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AUTUMN MIGRATION IN PÕÕSASPEA CAPE IN 2009.

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Abstract. The article provides an overview of the autumn migration of birds in Põõsaspea Cape in 2009. Censuses were carried out during 1.-11.7 and 29.11.-15.12. In total 2.13 million Anseriformes and Charadriiformes were counted. Only migration of these species is considered, whose percentage is significant as compared to the Northwestern population or who accumulate enough information on the composition of breeding success or gender. Current results are compared with the census performed in 2004. Data about breeding success and of species and gender composition are presented. Data from summer 2009 shows that the more arctic species the lower breeding success. The proportion of young Black Scoters was only 1.0%, 5.5% of Brent Goose, 6.0% of Velvet Scoter, 8.5% of Red-throated Diver and 16.0% of Black-throated Diver. Best breeding success was reported among Black-headed Gulls (30% of juveniles) and Black Terns (49% of juveniles). Compared to 2004, the abundance of Long-tailed Duck has declined.

Introduction

In autumn as well as in spring a significant number of Anatidae, Laridae and Waders, nesting in Eastern European and Western Siberian taiga and tundra zones, migrate through the Gulf of Finland. Their breeding grounds include Yamal (2000 km east of the Gulf of Finland) and Taymyr (3000 km from the Gulf of Finland) peninsulas. Local migratory birds mostly head for central and southern parts of the Baltic Sea, Danish straits, Wadden Sea and the surroundings of the North Sea. Several species, for instance waders and terns, migrate even further, including West-Africa (Delany & Scott 2006, Delany *et al*. 2009).

For birds starting their migration route from above-mentioned breeding grounds, the main stopover points include coast of the Gulf of Finland, the Norwegian coastline reaching from the Arctic Ocean to the North Sea, both shores of the Gulf of Bothnia, larger islands of the Baltic Sea (e.g. Gotland and Hiiumaa), and a few dales of large rivers in Russia (migration heading for Black Sea). A considerable proportion of the flyway sparsely runs over mainland (especially during nighttime), or occasionally heads for large inland waters.

Migration often runs along coastline in places where the shores of large water bodies are more or less parallel to the flyway. Põõsaspea Cape is the most western part of the Estonian coast and lies in the the Gulf of Finland. The gulf is relatively narrow and lies on the south-western and north-eastern

flyway of many waterfowls of Northwestern Europe and North Russian tundra as well as taiga zones (Scott & Rose 1996) whose autumn migration largely runs along the North Estonian coastline, whereby, the concentration of migrants becomes even higher in the western part of the Gulf of Finland.

The absolute numbers of the waterfowls migrating along the Gulf of Finland (partly or entirely) have not yet been estimated, however, they may reach up to 4–5 millions of individuals per autumn (incl. night migration, Scott & Rose 1996). For many species, the actual bottleneck lies in the strait between Osmussaare and Põõsaspea that is seven kilometres wide. The rest of the arctic birds heading for the Baltic Sea probably move over Finland and the Baltic States more sparsely.

Some species are more likely to follow the coastline than others. For example Brant Goose (*Branta bernicla*) and Black Scoter (*Melanitta nigra*) avoid crossing mainland. Therefore, geese and Tundra Swan (*Cygnus columbianus*) often cross the continental part of Estonia already in the eastern part of the Gulf of Finland for these are their migratory stopover sites. However, data on the actual number of birds crossing the continental part of Estonia before getting to Põõsaspea, remains insufficient. Also, no proper network enabling a comparison of observations has yet been established. As for the southern coast of the Gulf of Finland, there are a number of locations suitable for setting up an observation station, e.g. Sosnovy Bor, Pärispea Peninsula, Pakri Peninsula and Põõsaspea Cape. Yet there are several species that mostly follow coastline at daytime and occasionally cross mainland at nights. For instance, at nights, the voices of Long-tailed Duck (*Clangula hyemalis*) and Black Scoter are audible above mainland (*e.g.* in autumn 2009), therefore, at daytime only seldom encounters of these birds are made (analogous to spring migration, see Bergman & Donner 1964, Kumari 1975).

Põõsaspea Cape is known as a bottleneck for arctic waterfowl since 1958, when Kumari (1961) published rather casual data reported by the Migration Monitoring Network, which contained census results originating from more than 30 observation stations around the White Sea and the Baltic Sea. Already then Põõsaspea was in a leading position for the number of migrating Scoters, Long-tailed Ducks and Scaup Ducks (*Aythya marila*). In the 1990s, Põõsaspea was „discovered" by Finnish bird watchers and a selection of occasional observations has been published in Finnish (Pettay *et al.* 1998, Pettay *et al.* 2004). In 2004, Viron lintuseura (Estonian Birding Society), with the help of volunteers, organized a migration census that lasted throughout the entire autumn, and the results have also been published (Ellermaa & Pettay 2006). The current paper includes part of the results (mainly tabular) which at the

time remained unpublished. Another census took place in autumn 2009, organized by the Estonian Ornithological Society, funded by the Environmental Investment Center and put into practice by the authors of the current paper.

Flyway passing through Põõsaspea, mainly embraces the north-easterly and south-westerly migration route of numerous species. Species, migrating southbound and northbound, are relatively small in numbers (*e.g.* Garganey *Anas guarquedula*, Wood Sandpiper *Tringa glareola*, Black-backed Gull *Larus fuscus*). Flyway of some species breeding in Northern Russia, basically does not reach the Gulf of Finland at all, but is following the North Norwegian coast or directly crosses the northern part of Scandinavia to then head for south-west (e.g. Skuas *Stercorarius sp*. and Arctic Tern *Sterna paradisaea*).

Material and methods

People carrying out most of the observations have been mentioned at the end of the current paper, in the acknowledgements section. Daily countings took place during July 1st to November 9th and November 29th to December 15th. Daily observations started at least four hours before sunrise and lasted until two hours prior to sunset (excl. November 9th)

The total observation time of the season was 106 670 minutes (a mean of 11.9 hours per day; in 2004, a mean of 8.2 hours per day) and covered aproximately 90% of daylight hours (table of total numbers presented at www.eoy.ee/poosaspea). The least number of observations were carried out in mid-August, owing to long periods of daylight and low migration activity. During daylight hours, observation time was prolonged in case migration activity continued after the four hours of standard observation time.

Altitude of the observation station was 3 meters above ground. Data was recorded on special forms, and the time of passing migrating birds was registered to the nearest 30 minutes. All waterfowl (wans, geese, ducks, divers, grebes, cormorants, auks), waders and gulls (except Seagull and Herring Gull) were counted. The gender-specific and age-specific composition of passing flocks was registered. In terms of gender-specific and age-specific composition, small flocks were not taken into consideration and observations were randomized in order to provide an overview as adequate as possible. During most of the days also the totals of migratory non-target species were recorded (Table 2). Additionally, during several days waterfowl were counted in

stopover points. An adequate radius for counting birds in stopover sites was considered approximately two kilometres.

Every three hours meteorological conditions were registered, which makes 885 registrations per season. Wind direction and speed, cloud amount and visibility were described without using any devices. Temperature was measured to the nearest 1°C, using a thermometer.

