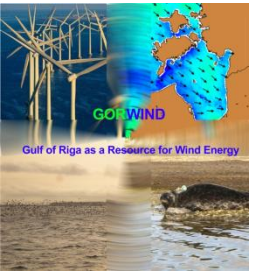
WP3 Birds

Ainars Aunins



Latvijas Dabas fonds

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EMÜ
Estonian University of Life Sciences

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European Union
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Gulf of Riga is among 4 most important bird areas of the Baltic Sea
Ca 1.5 million wintering waterbirds

Tasks and outputs of the WP3 (birds)

- Collection and analysis of existing data
  - Output: Report on bird densities and distributions 2001 - 2010
- Planning of surveys
  - Output: survey design, data collection protocols, etc.
- Manual on field survey methods
  - Output: Printed manual

Tasks and outputs of the WP3 (birds)

- Bird surveys
  - Transect aerial counts (ca 4000km, 5 times)
    - Spring (2 surveys)
    - Summer
    - Autumn
    - Winter
  - Breeding birds (ca 50 islands)
    - EE only

- Spatial modelling of bird distribution
  - Output: bird distribution and density maps

Collection and analysis of existing data

Dataset	Period	Area	Method
Mid-winter waterfowl counts	2001 - 2009 (1993 – 2011)	Gulf of Riga / Baltic sea	Coastal count by foot
Baltic MPA Bird database	2006 - 2008	Gulf of Riga / Baltic sea	Ship counts
Gretagrund MPA	2008 - 2009	Gretagrund/Ruhnu	Ship counts
National goose monitoring	2002; 2005; 2008	Estonian coast of the Gulf of Riga	Aerial counts
National swan monitoring	2001; 2004; 2007; 2010	Estonian coast of the Gulf of Riga	Coastal count by foot
Counts of moulting Goldeneyes	2004 - 2006	GoR: Engure – Mērsrags; Tūja - Ainaži	Coastal count by foot

Old data report

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ENVIRONMENTAL INVESTMENT CENTRE

Gulf of Riga as a resource for wind energy -GORWIND

Deliverable WP 3.2

Historical overview: Distribution and numbers of birds during non-breeding period in Gulf of Riga 2001-2010

Ainars Aunins, Latvian Fund for Nature
Andres Kuresoo & Leho Luigujõe,
Estonian University of Life Sciences
Antra Stipniece, Latvian Ornithological Society

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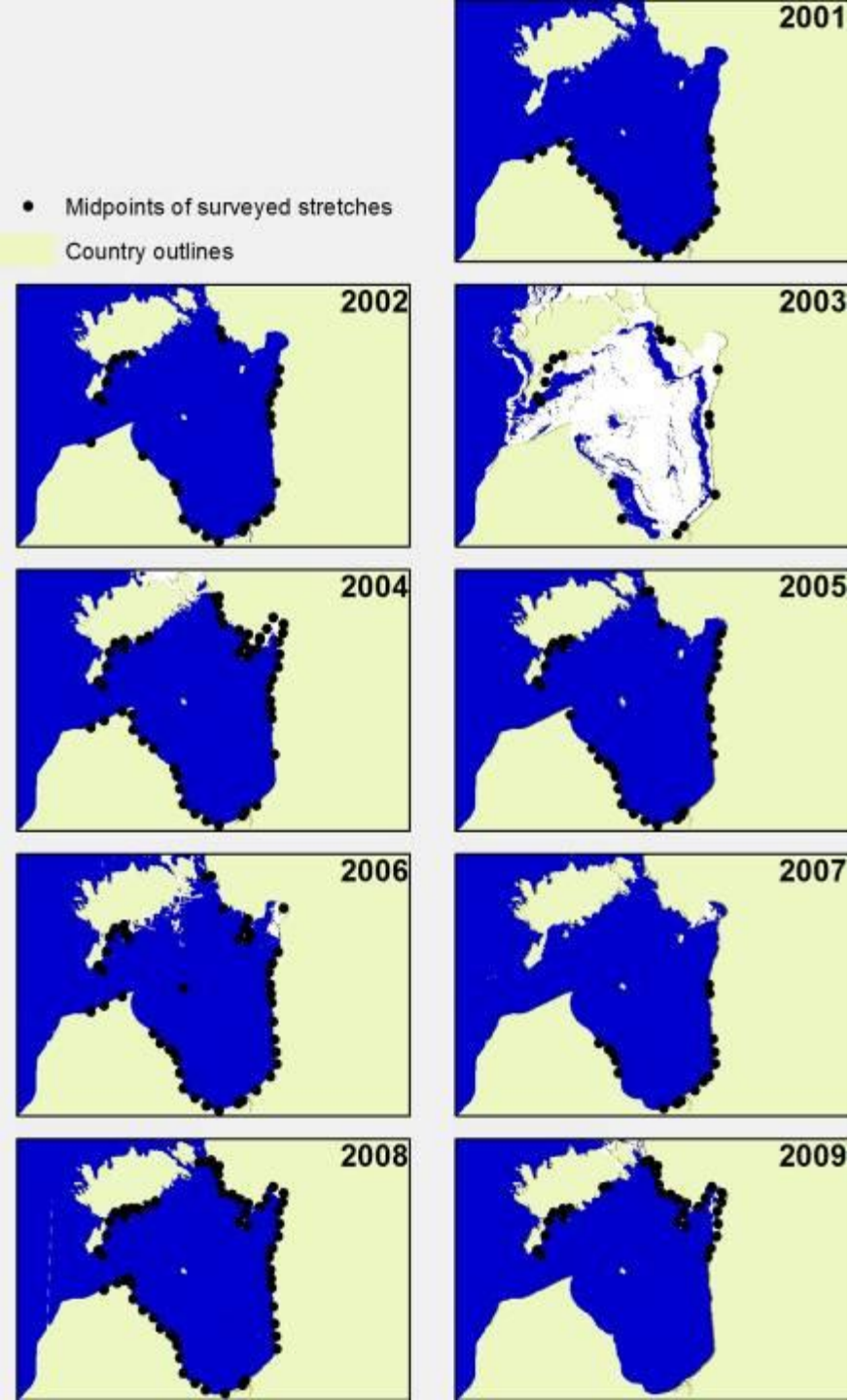
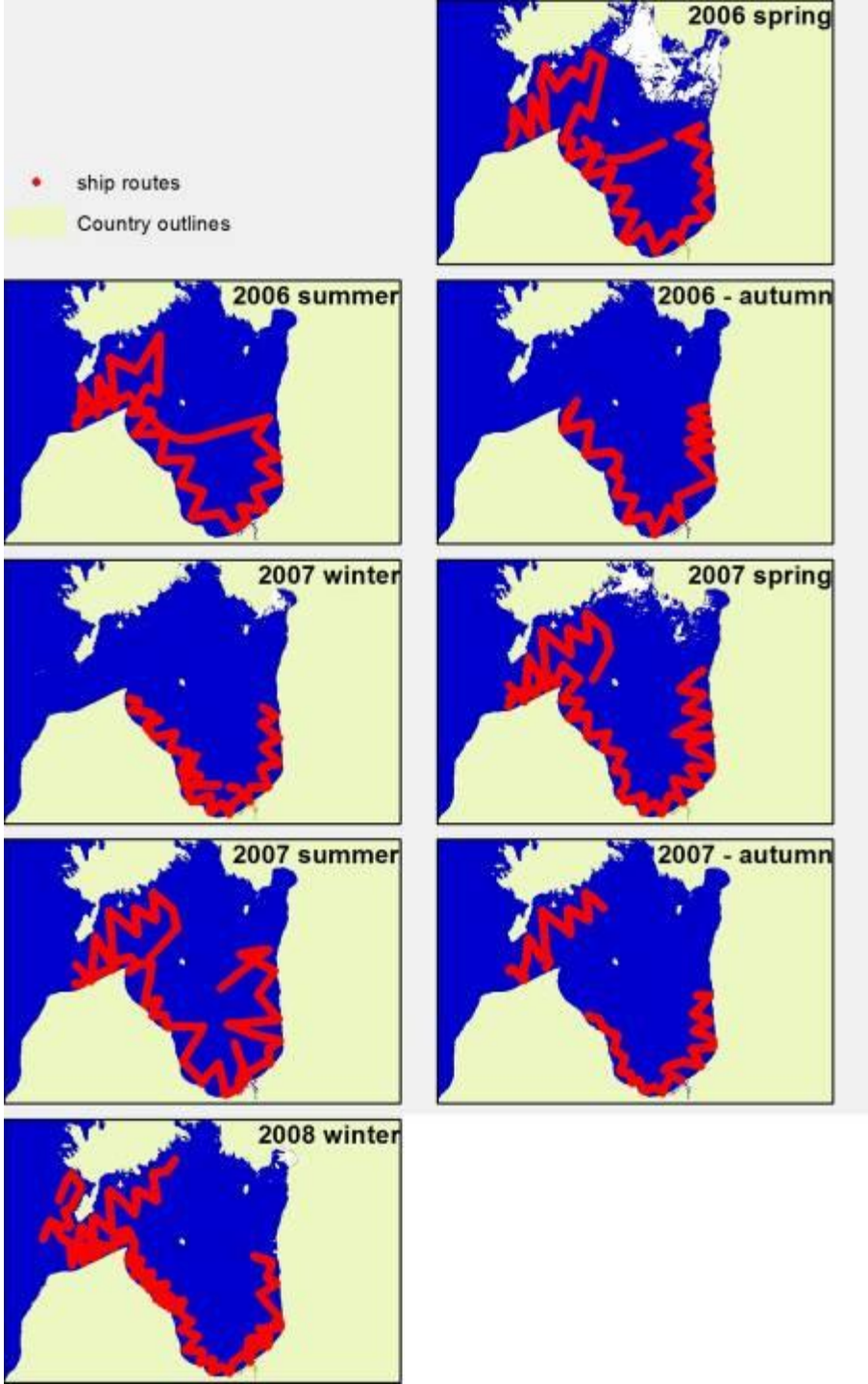
Latvijas Ornitoloģijas biedrība

