APPENDICES

Appendix 1– origin of carnivore range maps

Species	Range map from
Alopex lagopus	Sechrest 2003, Grenyer et al. 2006*
Canis aureus	Sechrest 2003, Grenyer et al. 2006, Van Valkenburgh and Wayne 1994*
Canis latrans	Hall 1981*
Canis lupus	Hall 1981
Gulo gulo	Hall 1981
Herpestes edwardsii	Harrison and Bates 1991*
Lontra canadensis	Hall 1981
Lutra lutra	Macdonald et al. 2002
Lynx canadensis	Hall 1981
Martes americana	Hall 1981*
Martes foina	Corbet and Hill 1992, Mitchell-Jones et al. 1993, Sechrest 2003, Grenyer et al. 2006, IUCN 2007
Martes martes	Sechrest 2003, Grenyer et al. 2006*
Meles meles	Bevanger and Lindström 1995, Mendelssohn and Yom-Tov 1999, Sechrest 2003, Grenyer et al. 2006
Mustela erminea (N)	Sechrest 2003, Grenyer et al. 2006*
Mustela erminea (P)	Mitchell-Jones et al. 1993, Sechrest 2003, Grenyer et al. 2006
Mustela frenata	Hall 1951, Sheffield and Thomas 1997
Mustela nivalis (N)	Hall 1981
Mustela nivalis (P)	Sheffield and King 1994*
Mustela putorius	Macdonald et al. 2002
Mustela vison	Hall 1981
Paradoxurus hermaphroditus	Sechrest 2003, Grenyer et al. 2006

Procyon lotor	Hall 1981*
Spilogale gracilis	Verts et al. 2001*
Urocyon cinereoargenteus	Hall 1981
Ursus arctos	Hall 1981, Servheen et al. 1998
Viverricula indica	Helin et al. 1999, Sechrest 2003, Grenyer et al. 2006
Vulpes vulpes (N)	Hall 1981
Vulpes vulpes (P)	Harrison and Bates 1991, Sechrest 2003, Grenyer et al. 2006*

(N) = Nearctic; (P) = Palaearctic.

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*Range further modified by the authors to include specimens that fall outside published map

Appendix 2 – sensitivity analysis with three distance categories

Slopes and probabilities of the relationship between condylo-basal length (CBL, in mm) and distance to range edge, controlling for latitude, longitude and sex. Distances are in km, 5 km and 30 km units. Sample sizes as in Table 1. (N) = Nearctic; (P) = Palaearctic.

Species	Slope of CBL vs. distance	Slope of CBL vs. distance	Slope of CBL vs. distance	p value	p value	p value
units	mm / log km	mm / log (5 km)	mm / log (30 km)	mm / log km	mm / log (5 km)	mm / log (30 km)
Alopex lagopus	-0.015	-0.077	-0.541	0.205	0.194	0.146
Canis aureus	-0.006	-0.030	-0.177	0.125	0.128	0.133
Canis latrans	0.000	0.001	0.011	0.953	0.949	0.917
Canis lupus	0.018	0.088	0.522	0.0001	0.0002	0.0002
Gulo gulo	-0.005	-0.025	-0.154	0.106	0.104	0.096
Herpestes edwardsii	0.002	0.009	0.054	0.412	0.405	0.394
Lontra canadensis	-0.009	-0.042	-0.231	0.029	0.033	0.051
Lutra lutra	-0.002	-0.011	-0.058	0.484	0.477	0.536
Lynx canadensis	0.001	0.005	0.029	0.657	0.660	0.647
Martes americana	-0.007	-0.035	-0.215	0.0002	0.0002	0.0002
Martes foina	0.001	0.004	0.035	0.560	0.564	0.414
Martes martes	0.003	0.013	0.078	0.290	0.285	0.282
Meles meles	0.001	0.007	0.032	0.565	0.567	0.671
Mustela erminea (N)	0.001	0.003	0.015	0.250	0.245	0.272
Mustela erminea (P)	0.002	0.009	0.050	0.121	0.129	0.159
Mustela frenata	-0.004	-0.018	-0.106	<0.0001	<0.0001	<0.0001
Mustela nivalis (N)	-0.002	-0.011	-0.063	0.006	0.006	0.007
Mustela nivalis (P)	-0.008	-0.038	-0.220	<0.0001	<0.0001	<0.0001
Mustela putorius	0.008	0.042	0.249	<0.0001	<0.0001	<0.0001
Mustela vison	0.001	0.005	0.023	0.462	0.454	0.599
Paradoxurus hermaphroditus	0.000	0.000	-0.017	0.988	0.990	0.938
Procyon lotor	0.009	0.049	0.183	0.179	0.170	0.407
Spilogale gracilis	-0.033	-0.163	-1.021	0.005	0.007	0.012
Urocyon cinereoargenteus	-0.002	-0.010	-0.080	0.606	0.592	0.490
Ursus arctos	-0.040	-0.198	-1.170	0.004	0.004	0.006
Viverricula indica	-0.006	-0.030	-0.195	0.028	0.028	0.020
Vulpes vulpes (N)	-0.001	-0.004	-0.013	0.781	0.786	0.887
Vulpes vulpes (P)	0.005	0.027	0.165	0.072	0.069	0.069

## Appendix 3 – General additive model maps of the spatial components of size for all species

Spatial components of GAMs of CBL (in mm) as a function of location.
   a. GAM statistics
   b. GAM maps
   c. Range maps and specimens locations
(N) = Nearctic; (P) = Palaearctic.

| Species	% Deviance explained by full model	Smooth term equivalent degrees of freedom	Approximate significance of smoothing	N
Alopex lagopus	37.4	10.7	0.0239	153
Canis aureus	78.5	25.33	<10E-5	108
Canis latrans	58.3	12.37	<10E-5	176
Canis lupus	46.2	13.64	<10E-5	173
Gulo gulo	53.1	4.394	0.0154	128
Herpestes edwardsii	60.5	8.921	0.00106	103
Lontra canadensis	56.5	17.17	<10E-5	153
Lutra lutra	68.4	20.753	<10E-5	105
*Lynx canadensis**	48.4	2	<10E-5	197
Martes americana	73.7	23.21	<10E-5	307
Martes foina	56.1	19.23	<10E-5	264
*Martes martes**	42.5	2	0.0227	145
Meles meles	67.8	20.49	<10E-5	328
Mustela erminea (N)	72.9	27.2	<10E-5	1227
Mustela erminea (P)	54.6	21.29	<10E-5	437
Mustela frenata	65.2	25.32	<10E-5	714
Mustela nivalis (N)	62.5	15.73	<10E-5	149
Mustela nivalis (P)	81.2	26.91	<10E-5	823
Mustela putorius	59.1	15.46	<10E-5	467
Mustela vison	70	24.43	<10E-5	404
Paradoxurus hermaphroditus	65.4	17.41	<10E-5	109
Procyon lotor	63.9	22.07	<10E-5	131
Spilogale gracilis	78.4	9.99	<10E-5	102
Urocyon cinereoargenteus	56.1	11.77	<10E-5	174
Ursus arctos	78.9	11.41	<10E-5	151
Viverricula indica	59.9	14.85	<10E-5	108
Vulpes vulpes (N)	68.1	22.47	<10E-5	235
Vulpes vulpes (P)	67.5	22.84	<10E-5	300

*Possible convergence failure
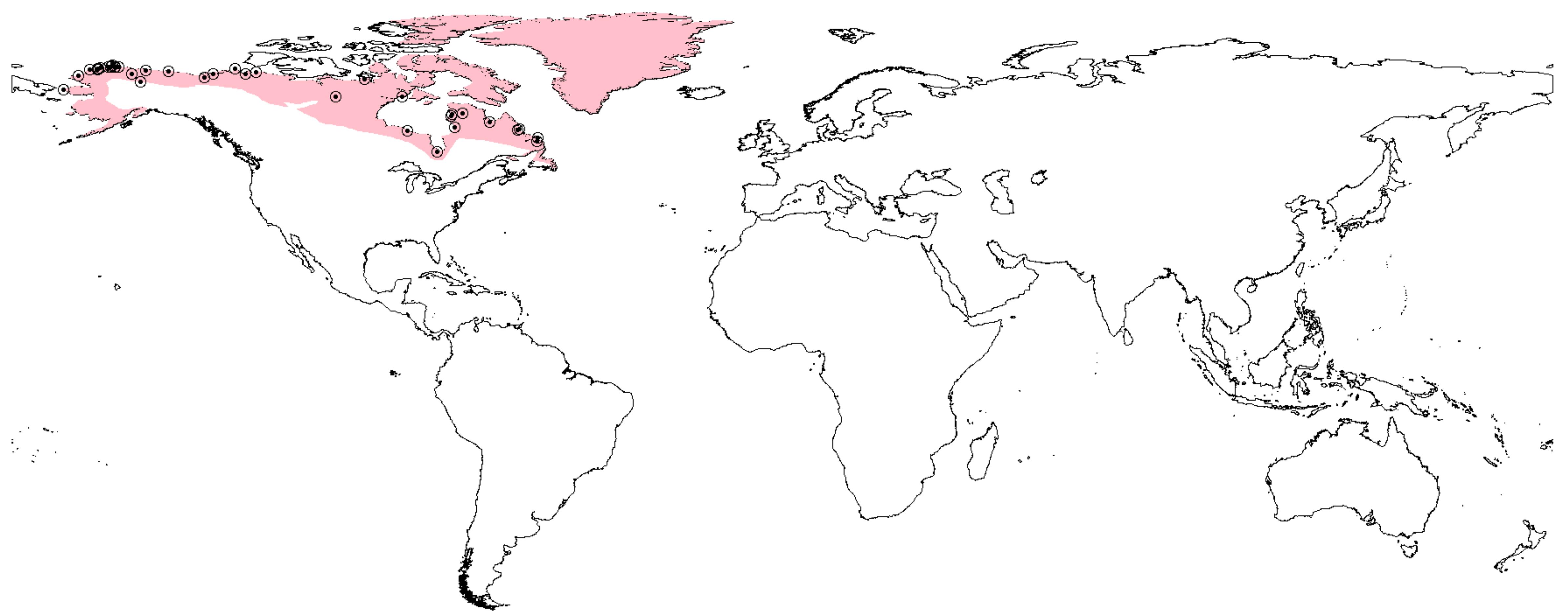
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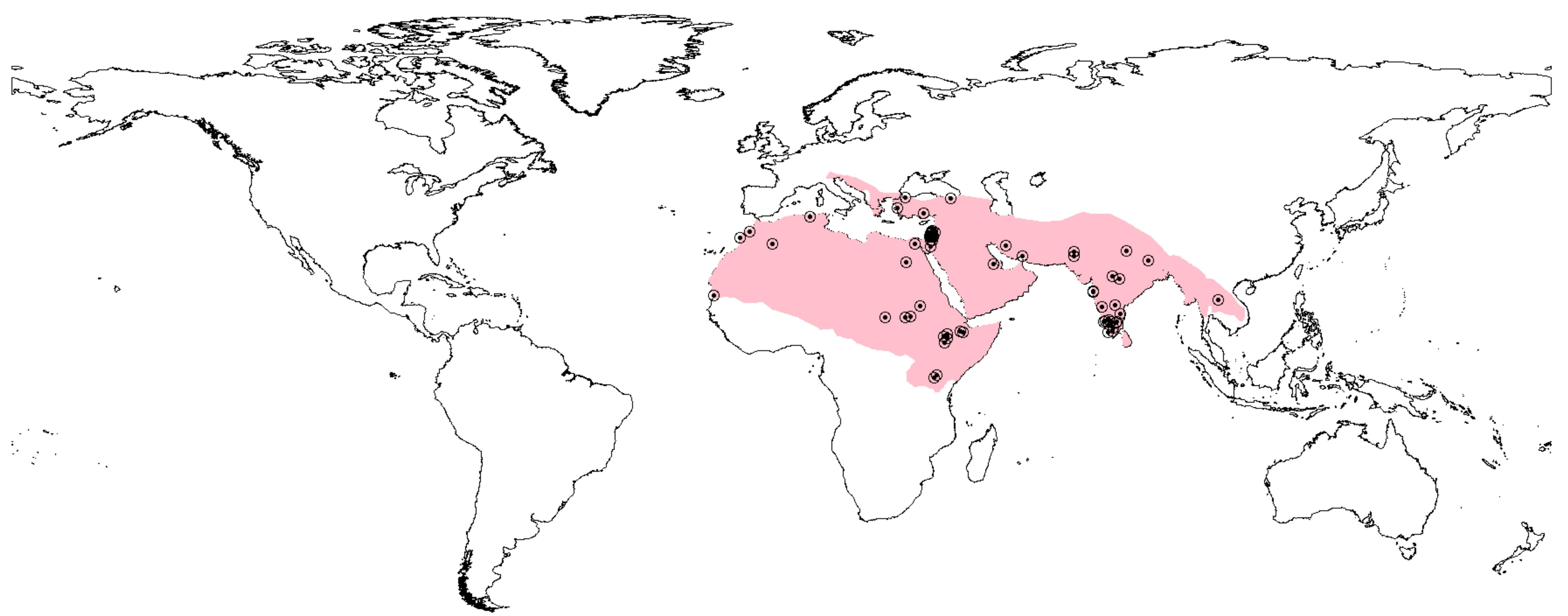
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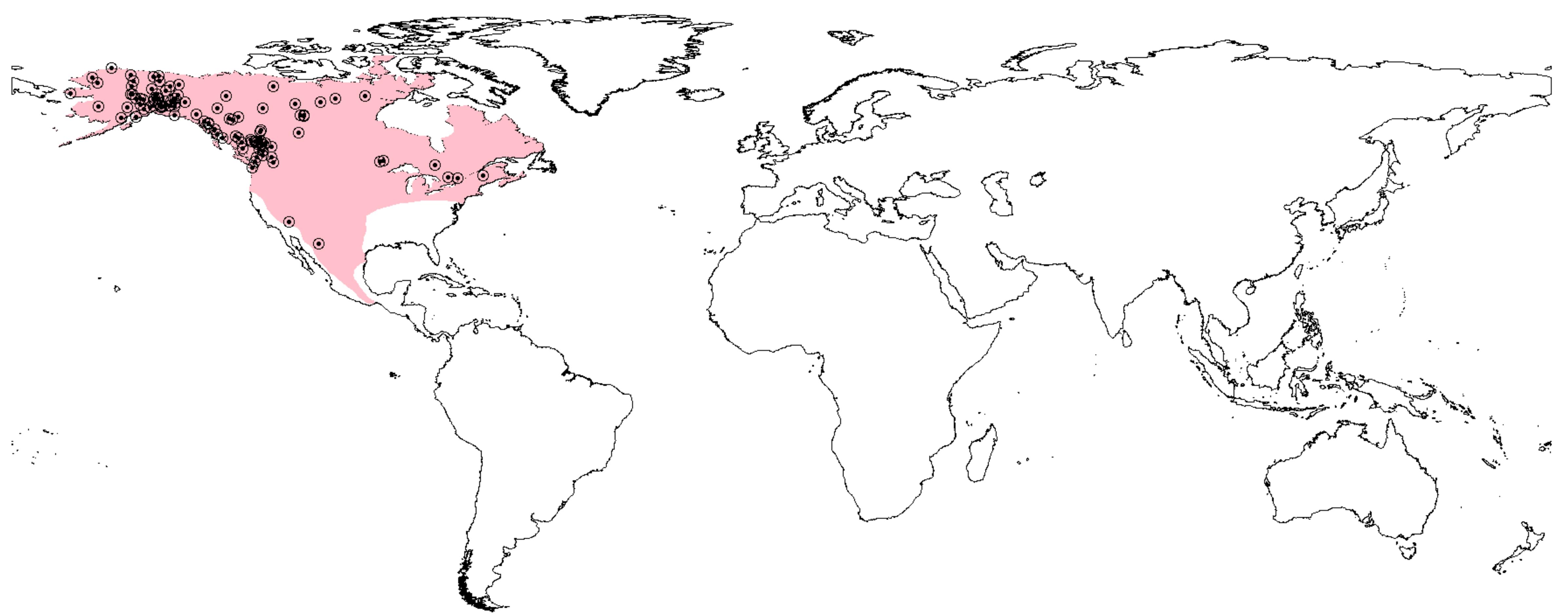
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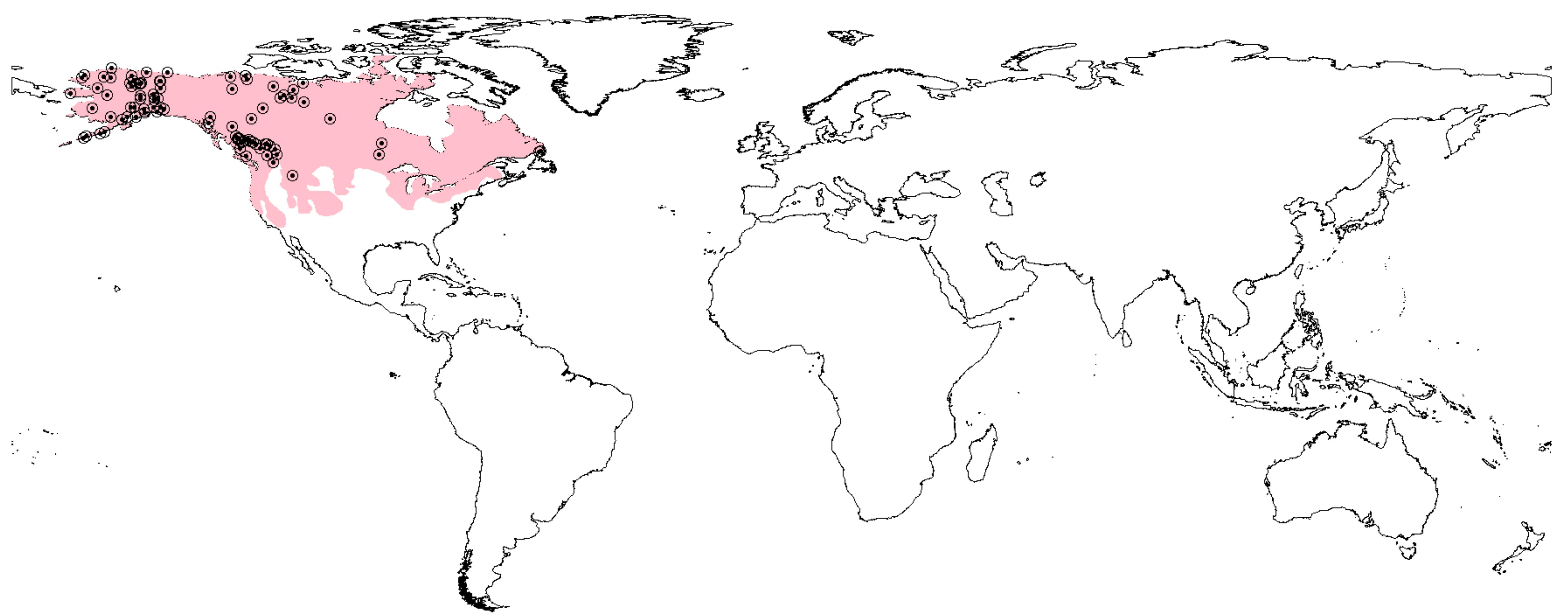
Gulo gulo