It was analysed whether migration in Põõsaspea Cape can be predicted by wind direction measured at the observation post, in Kunda (180 kilometers to eastern northeast) or at White Sea (900 kilometers to northeast). Data on wind direction and speed in Kunda observation station have been provided by the Estonian Meteorological and Hydrological Institute. For the western part of the White Sea, the predicted wind direction and speed (1100 entries in both cases) were registered every three hours during the whole season by using HIRLAM (www.emhi.ee). Even though latter model does not provide the most precise overview of the local wind conditions, it is the very best information available. Migration intensity coefficient was defined as the total number of target migrants counted on daily basis in Põõsaspea. Wind directions were divided in a linear manner into 9 different categories where the lowest value was given for northeast wind (energetically favourable tailwind) and highest for the southwest wind (energetically the most unproductive, or headwind). All three observation stations were included in a comparison, to detect, if wind direction registered on the same day, the previous day, or two, three, or four days ago had any effect on migration at Põõsapea.

Some migrating birds remained unidentified for they were too far away, or owing to poor observation conditions. Concerning the most numerous species, total numbers per species as well as theoretical totals are given. Calculated totals is defined as the total number of observed birds extrapolated onto identified species and added upon species that actually have been identified. For instance, in case of numerous duck species (Widgeon *Anas penelope*, Long-tailed Duck, Black Scoter), the proportion of daily totals of an identified species was multiplied by the daily totals of unidentified waterfowl, and the result was added upon the total number of the foregoing identified species. As an example, in case daily counts included 700 Widgeons (70% of all identified ducks), 200 Long-tailed Ducks (20%), 100 Black Scoters (10%) and 2000 unidentified duck species, the theoretical total of Widgeons is 1400 (70% of 2000) + 700 (the number of actually identified Widgeons), that equals 2100 specimen. The calculated totals were calculated on daily basis and the calculated totals of the whole season are the sums of single days. Foregoing

calculation method has been used in several works related to migration (Pettay 1996, Lehikoinen *et al.* 2008).

Similarly, the numbers of Brant Geese and Barnacle Geese (daily totals of unidentified geese, accordingly), the Black-throated Diver and the Red-throated Diver (daily totals of unidentified divers *Gavia* sp., accordingly) and the Common Tern (daily totals of unidentified Common Terns/Arctic Tern *Sterna hirundo/paradisea*, accordingly) have been calculated. Yet, as for gender-specific and age-specific composition of the beforementioned species, only totals of identified species were used.

Age-specific and gender-specific composition was considered in two parallel ways. Firstly, the proportion of the age and gender of the bird, determined during the season. However, among several species migration period differs among juveniles and adults, females and males and also migration intensity is changing. Therefore, this method provides an accurate overview only in case age-specific and gender-specific compositions are determined on daily basis and of equal quantity (constant percentage of migration). Since that was not possible, the following method was used in the analyses. Gender-specific (or age-specific) distribution was weighed by 10-day migration totals and added upon the entire season. For instance, in case of juvenile Laughing Gulls, a weighed proportion of 10 days out of the total census was $(x_1*0.01*n_1) +(x_2*0.01*n_2)...$, where x stands for the number of juvenile gulls identified during a 10-day period, and n for the totals of this species migrating during the same period (including gulls with determined and undetermined age). This method provides more reliable results. However, among several species both methods produced similar results.

In overviews of the species, following sources have been used: Durinck *et al.* (1994), Scott & Rose (1996), BirdLife (2004), Delany & Scott (2006), Delany *et al.* (2009). Other sources are referred to within the text. Data obtained from Hanko bird observatory in autumn 2009 were provided by A. Lehikoinen. Pearson's correlation test and regression analysis were performed using the statistical functions of MS Excel. In the results section, Pearson's correlation coefficient is marked with letter r and regression with R^2.

Results

Typical southwestern and western winds prevailed during the autumn season (Fig. 1). The relative importance of southeastern winds was unusually high, mainly resulting from a stagnant anticyclone at the end of the season. Northwest wind was the most uncommon of all winds, which however, would have been the most favorable wind for birds to gather in the top of Põõsaspea Cape (during daylight time). The period from the end of September and the beginning of October was especially windy (Fig. 2), and the temperature in September was rather warm (Fig. 3).

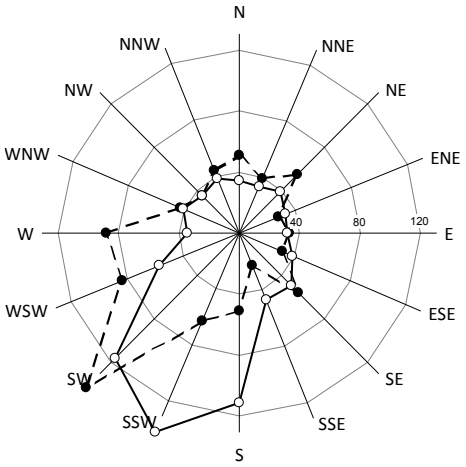

Figure 1. Wind directions in autumn 2009 in Kunda (○) and Põõsaspea (●). Numbers of observation days are shown on figure.

Joonis 1. *Tuulesuundade jaotus Põõsaspea neemel (●) ja Kundas (○) 2009. sügisrände ajal. Numbrid näitavad vaatluspäevade arvu.*

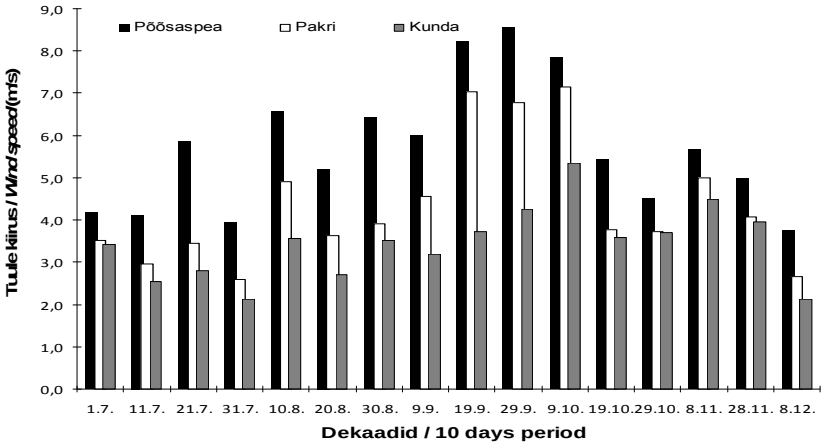

Figure 2. Mean wind speed in 10-day periods in three locations along north coast of Estonia.
Joonis 2. *Tuule keskmine tugevus kümnepäevaste perioodide kaupa Eesti põhjarannikul.*

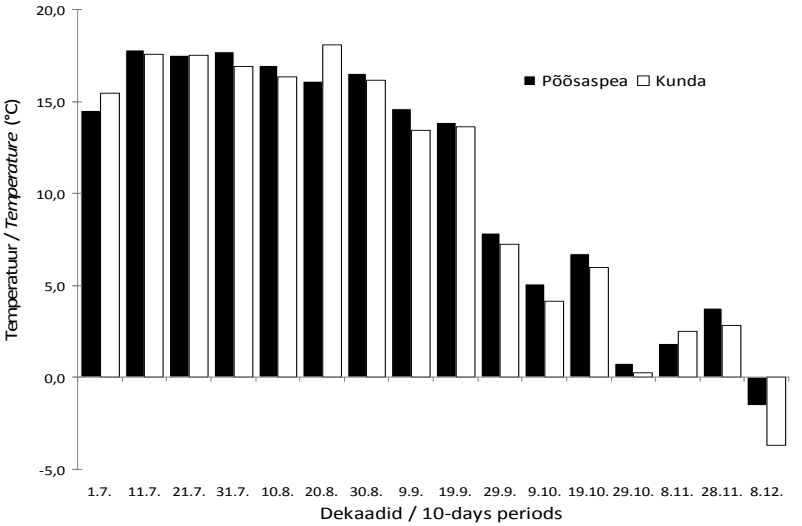

Figure 3. Mean temperatures of daylight periods in 10-day periods; statistics of two different locations are presented.
Joonis 3. *Keskmine temperatuur kümnepäevaste perioodidena Põõsaspea neemel rändeloenduse ajal (võrdluseks ka Kunda).*

