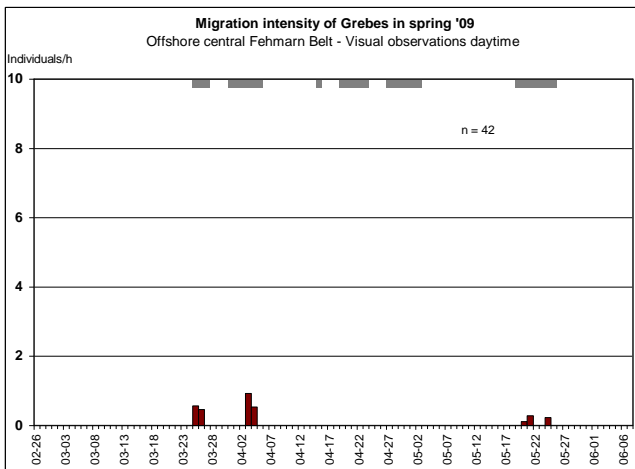
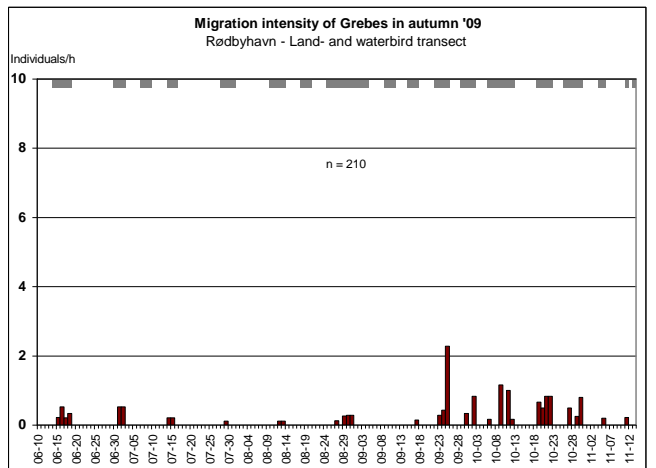
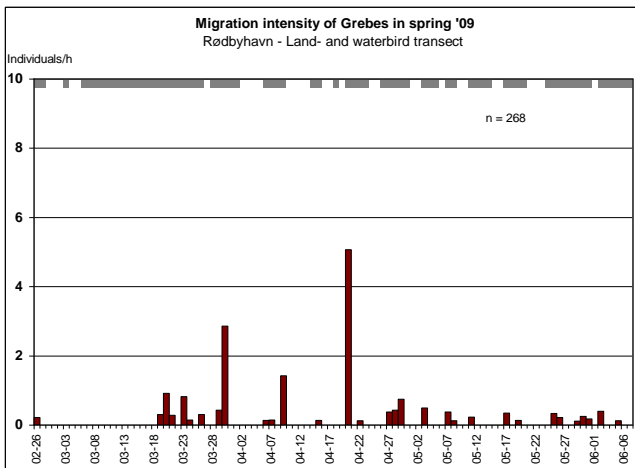
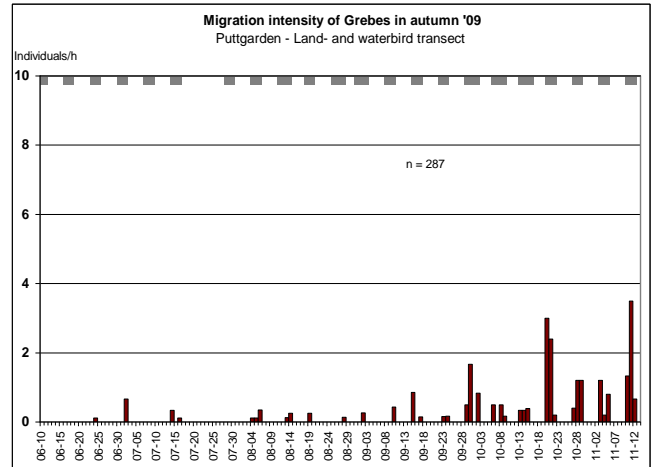
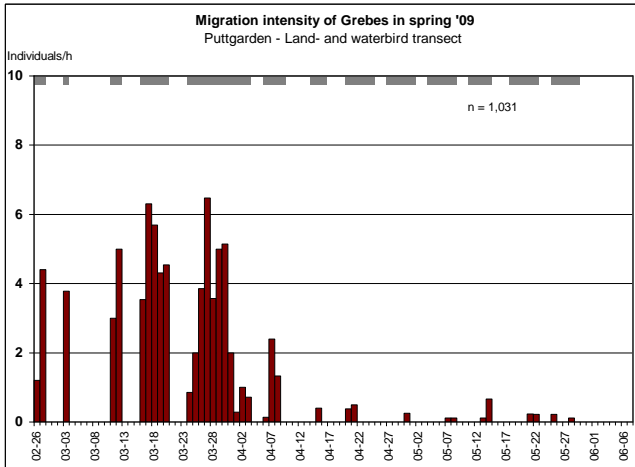
A.2.2 Divers – Gavia spp.



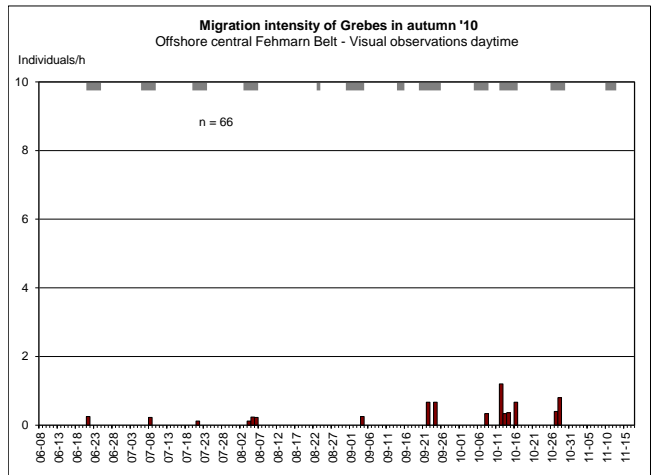
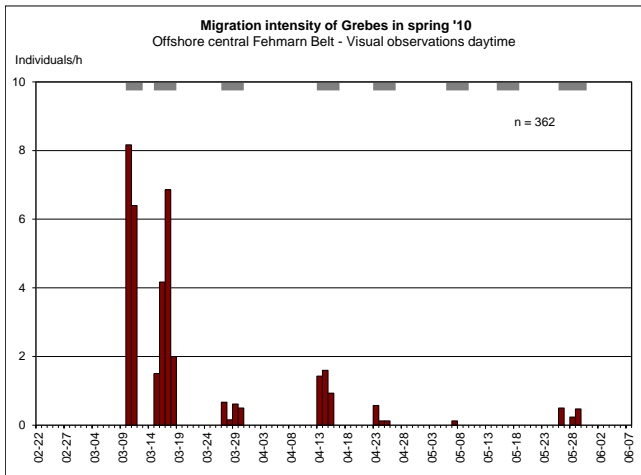
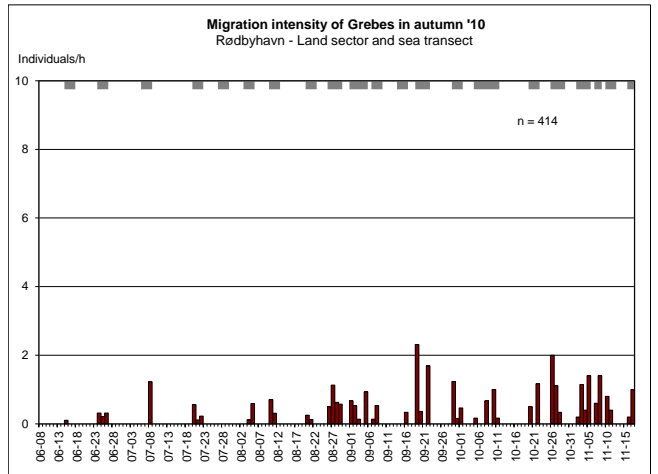
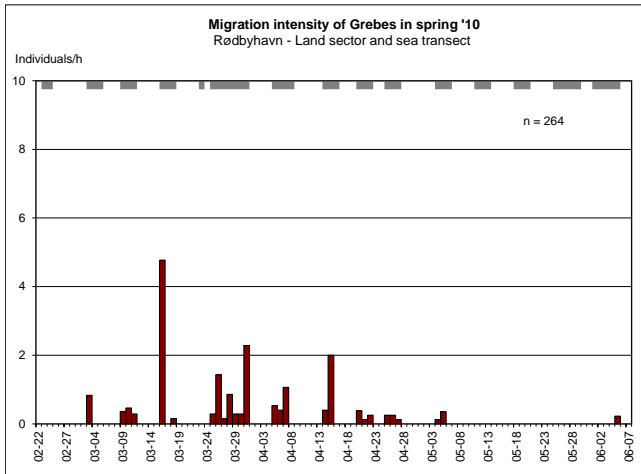
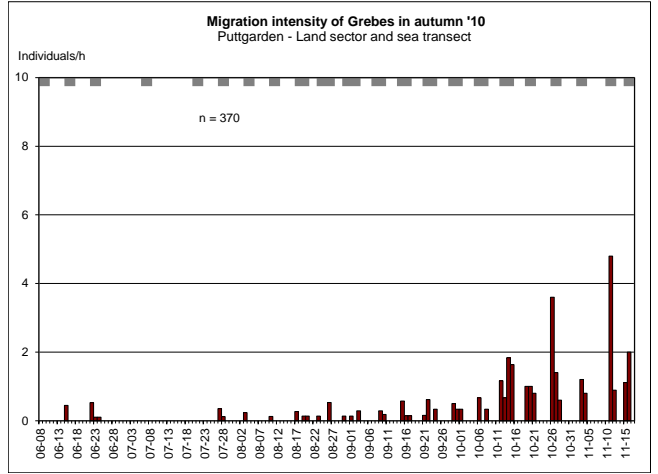
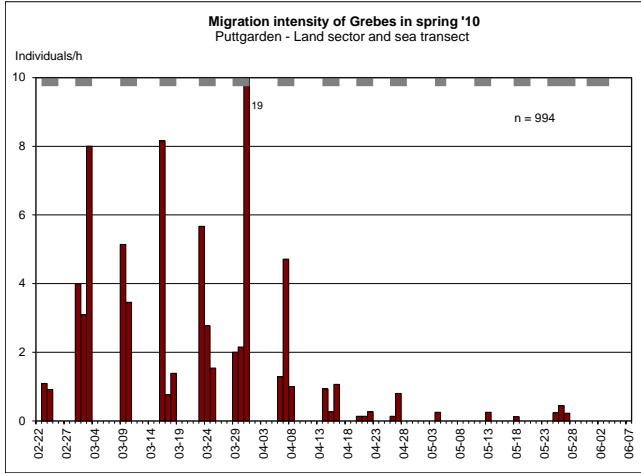
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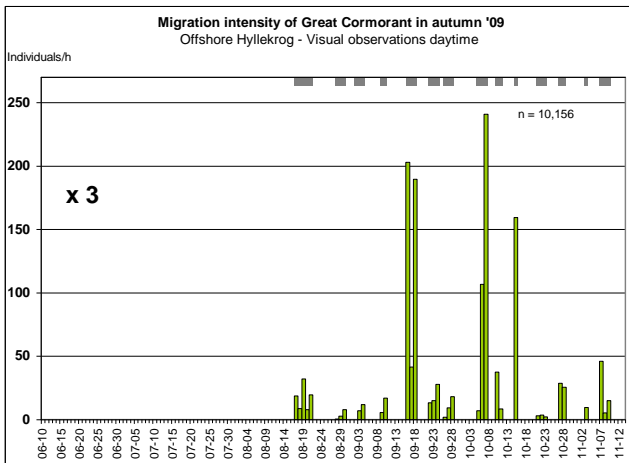
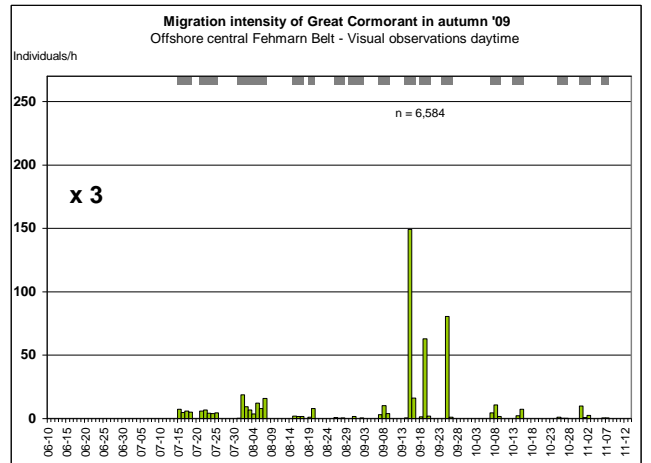
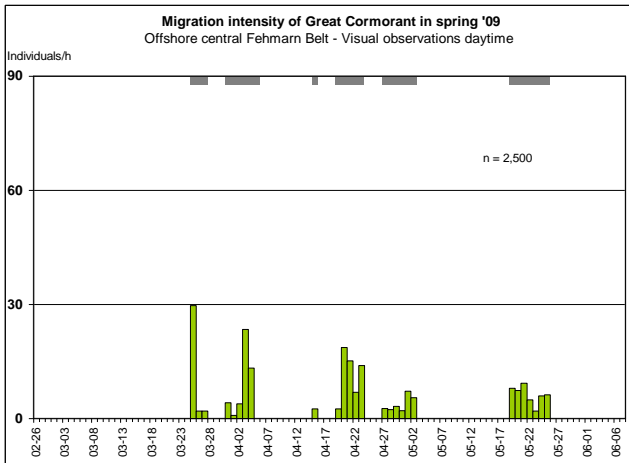
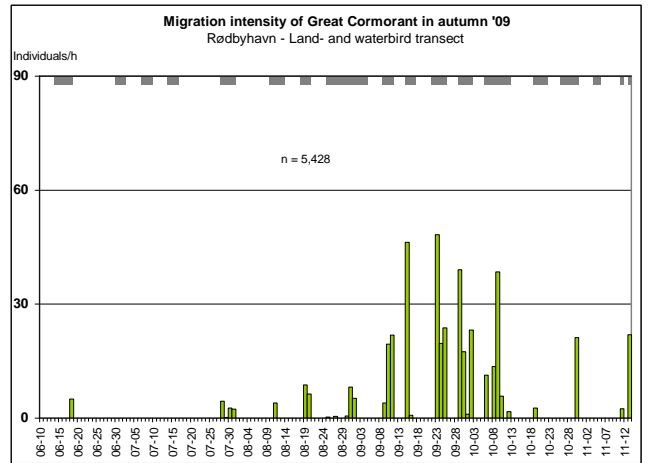
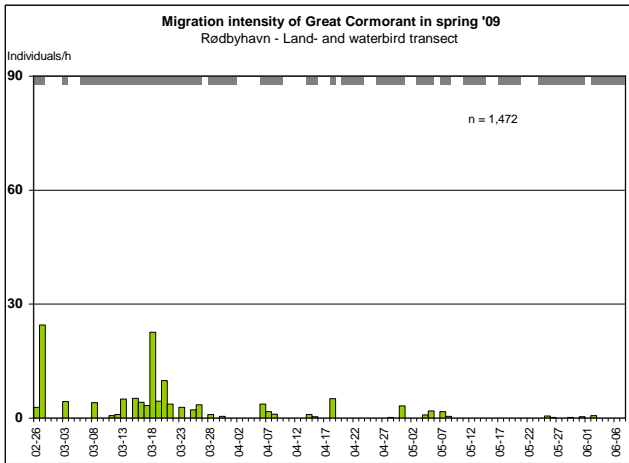
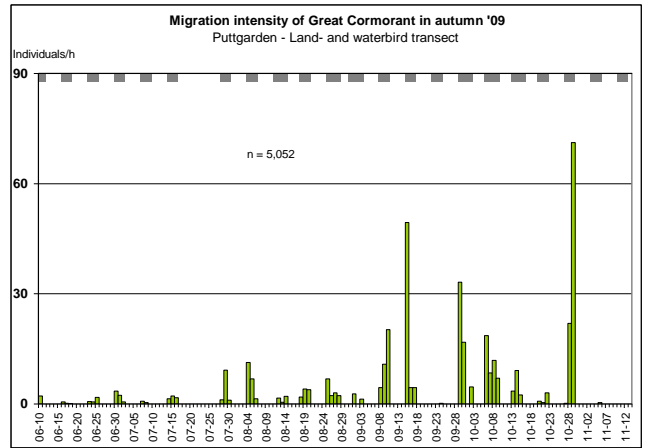
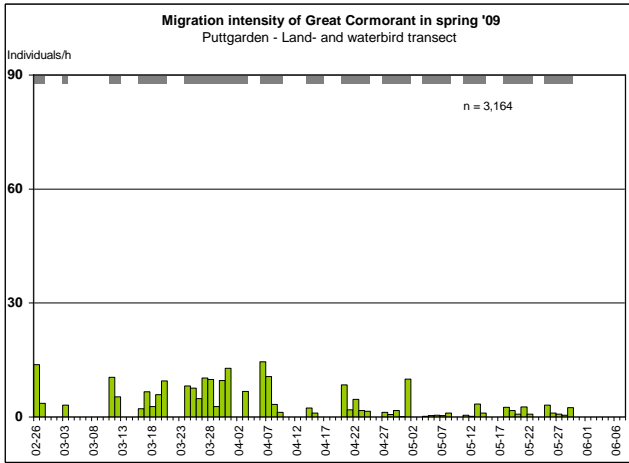
A.2.3 Grebes – Podiceps spp.



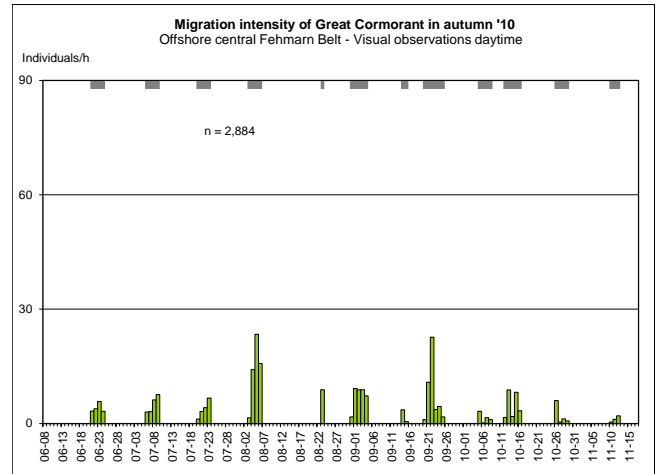
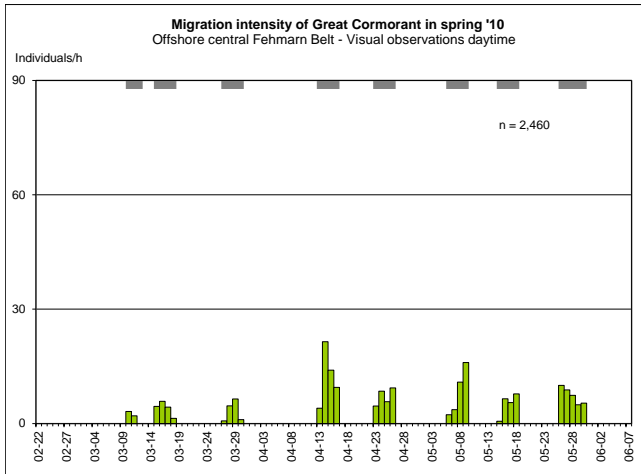
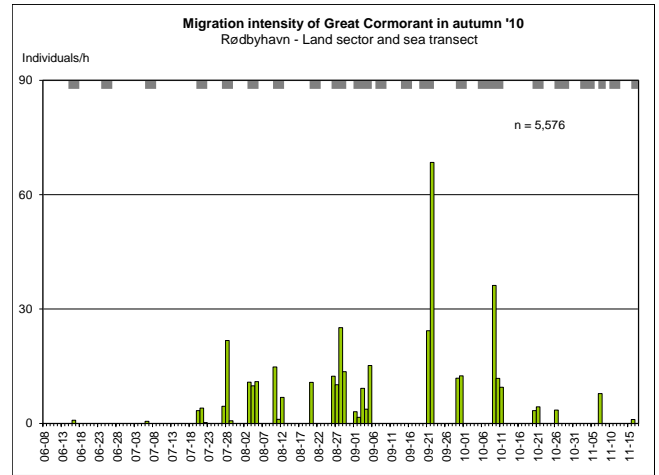
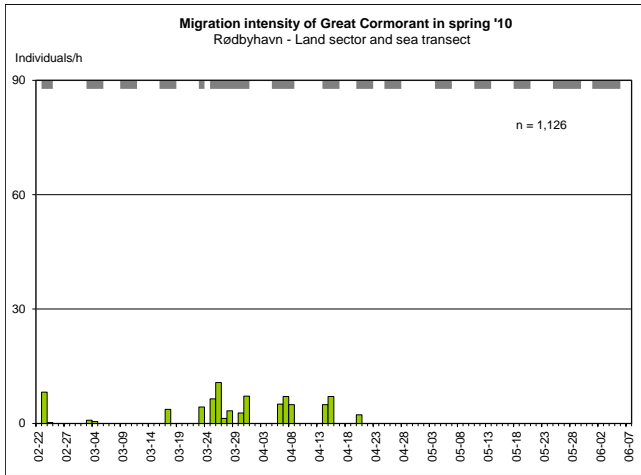
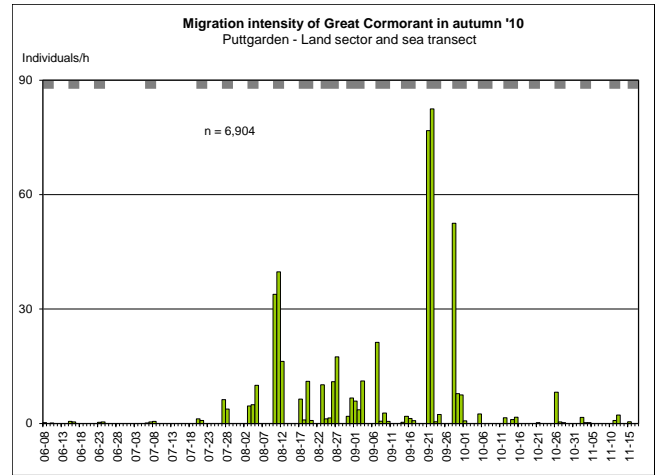
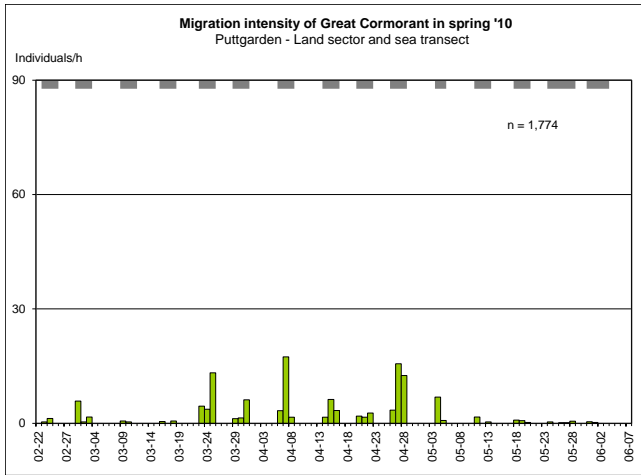
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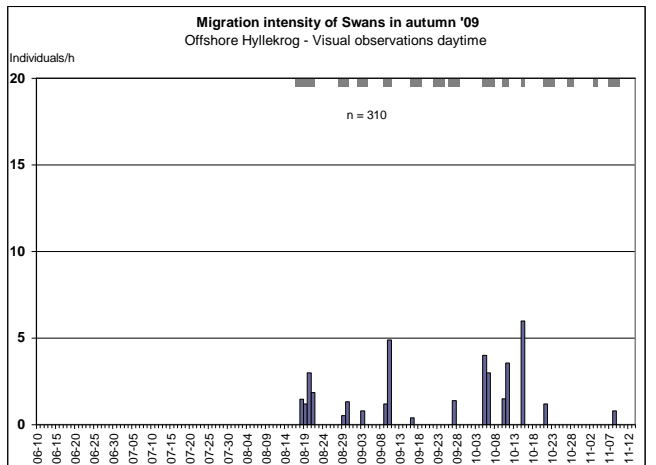
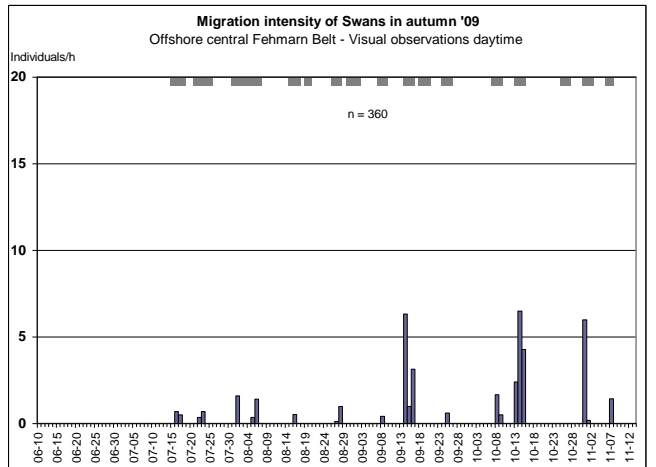
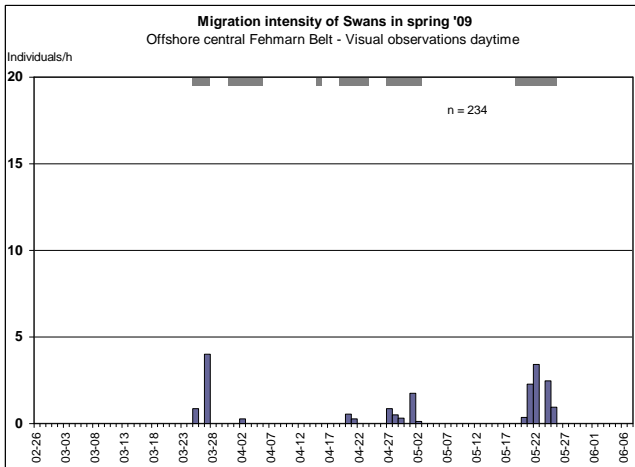
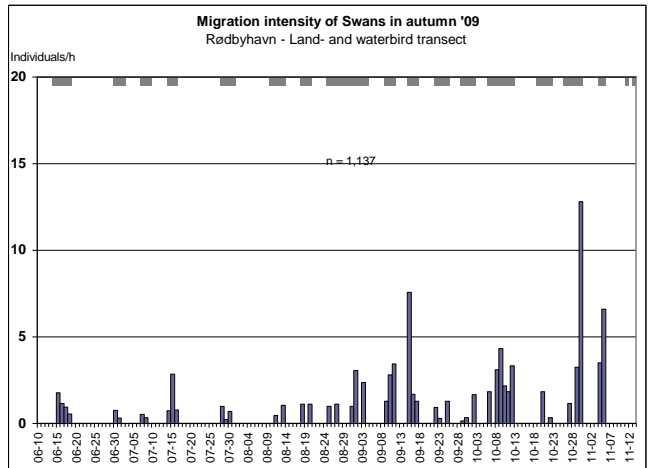
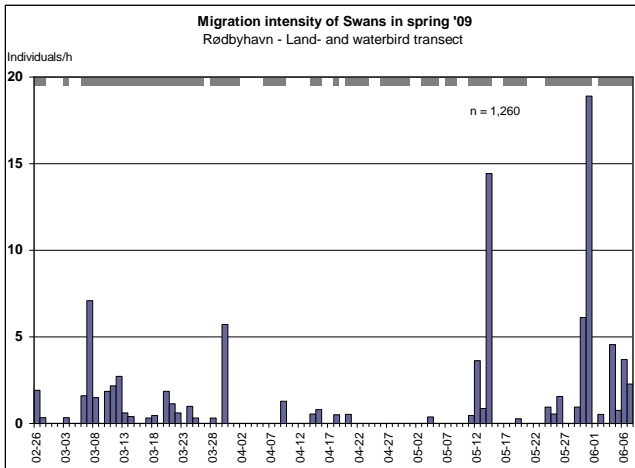
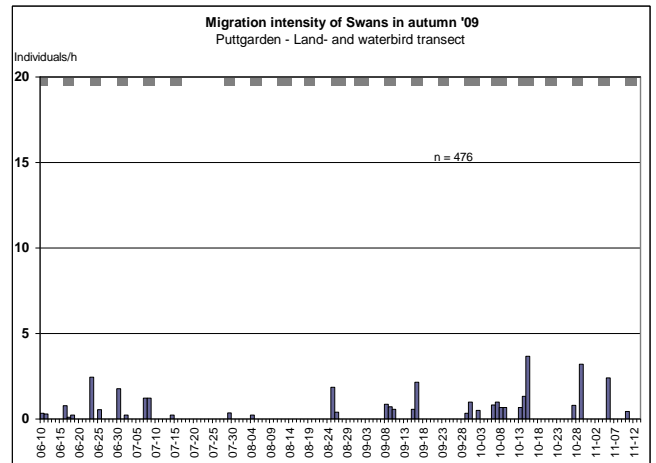
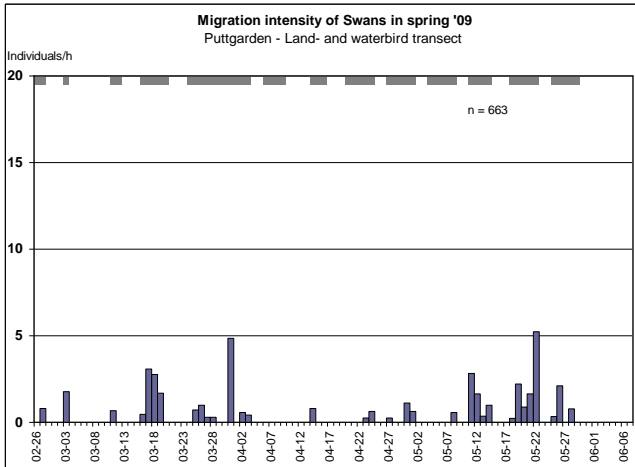
A.2.4 Great Cormorant – *Phalacrocorax carbo*



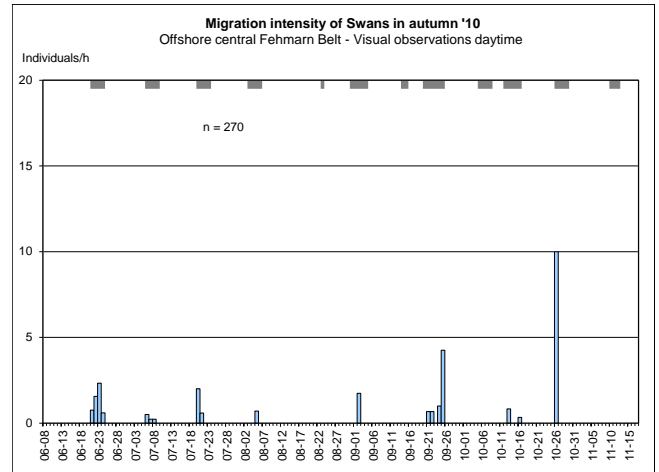
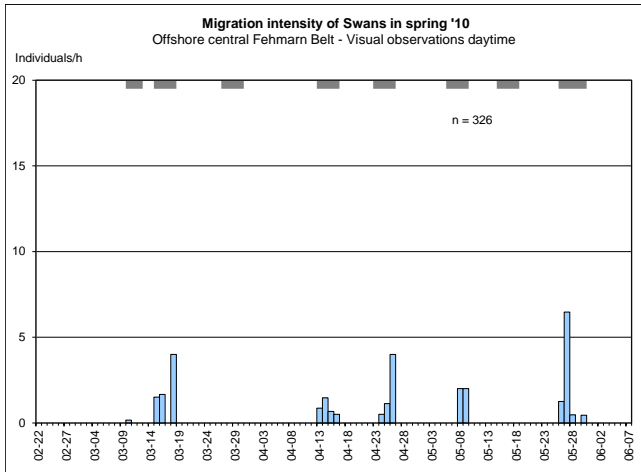
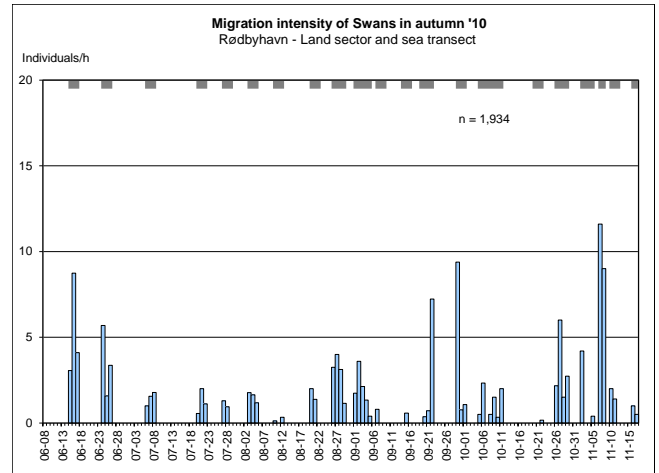
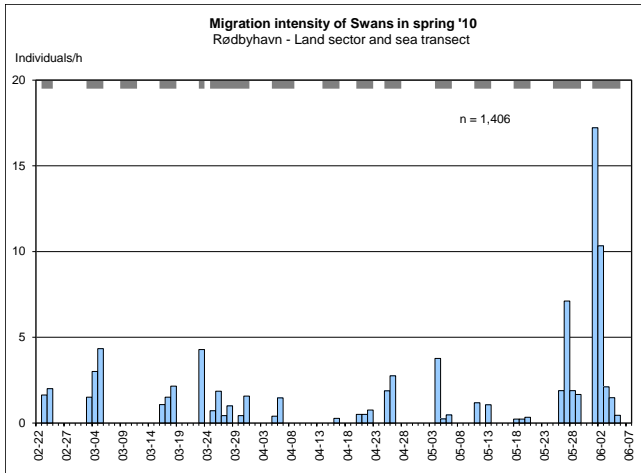
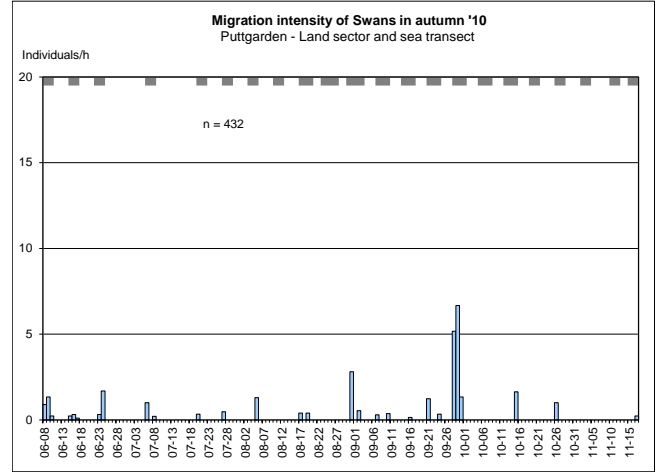
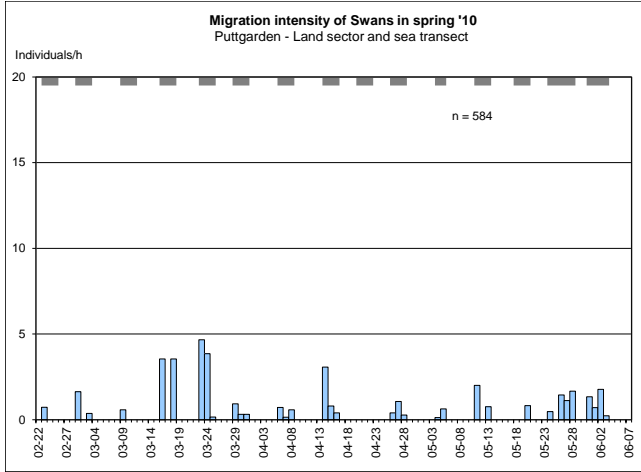
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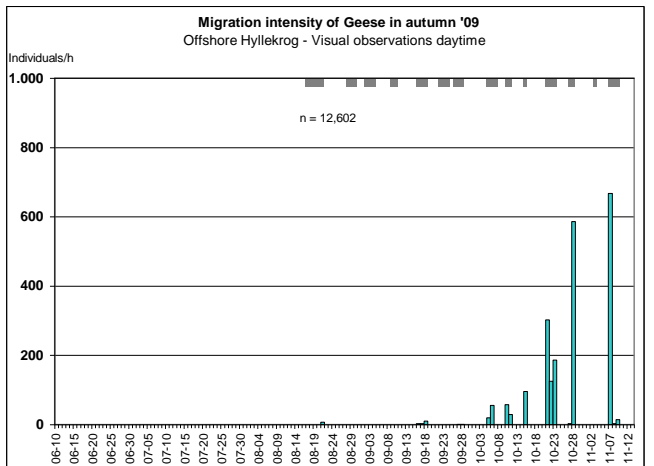
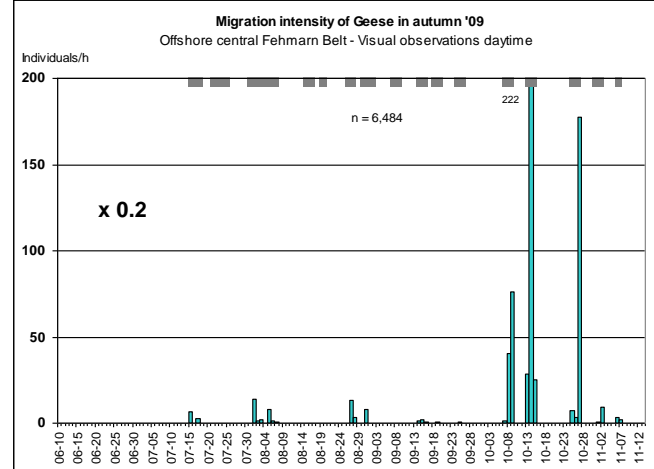
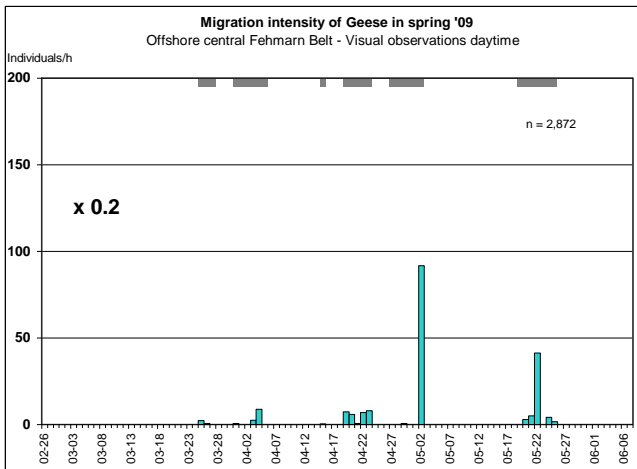
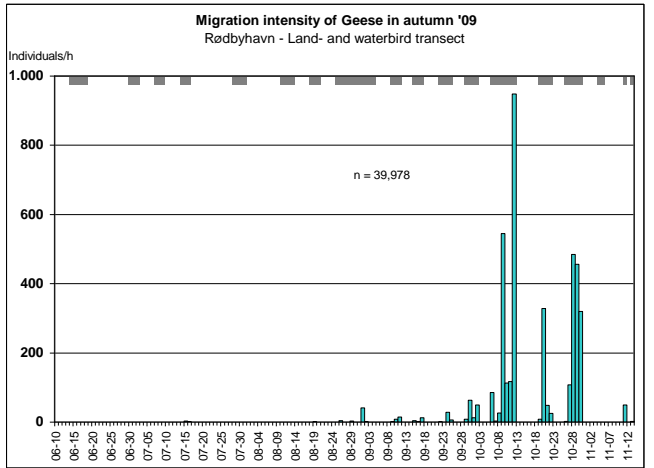
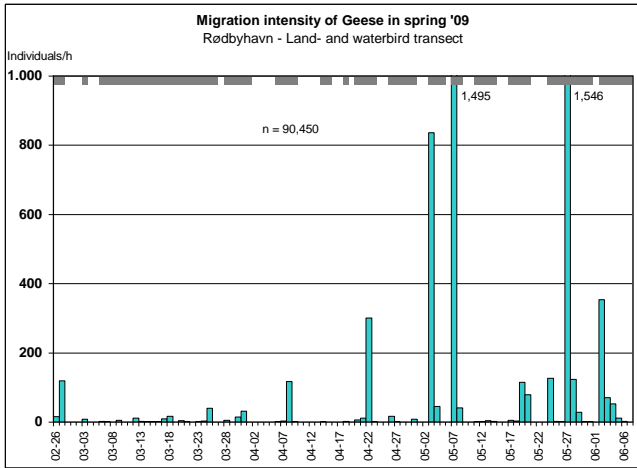
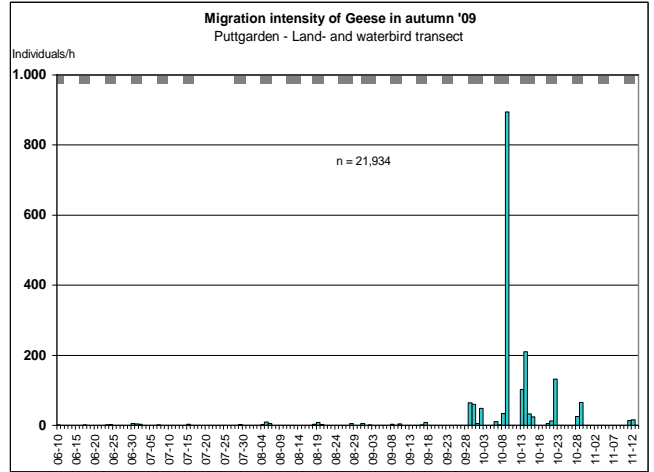
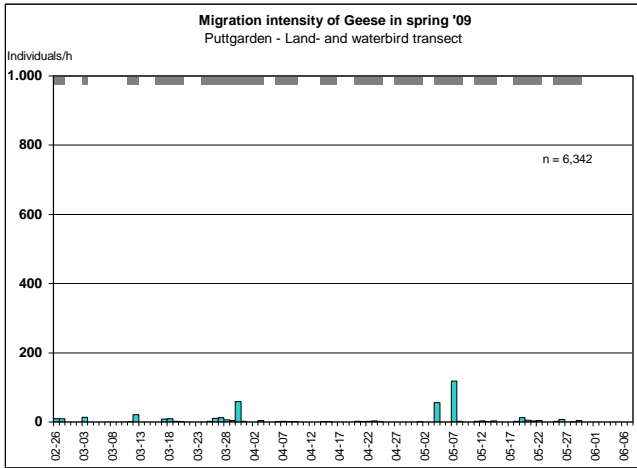
A.2.5 Swans – *Cygnus* spp.



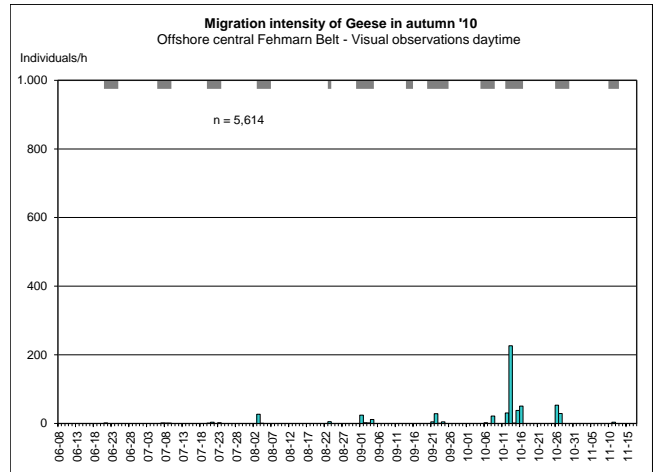
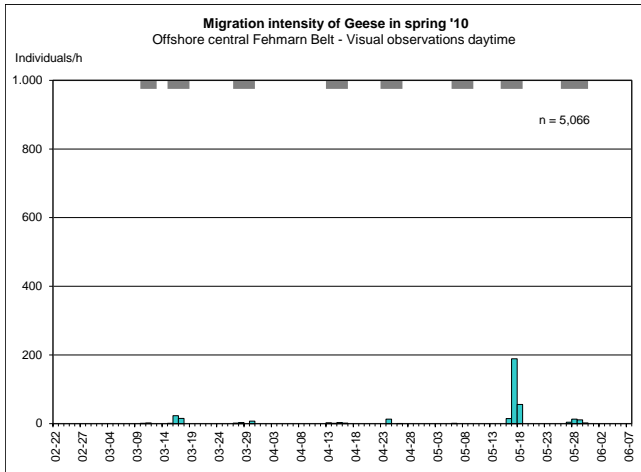
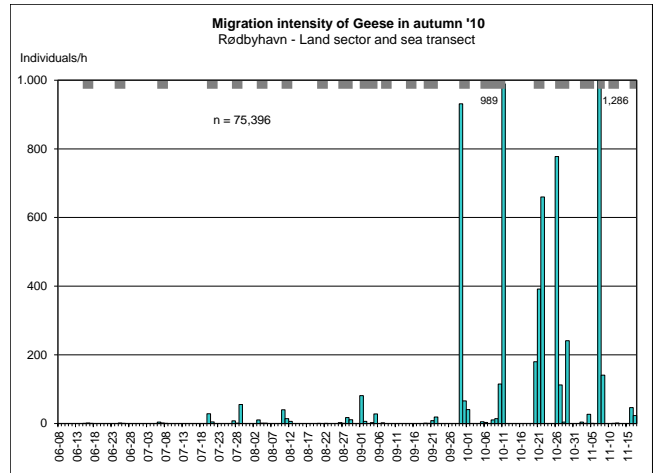
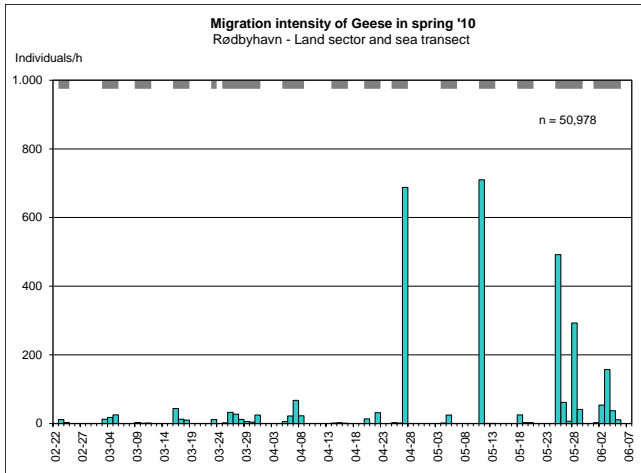
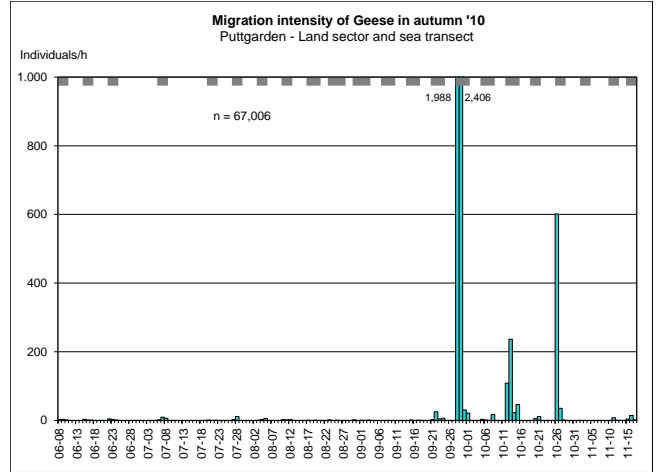
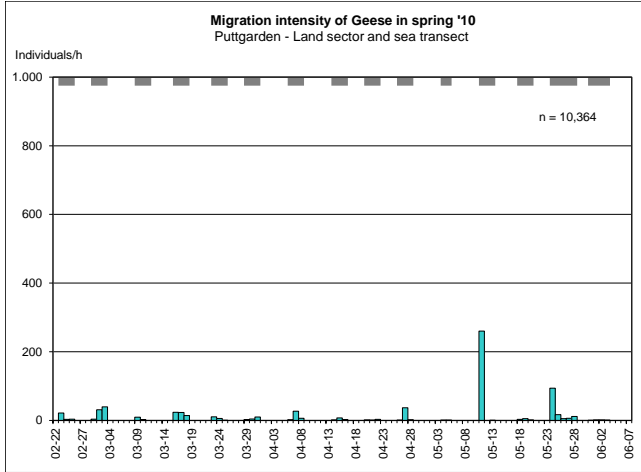
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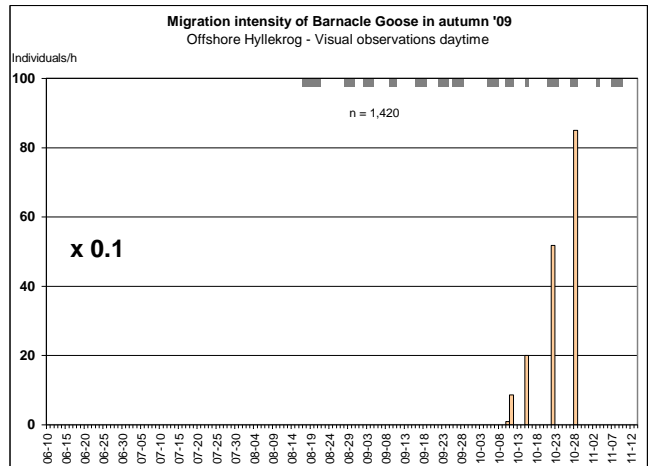
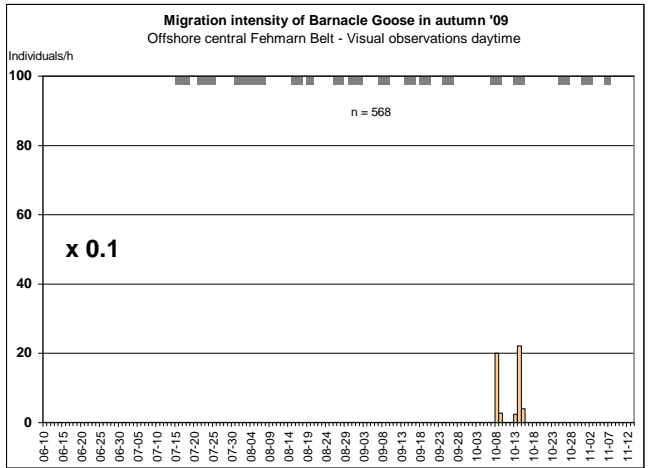
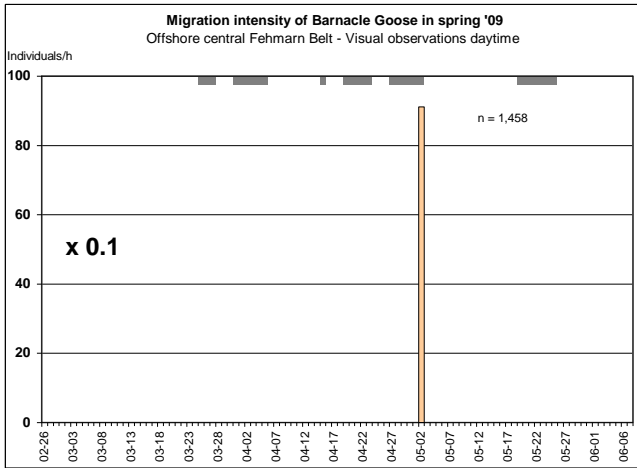
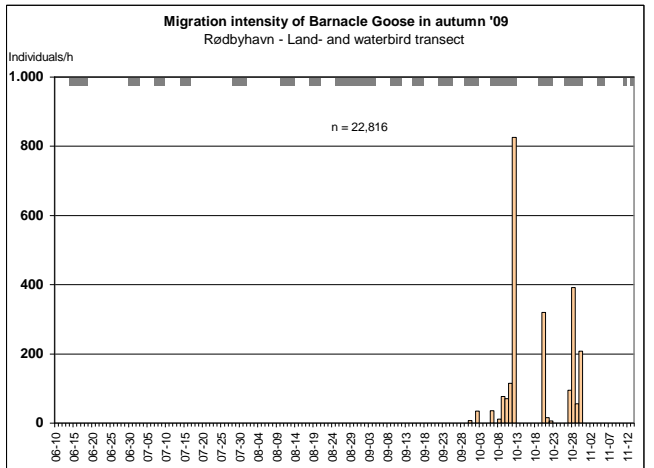
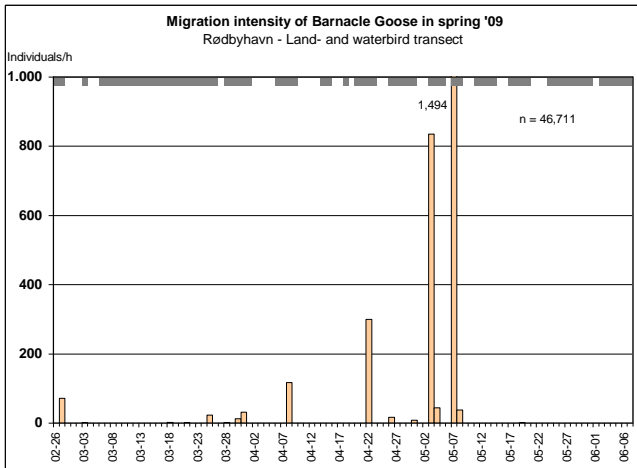
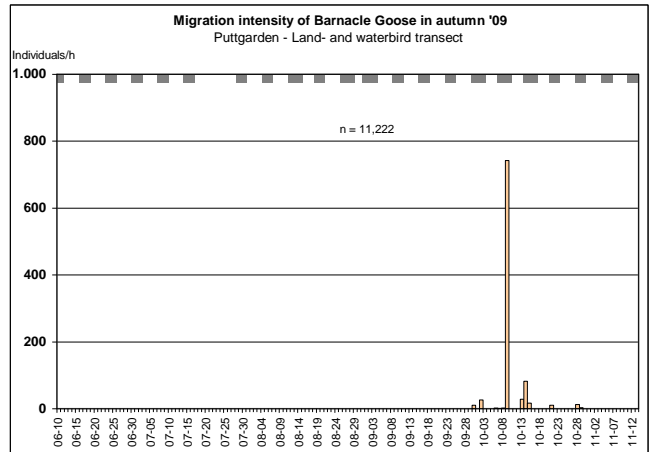
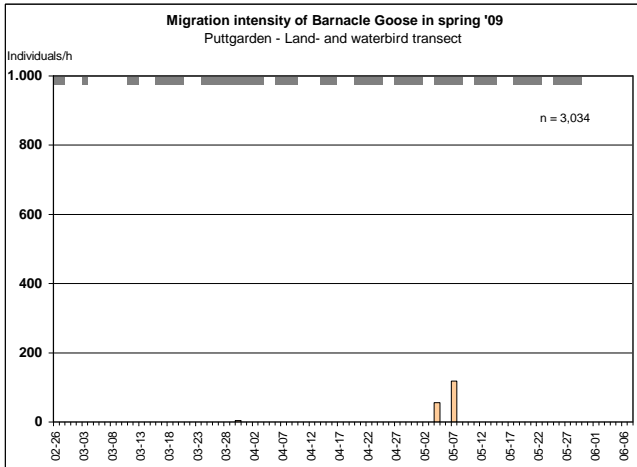
A.2.6 Geese



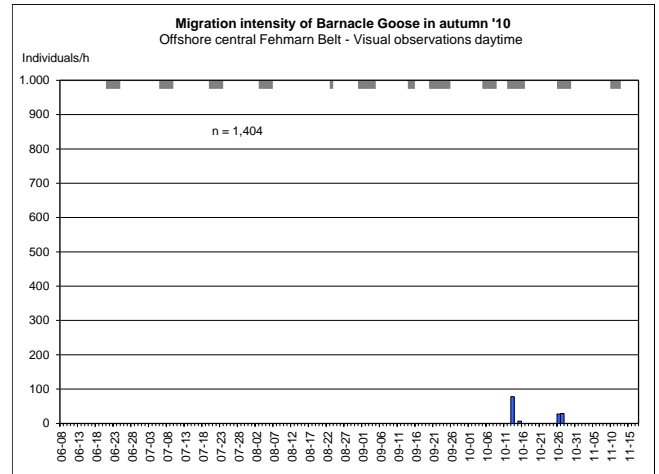
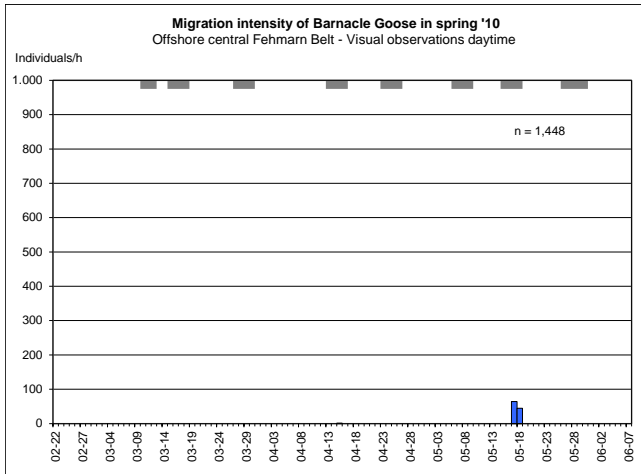
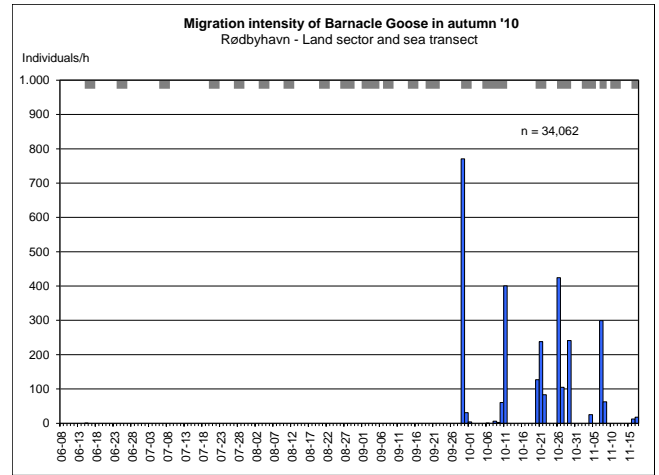
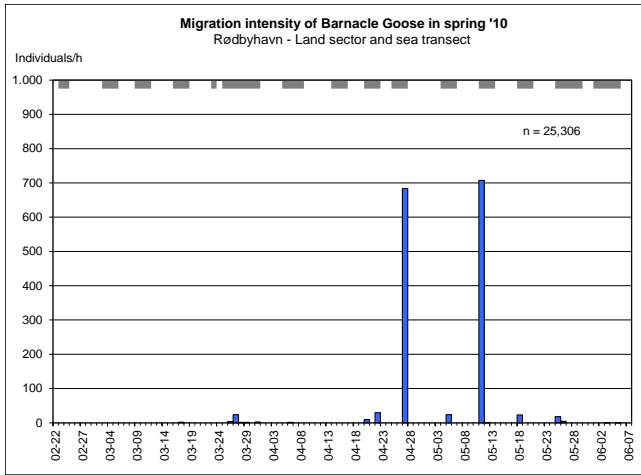
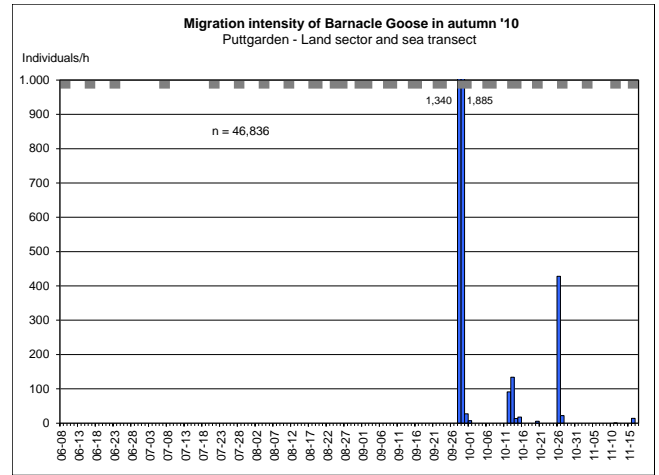
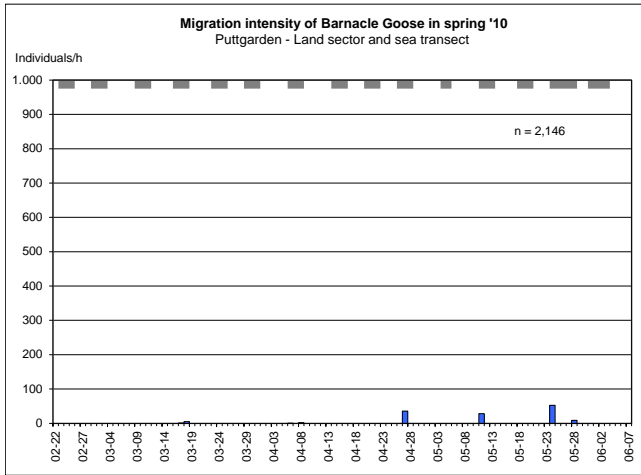
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Barnacle Goose – *Branta leucopsis*

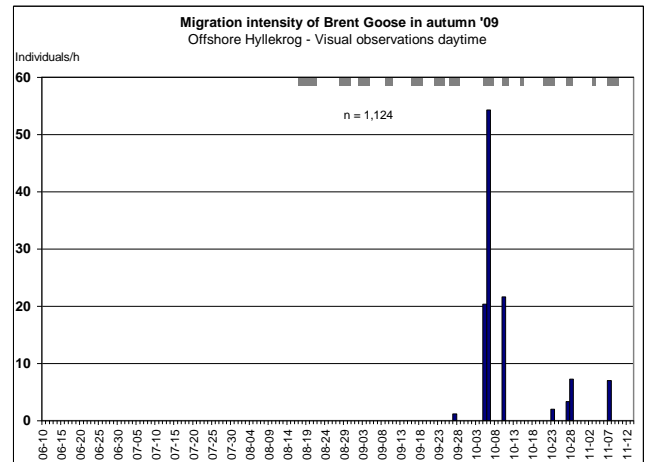
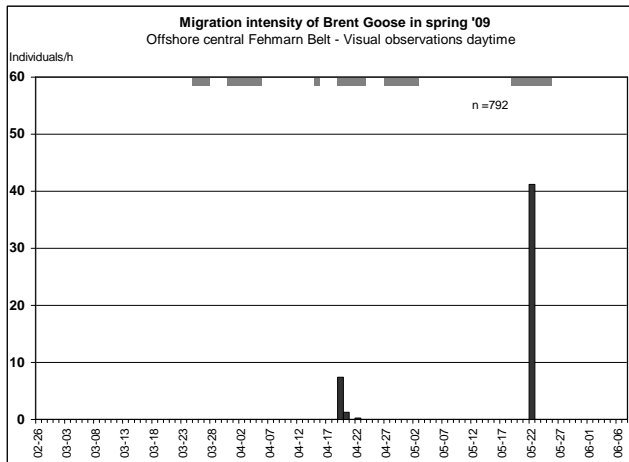
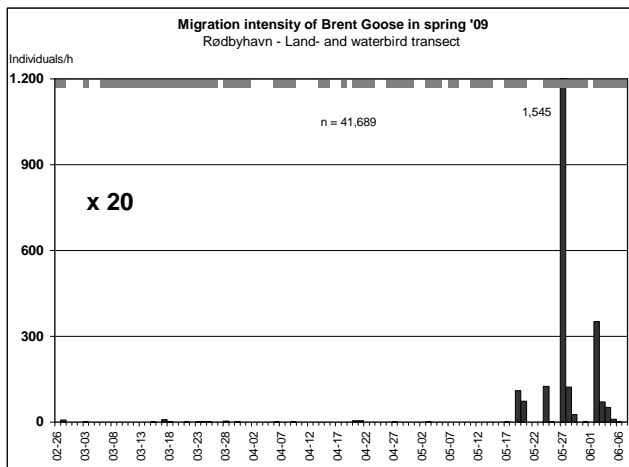
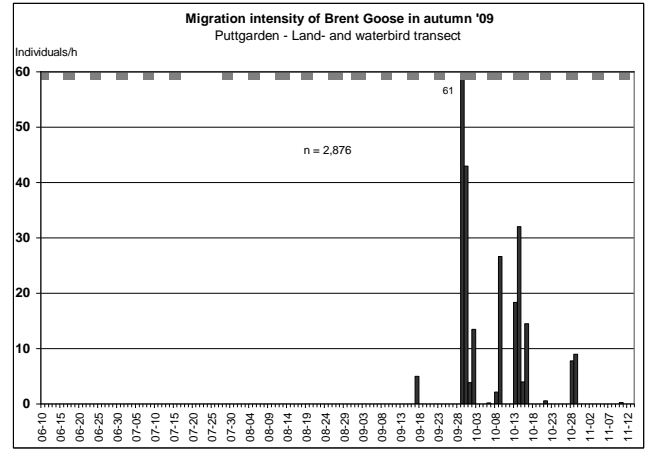


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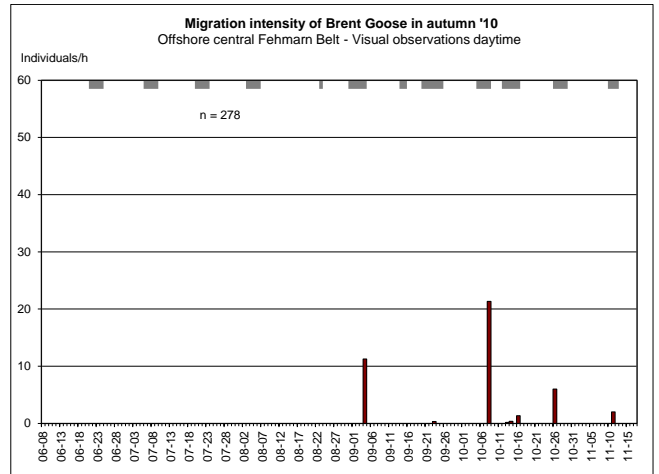
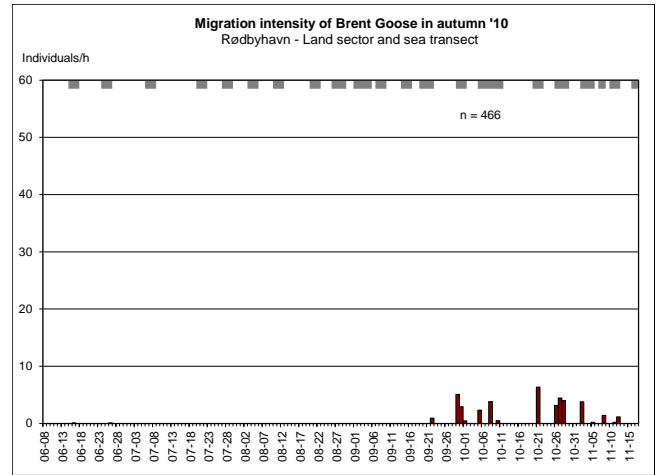
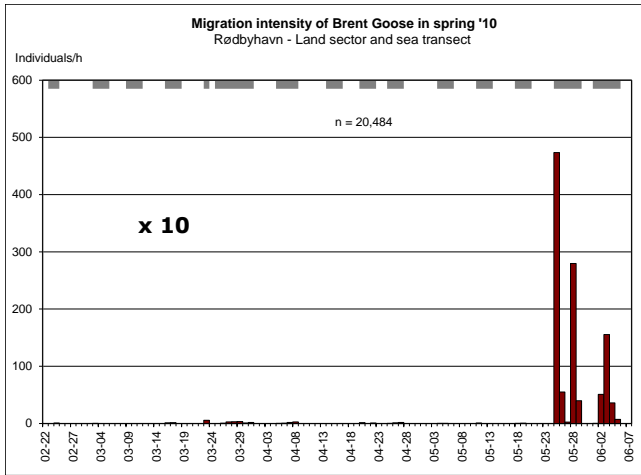
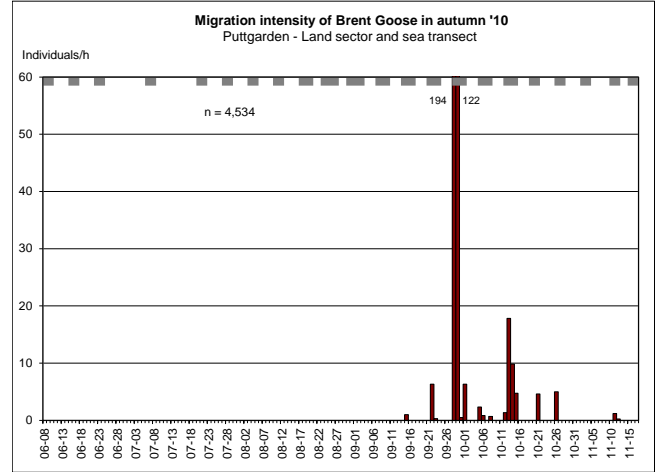
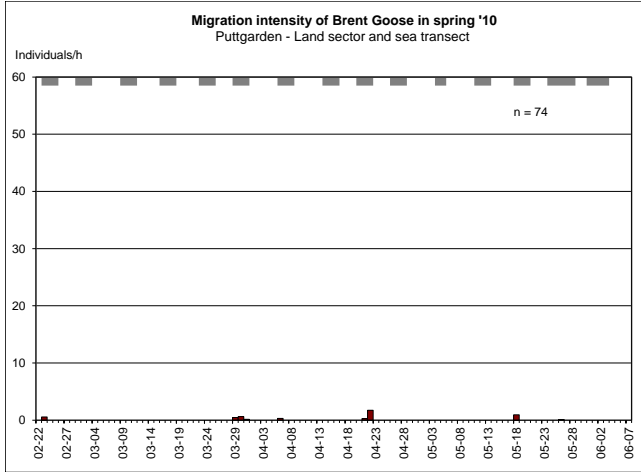


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Brent Goose – *Branta bernicla*

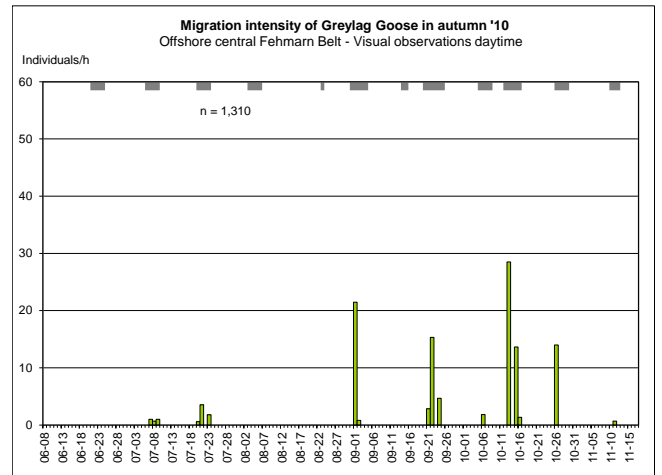
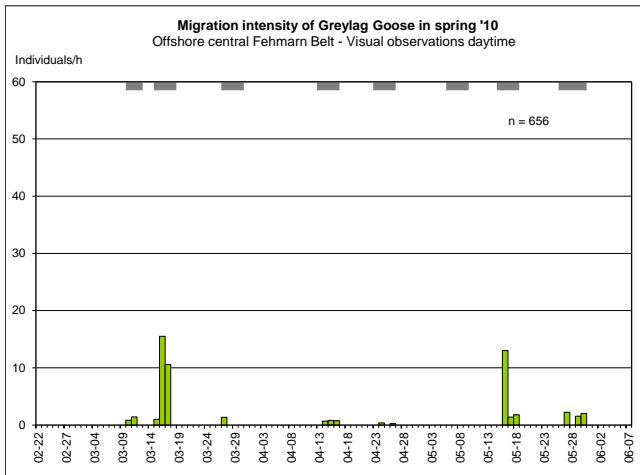
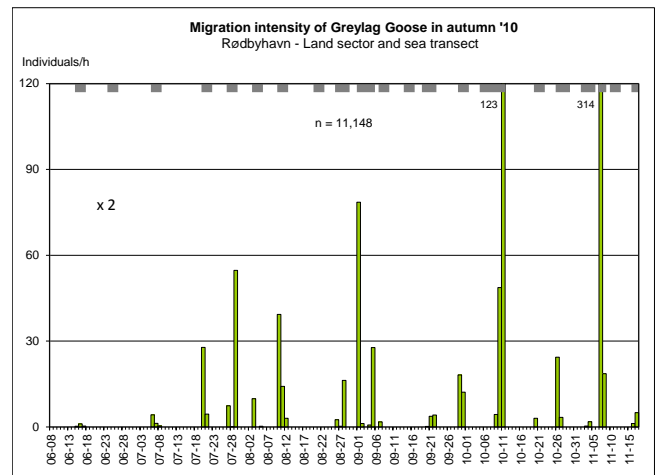
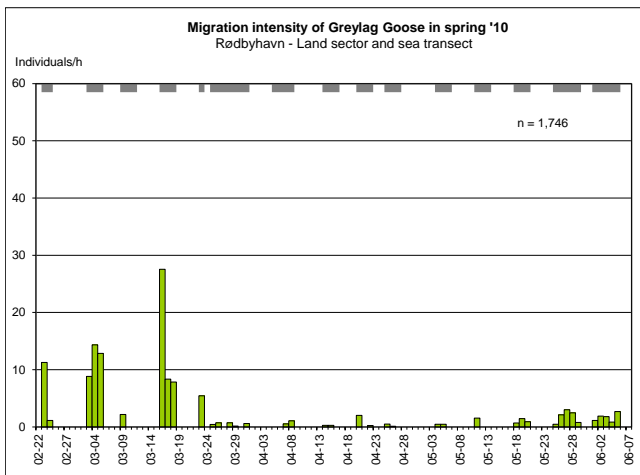
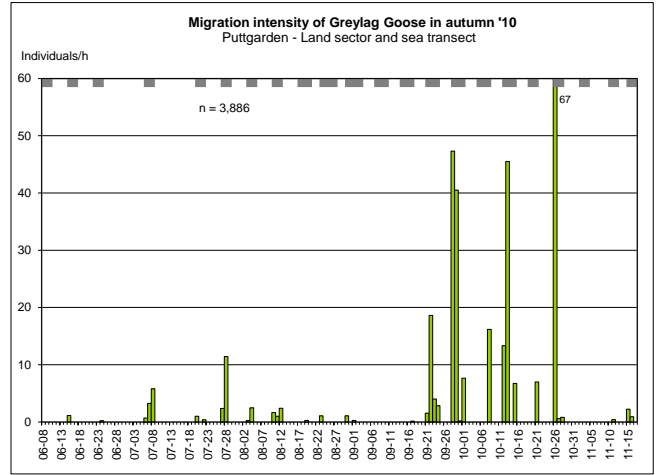
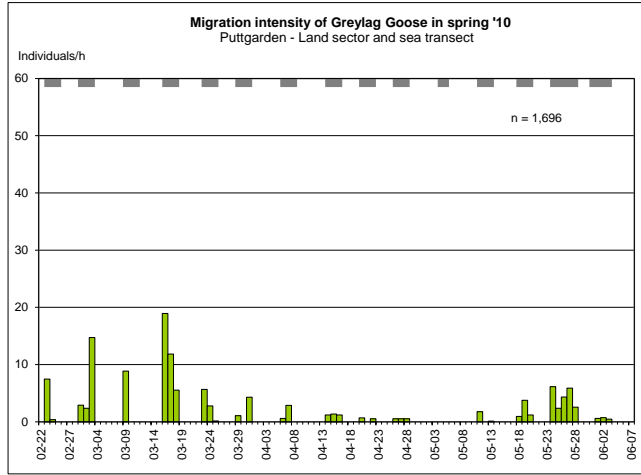


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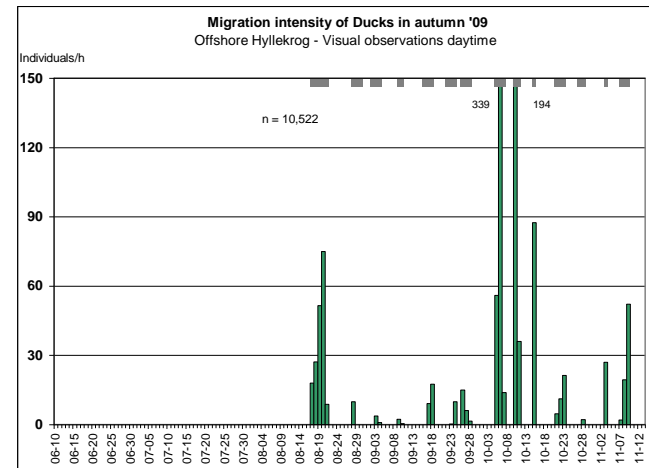
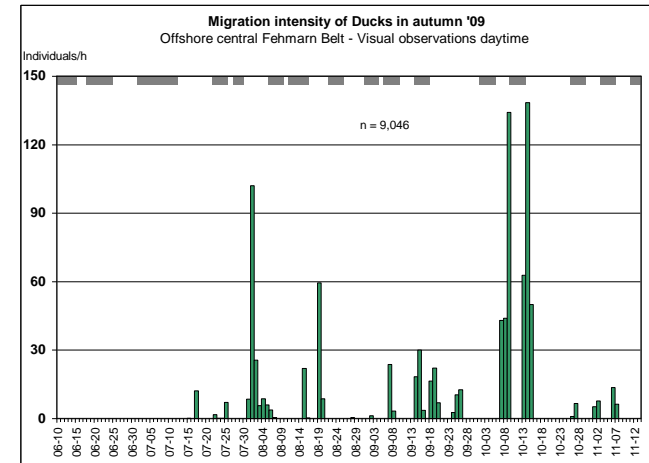
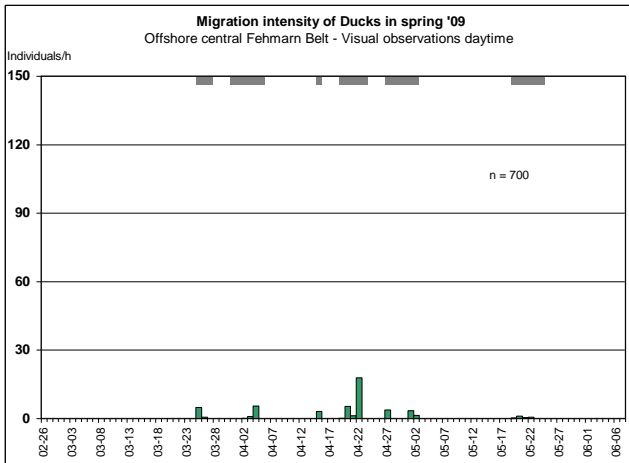
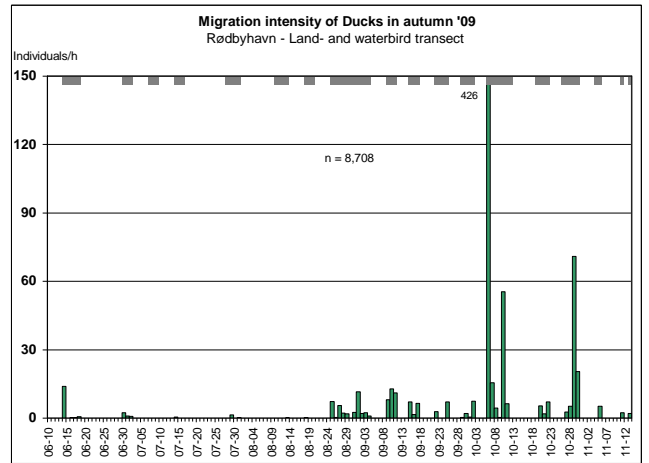
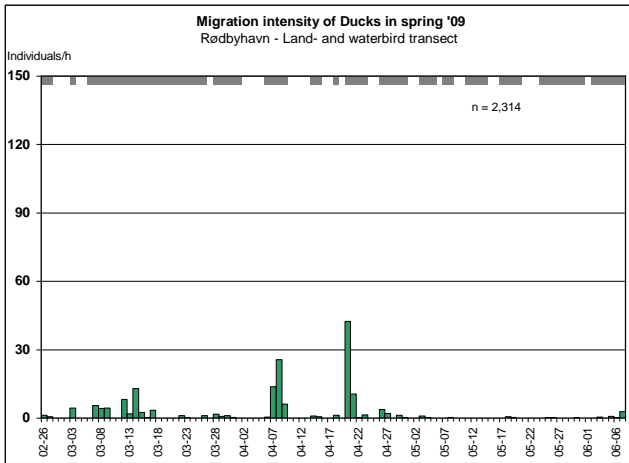
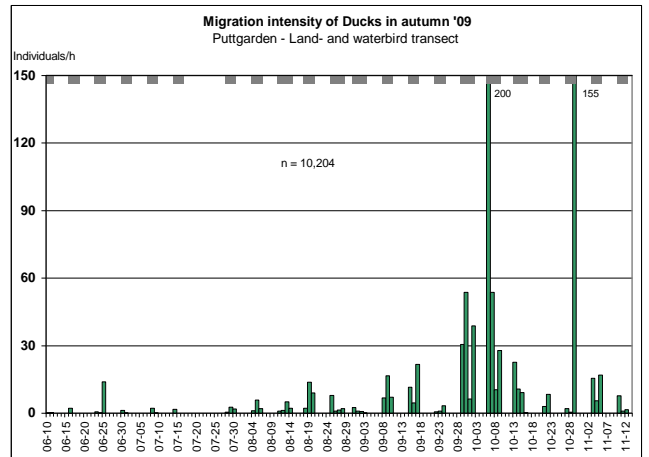
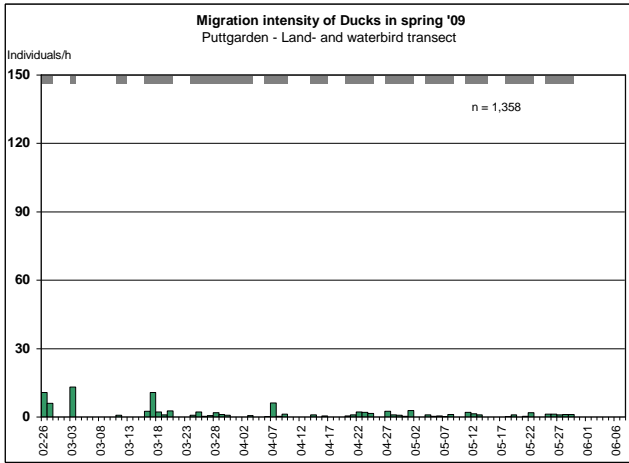


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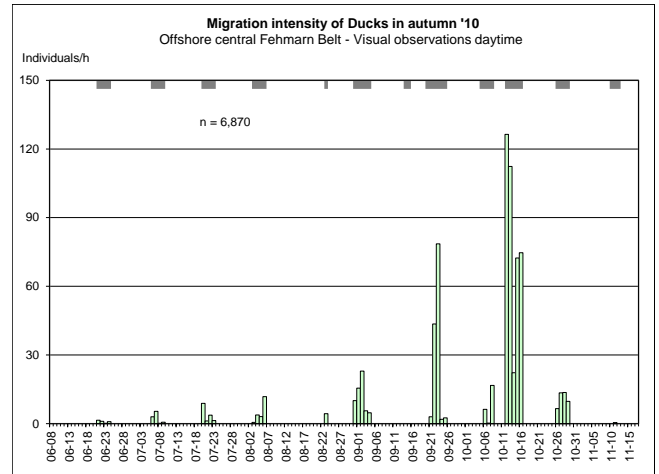
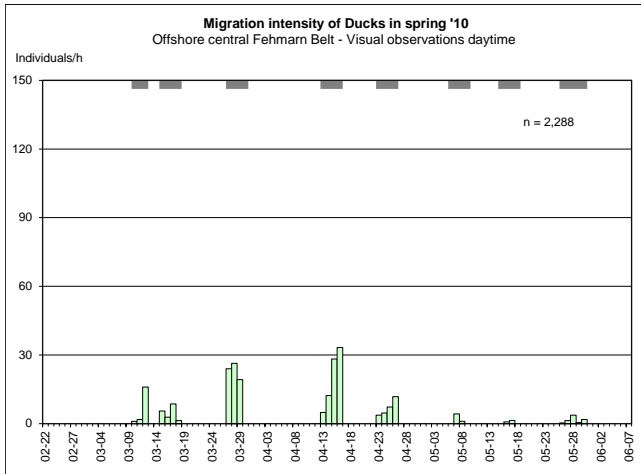
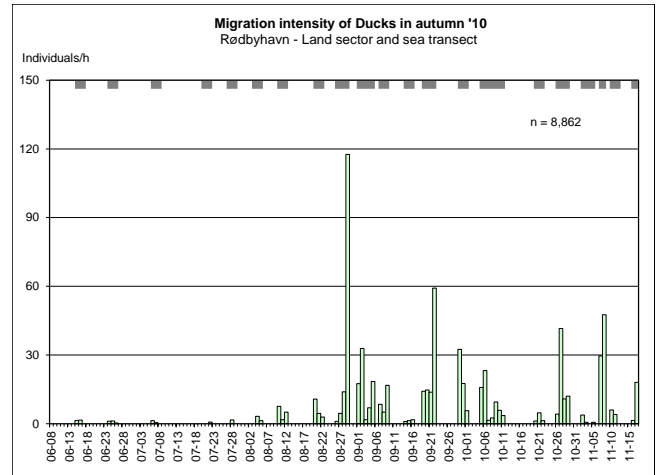
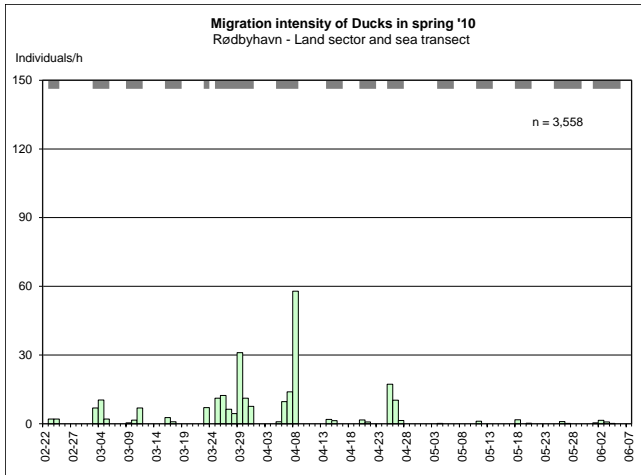
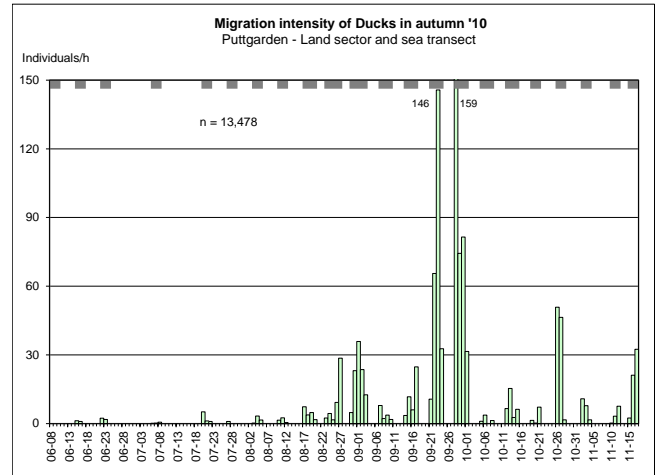
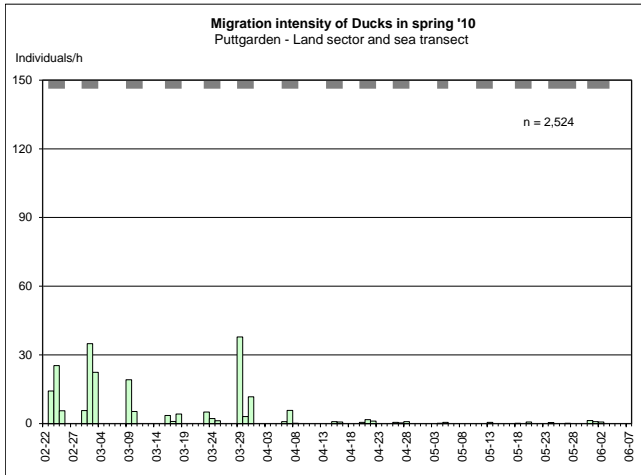
Greylag Goose – *Anser anser*



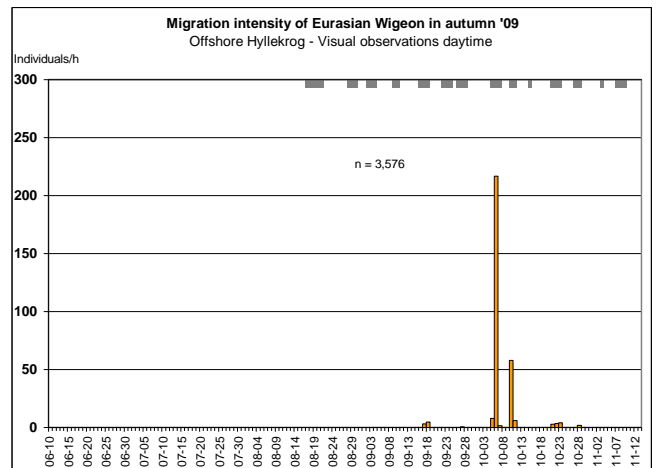
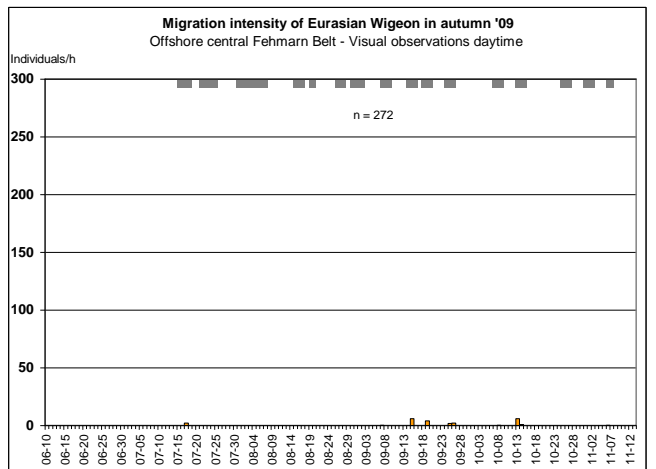
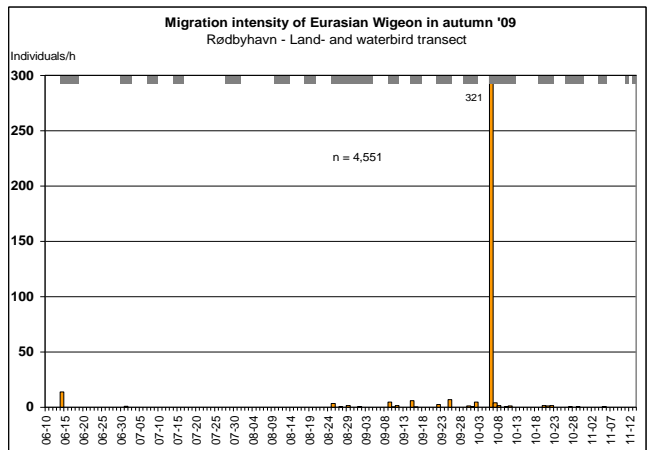
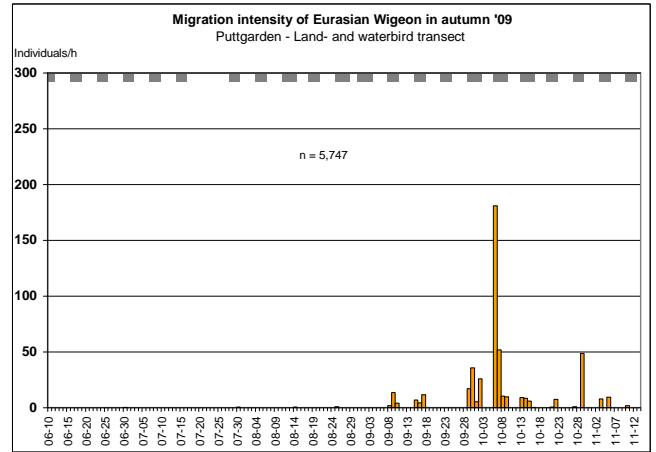
A.2.7 Ducks



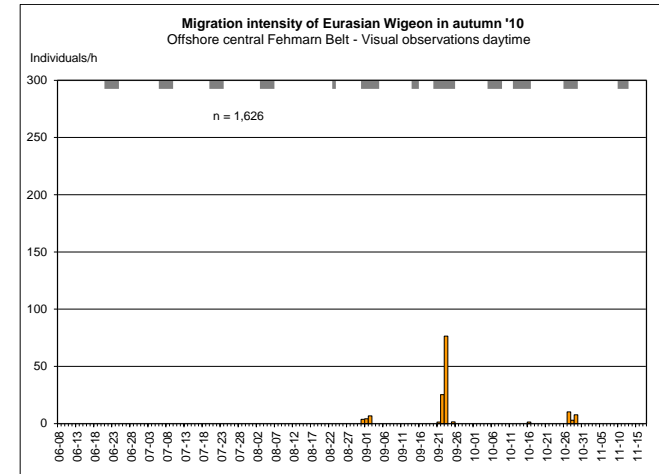
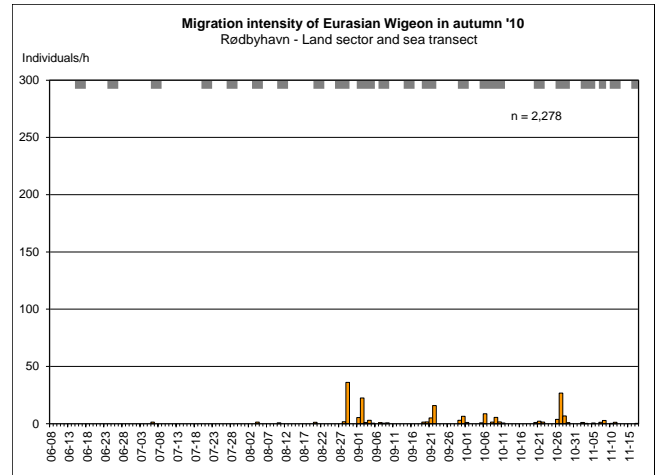
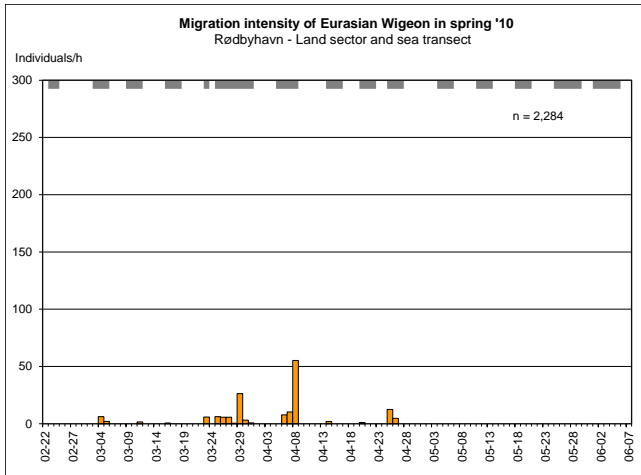
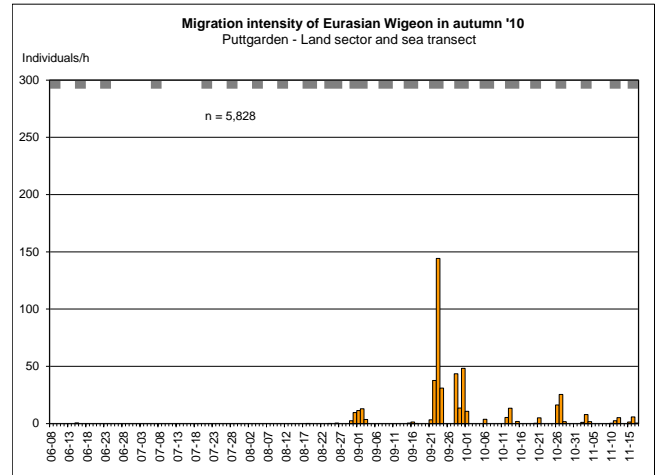
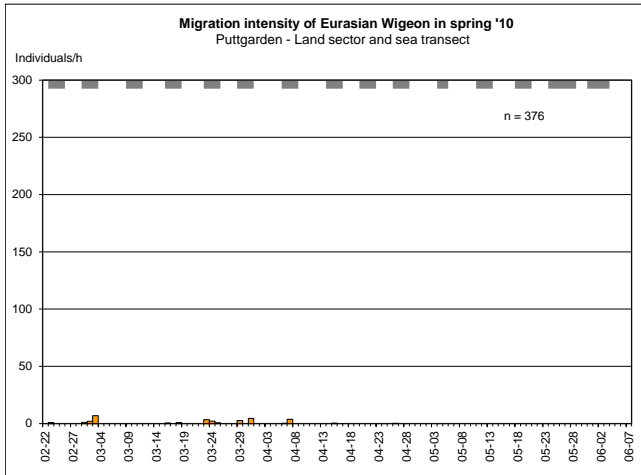
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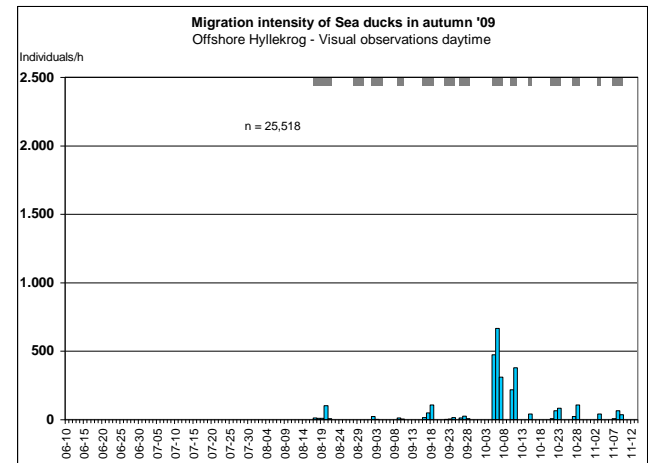
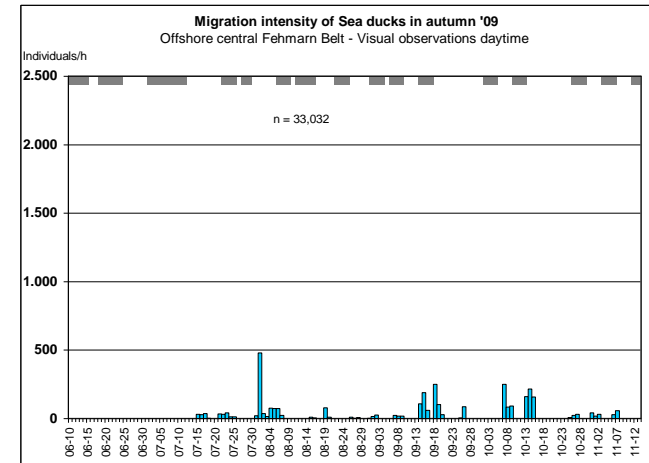
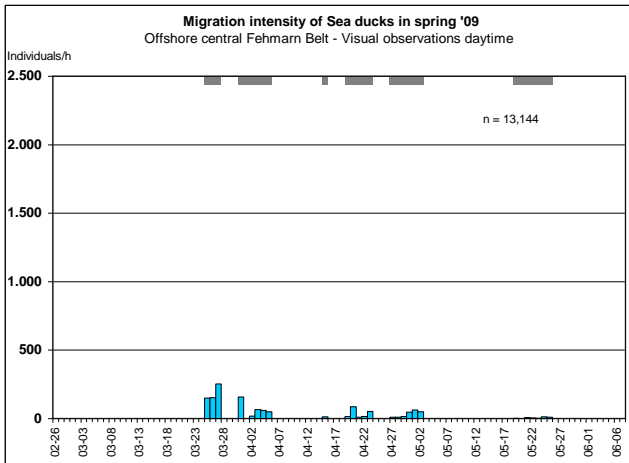
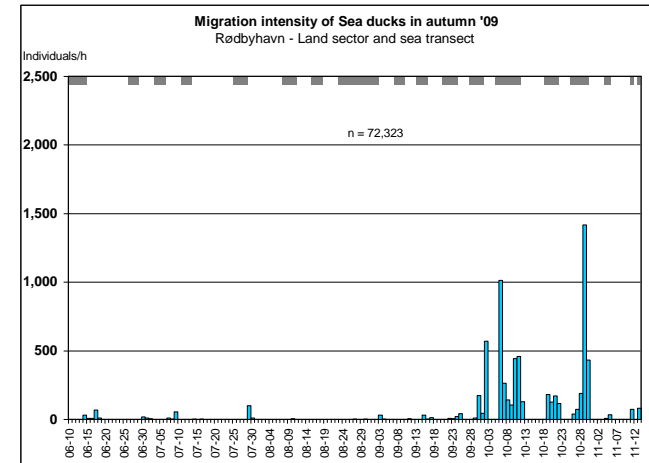
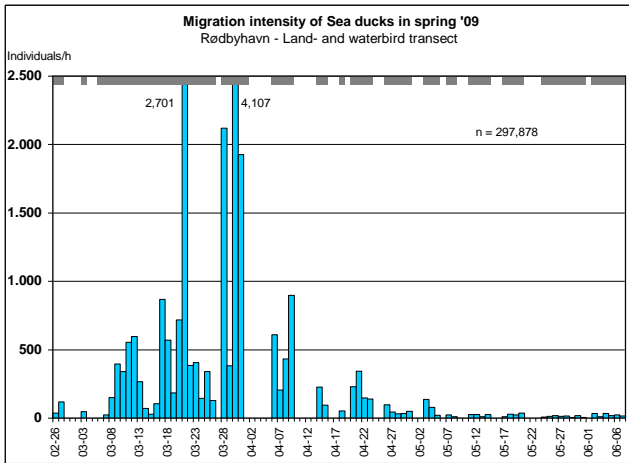
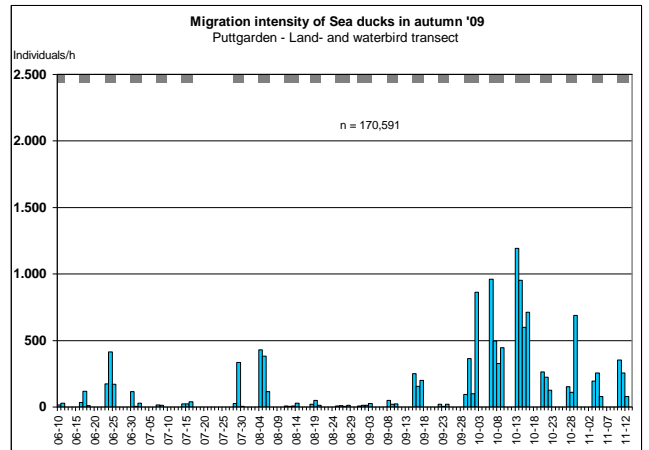
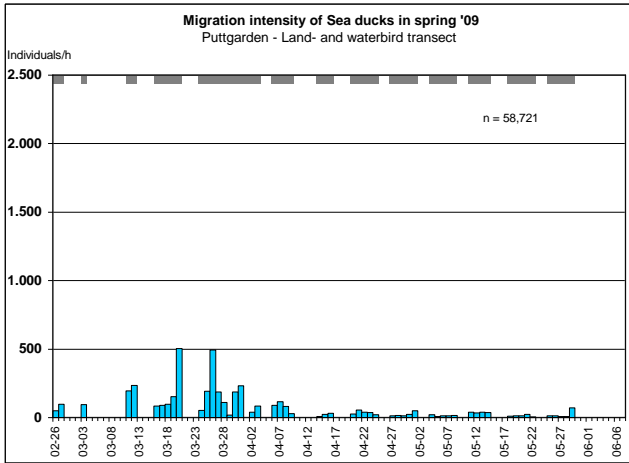
Eurasian Wigeon – *Anas penelope*



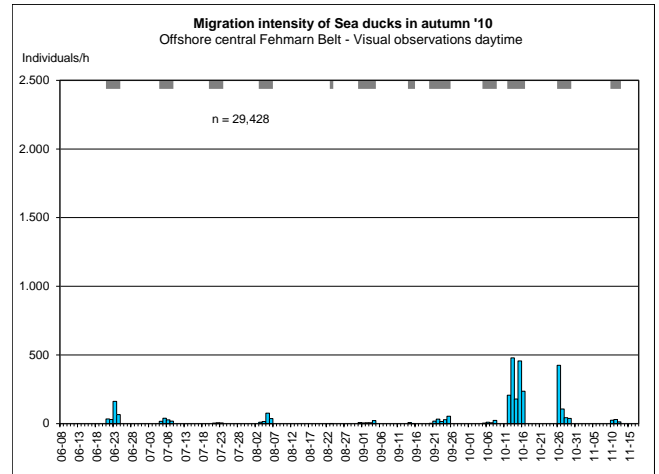
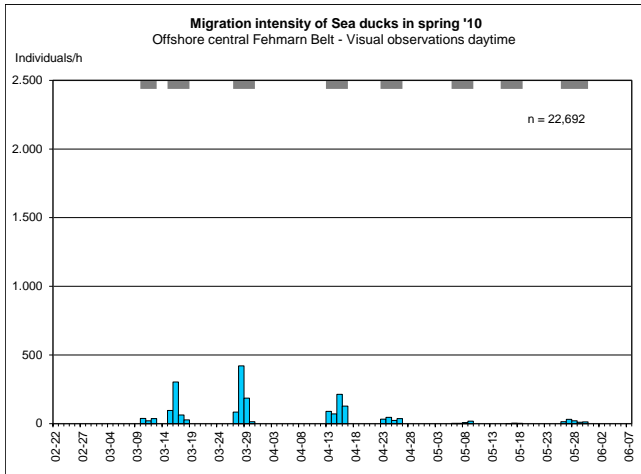
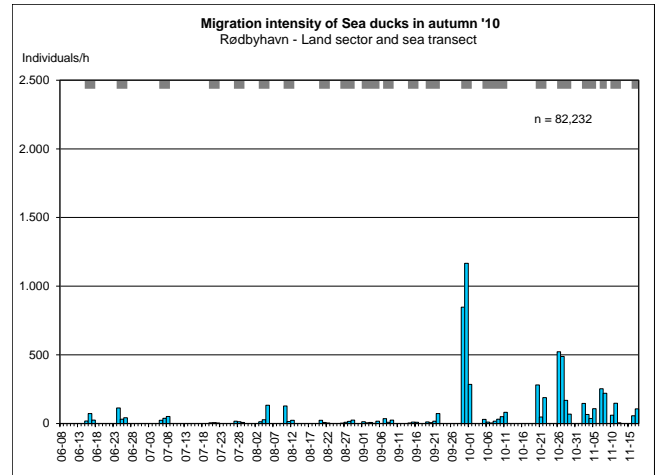
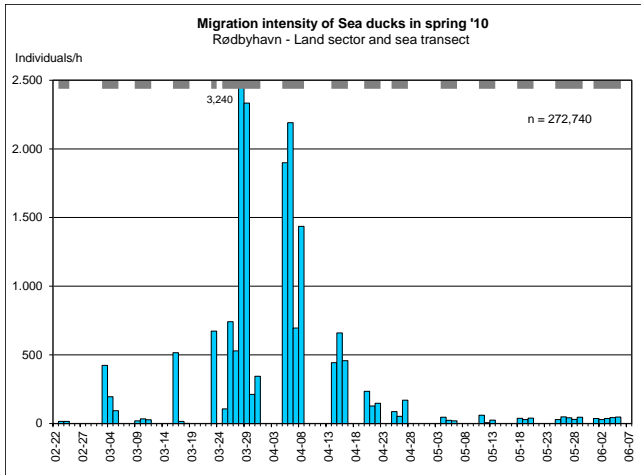
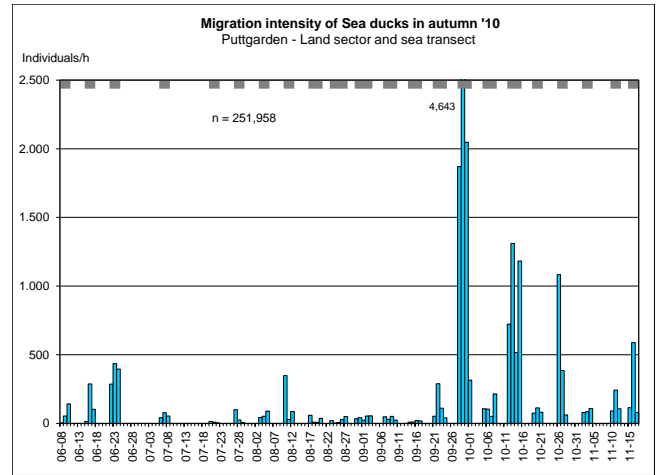
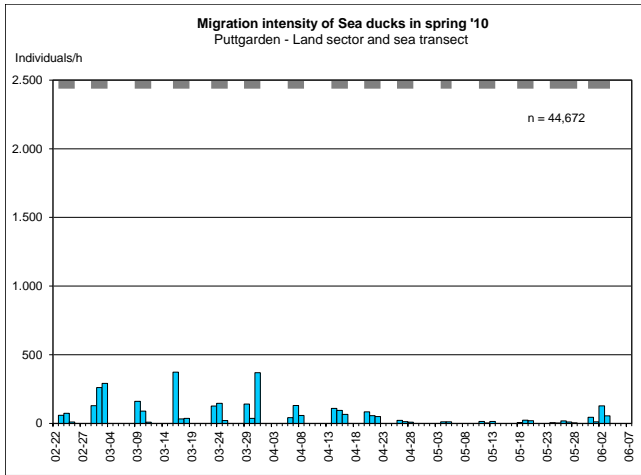
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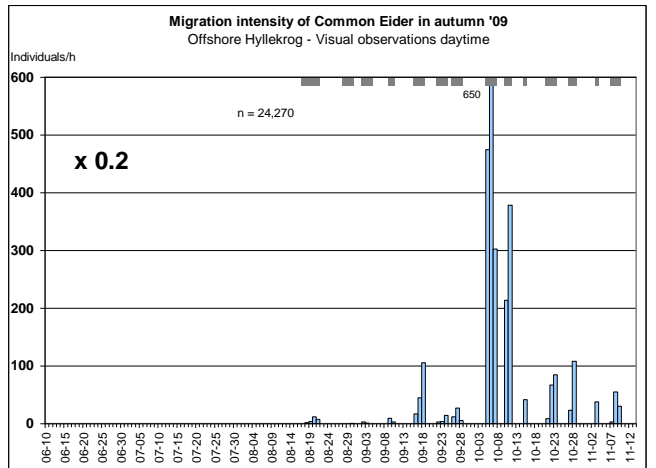
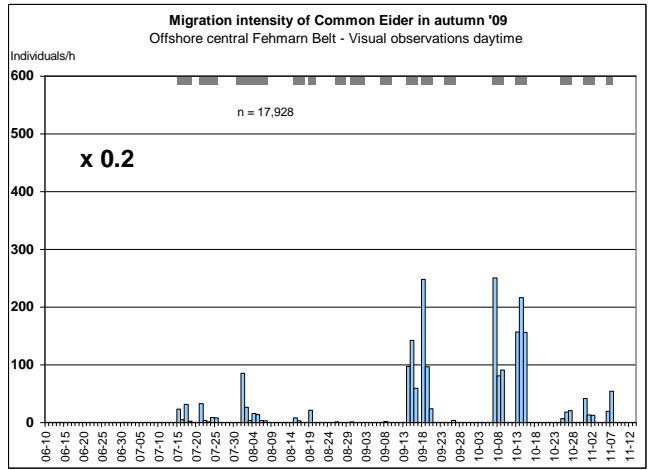
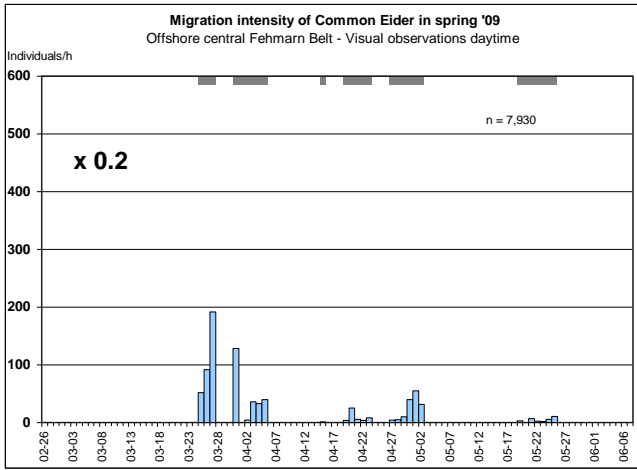
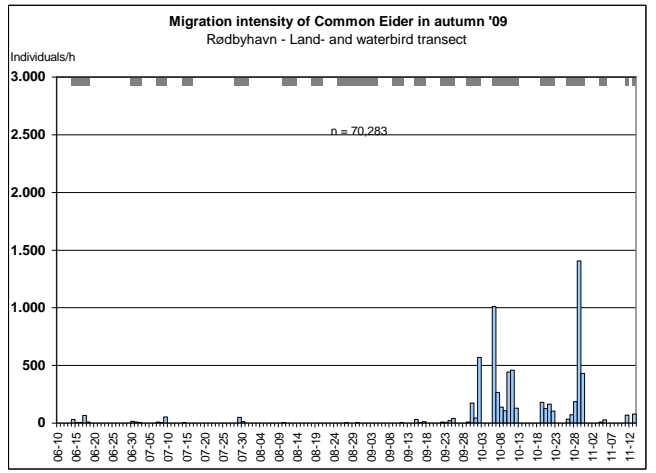
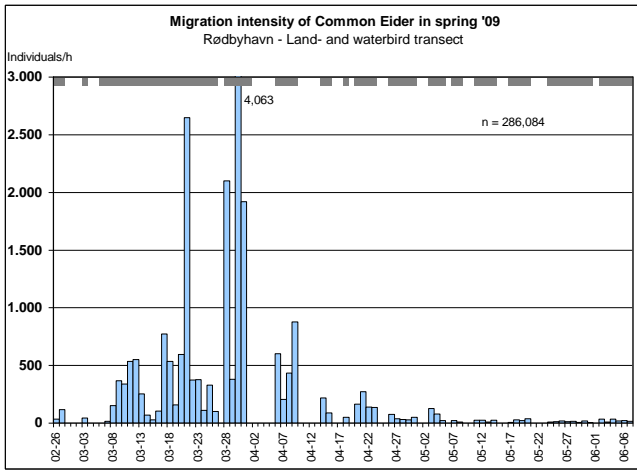
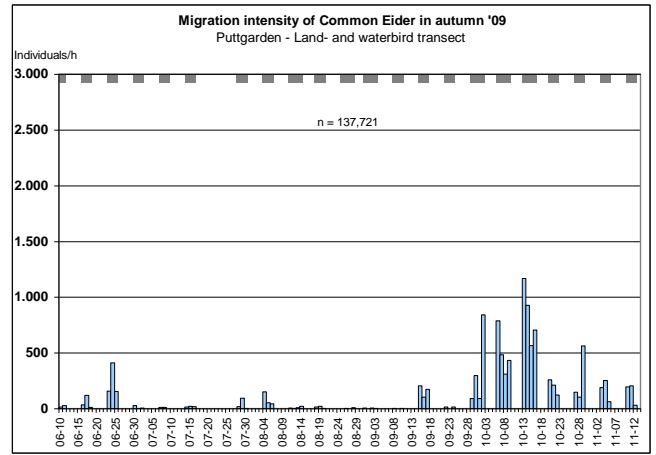
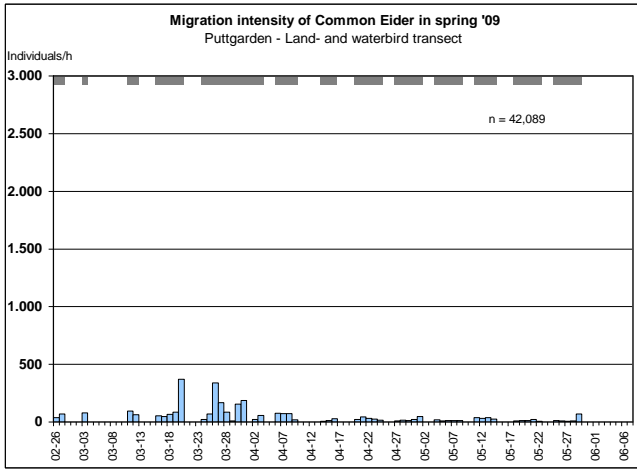
Seaducks



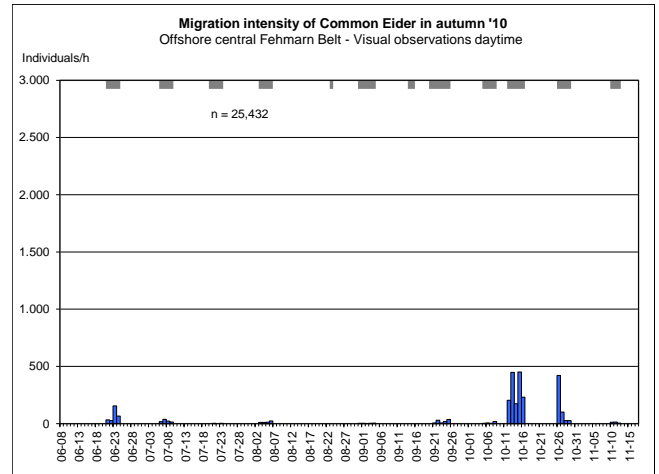
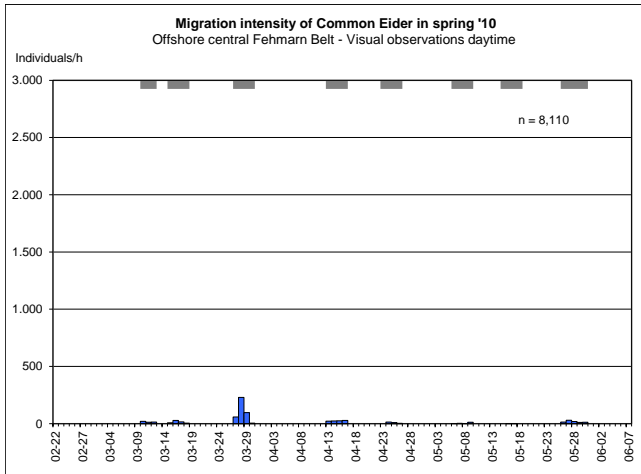
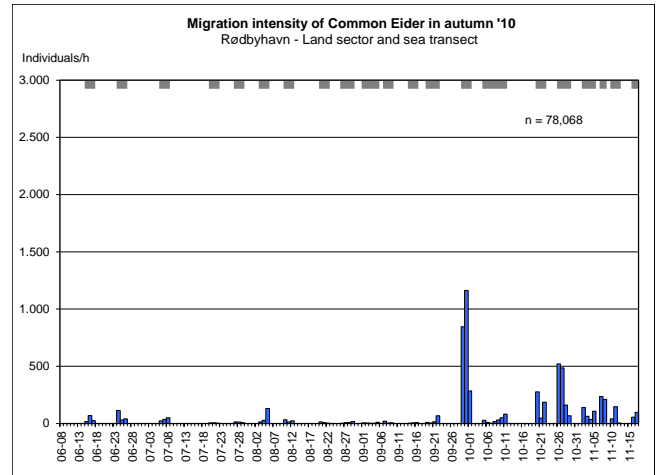
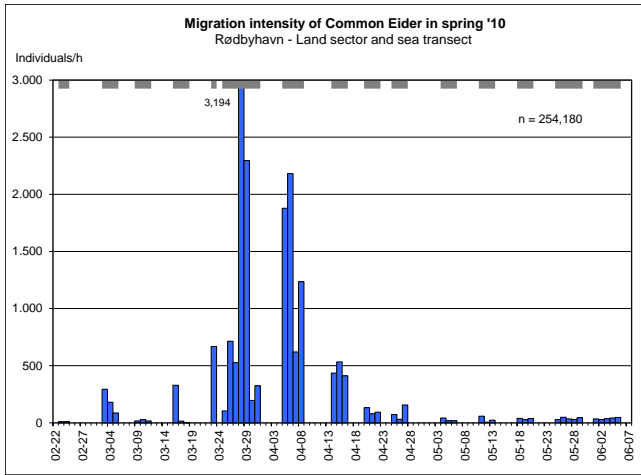
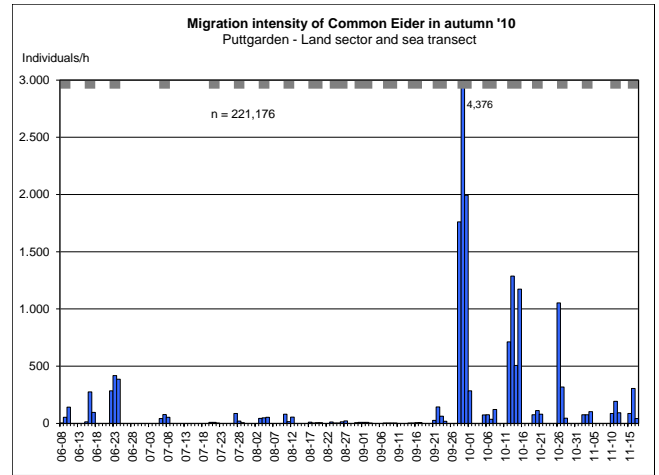
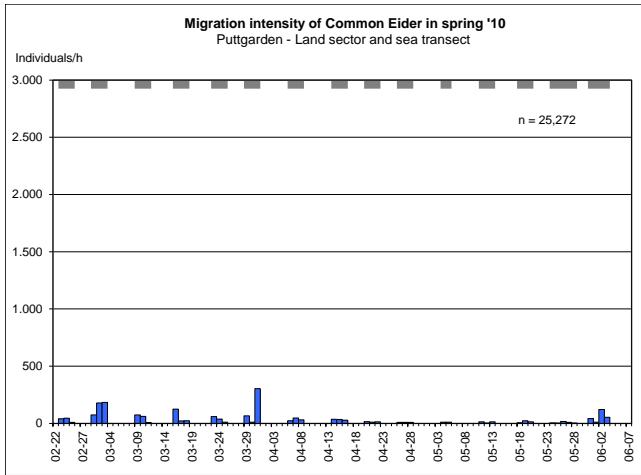
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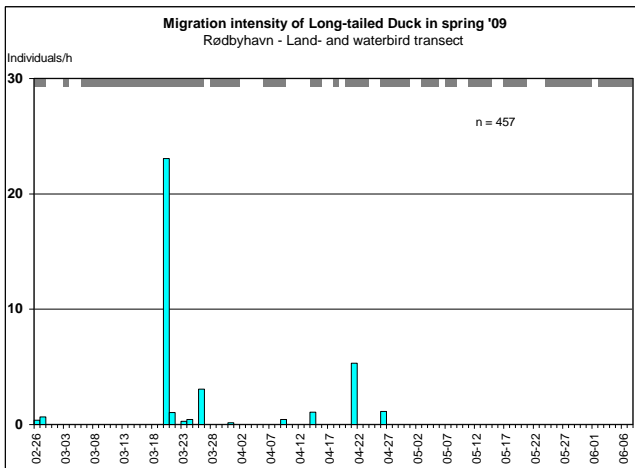
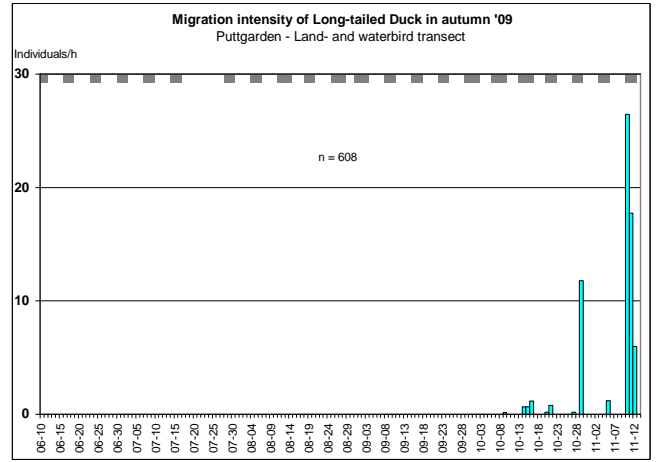
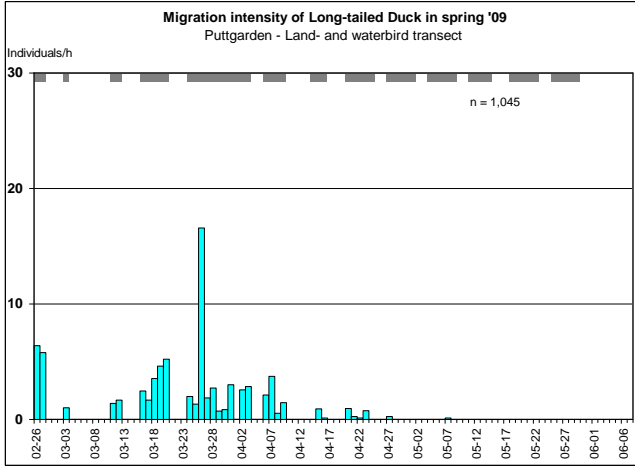
Common Eider – *Somateria mollissima*



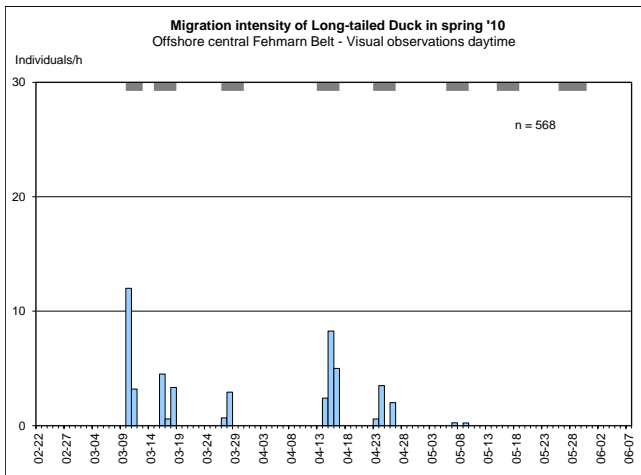
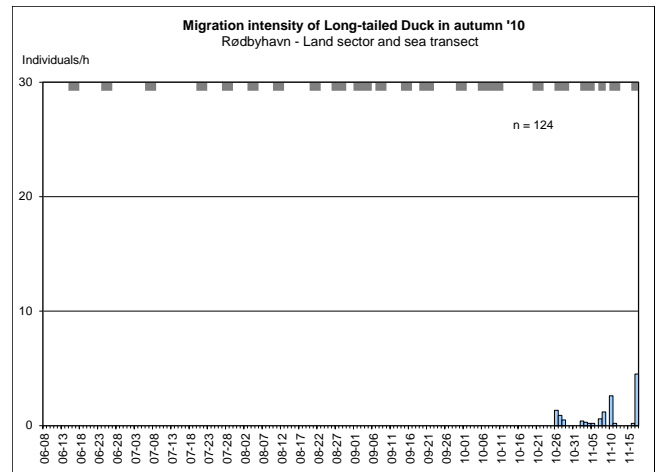
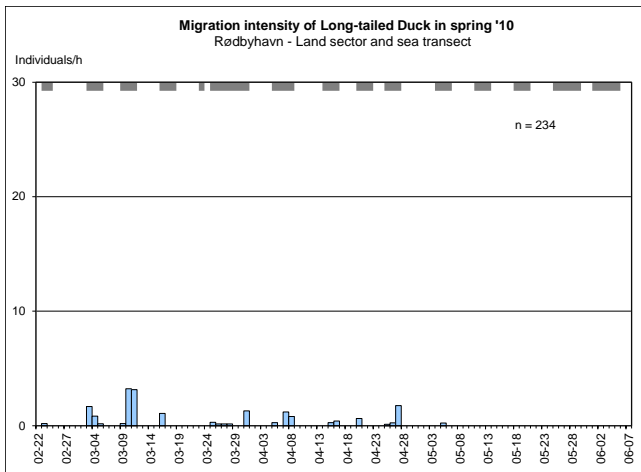
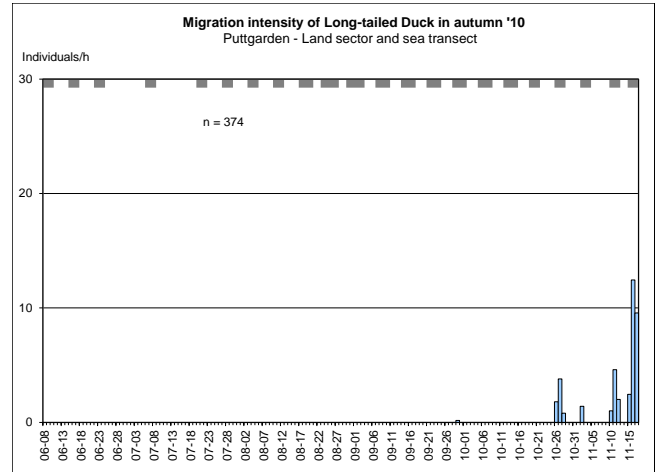
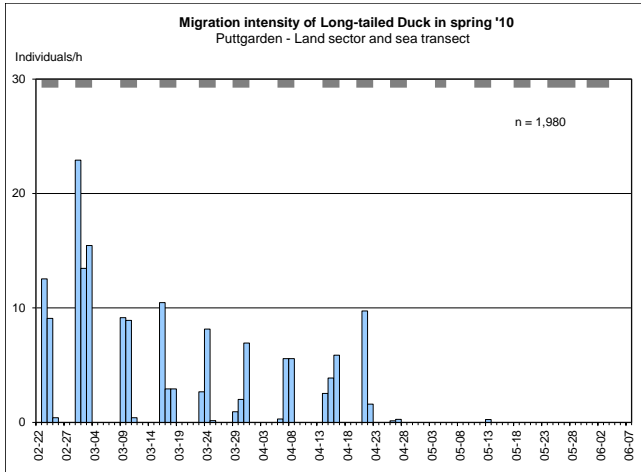
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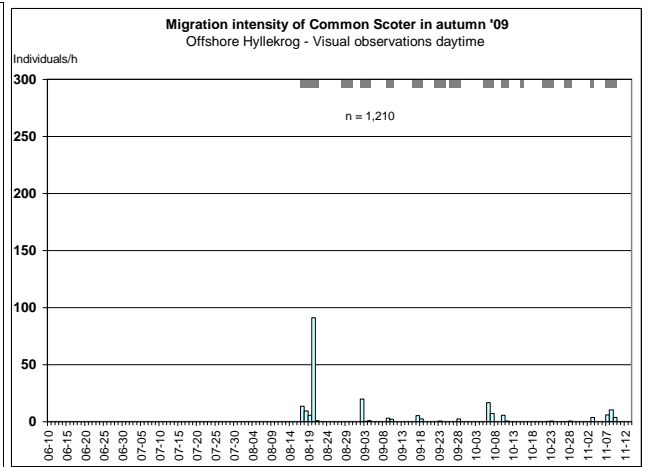
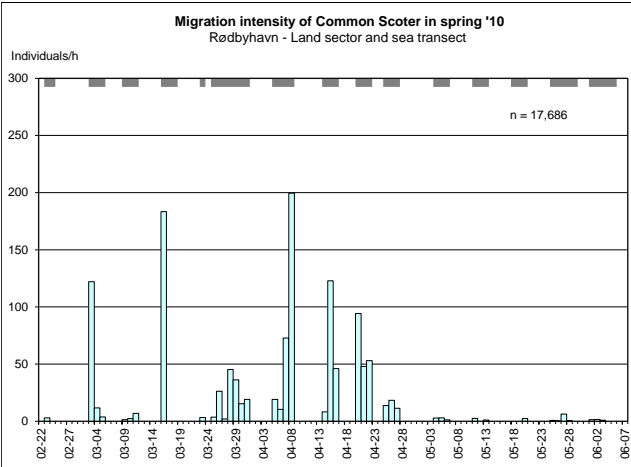
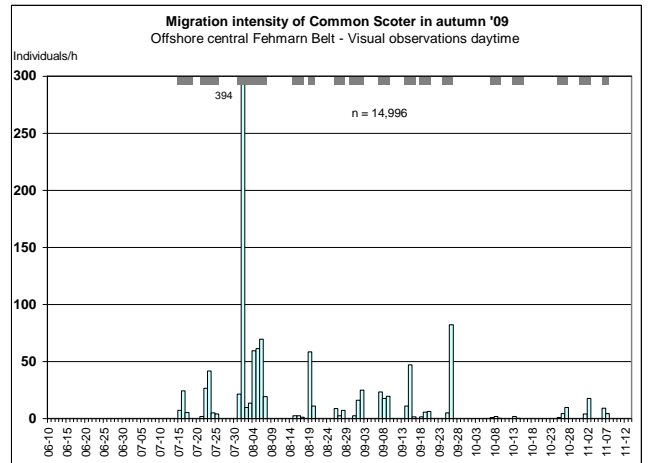
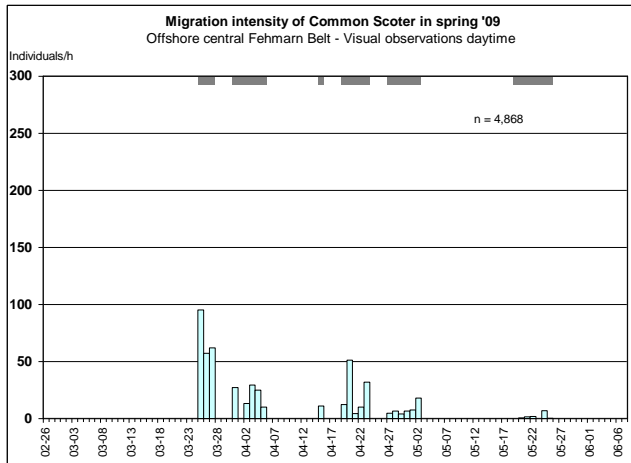
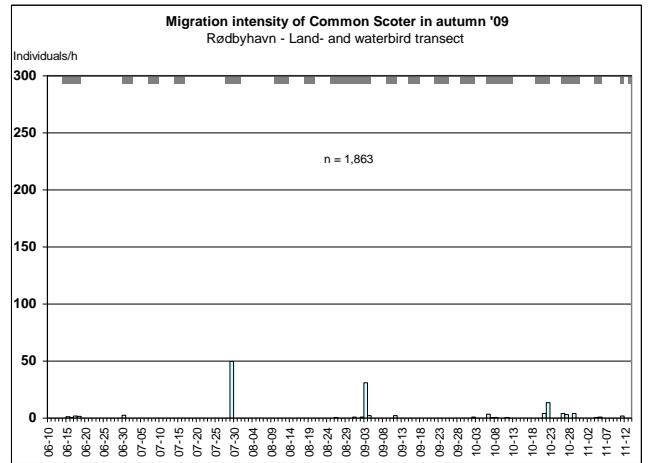
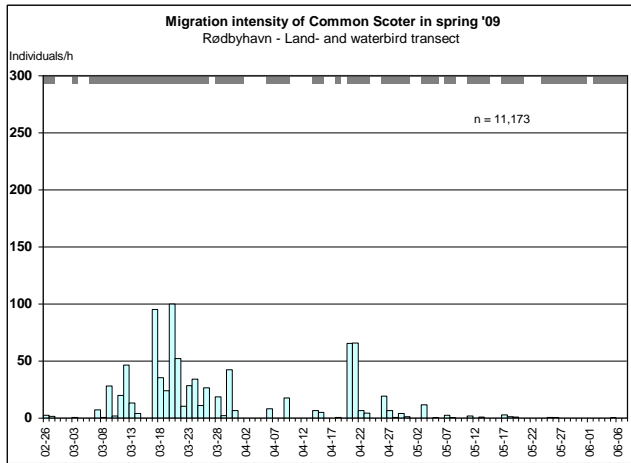
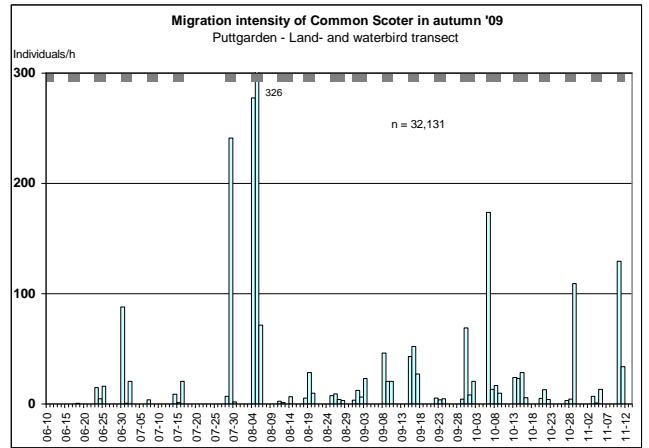
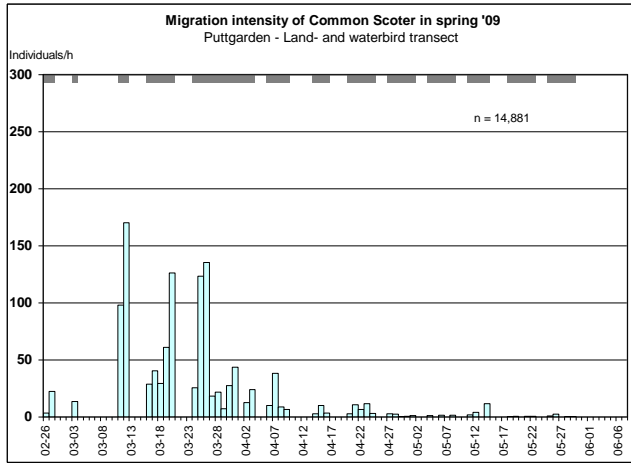
Long-tailed Duck – *Clangula hyemalis*



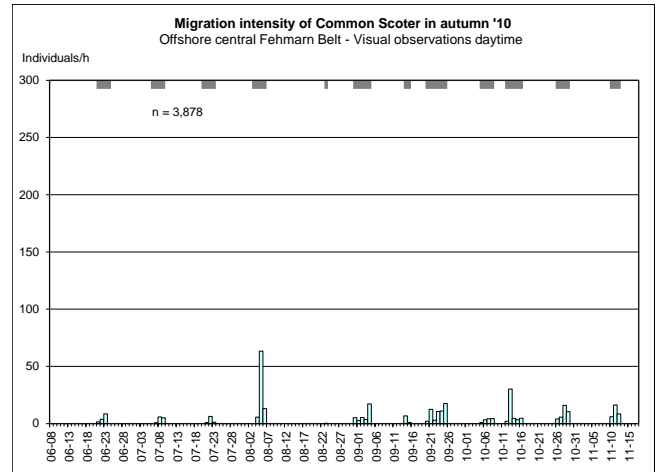
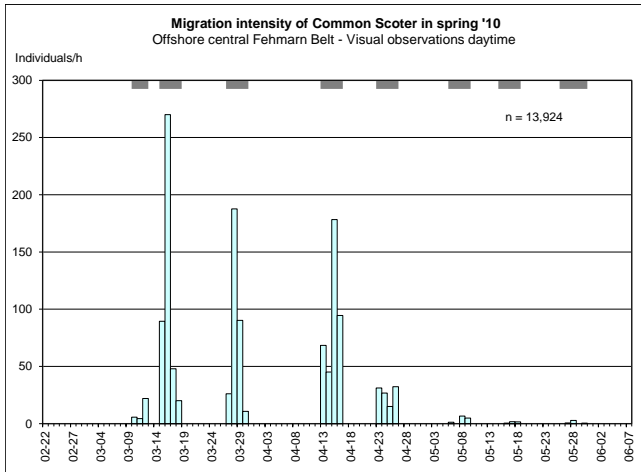
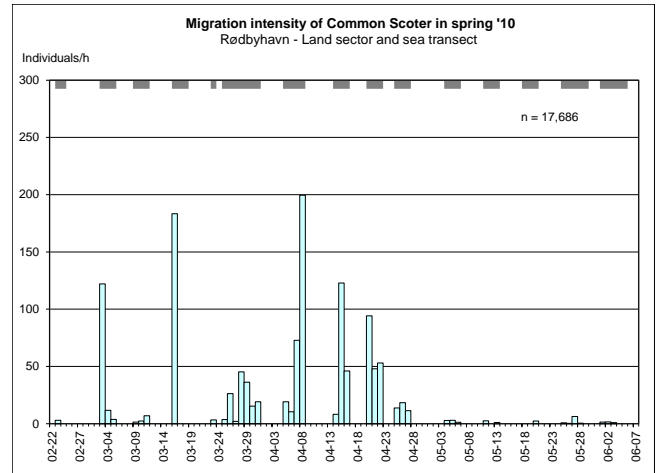
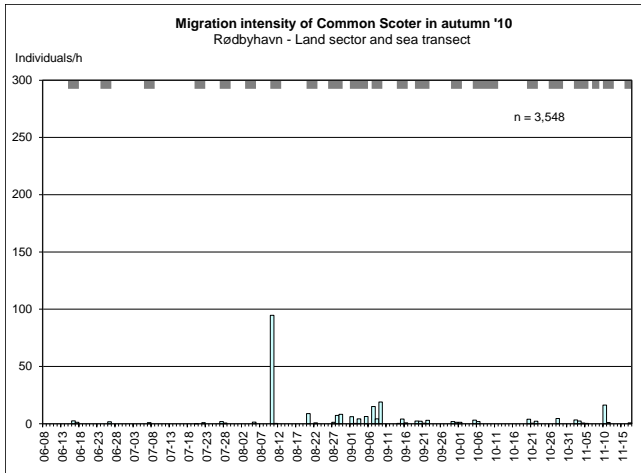
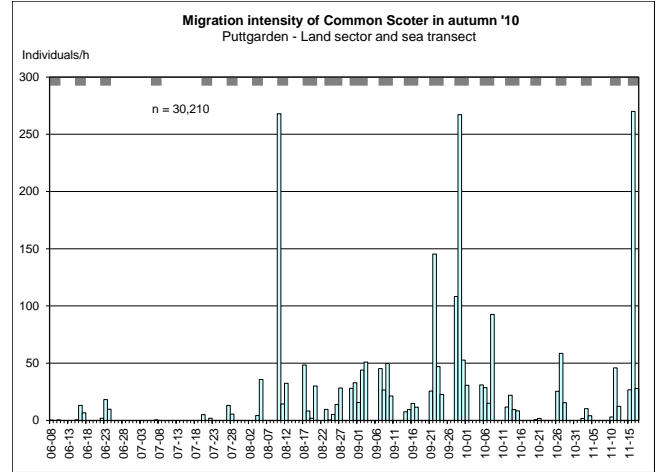
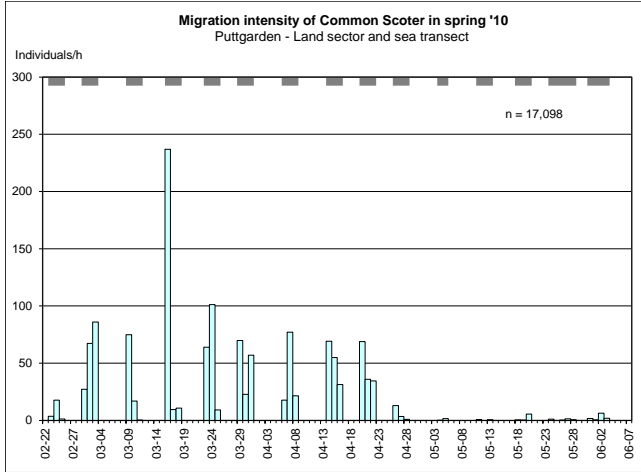
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Common Scoter – *Melanitta nigra*



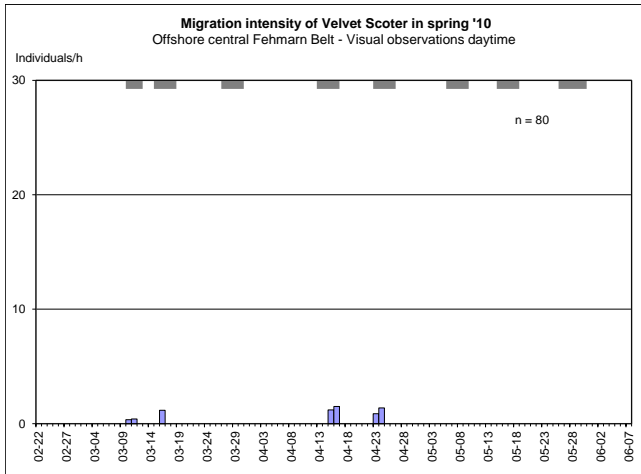
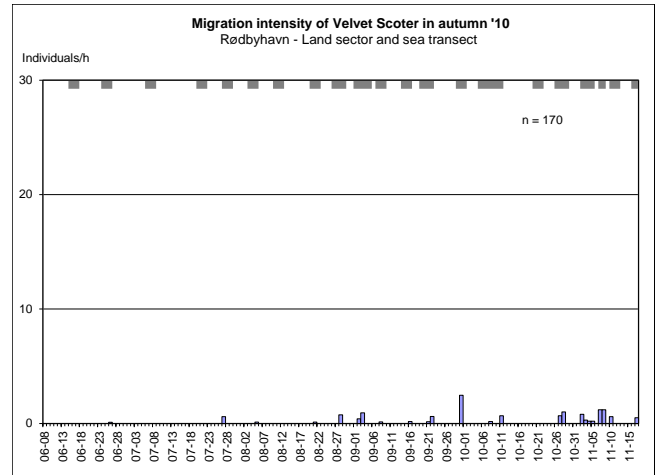
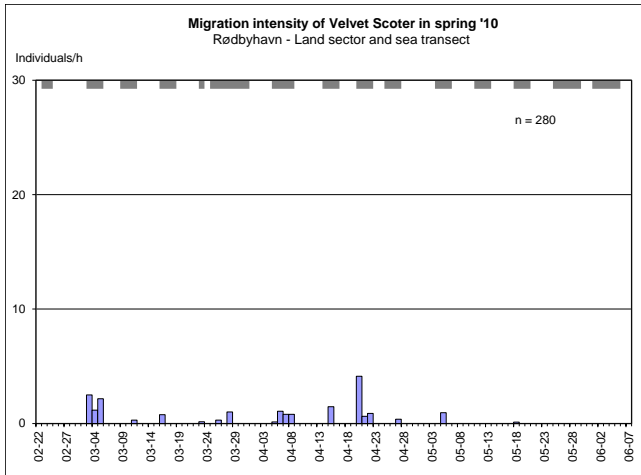
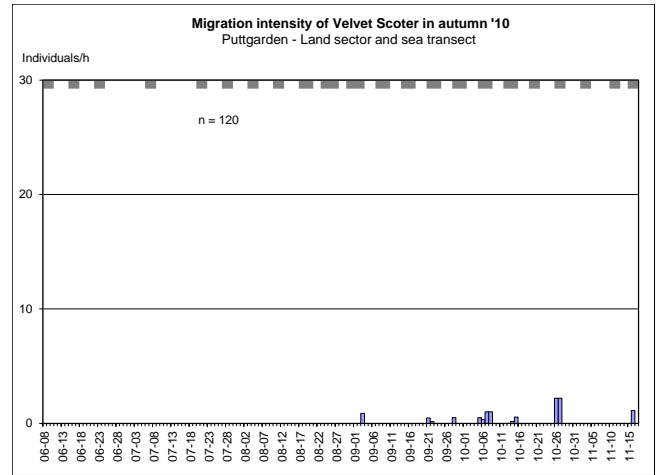
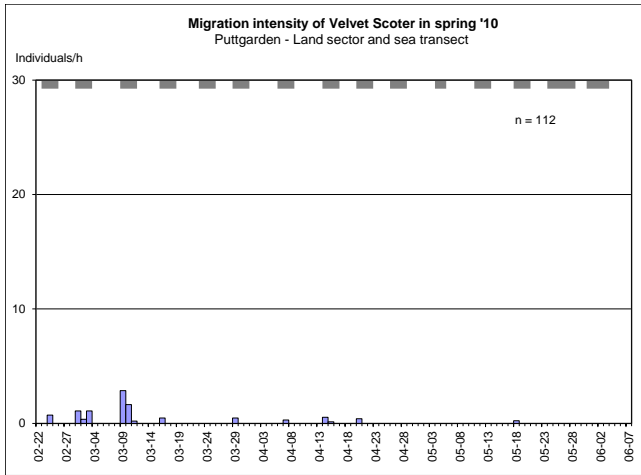
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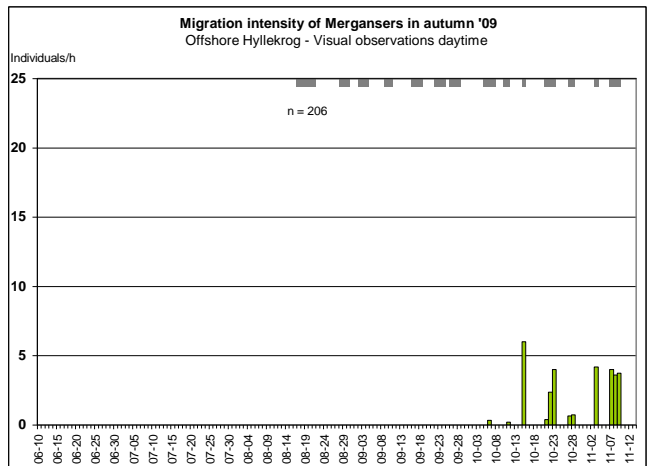
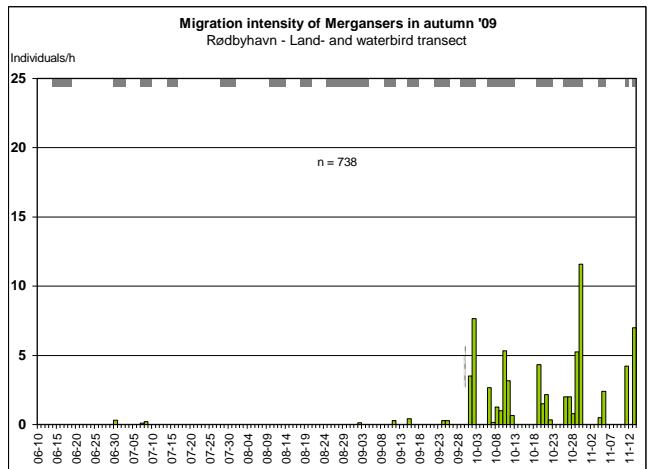
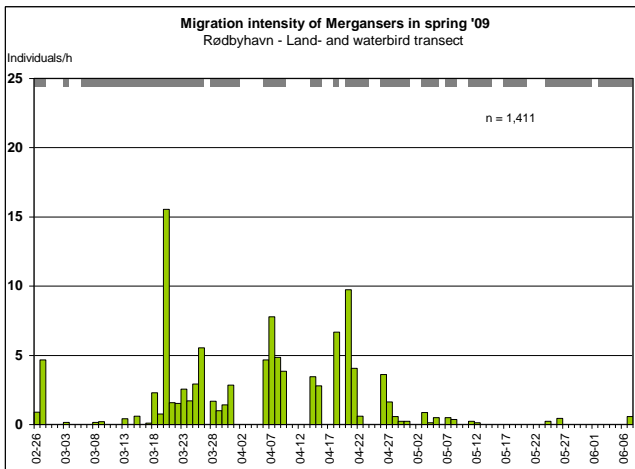
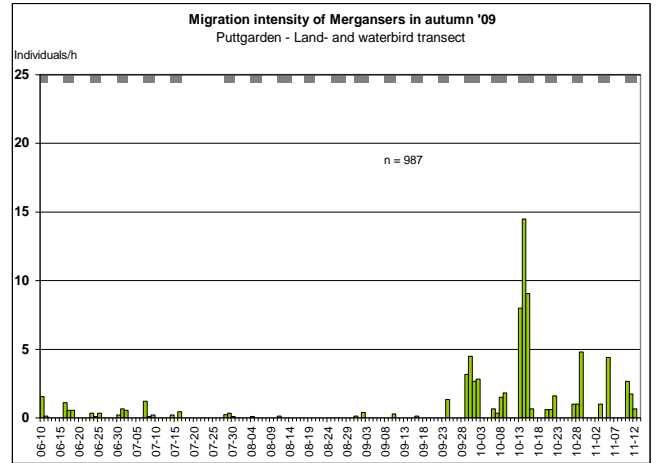
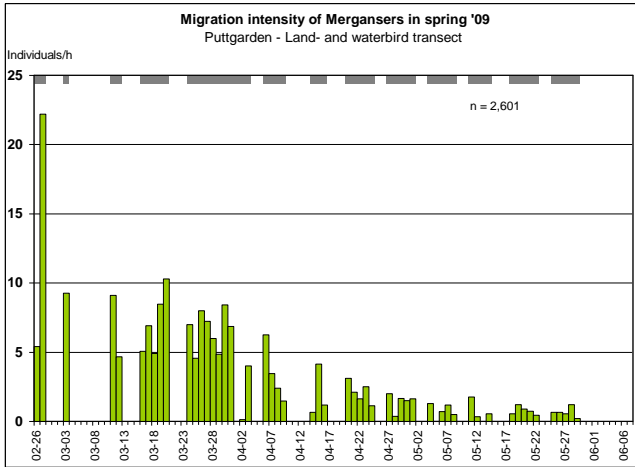
Velvet Scoter – *Melanitta fusca*

No Velvet Scoter data from 2009

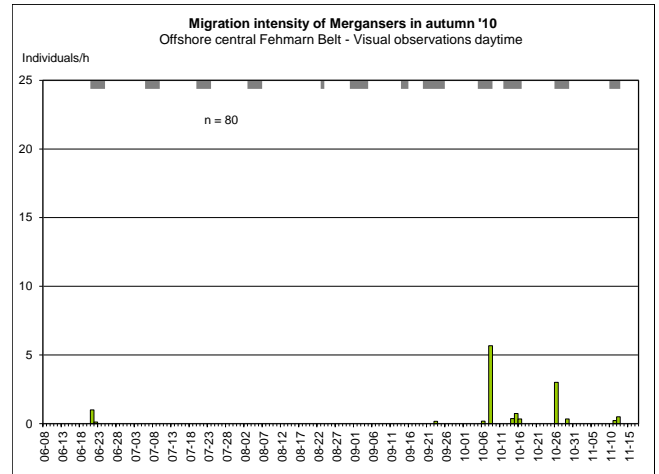
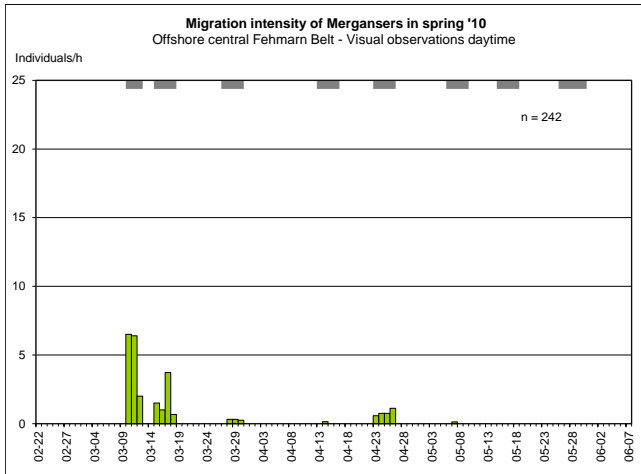
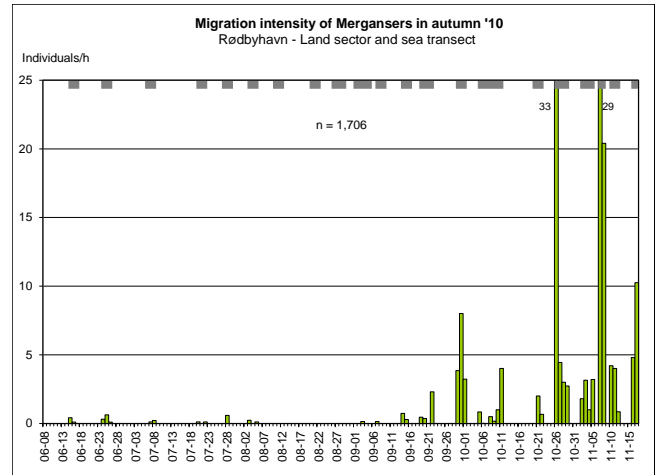
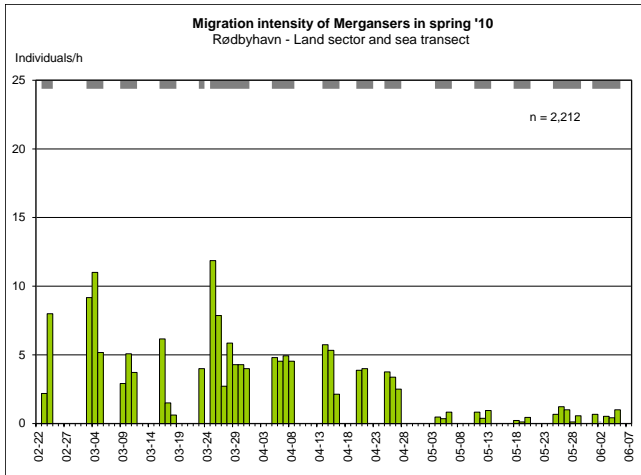
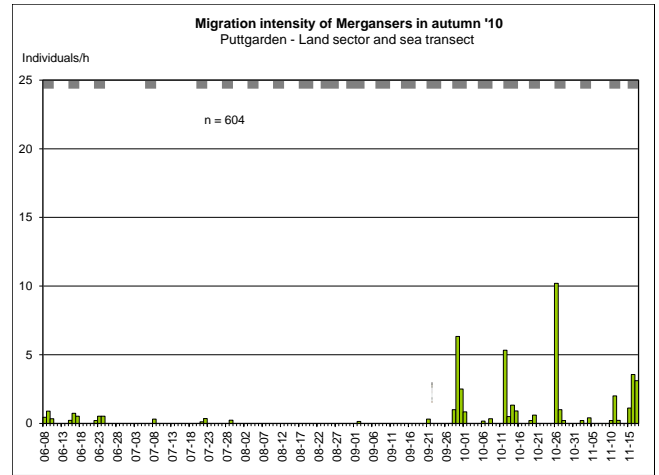
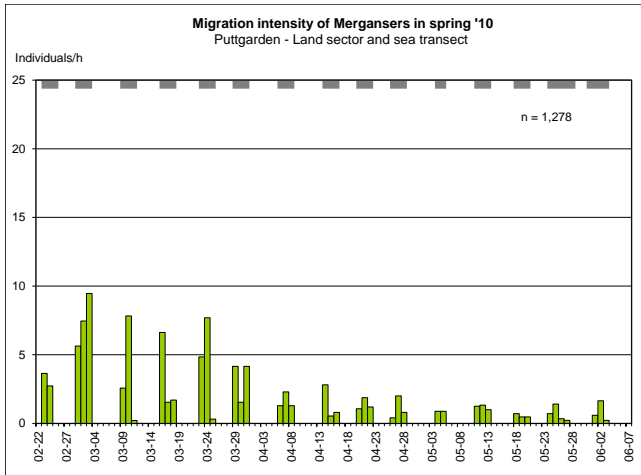
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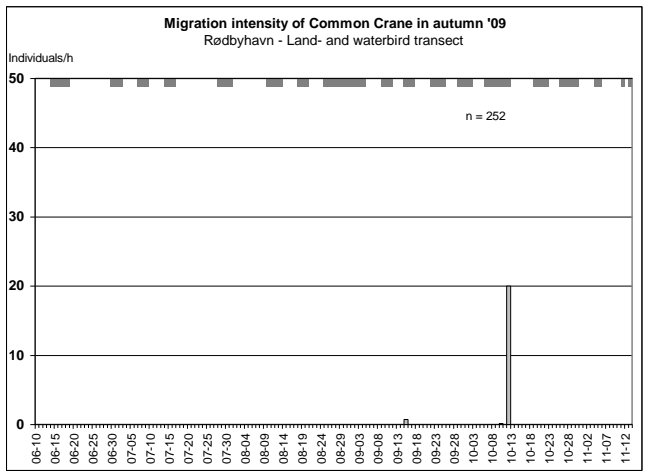
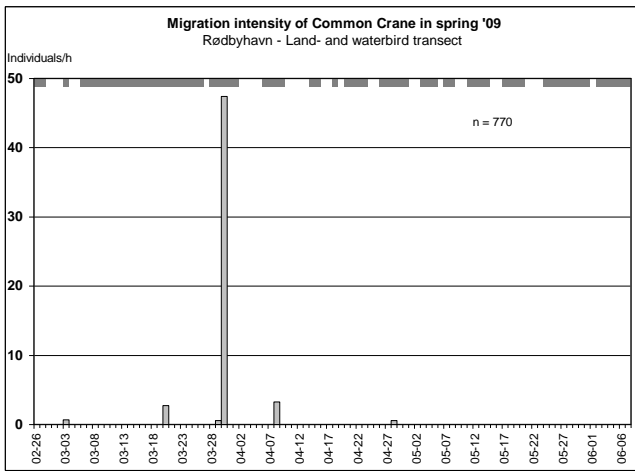
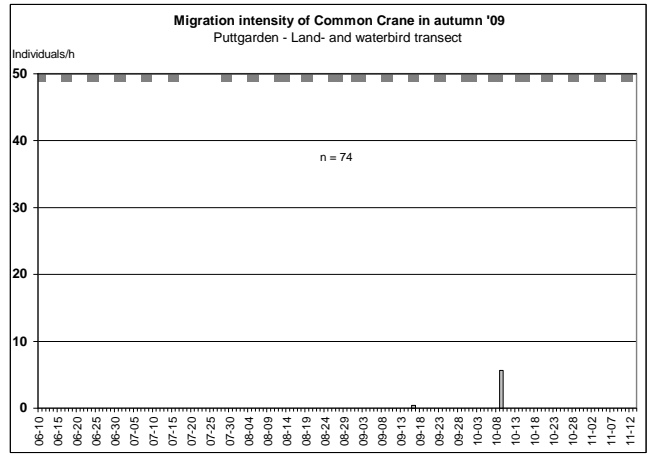
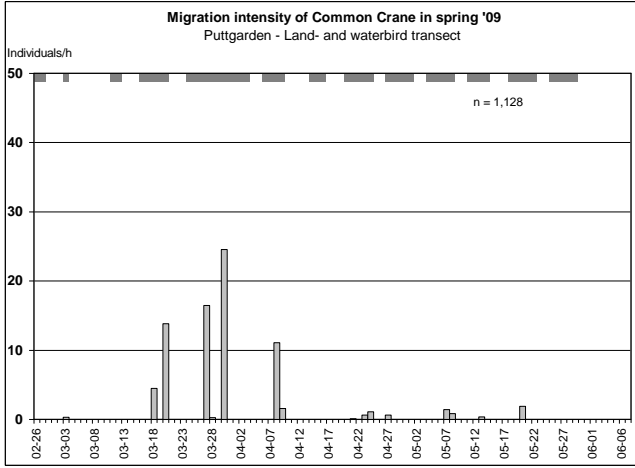
A.2.8 *Mergansers – Mergus spp.*



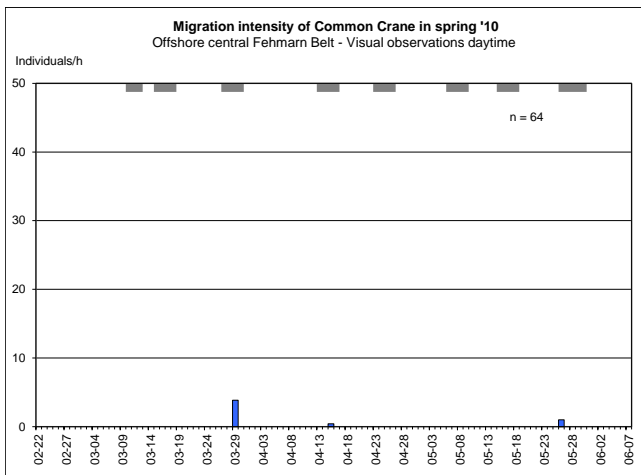
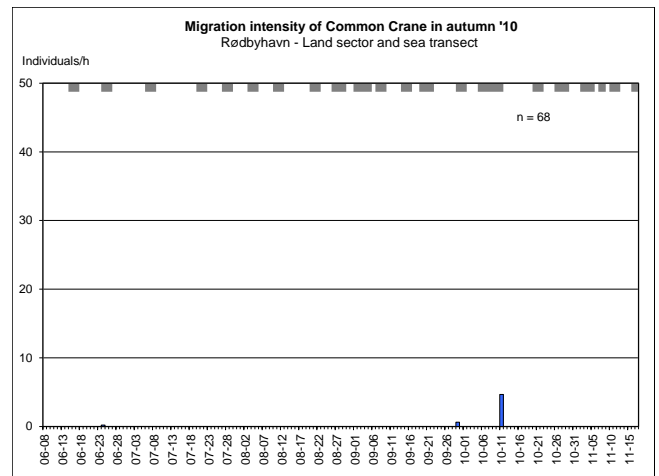
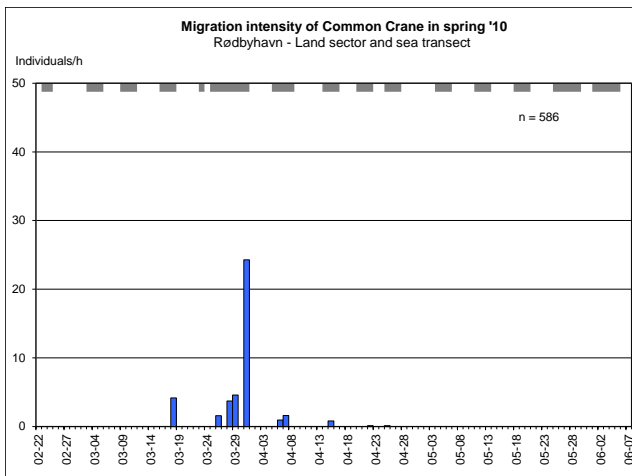
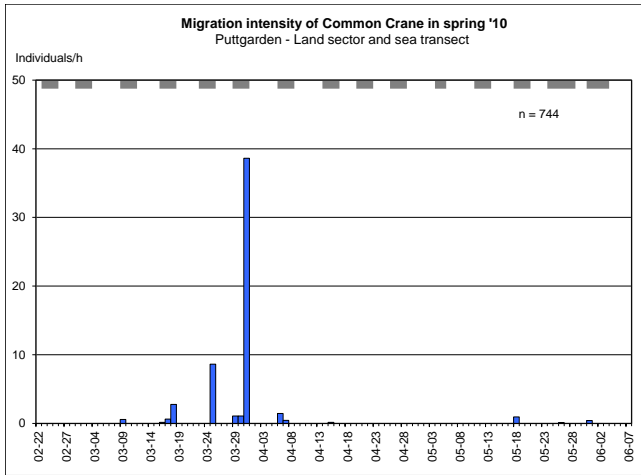
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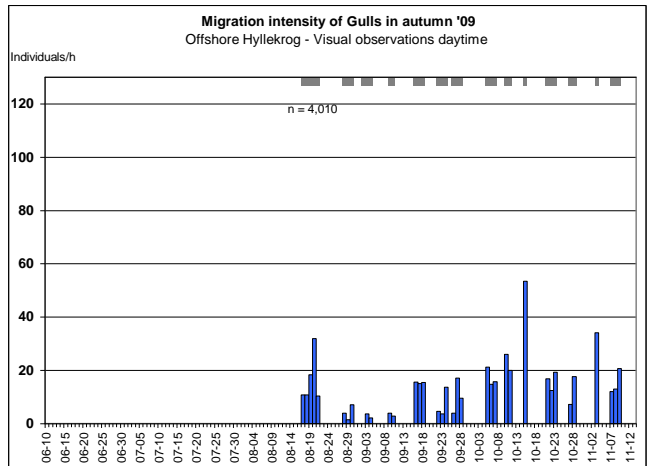
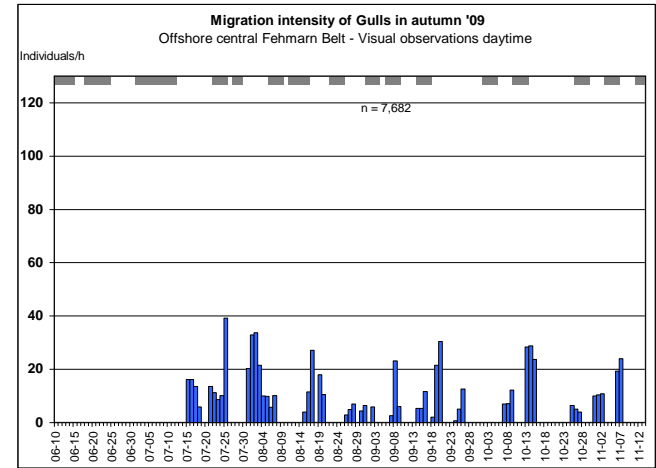
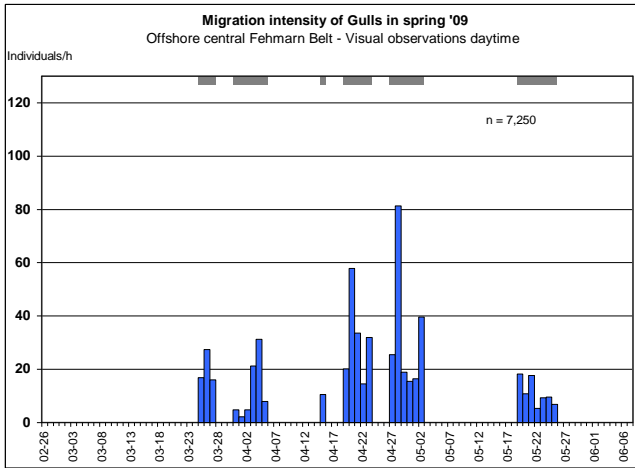
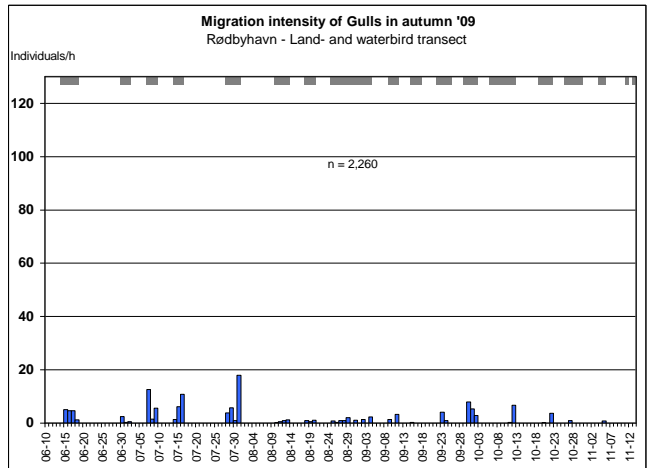
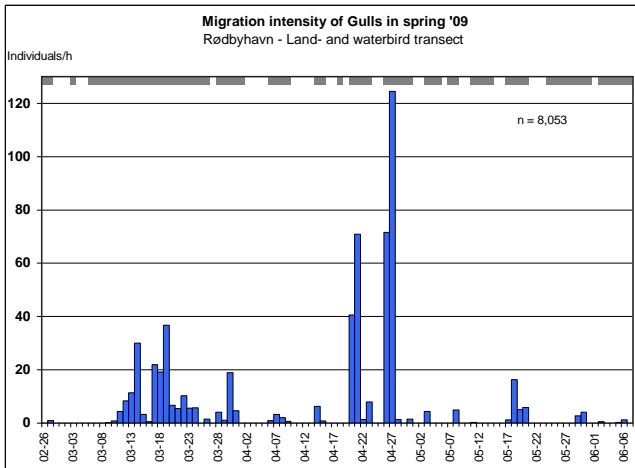
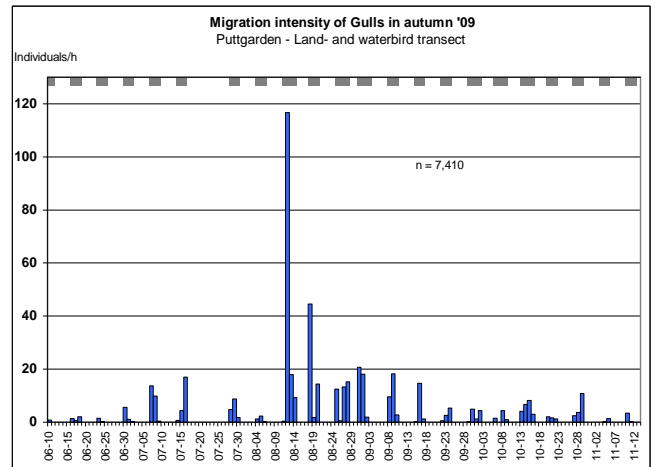
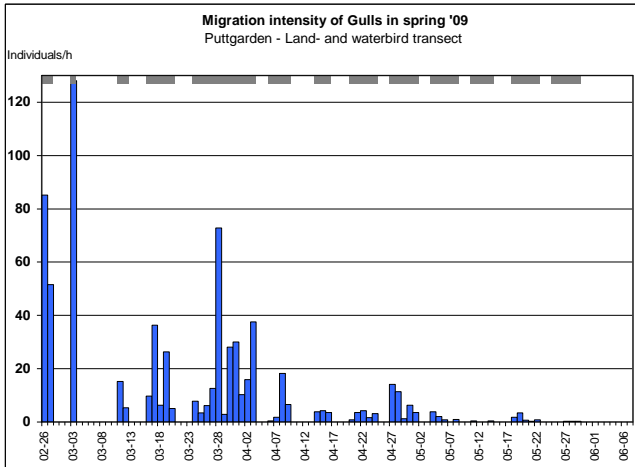
A.2.9 Common Crane – *Grus grus*



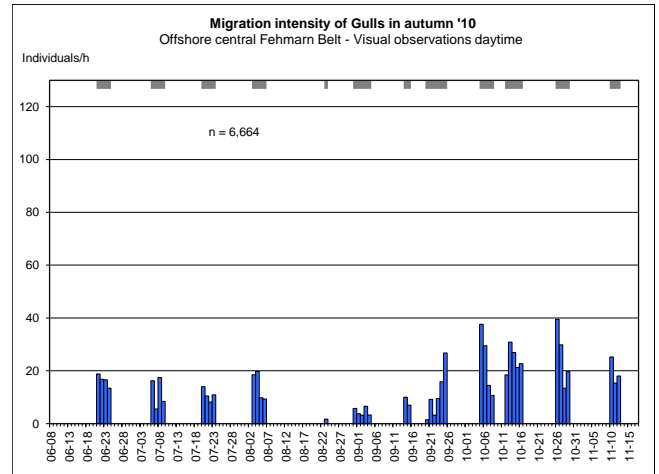
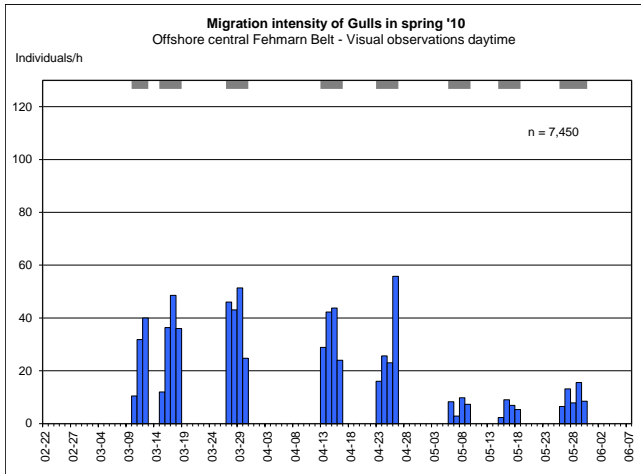
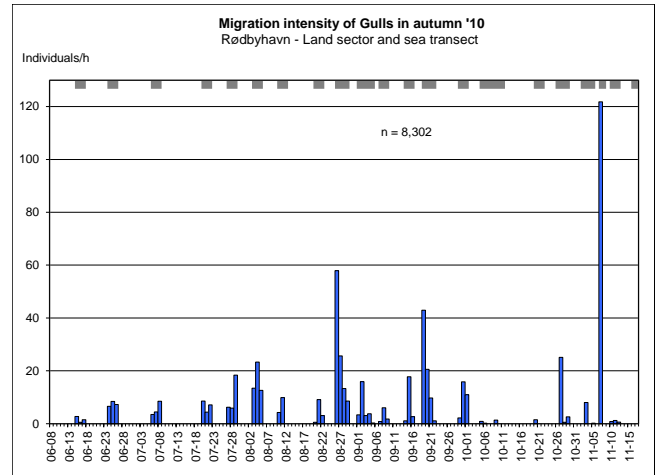
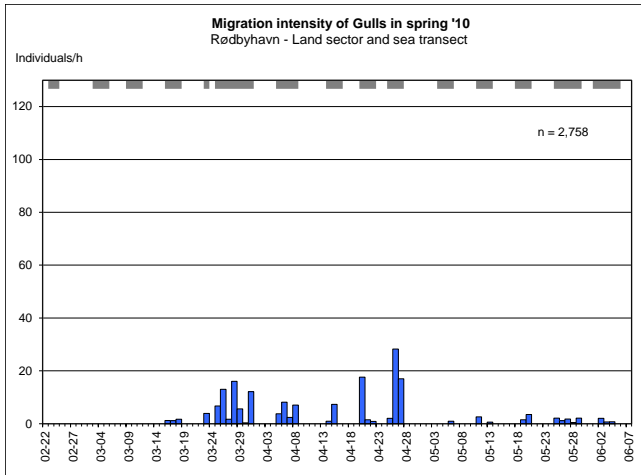
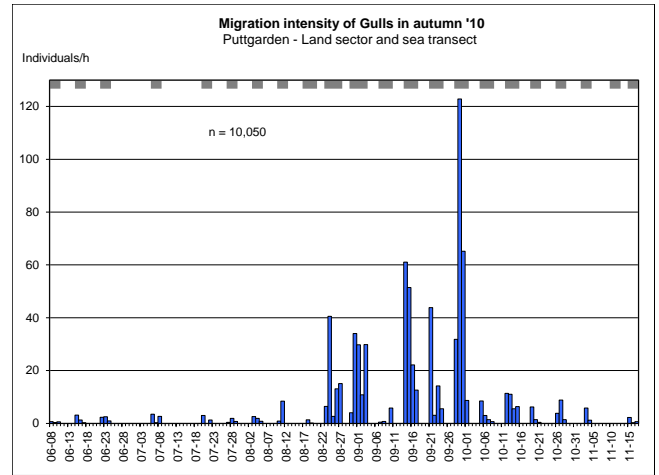
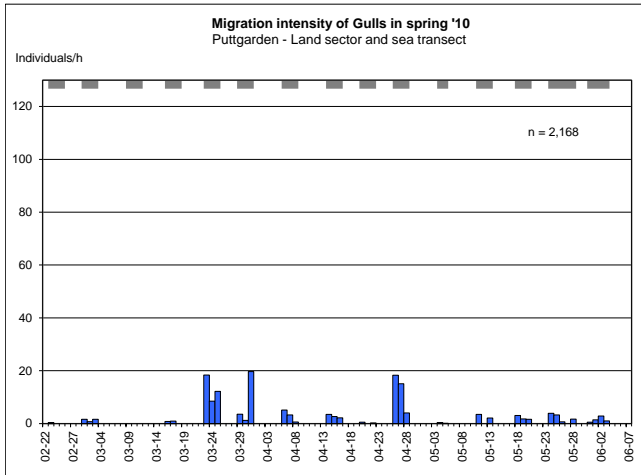
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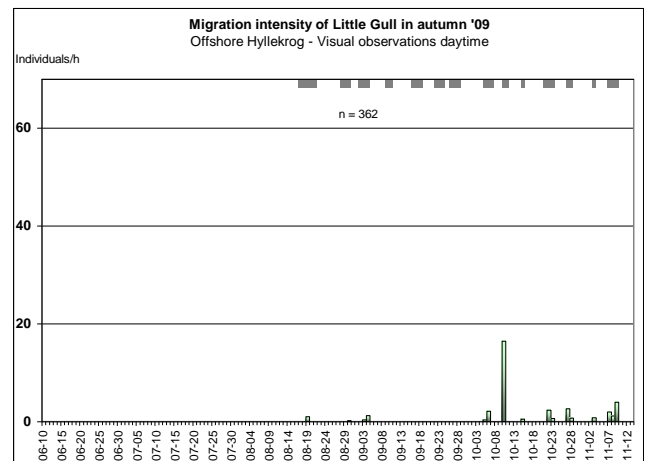
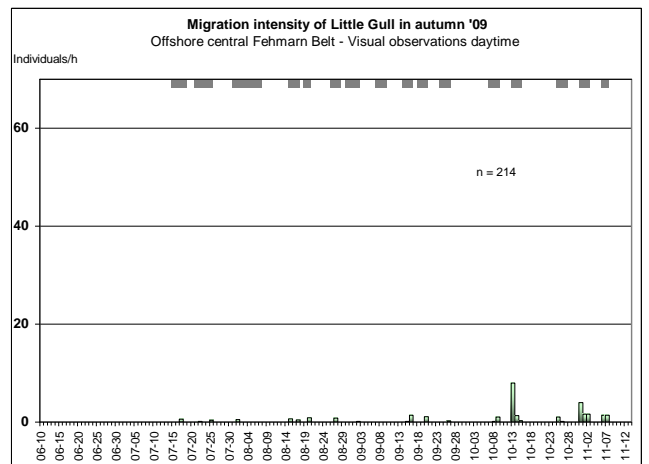
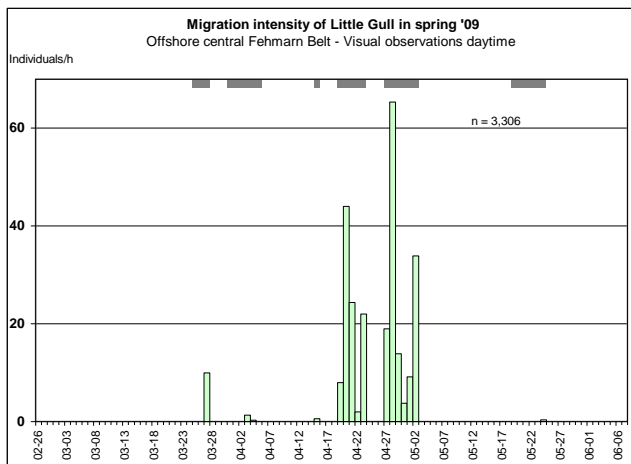
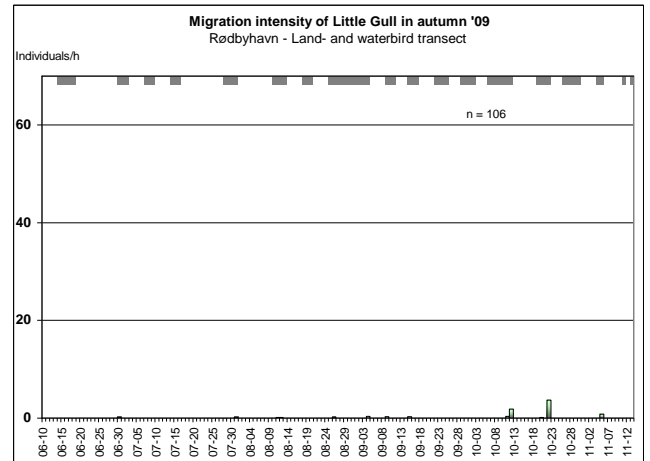
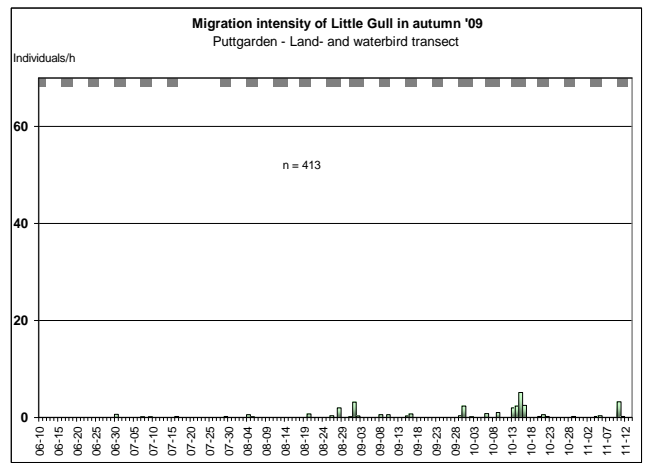
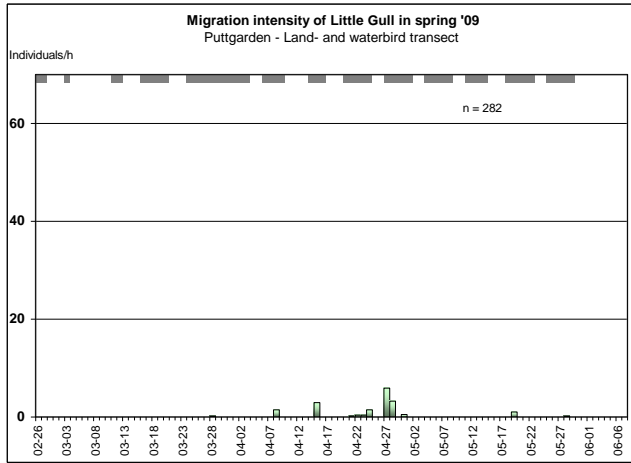
A.2.10 Gulls – Larus spp.