Herpestes edwardsii
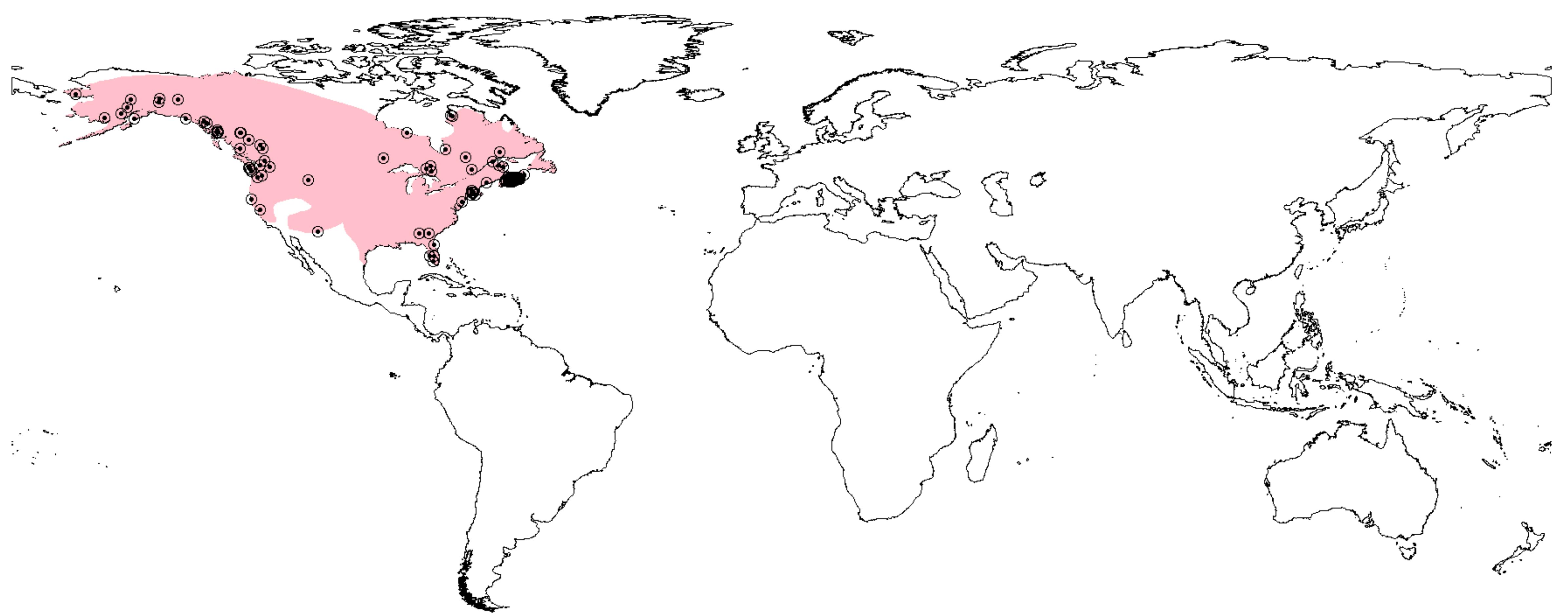
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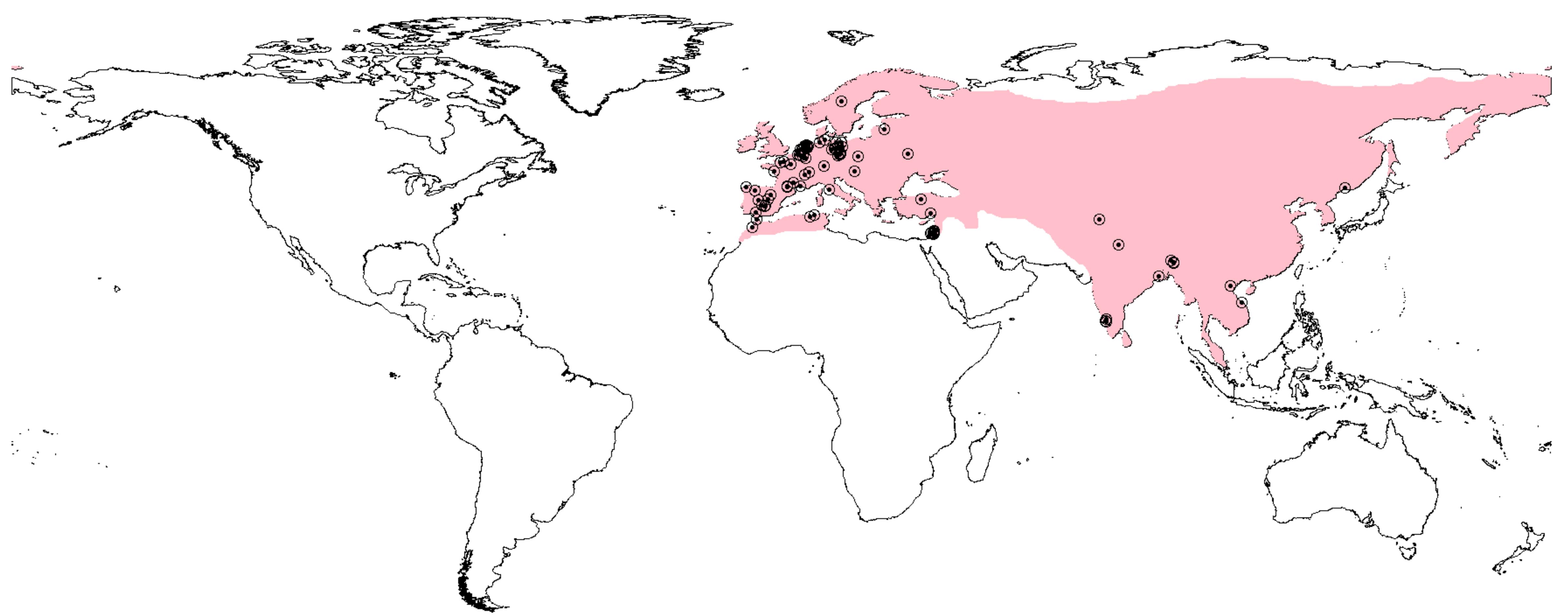
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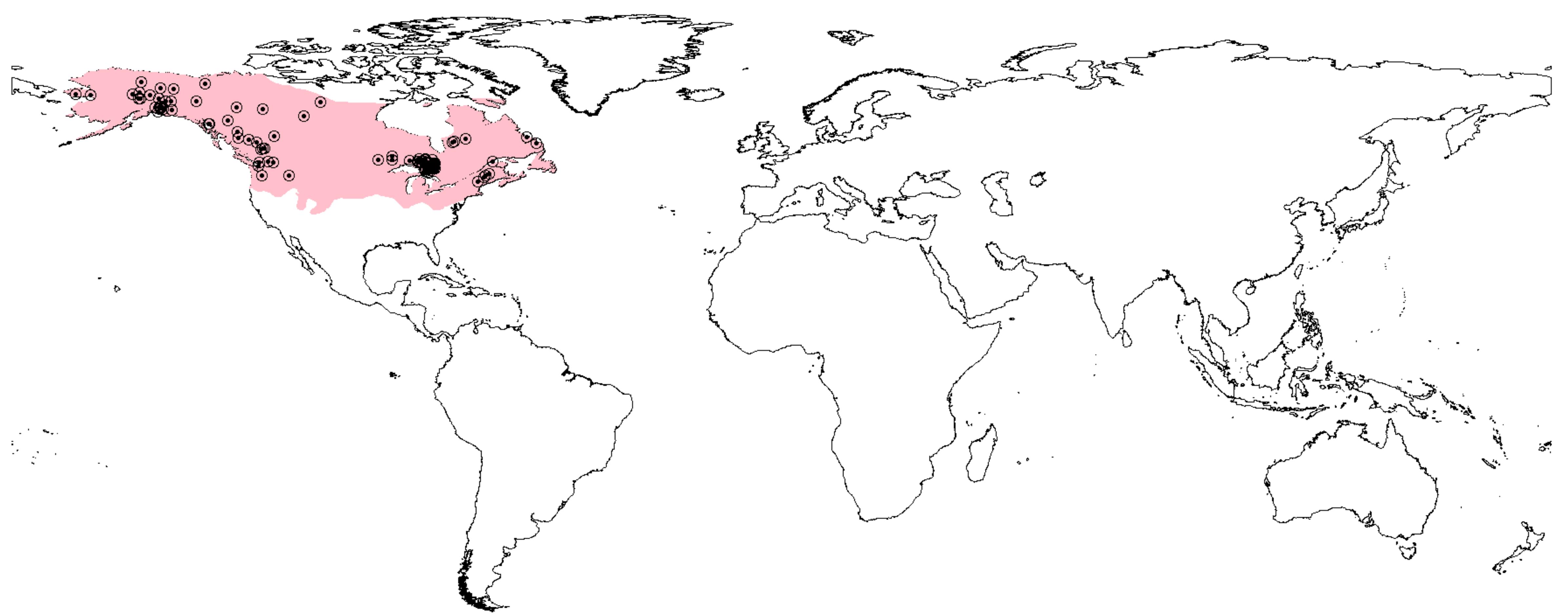
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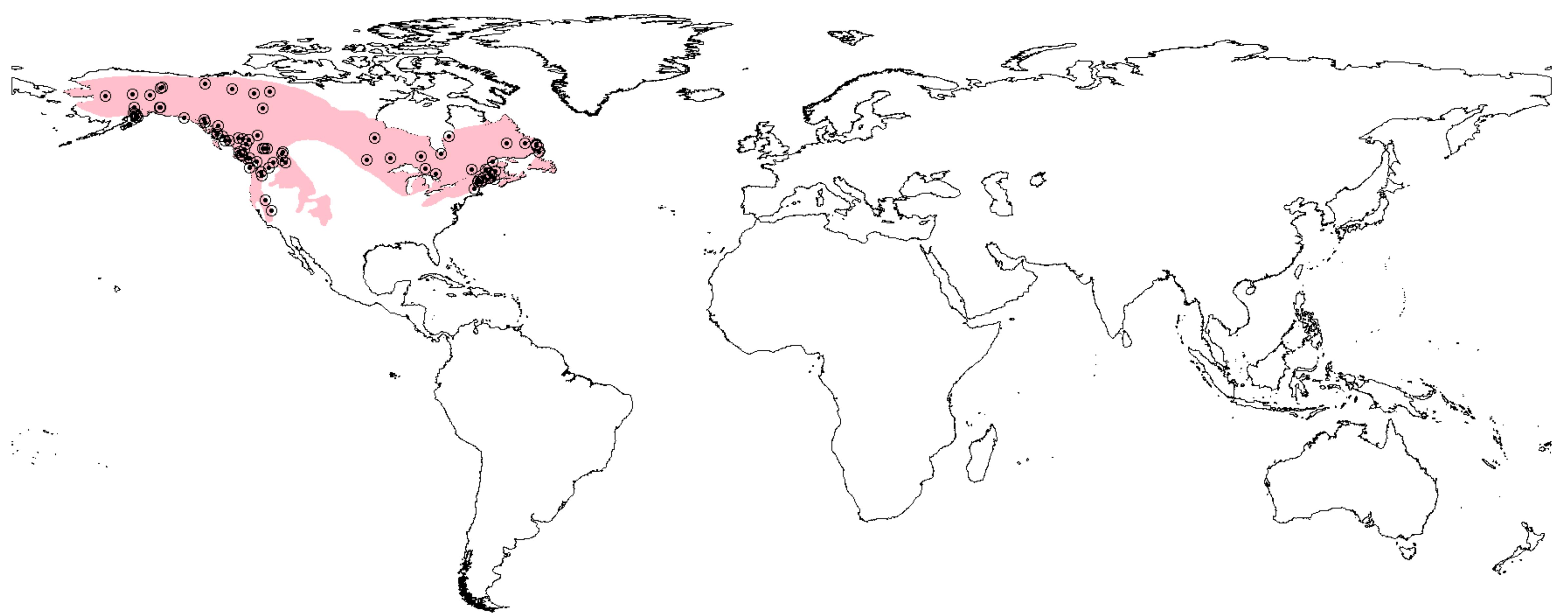
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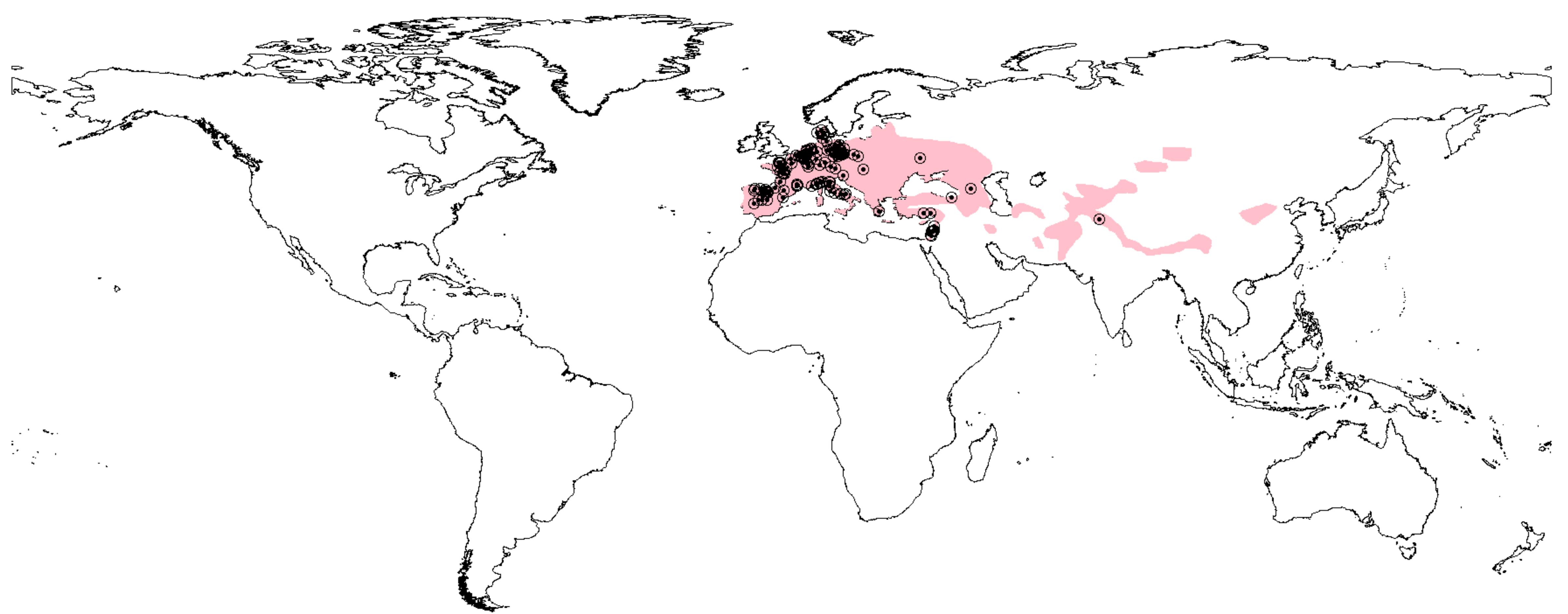
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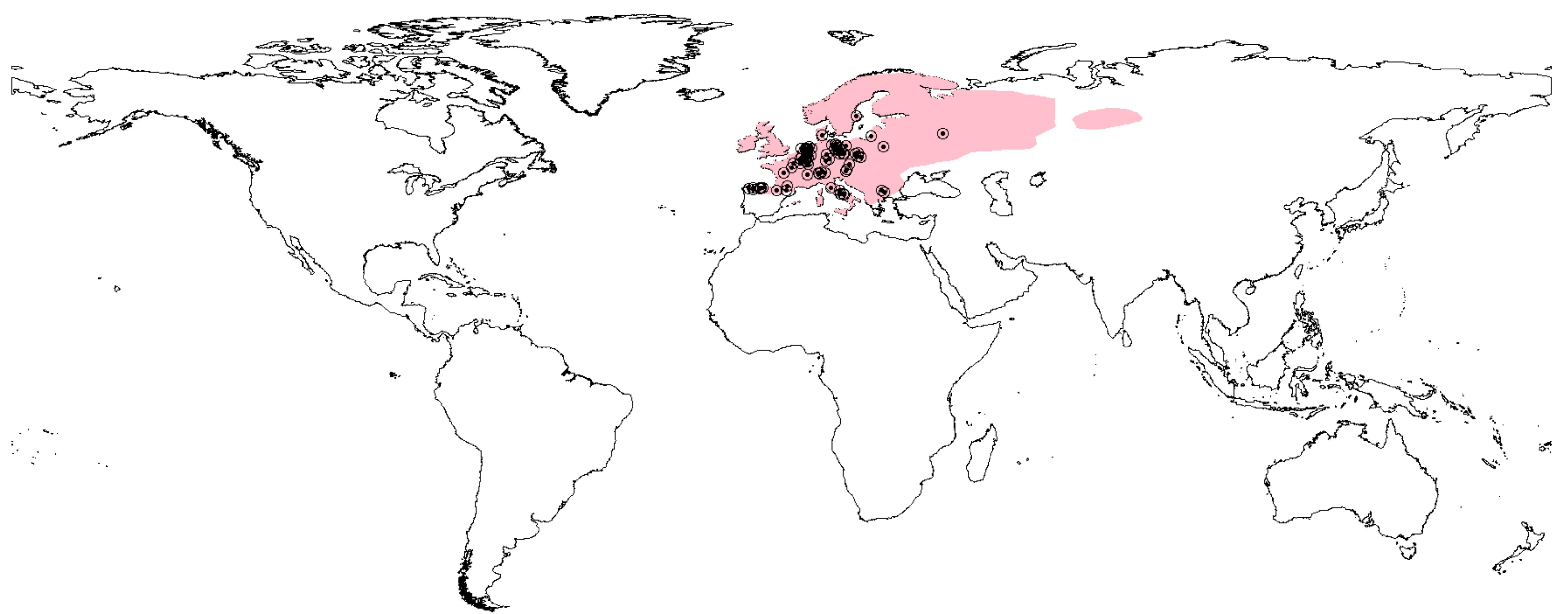
Martes martes
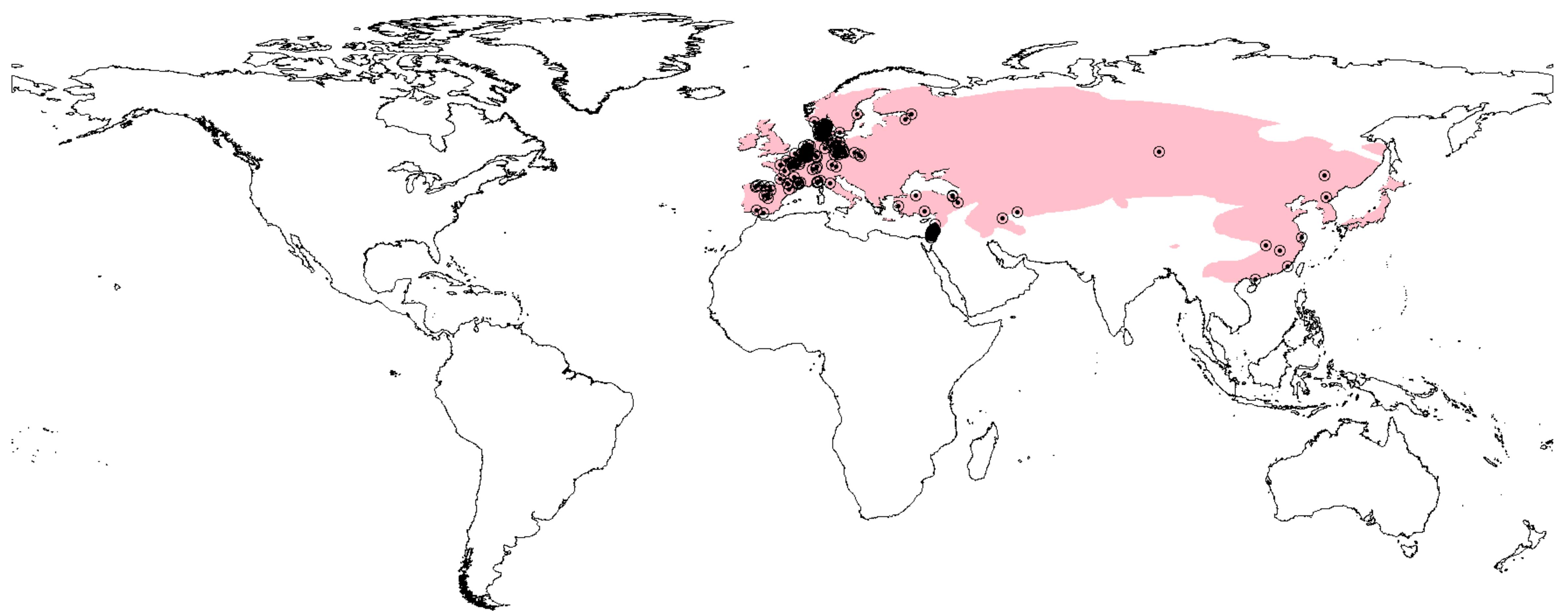