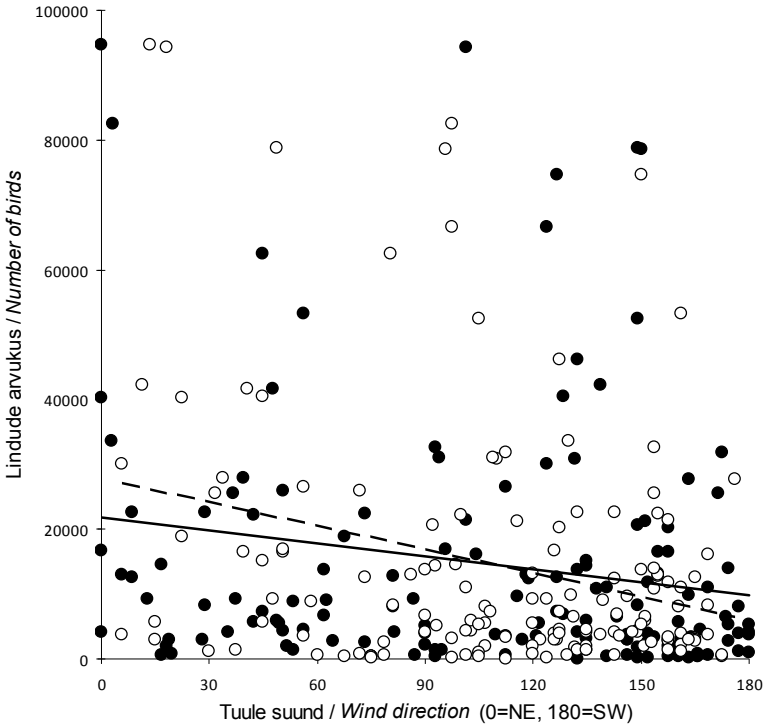

Figure 4. Relationship of migration intensity at Põõsaspea compared with wind direction of earlier day at White Sea (900 km northeast) and same day at Kunda (180 km east).
Joonis 4*. Põõsaspea rändeintensiivsuse seos eelmise päeva tuule suunaga Valgel merel (—●—) ja sama päeva tuule suunaga Kundas (- -○- -).*

There was no significant correlation between local winds at Põõsaspea and migration intensity. However, migration intensity correlated with wind direction reported the same day at Kunda observation station ($r= 0.29$, $n=144$, $p<0.001$, Fig. 4): wind direction reported at Kunda explains 7% of the migration intensity observed the same day at Põõsaspea. Additionally, a significant correlation between migration intensity and wind direction at White Sea, during the

previous day, was detected (r= 0.27, n=144, p=0.001, Fig. 4), yet the relation was not as strong as in the latter case. Also the relation between migration activity and favorable wind direction appears not to be very strong, since the combination of wind direction of the previous day at White Sea and wind direction of the same day at Kunda together explain only 10% of the migration intensity (R^2= 0.10, n=143, p<0.001). Moreover, migration intensity is clearly affected by wind strength on the entire flyway – strong winds bring about more migrants to Põõsaspea. Wind strength measured at Kunda and at Põõsaspea had an effect on migration intensity (Kunda: r= 0.29, n=144, p<0.001; Põõsaspea r= 0.27, n=144, p=0.001).

When interpretating the results, it appears, that larger number of birds starting migration from White Sea depend on tailwind and reach Põõsaspea the next day. Yet, intensive migration reaches Põõsaspea only in case of favorable weather conditions prevailing on the entire flyway (statistically significant relationship with wind direction as well as with wind strength, reported in Kunda).

The effect of wind direction and strength together explained only about 20% of migration intensity (R^2= 0.196, n=140, p=0.001). Evolutionarily, timing is probably a more relevant factor than weather. Latter, however, could not be tested for Põõsapea, since there are observation recordings only from 2004 and 2009.

Different data was obtained on different species (age, gender, size of flocks, *etc.*), on account of which the following overviews vary by species. Special attention was paid only to species whose migration runs clearly over Põõsaspea Cape, and whose local numbers make up a significant part of migration passing through the entire Europe.

Migration totals for the most numerous species are shown in Table 1. Also, additional data on migration totals obtained during the standardized observation hours are presented in Table 1. The migration totals for non-target species are presented in Table 2. Breeding successes, calculated on the basis of migration observations in 2009, are shown in Table 3.

Table 1. Numbers of standard (4 hours ahead from sunrise and 2 hours before sunset) and total census of migrating birds in Põõsaspea cape, during autumns in 2004 and 2009. Theoretical totals are given (2009 only), where unidentified birds are weighted by proportion of those species and added up. Data of 2004 has published mainly before but additional data is received from Viron lintuseura and presented here.
Tabel 1. *Standardaegade (4 tundi pärast päikesetõusu ja 2 tundi enne päikeseloojangut, Stan.) ja kogu sügisrände summad Põõsaspea neemel aastatel 2004 ja 2009. Osadel liikidel on märgitud ära ka arvutuslikud rändesummad (2009.a, vt tekstist). 2004. aasta andmed pärinevad Viron lintuseuralt (Ellermaa & Pettay 2006).*

Liik/*Species*		2004		2009		
		∑	Stan.*	∑	Stan.*	Arvutuslik max.
Punakurk-kaur	GAVSTE	25 479	12 918	22 523	10 985	28 633
Järvekaur	GAVARC	4050	2860	7888	5609	11 377
kaur	Gavia sp	10 307	6834	9600	6432	
Tuttpütt	PODCRI	2270	1669	1973	1198	
Hallpõsk-pütt	PODGRI	3380	2384	4136	2896	
Sarvikpütt	PODAUR	137	93	194	123	
Kormoran	PHACAR	12 753	9712	31 864	22 682	
Kühmnokk-luik	CYGOLO	400	309	763	510	
Väikeluik	CYGCOL	399	145	173	105	
Laululuik	CYGCYG	342	225	605	478	
Luik sp	Cygnus sp	585	426	284	210	
Rabahani	ANSFAB	882	322	1292	594	
Suur-laukhani	ANSALB	3050	1040	3772	2585	
Hallhani	ANSANS	133	94	444	209	
Hani sp	Anser sp	4540	1124	13 307	8279	
Valgepõsk-lagle	BRALEU	145 000	56 854	165 769	114 240	212 130
Mustlagle	BRABER	45 371	21 423	101 922	53 862	109 458
Kanada lagle	BRACAN	90	7	21	?	
hani/lagle	Anser/Branta sp	60 900	34 068	53 942	35 915	
Ristpart	TADTAD	153	119	447	176	
Viupart	ANAPEN	132 000	83 013	112 095	67 427	124 000
Rääkspart	ANASTR	69	61	175	118	
Piilpart	ANACRE	20 900	16 616	21 110	14 563	
Sinikael-part	ANAPLA	2660	1594	3646	2599	
Soopart	ANAACU	17 500	9108	22 950	11 815	
Rägapart	ANAQUE	52	41	34	14	
Luitsnokk-part	ANACLY	4240	2673	3619	2152	
ujupart sp	ANAS SP	11 200	7250	8871	5048	
Punapea-vart	AYTFER	135	116	208	164	
Tuttvart	AYTFUL	11 500	8303	15 546	9930	
Merivart	AYTMAR	34 100	21 352	26 638	13 777	
meri/tuttvart	AYTFUL/MAR	6130	3655	8792	6514	
Hahk	SOMMOL	21 900	10 565	11 791	8660	
Aul	CLAHYE	431 000	271 262	315 653	223 674	360 713
Mustvaeras	MELNIG	597 000	382 336	790 399	447 448	807 500
Tõmmuvaeras	MELFUS	52 300	26 578	60 562	29 620	
Sõtkas	BUCCLA	21 300	17 085	26 449	19 457	