Riga-Tartu 2011

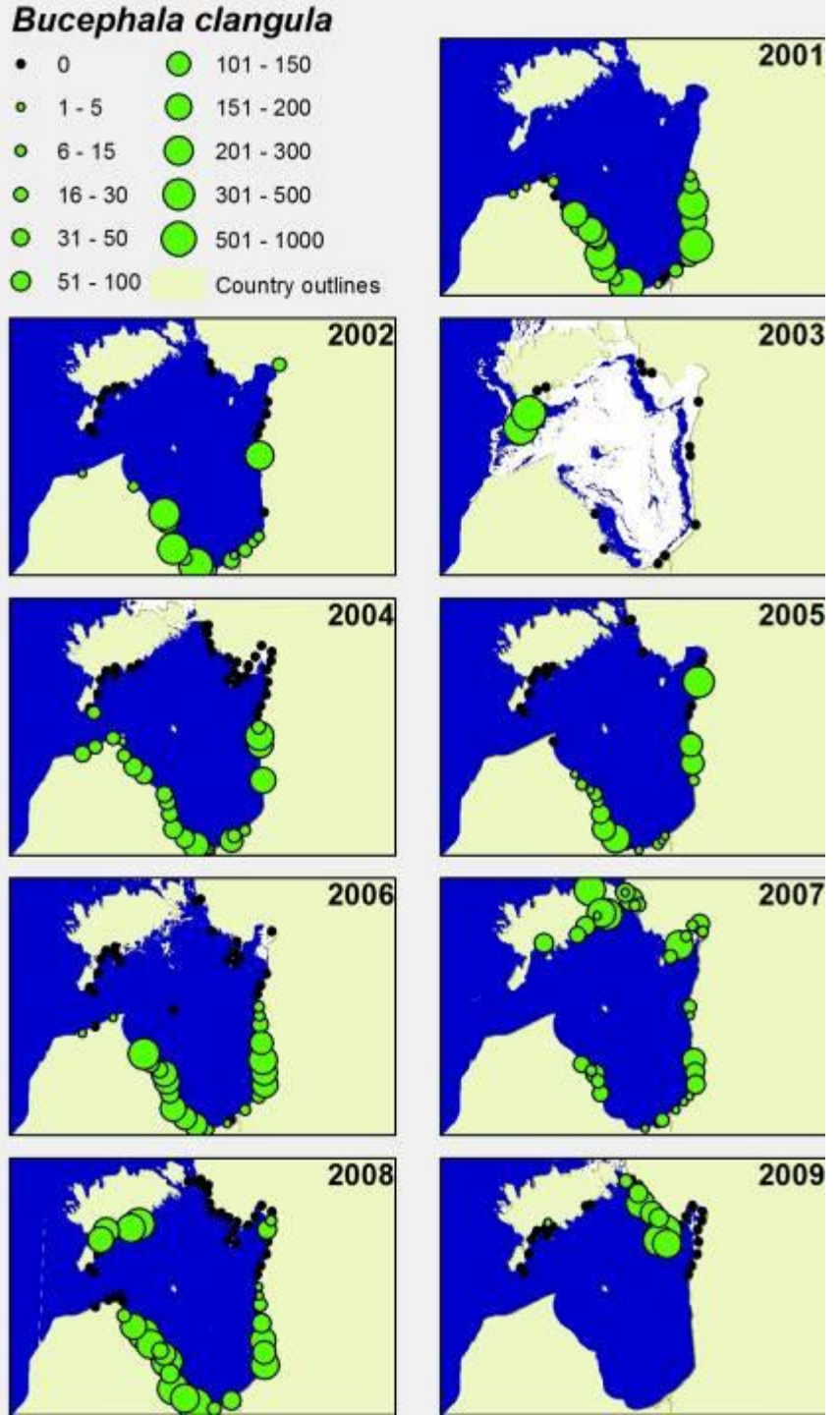
IWC midwinter counts



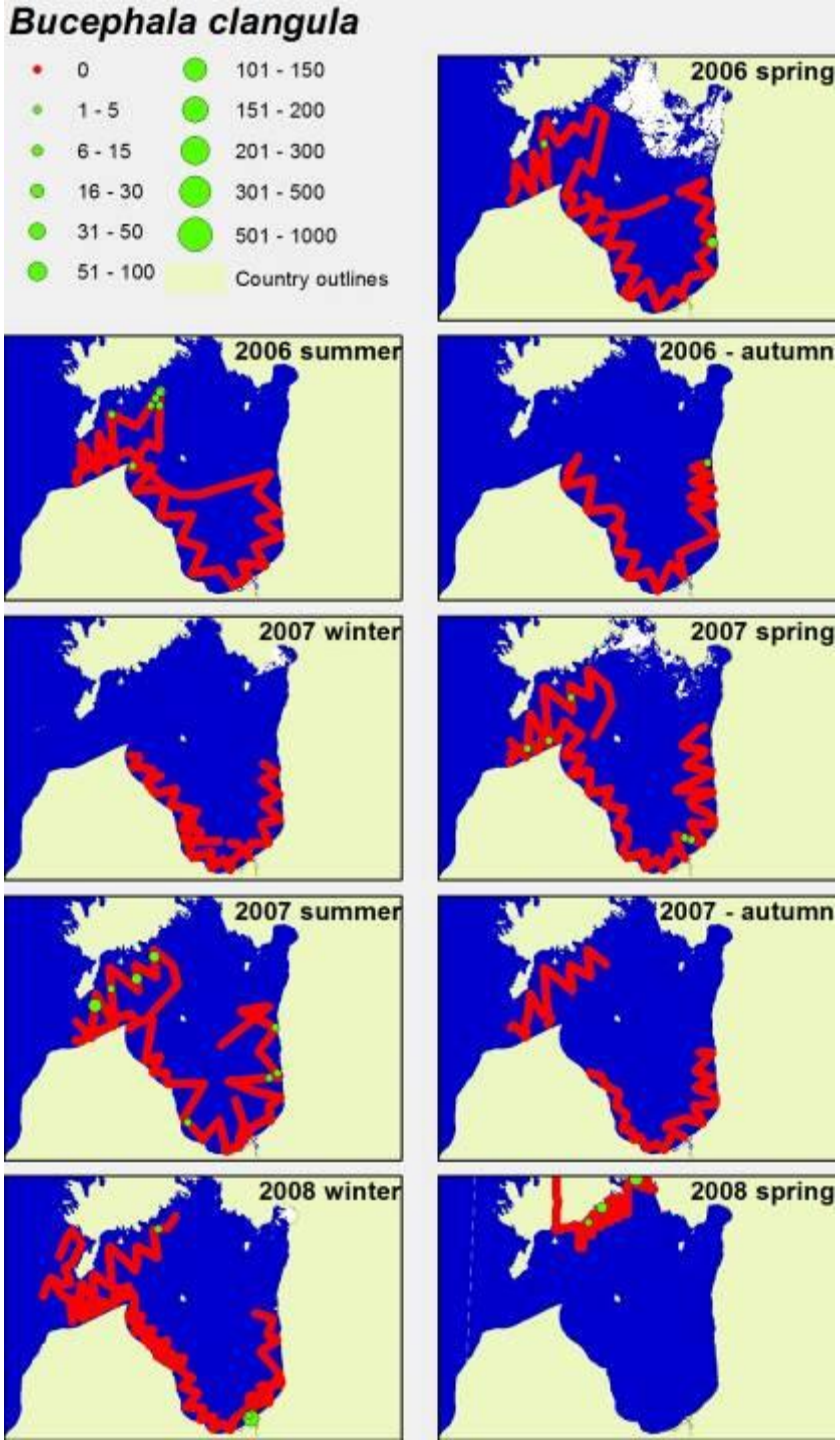
Ship counts


ship routes
Country outlines
2006 spring
2006 summer
2006 - autumn
2007 winter
2007 spring
2007 summer
2007 - autumn
2008 winter

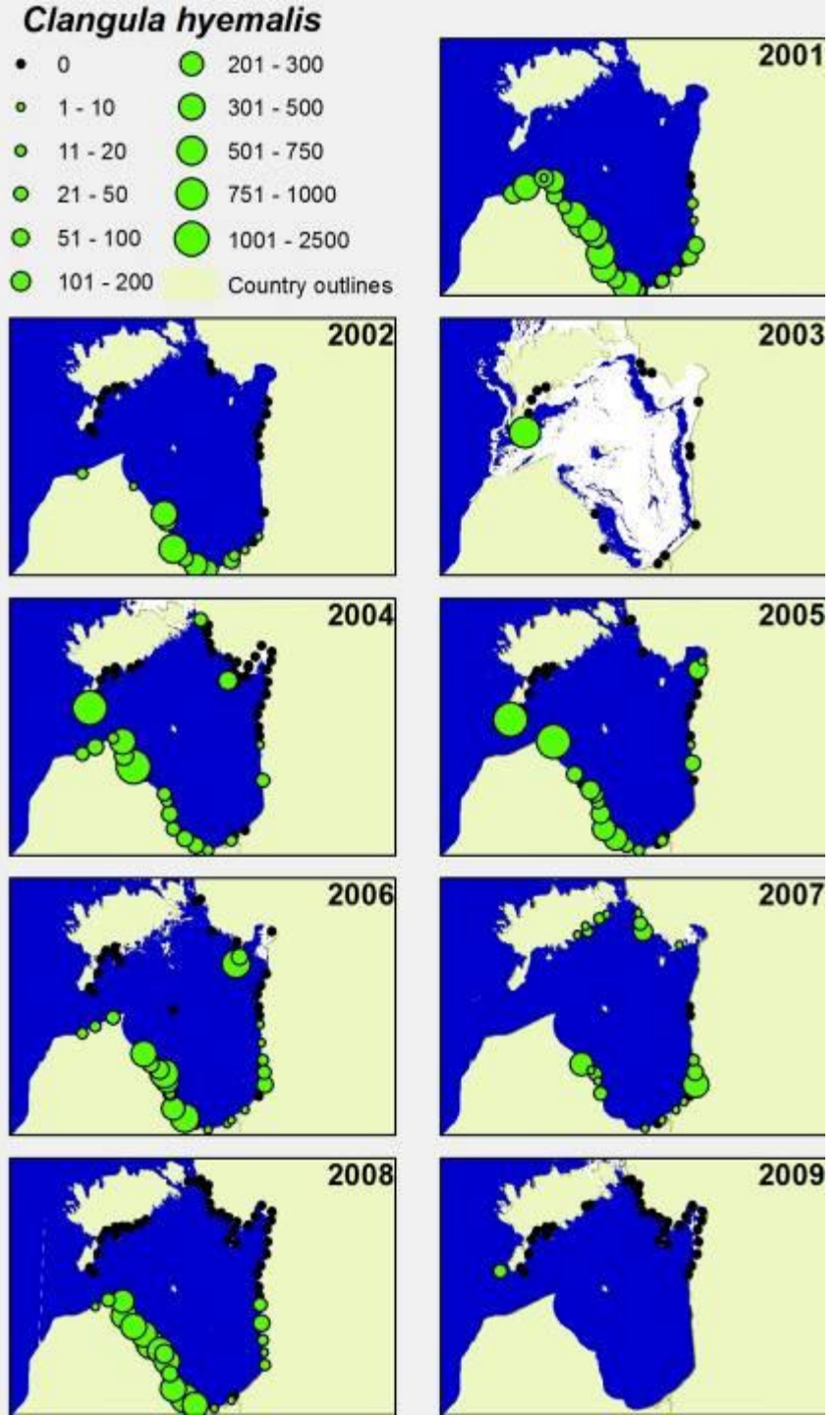
Goldeneye


Bucephala clangula
0
1 - 5
6 - 15
16 - 30
31 - 50
51 - 100
101 - 150
151 - 200
201 - 300
301 - 500
501 - 1000
Country outlines
2001
2002
2003
2004
2005
2006
2007
2008
2009

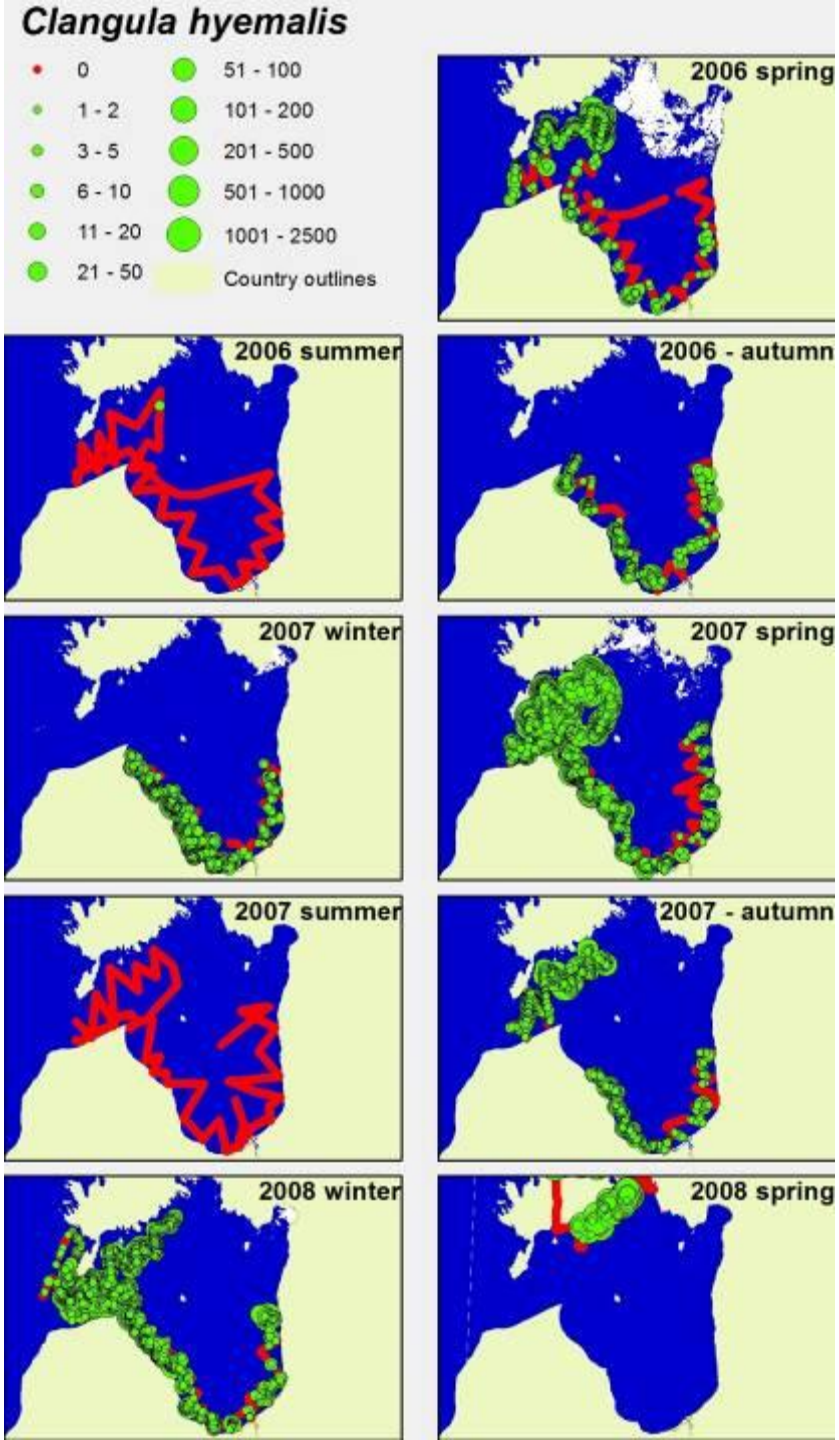
Goldeneye


Bucephala clangula
0
1 - 5
6 - 15
16 - 30
31 - 50
51 - 100
101 - 150
151 - 200
201 - 300
301 - 500
501 - 1000
Country outlines
2006 spring
2006 summer
2006 - autumn
2007 winter
2007 spring
2007 summer
2007 - autumn
2008 winter
2008 spring