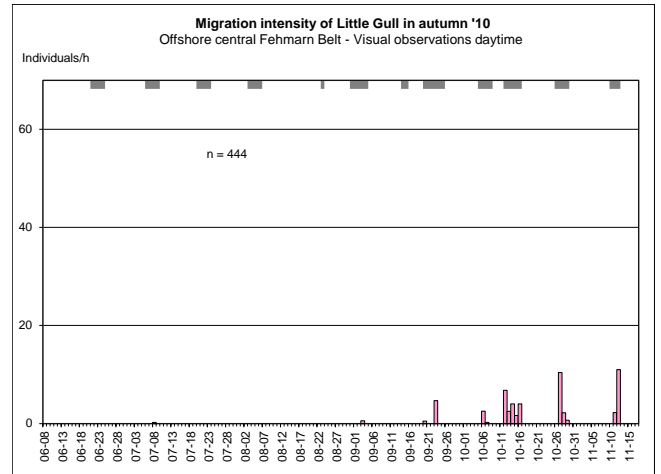
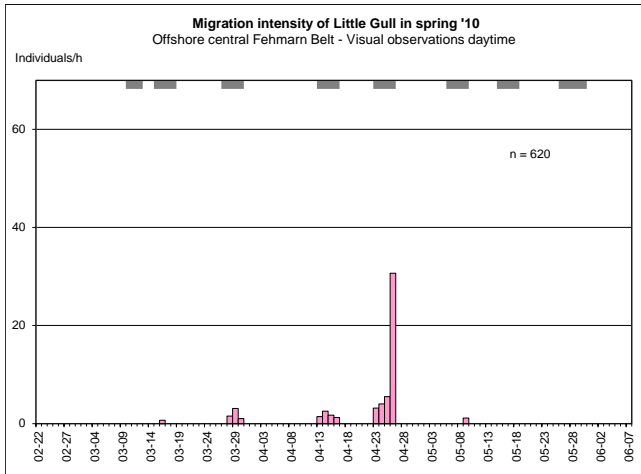
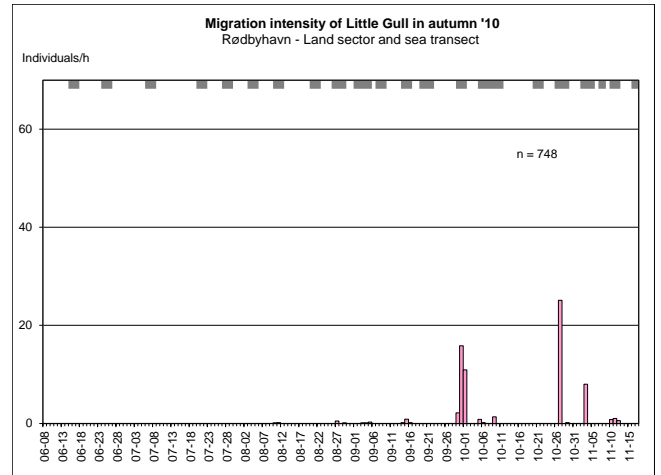
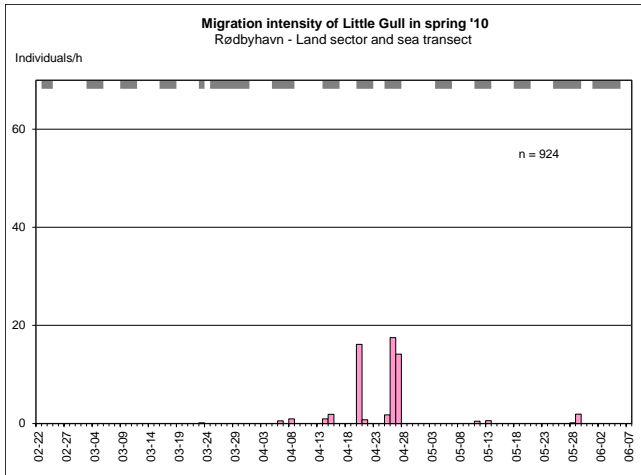
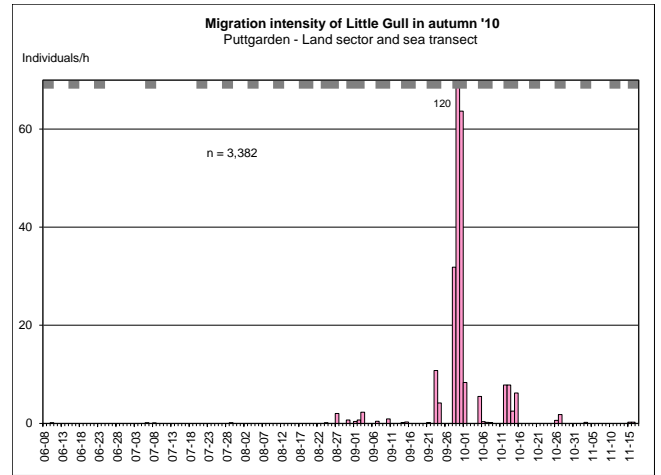
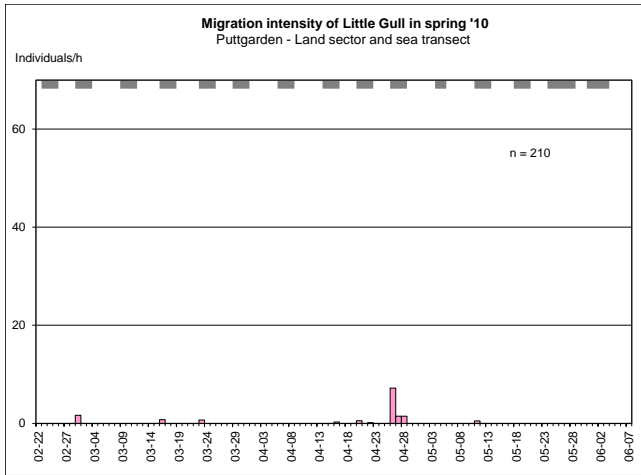
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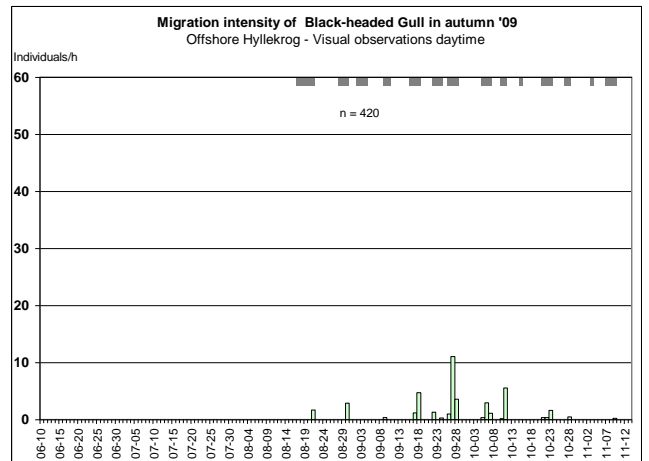
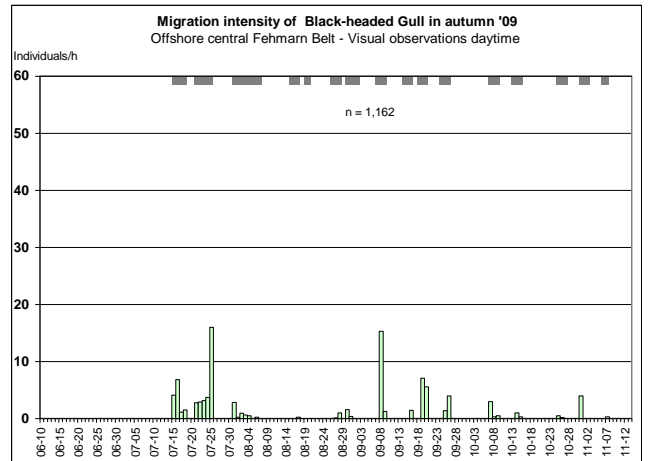
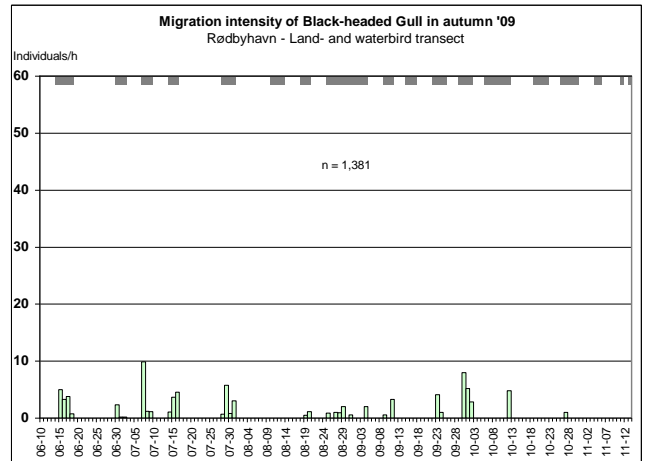
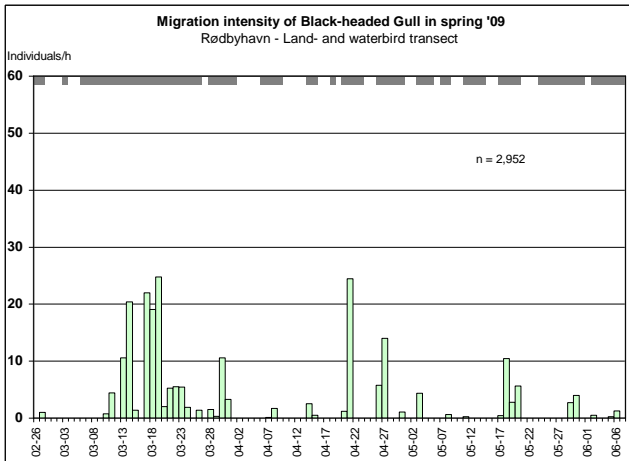
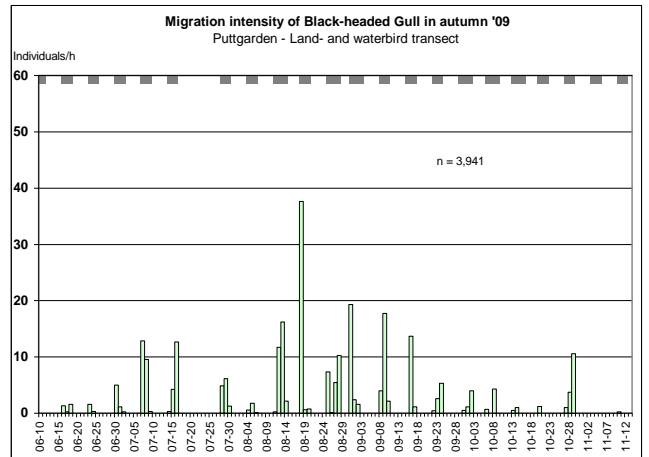
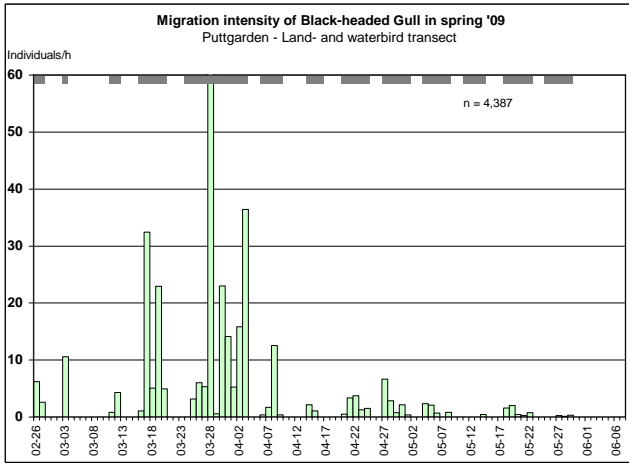
Little Gull – *Larus minutus*



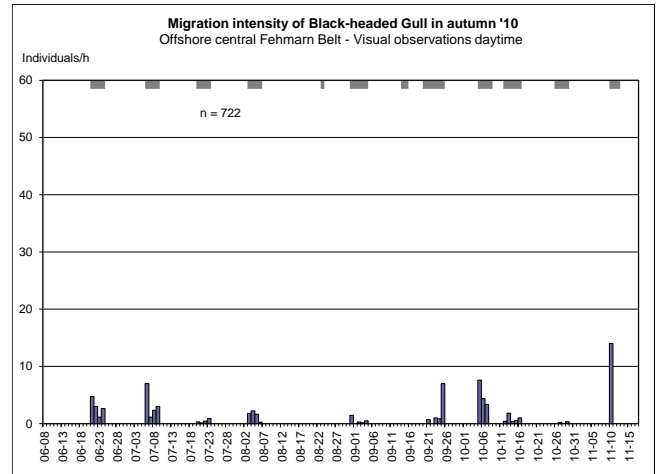
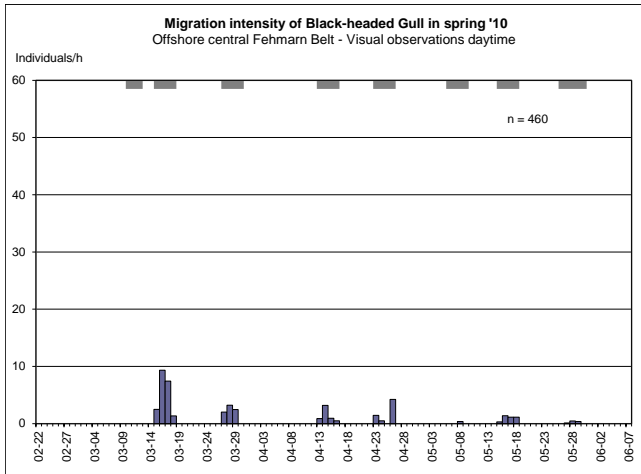
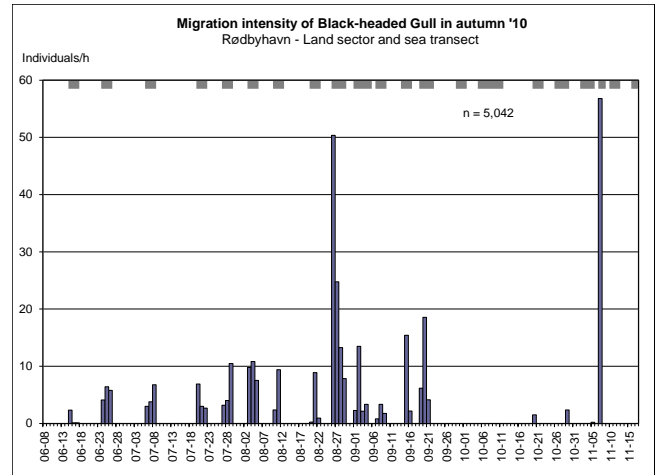
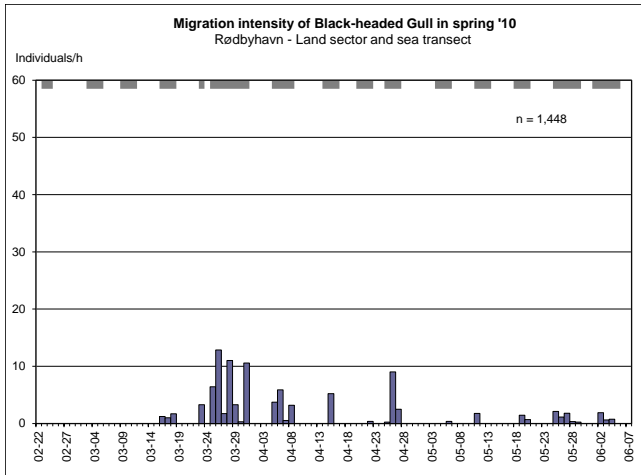
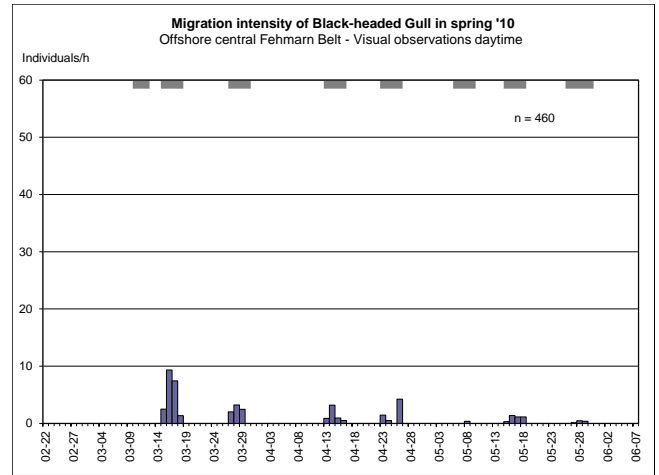
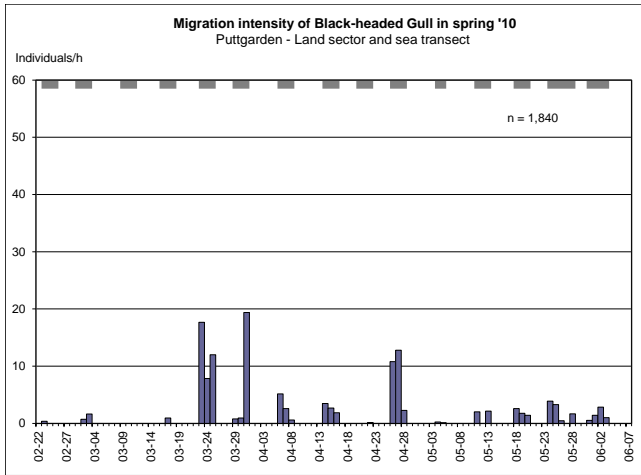
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Black-headed Gull – *Larus ridibundus*

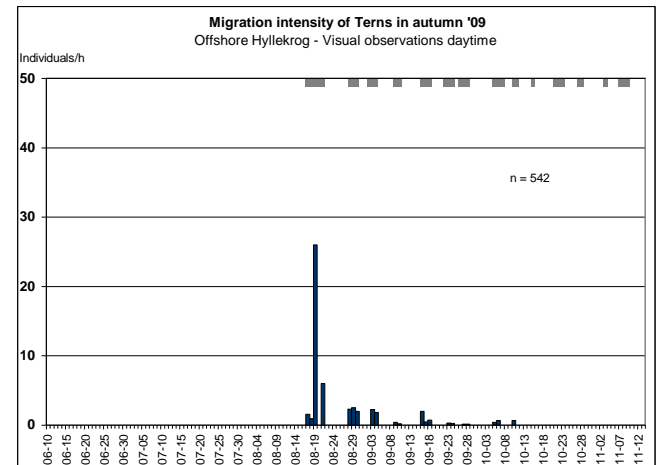
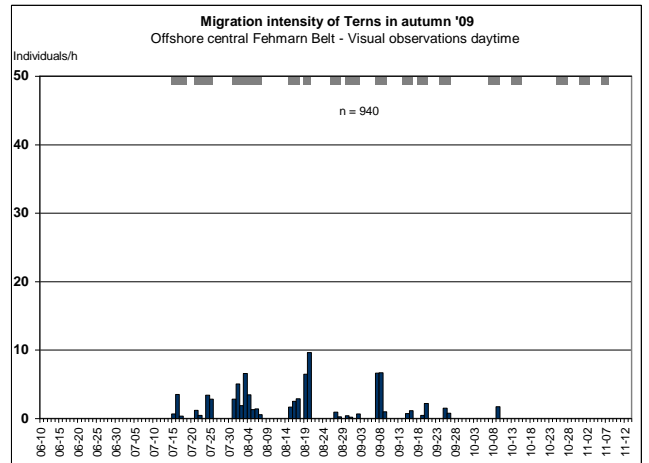
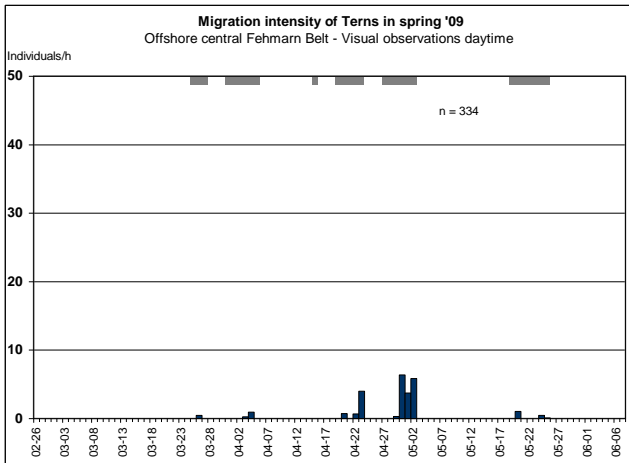
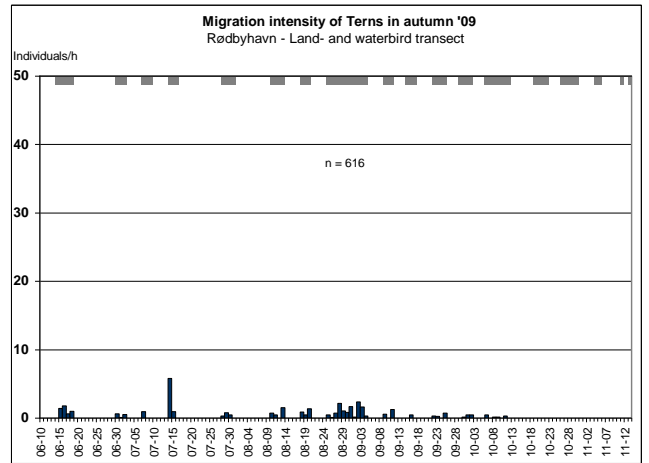
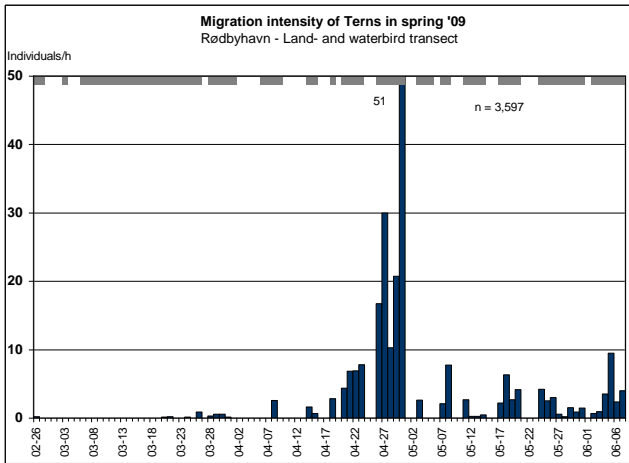
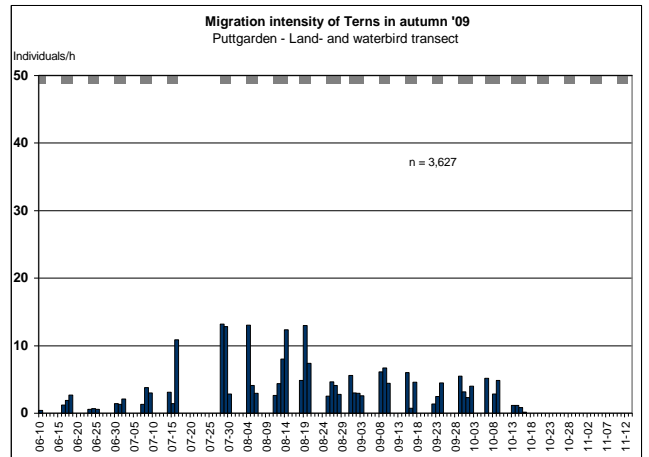
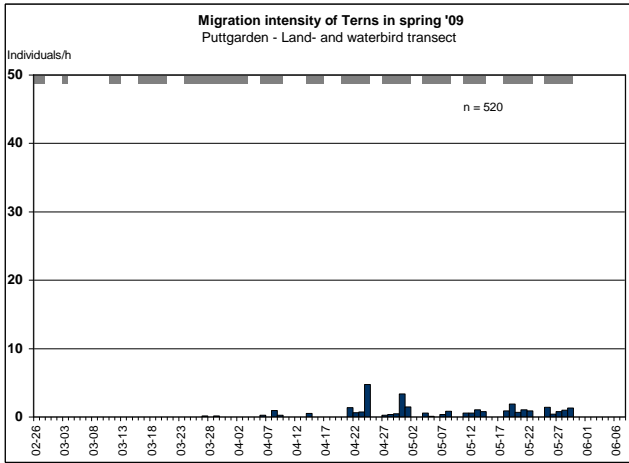


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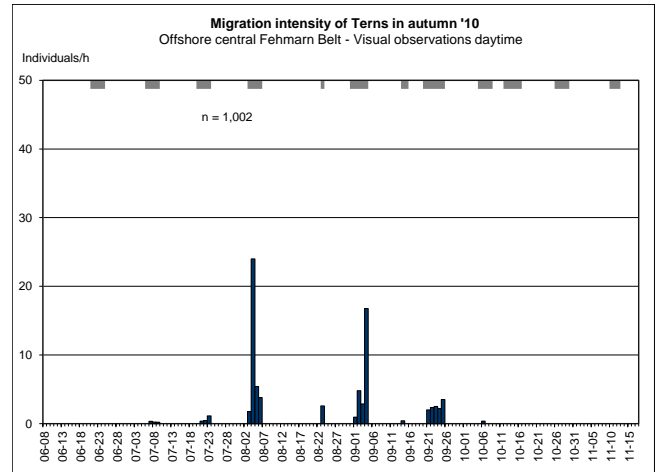
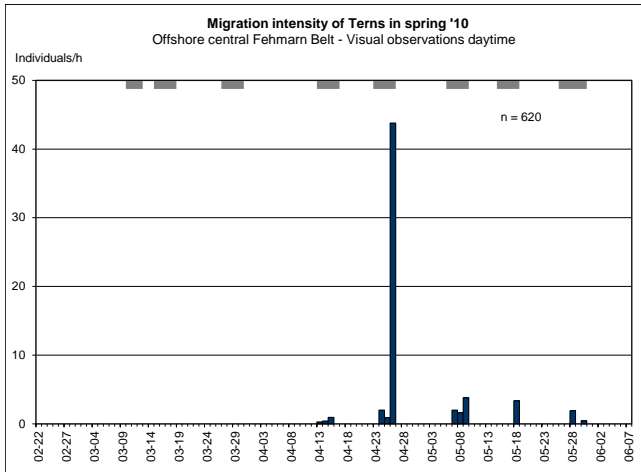
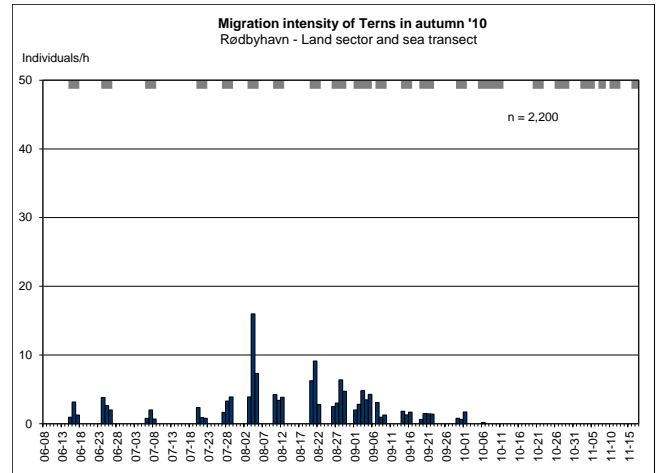
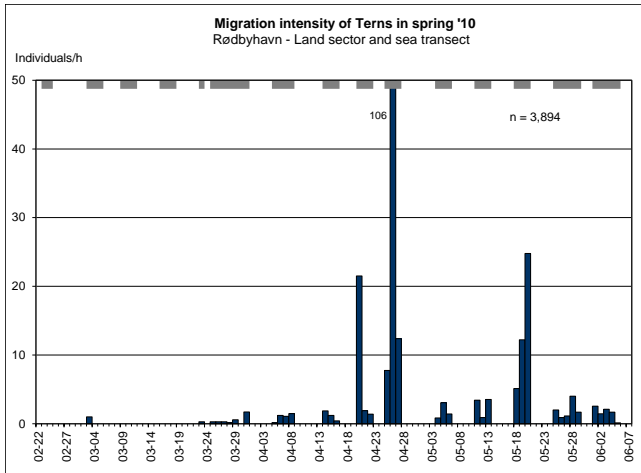
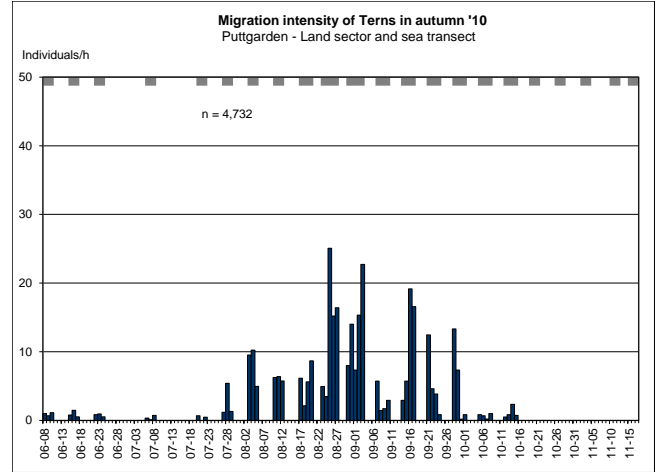
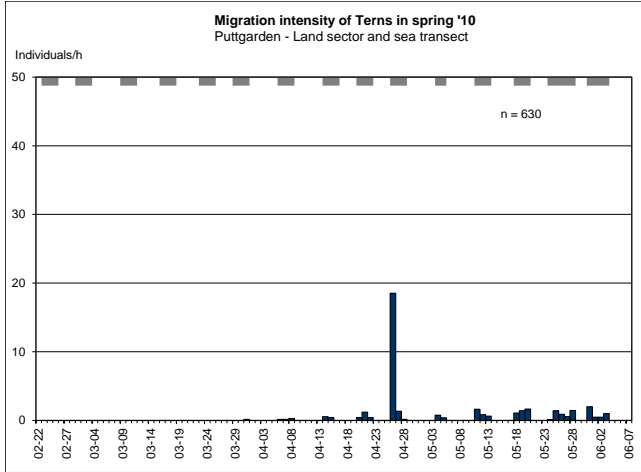


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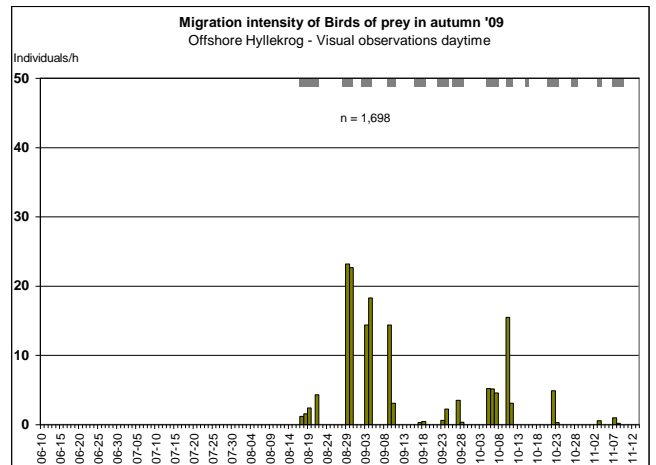
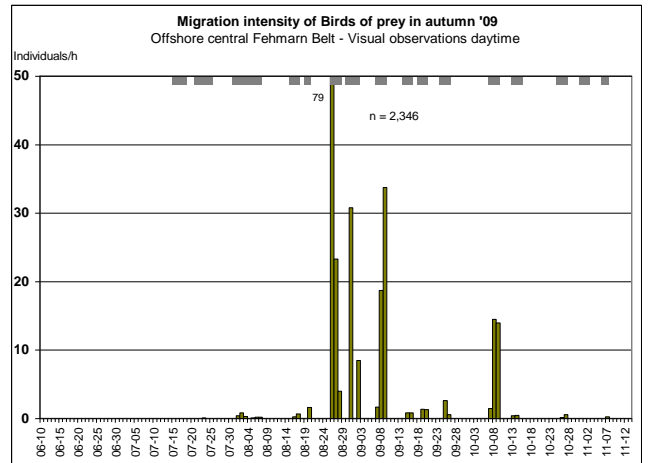
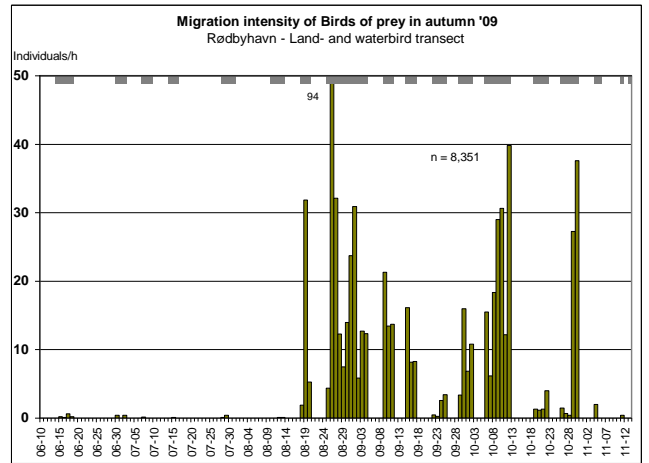
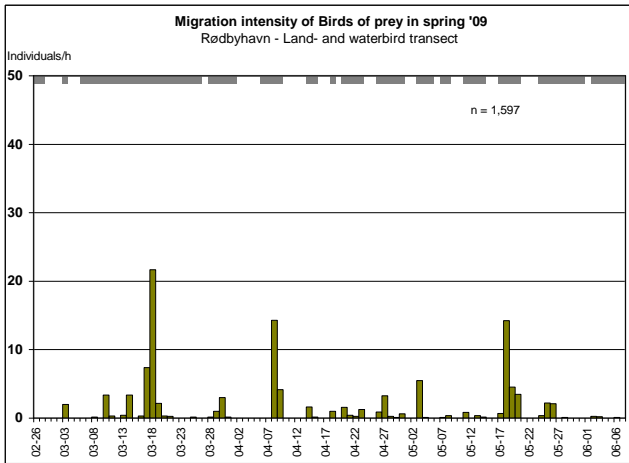
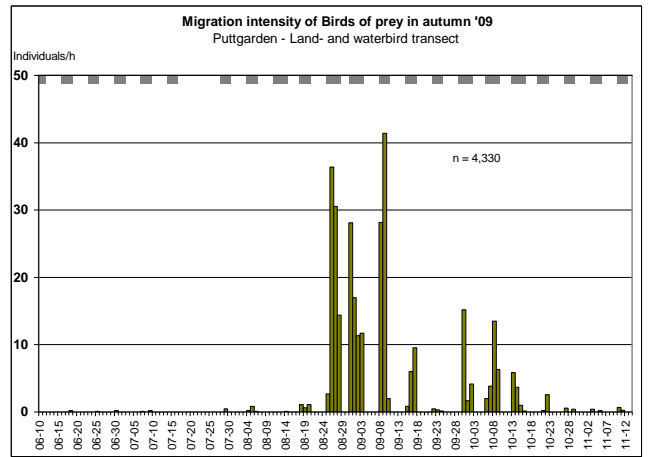
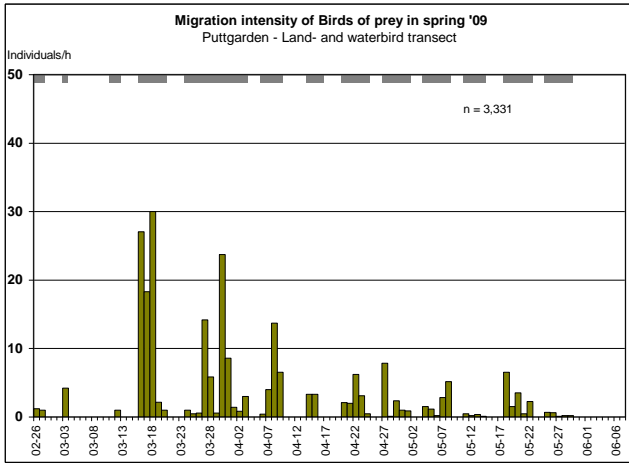
A.2.11 Terns – Sterna spp.



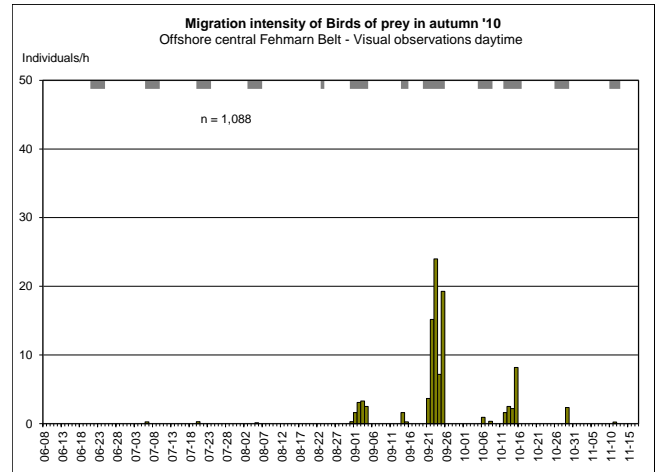
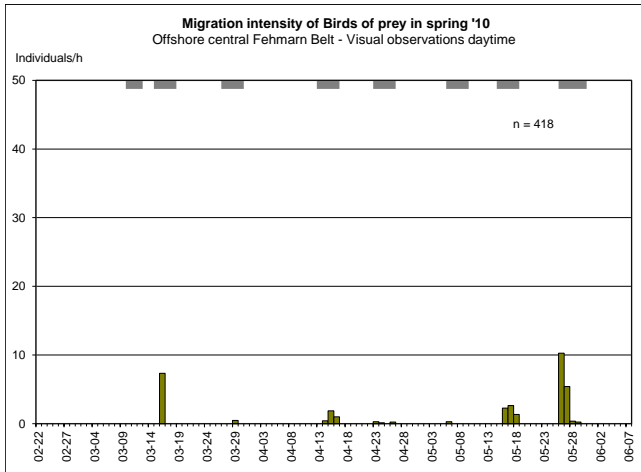
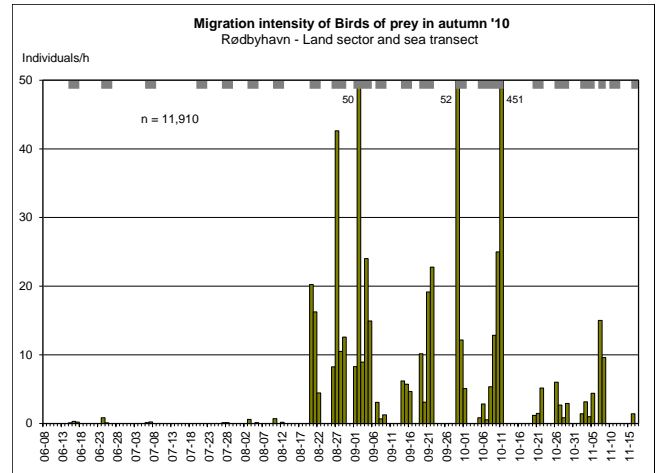
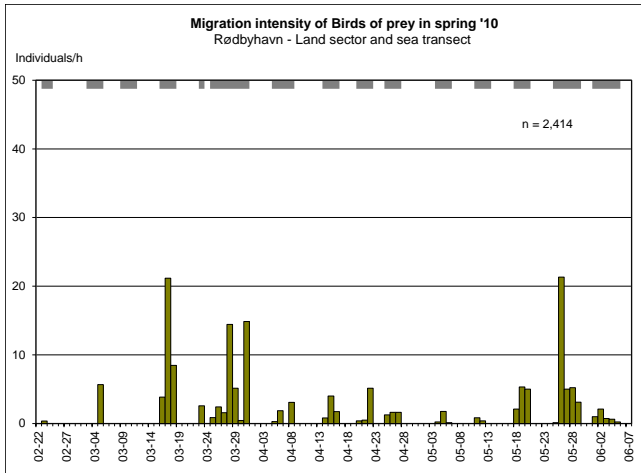
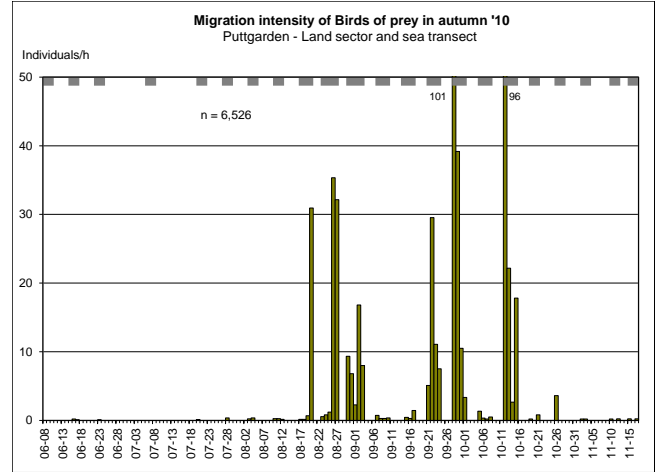
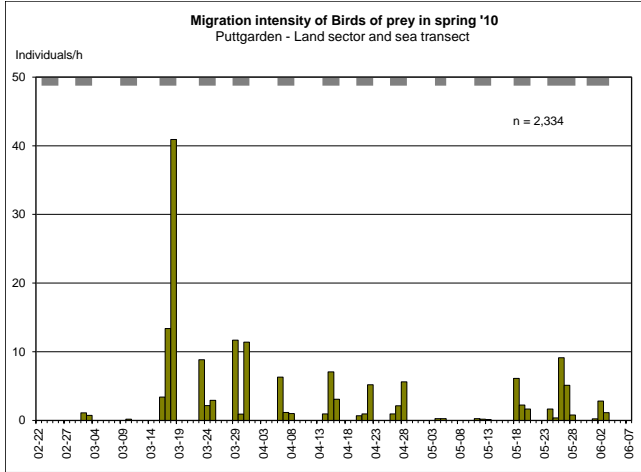
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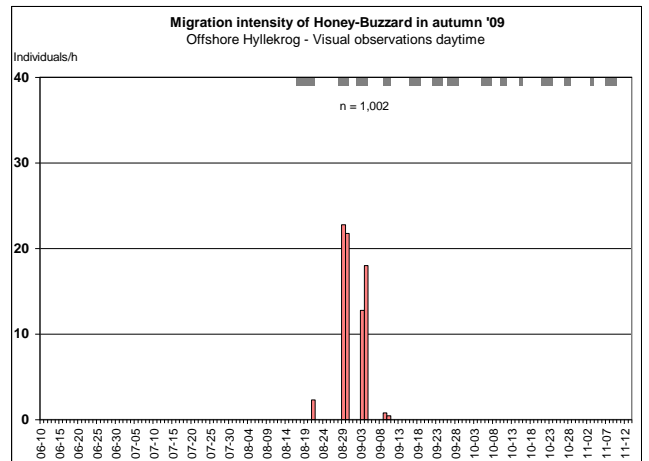
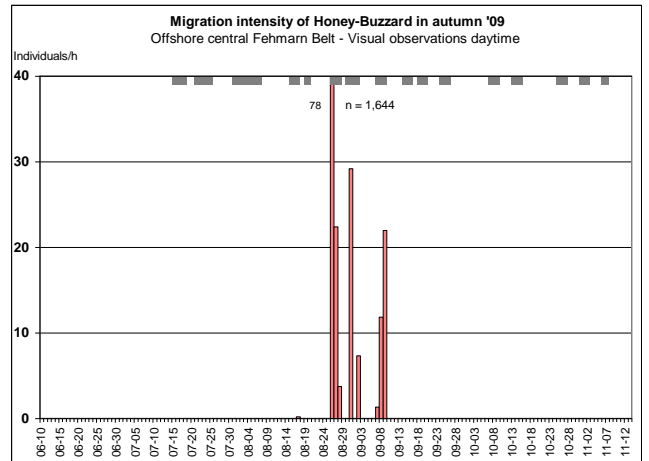
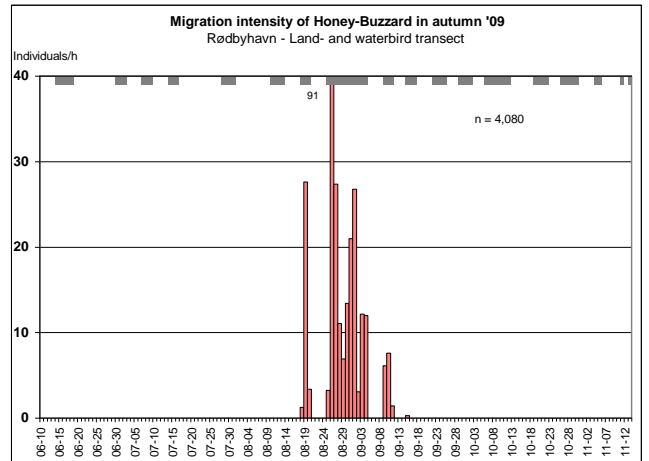
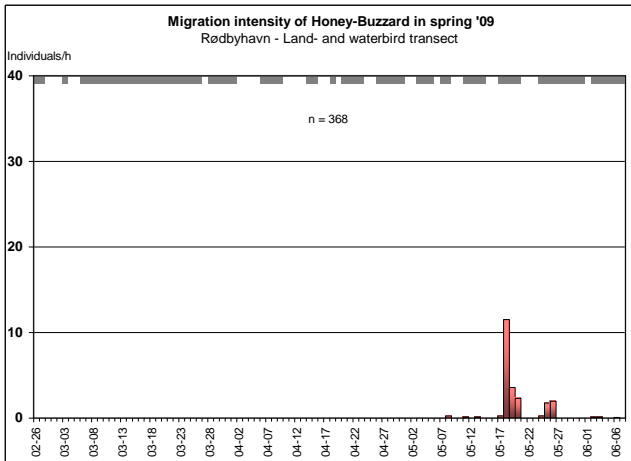
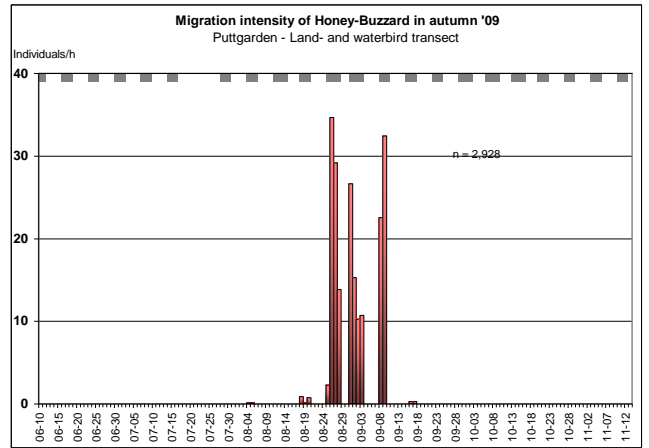
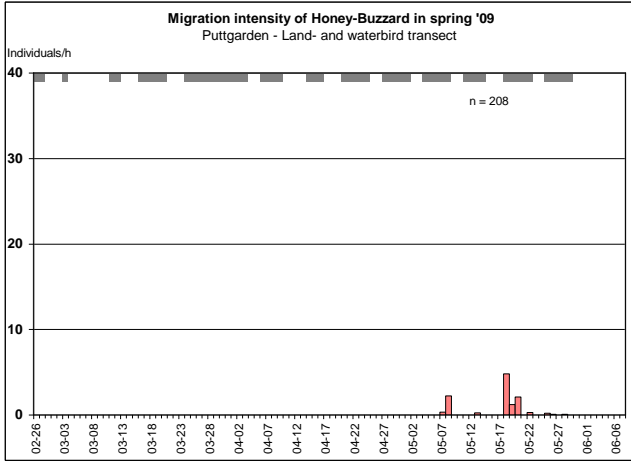
A.2.12 Birds of prey



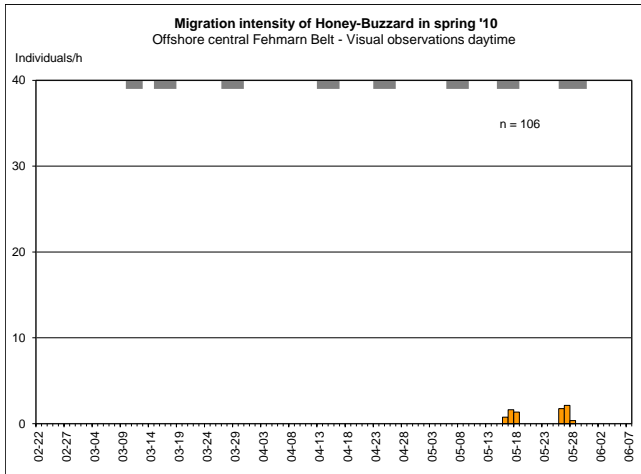
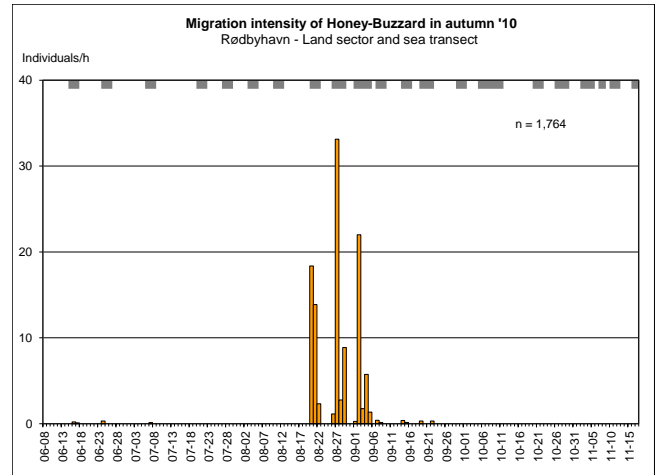
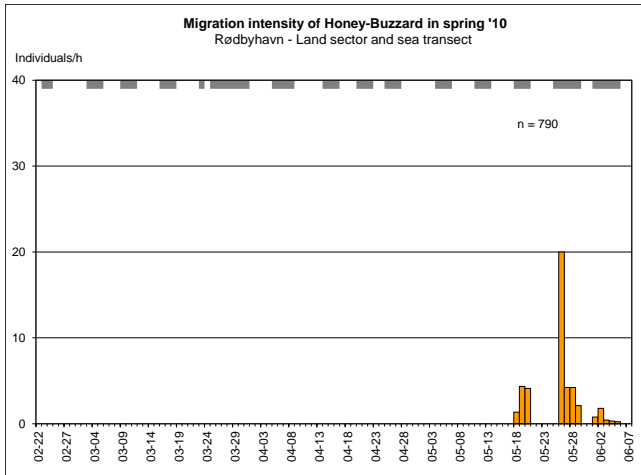
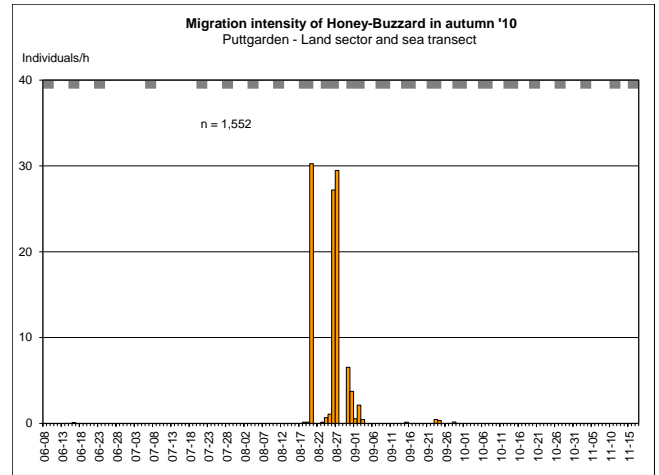
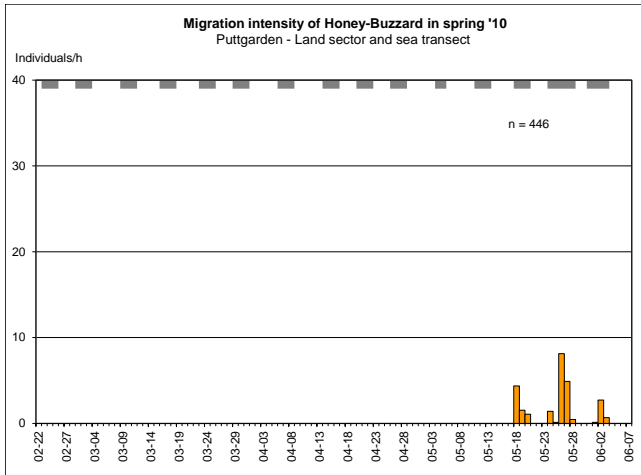
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Honey Buzzard – *Pernis apivorus*

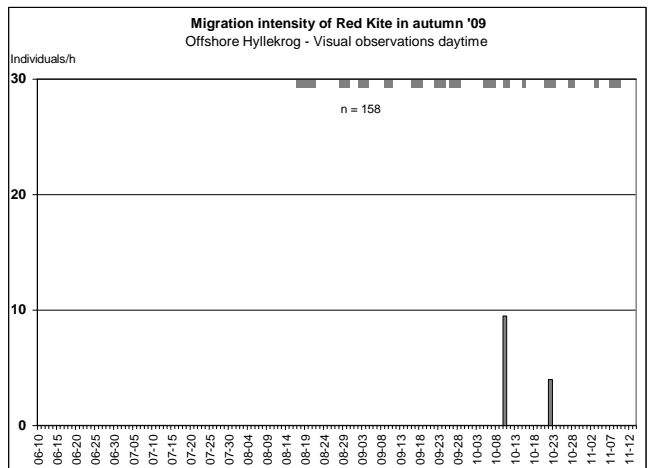
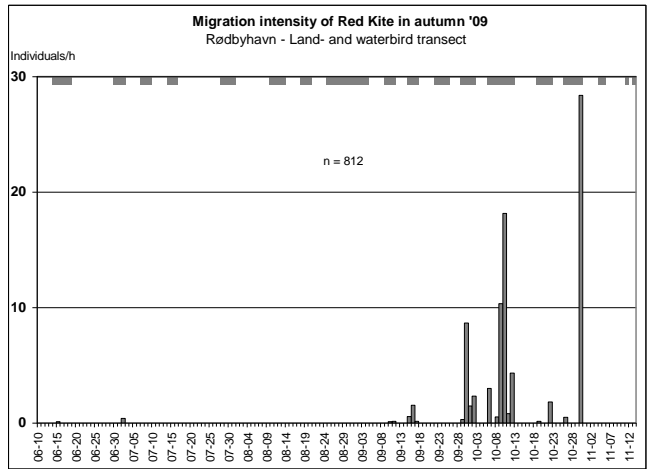
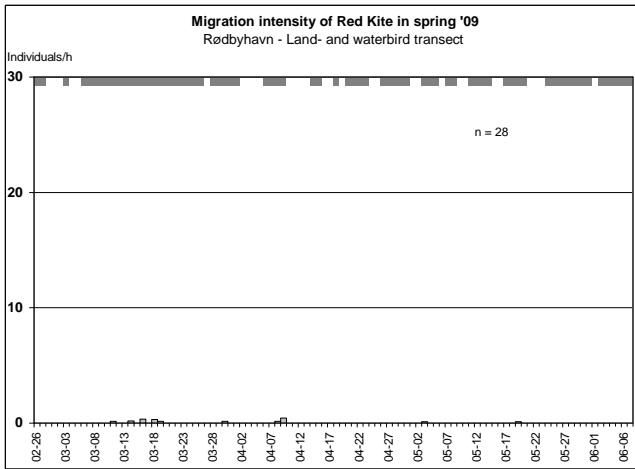
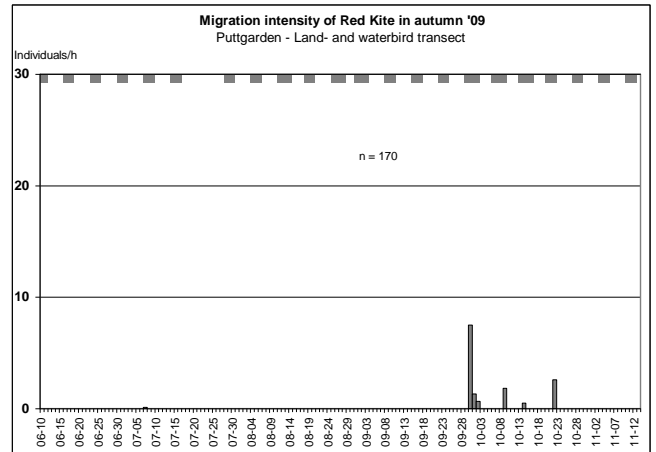
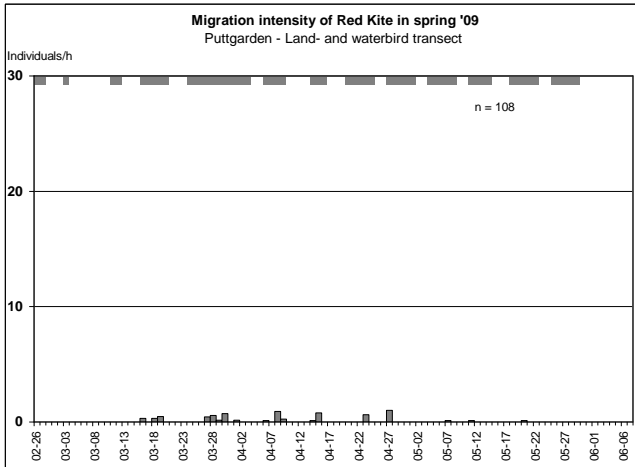


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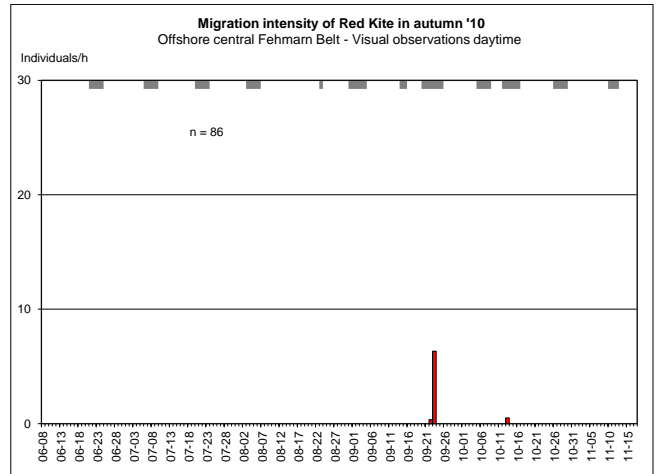
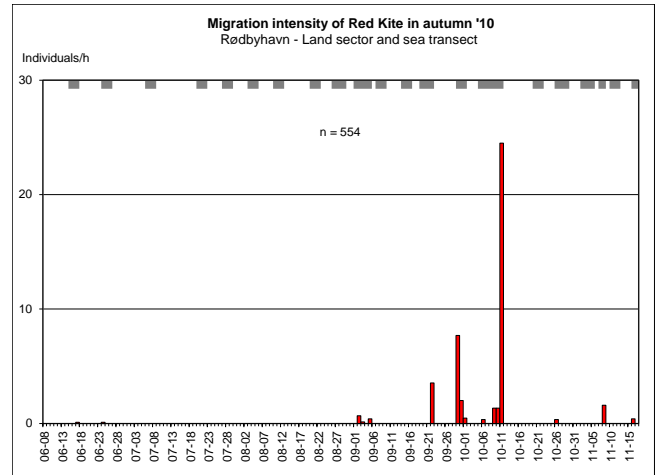
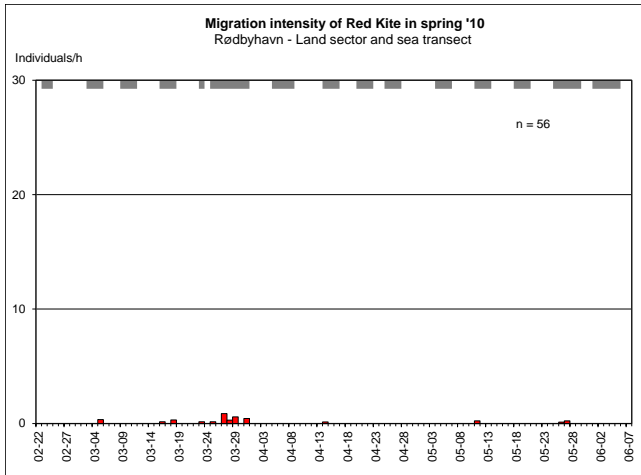
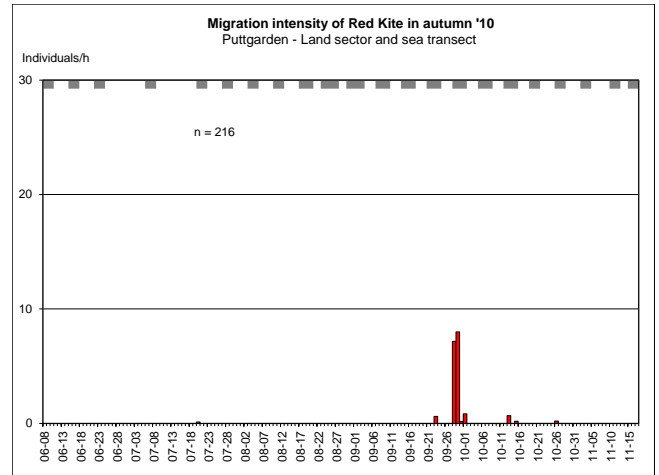
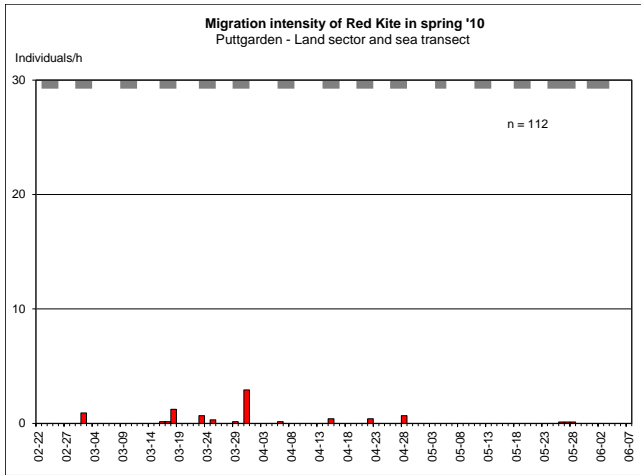


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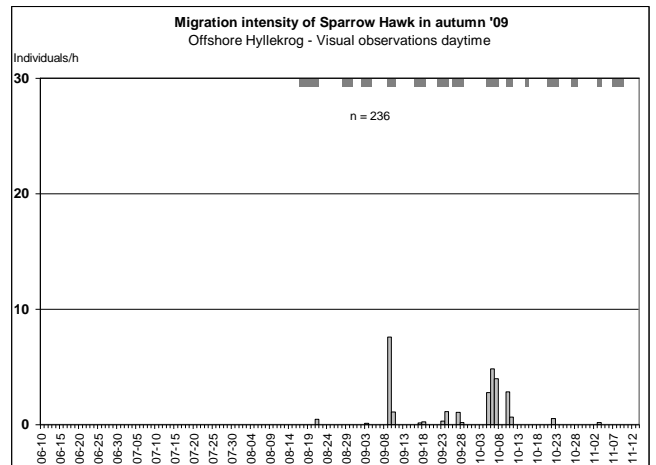
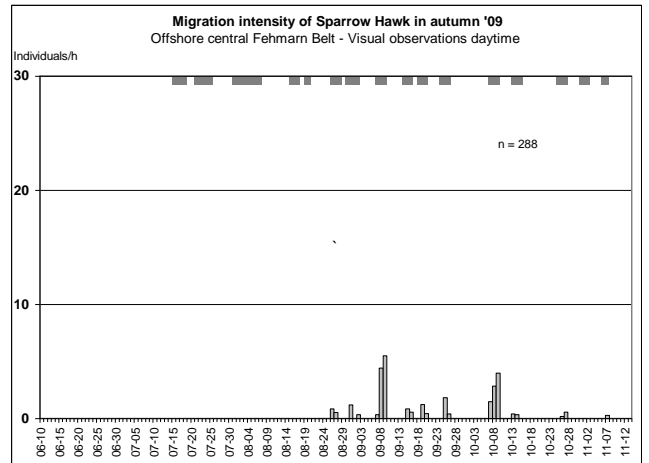
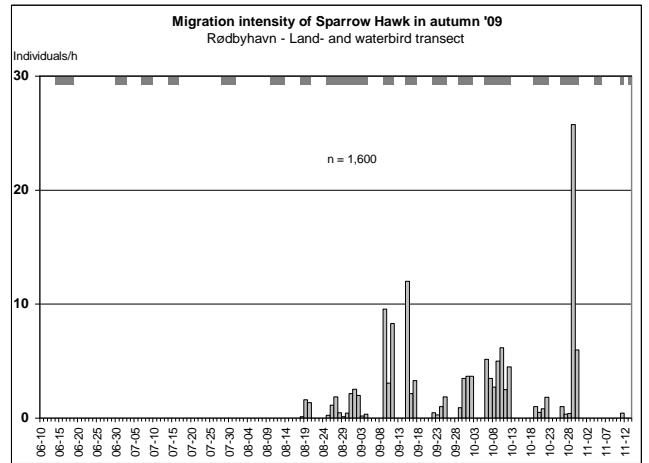
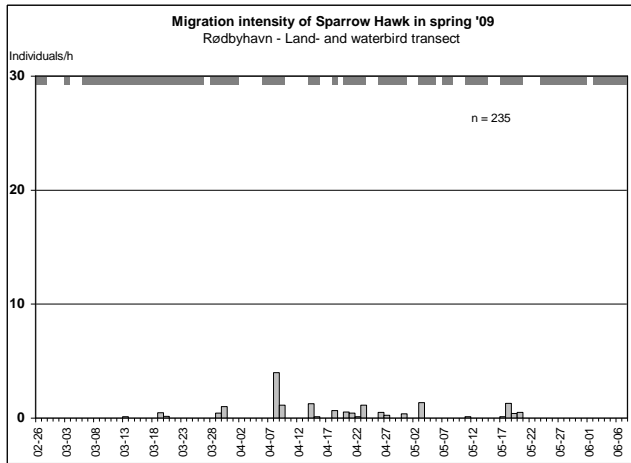
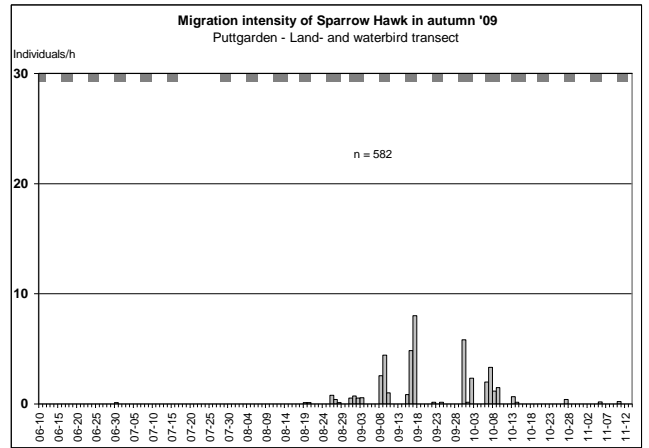
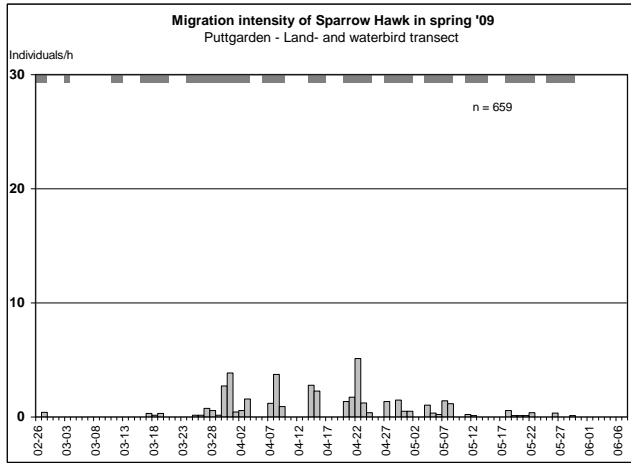
Red Kite – *Milvus milvus*



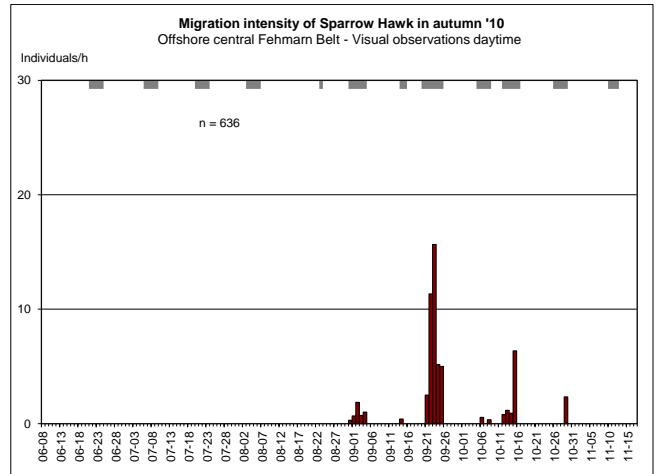
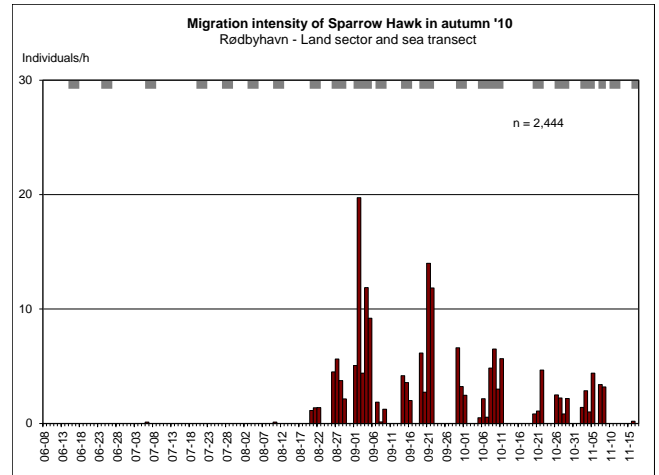
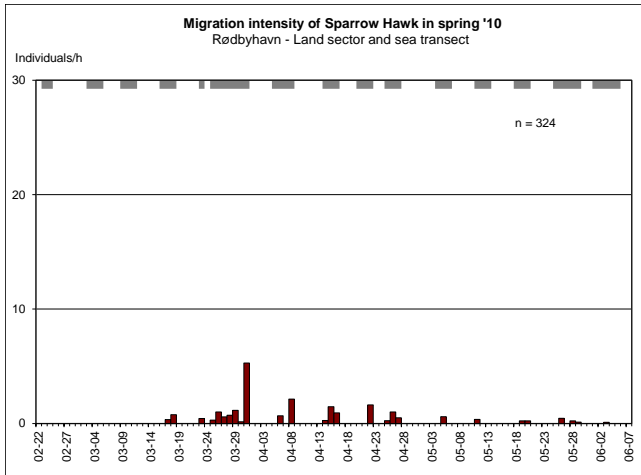
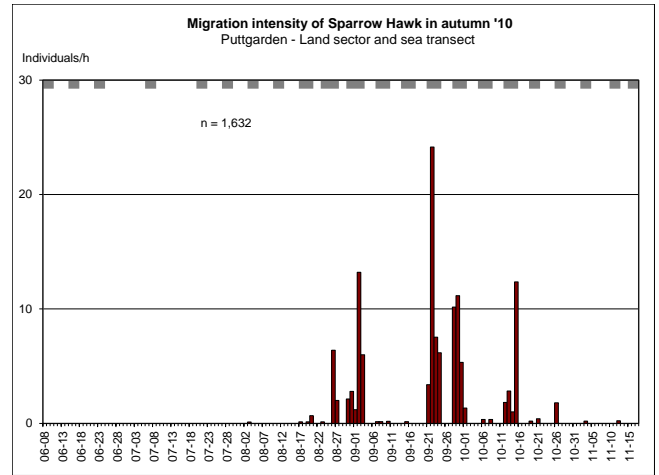
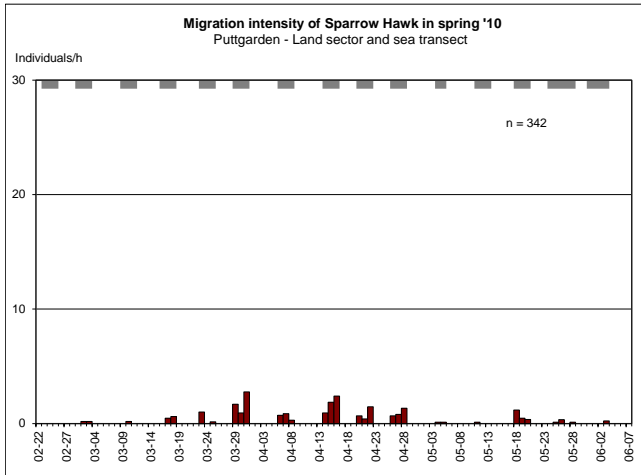
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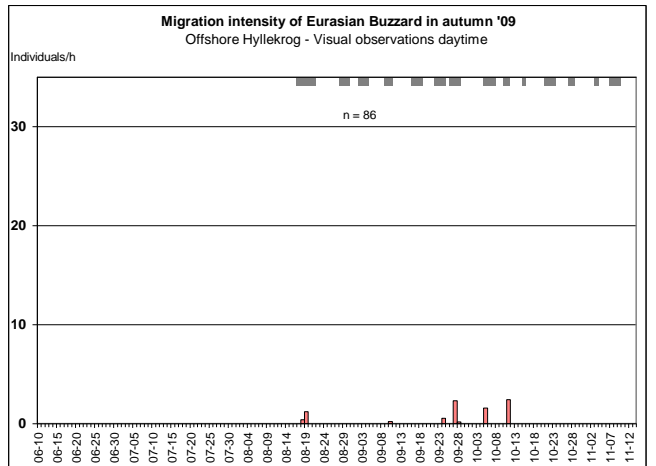
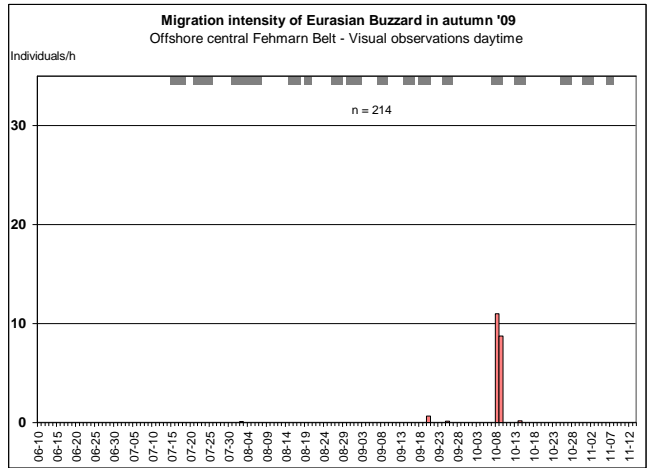
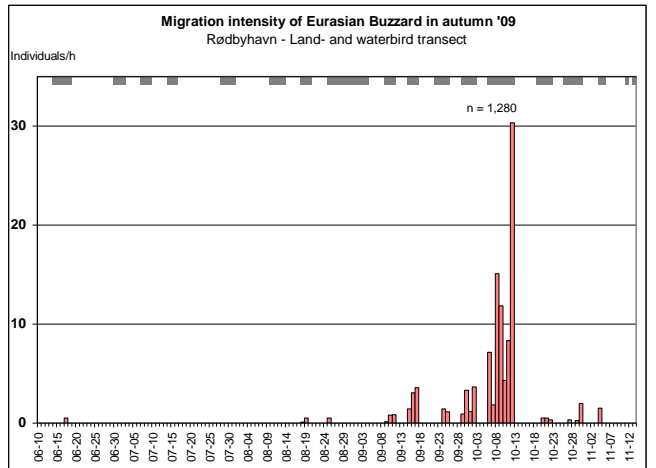
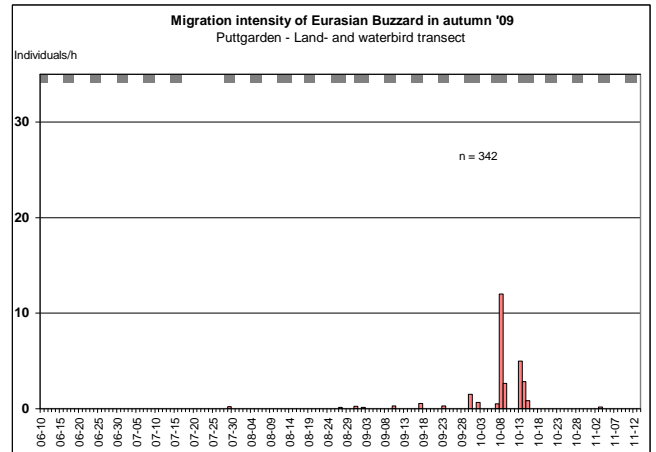
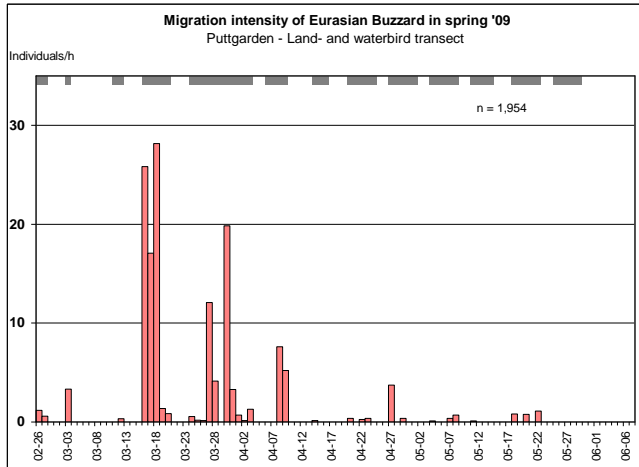
Sparrowhawk – *Accipiter nisus*



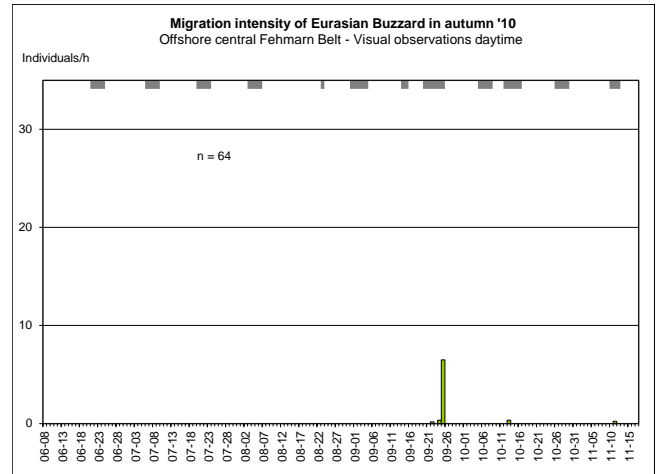
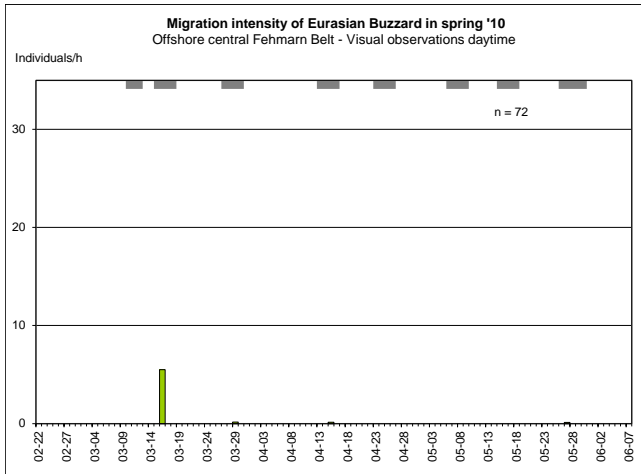
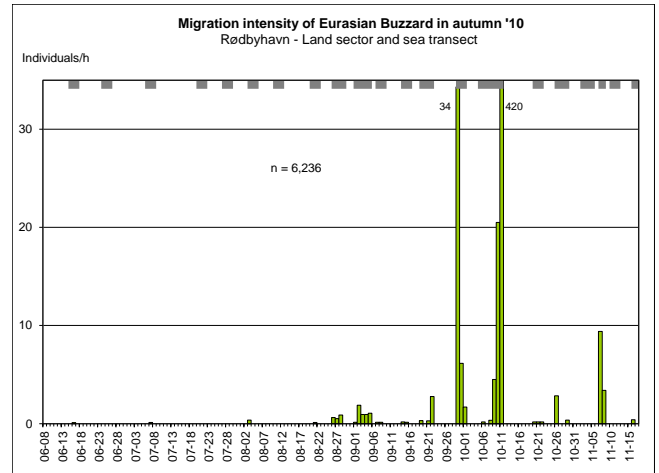
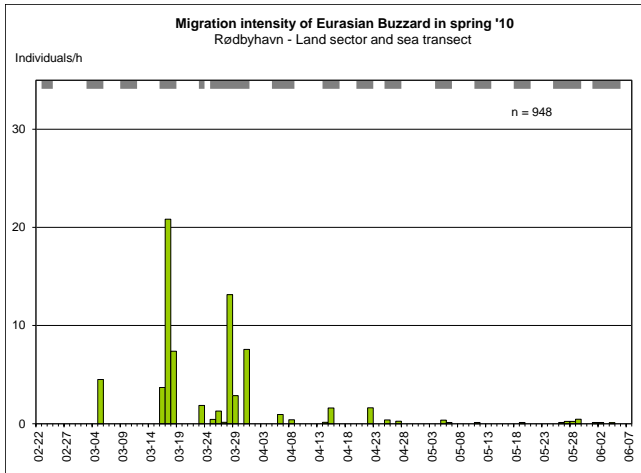
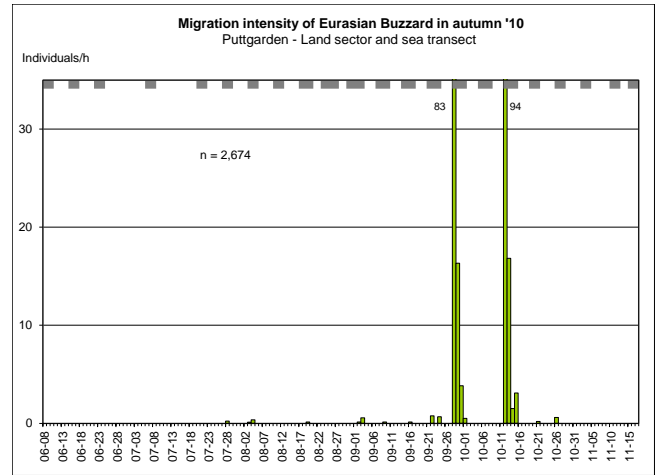
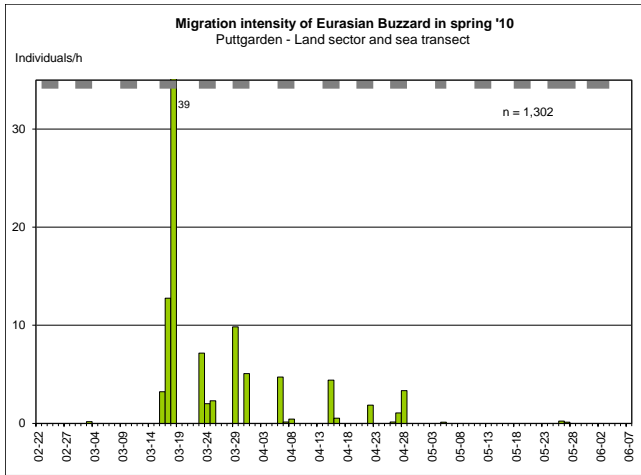
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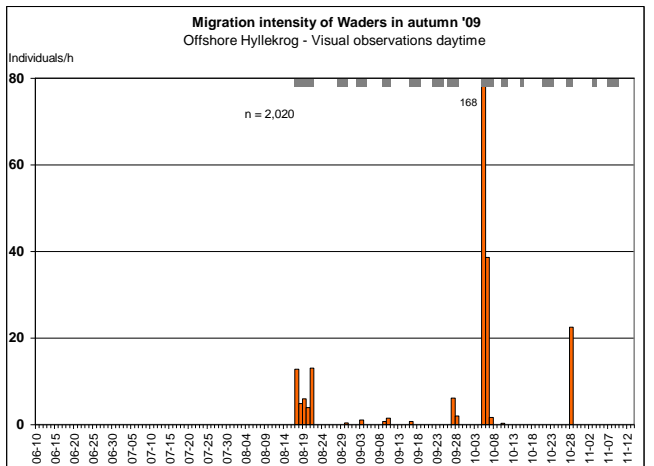
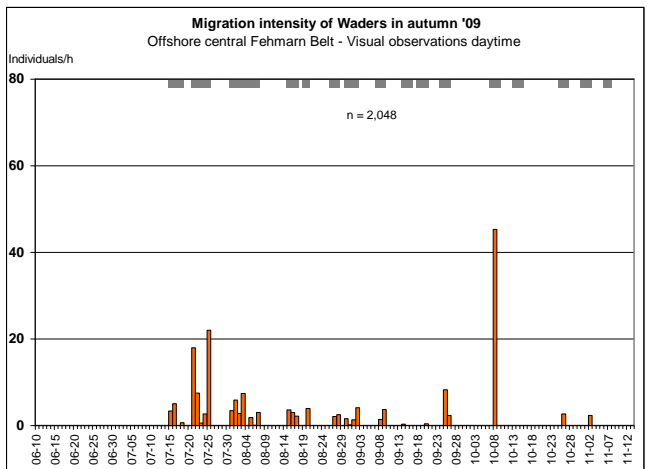
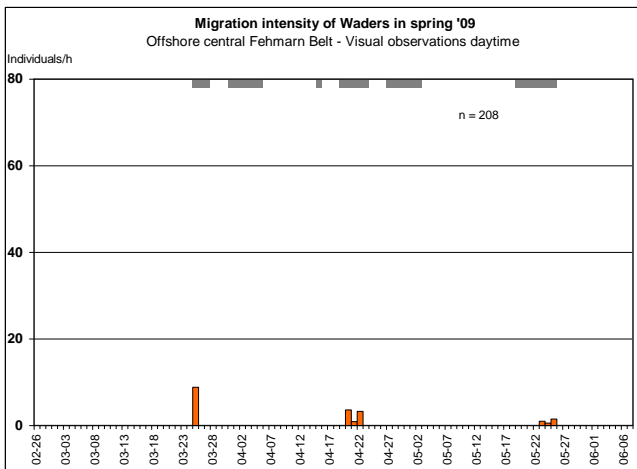
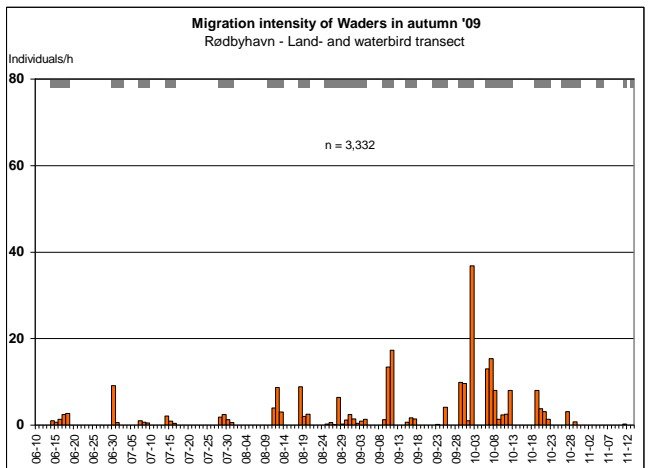
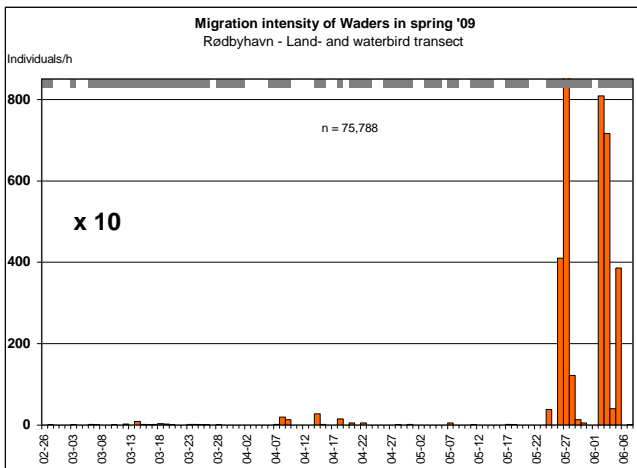
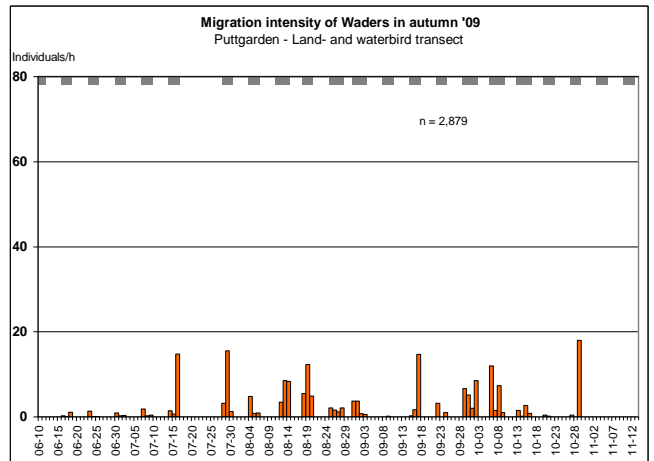
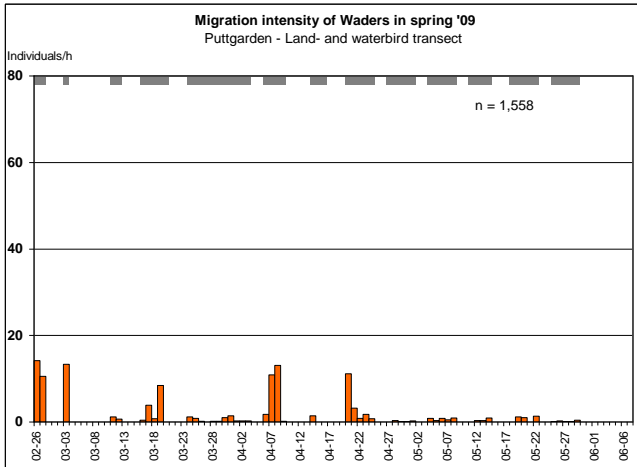
Common Buzzard – *Buteo buteo*



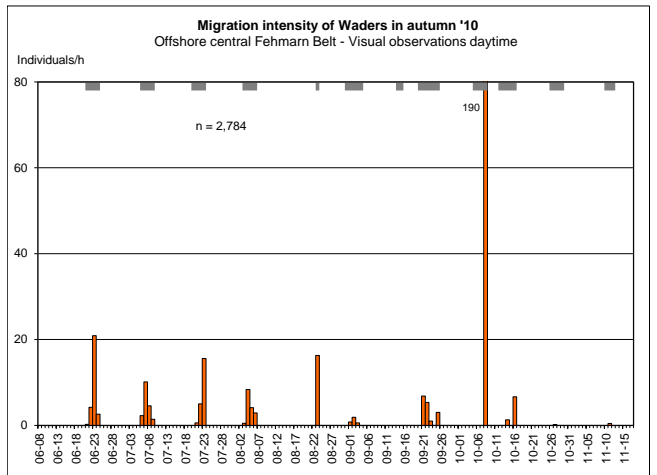
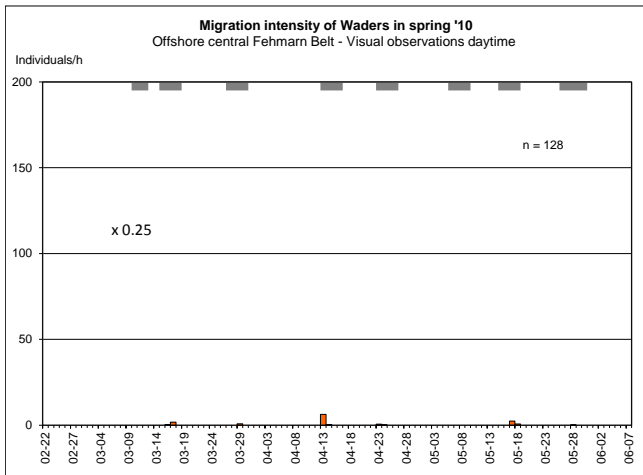
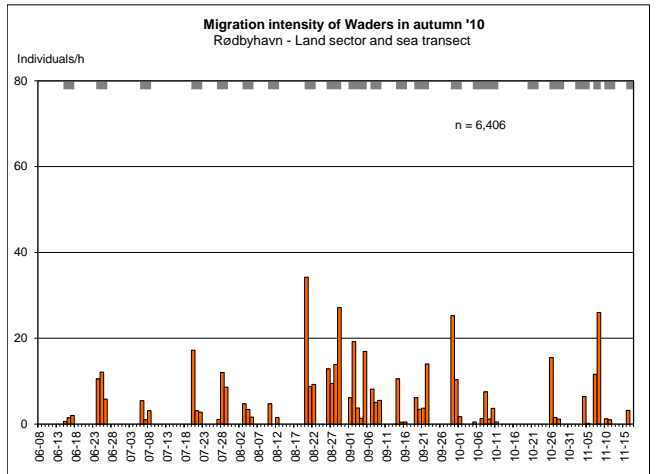
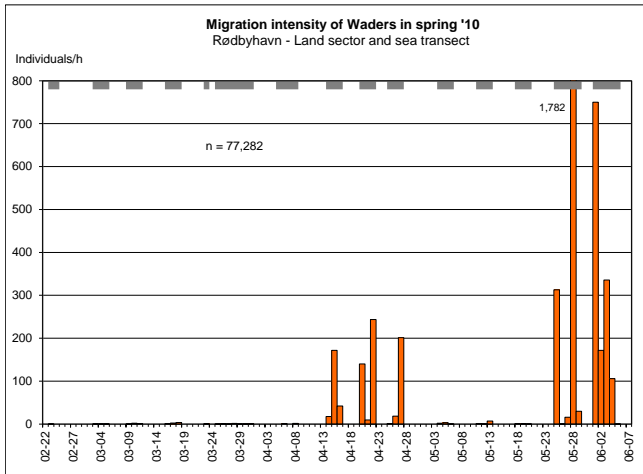
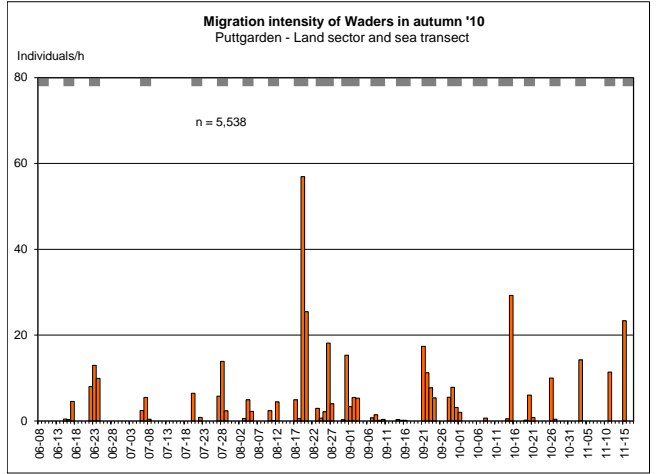
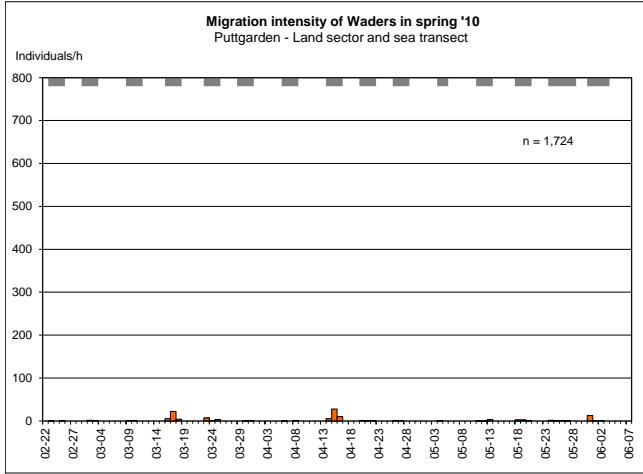
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A.2.13 Waders



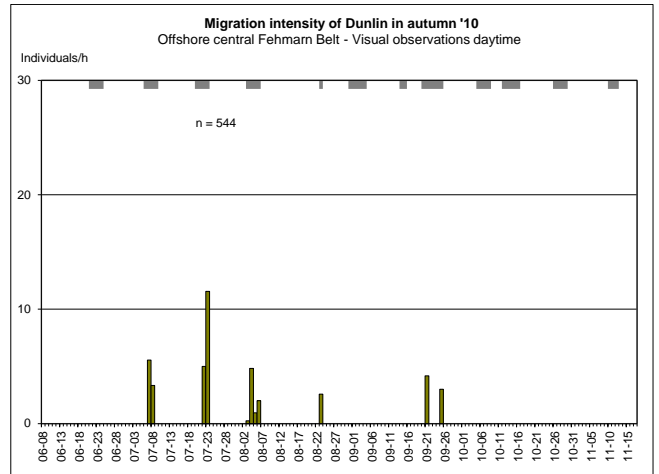
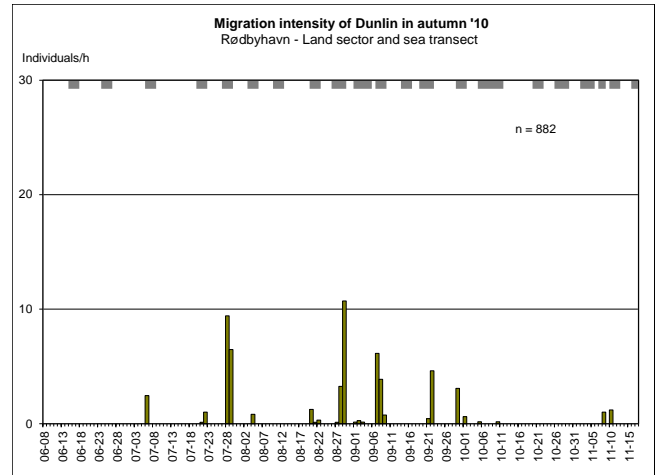
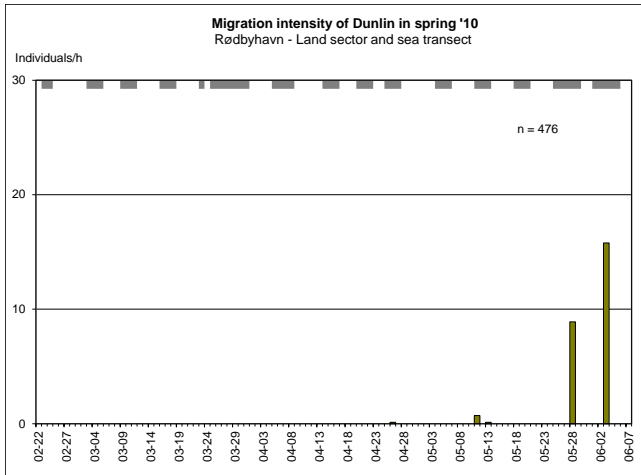
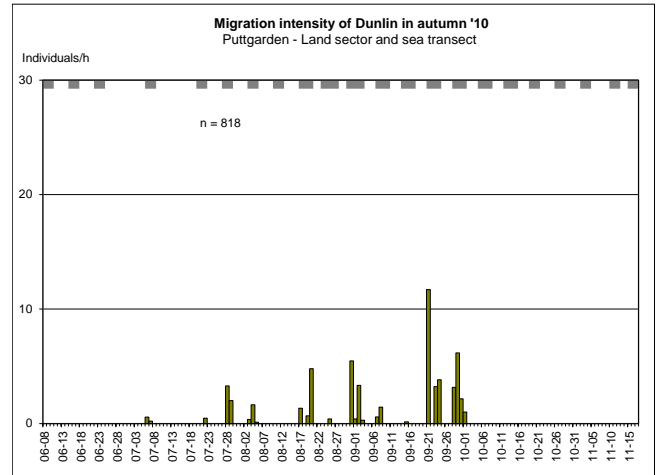
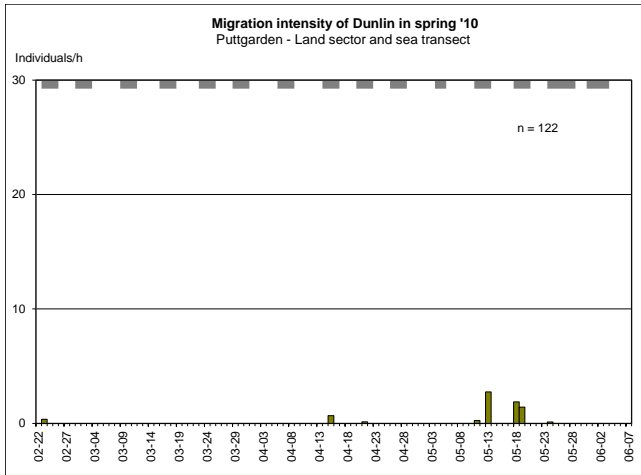
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Dunlin – *Calidris alpina*

No Dunlin data from 2009

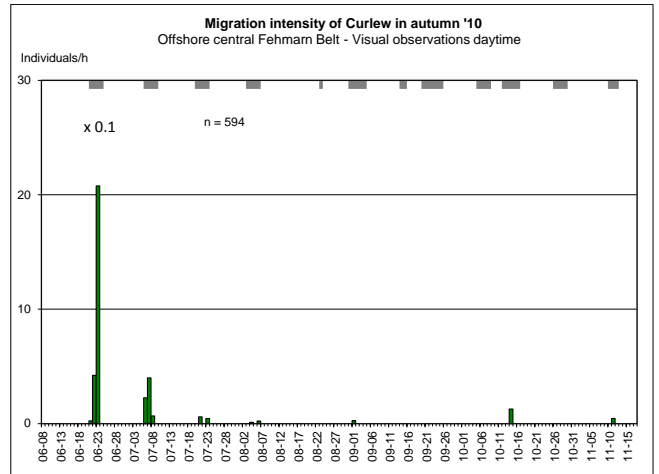
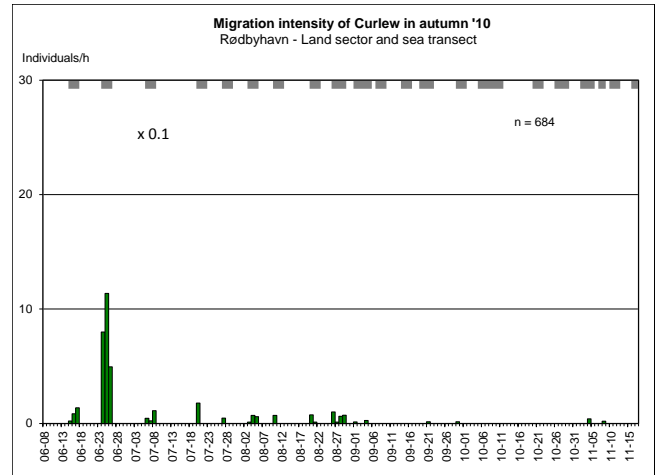
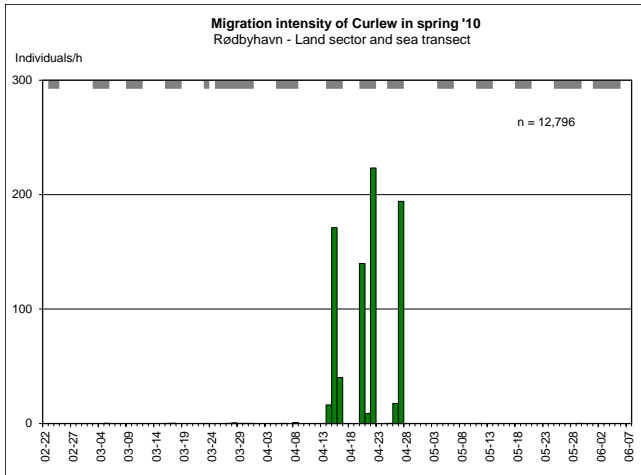
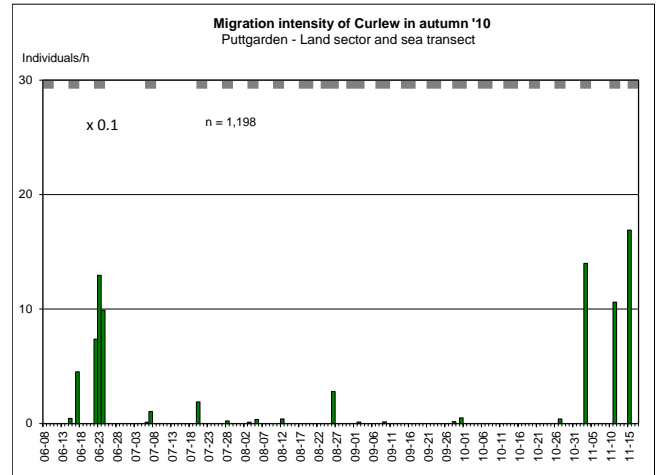
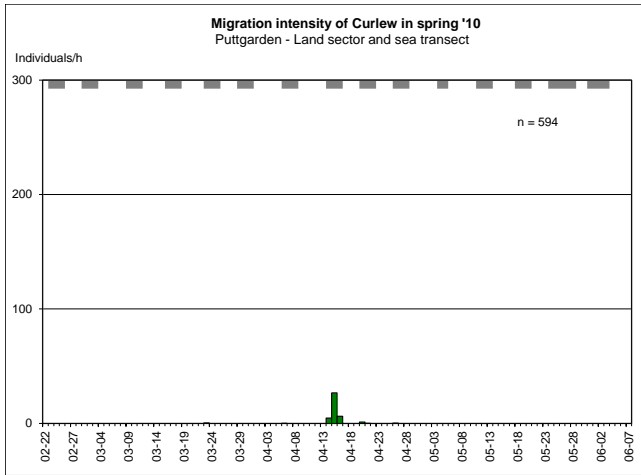
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Curlew – *Numenius arquata*

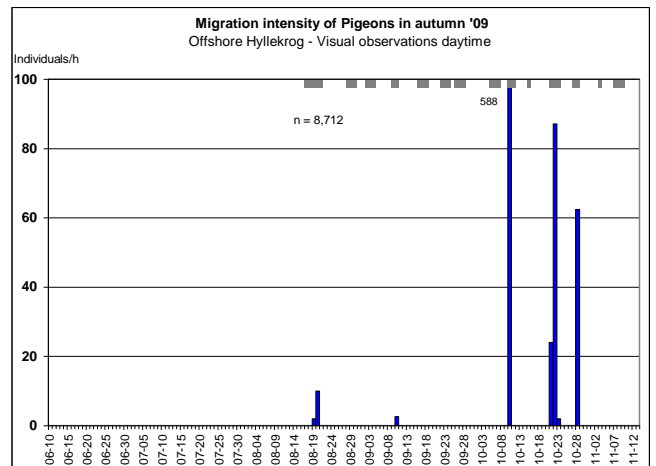
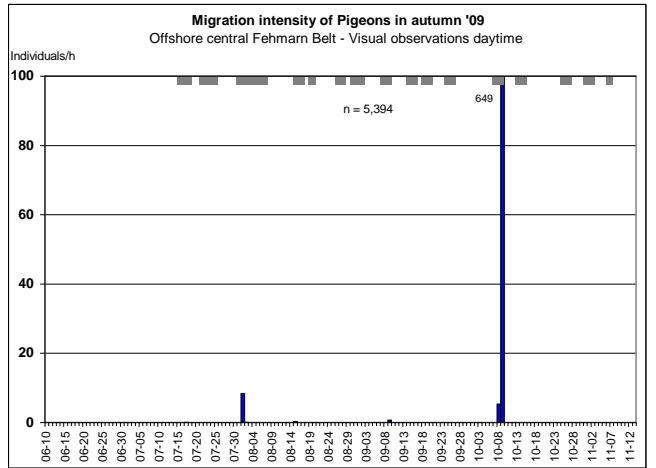
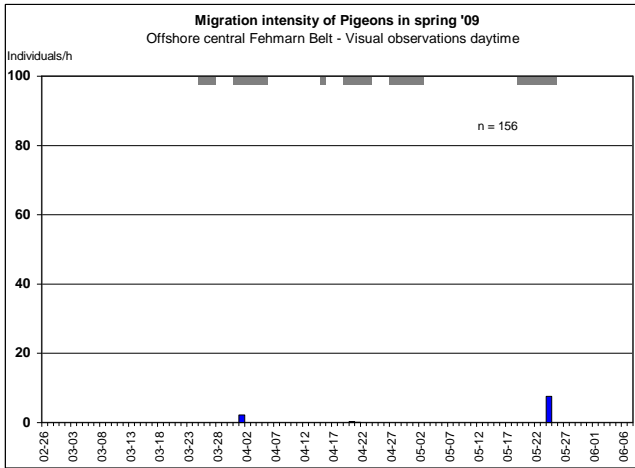
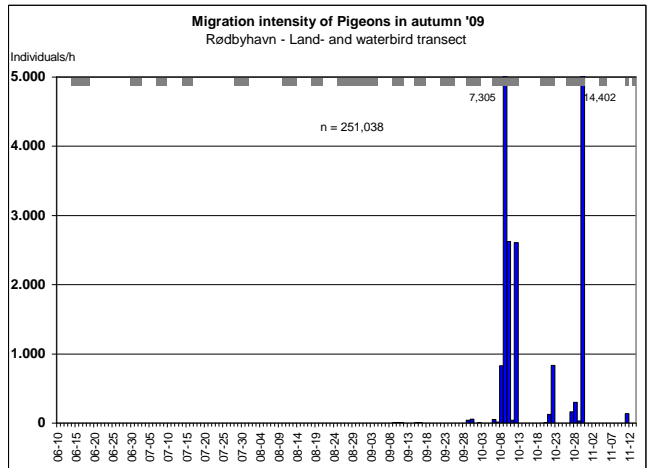
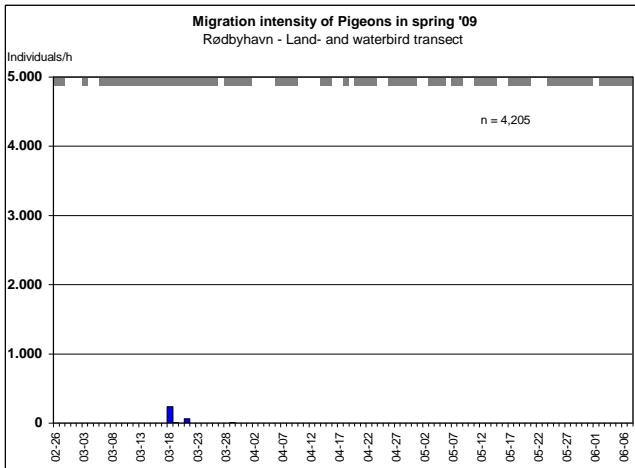
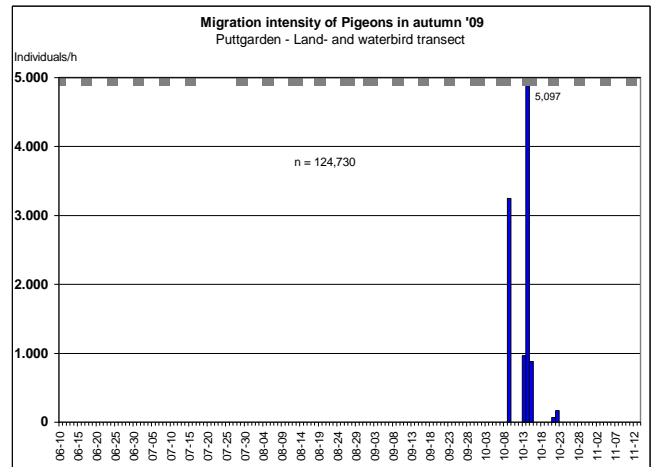
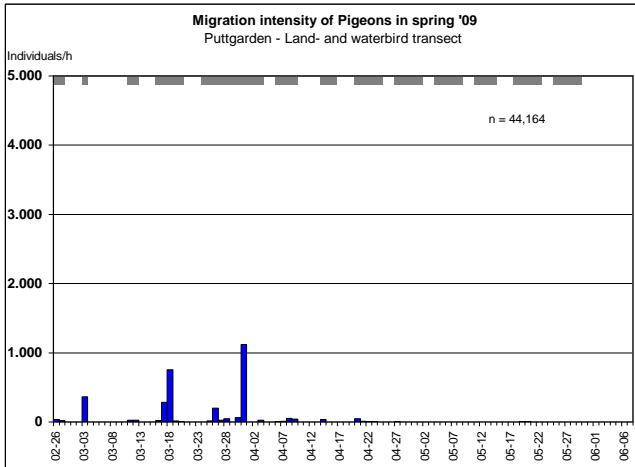
No Curlew data from 2009

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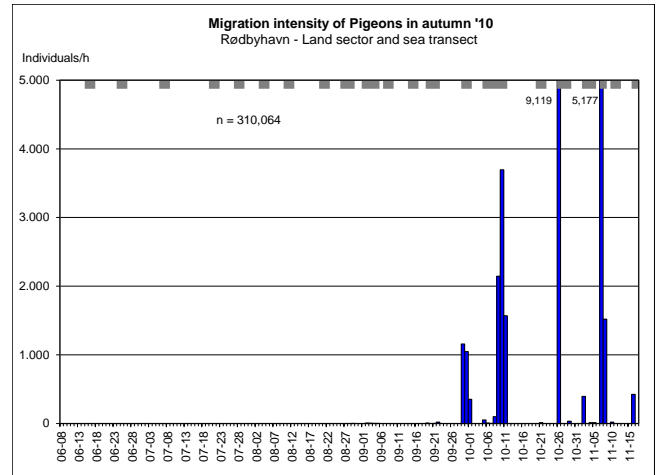
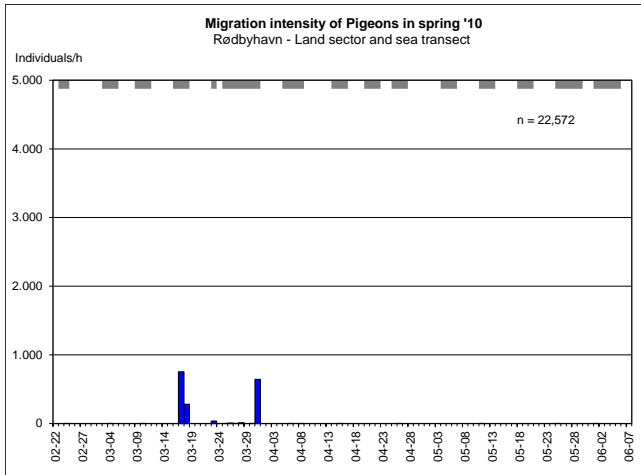
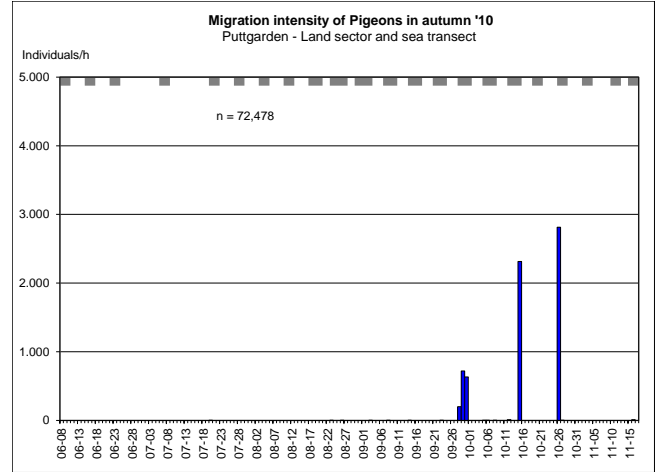
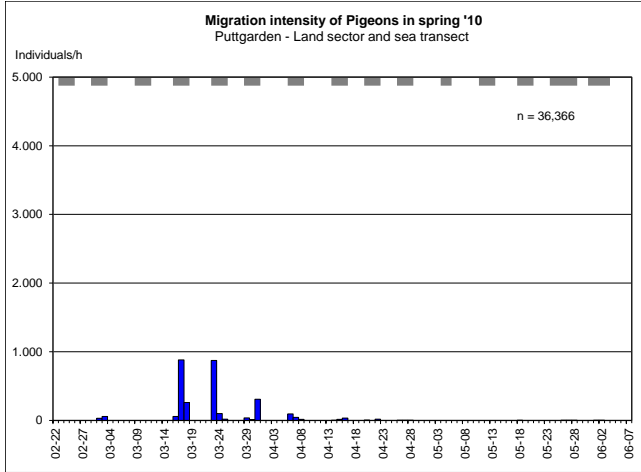


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A.2.14 Pigeons



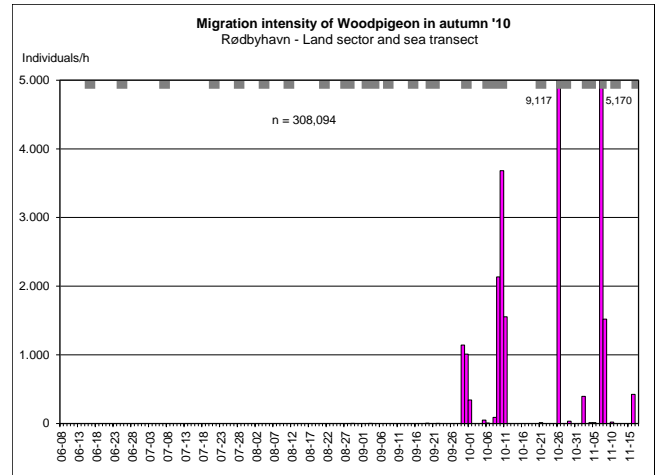
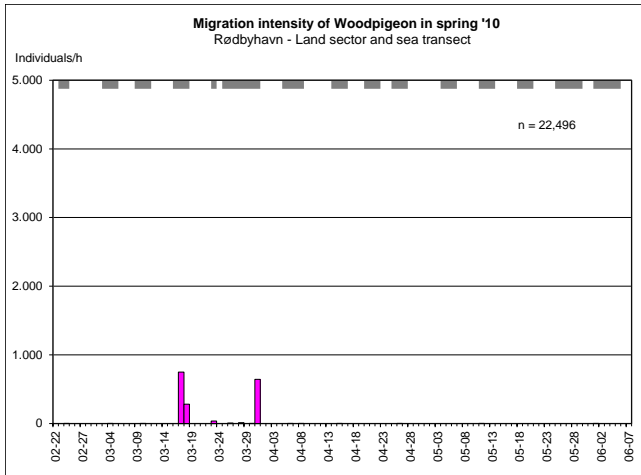
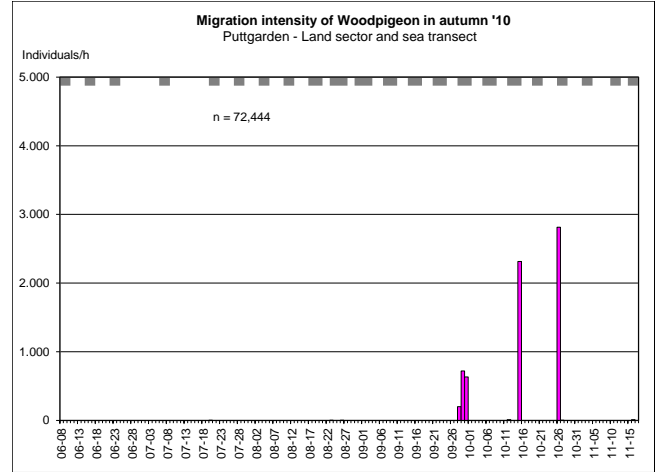
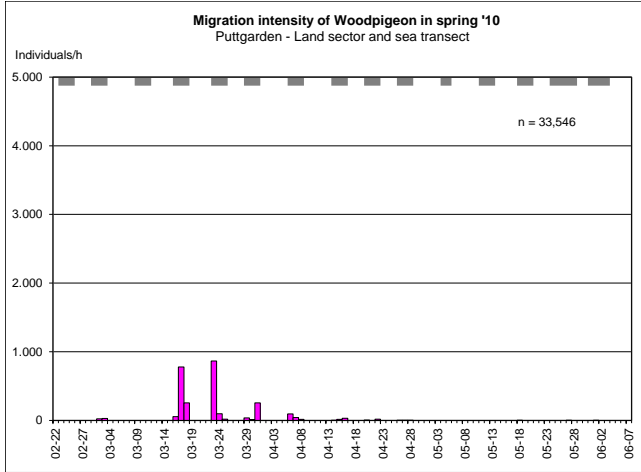
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Woodpigeon – *Columba palumbus*

No Woodpigeon data from 2009

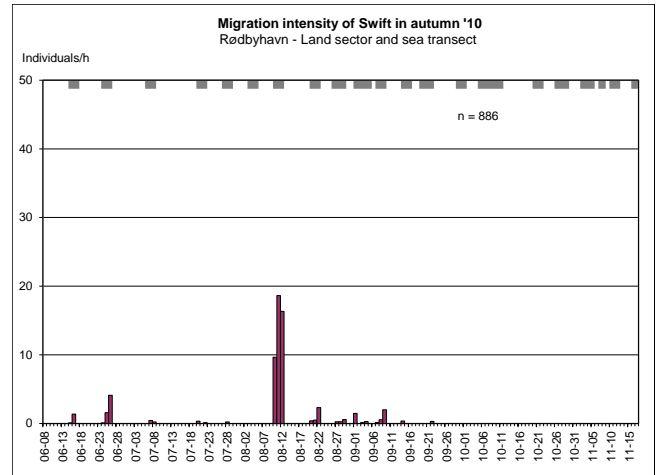
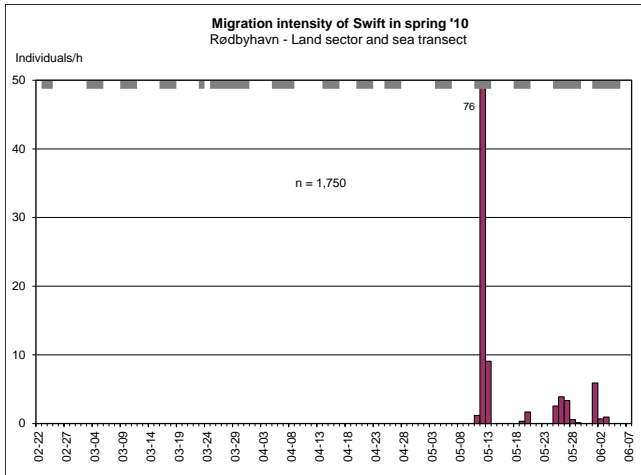
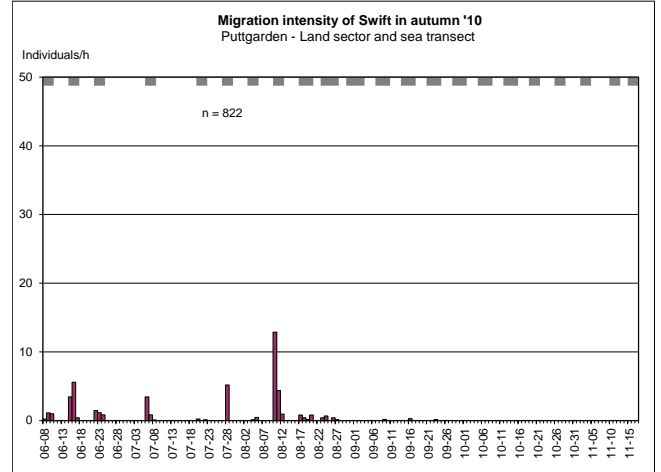
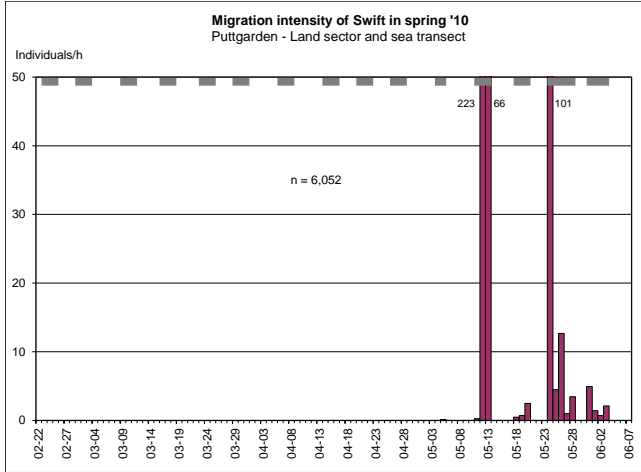
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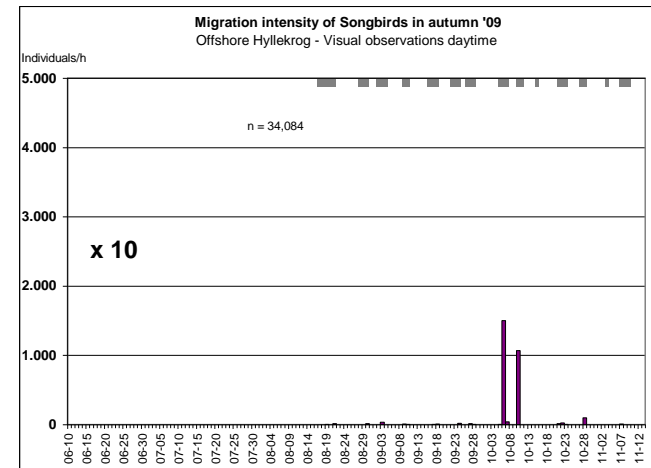
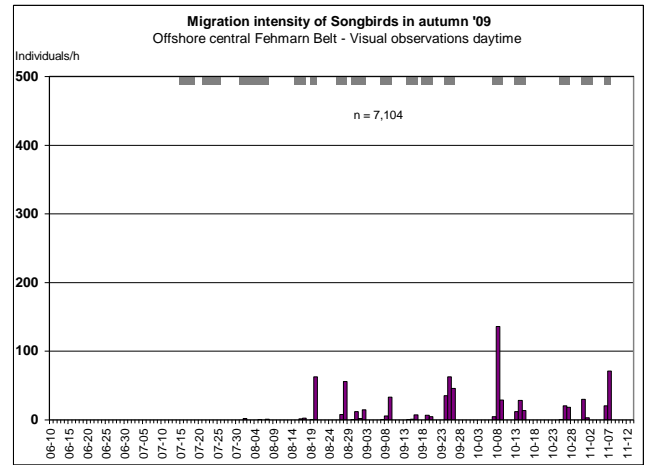
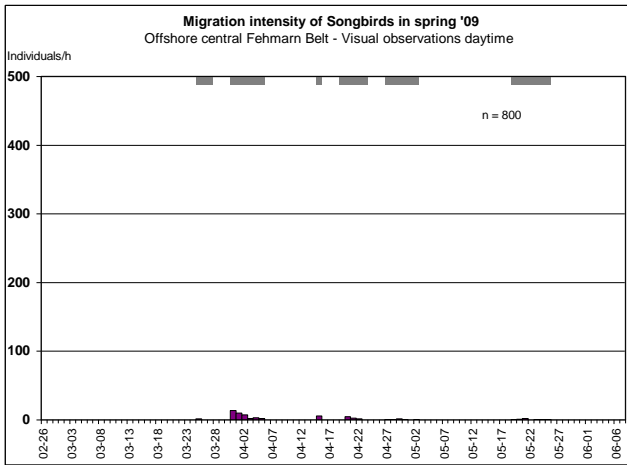
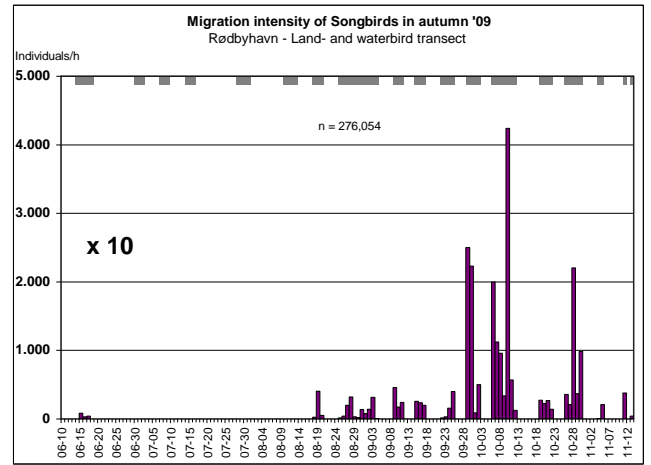
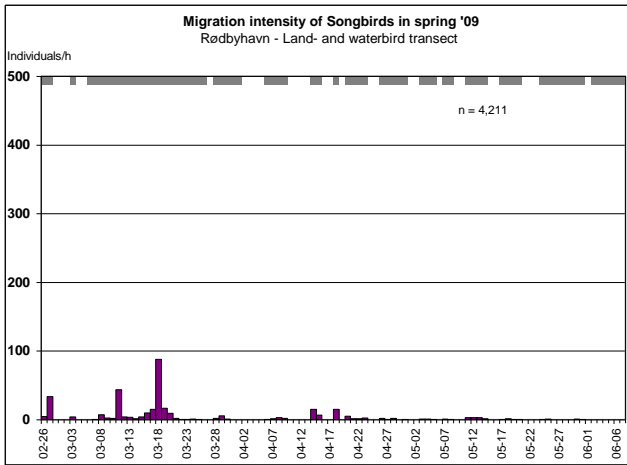
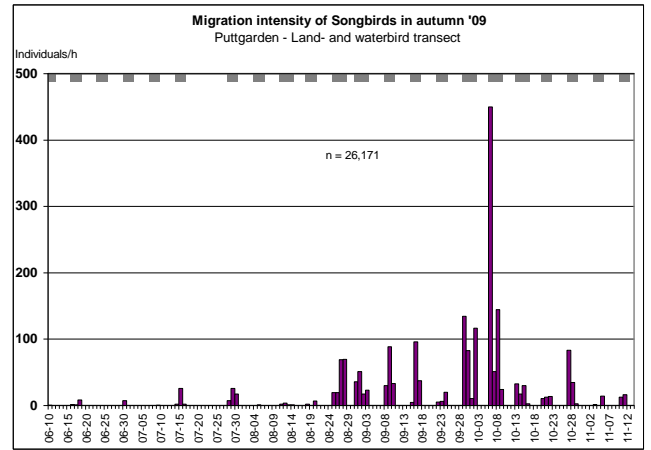
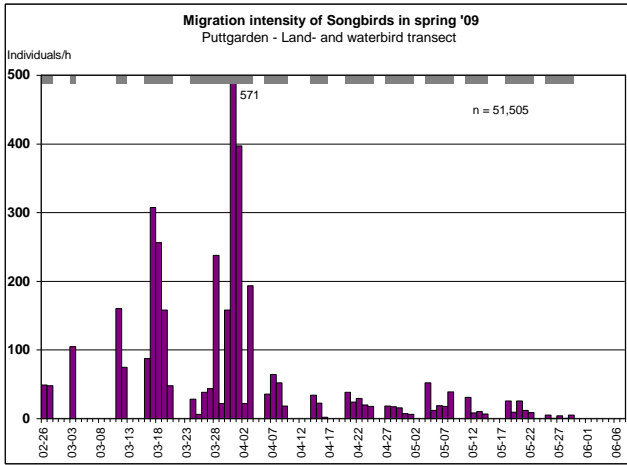
A.2.15 *Swift* – *Apus apus*

No Swift data from 2009

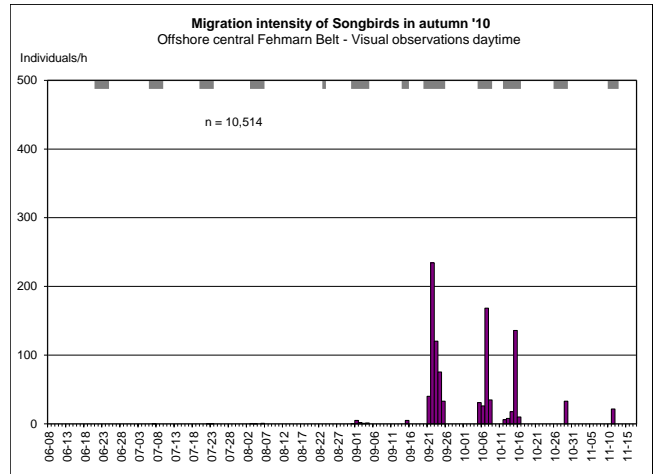
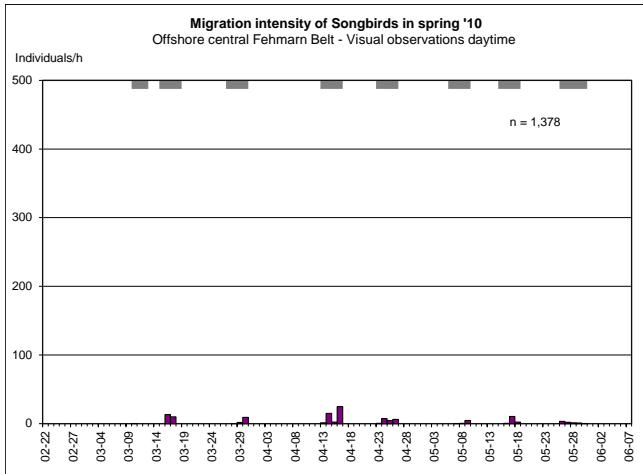
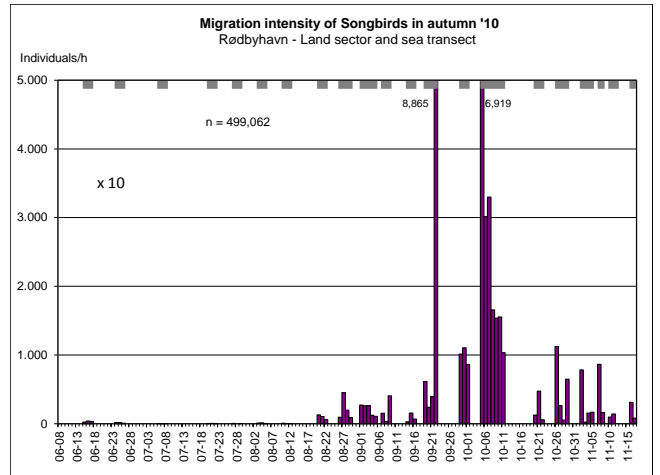
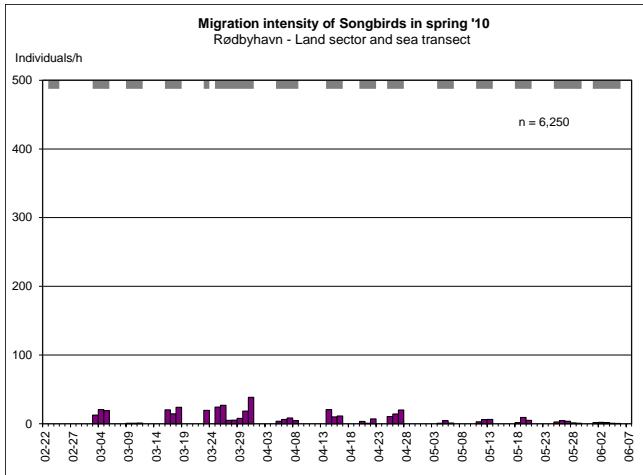
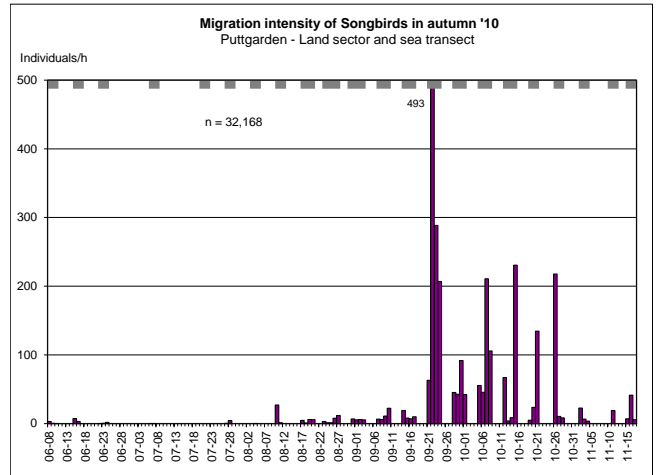
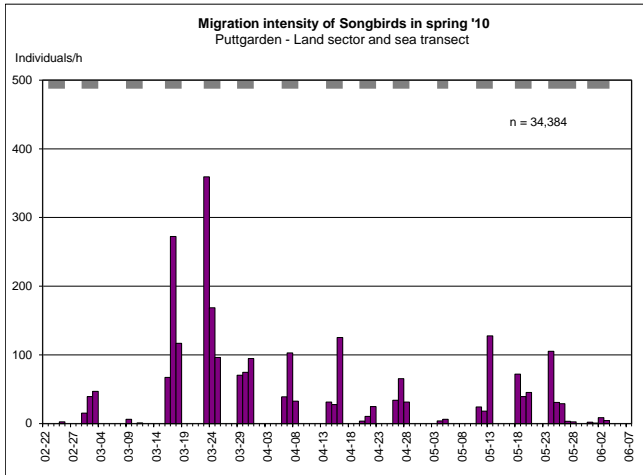
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A.2.16 Songbirds



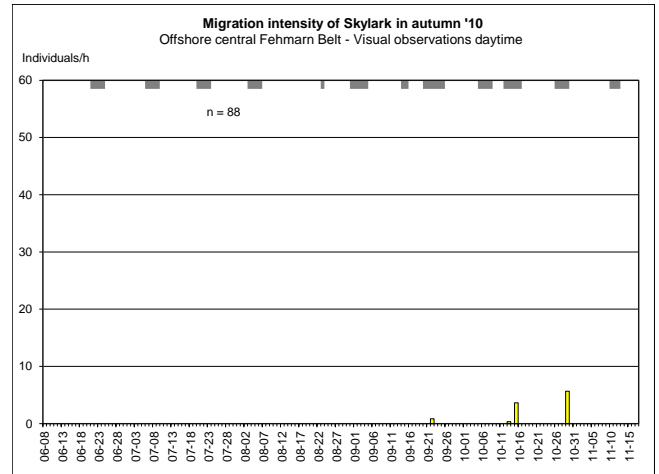
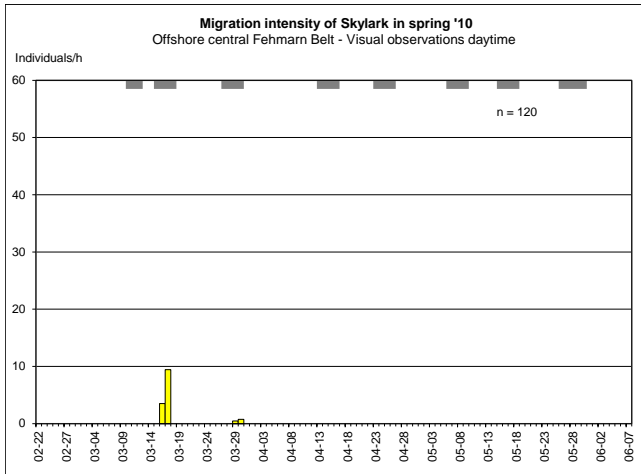
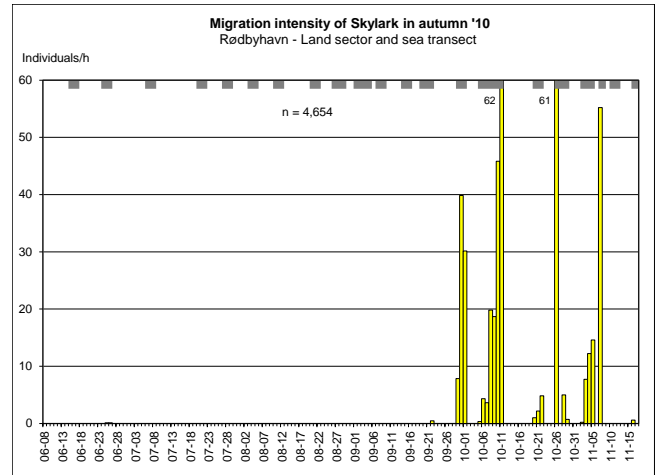
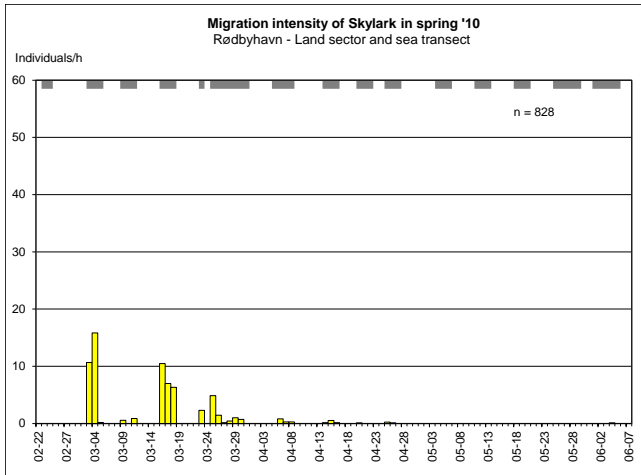
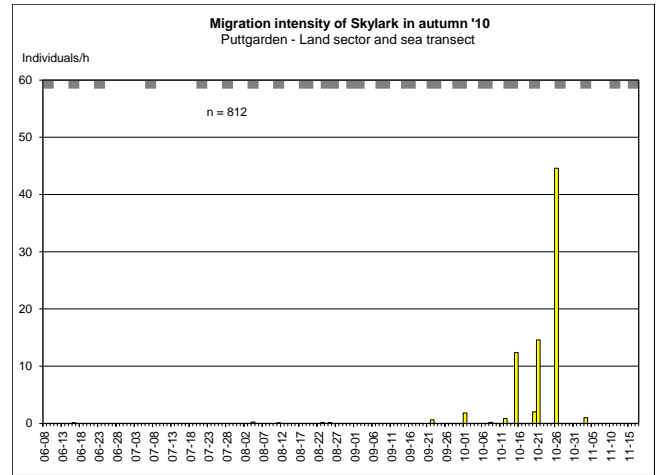
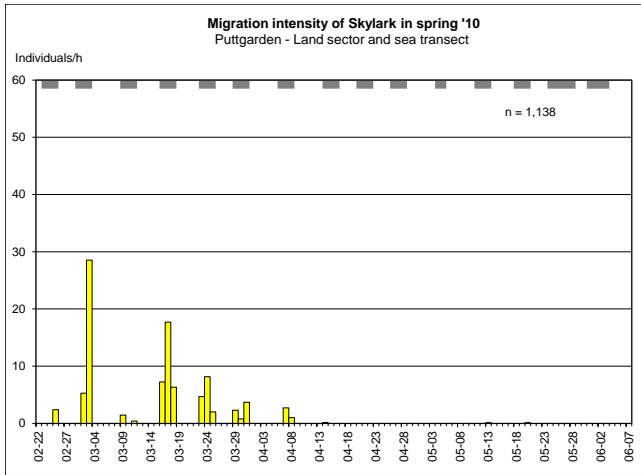
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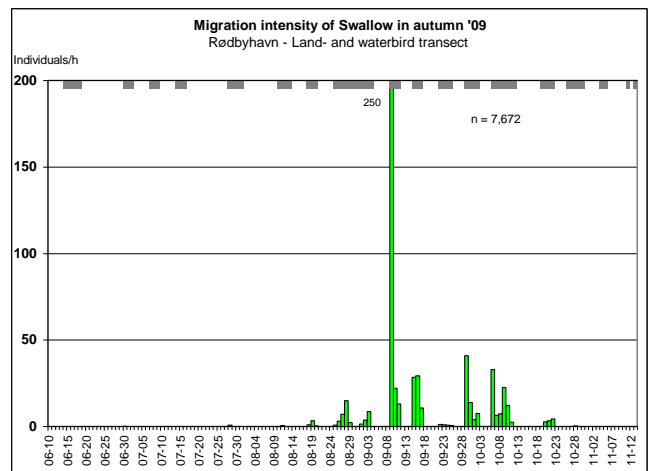
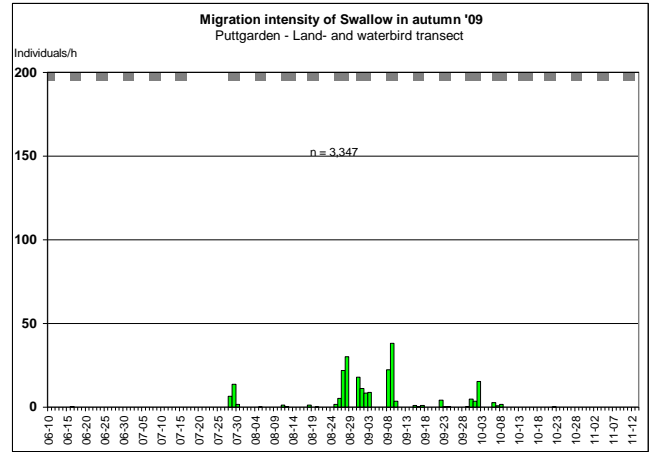
Skylark – *Alauda arvensis*

No Skylark data from 2009

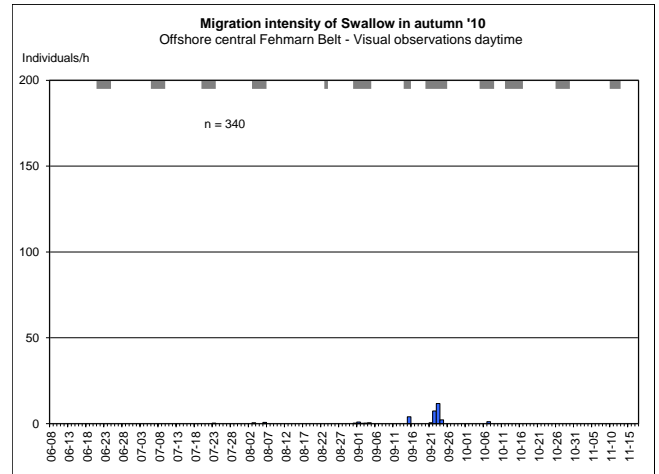
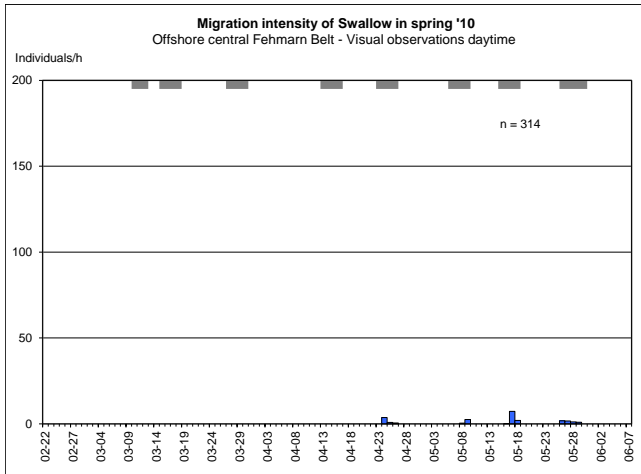
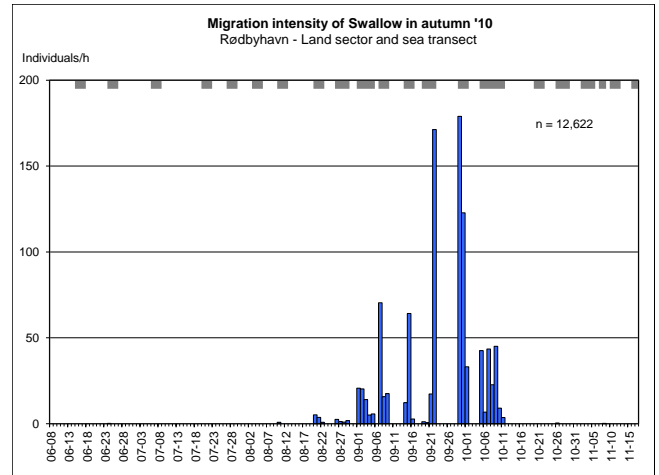
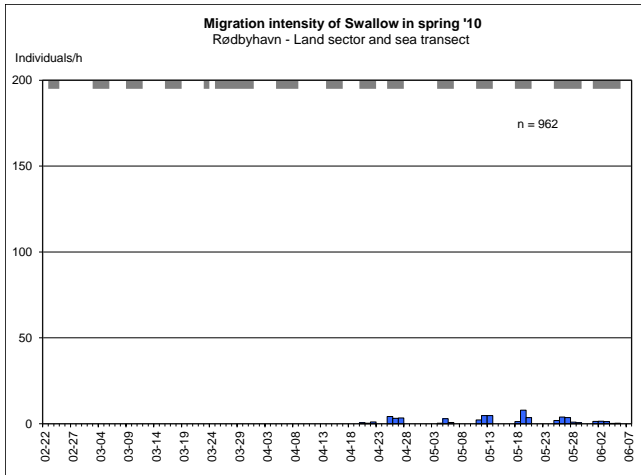
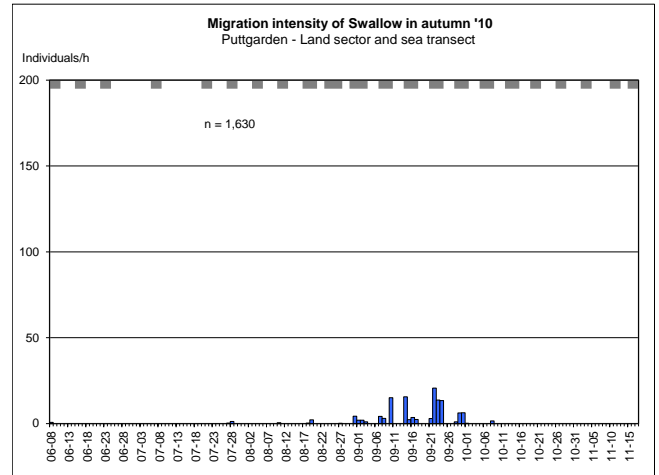
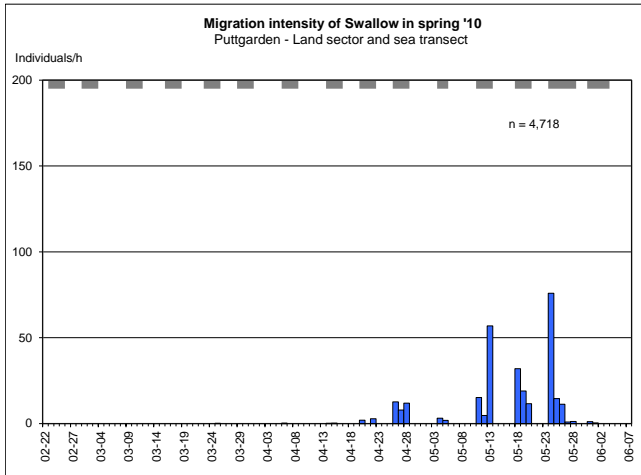
FEHMARNBELT BIRDS