Väikekoskel	MERALB	412	328	560	458	
Rohukoskel	MERSER	14 100	9703	19 559	12 747	
Jääkoskel	MERMER	1070	767	1415	1111	
määramata part	Anatidae sp	132 000	94 037	82 940	65 228	
Meriski	HAEOST	2120	737	6044	1410	
Liivatüll	CHAHIA	374	258	1194	567	
Rüüt	PLUAPR	406	128	474	206	
Plüü	PLUSQU	1420	848	1016	516	
Kiivitaja	VANVAN	107	35	311	177	
Suurrüdi	CALCAN	256	102	627	331	
Leeterüdi	CALALB	86	36	139	63	
Väikerüdi	CALUTA	23	9	38	24	
Värbrüdi	CALTEM	23	17	23	9	
Kõvernokk-rüdi	CALFER	142	86	663	295	
Tundrarüdi	CALALP	15 200	7409	41 754	16 905	
Tutkas	PHIPUG	210	138	107	62	
Tikutaja	GALGAL	79	44	83	57	
Vöötsaba-vigle	LIMLAP	2030	1540	2029	968	
Väikekoovitaja	NUMPHA	649	366	1587	403	
Suurkoovitaja	NUMARQ	1380	859	1931	825	
Vihitaja	ACTHYP	66	12	37	19	
Heletilder	TRINEB	122	86	508	187	
Mudatilder	TRIGLA	190	125	408	188	
Punajalg-tilder	TRITOT	29	18	191	54	
Kivirullija	AREINT	18	8	79	40	
Veetallaja	PHALOB	33	21	20	11	
suur kahlaja	big wader	790	445	811	441	
väike kahlaja	small wader	1760	1263	4090	1992	
kurvits	wader	34	30	334	134	
Söödikänn	STECUS	414	240	203	105	
änn	Stercorarius sp	47	23	32	21	
Väikekajakas	LARMIN	9330	6190	5392	2749	
Naerukajakas	LARRID	19 500	12 092	67 104	24 038	
Kalakajakas	LARCAN	18 000	12 276	18 559	10 425	
Tõmmukajakas	LARFUS	87	51	202	68	
Räusktiir	STECAS	51	38	119	67	
Tutt-tiir	STESAN	1750	1228	1980	893	
Jõgitiir	STEHIR	8960	6435	11 390	5048	20 920
Randtiir	STEAEA	672	589	1160	469	
Jõgi/Randtiir	STEHIR/AEA	6980	5155	10 287	6662	
Väiketiir	STEALB	46	30	121	72	
Mustviires	CHLNIG	275	158	208	107	
Lõunatirk	URIAAL	15	11	36	17	
Alk	ALCTOR	1260	840	1560	1013	
alk/tirk	ALC/URI	78	56	485	252	
Krüüsel	CEPGRY	96	63	58	39	
TOTAL		**1 926 886**	**1 179 175**	**2 137 305**	**1 287 561**	

* 2004 toimusid standardvaatlused vahemikus 03.07-15.12., 2009 01.07-8.11. ja 29.11-15.12.

Table 2. Totals of migratory non-target species in autumn 2009 in Põõsaspea.
Tabel 2. *Väikesearvuliste ja projektiväliste liikide rändesummad Põõsaspeal sügisel 2009.*

Liik		∑	Liik		∑	Liik		∑
Kuninghahk	SOMSPE	1	Vöötkakk	SURULU	1	Põhjatihane	PARMON	16
Hõbehaigur	EGRALB	6	Karvasjalg-kakk	AEGFUN	1	Musttihane	PARATE	377
Hallhaigur	ARDCIN	1255	Kõrvukas-räts	ASIOTU	1	Sinitihane	PARCAE	700
Herilaseviu	PERAPI	77	Piiritja	APUAPU	3961	Rasvatihane	PARMAJ	448
Must-harksaba	MILMIG	1	Hallpea-rähn	PICCAN	2	Peoleo	ORIORI	1
Merikotkas	HALALB	19	Musträhn	DRYMAR	46	Hallõgija	LANEXC	6
Roo-loorkull	CIRAER	53	Suur-kirjurähn	DENMAJ	460	Pasknäär	GARGLA	2741
Välja-loorkull	CIRCYA	24	Tamme-kirjurähn	DENMED	1	Harakas	PICPIC	15
Kanakull	ACCGEN	3	Väike-kirjurähn	DENMIN	8	Mänsak	NUCCAR	176
Raudkull	ACCNIS	367	Nõmmelõoke	LULARB	12	Hakk	CORMON	8
Hiireviu	BUTBUT	65	Põldlõoke	ALAARV	56	Künnivares	CORFRU	13
Karvasjalg-viu	BUTLAG	4	Sarviklõoke	EREALP	3	Vares	CORNIX	186
Kalakotkas	PANHAL	27	Kaldapääsuke	RIPRIP	97	Ronk	CORRAX	64
Tuuletallaja	FALTIN	48	Suitsupääsuke	HIRRUS	1464	Kuldnokk	STUVUL	130
Väikepistrik	FALCOL	23	Räästapääsuke	DELURB	51	Põldvarblane	PASMON	27
Lõopistrik	FALSUB	18	Metskiur	ANTTRI	45	Metsvint	FRICOE	228
Rabapistrik	FALPER	5	Sookiur	ANTPRA	2180	Põhjavint	FRIMON	20
Sookurg	GRUGRU	10866	Tundrakiur	ANTCER	1	Rohevint	CARCHL	128
Väiketüll	CHADUB	7	Randkiur	ANTPET	6	Ohakalind	CARCAR	110
Meririsla	CALMAR	2	Lambahänilane	MOTFLA	105	Siisike	CARSPI	377
Sooplütt	LIMFAL	13	Linavästrik	MOTALB	1564	Kanepilind	CARCAN	9
Mustsaba-vigle	LIMLIM	9	Siidisaba	BOMGAR	994	Mägi-kanepilind	CARRIS	2
Tumetilder	TRIERY	28	Vesipapp	CINCIN	1	Urvalind	CARMEA	2812
Lammitilder	TRISTA	1	Kivitäks	OENOEN	3	Vööt-käbilind	LOXLEU	4
Metstilder	TRIOCH	10	Musträstas	TURMER	4	Kuuse-käbilind	LOXCUR	933
Laisaba-änn	STEPOM	1	Hallrästas	TURPIL	1009	Männi-käbilind	LOXPYT	48
Hõbekajakas	LARARG	3500	Laulurästas	TURPHI	1	käbilind *sp.*	LOXIA	1201
Merikajakas	LARMAR	97	Vainurästas	TURILI	8	Karmiinleevike	CARERY	68
Kaljukajakas	RISTRI	30	Hoburästas	TURVIS	29	Leevike	PYRPYR	28
Kodutuvi	COLLIV	26	Salu-lehelind	PHYLUS	3	Suurnokk	COCCOC	14
Õõnetuvi	COLOEN	26	Põialpoiss	REGREG	9	Keltsalind	CALLAP	1
Kaelustuvi	COLPAL	130	Hall-kärbsenäpp	MUSSTR	2	Hangelind	PLENIV	169
Kägu	CUCCAN	2	Sabatihane	AEGCAU	255	Talvike	EMBCIT	43
						Rootsiitsitaja	EMBSCH	22