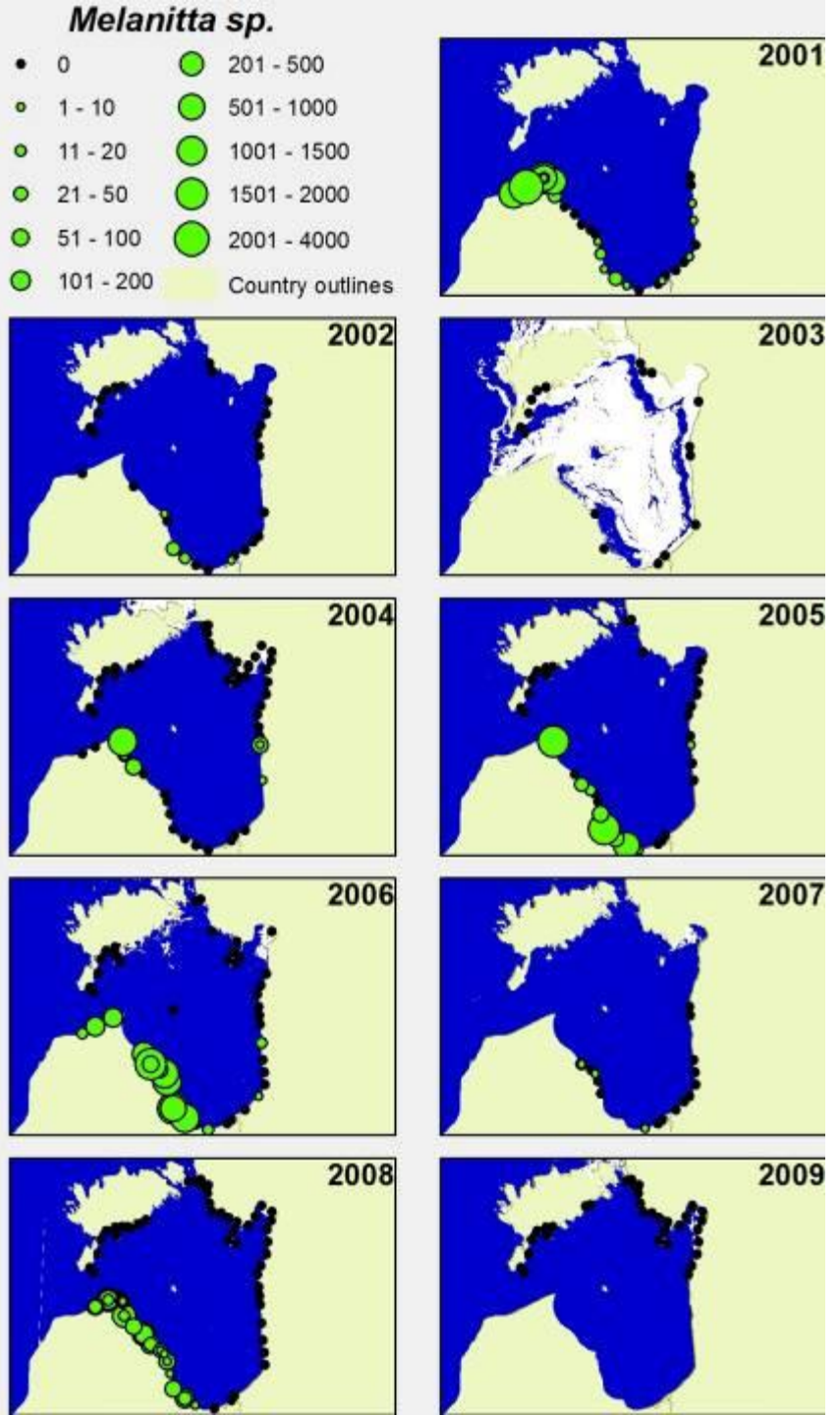
Long-tailed Ducks



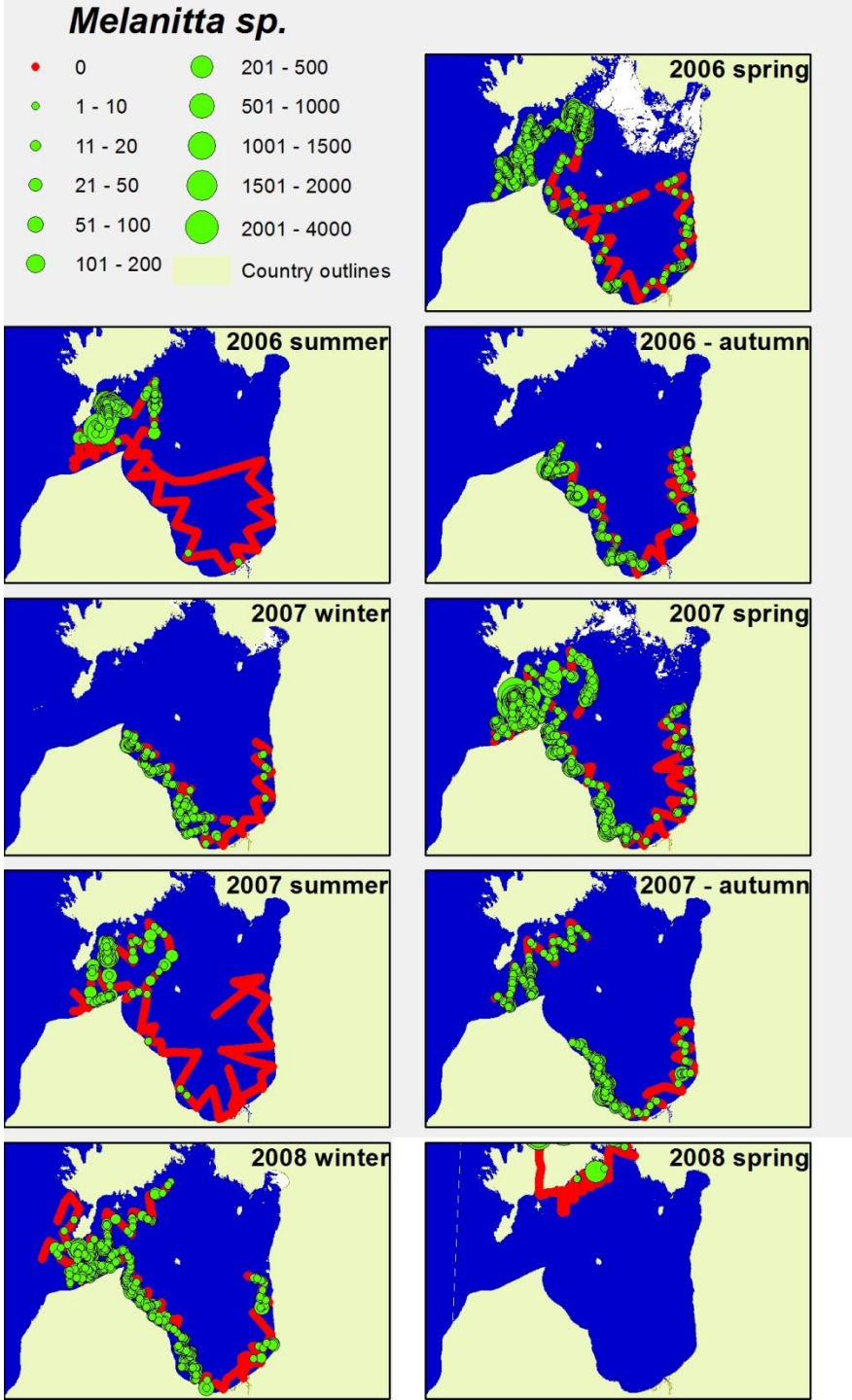
Long-tailed Ducks



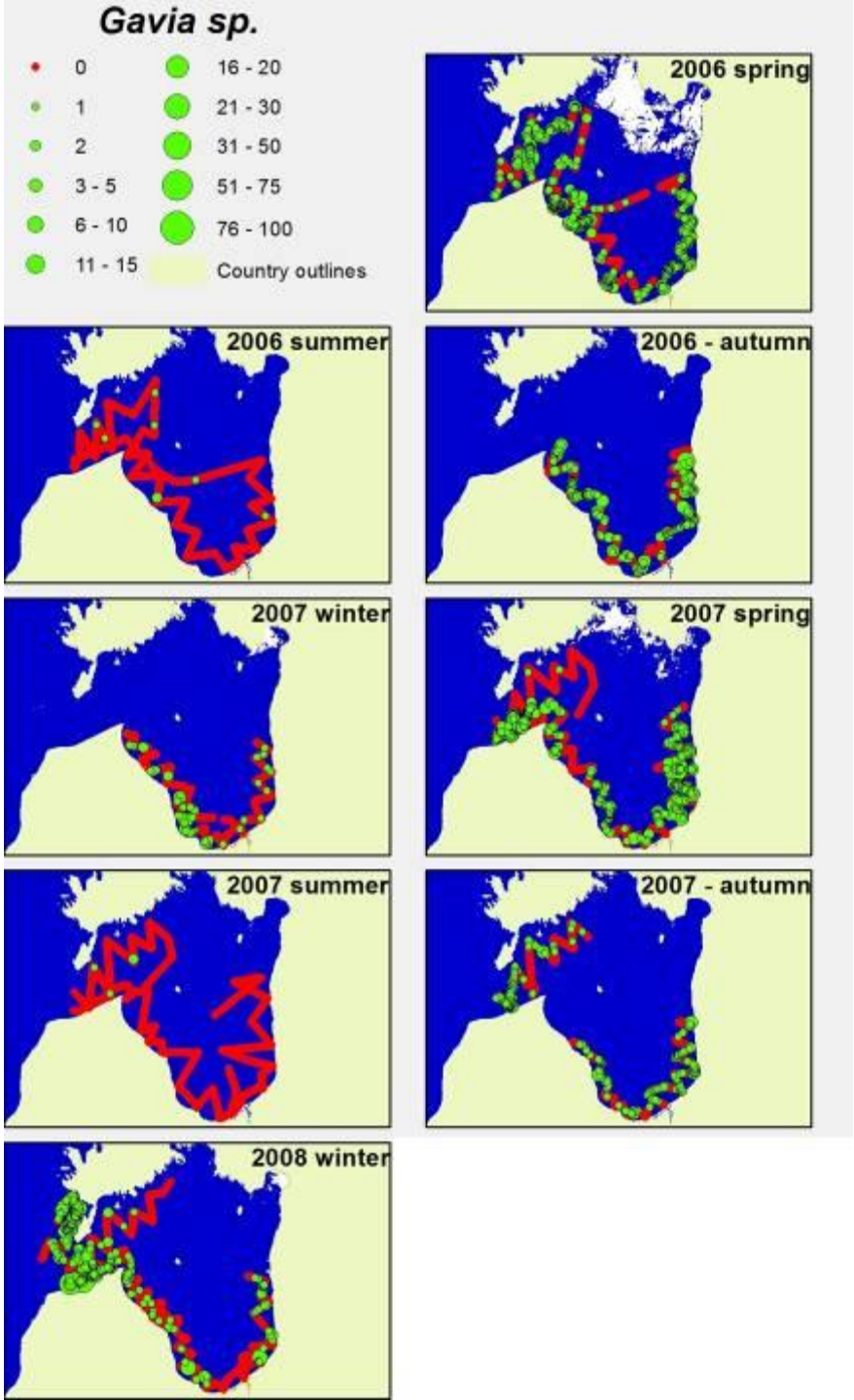
Scoters


Melanitta sp.
0
1 - 10
11 - 20
21 - 50
51 - 100
101 - 200
201 - 500
501 - 1000
1001 - 1500
1501 - 2000
2001 - 4000
Country outlines
2001
2002
2003
2004
2005
2006
2007
2008
2009