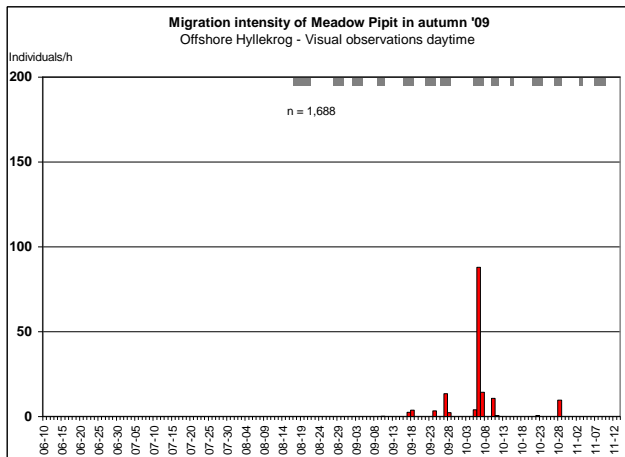
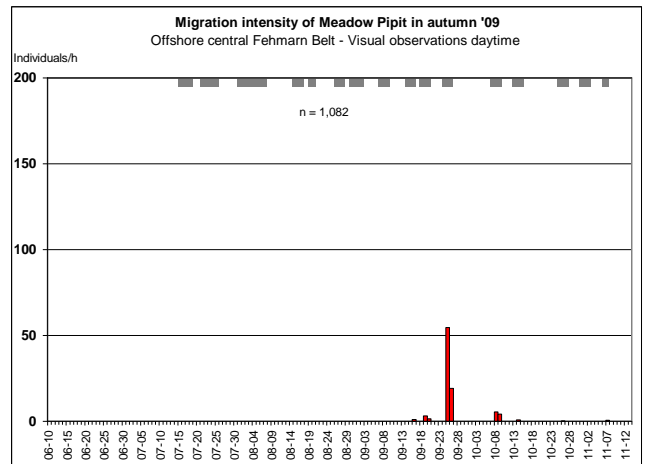
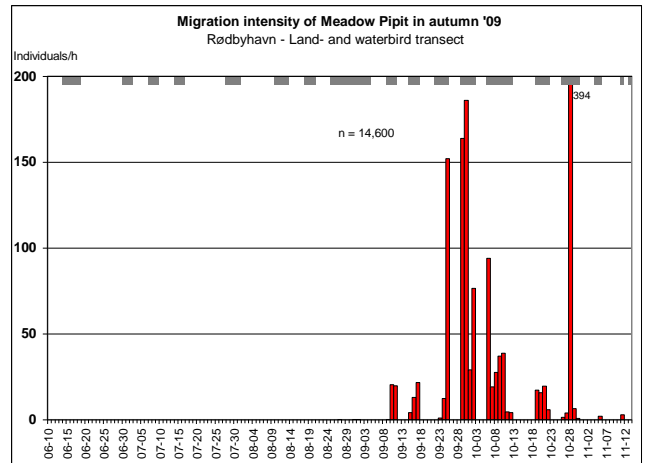
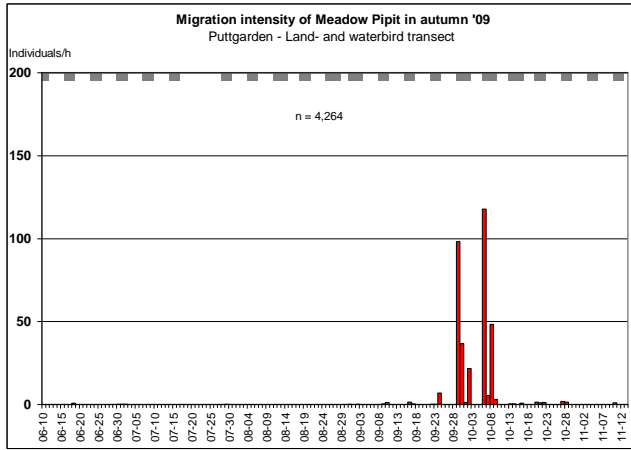
Swallows



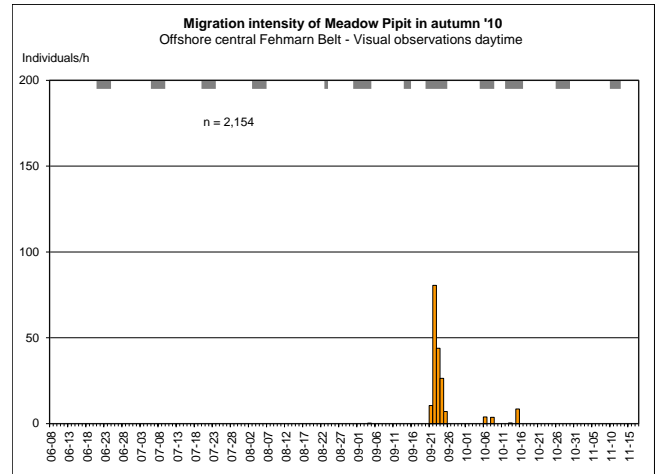
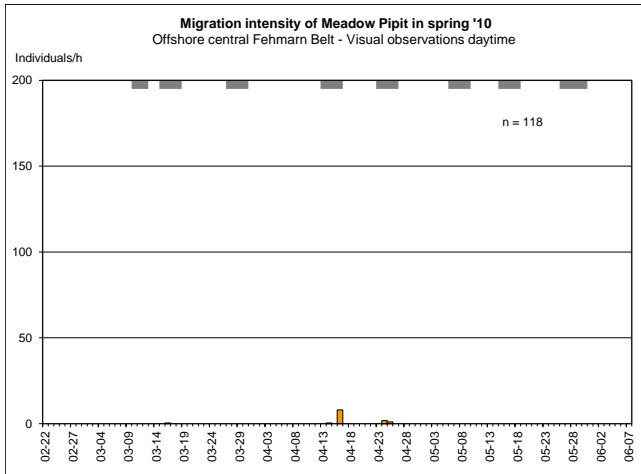
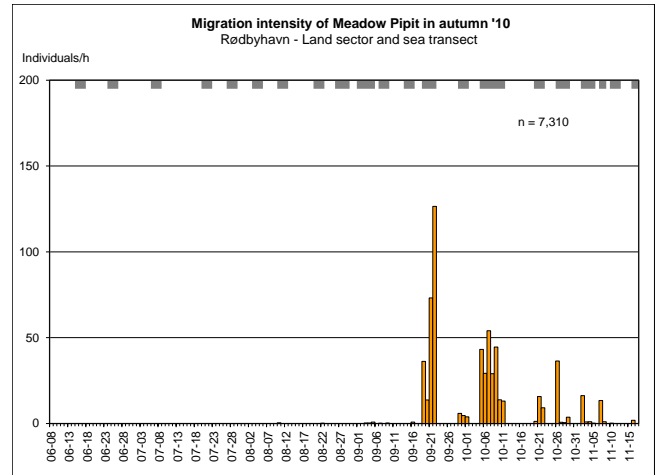
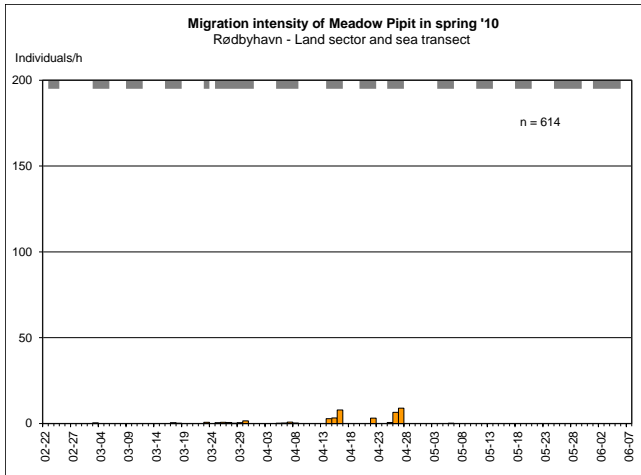
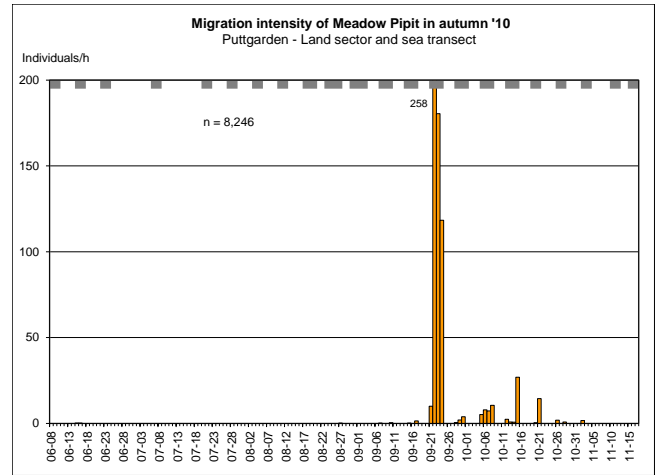
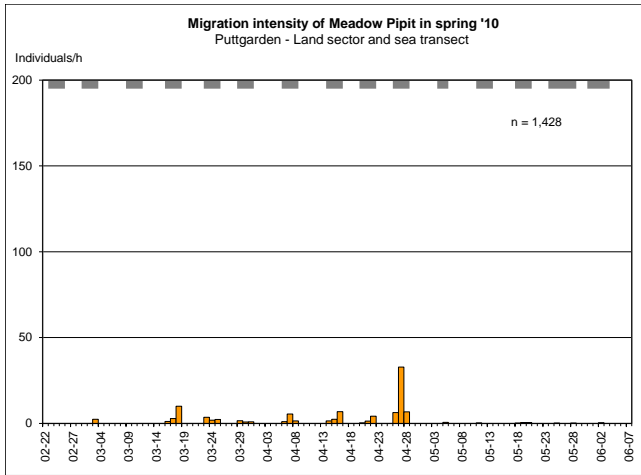
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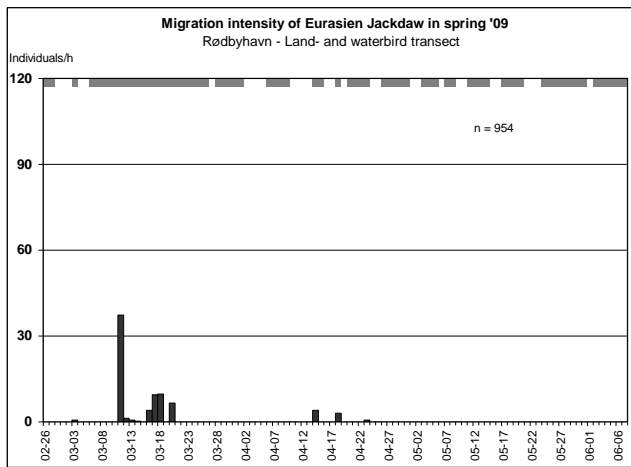
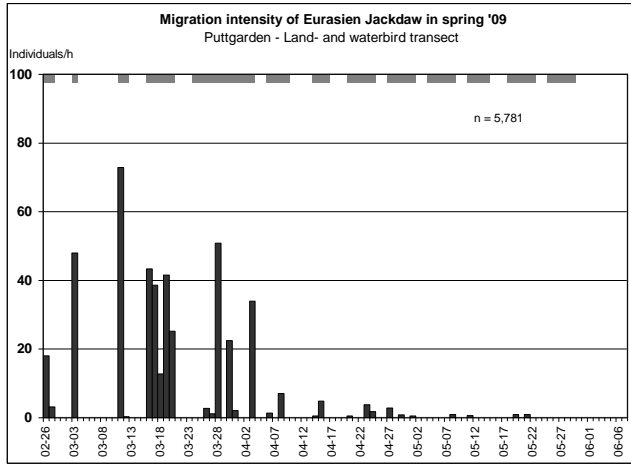
Meadow Pipit – *Anthus pratensis*



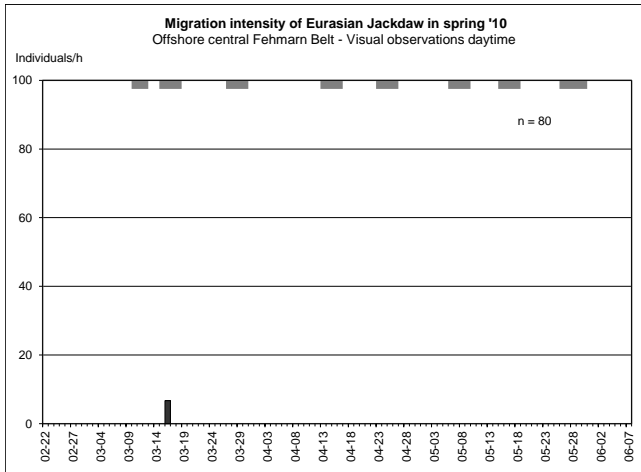
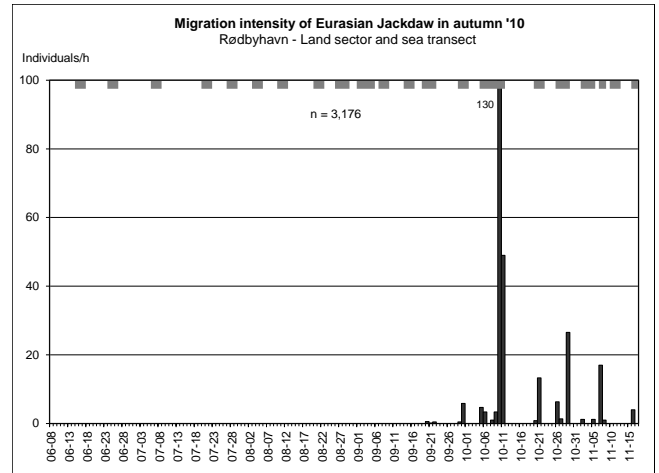
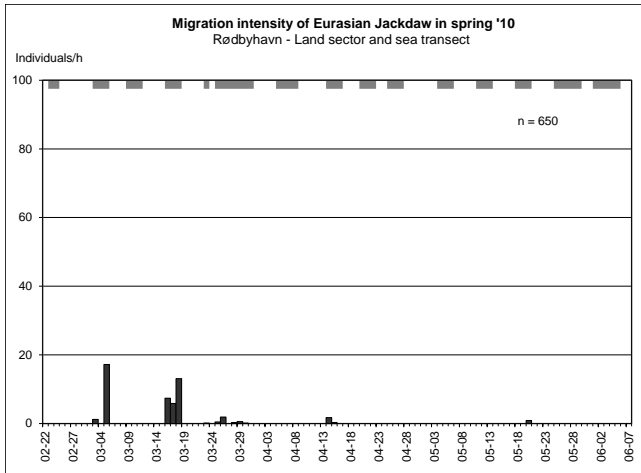
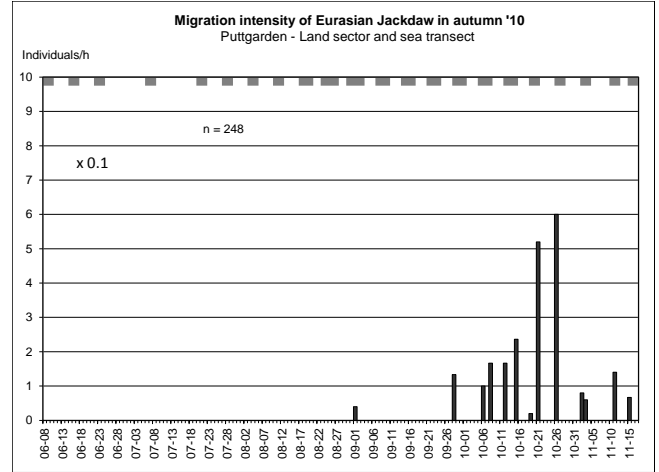
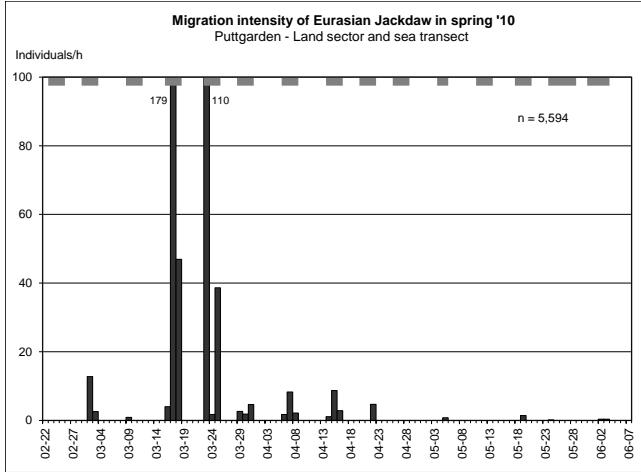
FEHMARNBELT BIRDS



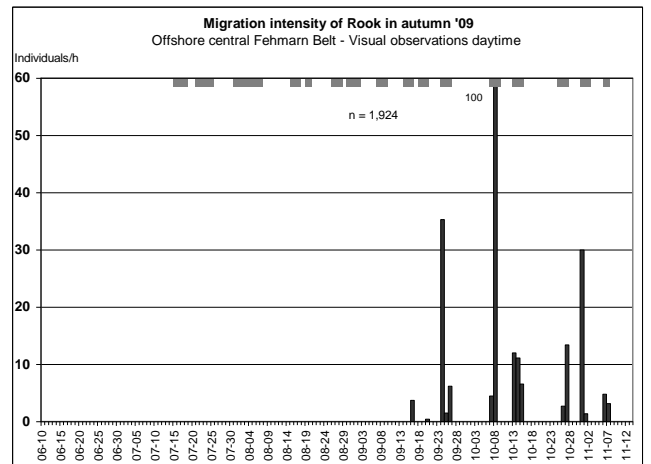
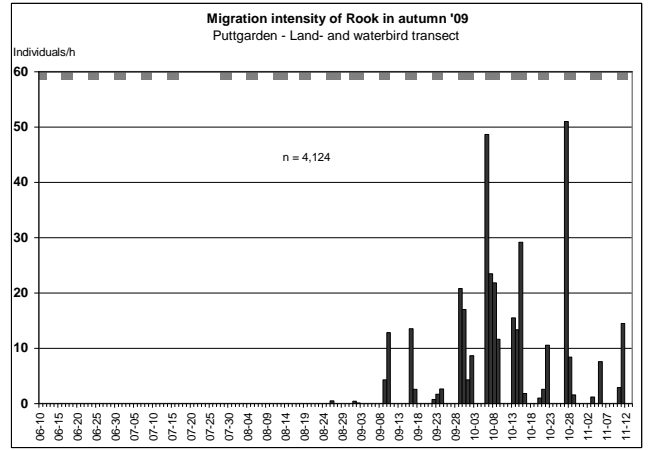
Eurasian Jackdaw – *Corvus monedula*



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Rook – *Corvus frugilegus*

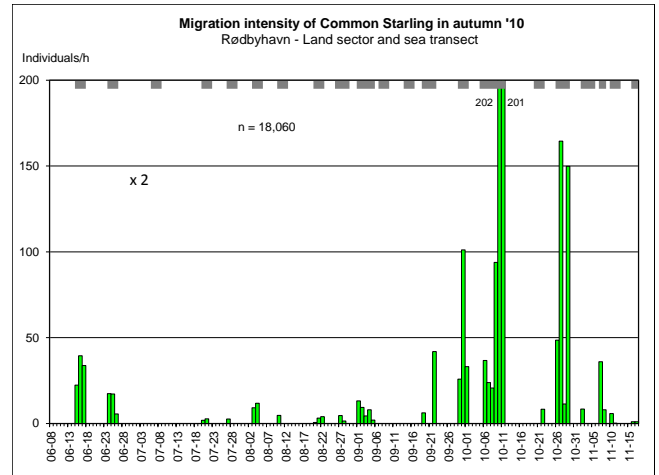
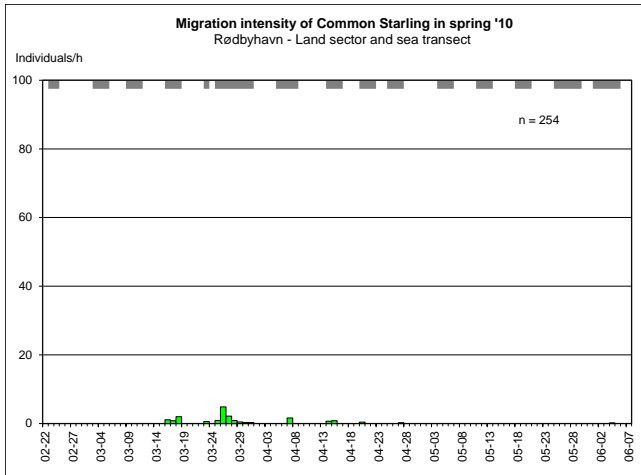
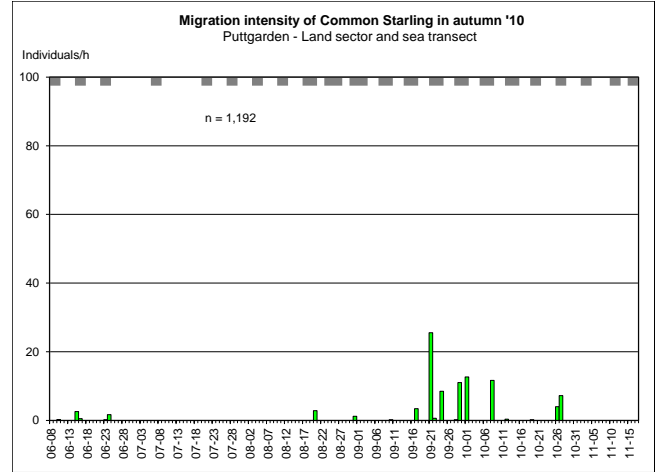
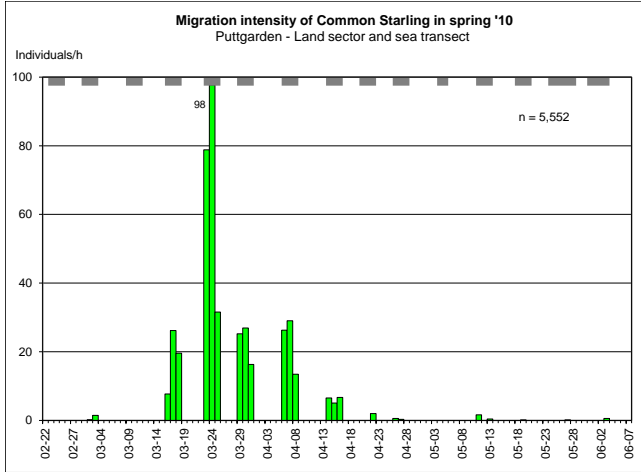


No Rook data from 2010

Common Starling – *Sturnus vulgaris*

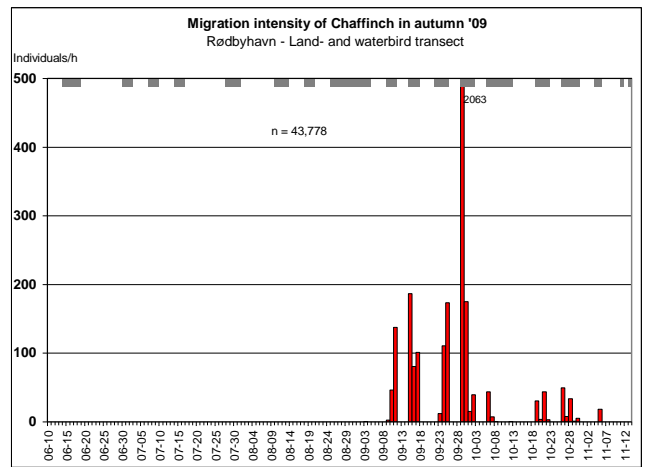
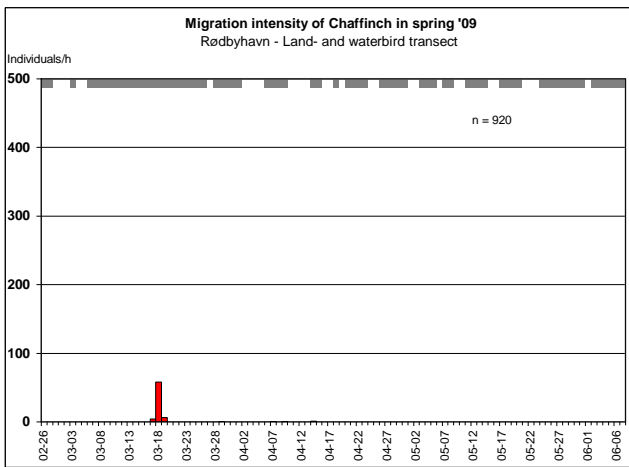
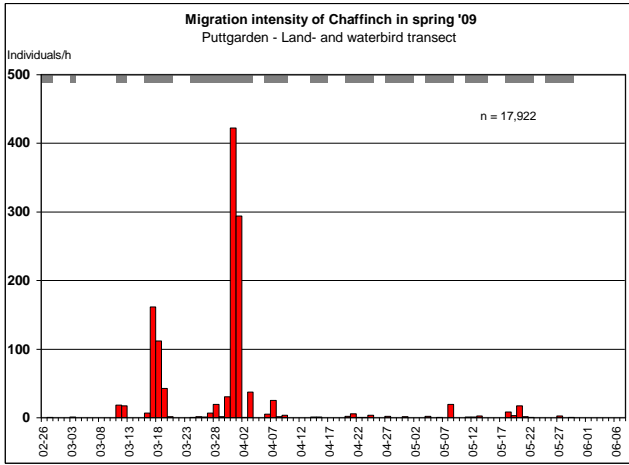
No starling data from 2009

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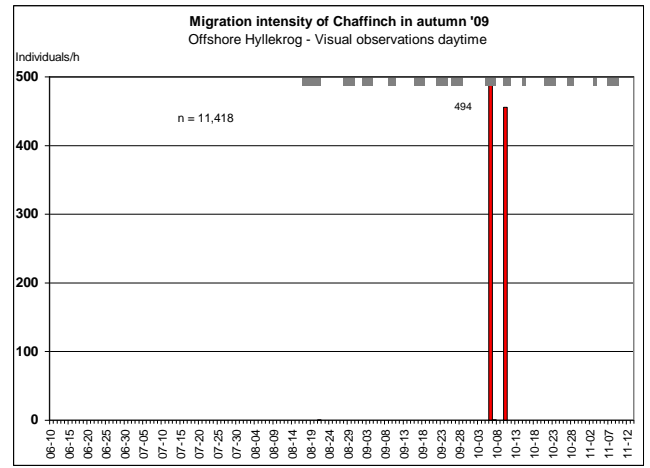


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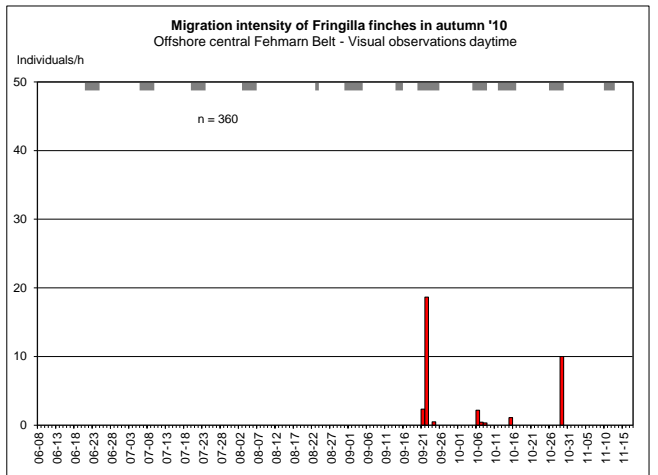
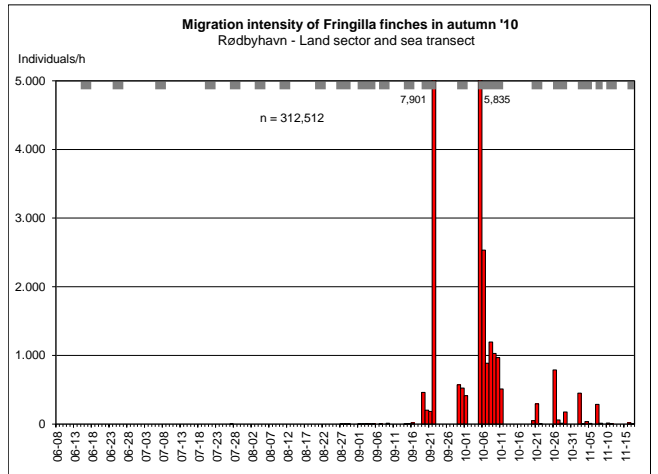
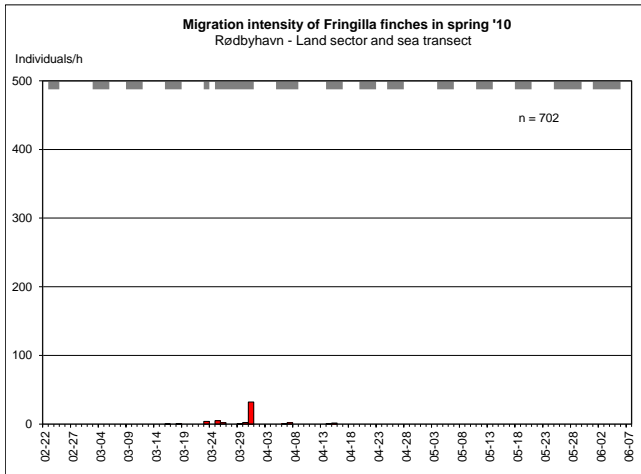
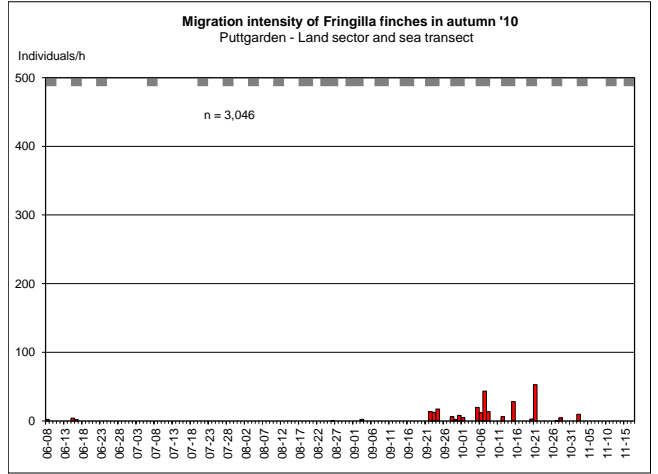
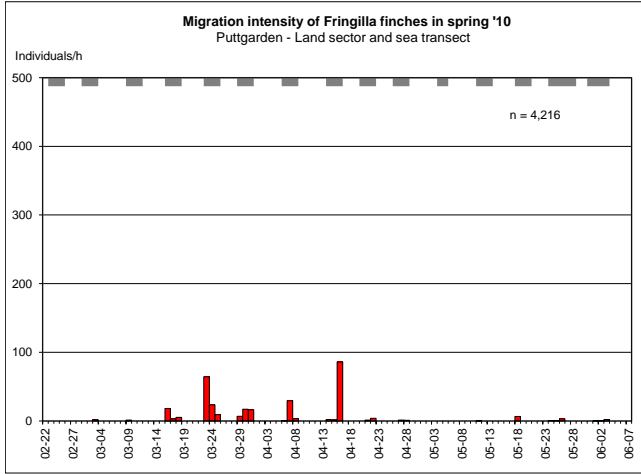
Chaffinches / *Fringilla* finches – *Fringilla coelebs* / *Fringilla* sp.



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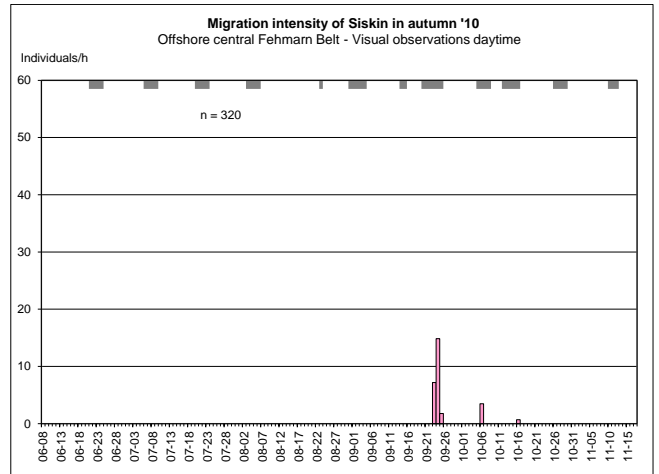
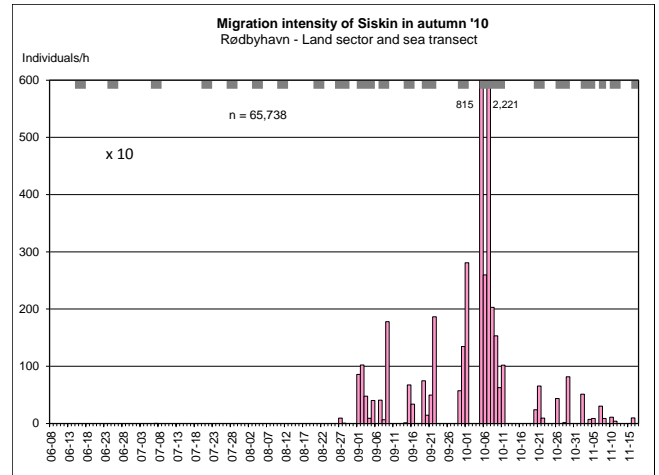
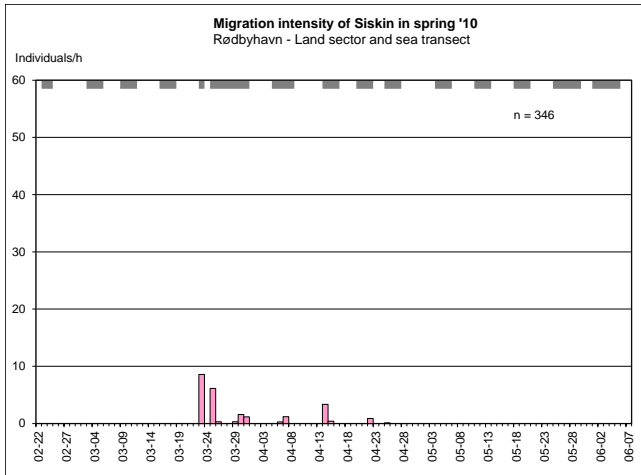
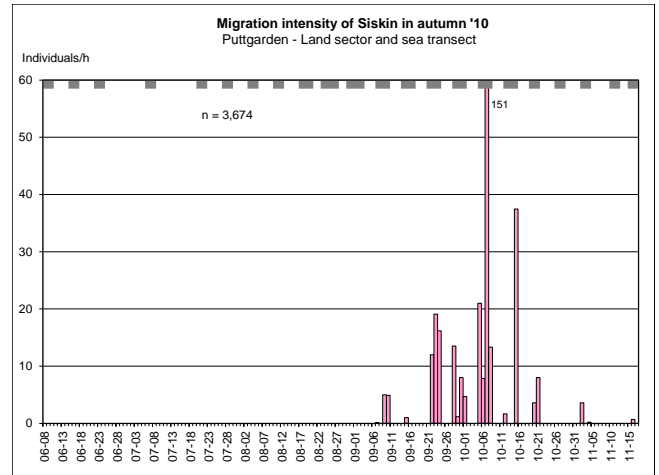
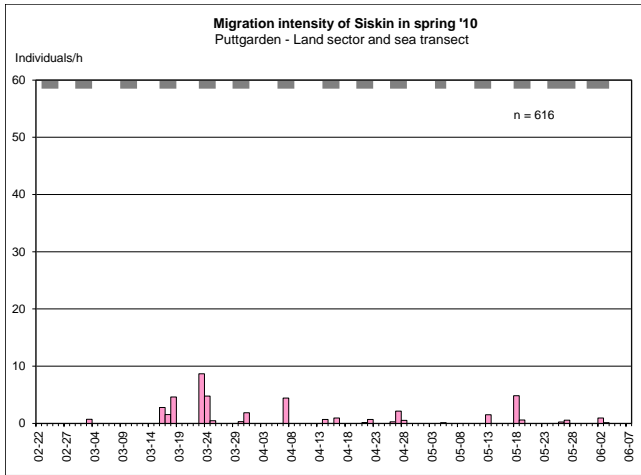
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Siskin – *Carduelis spinus*

No Siskin data from 2009

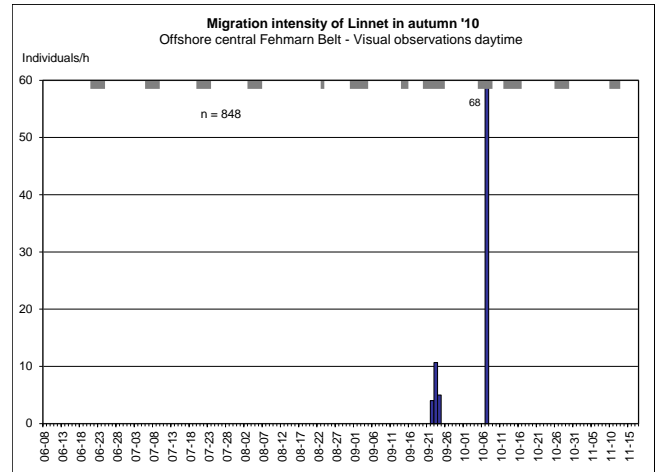
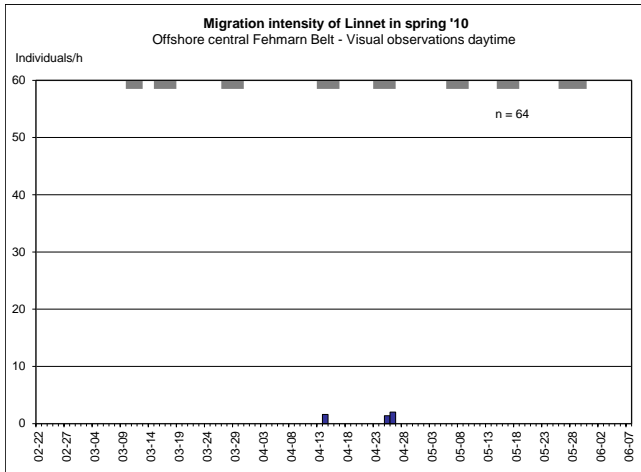
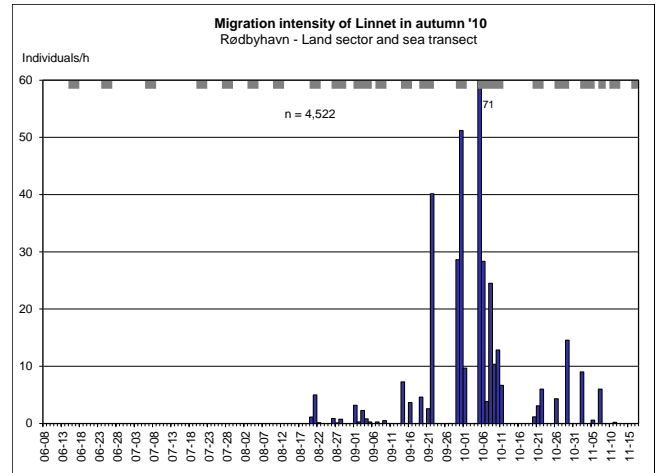
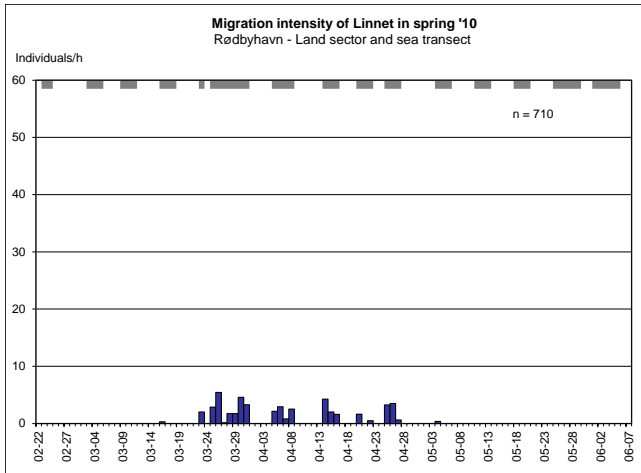
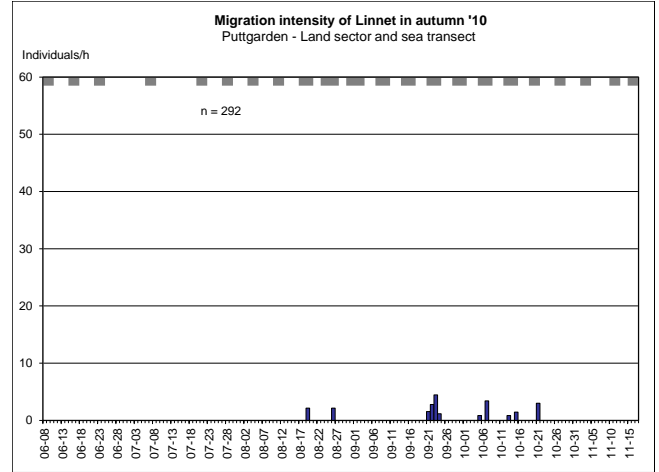
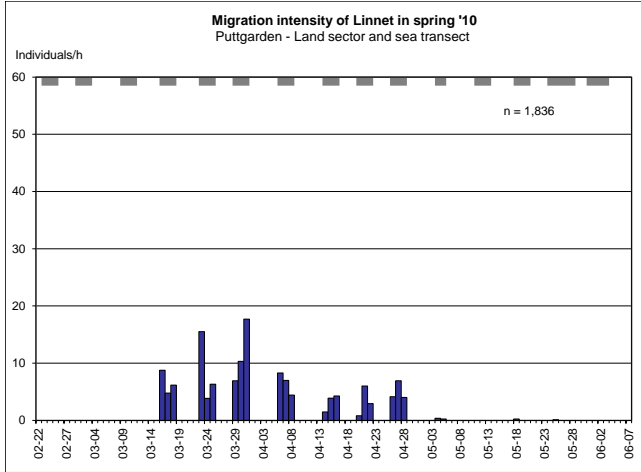
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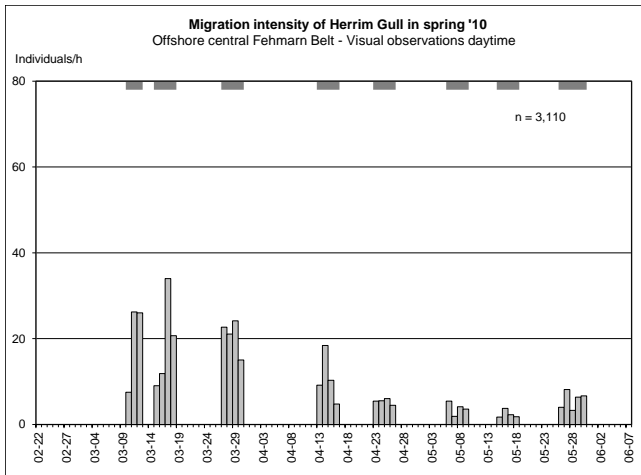
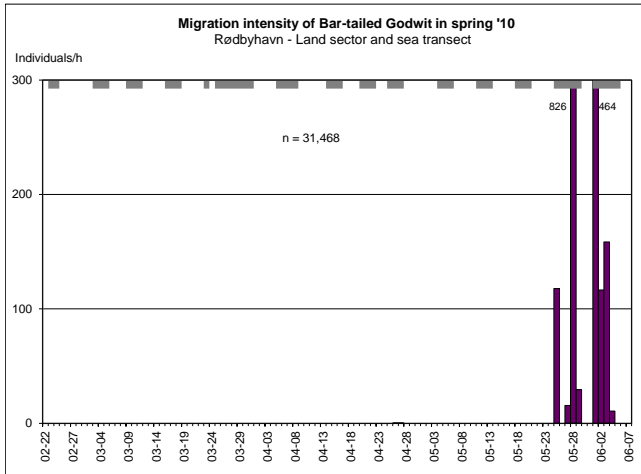
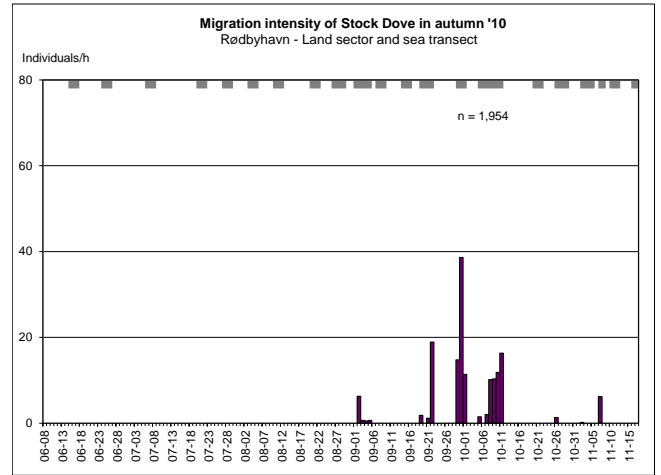
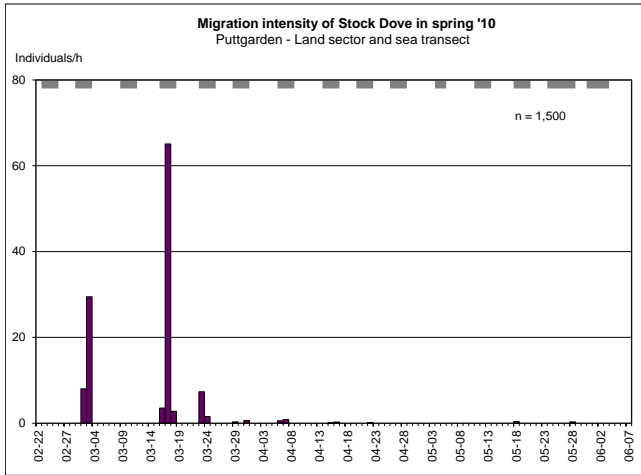
Linnet – *Carduelis cannabina*

No Linnet data from 2009

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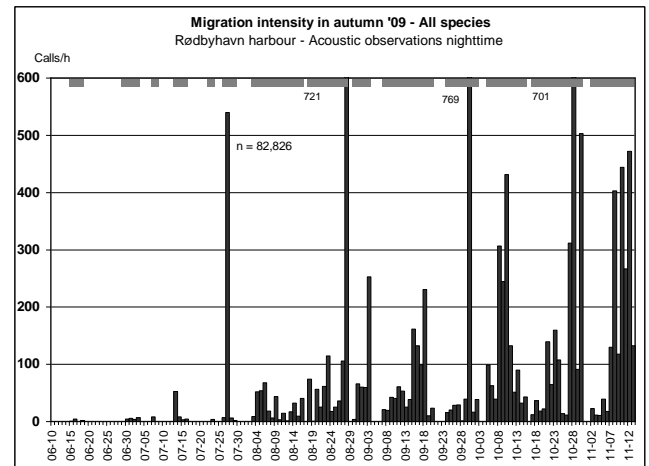
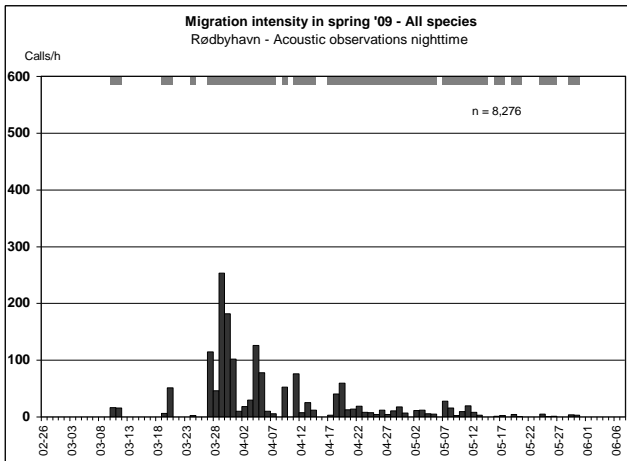
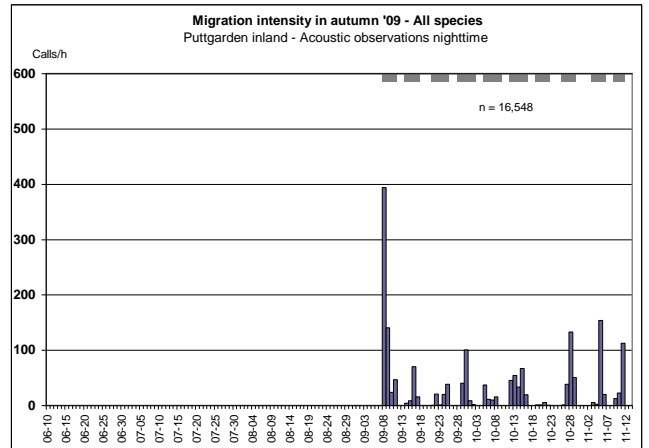
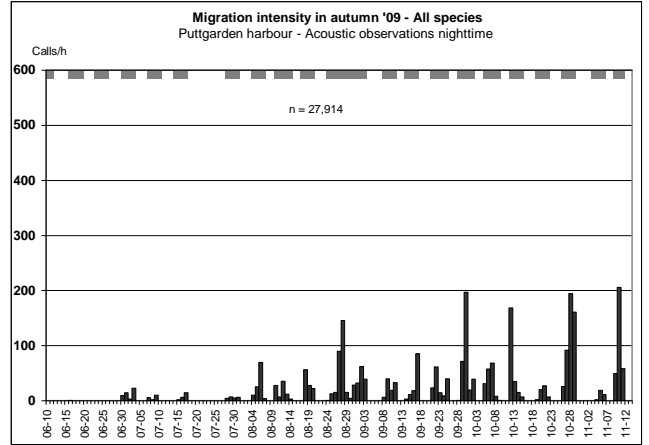
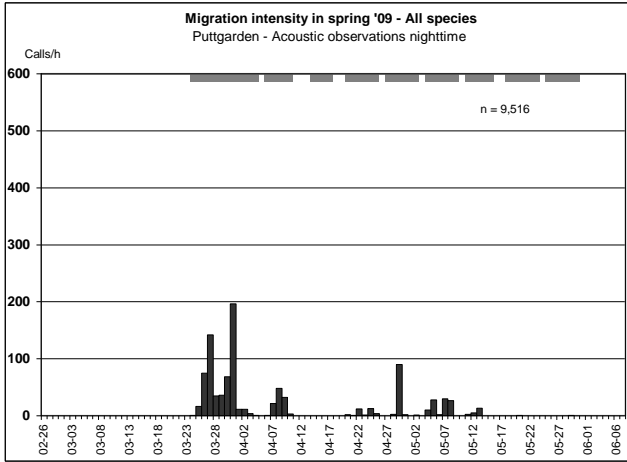


A.2.17 Other species

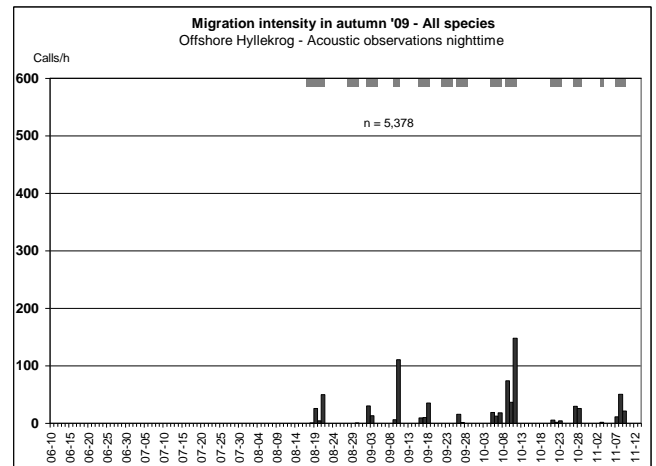
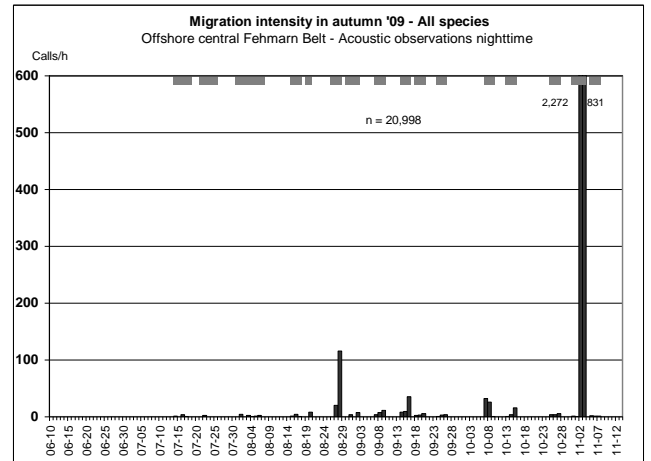
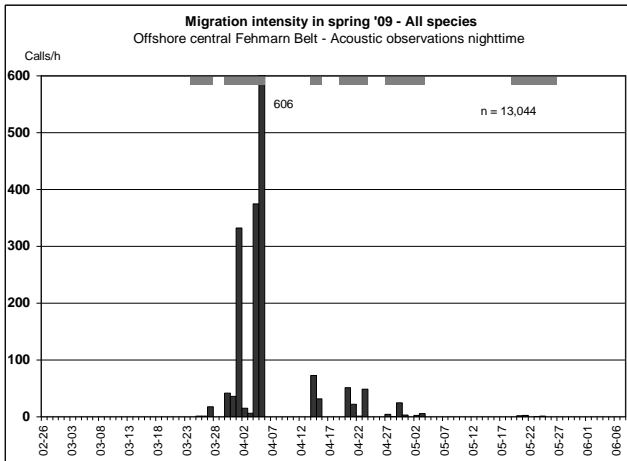
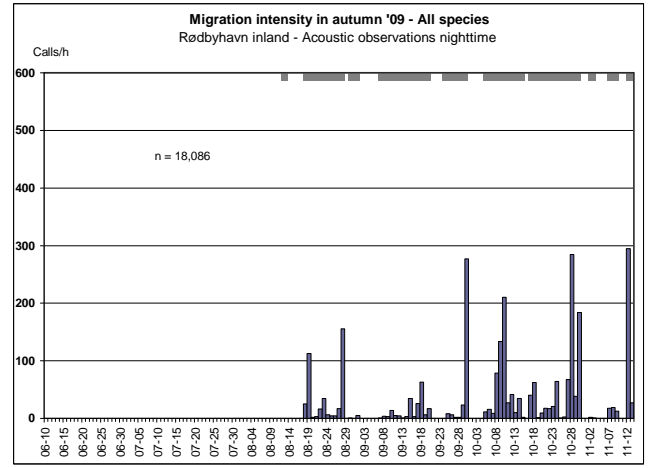


A.3 Migration intensities – acoustic night-time observations

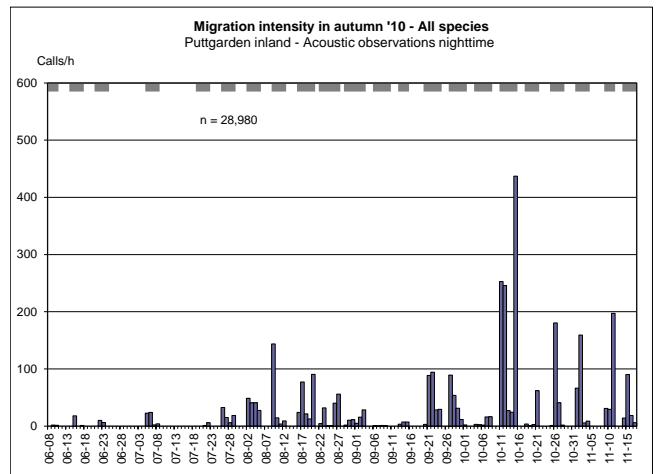
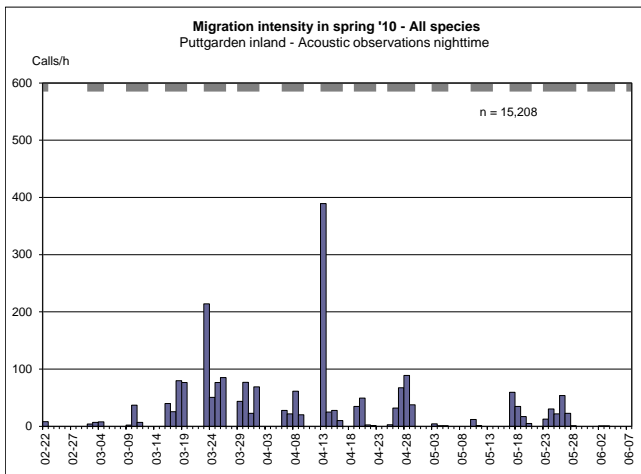
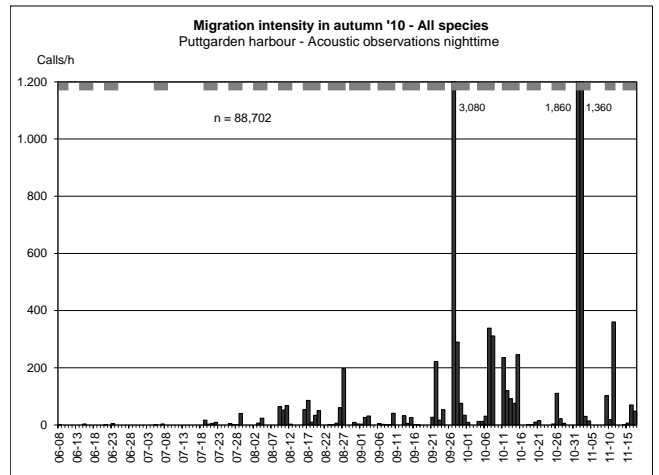
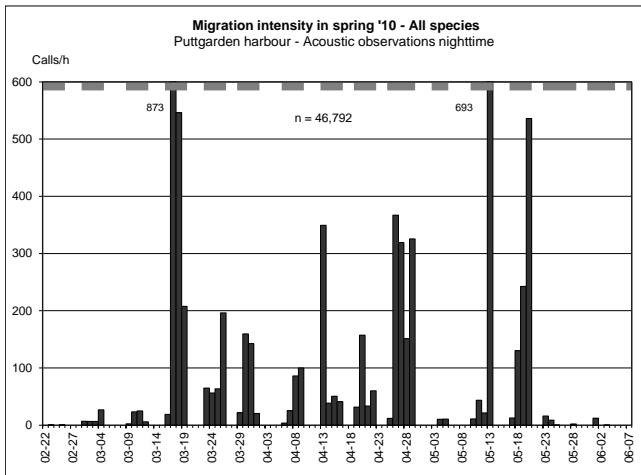
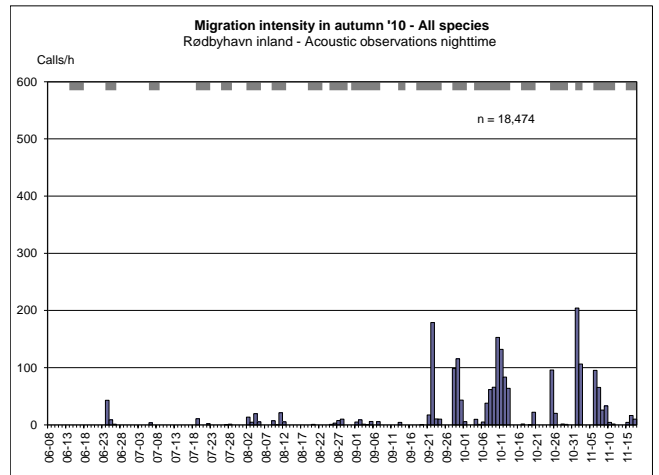
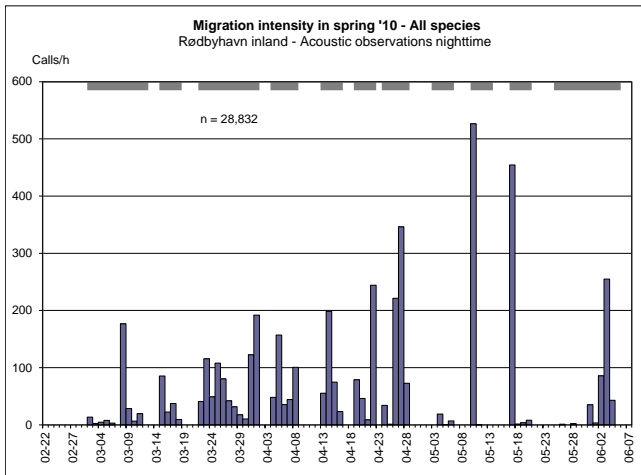
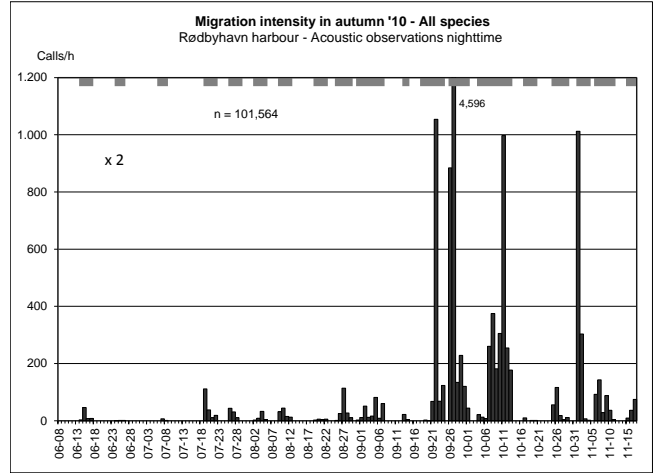
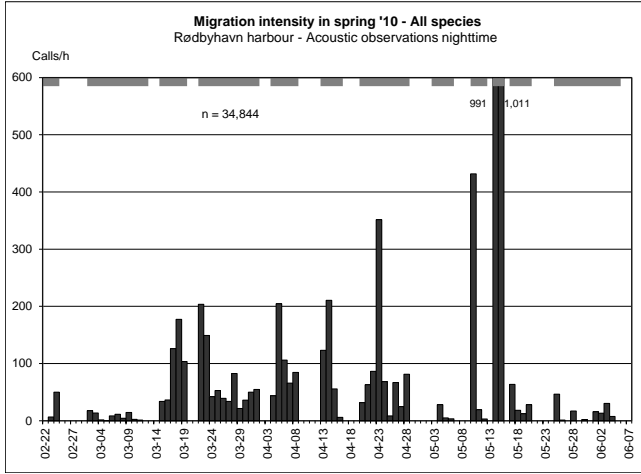
A.3.1 All species



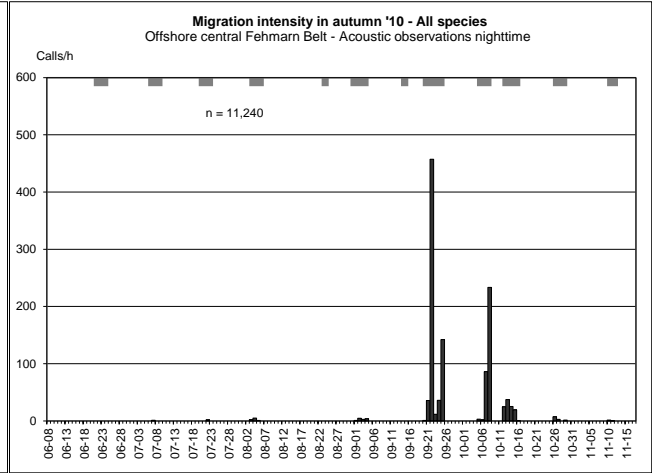
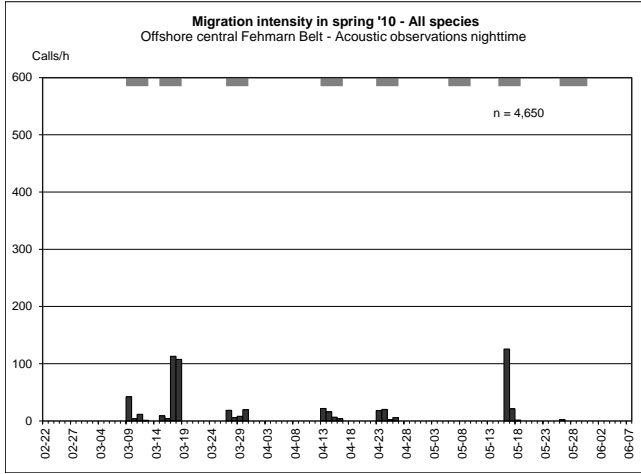
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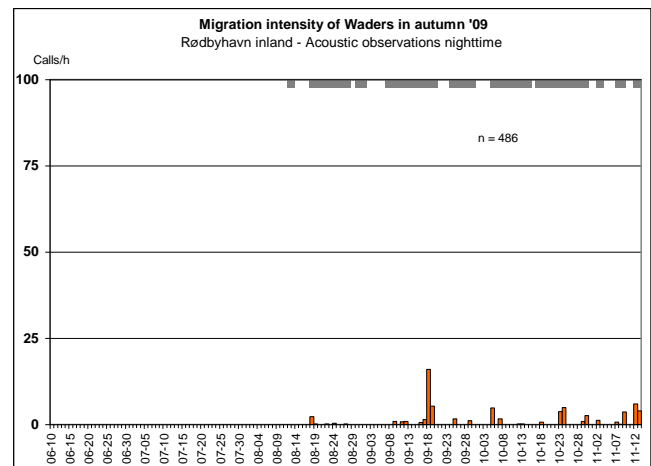
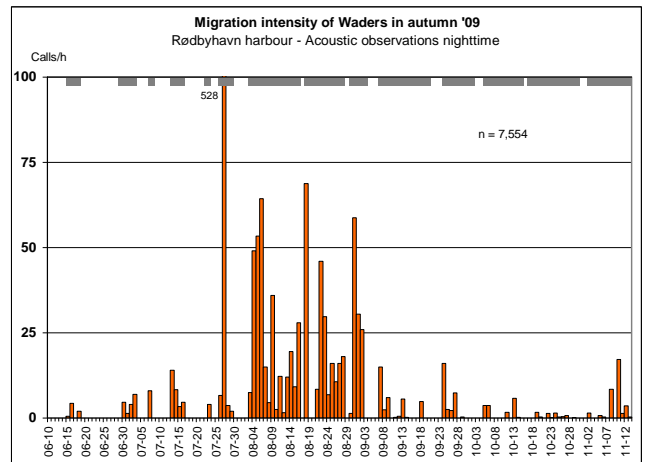
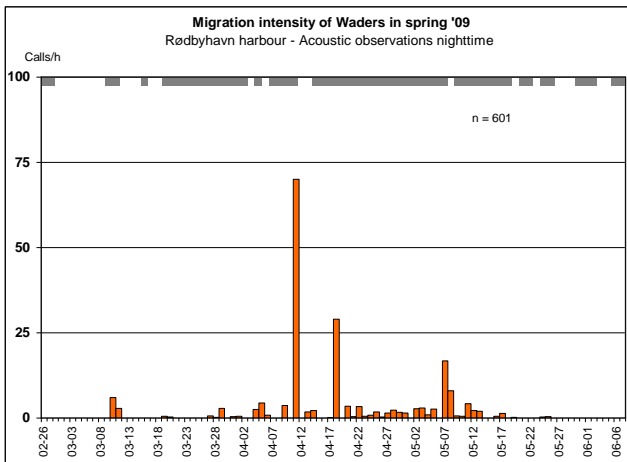
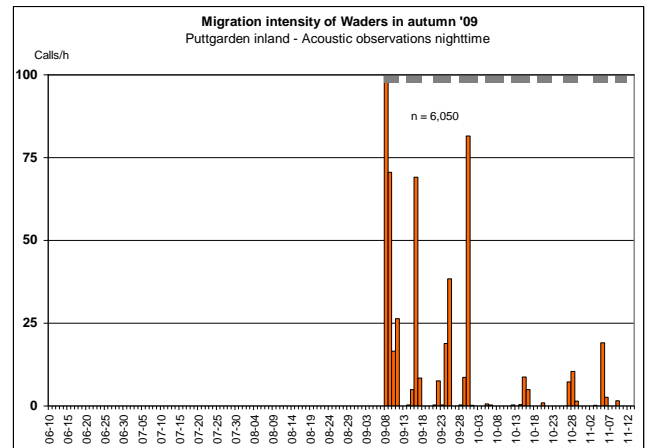
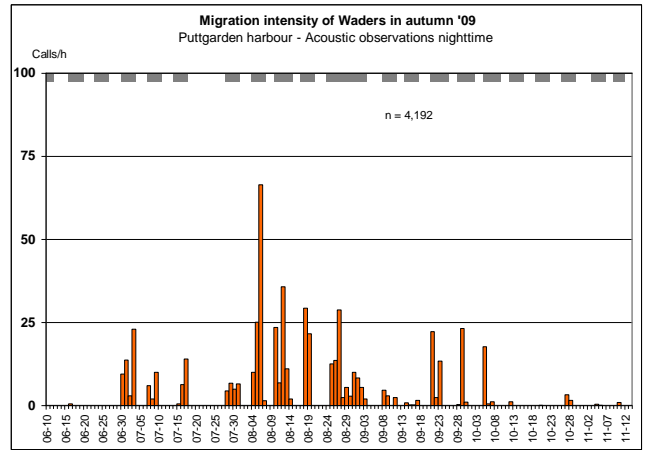
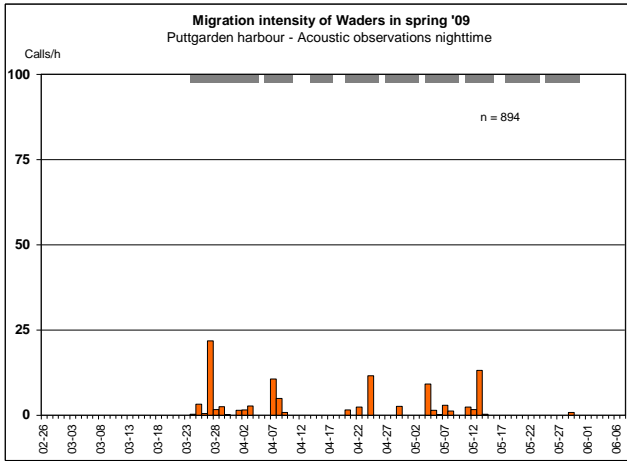


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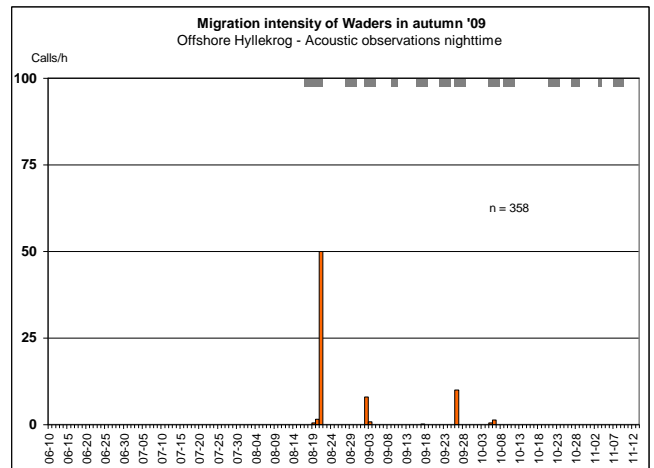
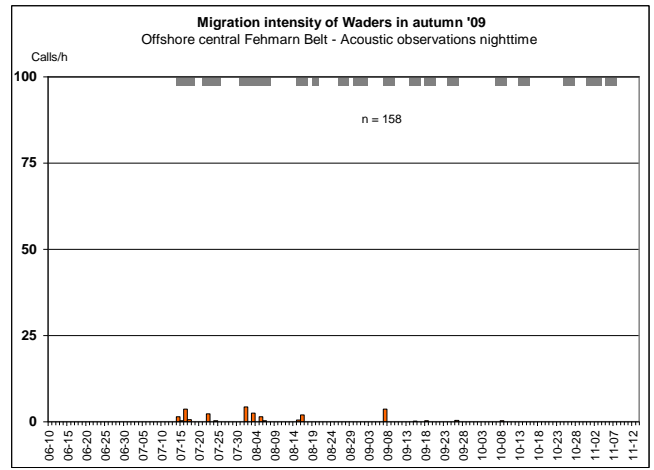


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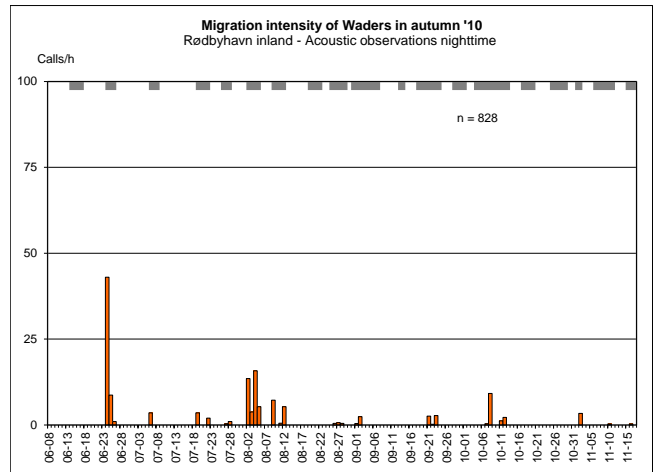
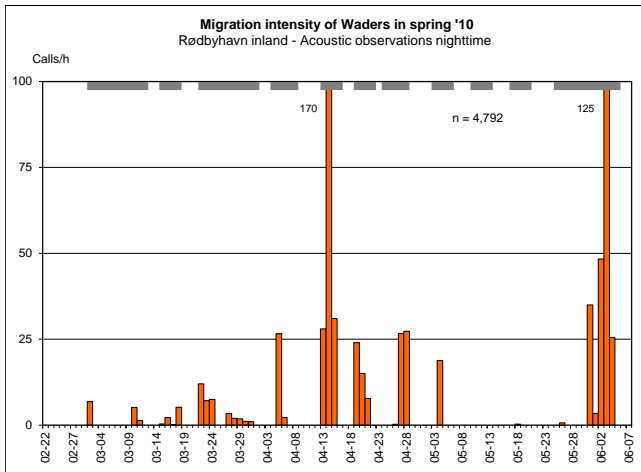
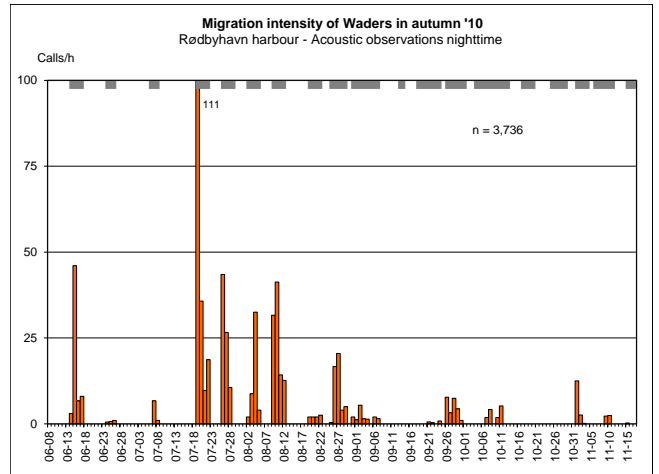
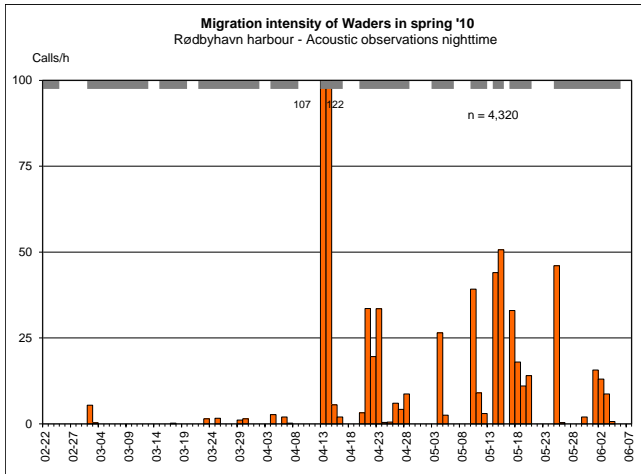
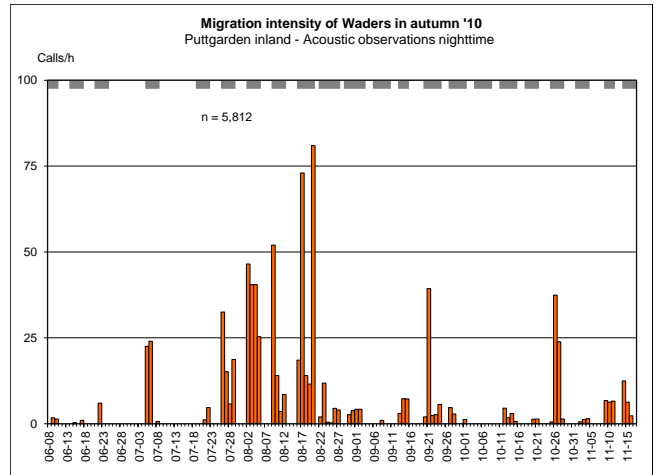
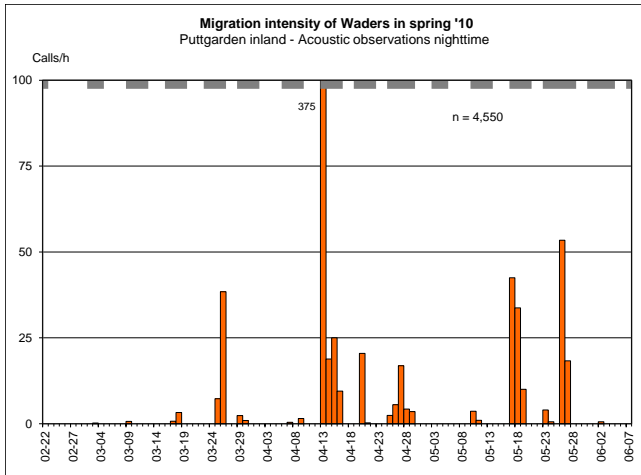
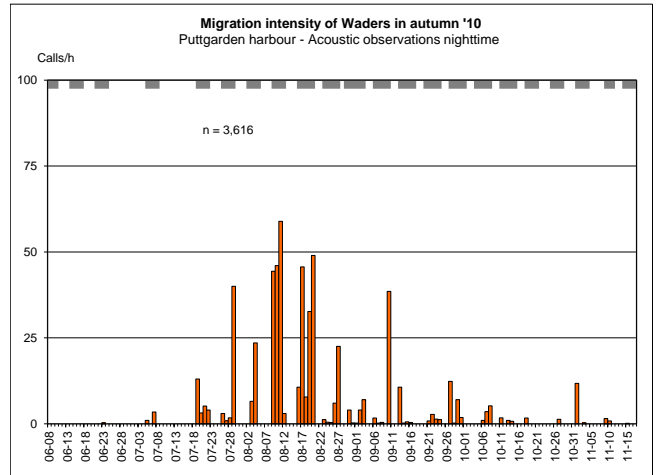
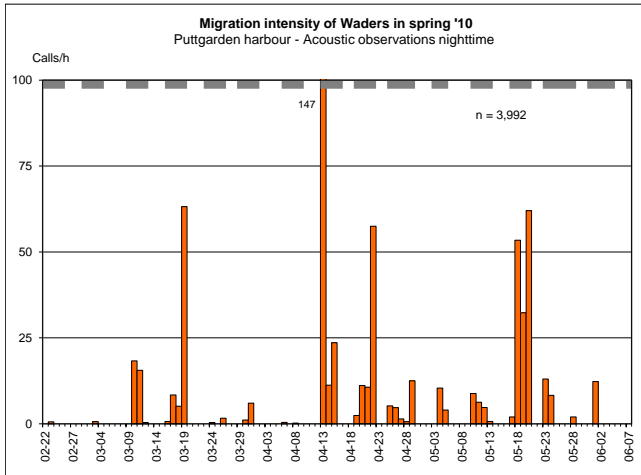
A.3.2 Waders



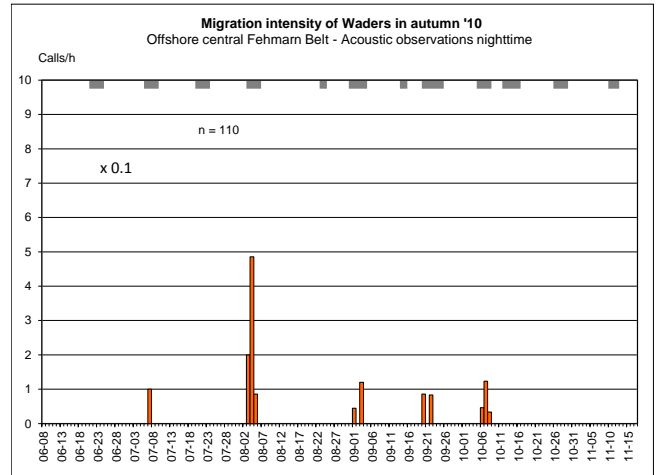
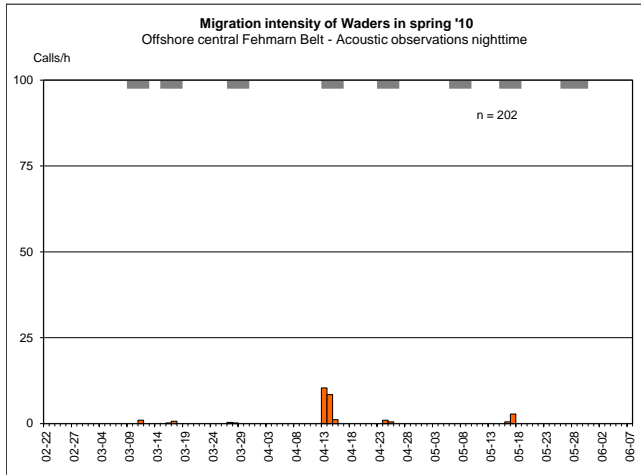
FEHMARNBELT BIRDS



FEHMARNBELT BIRDS



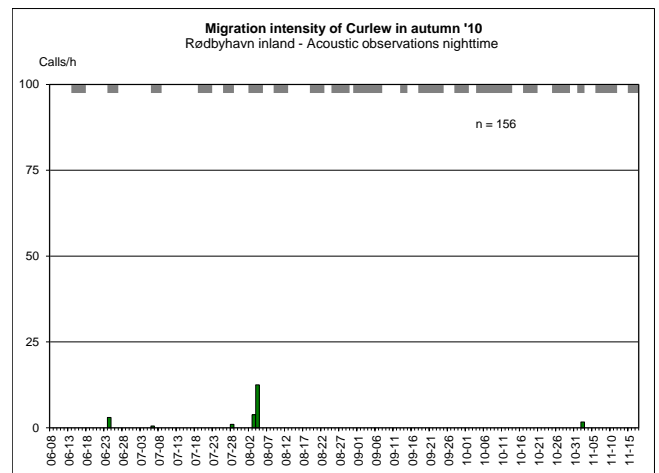
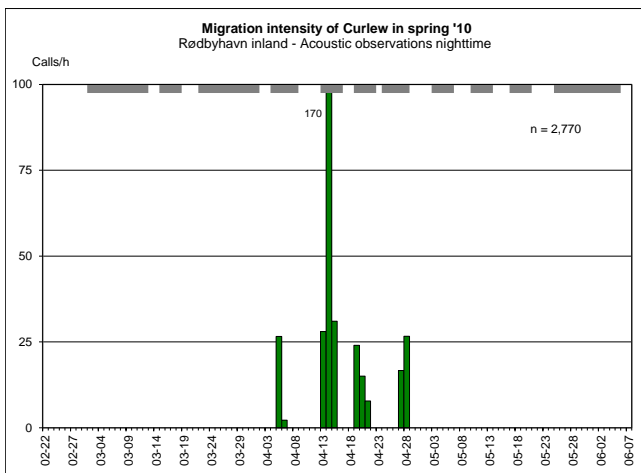
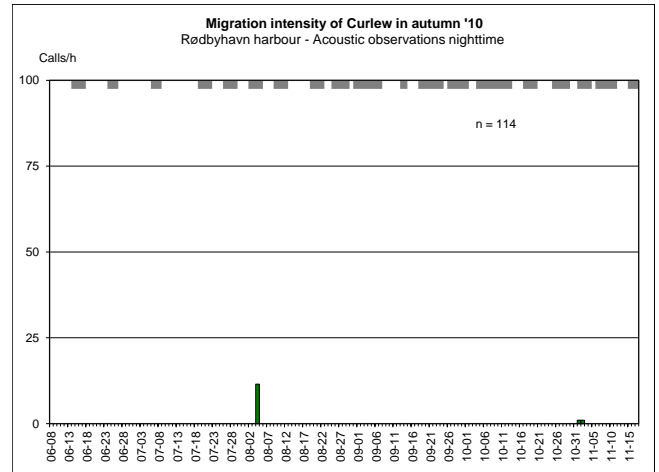
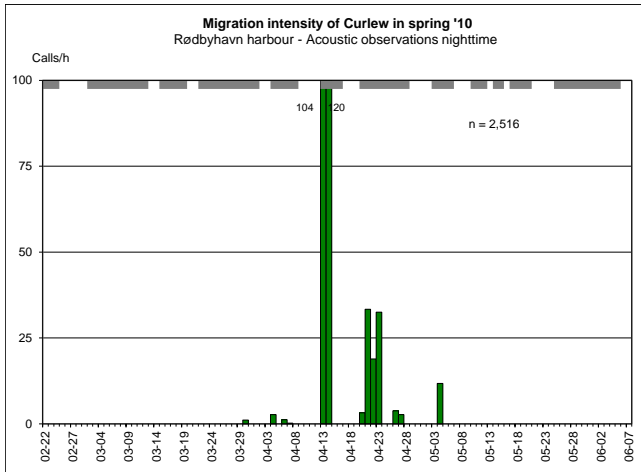
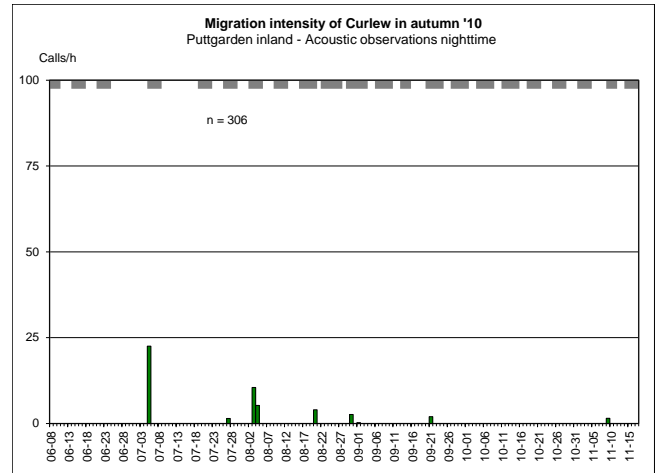
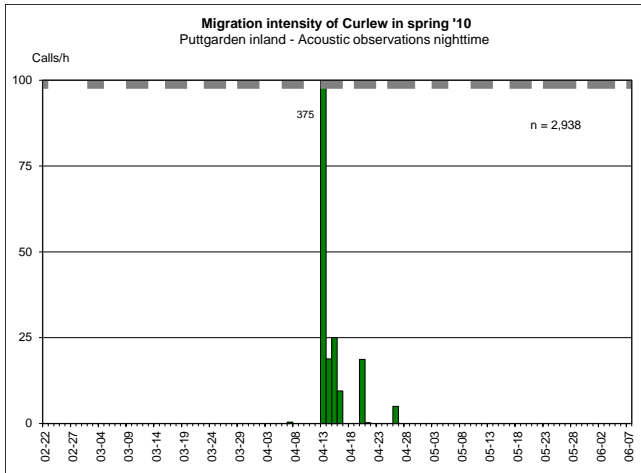
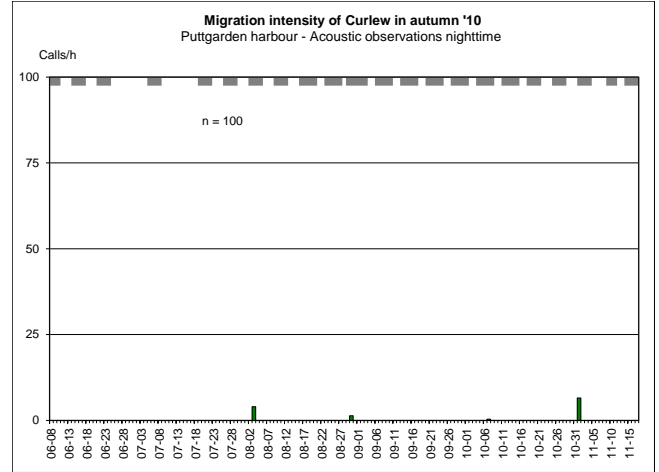
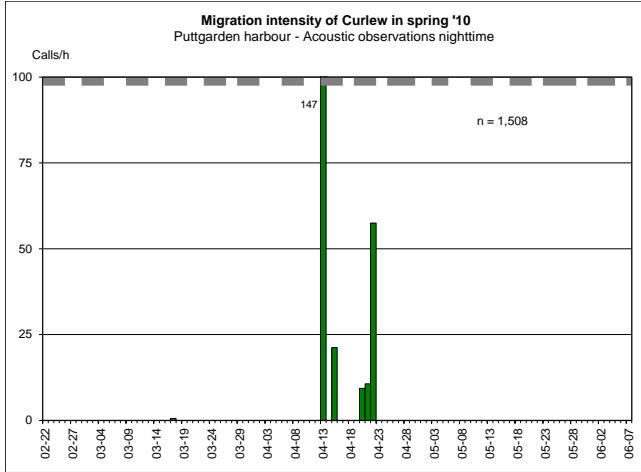
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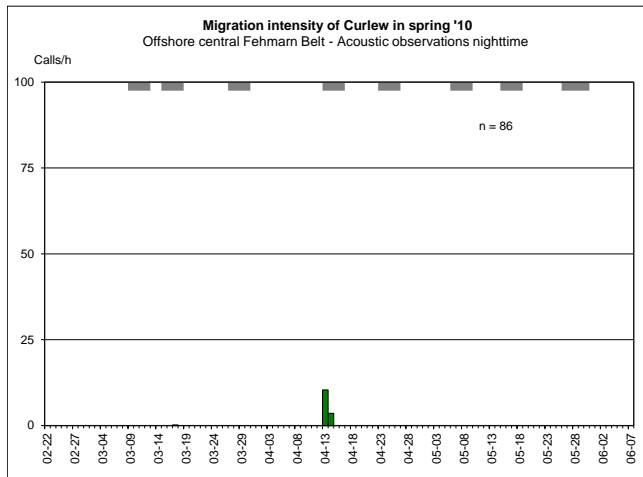
Curlew – *Numenius arquata*

No Curlew data from 2009

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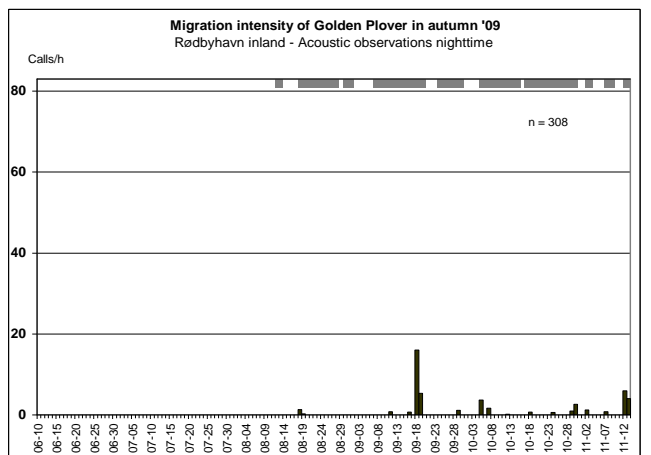
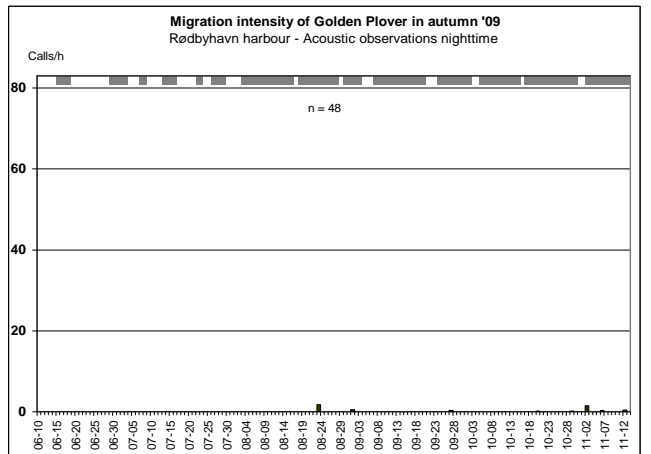
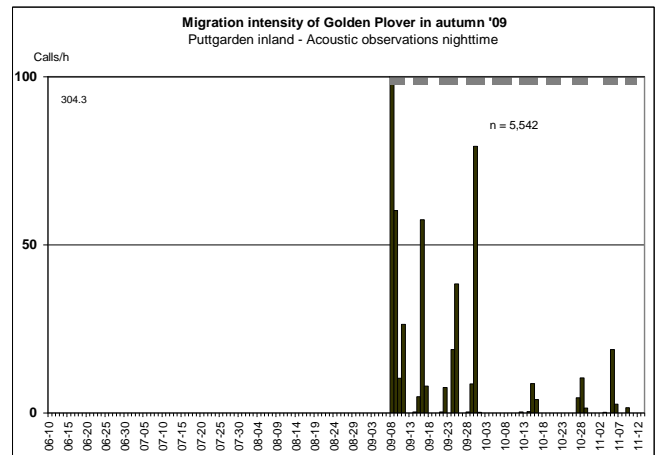
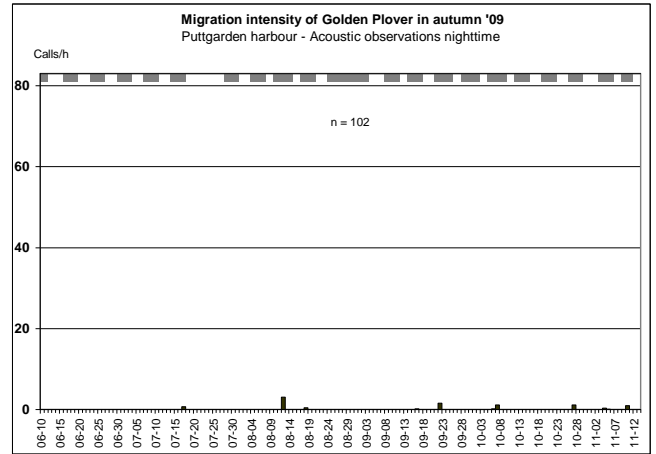


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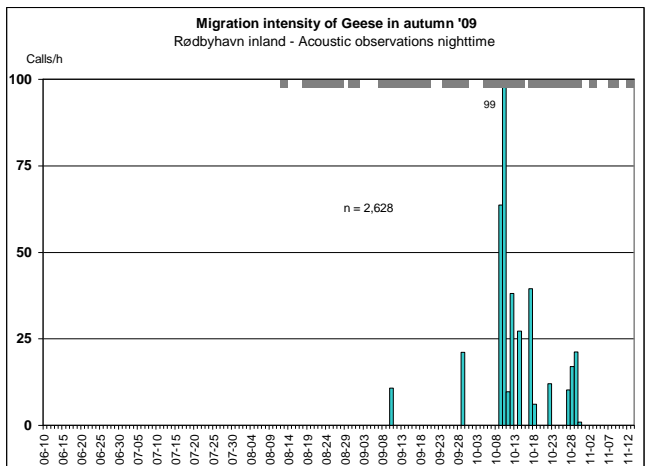
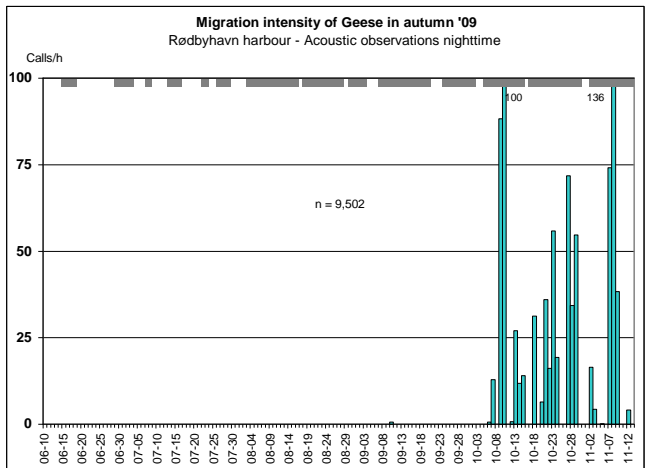
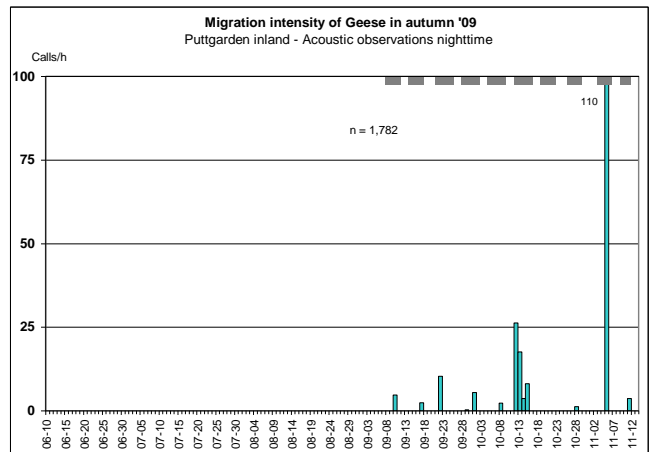
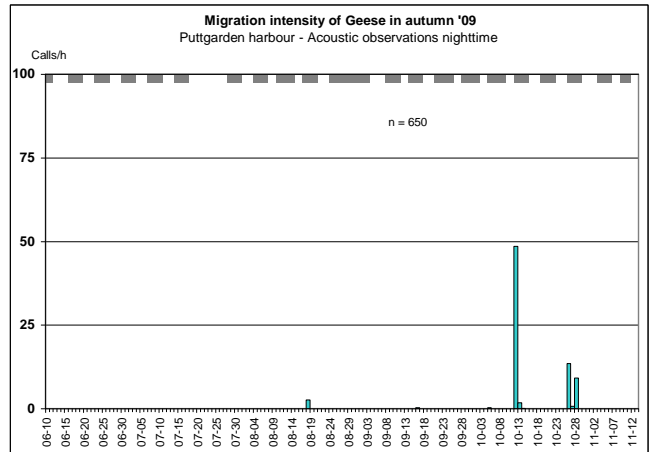
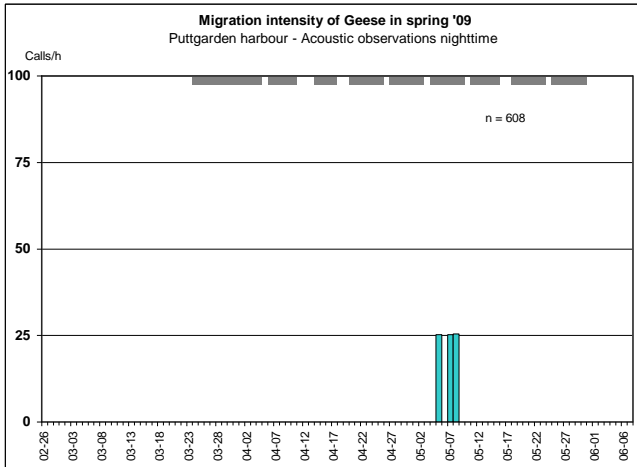
FEHMARNBELT BIRDS

Golden Plover – *Pluvialis apricaria*

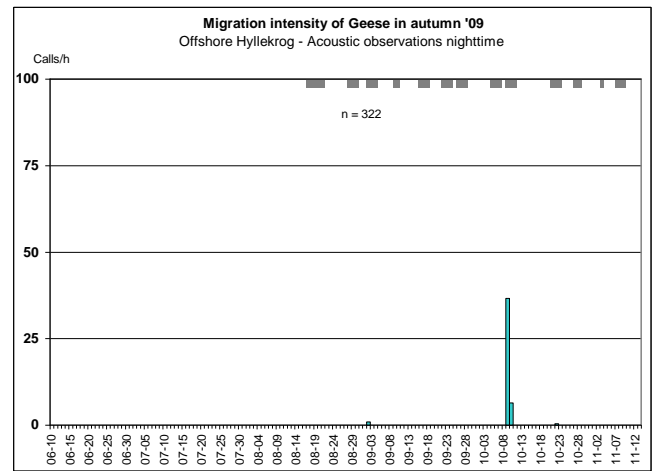


No Golden Plover data for 2010

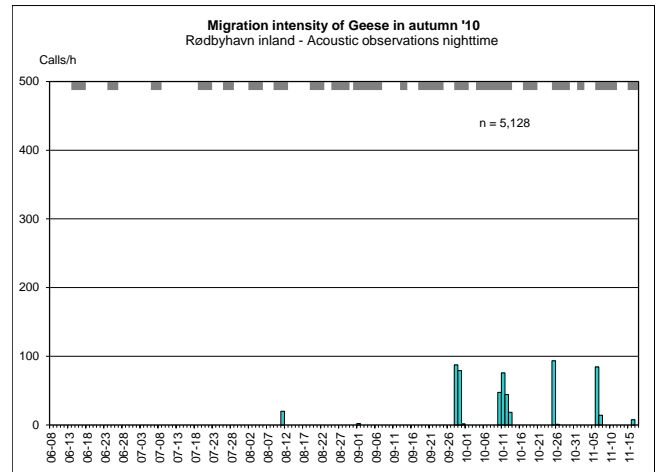
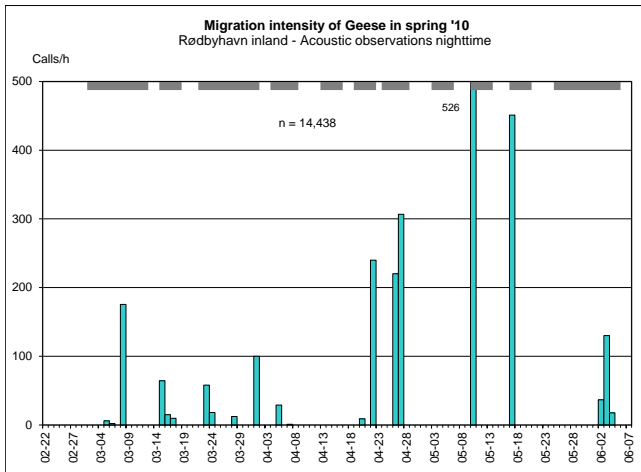
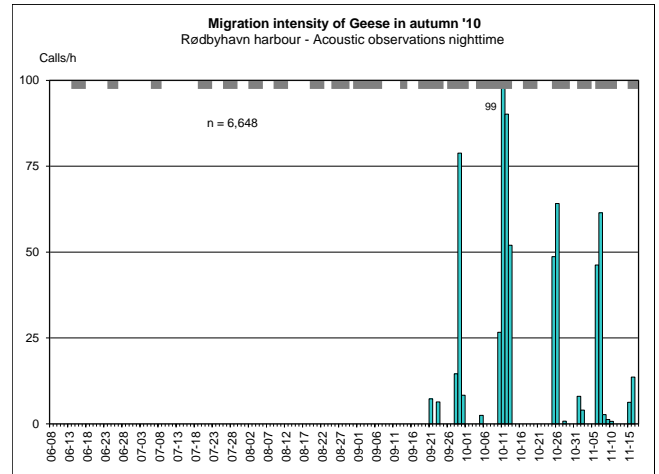
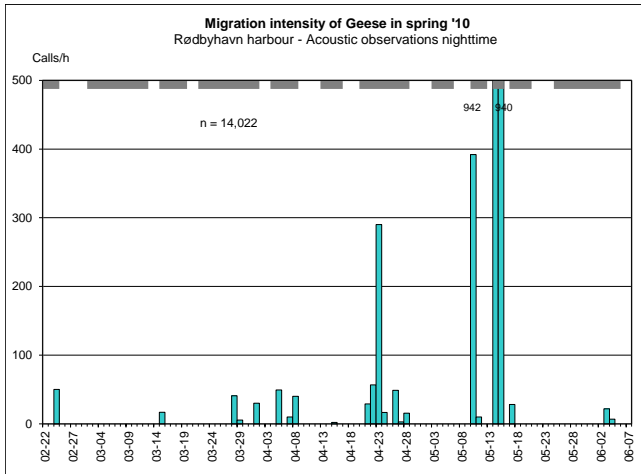
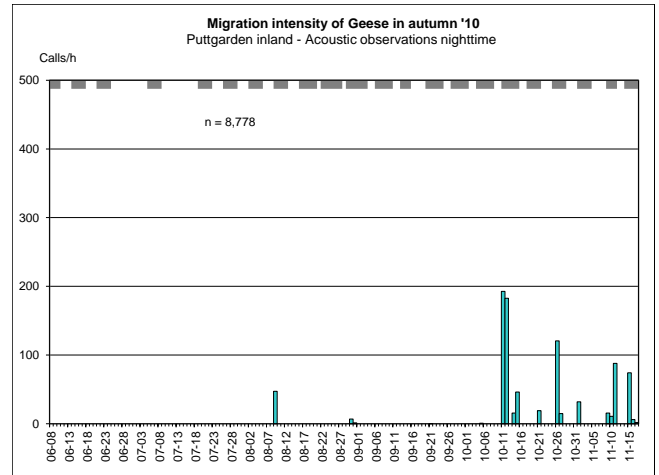
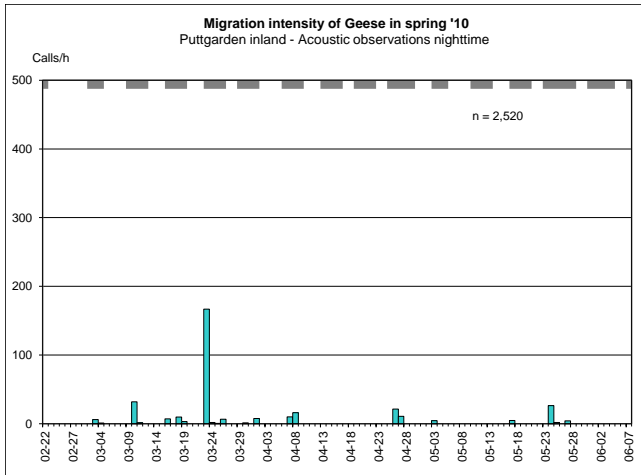
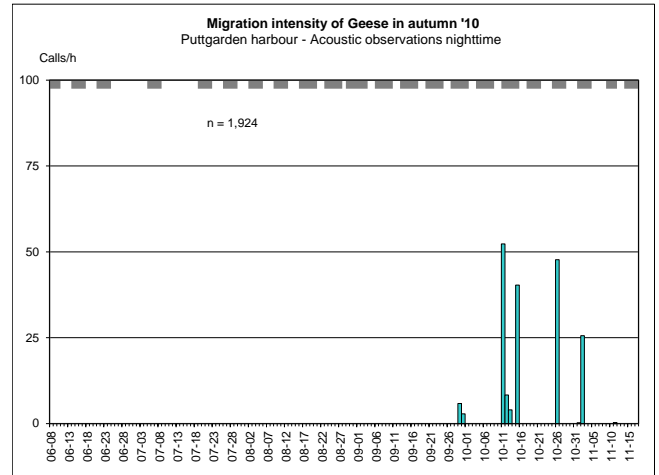
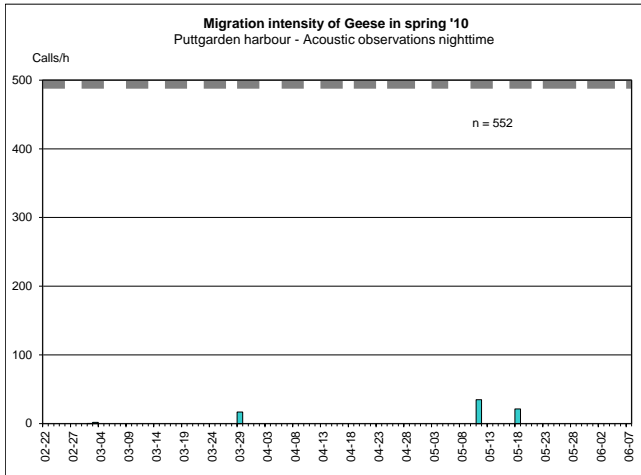
A.3.3 Geese



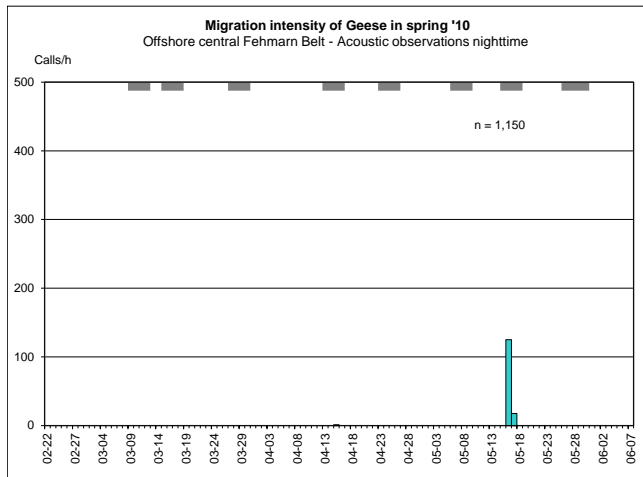
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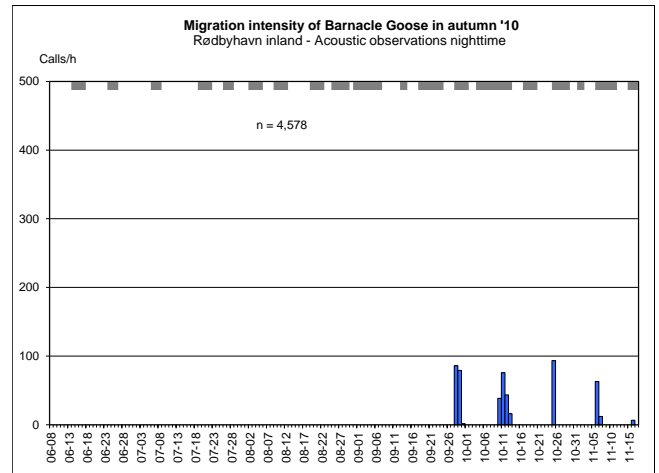
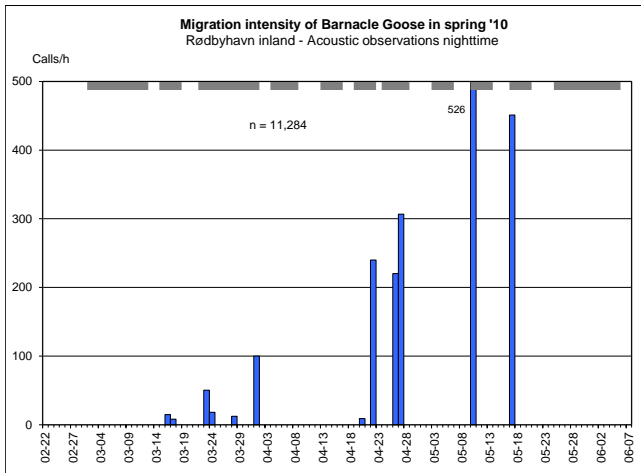
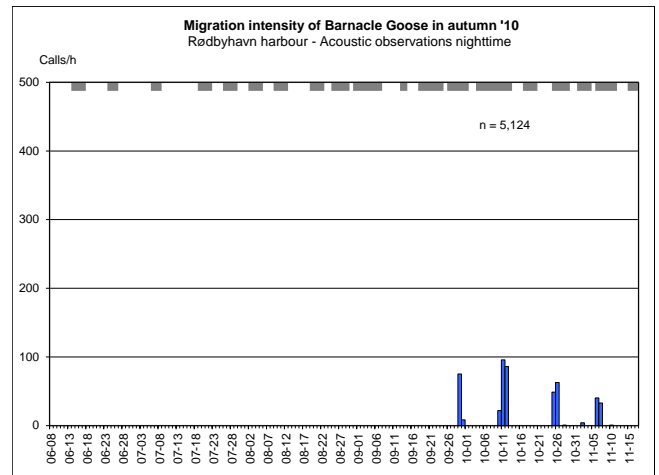
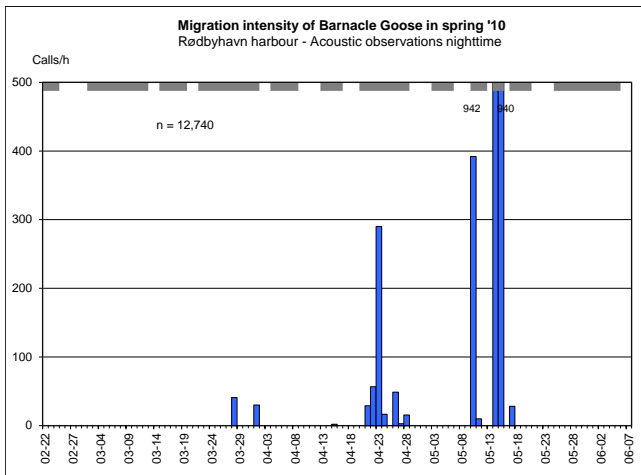
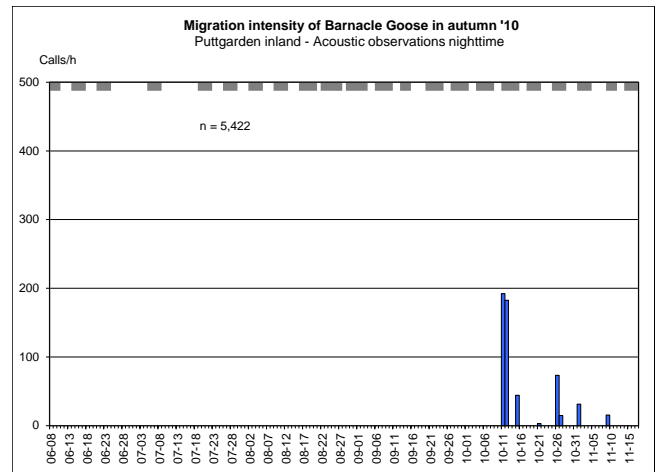
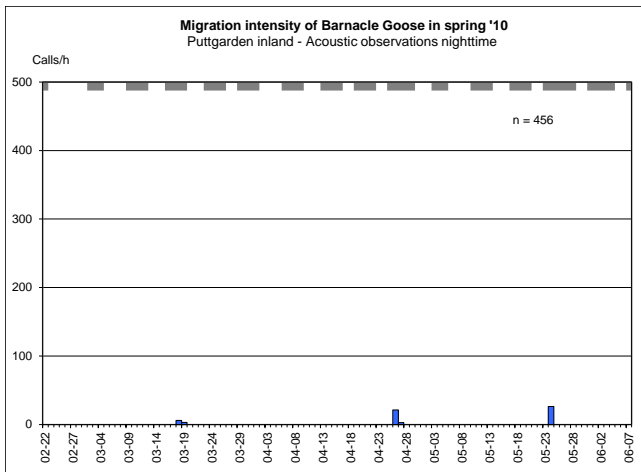
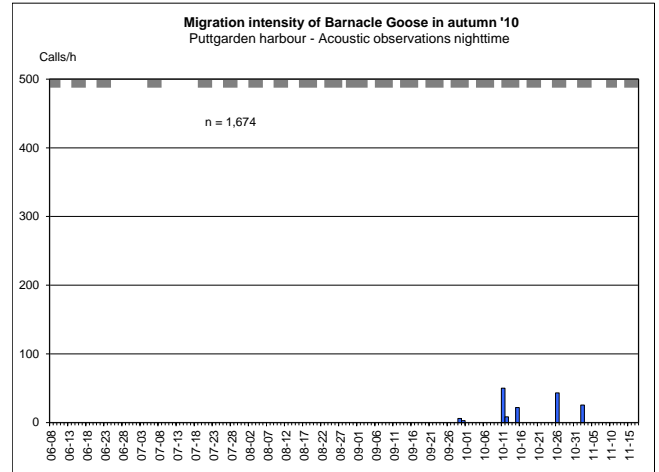
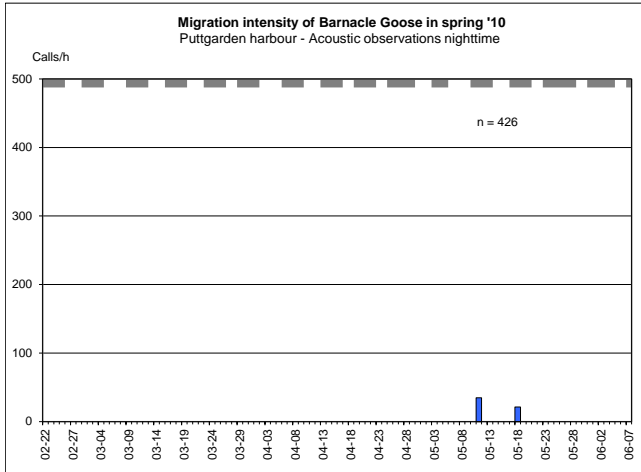
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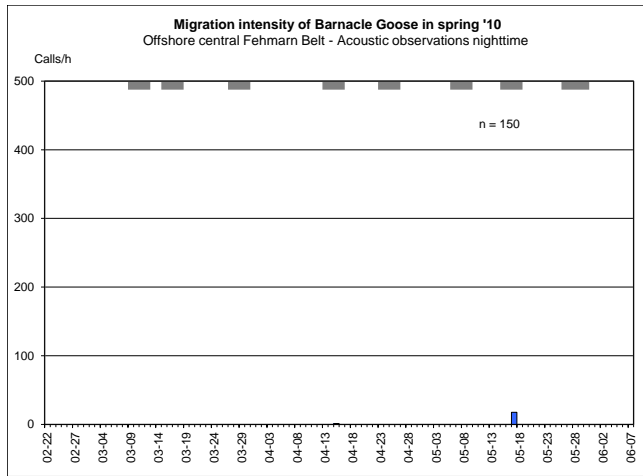
Barnacle Goose – *Branta leucopsis*

No Barnacle Goose data from 2009

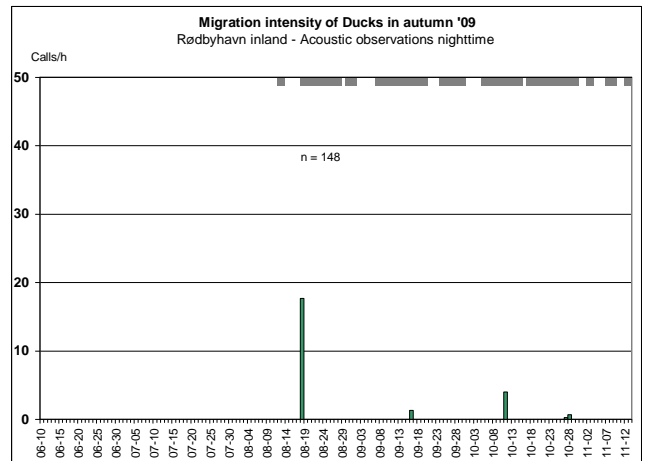
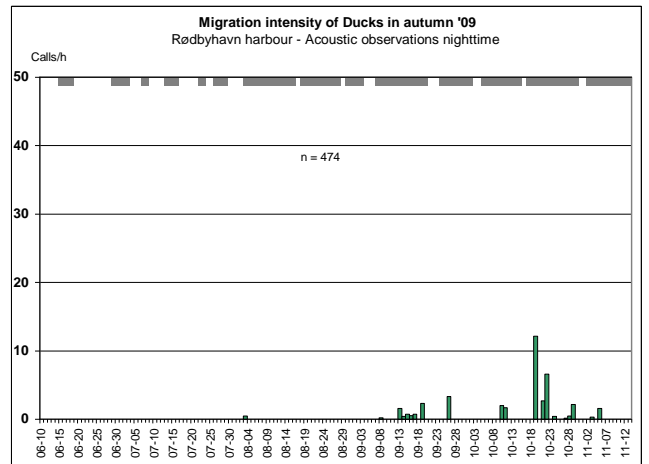
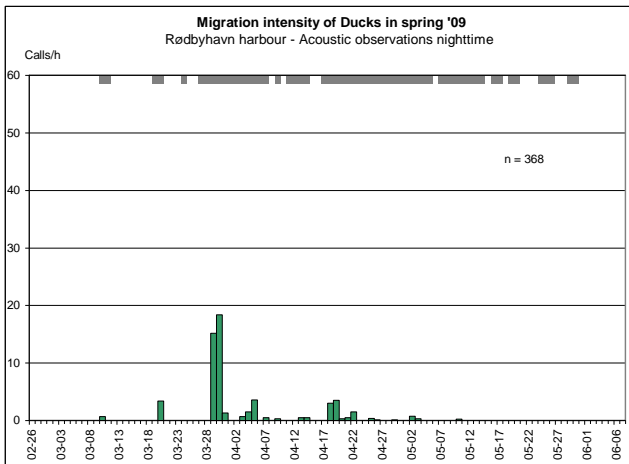
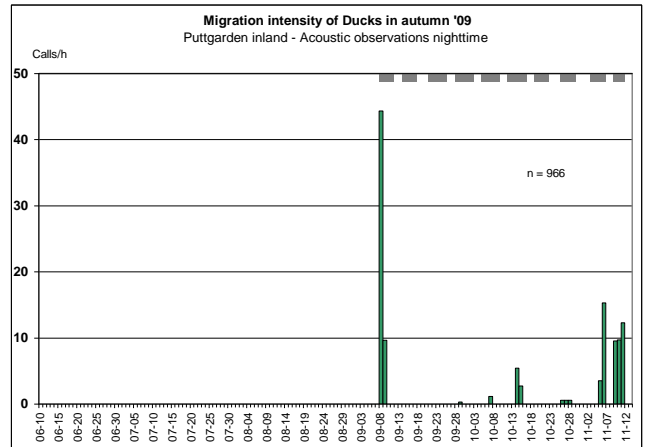
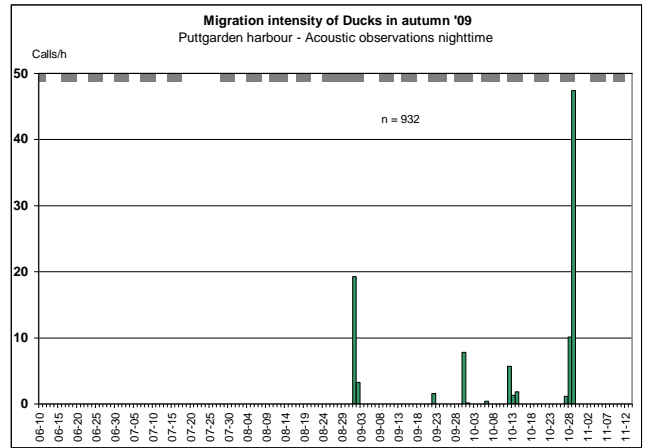
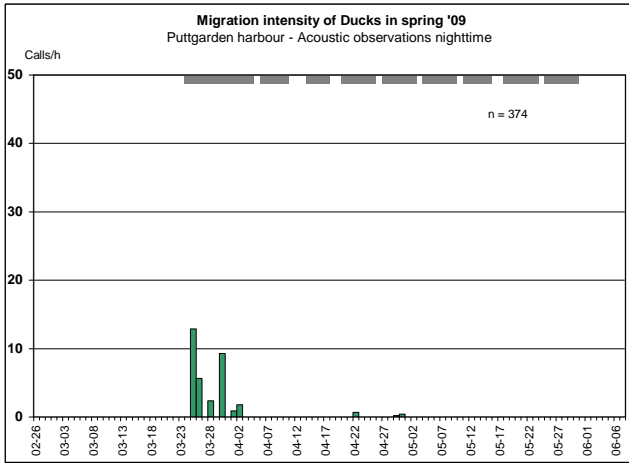
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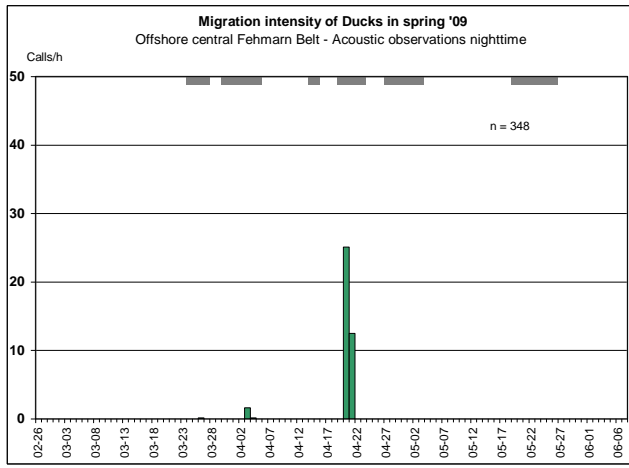
FEHMARNBELT BIRDS



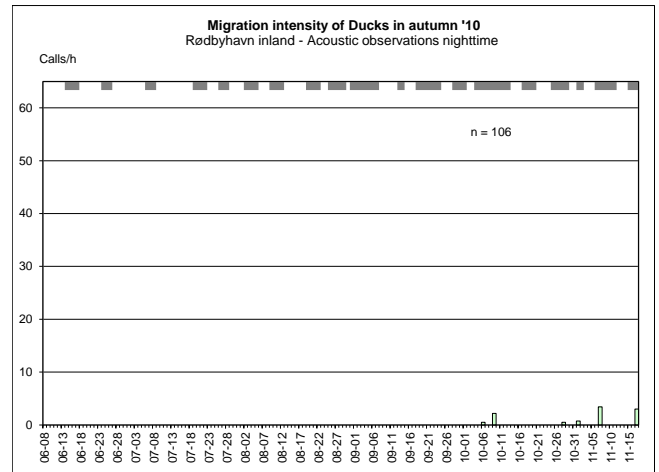
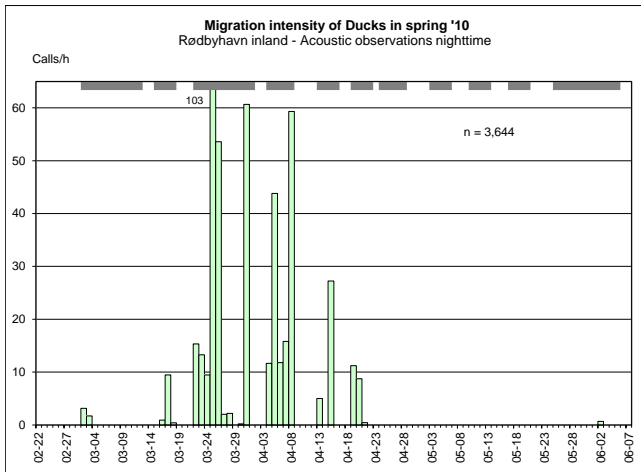
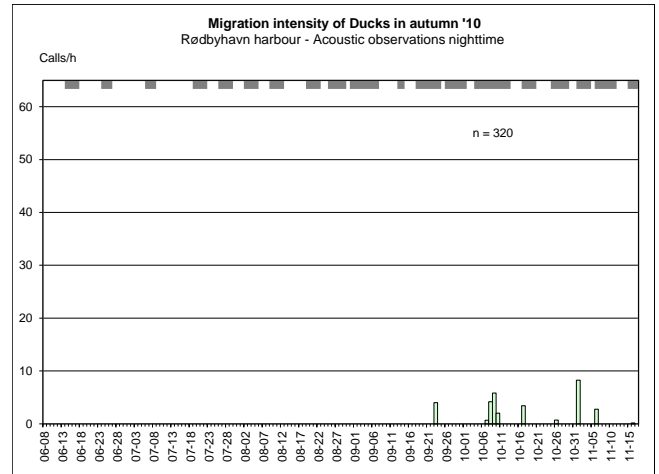
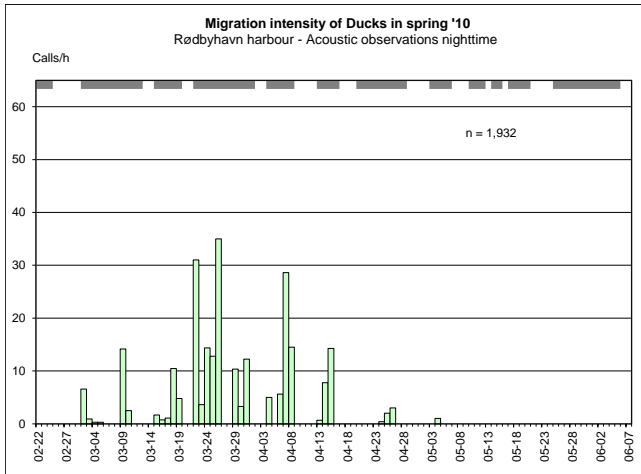
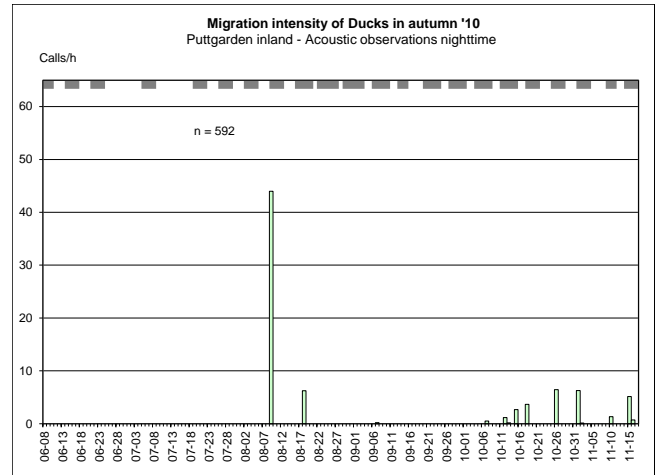
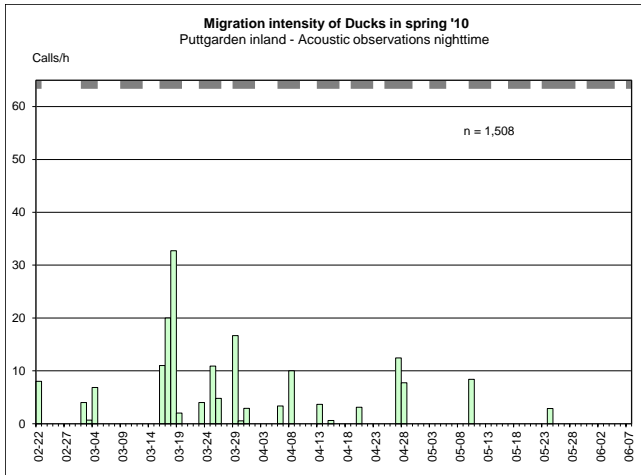
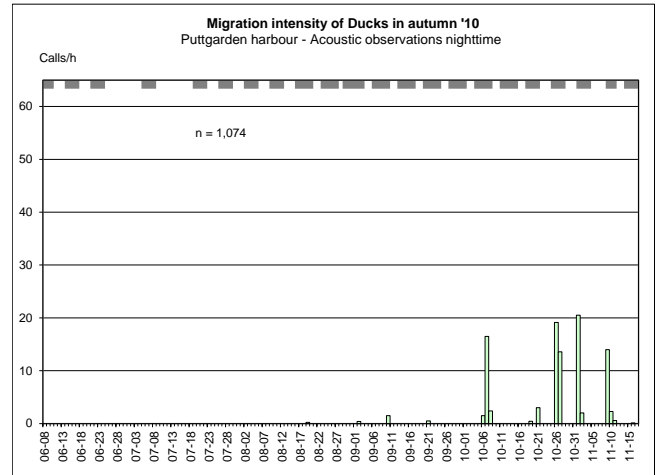
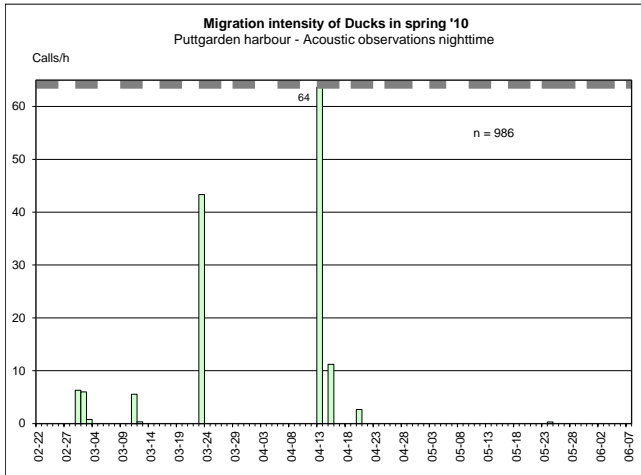
A.3.4 Ducks



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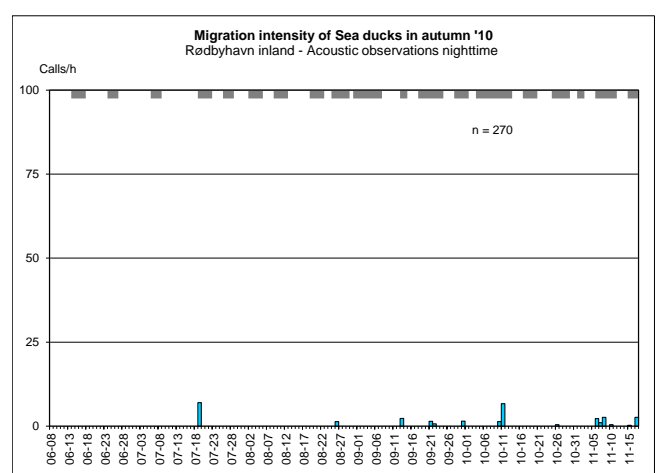
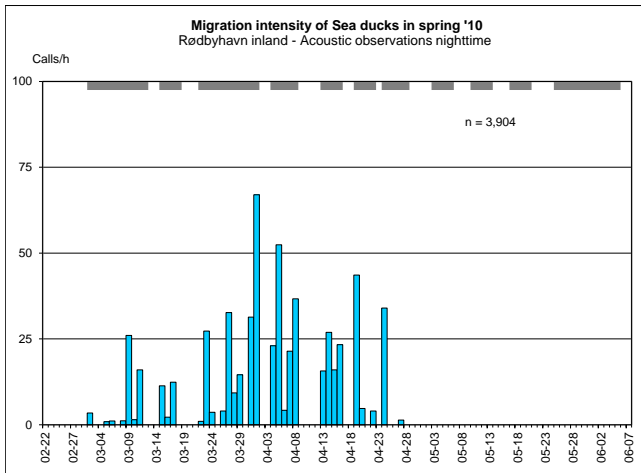
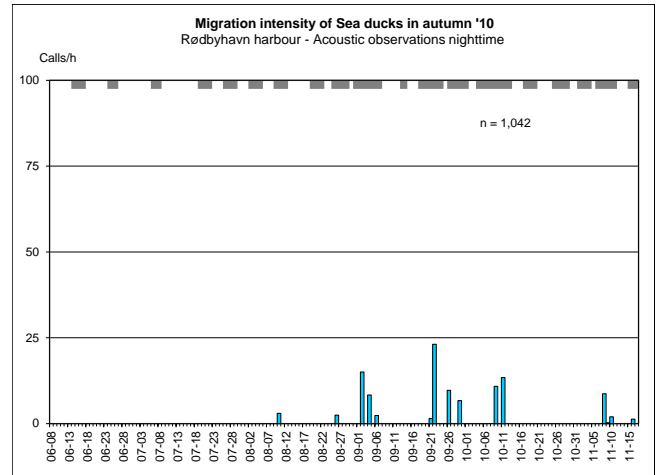
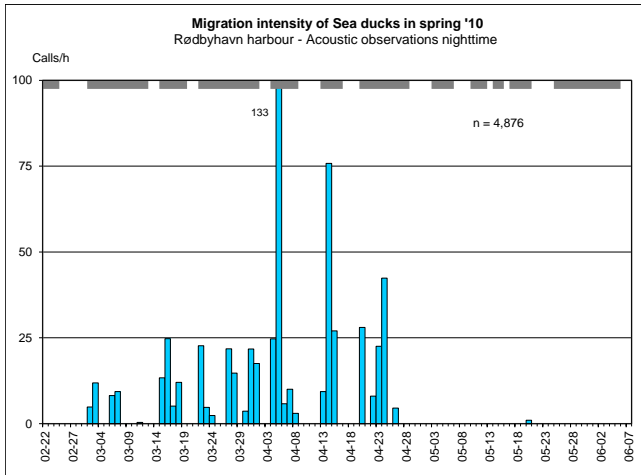
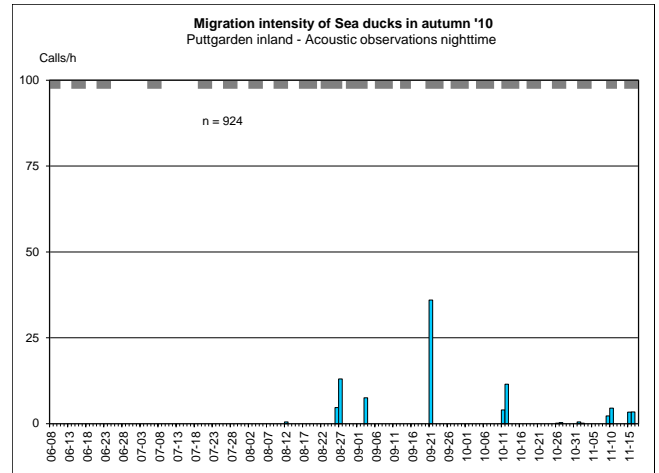
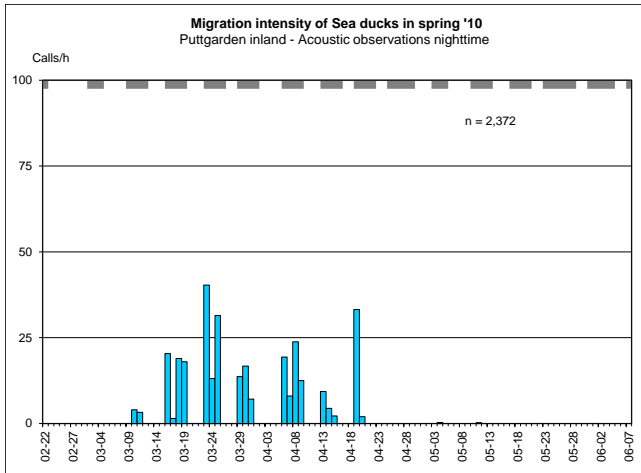
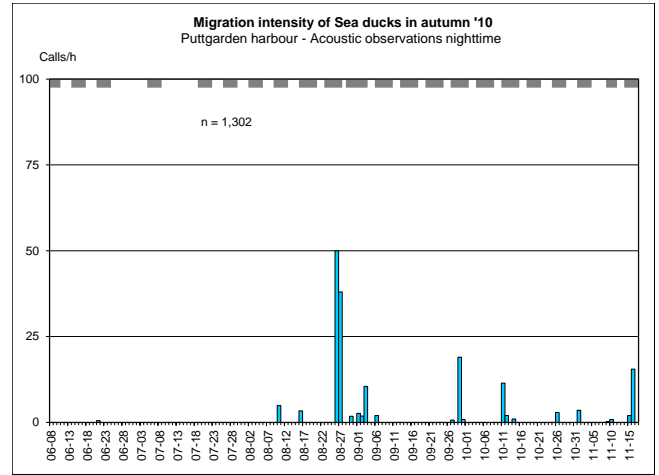
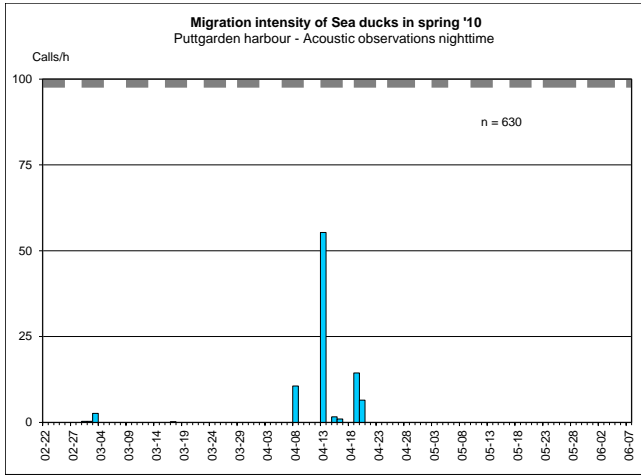
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No data for offshore Fehmarnbelt and offshore Hyllekrog from 2010

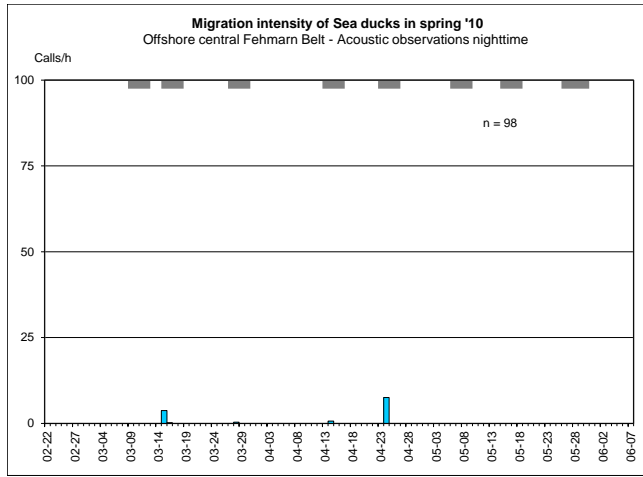
Seaducks

No seaducks data from 2009

FEHMARNBELT BIRDS

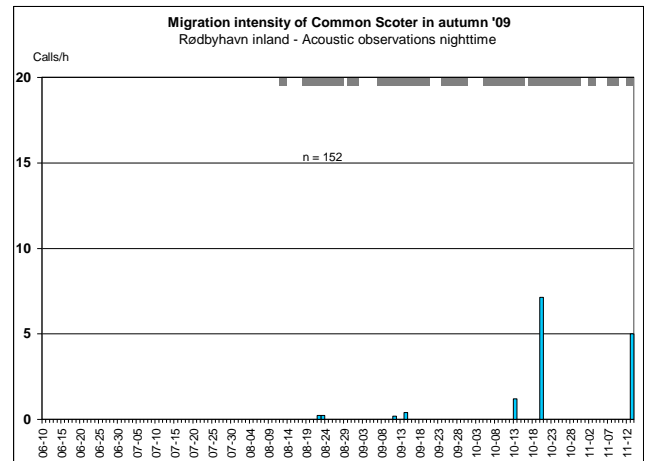
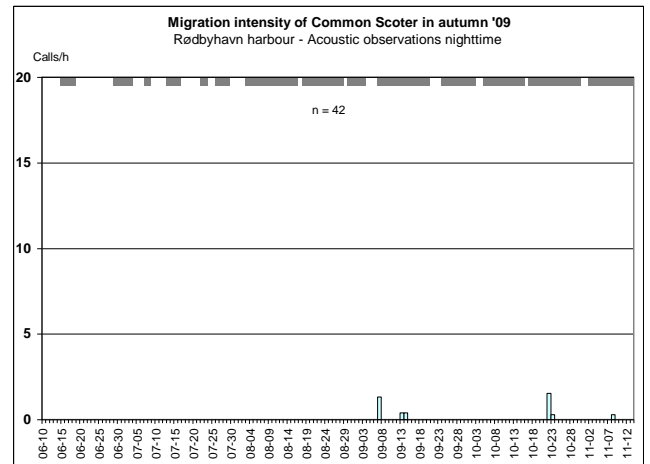
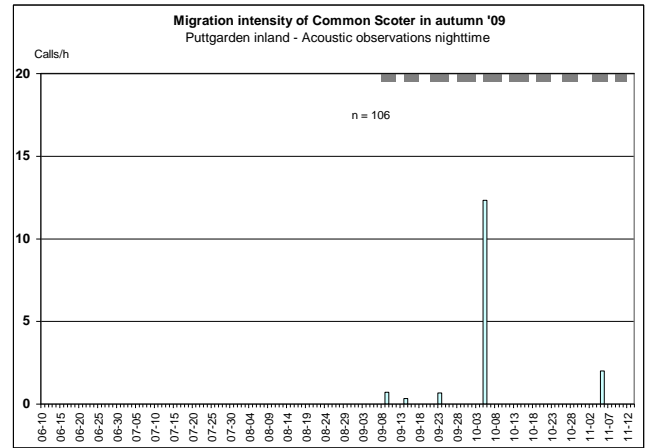
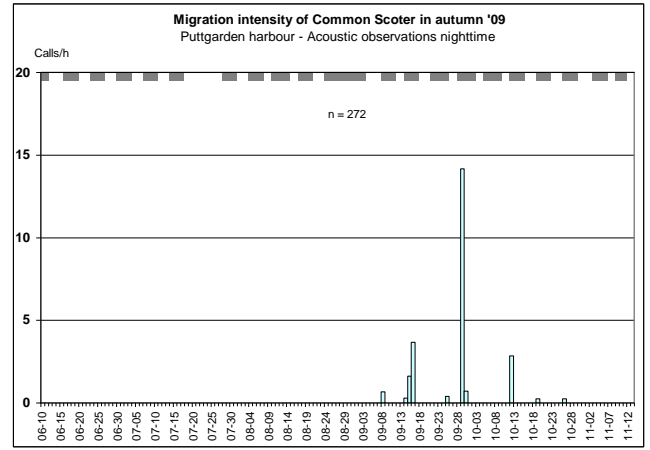


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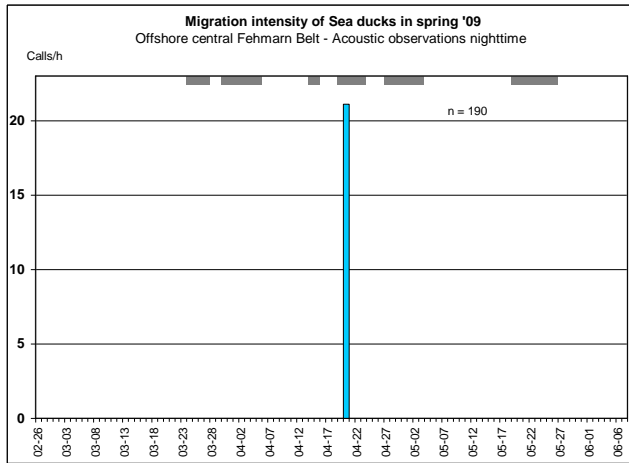


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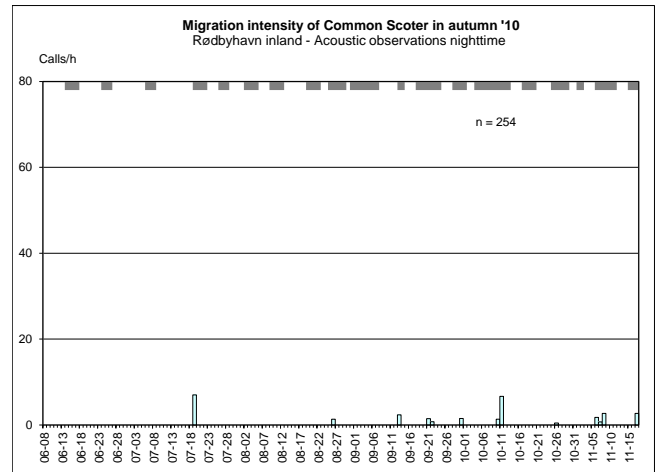
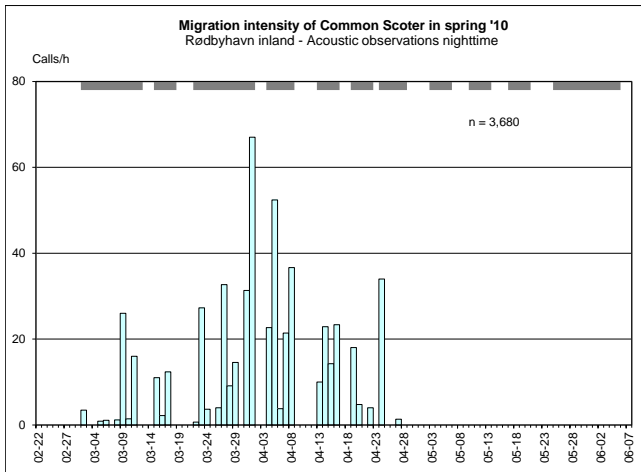
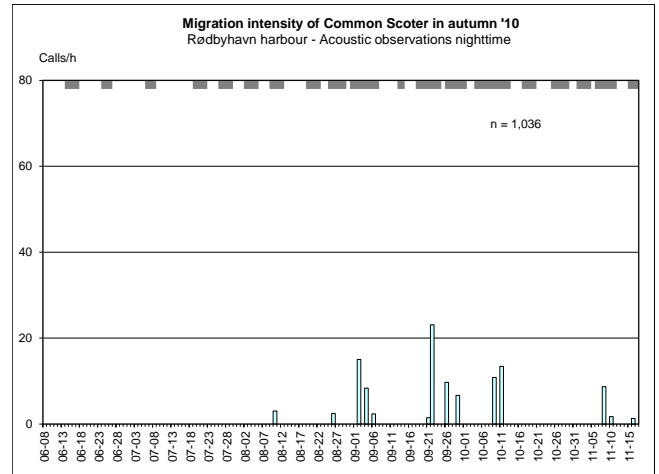
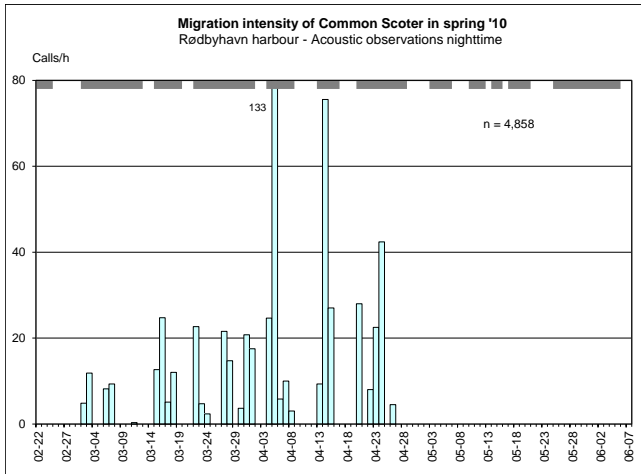
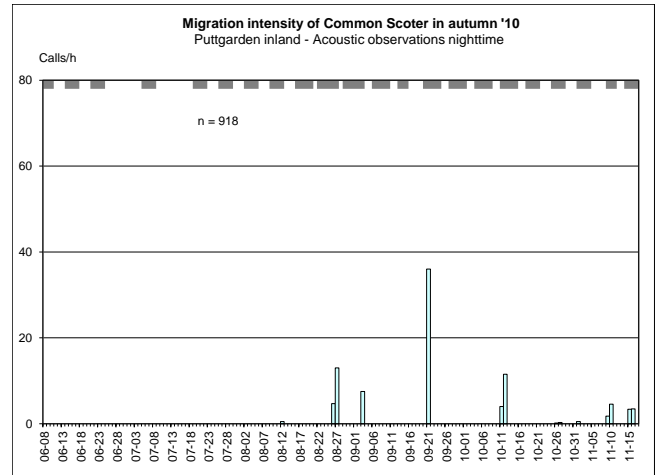
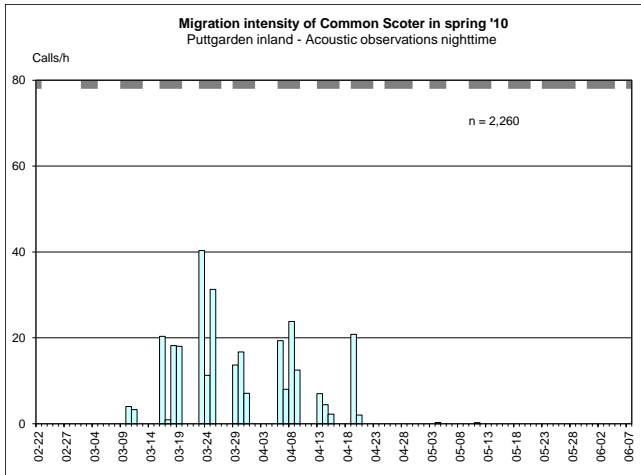
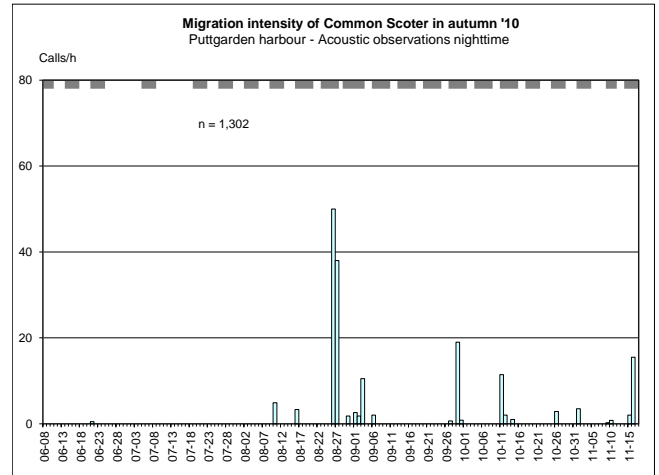
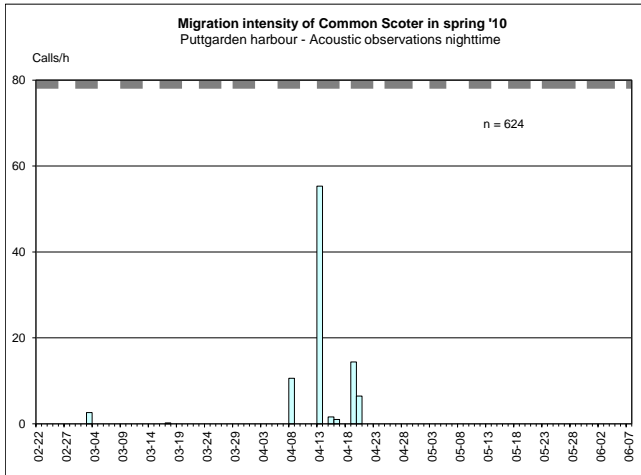
Common Scoter – *Melanitta nigra*



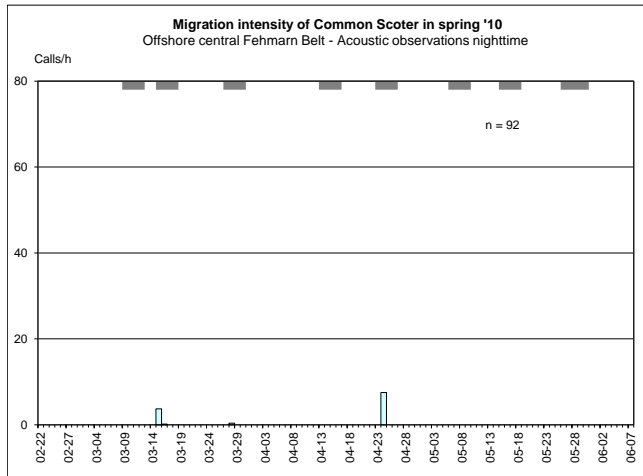
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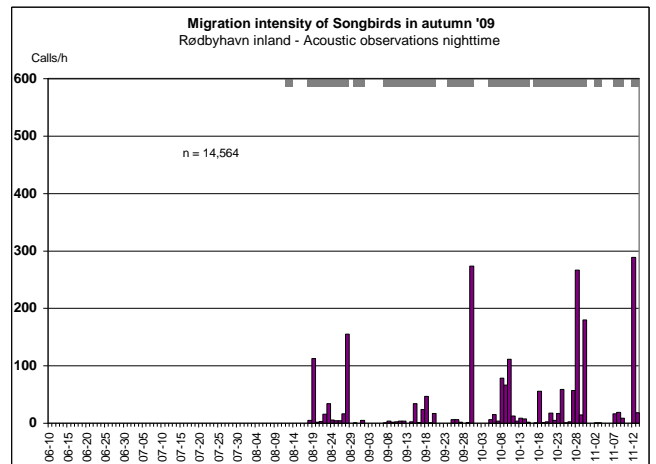
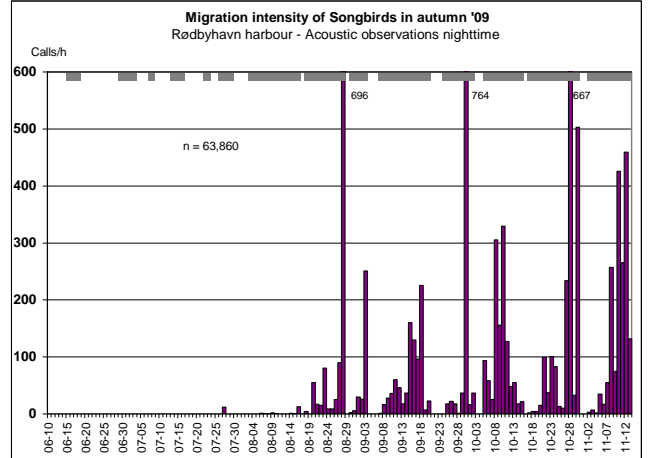
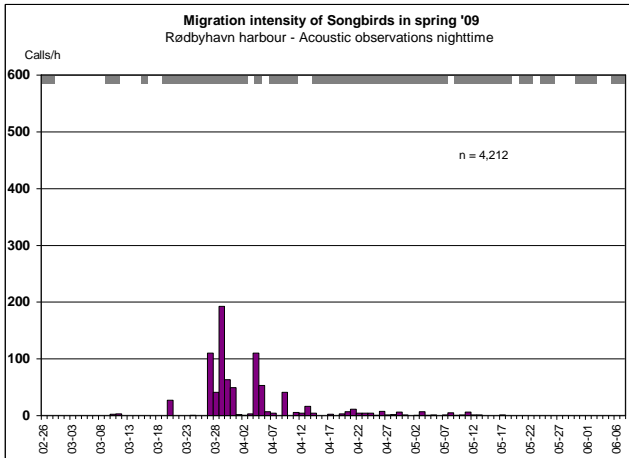
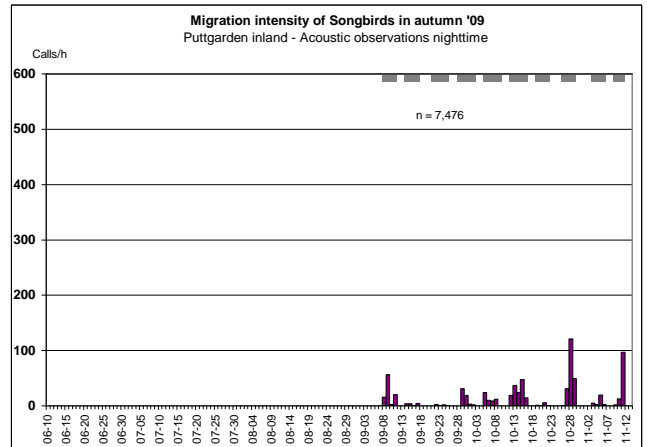
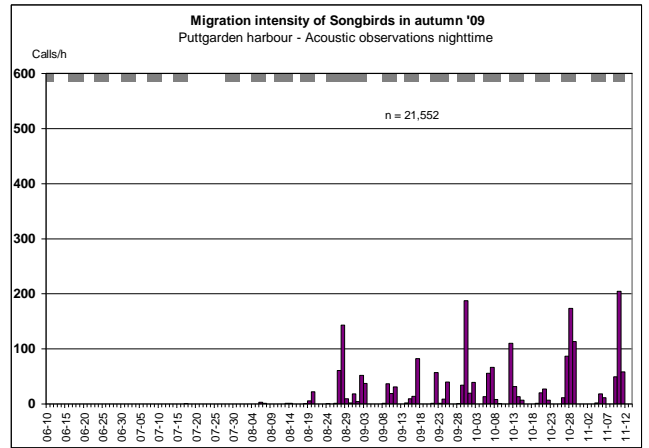
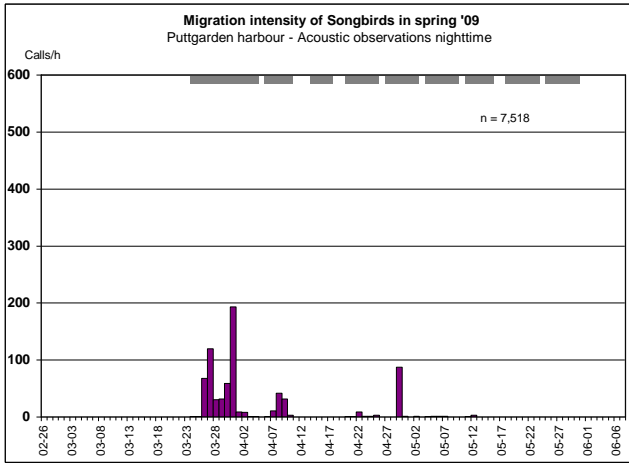
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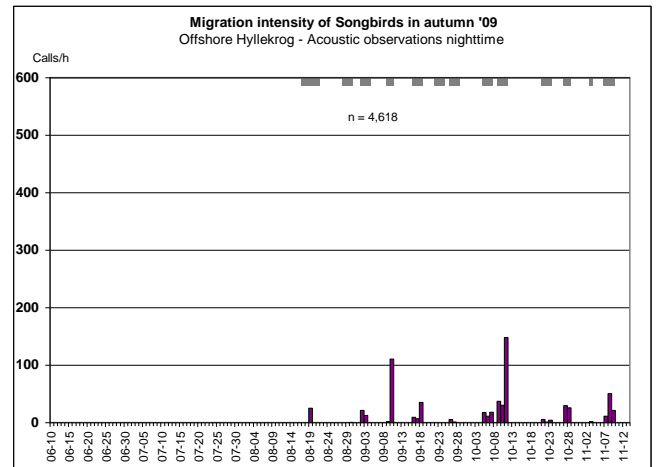
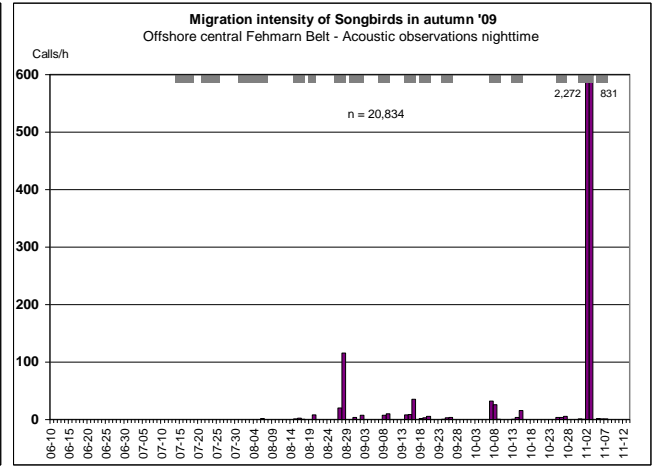
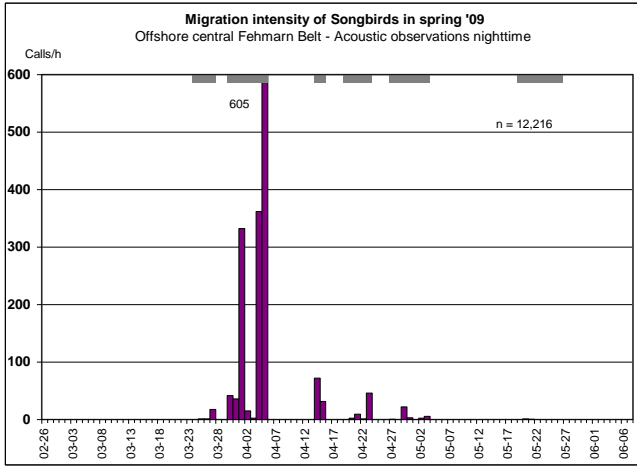
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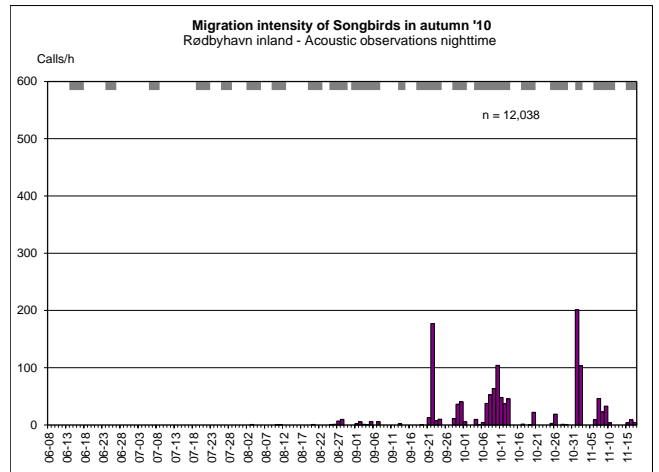
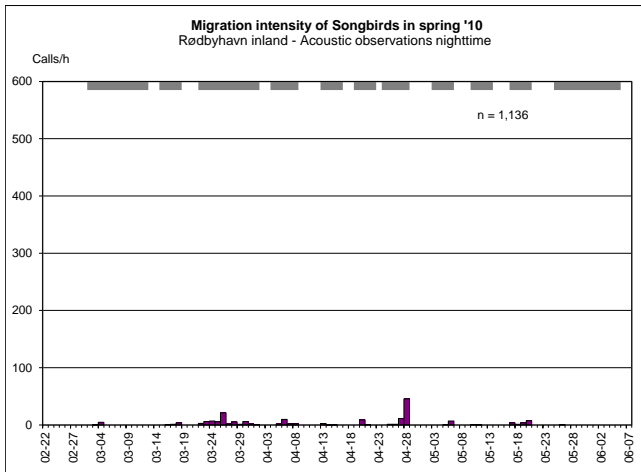
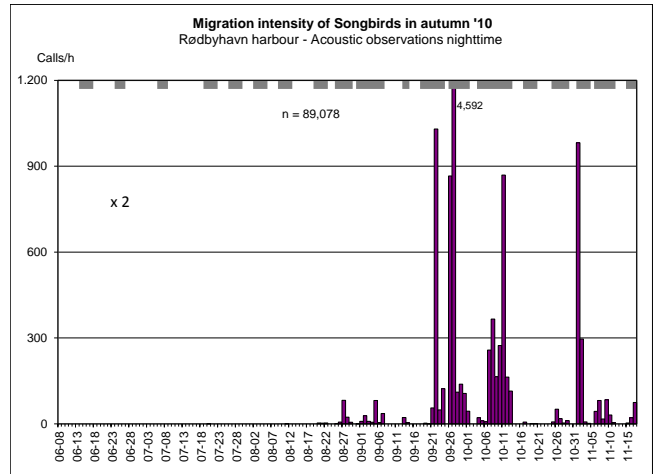
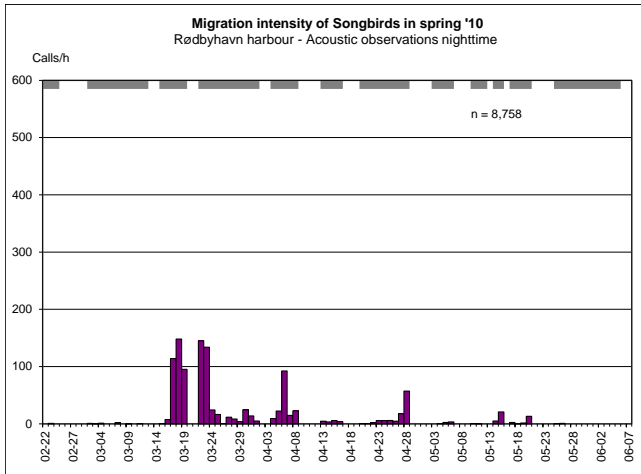
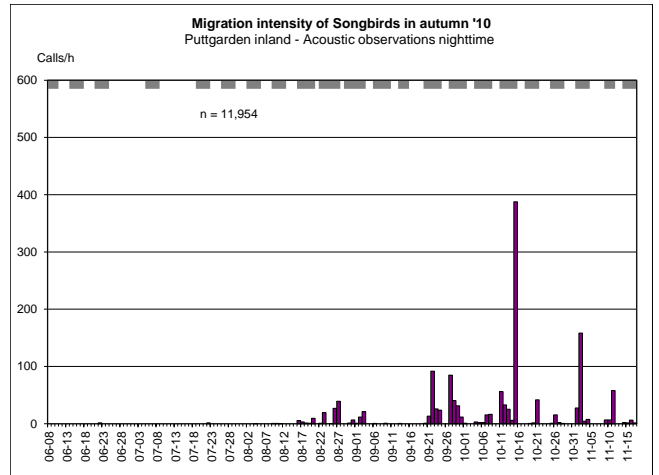
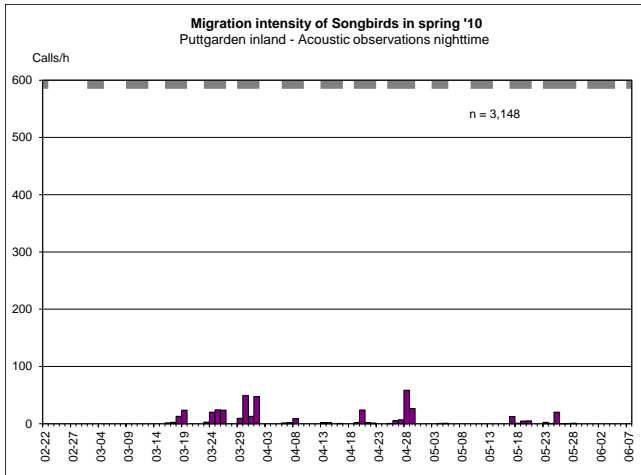
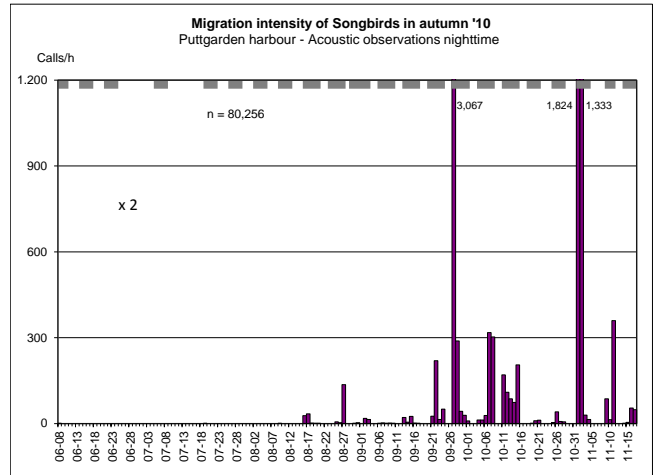
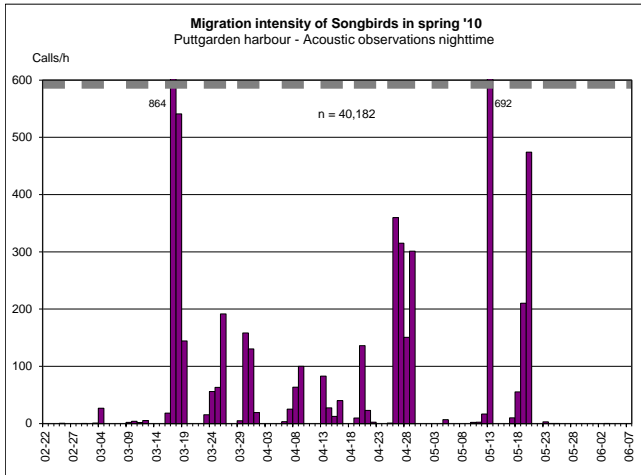
A.3.5 Songbirds