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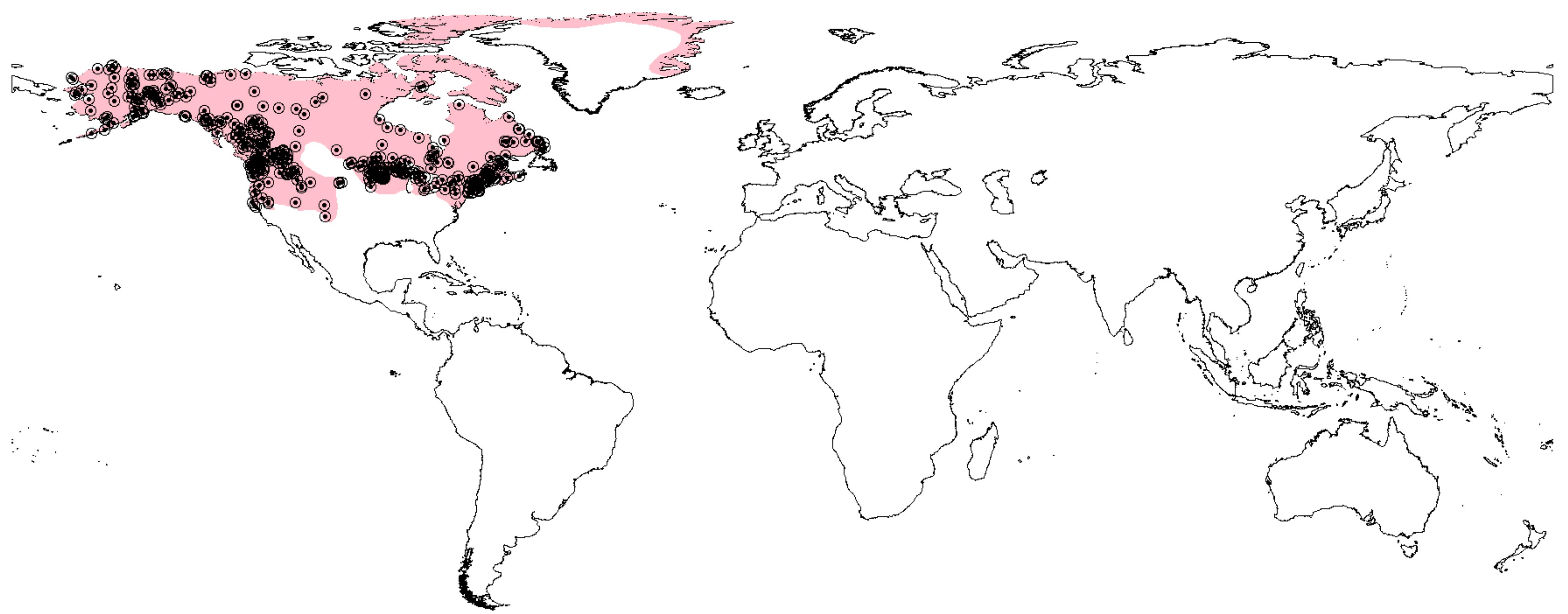
Mustela erminea Nearctic
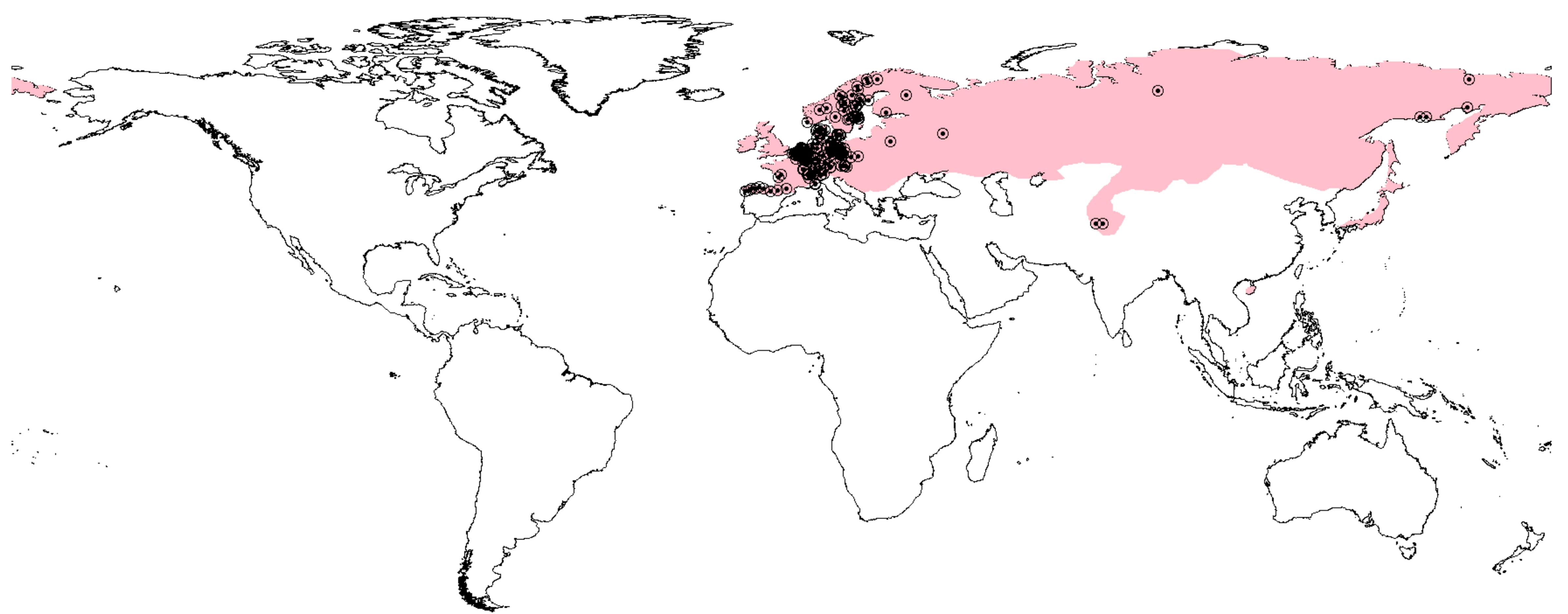
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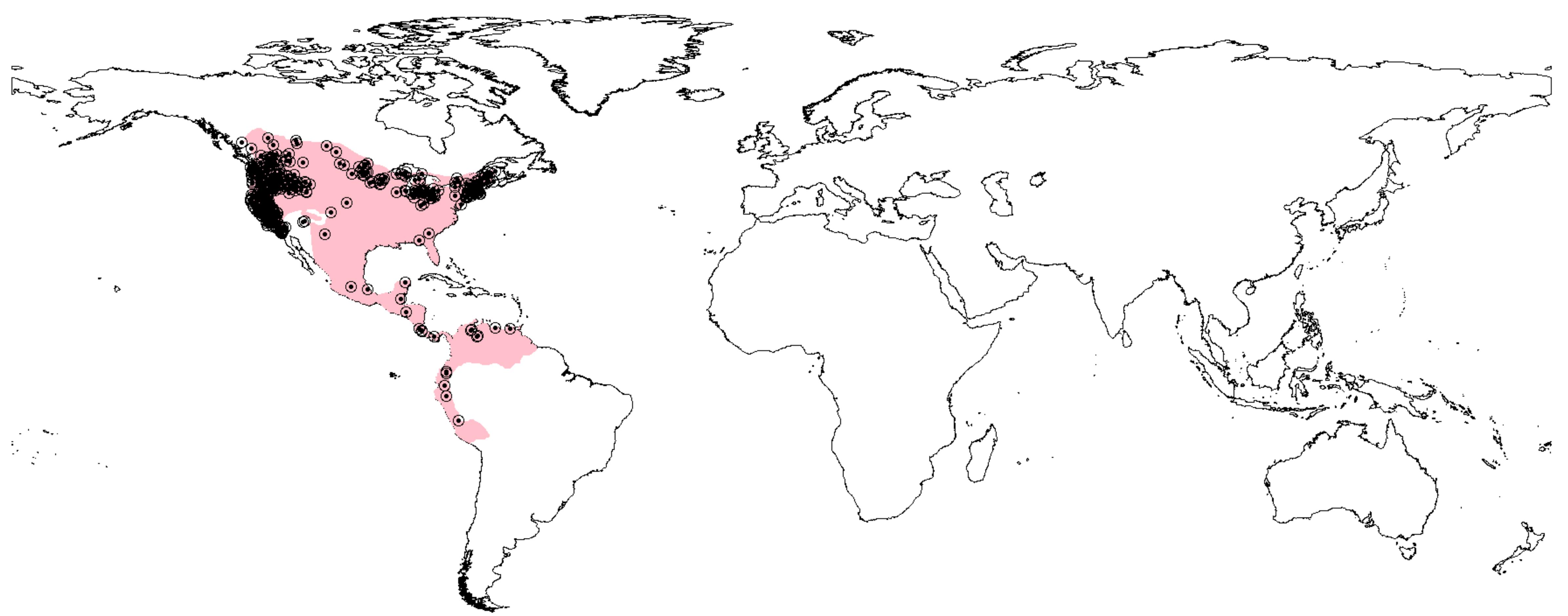
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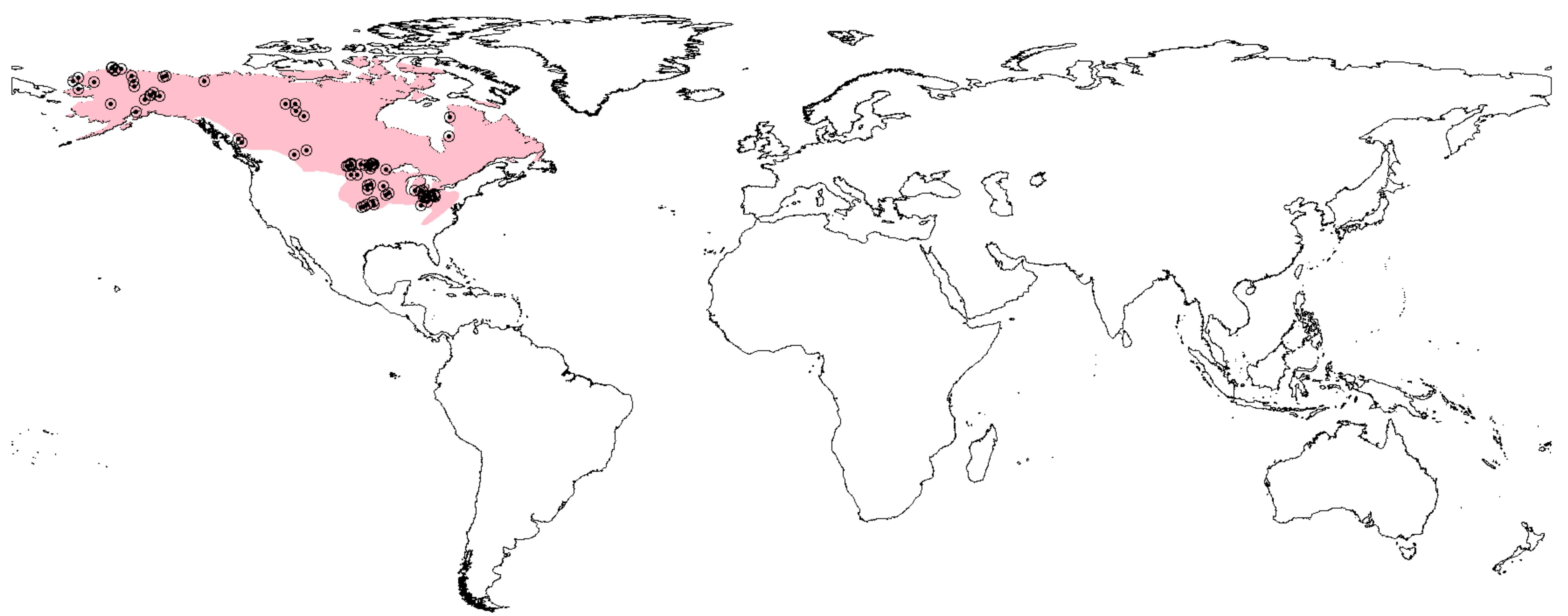
Mustela nivalis Nearctic
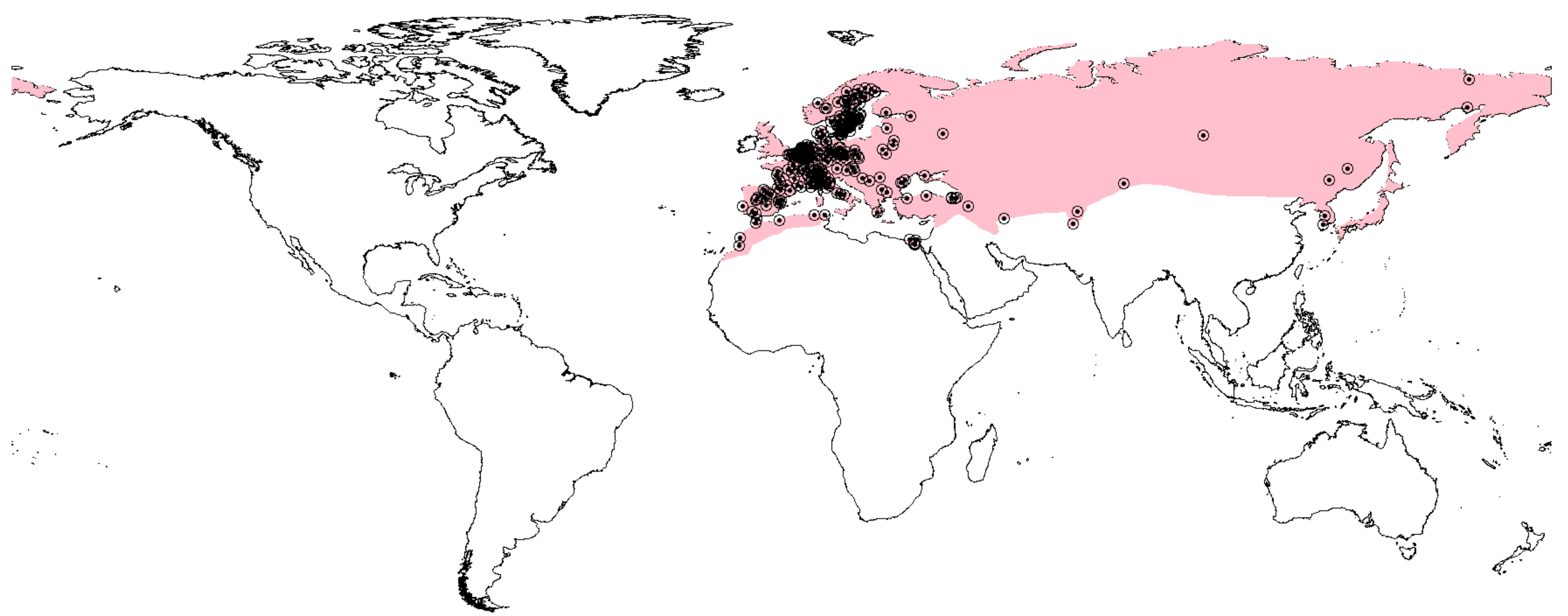
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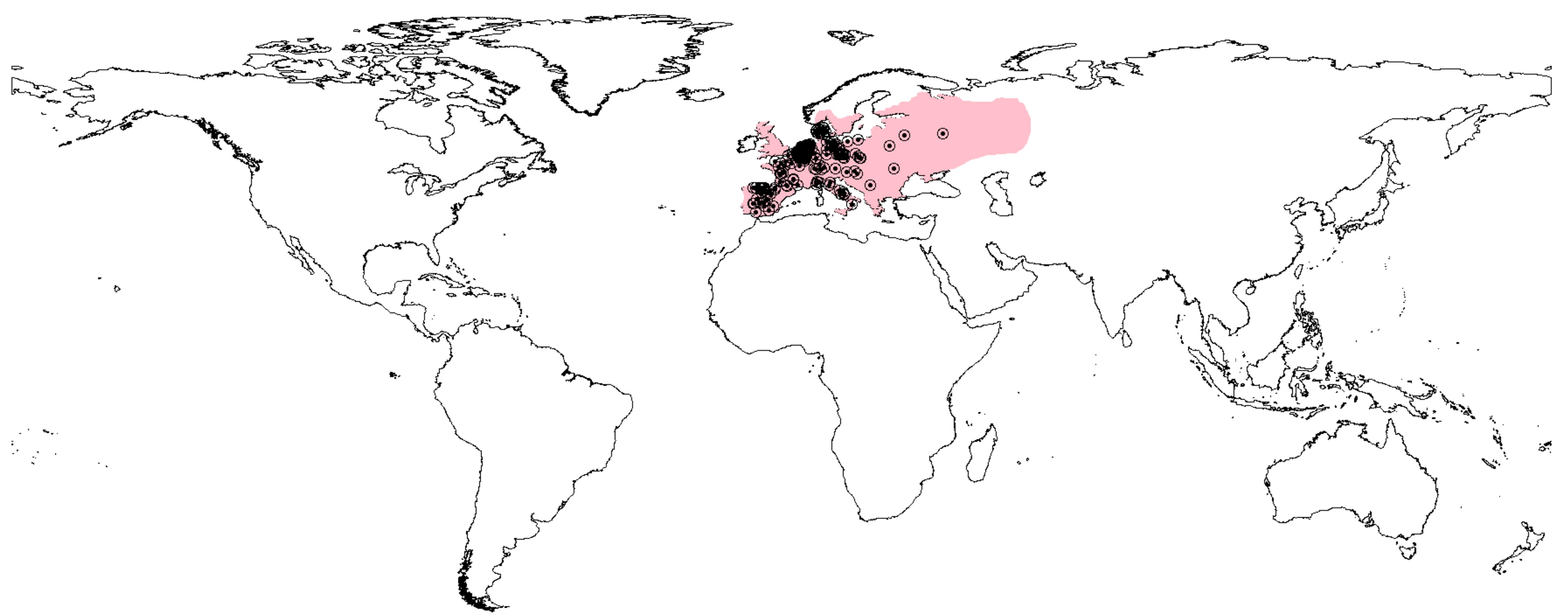
Mustela putorius
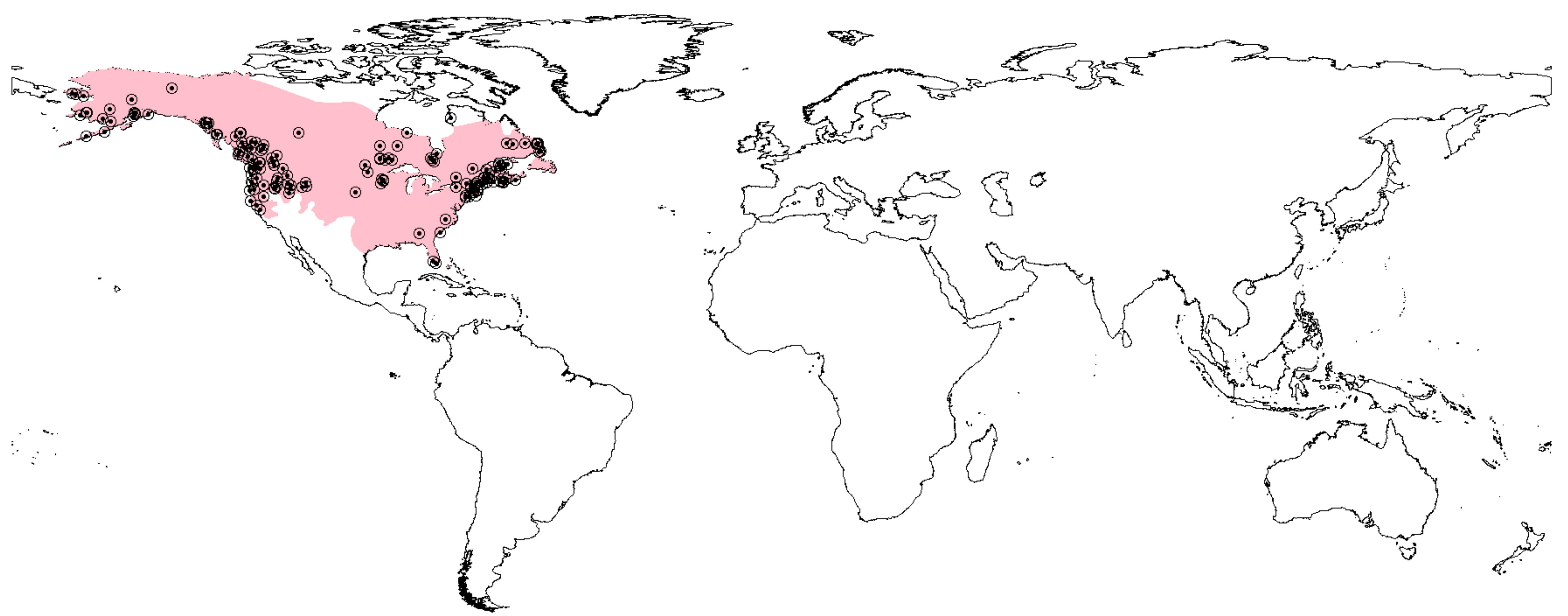
Mustela vison