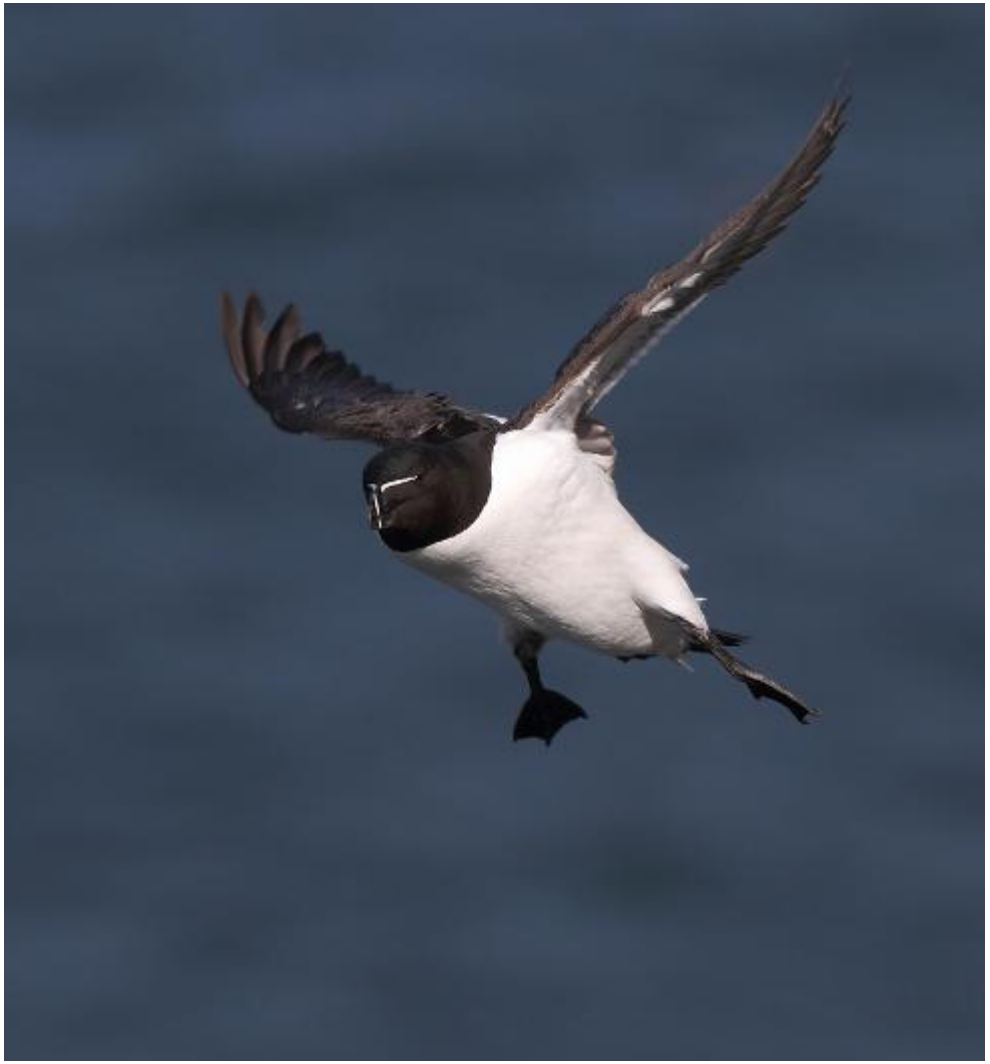
Scoters

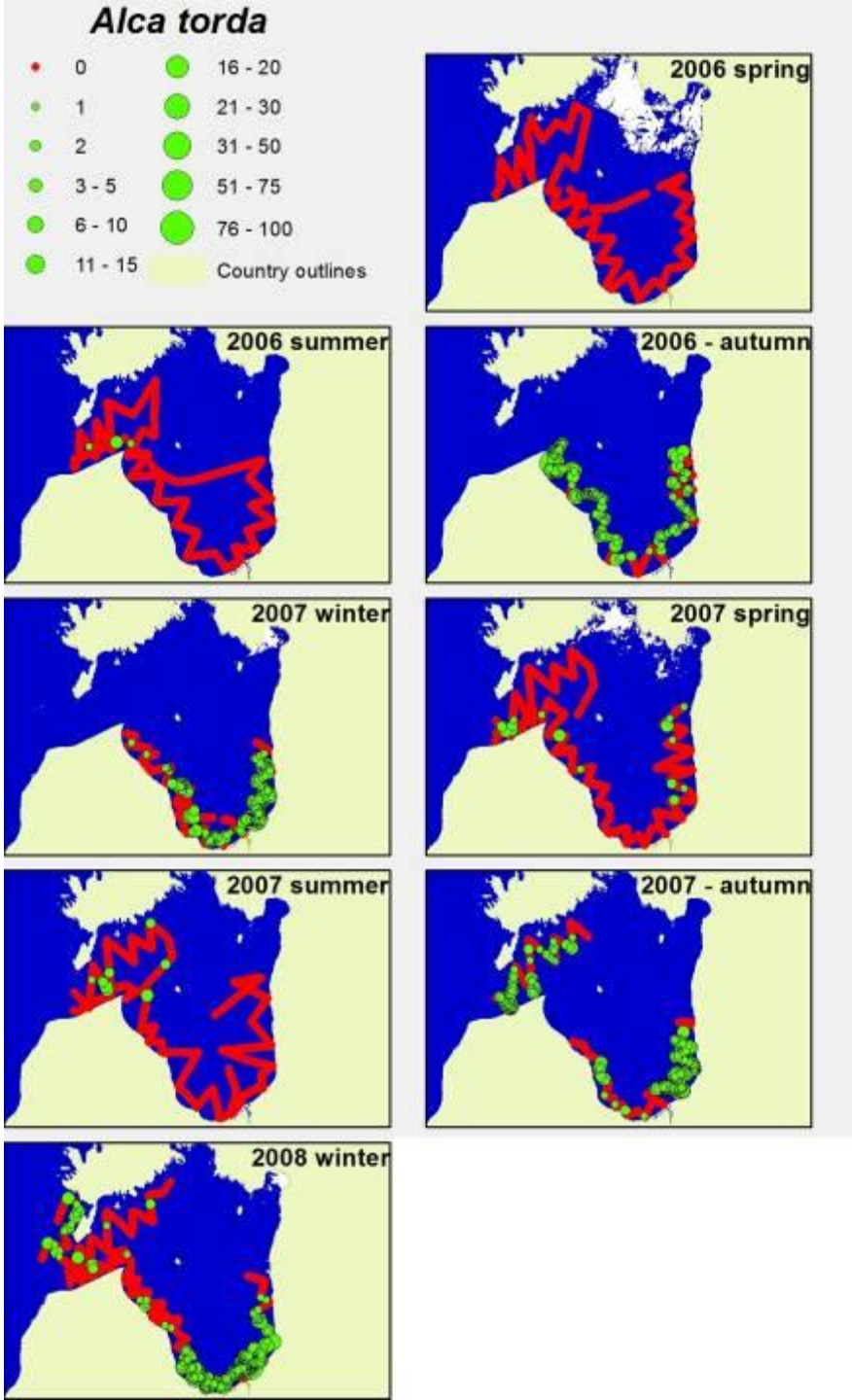

Melanitta sp.
0
1 - 10
11 - 20
21 - 50
51 - 100
101 - 200
201 - 500
501 - 1000
1001 - 1500
1501 - 2000
2001 - 4000
Country outlines
2006 spring
2006 summer
2006 - autumn
2007 winter
2007 spring
2007 summer
2007 - autumn
2008 winter
2008 spring

Divers

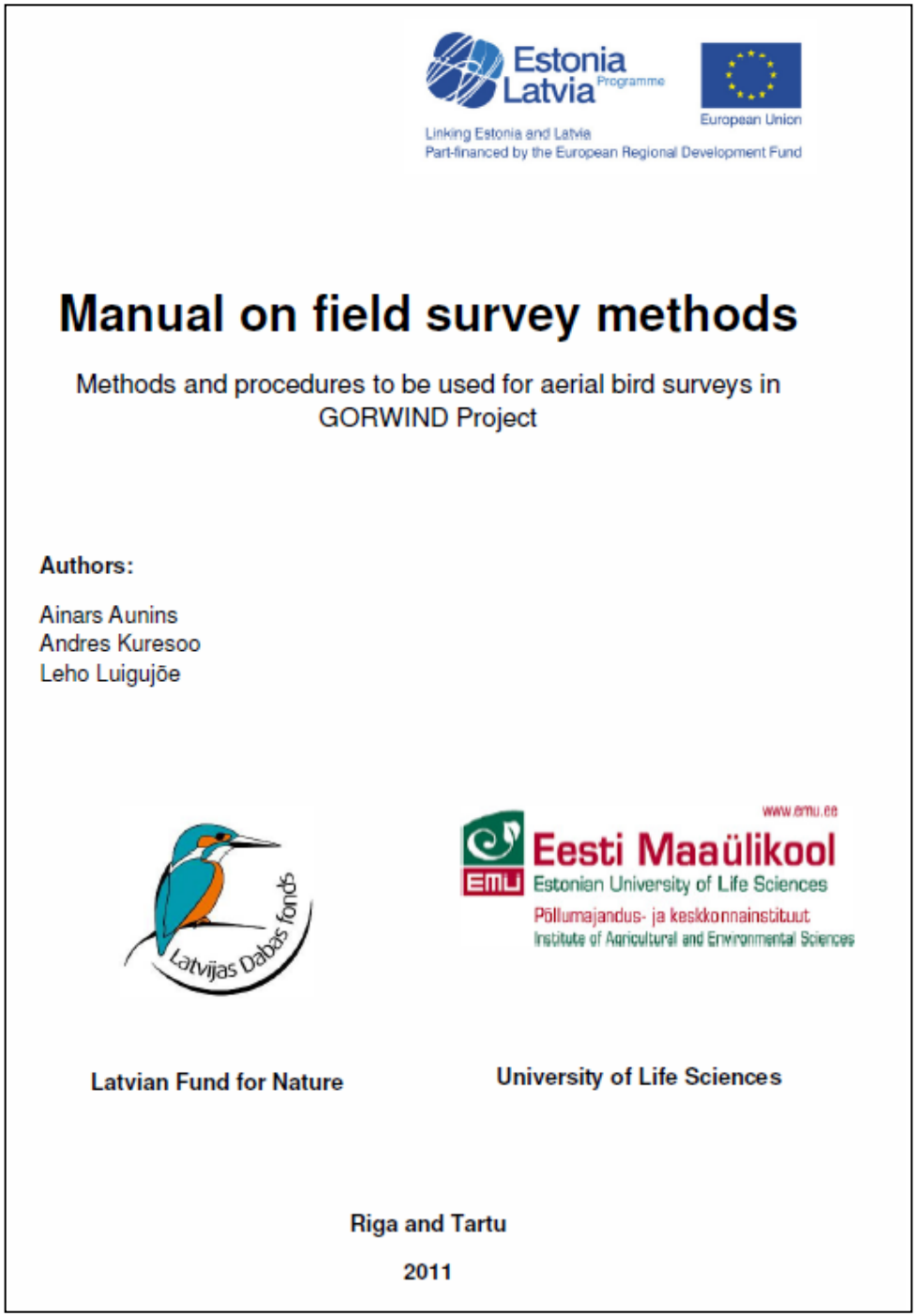

Gavia sp.
0
1
2
3 - 5
6 - 10
11 - 15
16 - 20
21 - 30
31 - 50
51 - 75
76 - 100
Country outlines
2006 spring
2006 summer
2006 - autumn
2007 winter
2007 spring
2007 summer
2007 - autumn
2008 winter

Razorbill




Alca torda
0
1
2
3 - 5
6 - 10
11 - 15
16 - 20
21 - 30
31 - 50
51 - 75
76 - 100
Country outlines
2006 spring
2006 summer
2006 - autumn
2007 winter
2007 spring
2007 summer
2007 - autumn
2008 winter

Manual for fieldwork



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Manual on field survey methods

Methods and procedures to be used for aerial bird surveys in GORWIND Project

Authors:

Ainars Aunins
Andres Kuresoo
Leho Luigujõe

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Eesti Maaülikool
EMU
Estonian University of Life Sciences
Põllumajandus- ja keskkonnainstituut
Institute of Agricultural and Environmental Sciences