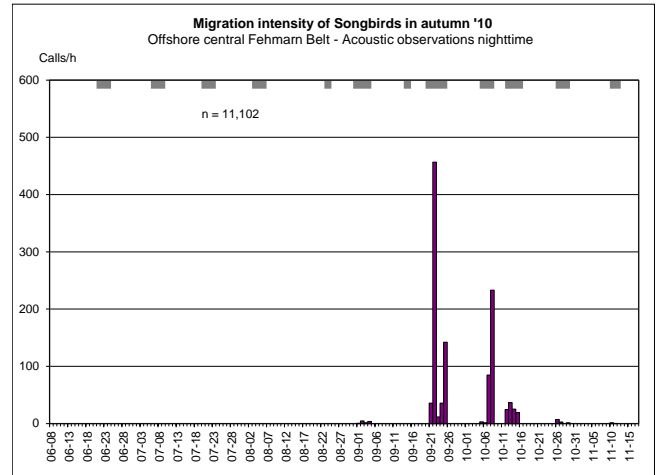
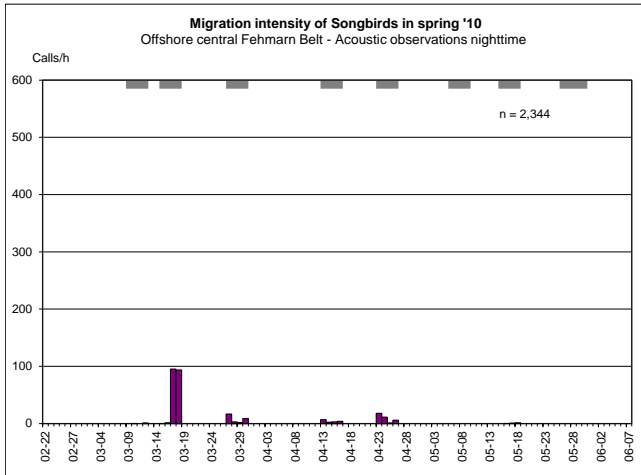
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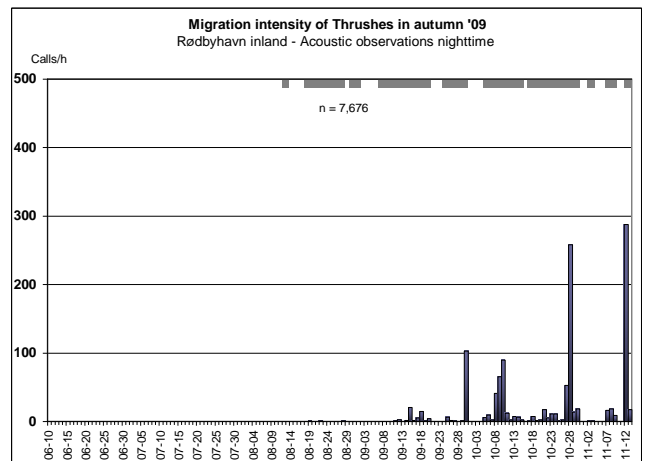
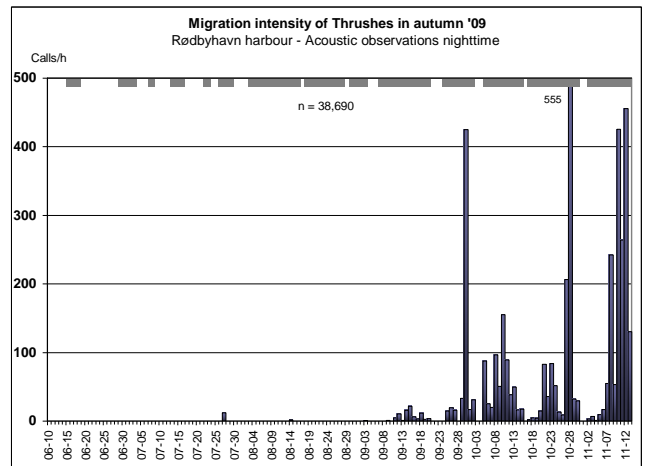
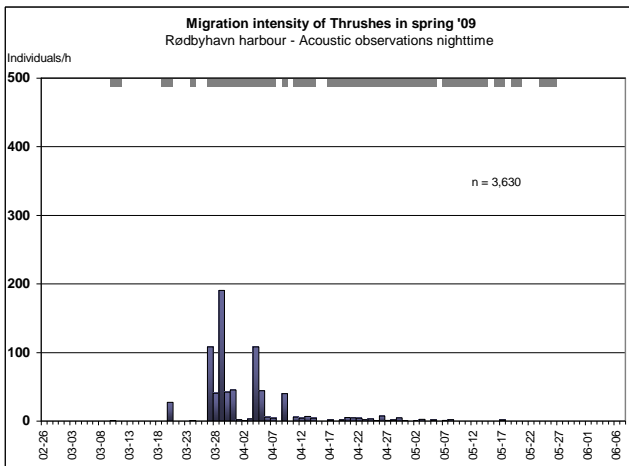
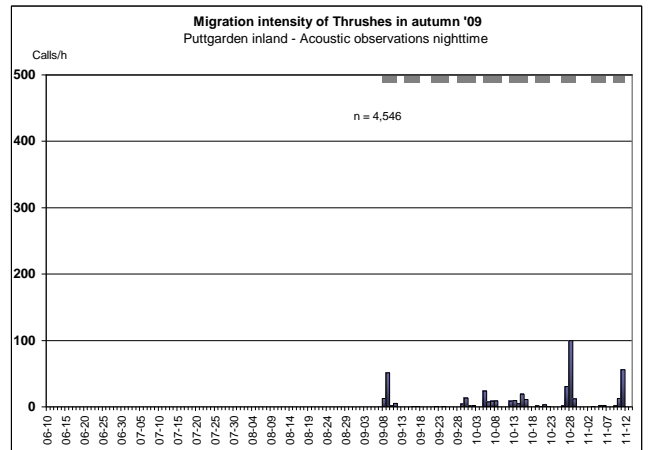
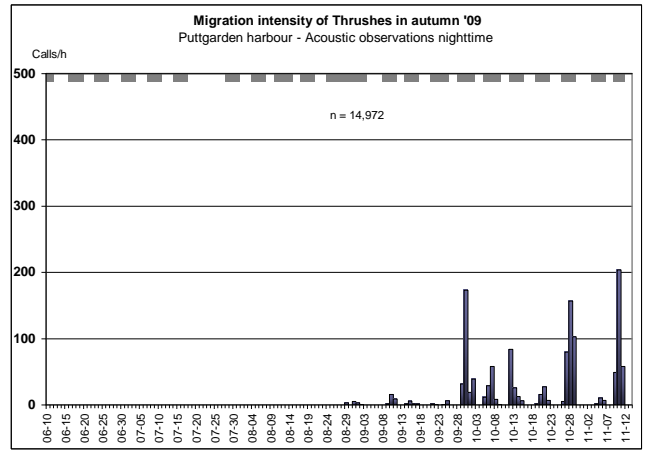
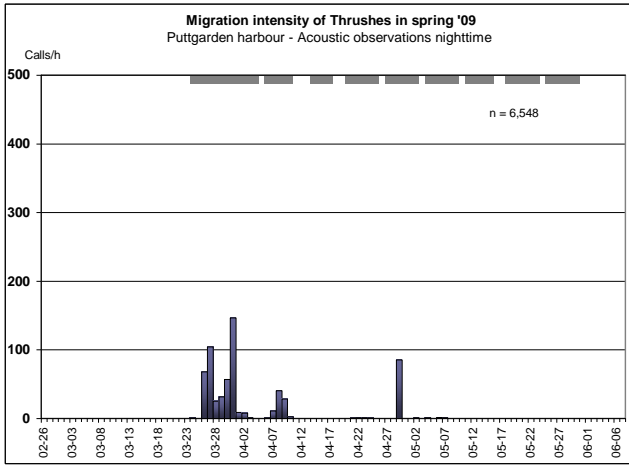
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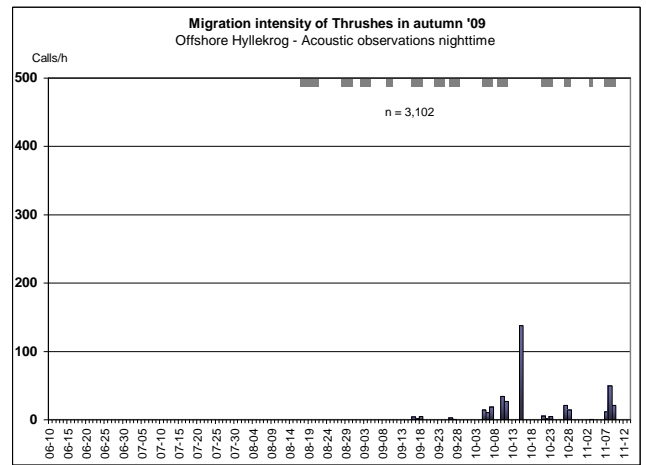
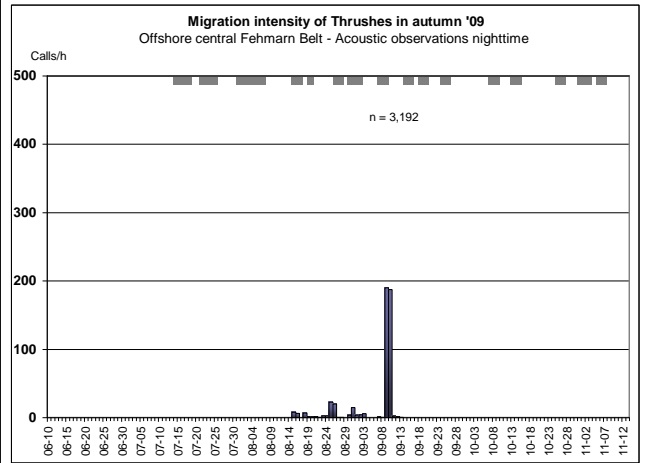
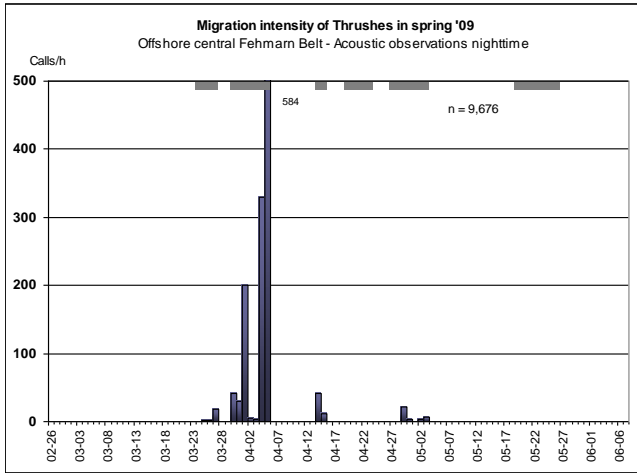
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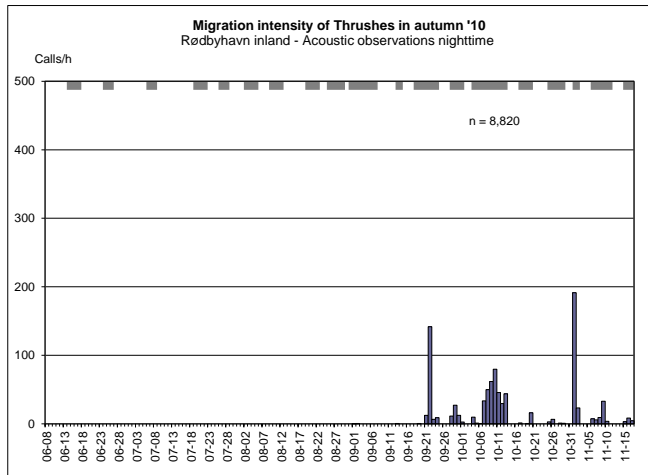
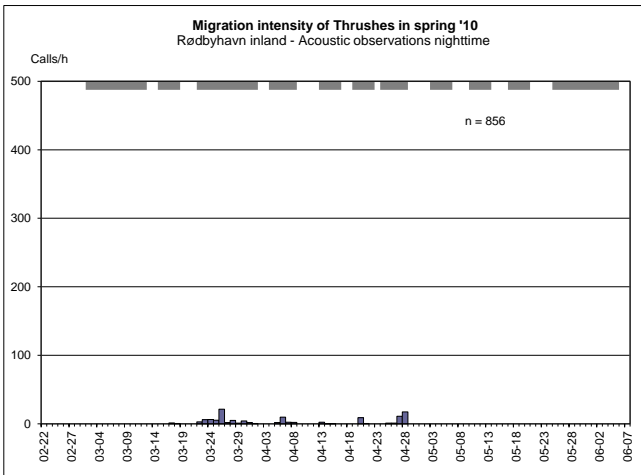
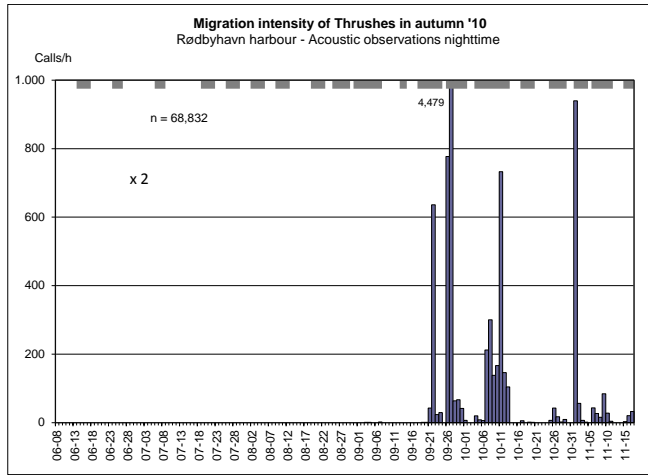
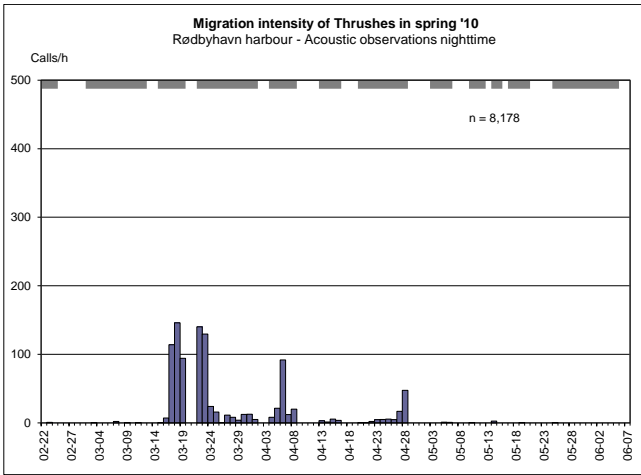
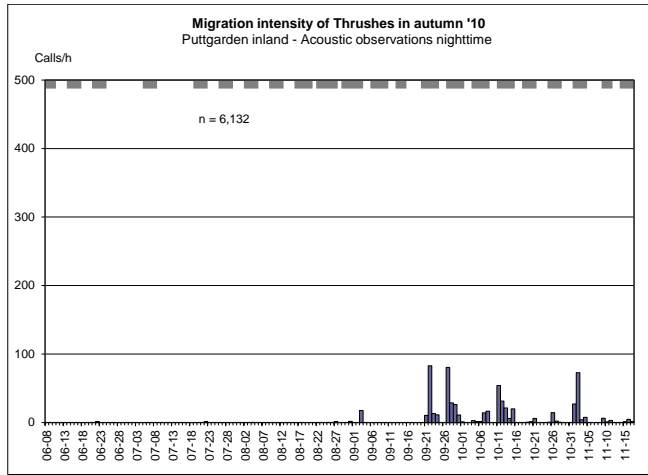
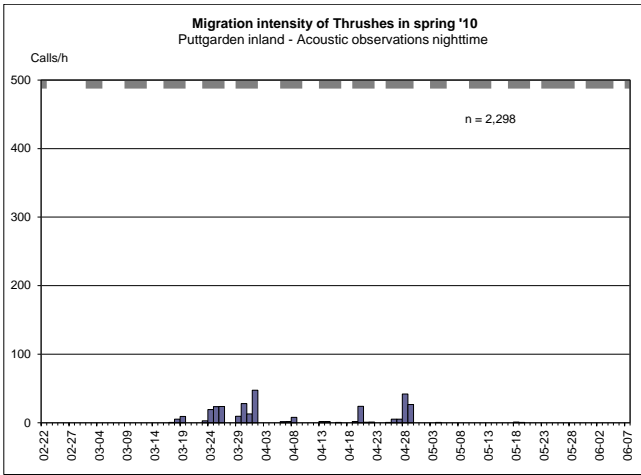
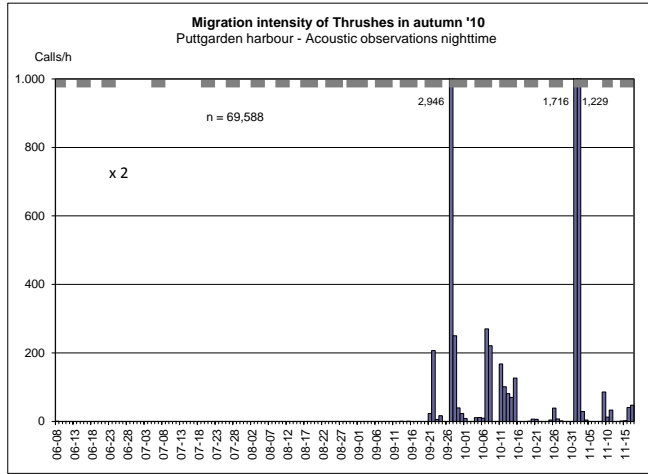
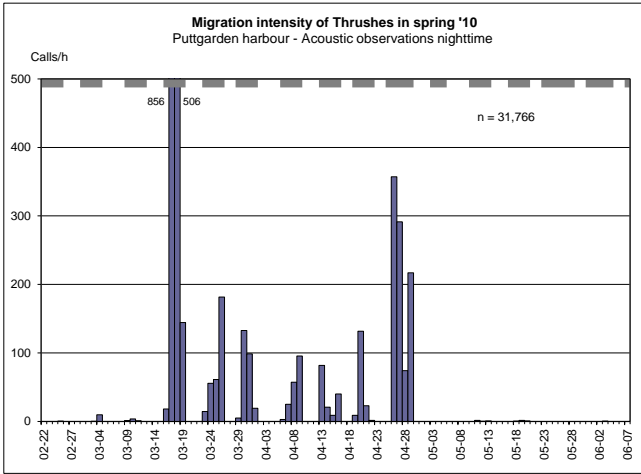
Thrushes – *Turdus spp.*



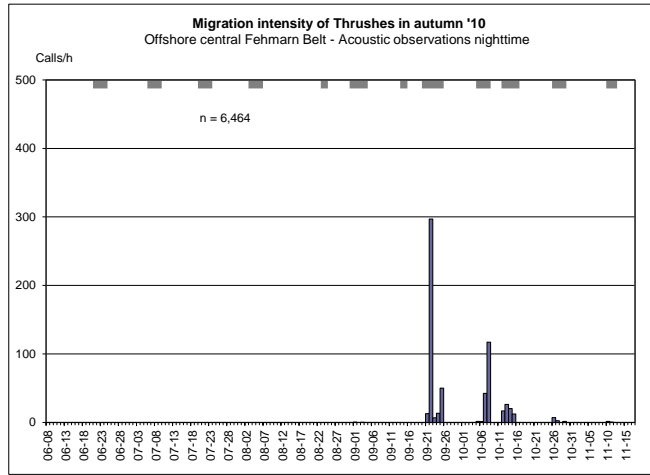
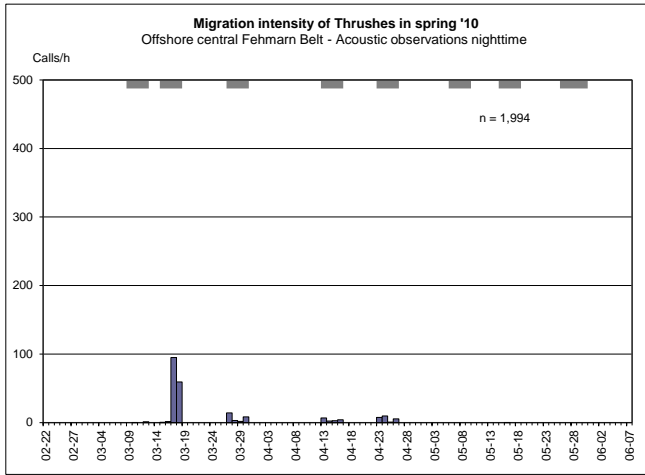
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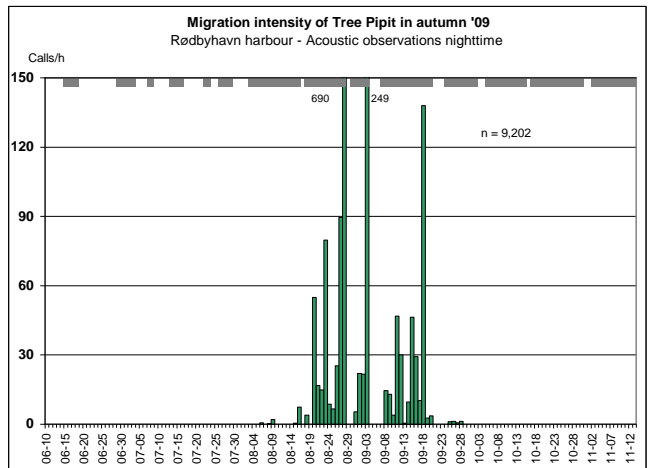
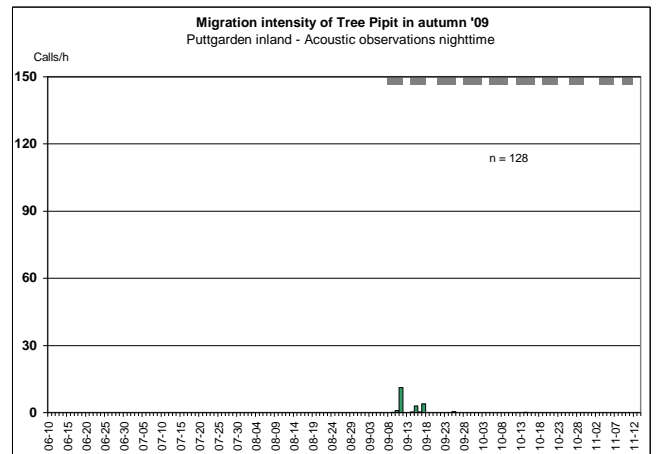
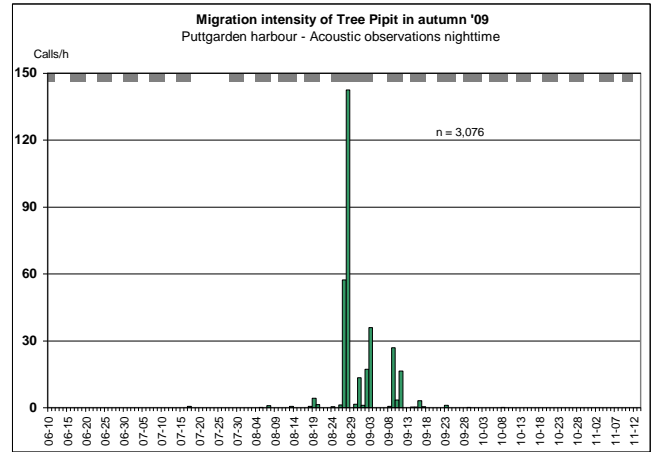
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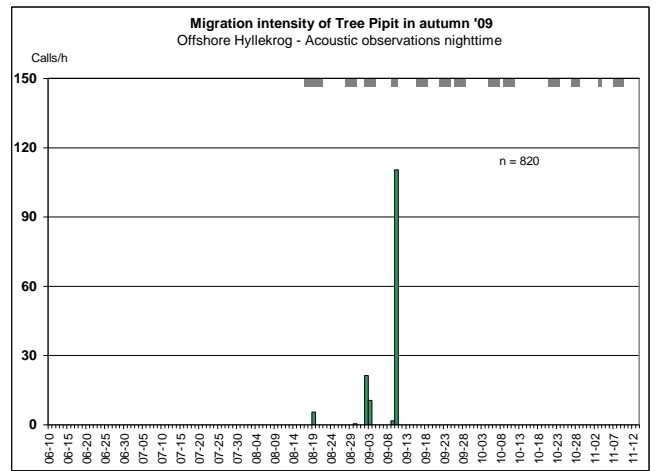
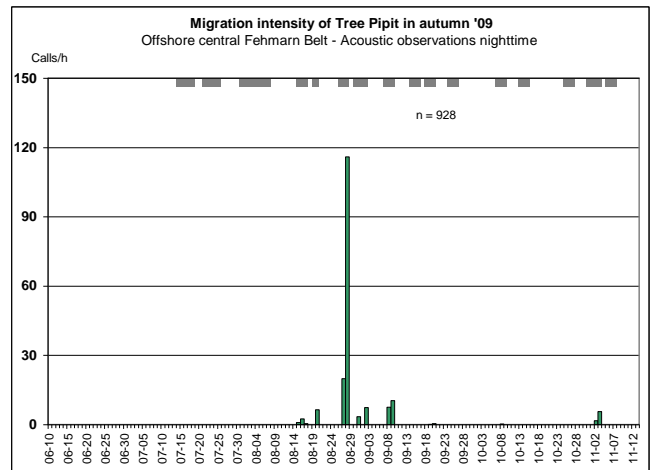
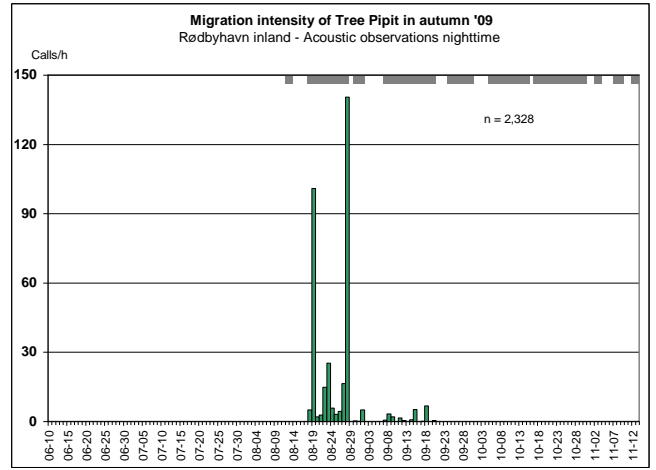
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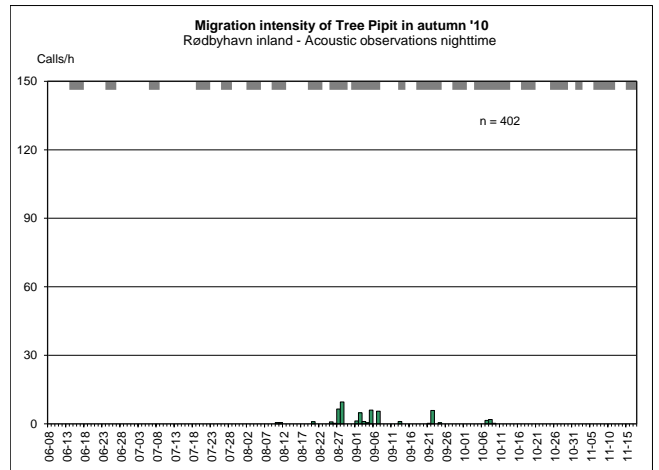
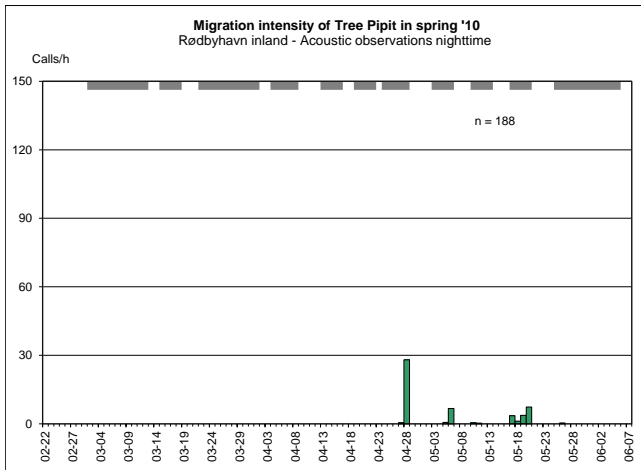
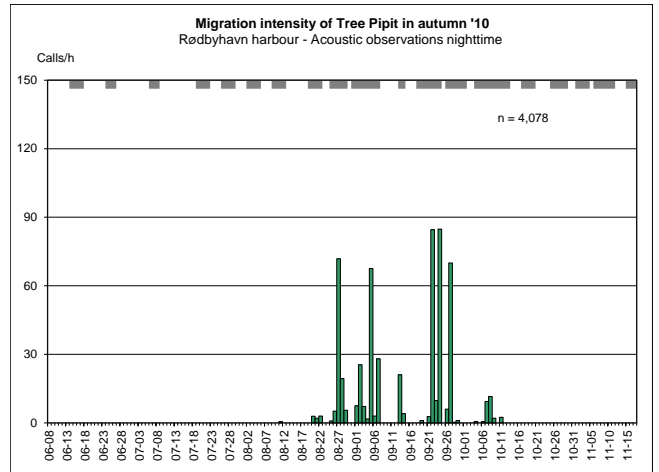
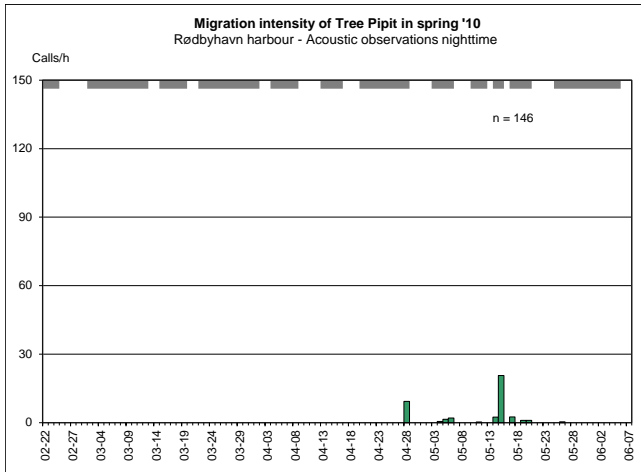
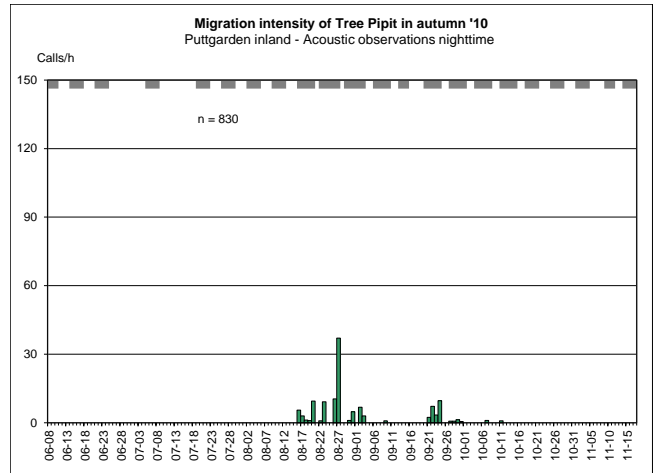
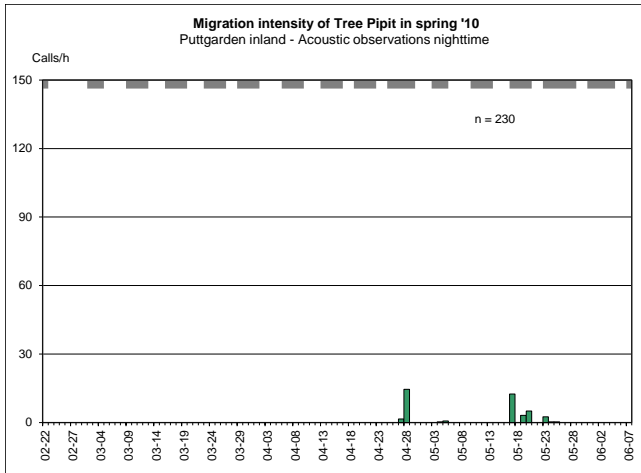
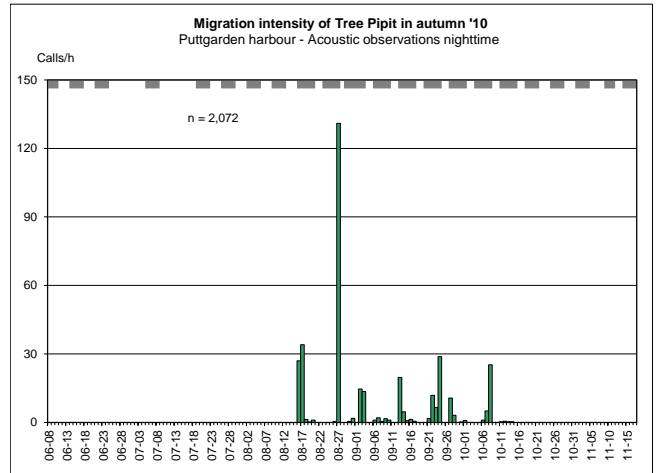
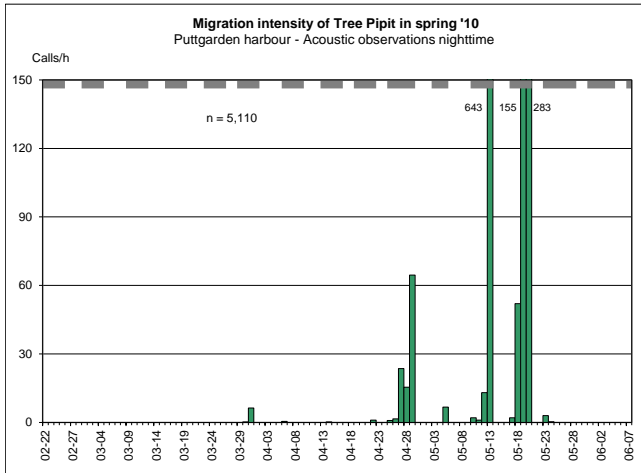
Tree Pipit – *Anthus trivialis*



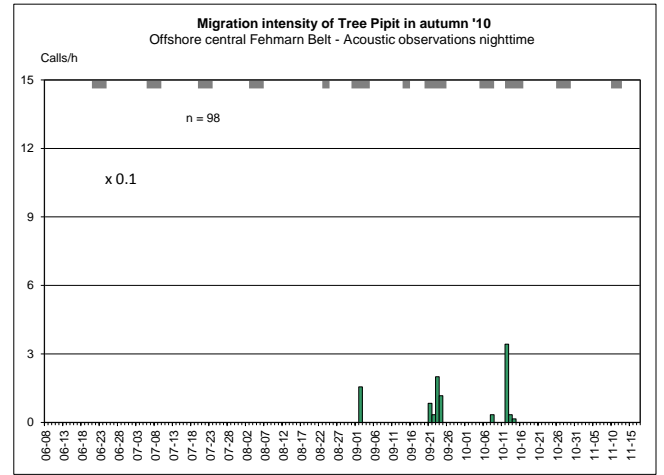
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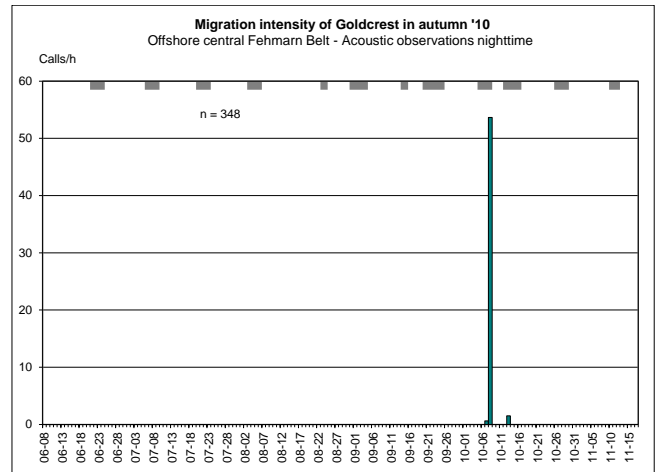
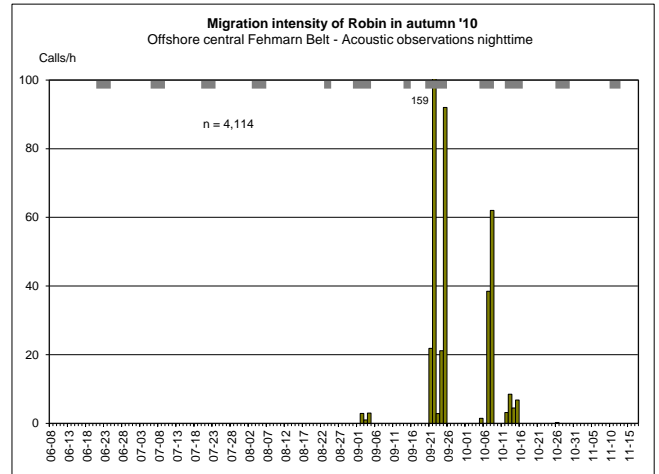
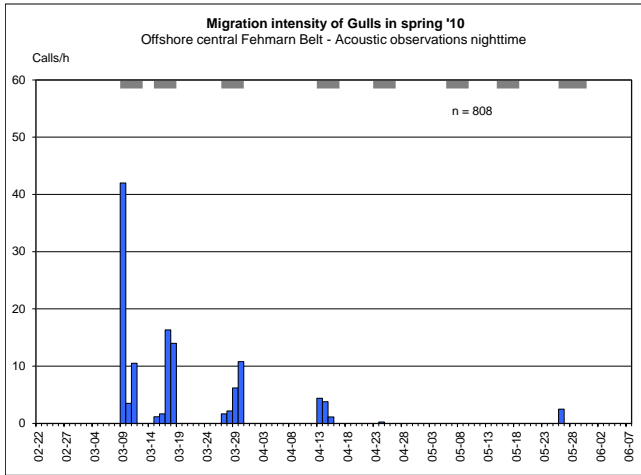
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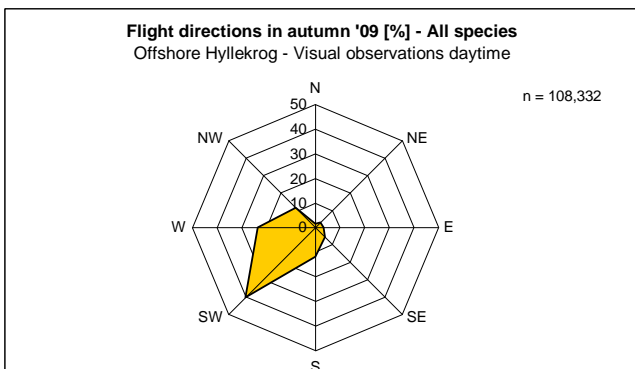
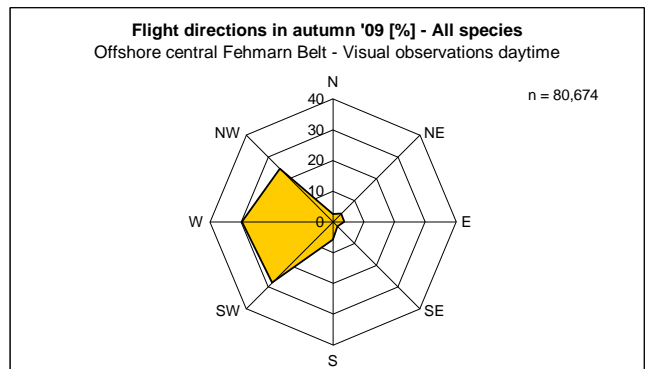
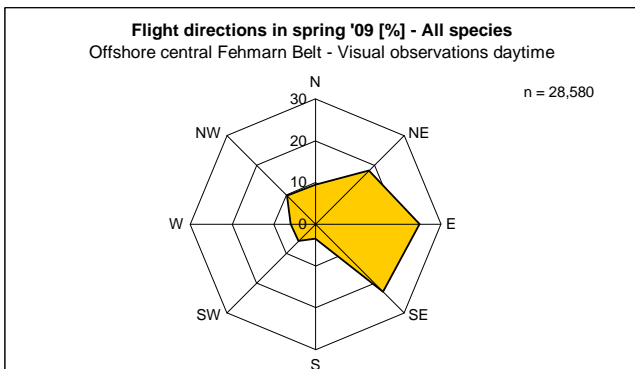
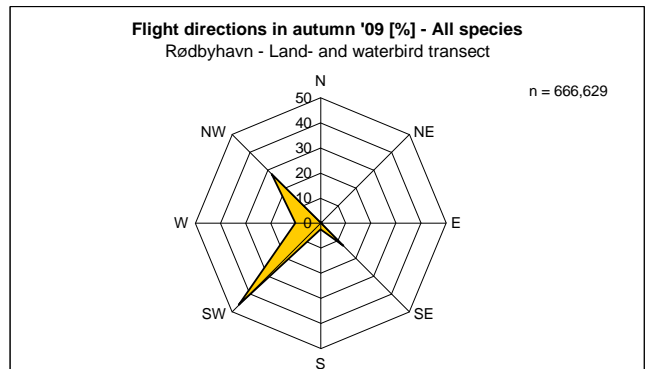
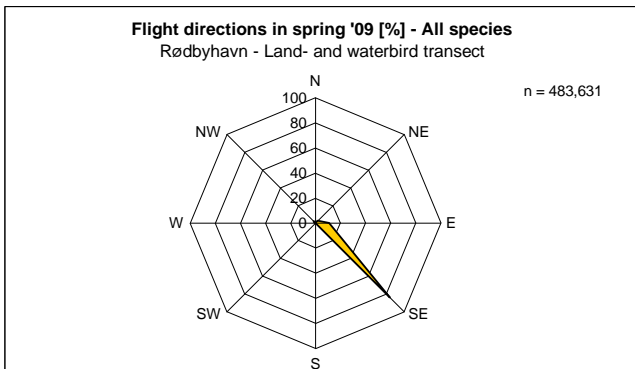
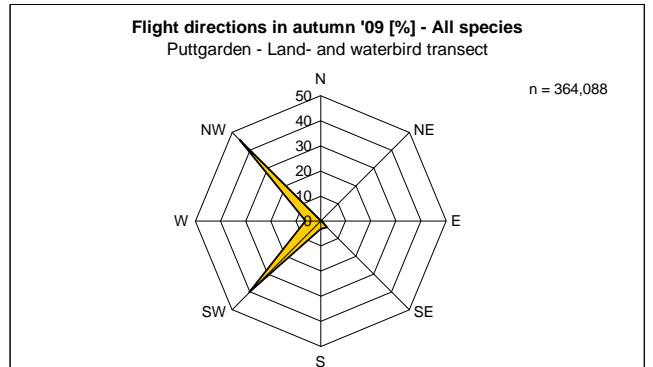
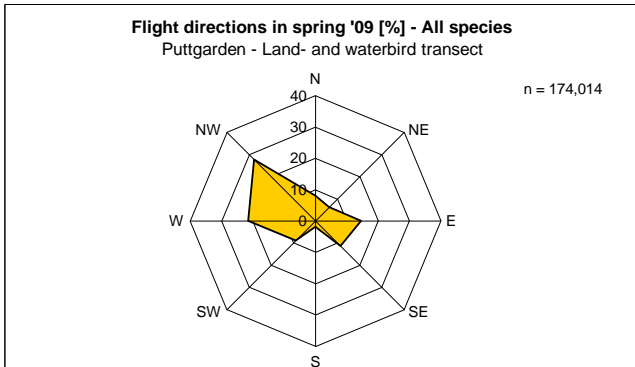


A.3.6 Other species

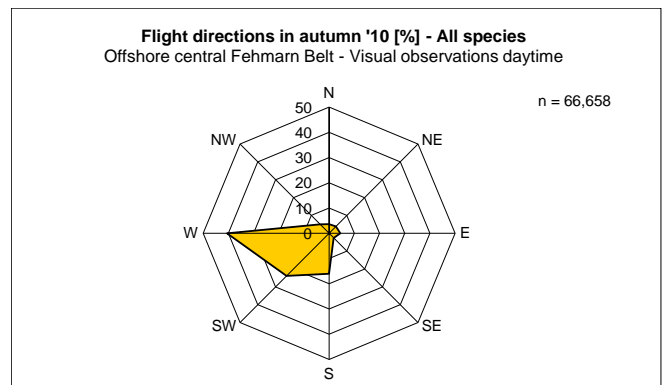
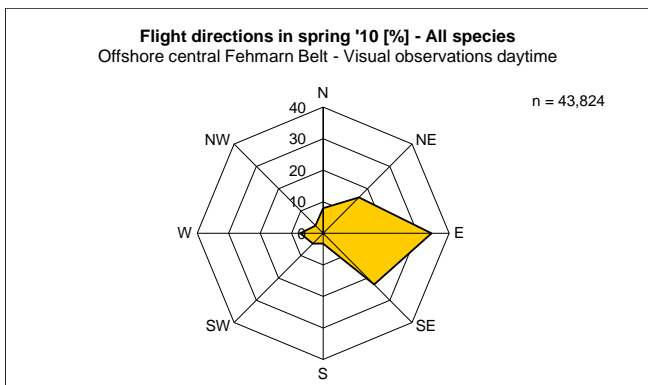
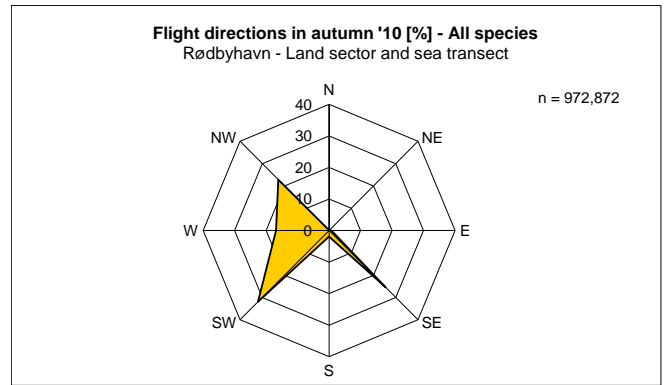
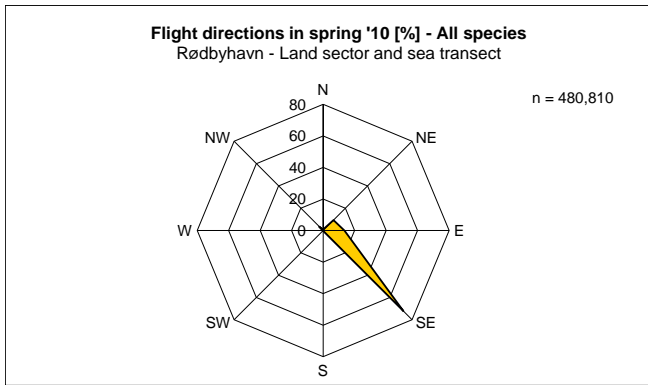
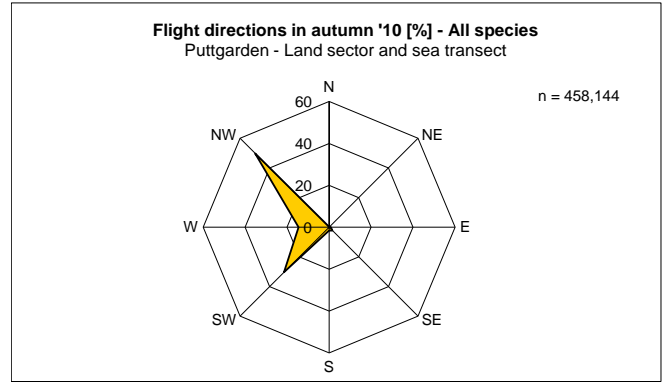
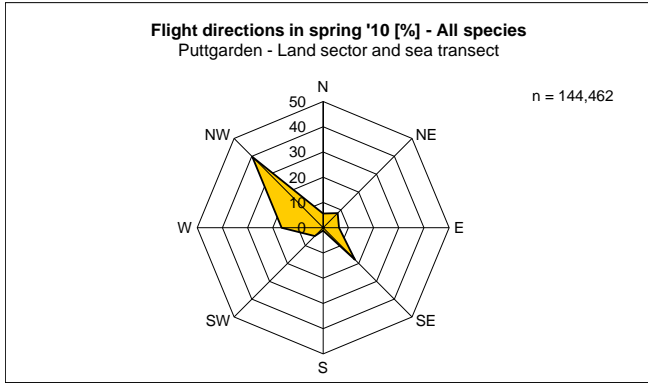


A.4 Flight directions – daytime visual observations

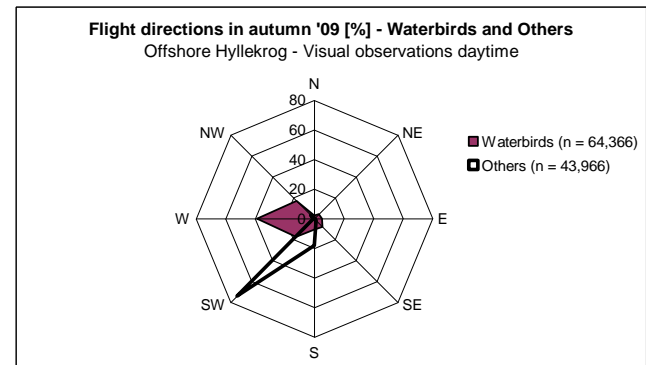
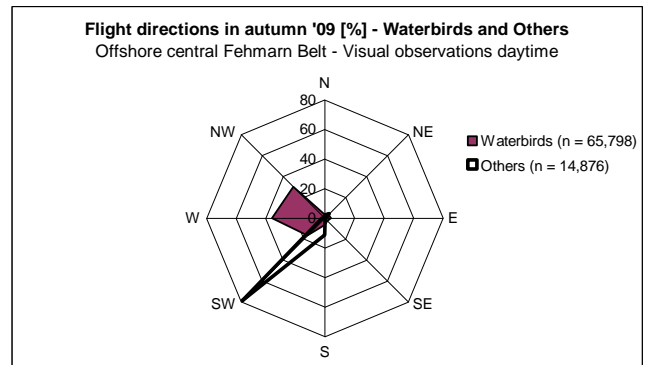
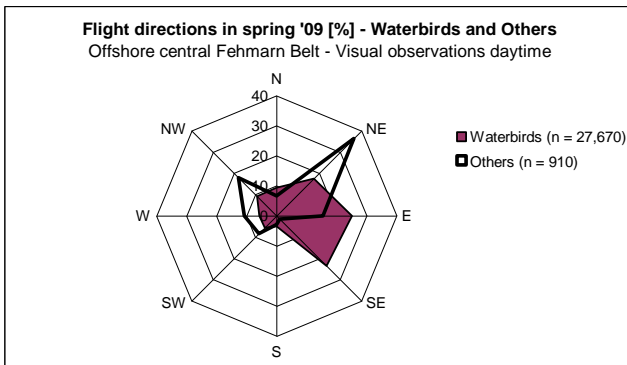
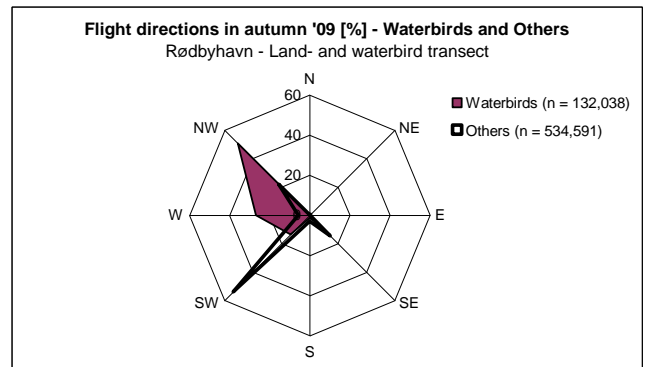
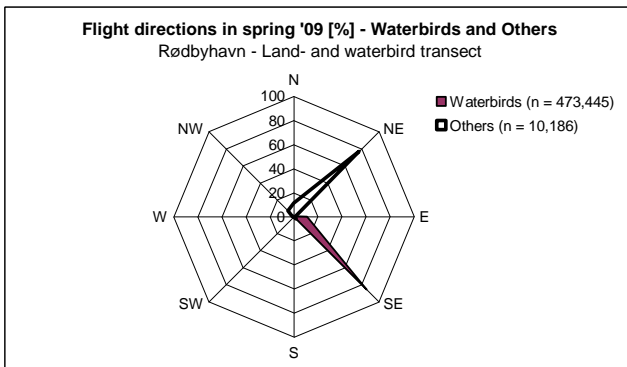
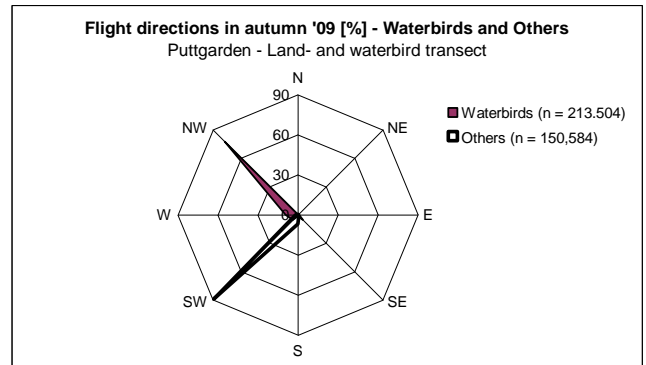
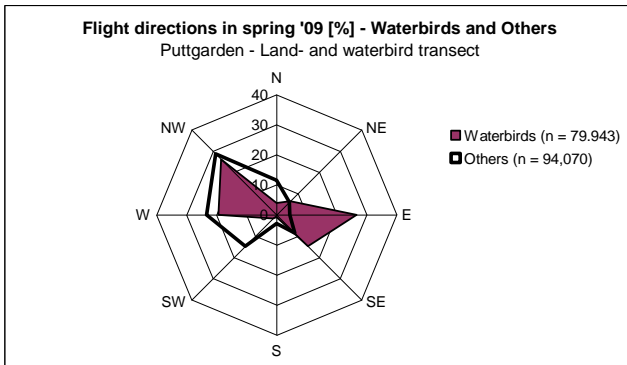
A.4.1 All species



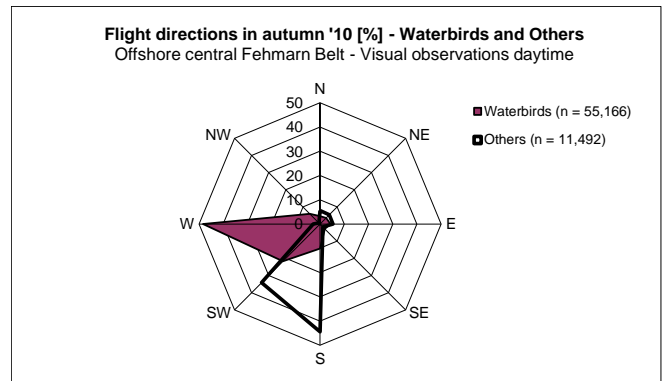
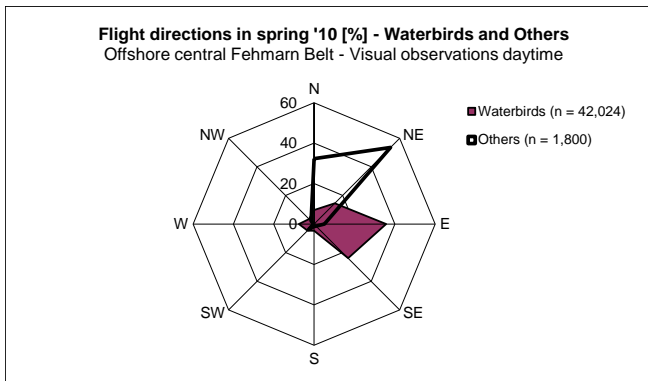
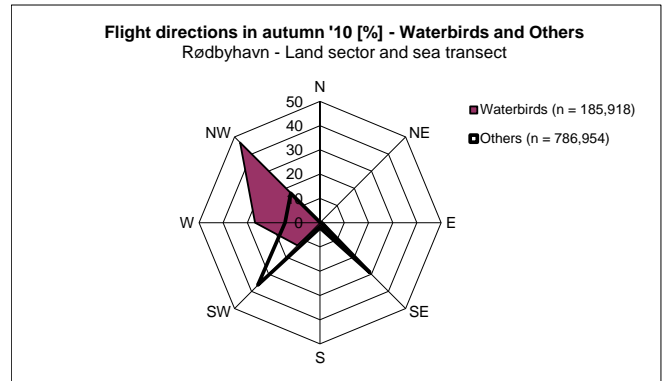
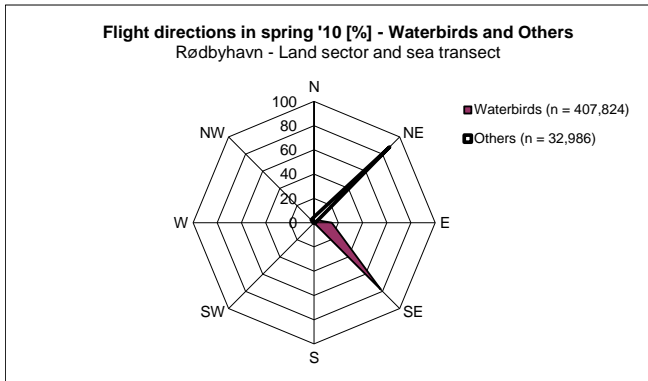
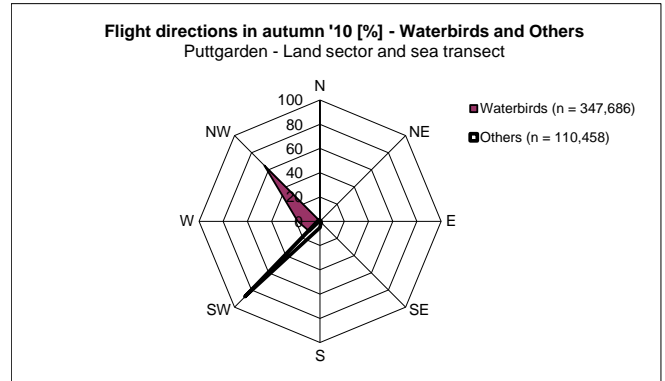
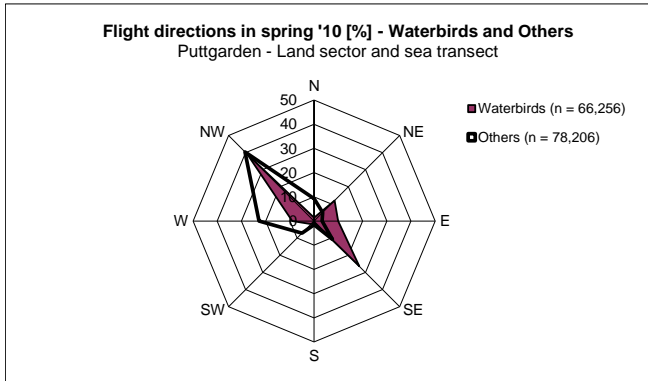
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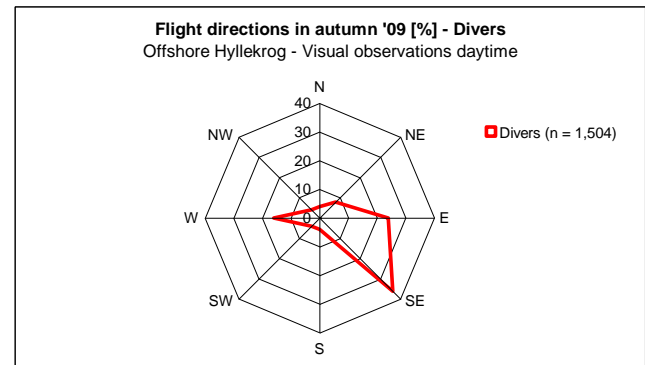
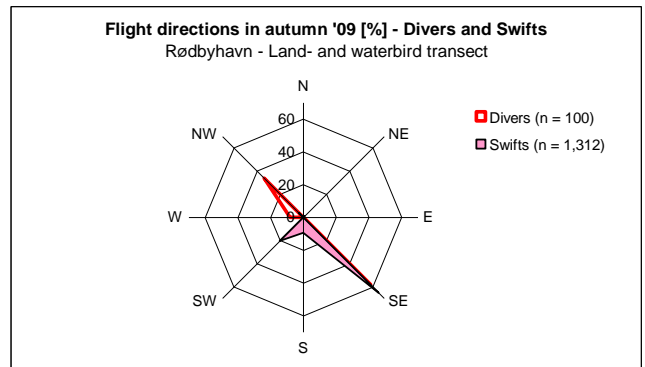
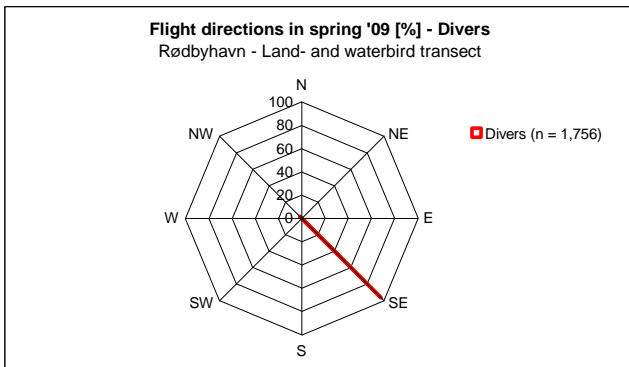
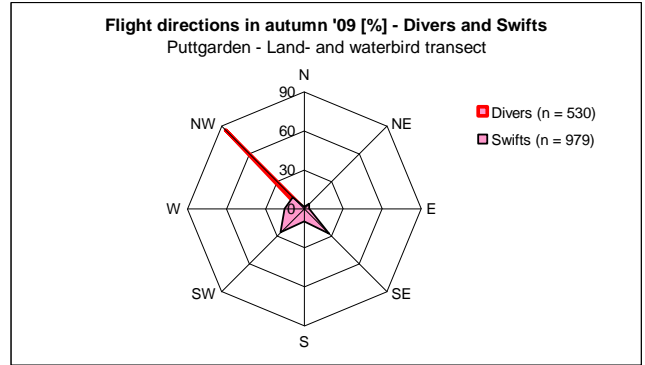
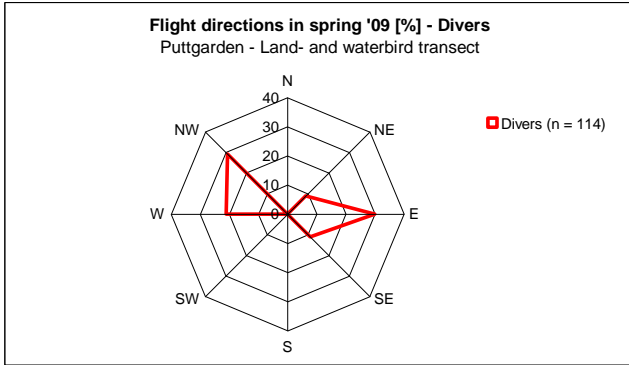
A.4.2 Waterbirds and others



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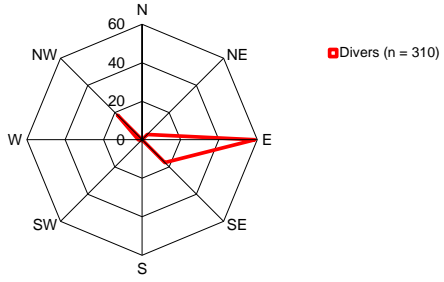


Divers / Swift – *Gavia spp.* / *Apus apus*

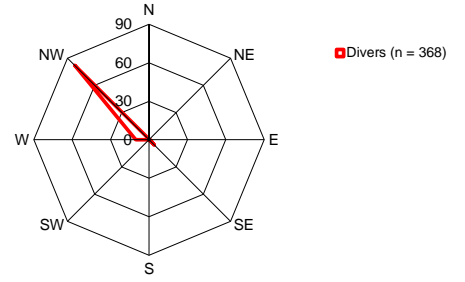


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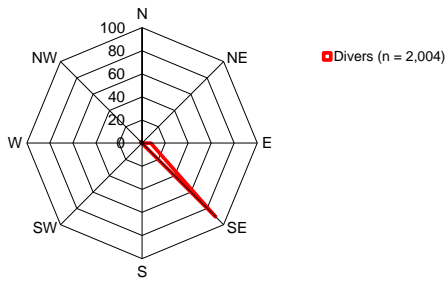
Flight directions in spring '10 [%] - Divers
Puttgarden - Land sector and sea transect



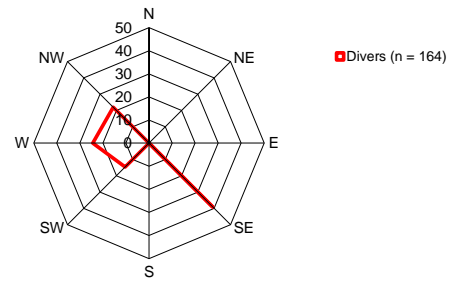
Flight directions in autumn '10 [%] - Divers
Puttgarden - Land sector and sea transect



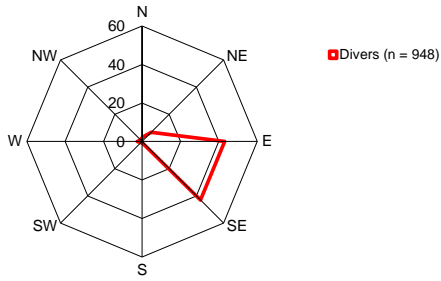
Flight directions in spring '10 [%] - Divers
Rødbyhavn - Land sector and sea transect



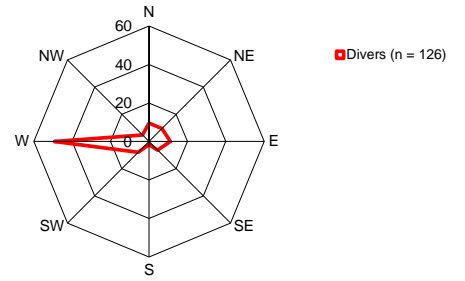
Flight directions in autumn '10 [%] - Divers
Rødbyhavn - Land sector and sea transect



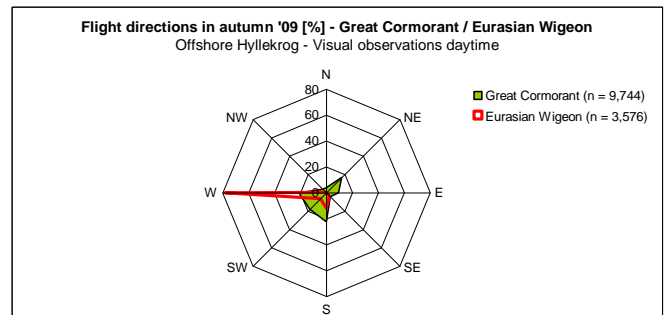
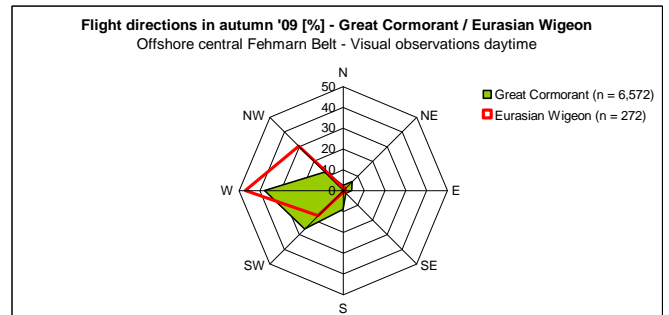
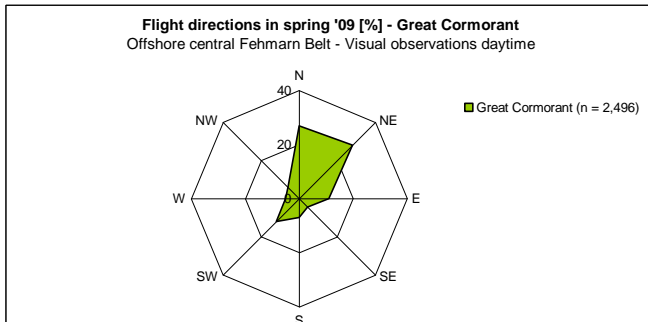
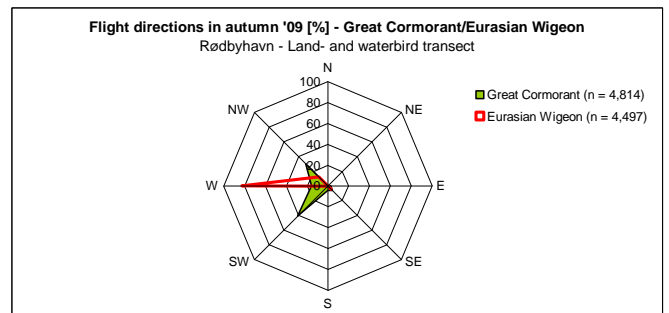
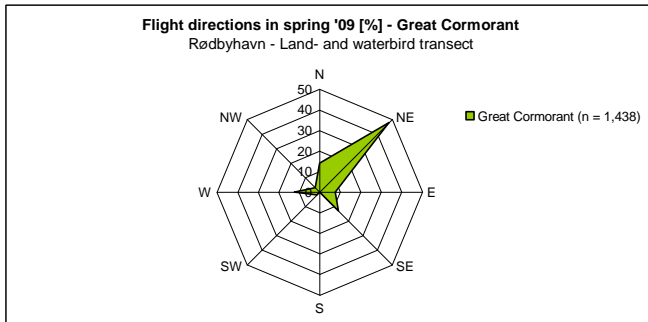
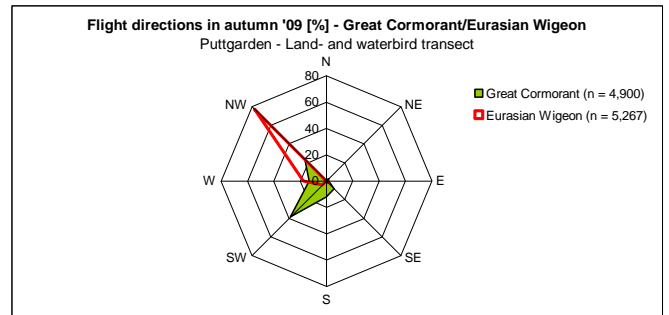
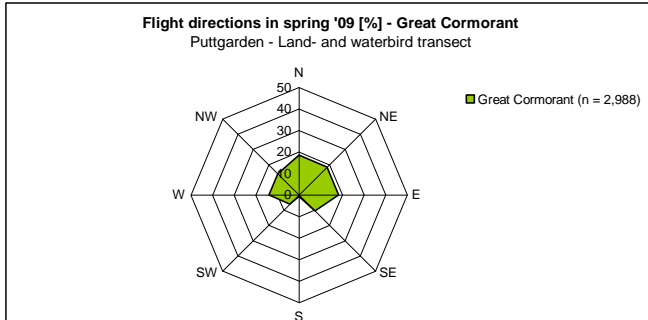
Flight directions in spring '10 [%] - Divers
Offshore central Fehmarn Belt - Visual observations daytime



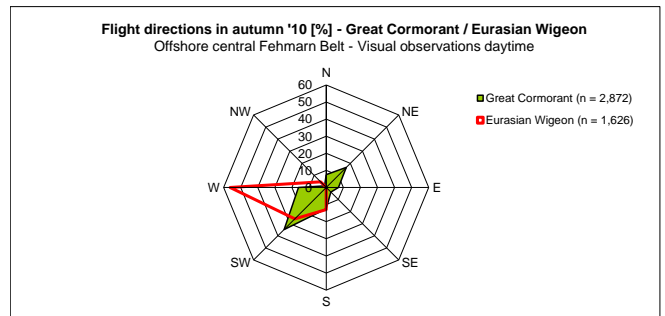
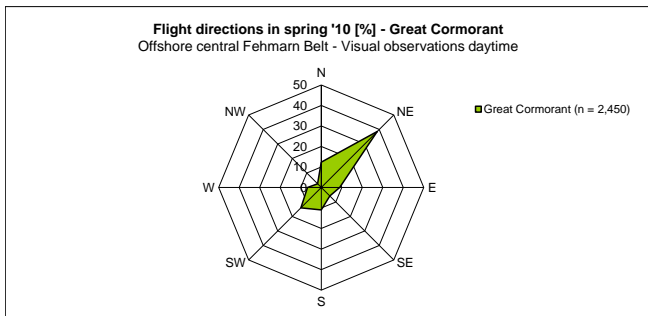
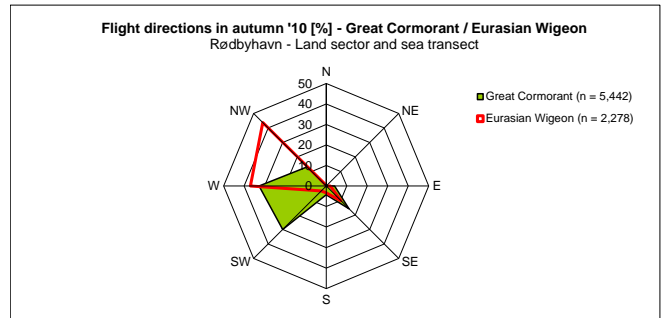
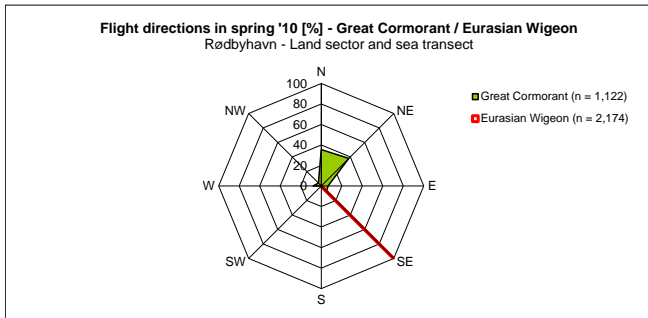
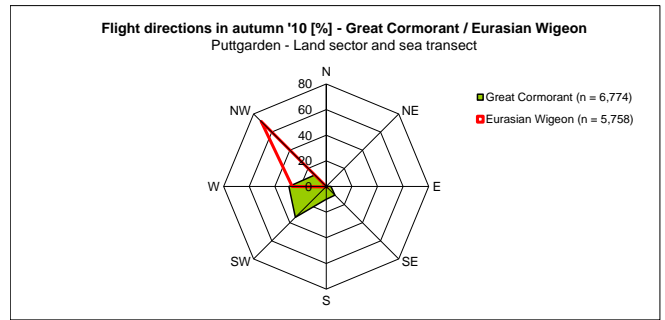
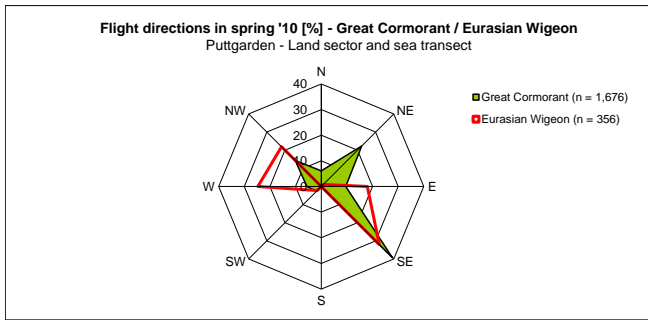
Flight directions in autumn '10 [%] - Divers
Offshore central Fehmarn Belt - Visual observations daytime



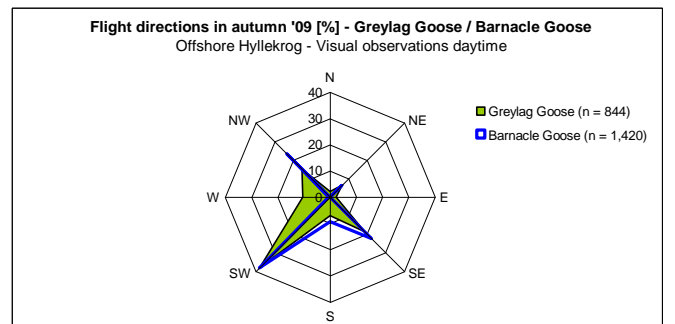
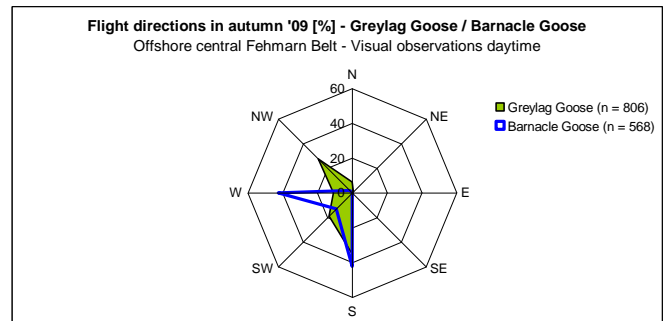
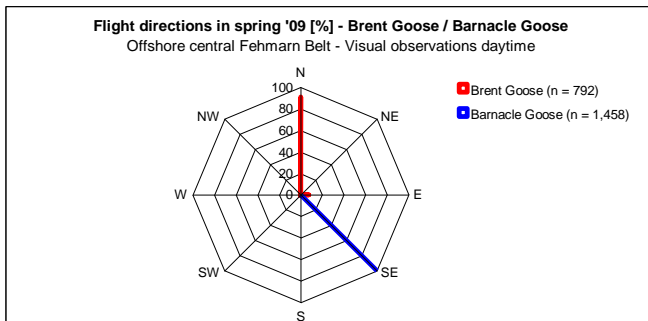
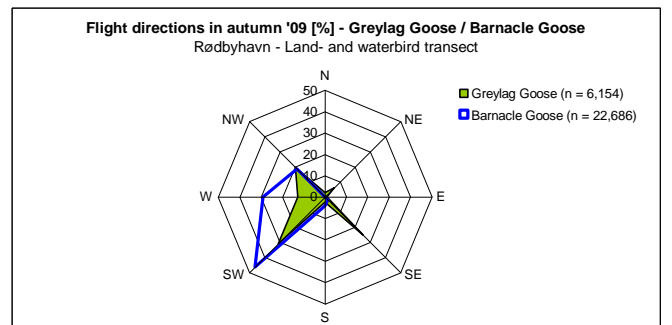
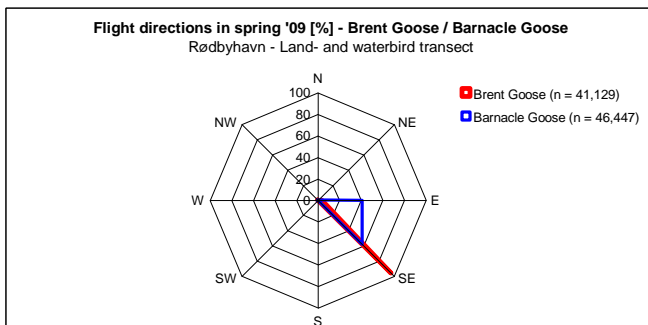
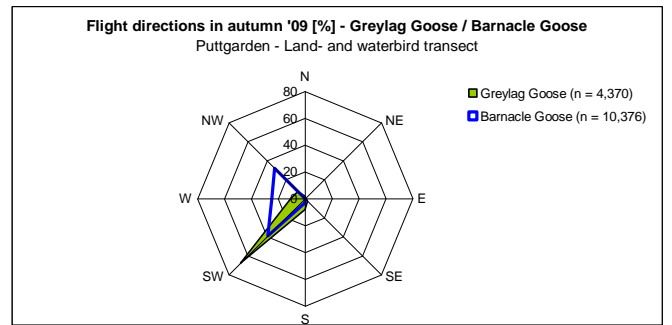
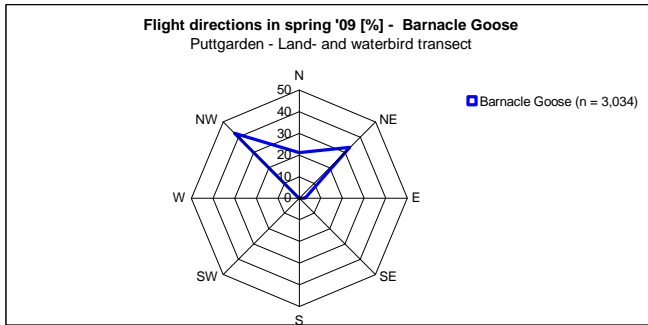
Great Cormorant / Eurasian Wigeon – *Phalacrocorax carbo* / *Anas penelope*



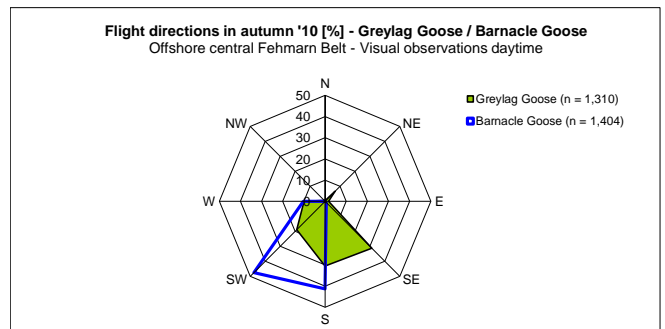
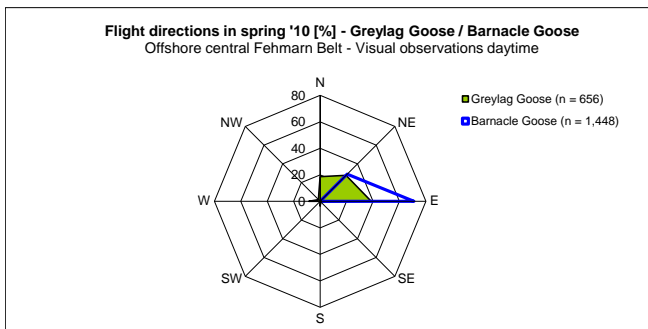
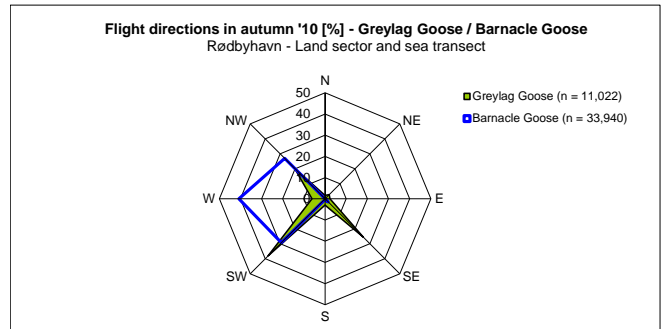
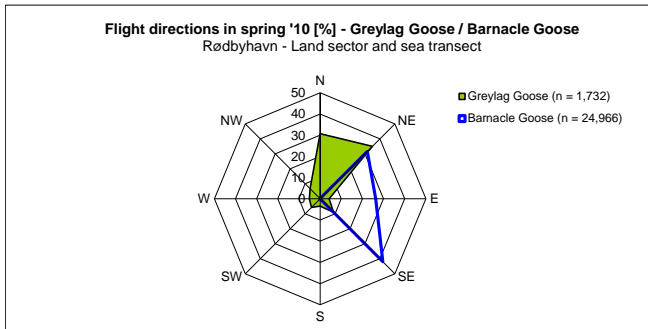
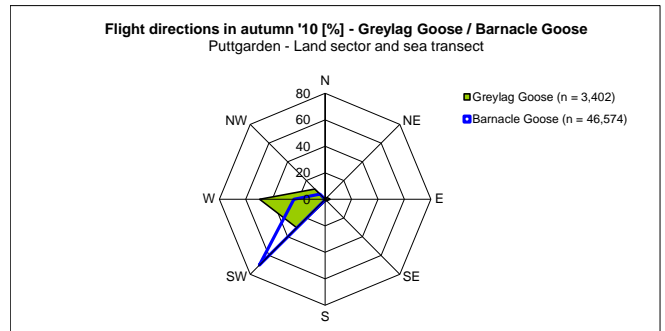
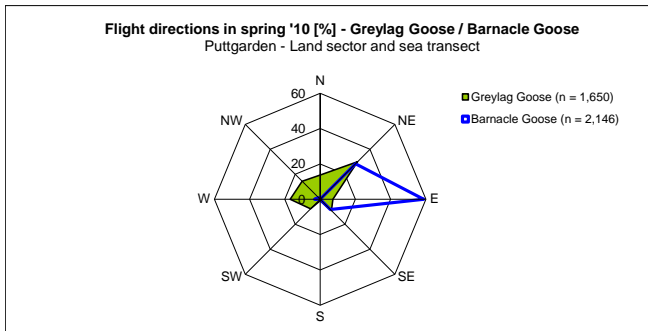
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Geese

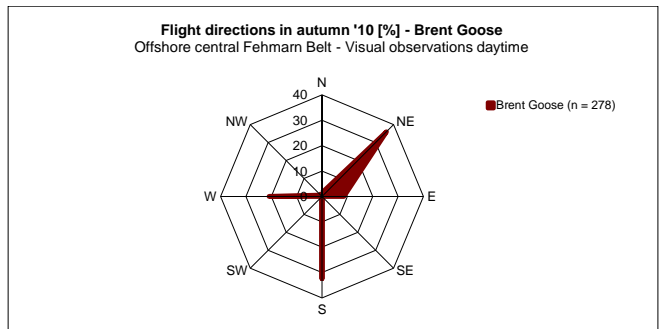
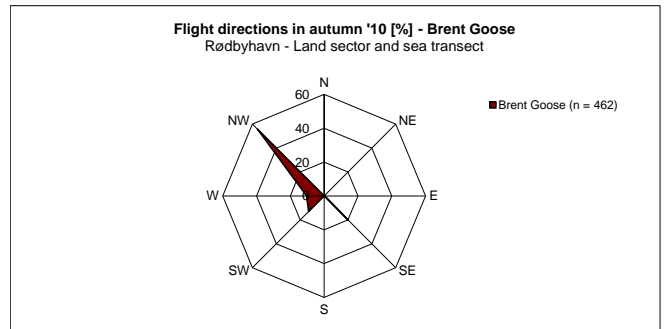
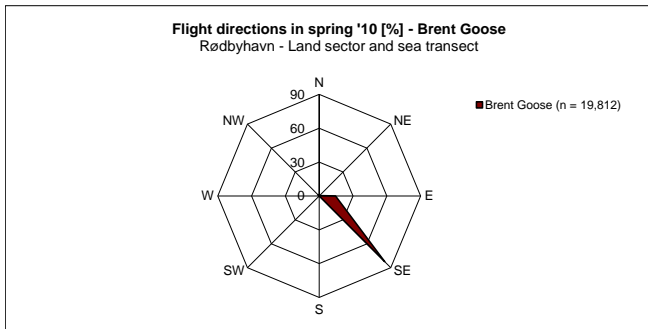
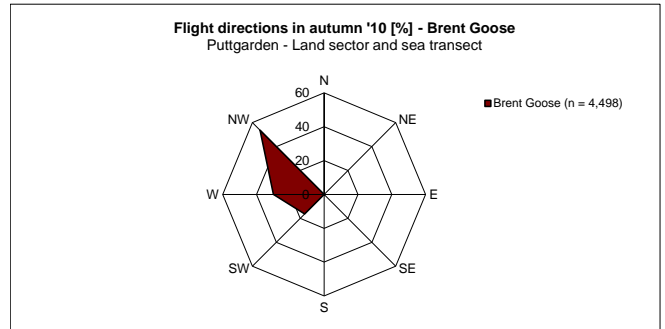
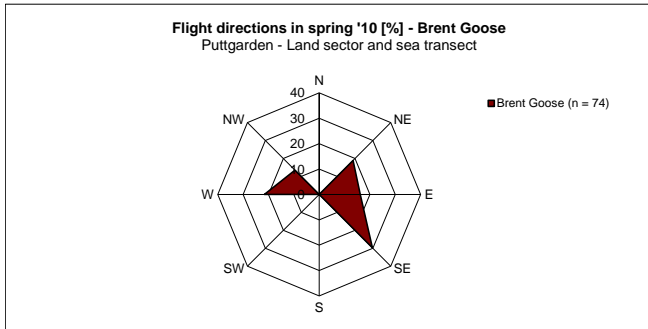


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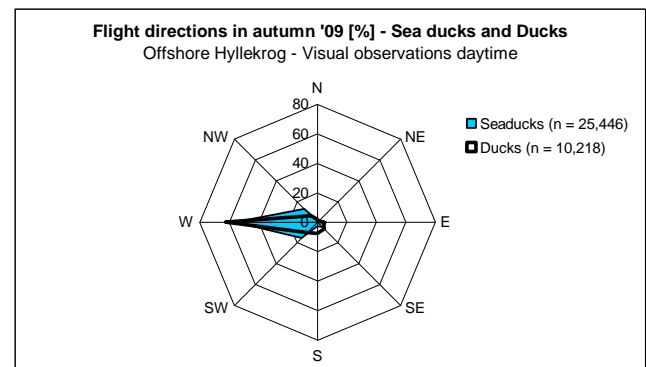
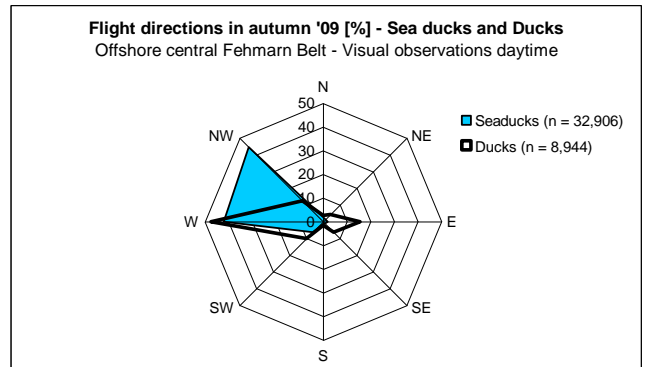
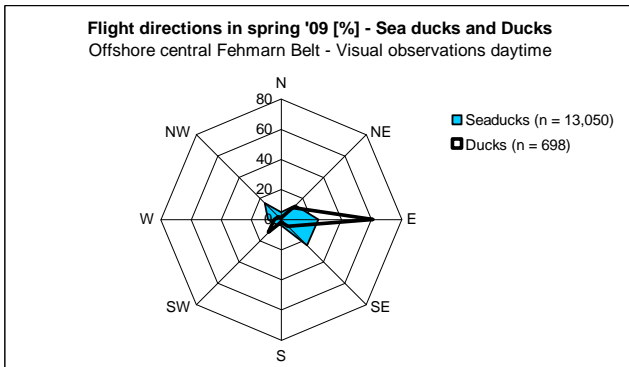
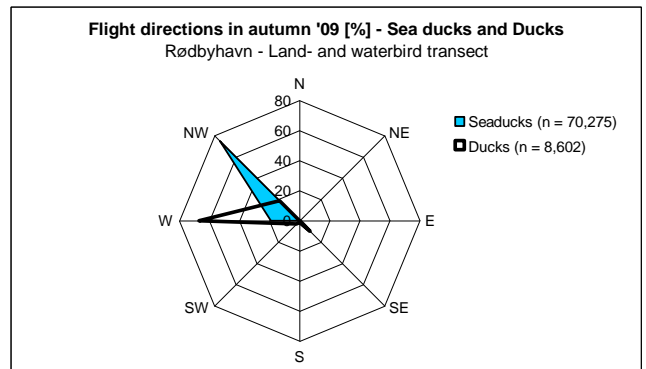
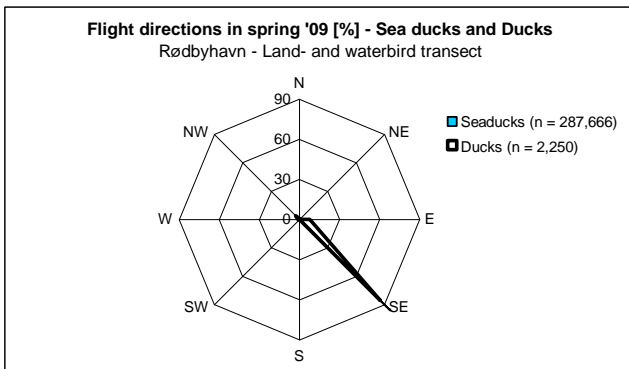
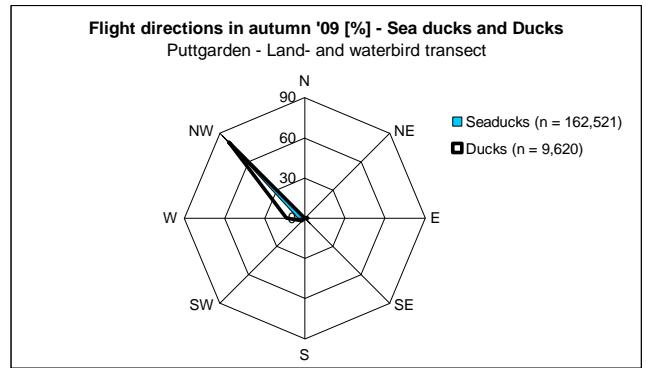
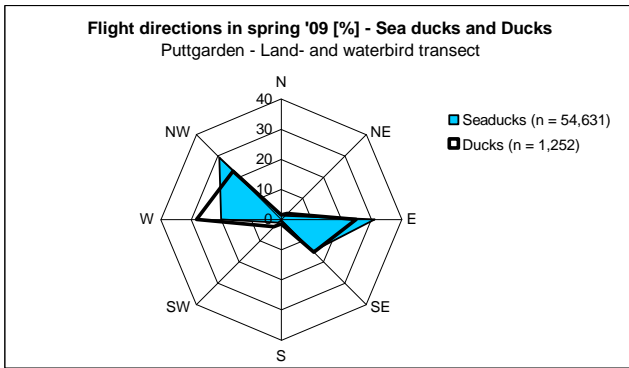


No Brent Goose data from 2009

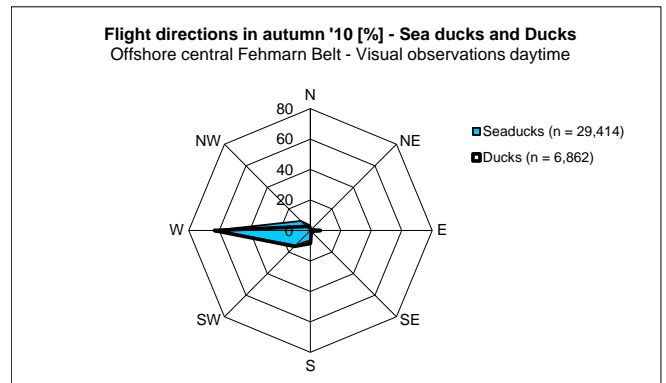
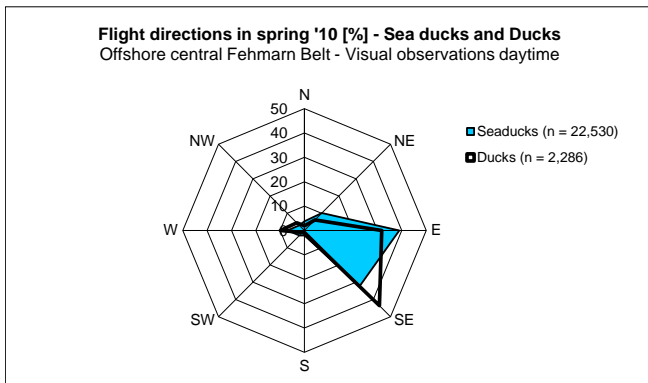
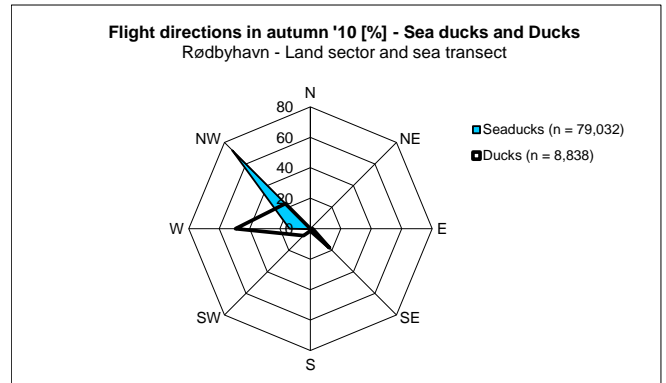
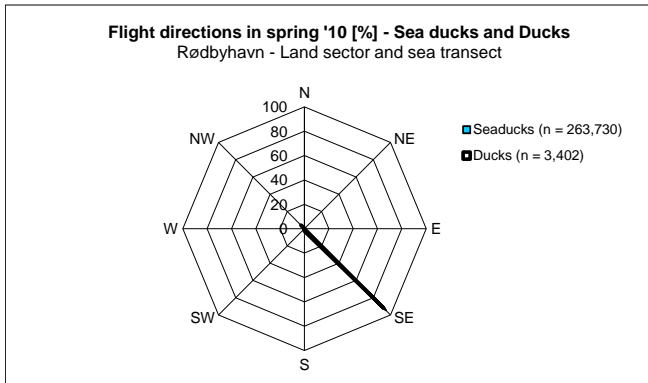
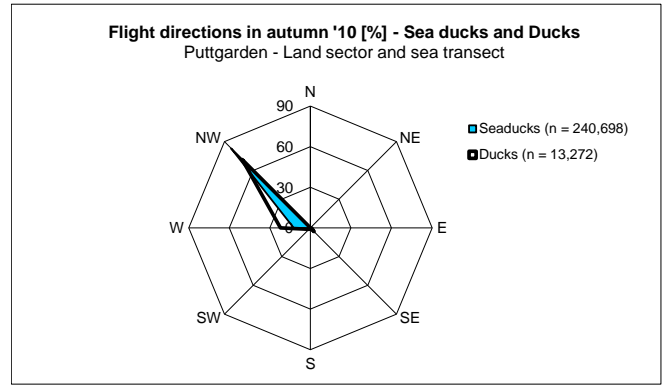
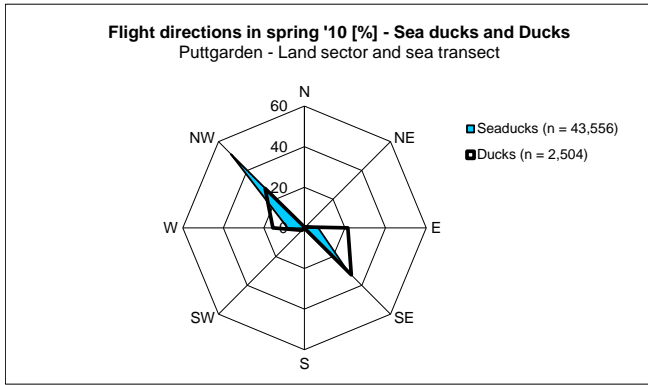
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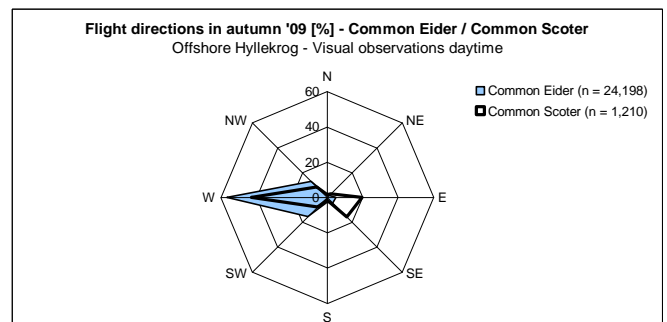
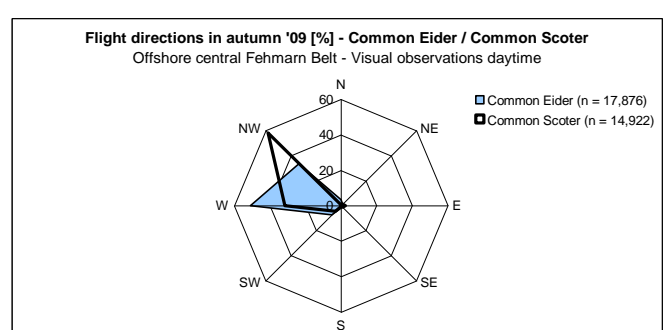
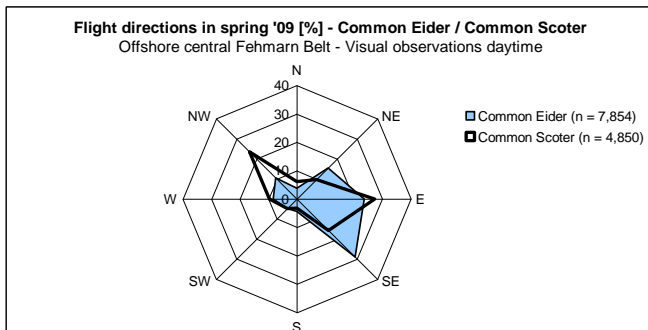
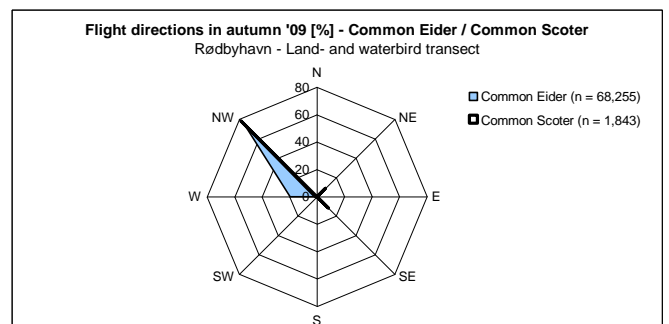
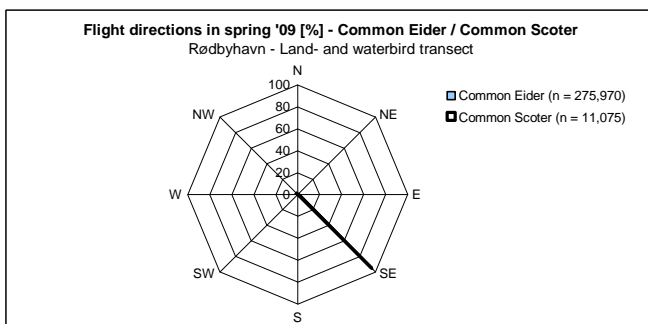
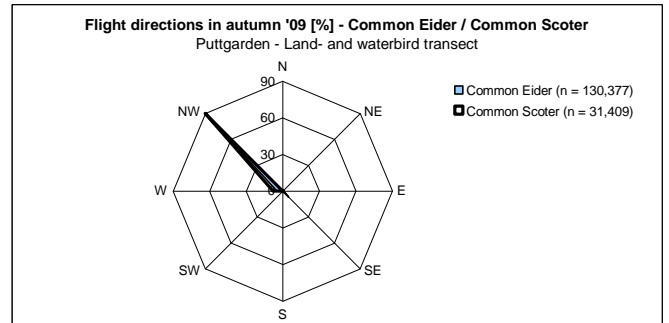
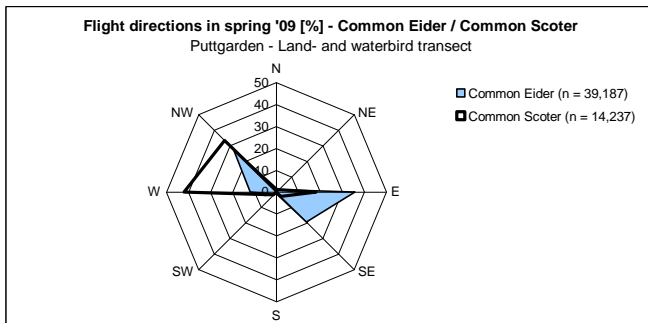
Seaducks / other ducks



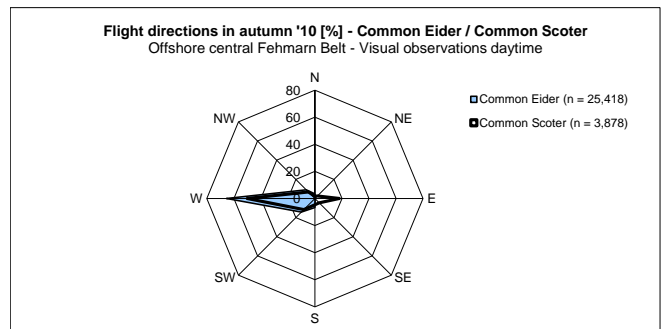
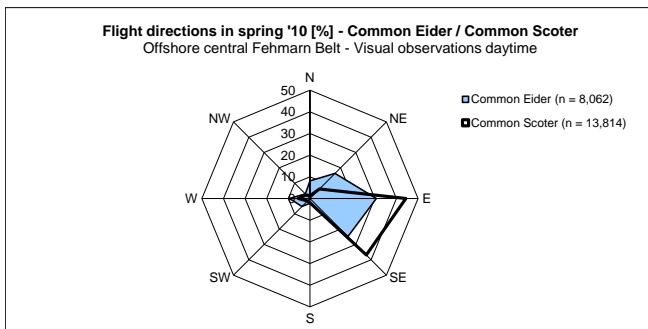
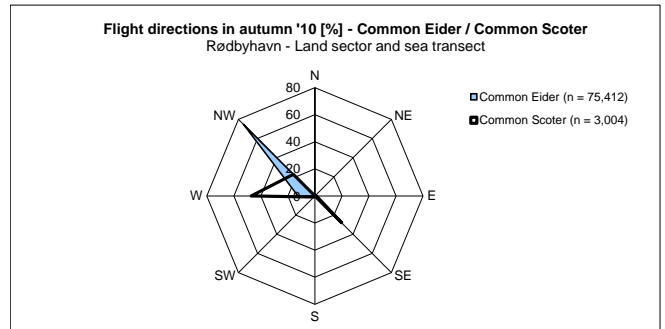
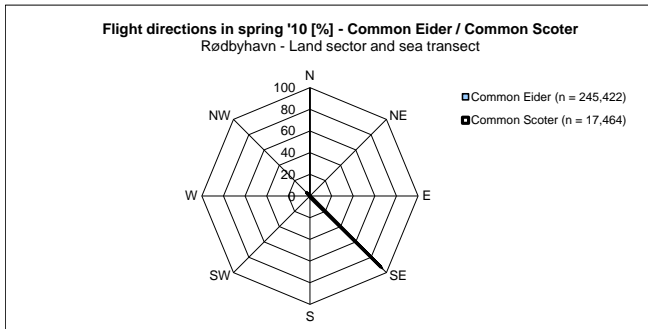
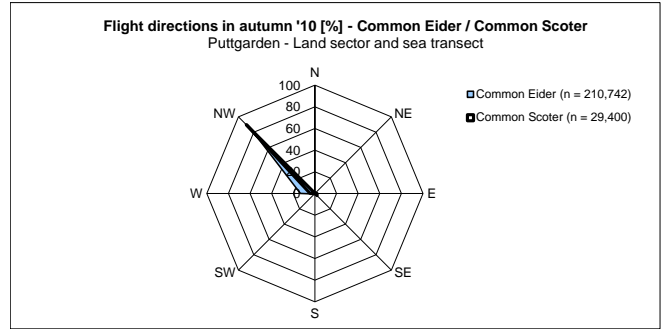
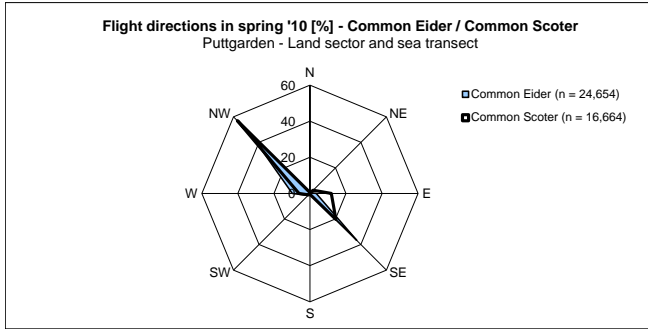
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Common Eider / Common Scoter – *Somateria mollissima* / *Melanitta nigra*



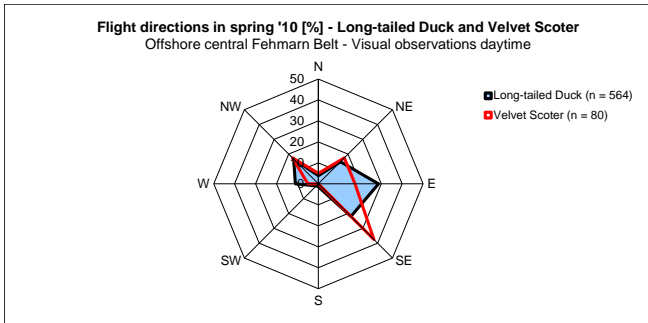
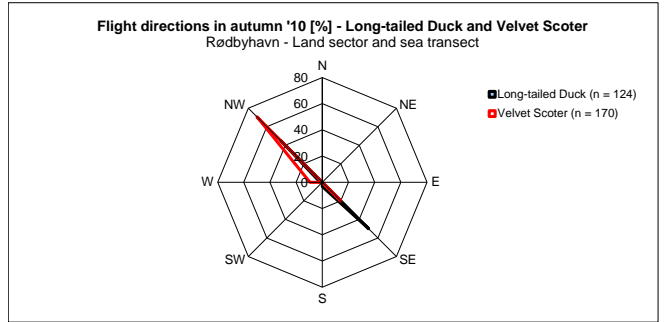
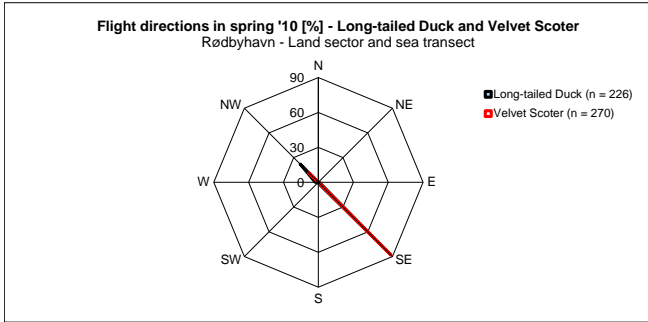
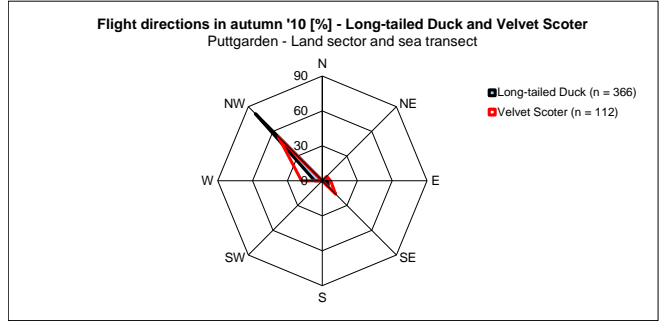
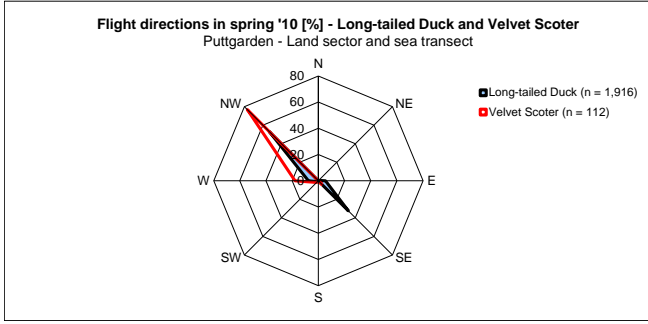
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Long-tailed Duck / Velvet Scoter – *Clangula hyemalis* / *Melanitta fusca*

No Long-tailed Duck data from 2009

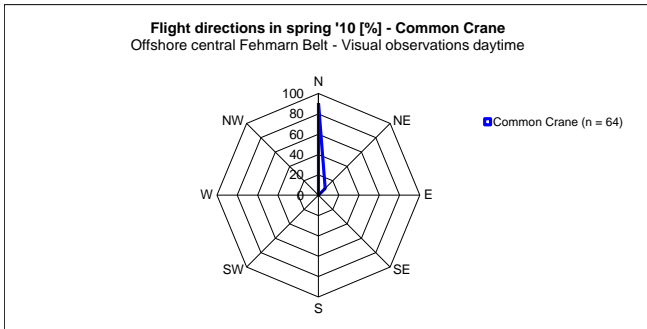
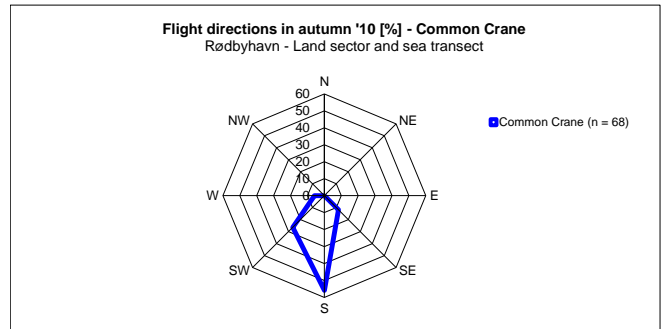
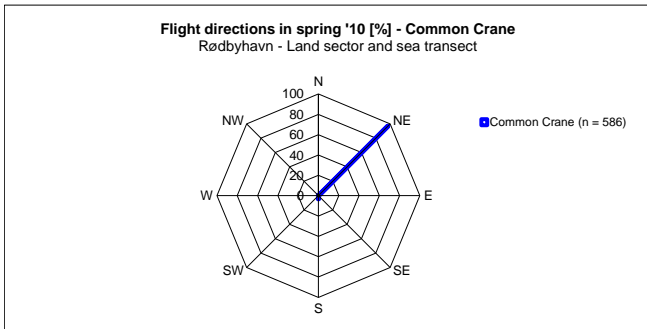
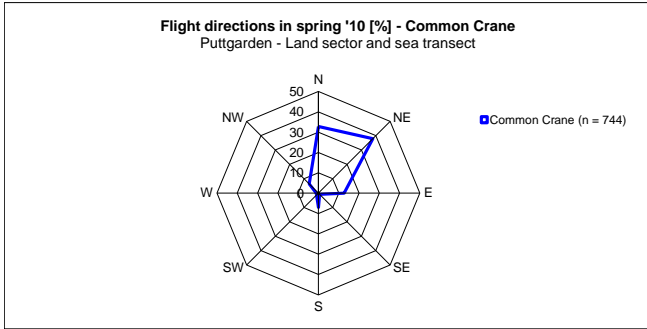
FEHMARNBELT BIRDS



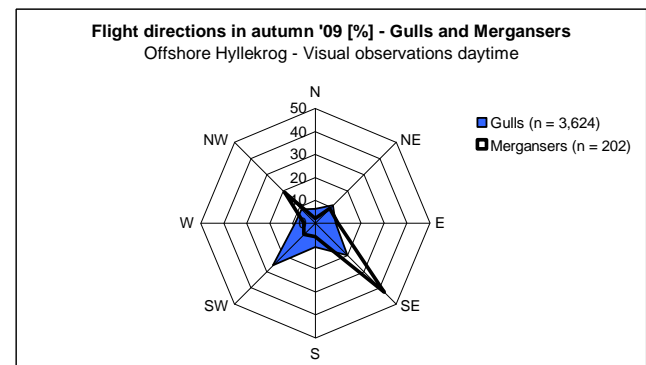
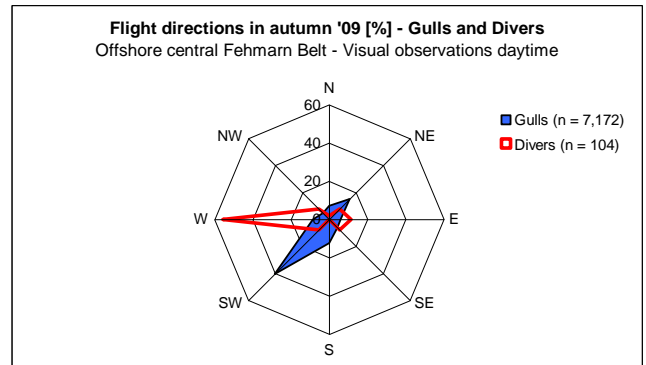
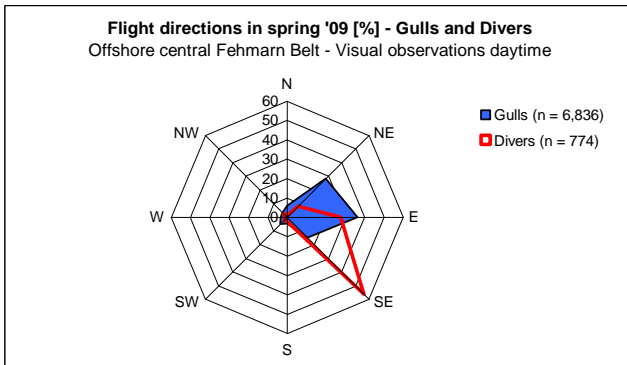
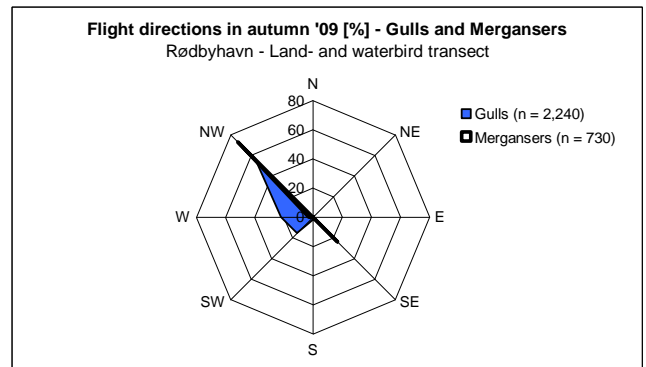
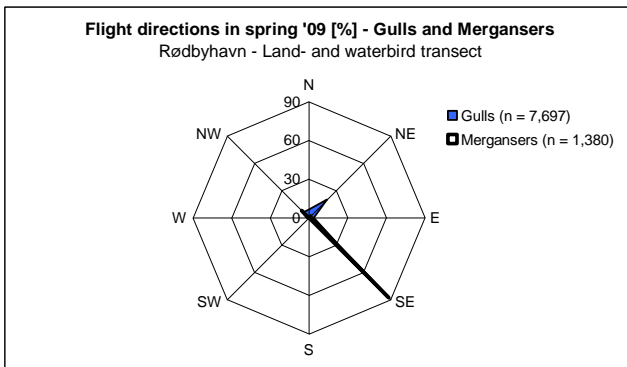
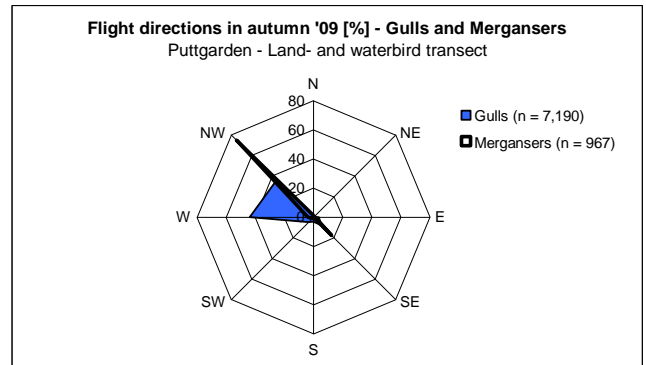
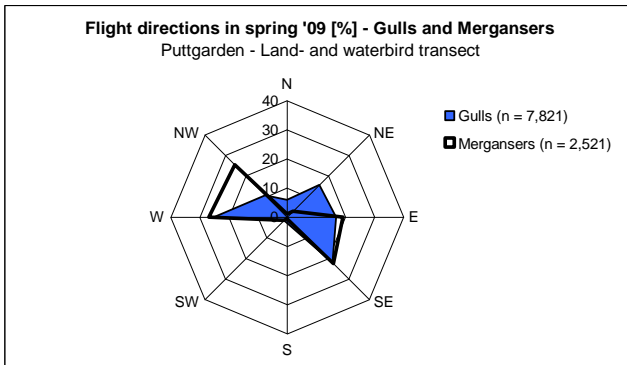
Common Crane – *Grus grus*

No Common Crane data from 2009

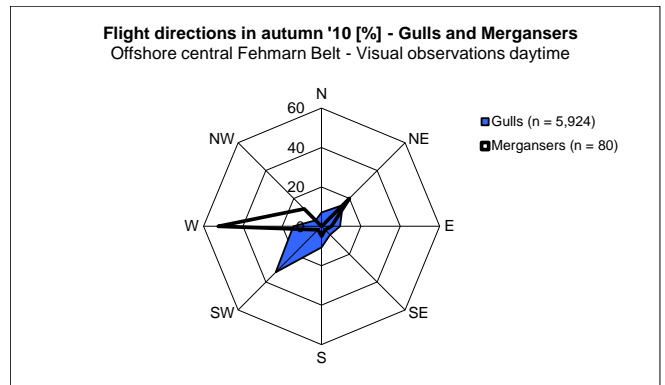
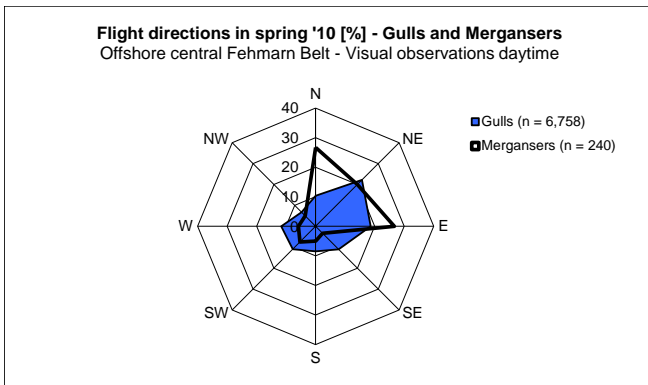
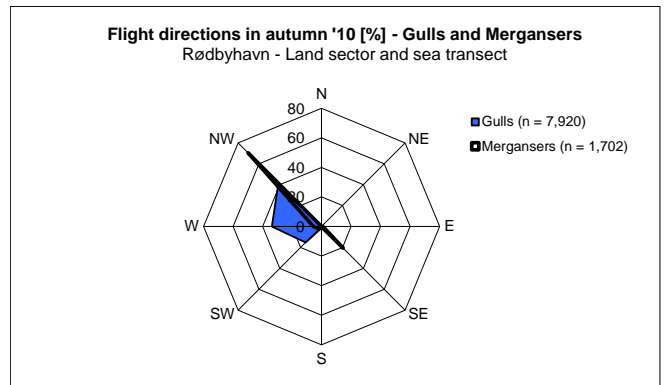
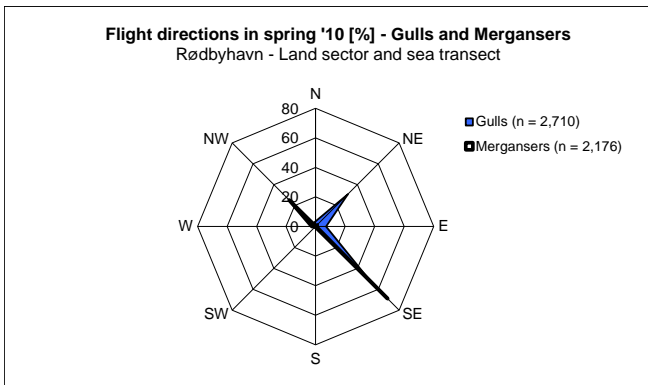
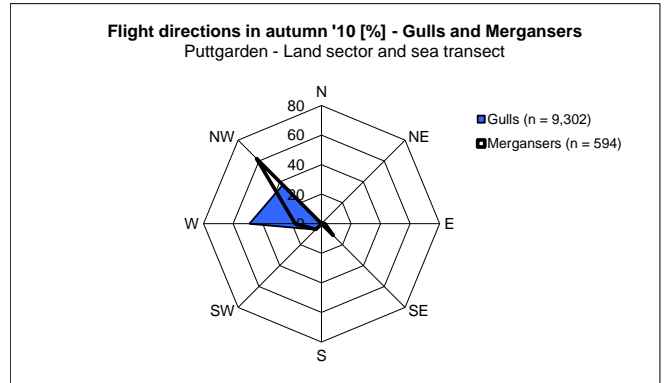
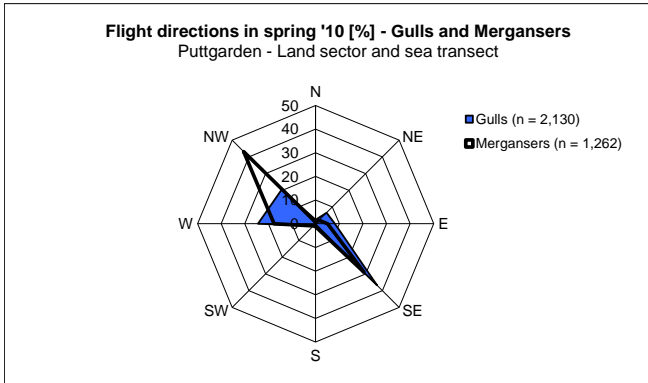
FEHMARNBELT BIRDS



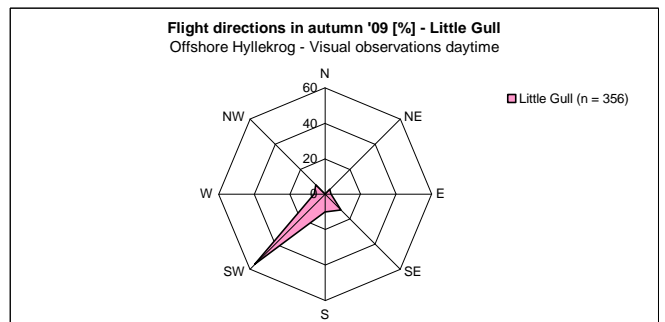
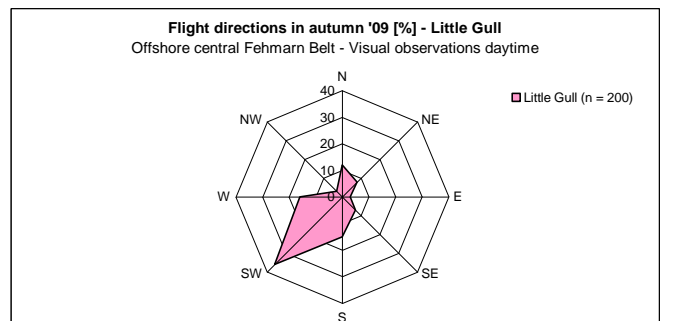
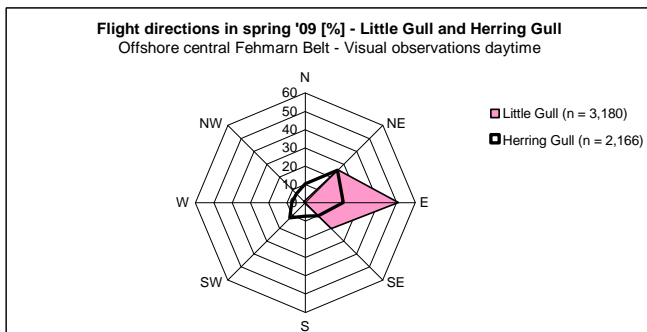
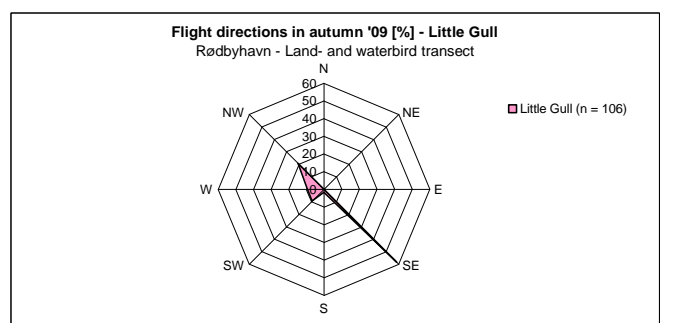
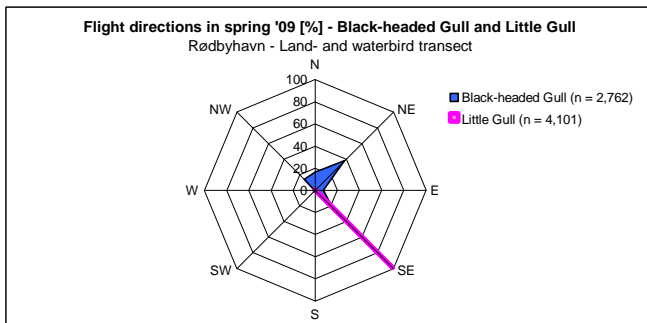
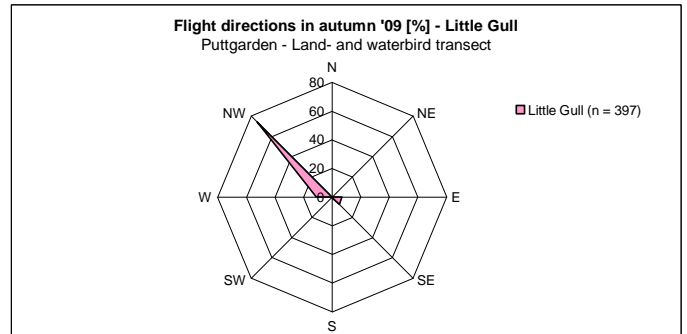
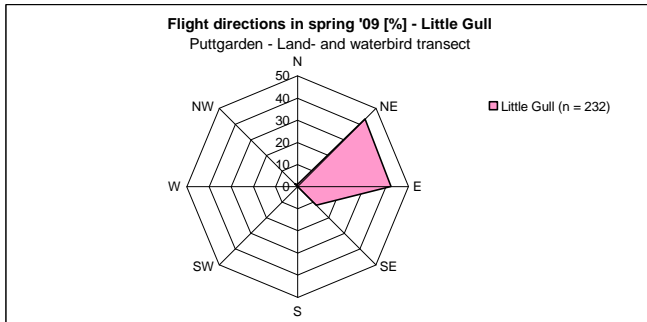
Gulls / Mergansers – Larus spp. / Mergus spp.



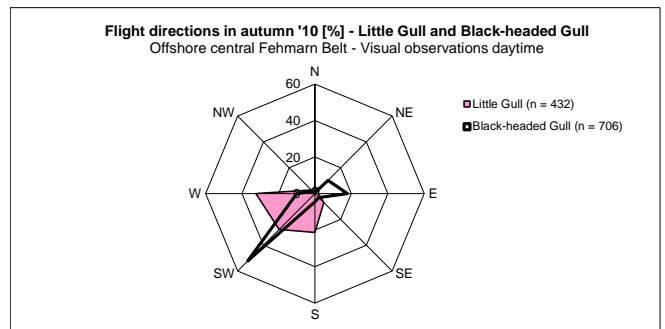
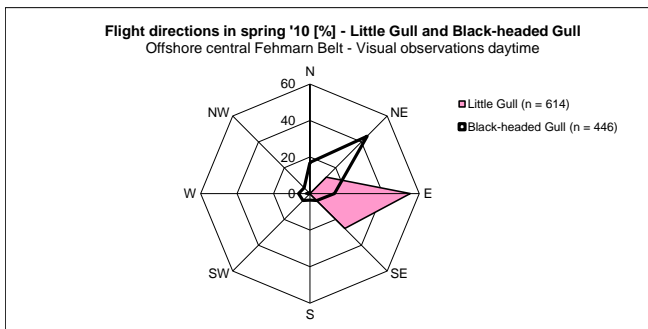
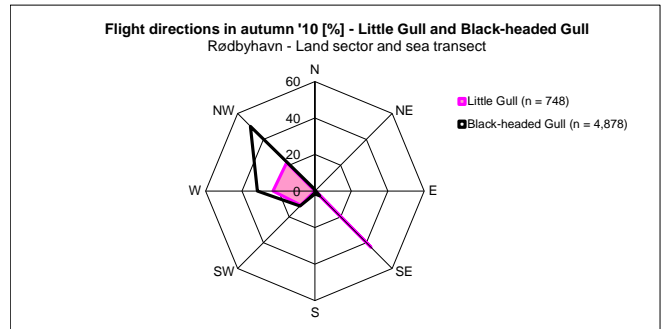
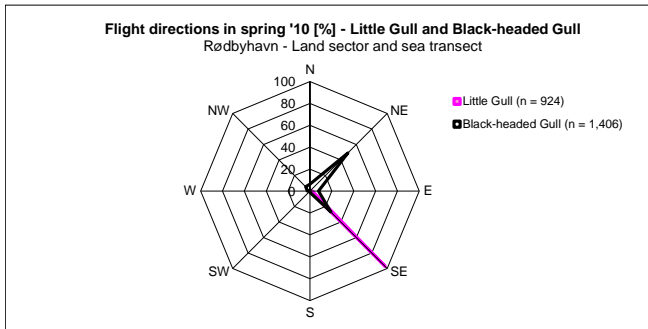
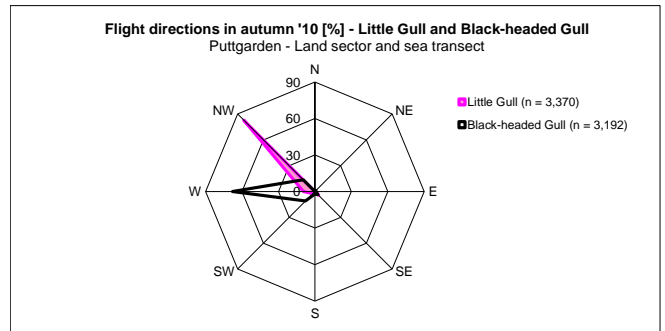
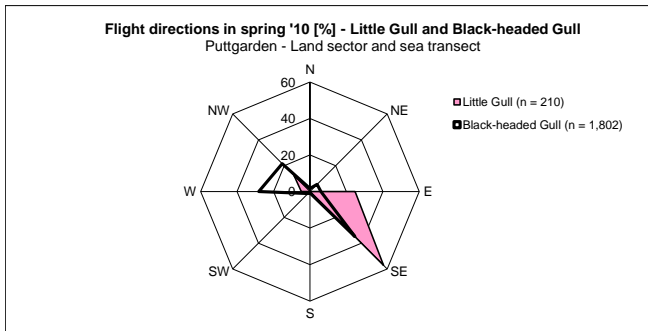
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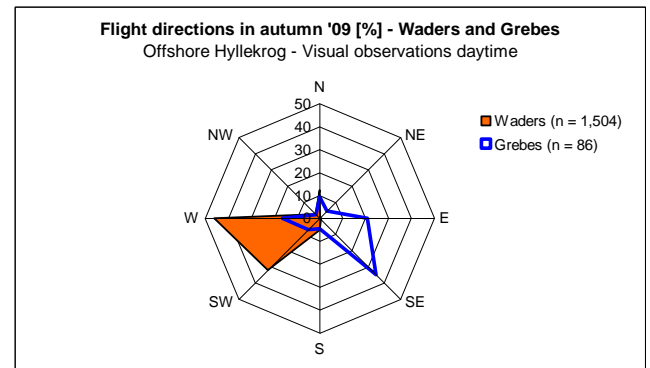
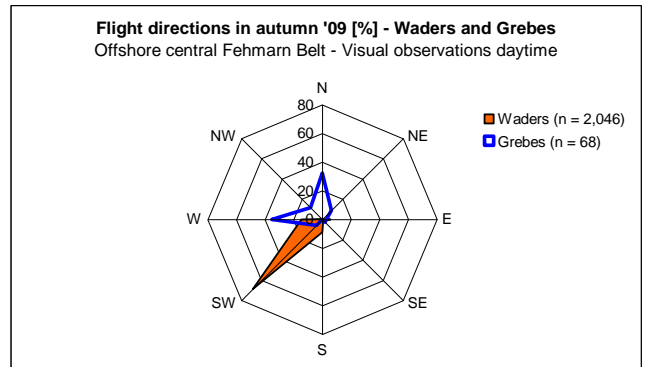
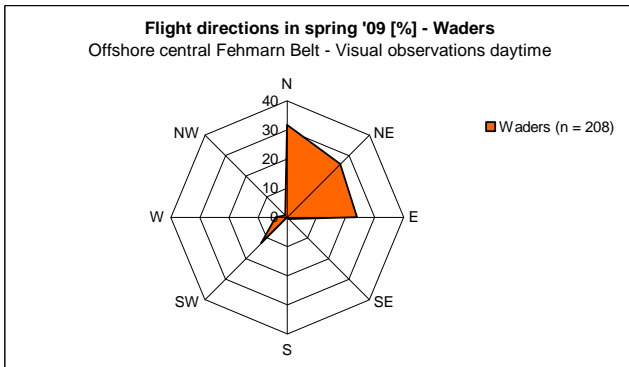
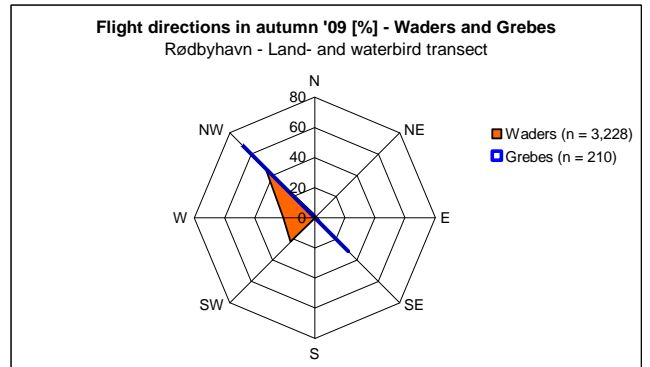
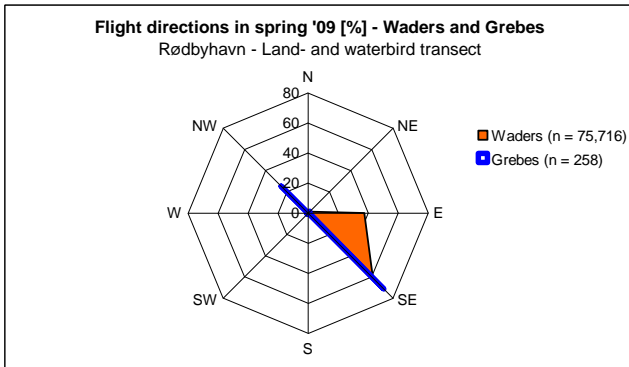
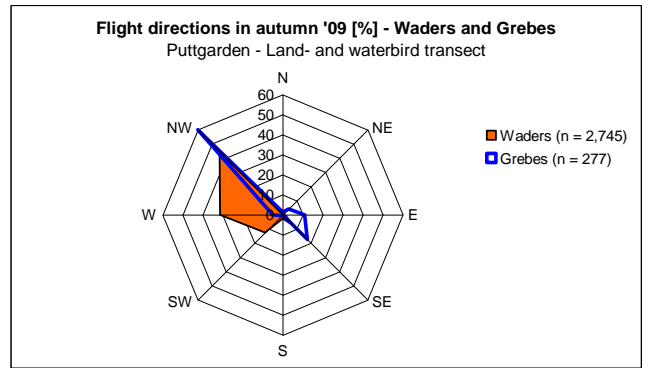
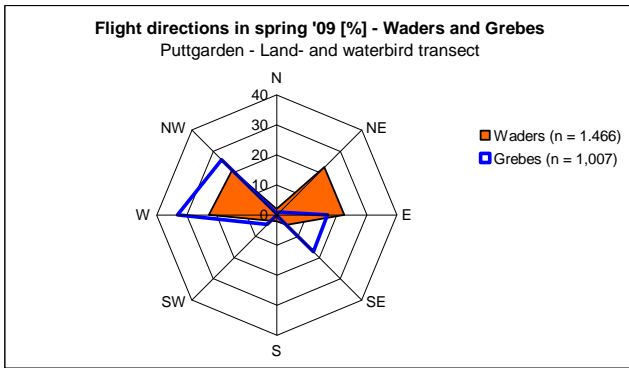
Gulls – *Larus spp.*



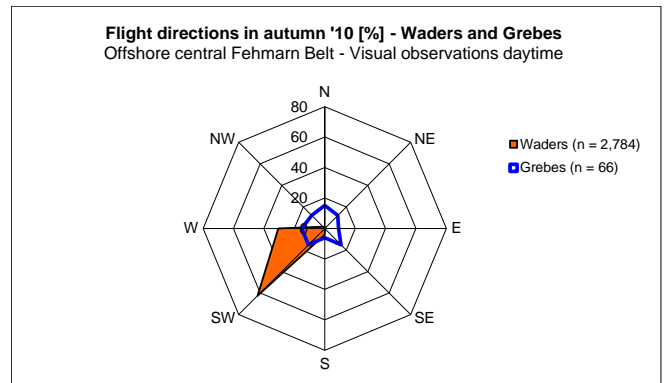
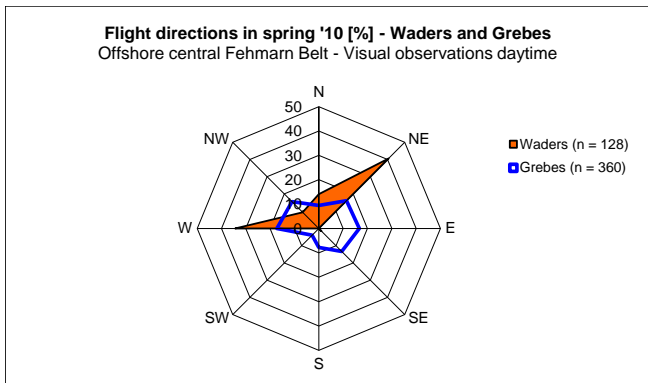
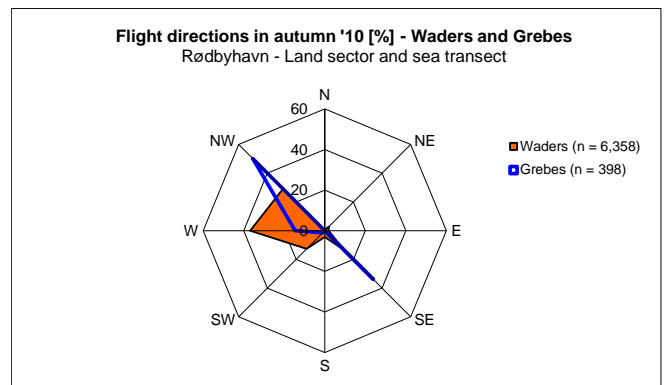
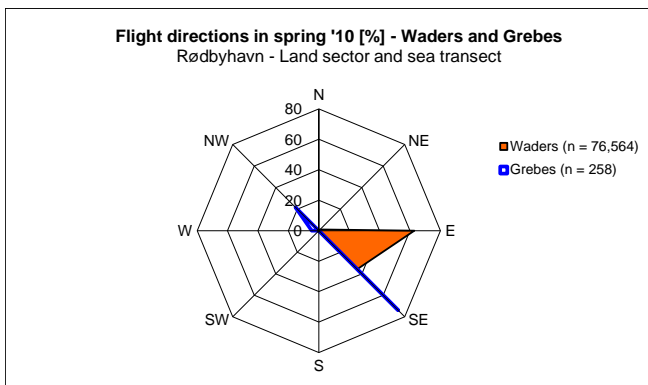
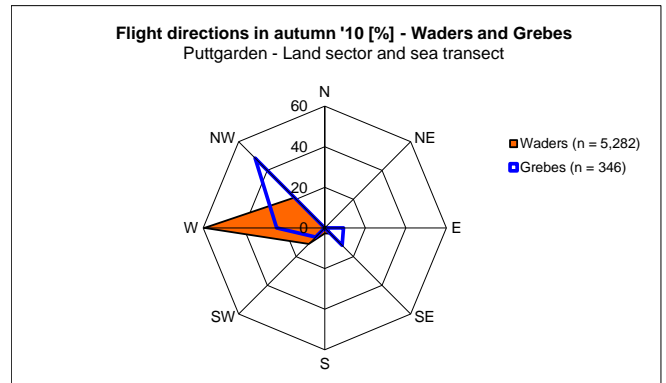
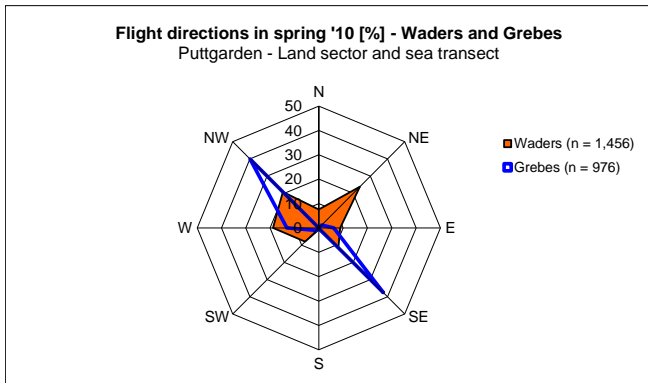
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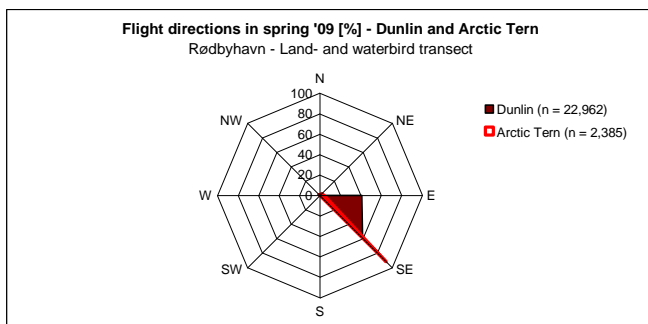
Waders / Grebes



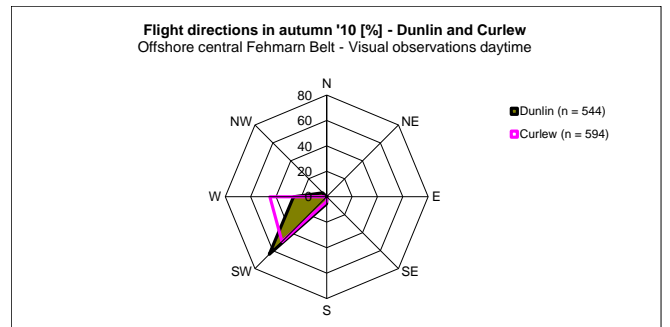
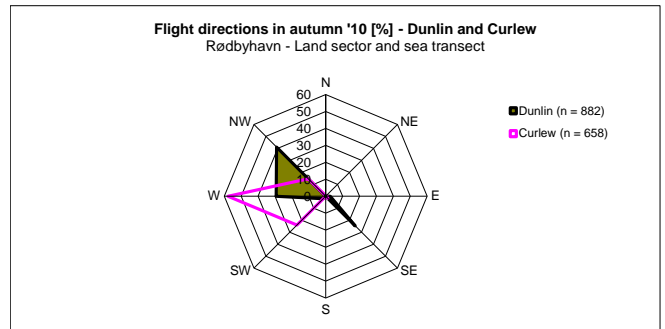
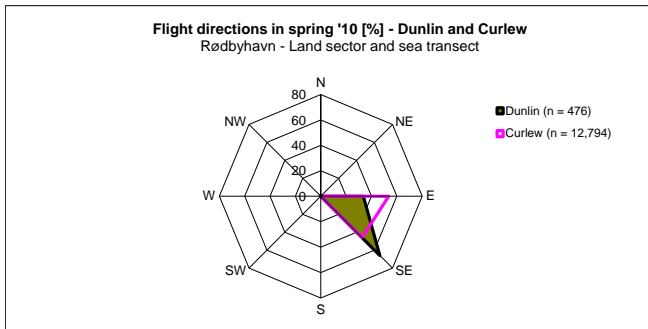
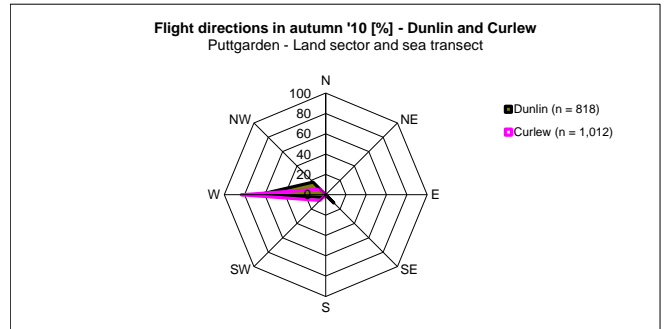
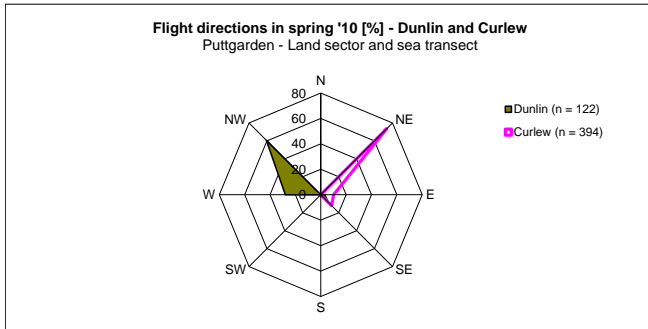
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Different waders

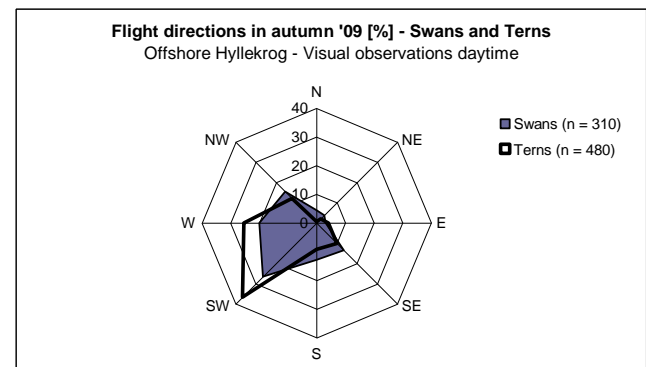
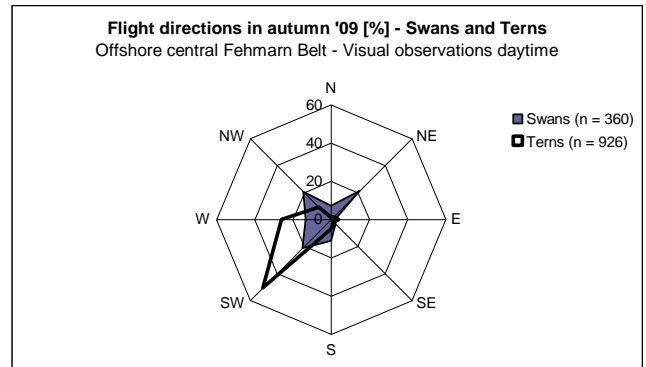
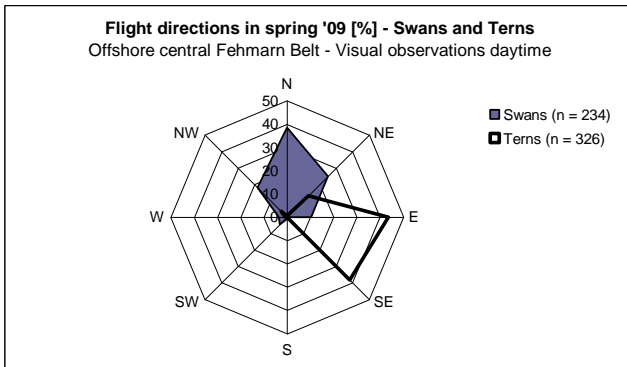
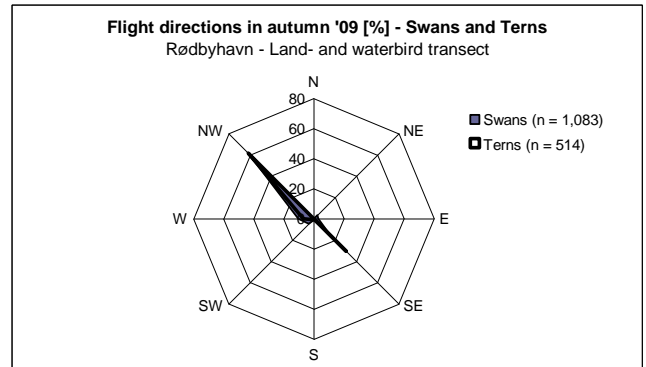
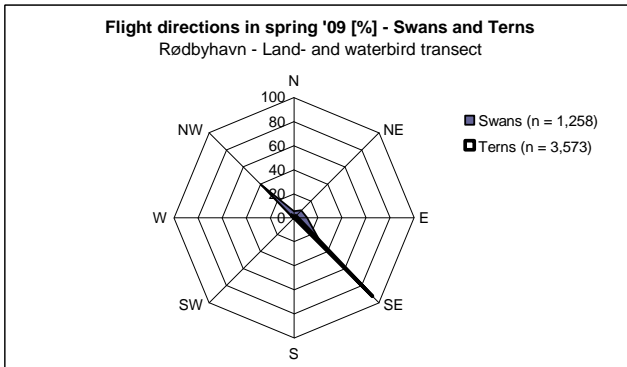
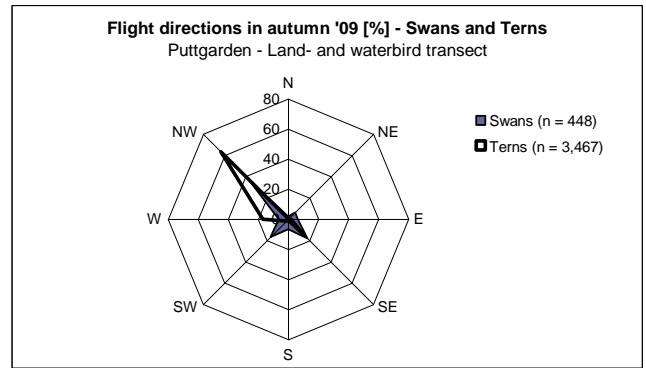
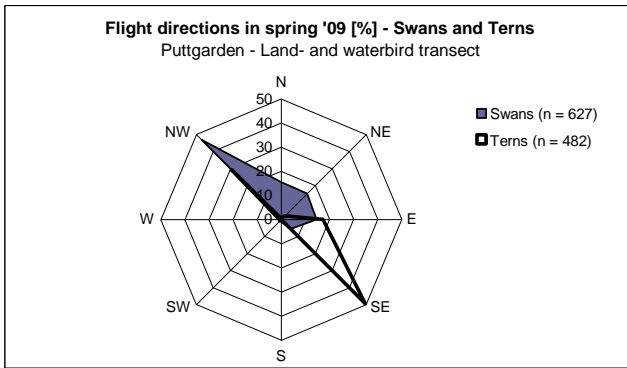


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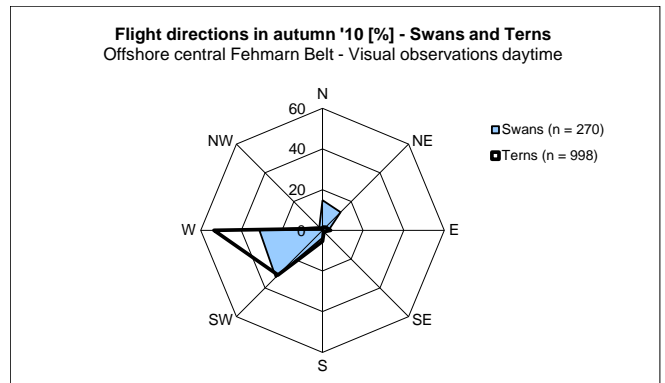
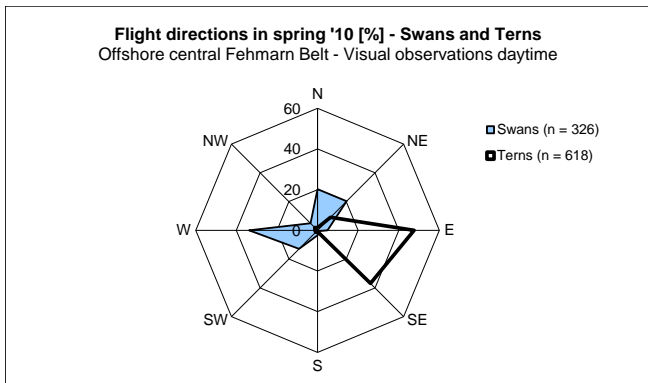
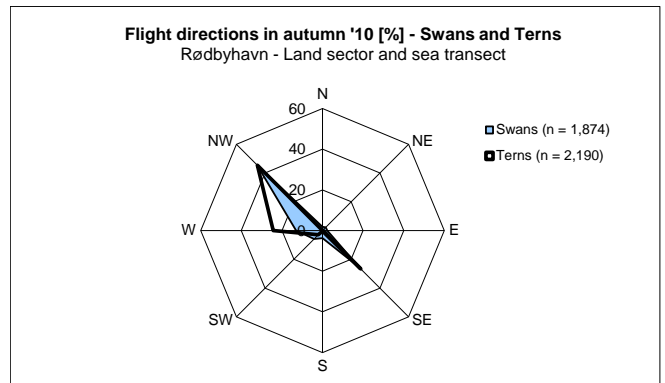
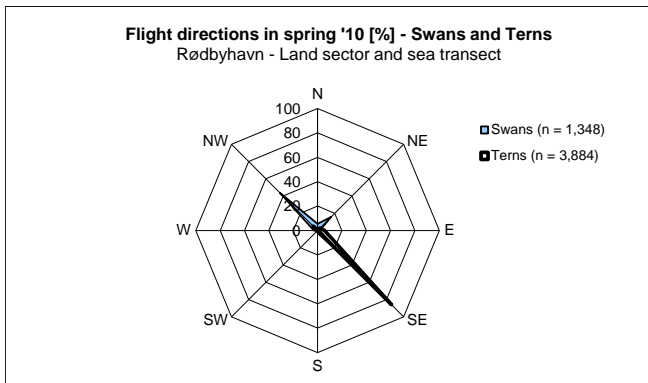
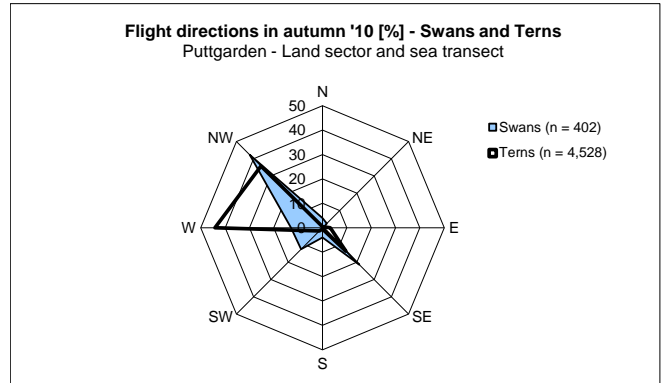
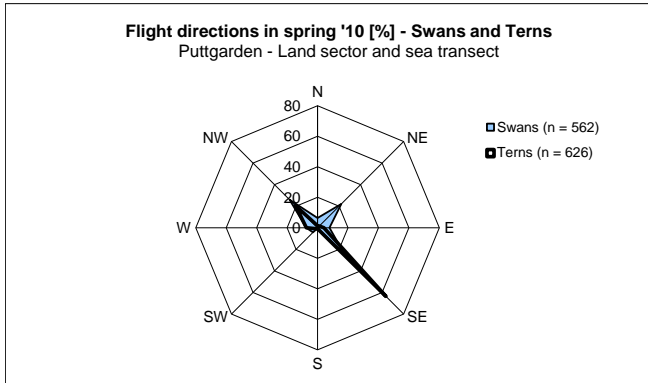