Table 3. Breeding success of some species in 2009. The proportions of juveniles are for several species (*) weighted by totals of migrants of 5- or 10-day periods. Immature birds are considered as adults in case of Gulls and Divers.
Tabel 3. *Mõnede liikide pesitsusedukus sügisel 2009. Rändedünaamika ebaühtluse tõttu on noorte lindude osakaal kaalutud 5- või 10-päevaste rändesummadega, mistõttu osade liikide noorte osakaal (*) võib erineda sellest, mis tabelis esitatud valim annaks. Kajakate ja kauride puhul sisalduvad vanalindude all ka immatuurseid linde.*

Liik / ***Species***		**N**	
		Noorlinnud(%) ***Juveniles (%)***	**Vanalinnud** ***Adults***
Punakurk-kaur	GAVSTE	1220 (9,5*)	13088
Järvekaur	GAVARC	744 (16,0*)	3915
Mustlagle	BRABER	1111 (5,5*)	16617
Ristpart	TADTAD	63 (17,0)	317
Mustvaeras	MELNIG	1986 (0,9*)	185029
Tõmmuvaeras	MELFUS	757 (6,0*)	19812
Merisk	HAEOST	384 (16,5*)	1385
Väikekajakas	LARMIN	615 (19,5*)	3083
Naerukajakas	LARRID	20588 (30,1*)	9517
Tõmmukajakas	LARFUS	47 (23,3)	155
Räusktiir	STECAS	19 (35,8)	34
Tutt-tiir	STESAN	373 (25,3)	1102
Jõgitiir	STEHIR	1682 (18,2*)	8302
Randtiir	STEAEA	149 (13,1*)	951
Väiketiir	STEALB	11 (12,9)	74
Mustviires	CHLNIG	91 (47,6)	100

Red-throated Diver (*Gavia stellata*). During autumn migration, a considerable number of Red-throated Divers gather at Põõsaspea. Migration totals of the season were 22 500 and calculated totals reached 28 600 specimen. Compared to 2004, the numbers were slightly lower (Table 1). The main wintering area of this species is the Baltic Sea, yet to some extent also the North Sea and even further. The numbers have probably been declining for some time (www.helcom.com). The proportion of first year birds was 8.5% (n=1220), and of the 2nd calendar year 91.5% (n=13 088). The proportion of juvenile birds weighed by 10-day migration totals was 9.5%. Compared to adult birds, identification of juvenile birds is more difficult (may be mistaken for different age brackets of adults in winter plumage); therefore, the proportion of juvenile

divers probably remains underestimated. On the other hand, in the Red-throated Divers population, the proportion of birds from the 1st calendar year is clearly underestimated, since birds from the 2nd and even from the 3rd calendar year do not leave their wintering grounds and thus do not pass Põõsaspea Cape neither during spring nor autumn migration (Okill 1994, Ervasti 2004). The Gulf of Finland, as such, is a wintering area for a number of Red-throated Divers, whereby, most of the reported divers had been observed in the end of the season (max 29. 11-13 specimen).

Black-throated Diver (*Gavia arctica*). The total numbers of the Black-throated Diver reached up to 7888 specimen and migration totals were 11 377. Regardless to the large breeding populations in Europe and West Siberia, the number of birds wintering in northwestern Europe has been estimated only up to 10 000 – 20 000 specimen. The numbers in the rest of the Europe, excluding the Black Sea population, reach only up to 17 000 – 30 000 specimen. Compared to Red-throated Divers, the spatial distribution of the wintering grounds of Black-throated Divers is higher, for what reson the flyways and total numbers are poorly known and it is also rather difficult to imagine such numbers gathering at Põõsaspea. Data from 2004 and 2009 show a clear increase in the numbers of the Black-throated Diver, for in 2009 almost twice as much Black-throated Divers have been reported (Table 1). The proportion of juveniles (1st calendar year) is significantly higher in the Black-throated Diver compared to the Red-throated Diver (16%, n=744). Among juveniles, the weighed percentages of the 10-day migration totals were 16%. The proportion of juveniles is probably even higher, since in autumn, the 1st year Black-throated Diver are smaller in size and resemble more Red-throated Divers than to the adult Black-throated Divers, therefore, part of the juveniles remain unidentified. For summer 2009, census results show a relatively high breeding success of the population migrating over the Gulf of Finland.

Grebes (*Podisceps sp.*). During the past five years, there has been a decline in the numbers of the Great Crested Grebe (*P. cristata*). Therefore, the numbers of the Red-necked Grebe (*P. grisegena*) have increased. These changes are manifested in the numbers of standard as well as in the total census of migrating birds (Table 1). Similar changes in the numbers have also been reported for the past years in Finland (BirdLife Finland, unpublished).

Swans (*Cygnus sp.*). While data on swans have been rather poor throughout the season, different species have not been described separately. Põõsaspea lies too far north from the main flyway of the Tundra Swans (*C. columbianus*), and the number of migrants is moderate when compared to the total population. Moreover, for the Whooper Swan (*C. cygnus*) Põõsaspea has

never been a gathering point of determinative importance. There were more Whooper Swans registered in autumn 2009 than in 2004. However, as the number of unidentified swan species was higher in 2004, it is not correct to assume that the number of Whooper Swans has increased in time. Extensive migration of the Mute Swan (*C. olor)* only occurs in case of ice cover, and due to mild weather conditions did not take place in autumn 2009.

Geese (*Anser sp., Branta sp.*). Altogether 340 500 Geese were counted. It is characteristic for Geese to gather only during a few days in autumn. Latter fact together with the tendency to migrate at nights increases the probability that changes in the migration totals below 50% do not necessarily reflect the actual changes in the numbers. For Geese, Põõsaspea Cape remains the periphery of the flyway where prevailing wind directions may have a substantial effect on the current results. Therefore, Geese are not considered separately. Migration totals are shown in Table 1.

Barnacle goose (*Branta leucopsis*). During the past decades, the number of Barnacle Geese has been increasing, reaching up to about 800 000 specimen (Ebbinge 2009). About 70 – 80% of these birds are breeding in West-Siberia (BirdLife 2004) and thus may potentially migrate over Põõsaspea Cape. In the beginning of the season, a few late spring migrants have been reported (86 individuals were heading east during July 1st to 14th). Atumn migration began on September 15th, when 9 specimens were counted. An extensive migration, however, started on September 20th, when 652 specimens were counted. The very last migrants were observed on November 9th (4 birds). This species does not stopover at Põõsaspea. Local individuals have been reported only twice (largest number on September 20th, 7 birds). The flyway of Geese is clearly affected by wind directions. In autumn 2009, the main migration route seemed to run somewhat southeast from Põõsaspea, since several unidentified flocks running over mainland came from that direction. Main migration, starting on October 10th, lasted also throughout the following night. Sounds of lower flying flocks were audible around the observation station at Tuksi throughout the night. Nevertheless, the total numbers of the season reached up to 165 700 and the theoretical totals up to 212 300, which should make up at least one third of the actual population of Siberia (BirdLife 2004, Ebbinge 2009). Night migration took place during October 10-11 and was definitely embracing tens of thousands of specimen.