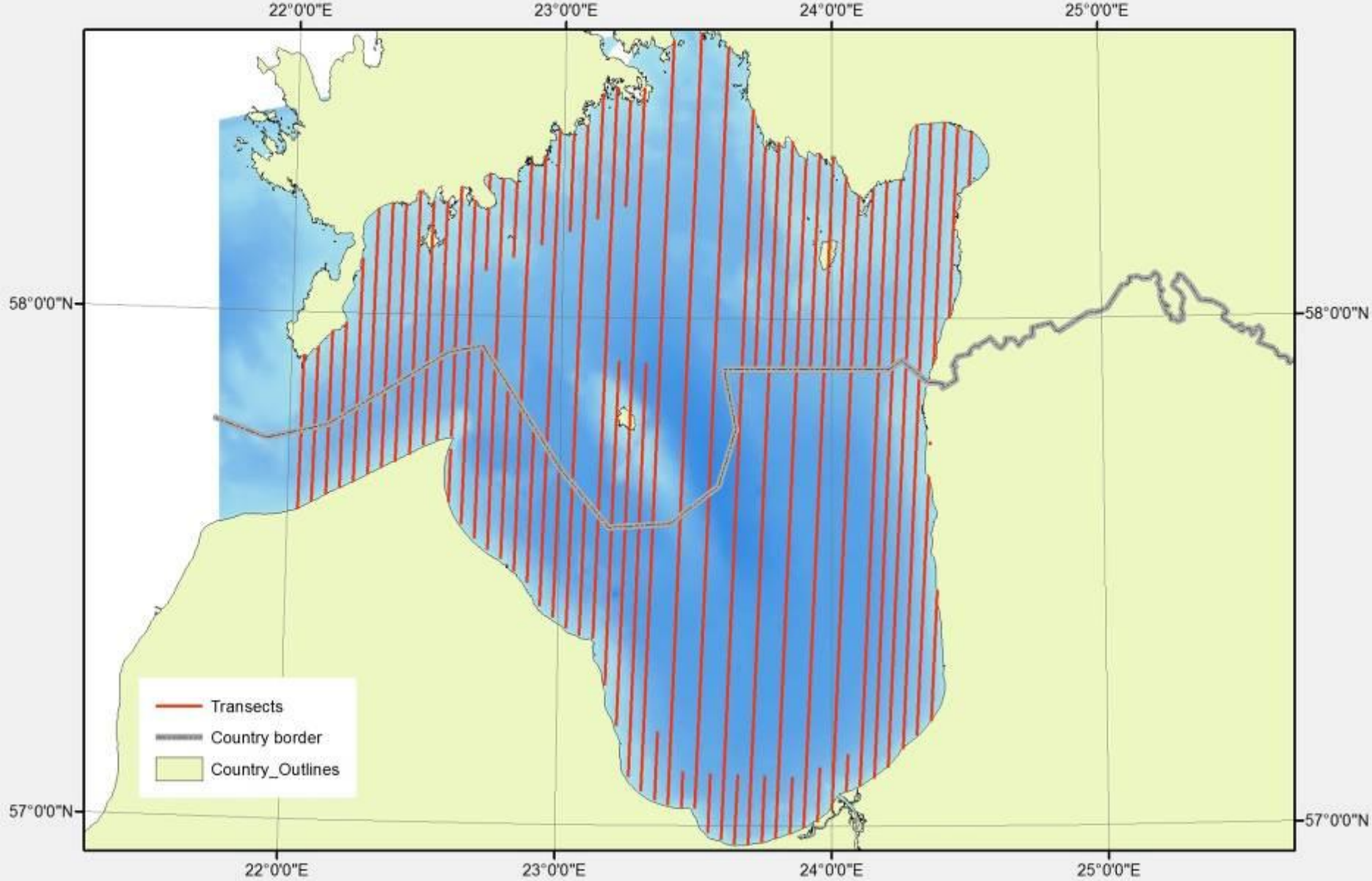
Latvian Fund for Nature

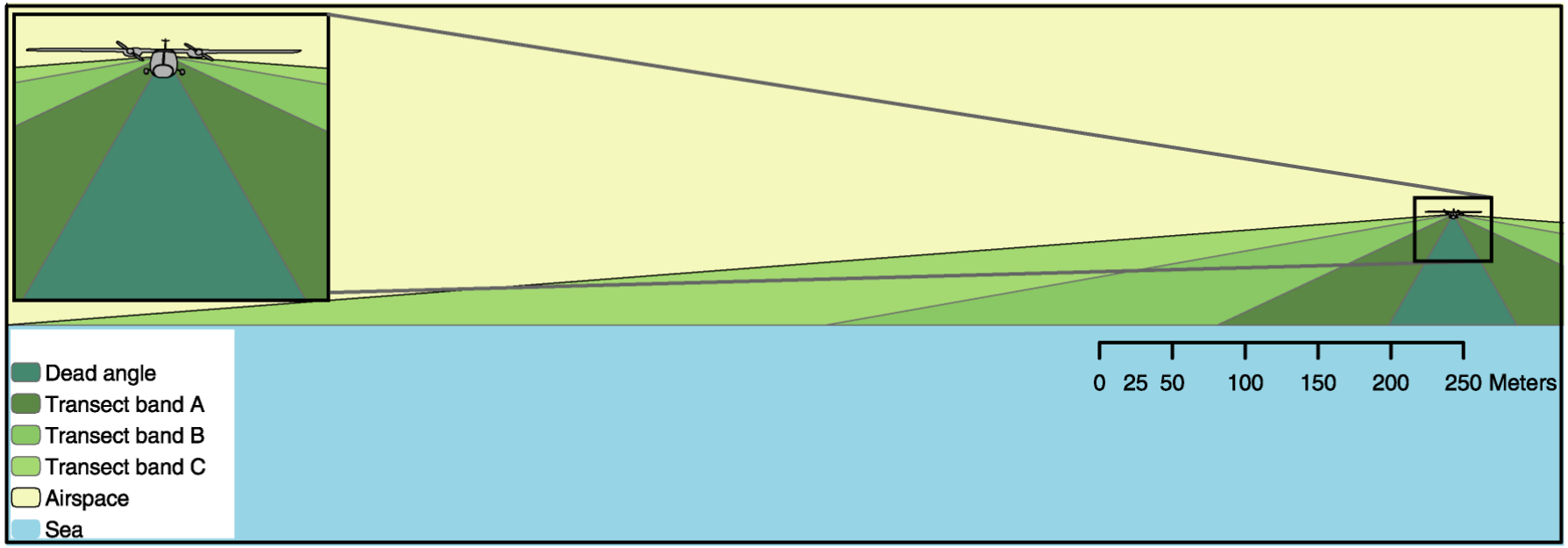
University of Life Sciences

Riga and Tartu

2011

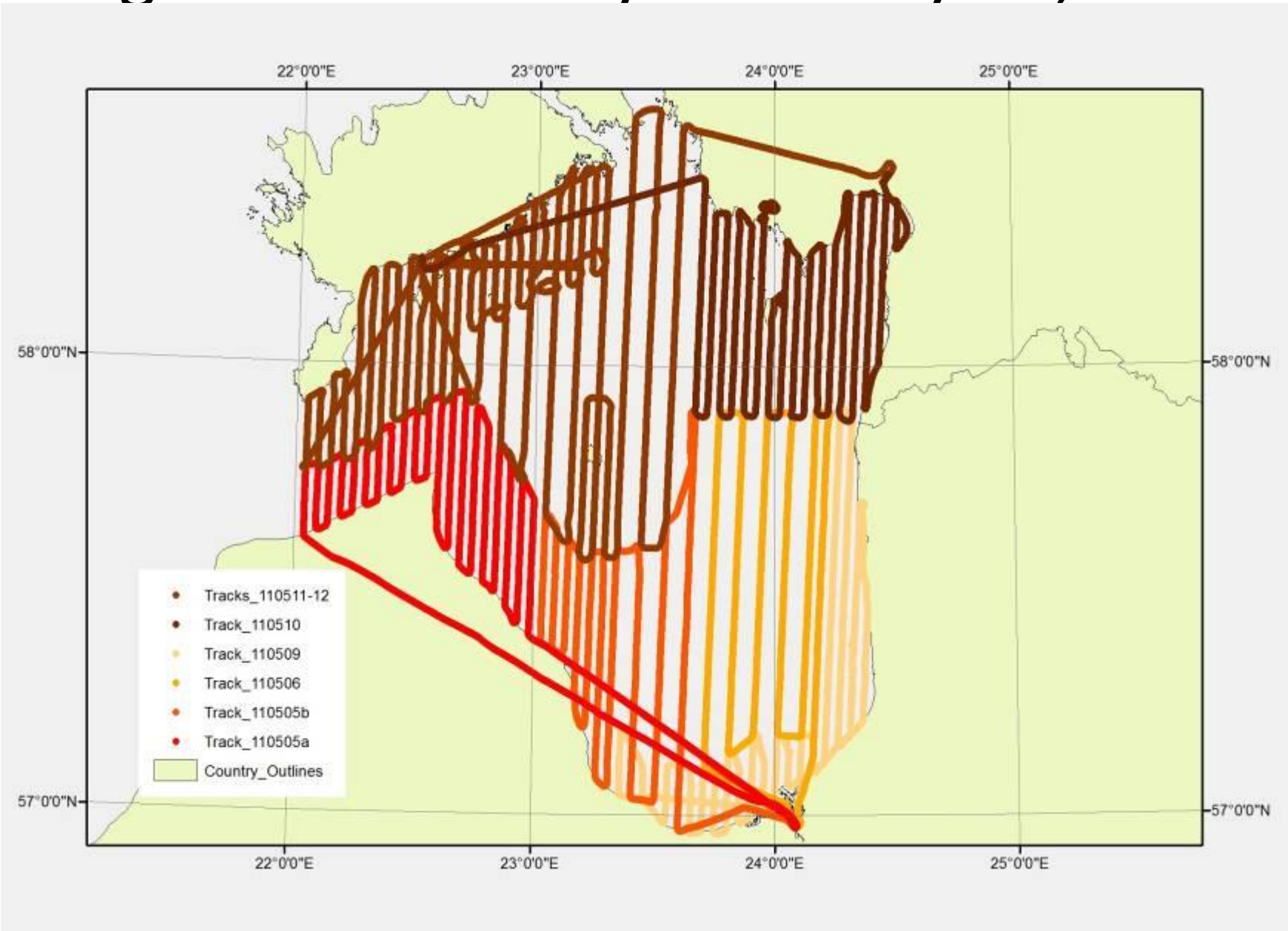
Fieldwork


22°0'0"E
23°0'0"E
24°0'0"E
25°0'0"E
58°0'0"N
57°0'0"N
Transects
Country border
Country_Outlines



Band	Boundary distances (m) from trackline	Declination in degrees from the horizon
A	44-163	60-25
B	164-432	25-10
C	433-1000	10-4
D	>1000	<4

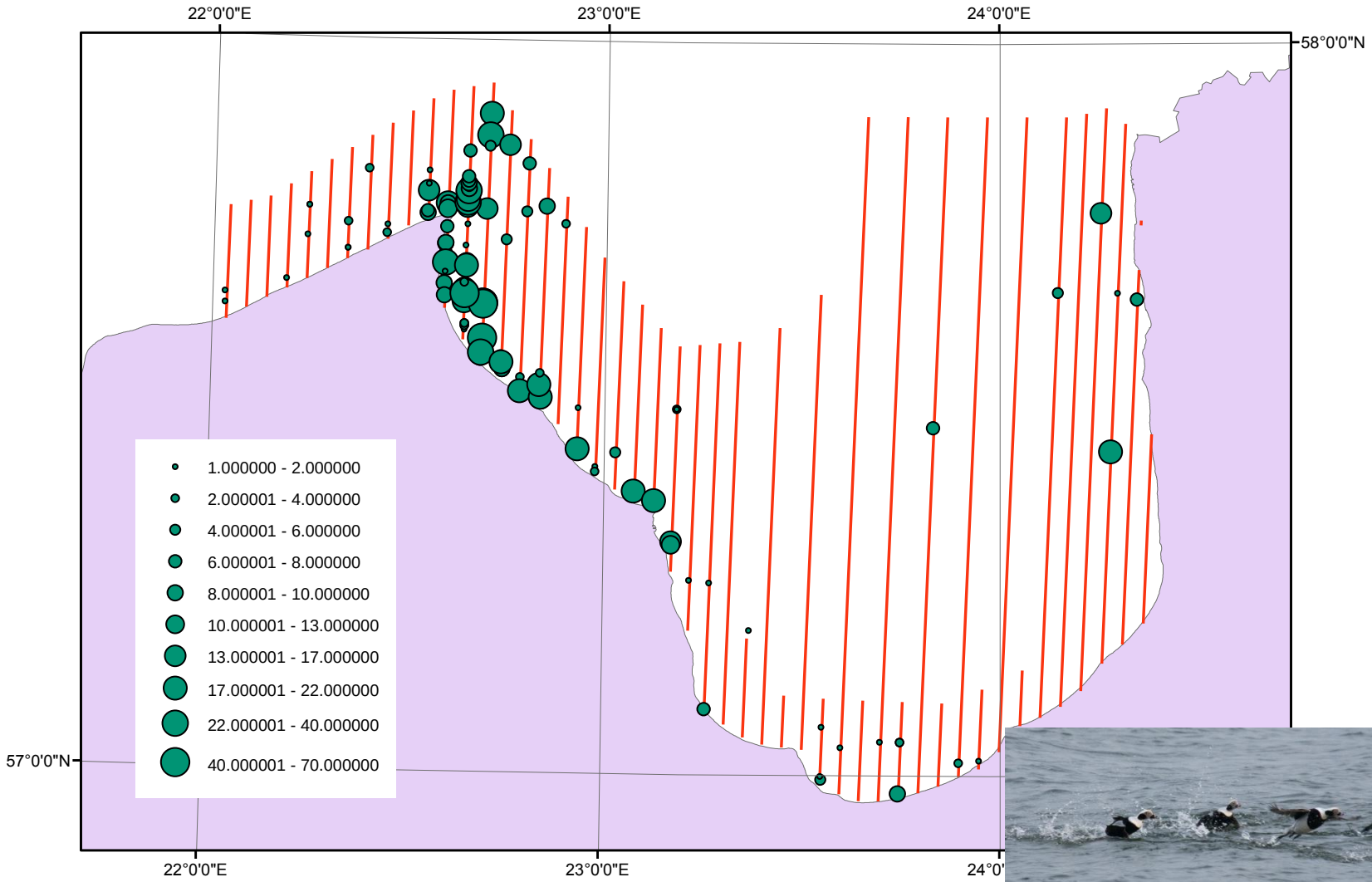
Flight tracks – May 05 – May 12, 2011



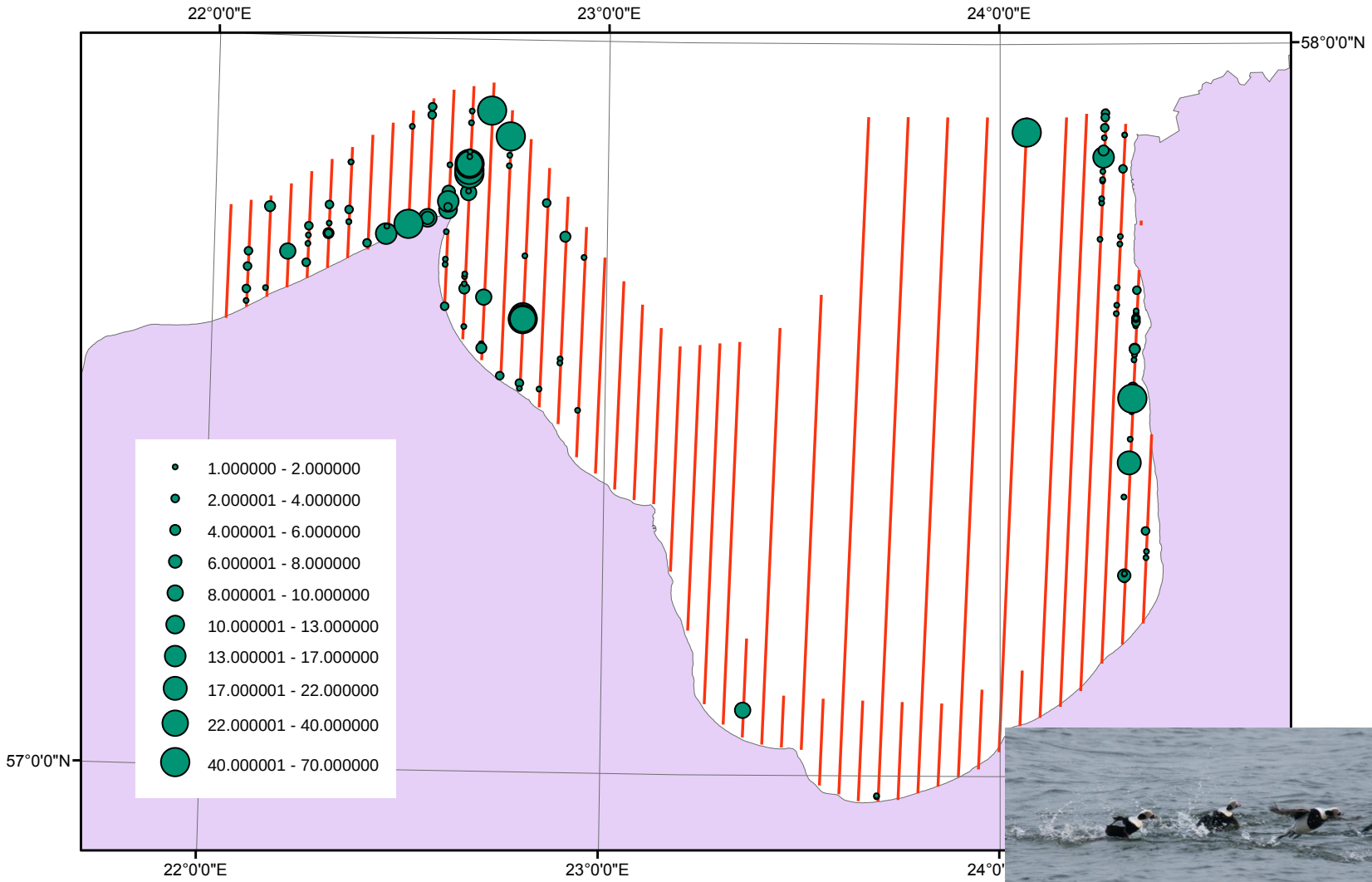
Fieldwork

- Completed flight sessions
  - Spring 1 (April 2011 – LV only)
  - Spring 2 (May 2011)
  - Summer (July – August 2011)
  - Autumn (October 2011)
- Remaining flight sessions
  - Winter (January - February 2012)
  - Spring 1 (April 2012 – EE only)