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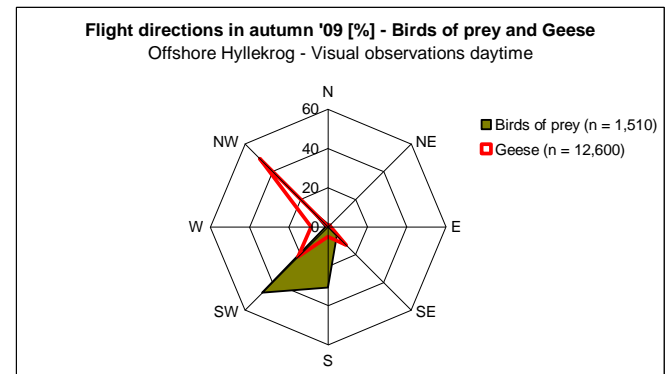
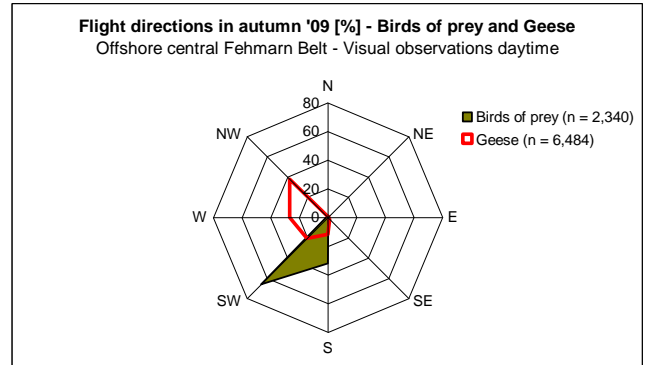
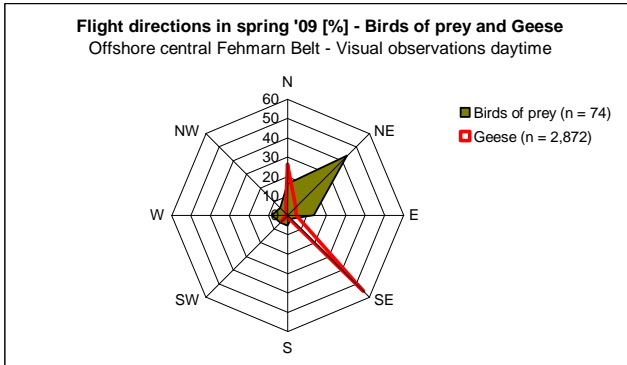
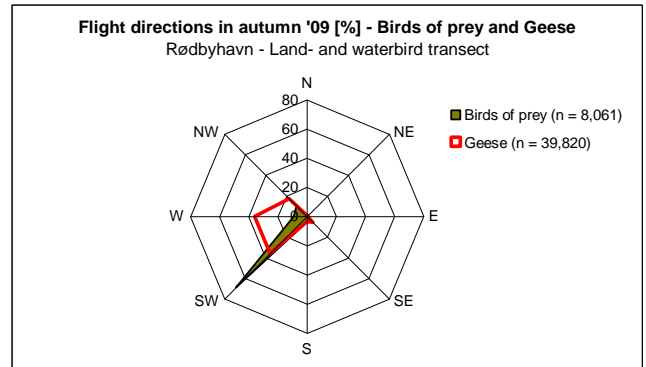
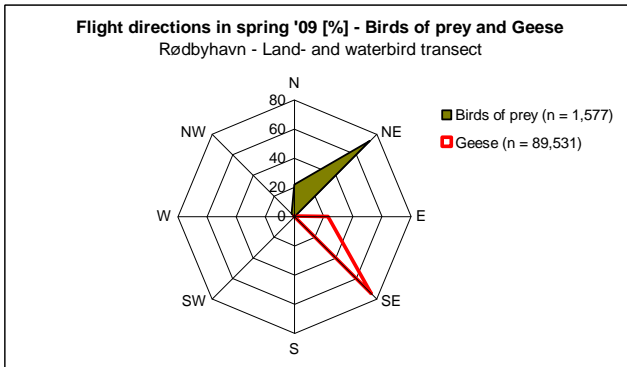
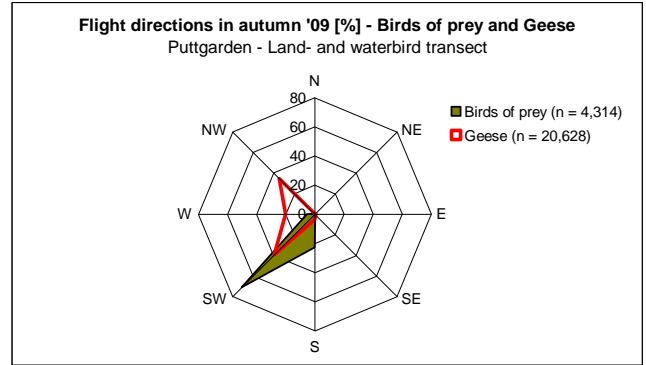
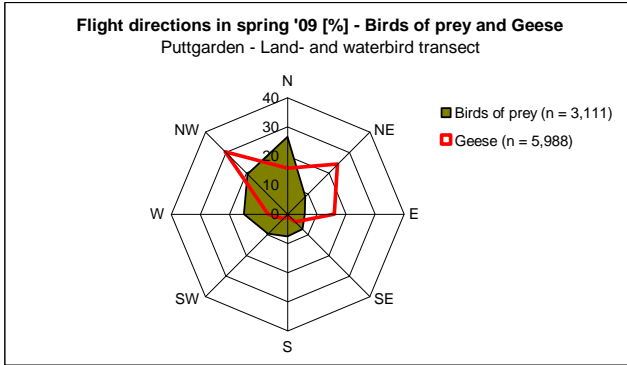
Swans / terns – *Cygnus spp.* / *Sterna spp.*



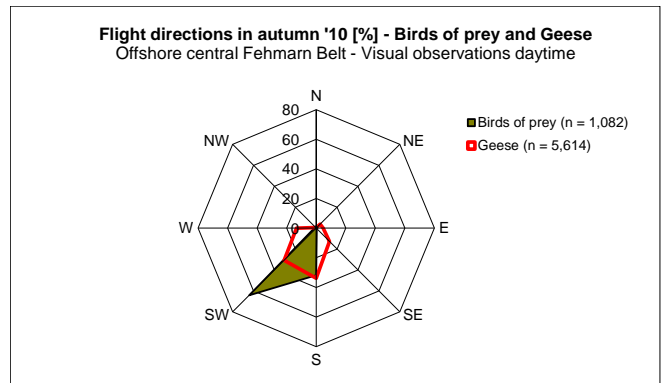
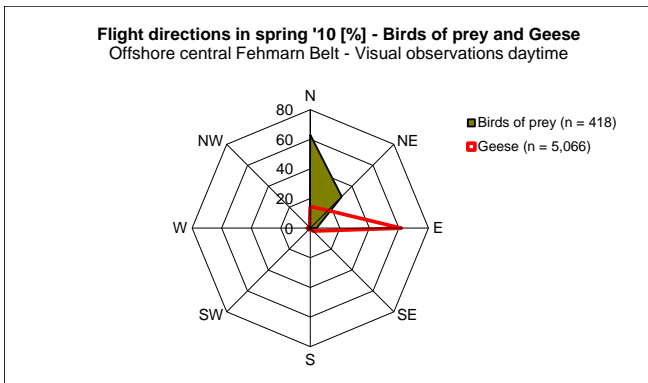
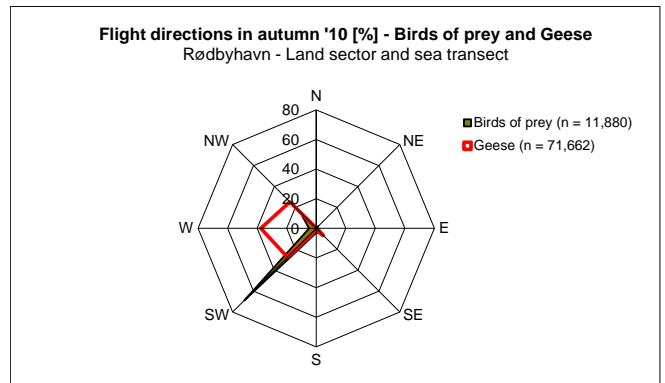
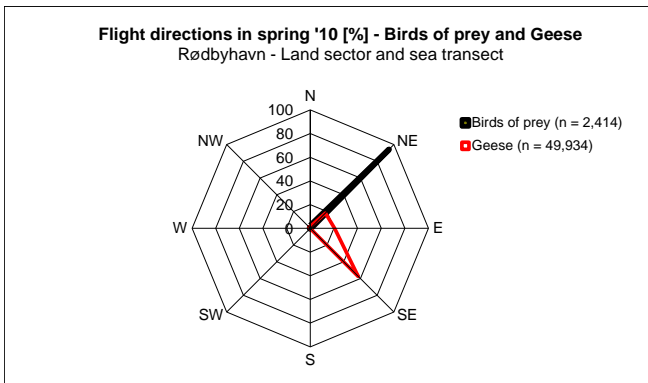
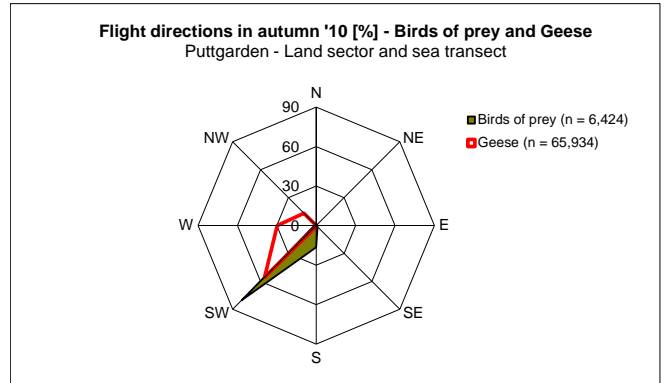
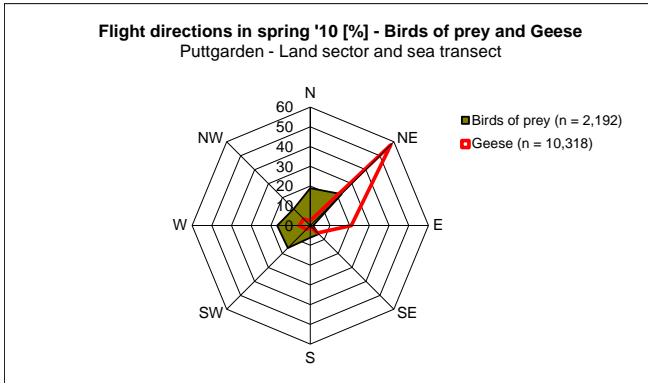
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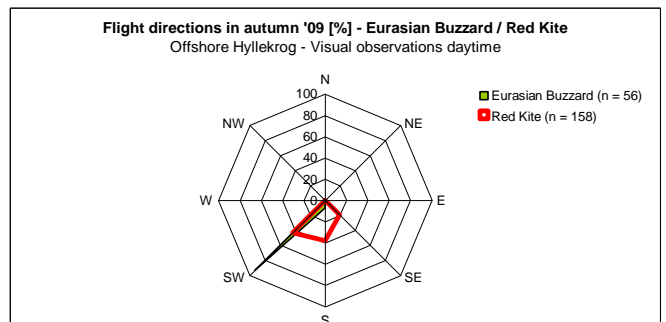
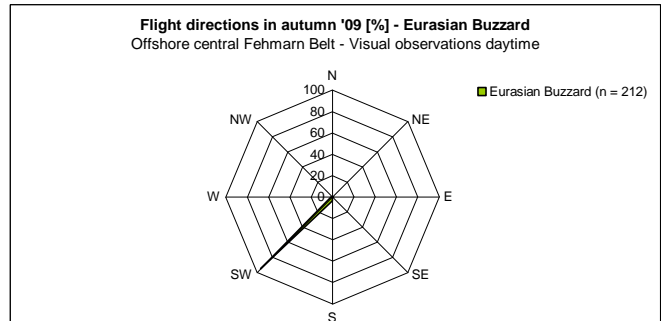
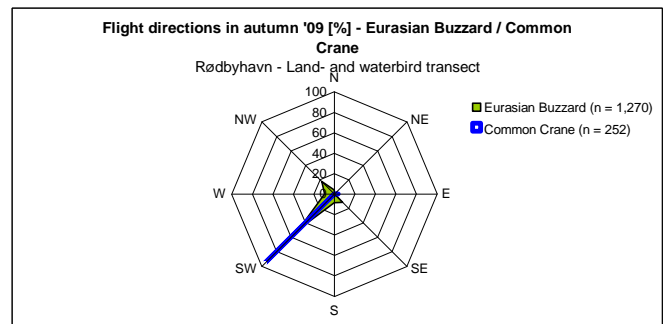
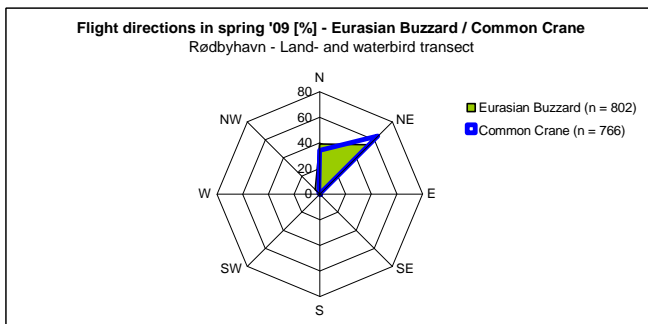
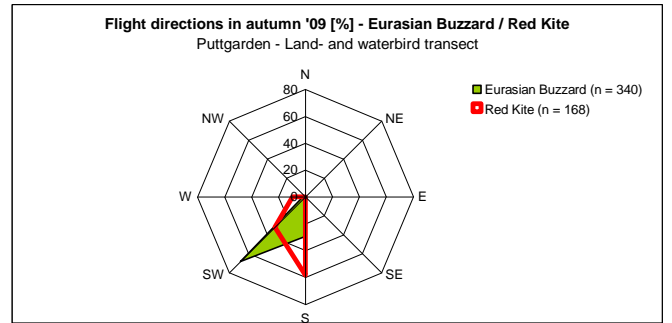
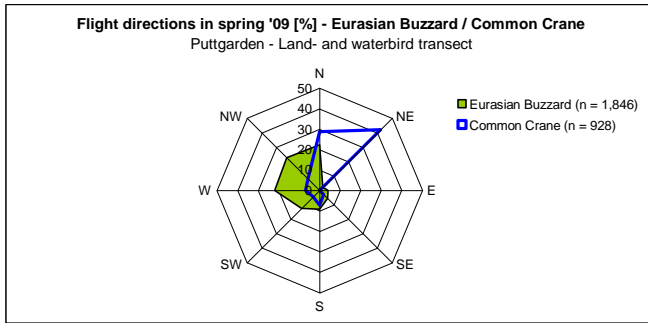
A.4.3 Birds of prey / geese / Common Crane



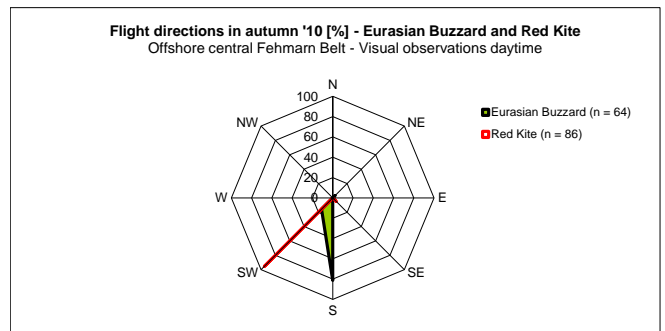
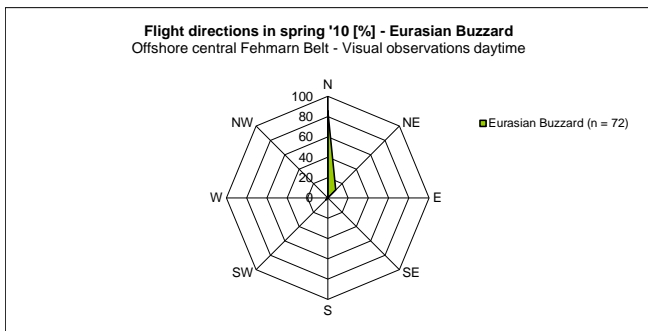
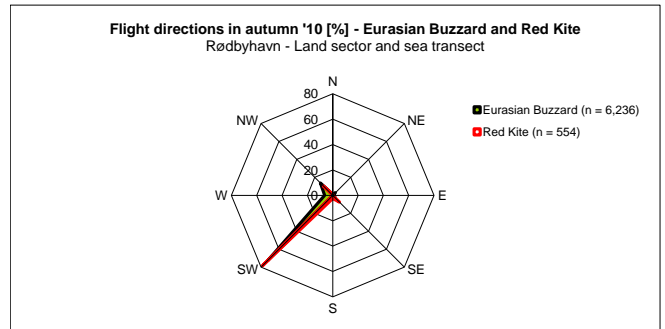
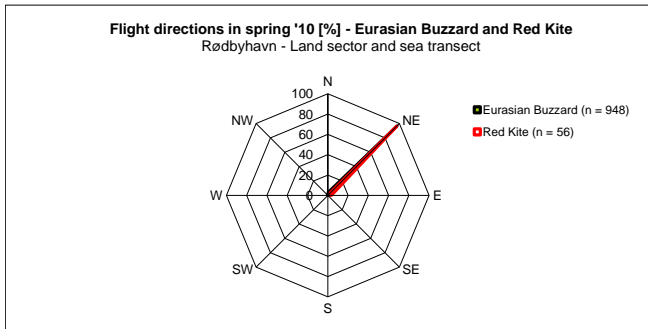
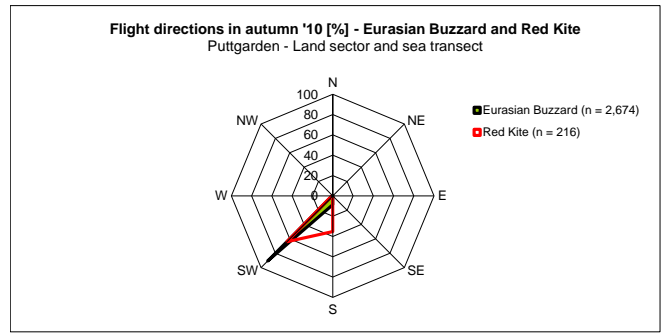
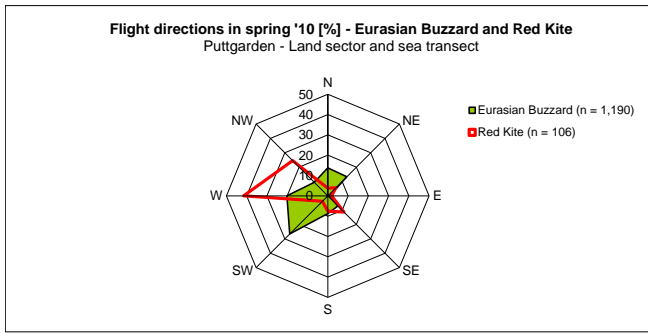
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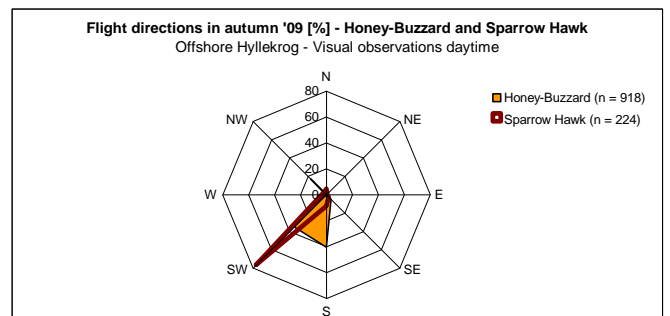
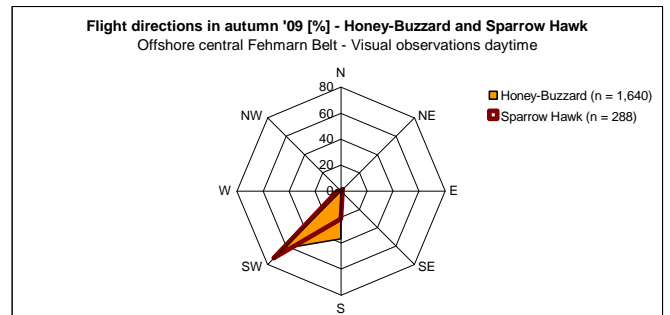
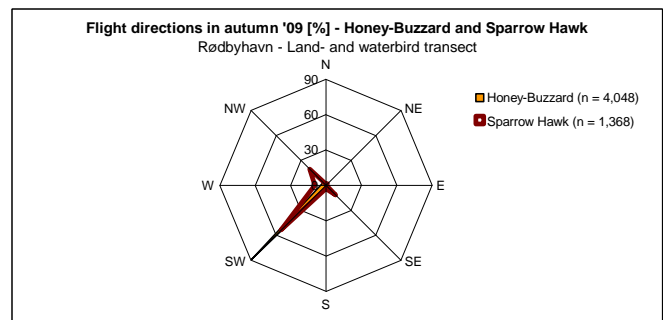
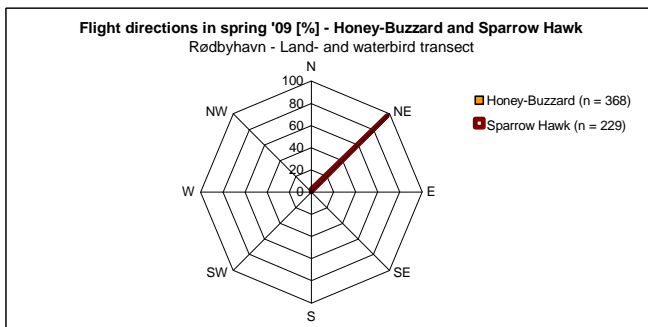
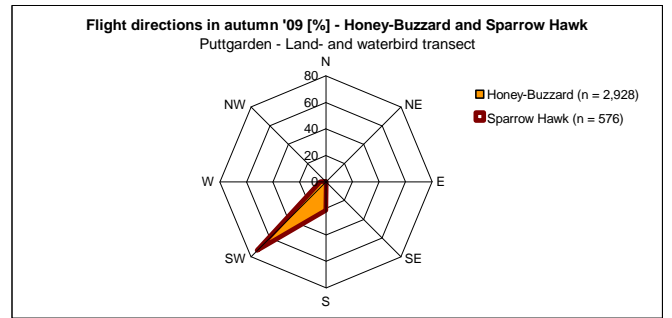
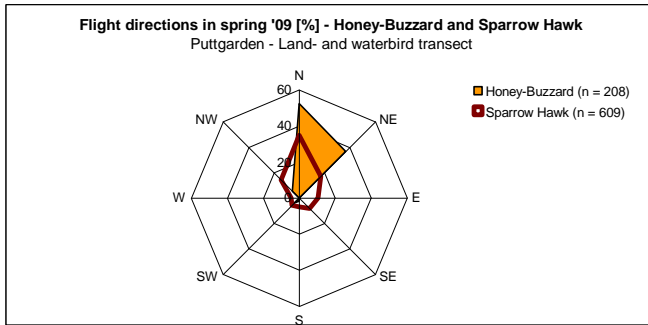
Common Buzzard / Red Kite / Common Crane – *Buteo buteo* / *Milvus milvus* / *Grus grus*



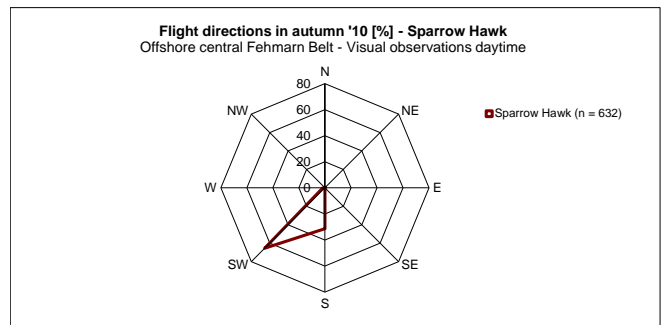
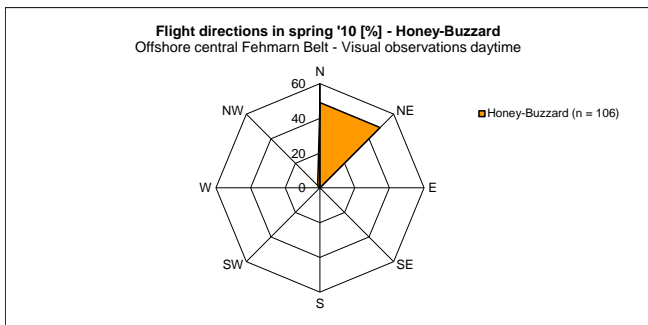
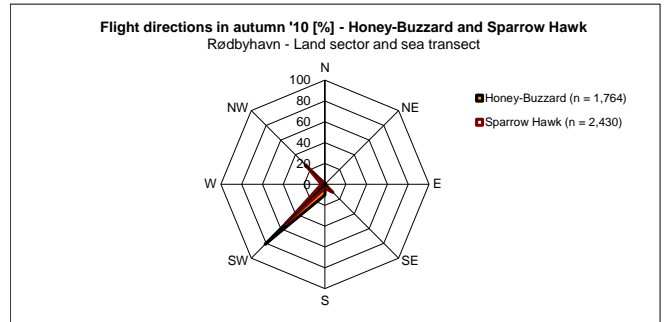
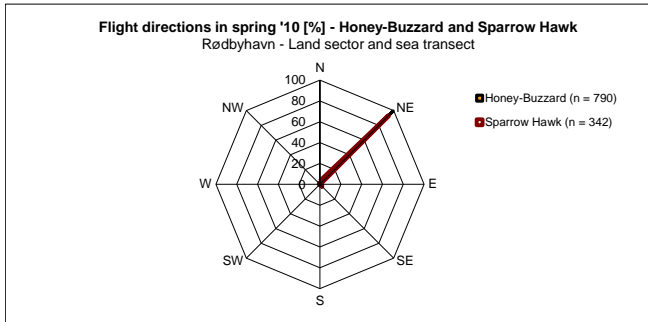
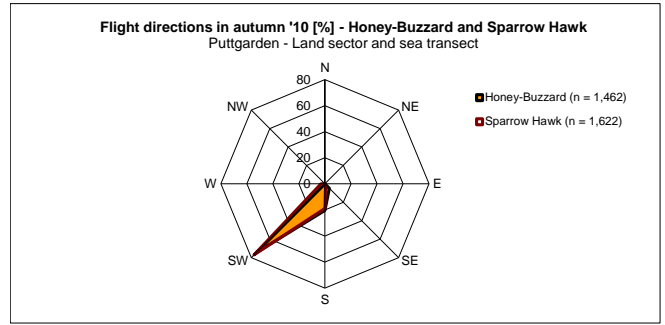
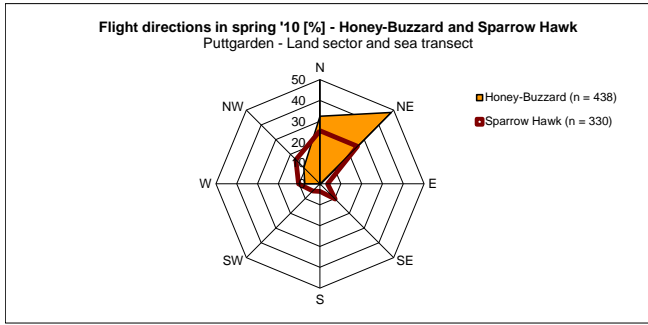
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Honey Buzzard / Sparrowhawk – *Pernis apivorus* / *Accipiter nisus*

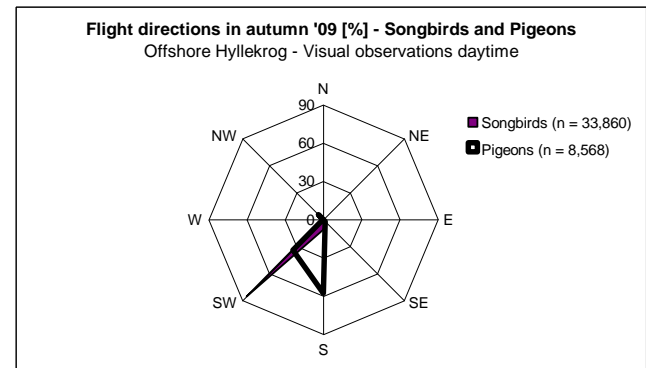
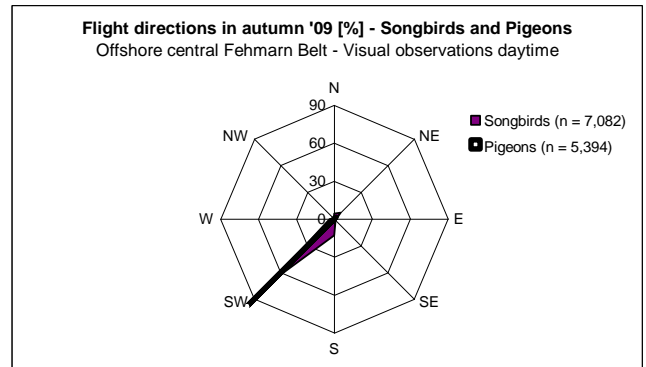
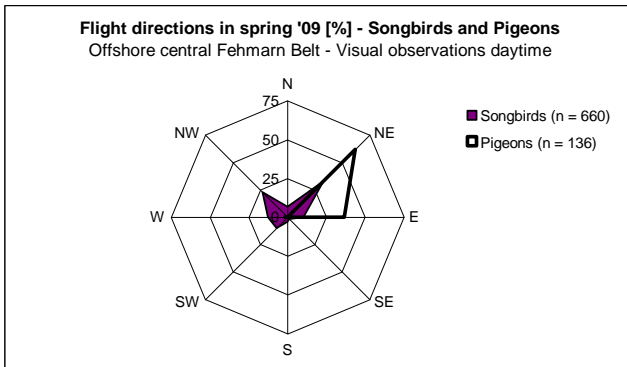
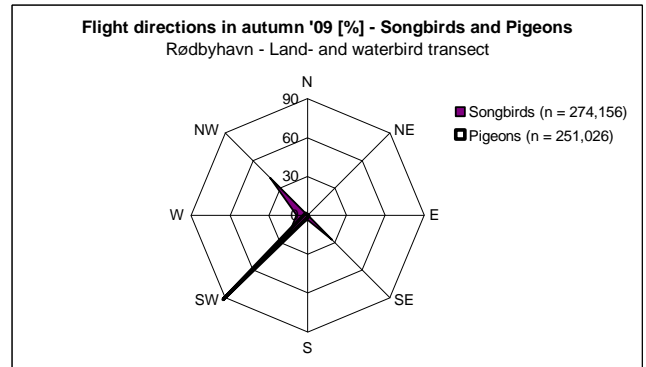
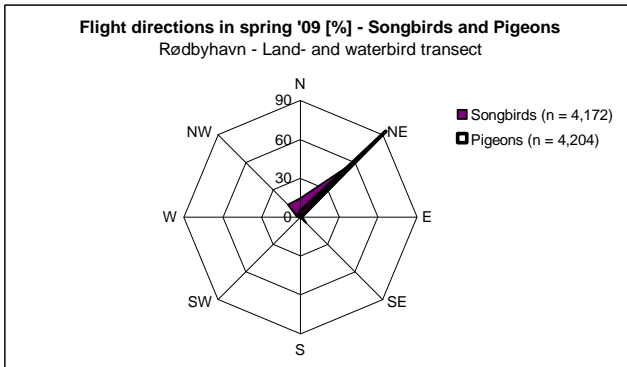
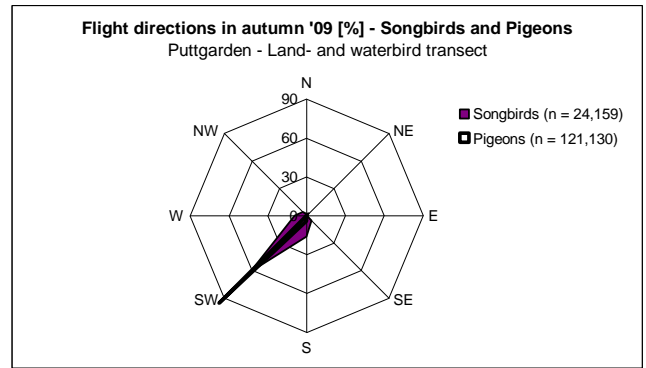
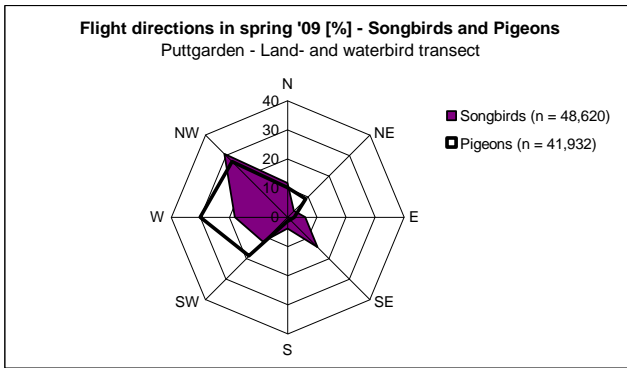


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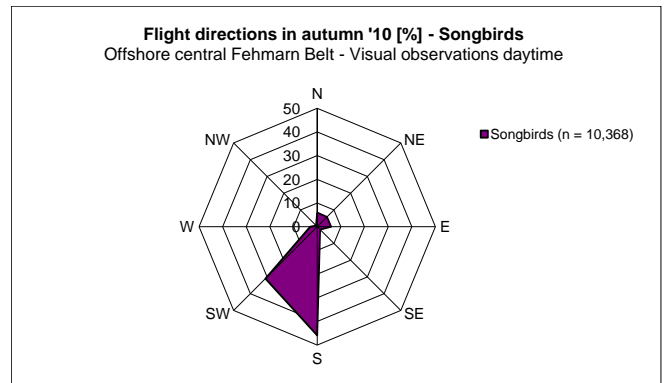
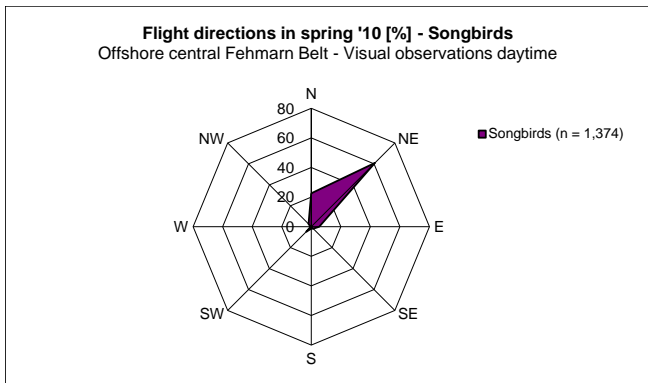
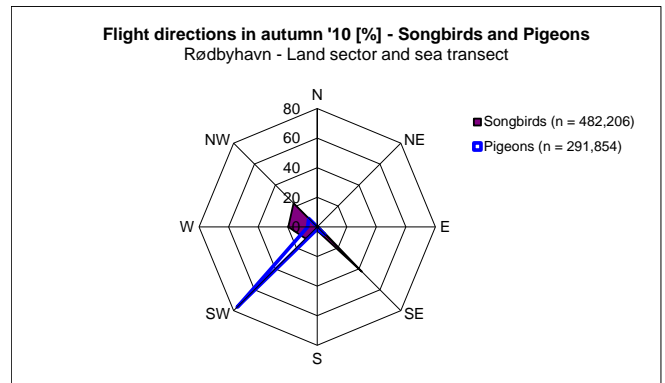
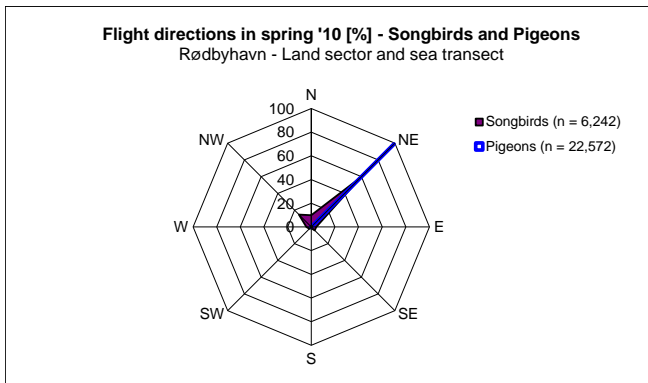
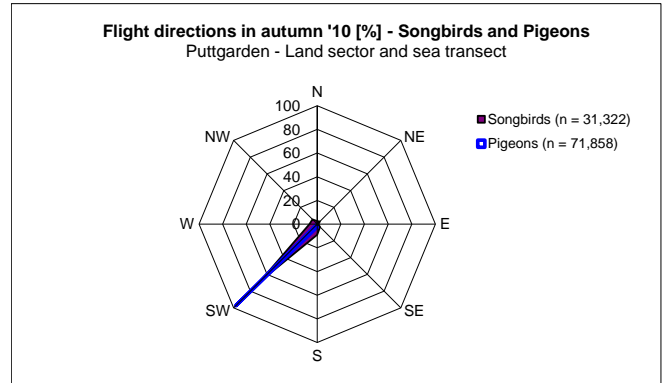
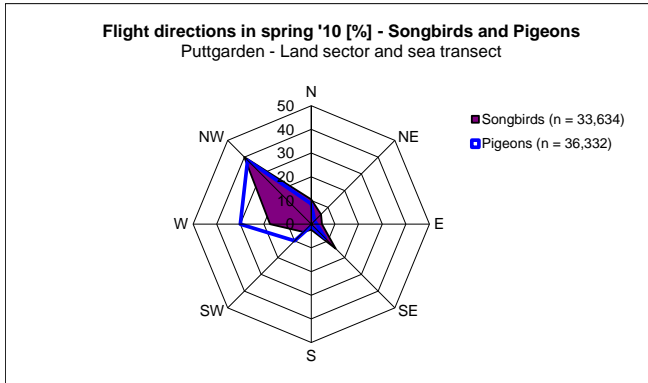


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A.4.4 Songbirds / pigeons / other species

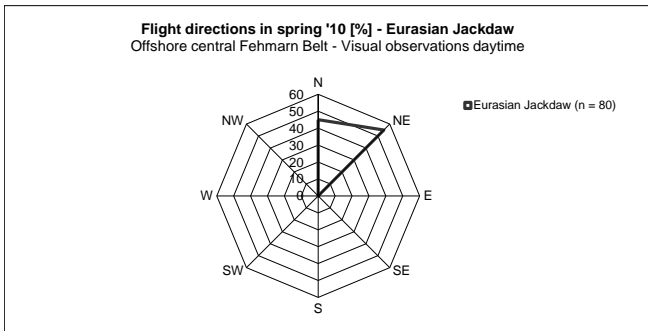
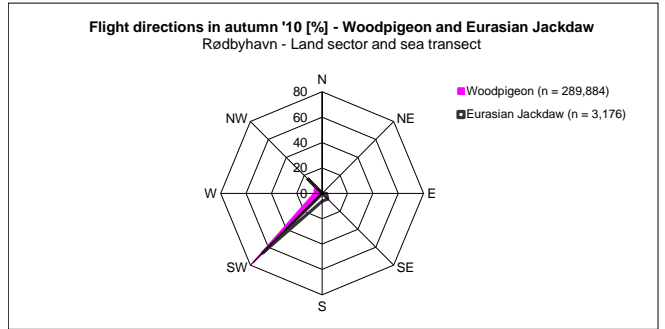
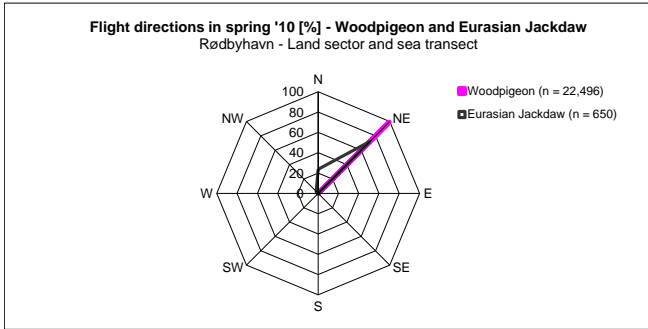
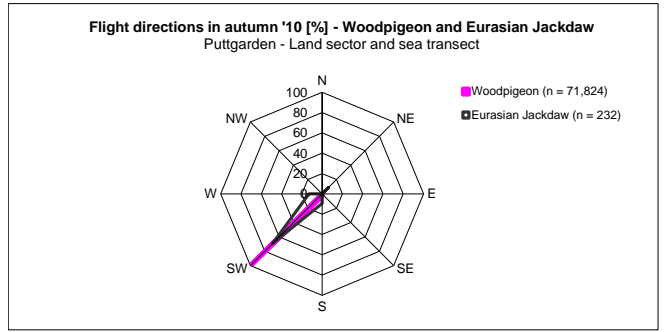
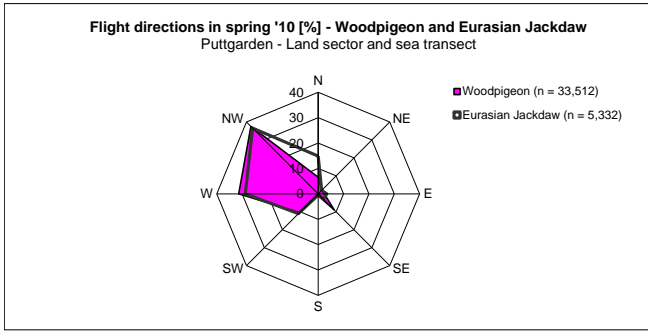


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No Woodpigeon and Jackdaw data from 2009

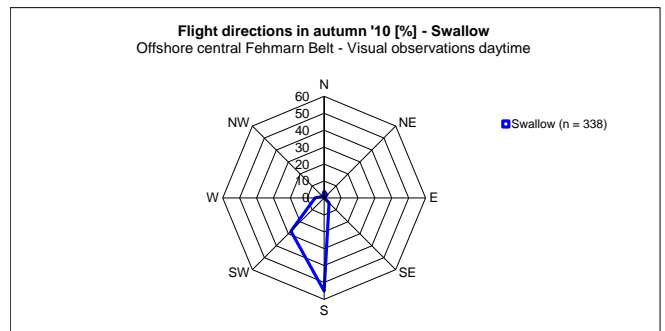
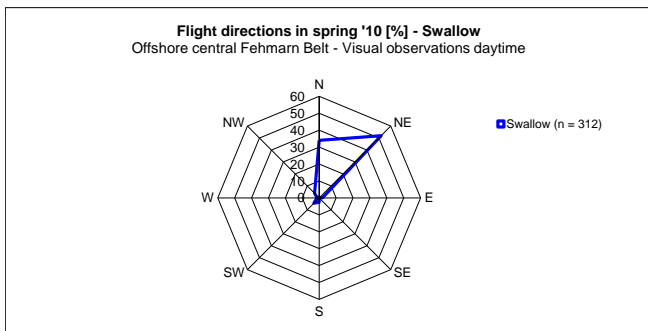
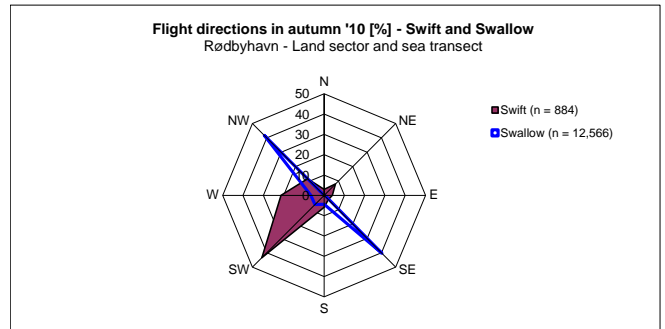
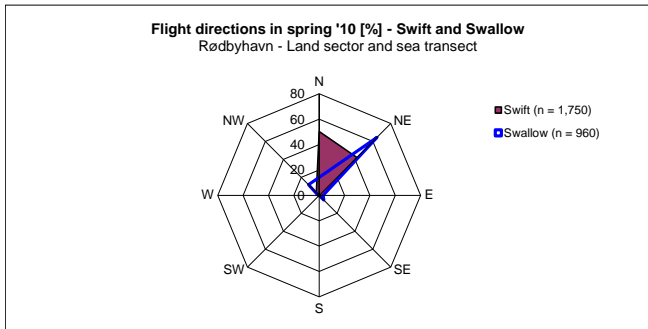
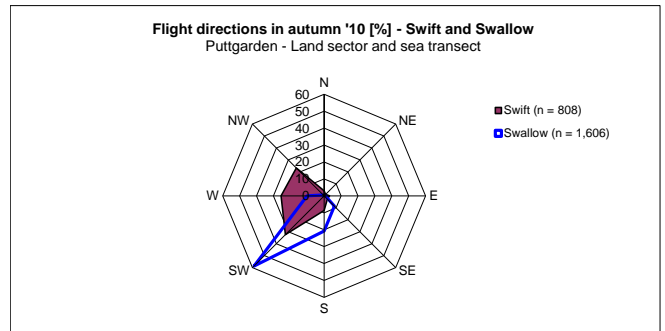
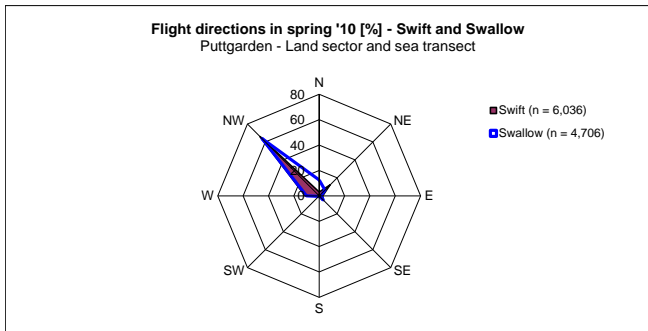
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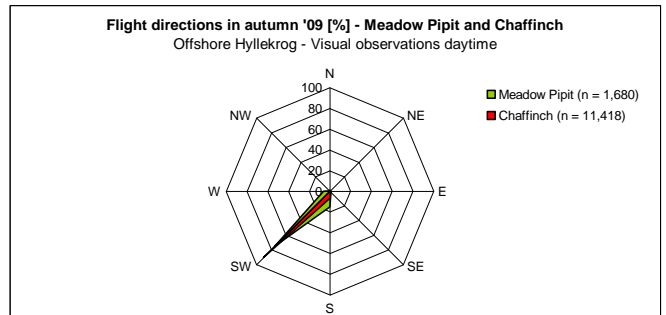
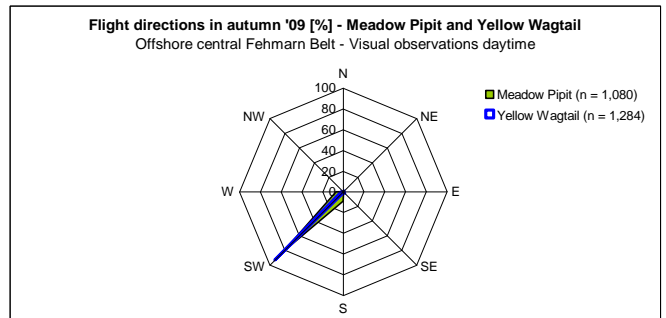
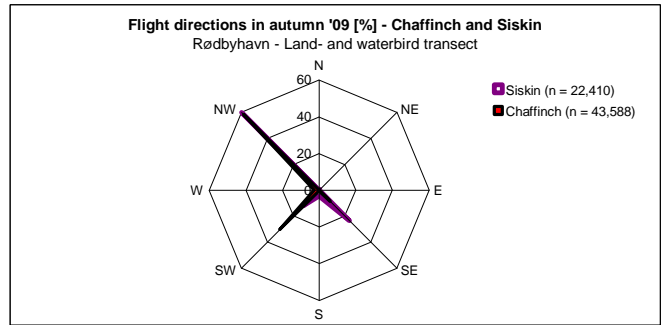
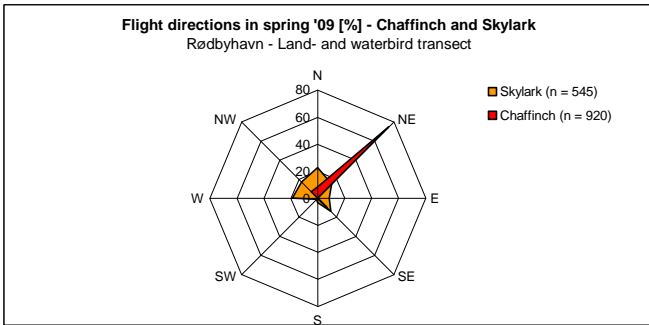
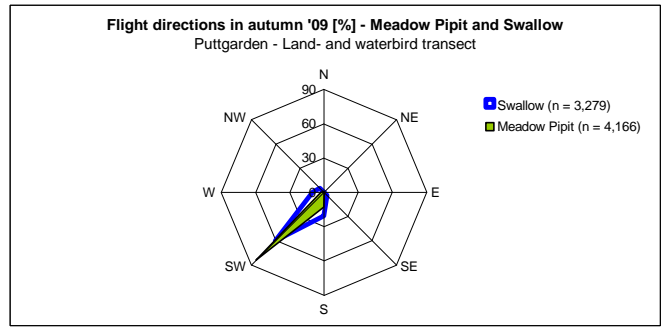
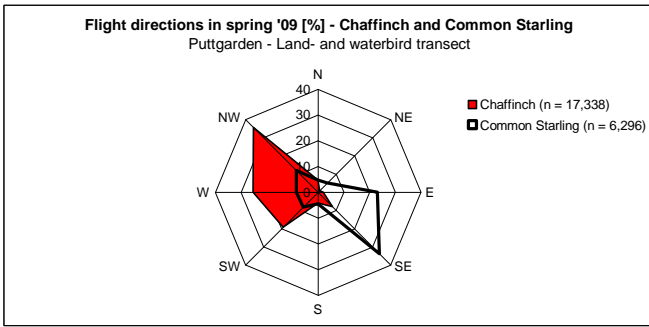
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Swallow data from 2009: see below

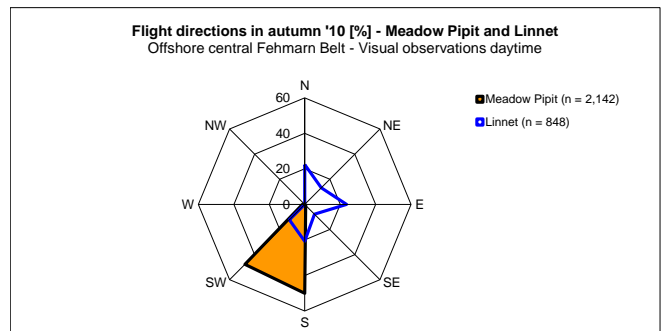
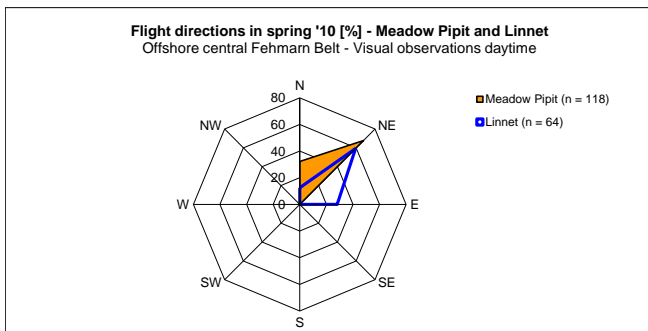
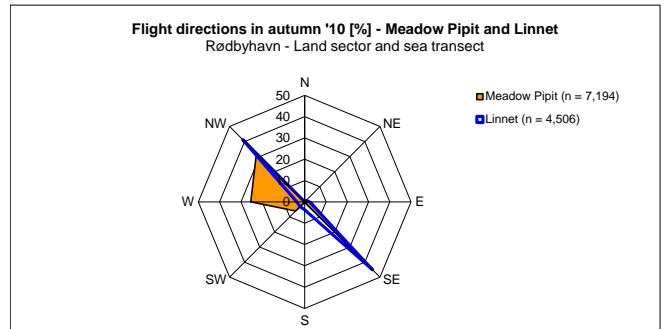
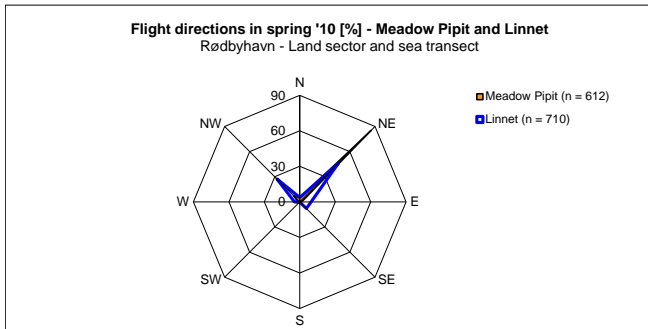
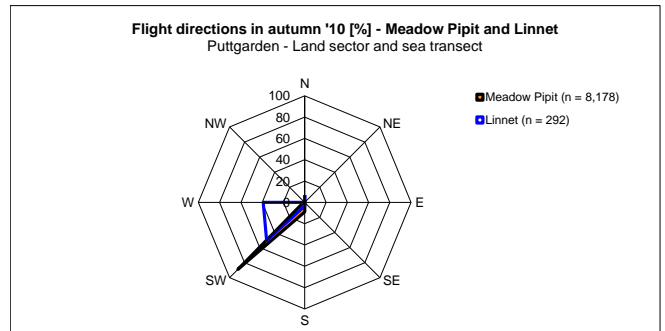
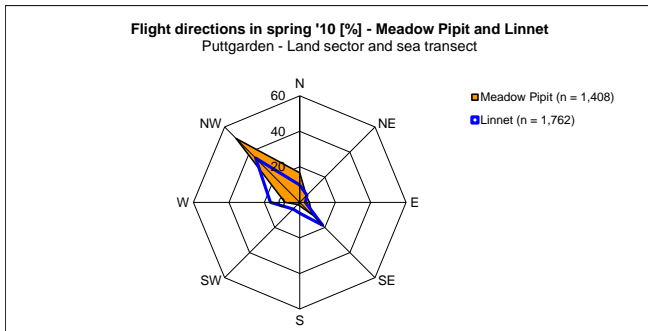
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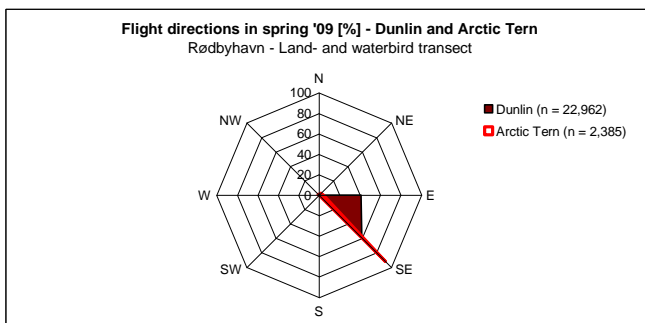
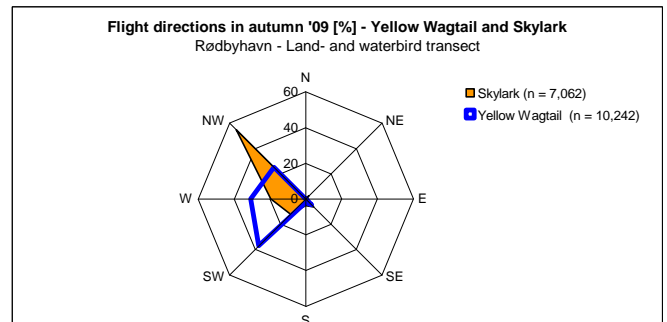
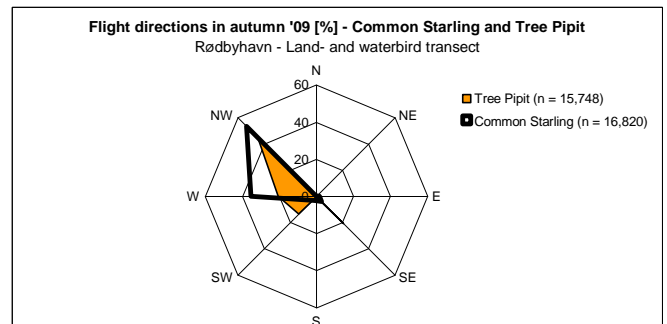
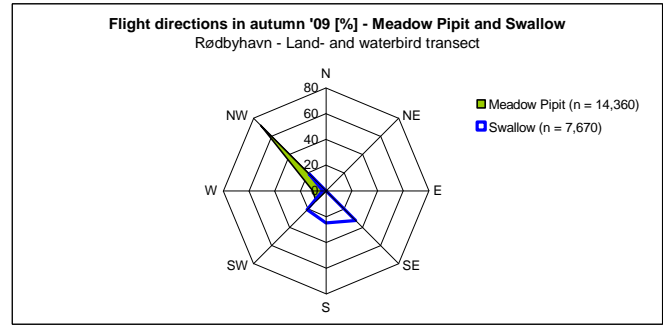
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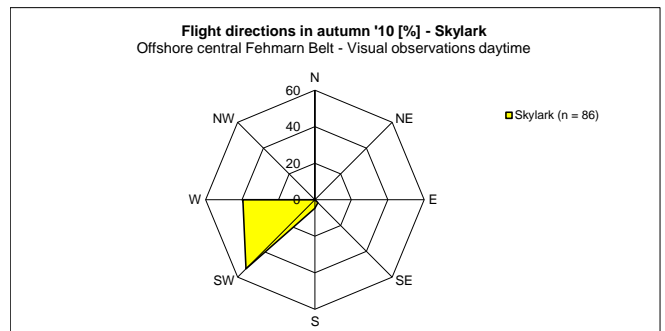
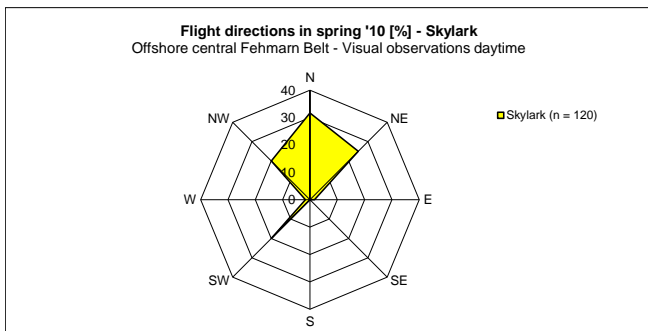
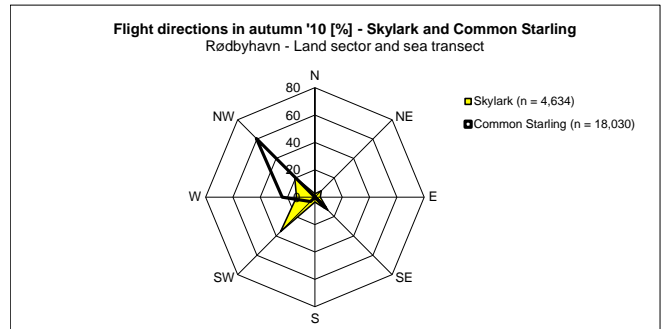
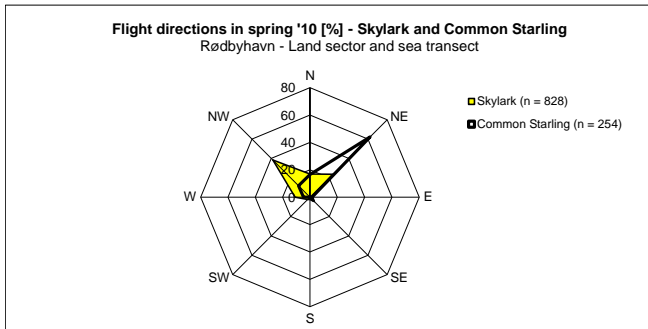
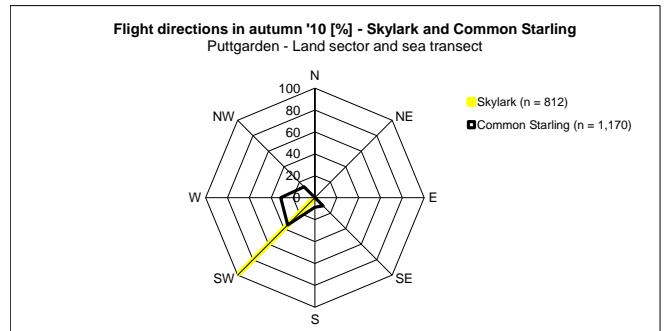
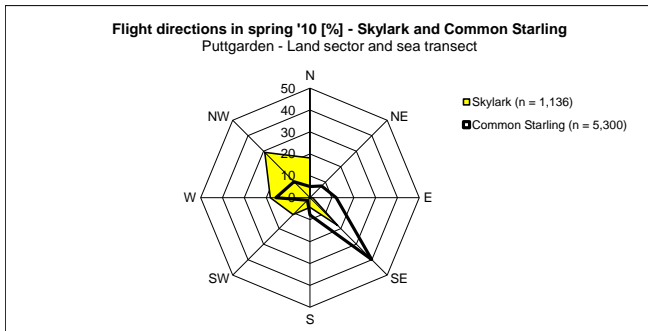
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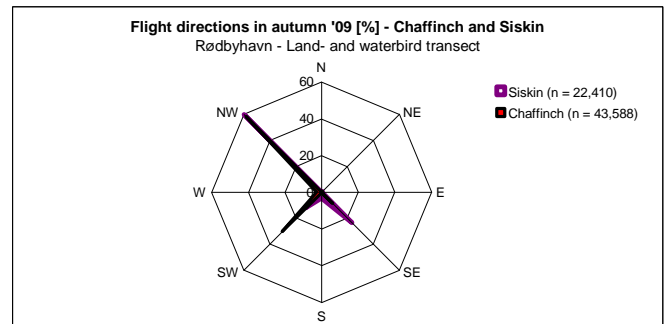
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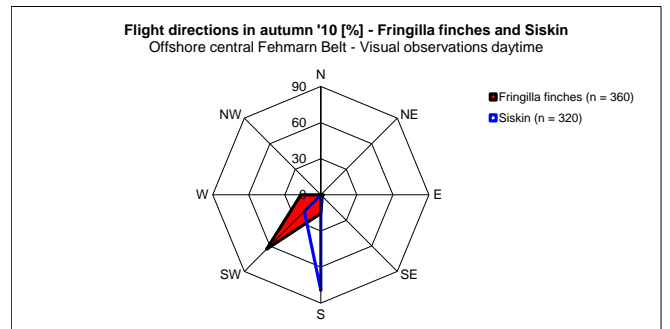
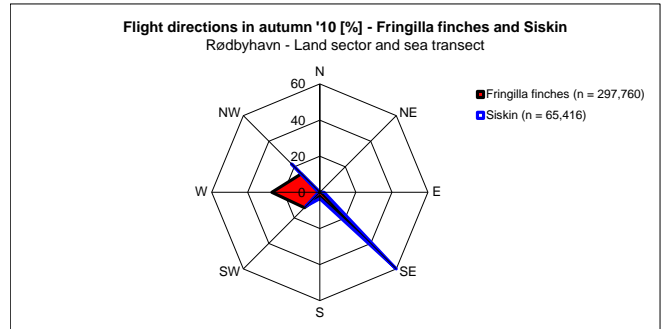
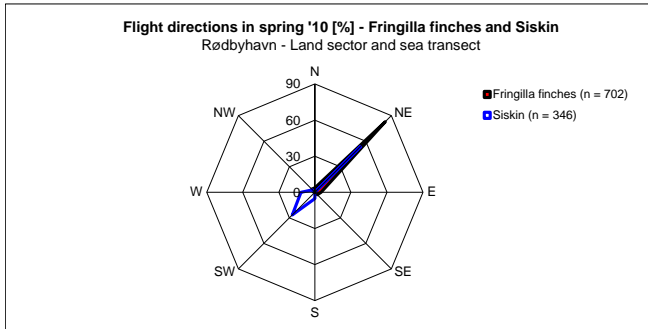
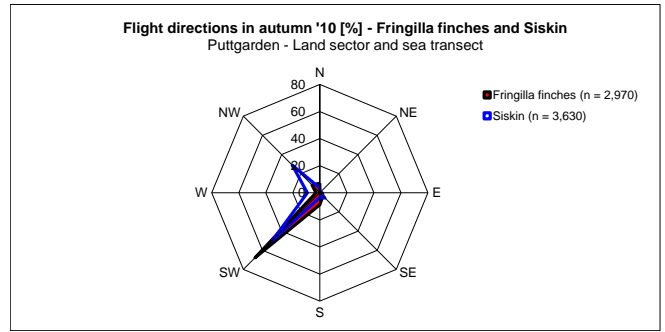
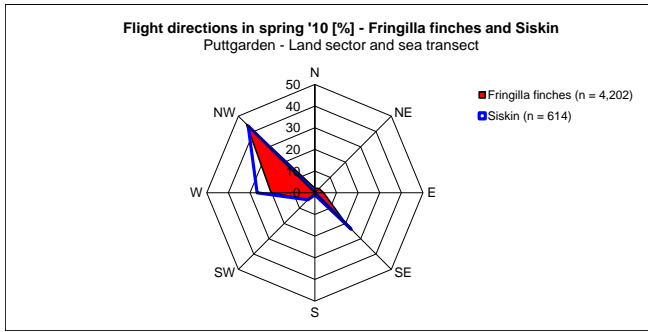
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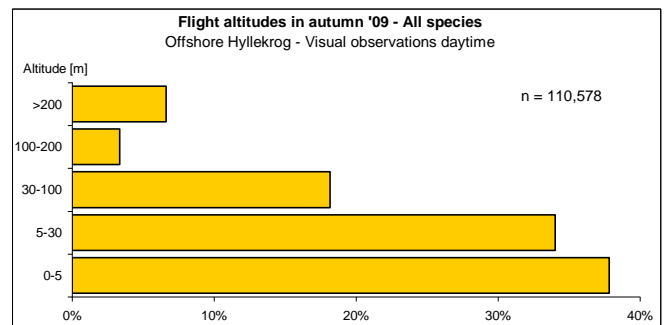
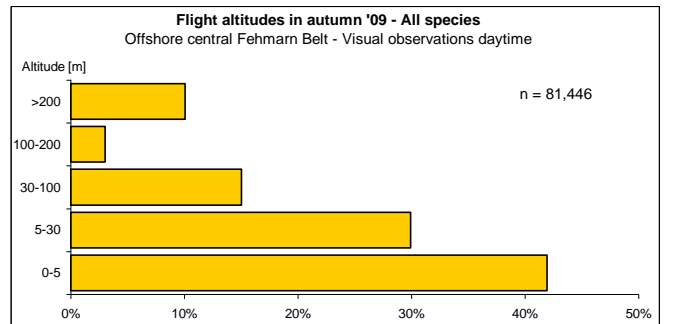
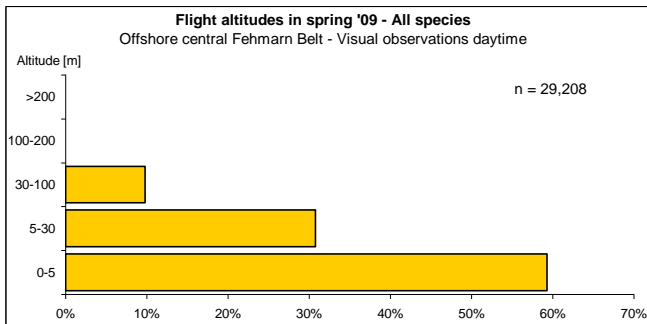
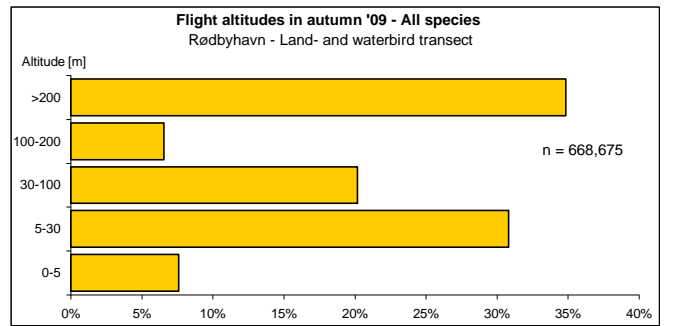
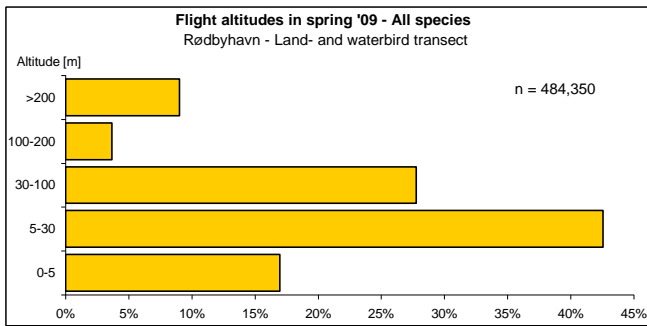
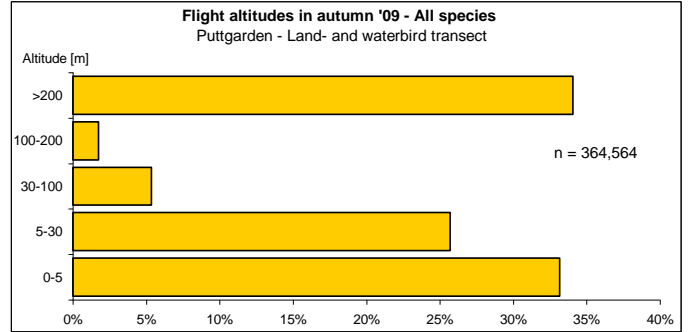
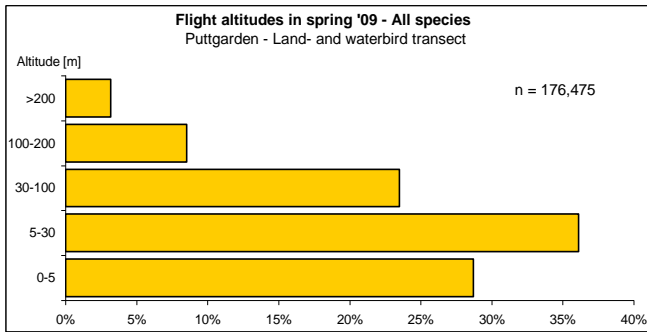


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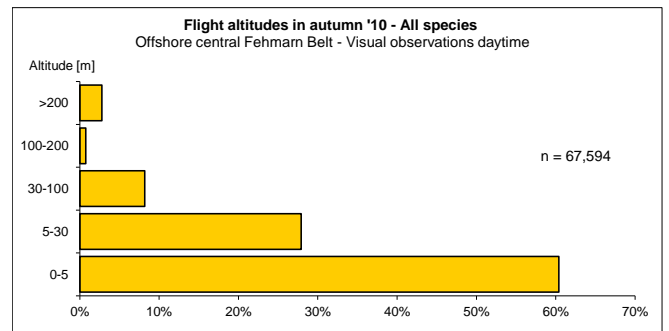
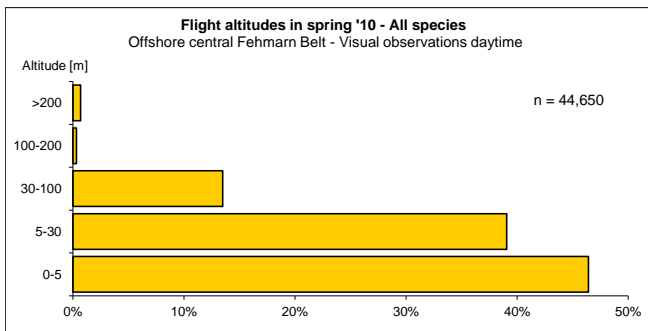
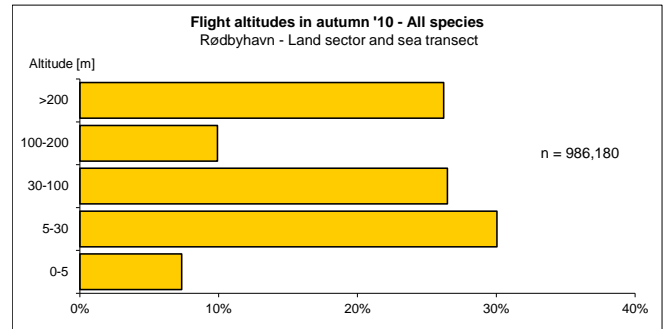
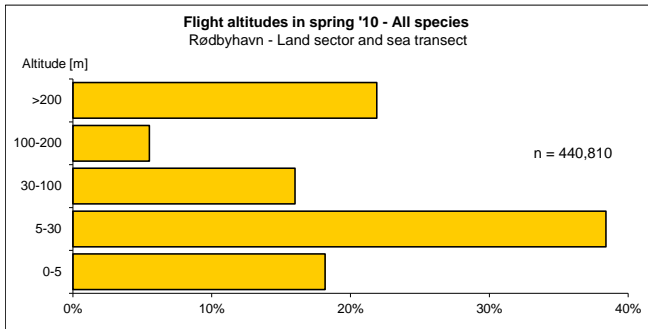
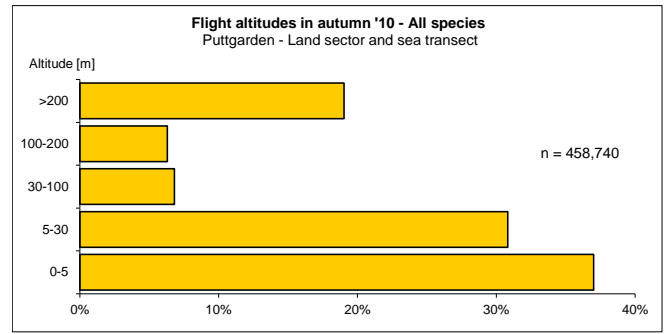
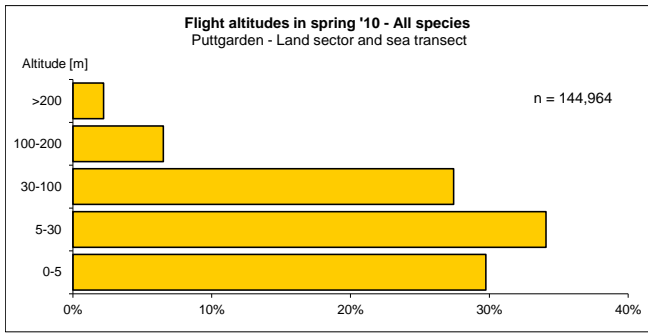


A.5 Flight altitudes – daytime visual observations

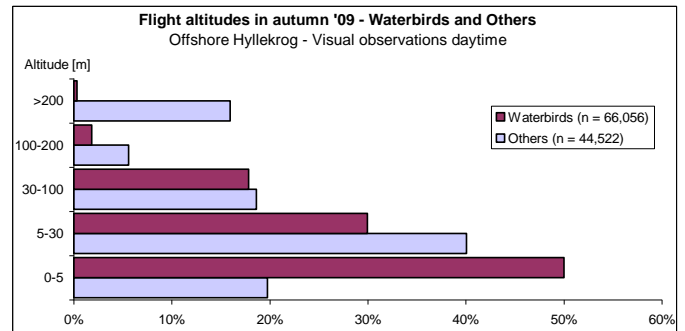
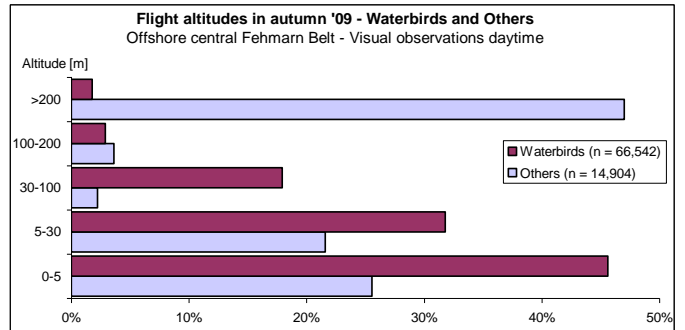
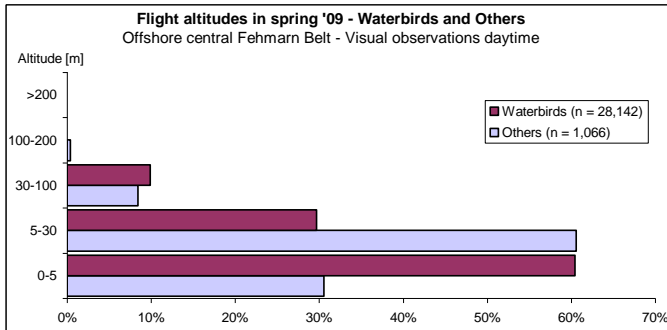
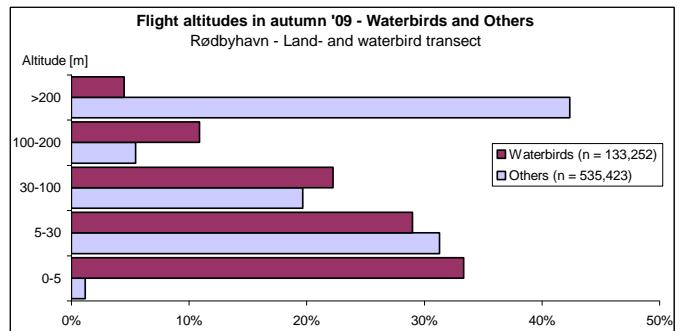
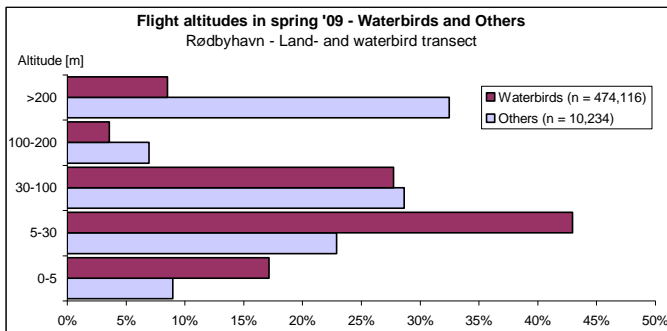
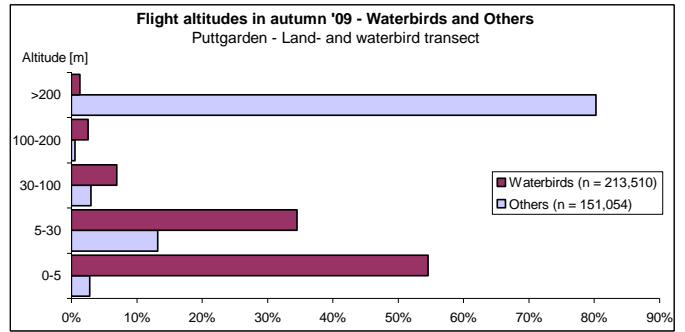
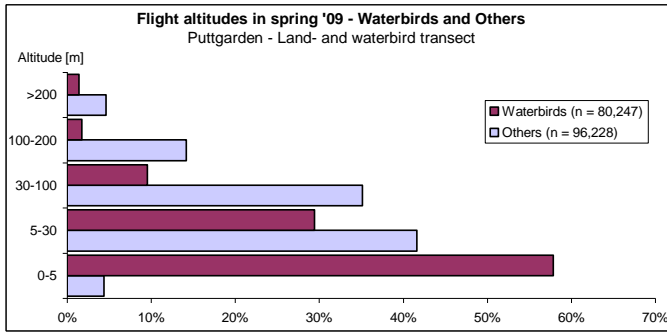
A.5.1 All species



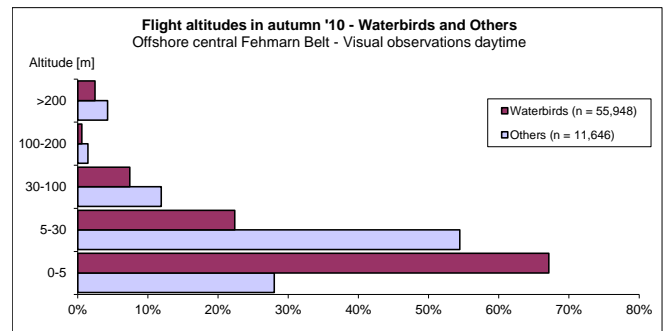
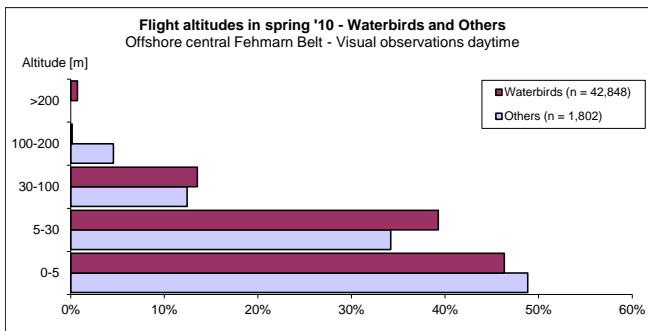
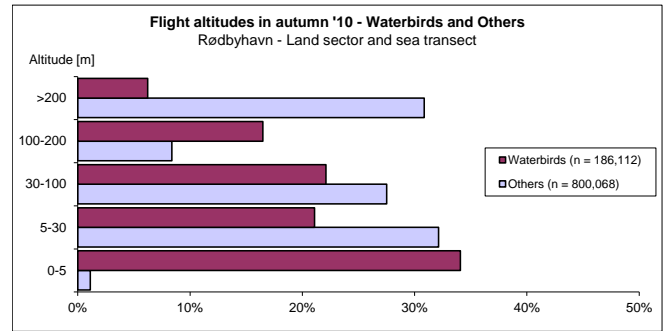
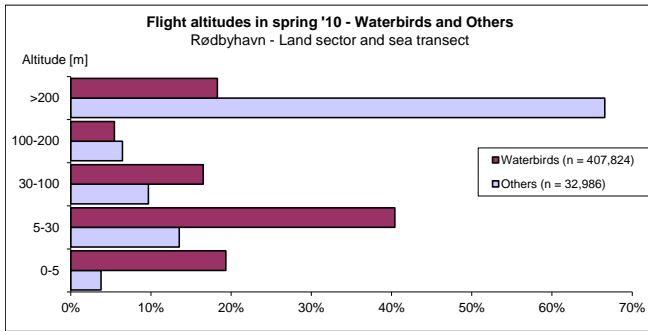
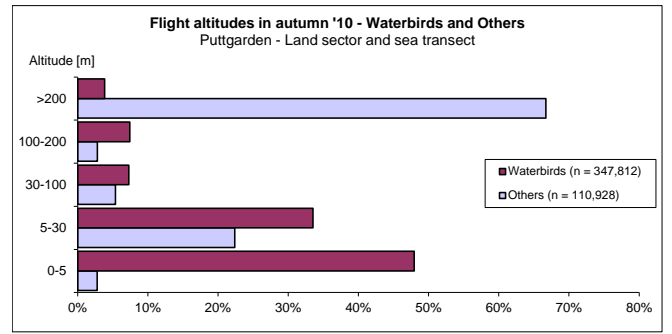
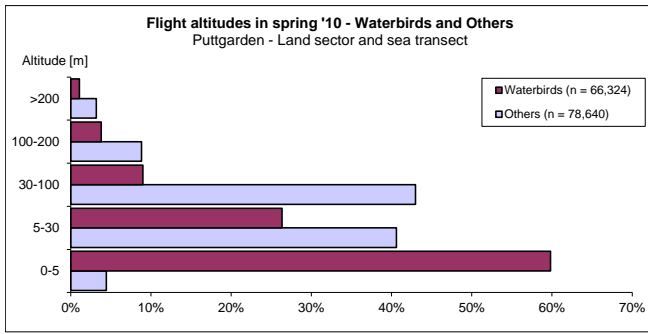
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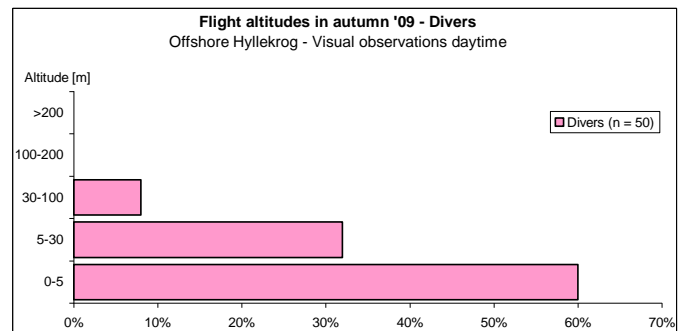
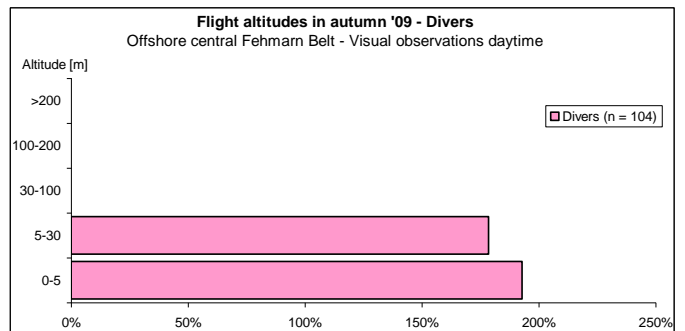
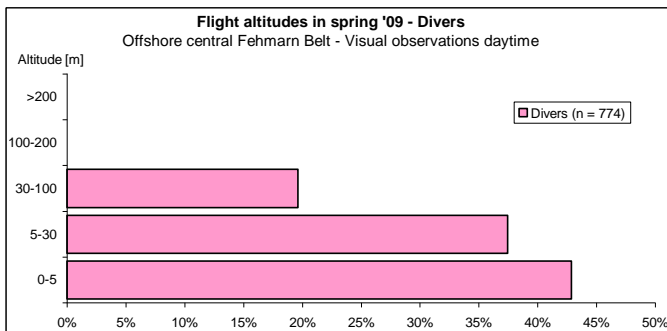
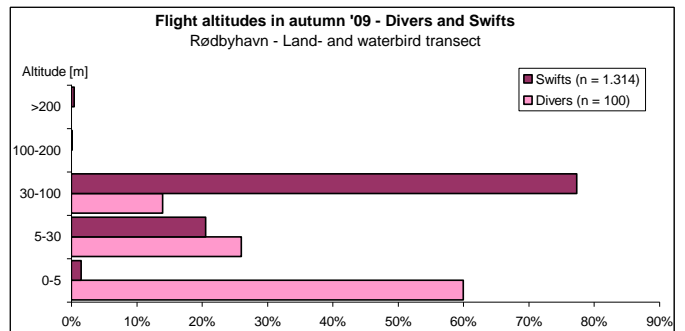
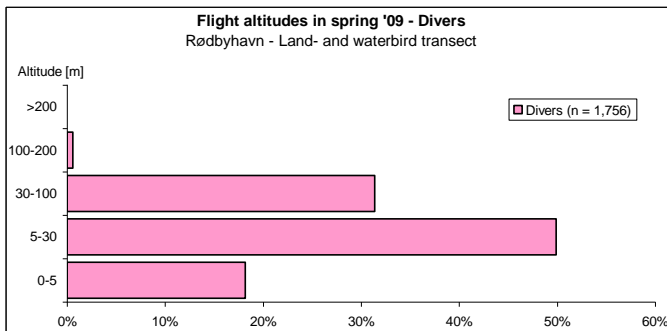
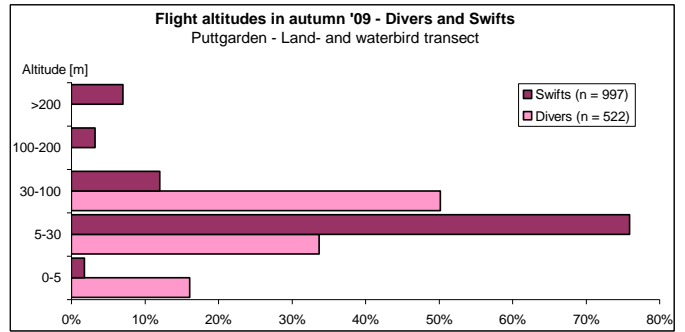
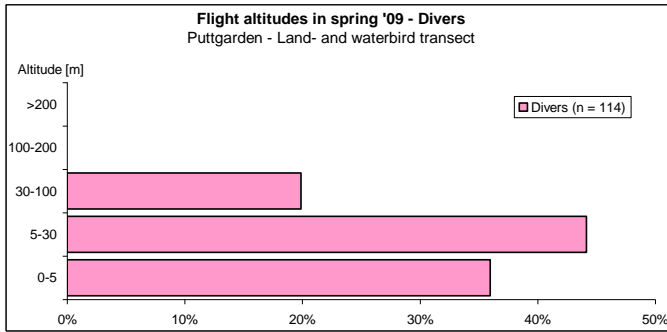
A.5.2 Waterbirds and others



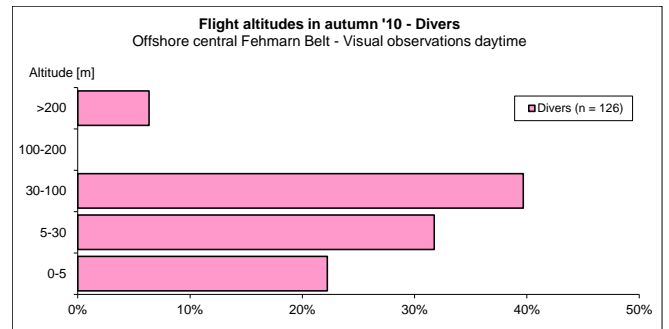
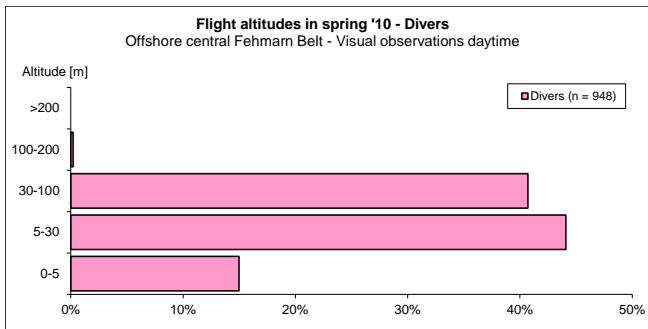
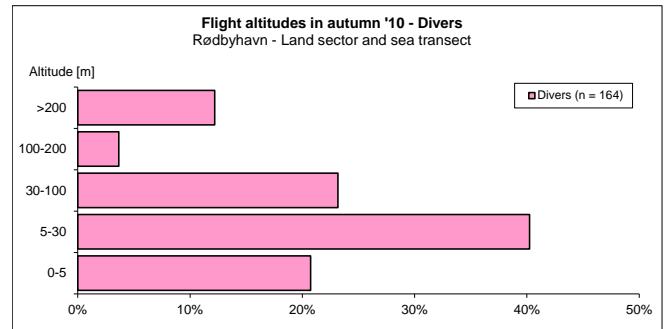
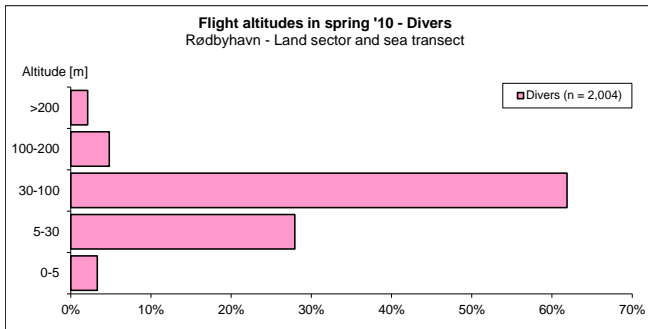
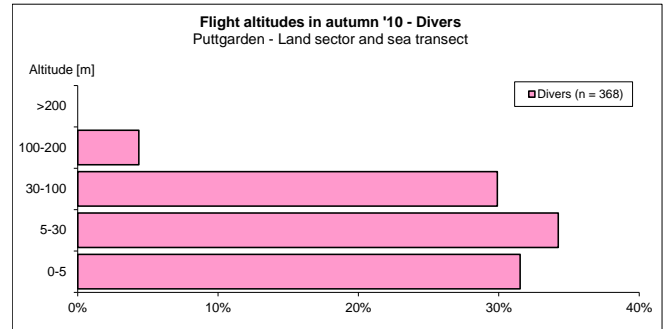
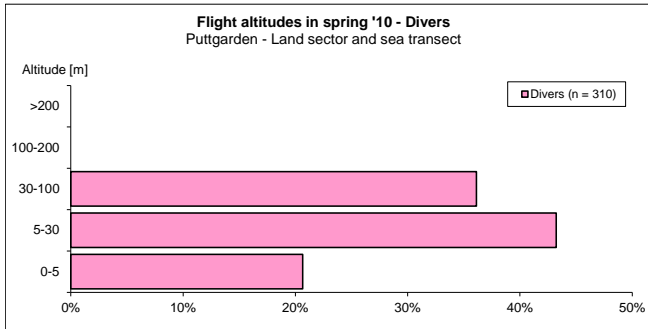
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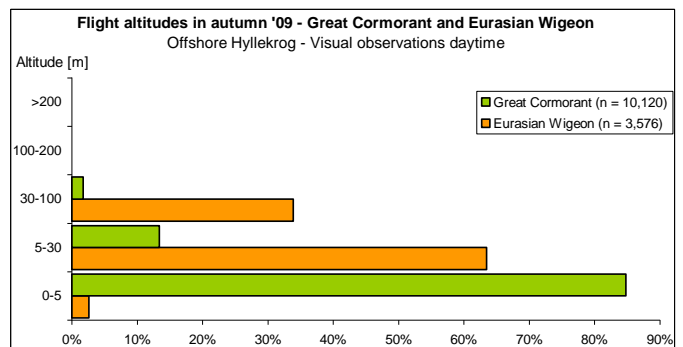
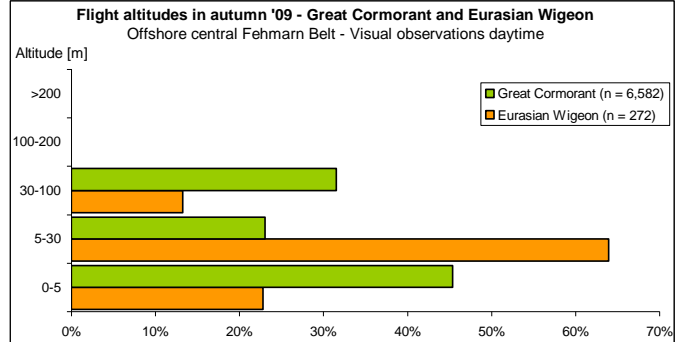
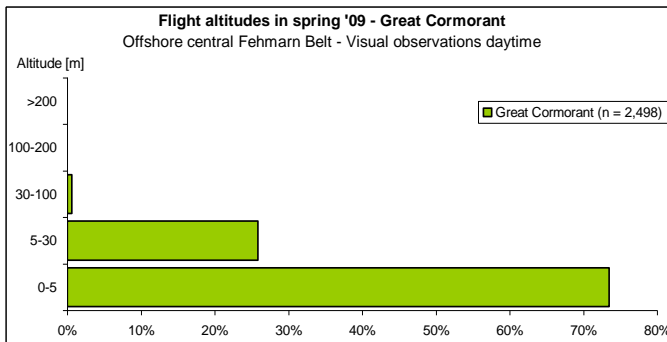
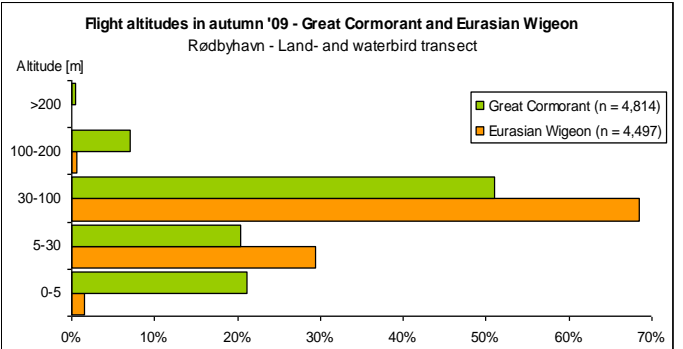
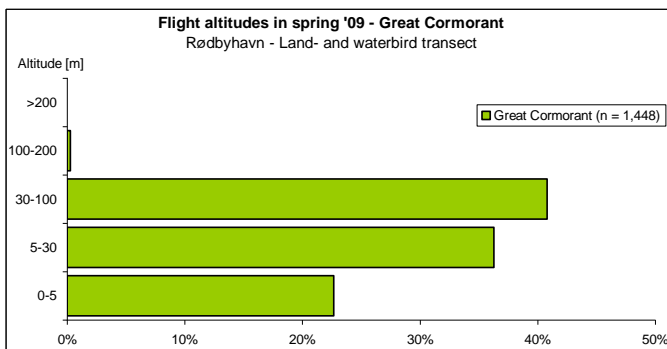
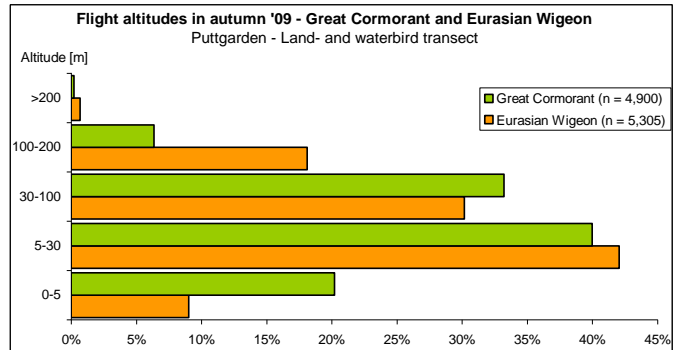
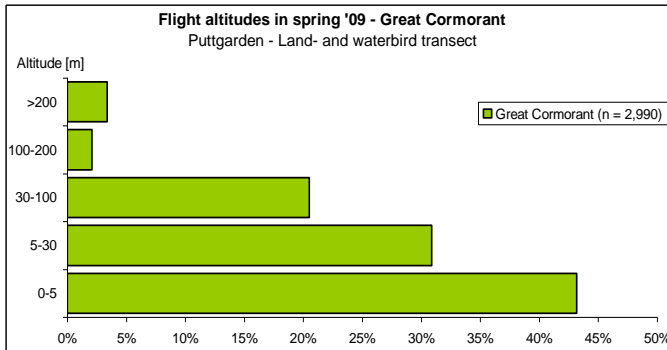
Divers / Swift – *Gavia spp.* / *Apus apus*



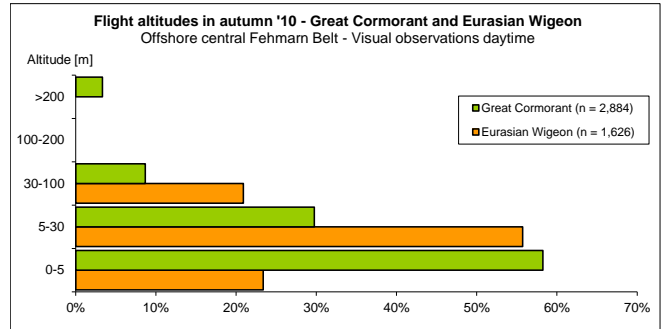
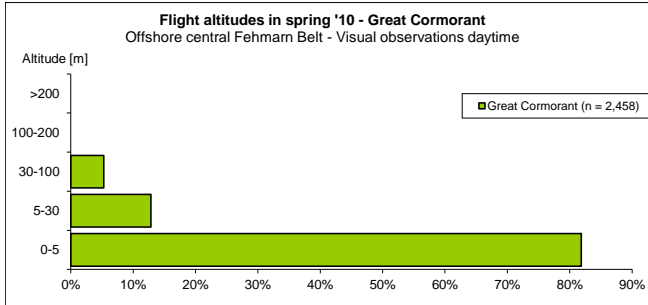
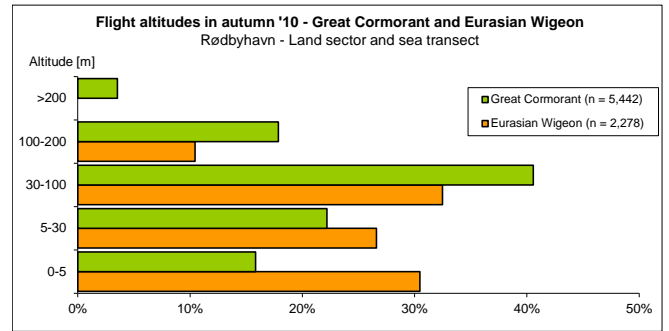
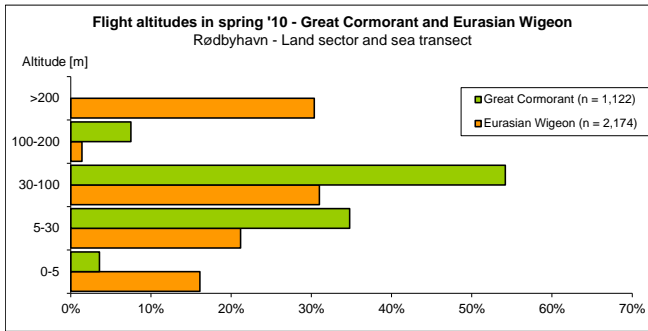
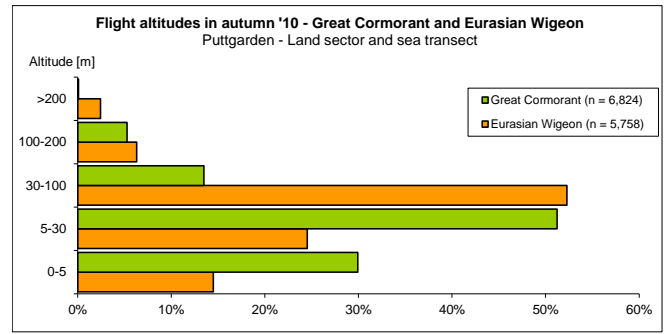
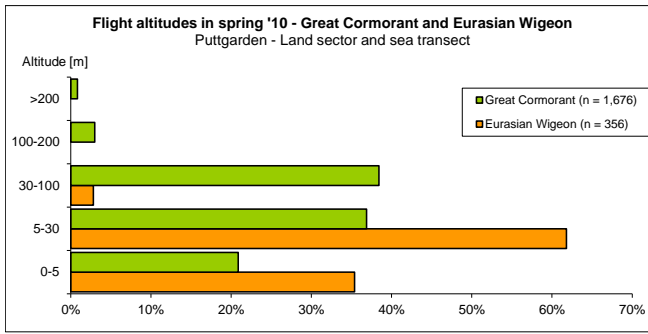
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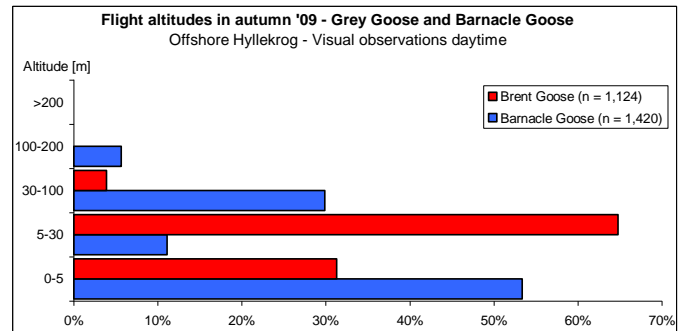
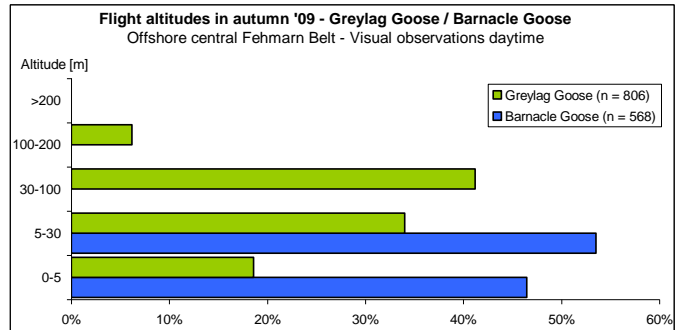
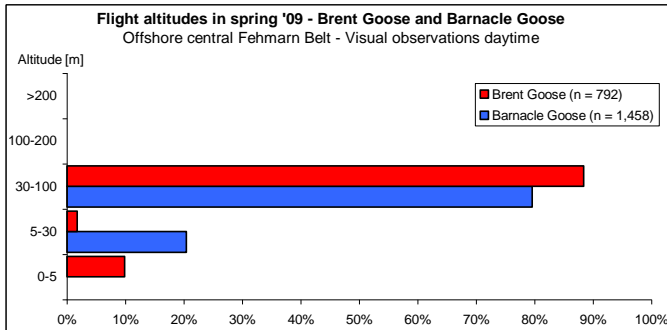
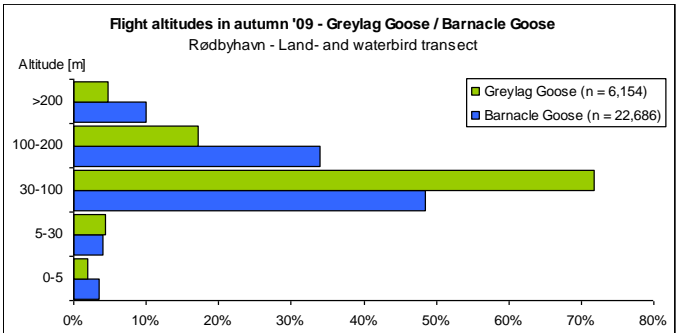
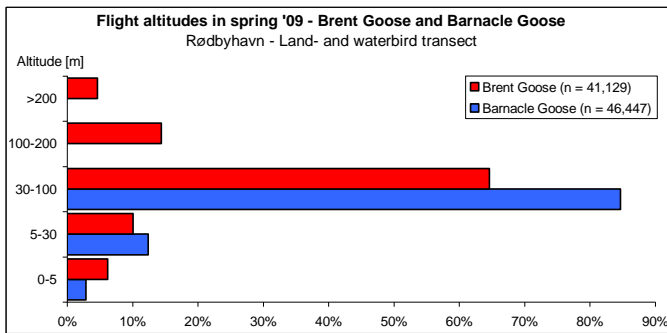
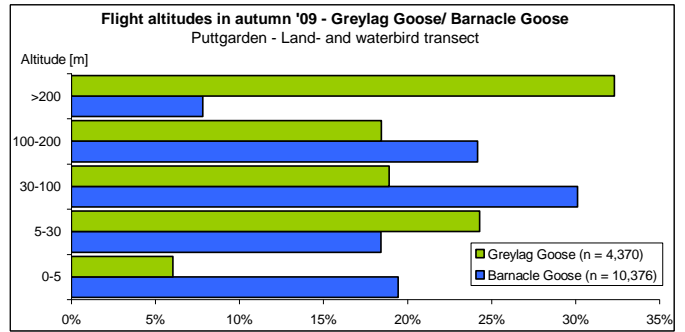
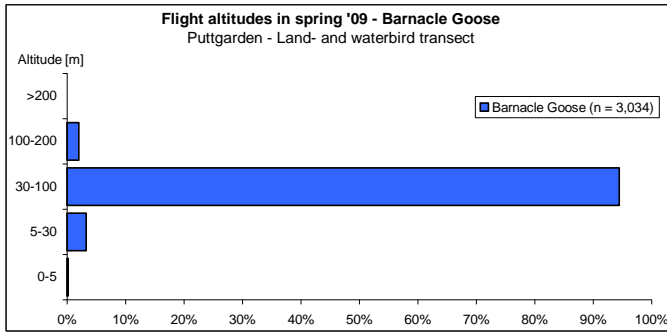
Great Cormorant / Eurasian Wigeon – *Phalacrocorax carbo* / *Anas penelope*



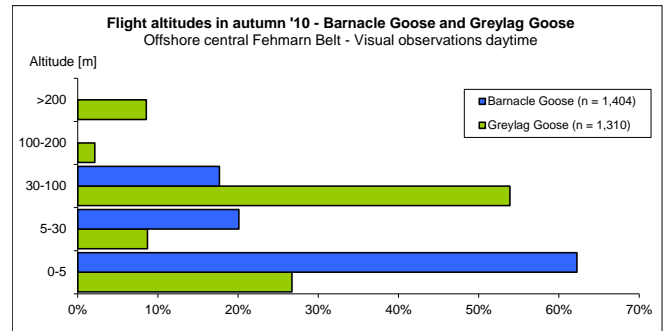
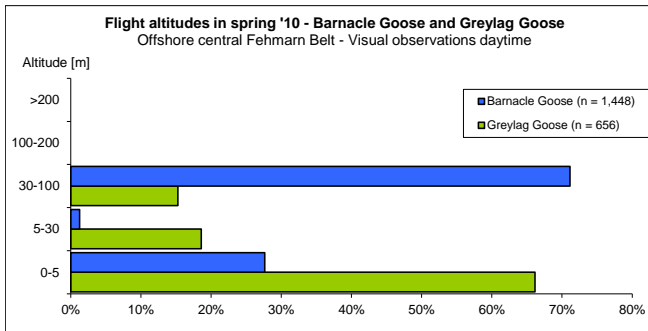
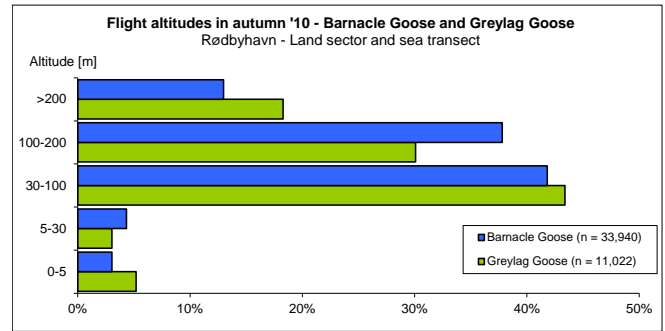
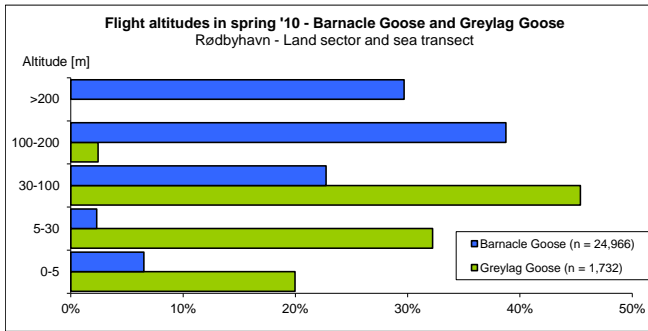
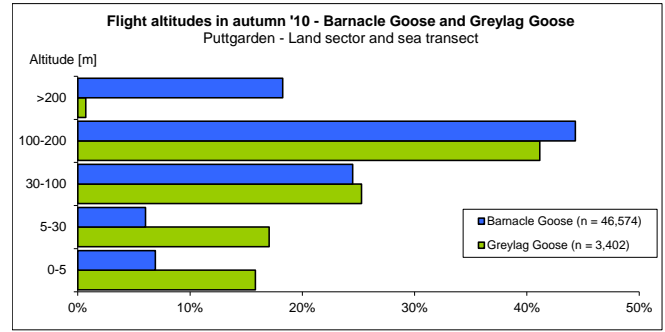
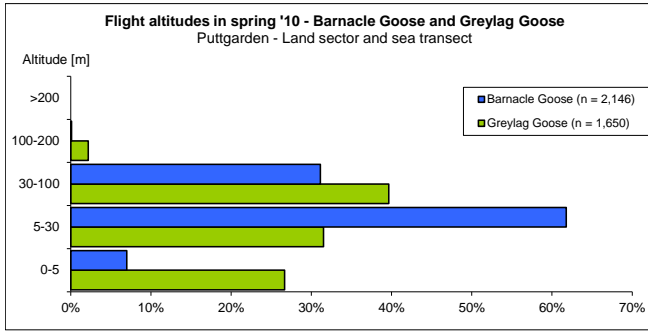
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Geese

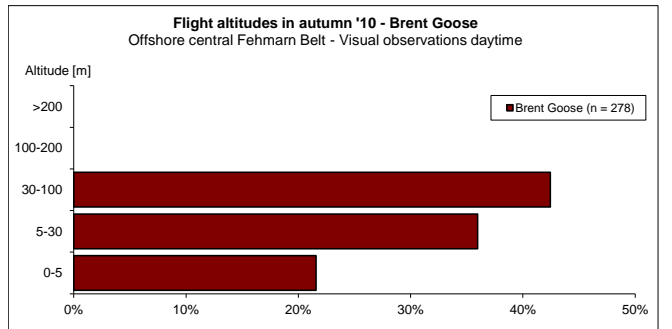
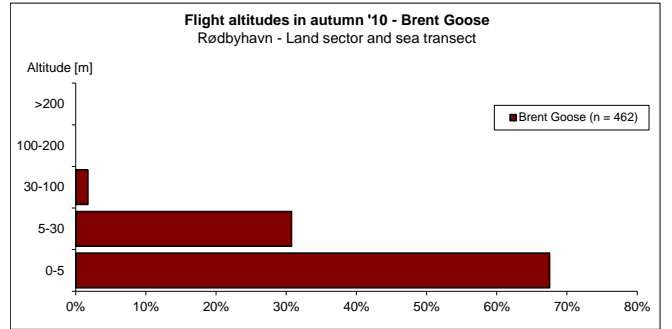
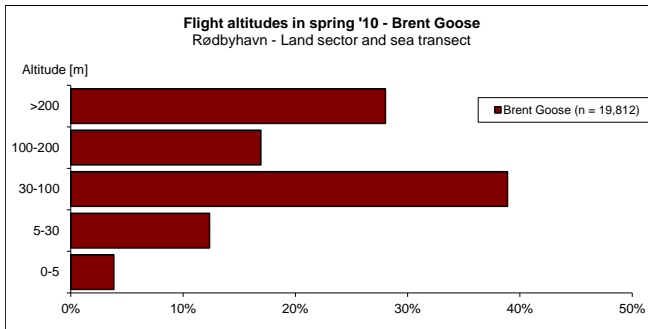
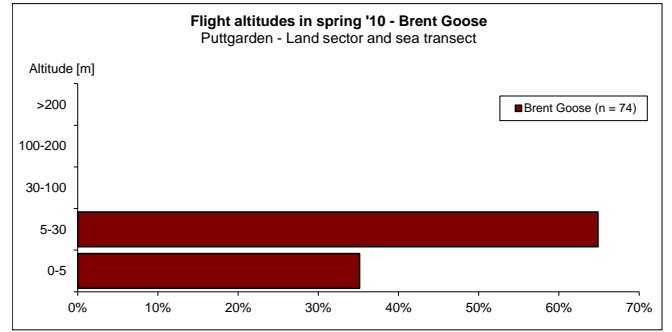
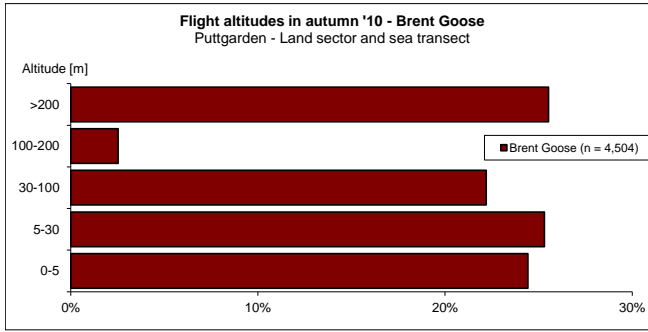


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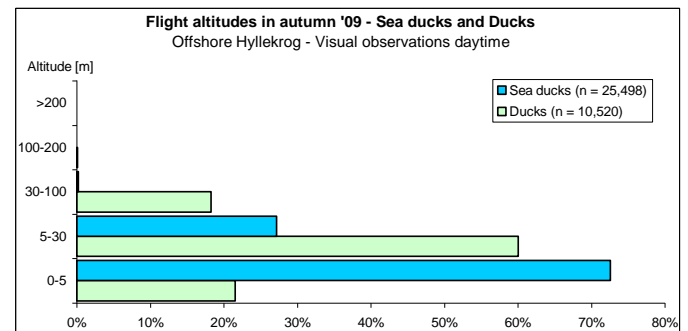
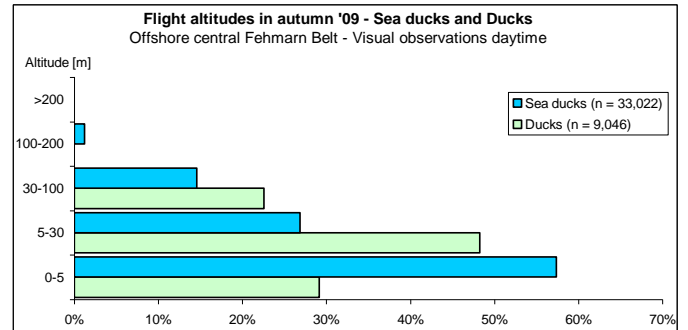
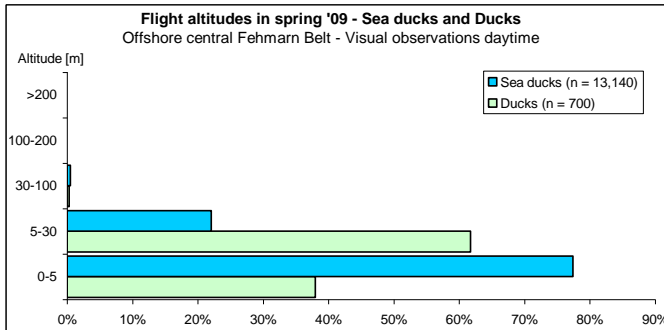
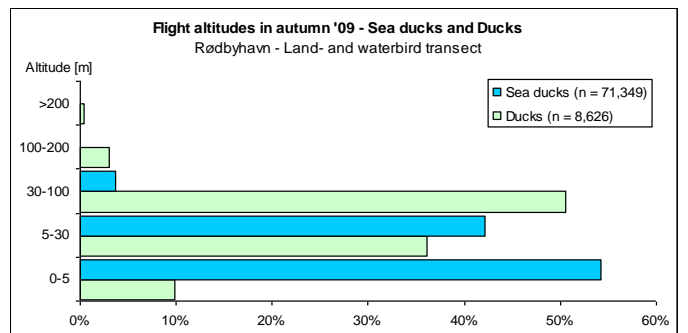
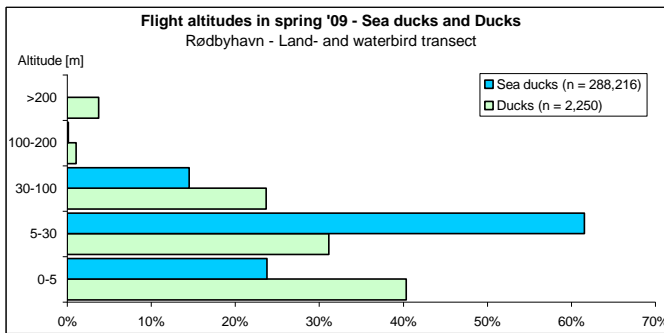
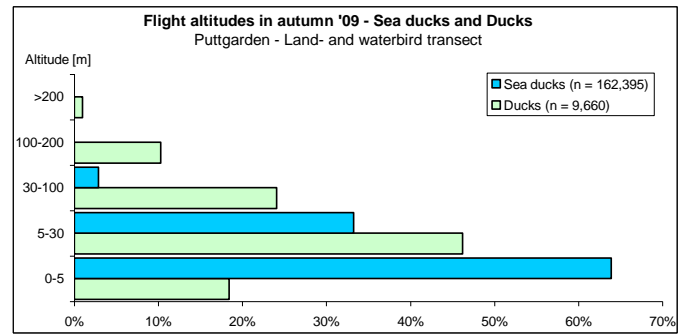
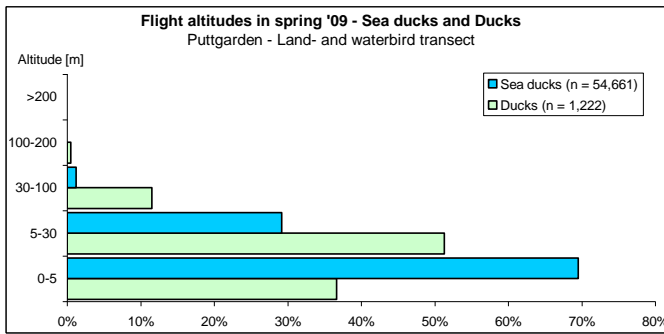


No Brent Goose data from 2009

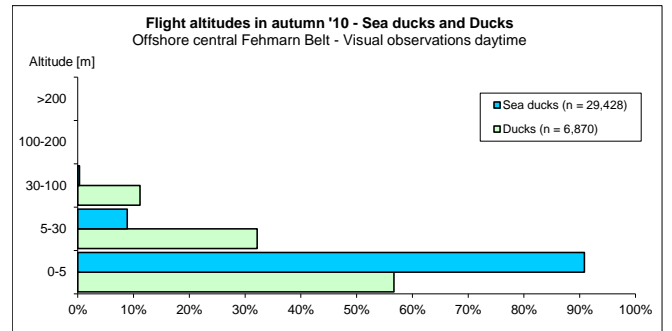
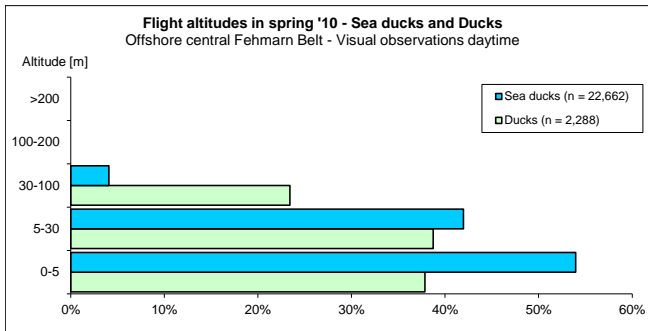
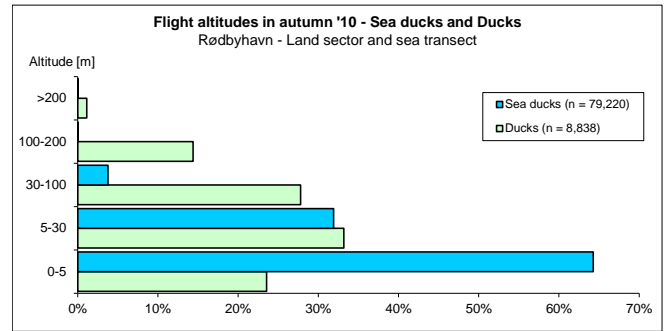
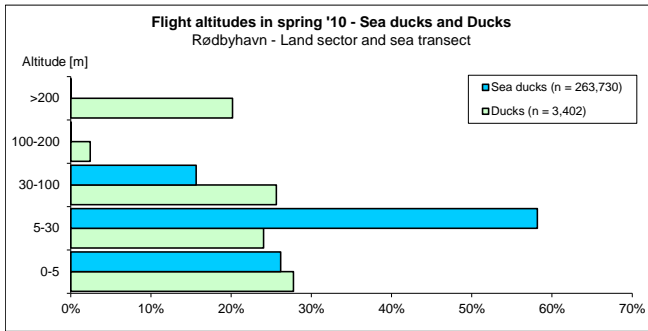
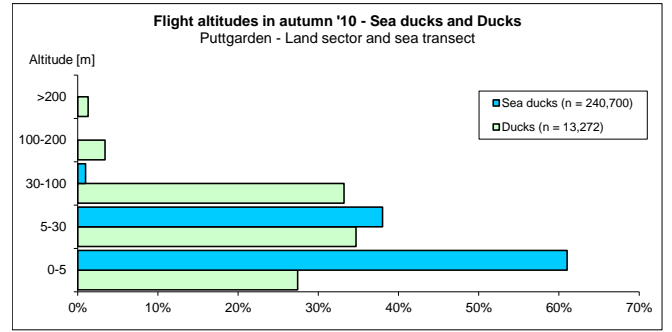
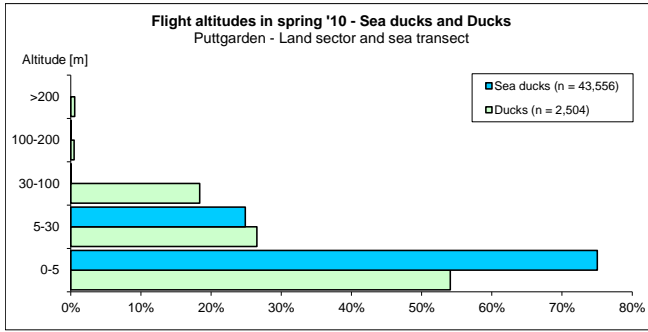
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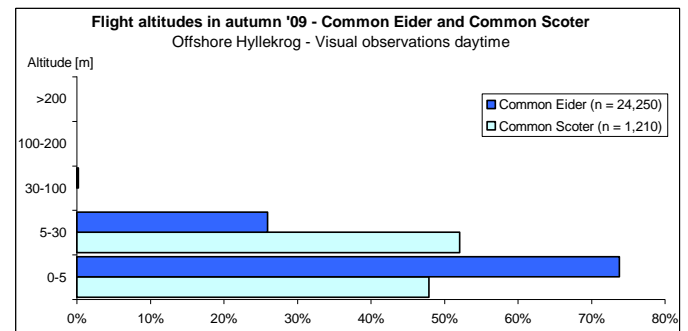
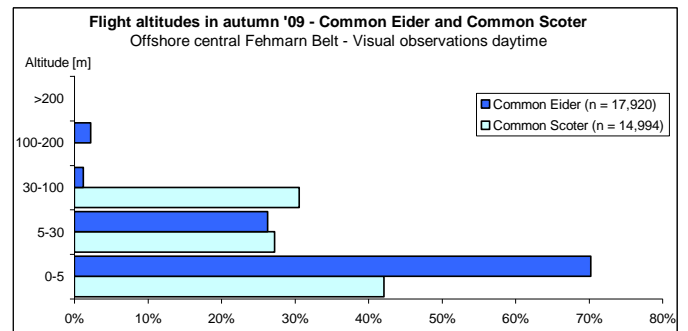
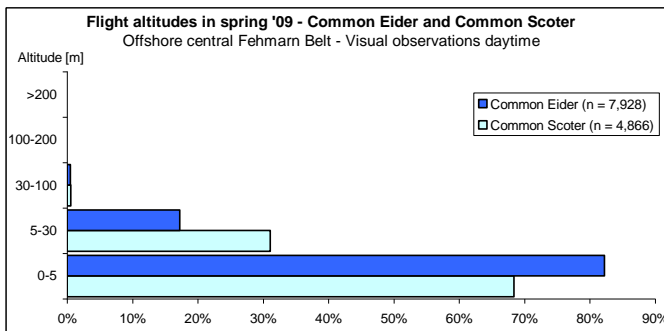
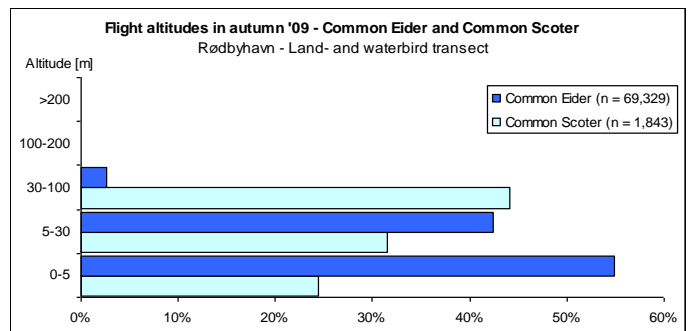
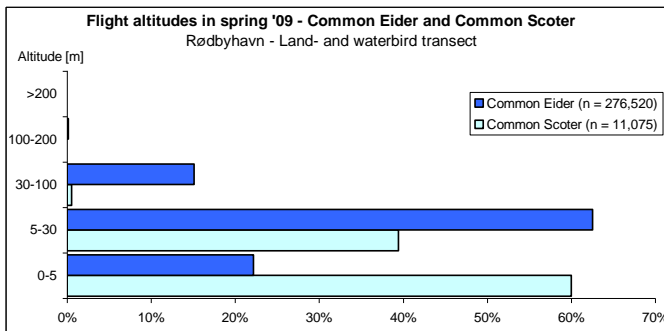
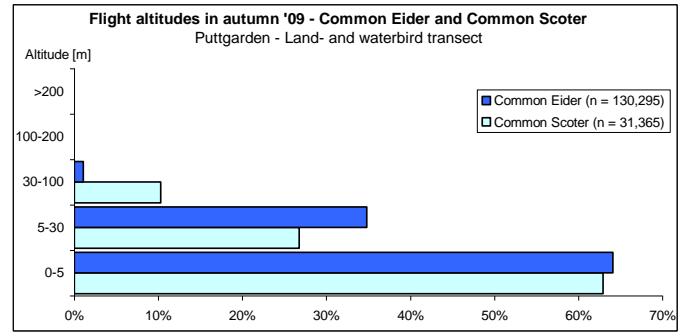
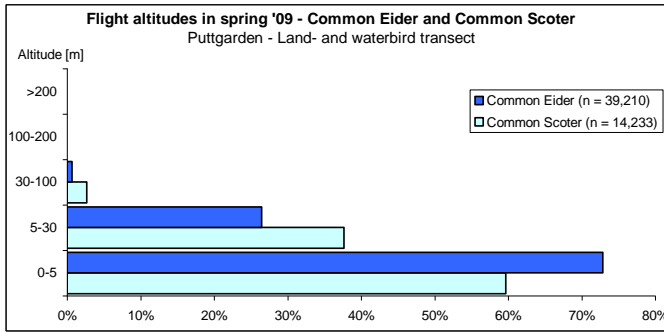
Seaducks / other ducks



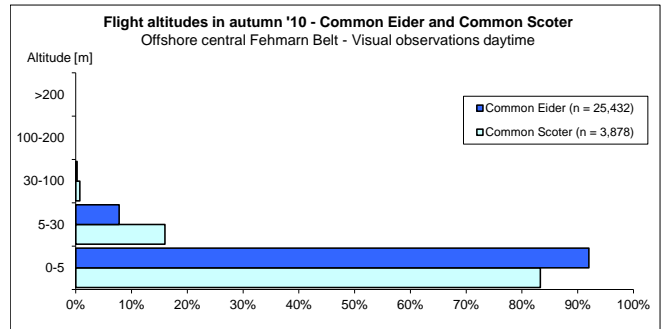
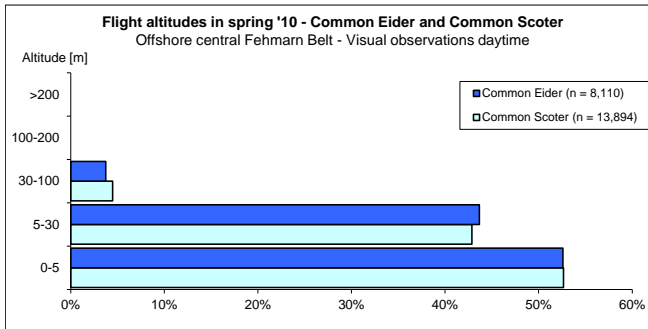
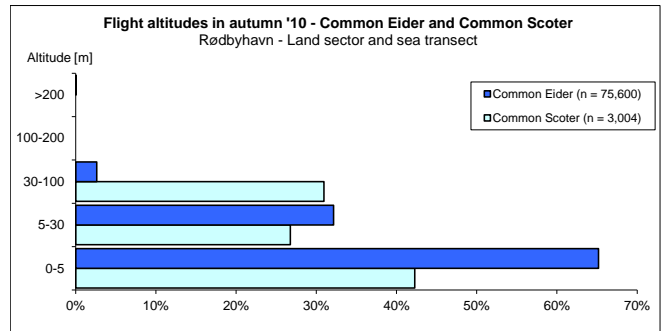
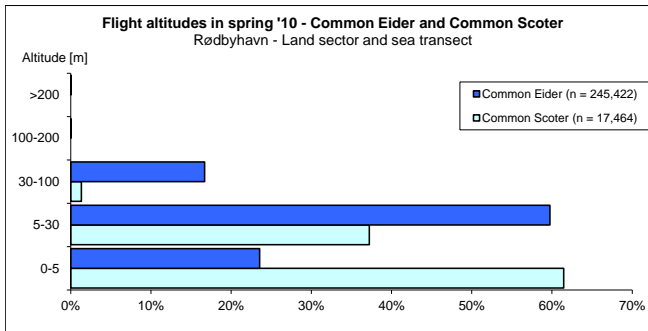
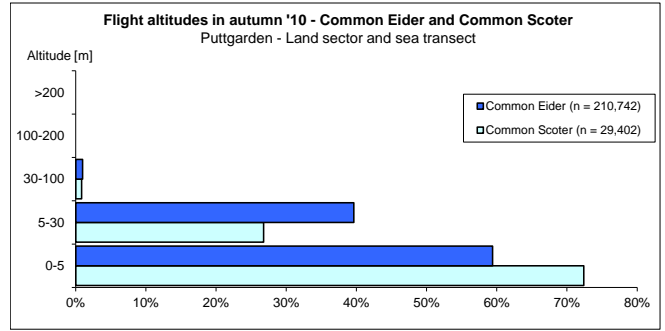
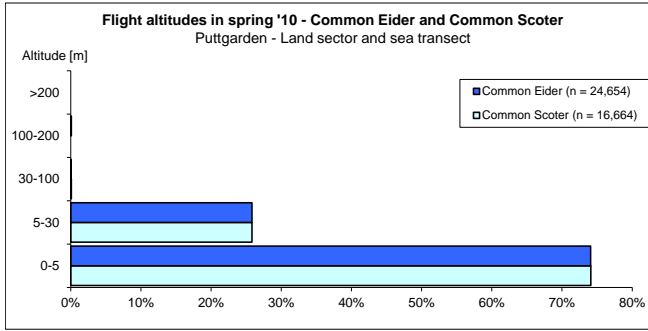
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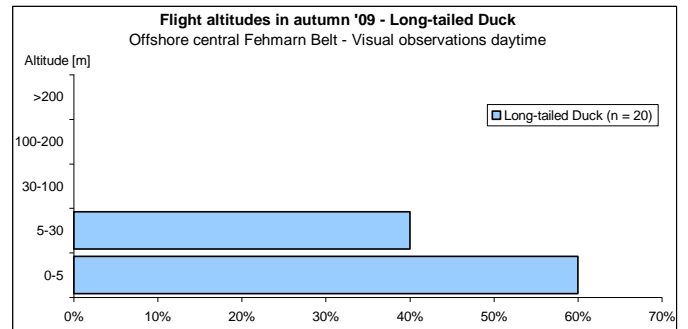
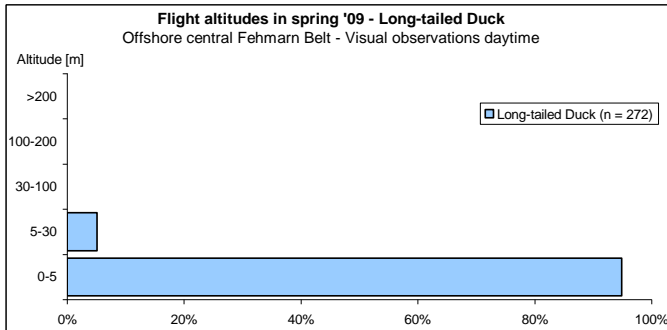
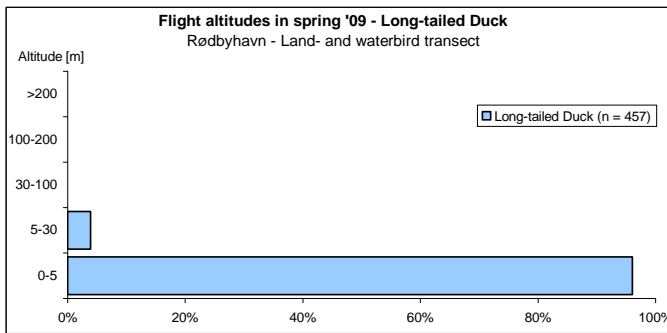
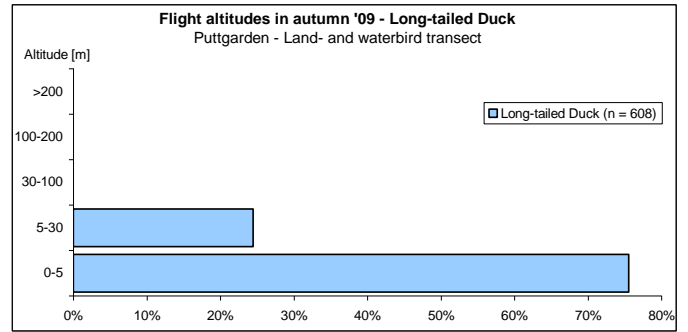
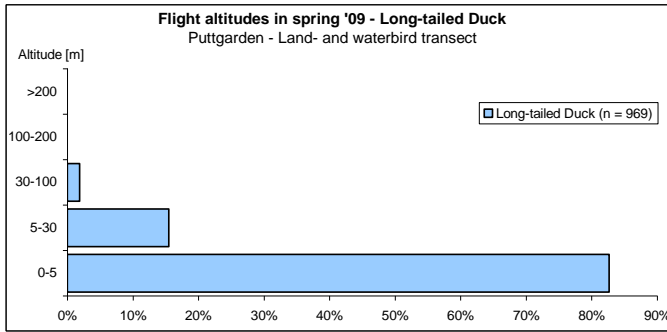
Common Eider / Common Scoter – *Somateria mollissima* / *Melanitta nigra*



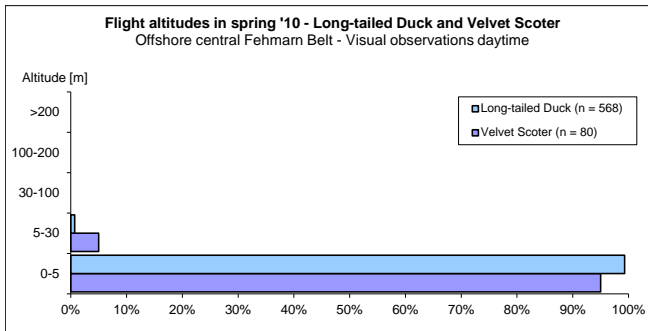
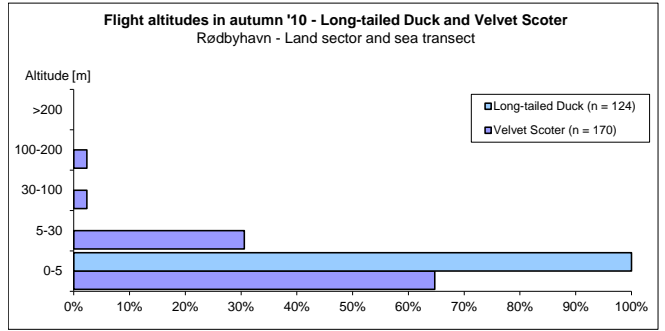
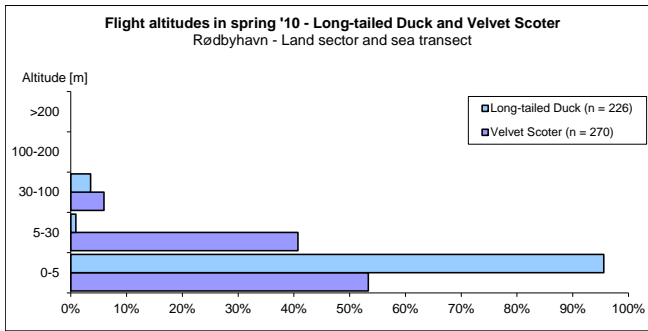
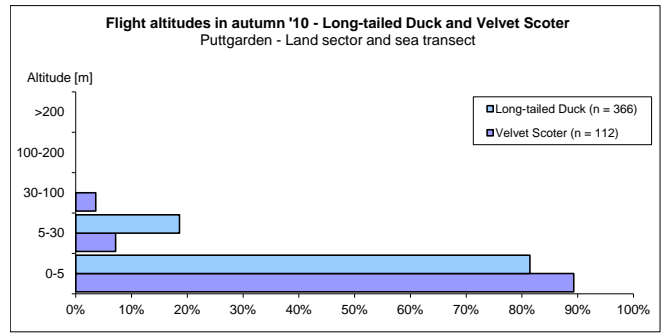
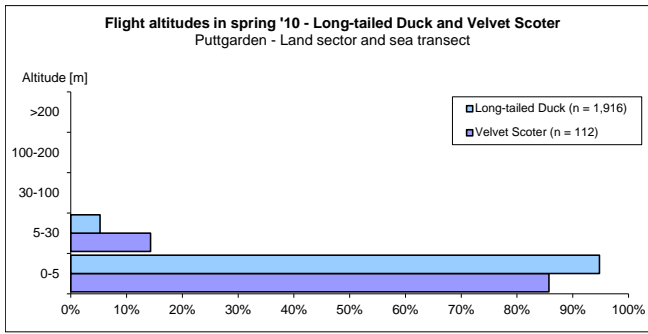
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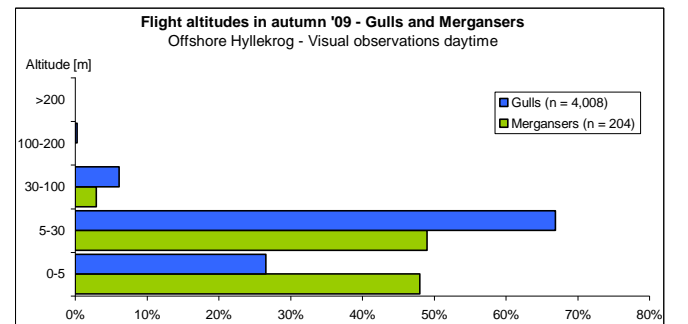
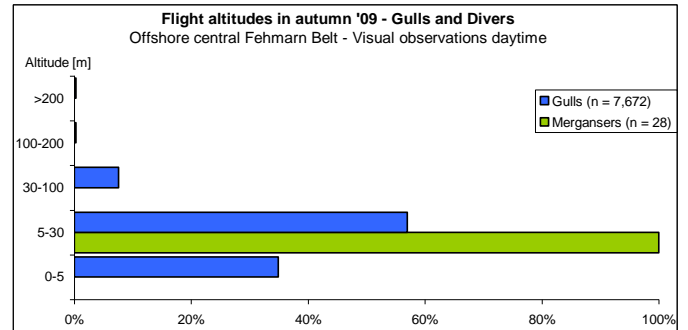
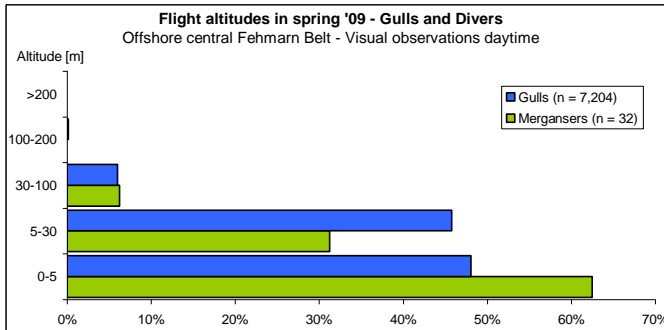
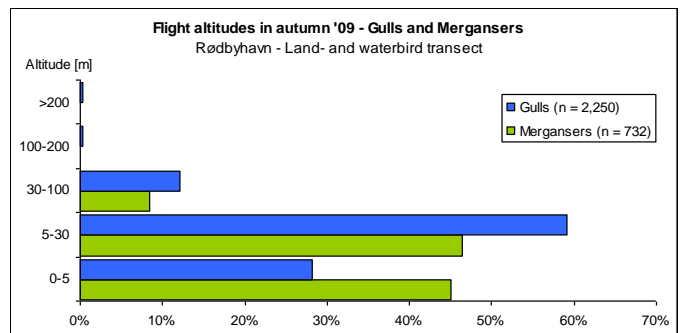
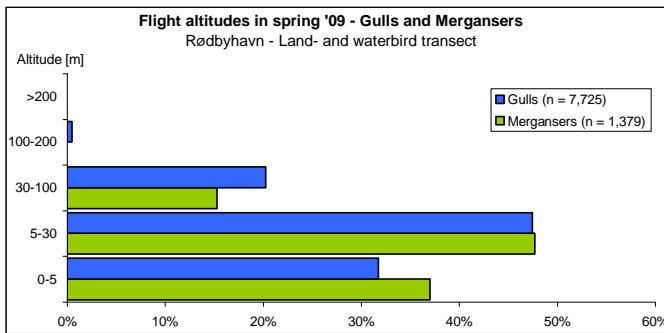
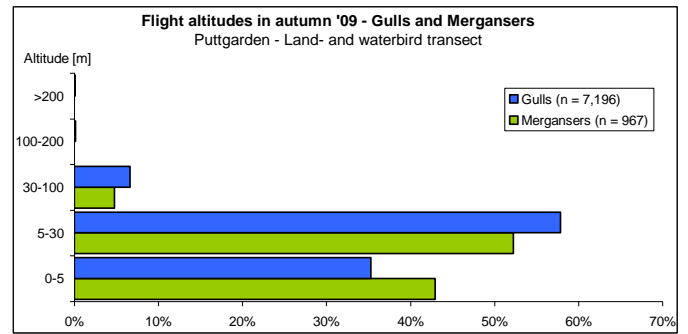
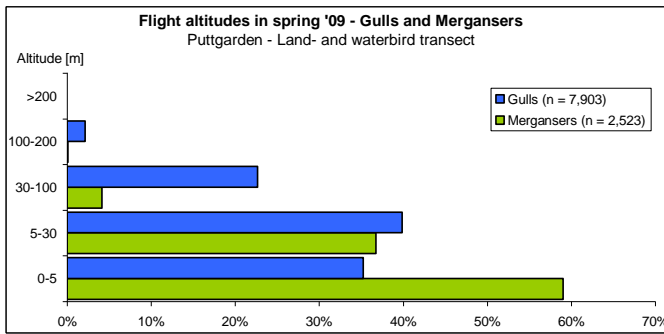
Long-tailed Duck – *Clangula hyemalis*



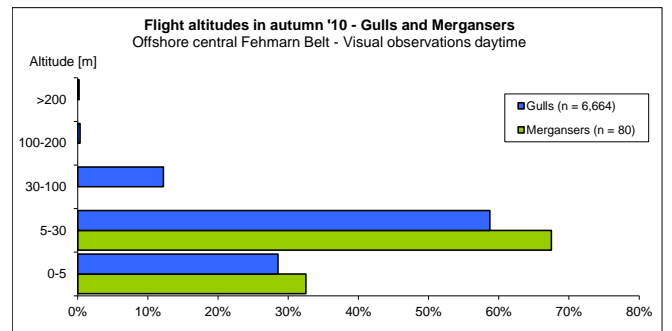
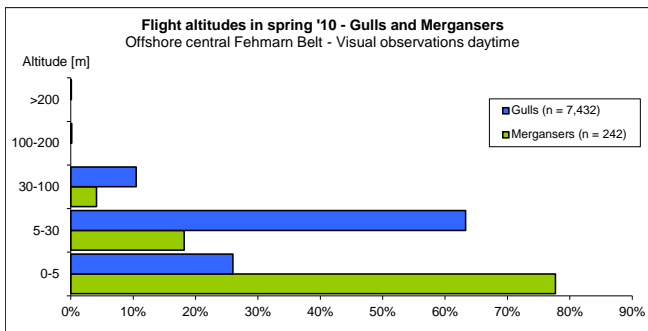
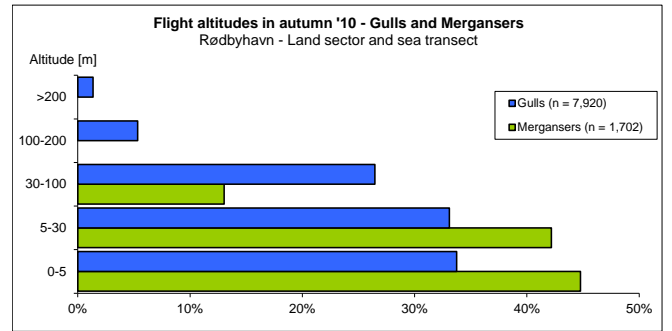
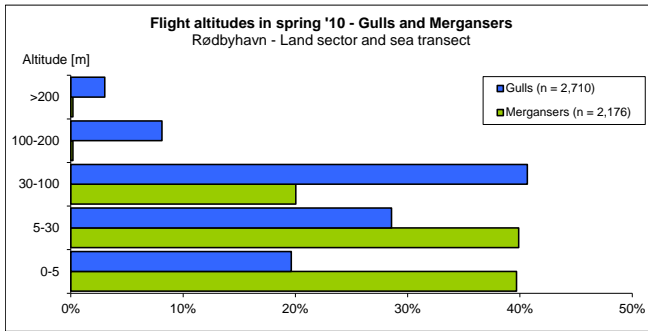
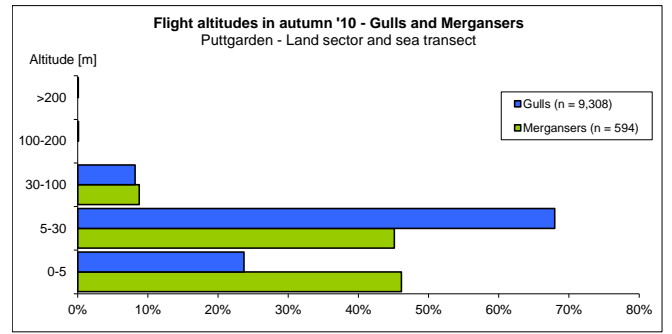
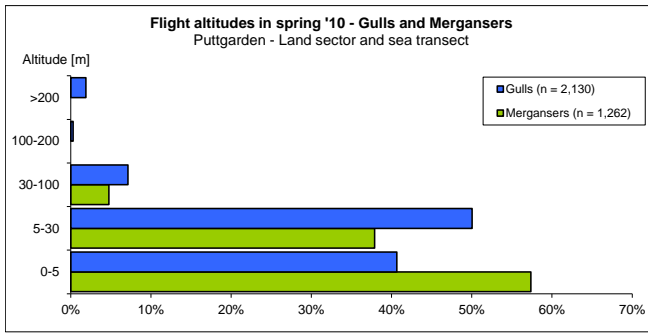
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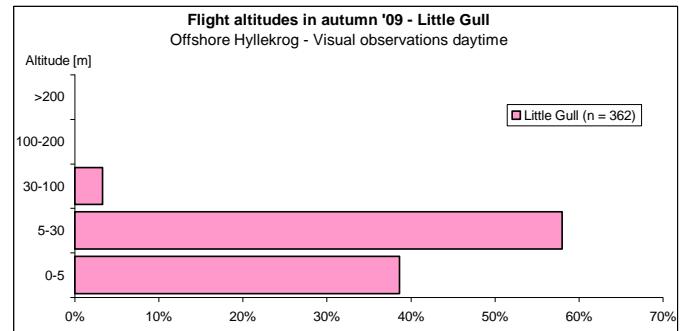
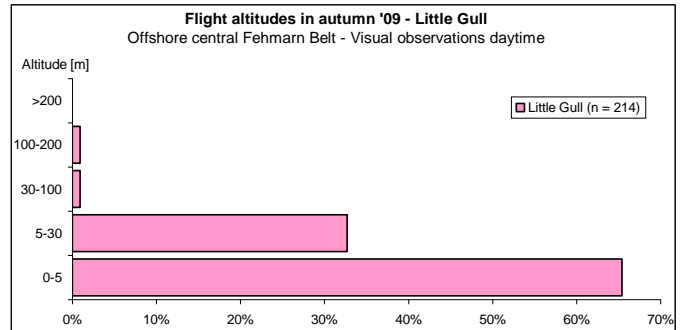
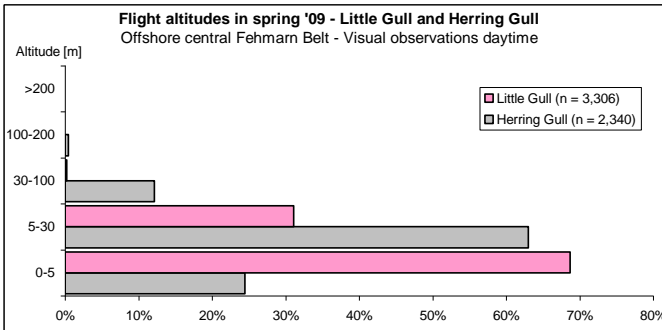
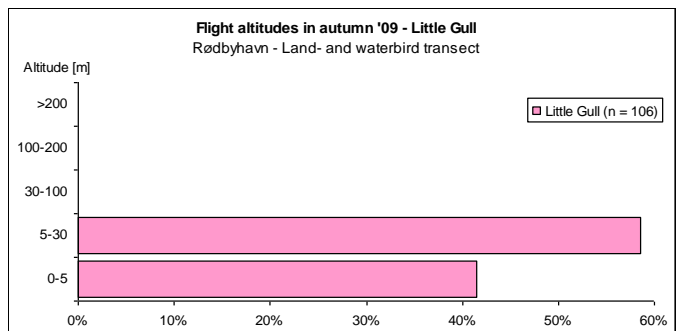
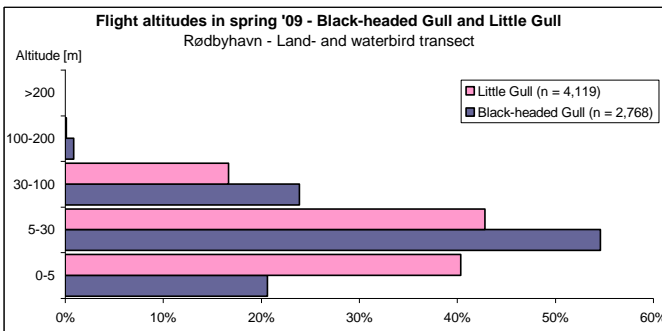
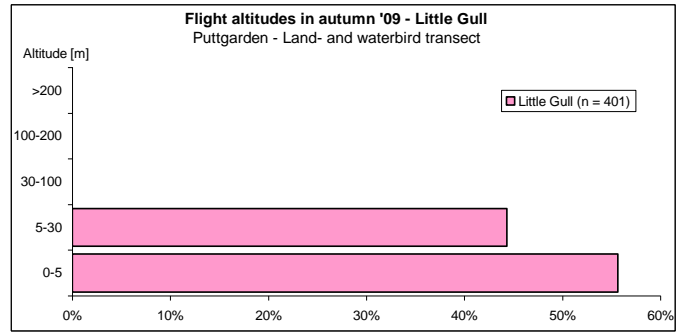
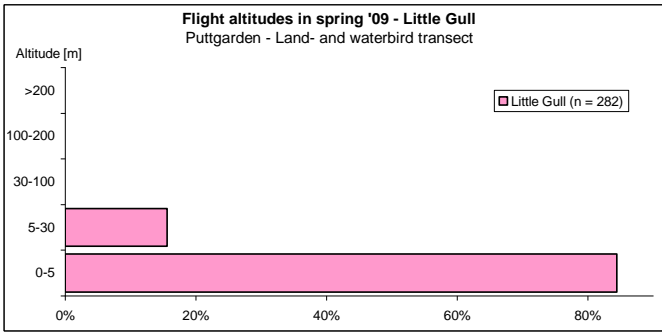
Gulls / mergansers – *Larus spp.* / *Mergus spp.*



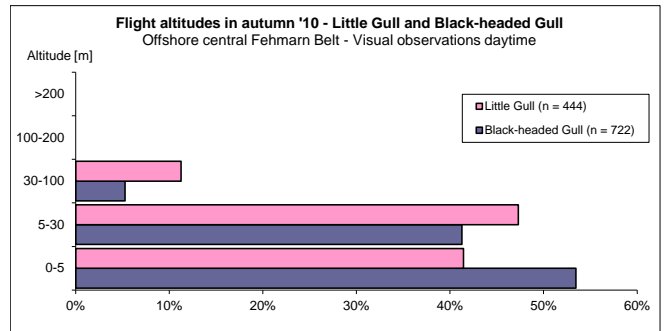
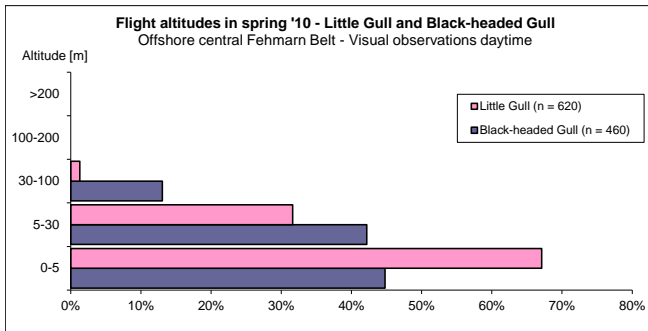
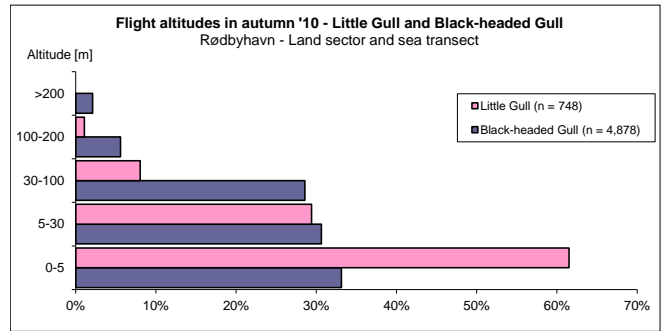
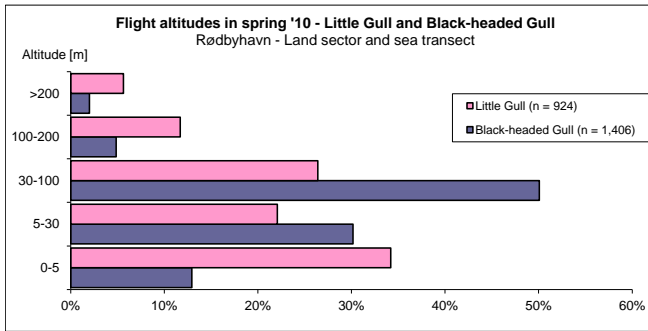
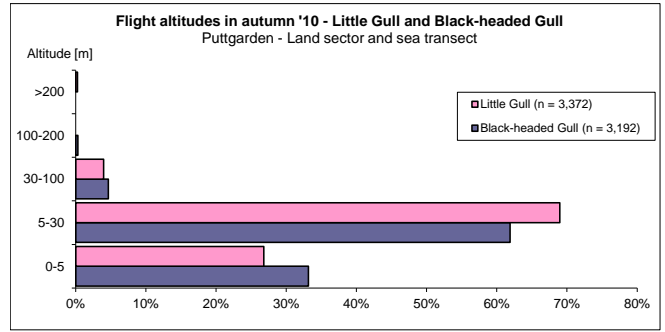
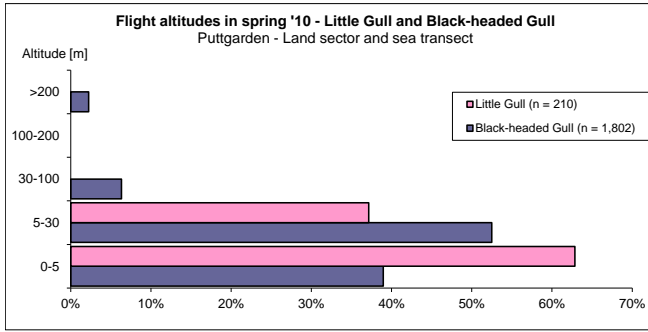
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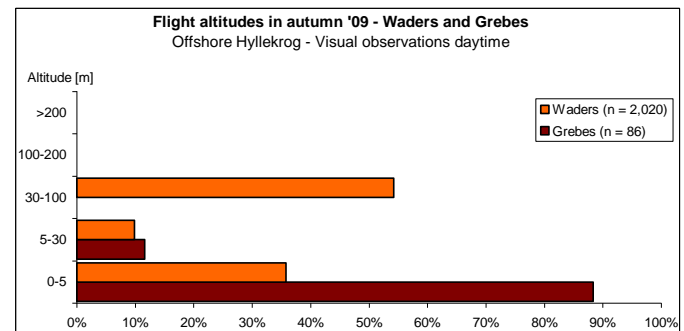
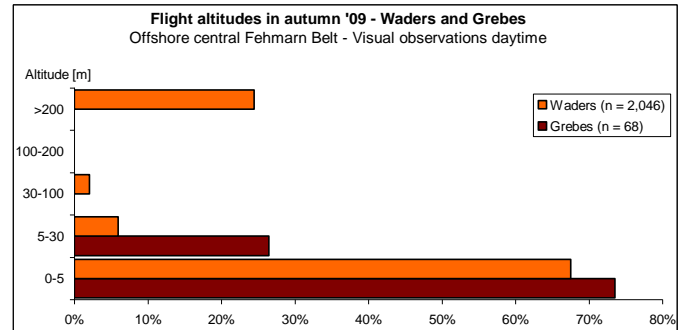
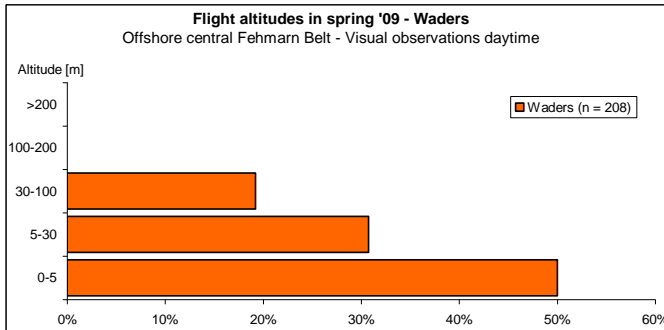
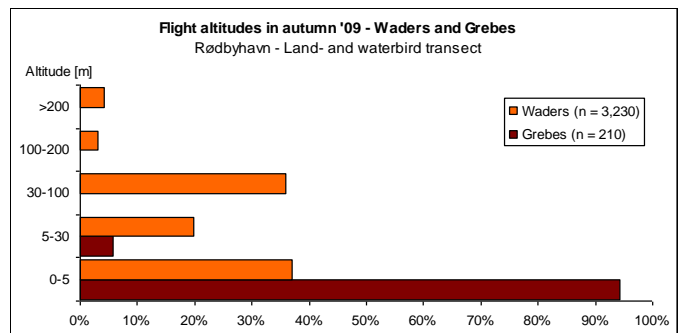
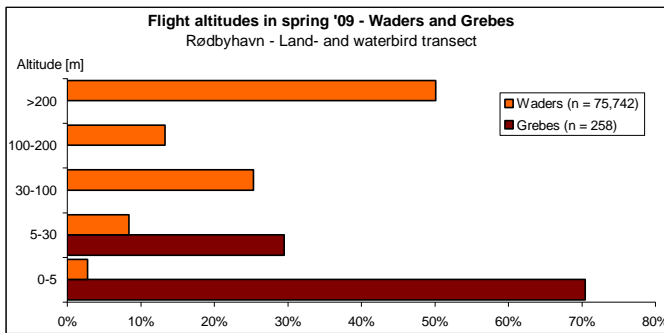
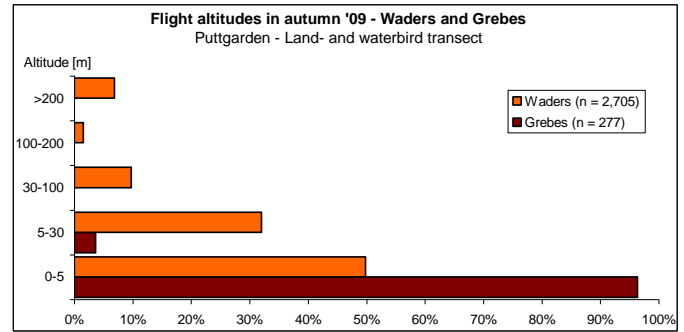
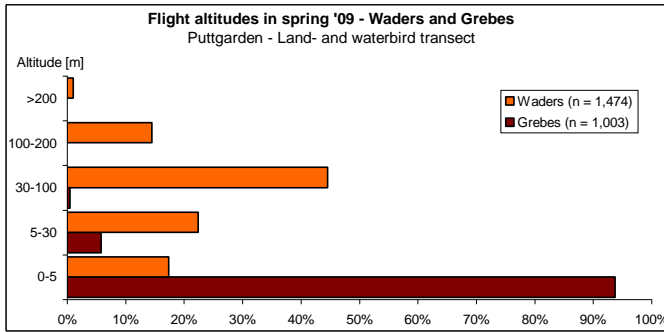
Little Gull – *Larus minutus*



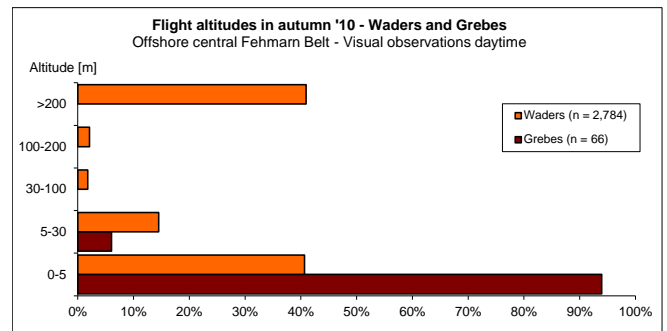
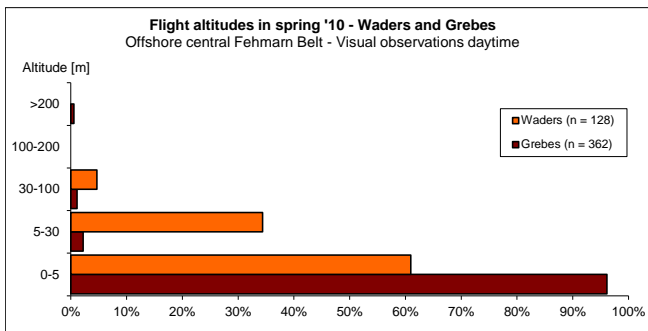
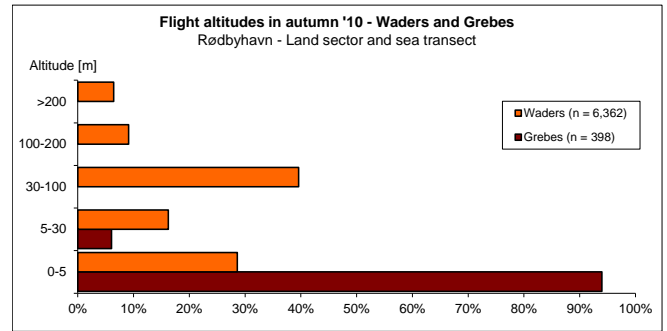
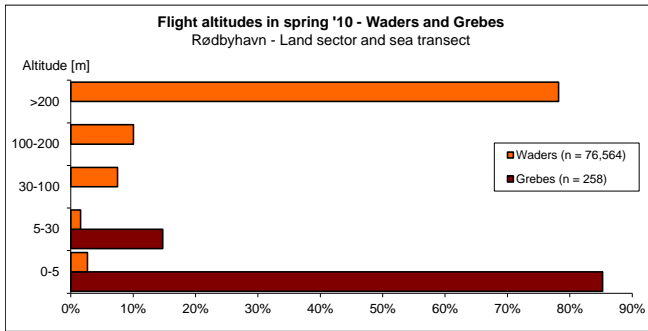
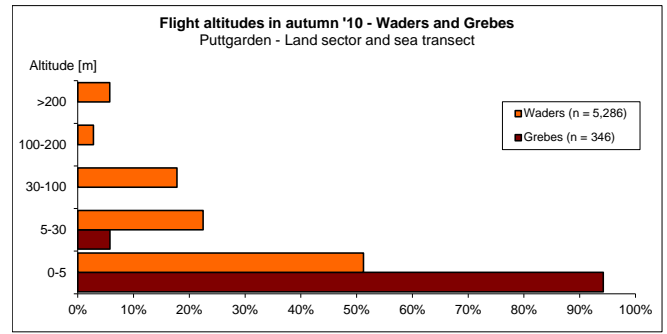
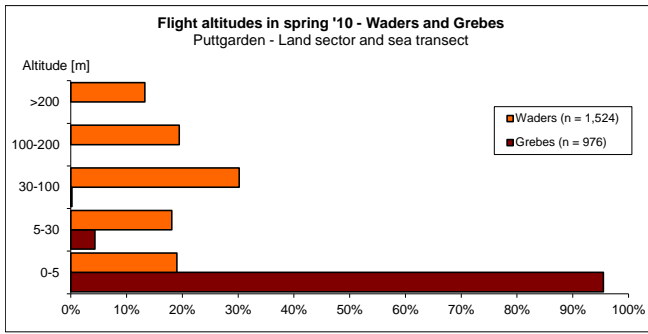
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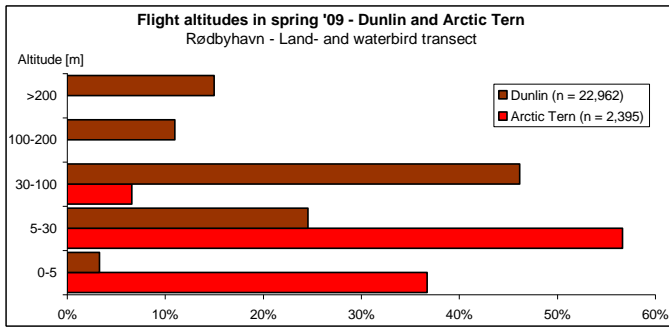
Waders / Grebes