Paradoxurus hermaphroditus

Procyon lotor

Spilogale gracilis

Urocyon cinereoargenteus

Ursus arctos

Viverricula indica
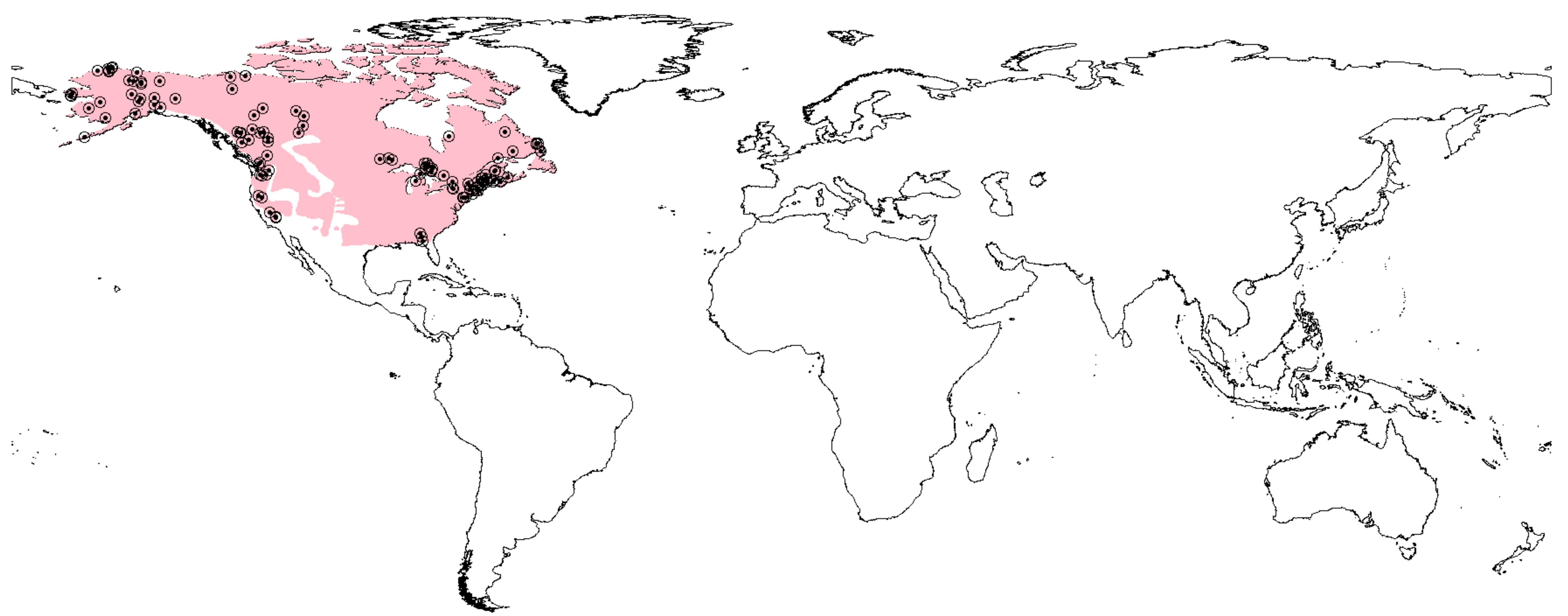
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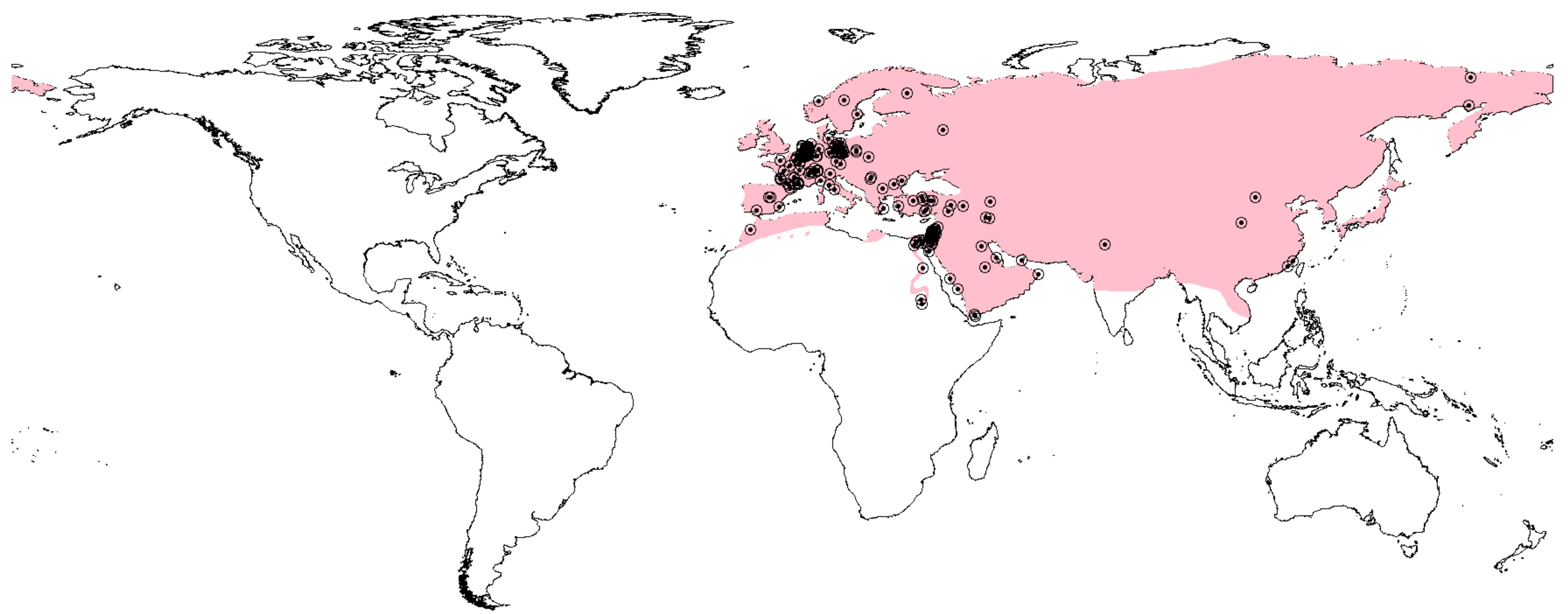
Vulpes vulpes Palearctic