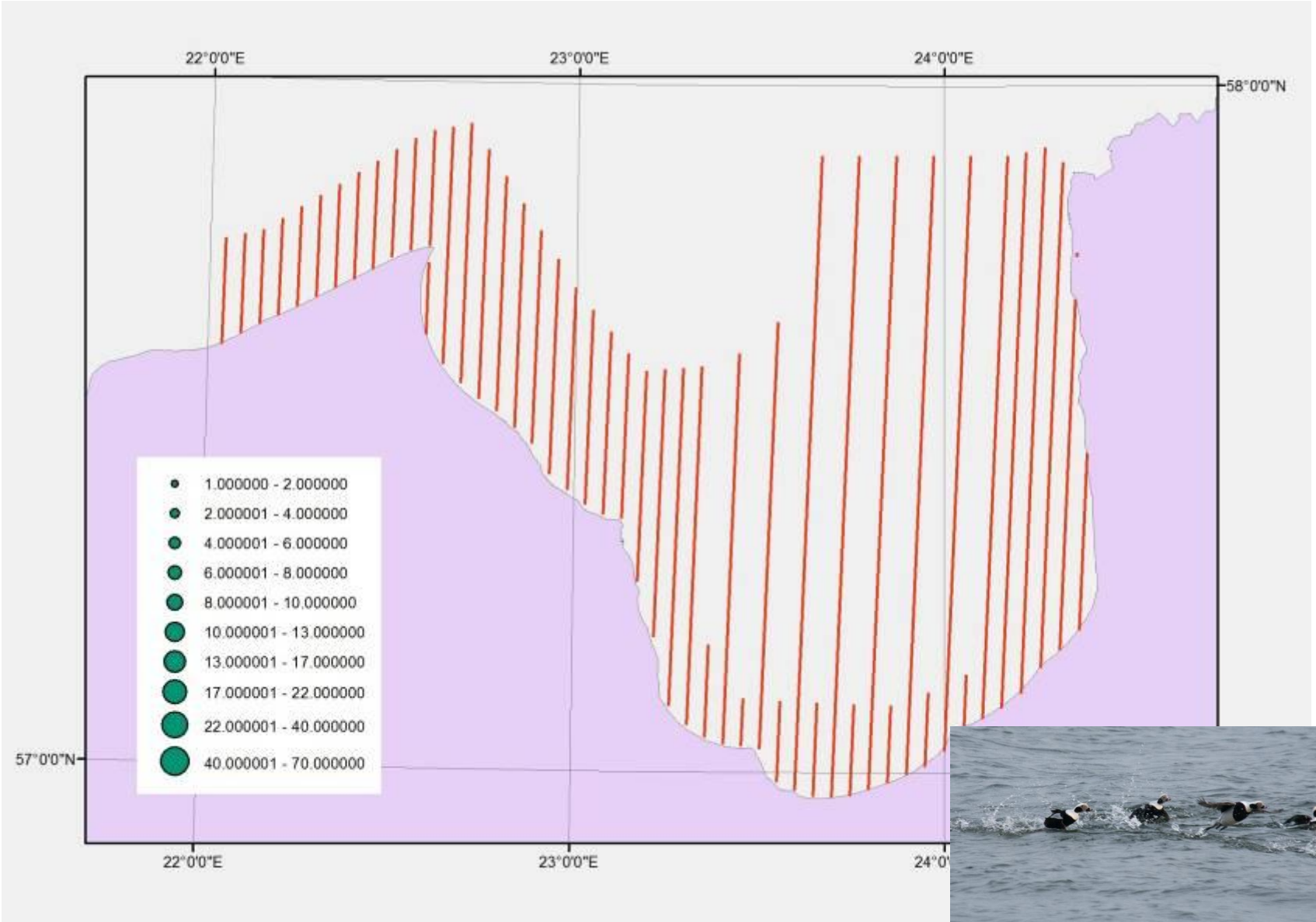
Clangula hyemalis – April 2011

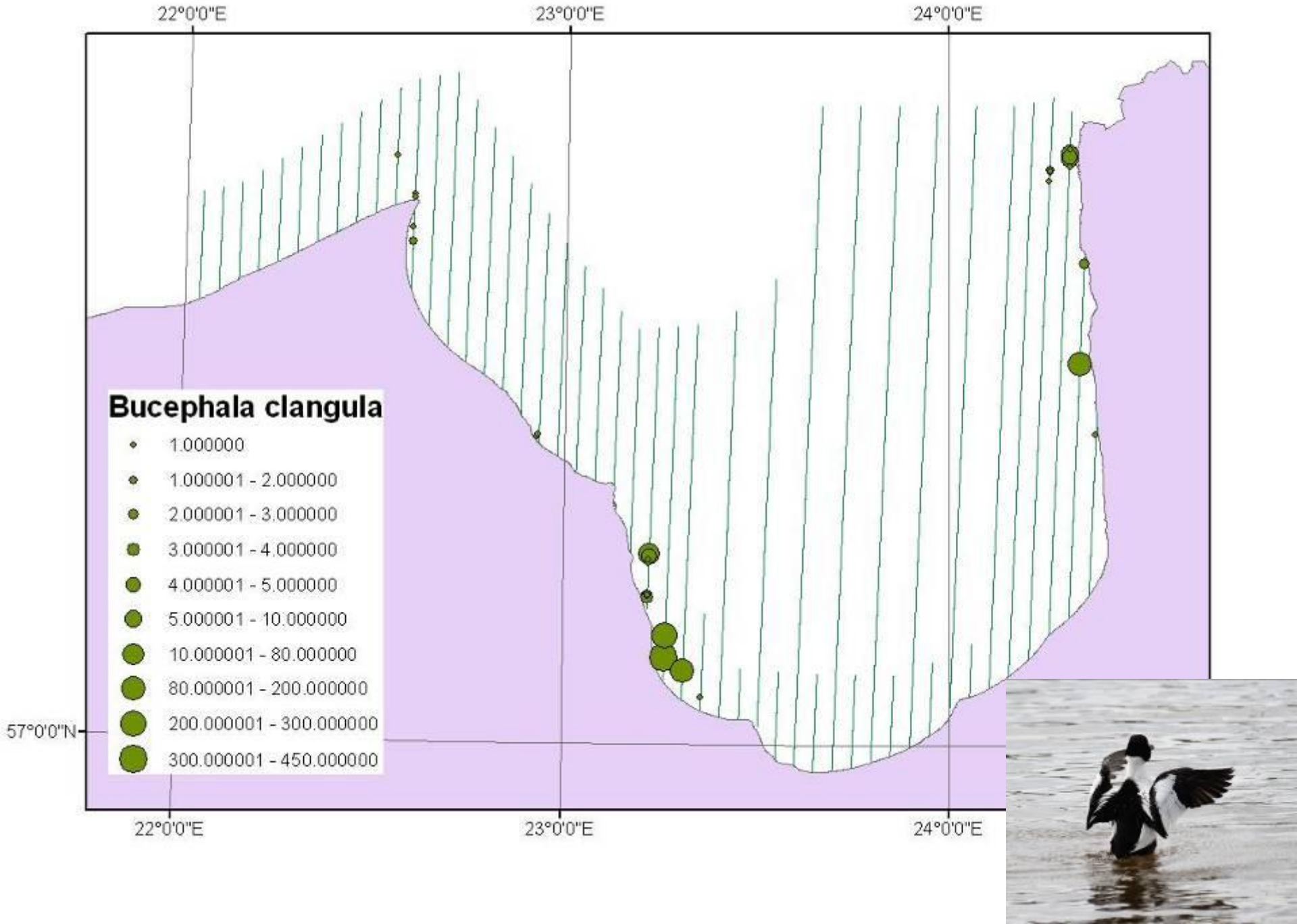


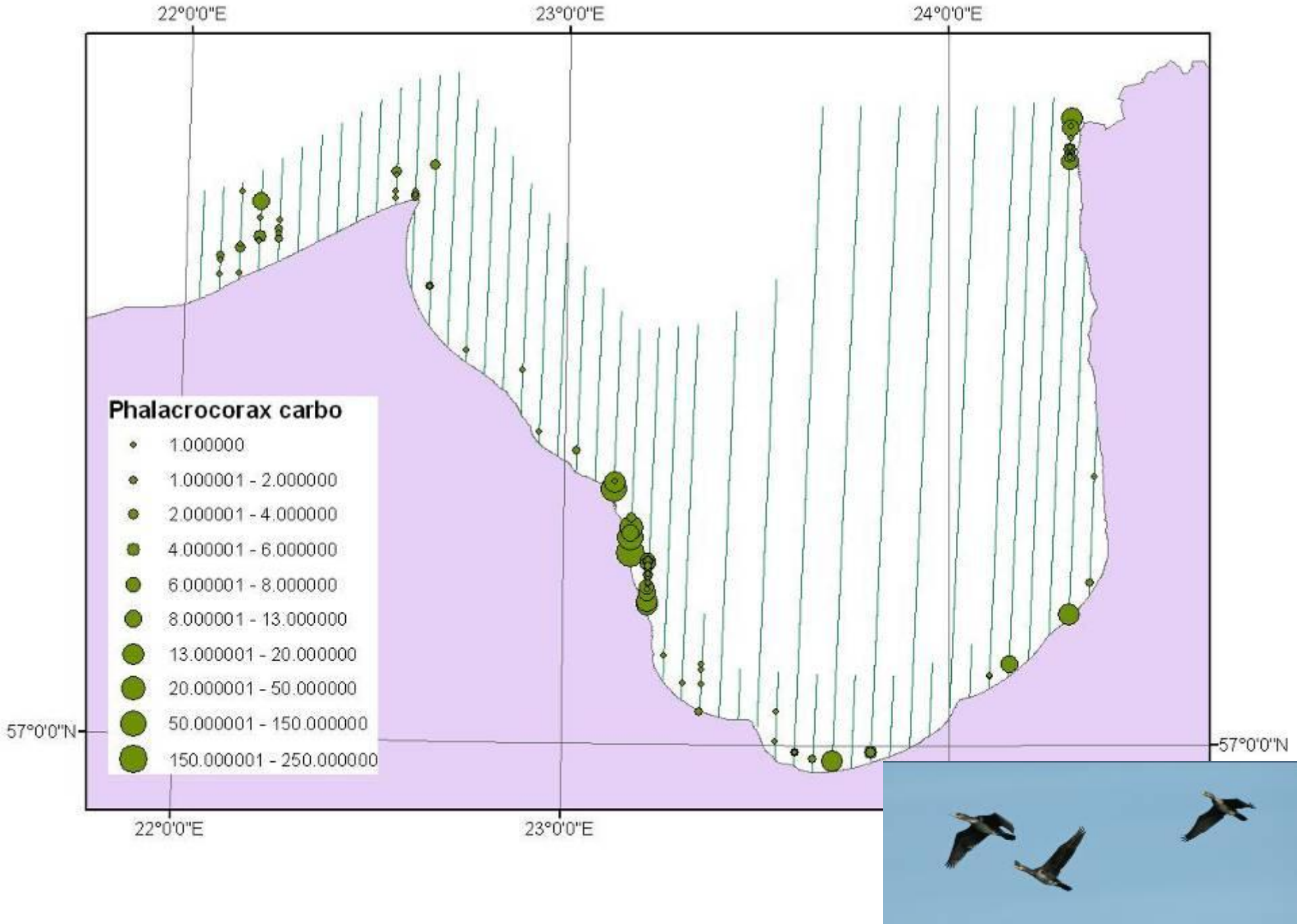
Clangula hyemalis – May 2011

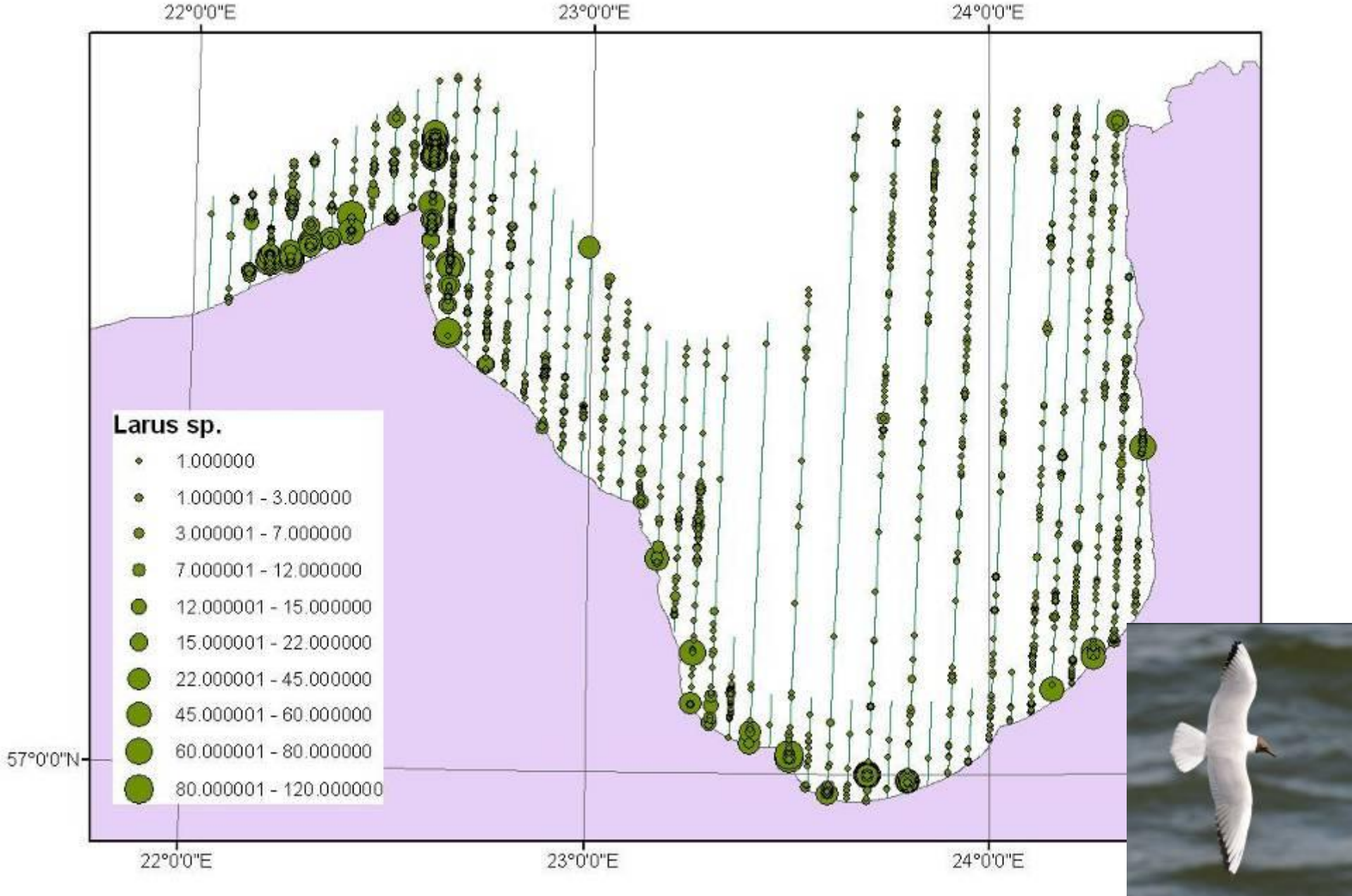


Clangula hyemalis – July 2011



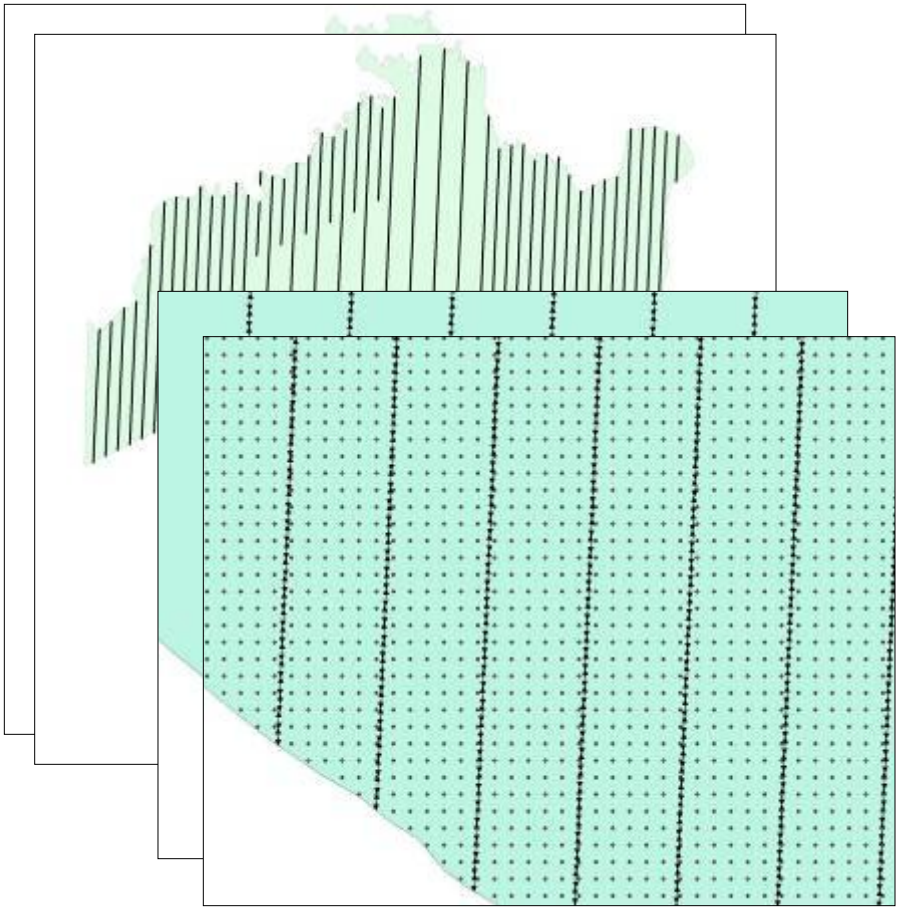

22°0'0"E
23°0'0"E
24°0'0"E
57°0'0"N
Bucephala clangula
1.000000
1.000001 - 2.000000
2.000001 - 3.000000
3.000001 - 4.000000
4.000001 - 5.000000
5.000001 - 10.000000
10.000001 - 80.000000
80.000001 - 200.000000
200.000001 - 300.000000
300.000001 - 450.000000

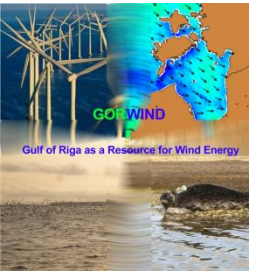

22°0'0"E
23°0'0"E
24°0'0"E
57°0'0"N
57°0'0"N
22°0'0"E
23°0'0"E
Phalacrocorax carbo
1.000000
1.000001 - 2.000000
2.000001 - 4.000000
4.000001 - 6.000000
6.000001 - 8.000000
8.000001 - 13.000000
13.000001 - 20.000000
20.000001 - 50.000000
50.000001 - 150.000000
150.000001 - 250.000000


22°0'0"E
23°0'0"E
24°0'0"E
57°0'0"N
Larus sp.
1.000000
1.000001 - 3.000000
3.000001 - 7.000000
7.000001 - 12.000000
12.000001 - 15.000000
15.000001 - 22.000000
22.000001 - 45.000000
45.000001 - 60.000000
60.000001 - 80.000000
80.000001 - 120.000000

Preparation of datasets

- Hierarhical structure
  - Study area
  - Transects
  - Sections
  - Observations
- Collection of external variables
- Preparation of prediction grid





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Distance - GW500_LV

File View Tools Data Window Help

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Data layers

- Study area
  - Grid_500m
  - Transects
    - Sections
      - Observations

Contents of SubSample1 layer 'Sections' and all fields from higher layers

Study area				Transects				Sections							
ID	Label	Area	Shape	ID	Label	Length	Shape	ID	Label	X_koord	Y_koord	Length	Depth	Depth_var	Shape
ID	Label	Decimal	Shape	ID	Label	Decimal	Shape	ID	Label	Decimal	Decimal	Decimal	Decimal	Decimal	Shape
n/a	n/a	m2	n/a	n/a	n/a	m	n/a	n/a	n/a	m	m	m	m	[None]	n/a
Int	Int	Int	Geog	Int	Int	Int	Geog	Int	Int	Int	Int	Int	Int	Int	Geog
1	GW_LV	7820084475.56	Polygon	1	Line 1	17022.4502028	Line	1	Lin1Sec1	382786.214671	6387584.98055	500.660300082	0.945072	0.381343	Lin
								2	Lin1Sec2	382808.364572	6388085.15064	500.660300081	3.10517	0.491152	Lin
								3	Lin1Sec3	382830.514474	6388585.32073	500.660300082	5.33204	0.520551	Lin
								4	Lin1Sec4	382852.664375	6389085.49082	500.660300081	7.43136	0.459858	Lin
								5	Lin1Sec5	382874.814276	6389585.6609	500.660300082	9.48291	0.345448	Lin
								6	Lin1Sec6	382896.964178	6390085.83099	500.660300082	11.1942	0.232776	Lin
								7	Lin1Sec7	382919.114079	6390586.00108	500.660300081	12.6047	0.143698	Lin
								8	Lin1Sec8	382941.263981	6391086.17117	500.660300082	13.8354	0.125999	Lin
								9	Lin1Sec9	382963.413882	6391586.34126	500.660300082	14.966	0.119392	Lin