Brent goose (*Branta bernicla*). Migration totals are shown in Table 1. A few spring migrants were observed in the beginning of the season. Autumn migration started on September 12th and lasted until November 8th. Observations of small numbers of resting birds (1–58 individuals) were made

throughout October, whereby in September, one day 160 individuals were reported. In September and in the beginning of October migrants were feeding on sea grass (*Zostera*). During the second half of October the main food was green alga mainly growing on coastal stones. During the entire season, about 50% of the world's population of the subspecies *Branta b. bernicla* was counted (Delany & Scott 2006). Altogether 2078 flocks were counted with an average of 49 specimens per flock (median 15). Brent Goose, unlike Barnacle Goose and other geese, preferred to migrate only above the water, and only a few individuals were observed crossing the cape. The age of 17 728 birds was determined (17.4%), out of which 16 617 were adults and 1111 (6.2%) juveniles (birds from the 1st calendar year). There was a stable decline in the relative importance of adults, reaching 99.7% in the beginning and 55.3% in the end of the season. Proportions of the main migration weighed by 10-day migration totals show an even lower percentage of juveniles – 5.5% of the total population. Latter could probably compensate for the natural death rate of adults, which is about 6% (Ebbinge 1991), yet not for the total death rate of 15% (Ebbinge 1991), which partially results from hunting in Europe (mostly Russia). The average annual kill in Europe (Mooij 2009) is clearly higher than the proportion of juveniles registered in Põõsaspea. Breeding success was clearly lower compared to 2004, when the proportion of juveniles in Põõsaspea was at least 15% (Ellermaa & Pettay 2006).

Over a long period, the breeding success of the Brent Goose has been poor. The numbers have considerably declined during 1990–2004 (Ebbinge 2004). Telemetric studies of Brant Geese have demonstrated that the majority of the Brent Geese did not reach their breeding grounds in time (http://www.geese.nl/gsg/), which could mean, that during spring migration, Brent Geese suffer from food shortage. The reason may lie in an actual food shortage or in disturbance at stopover sites (Drent 2005). There was a significant correlation between migration of Brent Geese and wind direction at Kunda, whereby, wind conditions were unfavourable (see Fig. 4) which directed the migrating Brent Geese to Põõsaspea ($R^2=0.319$, $df=50$, $p=0.02$).

Sheldrake (*Tadorna tadorna*). 447 migrating Sheldrakes were registered. Age was determined in 380 specimens. The percentage of juveniles was 17 (n=63). Among adults, ratio of males and females was 4:6. The authors are not sure if the reason lies in an uneven distribution of genders or in differences in migration dynamics between male and female birds. In either case, there is no information available (Cramp & Simmons 1977). Probably, Sheldrakes observed at Põõsaspea, are breeders from White Sea (also in Ladoga?), however, some sources do not include these waterbodies in the range of this species (Scott &

Rose 1996, Wetlands International 2006). Yet, there exists enough information of the migration of Sheldrakes over Ladoga and Southeast Finland (Kontiokorpi 1993, Loippo 2001), but also at White Sea (J. Kontiokorpi, personal observations). On the Russian and Finnish coasts of the Gulf of Finland the numbers of this species remain very low (Noskov 2002, Väisänen *et al*. 1998).

Dabbling ducks (*Anas sp.*). Altogether 172 500 migrating dabbling ducks were counted. Exact census results of the genus are presented in Table 1. Põõsaspea is a bottleneck area for migrting dabbling ducks. Latter argument finds support by the fact that there were 35 times less dabbling ducks registered (a total of 4900 per autumn 2009) at Hanko observation station, which is located 60 kilometers from Põõsaspea. The proportion of different species of dabbling ducks is the following: Widgeon *Anas penelope* 68.5%, Pintail *Anas acuta* 14.0%, Teal *Anas crecca* 12.9%, Mallard *Anas platyrhynchos* 2.2%, Shoveller *Anas clypeata* 2.2%, Gadwall *Anas strepera* 0.1% and Garganey *Anas querquedula* 0.02%. The most numerous species was Widgeon, whose numbers have declined since 2004 (Table 1). In Widgeons, the average flock size was 23 specimens (median 12; n=4863). During autumn migration, it is possible to distinguish adult males from the rest of the birds (n=17316). Birds without the characteristics of an adult male were classified as „adult females + juveniles" (n=14 695).

Migration totals of Widgeons were weighed by the proportion of adult males calculated for 10-day migration totals. The result showed a 57% proportion of adult males during the entire season. In 2004, probably due to poor breeding success, the percentage of adult males was only 45 (Ellermaa & Pettay 2006). Data on gender-specific and age-specific compositions of other dabbling ducks were poor. Similar to autumn 2004, the most extensive migration of all dabbling duck species in Põõsaspea occurred among Pintails. The number of counted birds makes up approximately 20% of the whole wintering population of Europe and 30-40% of the northwestern Europe (BirdLife Intrenational 2004). Compared to 2004, there was a decline in the numbers of Shoveller and Garganey. The numbers of standard times indicate a rise in the number of Mallards and Gadwalls (Table 1).

Diving ducks (*Aythya sp.*). The gender-specific and age-specific compositions of diving ducks could not be determined. The total numbers of migrating diving ducks has remained the same since 2004 (51 000). However, in autumn 2009, there was a higher proportion of Tufted Ducks and lower proportion of Greater Scaups (Table 1). In 2004, numbers of standard observation times demonstrated a ratio of (Tufted Duck: Greater Scaup) 1: 2.6, whereby, in 2009 the ratio was 1: 1.4. Yet, a comparison of standard observation

time numbers of the total census showed a decrease in the number of Greater Scaups rather than an increase in the number of Tufted Ducks (Table 1).

Common Eider (*Someteria mollissima*). According to observation data from Finland, there has been a decline in eider numbers in breeding grounds at the Gulf of Finland since 1997. Since 2004, the decline has been 20% (Hario & Rintala 2008). The results of the total census in Põõsaspea are also indicating to a decline, and based on standard observation time numbers, it is 20% (Table 1).

Steller's Eider (*Polysticta stelleri*). Steller's Eider is a vulnerable species (http://www.iucnredlist.org/), which makes monitoring especially intriguing. Unfortunately, Steller's Eiders did not start migrating before the current observation period had come to an end. The birds had not even reached their regular wintering grounds at Unduva by the first week of December (personal observation). Later on, during random observations in Põõsaspea, a few migrants were sighted. In mid-January, 550 specimen were observed in Saaremaa (L. Luigujõe, written notes). In 2009, there were exeptionally mild weather conditions at White Sea and Barents Sea, therefore, a probability exists that Steller's Eiders migration to the Baltic Sea is related only to icing at local stopover sites. Lately, the number of Steller's Eiders has been declining at the Baltic Sea. However, if the actual reason for the decline lies in the fact that wintering grounds at the Baltic Sea have been exchanged for the Norwegian coast or in an overall popultion decline, remains unknown (Zydelis *et al.* 2006, Hario *et al.* 2009).

Long-tailed Duck (*Clangula hyemalis*). Wintering grounds of the Long-tailed Duck are mainly located at the Baltic Sea but hard winter conditions lead them to Danish straits and North Sea. In autunm 1992, during three days, altogether 557 000 Long-tailed Ducks were registered at Põõsaspea (M. Leivo and O-P. Pietiläinen, personal notes). In autumn 1995, the 5-day totals were 643 000 migrants (M. Leivo *et al*., observational data). In autumn 2001, a total of 920 670 Long-tailed Ducks were counted during 14 observation days (October 17.-23.; Viron lintuseura, unpublished data). In autumn 2004, a significant decline in the number of Long-tailed Ducks was registered in Põõsapea (Ellermaa & Pettay 2006). The migration totals reached only up to 431 000 specimen (500 000 together with unidentified waterfowl), and census results of the most successful day was only 87 000 specimen together with unidentified ducks.