Marginal GAM Surface for CBL in male Alopex lagopus
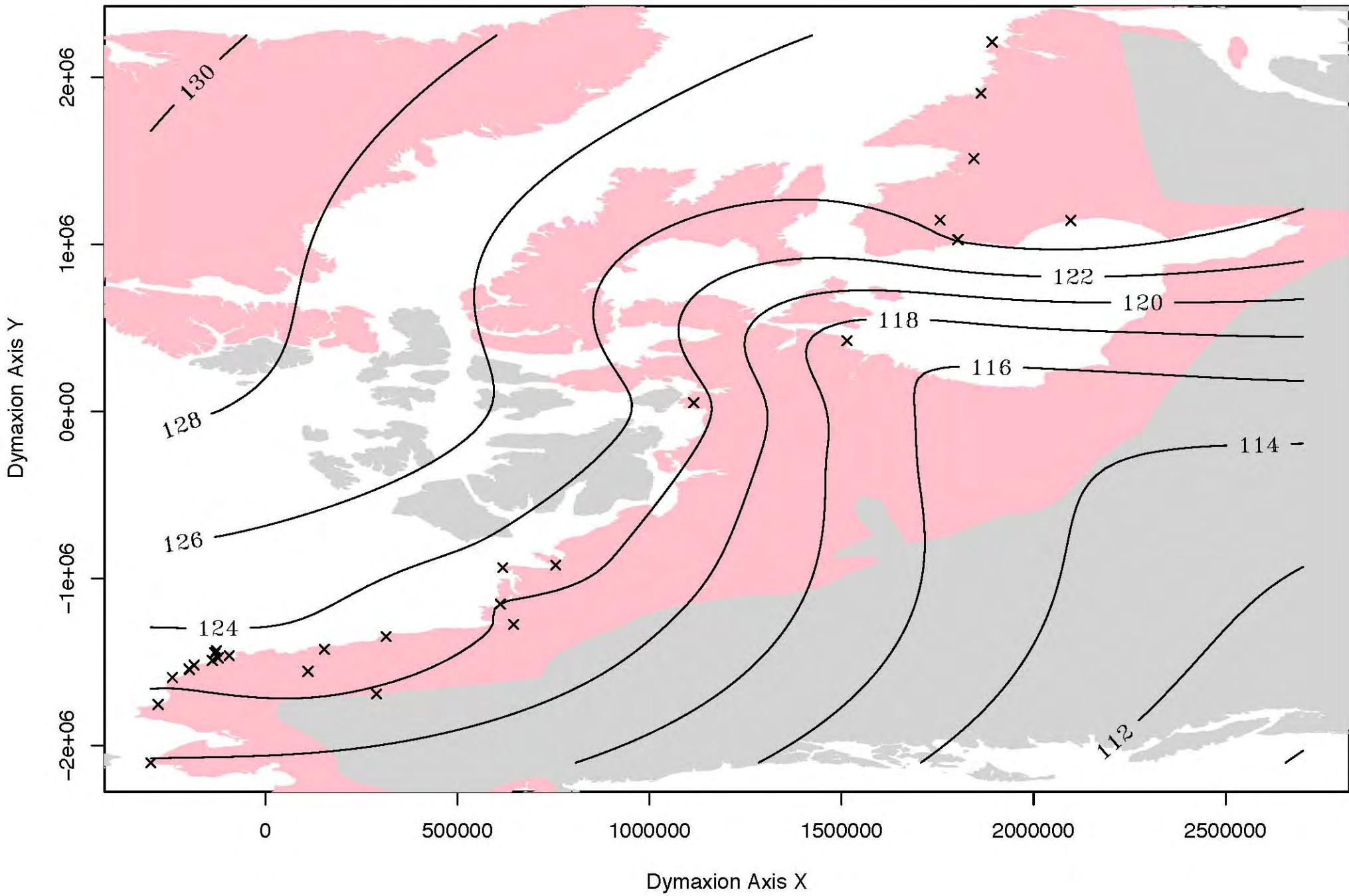
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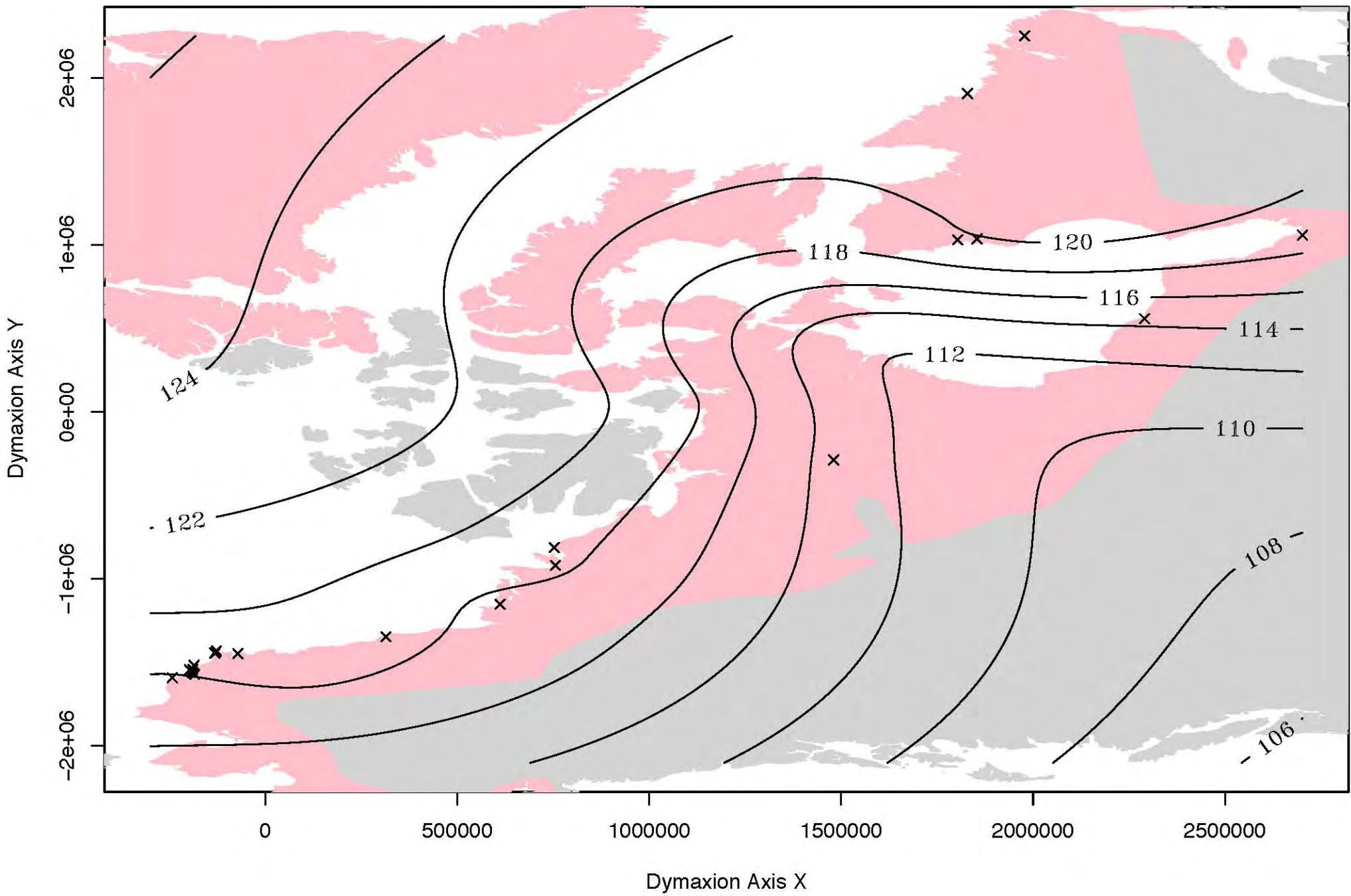
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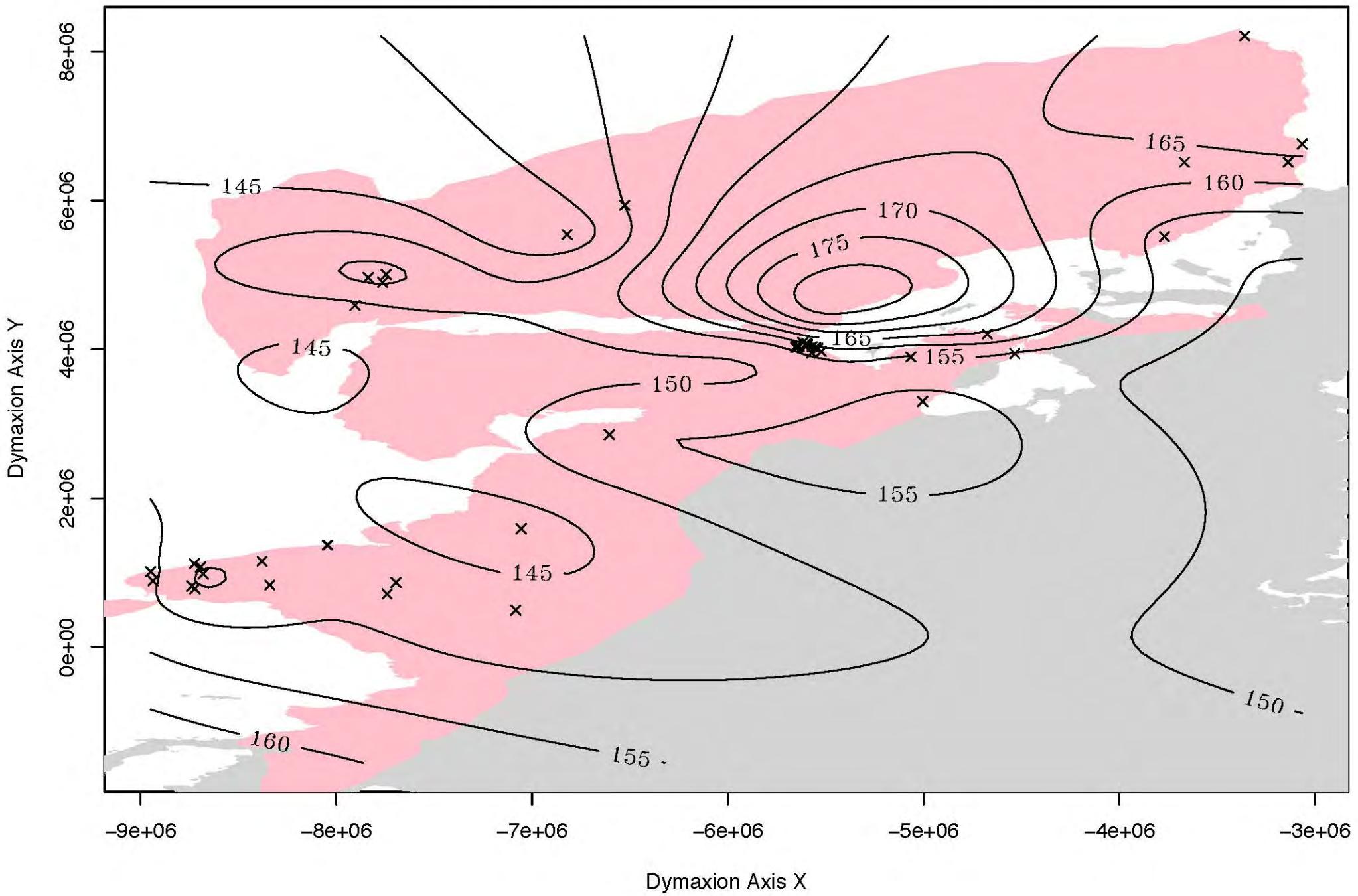
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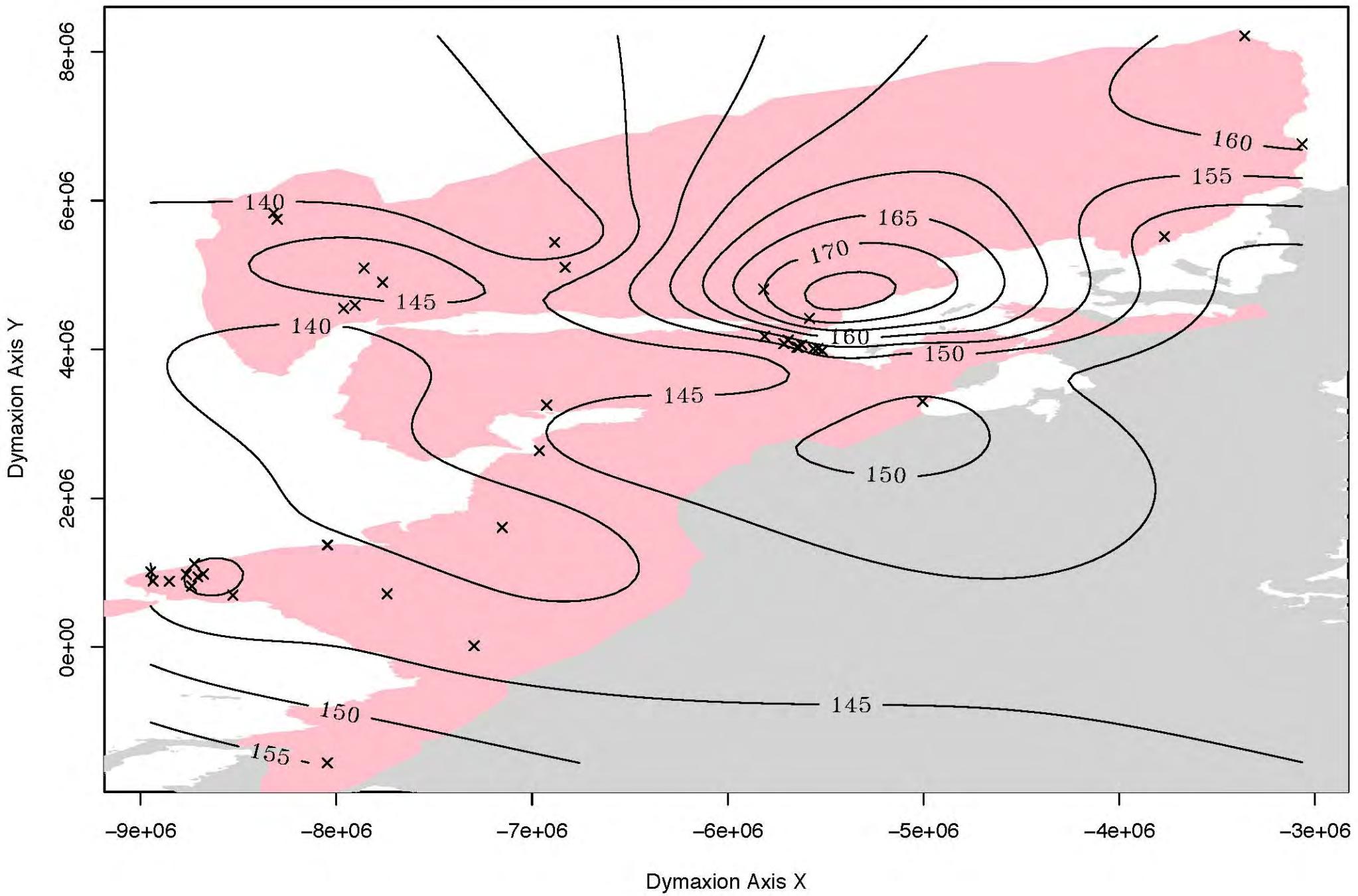
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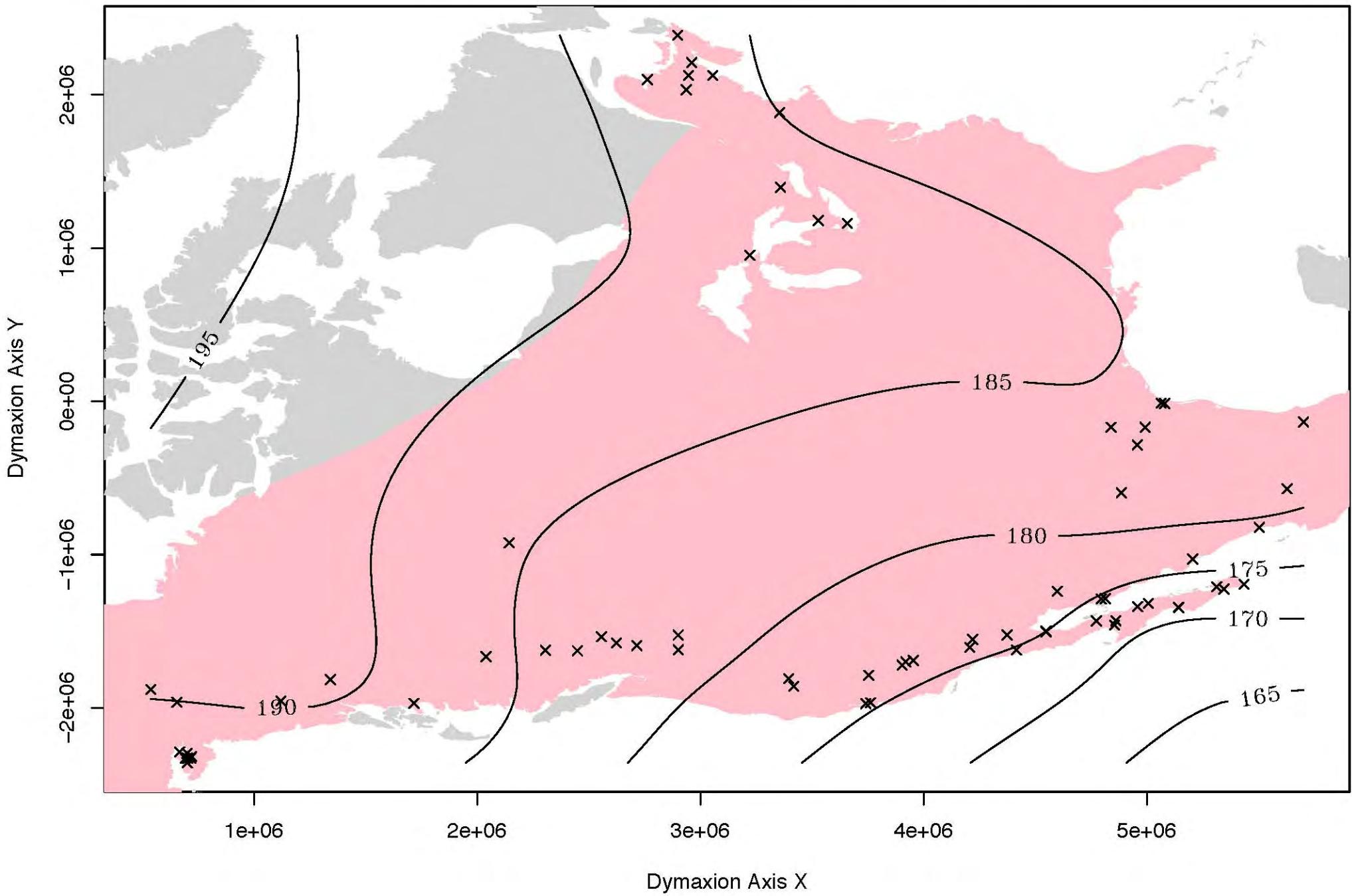