								10	Lin1Sec10	382985.563784	6392086.51135	500.660300081	16.1545	0.126391	Lin
								11	Lin1Sec11	383007.713685	6392586.68144	500.660300082	17.3729	0.132703	Lin
								12	Lin1Sec12	383029.863586	6393086.85153	500.660300081	18.7081	0.181353	Lin
								13	Lin1Sec13	383052.013488	6393587.02162	500.660300082	20.002	0.133877	Lin
								14	Lin1Sec14	383074.163389	6394087.19171	500.660300082	21.065	0.102605	Lin
								15	Lin1Sec15	383096.313291	6394587.36179	500.660300081	21.9131	0.0316203	Lin
								16	Lin1Sec16	383118.463192	6395087.53188	500.660300082	22	0.000408792	Lin
								17	Lin1Sec17	383140.613094	6395587.70197	500.660300081	21.8026	0.0288627	Lin
								18	Lin1Sec18	383162.762995	6396087.87206	500.660300082	21.1815	0.0590154	Lin
								19	Lin1Sec19	383184.912897	6396588.04215	500.660300082	21.0692	0.115991	Lin
								20	Lin1Sec20	383207.062798	6397088.21224	500.660300081	21.1042	0.193445	Lin
								21	Lin1Sec21	383229.212699	6397588.38233	500.660300082	21.7866	0.200558	Lin
								22	Lin1Sec22	383251.362601	6398088.55242	500.660300082	22.7732	0.137878	Lin
								23	Lin1Sec23	383273.512502	6398588.72251	500.660300081	22.6802	0.101429	Lin
								24	Lin1Sec24	383295.662404	6399088.8926	500.660300082	22.3821	0.107543	Lin
								25	Lin1Sec25	383317.812305	6399589.06269	500.660300081	22.1487	0.102532	Lin
								26	Lin1Sec26	383339.962207	6400089.23277	500.660300082	22.0556	0.359766	Lin
								27	Lin1Sec27	383362.112108	6400589.40286	500.660300082	21.5197	0.353802	Lin
								28	Lin1Sec28	383384.26201	6401089.57295	500.660300081	20.382	0.0804797	Lin
								29	Lin1Sec29	383406.411911	6401589.74304	500.660300082	20.0486	0.0222547	Lin
								30	Lin1Sec30	383428.561812	6402089.91313	500.660300082	20.2506	0.0438898	Lin
								31	Lin1Sec31	383450.711714	6402590.08322	500.660300081	20.412	0.0579897	Lin
								32	Lin1Sec32	383472.861615	6403090.25331	500.660300082	20.2771	0.0489604	Lin
								33	Lin1Sec33	383495.011517	6403590.4234	500.660300081	19.8269	0.0980488	Lin
								34	Lin1Sec34	383517.161418	6404090.59349	500.660300082	19.344	0.109119	Lin
				2	Line 2	16254.0943668	Line	35	Lin2Sec1	385852.349823	6389005.50793	507.940448962	1.25445	0.412115	Lin
								36	Lin2Sec2	385874.824498	6389512.95092	507.940448963	3.08546	0.571095	Lin
								37	Lin2Sec3	385897.299172	6390020.39391	507.940448962	5.74244	0.766759	Lin
								38	Lin2Sec4	385919.773847	6390527.8369	507.940448963	8.48978	0.632081	Lin
								39	Lin2Sec5	385942.248522	6391035.2799	507.940448962	10.3569	0.36527	Lin
								40	Lin2Sec6	385964.723196	6391542.72289	507.940448963	12.0885	0.277944	Lin
								41	Lin2Sec7	385987.197871	6392050.16588	507.940448962	13.89	0.235664	Lin
								42	Lin2Sec8	386009.672546	6392557.60887	507.940448963	15.399	0.151713	Lin