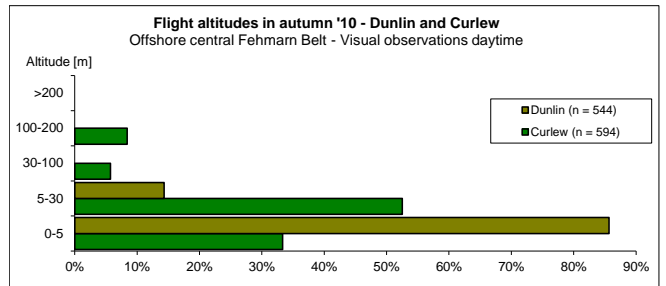
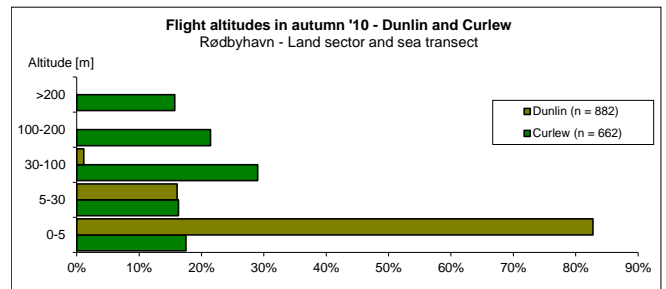
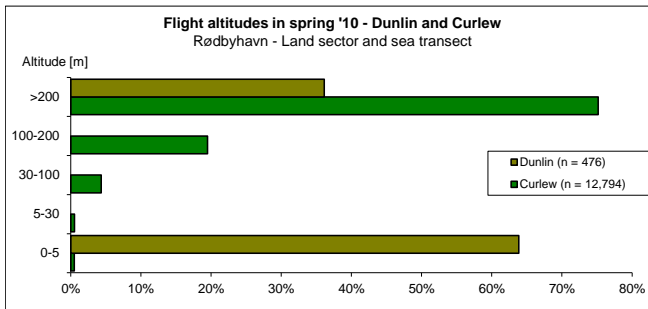
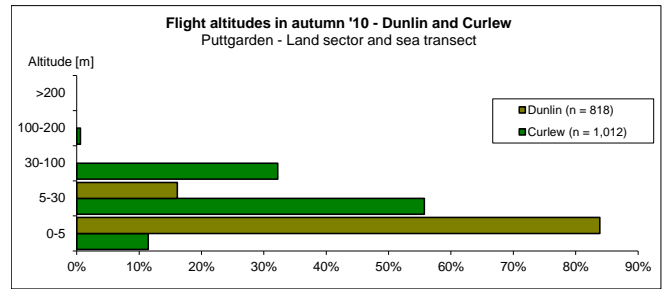
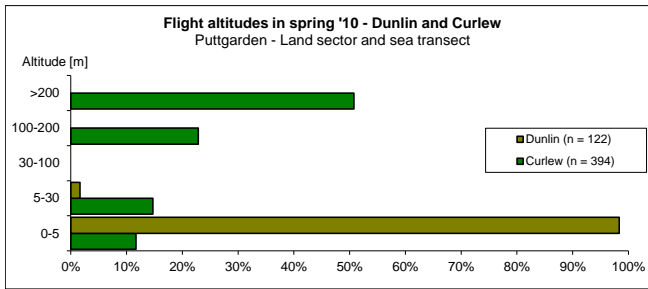
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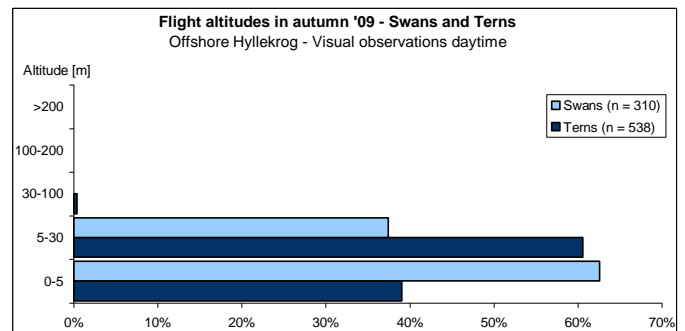
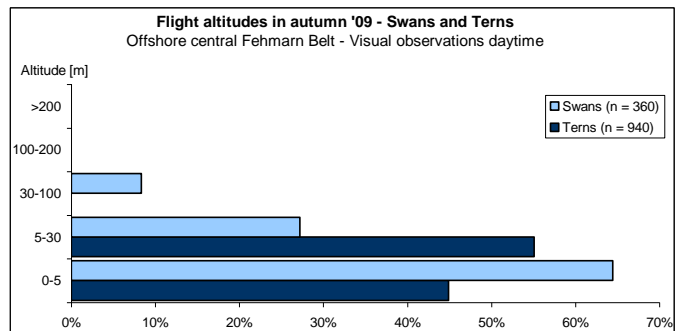
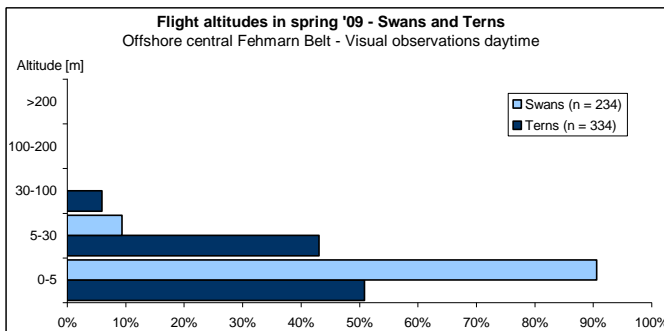
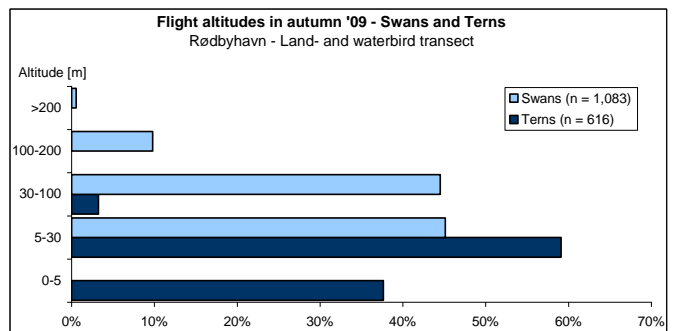
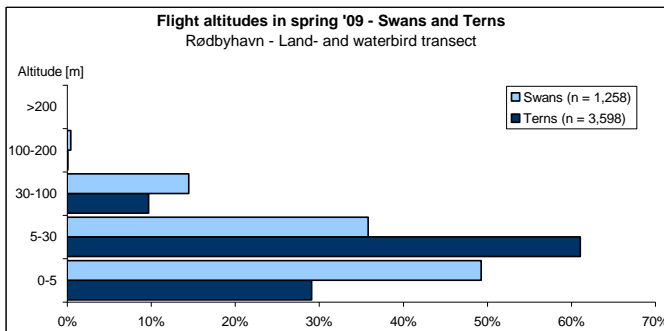
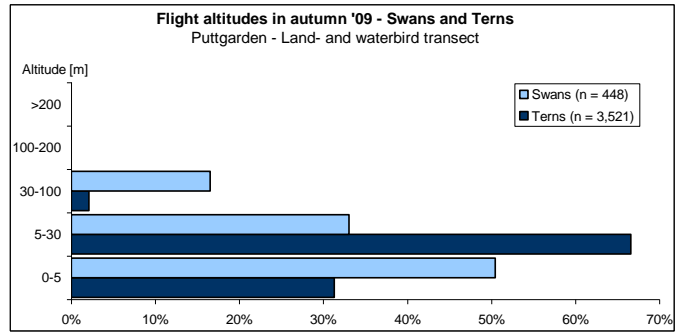
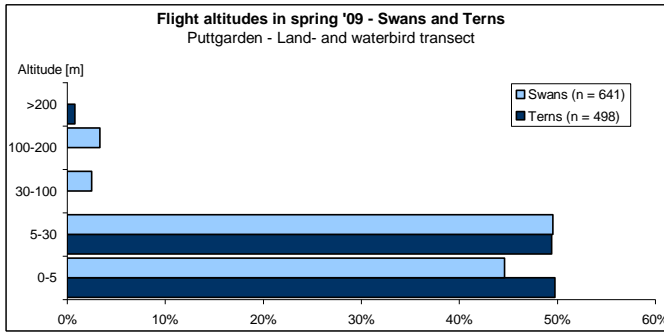
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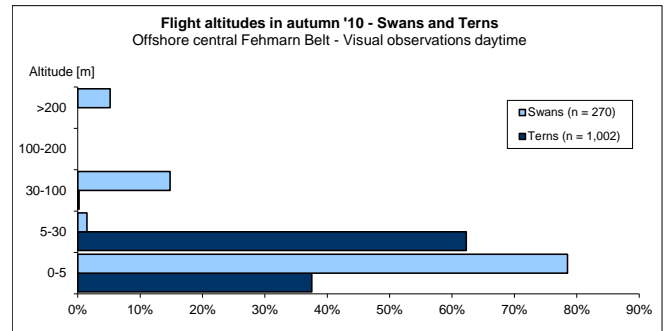
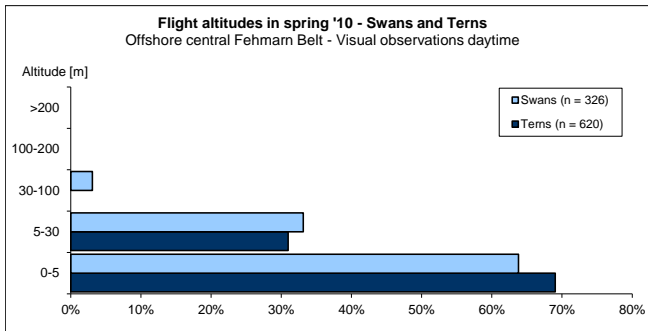
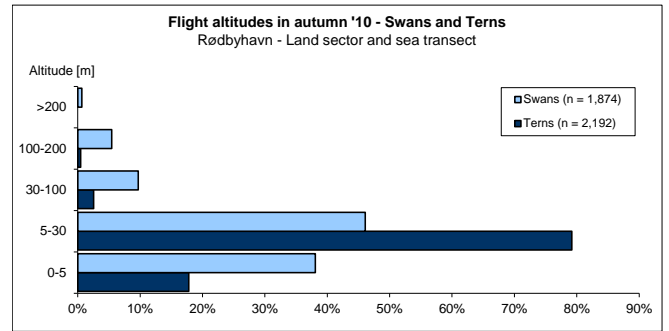
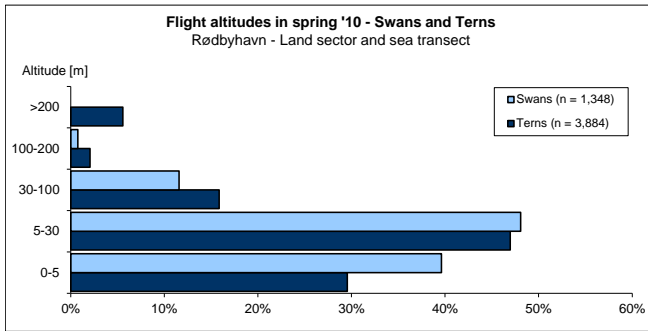
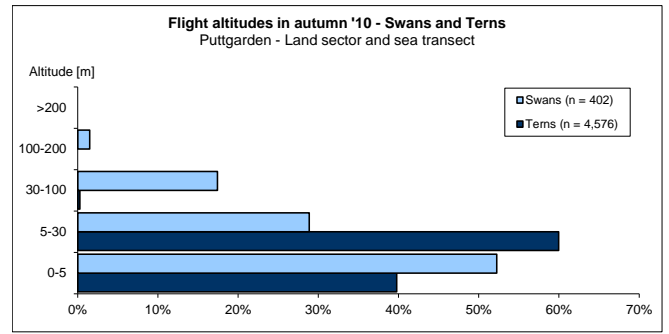
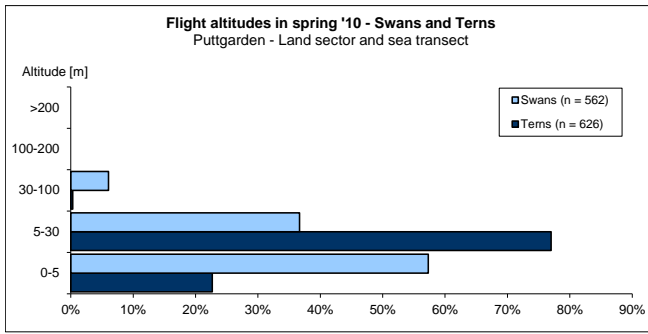
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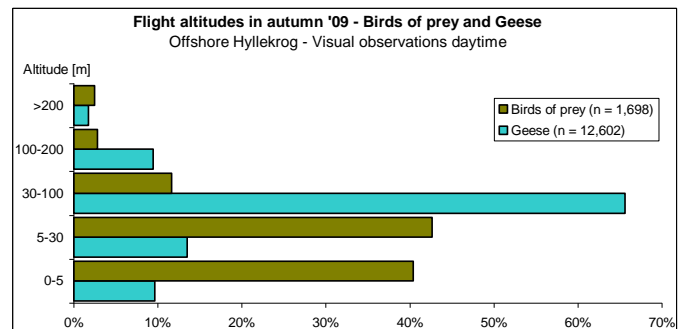
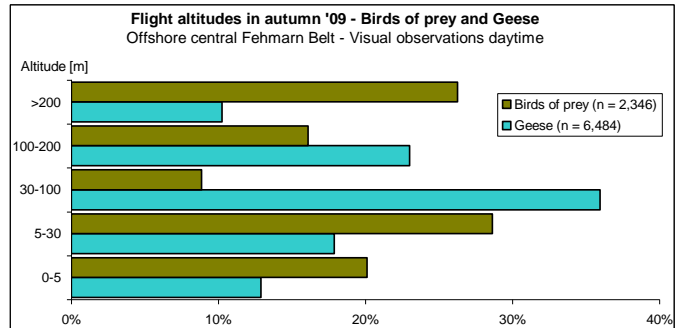
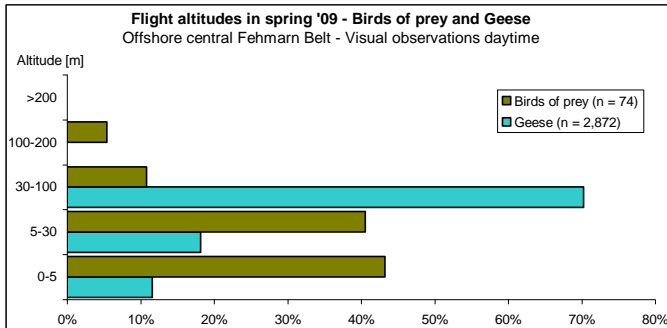
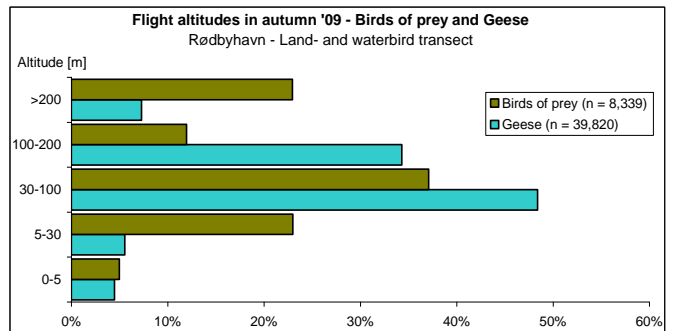
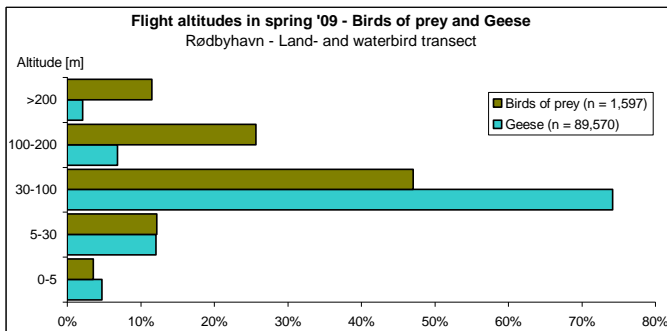
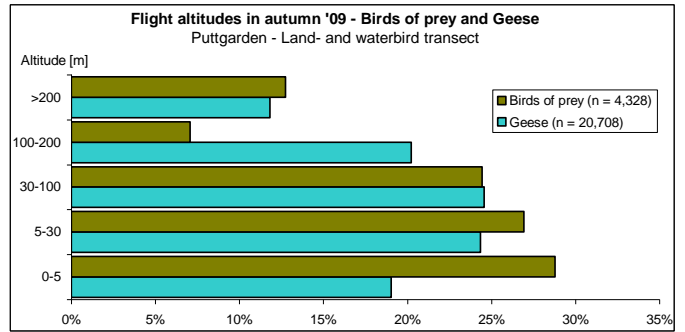
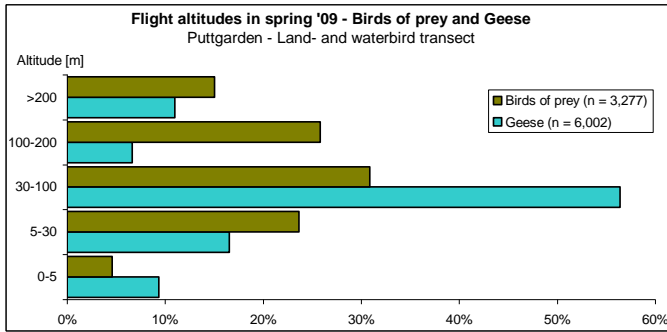
Swans / Terns – *Cygnus spp.* / *Sterna spp.*



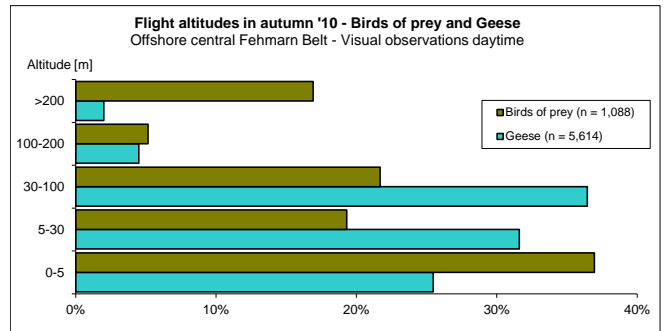
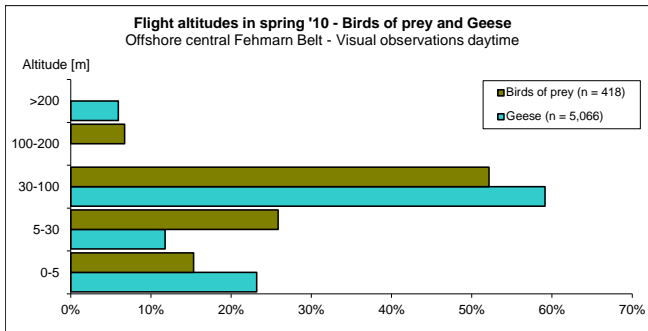
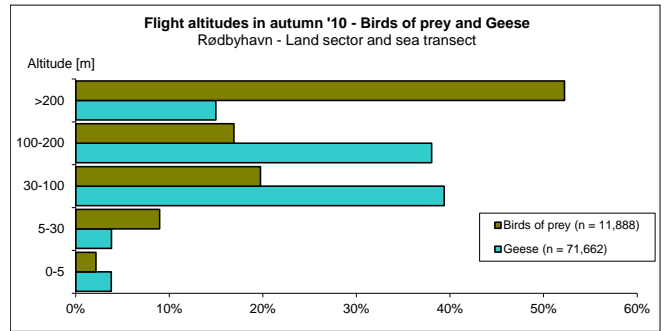
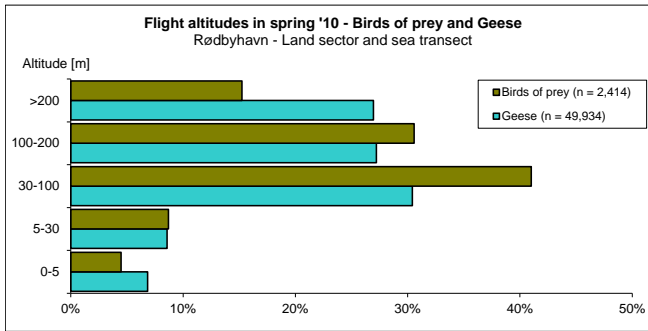
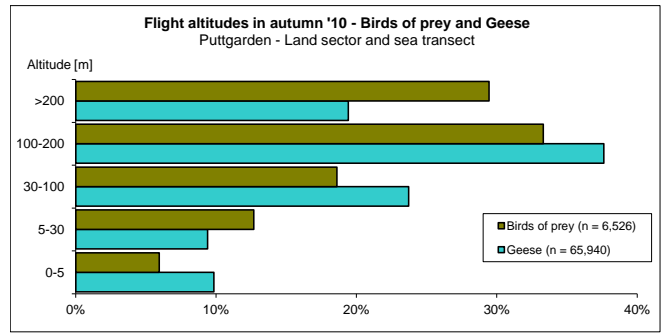
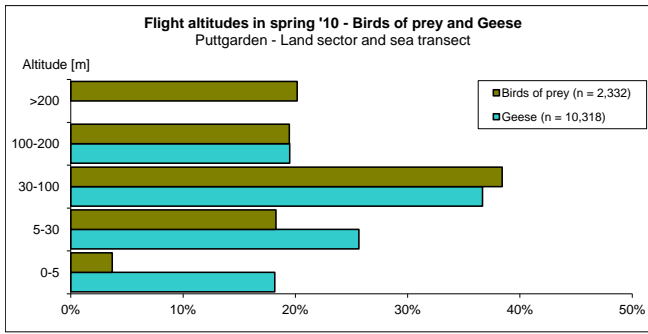
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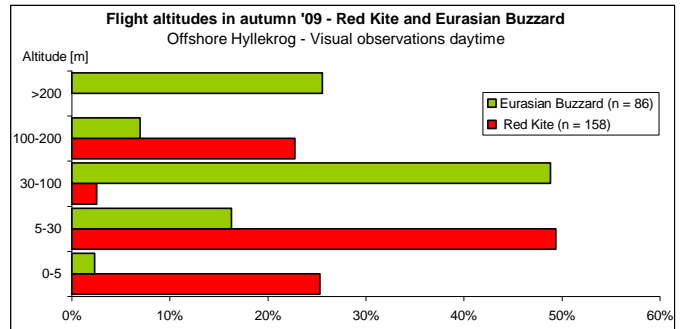
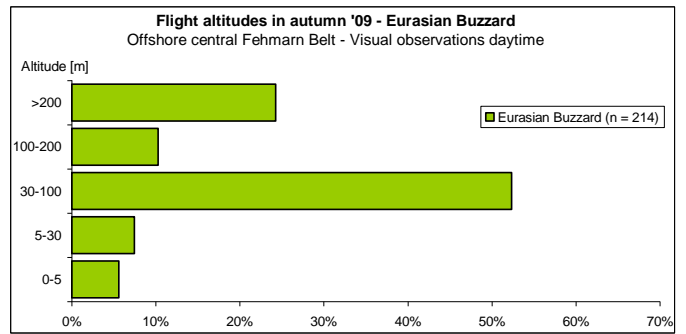
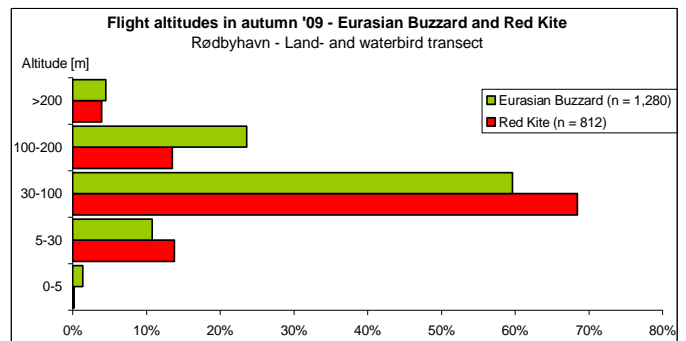
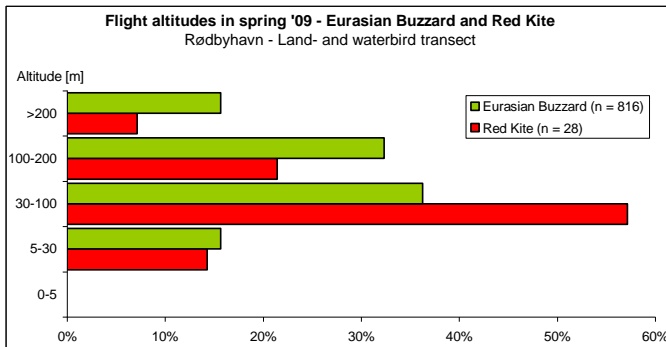
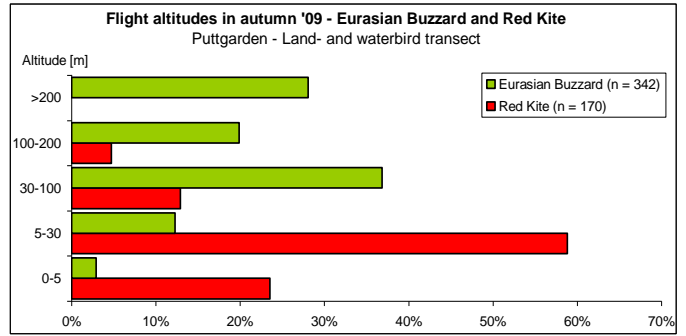
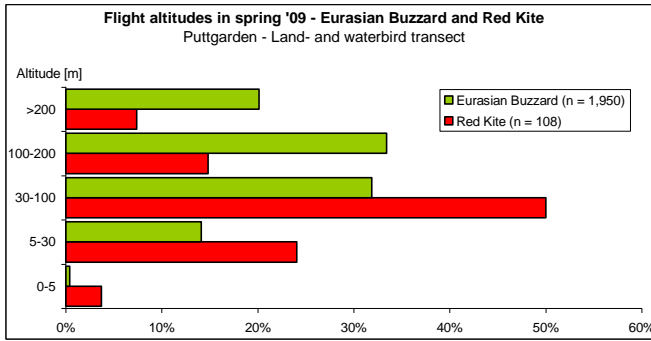
A.5.3 Birds of prey / geese



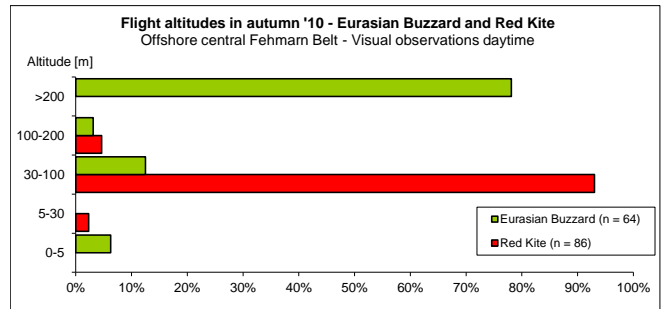
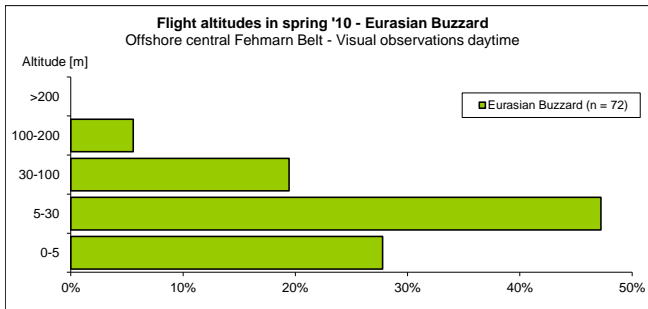
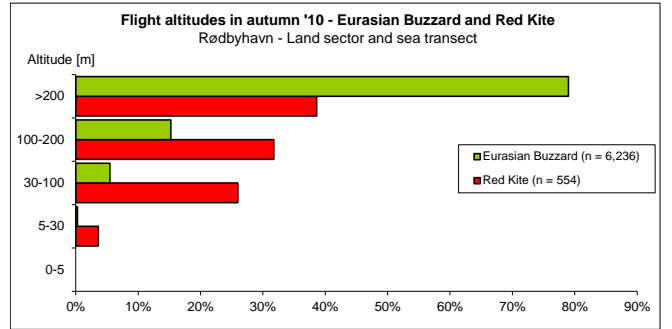
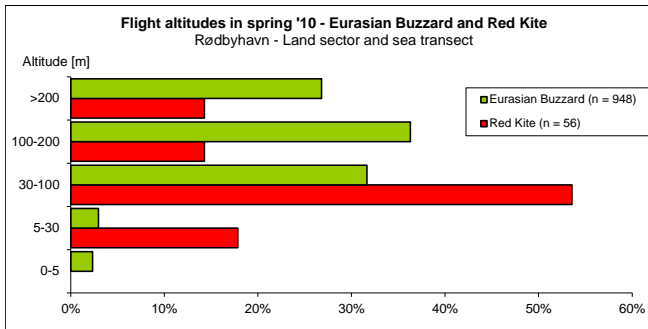
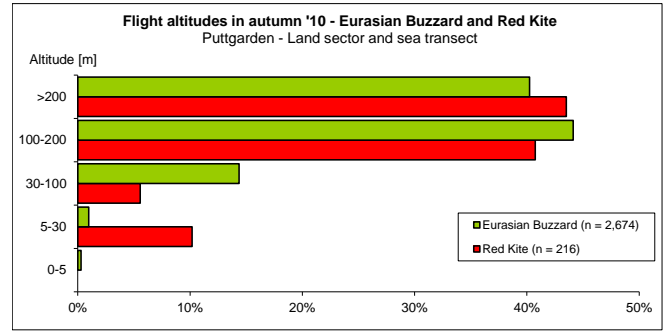
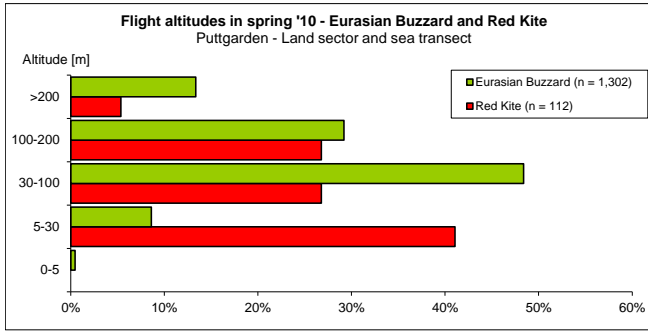
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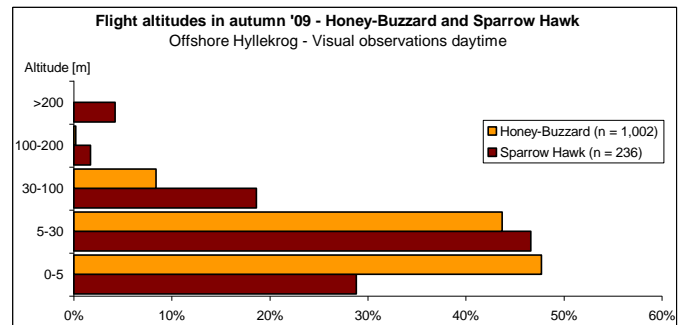
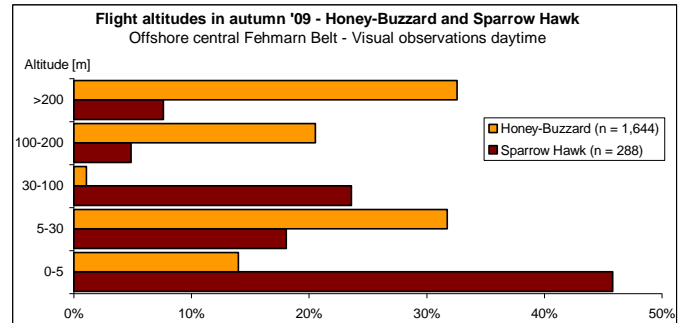
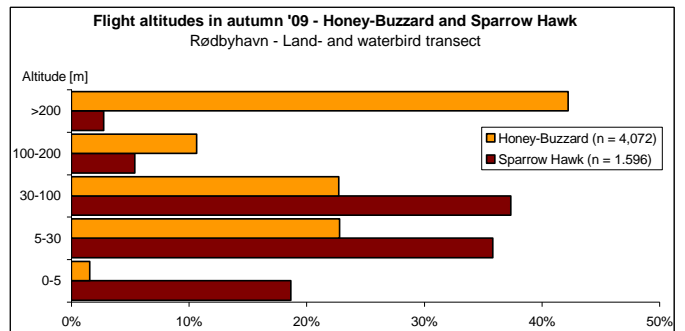
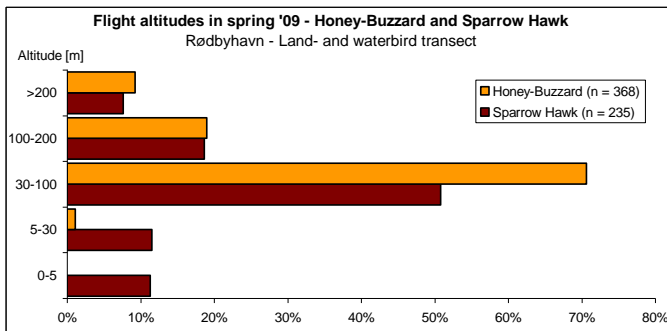
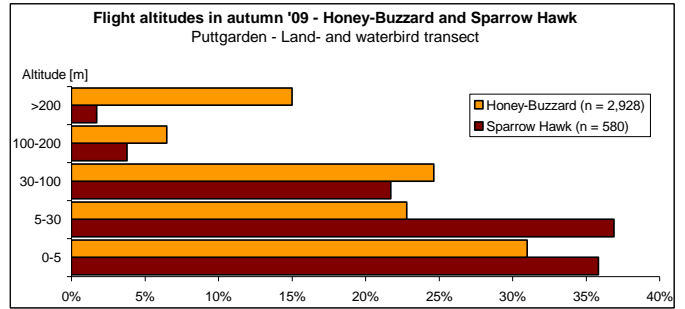
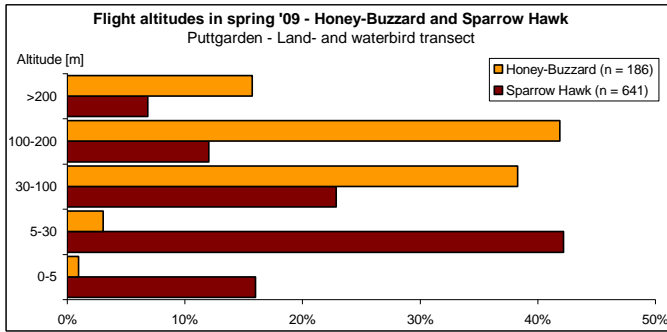
Common Buzzard / Red Kite – *Buteo buteo* / *Milvus milvus*



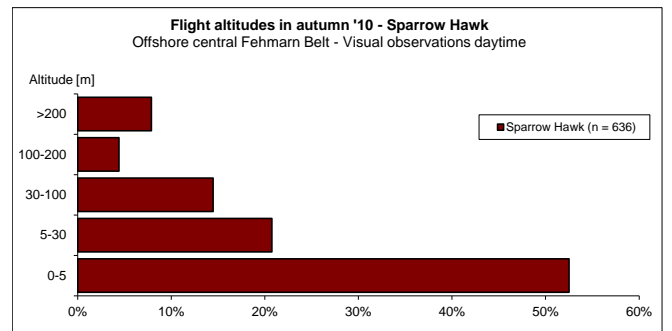
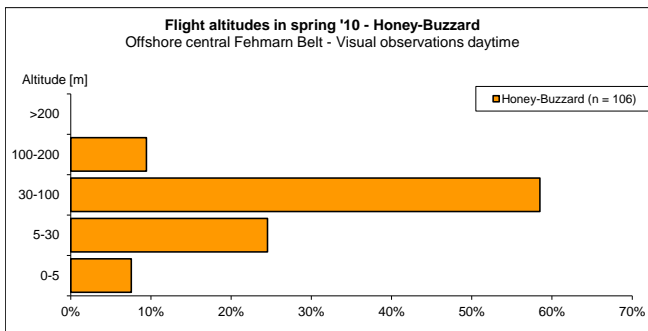
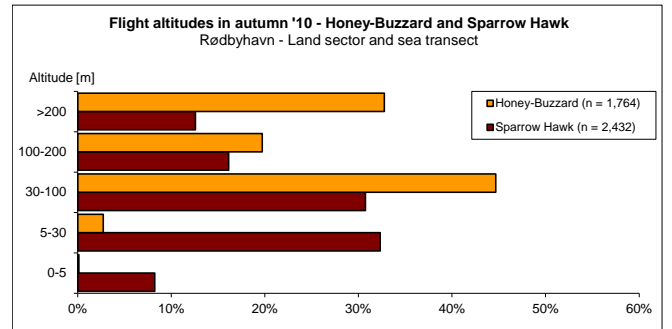
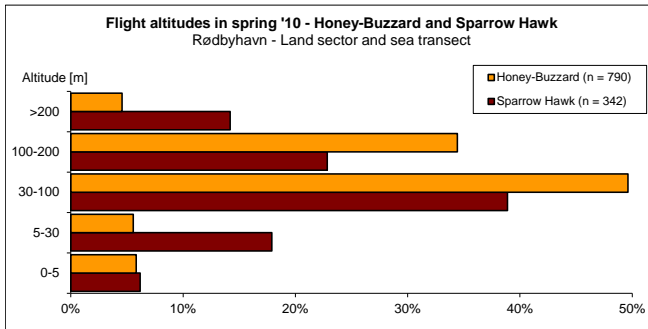
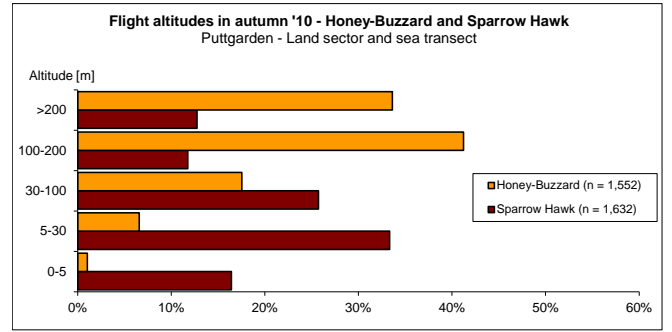
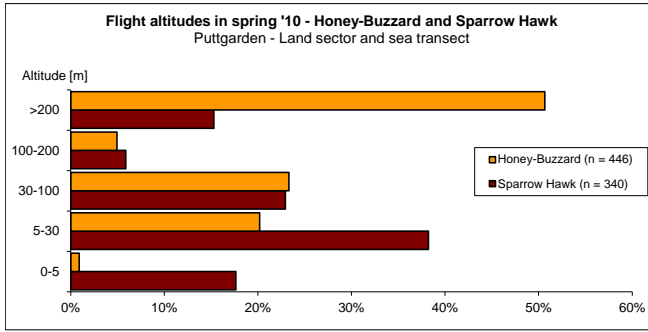
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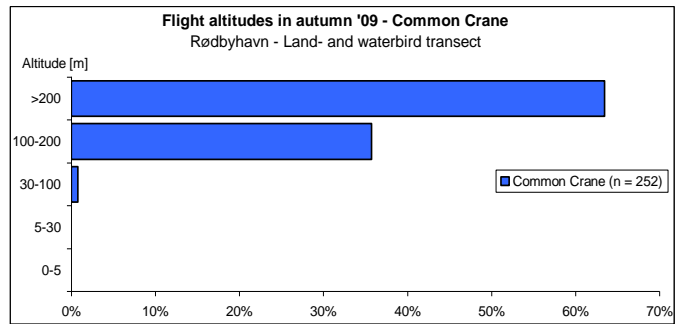
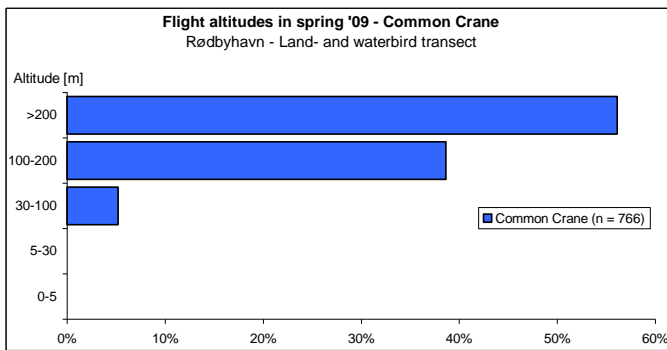
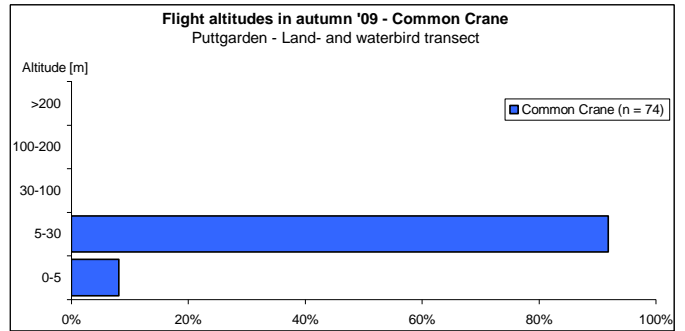
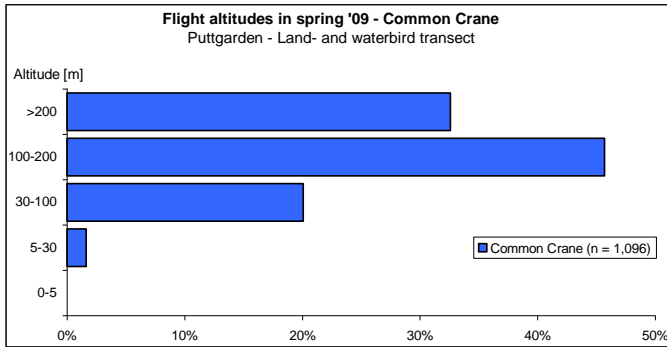
Honey Buzzard / Sparrowhawk – *Pernis apivorus* / *Accipiter nisus*



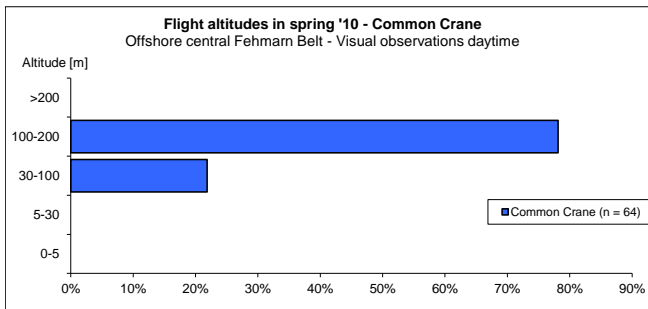
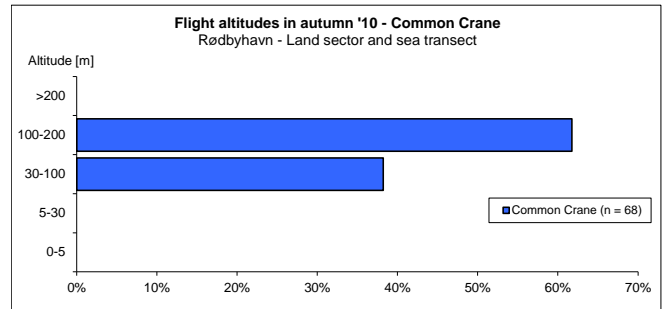
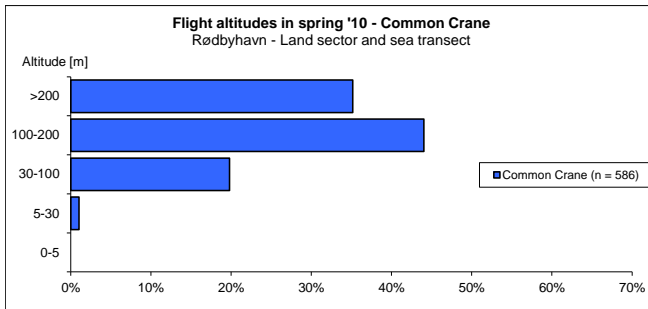
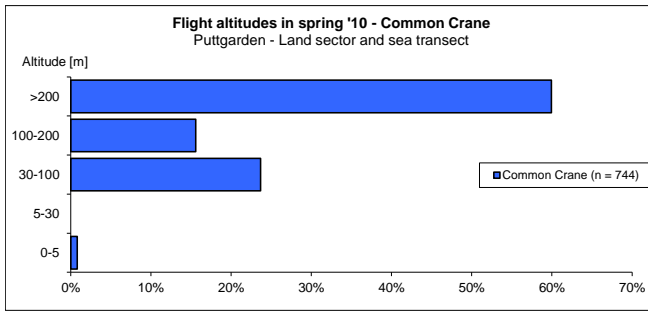
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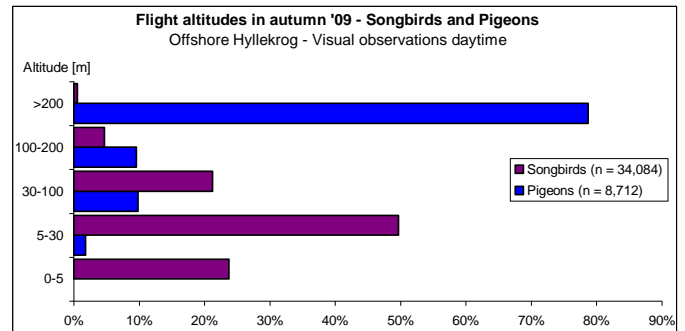
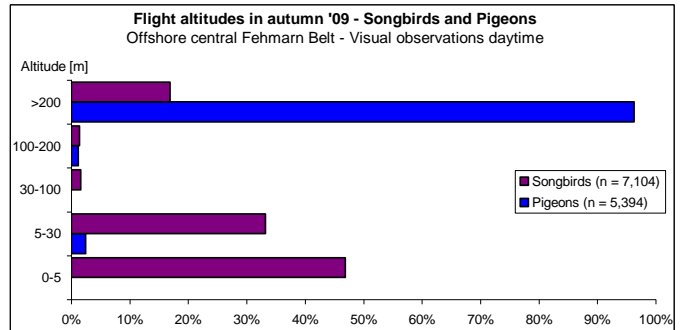
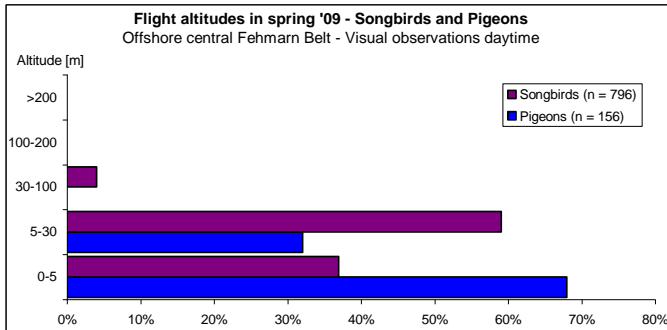
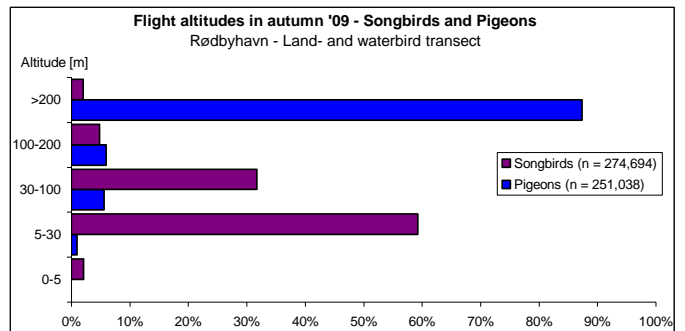
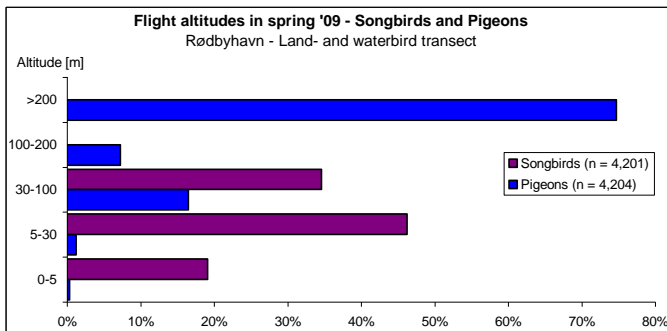
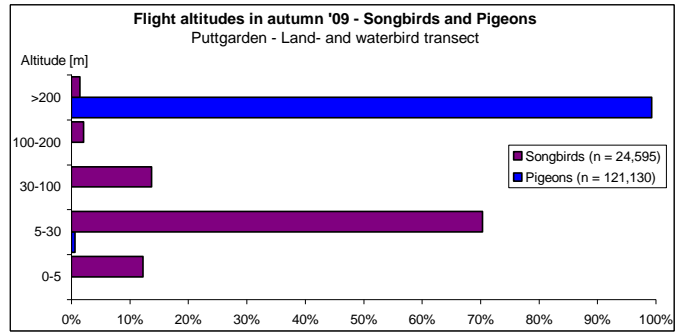
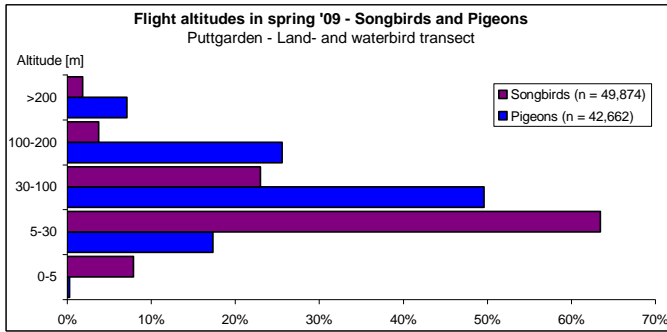
A.5.4 Common Crane – Grus grus



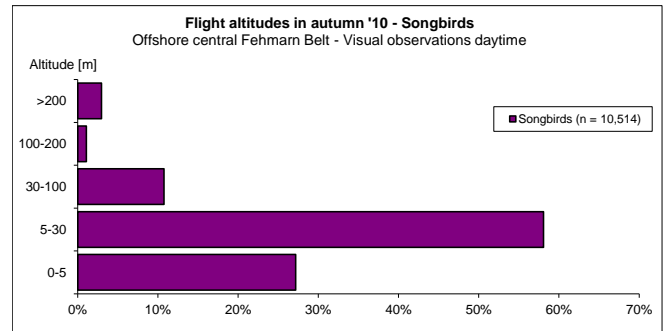
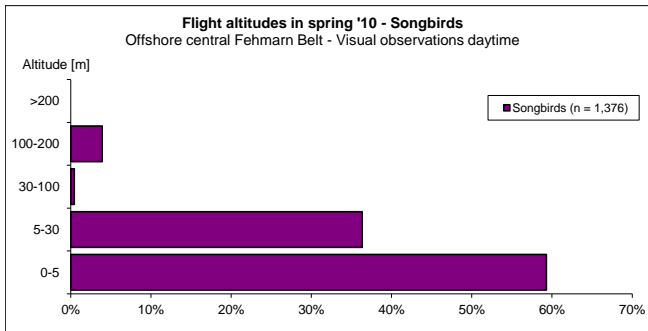
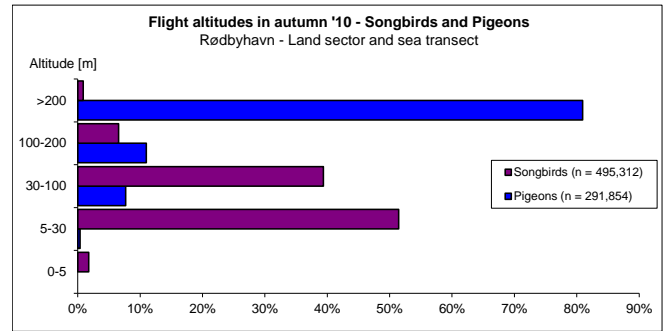
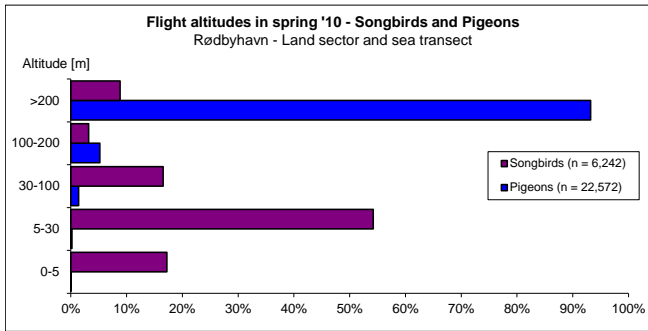
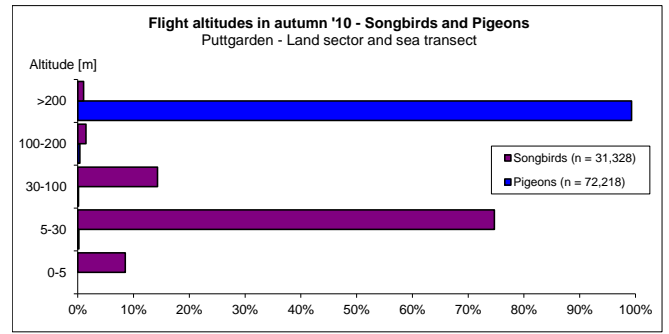
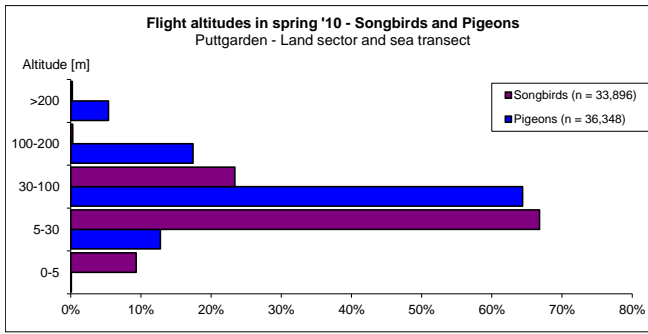
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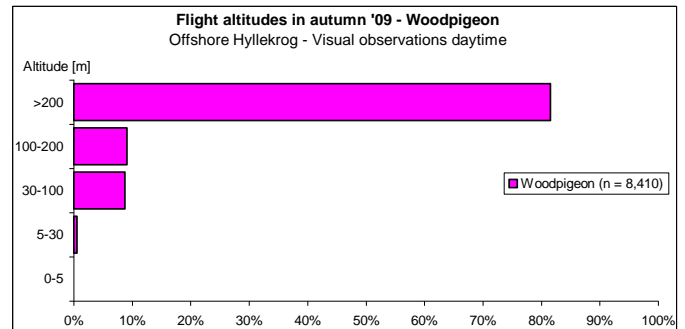
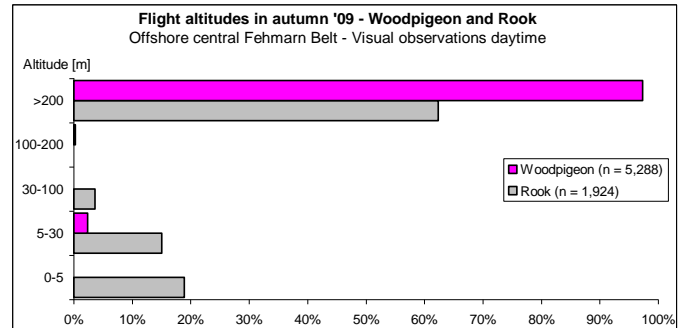
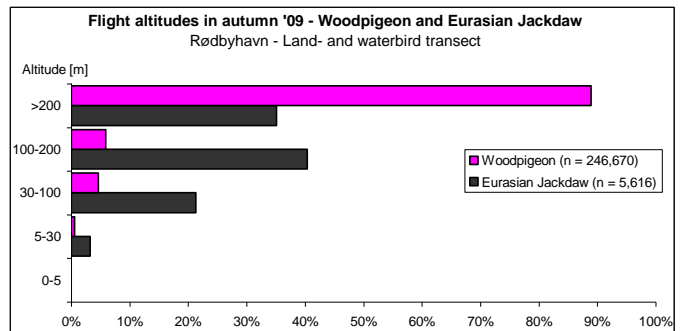
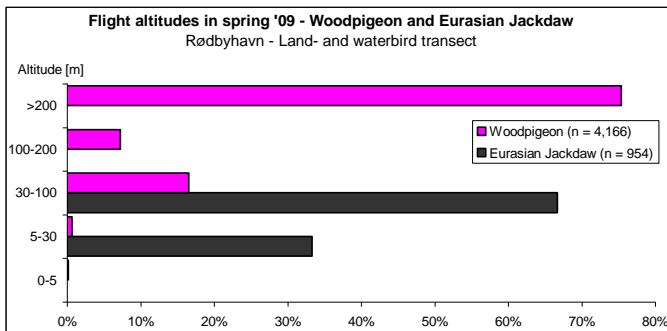
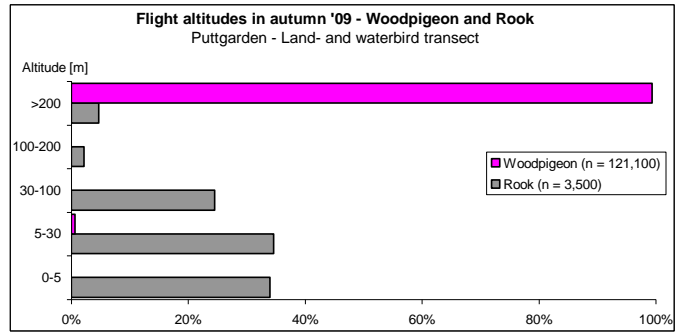
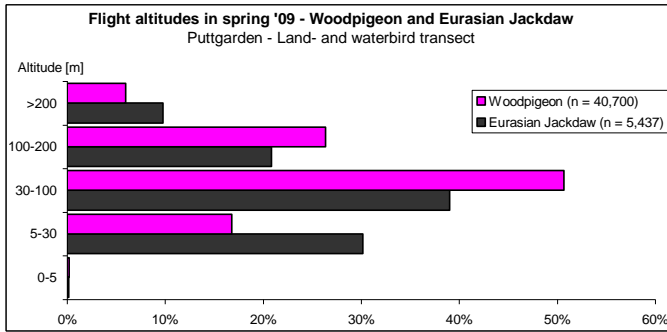
A.5.5 Songbirds / pigeons



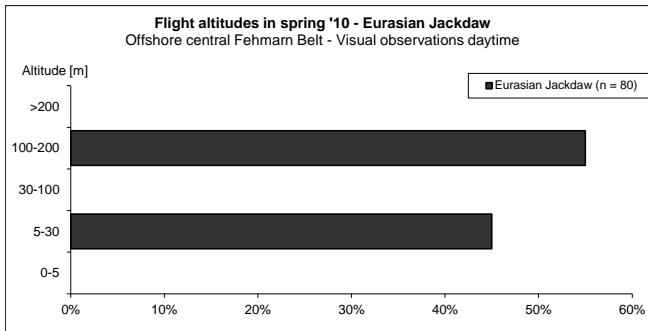
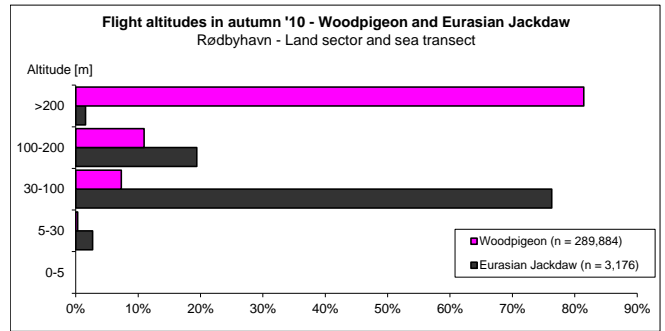
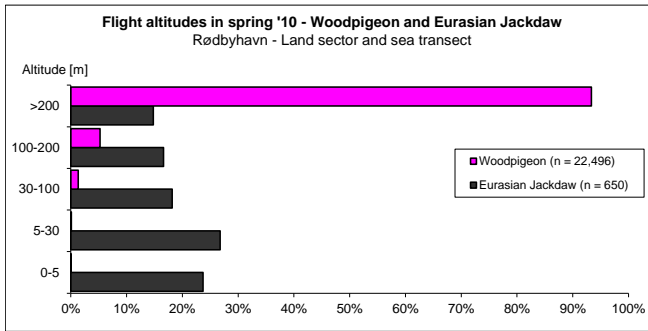
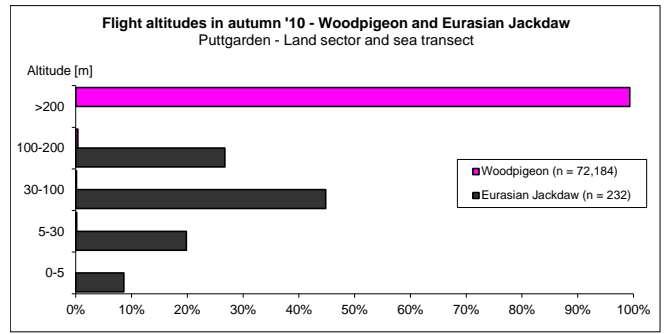
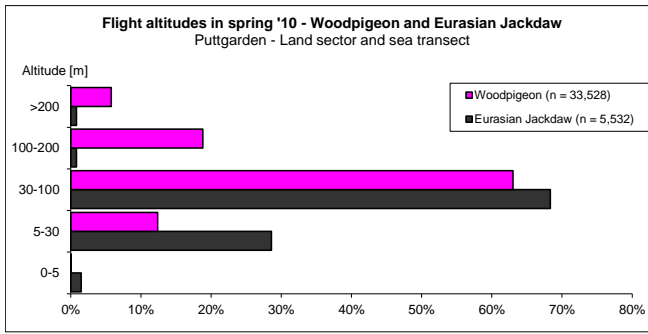
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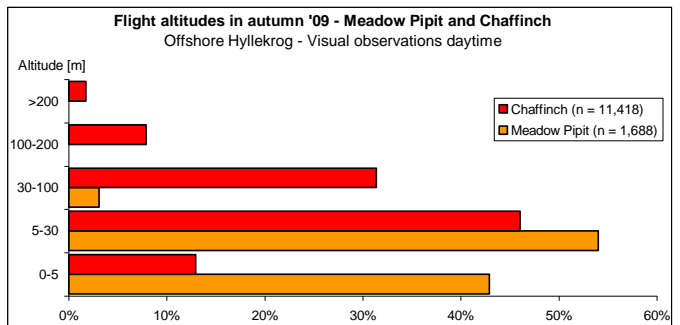
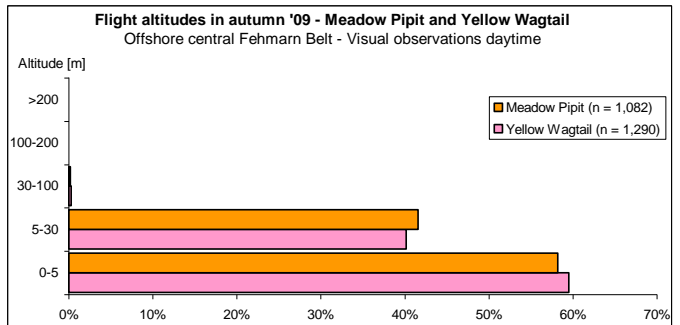
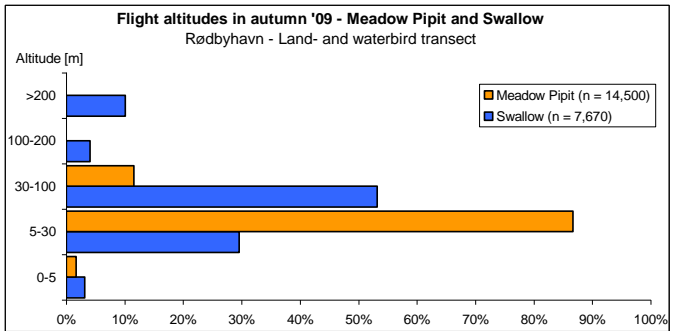
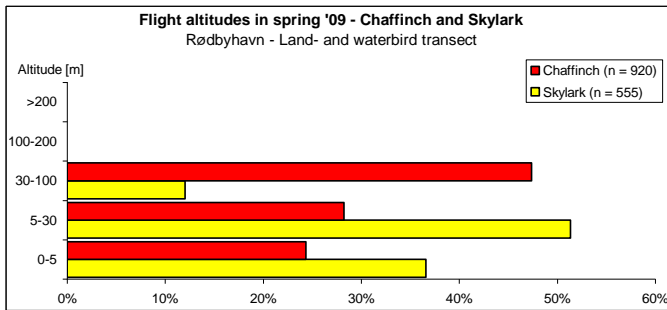
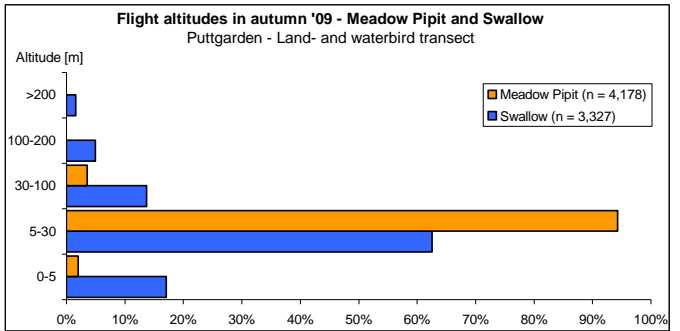
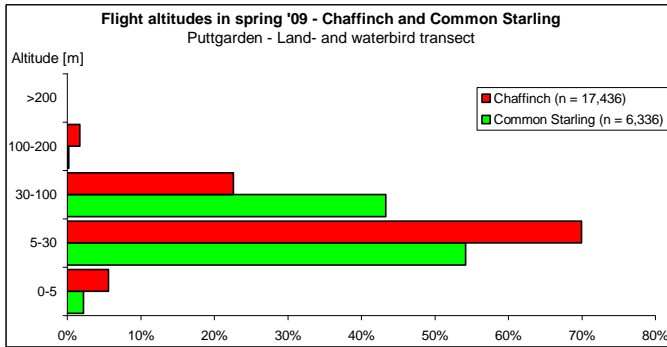
Woodpigeon / Eurasian Jackdaw – *Columba palumbus* / *Corvus monedula*



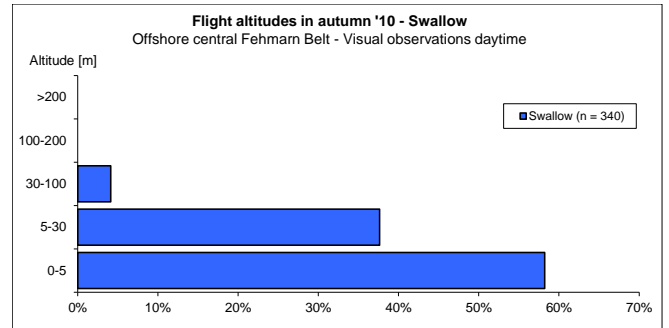
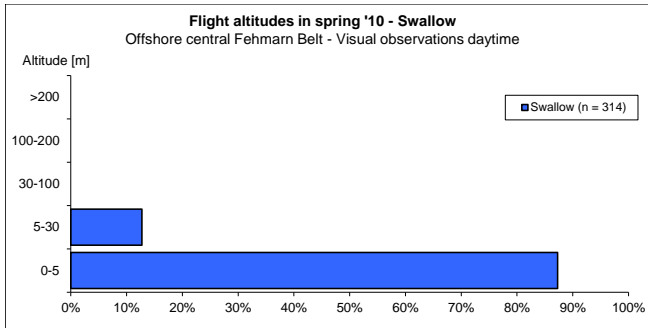
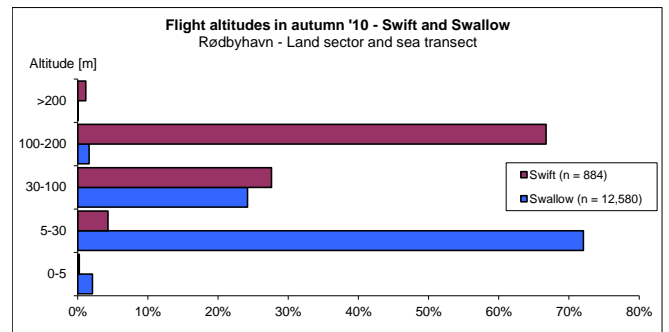
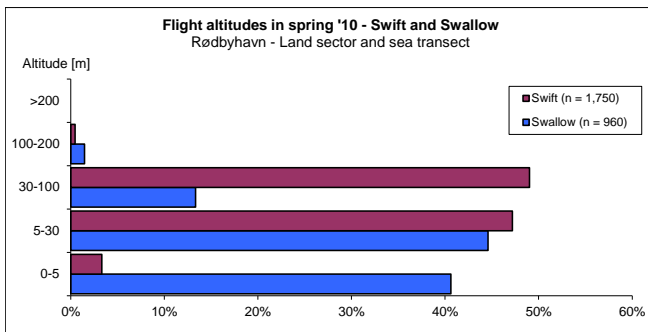
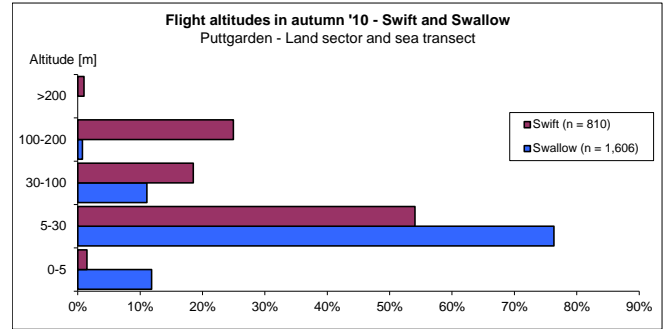
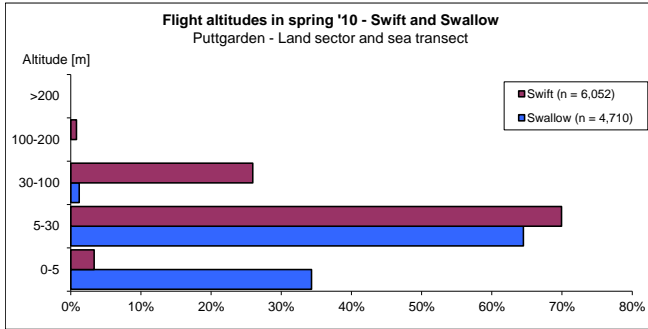
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Other species

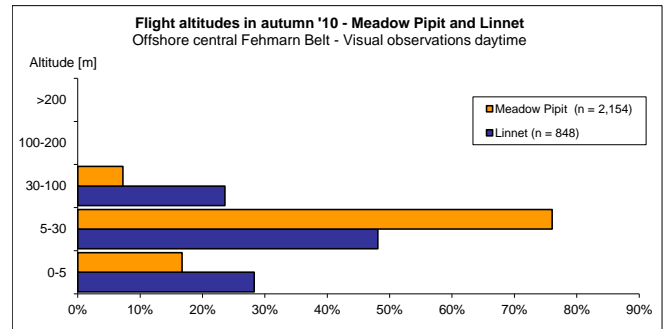
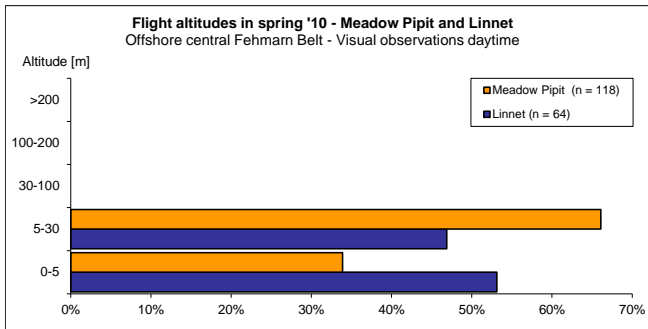
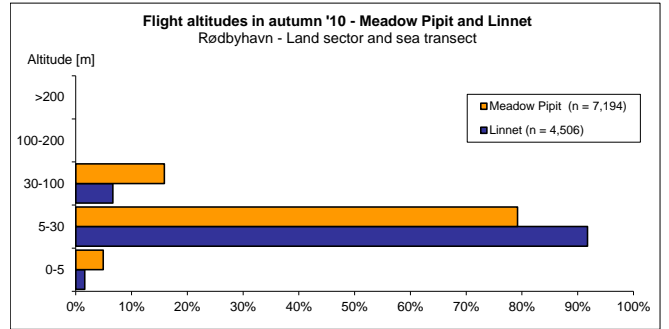
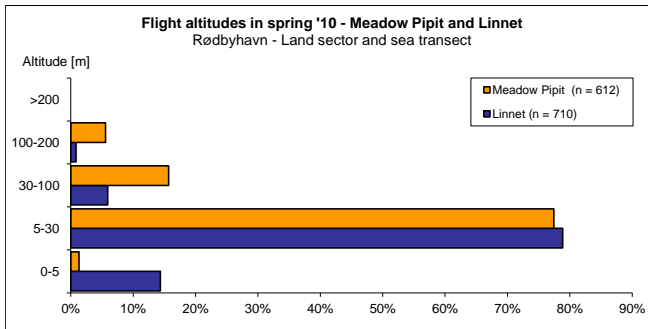
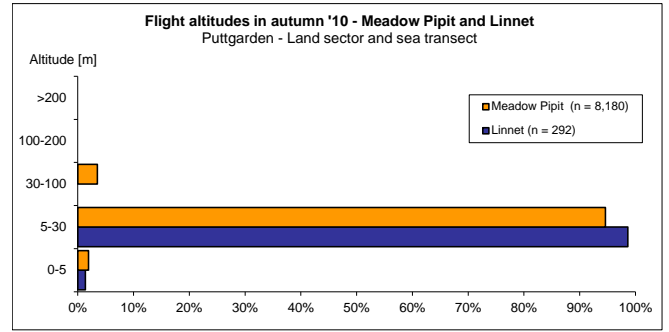
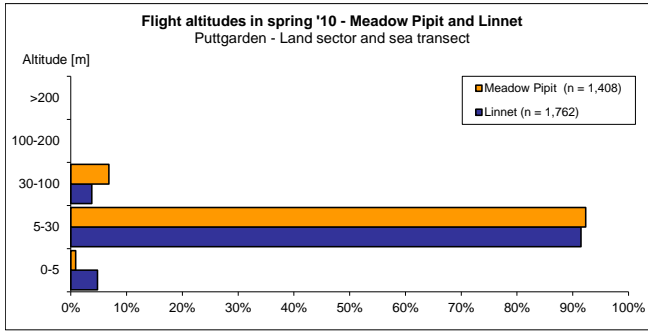


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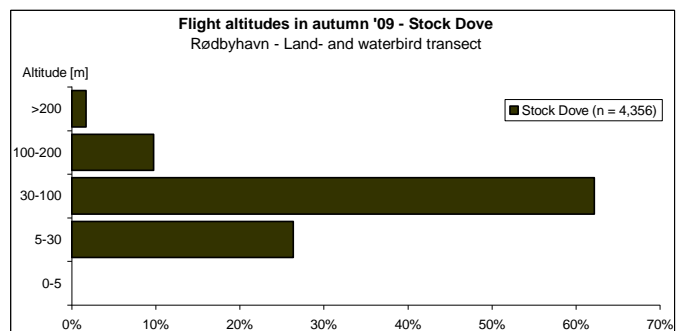
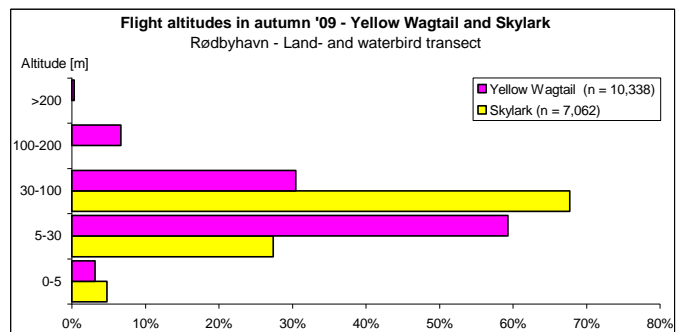
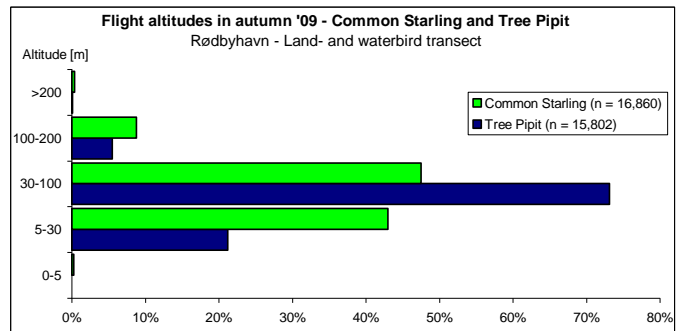
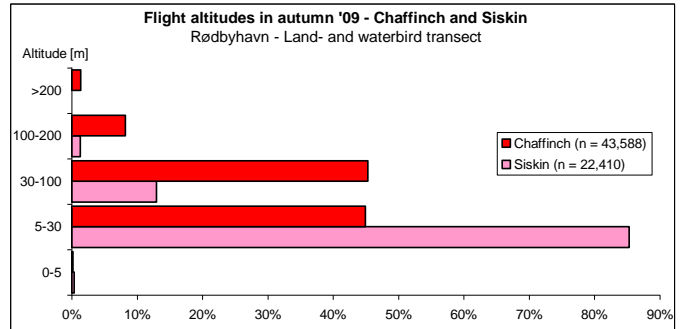
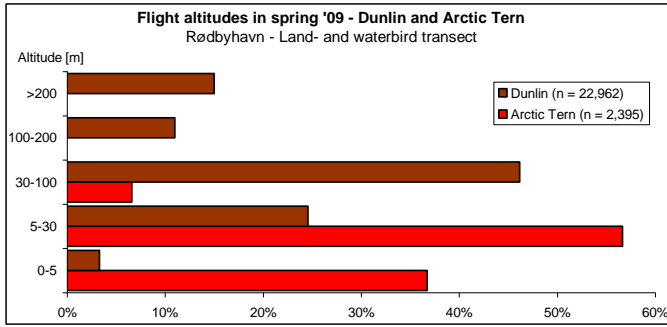


Meadow Pipit 2009: see page 232

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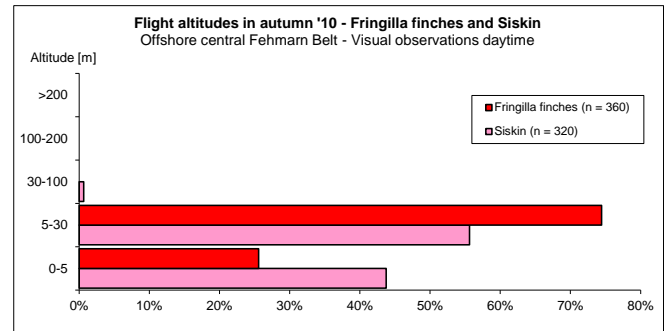
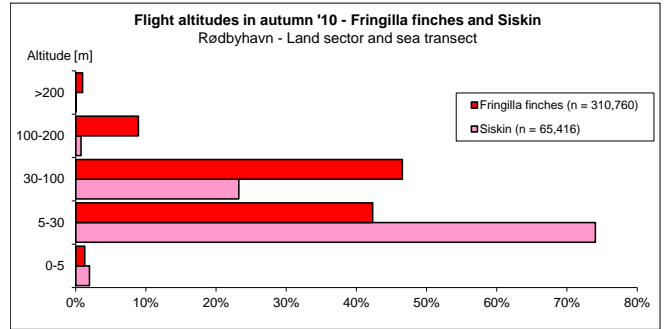
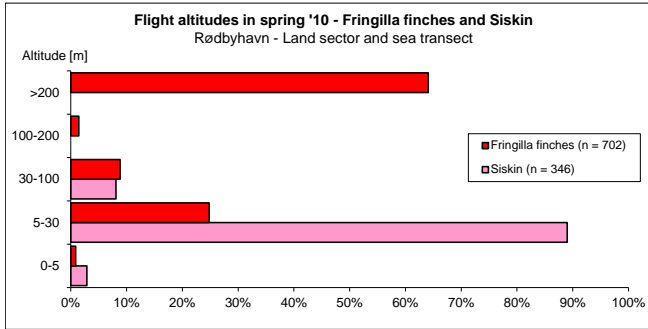
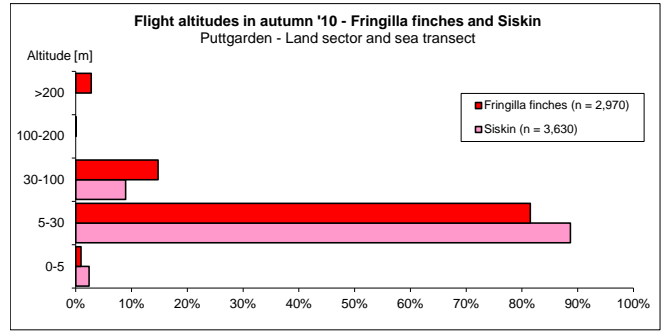
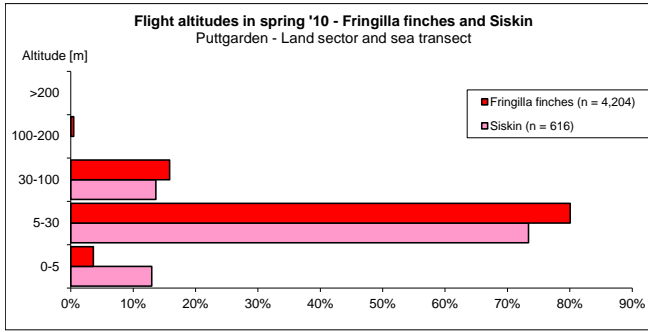
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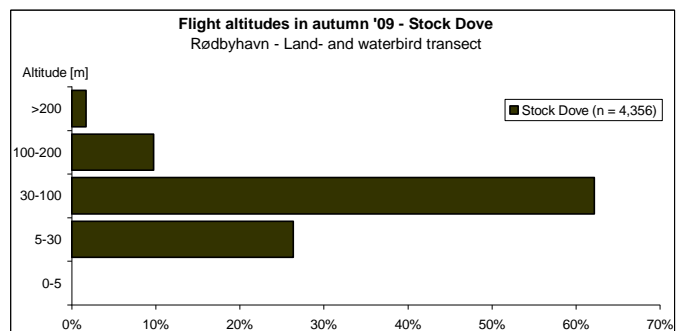
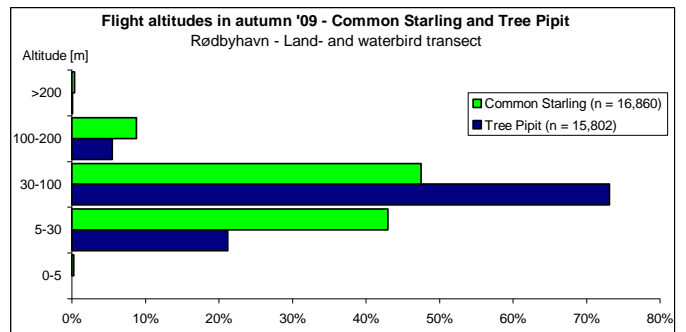
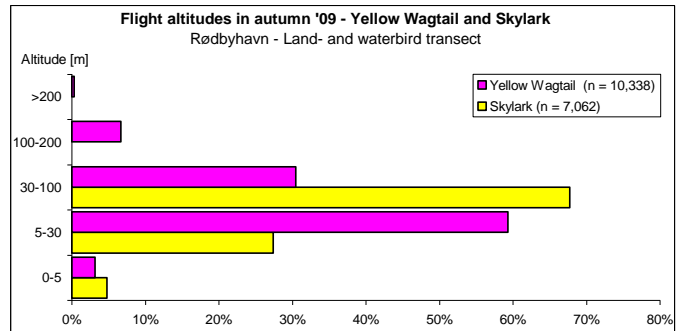
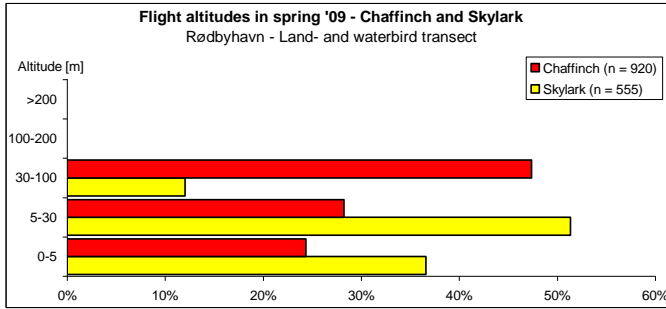
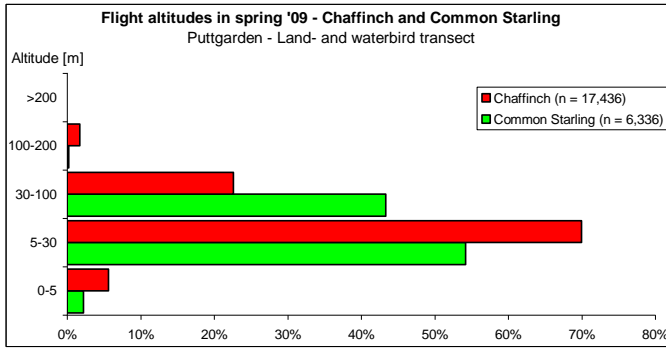
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Chaffinches 2009: see also below

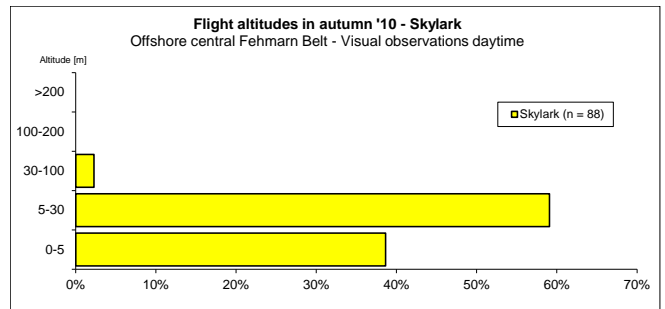
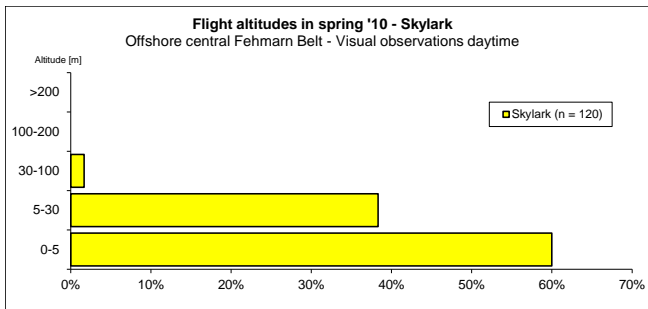
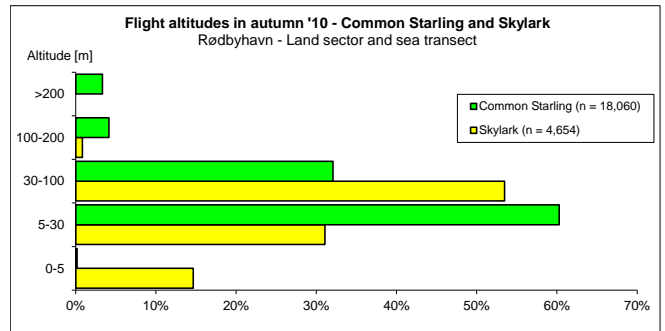
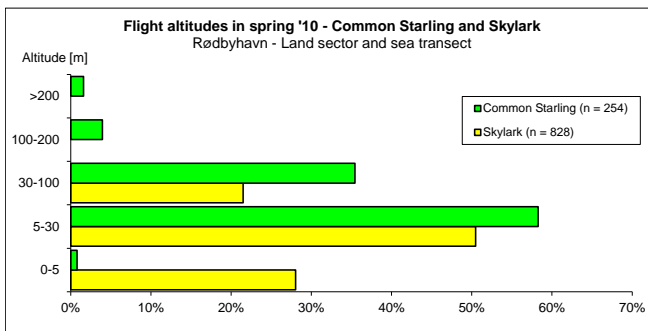
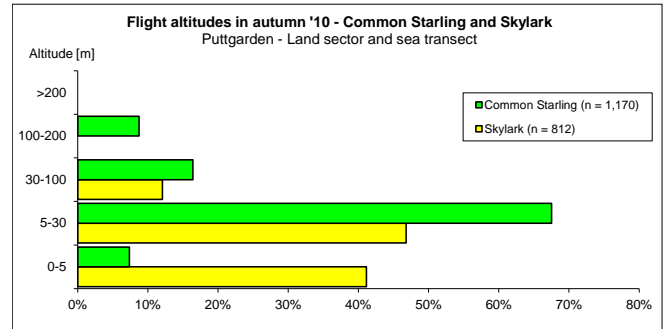
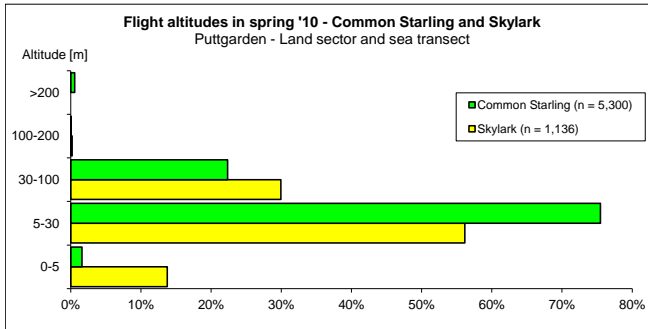
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A.6 Overview of migration and weather during 2009 and 2010 – including migration events

The present chapter provides a short overview of the weather and bird migration situation and events. It is preceded by an overview of weather parameters for 2009 and 2010 and followed by descriptions per season, including one weather event per season, which has been considered important for bird migration.

A.6.1 Weather and wind 2009 and 2010

In the following figures (Figure A.1 to Figure A.6), firstly the average wind directions are given in circular plots for all seasons, secondly the weather parameters visibility, wind speed, wind direction, air pressure and air temperature are given per hour during spring and autumn 2009 and 2010.

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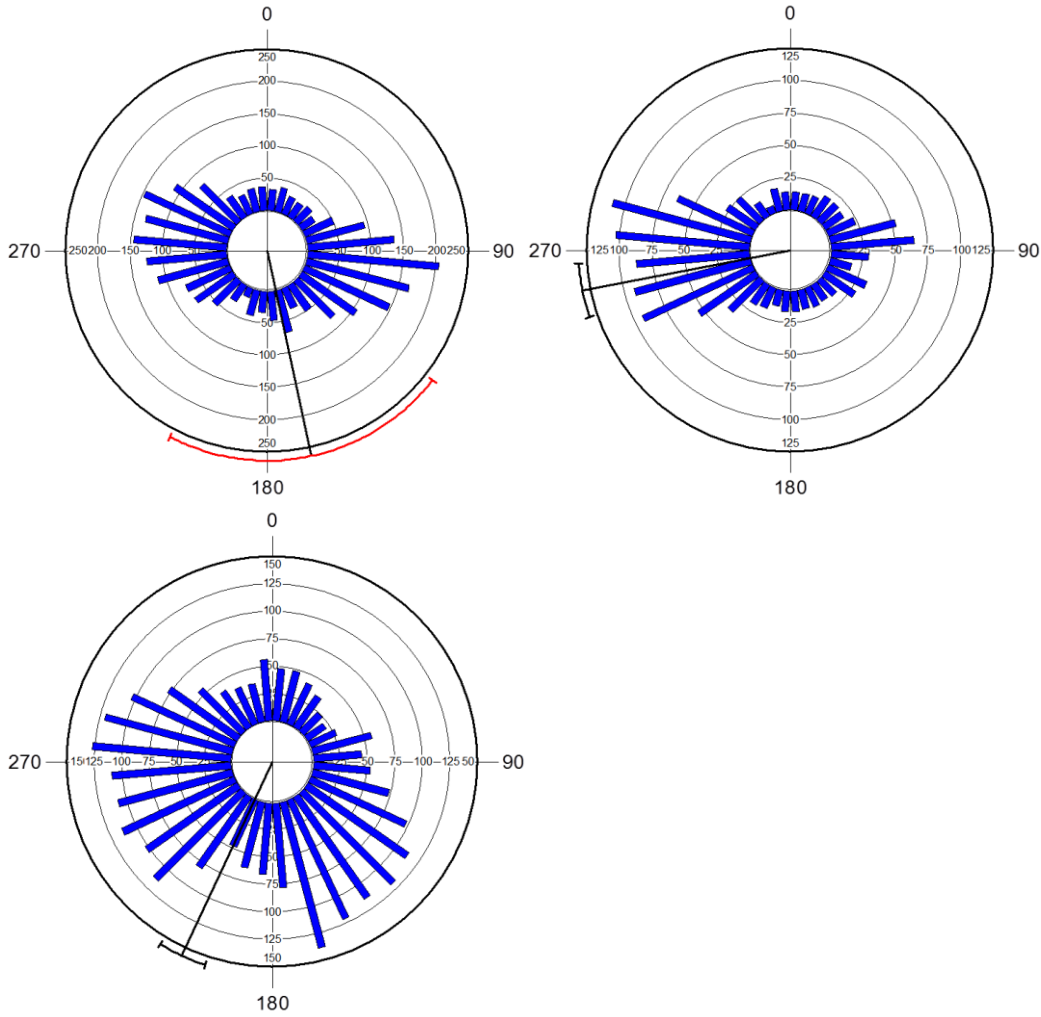


Figure A.1 Ground wind direction in spring (top left), summer (top right) and autumn (bottom) in 2009. Bars represent where the wind is coming from; the length of the bars represents the frequency, the black line plus sector (black – significant, red – not significant) represents the mean direction and the standard error.

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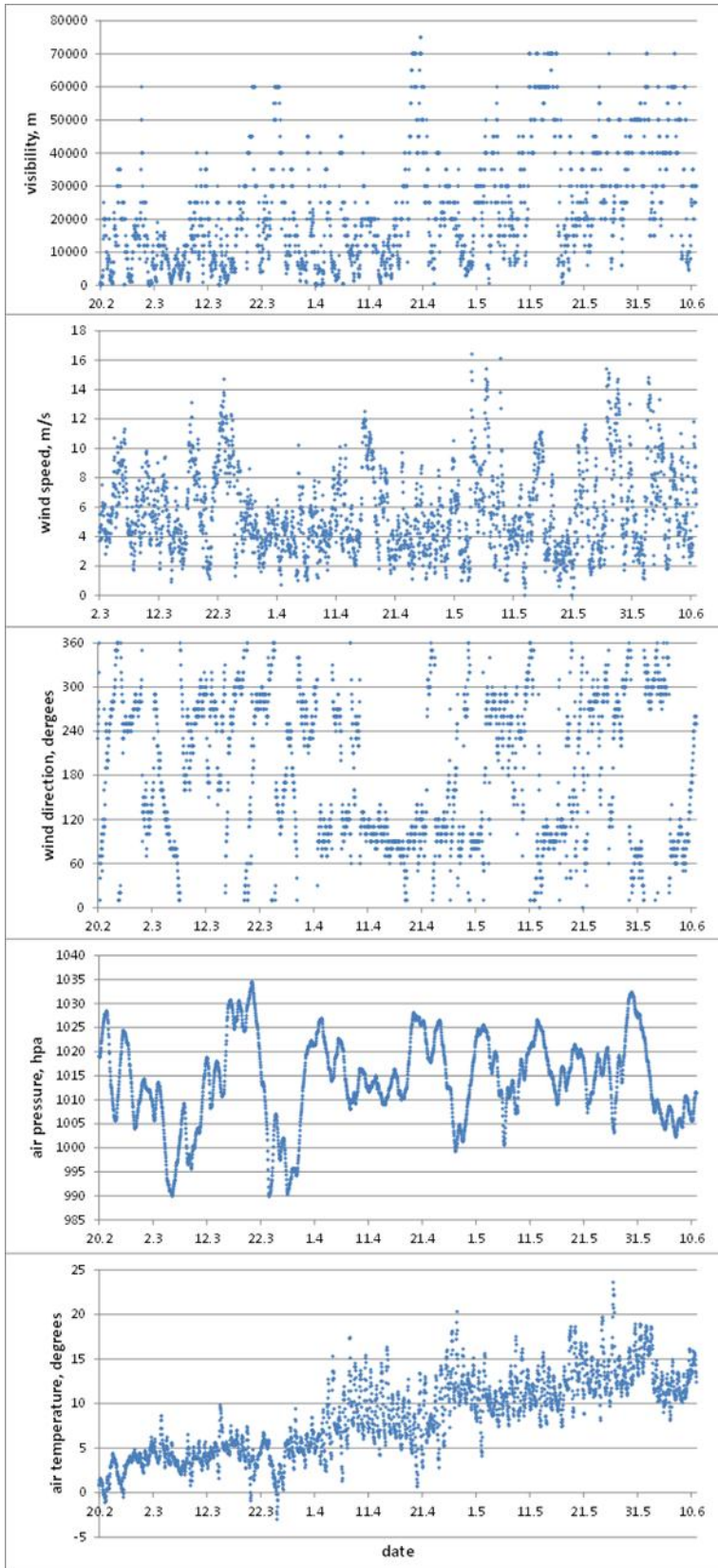


Figure A.2 Dynamics of main weather parameters, spring 2010. From top to bottom: visibility [m], ground wind speed [m/s], ground wind direction ($^{\circ}$), air pressure (hpa), air temperature ($^{\circ}$ C).

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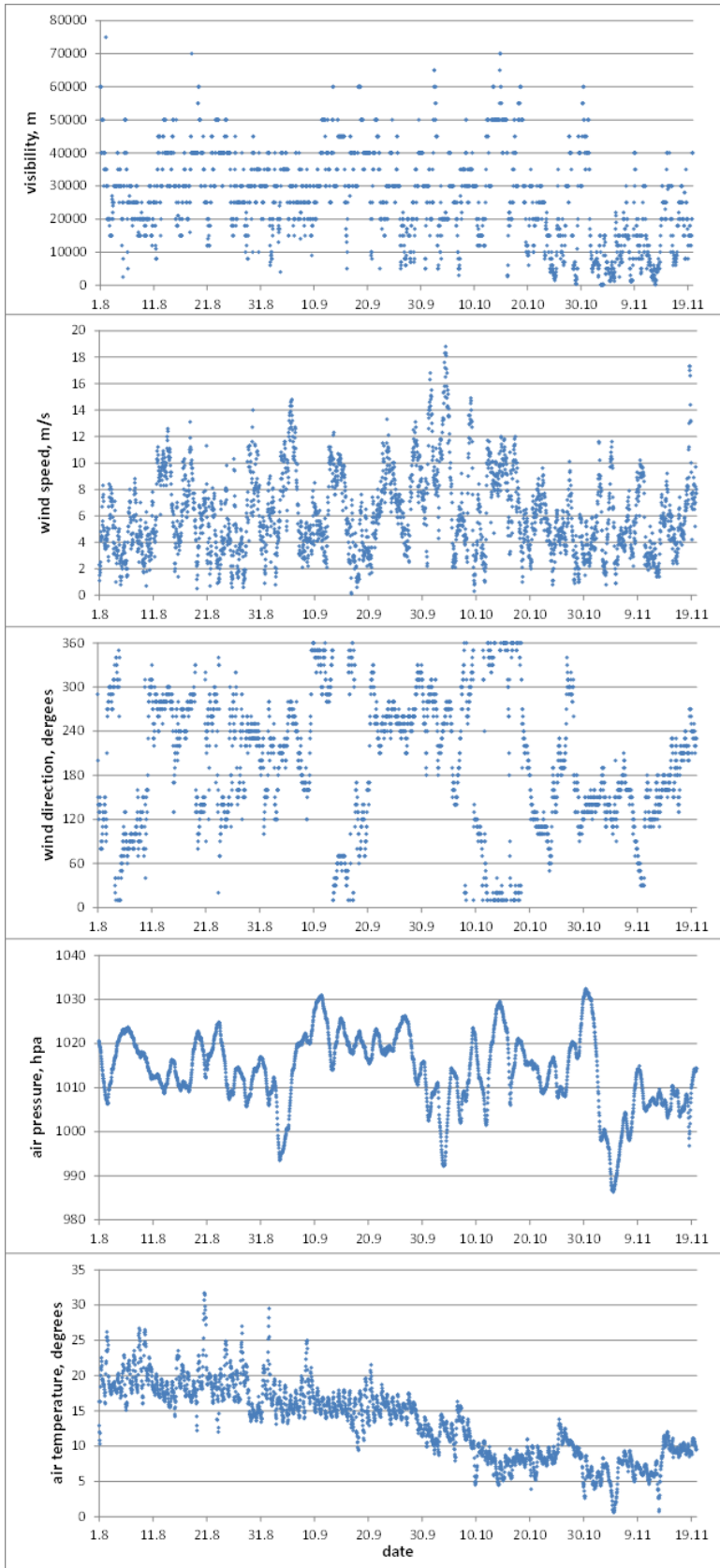


Figure A.3 Dynamics of main weather parameters, autumn 2009. From top to bottom: visibility [m], ground wind speed [m/s], ground wind direction ($^{\circ}$), air pressure (hpa), air temperature ($^{\circ}$ C).

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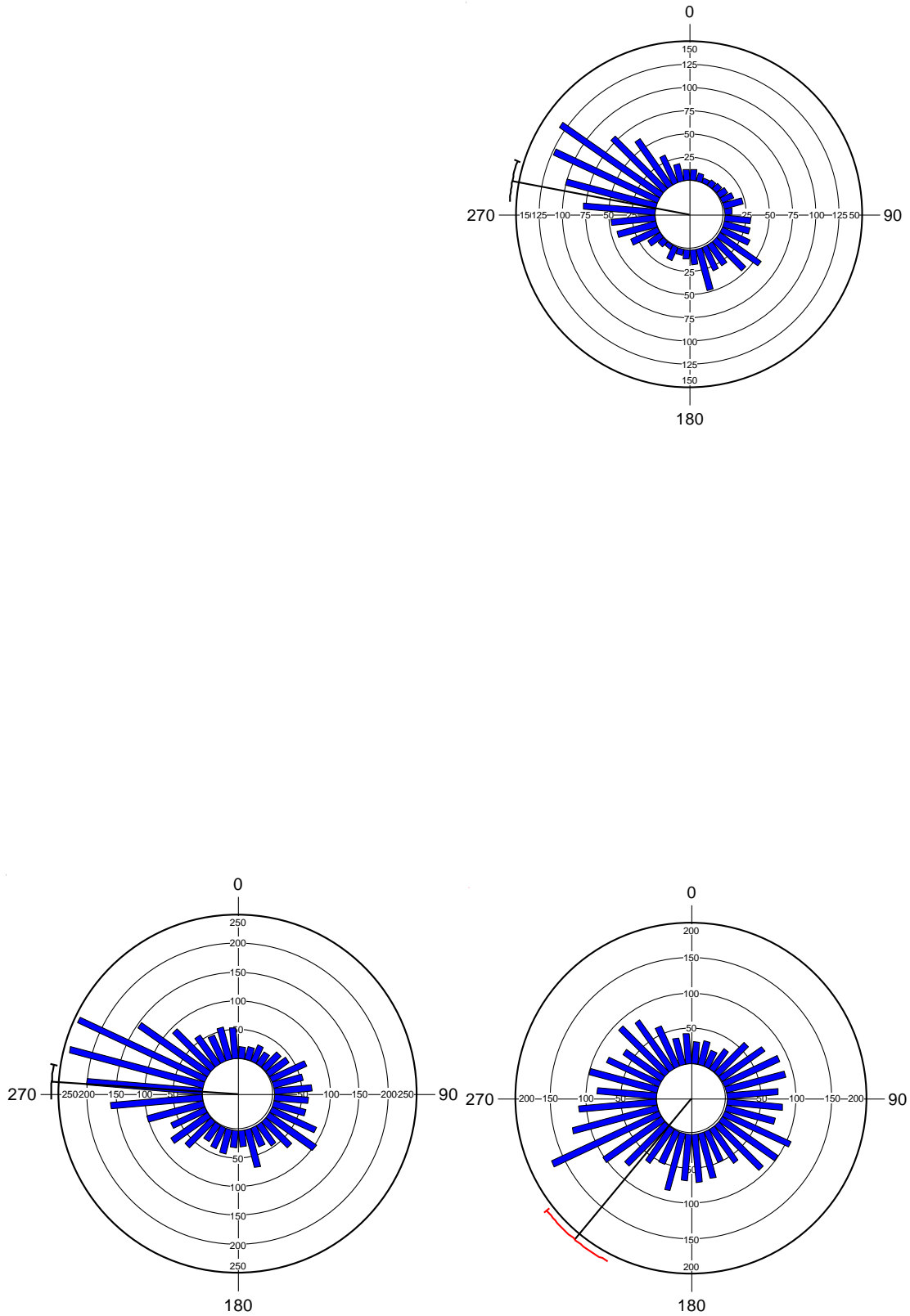


Figure A.4 Ground wind direction in spring (top left), summer (top right) and autumn (bottom) in 2010. Bars represent where the wind is coming from; the length of the bars represents the frequency, the black line plus sector (black – significant, red – not significant) represents the mean direction and the standard error.

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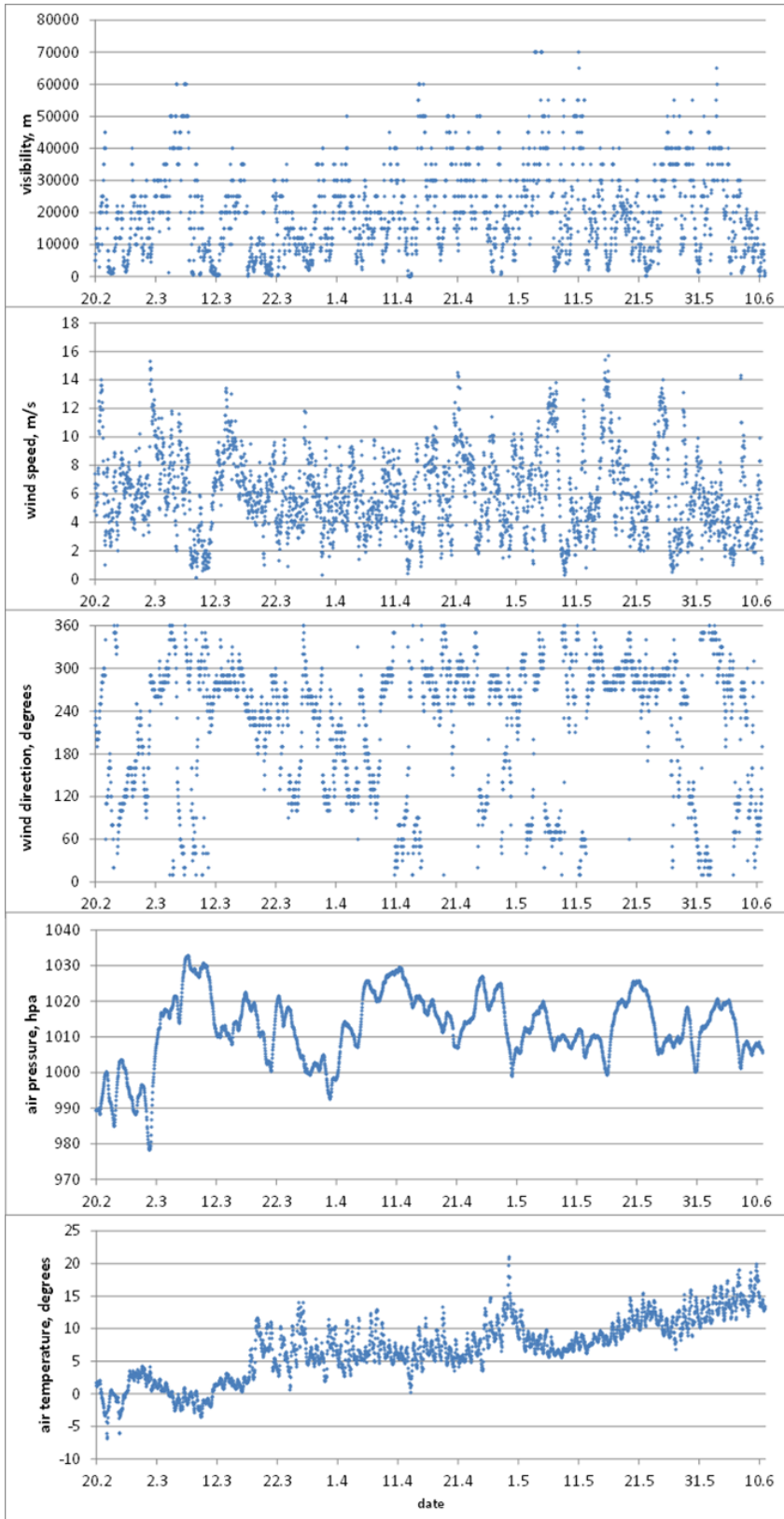


Figure A.5 Dynamics of main weather parameters, spring 2010. From top to bottom: visibility [m], ground wind speed [m/s], ground wind direction (°), air pressure (hpa), air temperature (°C).

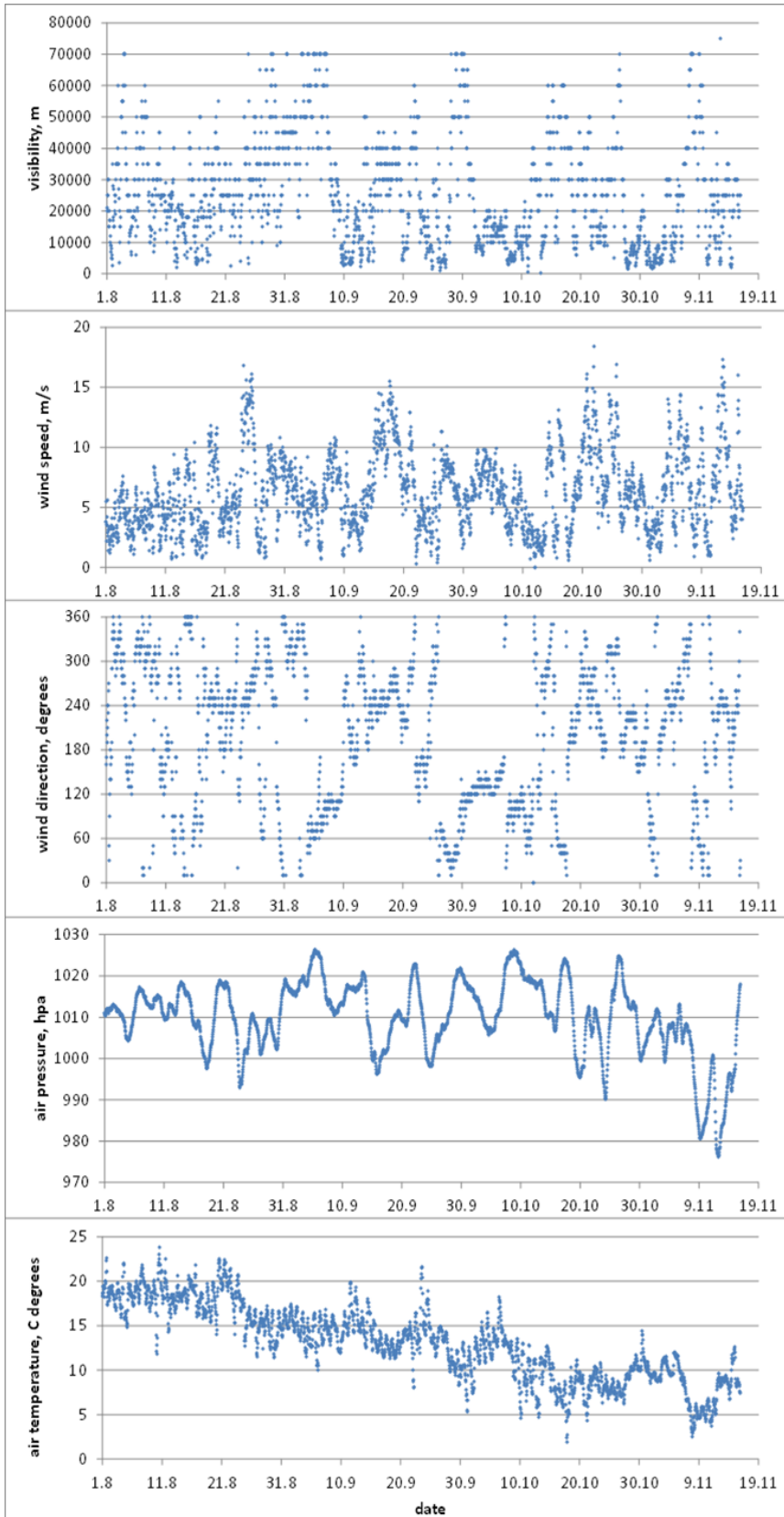


Figure A.6 Dynamics of main weather parameters, autumn 2010. From top to bottom: visibility [m], ground wind speed [m/s], ground wind direction (°), air pressure (hpa), air temperature (°C).

A.6.2 Spring 2009

Visual observations started in late February 2009 at the onshore stations. At the same time, the 'Superfledermaus' Radar at Rødbyhavn started operation and from mid-March surveillance radar stations at Puttgarden, Rødbyhavn and Westermarkelsdorf came into operation.

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The period from end of February until early April was characterised by irregular weather with some snow still in February and milder temperatures and some precipitation during March. For most of the months westerly winds dominated.

Seabird migration at both stations was regular, but peaked end of March accompanied by favourable westerly winds, with considerably numbers of Common Eiders and Common Scoters near Rødbyhavn and less offshore and at the Puttgarden station.

The large migratory event happened on 28 – 31 March, when winds changed to more northerly directions and wind speed decreased (Figure A.7, Figure A.8).

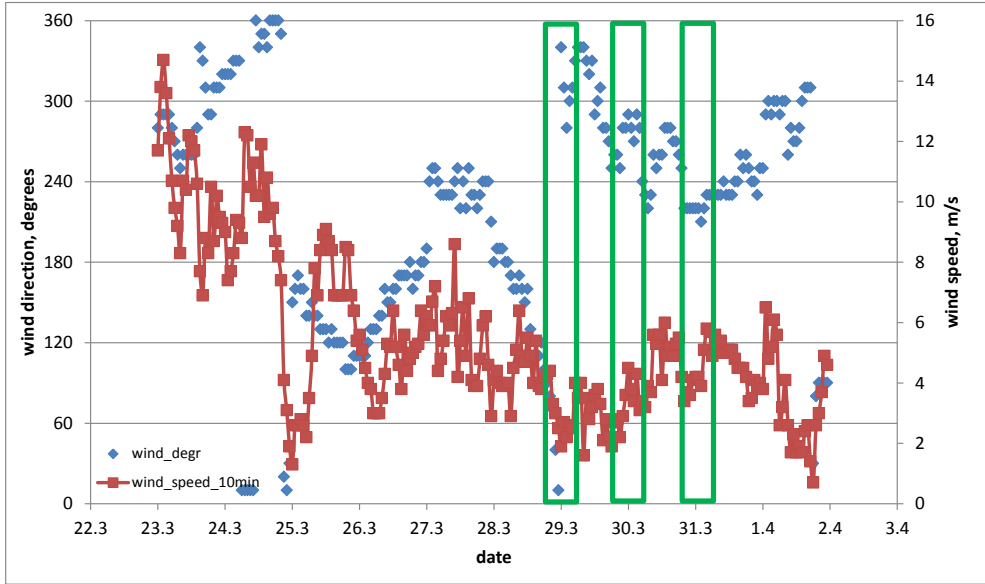


Figure A.7 Hourly dynamics of wind direction (blue dots) and wind speed (red line and dots) at ground level from March 22 to April 02, 2009. Green rectangles show the time periods of the strongest peak of migration followed by the change of wind direction and speed.

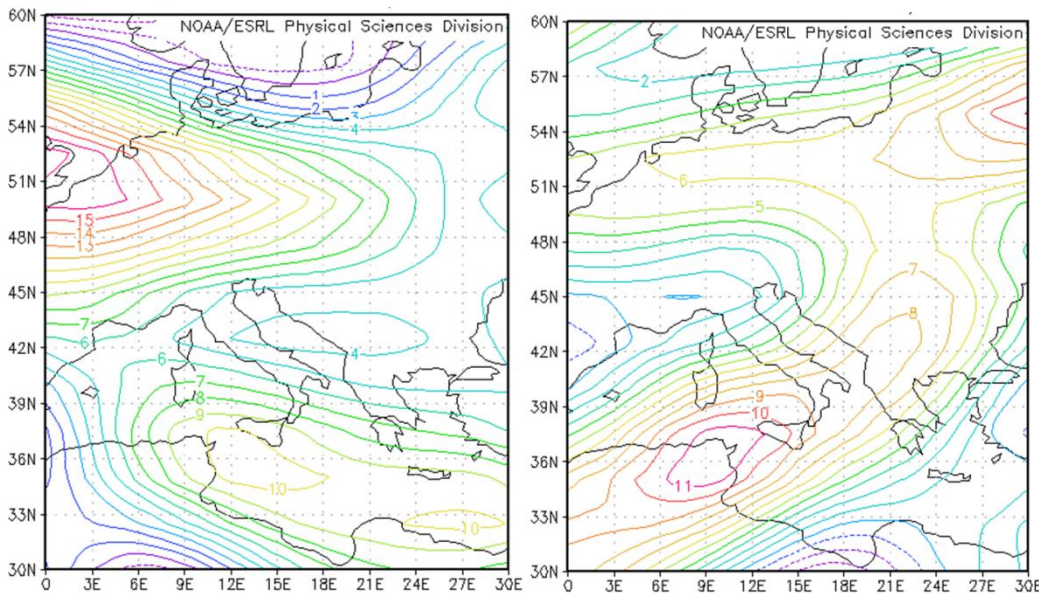


Figure A.8 Westerly component of wind (m/sec) at the level of 850 mb (app. 1,500m). Average from March 25-27, 2009 (migratory pause, left) and March 28-29, 2009 (migratory peak, right). Isolines connect areas with the same westerly wind speed. Colour gradient of isolines from blue to red reflects the increasing of the wind speed.

During acoustic night observations in late March and early April medium to high numbers of thrushes were detected, in particular during clear calm nights.

Intense seaduck migration was recorded from Rødbyhavn. At Puttgarden, frequent waterbird movements were registered. However, most of the latter seemed to be short distance flights between

roosting sites or between roosting sites and feeding grounds. Common Scoters often flew in westerly directions.

In April the wind shifted to easterly directions which continued with some exceptions until May. During these easterly winds e.g. Little Gulls were registered to be migrating in medium numbers. Also, divers and terns were seen in quite good numbers from mid-April until early May. However, for most species which normally are numerous during this time of year, this wind situation was rather unfavourable to poor. Species like Barnacle Geese, Curlews and Common Scoter were only seen in low numbers.

Most of May was characterised by westerly winds, but a few days, in particular between May 12 and May 21, were dominated by medium to strong easterly winds. In late May after a period with easterly winds low pressure fronts crossed the area from West to East accompanied by occasional rain showers. Along with these showers strong westerly wind built up with occasional wind speeds up to 20 m/sec (72 km/h). This situation continued into early June.

At Rødbyhavn, Barnacle Goose was the most numerous species during the first half of May, and in late May this role was taken over by the Brent Goose. It should be noted, that the weather situation strongly influenced the migration of Arctic waders which have been feeding at the Wadden Sea, gaining weight to prepare for the migration to the breeding grounds in the Siberian tundra. When wind turned west and increased, at the Rødbyhavn station large flocks of waders were registered to be migrating towards southeast and east. A similar migration was not registered at the Puttgarden station. Apparently, the Arctic waders did not cross the Fehmarnbelt. The wader migration started with mainly Bar-tailed Godwit, generally flying very high up to 2,400 m altitude and moving very fast, up to 160 km/h, supported by very strong tailwinds, as registered by the 'Superfledermaus'; the following days Grey Plovers migrated, then Red Knots and finally Dunlins.

During the entire spring, whenever the weather conditions were characterised by calm wind and medium to warm temperatures, landbird migration was apparent with days of medium to high numbers of e.g. Common Buzzards, Honey Buzzards, Cranes and Wood Pigeons. At Puttgarden, landbirds (passerines and pigeons) coming from the south frequently were observed following the coastline often in westerly directions and then leaving the Fehmarn coast west of the radar station. Passerines were registered in altitudes up to 50 m; pigeons, mainly Wood Pigeons, frequently flew in large flocks at higher altitudes.

A.6.3 Summer 2009

June, July and August were characterised by westerly winds with warm and sunny weather. Eiders and Mute Swans started their moult migration already in late May, and continued into June. At the end of June this migration seemed to have ceased. Numbers of Common Eiders observed were low compared to spring migration. During second half of July / early August moult migration of Common Scoters occurred, yet intensities were rather low in July and early August. In mid-June, starlings started their summer migration westwards.

A.6.4 Autumn 2009

From mid-August and onwards westerly to south-westerly winds prevailed, at some days with speeds up to 20 m/sec, continuing into the first days of September. Honey Buzzard migration peaked end of August in the Fehmarnbelt region. The migration occurred even with strong headwinds. In days with calm winds and unobstructed blue sky Honey Buzzards performed their preferred soaring-gliding flight, circling over the land mass to gain up to 600 meters altitude and then gliding towards SW for the next thermal. But during strong headwinds, they were registered at all stations actively flying at low altitudes over the water occasionally seeking hide from the wind behind the ferries. Also during those westerly winds landbird migration took place. Especially Tree Pipits were recorded by acoustic observations at all stations and Yellow Wagtails were numerous and continued into early September.

The rest of September was still characterised by westerly winds, with the exception of September 14-19, when easterly winds occurred. Visible and audible passerine migration was lower compared to the earlier autumn migration season. Worth mentioning is that Reed Bunting migrated in high numbers. In late September the Red Kites started migrating, peaking in October.

Early October was still dominated by westerly winds. Another example of a weather induced blocking of migration occurred on October 9/10, 2009. Areas with strong zonal (westerly) wind were located

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during the first days of October 2009 in Scandinavia and Northern Europe. Strong winds blocked the migration for several days, and when the wind changed direction and weakened during October 9 the largest peak of migration was detected for the autumn 2009 (Figure A.9, Figure A.10).

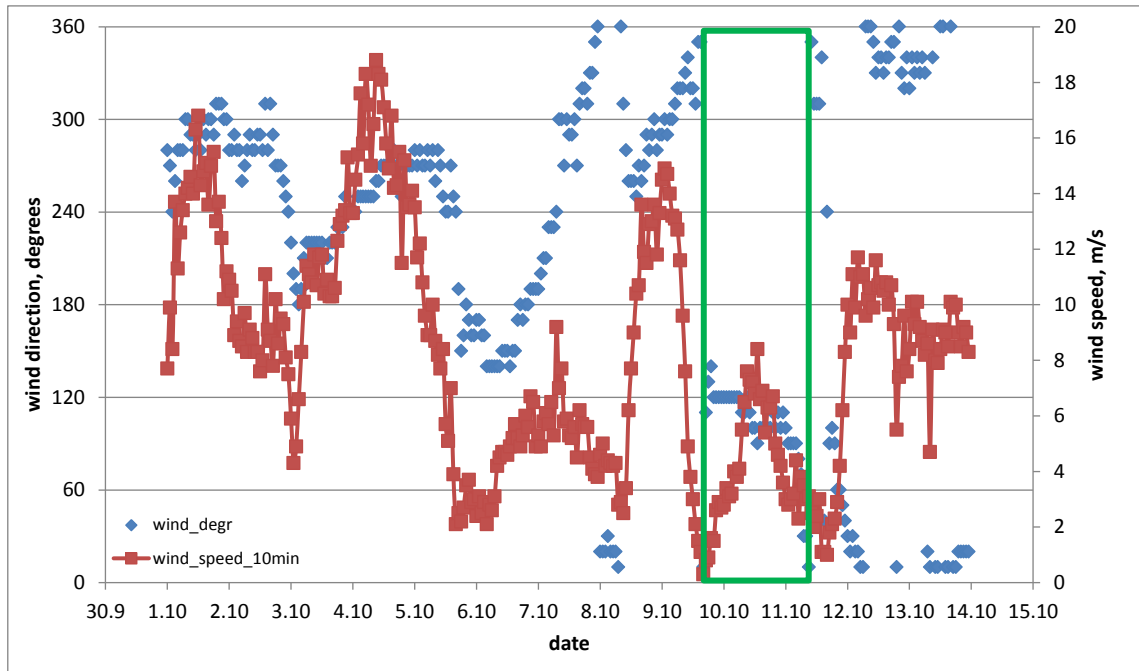


Figure A.9 Hourly dynamics of wind direction (blue dots) and wind speed (red line) at ground level during first 15 days of October 2009. Green rectangle shows the time period of the strongest peak of migration on October 9/10 followed by the change of wind direction and speed.

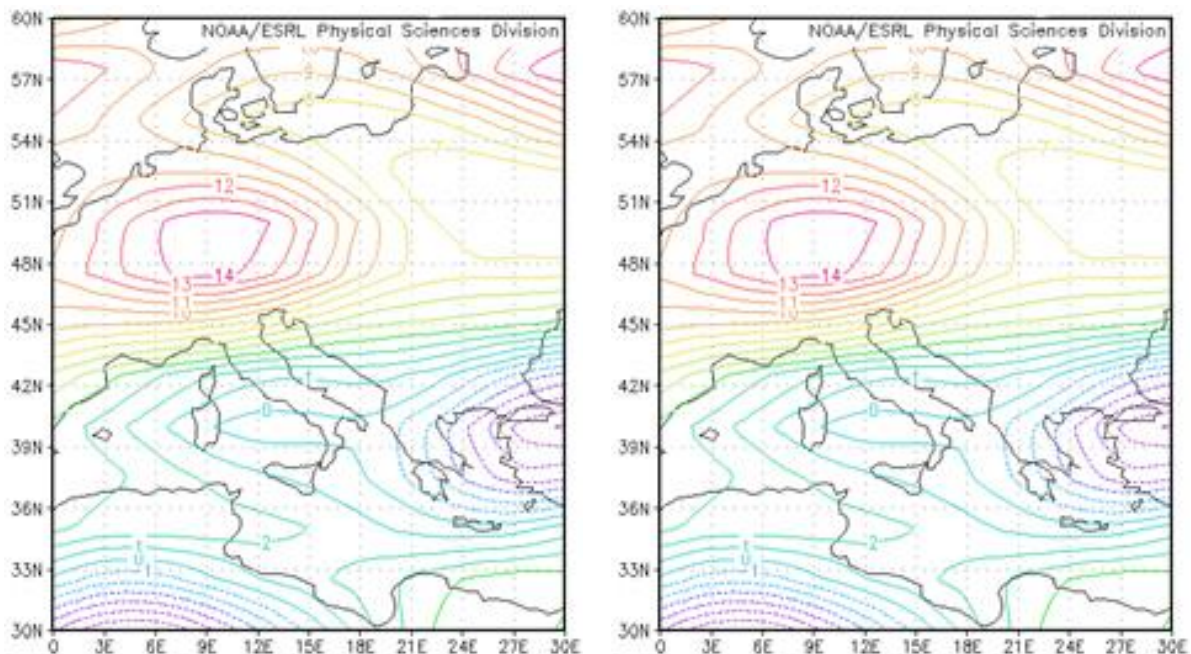


Figure A.10 Westerly component of wind (m/sec) at the level of 850 mb (app. 1,500m). Average from October 5-7, 2009 (left) and from October 8-10, 2009 (right). Isolines connect areas with the same westerly wind speed. Colour gradient of isolines from blue to red reflects the increasing of the wind speed.

From October 10 more days with easterly winds occurred, regularly from October 20 to November 14. The number of birds of prey migrating in October consisted of Red Kites, Common Buzzard and

Sparrowhawk. Passerine species such as Skylark, Siskin and Common Starling appeared in high numbers. Wood Pigeon passed in high numbers and at rather high altitudes between 500 and 2,000 m, with some large flocks counting more than 5,000 individuals. Stock Dove also was recorded passing the Fehmarnbelt, however in numbers considerably lower than Wood Pigeon.

Among waterbirds, Common Eider was the most numerous species, followed by Barnacle Goose and Wigeon. While days with easterly winds appeared to be favourable for the migration of seabirds, Common Eiders in particular were also registered in remarkable numbers flying low against the wind in periods of westerly winds both offshore in the Fehmarnbelt and on the Puttgarden side. On foggy days divers were observed at Puttgarden flying in westerly directions below low hanging clouds; high numbers of divers flying in mixed flocks of Red- and Black-throated Divers were registered in November.

The first half of November until the end of the observation period was mild compared to average years. Frequently, the first cold nights during this period can initiate migration of quite a number of passerine species, but in 2009, migration intensity was generally low, with some migration of thrushes registered by acoustic observations.

A.6.5 Winter 2009/2010

Most of December was unusually mild. In late December the weather became clear and cold. In January the temperatures dropped below zero, and during January and February the Baltic Sea started to freeze. Freshwater lakes also began to freeze, and in mid-January all lakes and most streams were frozen, the landscape was covered by snow.

Winter bird migration and movements were low compared to the migration seasons. Seaduck movements (Common Eider, Common Scoter) were very rare at the Danish Coast, but more frequent at the German coast close to Puttgarden. Low numbers of Great Cormorants, Goldeneye and Tufted Ducks were registered. Movements from Red-breasted Merganser and small flocks of Smew were also sighted only near Rødbyhavn.

A.6.6 Spring 2010

Because of the cold winter the birds did not start migrating as early as in 2009. March 2010 still started out being very cold with temperatures below zero. The landscape was still covered by snow. At some places snow patches were still visible in late April. Around mid-March wind directions turned west and temperatures increased.

During the second half of March strong Wood Pigeon migration was observed at Puttgarden with 300 birds/hour counted. Eider migration started later than 2009, but again peaked in late March and early April. As in 2009, very high numbers occurred at the Lolland coast, while lower numbers were observed from Puttgarden and offshore. Common Scoter migration was also recorded in high numbers at both coasts and offshore, with their migration period starting already in early March and lasting until late April. Both Common Eider and Common Scoter were the most common waterbird species in spring. Regular but overall medium numbers of Long-tailed Ducks occurred at the German side from end of February until end of April. Grebes, mainly Great Crested Grebe, migrated during March with regular observations at Puttgarden, offshore and some at Rødbyhavn. Red-breasted Mergansers also occurred regularly.

In spring the most numerous species on the land transect was Wood Pigeon, which passed mainly between March 14, 2010 and April 8, 2010. They were observed at Rødbyhavn starting to cross the Fehmarnbelt in huge flocks, the largest creating an echo on the radar screen of some 8 km. Other species occurring in high numbers during March were Greylag Goose, Stock Dove, Jackdaw, Common Buzzard, *Fringilla* finches, Common Starling, Linnets and Skylark. An interesting event was the peak of Common Buzzard migration during March 16-18, 2010, when peaks were observed at the different locations at different days - offshore on March 16 with 66 birds, at Rødbyhavn on March 17 with 250 individuals and at Puttgarden on March 18 with 504 individuals, which is most likely an effect of wind speed and direction affecting main migration directions and departure locations onshore. During late March, Crane migration took place, with many of the migrating flocks being observed at both land stations. Also White-tailed Eagle migration peaked in March. Although the spring started out very cold, some species arrived early. Both Arctic Tern and Parasitic Skua were already recorded in March.

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The weather continued being mild with westerly winds until the end of April, a situation markedly different from 2009, when April was dominated by easterly winds.

One of the largest migratory events in spring 2010 happened on April 24/25 and April 28. Massive migration of Common Scoters and Tree Pipits occurred after the period of strong westerly winds in previous 4 days over the large area of eastern North Sea and southern coast of Baltic Sea (Figure A.11, Figure A.12).

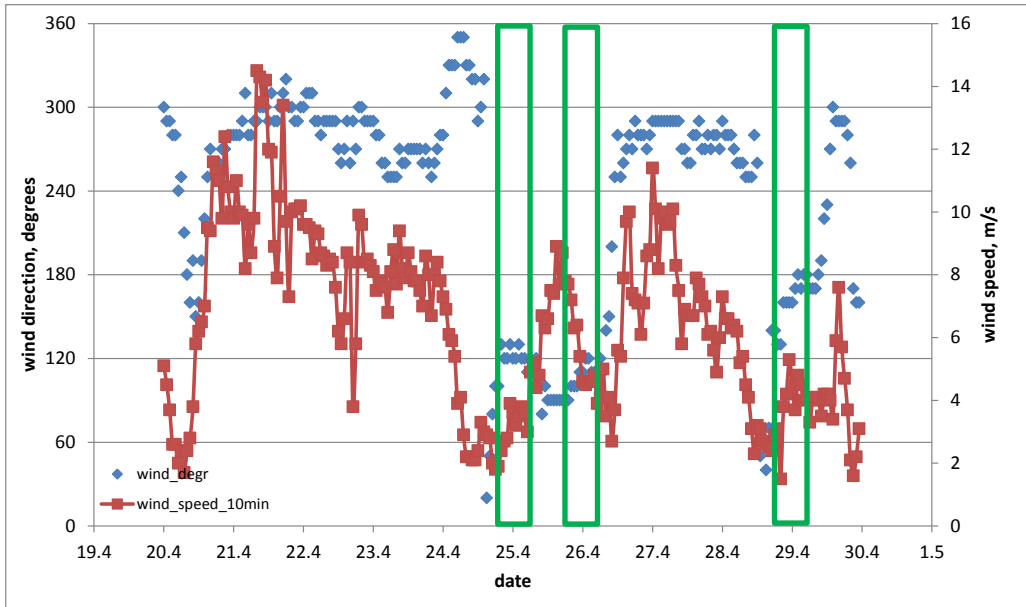


Figure A.11 Hourly dynamics of wind direction (blue dots) and wind speed (red line) at ground level during second half of April 2010. Green rectangle shows the time period of the strongest peak of migration.

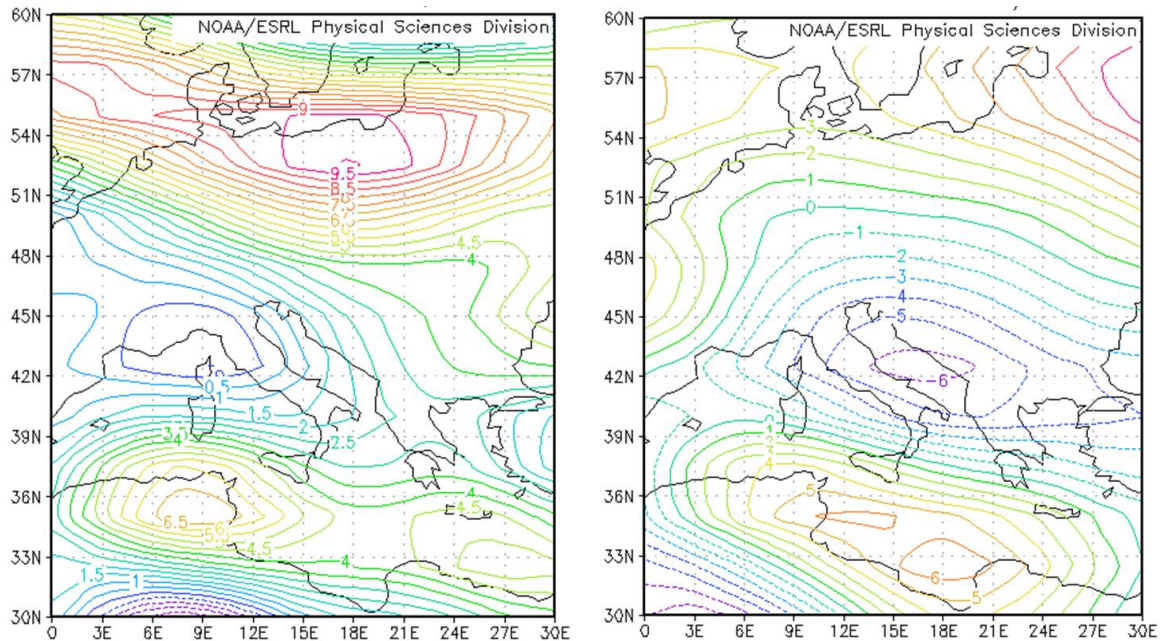


Figure A.12 Westerly component of wind (m/sec) at the level of 850 mb (app. 1,500m). Average from April 20-24, 2010 (migratory pause, left) and from April 24-26, 2010 (migratory peak, right). Isolines connect areas with the same westerly wind speed. Colour gradient of isolines from blue to red reflects the increasing of the wind speed.

Whereas large numbers of Little Gulls were registered in 2009, fewer Little Gulls occurred in 2010, with a small peak in late April, registered at all three stations. However, in 2010 high numbers of Eurasian Curlews were counted, migrating mainly during late afternoon and evening on days with strong tail winds, mainly registered at the Danish coast. This migration event can be compared to the Arctic wader migration seen in late May and early June 2009, when these species utilised tail

winds after a period of head winds. Common Eider and Common Scoter numbers were peaking in early April, mainly observed at the Danish coast, sharply decreasing until mid-April. Other species of waterbirds which occurred during April in fair numbers were: *Gavia divers* also offshore, terns, White-fronted Goose and Wigeon mainly at the Danish coast. During April only few landbirds were registered, most of them at the German coast, with Common Starling, Jackdaw, Skylark, Meadow Pipit and Linnet as the most numerous.

May was characterised by northerly winds and temperatures lower than average, also with above average rain and below average sunshine. In late May the wind turned more to the west, with showers and wind speed up to 18 m/sec. During the last days of May the winds once again turned towards north and stayed this way well into June.

The Barnacle Goose which already had a single migration peak day in April had another migration peak in May, registered at the Danish coast, and in low numbers also offshore and at the German coast. Greylag Goose was seen in regular numbers at all stations. *Gavia divers* passed in fair numbers during May and a few into early June, most observed at the Danish coast, second most at offshore station. In late May and early June the Arctic waders and Brent Geese started to migrate. The Bar-tailed Godwits and Red Knots appeared in numbers comparable to 2009, Brent Geese were less frequent and Dunlins almost absent.

Again, landbirds were not very numerous during May. However, at the German coast rather high numbers of Common Swift, Barn Swallow and Common and Honey Buzzard were seen, but only low numbers of Sparrowhawk.

Already during late May moult migration started. E.g. Common Eiders were registered with comparable numbers at all three stations in late May, most of them moving west. Mute Swans and Common Eiders are moulting during summer and Curlews are returning to the Wadden Sea. During mid-June Common Starlings were migrating west.

A.6.7 Summer 2010

Summer started cold in June with north and westerly winds continuing until early July when the wind turned east to southeast and the weather became warmer and stayed like this until late July. From late July and throughout August westerly winds prevailed.

Of the few birds counted during the summer season most of them were waterbirds. Common Eiders and Common Scoters passed in small numbers, followed by Greylag Goose. High numbers of Curlew could be observed offshore and from Puttgarden, various other species of waders and gulls. The number of Dunlins registered offshore during July was higher than at both land stations.

A.6.8 Autumn 2010

Weather conditions were rather variable during most of autumn, with frequent low pressures coming in from west. Wind directions in August, September and last half of October were mainly westerly. However, during the first half of October easterly winds prevailed. Already in the middle of October temperatures dropped to 0°C during night. The first half of November (up to the end of the observation period) was fairly mild with winds from various directions.

As for the autumn migration in 2009 waterbirds were more frequent at the German coast in 2010 with most numerous species being Common Eider, Barnacle Goose, Common Scoter, Great Cormorant, Eurasian Wigeon and Brent Goose. In turn, landbirds were registered in high numbers at the Danish coast, with most numerous species being Chaffinch and Brambling, Siskin, Barn Swallow, Yellow Wagtail and Common Starling. Of the landbirds, Wood Pigeon and Meadow Pipit were registered at both coasts in high numbers, the latter even with good numbers offshore.

One of the largest peaks of migration in autumn 2010 occurred on 26 – 27 of August after several days of strong winds over the southern Scandinavia (Figure A.13, Figure A.14).

FEHMARNBELT BIRDS

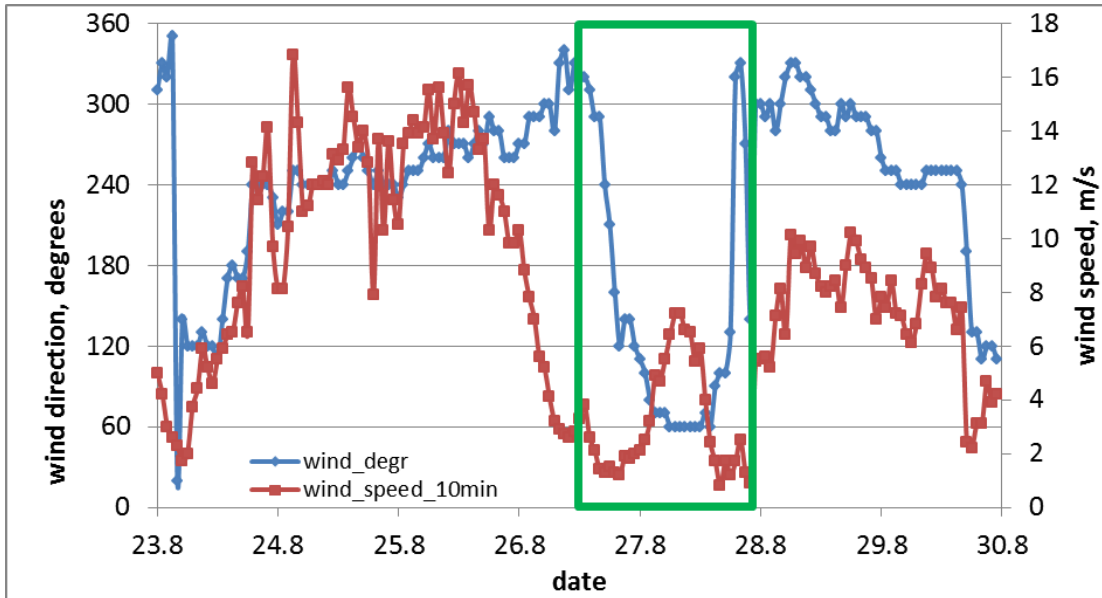


Figure A.13 Hourly dynamics of wind direction (blue) and wind speed (red) at ground level during the last 10 days of August 2010. Green rectangle shows the time period of the strongest peak of migration.

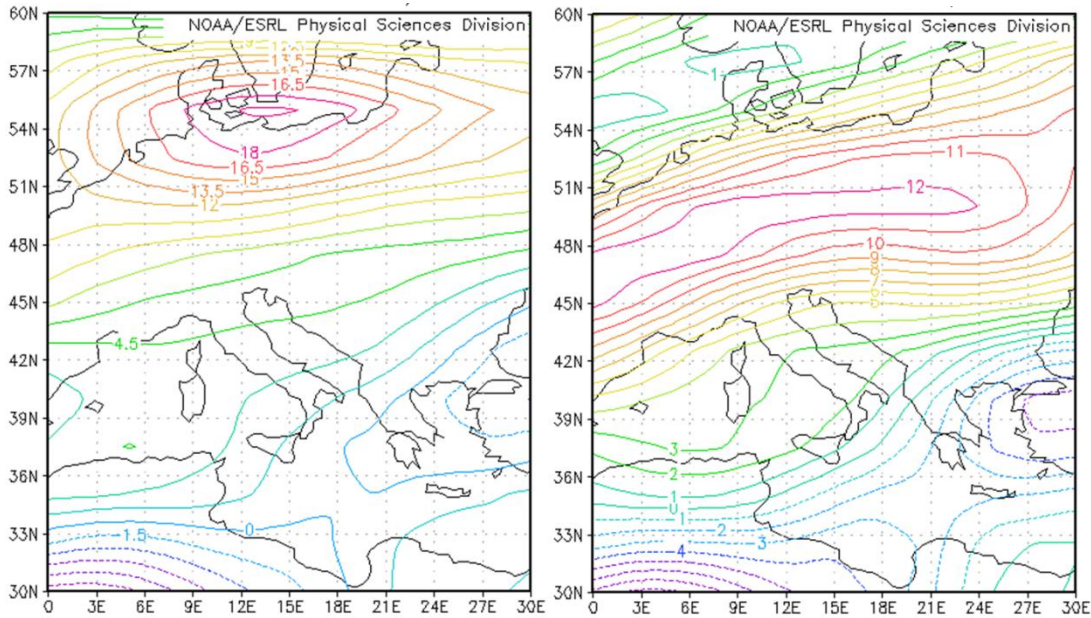


Figure A.14 Westerly component of wind (m/sec) at the level of 850 mb (app. 1,500m). Average from August 24-26, 2010 (migratory pause, left) and from August 26-28, 2010 (migratory peak, right). Isolines connect areas with the same westerly wind speeds. Colour gradient of isolines from blue to red reflects the increasing of the wind speed.

Also during August 2010, birds of prey migration started somewhat later than in the previous year. Honey Buzzard, Hen Harrier and Red Kite numbers were lower than in 2009, but numbers of most other birds of prey species were considerably higher than in 2009. In September, Sparrowhawk and in October Common Buzzard were the dominating species. During September 21-25 Sparrowhawk migration was registered at all three stations, most likely an effect of wind. A peak of Common Buzzard migration occurred at October 11/12, 2010. On October 11, following the passage of a cold front, 10,071 Common Buzzards were observed at Falsterbo, Sweden (SkOF 2010). Somewhat further west, at Stevns Klint, 8,879 buzzards were registered (DOF 2010). On that day, hours of intense migration in high altitudes occurred at the Rødbyhavn station, with sometimes more than 1,000 buzzards visible in a long stream, resulting in a total of 5,036 buzzards being registered. While migration intensity decreased at Puttgarden, 1,128 buzzards could still be registered the following day.

Passerines and pigeons were the most numerous migrating birds during autumn 2010. Wood Pigeons and finches started earlier than during 2009, and high migration intensities were registered already in September. Finches continued well into October and Wood Pigeons to the end of October,

while Stock Dove was observed in lower numbers than during 2009. A remarkable large invasion of Siskins was registered in 2010 with considerably more birds than during 2009. Typically, the Siskins were recorded at the Danish coast (some 66,000) while at the German coast the peaks contained only 3,700 birds. At Falsterbo a historic number of 83,000 Siskins were recorded on October 7, 2010. Other numerous passerines during autumn 2010 were Common Starling, swallows, Meadow and Tree Pipit and Yellow Wagtail. Linnets were registered in high numbers as well during one off-shore day (October 7, 2010), when other passerines were registered offshore, as well. Some unusual invasion species during autumn 2010 were Eurasian Jay, Bullfinch and Waxwing in fair numbers and high numbers of Common Redpoll and Blue Tit.

Waterbird migration was dominated by Common Eider, typical for autumn with higher numbers at the German coast. With a large peak around September 29, 2010, migration continued into the middle of November. Common Scoter was the second most common waterbird species in autumn. Migration started early in August and continued into November, with three peak days on August 10, September 29 and November 16, 2010, registered at the German coast.

Black-headed Gull was present in low numbers more or less throughout autumn. However, its phenology was remarkably different between the Danish and German coasts. While at Rødbyhavn, numbers were regularly medium to high from July onwards with one peak on August 26 and one on November 7, at Puttgarden numbers were somewhat lower but had a high peak during September 14-17, 2010. Most of the Little Gulls passed from September 28 to October 1 and were mainly recorded at the German coast during south-easterly wind. In August and September dabbling ducks migrated, with fewer Wigeons but more Pintails compared to 2009. Barnacle Geese migration started in September, with peak numbers during October and continuation into November.

During autumn one more remarkable case occurred of observing individual migration of birds along a migration route proposed for several species from Falsterbo (Sweden) over Stevns (Denmark) and across the Fehmarnbelt in the area of the planned fixed link. On August 27, 2010 a flock of 21 White Storks left Falsterbo, 30 minutes later reached Stevns, around 2.5 hours later they were recorded at the Rødbyhavn field station leaving the south coast of Lolland and 20 minutes later they were seen at Puttgarden field station.

A.7 Figures for Chapter 3.3.3: Flight directions and flight paths - horizontal surveillance radar screenshot data

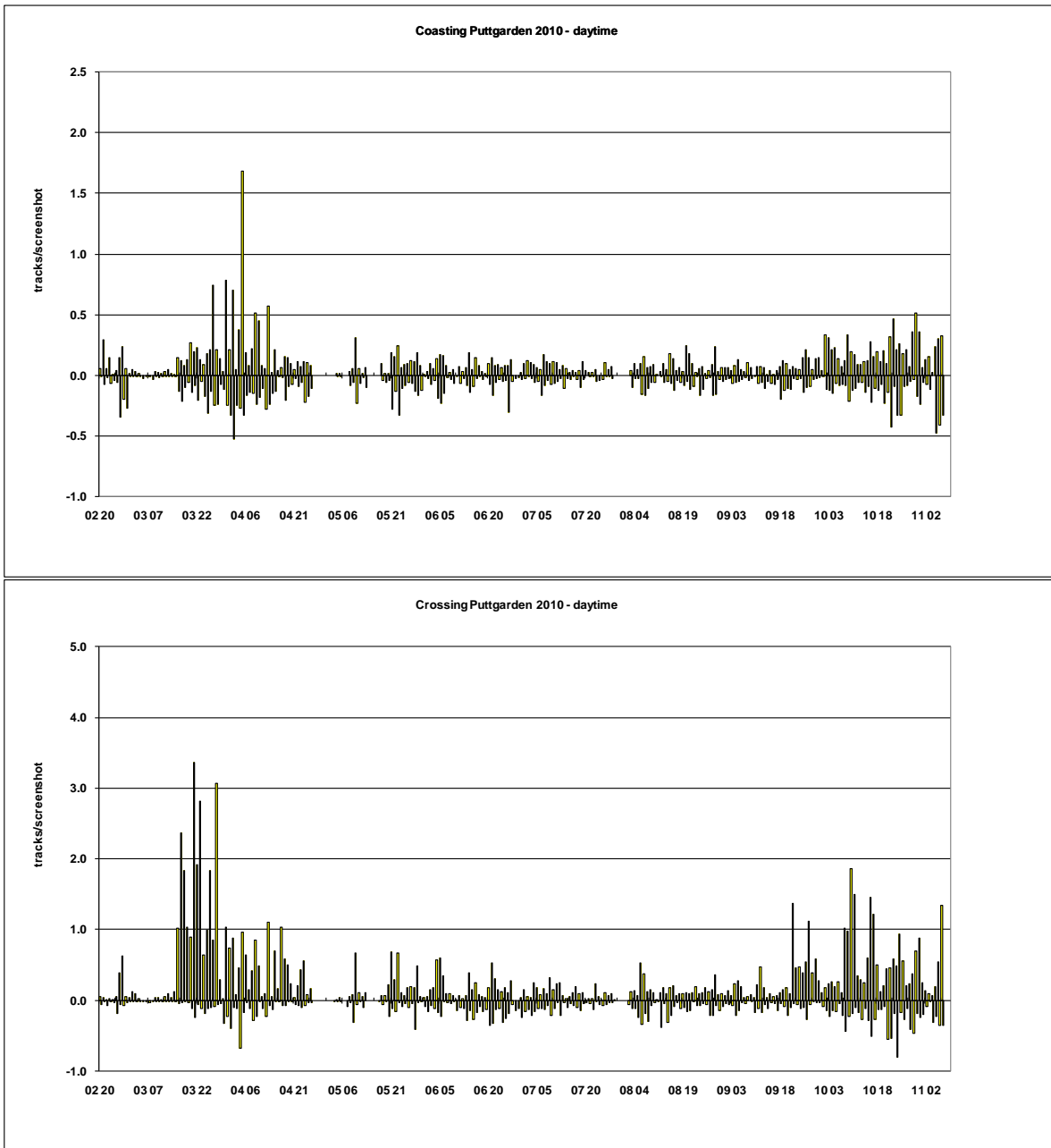


Figure A.15 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded at Puttgarden during 2010 during daytime. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

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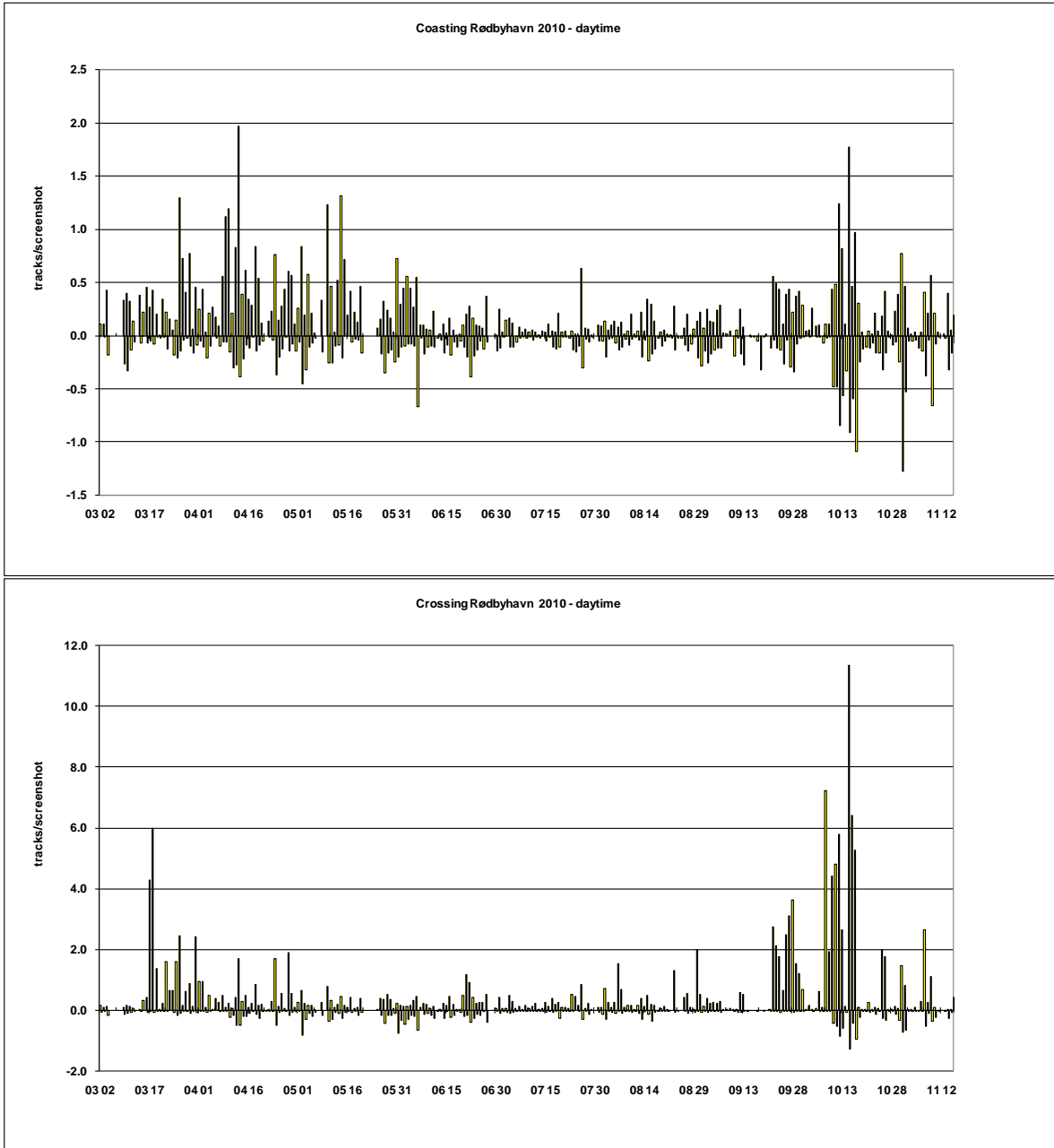


Figure A.16 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded at Rødbyhavn during 2010 during daytime. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

FEHMARNBELT BIRDS

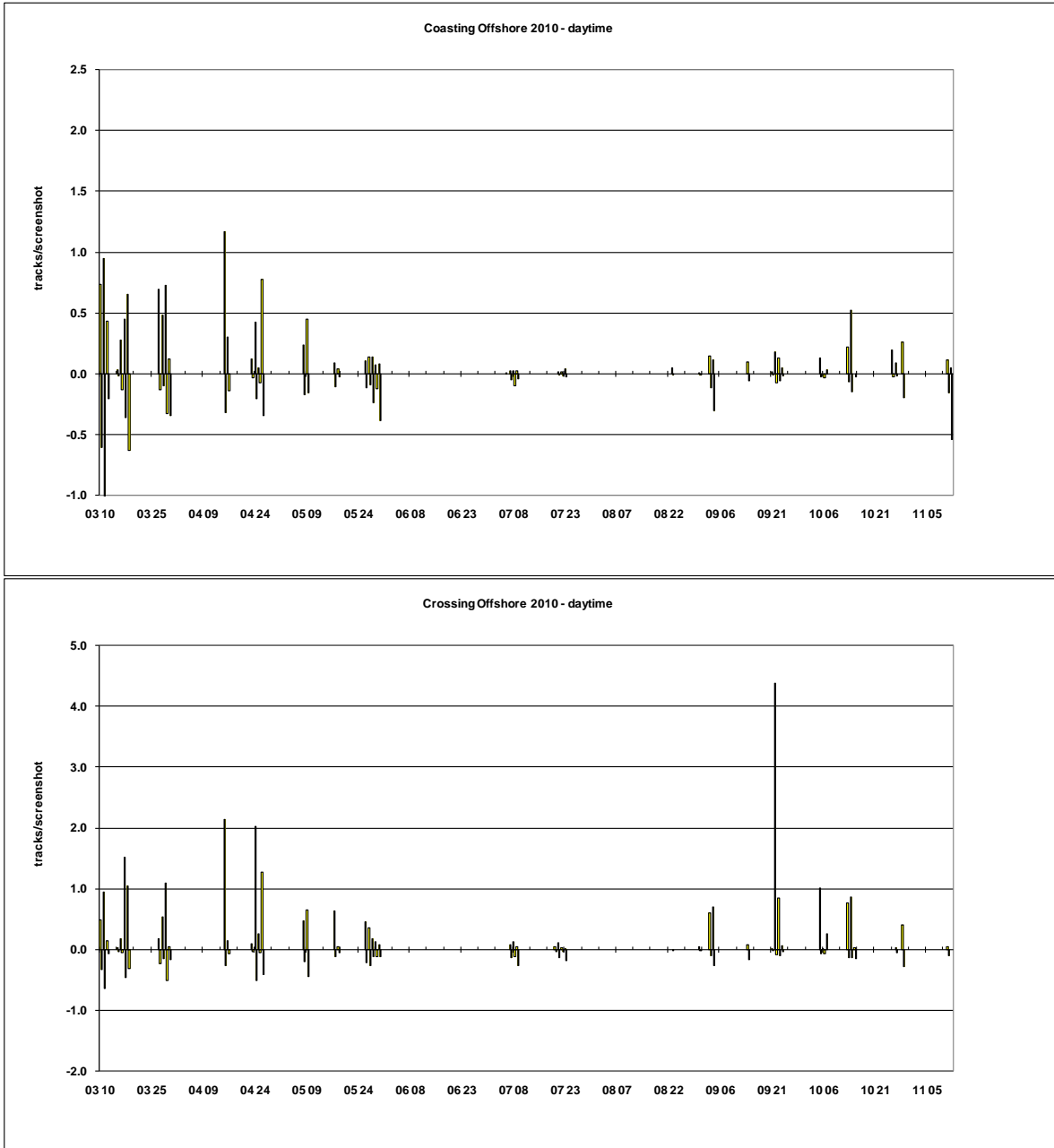


Figure A.17 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded offshore during 2010 during daytime. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

FEHMARNBELT BIRDS

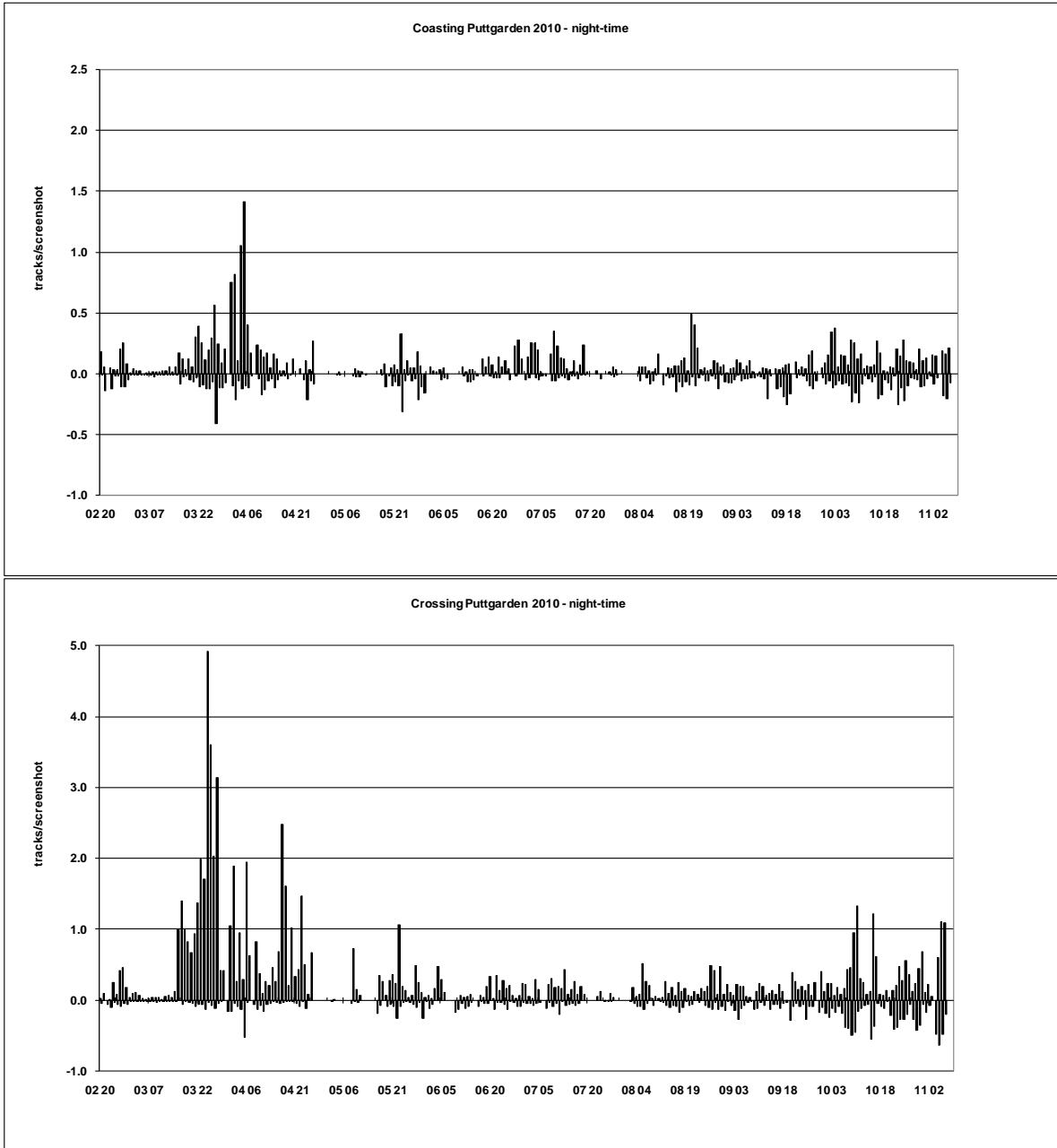


Figure A.18 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded at Puttgarden during 2010 during night-time. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

FEHMARNBELT BIRDS

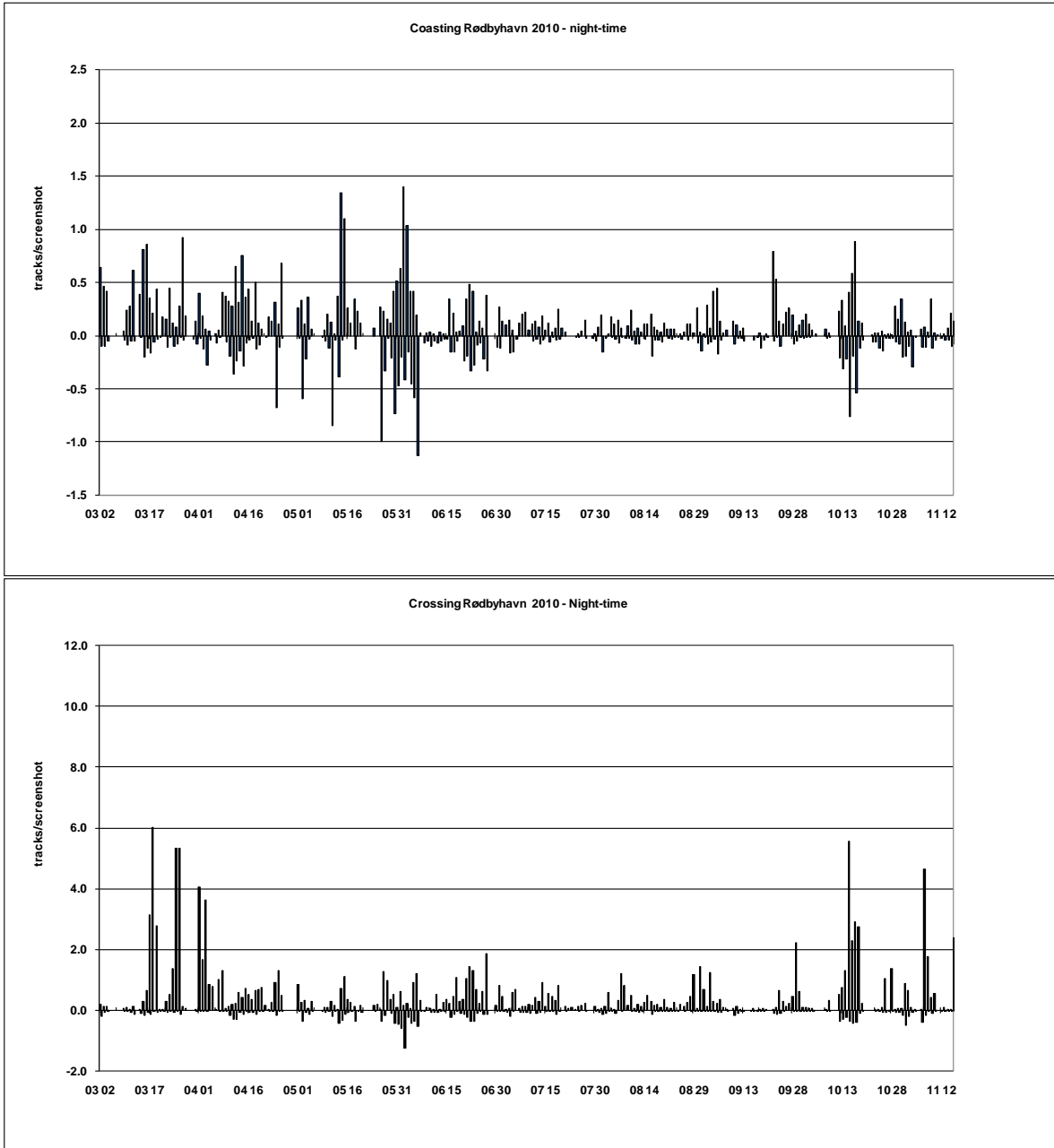


Figure A.19 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded at Rødbyhavn during 2010 during night-time. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

FEHMARNBELT BIRDS

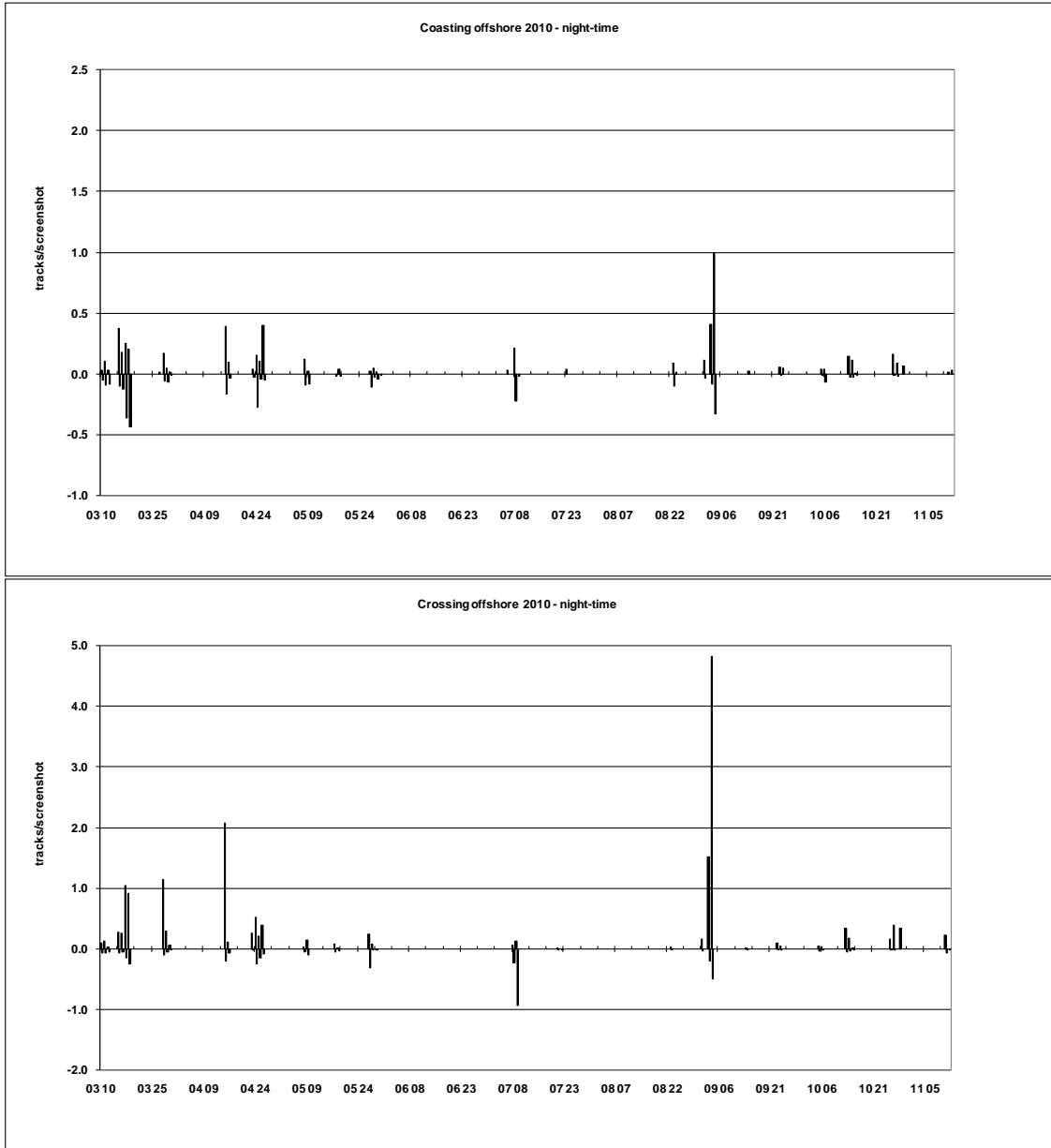
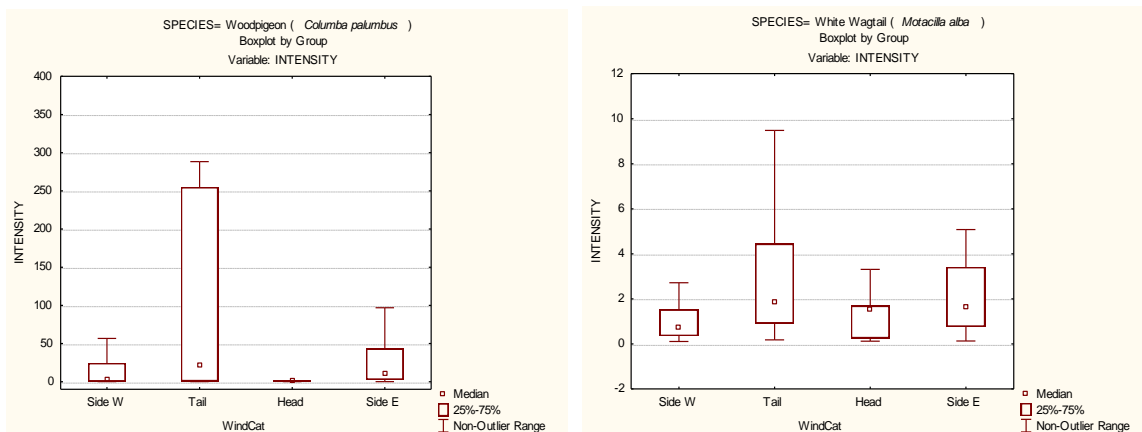


Figure A.20 Average number of tracks (6 km range) per horizontal radar screenshot per day recorded at Puttgarden during 2010 during daytime. The recordings have been split into tracks moving parallel to the coast (upper panel) and tracks crossing the Fehmarnbelt (lower panel). Negative track densities refer to tracks moving in the reverse directions.