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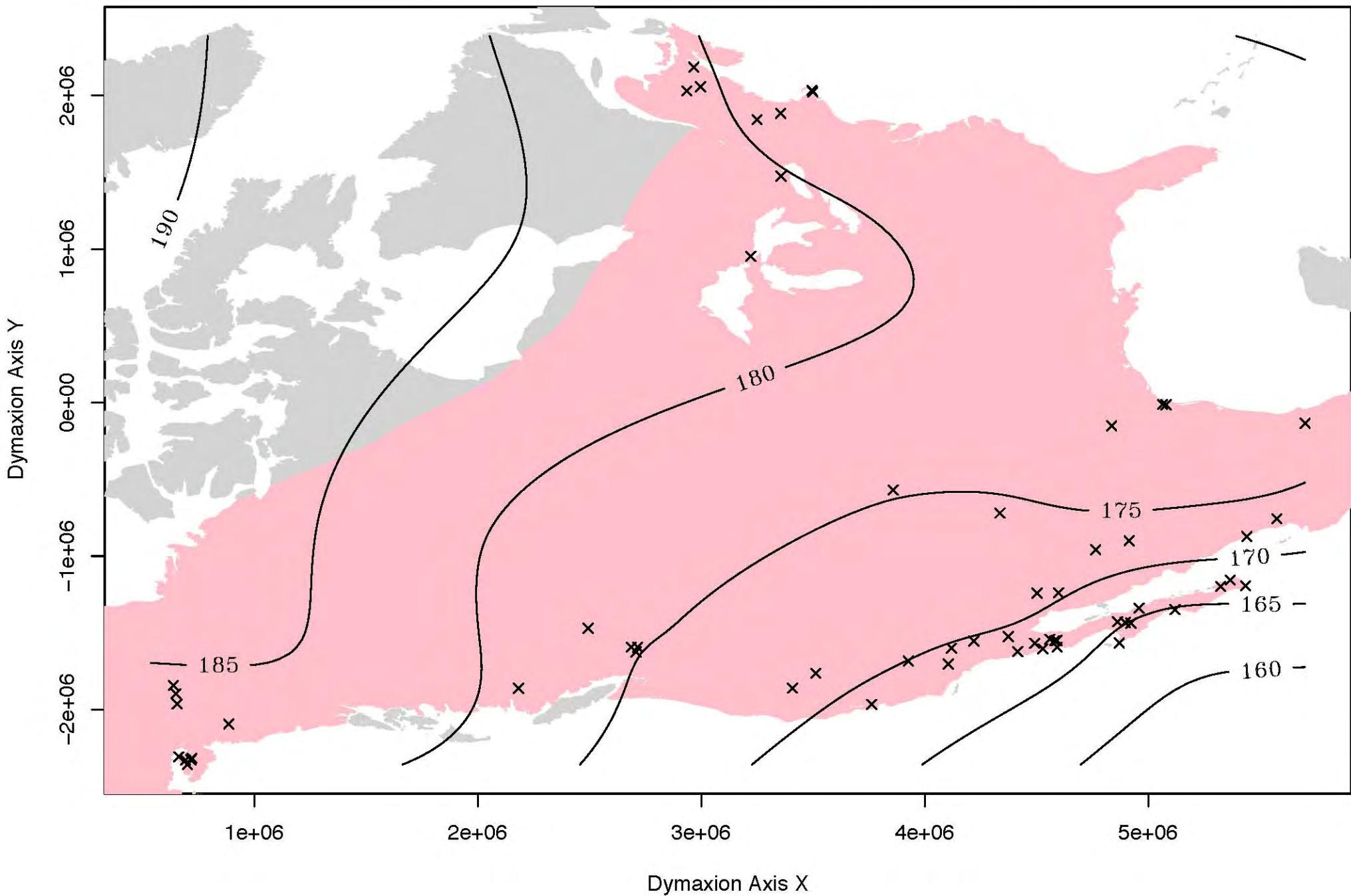
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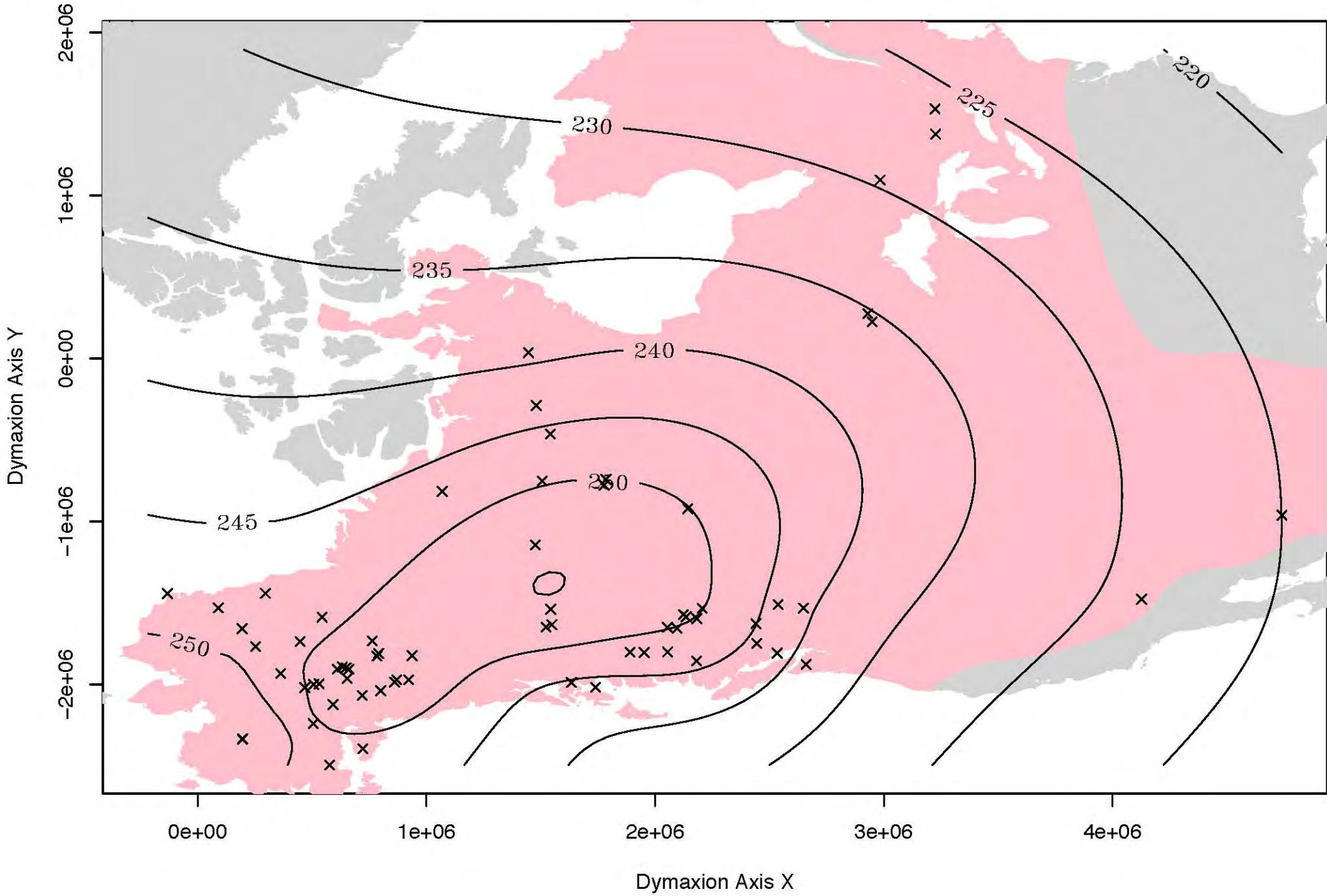
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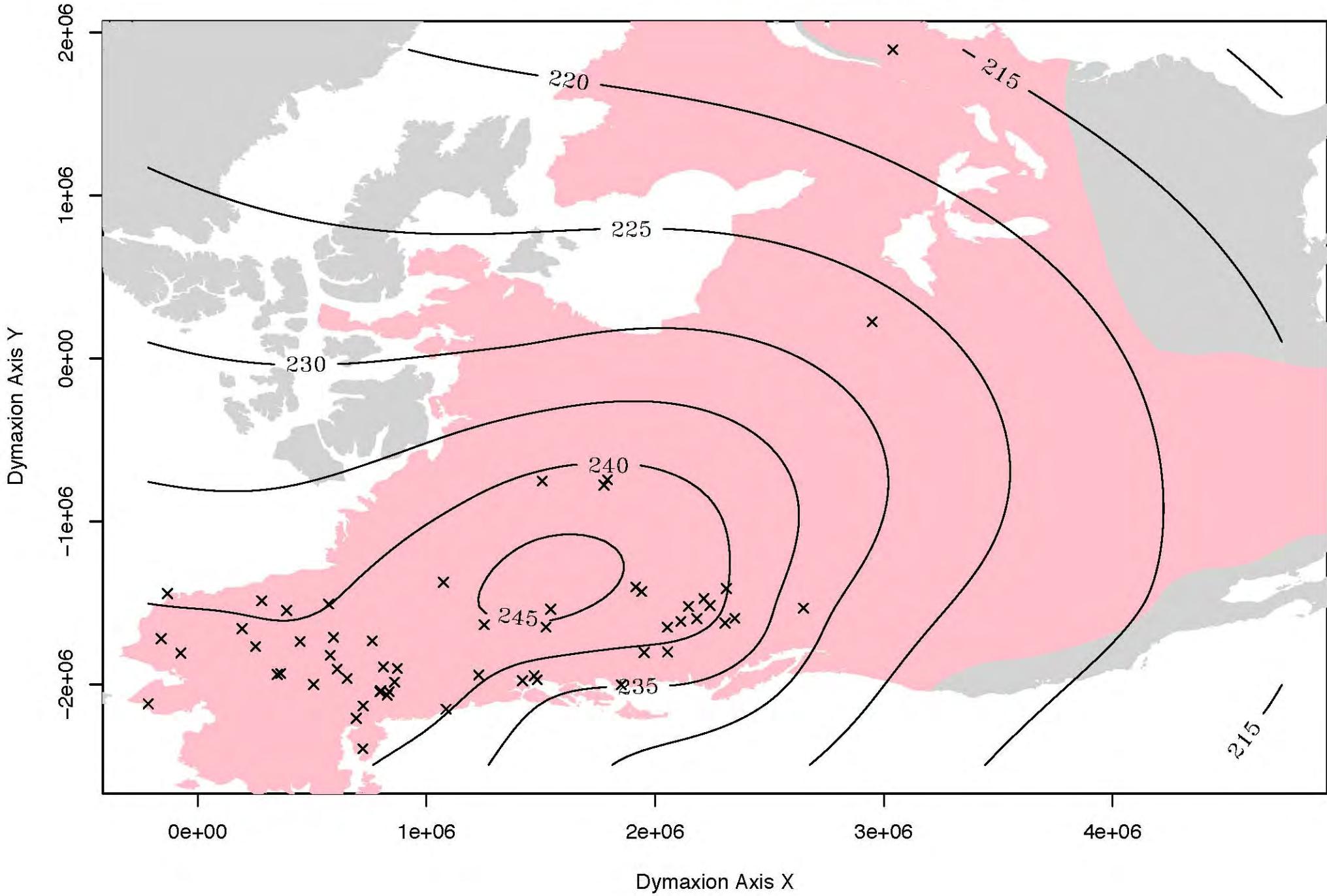
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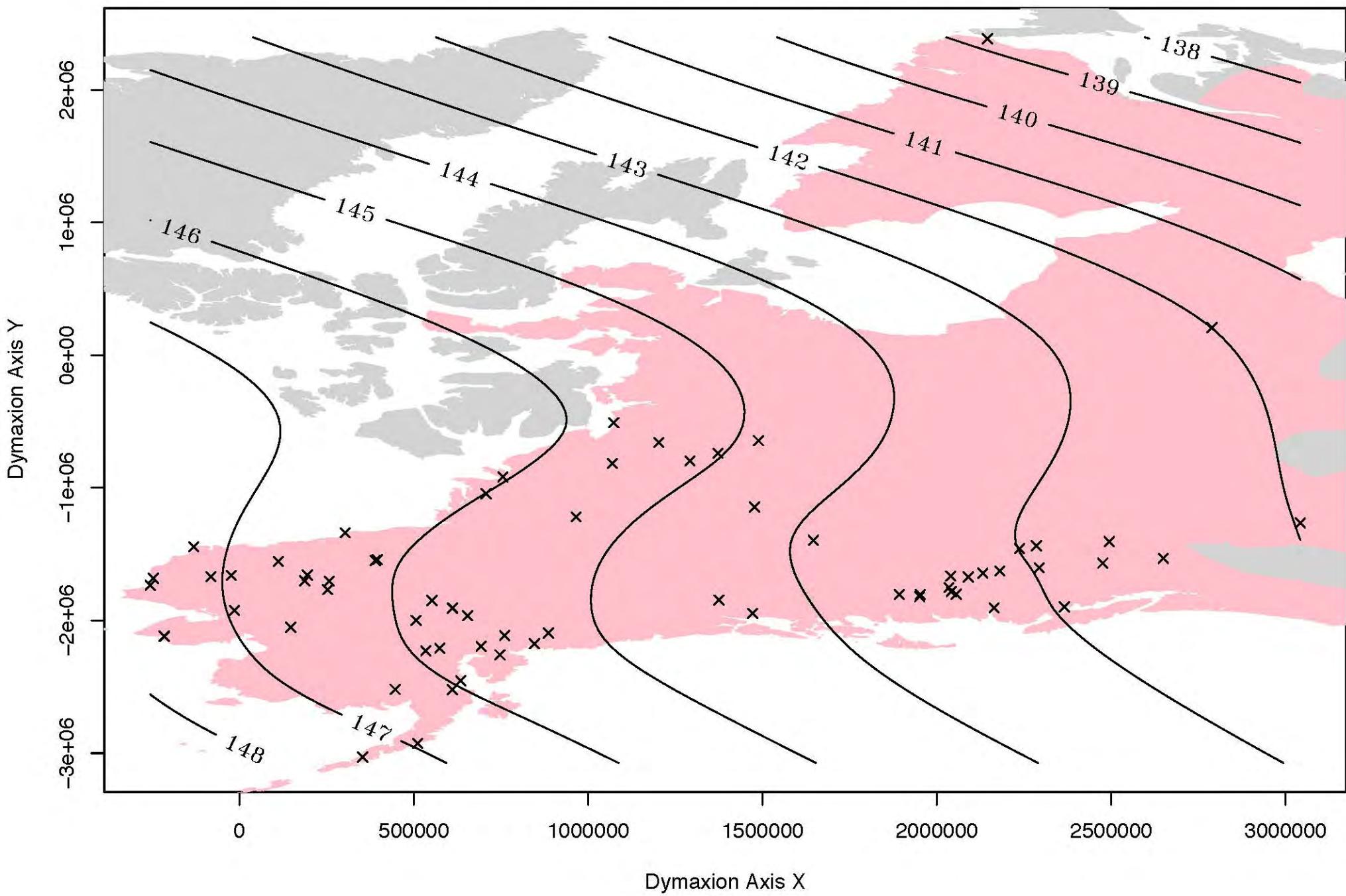
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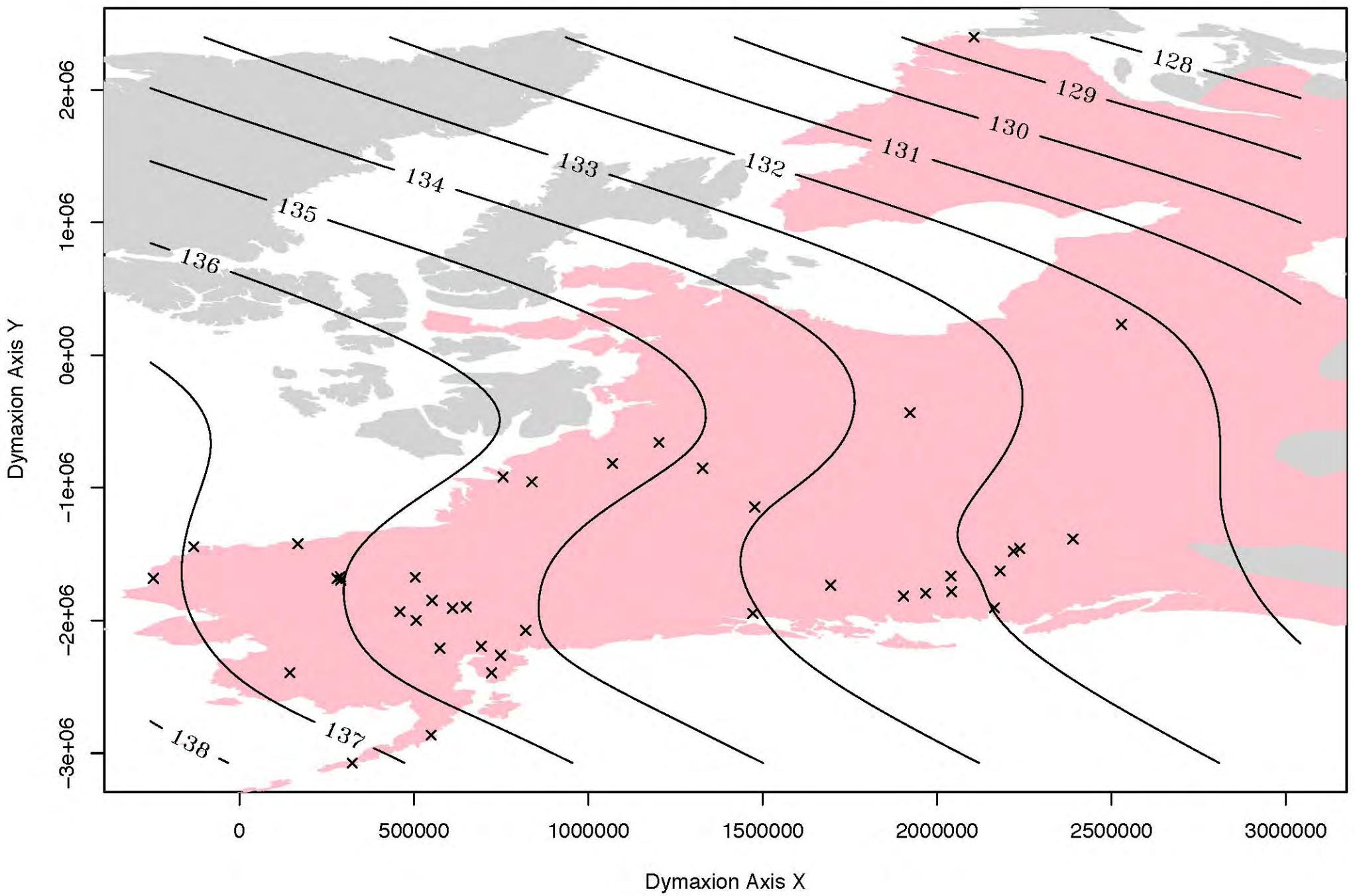
Marginal GAM Surface for CBL in male Herpestes edwardsii