Distance - GW500_LV

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Data layers

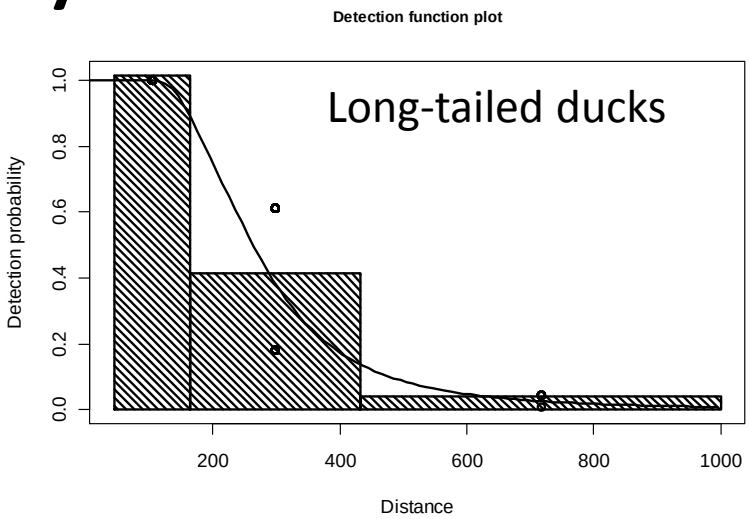
- Study area
  - Grid_500m
  - Transects
    - Sections
      - Observations

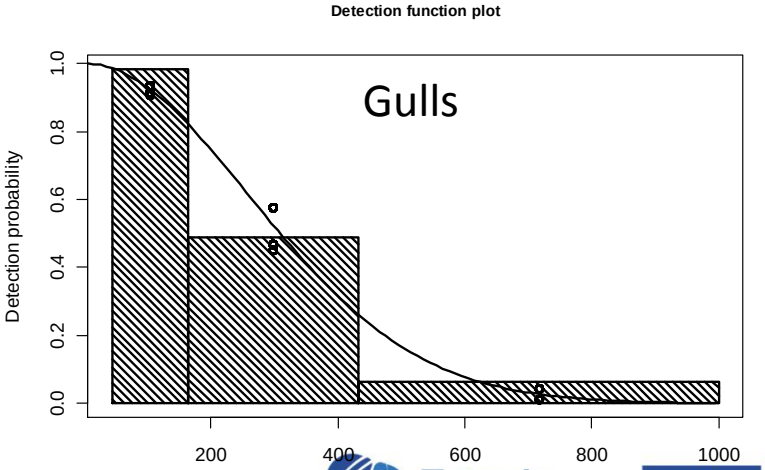
Contents of Observation layer 'Observations' and all fields from higher layers

Trans...	Sections								Observations							
Shape	ID	Label	X_koord	Y_koord	Length	Depth	Depth_var	Shape	ID	Species	Distance	Cluster	Behaviour	Age	Sex	Ice
Shape	ID	Label	Decimal	Decimal	Decimal	Decimal	Decimal	Shape	ID	Text	Decimal	Integer	Integer	Integer	Integer	Decimal
n/a	n/a	n/a	m	m	m	m	[None]	n/a	n/a	n/a	m	[None]	[None]	[None]	[None]	[None]
Geog	Int	Int	Int	Int	Int	Int	Int	Geog	Int	Int	Int	Int	Int	Int	Int	Int
Line	1	Lin1Sec1	382786.214671	6387584.98055	500.660300082	0.945072	0.381343	Line								
	2	Lin1Sec2	382808.364572	6388085.15064	500.660300081	3.10517	0.491152	Line								
	3	Lin1Sec3	382830.514474	6388585.32073	500.660300082	5.33204	0.520551	Line								
	4	Lin1Sec4	382852.664375	6389085.49082	500.660300081	7.43136	0.459858	Line								
	5	Lin1Sec5	382874.814276	6389585.6609	500.660300082	9.48291	0.345448	Line	1	Clhye	104	2	1	3		
	6	Lin1Sec6	382896.964178	6390085.83099	500.660300082	11.1942	0.232776	Line								
	7	Lin1Sec7	382919.114079	6390586.00108	500.660300081	12.6047	0.143698	Line	2	Laarg	104	1	4	3		
									3	laarg	104	15	4	0		
	8	Lin1Sec8	382941.263981	6391086.17117	500.660300082	13.8354	0.125999	Line	4	Clhye	300	1	1	3		
	9	Lin1Sec9	382963.413882	6391586.34126	500.660300082	14.966	0.119392	Line								
	10	Lin1Sec10	382985.563784	6392086.51135	500.660300081	16.1545	0.126391	Line								
	11	Lin1Sec11	383007.713685	6392586.68144	500.660300082	17.3729	0.132703	Line	5	Anasp	300	15	4	3		
	12	Lin1Sec12	383029.863586	6393086.85153	500.660300081	18.7081	0.181353	Line								
	13	Lin1Sec13	383052.013488	6393587.02162	500.660300082	20.002	0.133877	Line								
	14	Lin1Sec14	383074.163389	6394087.19171	500.660300082	21.065	0.102605	Line	6	melsp	104	15	1	0		
	15	Lin1Sec15	383096.313291	6394587.36179	500.660300081	21.9131	0.0316203	Line								
	16	Lin1Sec16	383118.463192	6395087.53188	500.660300082	22	0.000408792	Line								
	17	Lin1Sec17	383140.613094	6395587.70197	500.660300081	21.8026	0.0288627	Line								
	18	Lin1Sec18	383162.762995	6396087.87206	500.660300082	21.1815	0.0590154	Line								
	19	Lin1Sec19	383184.912897	6396588.04215	500.660300082	21.0692	0.115991	Line								
	20	Lin1Sec20	383207.062798	6397088.21224	500.660300081	21.1042	0.193445	Line								
	21	Lin1Sec21	383229.212699	6397588.38233	500.660300082	21.7866	0.200558	Line								
	22	Lin1Sec22	383251.362601	6398088.55242	500.660300082	22.7732	0.137878	Line								
	23	Lin1Sec23	383273.512502	6398588.72251	500.660300081	22.6802	0.101429	Line	7	Lacan	104	2	4	3		
	24	Lin1Sec24	383295.662404	6399088.8926	500.660300082	22.3821	0.107543	Line								
	25	Lin1Sec25	383317.812305	6399589.06269	500.660300081	22.1487	0.102532	Line								
	26	Lin1Sec26	383339.962207	6400089.23277	500.660300082	22.0556	0.359766	Line								
	27	Lin1Sec27	383362.112108	6400589.40286	500.660300082	21.5197	0.353802	Line								
	28	Lin1Sec28	383384.26201	6401089.57295	500.660300081	20.382	0.0804797	Line								
	29	Lin1Sec29	383406.411911	6401589.74304	500.660300082	20.0486	0.0222547	Line	8		710	0	0	0		
	30	Lin1Sec30	383428.561812	6402089.91313	500.660300082	20.2506	0.0438898	Line								
	31	Lin1Sec31	383450.711714	6402590.08322	500.660300081	20.412	0.0579897	Line								
	32	Lin1Sec32	383472.861615	6403090.25331	500.660300082	20.2771	0.0489604	Line								
	33	Lin1Sec33	383495.011517	6403590.4234	500.660300081	19.8269	0.0980488	Line								
	34	Lin1Sec34	383517.161418	6404090.59349	500.660300082	19.344	0.109119	Line								
Line	35	Lin2Sec1	385852.349823	6389005.50793	507.940448962	1.25445	0.412115	Line								
	36	Lin2Sec2	385874.824498	6389512.95092	507.940448963	3.08546	0.571095	Line								
	37	Lin2Sec3	385897.299172	6390020.39391	507.940448962	5.74244	0.766759	Line	9	melsp	710	20	4	0		
	38	Lin2Sec4	385919.773847	6390527.8369	507.940448963	8.48978	0.632081	Line	10	Menig	104	75	1	3		
	39	Lin2Sec5	385942.248522	6391035.2799	507.940448962	10.3569	0.36527	Line								
	40	Lin2Sec6	385964.723196	6391542.72289	507.940448963	12.0885	0.277944	Line	11	Lacan	300	1	4	3		
	41	Lin2Sec7	385987.197871	6392050.16588	507.940448962	13.89	0.235664	Line								

Data analysis

- Fitting detection probability curves
  - Species specific
  - Solutions for rare species
  - Dependence on observer, seat in plane, flock size, bird behaviour, sex and age, etc.





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Data analysis

- Estimating total abundance in the study area (LV part)

Species	N	LCL (95%)	UCL (95%)
Clangula hyemalis	10822	7840	14940
Melanitta sp.	27131	20736	35499
Bucephala clangula	439	217	886
Swans	300	86	1047
Gulls	9773	8276	11541

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Data analysis

- Estimating spatially explicit abundance
- Fitting density surface models
  - GAM
  - X, Y, depth, depth variance, bottom substrate
- Predictions using fitted models

Long-tailed Duck *Clangula hyemalis*

Family: quasipoisson
Link function: log

Formula:
N ~ depth + depth.var + x.koord + y.koord + offset(off.set)

Parametric coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-6.155e+01	1.062e+01	-5.797	7.27e-09	***
depth	-8.281e-02	3.441e-03	-24.068	< 2e-16	***
depth.var	5.174e-01	2.506e-02	20.647	< 2e-16	***
x.koord	-1.492e-05	1.058e-06	-14.095	< 2e-16	***
y.koord	8.473e-06	1.628e-06	5.204	2.05e-07	***

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

Deviance explained = 30.1%

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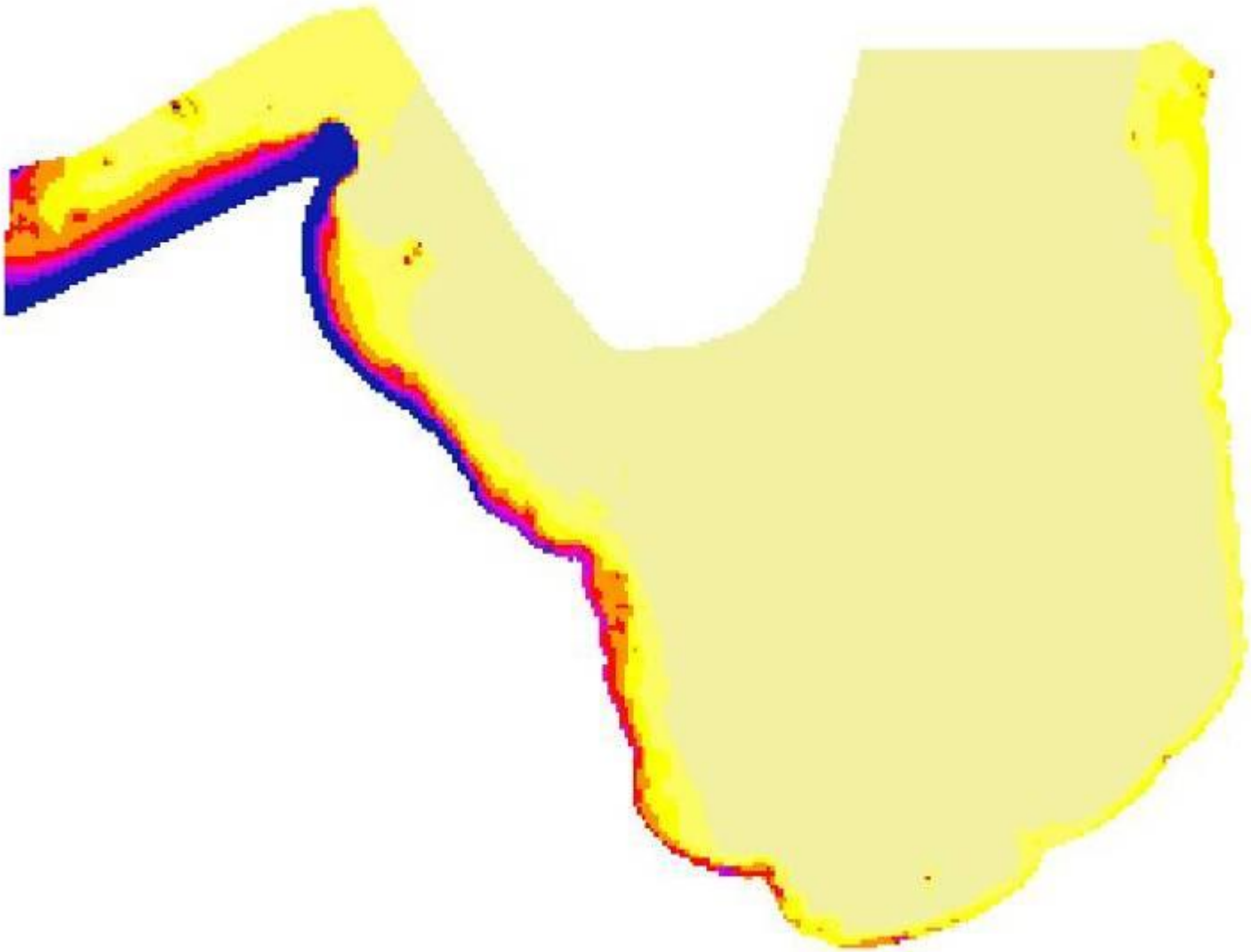
Clangula hyemalis



Further work

- Joining LV and EE fieldwork data
- Continue fitting detection probability models
- Continue fitting density surface models
- Fieldwork (next session January – February 2012)
- Final distribution and density maps
- Contribution to the spatial plan for the GoR

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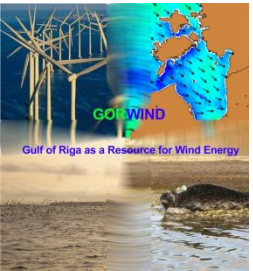
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