Data from the current year shows that the number of Long-tailed Ducks is still in decline. Season totals reached only up to 316 000 migrants, and theoretical totals only up to 360 700 specimen. A comparison of the numbers of standard observation times also demonstrates a decline (Table 1). It is rather

certain that in autumn 2009, the migration of Long-tailed Ducks migrated over Põõsaspea Cape. Latter also finds support by census data from Söderskäri. This is an island in the middle part of the Gulf of Finland, where migration routes remaining north from Põõsaspea can be observed. In 2009, the all-time least number of Long-tailed Ducks was counted there (28 000, G. Nordenswan, personal data). The theoretical numbers registered in Hanko bird station also reach about 28 000 specimen.

A lower number of Long-tailed Ducks in 2009 compared to 2004 is partly due to poor breeding success. There were 25 489 adult males and 21 311 „adult females + juveniles" identified. Thus, the proportion of adult males was 55%. Extrapolating these two groups on 5-day migration totals somewhat reduces the proportion of adult males, but yet it reaches 53%. Such a high proportion of males refer to a lower breeding success compared to 2004, where the proportion of adult males was 45% (Ellermaa & Pettay 2006). Sex ratio of Long-tailed Ducks has been poorly studied but a higher proportion of males have been observed. In spring 2006, in Finland, the ratio of males to females was 57:43 n=2026 (Hario *et al.* 2009). Presuming a similar sex ratio in autumn 2009, means that the proportion of juveniles was 2–4%.

In 2009, the mean flock size of the Long-tailed Ducks was 14 specimen (n=9544). The largest flock consisted of 550 specimens. The number of birds at stopover sites was low as well. In summer, there was a rather high number of nonmigrating males registered - 27 males and 1 female (July 14th) and 30 specimen (August 7th). The numbers were rising in July and birds flying from east were probably coming to molt. Although, male Long-tailed Ducks mainly molt at breeding sites or in the surroundings. Yet, it is more likely that these birds were single males on spring migration at the Baltic Sea. The highest number of stopping Long-tailed Ducks during main migration was 1700 specimen. In 2004, 3000-15 000 stopping birds were counted in Osmussaare Strait. Therefore in 2009, there was no gathering of Long-tailed Ducks registered, with the exception of November 29th where there was a larger number of birds sighted – approximately 5000 specimen at 4-5 km distance.

Lately, census results from other regions around the Baltic Sea also have been published. These data confirm a catastrophic decline in the number of Long-tailed Ducks (Hario *et al.* 2009, Nilsson 2009). According to IUCN criteria, this species would probably claccify as vulnerable, however, the forum will expand upon endangered species not earlier as in the end of 2010 (I. Burfield, personal data). Such a decline in the numbers is probably due to oil spill at wintering grounds but also to a continuously low breeding success in the past years (Larsson & Tydén 2005, Hario *et al.* 2009).

Common Scoter (*Melanitta nigra*). Autumn migration of Common Scoter males started already at the end of May, therefore, could be monitored from the very first observation days. Migration totals are presented in Table 1. During the past years, Common Scoter population has probably slightly increased as standard observation times show an increase of 15%. However, in summer 2009 there was practically no offspring produced: 149 160 adult males, 35 869 adult females (+1 calendar year) and only 1986 juveniles were identified. The number of juveniles was weighed by 5-day migration totals and the proportion of juveniles reached only 0.9%. The proportion of juvenile Common Scoters is probably underestimated due to variable migration dynamics of both, adult and juvenile birds. Common Scoter migration, taking place during late spring, does not concentrate in Põõsaspea, at least during dylight hours when monitoring is possible. However, that is the time when juveniles are mostly active.

Velvet Scoter *(Melanitta* fusca). Total census of migrating Velvet Scoters is presented in Table 1. Altogether 5520 migrating flocks were registered. Mean size of a flock was 11 (median 6) specimens. Extrapolated onto 10-day migration totals, the ratio of adult males (n=12 165) to adult females (n=7 647) of the whole season was 56:44. The proportion of juvenile birds was 6% (n=757) when weighed by 10-day totals. However, in November, no observations were carried out during a period of three weeks, when the migration was still continuing and the proportion of juvenile birds was rather high. Therefore, the proportion of juvenile Velvet Scoters may probably be somewhat higher than 6%. Breeding success of the Velvet Scoter was rather low, yet significantly higher compared to the Common Scoter.

Mergansers (*Mergus sp.*). Total census of migrating mergansers is presented in Table 1.

Red-breasted Merganser (*M. serrator*). Compared to autumn 2004, migration totals and numbers of standard observation times were about one-third higher in 2009 (Table 1). Altogether 10 004 adult males and 5384 adult females + juveniles were registered. In autumn 2009, the proportion of adult males was 65%, whereas in 2004 it was 72% (Ellermaa & Pettay 2006). Latter may probably be due to a higher breeding success in 2009. However, the proportion of males was slightly lower, 63%, when weighed by 10-day totals. The actual ratio of males to females remains unknown, on account of which an absolute breeding success could not be estimated. Brent Geese, together with Red-breasted Mergansers reached the most remarkable numbers at Põõsaspea. For example, the number of Red-breasted Mergansers migrating through Põõsaspea was 153 times higher when compared to Hanko bird station, considering that this species is breeding in the entire Finland. In Põõsapea,

perhaps even 80% of the Red-breasted Merganser population whose breeding areas remain east from Põõsaspea was observed.

An extensive migration of Goosanders (*M. merganser*) did not start before December, when it was getting frosty. Migration totals were somewhat higher compared to 2004 (Table 1). The reason may lie in milder weather conditions during the second part of autumn in 2004, compared to 2009. Regular wintering grounds of many Goosanders lie north from Põõsaspea and the fact that current wintering grounds are changed over only in case of ice cover makes it difficult to assay changes in the numbers. The number of migrating Smews (*M. albellus*) as well as Goosanders was rather low in Põõsaspea and information concerning the age and gender of the birds remained poor.

Waders (*Haematopodidae, Charadriidae, Scolopacidae*). During autumn migration, the number of waders reached 64 500. In autumn, waders are more numerous in Põõsaspea than in other observation stations around the Baltic Sea. For example, there were approximately 30 times more birds registered in Põõsapea than it was registered during an average autumn in Hanko bird station (Lehikoinen et al. 2008). The number of waders migrating through Gotland is similar to the numbers in Põõsaspea (Blomdahl *et al*. 2001, Elleström *et al*. 2002). However, the numbers are marginal and make up less than 5% of the population migrating from western Siberia to northwestern Europe. Waders tend to migrate at a high altitude, therefore, the actual migration pattern remains unclear. Wind plays a significant role in observing waders as strong headwind induces lower migration altidude. It is necessary to collect more data before making any conclusions on changes taking place at Põõsaspea. Better information can be obtained from resting areas at Wadden Sea and the West African coast (Delany *et al.* 2009).

The size of the Eurasian Oystercatcher (*Haematopus ostralegus*) population breeding at the White Sea and migrating over Põõsaspea is remarkable. It consists of about 20 000 specimen, however, there is no information about changes taking place in this population. The number of the Eurasian Oystercatchers on Põõsaspea is about a quarter of the total White Sea population (Table 1) as part of the encountered birds belonged to the population at the Gulf of Finland. Age was determined in 1769 birds, out of which juveniles made up 21.7% (n=384), however, only 16.5% when weighted by 10-day migration totals.

Arctic Skua (*Stercorarius parasiticus*). The number of Arctic Skuas was twice as high in 2004 (Table 1). As the migration of Arctic Skua does not embrace the Gulf of Finland, no conclusions about the changes in numbers must be made. Almost no juveniles were sighted (compared to 7% in 2004).