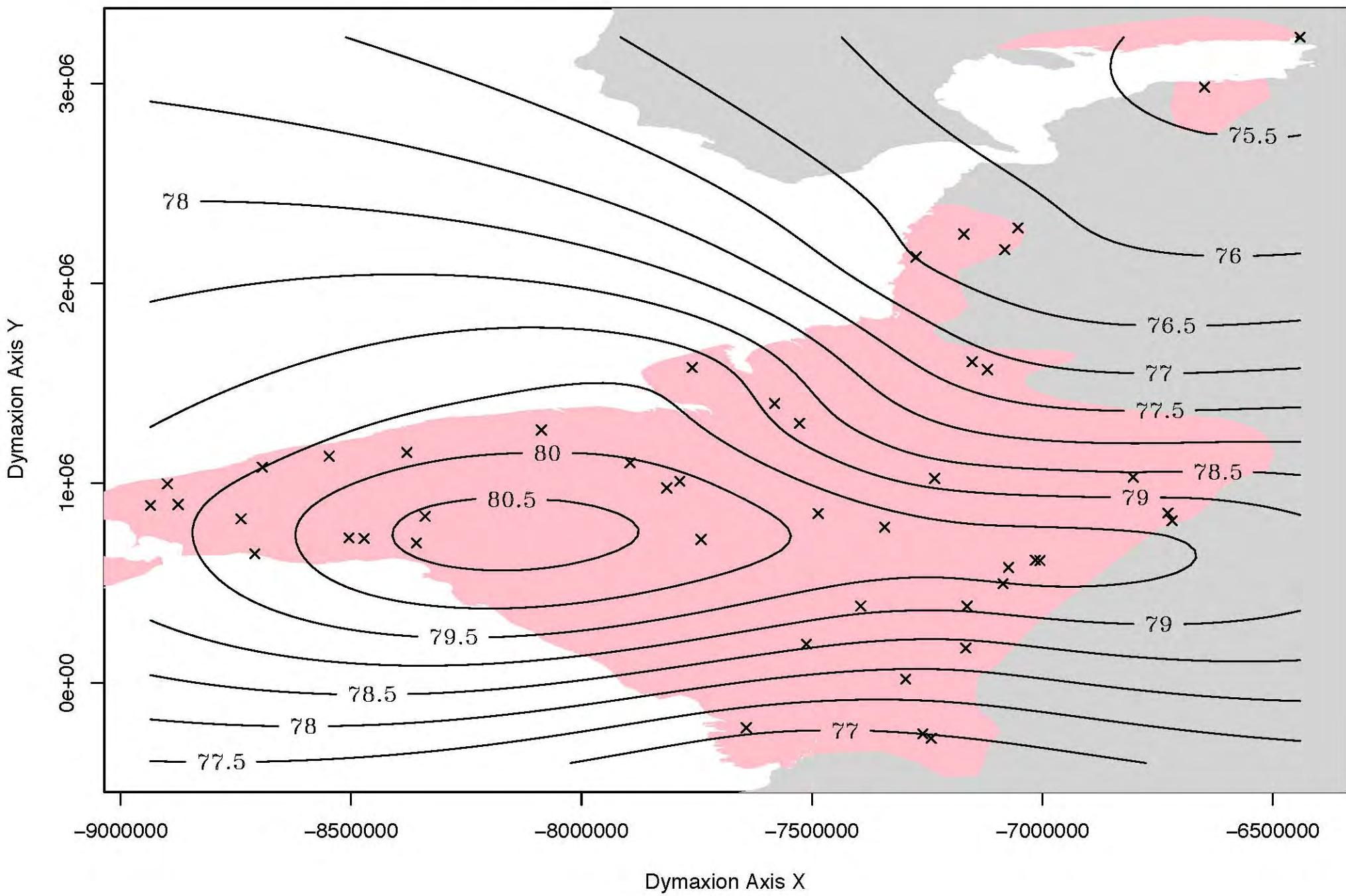
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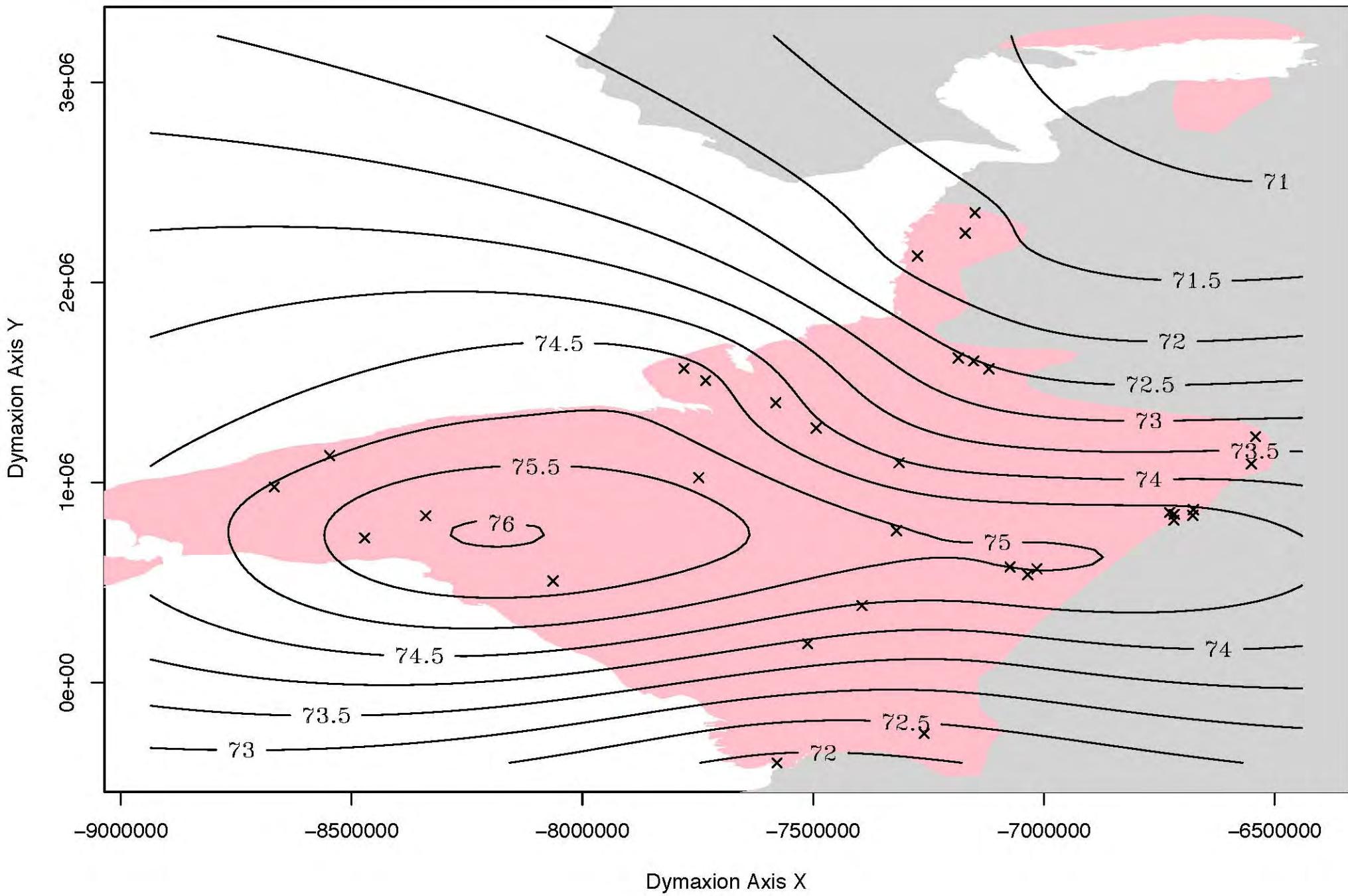
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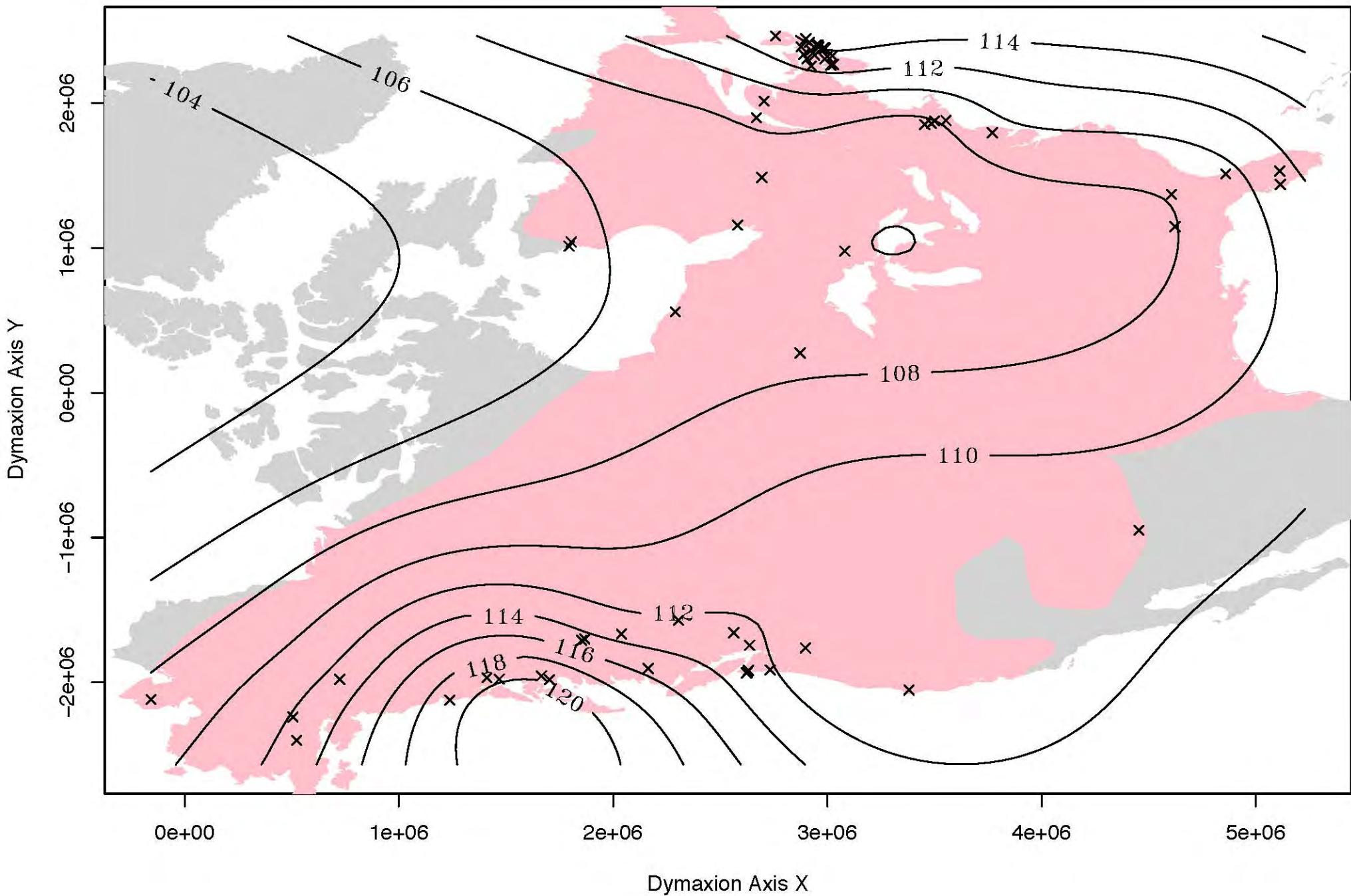
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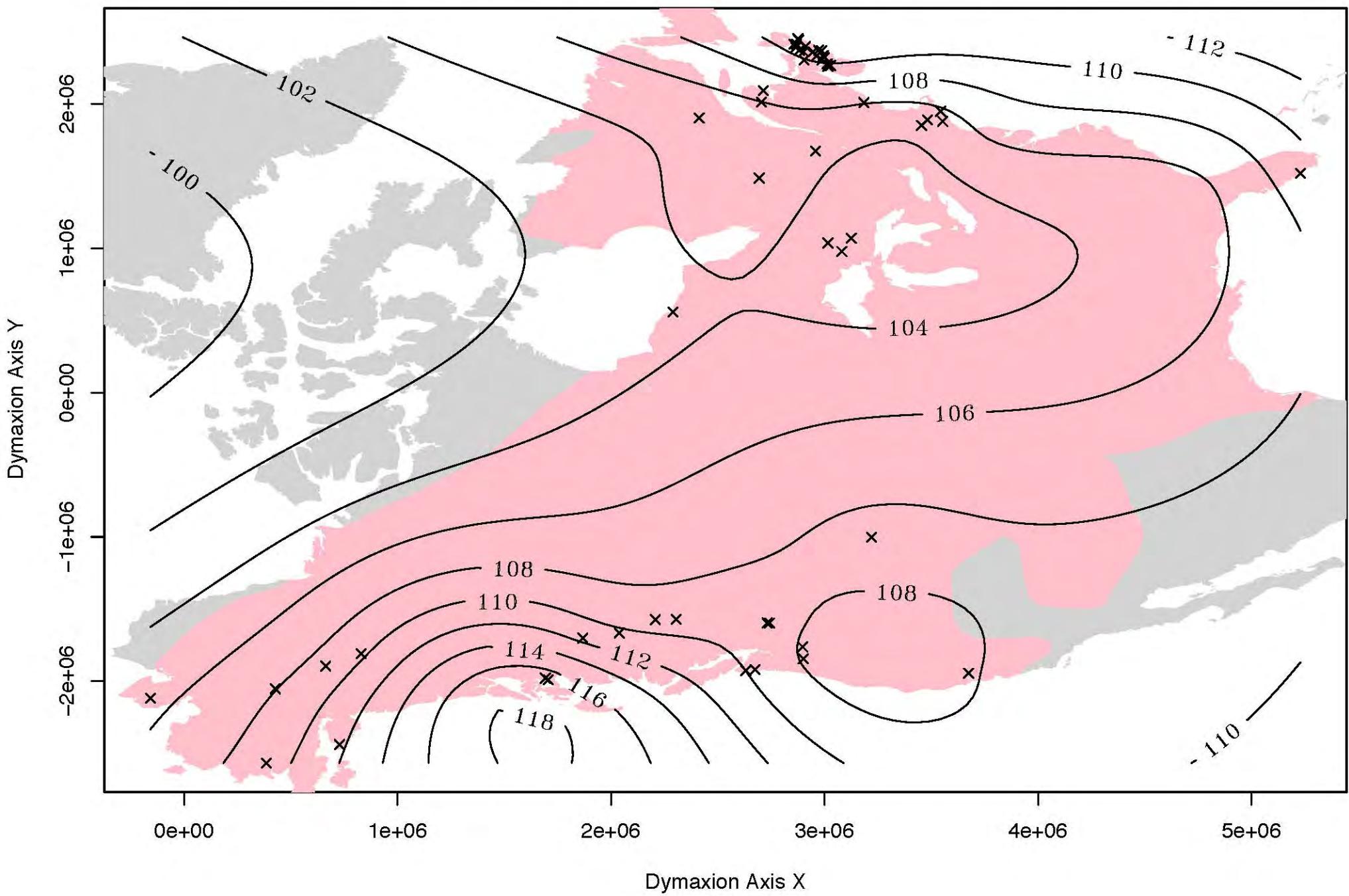
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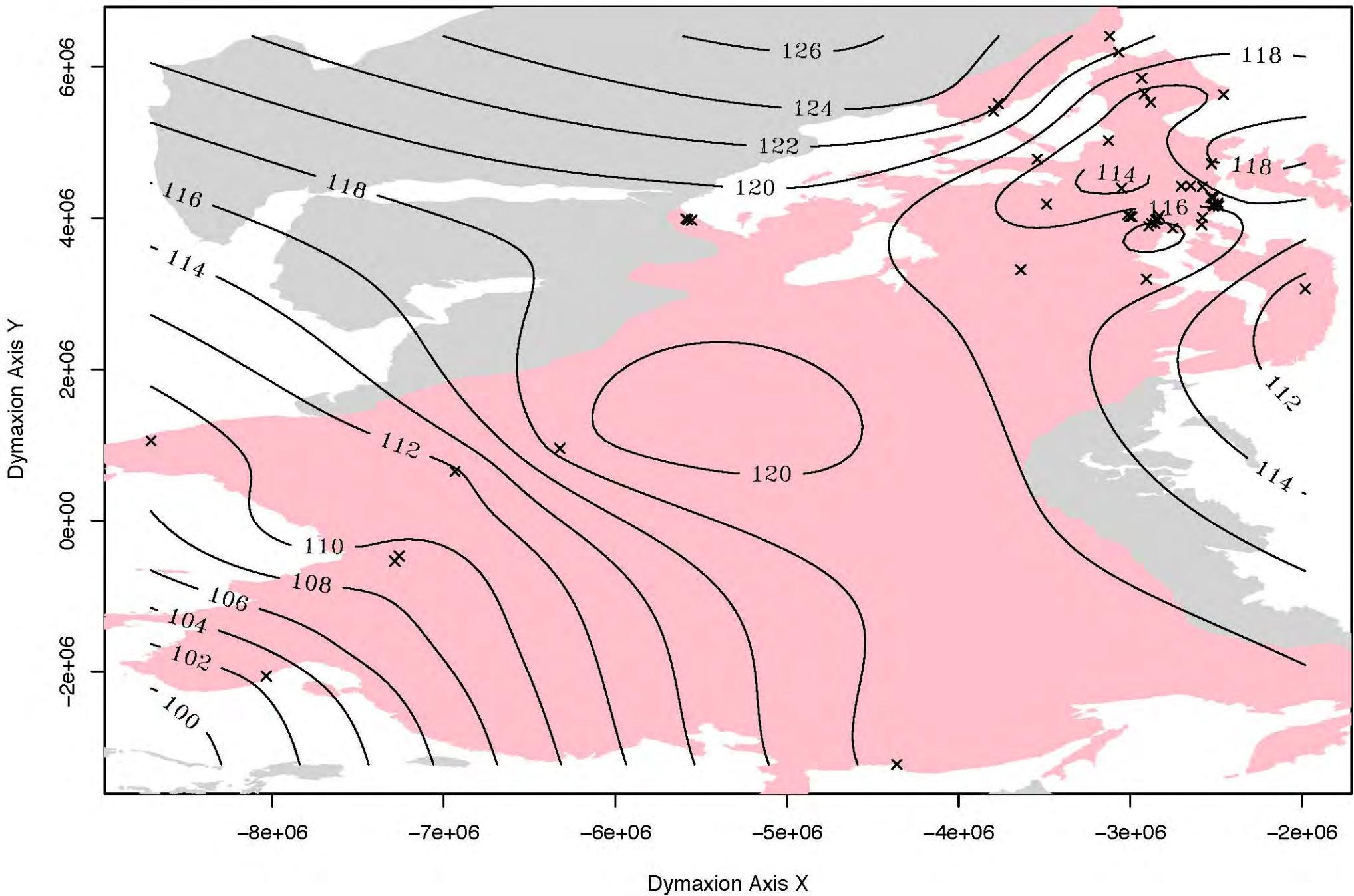
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Dymaxion Axis Y