A.8 Statistical figures (boxplots) for Chapter 4.1: Bird migration behaviour and wind – visual observations



FEHMARNBELT BIRDS

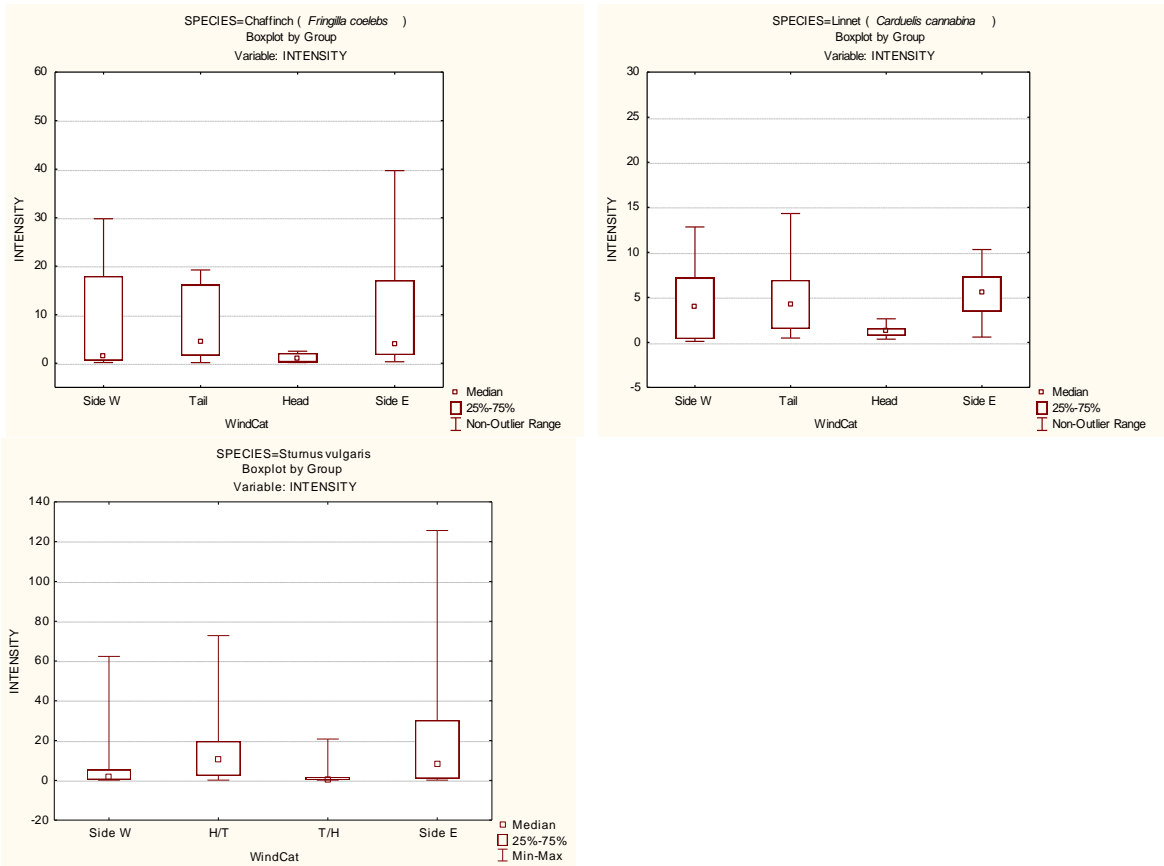
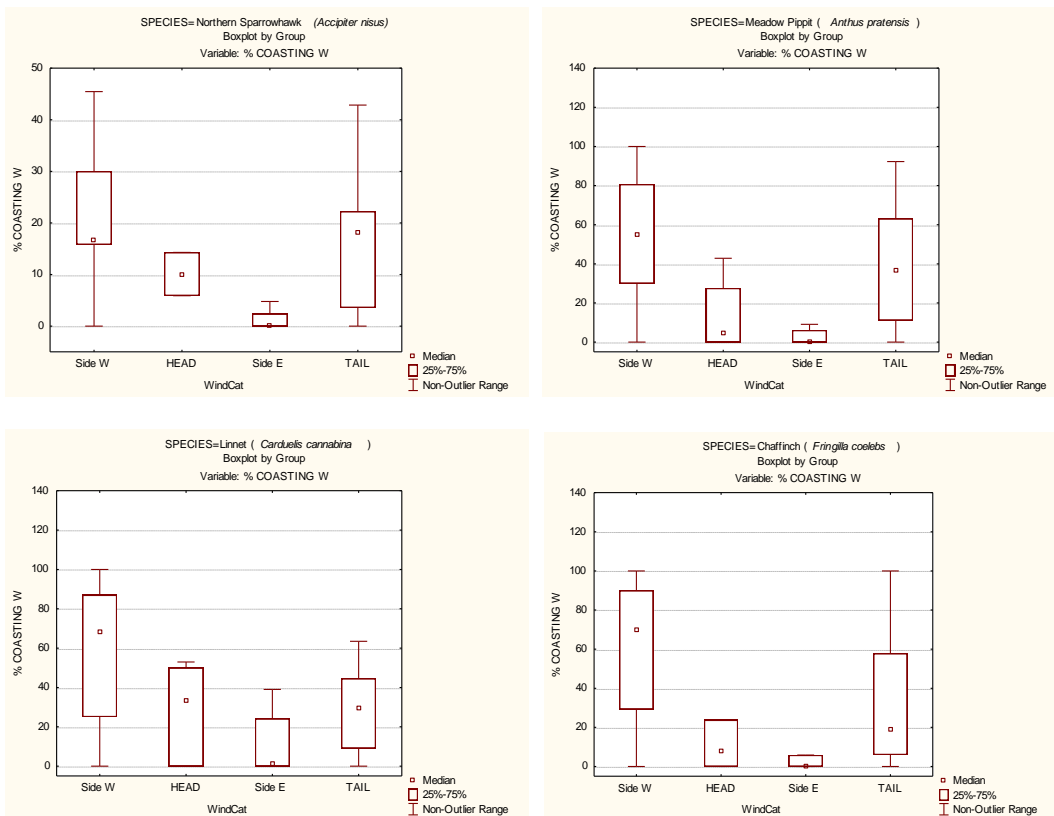


Figure A.21 Boxplots of migration intensity recorded for different wind components for species during spring 2010 at Puttgarden. Median intensity, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).



FEHMARNBELT BIRDS

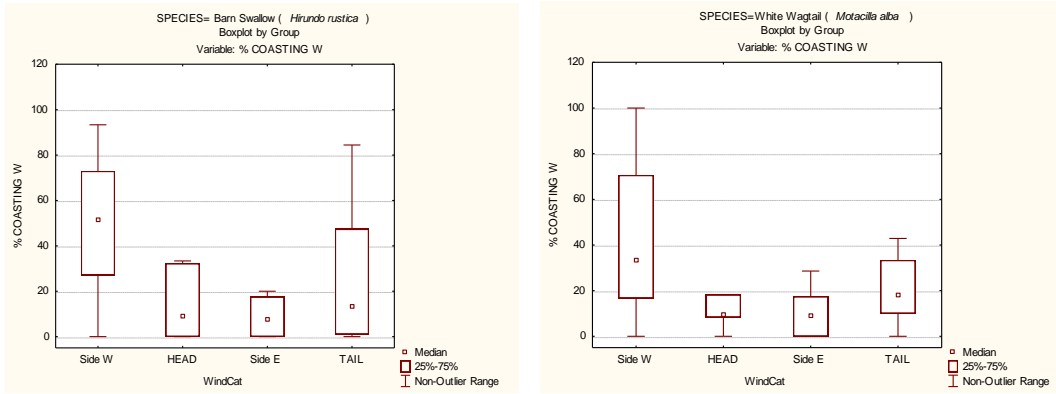


Figure A.22 Boxplots of proportion coasting west recorded for different wind components for selected species during spring 2010 at Puttgarden. Median, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).

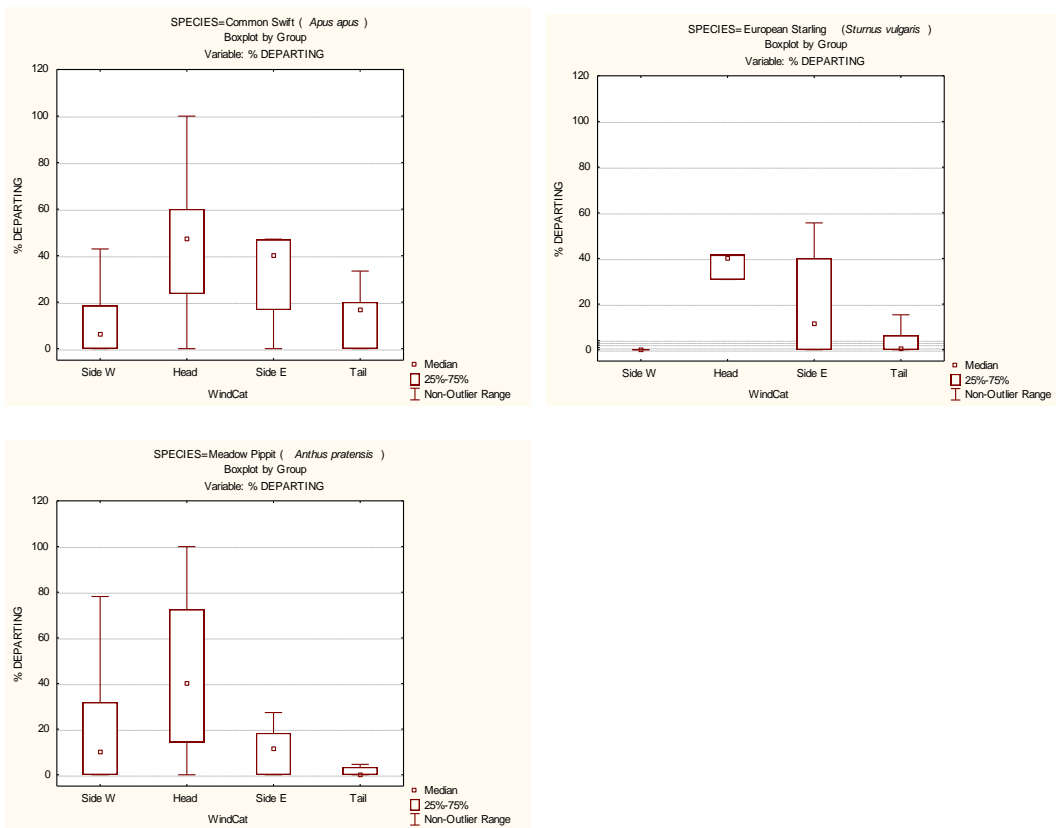


Figure A.23 Boxplots of proportion departing recorded for different wind components for selected species during spring 2010 at Puttgarden. Median, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).

FEHMARNBELT BIRDS

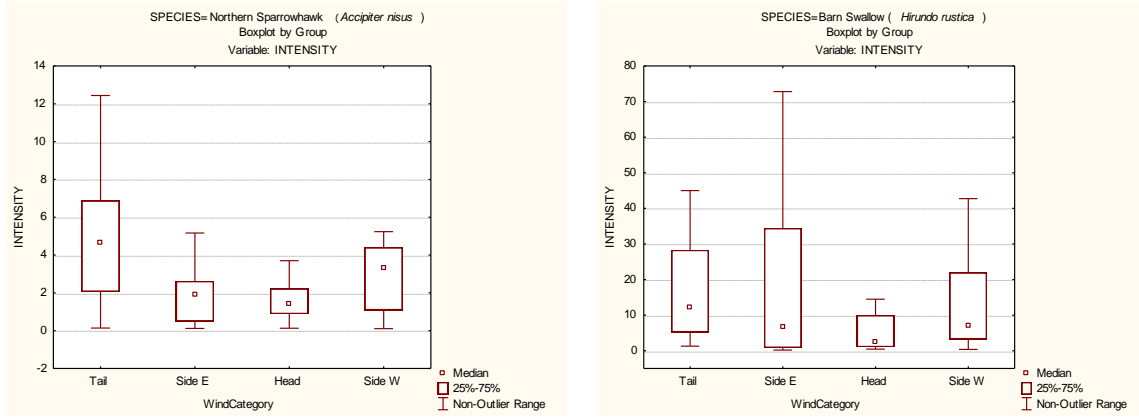
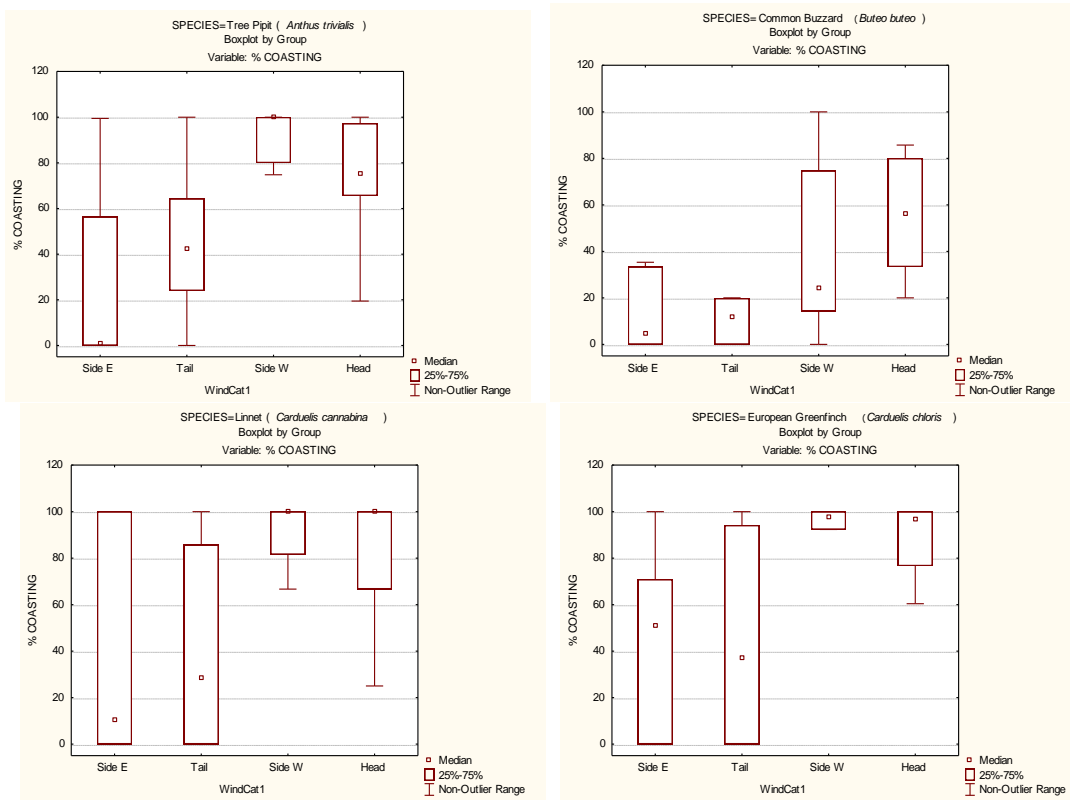


Figure A.24 Boxplots of migration intensity recorded for different wind components for selected species during autumn 2010 at Rødbyhavn. Median intensity, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).



FEHMARNBELT BIRDS

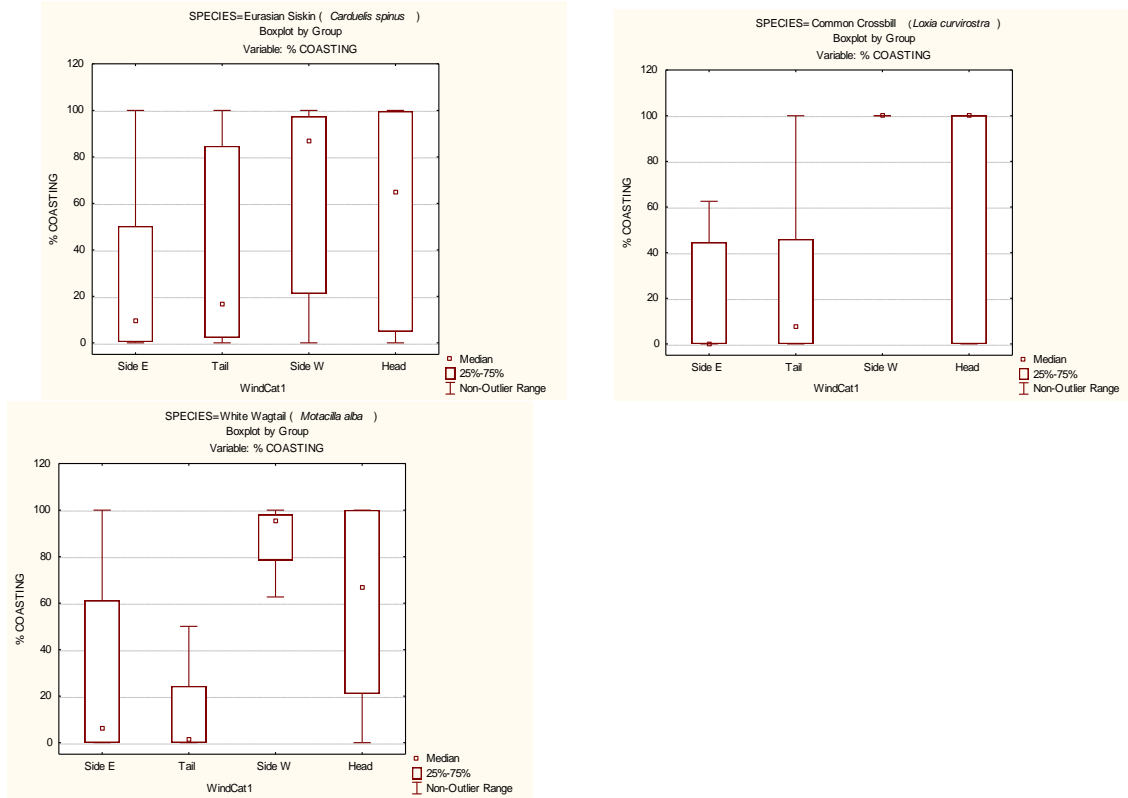
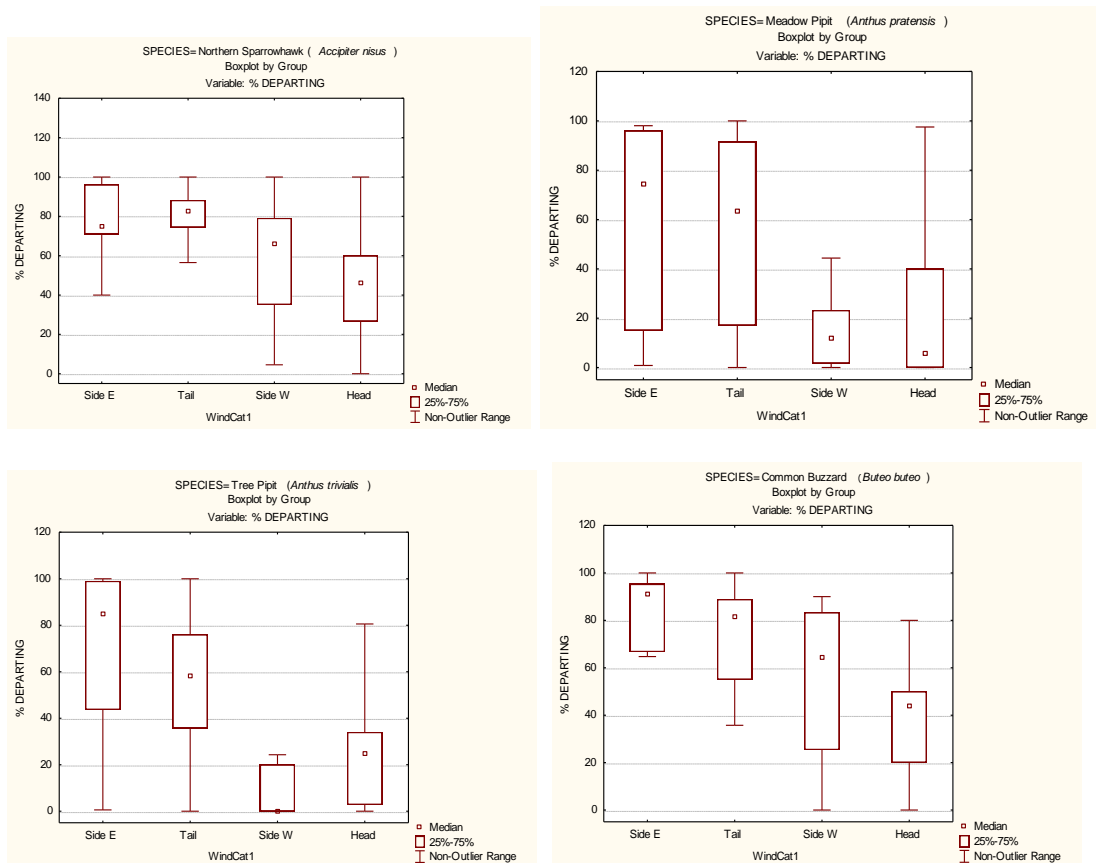


Figure A.25 Boxplots of proportion of coasting birds recorded for different wind components for selected species during autumn 2010 at Rødbyhavn. Median, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).



FEHMARNBELT BIRDS

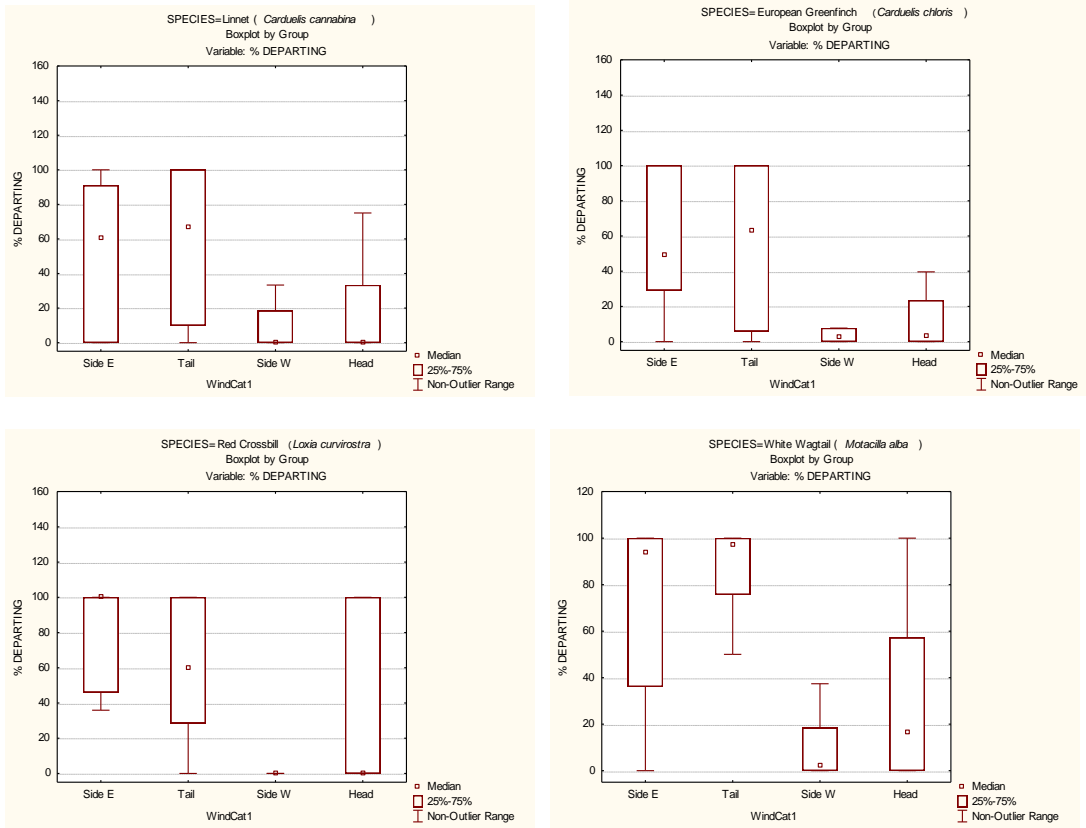


Figure A.26 Boxplots of proportion of departing birds recorded for different wind components for selected species during autumn 2010 at Rødbyhavn. Median, quartiles and non-outlier range are shown. Wind components are tail wind (Tail), side wind from the east (Side E), head wind (Head) and side wind from the west (Side W).

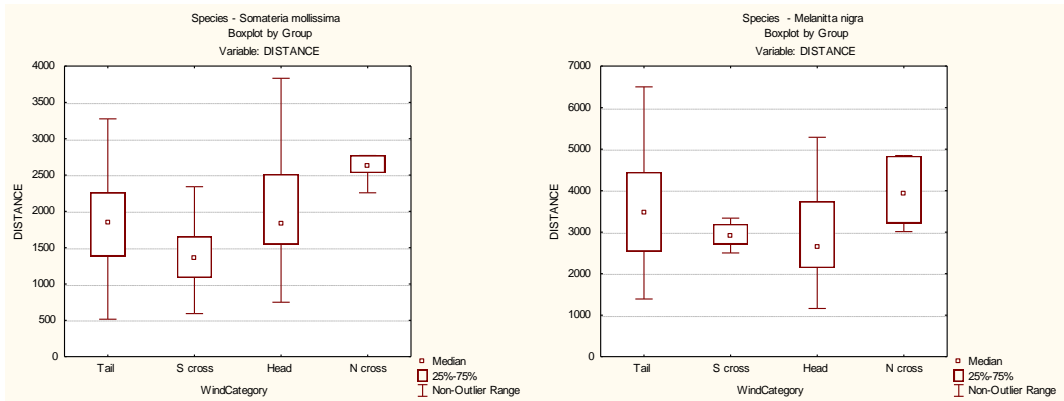


Figure A.27 Boxplots of distance to coast recorded for different wind components for selected species during spring 2010 at Rødbyhavn. Median, quartiles and non-outlier ranges are shown. Wind components are tail wind (Tail), cross wind from the north (N Cross), head wind (Head) and cross wind from the south (S Cross).

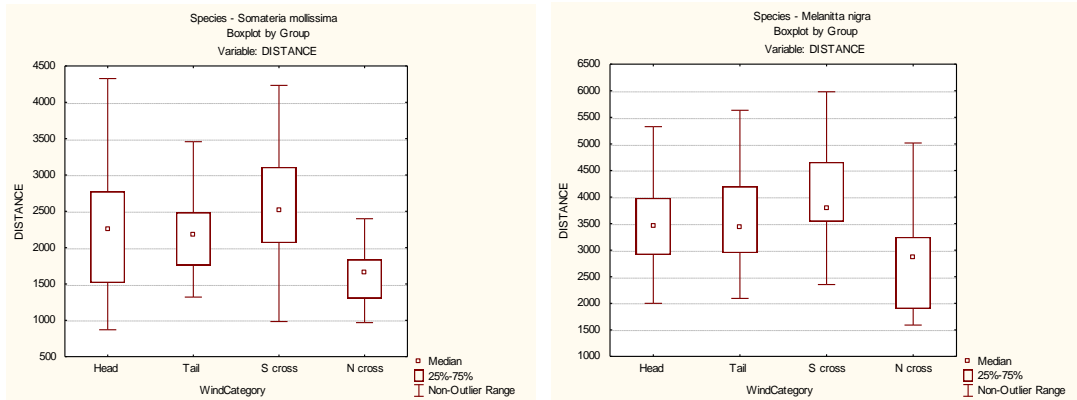


Figure A.28 Boxplots of distance to coast recorded for different wind components for selected species during autumn 2010 at Puttgarden. Median, quartiles and non-outlier ranges are shown. Wind components are tail wind (Tail), cross wind from the north (N Cross), head wind (Head) and cross wind from the south (S Cross).

A.9 Modelling results for Chapter 4.3: Bird migration intensity and weather: modelling for selected species

A.9.1 2009 data

Summary of methods

We present the results of the first approach for modelling of spring and autumn migration of selected species (Common Buzzard, Honey Buzzard, Common Eider, Barnacle Goose, Tree Pipit) across the Fehmarnbelt in 2009. Generalized Additive Model (GAM) was used (package "mgcv", R). Effort corrected intensity of migration through Fehmarn and Lolland (birds/hour) was modelled with following parameters: Julian day (jul_day), cloud altitude (cloud_alt), visibility (visibility), cloud cover, temperature (temper), trend of the temperature during previous 3 days (linearregr_of2past_days12), two alternative sets of parameters characterizing wind (1. wind speed and combination of sin and cos of wind direction, $s(\sin_x, \cos_y) + s(\text{wind_speed_10min})$ 2. projection of wind vector on x and y axis (x_proj, y_proj)). The best model was selected using minimal Akaike's Information Criterion (AIC). No bootstrap was applied. Results are summarized in tables per species/season/location. Details for some models are listed below the tables including formulas, statistics and transformation functions. The whole exercise will be repeated when the results of visual observations for 2010 are available.

Structure of models for each species and season:

With projection of the wind vector:

```
ggg1<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj), data=...)
ggg2<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(visibility), data=...)
ggg3<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(cloud_alt), data=...)
ggg4<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(linearregr_of2past_days12), data=...)
ggg5<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(temper), data=...)
ggg6<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(ppt_12h), data=...)
```

with sin and cos and wind speed:

```
ggg7<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min), data=...)
ggg8<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(visibility), data=...)
ggg9<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(cloud_alt), data=...)
ggg10<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(linearregr_of2past_days12), data=...)
ggg11<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(temper), data=...)
ggg12<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(ppt_12h), data=...)
```

Common Buzzard – *Buteo buteo*

Spring

The GAM model of spring migration of Common Buzzards explains 54% of the variation of migration intensities and includes two parameters – Julian day and the wind speed and direction.

Spring – Fehmarn

	df	AIC
ggg1	16.40308	362.7883
ggg2	16.80045	364.7509
ggg3	12.55433	360.2854
ggg4	16.48349	364.3317
ggg5	12.41750	359.5606
ggg7	14.19319	363.2565
ggg8	15.35816	364.3439
ggg9	21.27319	347.3665
ggg10	15.11664	364.2544
ggg11	17.39279	354.3356

Family: Gaussian, Link function: identity

Formula: ggg9: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(cloud_alt)

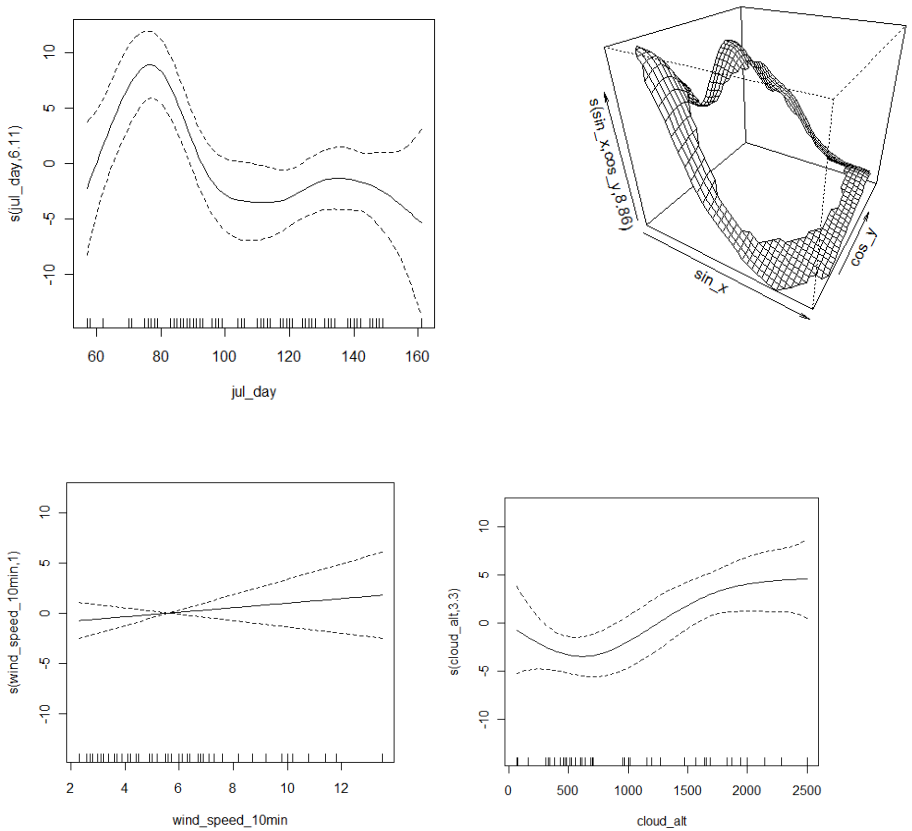
Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.5416	0.5453	4.661	3.86e-05 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.109	7.139	5.805	0.000120 ***
s(sin_x,cos_y)	8.864	11.640	2.709	0.010208 *
s(wind_speed_10min)	1.000	1.000	0.696	0.409277
s(cloud_alt)	3.300	4.002	3.594	0.014046 *

R-sq.(adj) = 0.552 Deviance explained = 70.3%
 GCV score = 26.517 Scale est. = 17.248 n = 58



Transformation functions for the model ggg9, Common Buzzard, spring, Fehmarn, 2009.

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Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

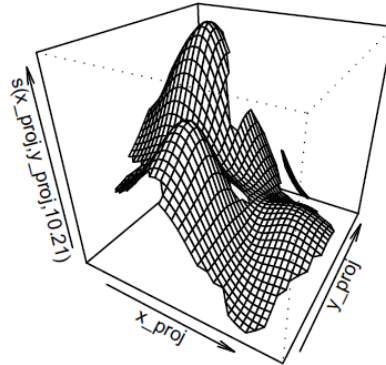
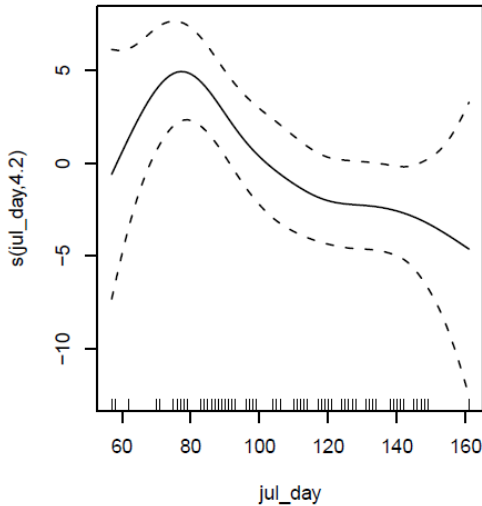
Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.5416	0.6375	3.987	0.000258 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.195	5.087	3.455	0.0101 *
s(x_proj,y_proj)	10.208	13.925	1.173	0.3297

R-sq.(adj) = 0.387 Deviance explained = 54.2%
 GCV score = 32.098 Scale est. = 23.574 n = 58



Transformation functions for the model of spring migration on Fehmarn.

Spring – Lolland

	df	AIC
ggg1	5.697736	365.2516
ggg2	6.000000	367.2920
ggg3	8.476396	349.7889
ggg4	8.488066	365.6264
ggg5	7.468223	364.5283
ggg7	6.000000	368.2922
ggg8	7.000000	370.2712
ggg9	11.101730	352.6995
ggg10	12.668071	369.4326
ggg11	9.243348	368.9520

Family: Gaussian, Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(cloud_alt)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.8713	0.3039	2.867	0.00559 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

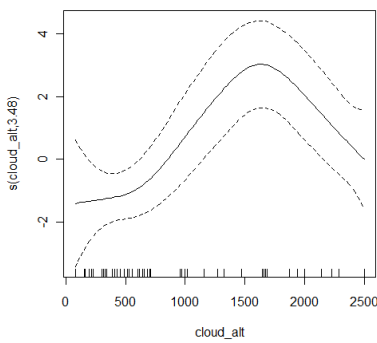
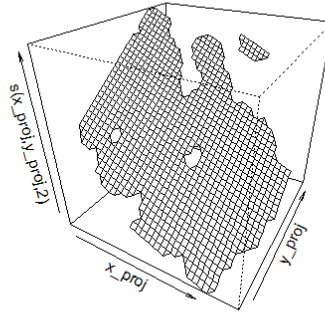
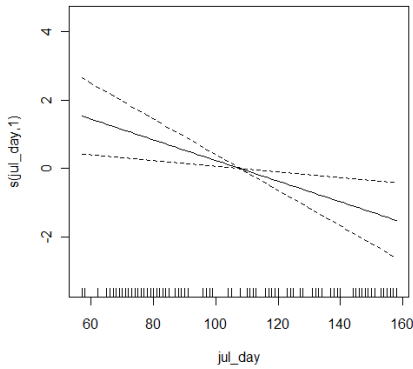
	edf	Ref.df	F	p-value
s(jul_day)	1.000	1.000	7.585	0.00764 **
s(x_proj,y_proj)	2.000	2.000	5.033	0.00931 **
s(cloud_alt)	3.476	4.276	4.972	0.00117 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.259 Deviance explained = 32.7%

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GCV score = 7.4195 Scale est. = 6.6491 n = 72



Transformation functions for the model ggg3, Common Buzzard, spring, Lolland, 2009.

Autumn

The model of migration of Common Buzzards on Lolland includes two parameters – Julian day and wind speed and direction and explains 90% of the variation. Due to too high explanatory power this model might be over-fitted, we will check it when data from 2010 will be available.

Autumn – Fehmarn

	df	AIC
ggg1	31.055248	115.54690
ggg2	32.501422	108.56345
ggg3	31.856342	117.45291
ggg4	34.224106	101.96232
ggg5	31.885322	117.73388
ggg6	35.898741	99.02794
ggg7	9.128674	208.85133

Family: Gaussian, Link function: identity

Formula: ggg6: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)

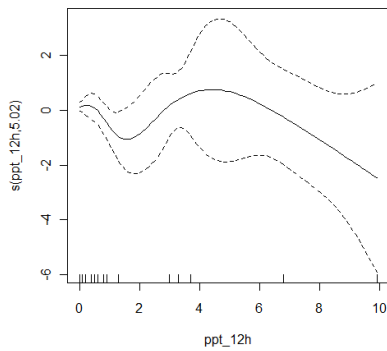
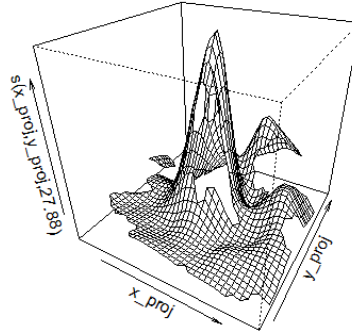
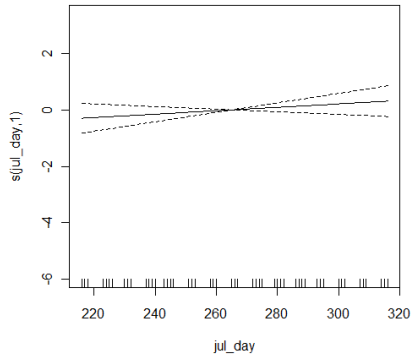
Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.59137	0.07875	7.509	1.2e-06 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.00	1.00	1.283	0.274
s(x_proj,y_proj)	27.88	28.82	19.507	5.55e-08 ***
s(ppt_12h)	5.02	5.67	1.552	0.226

R-sq.(adj) = 0.923 Deviance explained = 97.5%
 GCV score = 1.0019 Scale est. = 0.31631 n = 51



Transformation functions for the model ggg6, Common Buzzard, autumn, Fehmarn, 2009.

Autumn – Lolland

	df	AIC
ggg1	27.39036	295.6769
ggg2	29.12393	287.1495
ggg3	28.08487	297.6507
ggg4	28.39243	295.9970
ggg5	28.01634	296.5663
ggg6	29.43901	294.6568
ggg7	35.60174	327.6652
ggg8	37.37543	318.7196
ggg9	36.92591	326.4543
ggg10	36.69968	328.3516
ggg11	36.68071	328.1138
ggg12	38.38271	323.2972

Family: Gaussian, Link function: identity

Formula: ggg2: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

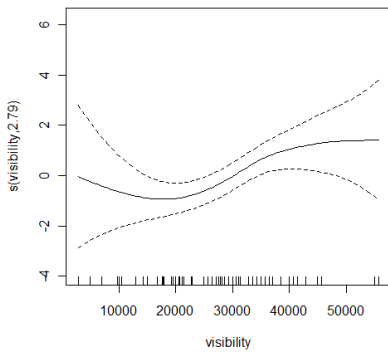
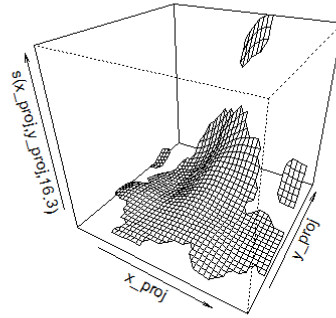
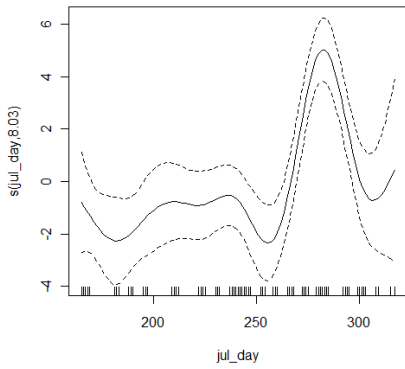
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.5121	0.1918	7.884	8.3e-10 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	8.034	8.630	9.083	2.45e-07 ***
s(x_proj,y_proj)	16.301	20.835	8.359	3.98e-09 ***
s(visibility)	2.789	3.455	2.984	0.0356 *

R-sq.(adj) = 0.863 Deviance explained = 91.7%
 GCV score = 4.3047 Scale est. = 2.5752 n = 70

FEHMARNBELT BIRDS



Transformation functions for the model ggg2, Common Buzzard, autumn, Lolland, 2009.

Family: Gaussian, Link function: identity

Formula: INTENSITY \sim s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

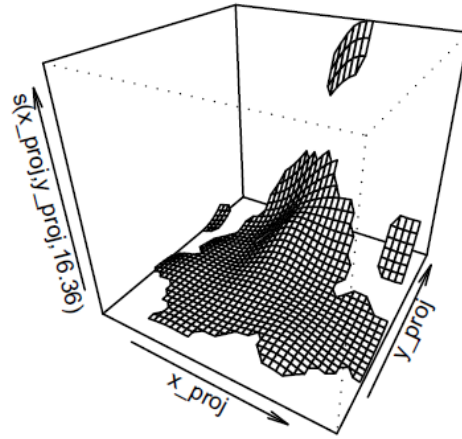
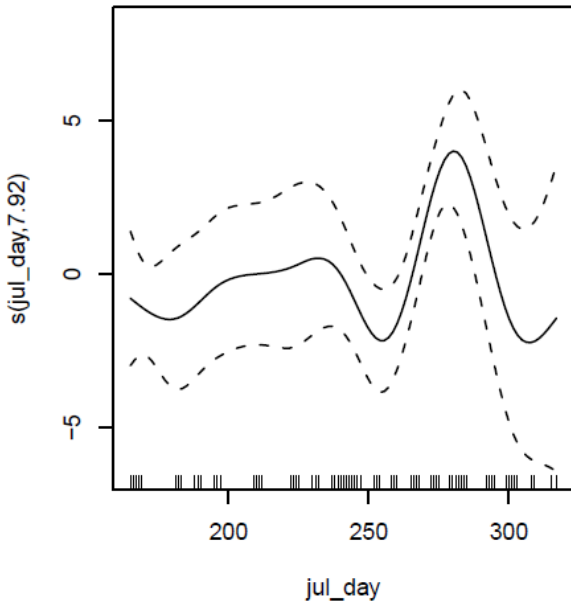
Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.5121 0.2048 7.385 3.3e-09 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	8.067	8.66	7.456	2.10e-06 ***
s(x_proj,y_proj)	17.323	21.98	8.669	1.02e-09 ***

R-sq.(adj) = 0.844 Deviance explained = 90.1%
 GCV score = 4.7111 Scale est. = 2.935 n = 70



Transformation functions for the model of autumn migration on Lolland.

Honey Buzzard – *Pernis apivorius*

Spring – Fehmarn

	df	AIC
ggg1	10.57456	119.18348
ggg2	15.41323	114.94018
ggg3	24.98488	90.58289
ggg4	14.74108	111.07061
ggg5	13.59462	110.73451
ggg7	12.35324	114.67292
ggg8	18.53659	108.49985
ggg9	18.75293	92.83825
ggg10	15.25774	110.87581
ggg11	15.24399	108.59010

Family: Gaussian, Link function: identity

Formula: ggg3: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(cloud_alt)

Parametric coefficients:

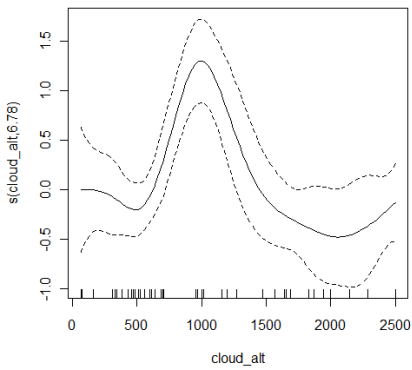
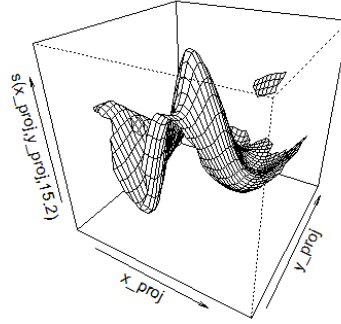
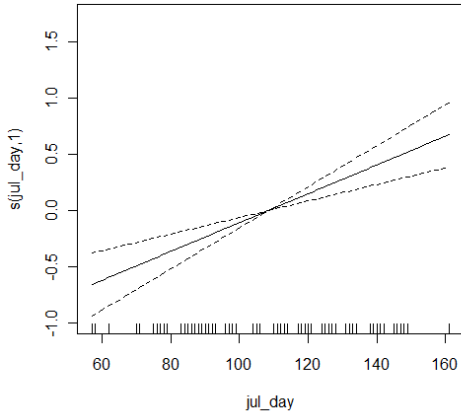
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.19552	0.05888	3.321	0.00215 **

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.000	1.000	22.127	4.14e-05 ***
s(x_proj,y_proj)	15.202	19.795	1.343	0.219522
s(cloud_alt)	6.783	7.691	5.882	0.000112 ***

R-sq.(adj) = 0.598 Deviance explained = 76%
 GCV score = 0.34288 Scale est. = 0.20109 n = 58

FEHMARNBELT BIRDS



Transformation functions for the model ggg3, Honey Buzzard, spring, Fehmarn, 2009.

Spring – Lolland

	df	AIC
ggg1	12.07155	258.3341
ggg2	14.62316	255.7383
ggg3	17.71891	253.7024
ggg4	12.94270	255.9660
ggg5	13.55464	256.2474
ggg7	36.89046	228.0943
ggg8	39.38640	218.1591
ggg9	33.73718	234.5001
ggg10	38.54406	223.6038
ggg11	37.27590	226.5979

Family: Gaussian, Link function: identity

Formula: ggg8: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(visibility)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

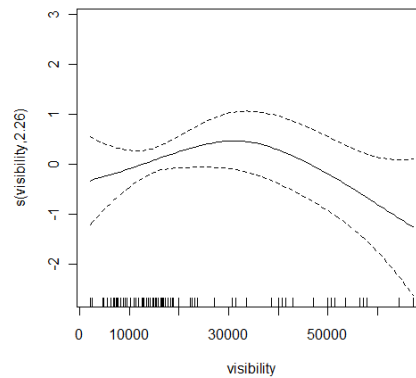
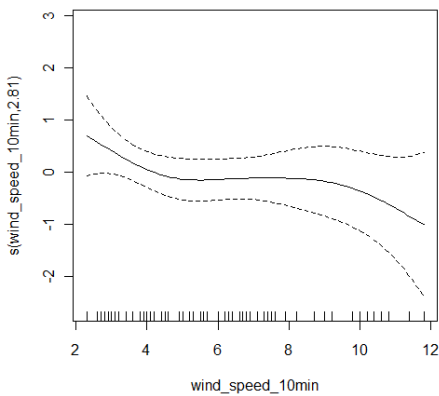
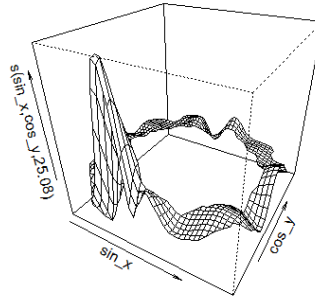
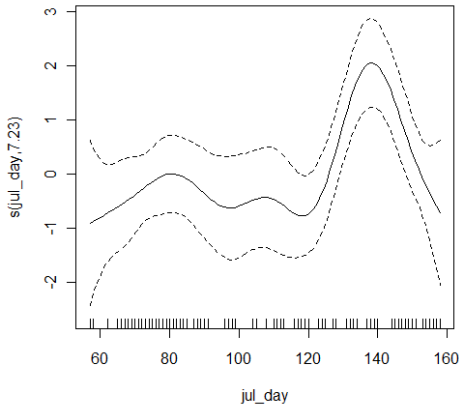
(Intercept) 0.3218 0.1099 2.929 0.00607 **

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	7.229	8.101	3.535	0.00441 **
s(sin_x,cos_y)	25.084	27.729	2.340	0.00982 **
s(wind_speed_10min)	2.811	3.418	1.463	0.23957
s(visibility)	2.262	2.788	1.674	0.19384

R-sq.(adj) = 0.616 Deviance explained = 81.8%
 GCV score = 1.8617 Scale est. = 0.86917 n = 72

FEHMARNBELT BIRDS



Transformation functions for the model ggg7, Honey Buzzard, spring, Lolland, 2009.

Autumn – Fehmarnbelt

	df	AIC
ggg1	10.89393	341.2758
ggg2	11.86705	343.1512
ggg3	12.90554	341.7630
ggg4	12.54403	342.5550
ggg5	12.06646	343.0068
ggg6	11.85745	343.2836
ggg7	12.39892	338.6994

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

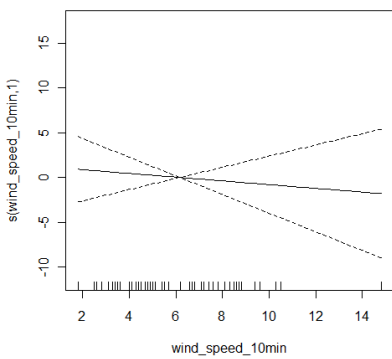
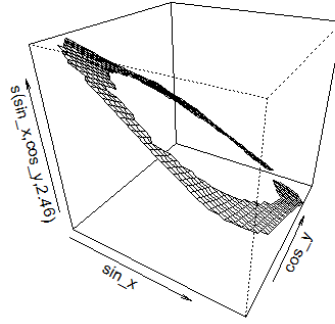
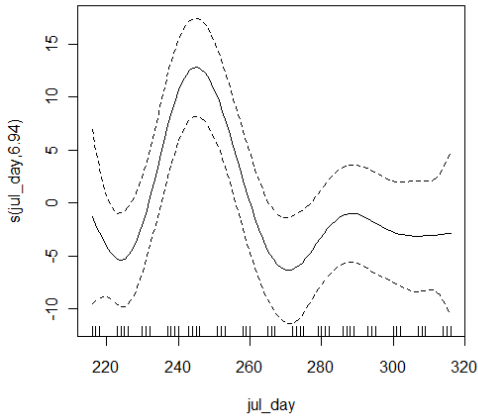
(Intercept) 4.0363 0.8345 4.837 2.03e-05 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.943	7.974	5.076	0.000223 ***
s(sin_x,cos_y)	2.456	2.847	2.263	0.099033 .
s(wind_speed_10min)	1.000	1.000	0.251	0.619113

R-sq.(adj) = 0.597 Deviance explained = 68.1%
 GCV score = 45.741 Scale est. = 35.517 n = 51

FEHMARNBELT BIRDS



Transformation functions for the model ggg7, Honey Buzzard, autumn, Fehmarn, 2009.

Autumn - Lolland

	df	AIC
ggg1	10.36952	545.5708
ggg2	11.19761	547.2082
ggg3	11.52672	546.4570
ggg4	15.03764	541.3230
ggg5	11.23646	547.5561
ggg6	11.28096	547.5498
ggg7	10.58464	545.6184
ggg8	11.45856	547.0281
ggg9	11.65509	545.9103
ggg10	16.29468	541.5857
ggg11	11.47969	547.5609
ggg12	11.48090	547.6095

Family: Gaussian; Link function: identity

Formula: ggg4: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(linearregr_of2past_days12)

Parametric coefficients:

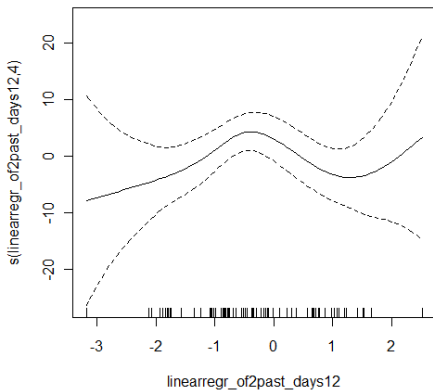
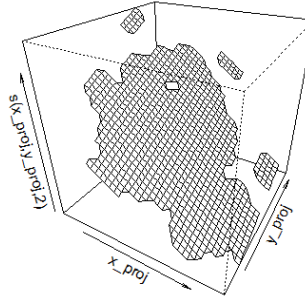
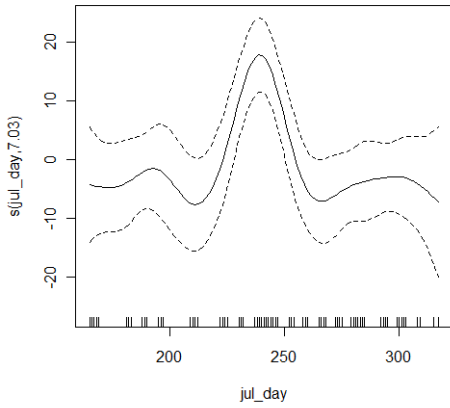
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3.968	1.247	3.183	0.00238 **

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	7.035	7.693	4.142	0.000709 ***
s(x_proj,y_proj)	2.000	2.000	0.040	0.961289
s(linearregr_of2past_days12)	4.003	4.959	1.588	0.179020

R-sq.(adj) = 0.338 Deviance explained = 46.3%
 GCV score = 136.09 Scale est. = 108.8 n = 70

FEHMARNBELT BIRDS



Transformation functions for the model ggg4, Honey Buzzard, autumn, Lolland, 2009.

Common Eider – *Somateria mollissima*

Spring

Model - Fehmarn. GAM with four parameters (Julian day, wind vector projections, visibility and temperature trend during previous 2 days) explains 81% of the variation of spring migration intensity at Fehmarn. Transformation functions are shown in Figures.

	df	AIC
ggg1	25.741034	654.7798
ggg2	25.227813	647.3182
ggg3	28.275139	647.2788
ggg4	8.978660	668.7269
ggg5	28.853017	639.4126
ggg7	10.652653	670.3208
ggg8	11.783612	666.2005
ggg9	7.599343	671.0809
ggg10	15.292814	666.6547
ggg11	8.147174	669.0897

Family: Gaussian; Link function: identity

Formula: ggg5: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(temper)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 60.745 6.637 9.152 3.3e-10 ***

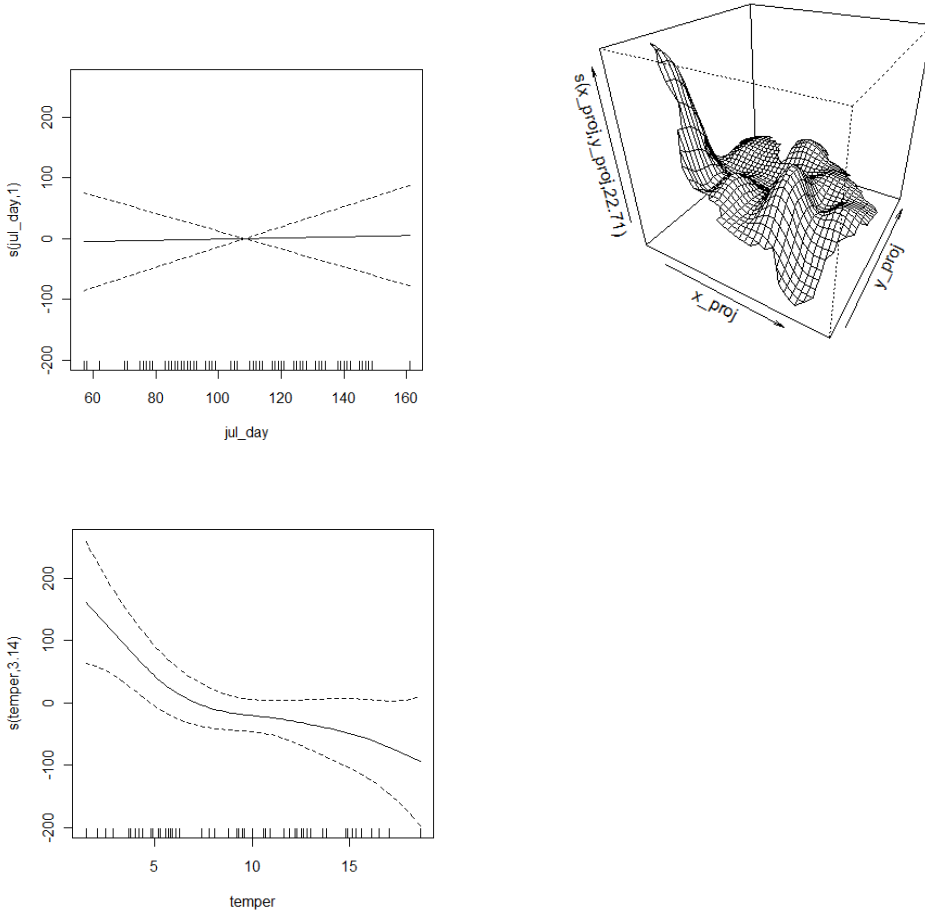
Approximate significance of smooth terms:

edf Ref.df F p-value

FEHMARNBELT BIRDS

```

s(jul_day)      1.000  1.000  0.016  0.90169
s(x_proj,y_proj) 22.711 26.585 2.539 0.00728 **
s(temper)       3.142  3.833  3.421  0.02150 *
R-sq.(adj) =  0.672  Deviance explained = 82.6%
GCV score = 4916.1  Scale est. = 2555.2   n = 58
    
```



Transformation functions for the model ggg5, Common Eider, spring, Fehmarn, 2009.

Family: Gaussian; Link function: identity

Common Eider	%	AIC	
INTENSITY FM ~ s(jul_day) + s(x_proj, y_proj)	74.8	654.7798	
INTENSITY FM ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)	44.6	670.3208	
INTENSITY LL ~ s(jul_day) + s(x_proj, y_proj) + s(visibility) + s(linearregr_of2past_days12)	49.9	1120.632	

Fehmarn

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 60.745 7.612 7.98 3.14e-09 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

edf Ref.df F p-value

FEHMARNBELT BIRDS

```
s(jul_day)      1.00  1.00 17.646 0.000187 ***
s(x_proj,y_proj) 22.74 26.74 1.767 0.059887 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
R-sq.(adj) = 0.568  Deviance explained = 74.8%
GCV score = 5860.8  Scale est. = 3360.8  n = 58
>
AIC(ggg)
[1] 654.7798
```

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 60.745    9.363  6.487 4.36e-08 ***
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Approximate significance of smooth terms:

```
edf Ref.df  F p-value
s(jul_day)      2.034 2.558 8.884 0.000182 ***
s(sin_x,cos_y)  5.619 7.502 0.831 0.573434
s(wind_speed_10min) 1.000 1.000 0.065 0.799794
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
R-sq.(adj) = 0.347  Deviance explained = 44.6%
GCV score = 6100.4  Scale est. = 5085.1  n = 58
>
AIC(ggg)
[1] 670.3208
```

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility) + s(linearregr_of2past_days12)

Parametric coefficients:

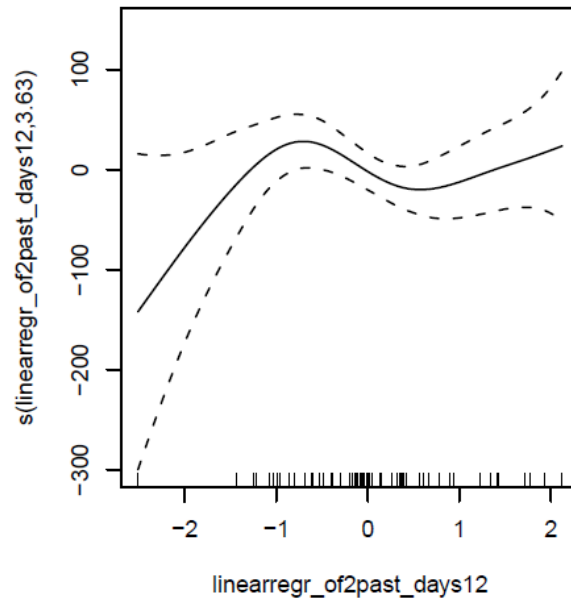
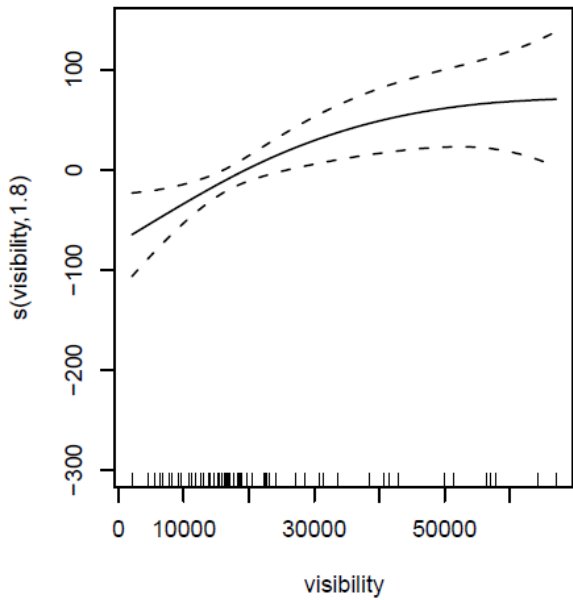
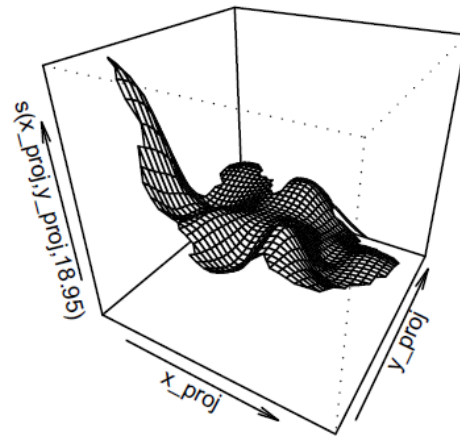
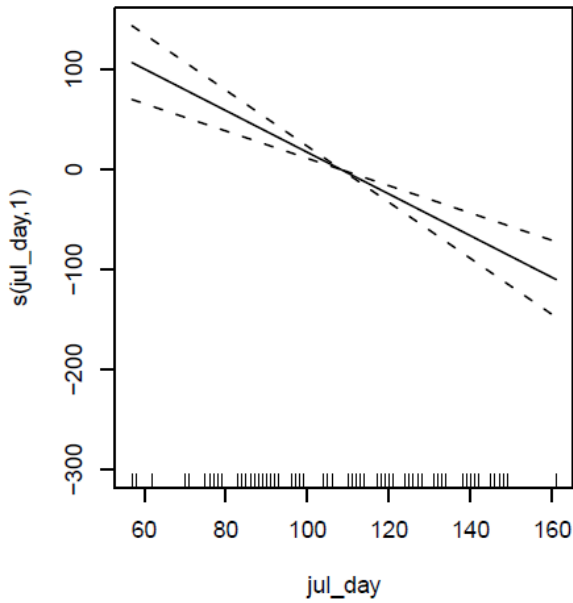
```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 60.745    6.733  9.022 2.95e-10 ***
```

Approximate significance of smooth terms:

```
edf Ref.df  F p-value
s(jul_day)      1.000 1.000 33.748 1.97e-06 ***
s(x_proj,y_proj) 18.953 23.364 1.883 0.04870 *
s(visibility)    1.797 2.172 6.300 0.00411 **
s(linearregr_of2past_days12) 3.634 4.356 1.717 0.16669
```

```
R-sq.(adj) = 0.662  Deviance explained = 81.3%
GCV score = 4823.3  Scale est. = 2629.2  n = 58
```

FEHMARNBELT BIRDS



Transformation functions for the model of spring migration of Common Eider on Fehmarn.

Model – Lolland. The same set of four parameters explains only 50% of the variation of spring migration intensity at Lolland.

	df	AIC
ggg1	8.434523	1120.862
ggg2	13.996725	1121.184
ggg3	9.352408	1122.728
ggg4	10.987829	1121.755
ggg5	8.737567	1121.250
ggg7	11.482082	1120.054
ggg8	15.781218	1118.830
ggg9	12.405092	1121.873
ggg10	15.142854	1119.628
ggg11	12.621017	1120.604

Family: Gaussian; Link function: identity

Formula: ggg8: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(visibility)

Parametric coefficients:

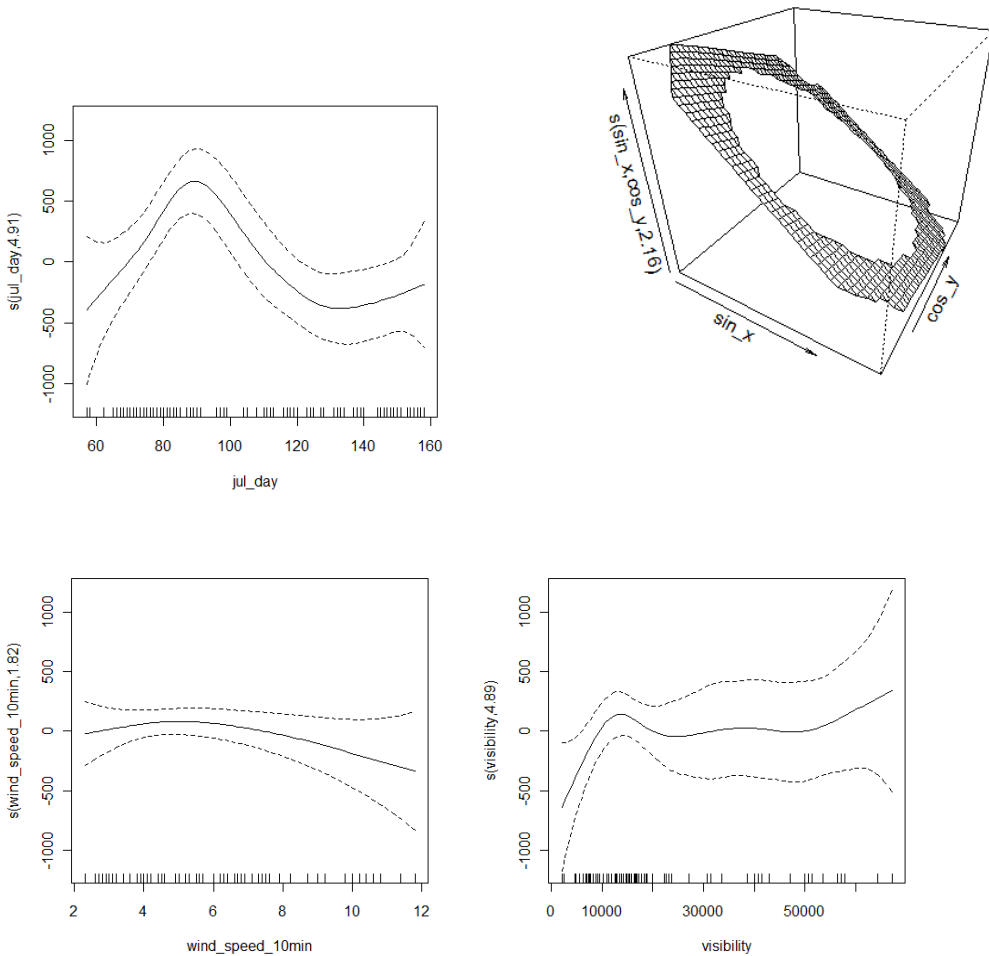
Estimate Std. Error t value Pr(>|t|)

(Intercept) 296.21 60.83 4.869 9.2e-06 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.913	5.964	4.969	0.000381 ***
s(sin_x,cos_y)	2.161	2.310	2.453	0.087274 .
s(wind_speed_10min)	1.822	2.249	0.978	0.390521
s(visibility)	4.886	5.956	1.315	0.265551

R-sq.(adj) = 0.364 Deviance explained = 48.7%
 GCV score = 3.3525e+05 Scale est. = 2.6642e+05 n = 72



Transformation functions for the model ggg8, Common Eider, spring, Lolland, 2009.

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility) + s(linearregr_of2past_days12)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 296.21 61.07 4.85 1.04e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	5.201	6.262	4.383	0.000933 ***
s(x_proj,y_proj)	3.781	5.087	0.986	0.435212
s(visibility)	5.111	6.170	1.187	0.326759

FEHMARNBELT BIRDS

```
s(linearregr_of2past_days12) 1.387 1.667 0.373 0.652310
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
R-sq.(adj) = 0.359 Deviance explained = 49.9%
GCV score = 3.4828e+05 Scale est. = 2.6856e+05 n = 72
```

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 296.21 62.81 4.716 1.42e-05 ***
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Approximate significance of smooth terms:

```
edf Ref.df F p-value
s(jul_day) 4.719 5.758 4.742 0.000585 ***
s(sin_x,cos_y) 2.504 2.941 2.188 0.099586 .
s(wind_speed_10min) 2.259 2.794 0.886 0.447231
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
R-sq.(adj) = 0.322 Deviance explained = 41.2%
GCV score = 3.3242e+05 Scale est. = 2.8402e+05 n = 72
> AIC(ggg)= 1120.054
```

**Autumn
Model - Fehmarn.**

GAM of the intensity of Common Eider migration at Puttgarden with three parameters - Julian day, wind vector projections and trend of the temperature change in previous 2 days explains 96% of the variation. Transformation functions are shown in Figures. The intensity of migration at Fehmarn increases during northern winds. Maximal intensity at Lolland was found during south-east winds.

```
df AIC
ggg1 29.62668 641.1507
ggg2 29.79631 643.7869
ggg3 30.50665 641.4939
ggg4 32.98317 628.2375
ggg5 31.74651 636.1507
ggg6 32.42531 631.7873
ggg7 21.39647 661.0536
```

Family: Gaussian; Link function: identity

Formula: ggg4: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(linearregr_of2past_days12)

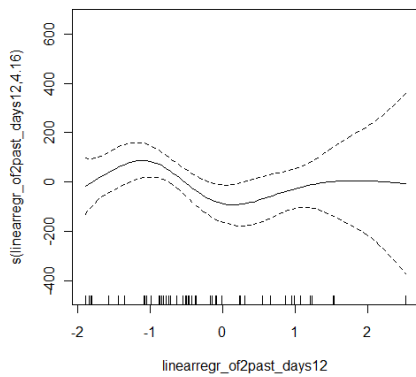
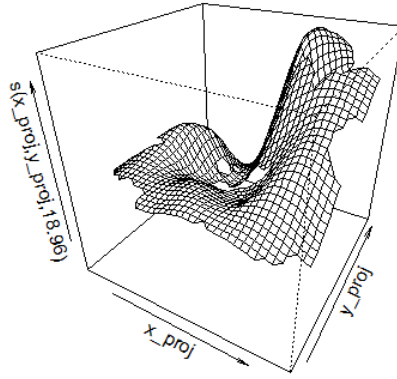
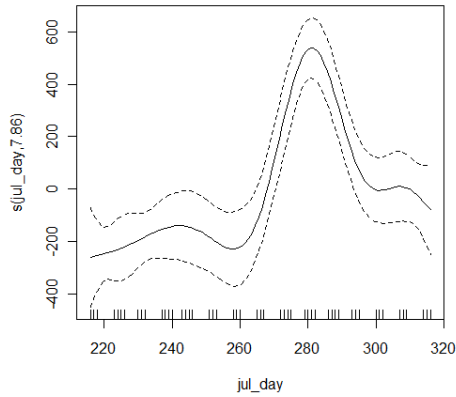
Parametric coefficients:

```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 206.46 13.75 15.02 5.31e-12 ***
```

Approximate significance of smooth terms:

```
edf Ref.df F p-value
s(jul_day) 7.861 8.465 15.178 7.91e-07 ***
s(x_proj,y_proj) 18.960 23.100 3.462 0.00394 **
s(linearregr_of2past_days12) 4.162 4.842 1.675 0.19023
R-sq.(adj) = 0.891 Deviance explained = 95.8%
GCV score = 25850 Scale est. = 9638.8 n = 51
```

FEHMARNBELT BIRDS



Transformation functions for the model *ggg4*, Common Eider, autumn, Fehmarn, 2009.

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(linearregr_of2past_days12)

Parametric coefficients:

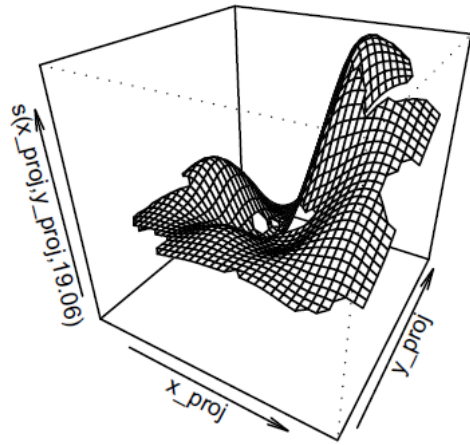
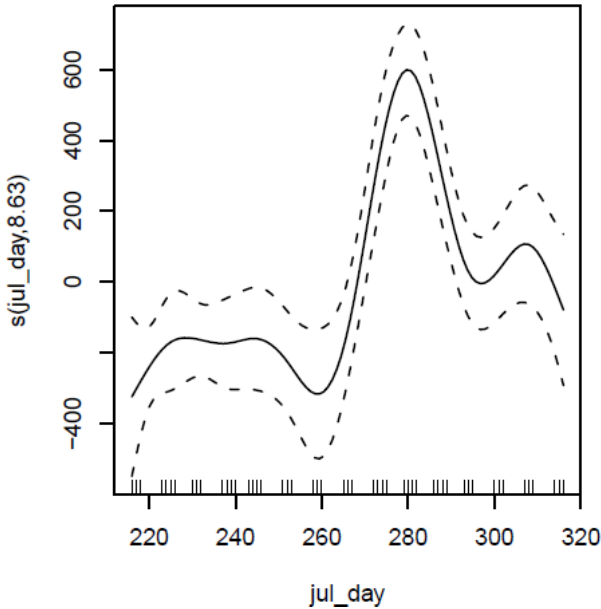
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	206.46	13.75	15.02	5.31e-12 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	7.861	8.465	15.178	7.91e-07 ***
s(x_proj, y_proj)	18.960	23.100	3.462	0.00394 **
s(linearregr_of2past_days12)	4.162	4.842	1.675	0.19023

R-sq.(adj) = 0.891 Deviance explained = 95.8%
 GCV score = 25850 Scale est. = 9638.8 n = 51

FEHMARNBELT BIRDS



Transformation functions for the model of autumn migration of Common Eider on Fehmarn.

Model – Lolland. Three parameters were included into the model, Julian day, wind projections and temperature trend during previous 2 days. These parameters explain 70% of the variation of migration intensity. Maximal intensity at Lolland was found during south-east winds.

	df	AIC
ggg1	8.936128	931.5348
ggg2	9.818246	933.2229
ggg3	37.911661	889.1354
ggg4	28.333593	916.0478
ggg5	10.452711	930.4614
ggg6	11.569086	931.7668
ggg7	11.208099	930.1573
ggg8	11.999490	932.0511
ggg9	12.077051	931.9253
ggg10	16.335356	927.5941
ggg11	13.152042	926.8656
ggg12	13.009343	930.3213

Family: Gaussian; Link function: identity

Formula: ggg3: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(cloud_alt)

Parametric coefficients:

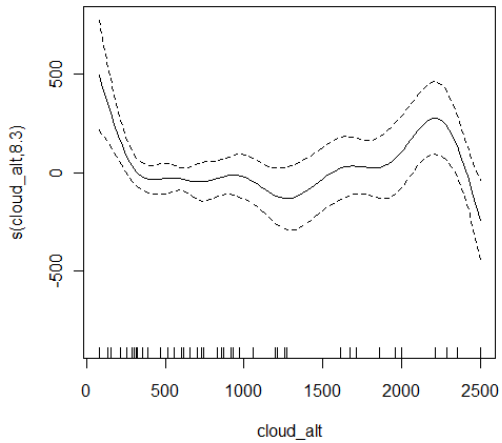
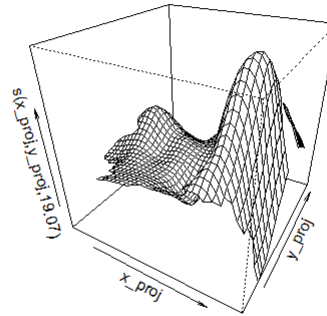
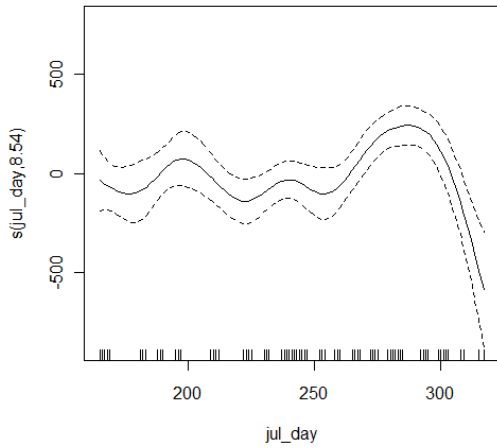
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	89.64	14.03	6.392	3.03e-07 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	8.542	8.865	6.092	5.37e-05 ***
s(x_proj,y_proj)	19.074	23.522	2.297	0.01381 *
s(cloud_alt)	8.295	8.803	3.659	0.00303 **

R-sq.(adj) = 0.676 Deviance explained = 84.4%
 GCV score = 29129 Scale est. = 13769 n = 70

FEHMARNBELT BIRDS



Transformation functions for the model *ggg3*, Common Eider, autumn, Lolland, 2009.

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(linearregr_of2past_days12)

Parametric coefficients:

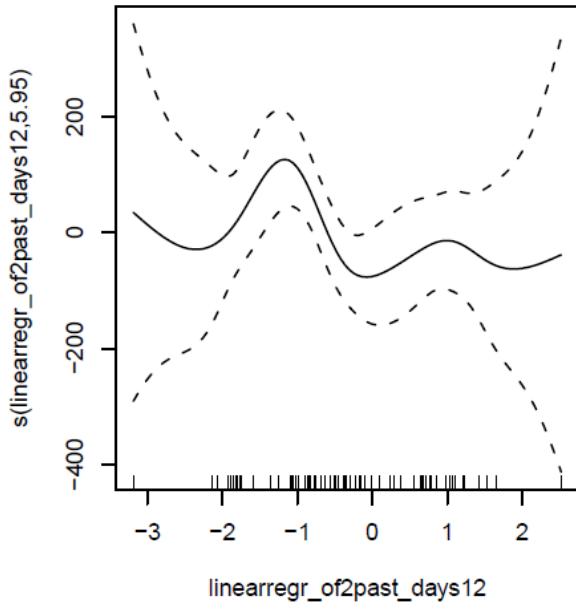
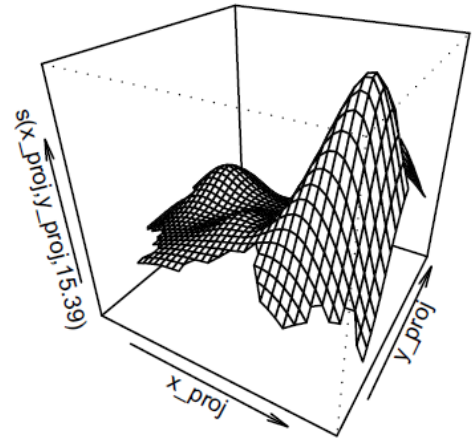
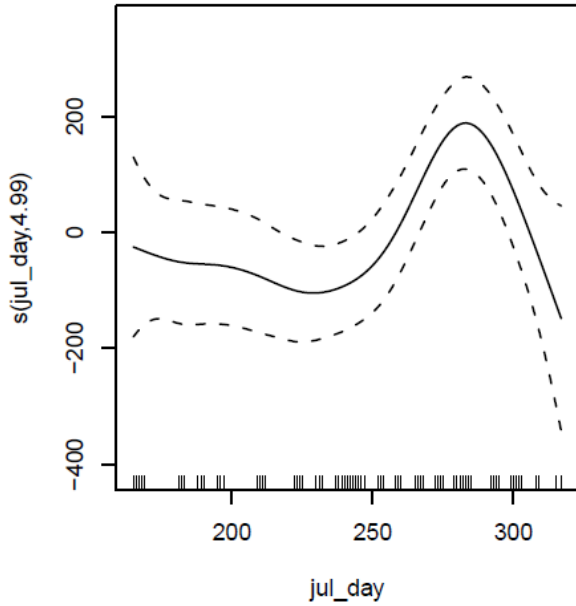
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	89.64	17.16	5.223	4.96e-06 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.990	5.944	4.121	0.00244 **
s(x_proj, y_proj)	15.388	19.731	1.549	0.11490
s(linearregr_of2past_days12)	5.955	6.892	1.597	0.16329

R-sq.(adj) = 0.514 Deviance explained = 70%
 GCV score = 33832 Scale est. = 20621 n = 70

FEHMARNBELT BIRDS



Transformation functions for the model of autumn migration of Common Eider at Lolland.

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 89.64 20.97 4.275 6.71e-05 ***

Approximate significance of smooth terms:

edf Ref.df F p-value

s(jul_day) 4.936 6.028 3.775 0.00284 **

s(x_proj,y_proj) 2.000 2.000 1.544 0.22154

R-sq.(adj) = 0.275 Deviance explained = 34.8%

GCV score = 34721 Scale est. = 30785 n = 70

AIC(ggg)= 931.5348

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 89.64 20.48 4.377 4.91e-05 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.743	5.790	3.586	0.00462 **
s(sin_x,cos_y)	3.466	4.525	1.178	0.33045
s(wind_speed_10min)	1.000	1.000	0.932	0.33815

R-sq.(adj) = 0.308 Deviance explained = 40.1%
 GCV score = 34376 Scale est. = 29363 n = 70
 AIC(ggg)= 930.1573

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(linearregr_of2past_days12)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 89.64 19.55 4.586 2.67e-05 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.891	5.942	3.766	0.00338 **
s(sin_x,cos_y)	2.289	2.546	1.974	0.13748
s(wind_speed_10min)	1.825	2.296	1.117	0.34067
s(linearregr_of2past_days12)	5.330	6.359	1.536	0.18052

R-sq.(adj) = 0.37 Deviance explained = 50.1%
 GCV score = 34245 Scale est. = 26743 n = 70
 AIC(ggg)= 927.5941

Barnacle Goose – *Branta leucopsis***Spring - Fehmarn**

df AIC

ggg1 5.983911 500.3529

ggg2 6.962952 502.2430

ggg3 7.289133 500.5946

ggg4 6.947967 502.1210

ggg5 7.051309 502.1381

ggg7 7.387470 502.2119

ggg8 8.389365 504.0222

ggg9 8.637011 502.6279

ggg10 8.523646 503.9963

ggg11 8.420839 504.0471

Family: Gaussian; Link function: identity

Formula: ggg1: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

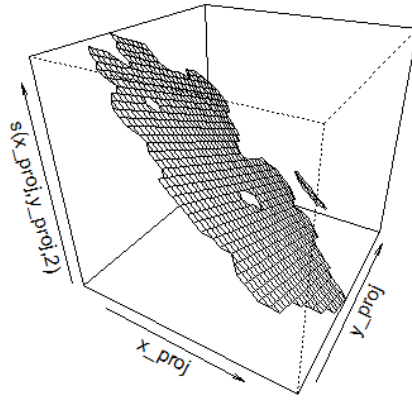
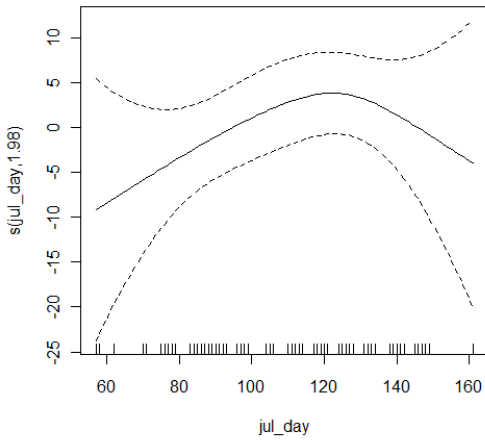
Estimate Std. Error t value Pr(>|t|)

(Intercept) 3.182 2.239 1.421 0.161

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.984	2.534	1.311	0.280
s(x_proj,y_proj)	2.000	2.000	2.153	0.126

R-sq.(adj) = 0.0524 Deviance explained = 11.9%
 GCV score = 318.06 Scale est. = 290.73 n = 58



Transformation functions for the model ggg1, Barnacle Goose, spring, Fehmarn, 2009.

Spring – Lolland

	df	AIC
ggg1	6.675560	972.2560
ggg2	7.686113	973.5985
ggg3	7.849572	969.4389
ggg4	7.641551	974.2276
ggg5	7.915439	973.1955
ggg7	7.656384	971.8369
ggg8	8.612549	973.6539
ggg9	8.766511	970.2180
ggg10	8.621932	973.8118
ggg11	8.864859	972.6840

Family: Gaussian; Link function: identity

Formula: ggg3: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(cloud_alt)

Parametric coefficients:

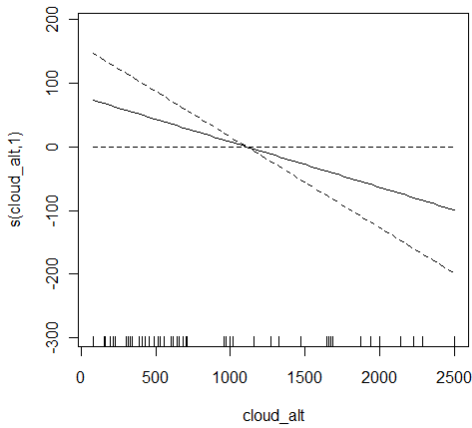
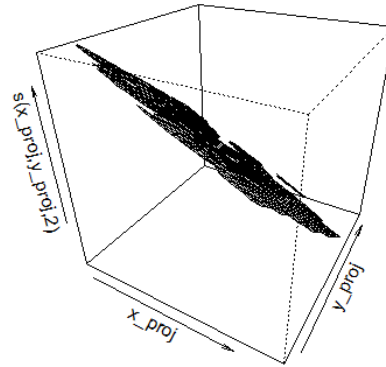
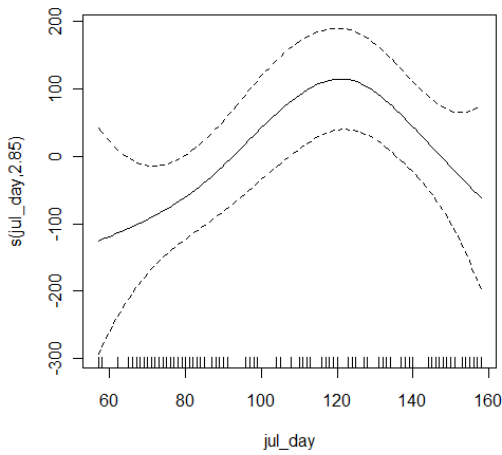
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	41.98	22.55	1.861	0.0672 .

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.85	3.561	2.748	0.0411 *
s(x_proj,y_proj)	2.00	2.000	0.715	0.4929
s(cloud_alt)	1.00	1.000	3.989	0.0500 *

R-sq.(adj) = 0.112 Deviance explained = 18.5%
 GCV score = 40475 Scale est. = 36625 n = 72

FEHMARNBELT BIRDS



Transformation functions for the model ggg3, Barnacle Goose, spring, Lolland, 2009.

Autumn – Fehmarn

	df	AIC
ggg1	5.000000	631.9524
ggg2	6.000000	633.7237
ggg3	6.000000	633.4969
ggg4	7.269754	629.2025
ggg5	6.000000	633.9291
ggg6	6.000000	633.6615
ggg7	37.908662	551.9551

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

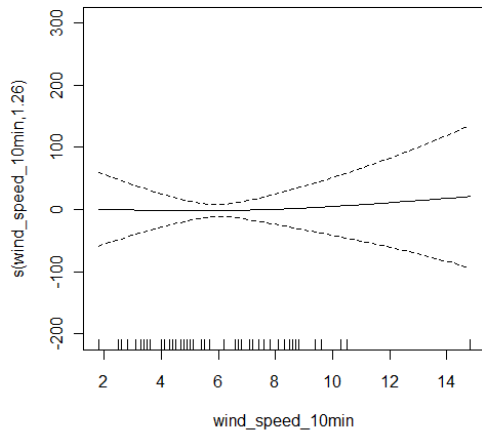
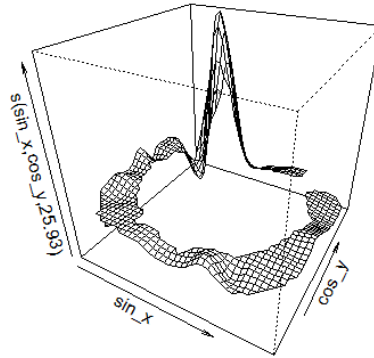
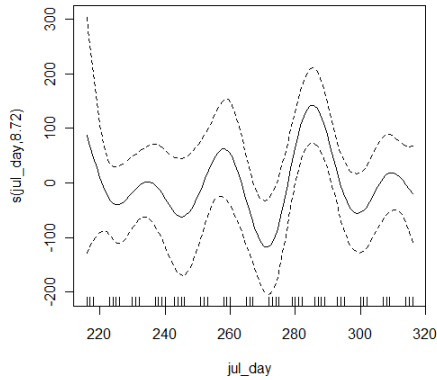
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	19.957	6.864	2.907	0.0114 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	8.719	8.909	2.700	0.046594 *
s(sin_x,cos_y)	25.928	27.814	6.542	0.000298 ***
s(wind_speed_10min)	1.261	1.441	0.120	0.822248

R-sq.(adj) = 0.814 Deviance explained = 94.8%
 GCV score = 8696.6 Scale est. = 2402.9 n = 51

FEHMARNBELT BIRDS



Transformation functions for the model ggg7, Barnacle Goose, autumn, Fehmarn, 2009.

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

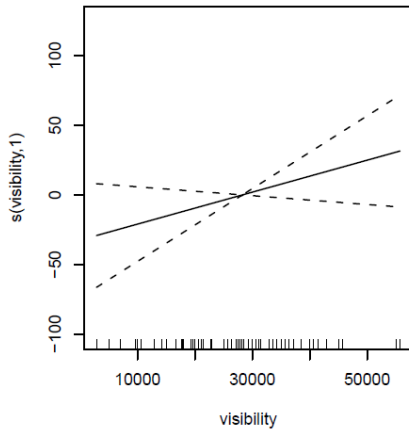
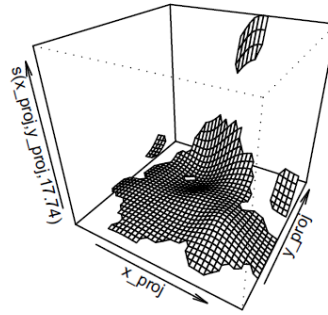
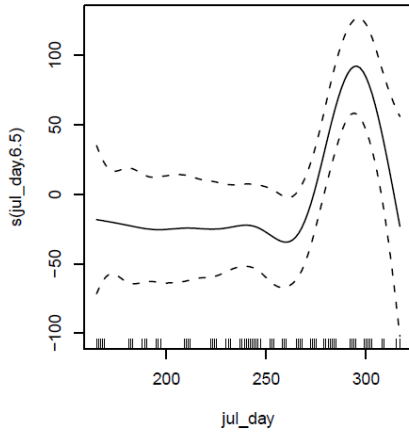
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	29.783	5.677	5.246	4.32e-06 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.497	7.486	4.259	0.00094 ***
s(x_proj, y_proj)	17.741	22.372	8.873	6.05e-10 ***
s(visibility)	1.000	1.000	2.454	0.12439

R-sq.(adj) = 0.818 Deviance explained = 88.5%
 GCV score = 3608.7 Scale est. = 2256.1 n = 70

FEHMARNBELT BIRDS



Transformation functions for the GAM of autumn migration on Lolland.

Autumn – Lolland

	df	AIC
ggg1	26.70963	758.9519
ggg2	27.23748	760.7439
ggg3	28.54913	755.2085
ggg4	27.80583	759.5861
ggg5	29.18161	753.1949
ggg6	28.75942	754.3259
ggg7	32.13327	811.1795
ggg8	35.17387	797.1729
ggg9	34.38163	805.8191
ggg10	32.73205	813.4102
ggg11	33.21096	796.6194
ggg12	32.73702	813.1861

Family: Gaussian; Link function: identity

Formula: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(temper)

Parametric coefficients:

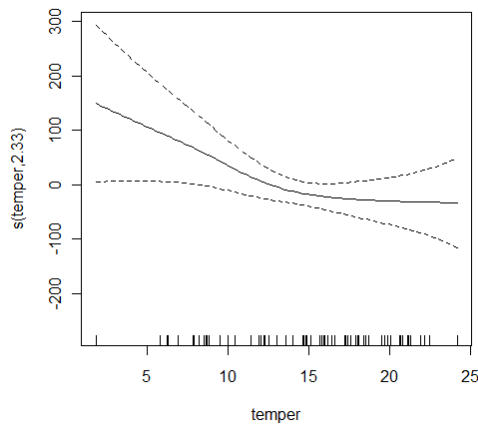
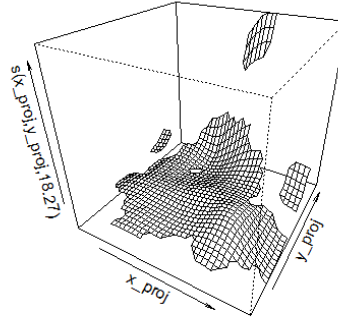
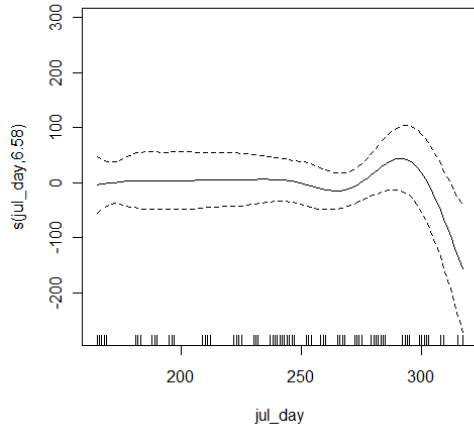
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	29.783	5.352	5.565	1.70e-06 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.580	7.536	3.093	0.00882 **
s(x_proj, y_proj)	18.268	22.760	10.568	6.06e-11 ***
s(temper)	2.333	2.925	1.653	0.19276

R-sq.(adj) = 0.839 Deviance explained = 90.2%
 GCV score = 3356.3 Scale est. = 2005.1 n = 70

FEHMARNBELT BIRDS



Transformation functions for the model *ggg5*, Barnacle Goose, autumn, Lolland, 2009.

Tree Pipit – *Anthus trivialis*

Spring

The number of birds counted at Lolland is very low, and it does not allow a reasonable modelling, but the model of migration at Fehmarn includes Julian day and wind direction and speed and explains 42% of the variation (Table below).

Spring – Fehmarn

	df	AIC
ggg1	6.958261	82.30890
ggg2	14.838425	70.87007
ggg3	17.845527	78.44657
ggg4	7.942606	84.17180
ggg5	18.875116	77.40014
ggg7	12.765406	80.10548
ggg8	16.968234	71.47553
ggg9	12.168459	80.18398
ggg10	11.691624	82.33627
ggg11	12.835468	80.13336

Family: Gaussian; Link function: identity

Formula: $ggg2: INTENSITY \sim s(jul_day) + s(x_proj, y_proj) + s(visibility)$

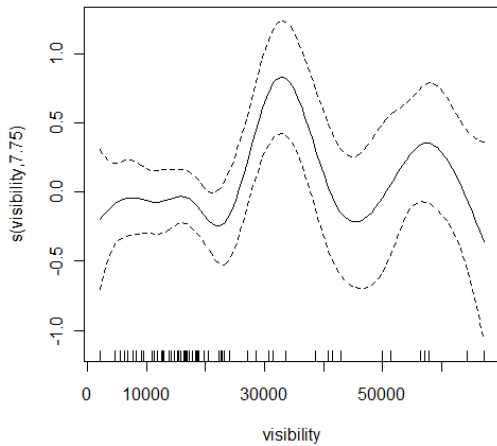
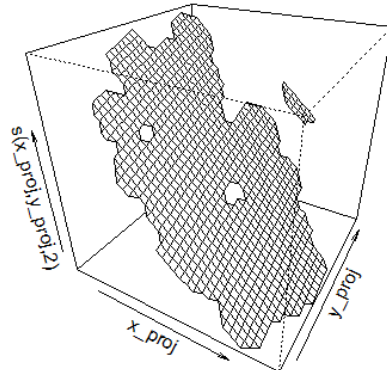
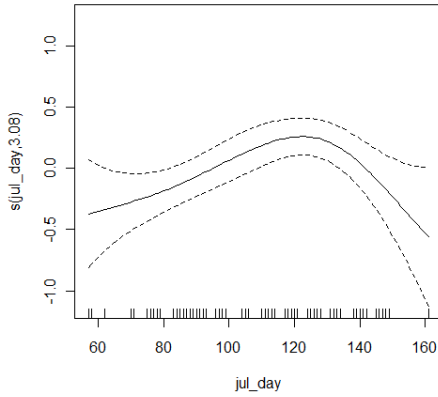
Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.22017	0.05194	4.239	0.000113 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.085	3.864	3.764	0.0109 *
s(x_proj,y_proj)	2.000	2.000	2.553	0.0893 .
s(visibility)	7.754	8.600	2.523	0.0213 *

R-sq.(adj) = 0.407 Deviance explained = 54.1%
 GCV score = 0.20547 Scale est. = 0.15644 n = 58



Transformation functions for the model ggg2, Tree Pipit, spring, Fehmann, 2009.

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.22017	0.05696	3.865	0.000345 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.113	3.904	5.095	0.00188 **
s(sin_x,cos_y)	2.000	2.000	1.693	0.19515
s(wind_speed_10min)	5.652	6.654	1.855	0.10239

R-sq.(adj) = 0.287 Deviance explained = 42.1%
 GCV score = 0.2361 Scale est. = 0.18821 n = 58
 AIC(ggg)= 80.10548

Family: Gaussian; Link function: identity

Formula: ggg1: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.22017 0.06048 3.64 0.000627 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.958	3.733	3.66	0.0122 *
s(x_proj,y_proj)	2.000	2.000	2.55	0.0878 .

R-sq.(adj) = 0.196 Deviance explained = 26.6%
 GCV score = 0.23648 Scale est. = 0.21218 n = 58
 AIC(ggg)= 82.3089

Model – spring Lolland

	df	AIC
ggg1	6.908863	-196.0787
ggg2	7.093864	-196.5709
ggg3	8.119418	-202.0754
ggg4	7.626407	-199.7253
ggg5	10.408305	-204.2337
ggg7	31.683710	-227.0807
ggg8	33.497466	-237.0825
ggg9	32.243039	-226.7600
ggg10	32.519007	-231.9168
ggg11	34.873683	-237.2545

Family: Gaussian; Link function: identity

Formula: ggg1: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

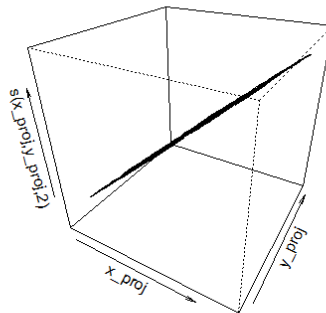
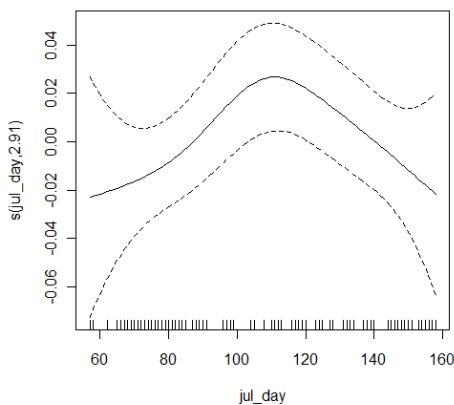
Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.017778 0.006929 2.566 0.0126 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.909	3.632	1.657	0.176
s(x_proj,y_proj)	2.000	2.000	0.597	0.554

R-sq.(adj) = 0.0789 Deviance explained = 14.3%
 GCV score = 0.0037656 Scale est. = 0.0034566 n = 72



Transformation functions for the model ggg1, Tree Pipit, spring, Lolland, 2009.

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)

FEHMARNBELT BIRDS

(Intercept) 0.017778 0.005009 3.549 0.00098 ***

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.452	1.755	0.349	0.67949
s(sin_x,cos_y)	25.078	27.857	2.480	0.00395 **
s(wind_speed_10min)	3.153	3.879	2.275	0.07924 .

R-sq.(adj) = 0.519 Deviance explained = 72%
 GCV score = 0.0031478 Scale est. = 0.0018063 n = 72
 AIC = -227.08

Table: Percentage of explained variation and the AIC value for different models of spring migration of Tree Pipits at Fehmarn (FM) and Lolland (LL).

model	% of explained variation	AIC
INTENSITY FM ~ s(jul_day) + s(x_proj, y_proj)	26.6	82.3089
INTENSITY FM ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)	42.1	80.10548
INTENSITY LL ~ s(jul_day) + s(x_proj, y_proj)	14.3	-196.0787
INTENSITY LL ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)	72	-227.08

Autumn

Most important weather parameters (Julian day, wind direction and speed and precipitation) explain relatively small part of the total variation in compare to other species (Table [below](#))

Table: Percentage of explained variation and the AIC value for different models of autumn migration of Tree Pipits at Fehmarn and Lolland.

model	% explained variation	AIC
INTENSITY FM ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)	24.1	100.5502
INTENSITY FM ~ s(jul_day) + s(x_proj, y_proj)	18.2	101.6724
INTENSITY FM ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)	18.1	103.6109
INTENSITY LL ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)	30	751.1057
INTENSITY LL ~ s(jul_day) + s(x_proj, y_proj)	26.9	755.0466
INTENSITY LL ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)	26.4	757.018

Model – autumn - Fehmarn.

df	AIC
ggg1	6.865870 101.6724
ggg2	7.825252 99.4546
ggg3	7.884044 103.5687
ggg4	7.734761 102.8004
ggg5	6.509900 102.4327
ggg6	7.821224 103.6109
ggg7	8.221611 100.5502

Family: Gaussian; Link function: identity

Formula: ggg2: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

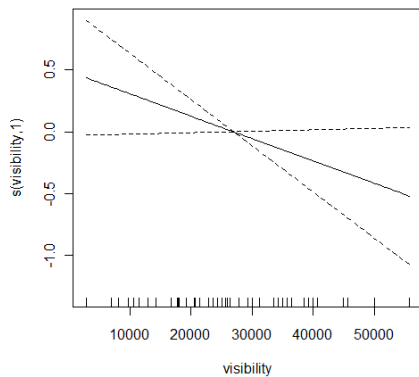
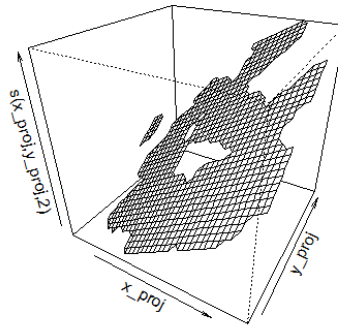
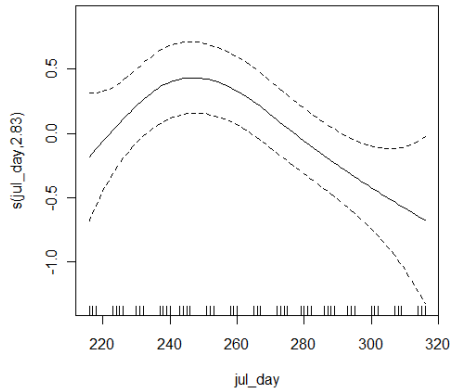
FEHMARNBELT BIRDS

Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.22255 0.08279 2.688 0.0101 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.825	3.528	3.144	0.0279 *
s(x_proj,y_proj)	2.000	2.000	0.591	0.5582
s(visibility)	1.000	1.000	3.526	0.0670 .

R-sq.(adj) = 0.146 Deviance explained = 24.6%
 GCV score = 0.40361 Scale est. = 0.34959 n = 51



Transformation functions for the model ggg2, Tree Pipit, autumn, Fehmarn, 2009.

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.22255 0.08341 2.668 0.0107 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.737	3.414	2.035	0.115
s(sin_x,cos_y)	2.485	2.909	0.165	0.915
s(wind_speed_10min)	1.000	1.000	2.308	0.136

R-sq.(adj) = 0.133 Deviance explained = 24.1%
 GCV score = 0.4134 Scale est. = 0.35486 n = 51
 AIC(ggg)= 100.5502

Family: Gaussian; Link function: identity

Formula: ggg1: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.2225 0.0853 2.609 0.0123 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.758	3.436	2.101	0.105
s(x_proj,y_proj)	2.108	2.212	0.227	0.819

R-sq.(adj) = 0.0936 Deviance explained = 18.2%
 GCV score = 0.4193 Scale est. = 0.37107 n = 51
 AIC(ggg)= 101.6724

Family: Gaussian; Link function: identity

Formula: ggg6: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)

Parametric coefficients:

Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.22255 0.08624 2.581 0.0133 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.691	3.354	1.788	0.158
s(x_proj,y_proj)	2.130	2.254	0.328	0.747
s(ppt_12h)	1.000	1.000	0.113	0.738

R-sq.(adj) = 0.0735 Deviance explained = 18.1%
 GCV score = 0.43787 Scale est. = 0.3793 n = 51
 AIC(ggg)= 103.6109

Model – autumn – Lolland.

	df	AIC
ggg1	9.566058	755.0466
ggg2	13.921207	732.8611
ggg3	16.428371	741.9136
ggg4	11.386671	756.1044
ggg5	10.003329	756.8336
ggg6	10.317092	757.0181
ggg7	9.121733	751.1057
ggg8	14.591977	729.8776
ggg9	13.812883	736.7615
ggg10	10.773465	752.4184
ggg11	9.786990	752.8266
ggg12	10.003880	752.7734

Family: Gaussian; Link function: identity

Formula: ggg8: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(visibility)

Parametric coefficients:

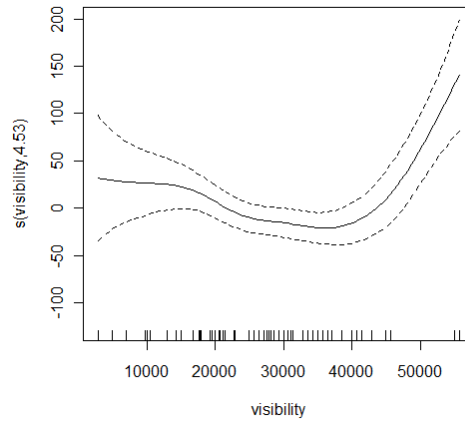
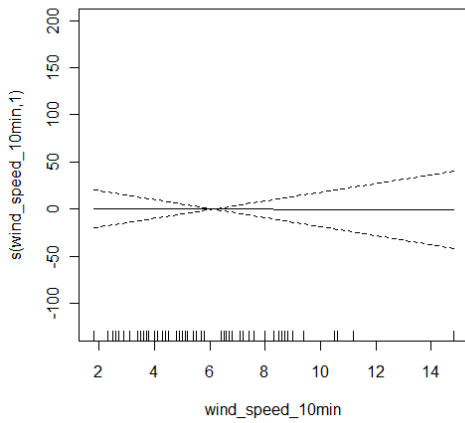
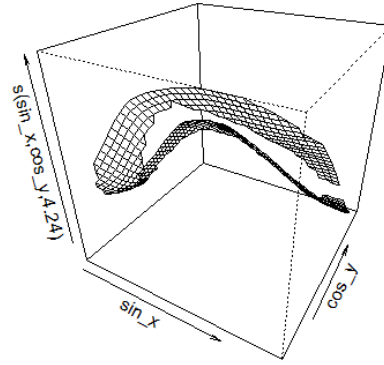
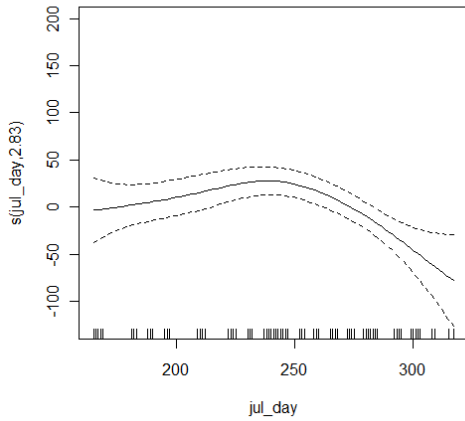
Estimate Std. Error t value Pr(>|t|)
 (Intercept) 14.985 4.805 3.118 0.00286 **

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.829	3.520	5.066	0.002218 **
s(sin_x,cos_y)	4.237	5.639	1.615	0.163662
s(wind_speed_10min)	1.000	1.000	0.001	0.972127
s(visibility)	4.527	5.525	4.810	0.000687 ***

R-sq.(adj) = 0.459 Deviance explained = 55.8%
 GCV score = 2005.8 Scale est. = 1616.3 n = 70

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Transformation functions for the model ggg8, Tree Pipit, autumn, Lolland, 2009.

Family: Gaussian; Link function: identity

Formula: ggg7: INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	14.985	5.773	2.596	0.0118 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.517	3.128	3.366	0.0226 *
s(sin_x,cos_y)	3.605	4.743	2.210	0.0677 .
s(wind_speed_10min)	1.000	1.000	0.541	0.4648

R-sq.(adj) = 0.219 Deviance explained = 30%
 GCV score = 2639.2 Scale est. = 2333 n = 70
 AIC(ggg) = 751.1057

Family: Gaussian; Link function: identity

Formula: ggg1: INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	14.985	5.922	2.53	0.0140 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.090	3.839	2.551	0.0501 .

s(x_proj,y_proj) 4.476 6.257 1.269 0.2840
 R-sq.(adj) = 0.179 Deviance explained = 26.9%
 GCV score = 2796.9 Scale est. = 2454.6 n = 70
 AIC(ggg)= 755.0466

Family: Gaussian; Link function: identity

Formula: ggg6: INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	14.985	5.978	2.507	0.0149 *

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.920	3.633	2.351	0.0697 .
s(x_proj,y_proj)	4.397	6.133	1.276	0.2810
s(ppt_12h)	1.000	1.000	0.097	0.7568

R-sq.(adj) = 0.163 Deviance explained = 26.4%
 GCV score = 2885.8 Scale est. = 2501.7 n = 70
 AIC(ggg)= 757.018

A.9.2 2009/2010 data

Plot function R do not plot empty graphs when there are no data, so zeros included into the dataset
 The complete dataset after zero inclusion is longer than 65000, so not possible to convert into xls
 Use only selected species in the file: for_modeling_2009_2010_selectedspecies_xls.xls

Structure of the models

With wide time window, precise wind parameters:

```

ggg1<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj), data=autumnFM)
ggg2<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(visibility), data=autumnFM)
ggg3<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(cloud_alt), data=autumnFM)
ggg4<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(pearsontemp_2days), da-
ta=autumnFM)
ggg5<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(temper), data=autumnFM)
ggg6<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(ppt_12h), data=autumnFM)

ggg7<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min), da-
ta=autumnFM)
ggg8<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(visibility),
data=autumnFM)
ggg9<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(cloud_alt),
data=autumnFM)
ggg10<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days), data=autumnFM)
ggg11<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(temper),
data=autumnFM)
ggg12<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(ppt_12h), data=autumnFM)
    
```

with narrow time window, precise wind parameters:

```

ggg1<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj), data=autumnFM_narrowTP)
ggg2<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(visibility), data=autumnFM_narrowTP)
ggg3<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(cloud_alt), data=autumnFM_narrowTP)
ggg4<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(pearsontemp_2days), da-
ta=autumnFM_narrowTP)
ggg5<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(temper), data=autumnFM_narrowTP)
ggg6<-gam(INTENSITY~s(jul_day)+s(x_proj, y_proj)+s(ppt_12h), data=autumnFM_narrowTP)
    
```

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```

ggg7<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min), da-
ta=autumnFM_narrowTP)
ggg8<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(visibility), da-
ta=autumnFM_narrowTP)
ggg9<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(cloud_alt), da-
ta=autumnFM_narrowTP)
ggg10<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days), data=autumnFM_narrowTP)
ggg11<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(temper), da-
ta=autumnFM_narrowTP)
ggg12<-gam(INTENSITY~s(jul_day)+s(sin_x, cos_y)+s(wind_speed_10min)+s(ppt_12h), da-
ta=autumnFM_narrowTP)

```

narrow time window, grouped wind parameters:

```

ggg13<-gam(INTENSITY~s(wind_speed_category)+s(sin_x_group, cos_y_group), da-
ta=springFM_narrowTP)
    ggg14<-gam(INTENSITY~s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(visibility), data=springFM_narrowTP)
    ggg15<-gam(INTENSITY~s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(cloud_alt), data=springFM_narrowTP)
    ggg16<-gam(INTENSITY~s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(pearsontemp_2days), data=springFM_narrowTP)
    ggg17<-gam(INTENSITY~s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(temper), data=springFM_narrowTP)
    ggg18<-gam(INTENSITY~s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(ppt_12h), data=springFM_narrowTP)

    ggg19<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category), data=springFM_narrowTP)
    ggg20<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(visibility), data=springFM_narrowTP)
    ggg21<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(cloud_alt), data=springFM_narrowTP)
    ggg22<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(pearsontemp_2days), data=springFM_narrowTP)
    ggg23<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(temper), data=springFM_narrowTP)
    ggg24<-gam(INTENSITY~s(jul_day)+s(sin_x_group,
cos_y_group)+s(wind_speed_category)+s(ppt_12h), data=springFM_narrowTP)

    ggg101<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt), data=springLL)
    ggg102<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover), da-
ta=springLL)
    ggg103<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h),
data=springLL)
    ggg104<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper), data=springLL)
    ggg105<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper)+s(ppt_last4times_sum), data=springLL)
    ggg106<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper)+s(ppt_last4times_sum)+s(air_press_h_corrected), data=springLL)
    ggg107<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper)+s(ppt_last4times_sum)+s(air_press_h_corrected)+s(pearsontemp_1day), data=springLL)

```

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```
ggg108<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper)+s(ppt_last4times_sum)+s(air_press_h_corrected)+s(pearsontemp_1day)+s(visibility),
data=springLL)
```

Common Buzzard – *Buteo buteo*

Wide time window, precise wind parameters
Spring FM

```
df    AIC
ggg1  18.19593 664.4526
ggg2  17.67763 664.2283
ggg3  19.99847 652.3507
ggg4  19.05167 666.4512
ggg5  21.39387 652.1765
ggg6  19.34262 665.9404
ggg7  18.16921 658.8266
ggg8  19.35598 657.9114
ggg9  20.26776 647.3765
ggg10 19.12384 660.8455
ggg11 20.90927 648.0619
ggg12 19.08796 660.6485
> summary(ggg9)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(cloud_alt)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 2.2571 0.4133 5.462 4.17e-07 ***

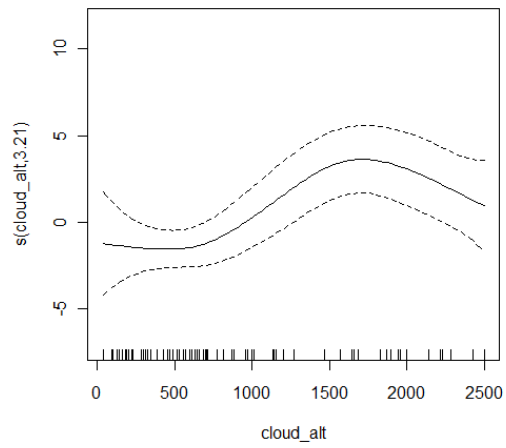
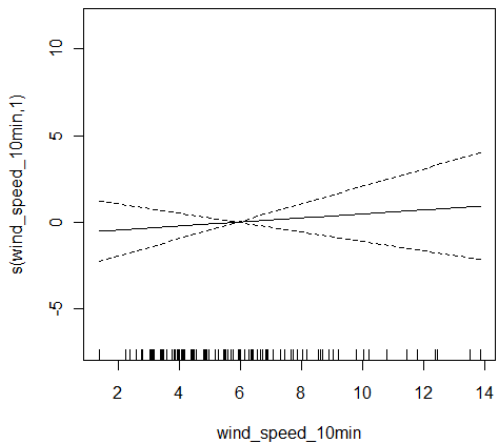
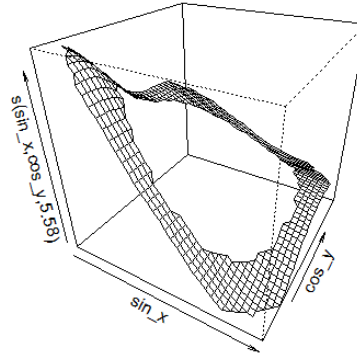
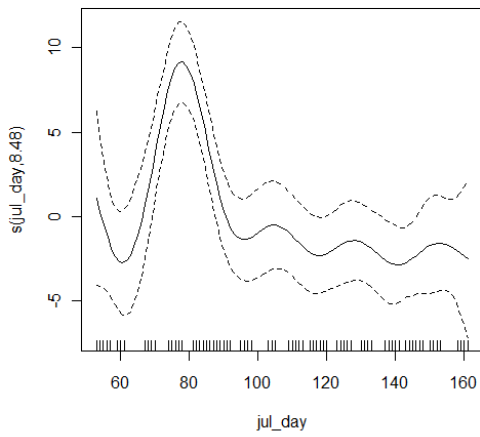
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 8.481 8.901 7.341 6.72e-08 ***
s(sin_x,cos_y) 5.577 7.496 3.415 0.00224 **
s(wind_speed_10min) 1.000 1.000 0.360 0.55009
s(cloud_alt) 3.210 3.925 3.992 0.00527 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.488 Deviance explained = 57.5%
GCV score = 22.613 Scale est. = 18.615 n = 109

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Spring LL

```

df   AIC
ggg1 7.194302 633.0567
ggg2 13.695292 634.1219
ggg3 16.178730 605.9211
ggg4 13.737691 633.6294
ggg5 14.185294 632.3227
ggg6 8.658175 634.3190
ggg7 10.371880 633.4629
ggg8 10.767508 635.4131
ggg9 16.621224 605.3523
ggg10 9.831485 635.3026
ggg11 12.143126 633.8630
ggg12 12.889919 634.0198
> summary(ggg9)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(cloud_alt)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.084 0.239 4.536 1.50e-05 ***

FEHMARNBELT BIRDS

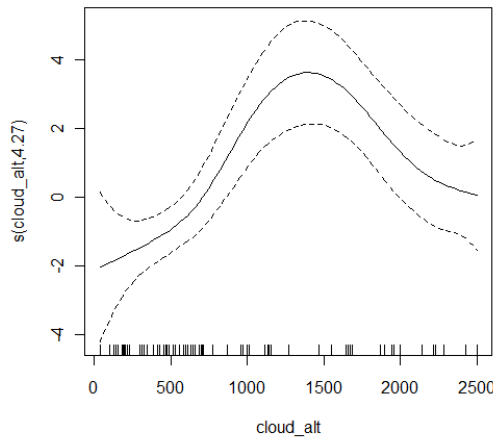
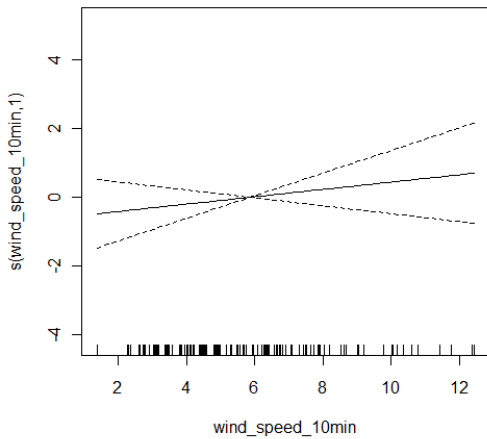
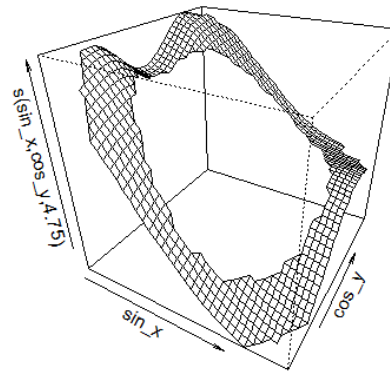
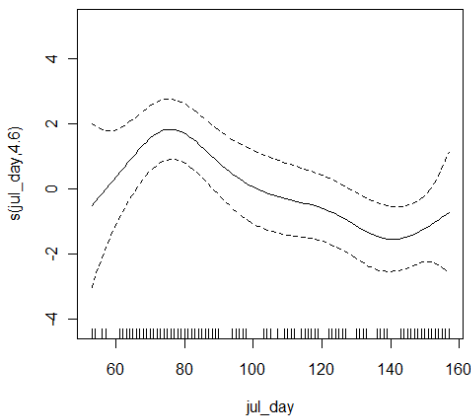
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.597	5.627	3.757	0.00244 **
s(sin_x,cos_y)	4.749	6.326	1.617	0.14558
s(wind_speed_10min)	1.000	1.000	0.923	0.33875
s(cloud_alt)	4.274	5.205	6.635	1.53e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.328 Deviance explained = 40.8%
 GCV score = 8.0451 Scale est. = 7.0234 n = 123



Autumn FM

	df	AIC
ggg1	8.217855	872.6864
ggg2	9.277721	873.7890
ggg3	9.174675	874.4101
ggg4	8.941659	874.5711
ggg5	15.663239	865.4326
ggg6	9.361808	874.1910
ggg7	31.159089	850.0779
ggg8	31.914217	852.0552
ggg9	32.625716	850.5061
ggg10	32.083208	851.6481

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```
ggg11 32.379870 851.2883
ggg12 32.222336 851.4423
> summary(ggg7)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.3911	0.9722	2.46	0.0161 *

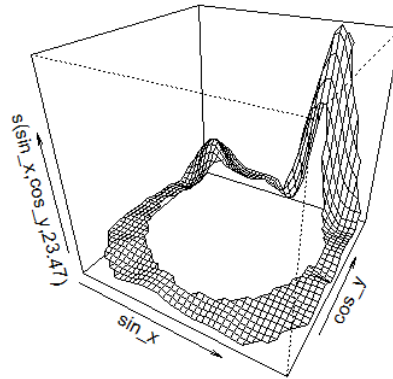
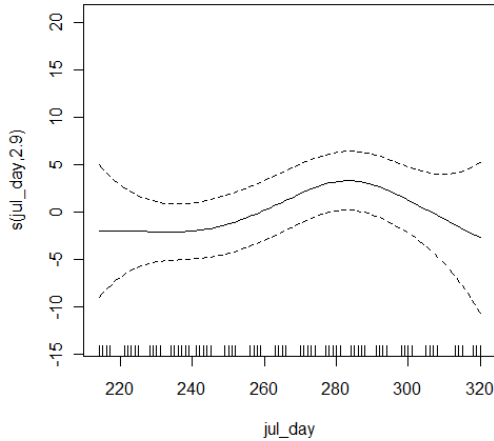
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

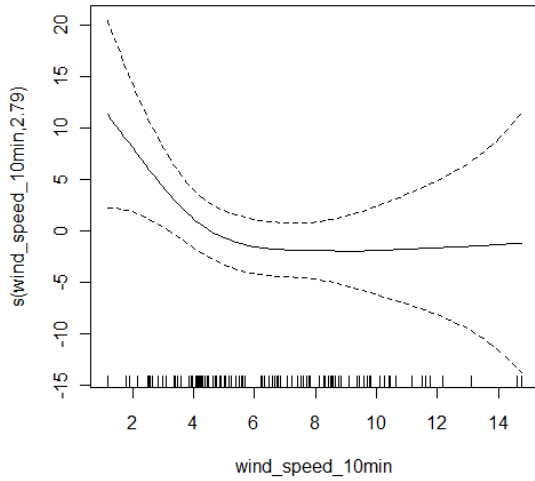
	edf	Ref.df	F	p-value
s(jul_day)	2.900	3.567	1.265	0.29157
s(sin_x,cos_y)	23.473	26.992	2.121	0.00527 **
s(wind_speed_10min)	2.786	3.473	2.003	0.11121

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.354 Deviance explained = 52.7%
GCV score = 143.23 Scale est. = 103.96 n = 110



FEHMARNBELT BIRDS



```
Autumn LL
      df   AIC
ggg1  5.000000 1412.664
ggg2  6.000000 1414.146
ggg3  8.667524 1415.015
ggg4  6.266751 1414.507
ggg5  6.000000 1414.565
ggg6  6.000000 1414.367
ggg7 32.679044 1381.566
ggg8 33.453775 1383.304
ggg9 33.890181 1379.794
ggg10 33.815808 1383.115
ggg11 33.411681 1382.912
ggg12 35.404328 1373.520
> summary(ggg12)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.424 2.378 1.861 0.0655 .

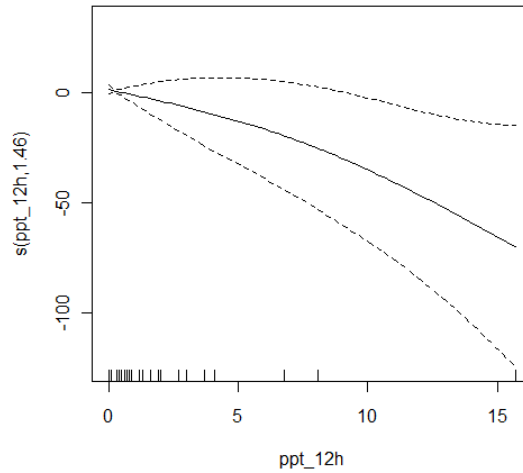
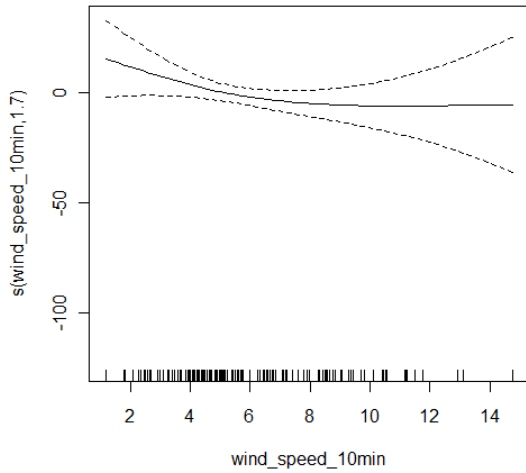
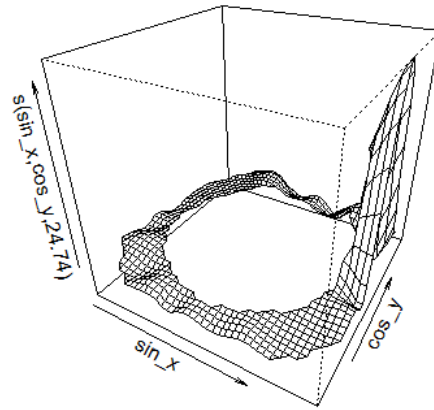
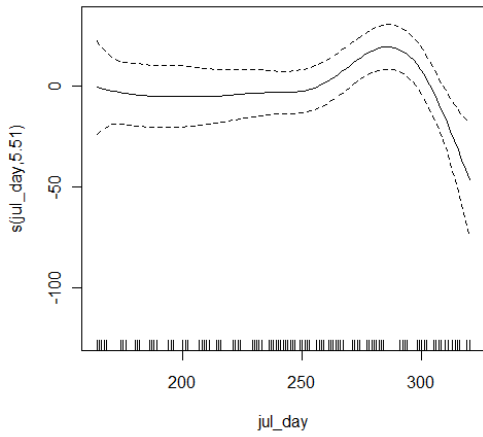
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 5.511 6.594 3.115 0.00586 **
s(sin_x,cos_y) 24.736 27.724 2.909 4.5e-05 ***
s(wind_speed_10min) 1.701 2.142 1.576 0.21013
s(ppt_12h) 1.456 1.748 4.433 0.01802 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.369 Deviance explained = 51.9%
GCV score = 1054.3 Scale est. = 797.06 n = 141

FEHMARNBELT BIRDS



Buteo buteo, Narrow time window
Spring LL

	df	AIC
ggg1	7.663891	607.9734
ggg2	13.569245	609.3441
ggg3	15.872096	580.5508
ggg4	14.341591	607.6164
ggg5	14.608286	606.6677
ggg6	14.234280	608.2990
ggg7	9.334443	608.7411
ggg8	10.246563	610.6069
ggg9	13.533316	580.5429
ggg10	9.474095	610.4199
ggg11	9.868226	608.7845
ggg12	12.903153	609.0580
ggg101	15.093942	581.9042
ggg102	16.107147	583.3278
ggg103	16.977153	585.0455
ggg104	23.224898	585.6795
ggg105	26.508679	586.0516
ggg106	27.381503	586.9758

> summary(ggg9)

FEHMARNBELT BIRDS

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(cloud_alt)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.1396	0.2521	4.521	1.63e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

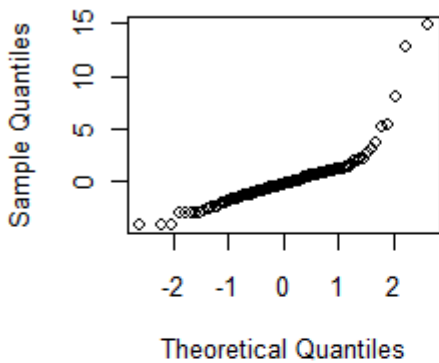
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.367	5.380	4.000	0.00180 **
s(sin_x,cos_y)	2.000	2.000	4.298	0.01608 *
s(wind_speed_10min)	1.000	1.000	1.189	0.27813
s(cloud_alt)	4.166	5.087	7.038	9.26e-06 ***

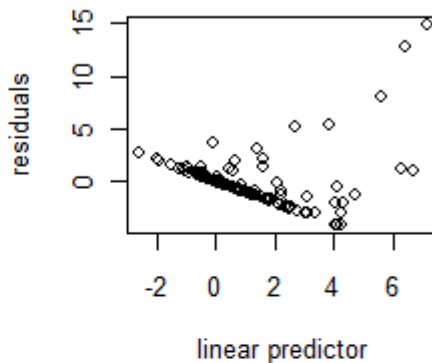
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.32 Deviance explained = 38.7%
GCV score = 8.3253 Scale est. = 7.4335 n = 117

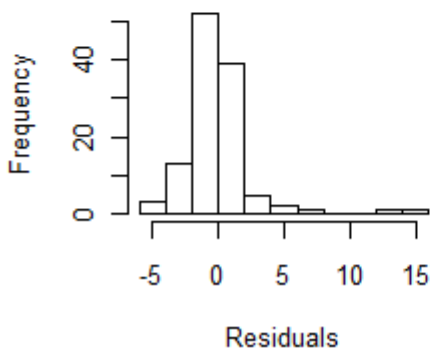
Normal Q-Q Plot



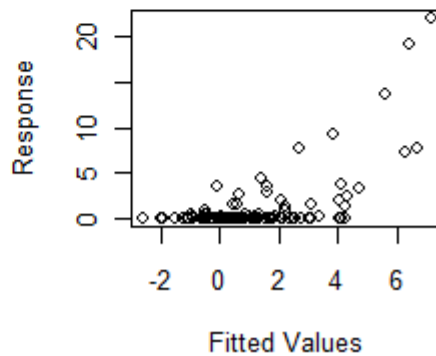
Resids vs. linear pred.



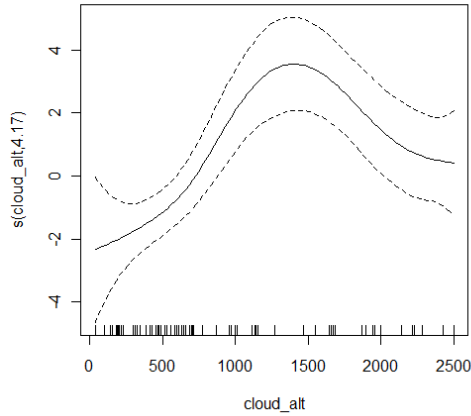
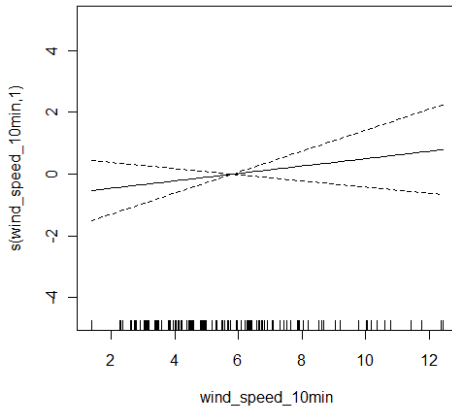
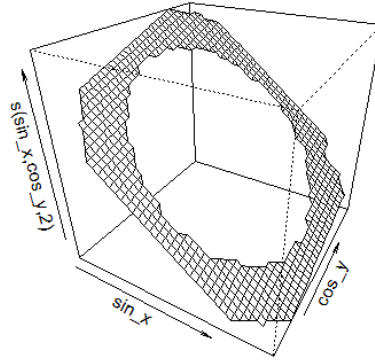
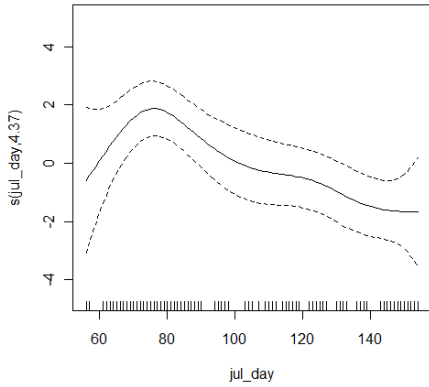
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



spring FM

```

df    AIC
ggg1  18.43047 622.0467
ggg2  18.64092 622.1929
ggg3  18.24236 612.3160
ggg4  19.04228 624.1282
ggg5  17.20183 611.1828
ggg6  19.86514 622.9205
ggg7  31.45338 594.5243
ggg8  32.24386 596.4878
ggg9  35.74806 573.4667
ggg10 32.49430 595.3717
ggg11 32.94968 583.2723
ggg12 32.33782 595.9603
ggg101 36.02922 574.9260
ggg102 38.30700 574.6727
ggg103 38.56865 575.0391
ggg104 41.58748 573.0026
> summary(ggg104)

```

Family: gaussian
Link function: identity

Formula:
 $\text{INTENSITY} \sim s(\text{jul_day}) + s(\text{sin_x}, \text{cos_y}) + s(\text{wind_speed_10min}) + s(\text{pearsontemp_2days}) + s(\text{cloud_alt}) + s(\text{cloud_cover}) + s(\text{ppt_12h}) + s(\text{ppt_last4times_sum})$

FEHMARNBELT BIRDS

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.4358	0.3518	6.924	3.27e-09 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

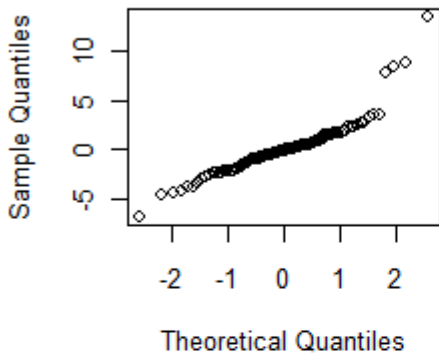
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.798	5.787	6.838	1.78e-05 ***
s(sin_x,cos_y)	24.616	27.046	4.149	2.17e-06 ***
s(wind_speed_10min)	1.000	1.000	0.925	0.3400
s(pearsontemp_2days)	1.000	1.000	0.045	0.8324
s(cloud_alt)	3.291	3.975	3.478	0.0129 *
s(cloud_cover)	1.872	2.306	1.278	0.2881
s(ppt_12h)	1.000	1.000	0.737	0.3939
s(ppt_last4times_sum)	2.011	2.466	0.381	0.7281

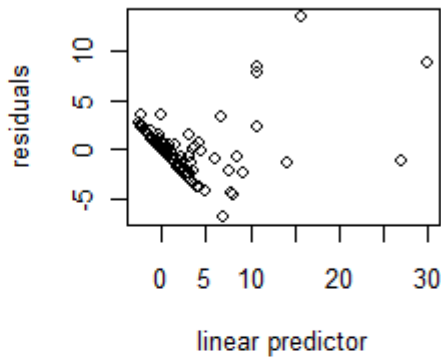
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.678 Deviance explained = 80.6%
 GCV score = 20.9 Scale est. = 12.501 n = 101

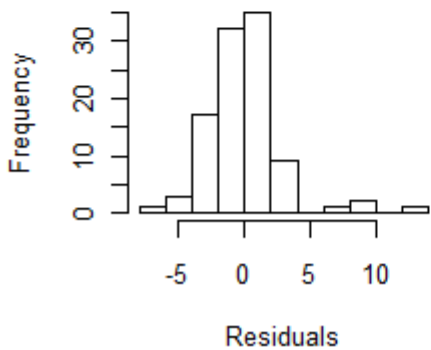
Normal Q-Q Plot



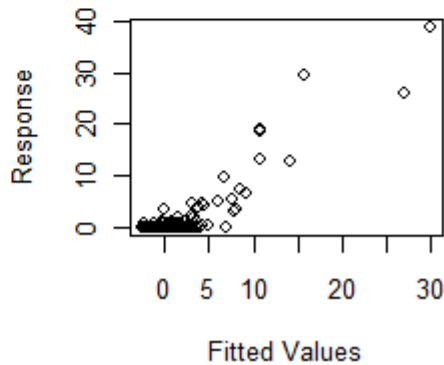
Resids vs. linear pred.



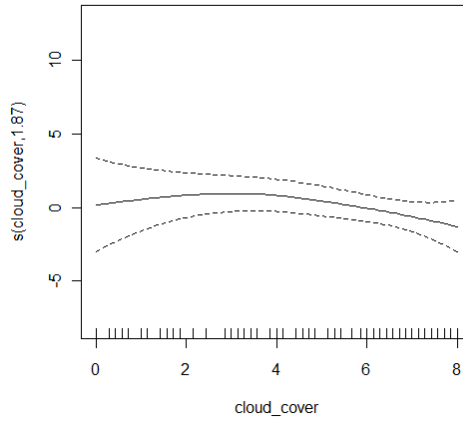
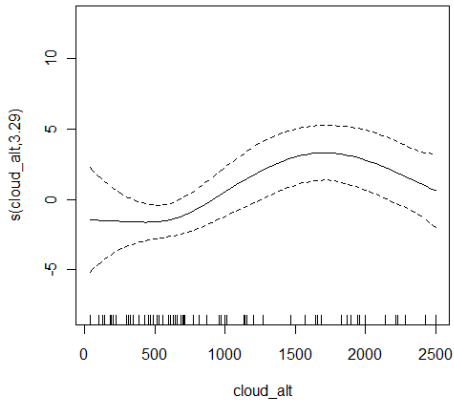
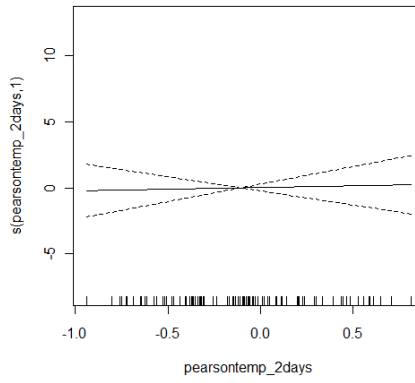
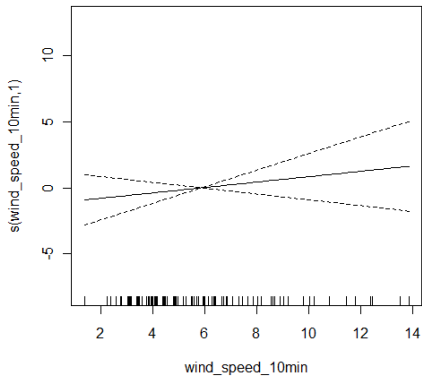
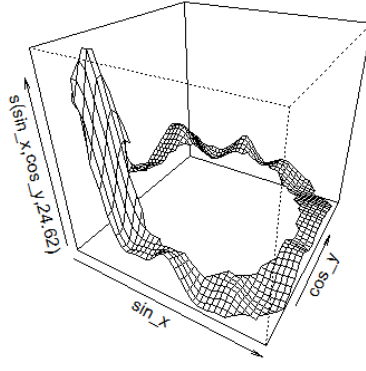
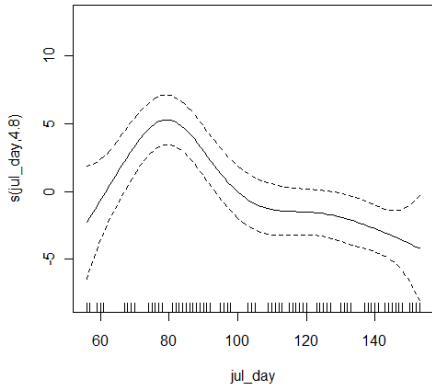
Histogram of residuals



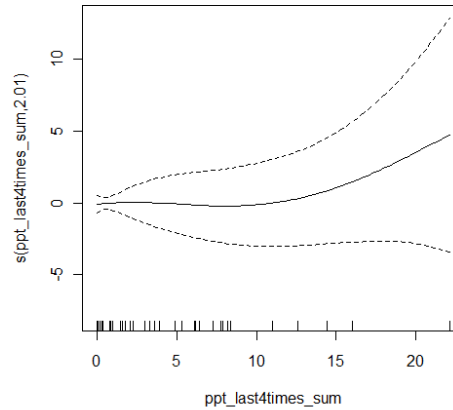
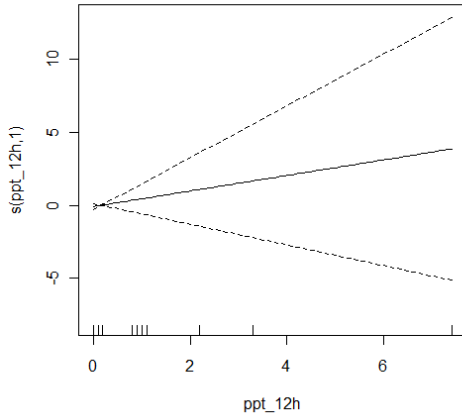
Response vs. Fitted Values



FEHMARNBELT BIRDS



FEHMARNBELT BIRDS



autumn LL

```

df      AIC
ggg1    5.562856 1019.8973
ggg2    6.487099 1021.3221
ggg3    7.048669 1021.3716
ggg4    6.687485 1021.7767
ggg5    6.537027 1021.8672
ggg6    6.466313 1021.7248
ggg7   38.557879  952.6148
ggg8   39.439237  953.0458
ggg9   39.208521  951.4391
ggg10  39.489924  954.5163
ggg11  39.423291  953.6896
ggg12  55.461351  872.5004
ggg101 40.101300  953.4752
ggg102 40.950189  955.2032
ggg103 41.735049  957.1399
ggg104 42.549142  959.1526
> summary(ggg12)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 6.354 1.786 3.558 0.000916 ***

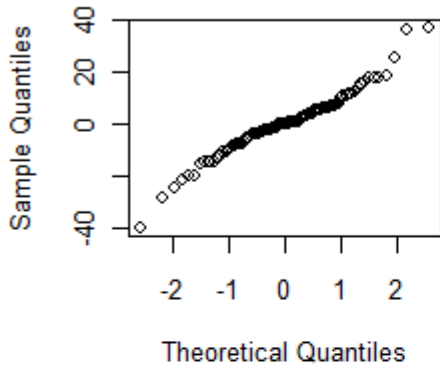
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 8.292 8.840 3.696 0.00173 **
s(sin_x,cos_y) 28.916 28.996 12.226 5.76e-13 ***
s(wind_speed_10min) 7.253 8.269 1.976 0.07057 .
s(ppt_12h) 9.000 9.000 8.997 1.63e-07 ***

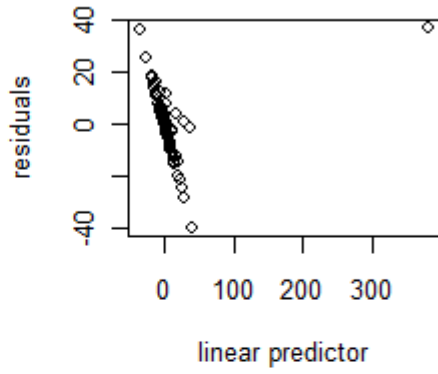
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.827 Deviance explained = 92.2%
GCV score = 703.42 Scale est. = 312.51 n = 98

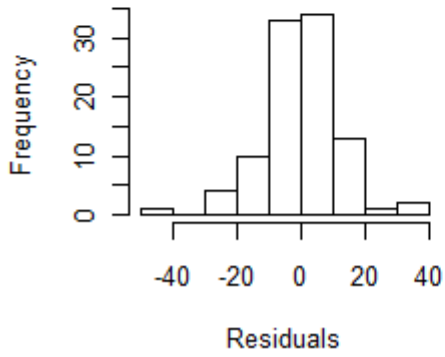
Normal Q-Q Plot



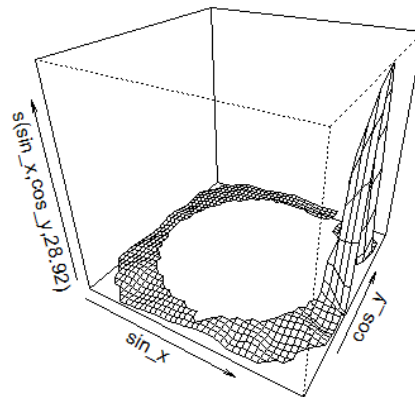
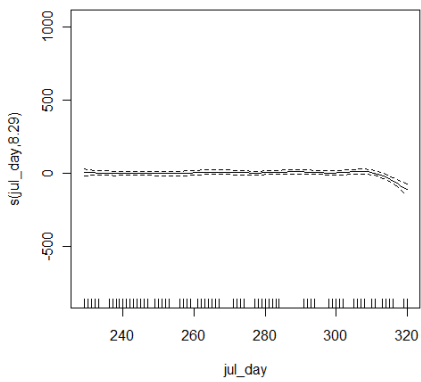
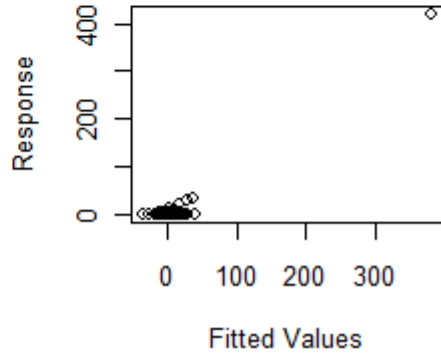
Resids vs. linear pred.