Gulls (*Larus sp.*). Little Gull (*L. minutus*). Migration totals as well as numbers of standard observation times were rather moderate, being about twice as high in 2004 (Table 1). The numbers have also declined during spring migration in Kabli (http://kabli.nigula.ee/) as well as in the Finnish population (BirdLife Finland, unpublished data). Age was determined in 3698 birds, out of which juveniles made up 20% (n=615). The proportion of juveniles remained the same also when weighted by 5-day migration. Weather conditions did not significantly affect the observation processs. Only during late autumn when migrating birds avoided the coastline, and therefore remained out of the visual range.

During the past five years, Black-headed Gulls (*L. ridibundus*) have increased twice in numbers (Table 1). This rise in numbers is not surprising as there was a rather high breeding success in 2009. The proportion of juveniles was 28% (n=8093) and the number of adults (ad+subad) reached 20 588. The proportion of juveniles was even higher when weighted by totals of 5-day periods, and reached 30%. The exact same percentage was observed in 2004 (Ellermaa & Pettay 2006). Part of the adult population could have left already in late June when the observations had not yet begun. During autumn migration, 9% of the Black-headed Gull population was passing through Hanko bird station.

There has been a decline in the number of Lesser Black-backed Gulls (*L. fuscus*) at the Gulf of Finland (Hario & Rintala 2008). It is not clear, which populations migrate through Põõsaspea since three gulls were representing the subspecies *graellsi/intermedius/heuglini*. A rather high number of migrants in September suggest that a large number of birds do not originate from the Gulf of Finland but from breeding grounds elsewhere. Age of all birds was determined: 47 (23%) juveniles, 4 (2-3 calendar year) sub-adults and 151 (> 3 calendar year) adults.

The number of Common Gulls (*Larus canus*) was about the same as in 2004 (Table 1). As no observations were carried out during a period of three weeks, a considerable part of the migration probably remained unseen. Many Common Gulls may migrate in late autumn.

Terns (*Sterna sp.*). The majority of Caspian Terns (*S. caspia*), sighted at Põõsaspea belong to the Finnish population. According to ringing information, Caspian Terns migrate straight to south. Observations at Põõsapea also confirmed that Caspian Terns headed south while most of the migrating bird species were heading southwest. 50-60 km north from Põõsaspea remains one of the largest Caspian Tern populations. Probably a large proportion of migrating

Caspian Terns, observed at Põõsaspea, belong to this population (one staging juvenile was wearing a Finnish ring).

Among Sandwich Terns (*S. sandvicensis*), wandering preceding autumn migration rather than migration as such was observed. A remarkable proportion of observed birds were heading east. Same trajectory was observed in 2004. A large number of birds probably repeatedly passed the observation post. Feeding trips and wandering of the Sandwich Tern extend to Naissaar, also confirmed by observations made from Pakri Peninsula. The proportion of juveniles was 32.5%.

Numbers of standard observation times demonstrate that migration totals of the Common Tern (*S. hirundo*), Arctic Tern (*S. paradisaea*) and unidentified terns (*S. hirundo/paradisaea*) in autumn 2009 and 2004 were similar, reaching up to 12 179 specimen in both years. As the number of unidentified terns varied among years, no conclusions must be drawn upon changes in the proportion of these two species. Totals of the season were clearly higher in 2009 compared to 2004. However, in 2009 observations were made during a longer mid-day period – a time when active migration of terns took place. Breeding success of the Common Tern was lower in 2009. The proportion of juveniles was 18.2% in 2009, while 22.5% in 2004 (Ellermaa & Pettay 2006). At the Gulf of Finland breeding success of terns and gulls was affected by pouring rain in the beginning of June that lasted for three days (BirdLife Finland, unpublished data).

The number of Little Terns (*S. albifrons*) was remarkably higher in 2009 (Table 1), even though the population remaining east of Põõsaspea is small. Breeding success was probably very low since the proportion of juveniles was only 13%, which in order to maintain a stable population needs to be twice as high (RSPB).

The number of Black Terns (*Chlidonias niger*) was lower compared to 2004. The proportion of juveniles was high, reaching up to 47.6%.

Discussion

In 2009, breeding success of arctic birds was very low (Tabel 3). A clearly higher breeding success was observed among species whose range is closer to Põõsapea (*e.g.* gulls and terns). Breeding success of the arctic birds strongly depends on the number of Lemmings and other rodents, specifically the 3-4 year population cycles (Kokorev & Kuksov 2002, Hario 2009). In peak population years, gulls, skuas, Arctic Fox (*Alopex lagopus*), Stoat (*Mustela erminea*) and a few raptors mostly feed on rodents, while in the low phase of the cycle predators mostly feed on birds. The population density of lemmings was

probably low in 2009 considering the poor breeding success of all arctic species, for example Brent Goose and Long-tailed Duck (Ebbinge 2004, Hario 2009). On Taimyr Peninsula, the 3-4 year rodent cycles started disappearing in mid-1990s and there are no peak years anymore (Kokorev & Kuksov 2002, Hario 2009). Latter is probably due to global warming. Also oil spill, hunting and other factors occurring at wintering grounds or on flyway might affect some bird species by causing stress. In case population cycles of the Lemming do not recover, a probable decline in the Common Scoter numbers is expected in near future. The number of Long-tailed Ducks and Brent Geese have already declined (see the results chapter) while the number of Greater Scaups and Velvet Scoters are probably in downtrend (Table 1).

The extensive breeding grounds and flyways of several bird species in tundra and northern taiga partly remain unlocated, and thus make it difficult to estimate the population size. Hence, in terms of bird conservation, lack of the most basic information (population dynamics) makes it problematic to determine the degree of threat as well as the cause for it. Therefore, censuses should be taken on areas which enable to observe the maximum number of species with the least possible effort. For instance, census of several waders can only be taken in wintering grounds and stopover sites where the majority of the population is gathering (Delany *et al*. 2009).

The singularity of the Põõsaspea Cape comes from a high number of migrating arctic ducks. Moreover, a close passage of migrants often enables to also determine the gender and age of the migrants. On the northern coast of the Gulf of Finland it is not possible to obtain data neither on gender nor age of almost any migratory bird species (www.tiira.fi).

For that reason, the most efficient way for monitoring migrating arctic waterfowl at the Baltic Sea is to take regular censuses at Põõsaspea Cape. However, as it is not possible to obtain full data on population dynamics at one single monitoring point, additional observations along the entire flyway as well as at breeding grounds are required. The advantage of Põõsaspea lies in the utility of already conducted monitorings that provides information on large populations at a glance. In most publications upon general topics, data is obtained by nonstandard methods and collected at discontinuous intervals. Often information has already expired by the time it is published (eg Scott & Rose 1996, BirdLife 2004, Wetlands International 2006). Data collected at Põõsaspea would be easily accessible for discussions held annually on the Globally Threatened Birds Forum.

At Põõsaspea Cape censuses are repeated after every 5 years which is also the longest permitted interval between two censuses. Even though this interval

also seems too long for calibrating demographic parameters or for distinguishing tendencies of some species from their natural cyclic breeding success. Future autumn censuses should be taken between July 1st and December 15th and without any discontinuance. Even this period of time is not enough and migration of some species (Steller's Eider, Goosander, Mute Swan) will to some extent remain unrecorded.

In 2009 there was no occurrence of any major oil spills within a radius of 100 km from Põõsapea. One oiled bird was sighted on September 26th which was a Lesser Black-backed Gull (adult) who landed on a stone at the top of the peninsula.

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