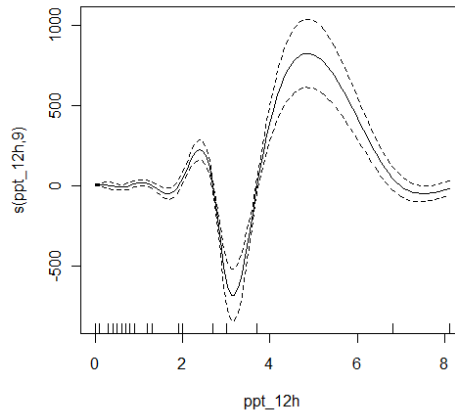
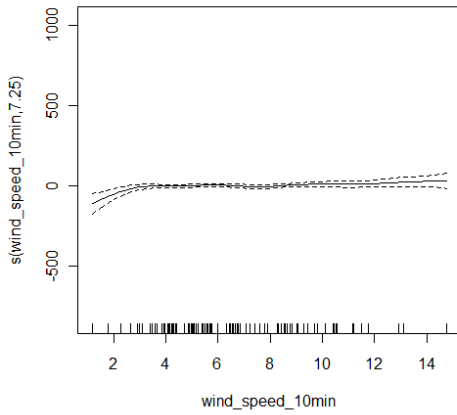
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



autumn FM

```

df    AIC
ggg1  7.691596 775.5215
ggg2  8.675622 776.7667
ggg3  8.720315 777.2892
ggg4  8.399441 777.4322
ggg5 14.526696 770.1955
ggg6  8.922234 776.9898
ggg7 28.481895 759.0546
ggg8 29.094147 761.1565
ggg9 29.806732 759.7104
ggg10 29.399058 760.4767
ggg11 29.766280 760.0003
ggg12 29.699088 759.8364
ggg101 30.607749 761.4013
ggg102 31.789463 762.1766
ggg103 32.621026 763.9146
ggg104 33.197000 766.2570
> summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.735	1.132	2.415	0.0184 *

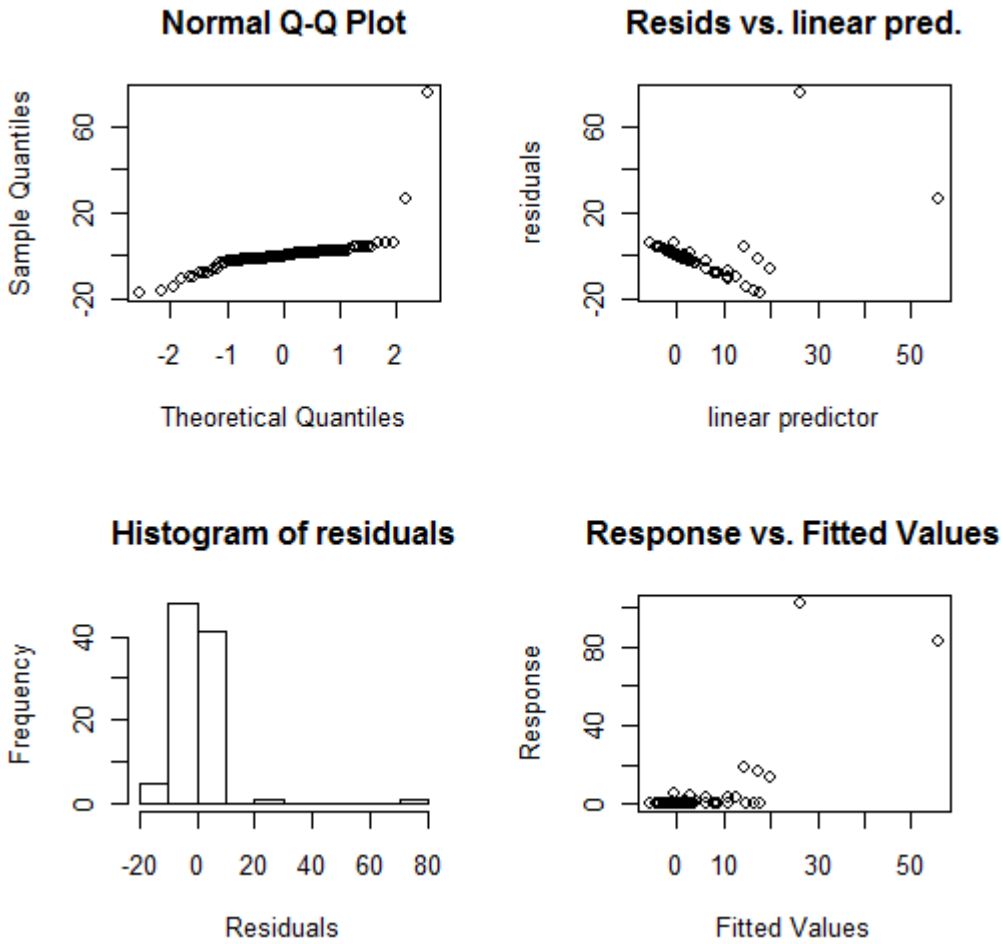
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.696	3.306	1.378	0.2551
s(sin_x,cos_y)	21.243	25.313	1.845	0.0239 *
s(wind_speed_10min)	2.542	3.164	1.834	0.1463

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.33 Deviance explained = 51.7%
GCV score = 172.44 Scale est. = 123.08 n = 96



Honey Buzzard - *Pernis apivorus*

Both years, precise wind parameters, wide time window
Spring FM

```

df    AIC
ggg1 10.80637 330.5016
ggg2 13.29564 330.1181
ggg3 11.76941 332.3059
ggg4 11.75809 332.4328
ggg5 11.58051 331.9239
ggg6 11.65868 331.8736
ggg7 10.68150 330.6123
ggg8 12.55814 330.5536
ggg9 11.42834 332.3571
ggg10 11.72070 332.5572
ggg11 11.45073 332.0789
ggg12 11.29367 332.2520
> summary(ggg2)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)

FEHMARNBELT BIRDS

```
(Intercept) 0.34514 0.09902 3.486 0.00074 ***
```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Approximate significance of smooth terms:
```

```

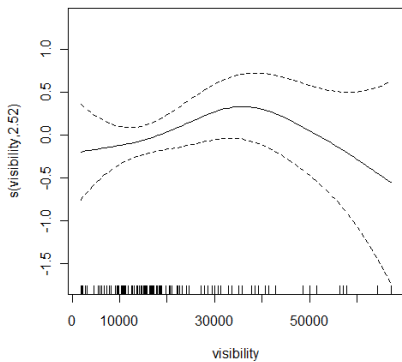
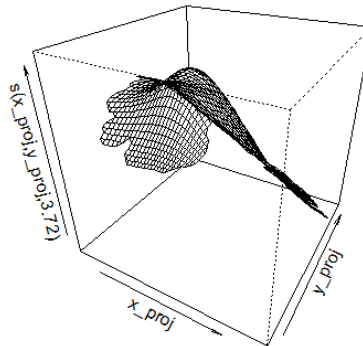
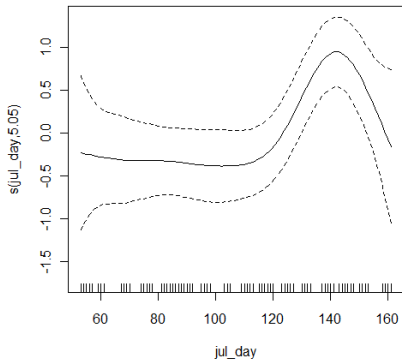
      edf Ref.df   F p-value
s(jul_day)      5.050 6.110 3.621 0.00262 **
s(x_proj,y_proj) 3.723 5.013 0.685 0.63610
s(visibility)   2.523 3.160 1.145 0.33625

```

```
---
```

```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
R-sq.(adj) = 0.234  Deviance explained = 31.4%
GCV score = 1.2046  Scale est. = 1.0687  n = 109
```



```
Spring LL
```

```

      df   AIC
ggg1 11.68873 536.4605
ggg2 14.02805 537.3642
ggg3 12.83902 537.2806
ggg4 16.25655 535.0464
ggg5 12.61317 537.2241
ggg6 12.64023 538.3979
ggg7 11.47448 535.5633
ggg8 13.13351 536.4221
ggg9 12.99844 536.5131
ggg10 15.48610 533.9015
ggg11 12.75342 535.8209
ggg12 12.45556 537.5534
> summary(ggg10)

```

FEHMARNBELT BIRDS

Family: gaussian
 Link function: identity

Formula:
 $INTENSITY \sim s(jul_day) + s(\sin_x, \cos_y) + s(wind_speed_10min) + s(pearsontemp_2days)$

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.5549	0.1794	3.092	0.00252 **

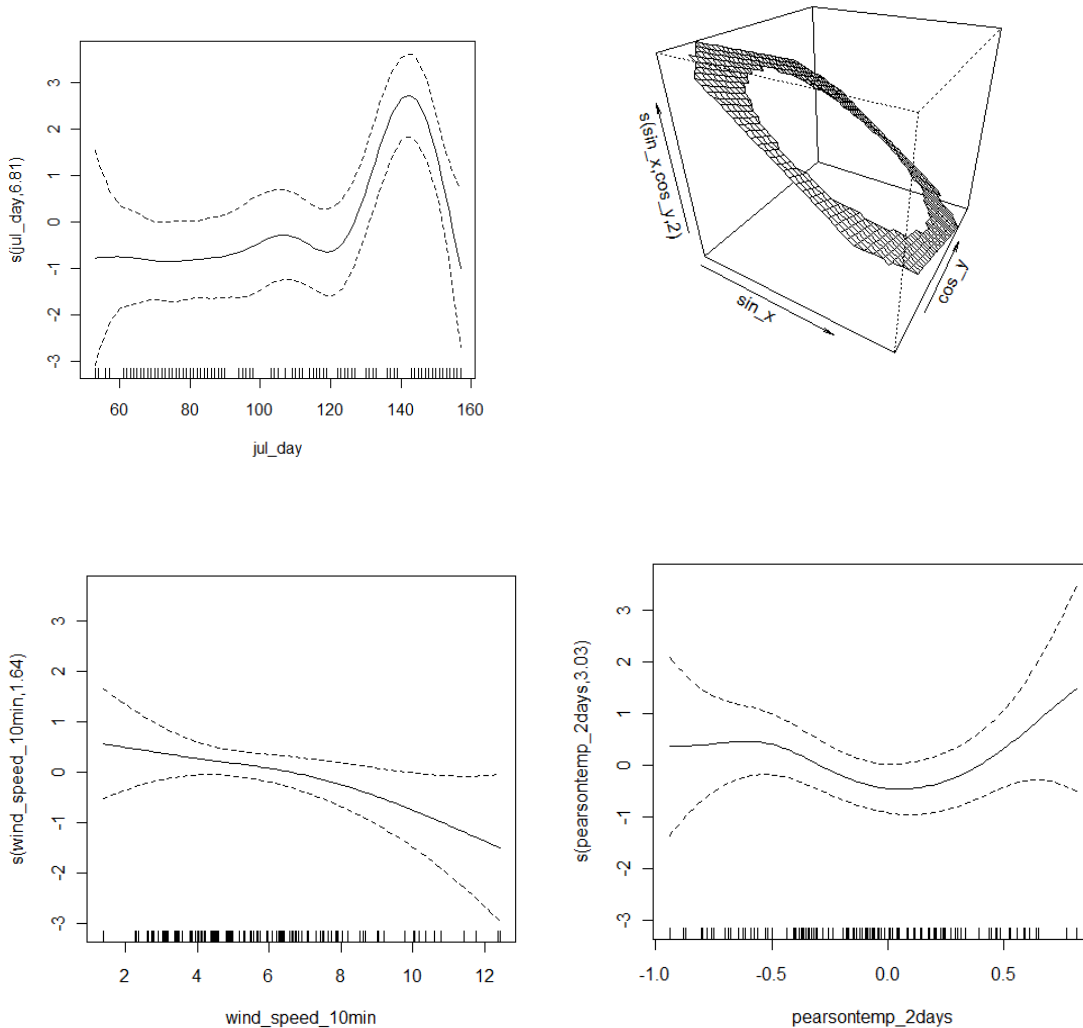
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.810	7.904	4.938	3.42e-05 ***
s(sin_x,cos_y)	2.000	2.000	1.023	0.3628
s(wind_speed_10min)	1.644	2.042	2.348	0.0992 .
s(pearsontemp_2days)	3.033	3.807	1.354	0.2559

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.245 Deviance explained = 32.8%
 GCV score = 4.4888 Scale est. = 3.9602 n = 123



Autumn LL

```

df    AIC
ggg1 12.13185 1013.403
ggg2 12.27977 1014.605
ggg3 13.12939 1015.289
ggg4 12.28275 1014.393
ggg5 16.20104 1014.840
ggg6 13.07182 1015.035
ggg7 11.45447 1012.385
ggg8 12.44957 1014.381
ggg9 12.45968 1014.092
ggg10 12.45183 1014.192
ggg11 12.37966 1014.253
ggg12 12.42062 1014.110
> summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.7940	0.7075	3.949	0.000128 ***

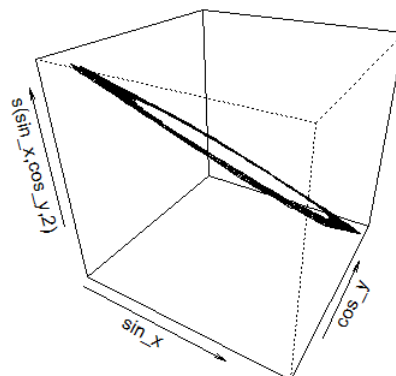
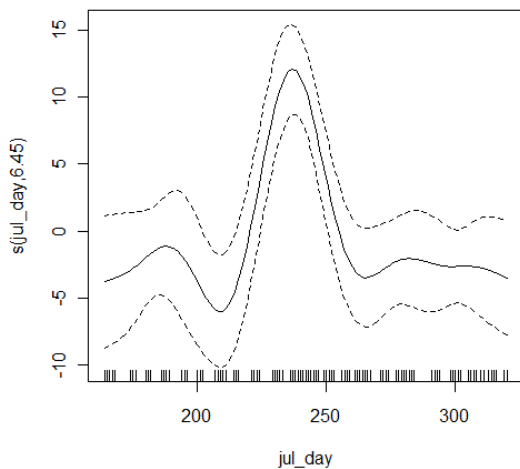
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

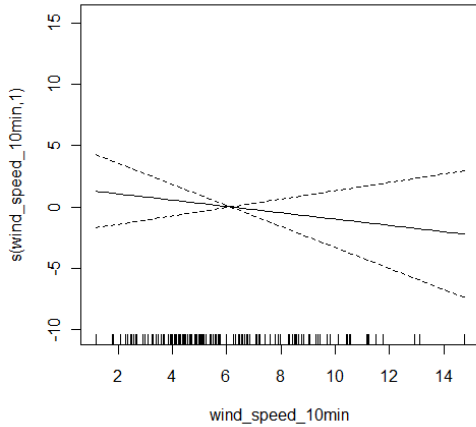
	edf	Ref.df	F	p-value
s(jul_day)	6.455	6.899	7.822	7.92e-08 ***
s(sin_x,cos_y)	2.000	2.000	0.672	0.512
s(wind_speed_10min)	1.000	1.000	0.737	0.392

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.279 Deviance explained = 32.8%
GCV score = 76.23 Scale est. = 70.578 n = 141



FEHMARNBELT BIRDS



Autumn FM

```

df    AIC
ggg1  17.77987 727.2300
ggg2  22.64850 719.2051
ggg3  19.19687 722.1005
ggg4  18.35615 728.8943
ggg5  19.90349 724.7754
ggg6  18.80681 728.4733
ggg7  14.24129 729.0469
ggg8  17.84786 723.0756
ggg9  17.36584 722.6270
ggg10 14.46711 729.7087
ggg11 18.73409 724.4007
ggg12 15.28248 730.1801
>      summary(ggg2)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.8378	0.5508	5.152	1.55e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

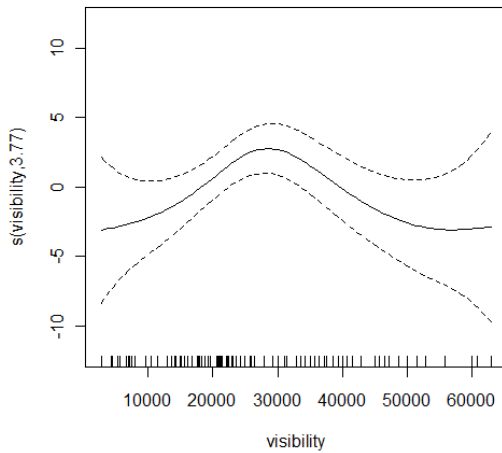
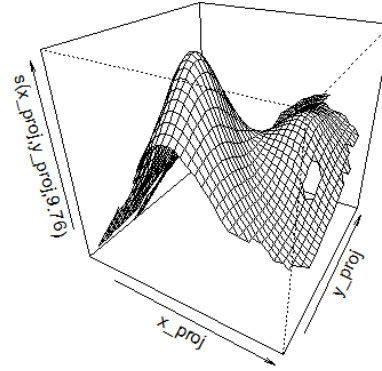
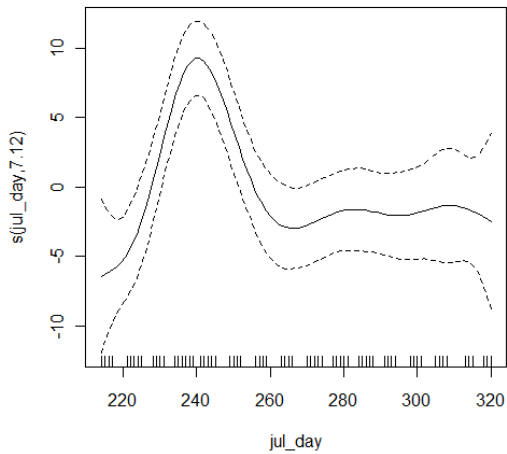
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	7.115	8.070	6.768	6.31e-07 ***
s(x_proj,y_proj)	9.758	13.465	1.730	0.0660 .
s(visibility)	3.775	4.619	2.452	0.0438 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.486 Deviance explained = 58.3%
GCV score = 41.549 Scale est. = 33.372 n = 110

FEHMARNBELT BIRDS



Long list of parameters in the model:

Spring LL

```
> ggg101<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt), data=springLL)
> ggg102<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover), da-
ta=springLL)
> ggg103<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h),
data=springLL)
> ggg104<-gam(INTENSITY~s(jul_day)+s(sin_x,
cos_y)+s(wind_speed_10min)+s(pearsontemp_2days)+s(cloud_alt)+s(cloud_cover)+s(ppt_12h)+s
(temper), data=springLL)
> AIC(ggg101, ggg102, ggg103, ggg104)
      df      AIC
ggg101 16.90560 534.6643
ggg102 17.69411 535.1651
ggg103 18.63529 537.1411
ggg104 19.59003 538.1354
> summary(ggg101)
```

Family: gaussian

Link function: identity

Formula:

$INTENSITY \sim s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(pearsontemp_2days) + s(cloud_alt)$

Parametric coefficients:

```

      Estimate Std. Error t value Pr(>|t|)
(Intercept) 0.5549    0.1791  3.098 0.00249 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Approximate significance of smooth terms:

```

      edf Ref.df   F p-value
s(jul_day)      7.021 8.082 5.038 2.36e-05 ***
s(sin_x,cos_y)  2.000 2.000 0.472  0.6248
s(wind_speed_10min) 1.840 2.300 2.489  0.0799 .
s(pearsontemp_2days) 3.045 3.821 1.349  0.2580
s(cloud_alt)     1.000 1.000 0.595  0.4421
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

R-sq.(adj) = 0.248 Deviance explained = 34%
GCV score = 4.5315 Scale est. = 3.9455 n = 123

Both years, narrow time window, Pernis apivorus
Does not want to compute, with n=46 why? Too few arguments?

Here with n=54:

```

Spring LL
>      AIC(ggg1)
[1] 249.9620
>      summary(ggg1)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:

```

      Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.4837    0.4997  2.969 0.005 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Approximate significance of smooth terms:

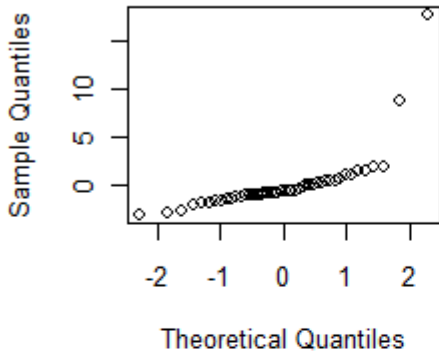
```

      edf Ref.df   F p-value
s(jul_day)      2.148 2.654 2.345  0.094 .
s(x_proj,y_proj) 2.333 2.641 0.375  0.746
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

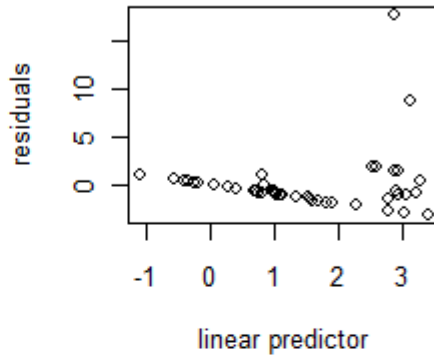
```

R-sq.(adj) = 0.103 Deviance explained = 19.3%
GCV score = 13.04 Scale est. = 11.486 n = 46

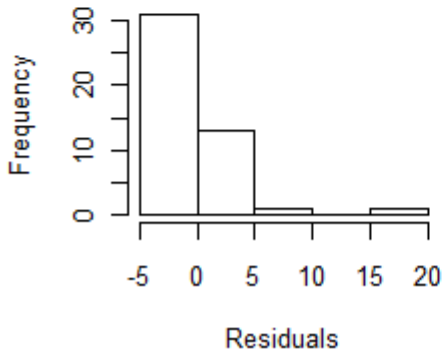
Normal Q-Q Plot



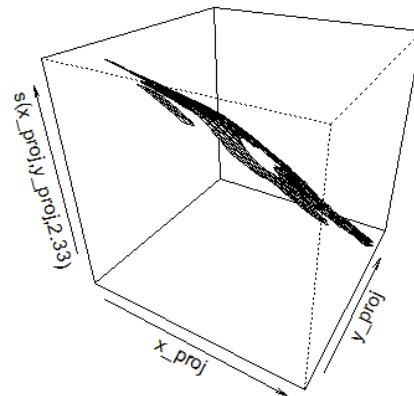
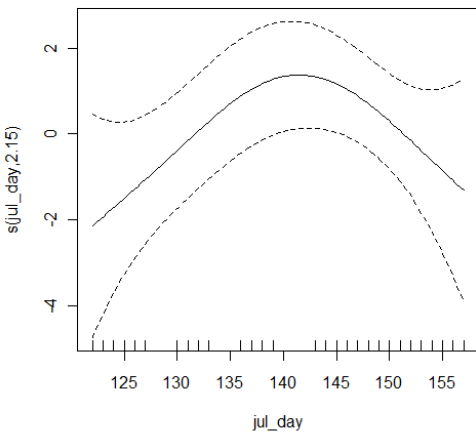
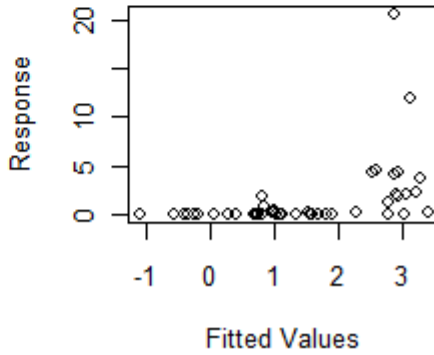
Resids vs. linear pred.



Histogram of residuals



Response vs. Fitted Values



Spring FM

```
> AIC(ggg1)
[1] 164.9582
> summary(ggg1)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

FEHMARNBELT BIRDS

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.9405	0.2744	3.427	0.00161 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

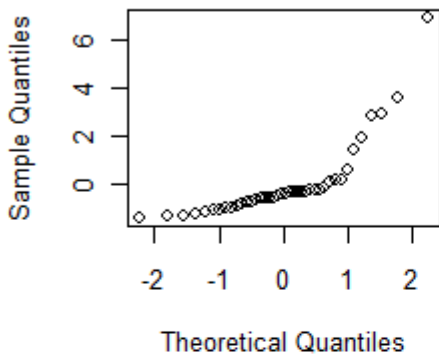
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.844	2.258	1.552	0.225
s(x_proj,y_proj)	2.955	3.745	0.548	0.691

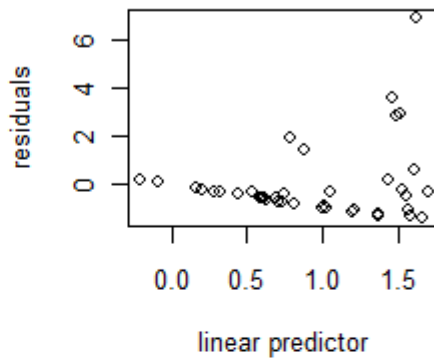
R-sq.(adj) = 0.0839 Deviance explained = 19.7%

GCV score = 3.5232 Scale est. = 3.0124 n = 40

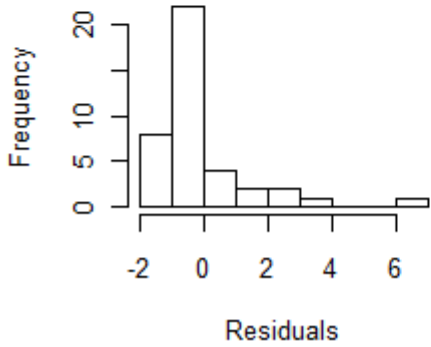
Normal Q-Q Plot



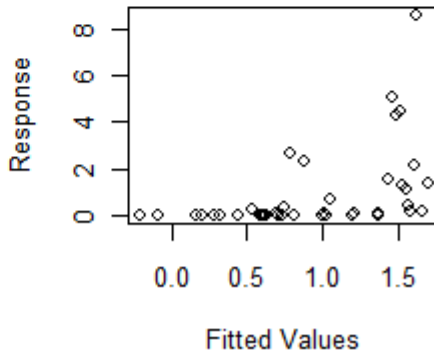
Resids vs. linear pred.



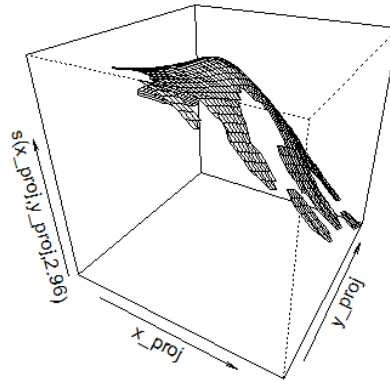
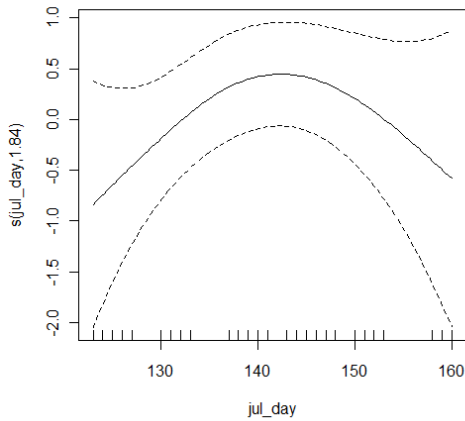
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



Autumn LL

```

df    AIC
ggg1  5.00000 428.2773
ggg2  6.00000 430.2068
ggg3  6.00000 429.9729
ggg4  6.00000 429.7174
ggg5 15.96558 419.0156
ggg7  6.00000 428.8879
>      summary(ggg5)

```

Family: gaussian

Link function: identity

Formula:

INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(temper)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	7.562	1.644	4.6	4.82e-05 ***

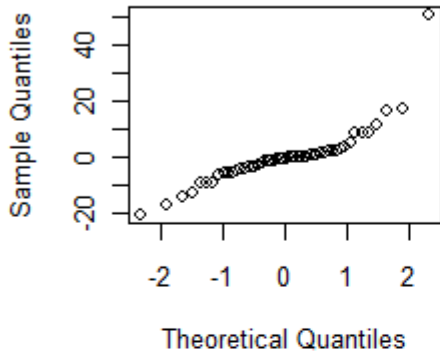
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

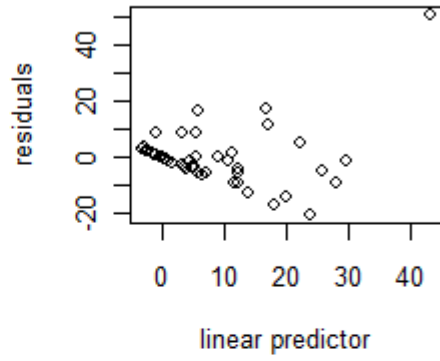
	edf	Ref.df	F	p-value
s(jul_day)	4.109	5.046	1.681	0.163
s(x_proj,y_proj)	2.000	2.000	0.314	0.732
s(temper)	7.857	8.645	1.713	0.123

R-sq.(adj) = 0.395 Deviance explained = 56%
 GCV score = 197.32 Scale est. = 140.53 n = 52

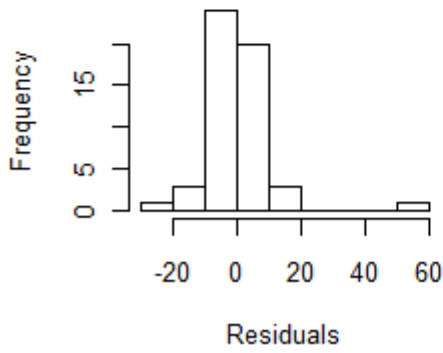
Normal Q-Q Plot



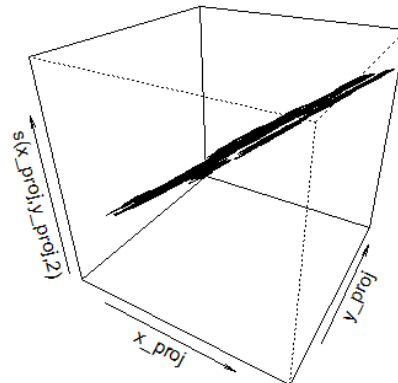
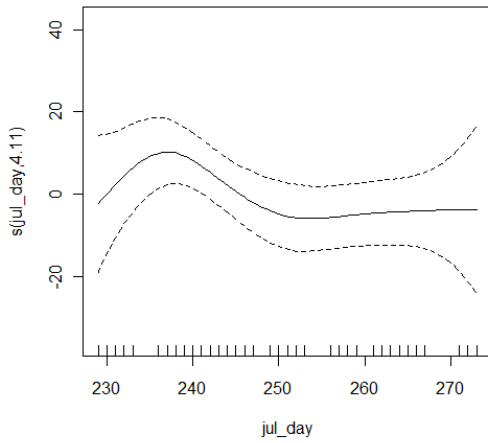
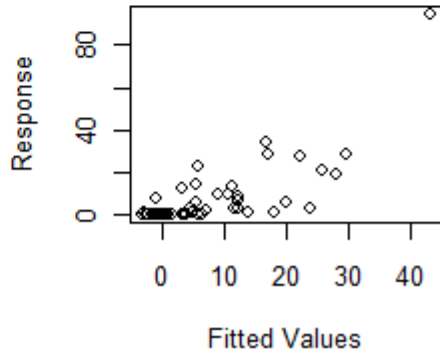
Resids vs. linear pred.



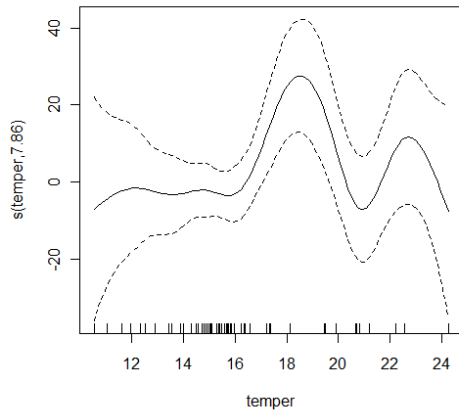
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



autumnFM

```

      df   AIC
ggg1 15.44806 388.7752
ggg2 25.42704 366.7458
ggg3 15.86142 389.6724
ggg4 15.29589 390.3931
ggg5 15.38741 390.9874
ggg6 16.27742 389.6958
ggg7 11.66990 389.7714
>      summary(ggg2)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	5.7763	0.8291	6.967	1.05e-07 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

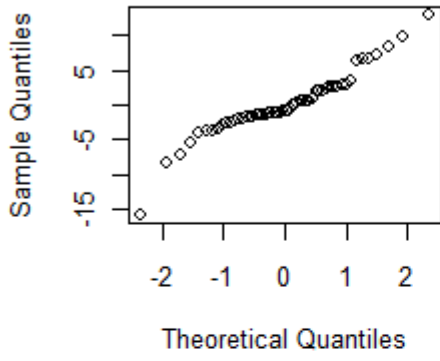
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	2.872	3.427	4.802	0.00583 **
s(x_proj,y_proj)	16.626	20.995	2.687	0.00682 **
s(visibility)	3.928	4.689	3.502	0.01463 *

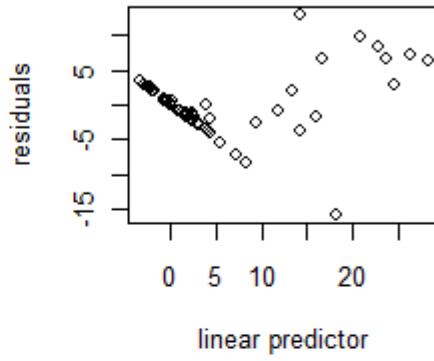
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.68 Deviance explained = 82.2%
GCV score = 67.777 Scale est. = 37.118 n = 54

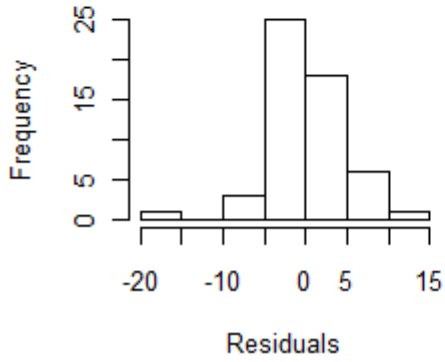
Normal Q-Q Plot



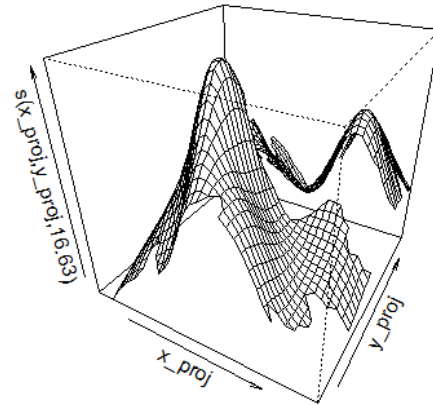
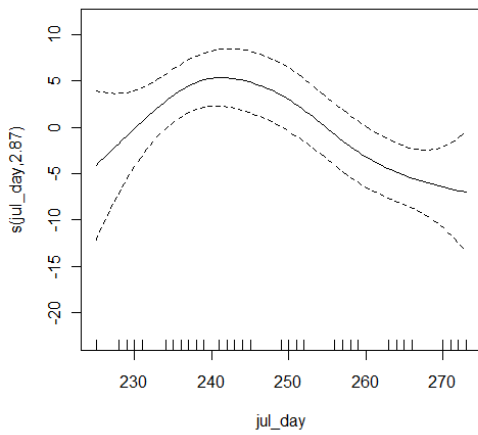
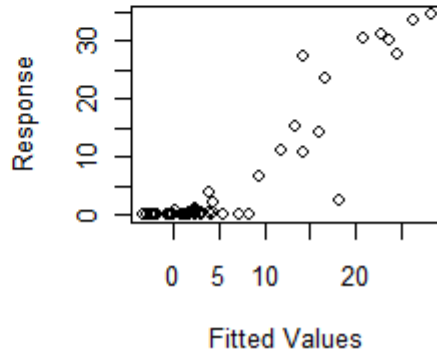
Resids vs. linear pred.

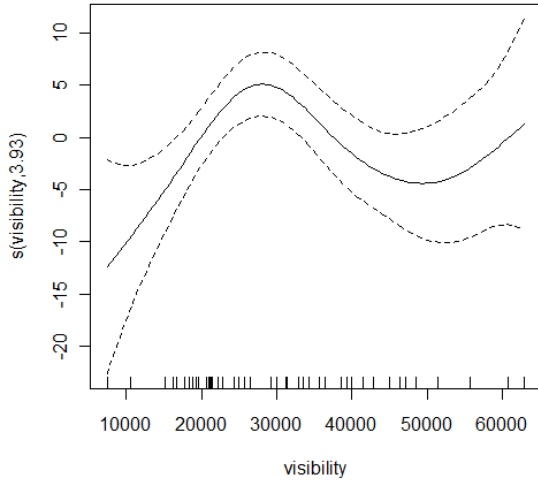


Histogram of residuals



Response vs. Fitted Values





Common Eider – *Somateria mollissima*

Precise wind parameters, wide time window, both 2009 and 2010
Spring LL

```

df    AIC
ggg1  11.21748 1896.461
ggg2  18.70001 1889.039
ggg3  11.59772 1897.927
ggg4  15.77251 1885.569
ggg5  12.73928 1897.223
ggg6  12.64016 1898.303
ggg7  13.05176 1897.614
ggg8  18.50227 1889.270
ggg9  13.83591 1898.891
ggg10 17.15481 1885.910
ggg11 14.39516 1897.981
ggg12 14.09916 1899.466
>      summary(ggg4)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(pearsontemp_2days)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	320.07	43.62	7.337	4.24e-11 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

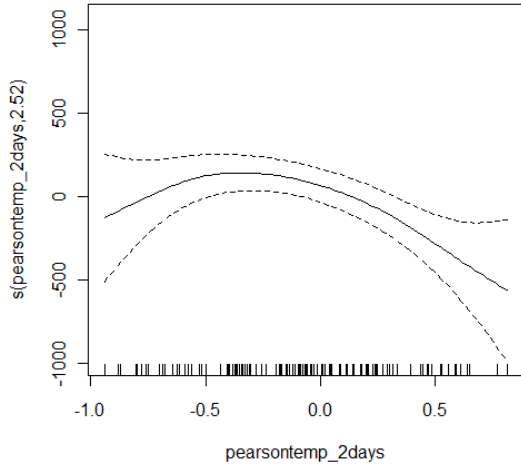
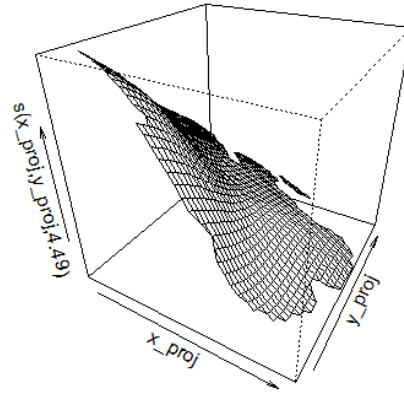
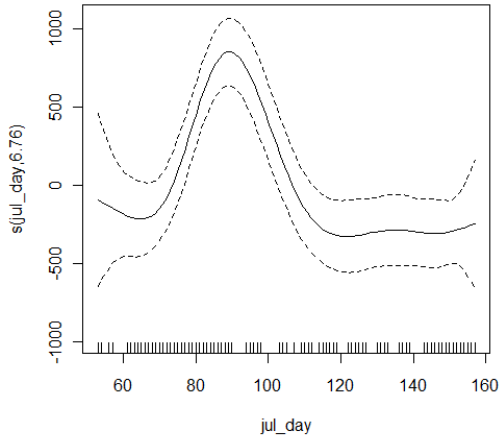
	edf	Ref.df	F	p-value
s(jul_day)	6.761	7.847	9.355	1.23e-09 ***
s(x_proj,y_proj)	4.495	6.235	2.014	0.06730 .
s(pearsontemp_2days)	2.517	3.158	3.930	0.00933 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.466 Deviance explained = 52.6%

FEHMARNBELT BIRDS

GCV score = 2.6604e+05 Scale est. = 2.3408e+05 n = 123



Spring FM

```

df    AIC
ggg1 14.233271 1233.044
ggg2 22.747249 1214.886
ggg3 18.035689 1231.684
ggg4 15.676201 1234.272
ggg5 17.152261 1233.039
ggg6 15.199331 1234.654
ggg7  7.729191 1239.564
ggg8 12.834308 1225.114
ggg9  9.905165 1239.094
ggg10 8.743397 1240.281
ggg11 11.069025 1238.675
ggg12 12.046640 1242.020
> summary(ggg2)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

FEHMARNBELT BIRDS

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	52.141	5.534	9.423	5.97e-15 ***

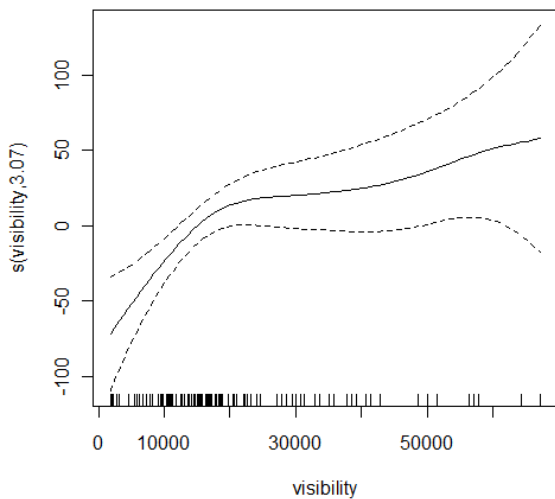
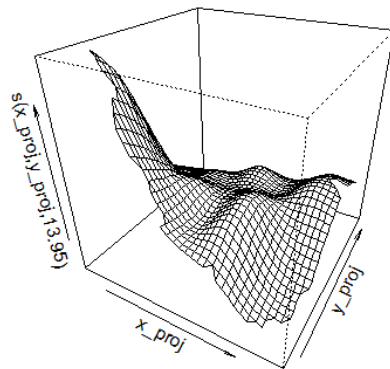
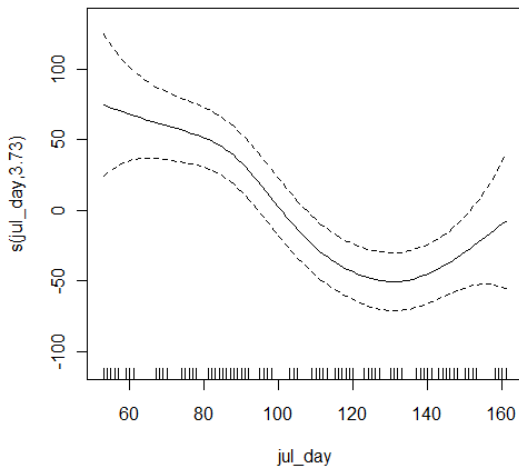
 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.727	4.554	9.794	4.44e-07 ***
s(x_proj,y_proj)	13.955	18.608	1.123	0.34354
s(visibility)	3.066	3.778	4.777	0.00191 **

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.414 Deviance explained = 52.7%
 GCV score = 4169.5 Scale est. = 3337.6 n = 109



Autumn FM

	df	AIC
ggg1	12.81174	1671.131
ggg2	17.43224	1650.954
ggg3	14.87193	1671.393
ggg4	13.41592	1672.710
ggg5	18.34938	1656.244

FEHMARNBELT BIRDS

```

ggg6 14.89677 1671.283
ggg7 23.12196 1662.007
ggg8 31.28227 1629.453
ggg9 24.19073 1661.770
ggg10 23.24606 1663.792
ggg11 35.70991 1640.180
ggg12 44.15345 1624.834
      df    AIC
ggg101 24.58872 1663.524
ggg102 29.76637 1655.887
ggg103 46.61920 1609.879
ggg104 55.25522 1571.388
ggg105 56.21072 1571.917
> summary(ggg104)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h) +
s(temper)

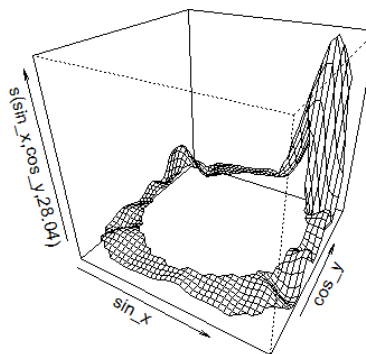
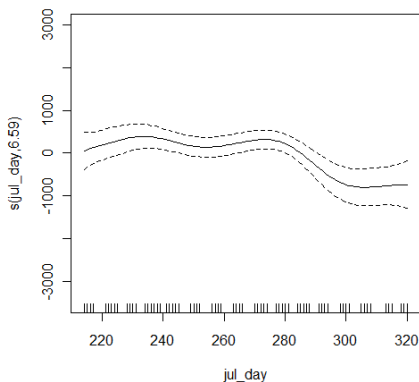
Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 243.1 24.8 9.799 9.97e-14 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

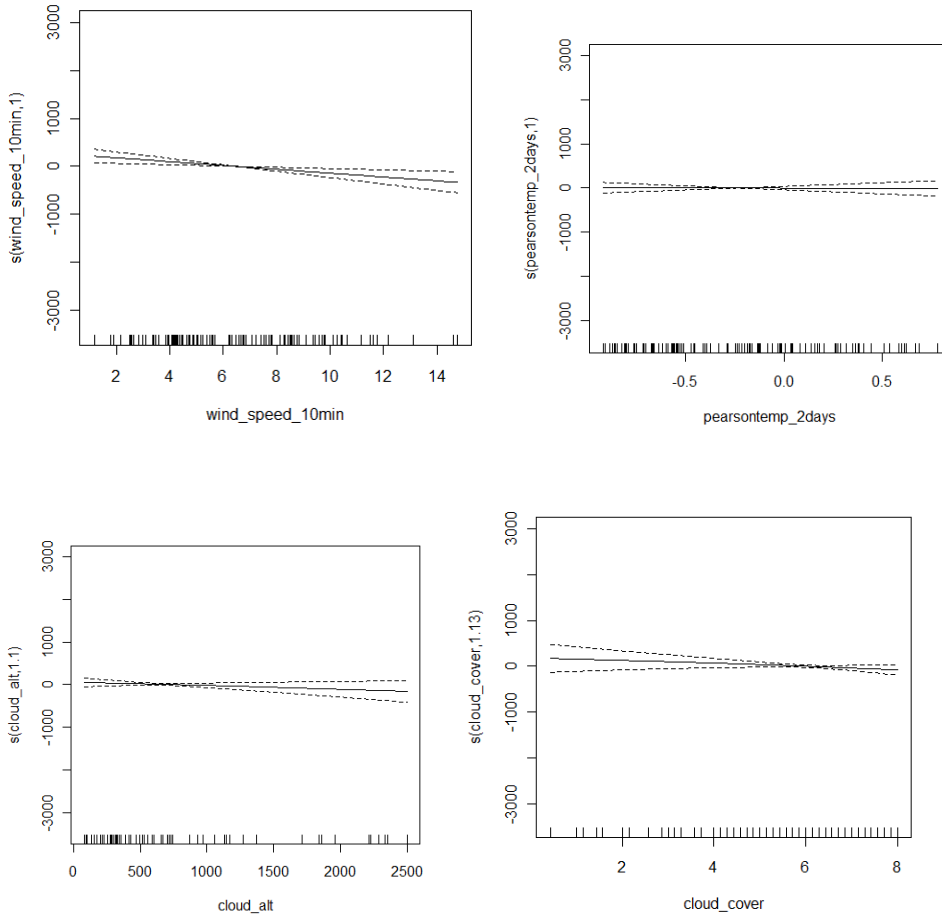
Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 6.593 7.711 3.722 0.00169 **
s(sin_x,cos_y) 28.042 28.892 6.102 4.37e-09 ***
s(wind_speed_10min) 1.000 1.000 8.953 0.00412 **
s(pearsontemp_2days) 1.000 1.000 0.010 0.91933
s(cloud_alt) 1.101 1.186 1.427 0.24217
s(cloud_cover) 1.134 1.248 1.184 0.29358
s(ppt_12h) 7.732 7.959 7.636 7.99e-07 ***
s(temper) 6.653 7.780 3.616 0.00206 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.772 Deviance explained = 88.3%
GCV score = 1.3355e+05 Scale est. = 67678 n = 110



FEHMARNBELT BIRDS



> summary(ggg12)

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	243.05	31.95	7.608	1.24e-10	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

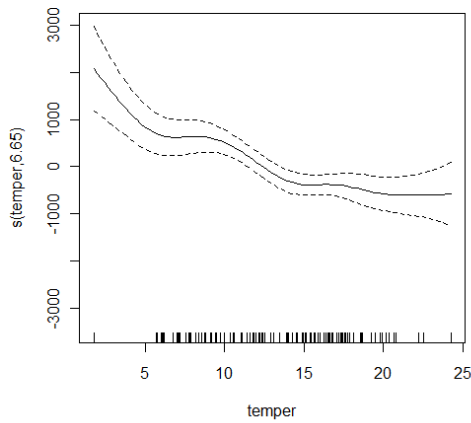
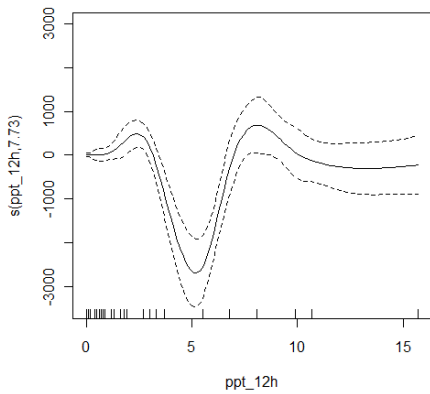
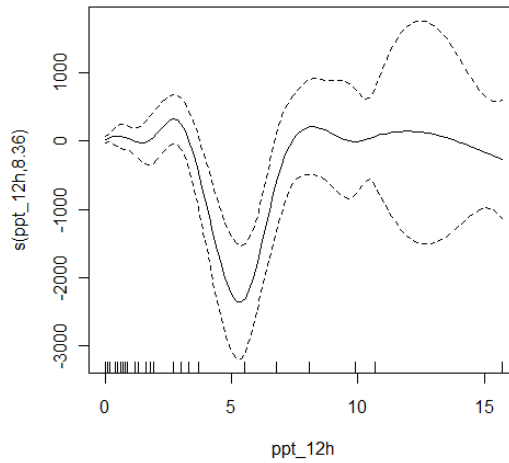
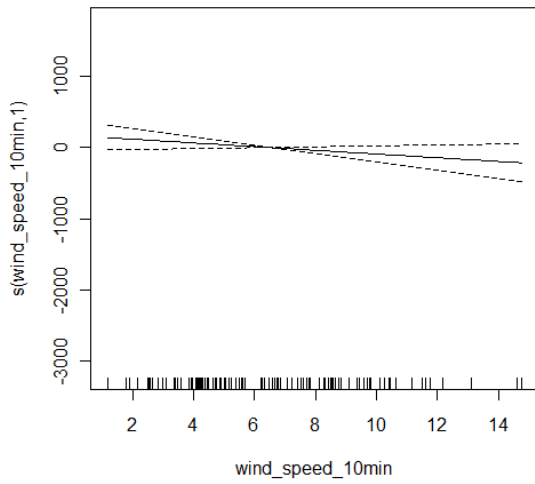
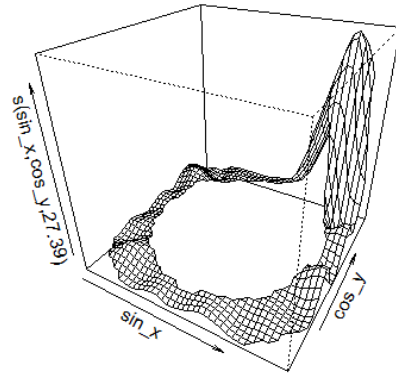
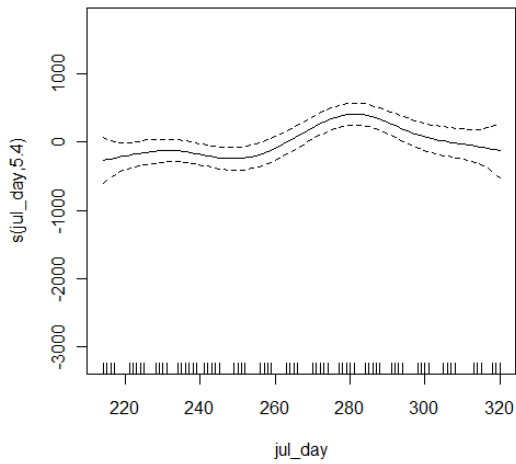
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value	
s(jul_day)	5.404	6.502	5.285	0.000112	***
s(sin_x,cos_y)	27.390	28.776	4.561	1.61e-07	***
s(wind_speed_10min)	1.000	1.000	2.594	0.111949	
s(ppt_12h)	8.360	8.849	3.939	0.000496	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.621 Deviance explained = 76.8%
GCV score = 1.8474e+05 Scale est. = 1.1227e+05 n = 110

FEHMARNBELT BIRDS



Autumn LL

	df	AIC
ggg1	8.966471	1868.036
ggg2	12.779119	1847.941
ggg3	9.981417	1869.761
ggg4	9.943725	1869.043
ggg5	11.630979	1863.103
ggg6	10.046269	1869.331
ggg7	11.964233	1866.918

FEHMARNBELT BIRDS

```

ggg8 14.053965 1849.167
ggg9 12.951037 1868.366
ggg10 12.925562 1868.341
ggg11 14.564362 1861.552
ggg12 13.075875 1868.273
      df      AIC
ggg101 13.91320 1869.897
ggg102 15.50539 1869.890
ggg103 16.48219 1871.535
ggg104 18.69081 1867.419
ggg105 27.78180 1852.901
ggg106 28.72527 1854.868
ggg107 23.38013 1857.512
ggg108 43.33349 1816.020
>      summary(ggg108)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h) +
s(temper) + s(ppt_last4times_sum) + s(air_press_h_corrected) +
s(pearsontemp_1day) + s(visibility)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 89.72 11.22 7.996 2.49e-12 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

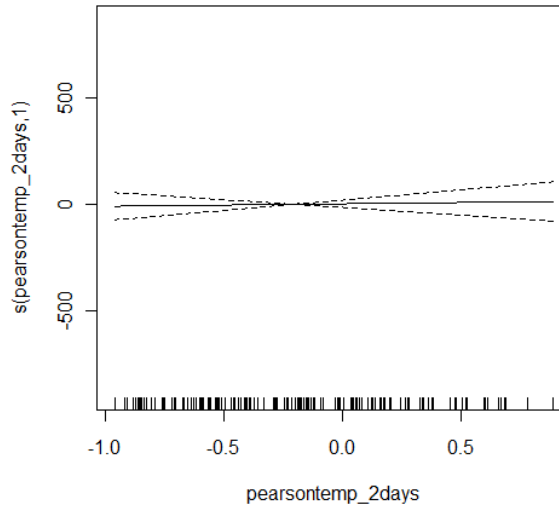
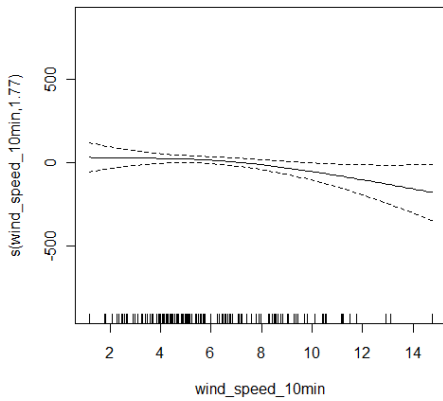
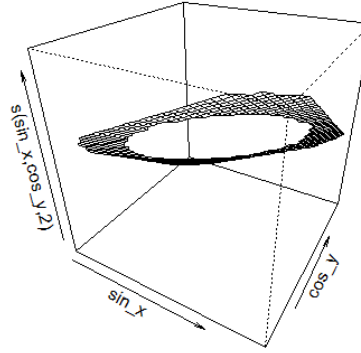
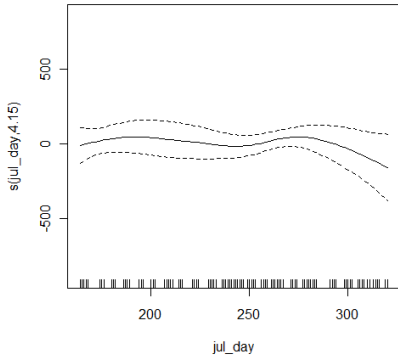
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.154	5.192	1.451	0.211007
s(sin_x,cos_y)	2.000	2.000	0.363	0.696235
s(wind_speed_10min)	1.773	2.241	2.484	0.082264 .
s(pearsontemp_2days)	1.000	1.000	0.079	0.778655
s(cloud_alt)	6.686	7.791	1.239	0.285307
s(cloud_cover)	1.000	1.000	0.076	0.783753
s(ppt_12h)	1.997	2.375	3.484	0.027310 *
s(temper)	6.121	7.239	3.180	0.004048 **
s(ppt_last4times_sum)	7.581	7.903	3.342	0.002080 **
s(air_press_h_corrected)	1.000	1.000	0.737	0.392704
s(pearsontemp_1day)	1.779	2.204	1.470	0.233943
s(visibility)	6.244	7.336	4.468	0.000187 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.553 Deviance explained = 68.5%
GCV score = 25364 Scale est. = 17748 n = 141

FEHMARNBELT BIRDS



```
> summary(ggg2)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 89.72 13.64 6.58 1.07e-09 ***

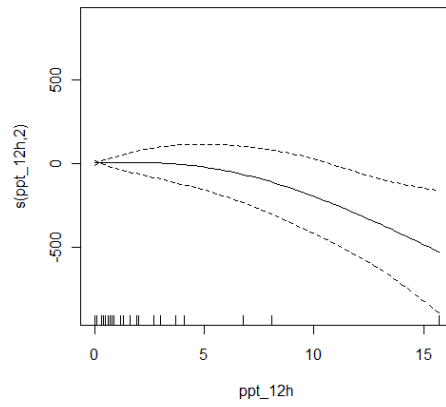
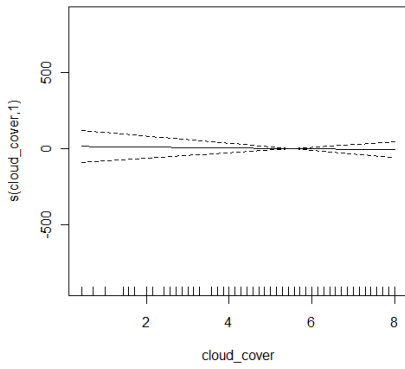
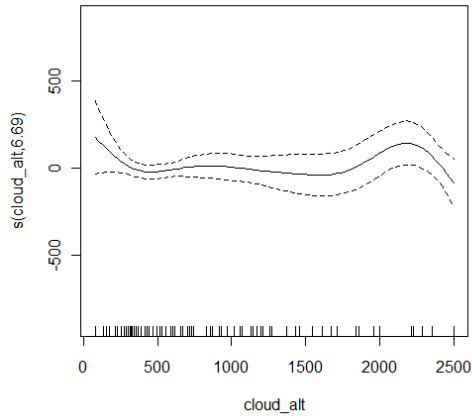
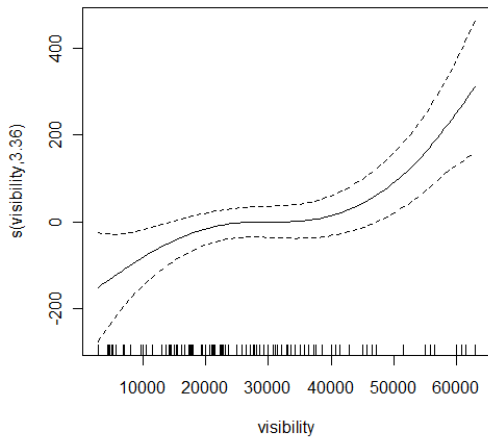
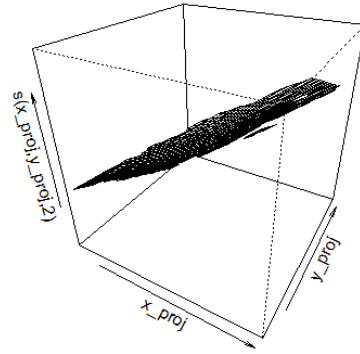
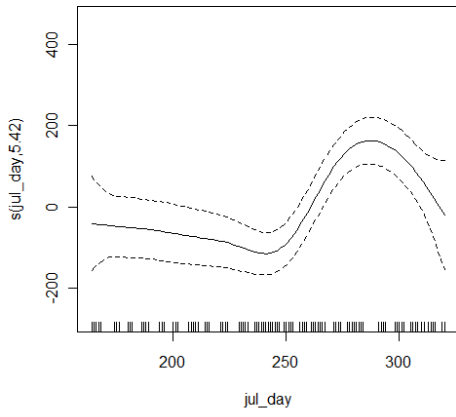
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 5.416 6.524 7.196 5.67e-07 ***
s(x_proj,y_proj) 2.000 2.000 2.407 0.094109 .
s(visibility) 3.363 4.185 5.700 0.000234 ***

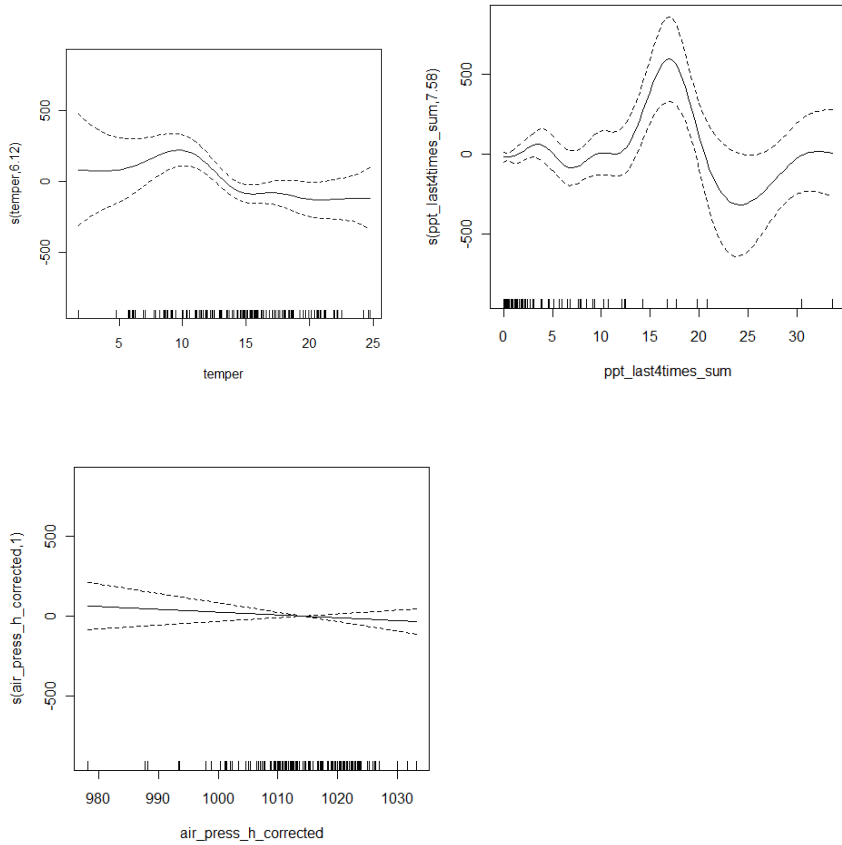
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.34 Deviance explained = 39.1%
GCV score = 28604 Scale est. = 26214 n = 141

FEHMARNBELT BIRDS



FEHMARNBELT BIRDS



Precise parameters of wind, narrow time window, (25-75% from Falsterbo in autumn) window
Autumn FM

```

df    AIC
ggg1 15.62171 978.5632
ggg2 19.20558 969.5271
ggg3 17.99450 978.9540
ggg4 16.62889 980.4224
ggg5 13.19912 980.2804
ggg6 18.37612 977.0255
ggg7 16.20469 974.5497
ggg8 26.19650 951.2588
ggg9 18.22902 974.9253
ggg10 16.43349 974.8293
ggg11 14.81390 974.3794
ggg12 35.20642 923.4876
>      summary(ggg12)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 343.48 39.31 8.738 1.36e-09 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

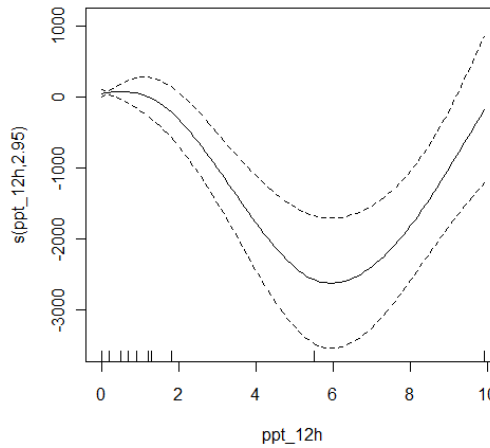
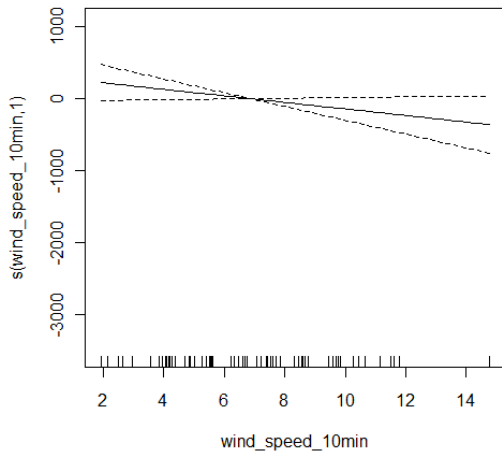
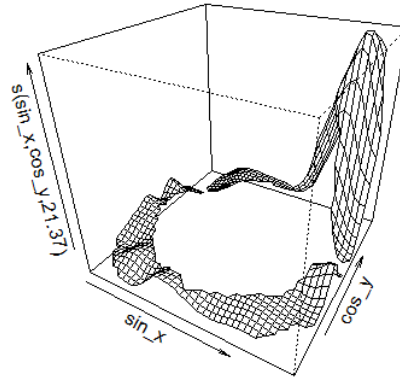
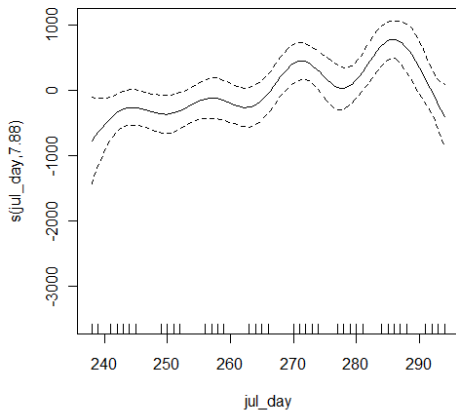
FEHMARNBELT BIRDS

```

                edf Ref.df    F p-value
s(jul_day)      7.881  8.450  6.490 6.48e-05 ***
s(sin_x,cos_y)  21.372 24.952  4.437 9.62e-05 ***
s(wind_speed_10min) 1.000 1.000  3.248  0.082 .
s(ppt_12h)      2.953  2.994 10.905 5.96e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

R-sq.(adj) = 0.794 Deviance explained = 90.4%
 GCV score = 2.1298e+05 Scale est. = 97341 n = 63



Autumn LL

```

                df    AIC
ggg1  9.758655 885.5068
ggg2 13.348384 872.0605
ggg3 10.232143 886.6377
ggg4 11.052061 886.7589
ggg5 10.633017 885.0236
ggg7 10.015514 883.4625
ggg8 11.790655 874.1210
ggg9 14.695078 882.1736
ggg10 11.232700 884.5155
ggg11 11.089627 882.6221
> summary(ggg2)

```

Family: gaussian

FEHMARNBELT BIRDS

Link function: identity

Formula:

INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	114.60	22.24	5.152	3.93e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

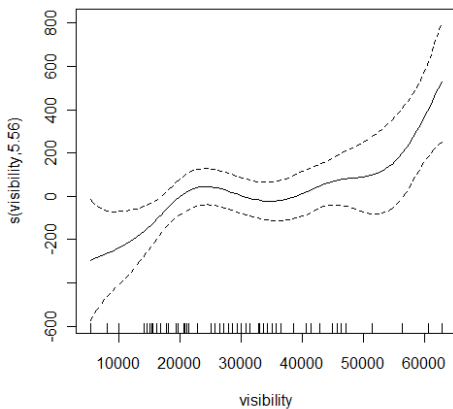
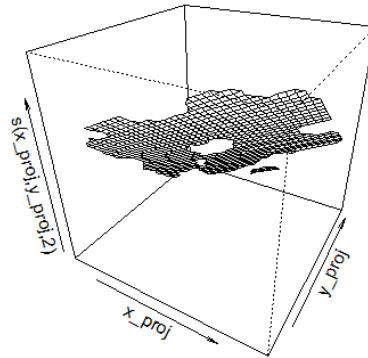
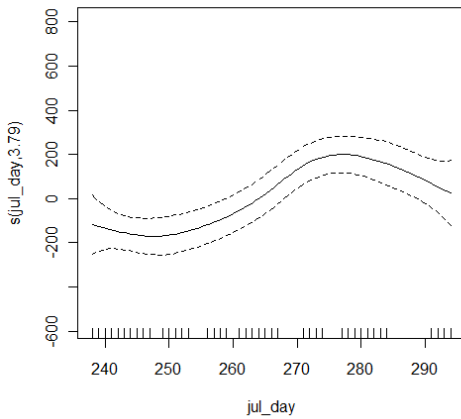
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.789	4.618	7.329	4.33e-05 ***
s(x_proj,y_proj)	2.000	2.000	1.486	0.2356
s(visibility)	5.560	6.666	3.516	0.0041 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.432 Deviance explained = 53.3%

GCV score = 39700 Scale est. = 32158 n = 65



Spring LL

	df	AIC
ggg1	10.45159	1093.830
ggg2	15.91314	1092.421
ggg3	16.60785	1089.520
ggg4	15.12642	1084.465

FEHMARNBELT BIRDS

```

ggg5 11.70891 1093.738
ggg7 11.79945 1094.197
ggg8 16.43024 1092.624
ggg9 17.63550 1092.526
ggg10 17.59836 1082.264
ggg11 12.89226 1093.479
> summary(ggg10)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	445.65	65.96	6.756	1.17e-08 ***

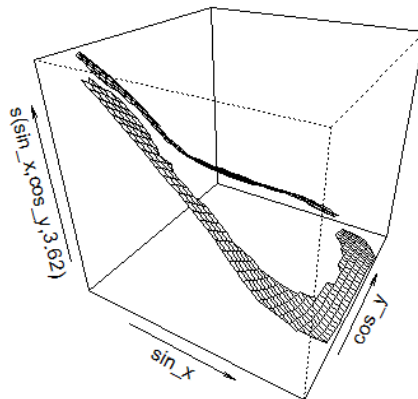
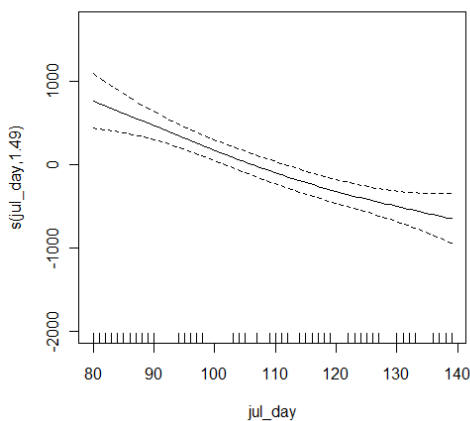
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

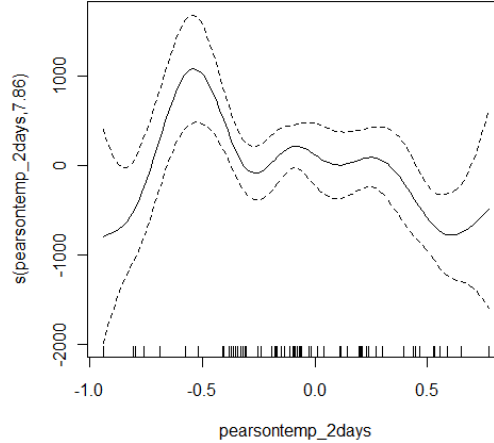
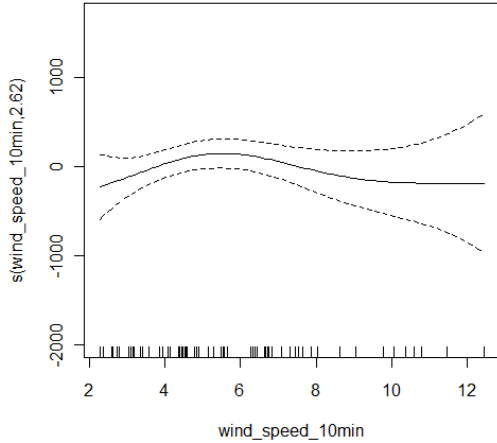
	edf	Ref.df	F	p-value
s(jul_day)	1.486	1.802	17.279	3.65e-06 ***
s(sin_x,cos_y)	3.624	4.696	3.534	0.00908 **
s(wind_speed_10min)	2.624	3.244	1.090	0.36459
s(pearsontemp_2days)	7.865	8.636	3.053	0.00570 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.544 Deviance explained = 64.9%
GCV score = 3.9528e+05 Scale est. = 3.0019e+05 n = 69



FEHMARNBELT BIRDS



Spring FM

```

df    AIC
ggg1  5.829333 720.9655
ggg2 11.019137 715.2132
ggg3  7.088595 718.5270
ggg4  7.040716 717.6656
ggg5  6.659357 719.9202
ggg7  8.652106 720.9672
ggg8 12.294569 715.3066
ggg9  9.932750 717.8104
ggg10 9.992767 717.1036
ggg11 10.499781 718.4204
>      summary(ggg8)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(visibility)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	42.789	6.128	6.983	4.13e-09 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

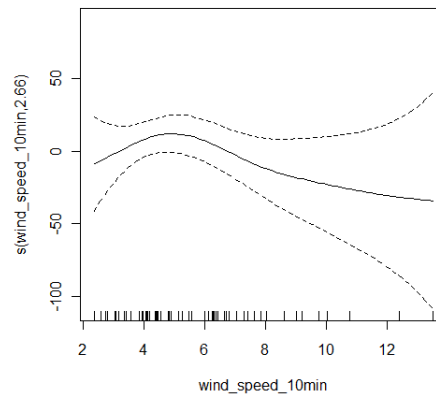
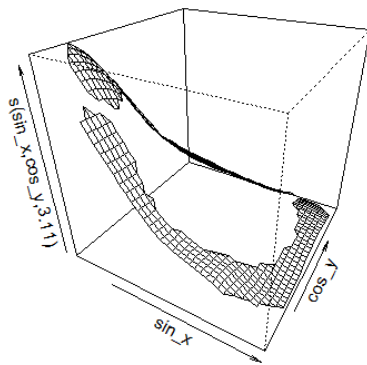
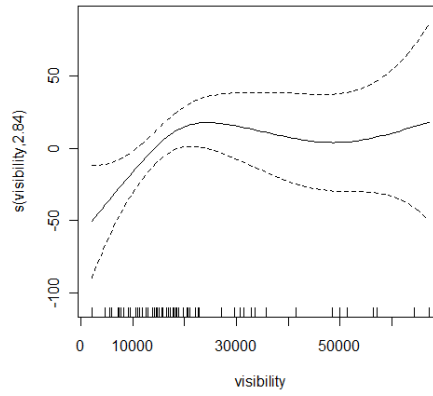
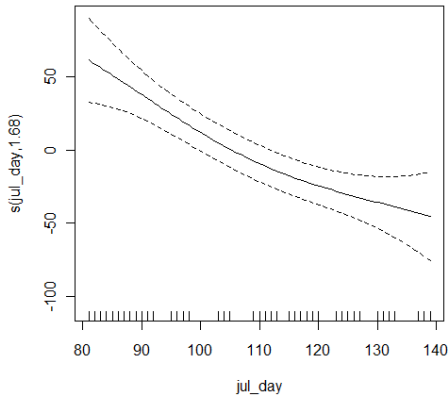
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.682	2.063	11.208	7.08e-05 ***
s(sin_x,cos_y)	3.109	3.921	0.728	0.5742
s(wind_speed_10min)	2.661	3.300	1.276	0.2919
s(visibility)	2.843	3.523	2.468	0.0625 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.364 Deviance explained = 46.5%
GCV score = 2989.7 Scale est. = 2478.1 n = 66

FEHMARNBELT BIRDS



Long list of parameters in the model
Spring LL soma moll

```

df    AIC
ggg101 17.99363 1887.835
ggg102 18.96844 1889.711
ggg103 19.54523 1890.978
ggg104 21.42302 1892.477
ggg105 21.31037 1884.612
ggg106 23.09898 1883.892
ggg107 25.63870 1886.017
> summary(ggg106)

```

Family: gaussian
Link function: identity

Formula:
 $INTENSITY \sim s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h) + s(temper) + s(ppt_last4times_sum) + s(air_press_h_corrected)$

Parametric coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 320.07 42.28 7.57 1.81e-11 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

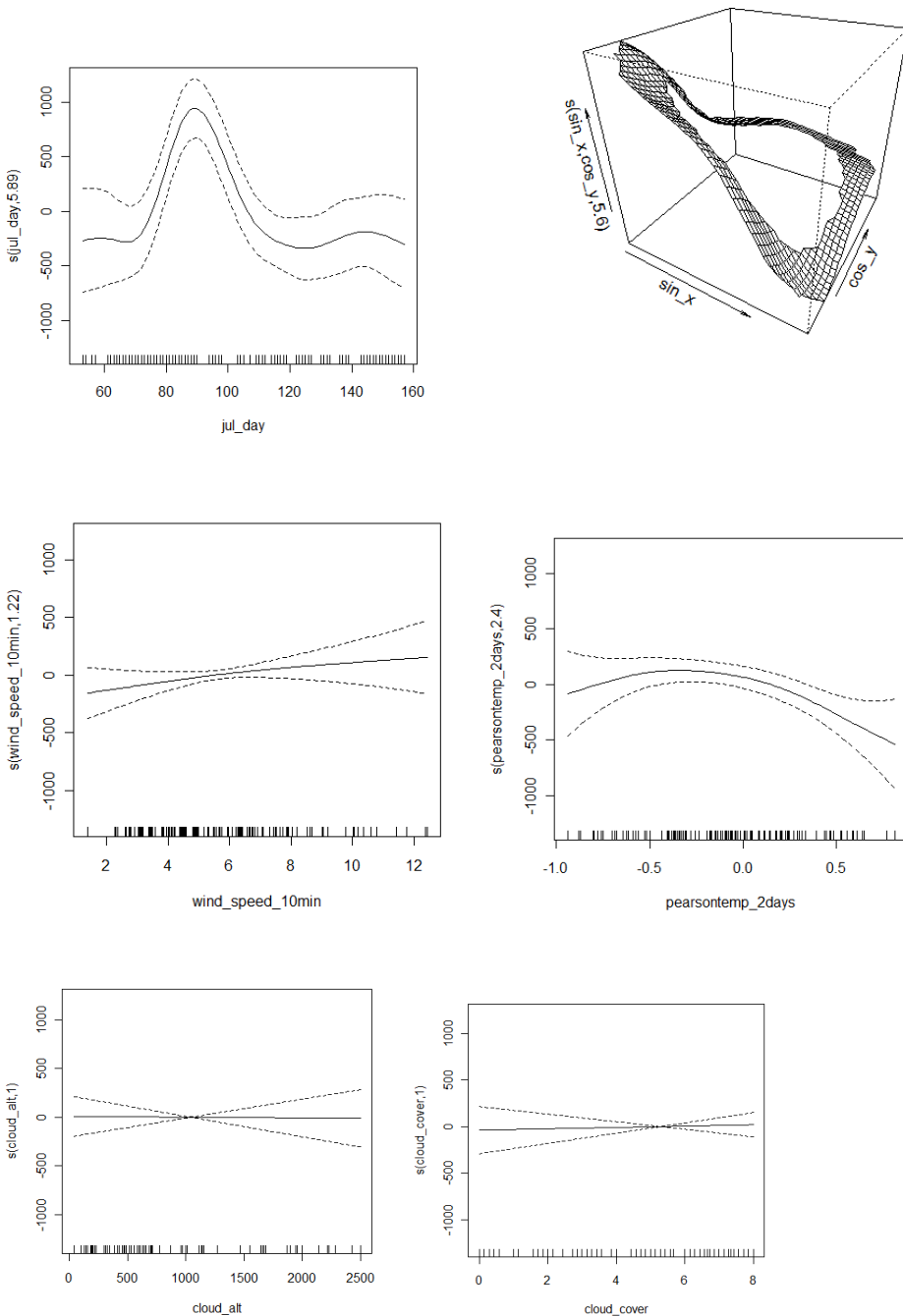
Approximate significance of smooth terms:

FEHMARNBELT BIRDS

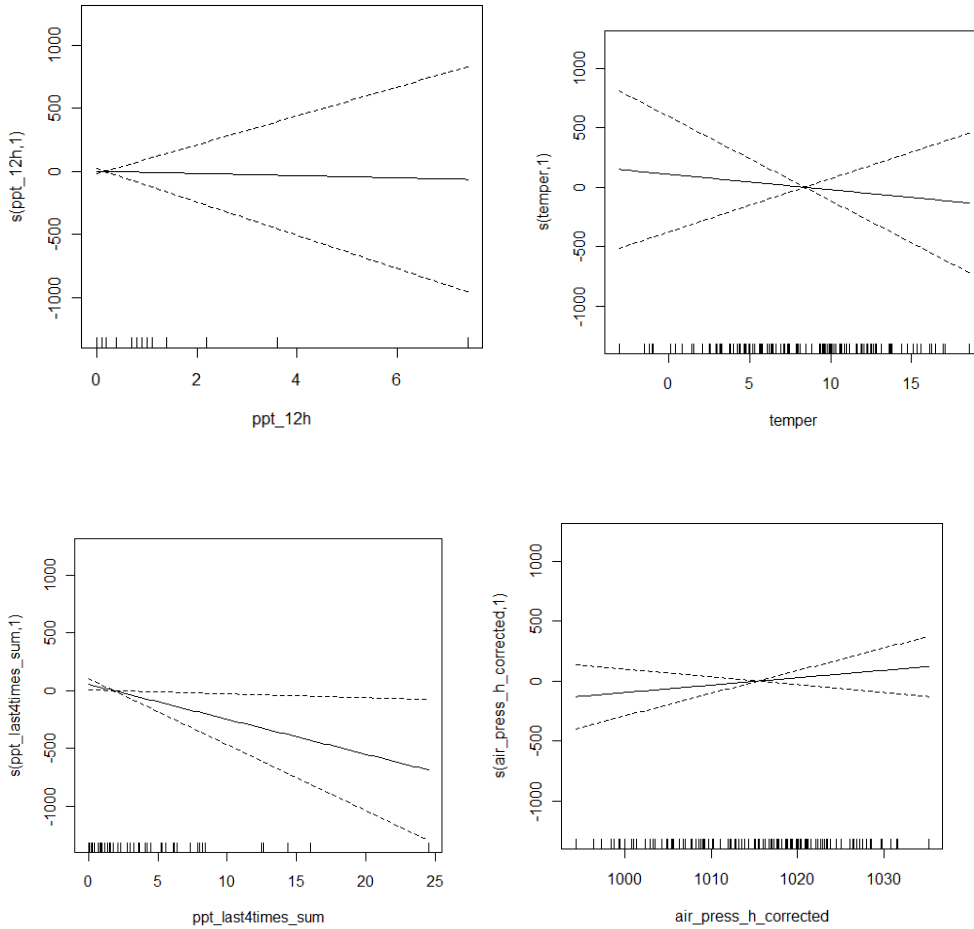
	edf	Ref.df	F	p-value	
s(jul_day)	5.8895	6.5965	10.371	2.00e-09	***
s(sin_x,cos_y)	5.5960	7.4728	1.844	0.0822	.
s(wind_speed_10min)	1.2163	1.3978	1.711	0.1932	
s(pearsontemp_2days)	2.3975	3.0205	3.703	0.0140	*
s(cloud_alt)	0.9999	0.9999	0.006	0.9361	
s(cloud_cover)	1.0000	1.0000	0.090	0.7644	
s(ppt_12h)	1.0000	1.0000	0.020	0.8876	
s(temper)	0.9999	0.9999	0.203	0.6535	
s(ppt_last4times_sum)	1.0000	1.0000	5.066	0.0266	*
s(air_press_h_corrected)	1.0000	1.0000	0.949	0.3323	

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.498 Deviance explained = 58.5%
 GCV score = 2.6802e+05 Scale est. = 2.1986e+05 n = 123



FEHMARNBELT BIRDS



```
> summary(ggg107)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h) +
s(temper) + s(ppt_last4times_sum) + s(air_press_h_corrected) +
s(pearsontemp_1day)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	320.07	42.31	7.565	2.09e-11 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	7.278	8.263	8.393	8.78e-09 ***
s(sin_x,cos_y)	5.721	7.638	1.950	0.06383 .
s(wind_speed_10min)	1.139	1.261	1.547	0.21989
s(pearsontemp_2days)	2.501	3.139	4.087	0.00794 **
s(cloud_alt)	1.000	1.000	0.001	0.97012
s(cloud_cover)	1.000	1.000	0.078	0.78043
s(ppt_12h)	1.000	1.000	0.008	0.93100
s(temper)	1.000	1.000	0.090	0.76470
s(ppt_last4times_sum)	1.000	1.000	5.271	0.02380 *
s(air_press_h_corrected)	1.000	1.000	1.073	0.30286

FEHMARNBELT BIRDS

```
s(pearsontemp_1day) 1.000 1.000 0.557 0.45733
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.498 Deviance explained = 59.5%
GCV score = 2.7535e+05 Scale est. = 2.2019e+05 n = 123
Spring FM
df AIC
ggg101 16.00403 1237.360
ggg102 11.55205 1240.660
ggg103 12.30415 1242.407
ggg104 14.63773 1243.024
ggg105 15.61341 1245.017
> summary(ggg101)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt)

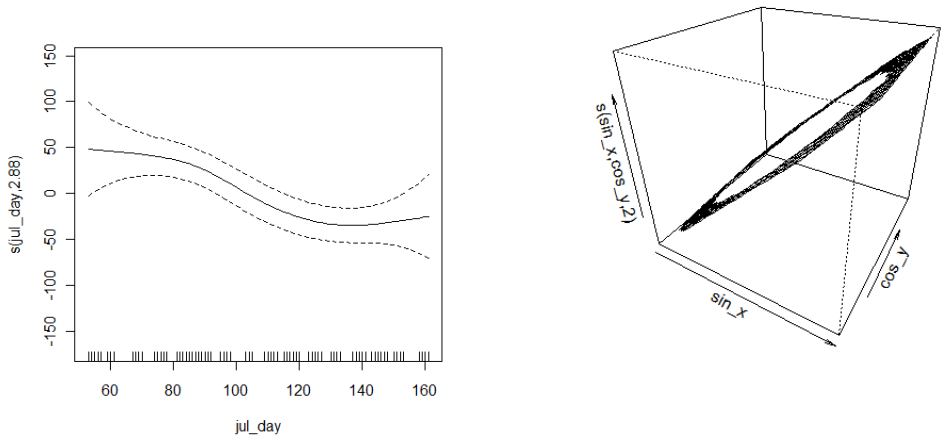
Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 52.141 6.288 8.293 7.74e-13 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

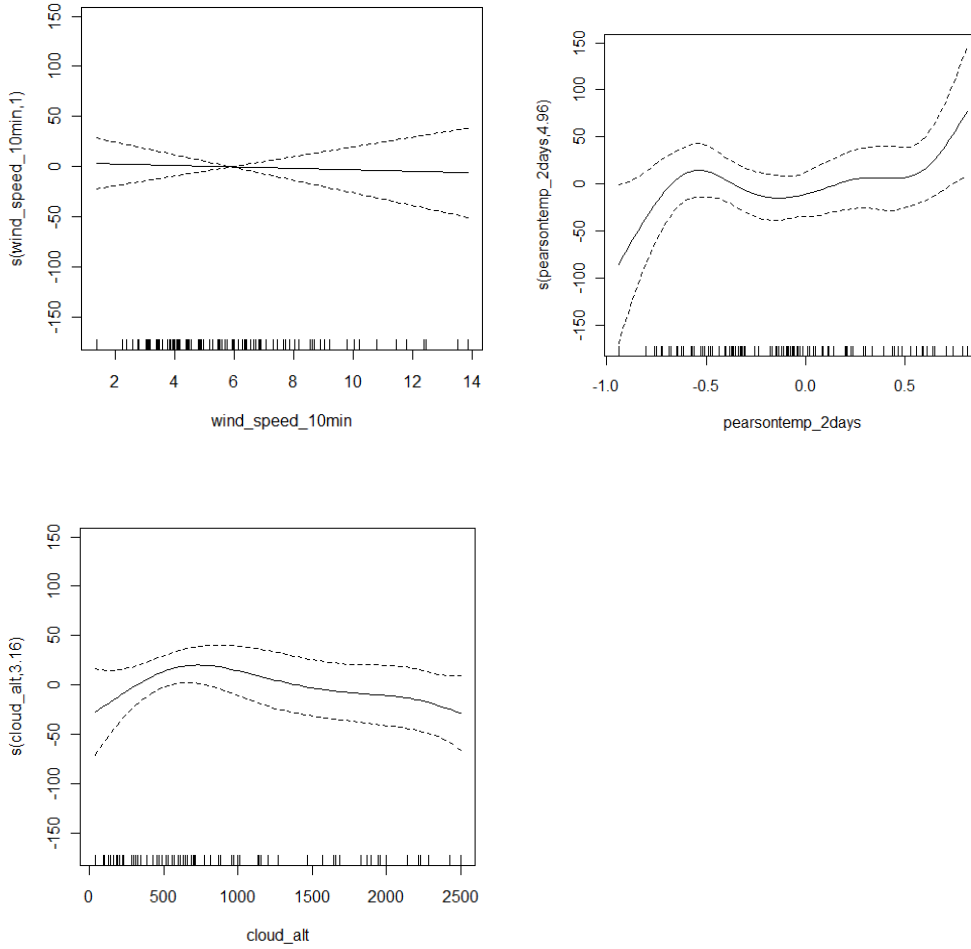
Approximate significance of smooth terms:
edf Ref.df F p-value
s(jul_day) 2.884 3.608 5.911 0.000446 ***
s(sin_x,cos_y) 2.000 2.000 0.597 0.552444
s(wind_speed_10min) 1.000 1.000 0.069 0.793474
s(pearsontemp_2days) 4.962 5.993 1.354 0.241355
s(cloud_alt) 3.158 3.869 1.426 0.232722

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.244 Deviance explained = 34.2%
GCV score = 4997 Scale est. = 4309.1 n = 109



FEHMARNBELT BIRDS



Barnacle Goose – *Branta leucopsis*

Wide time window, both years, precise wind parameters
Spring LL

```

df    AIC
ggg1  9.96256 1620.650
ggg2 10.85592 1622.268
ggg3 10.00851 1621.360
ggg4 13.20763 1620.895
ggg5 10.94222 1622.632
ggg6 10.94377 1622.215
ggg7 10.47852 1620.456
ggg8 11.40852 1622.298
ggg9 13.17616 1620.969
ggg10 13.76584 1621.531
ggg11 11.97505 1622.292
ggg12 11.43884 1622.195
>      summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)

FEHMARNBELT BIRDS

(Intercept) 37.44 15.14 2.473 0.0149 *

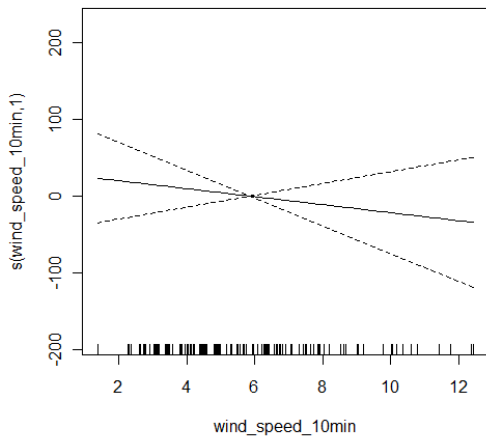
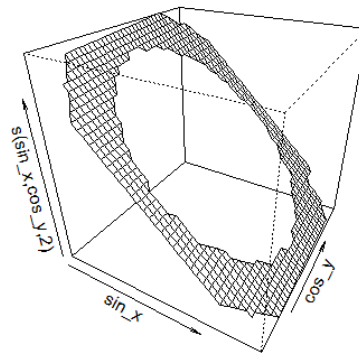
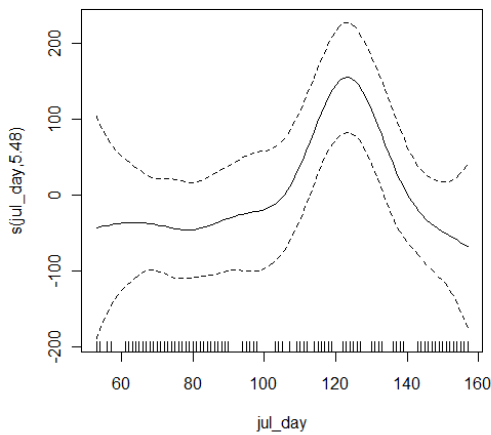
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	5.479	6.511	2.805	0.0117 *
s(sin_x,cos_y)	2.000	2.000	2.482	0.0881 .
s(wind_speed_10min)	1.000	1.000	0.647	0.4227

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.122 Deviance explained = 18.3%
 GCV score = 30533 Scale est. = 28180 n = 123



Spring FM

	df	AIC
ggg1	6.541349	891.1273
ggg2	7.718638	892.7156
ggg3	7.350499	890.8265
ggg4	7.474971	891.5874
ggg5	7.544110	892.8585
ggg6	12.986357	884.4467
ggg7	8.157481	892.6779
ggg8	9.228007	894.4382
ggg9	8.998523	893.0930
ggg10	9.608996	893.3802
ggg11	9.136757	894.6591

FEHMARNBELT BIRDS

```
ggg12 14.022970 886.8143
> summary(ggg6)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.931	1.261	2.325	0.0222 *

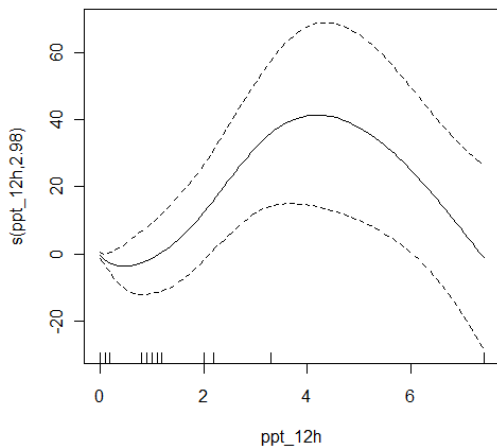
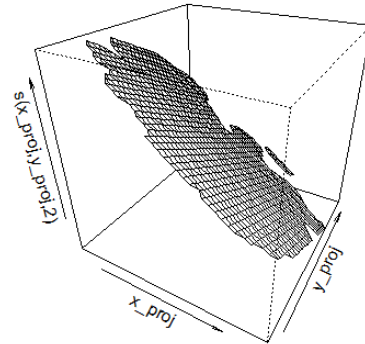
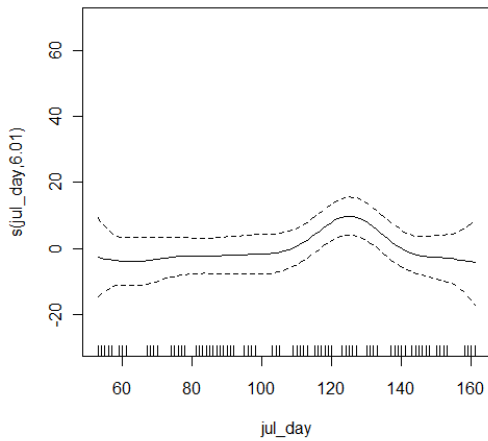
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	6.011	7.151	1.552	0.1574
s(x_proj,y_proj)	2.000	2.000	1.993	0.1418
s(ppt_12h)	2.975	3.351	3.571	0.0136 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.156 Deviance explained = 24.1%
GCV score = 194.62 Scale est. = 173.21 n = 109



Autumn FM
df AIC

FEHMARNBELT BIRDS

```

ggg1 27.76512 1480.671
ggg2 28.30377 1478.371
ggg3 29.35813 1480.131
ggg4 28.63717 1482.211
ggg5 33.07237 1476.882
ggg6 28.52718 1478.615
ggg7 29.74317 1461.188
ggg8 30.51272 1458.692
ggg9 30.35557 1461.082
ggg10 30.24294 1462.524
ggg11 35.61861 1456.170
ggg12 40.57807 1399.857
> summary(ggg12)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	45.68	11.56	3.95	0.000183 ***

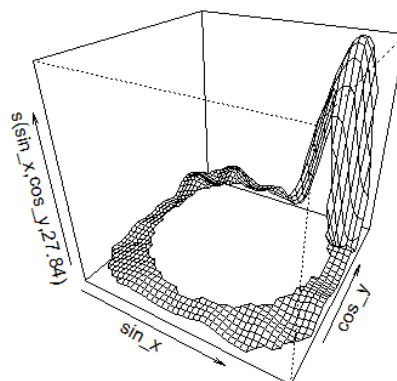
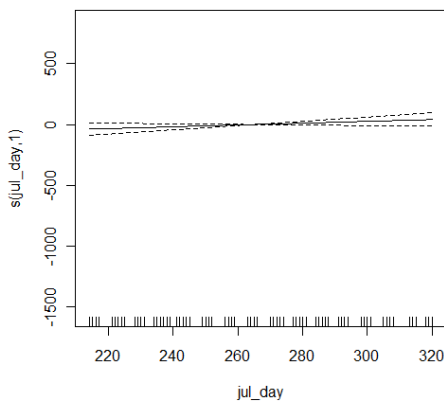
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

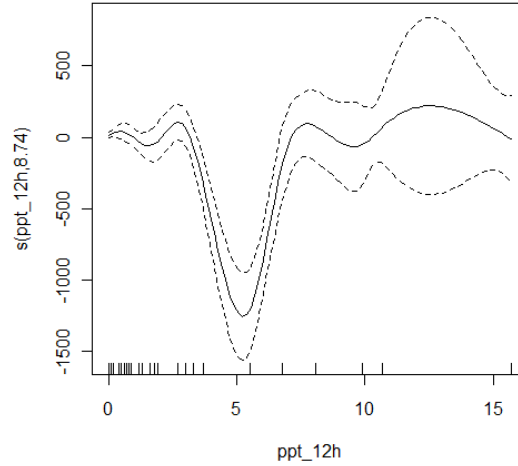
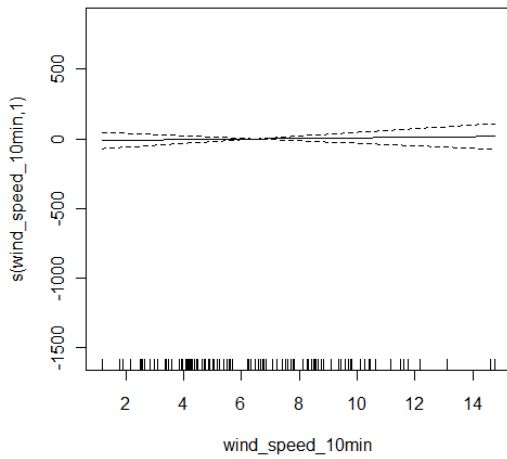
	edf	Ref.df	F	p-value
s(jul_day)	1.00	1.000	2.206	0.142
s(sin_x,cos_y)	27.84	28.895	10.846	3.05e-16 ***
s(wind_speed_10min)	1.00	1.000	0.149	0.701
s(ppt_12h)	8.74	8.974	7.895	6.02e-08 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.733 Deviance explained = 82.7%
GCV score = 22977 Scale est. = 14710 n = 110



FEHMARNBELT BIRDS



Autumn LL

```

df    AIC
ggg1 25.47618 1688.715
ggg2 25.38642 1677.051
ggg3 26.10736 1690.303
ggg4 26.31508 1690.139
ggg5 28.54381 1675.389
ggg6 26.20143 1689.235
ggg7 27.89011 1722.389
ggg8 29.89935 1702.666
ggg9 28.65031 1724.049
ggg10 29.23572 1722.100
ggg11 31.34143 1699.098
ggg12 28.97325 1722.811
> summary(ggg5)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(temper)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	35.982	7.057	5.099	1.38e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

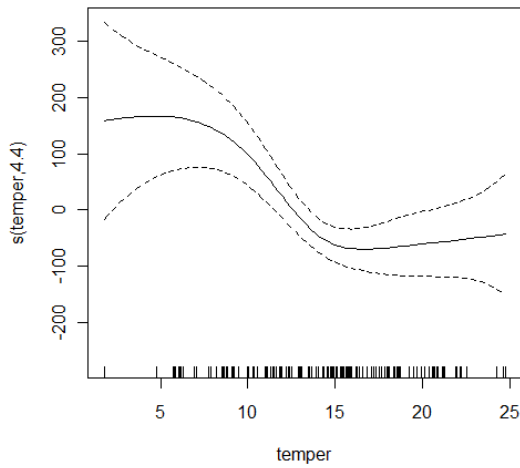
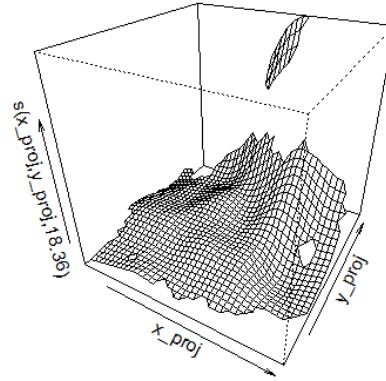
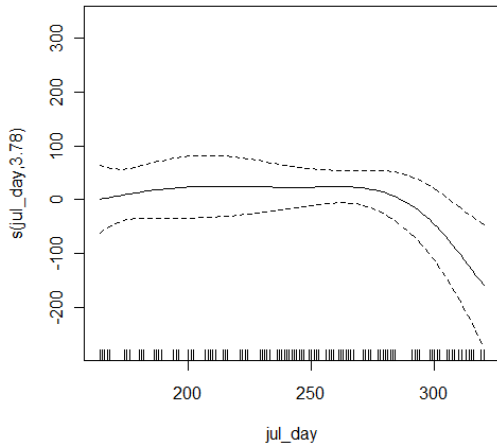
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.784	4.721	2.342	0.04920 *
s(x_proj,y_proj)	18.363	23.233	3.222	1.84e-05 ***
s(temper)	4.396	5.461	3.695	0.00296 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.51 Deviance explained = 60.3%
GCV score = 8726.5 Scale est. = 7021.8 n = 141

FEHMARNBELT BIRDS



Maybe during autumn Barnacle Goose also follow the green wave, but inversed, follow the temperature wave about 6-7 degrees? (See Green, Eichorn) In spring the reason for this is when grass starts to grow, but in autumn this is the temperature when grass stops to grow?? In spring this effect was not found on our data of visual diurnal observations. Maybe it will be visible if nocturnal data are included?

Narrow time window *Branta leucopsis*, both years
Spring LL

	df	AIC
ggg1	9.555230	1559.530
ggg2	9.987509	1560.720
ggg3	9.760152	1560.394
ggg4	12.791231	1560.088
ggg5	10.550791	1561.489
ggg6	10.084085	1560.723
ggg7	10.167268	1559.046
ggg8	11.084496	1560.783
ggg9	12.750899	1560.136
ggg10	11.252542	1560.418
ggg11	11.121747	1560.851
ggg12	11.106189	1560.791
ggg101	13.598976	1559.110
ggg102	15.856353	1557.904
ggg103	16.599952	1559.741

FEHMARNBELT BIRDS

```
ggg104 16.733634 1561.251
ggg105 17.658368 1563.083
ggg106 18.956727 1563.421
> summary(ggg102)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	39.02	15.33	2.545	0.0124 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

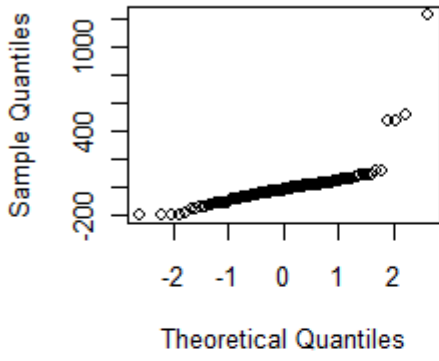
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	5.187	6.317	3.140	0.00632 **
s(sin_x,cos_y)	2.000	2.000	0.967	0.38351
s(wind_speed_10min)	1.000	1.000	1.254	0.26536
s(pearsontemp_2days)	1.000	1.000	0.990	0.32202
s(cloud_alt)	3.669	4.495	1.198	0.31602
s(cloud_cover)	1.000	1.000	4.071	0.04624 *

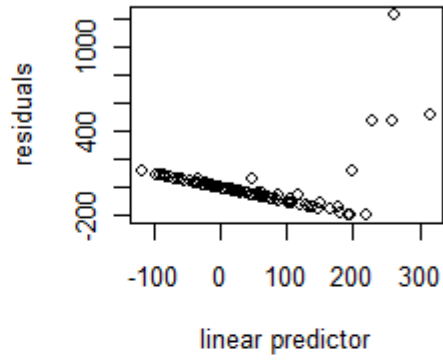
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.17 Deviance explained = 26.8%
GCV score = 31732 Scale est. = 27737 n = 118

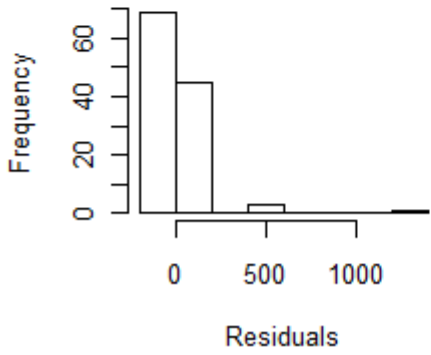
Normal Q-Q Plot



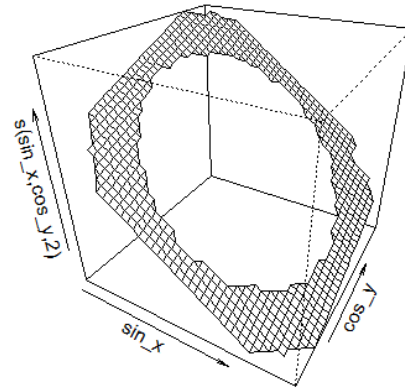
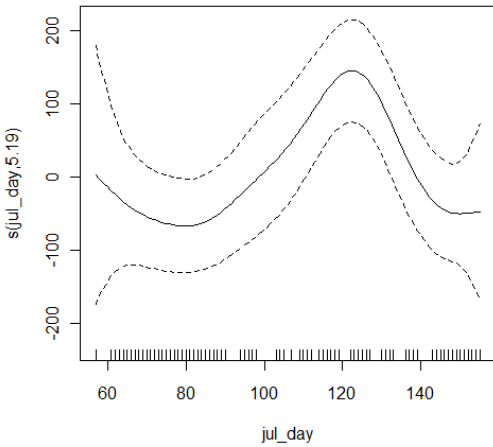
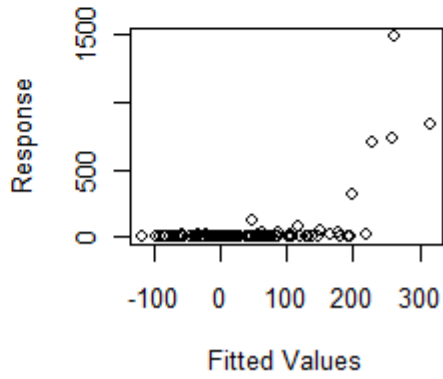
Resids vs. linear pred.



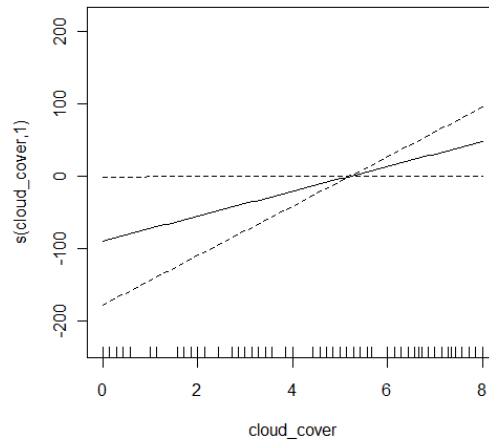
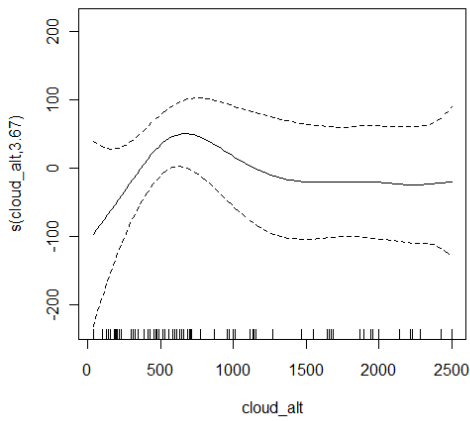
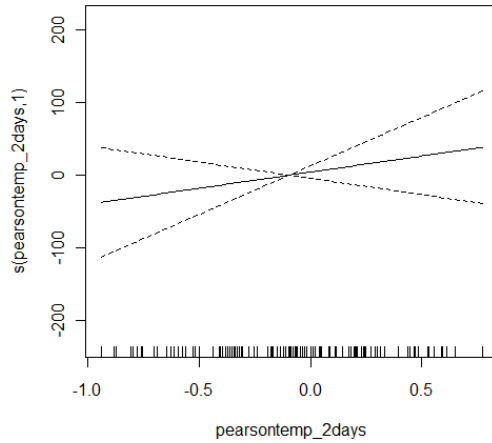
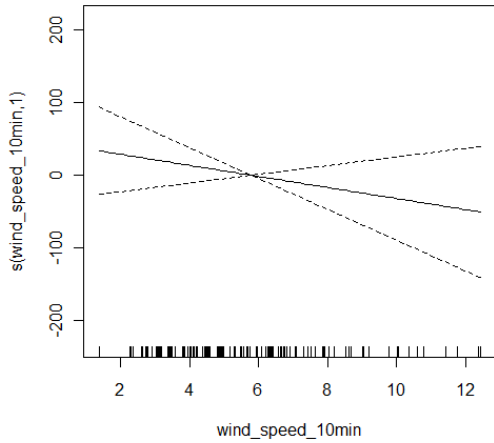
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



Spring FM

	df	AIC
ggg1	5.563597	825.5584
ggg2	6.604386	827.4105
ggg3	6.728648	825.6892
ggg4	7.791028	825.2835
ggg5	6.587915	827.4470
ggg6	11.413577	820.1451
ggg7	7.819865	827.8772
ggg8	8.749782	829.7961
ggg9	8.345612	828.6358
ggg10	8.921611	828.3916
ggg11	8.730208	829.8794
ggg12	11.552754	822.7340
ggg101	9.617036	829.7345
ggg102	11.239858	829.8155
ggg103	13.819736	825.3186
ggg104	14.540462	827.4171

```
> summary(ggg6)
```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(ppt_12h)

FEHMARNBELT BIRDS

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3.194	1.377	2.32	0.0226 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

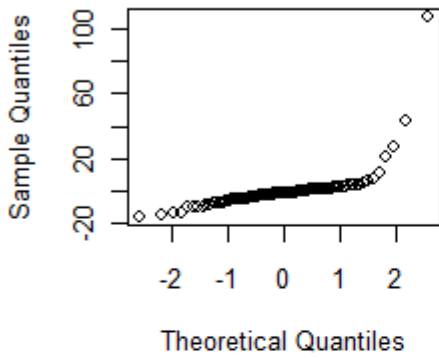
	edf	Ref.df	F	p-value
s(jul_day)	4.698	5.758	1.480	0.1965
s(x_proj,y_proj)	2.000	2.000	1.748	0.1799
s(ppt_12h)	2.716	2.929	2.569	0.0606 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

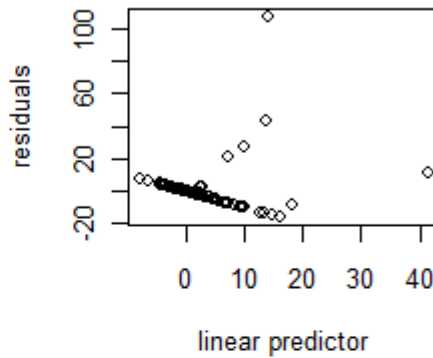
R-sq.(adj) = 0.149 Deviance explained = 23%

GCV score = 211.71 Scale est. = 189.67 n = 100

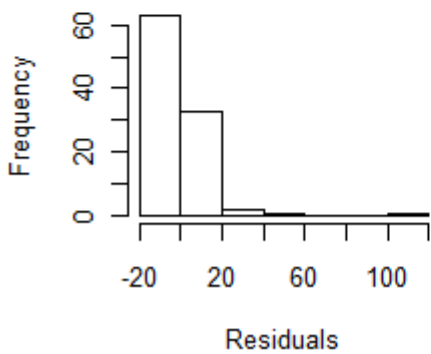
Normal Q-Q Plot



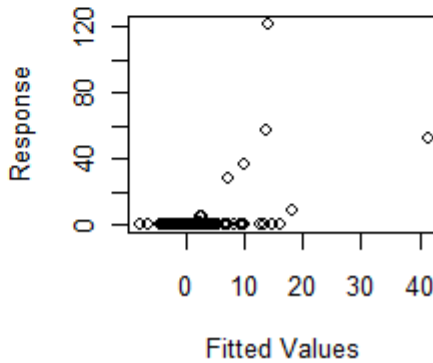
Resids vs. linear pred.

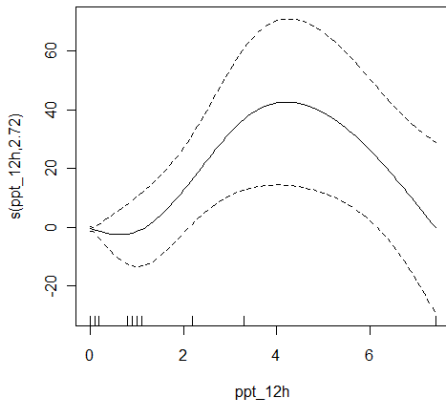
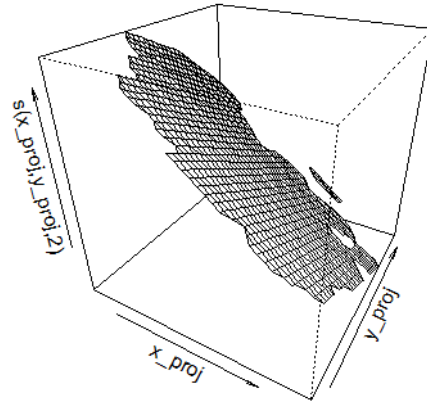
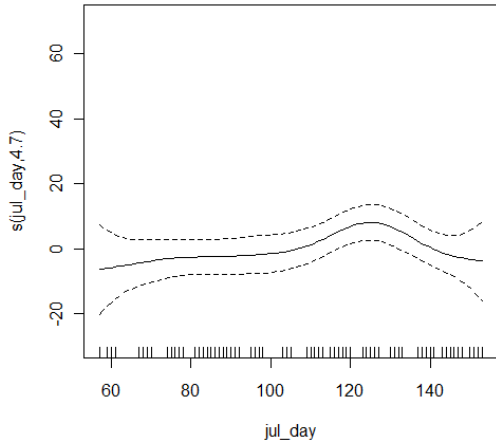


Histogram of residuals



Response vs. Fitted Values





Autumn LL

```

df    AIC
ggg1 22.02519 653.4912
ggg2 20.52884 649.5056
ggg3 22.45036 655.6765
ggg4 32.85095 626.4617
ggg5 22.40000 650.1199
ggg6 23.31881 654.0127
ggg7 35.07987 588.6310
> summary(ggg7)

```

Family: gaussian
 Link function: identity

Formula:
 INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 97.56 8.36 11.67 8.31e-10 ***

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
 edf Ref.df F p-value

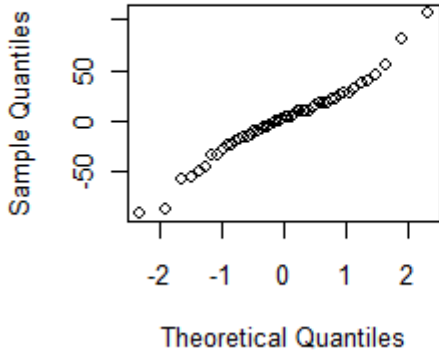
FEHMARNBELT BIRDS

s(jul_day) 6.52 7.323 3.245 0.0200 *
 s(sin_x,cos_y) 25.56 27.664 10.720 1.6e-06 ***
 s(wind_speed_10min) 1.00 1.000 0.012 0.9137

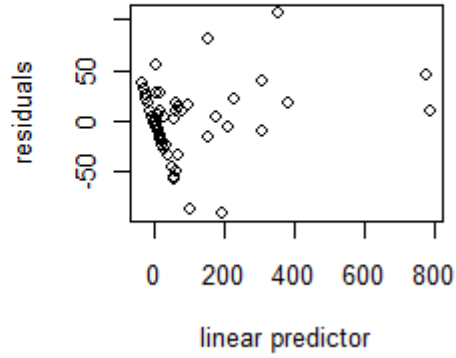
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.891 Deviance explained = 96.2%
 GCV score = 10545 Scale est. = 3633.8 n = 52

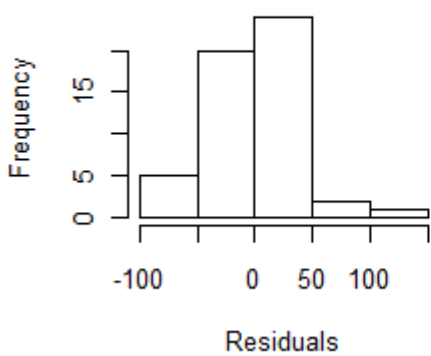
Normal Q-Q Plot



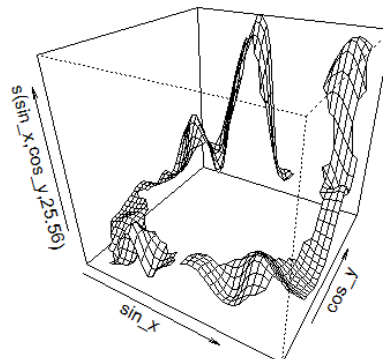
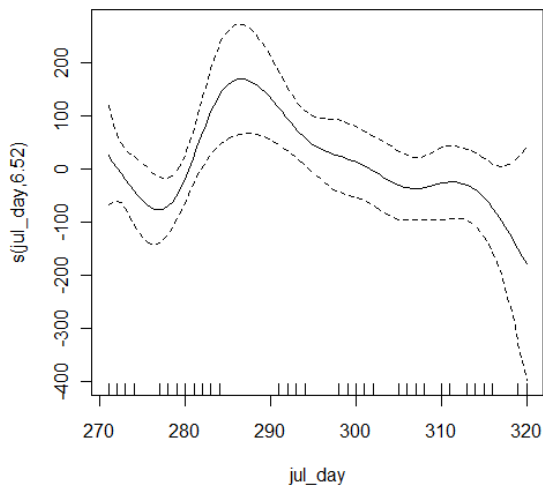
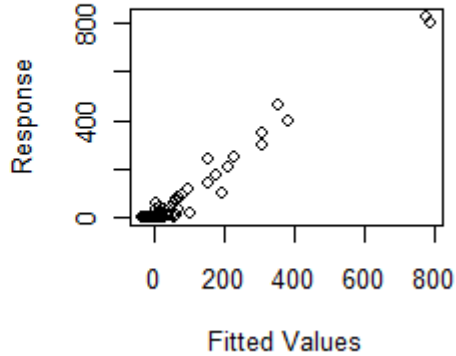
Resids vs. linear pred.



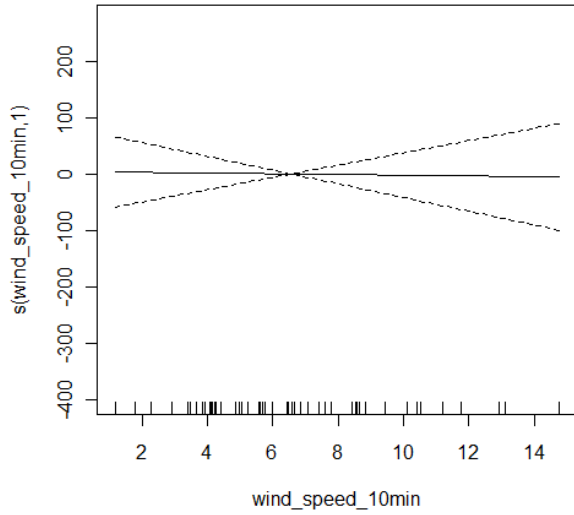
Histogram of residuals



Response vs. Fitted Values



FEHMARNBELT BIRDS



Autumn FM

```

df    AIC
ggg1 14.19069 726.7828
ggg2 17.10666 724.6393
ggg3 24.21592 714.4197
ggg4 21.55591 720.6731
ggg5 19.25407 723.2195
ggg6 41.88147 621.9042
ggg7 34.70477 536.3079
>      summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	98.528	5.659	17.41	2.11e-12 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

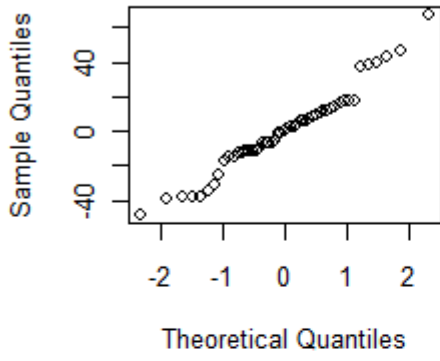
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	4.224	5.13	2.499	0.0698 .
s(sin_x,cos_y)	27.481	27.93	86.568	8.7e-14 ***
s(wind_speed_10min)	1.000	1.00	1.340	0.2627

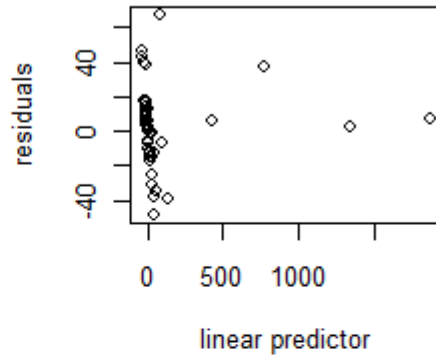
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.986 Deviance explained = 99.5%
GCV score = 4816.4 Scale est. = 1633.3 n = 51

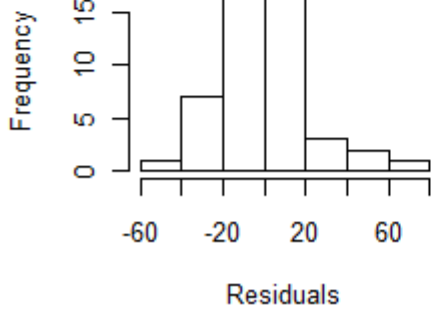
Normal Q-Q Plot



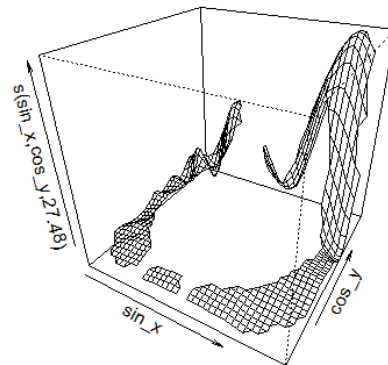
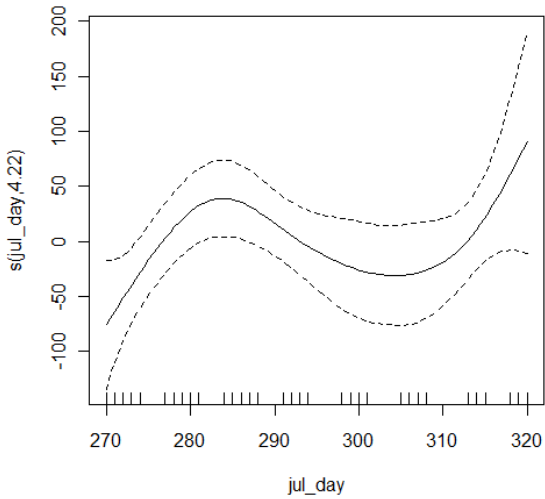
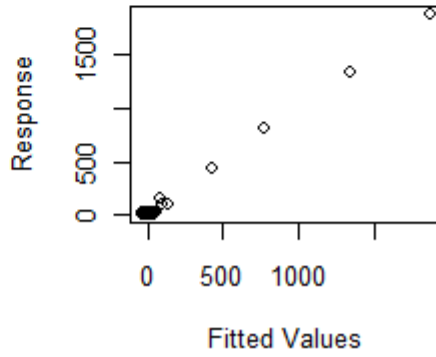
Resids vs. linear pred.

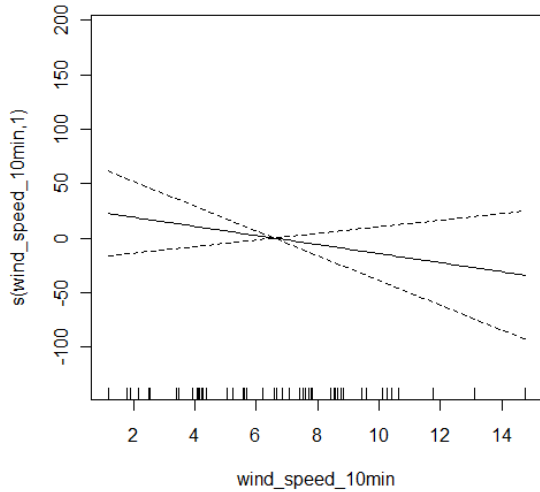


Histogram of residuals



Response vs. Fitted Values





Tree Pipit – *Anthus trivialis*

Precise weather parameters, same time period as in report before (whole season)
Spring FM

```

df    AIC
ggg1  8.476007 221.8653
ggg2  9.472724 223.6846
ggg3  9.230926 222.8723
ggg4 10.469381 223.0703
ggg5  9.360183 223.7357
ggg6  9.303595 222.7532
ggg7  8.417691 220.2584
ggg8  9.410527 222.1932
ggg9  9.339686 221.6134
ggg10 10.466672 220.8358
ggg11  9.409992 222.2111
ggg12  9.424940 221.4043
df    AIC
ggg101 11.41581 222.1208
ggg102 12.56130 223.5162
ggg103 13.36908 223.7712
ggg104 16.51633 224.0172
ggg105 17.16759 223.7918
>      summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.25908	0.06104	4.245	4.85e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

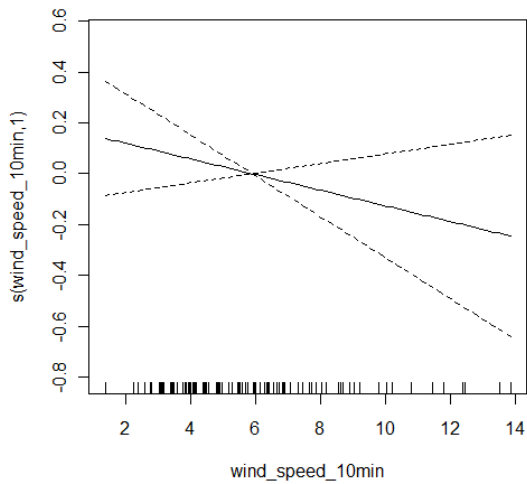
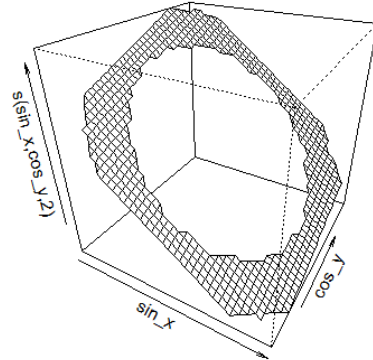
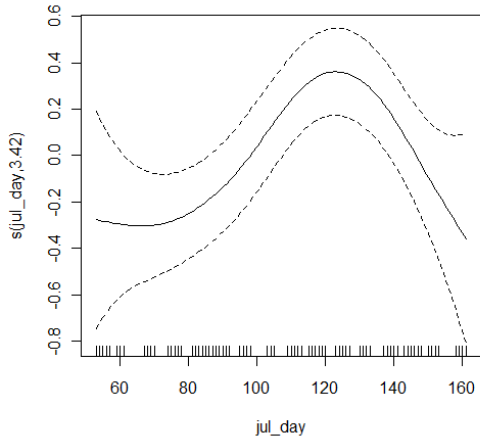
	edf	Ref.df	F	p-value
s(jul_day)	3.418	4.254	4.195	0.00287 **

FEHMARNBELT BIRDS

s(sin_x,cos_y) 2.000 2.000 3.253 0.04274 *
 s(wind_speed_10min) 1.000 1.000 1.532 0.21862

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.169 Deviance explained = 21.8%
 GCV score = 0.43576 Scale est. = 0.40611 n = 109



SpringLL
 for 2010spr observed only one day

	df	AIC
ggg1	7.303775	-393.5246
ggg2	8.240893	-394.2628
ggg3	9.186596	-398.2454
ggg4	8.364519	-393.4120
ggg5	9.193607	-405.5197
ggg6	8.104997	-391.9000
ggg7	31.101575	-411.3788
ggg8	32.071113	-412.4553
ggg9	31.510330	-410.4010
ggg10	33.063619	-413.9216
ggg11	31.415785	-419.0510
ggg12	32.274746	-411.0529
	df	AIC
ggg101	33.52410	-412.0269

FEHMARNBELT BIRDS

```

ggg102 34.18079 -409.8030
ggg103 35.43345 -408.7344
ggg104 31.80071 -413.7278
ggg105 32.20093 -411.5112
ggg106 33.87846 -414.4452
ggg107 33.24449 -411.5861
> summary(ggg11)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(temper)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.011463	0.003546	3.233	0.0017 **

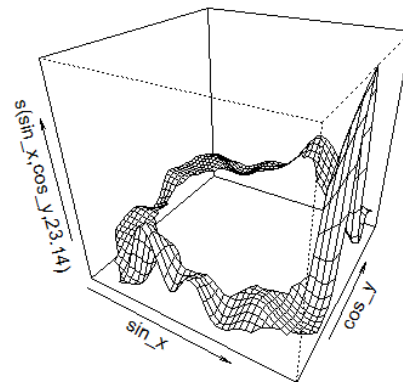
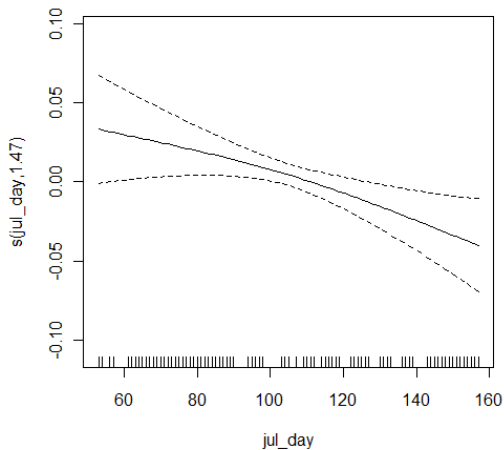
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

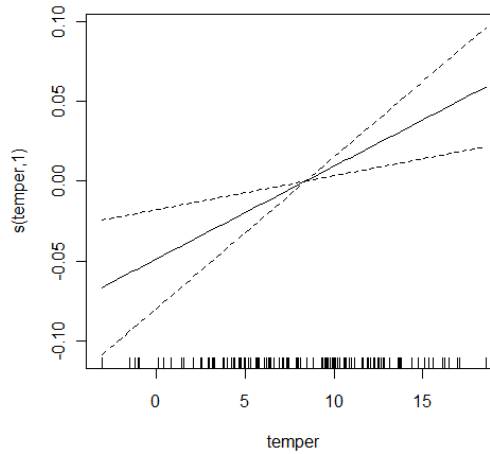
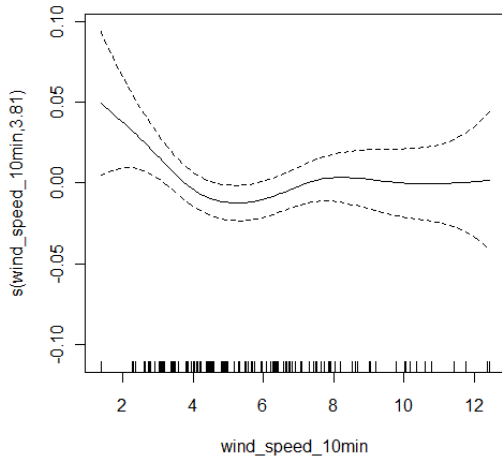
	edf	Ref.df	F	p-value
s(jul_day)	1.470	1.781	5.157	0.00976 **
s(sin_x,cos_y)	23.137	26.741	1.715	0.03087 *
s(wind_speed_10min)	3.809	4.722	2.087	0.07771 .
s(temper)	1.000	1.000	9.979	0.00214 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.349 Deviance explained = 50.6%
GCV score = 0.002055 Scale est. = 0.0015468 n = 123



FEHMARNBELT BIRDS



Autumn LL

2009 plus 2010 together, time period is the same as in 2009, whole season long.

```

df    AIC
ggg1 12.87136 1460.793
ggg2 19.91200 1449.658
ggg3 20.52210 1457.396
ggg4 13.82279 1462.770
ggg5 13.49490 1462.743
ggg6 13.51084 1462.484
ggg7 13.09699 1459.803
ggg8 20.98352 1449.507
ggg9 20.17960 1455.741
ggg10 14.04309 1461.773
ggg11 13.95380 1461.739
ggg12 13.83828 1461.512
df    AIC
ggg101 16.83565 1459.368
ggg102 17.73416 1461.259
ggg103 18.51393 1462.959
ggg104 18.56438 1463.648
ggg105 19.50648 1465.625
ggg106 27.07131 1457.432
ggg107 27.32350 1458.506
ggg108 34.88758 1443.156
> summary(ggg108)

```

Family: gaussian
Link function: identity

Formula:

```

INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
  s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h) +
  s(temper) + s(ppt_last4times_sum) + s(air_press_h_corrected) +
  s(pearsontemp_1day) + s(visibility)

```

Parametric coefficients:

```

Estimate Std. Error t value Pr(>|t|)
(Intercept) 13.362    3.047  4.385 2.72e-05 ***
---

```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

```

edf Ref.df    F p-value

```

FEHMARNBELT BIRDS

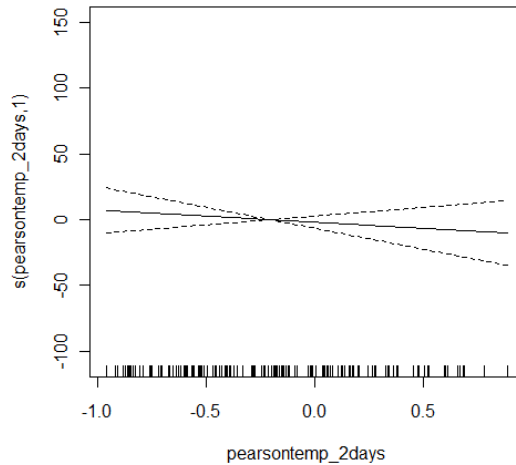
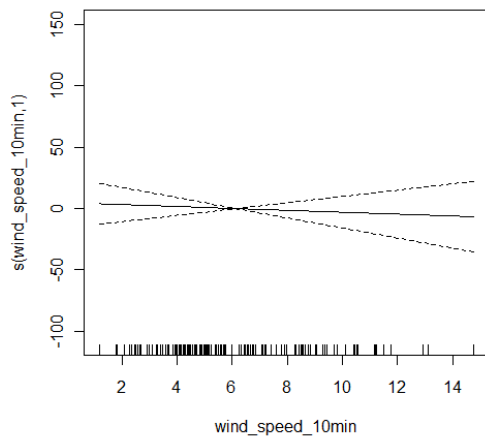
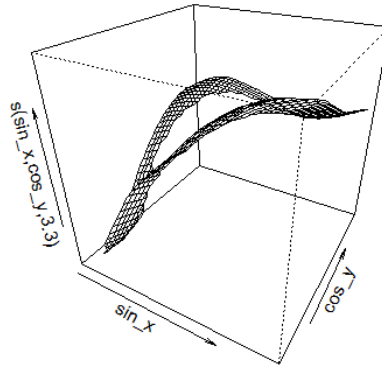
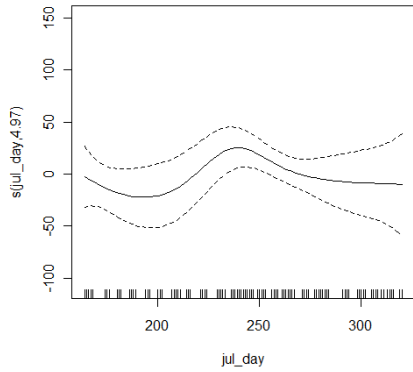
```

s(jul_day)          4.966 6.060  3.097 0.007584 **
s(sin_x,cos_y)      3.304 4.251  0.683 0.614205
s(wind_speed_10min) 1.000 1.000  0.215 0.643912
s(pearsontemp_2days) 1.000 1.000  0.681 0.411195
s(cloud_alt)        1.000 1.000  0.000299 0.986246
s(cloud_cover)      3.161 3.935  1.458 0.220793
s(ppt_12h)          1.000 1.000  0.323 0.571190
s(temper)           1.000 1.000  1.004 0.318673
s(ppt_last4times_sum) 1.652 2.022  1.374 0.257501
s(air_press_h_corrected) 5.625 6.742  2.393 0.027485 *
s(pearsontemp_1day) 1.000 1.000  1.476 0.227000
s(visibility)       8.181 8.789  3.800 0.000383 ***

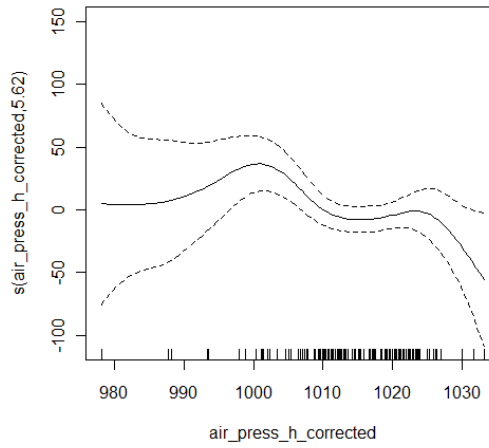
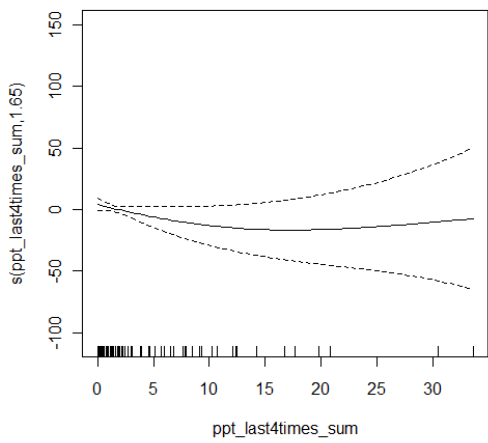
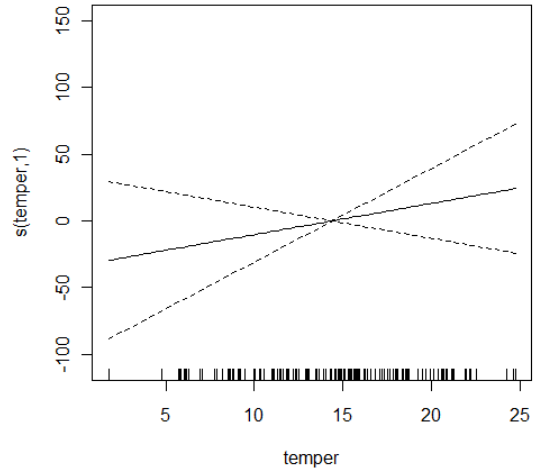
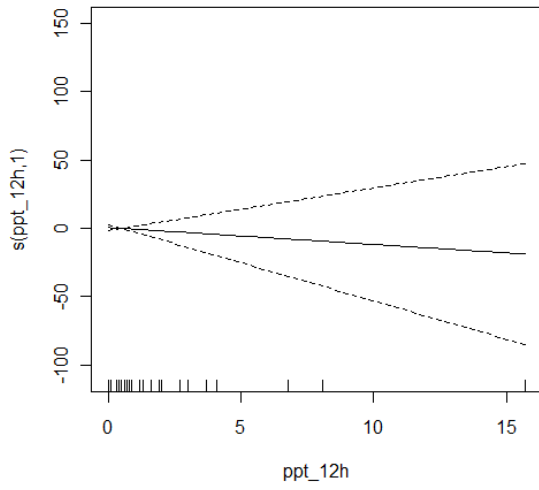
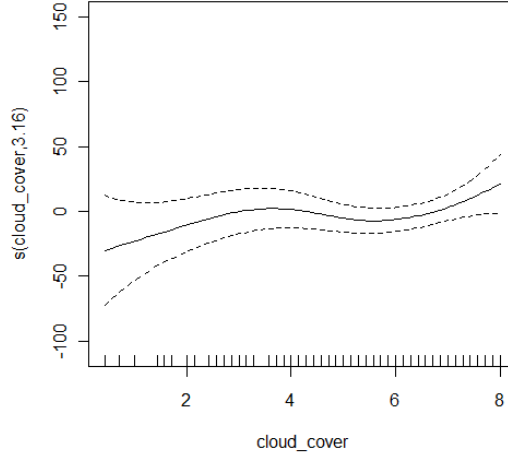
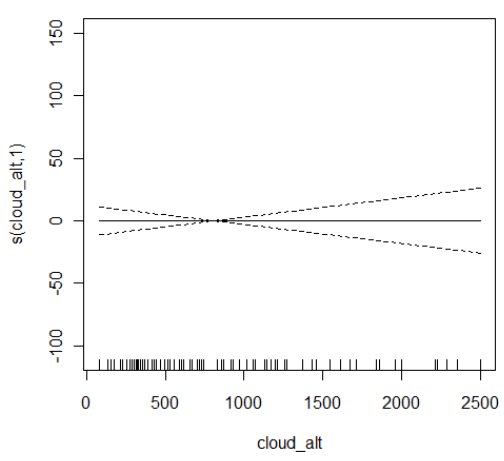
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

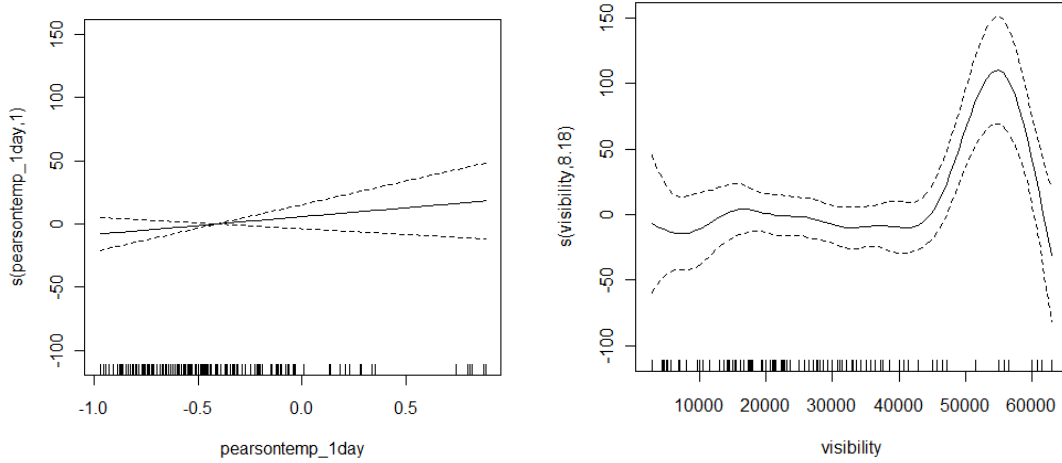
R-sq.(adj) = 0.396 Deviance explained = 53.8%
GCV score = 1723.6 Scale est. = 1309.4 n = 141



FEHMARNBELT BIRDS



FEHMARNBELT BIRDS



summary(ggg2)

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(visibility)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	13.362	3.248	4.114	7.1e-05 ***

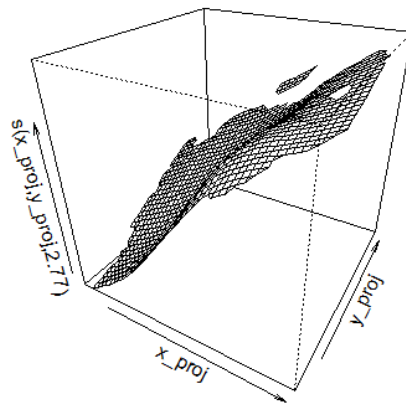
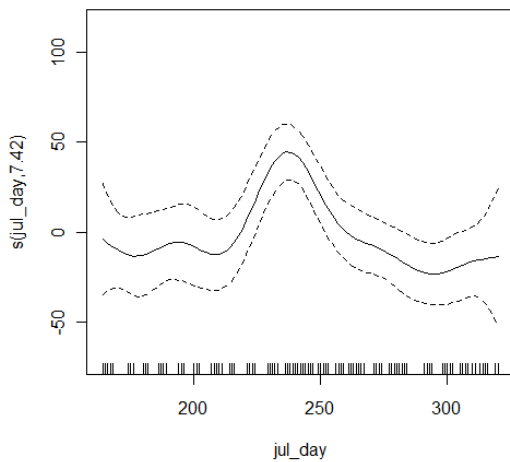
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

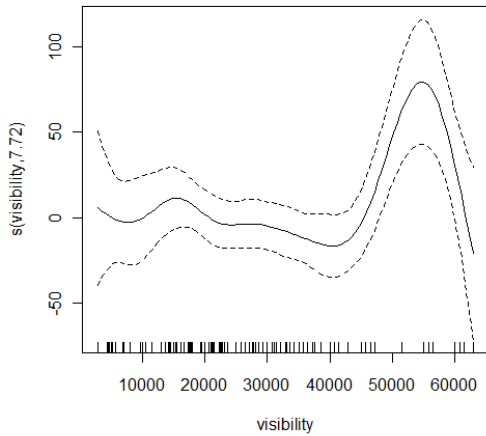
	edf	Ref.df	F	p-value
s(jul_day)	7.421	8.345	4.365	9.23e-05 ***
s(x_proj,y_proj)	2.771	3.445	0.481	0.72184
s(visibility)	7.720	8.577	2.656	0.00854 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.314 Deviance explained = 40.2%
GCV score = 1718.1 Scale est. = 1487.7 n = 141



FEHMARNBELT BIRDS



Autumn FM

```

      df   AIC
ggg1  7.060963 320.8210
ggg2  8.114067 321.1639
ggg3  8.054344 322.6720
ggg4  8.048333 322.8125
ggg5  7.964670 322.5591
ggg6  8.063233 322.2210
ggg7 34.013327 300.1292
ggg8 35.062001 301.3353
ggg9 34.895631 302.1208
ggg10 35.164443 299.2587
ggg11 35.019717 301.8448
ggg12 35.030871 302.1276
      df   AIC
ggg101 36.05713 301.1803
ggg102 40.88874 292.2619
ggg103 40.94259 294.9435
ggg104 42.34279 296.1030
ggg105 42.86530 298.4917
> summary(ggg102)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 0.23418 0.07523 3.113 0.00268 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

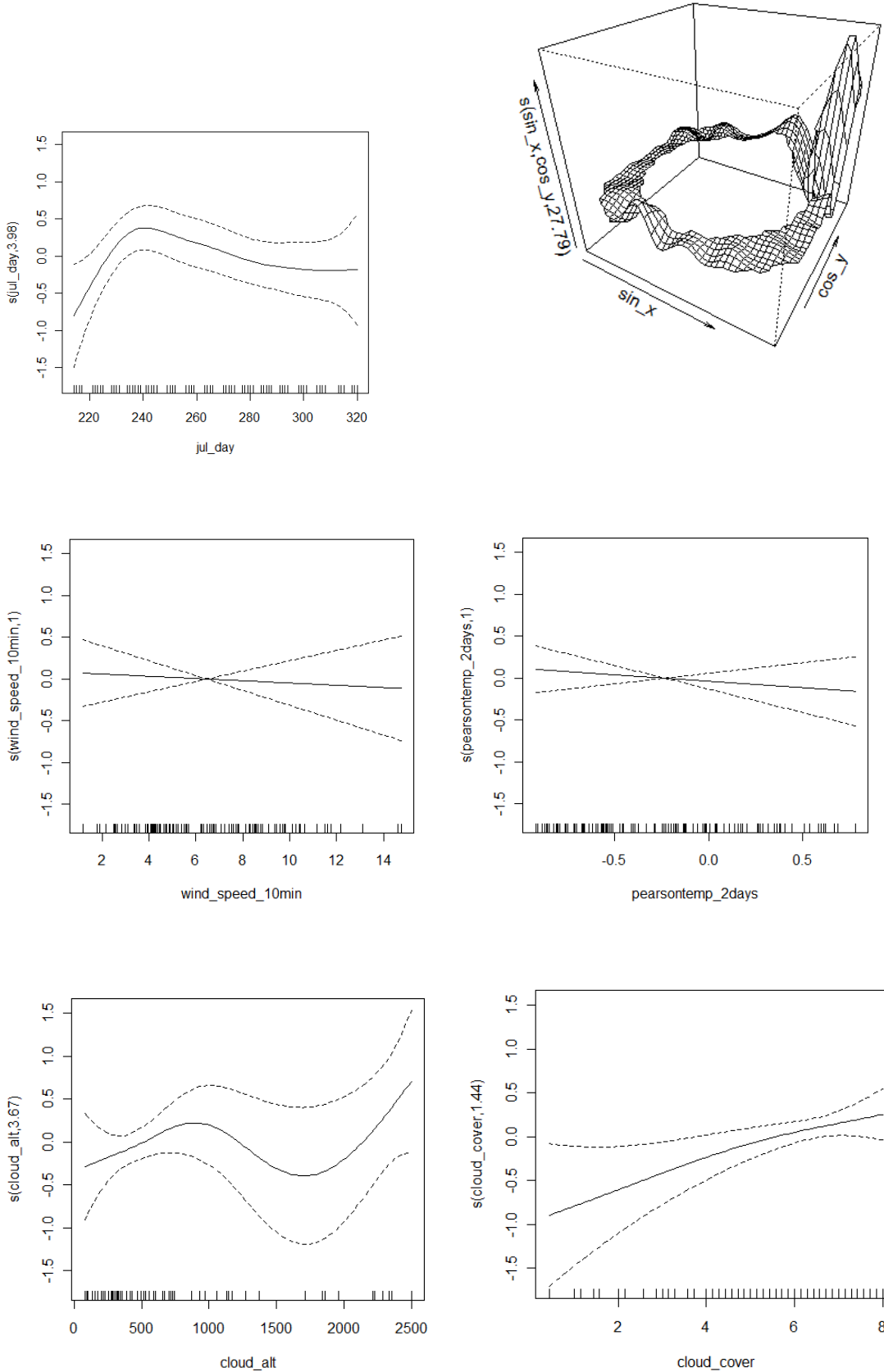
Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	3.983	4.875	2.048	0.084059 .
s(sin_x,cos_y)	27.790	28.853	2.709	0.000362 ***
s(wind_speed_10min)	1.000	1.000	0.127	0.722224
s(pearsontemp_2days)	1.000	1.000	0.573	0.451583
s(cloud_alt)	3.671	4.526	1.195	0.320685
s(cloud_cover)	1.445	1.735	3.930	0.029390 *

FEHMARNBELT BIRDS

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.414 Deviance explained = 62.3%
 GCV score = 0.97669 Scale est. = 0.62252 n = 110



FEHMARNBELT BIRDS

```
> summary(ggg10)
```

Family: gaussian
Link function: identity

Formula:

```
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
  s(pearsontemp_2days)
```

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.23418	0.07866	2.977	0.0039 **

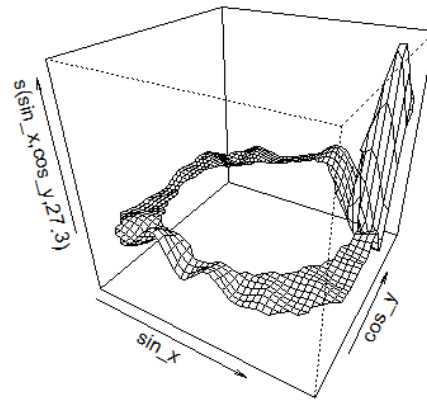
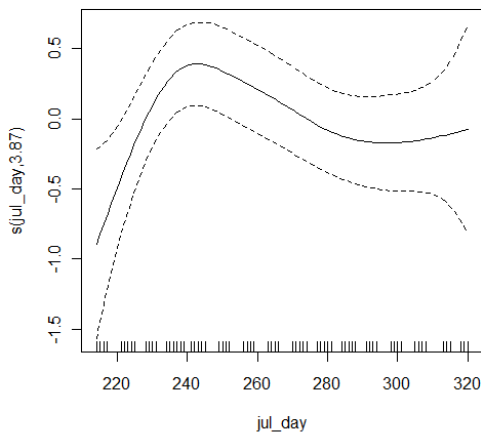
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

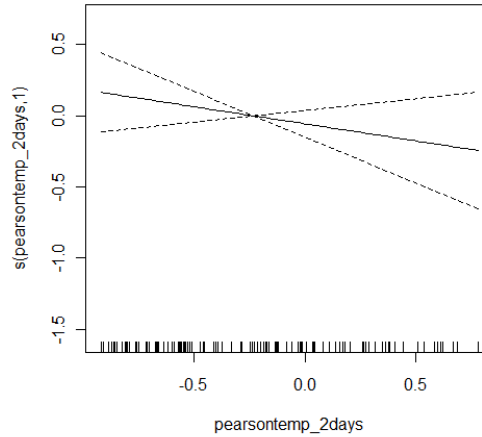
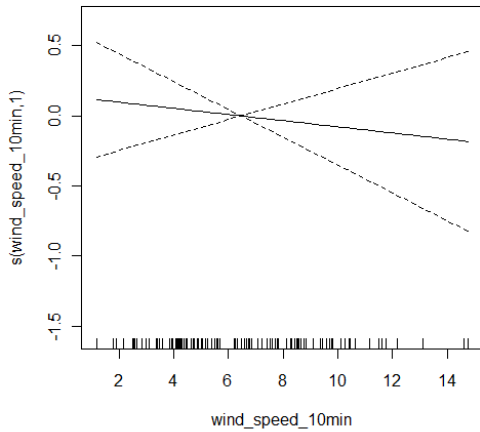
	edf	Ref.df	F	p-value
s(jul_day)	3.867	4.739	2.394	0.04817 *
s(sin_x,cos_y)	27.297	28.772	2.289	0.00221 **
s(wind_speed_10min)	1.000	1.000	0.324	0.57066
s(pearsontemp_2days)	1.000	1.000	1.413	0.23833

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.36 Deviance explained = 55.5%
GCV score = 0.98721 Scale est. = 0.6806 n = 110



FEHMARNBELT BIRDS



Precise weather parameters, narrow time window
Spring FM

```

df    AIC
ggg1  5.849863 142.1443
ggg2  6.907121 143.9660
ggg3  6.660129 143.7429
ggg4  7.989339 141.5040
ggg5  6.950374 143.9275
ggg7  6.356736 140.5111
>      summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.5648	0.1300	4.345	7.93e-05 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value
s(jul_day)	1.357	1.631	0.230	0.7501
s(sin_x,cos_y)	2.000	2.000	3.042	0.0578 .
s(wind_speed_10min)	1.000	1.000	1.864	0.1790

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.0622 Deviance explained = 14.6%
GCV score = 0.94621 Scale est. = 0.84484 n = 50

```

SpringLL
df    AIC
ggg1  5.00000 -111.3539
ggg2  6.00000 -111.5486
ggg3  8.00498 -113.7053
ggg4  6.00000 -111.9458
ggg5  6.00000 -119.8609
ggg7 35.08766 -197.8697
>      summary(ggg1)

```

FEHMARNBELT BIRDS

Family: gaussian
 Link function: identity

Formula:
 INTENSITY ~ s(jul_day) + s(x_proj, y_proj)

Parametric coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.02878 0.01046 2.752 0.0085 **

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
 edf Ref.df F p-value
 s(jul_day) 1 1 2.607 0.113
 s(x_proj,y_proj) 2 2 0.806 0.453

R-sq.(adj) = 0.0316 Deviance explained = 9.21%
 GCV score = 0.0058333 Scale est. = 0.0053571 n = 49

Autumn LL
 df AIC
 ggg1 9.584086 736.8423
 ggg2 14.483118 733.2894
 ggg3 13.475456 731.1608
 ggg4 10.627544 737.8486
 ggg5 10.618151 738.2087
 ggg7 8.502660 735.1349
 ggg8 14.540846 731.0190
 ggg9 10.278078 730.4902
 ggg10 9.935514 735.5493
 ggg11 10.071149 735.4266
 > summary(ggg9)

Family: gaussian
 Link function: identity

Formula:
 INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
 s(cloud_alt)

Parametric coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 28.120 6.368 4.416 4.47e-05 ***

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
 edf Ref.df F p-value
 s(jul_day) 1.000 1.000 14.754 0.000307 ***
 s(sin_x,cos_y) 4.984 6.657 2.340 0.038056 *
 s(wind_speed_10min) 1.000 1.000 1.644 0.204870
 s(cloud_alt) 1.294 1.524 4.310 0.026888 *

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.35 Deviance explained = 43.2%
 GCV score = 3153.5 Scale est. = 2716.8 n = 67

Autumn FM
 df AIC

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```

ggg1  5.00000 230.82699
ggg2  6.00000 230.52783
ggg3  6.00000 232.60991
ggg4  6.00000 232.71818
ggg5  6.00000 232.72905
ggg6  6.00000 231.98637
ggg7  33.51929 146.59167
ggg8  33.53755 146.44449
ggg9  42.61744  88.00088
ggg10 34.48642 148.48597
ggg11 33.82782 142.40092
ggg12 34.60853 147.62455
>      summary(ggg9)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(cloud_alt)

Parametric coefficients:

```

      Estimate Std. Error t value Pr(>|t|)
(Intercept) 0.37882    0.04808   7.88 2.12e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

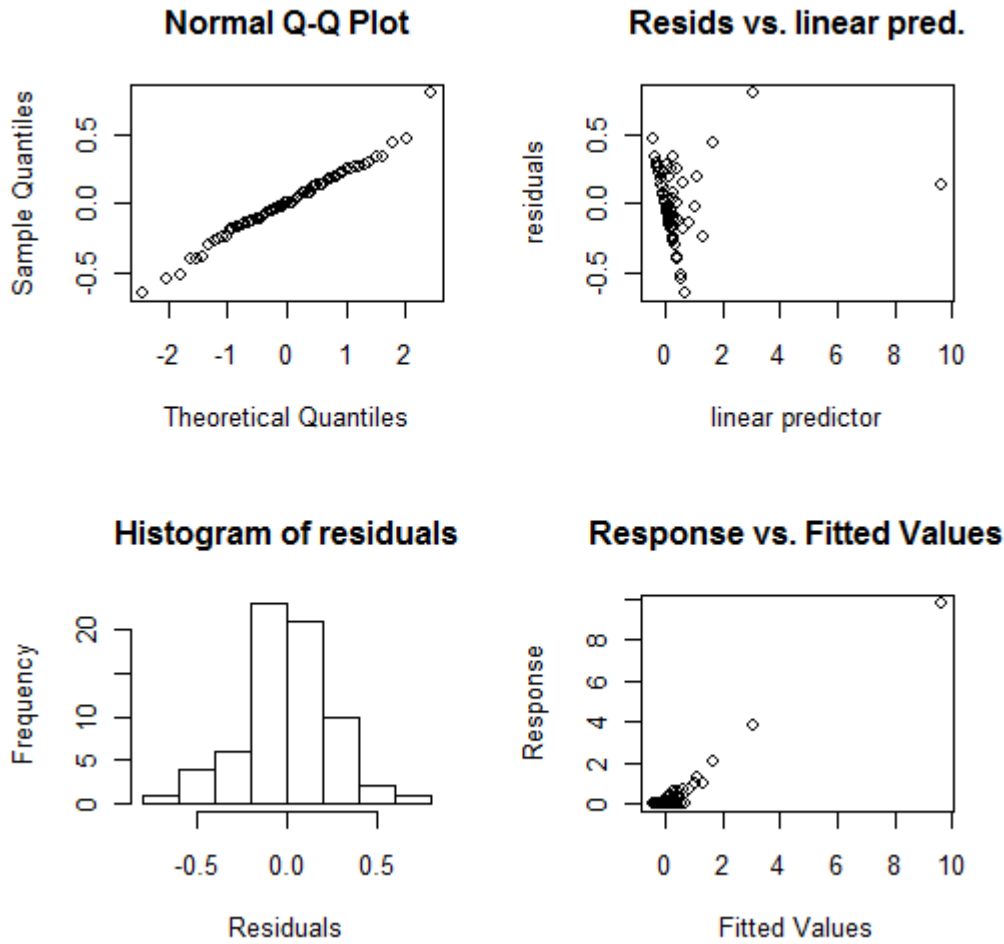
Approximate significance of smooth terms:

```

      edf Ref.df    F p-value
s(jul_day)      4.710  5.704  4.175 0.004900 **
s(sin_x,cos_y)  28.915 28.993 19.481 1.43e-11 ***
s(wind_speed_10min) 1.000  1.000  0.293 0.592660
s(cloud_alt)     5.992  7.059  5.859 0.000347 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

R-sq.(adj) = 0.906 Deviance explained = 96.3%
GCV score = 0.40511 Scale est. = 0.15717 n = 68



Grouped wind directions and wind speed, narrow time window
 System says it is too few degrees of freedom for all combinations of grouped wind parameters.

Tree pipit, long list of parameters

Spring LL

```

df      AIC
ggg101 33.52410 -412.0269
ggg102 34.18079 -409.8030
ggg103 35.43345 -408.7344
ggg104 31.80071 -413.7278
> summary(ggg103)
    
```

Family: gaussian
 Link function: identity

Formula:
 INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
 s(pearsontemp_2days) + s(cloud_alt) + s(cloud_cover) + s(ppt_12h)

Parametric coefficients:
 Estimate Std. Error t value Pr(>|t|)
 (Intercept) 0.01146 0.00366 3.132 0.00235 **

 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:
 edf Ref.df F p-value

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```
s(jul_day)      1.643 2.024 0.764 0.470
s(sin_x,cos_y) 23.550 26.984 1.590 0.055 .
s(wind_speed_10min) 3.701 4.585 1.908 0.107
s(pearsontemp_2days) 1.539 1.890 0.973 0.378
s(cloud_alt)    1.000 1.000 0.367 0.546
s(cloud_cover) 1.000 1.000 0.087 0.769
s(ppt_12h)     1.000 1.000 0.195 0.660
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.307 Deviance explained = 49.7%

GCV score = 0.0022877 Scale est. = 0.0016473 n = 123

Long list of parameters does not work with narrow time window for tree pipit spring LL

Greenfinch – *Carduelis chloris*

Wide time window, both years, precise wind parameters

Spring FM

```
df    AIC
ggg1  9.133031 704.5792
ggg2 12.687593 700.2820
ggg3 11.021990 701.6416
ggg4  9.718468 705.9422
ggg5 11.733153 695.5164
ggg6 10.117698 706.5588
ggg7 15.514989 704.4650
ggg8 20.036448 695.1513
ggg9 17.779555 699.9007
ggg10 19.185995 700.3752
ggg11 16.226137 698.2065
ggg12 17.618752 704.0456
> summary(ggg8)
```

Family: gaussian

Link function: identity

Formula:

INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) + s(visibility)

Parametric coefficients:

```
Estimate Std. Error t value Pr(>|t|)
(Intercept) 2.2735 0.5149 4.415 2.8e-05 ***
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

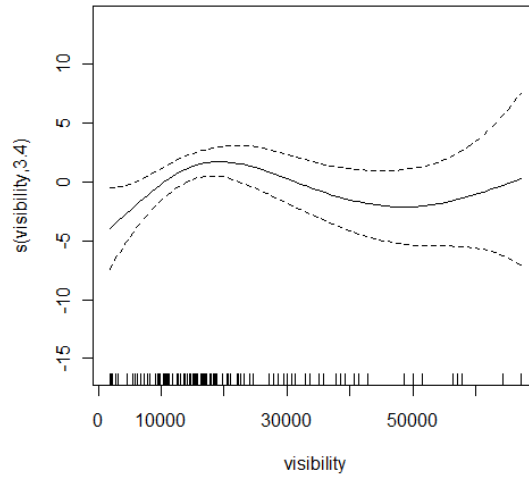
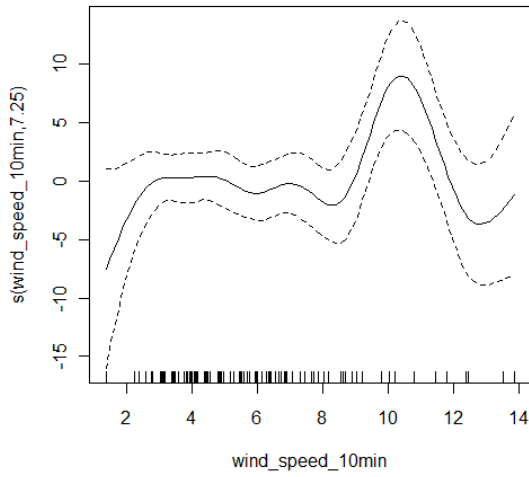
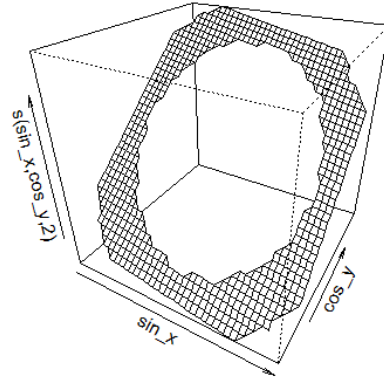
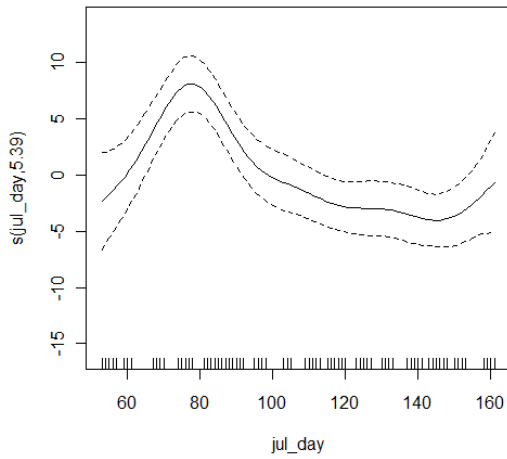
```
edf Ref.df  F p-value
s(jul_day) 5.392 6.396 7.495 9.32e-07 ***
s(sin_x,cos_y) 2.000 2.000 3.364 0.0390 *
s(wind_speed_10min) 7.246 7.799 2.271 0.0304 *
s(visibility) 3.398 4.227 2.378 0.0544 .
```

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.396 Deviance explained = 49.7%

GCV score = 35.019 Scale est. = 28.903 n = 109

FEHMARNBELT BIRDS



Spring LL

	df	AIC
ggg1	8.210856	278.6810
ggg2	9.362439	280.4440
ggg3	9.781261	272.9554
ggg4	9.303315	279.6552
ggg5	9.401292	274.3429
ggg6	9.273014	280.0849
ggg7	9.282198	280.7481
ggg8	11.100198	281.7378
ggg9	10.466231	273.3457
ggg10	10.177743	280.9789
ggg11	10.086207	275.8131
ggg12	9.950051	282.1410

> summary(ggg3)

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(x_proj, y_proj) + s(cloud_alt)

Parametric coefficients:
Estimate Std. Error t value Pr(>|t|)

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(Intercept) 0.20780 0.06342 3.277 0.00139 **

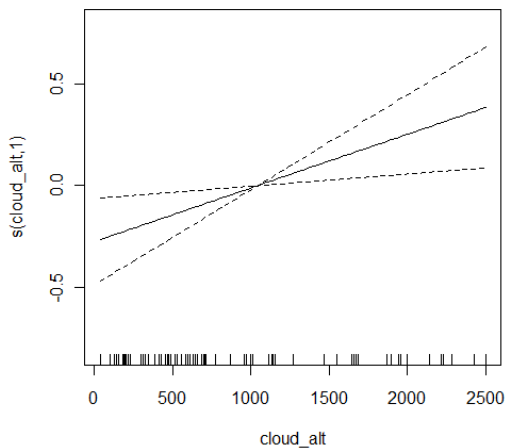
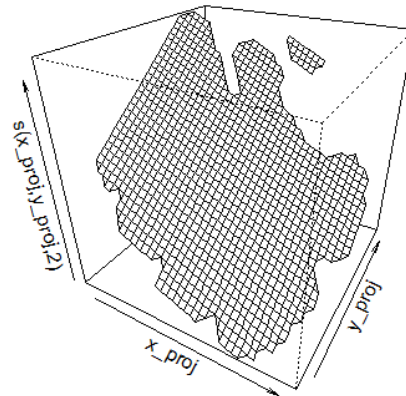
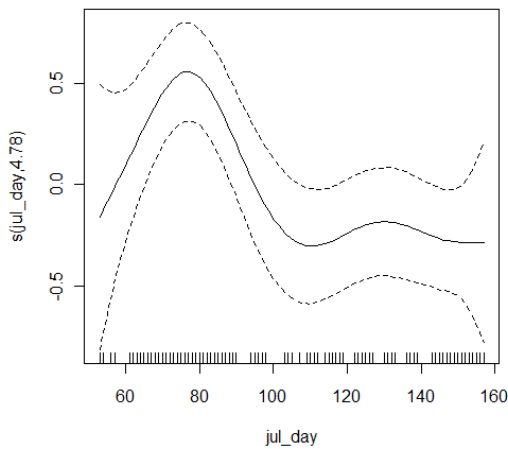
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

	edf	Ref.df	F	p-value	
s(jul_day)	4.781	5.862	3.939	0.00141	**
s(x_proj,y_proj)	2.000	2.000	2.596	0.07900	.
s(cloud_alt)	1.000	1.000	6.725	0.01075	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.157 Deviance explained = 21.1%
 GCV score = 0.53279 Scale est. = 0.49475 n = 123



Autumn FM

	df	AIC
ggg1	6.221431	437.0515
ggg2	7.433208	437.2686
ggg3	7.148983	438.9897
ggg4	7.132198	438.5702
ggg5	7.329925	438.9681
ggg6	6.832981	438.7875
ggg7	6.960383	432.8331
ggg8	7.864611	433.5483

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```

ggg9 7.913802 434.7759
ggg10 7.949038 434.6563
ggg11 7.947061 434.7866
ggg12 7.880072 434.7860
> summary(ggg7)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.3743	0.1593	2.35	0.0207 *

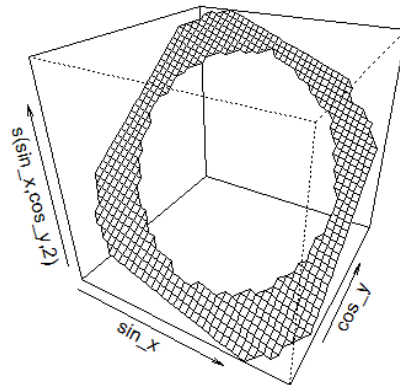
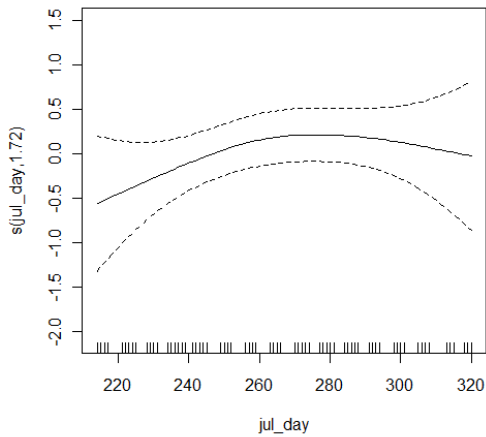
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Approximate significance of smooth terms:

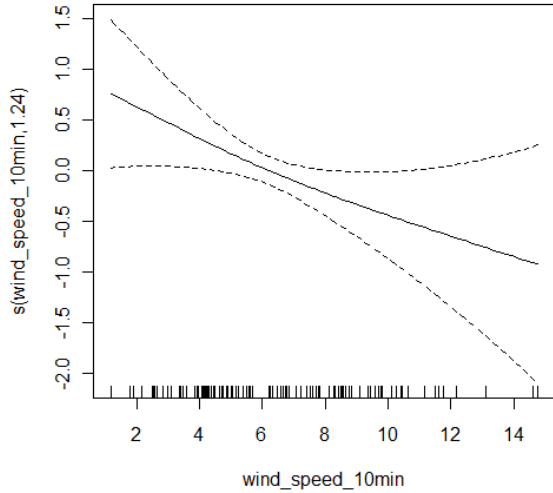
	edf	Ref.df	F	p-value
s(jul_day)	1.722	2.151	1.224	0.2999
s(sin_x,cos_y)	2.000	2.000	1.698	0.1882
s(wind_speed_10min)	1.238	1.441	2.701	0.0886 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

R-sq.(adj) = 0.0424 Deviance explained = 8.6%
GCV score = 2.9501 Scale est. = 2.7902 n = 110



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Autumn LL

```

df    AIC
ggg1 23.63335 1154.915
ggg2 23.80092 1155.685
ggg3 26.20235 1153.536
ggg4 24.55248 1155.328
ggg5 17.65150 1150.426
ggg6 28.33130 1141.699
ggg7 15.26396 1154.948
ggg8 15.74773 1155.534
ggg9 17.31293 1154.932
ggg10 16.34865 1155.375
ggg11 18.35316 1147.469
ggg12 22.41597 1141.394
> summary(ggg12)

```

Family: gaussian
Link function: identity

Formula:
INTENSITY ~ s(jul_day) + s(sin_x, cos_y) + s(wind_speed_10min) +
s(ppt_12h)

Parametric coefficients:

```

Estimate Std. Error t value Pr(>|t|)
(Intercept) 8.162 1.081 7.552 9.4e-12 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

Approximate significance of smooth terms:

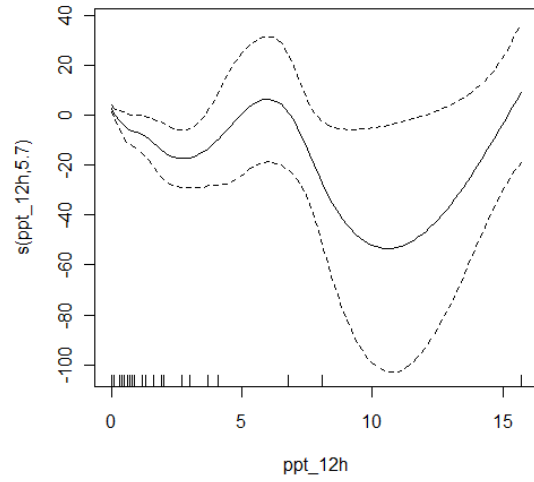
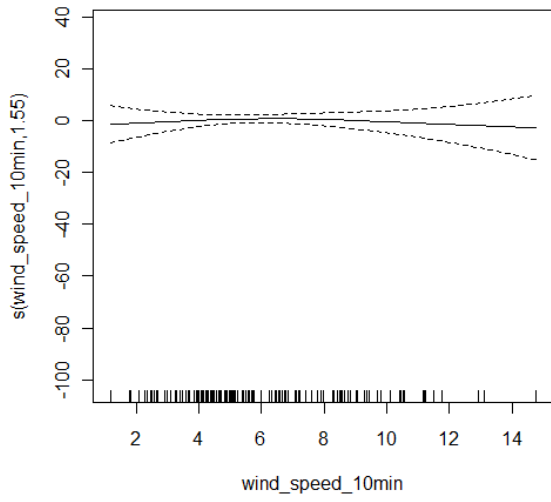
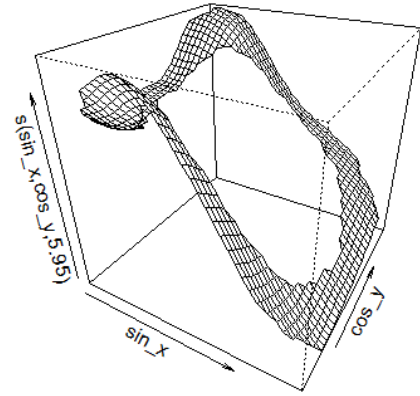
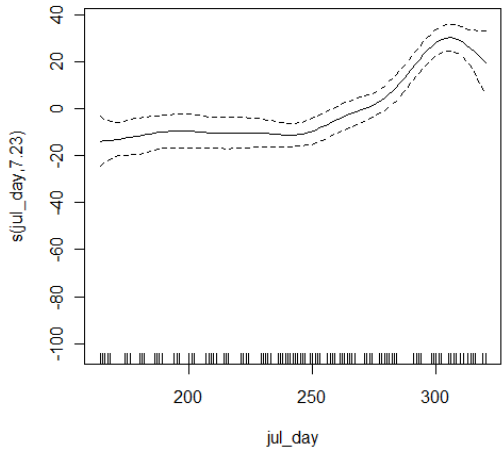
```

edf Ref.df F p-value
s(jul_day) 7.228 8.193 17.739 < 2e-16 ***
s(sin_x,cos_y) 5.947 7.952 2.711 0.00900 **
s(wind_speed_10min) 1.546 1.919 0.337 0.70572
s(ppt_12h) 5.695 6.602 3.170 0.00489 **
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

R-sq.(adj) = 0.536 Deviance explained = 60.4%
GCV score = 194.15 Scale est. = 164.66 n = 141

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B. APPENDIX – TECHNICAL REPORTS ON BIRD MIGRATION

- B.1** *Appendix B.1: Stark, H. and Liechti, F. 2009. Technical report: Bird migration monitored by the tracking radar 'Superfledermaus' in spring 2009.*
- B.2** *Appendix B.2: Stark, H., Liechti, F., Aschwanden, J. 2010. Technical report: Nocturnal movements of birds monitored by tracking radar and thermal imaging during July 2009. Unpublished report to DHI, DK.*
- B.3** *Appendix B.3: Stark, H., Liechti, F., Aschwanden, J. 2010. Technical report: Bird migration monitored by the tracking radar 'Superfledermaus' in autumn 2009. Unpublished report to DHI, DK.*
- B.4** *Appendix B.4: Stark, H., Liechti, F., Aschwanden, J. 2010. Technical report: Bird migration monitored by the tracking radar 'Superfledermaus' in spring 2010. Unpublished report to DHI, DK.*
- B.5** *Appendix B.5: Stark, H., Liechti, F., Aschwanden, J. 2011. Technical report: Bird migration monitored by the tracking radar 'Superfledermaus' in autumn 2010. Unpublished report to DHI, DK.*
- B.6** *Appendix B.6: BioConsult SH and Arbeitsgruppe für regionale Struktur- und Umweltforschung (ARSU GmbH) 2011. Bird migration in the Fehmarnbelt Region - Results of the recent 10 years, 2000-2009, based on German and Swedish databases. FEBI technical report.*
- B.7** *Appendix B.7: Desholm, M. and Bøvith, T. 2011. Regional scale study of bird migration over southcentral Denmark in 2009 and 2010 - a development project using radar and aerial raptor survey.*

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