Dymaxion Axis X
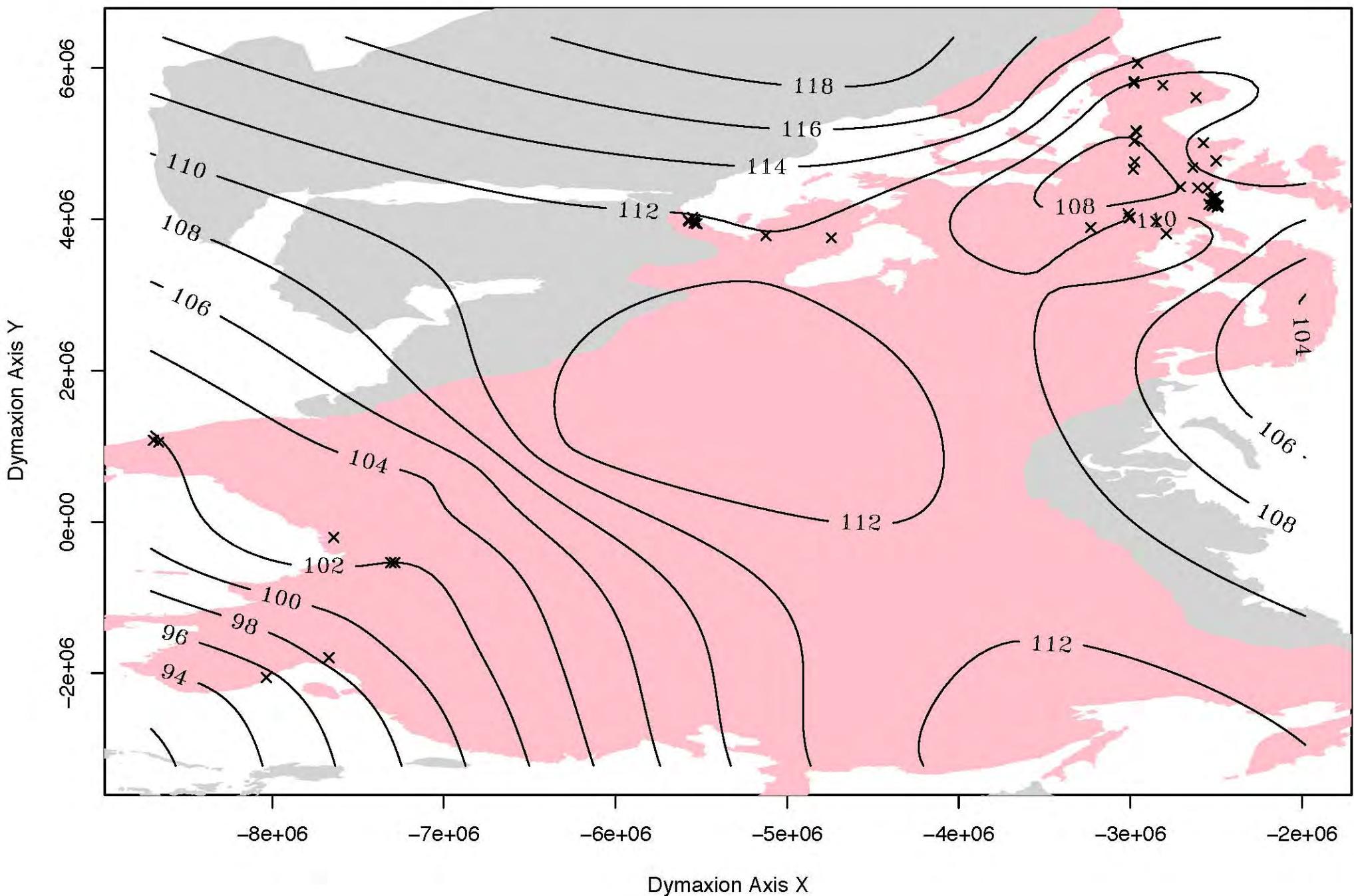
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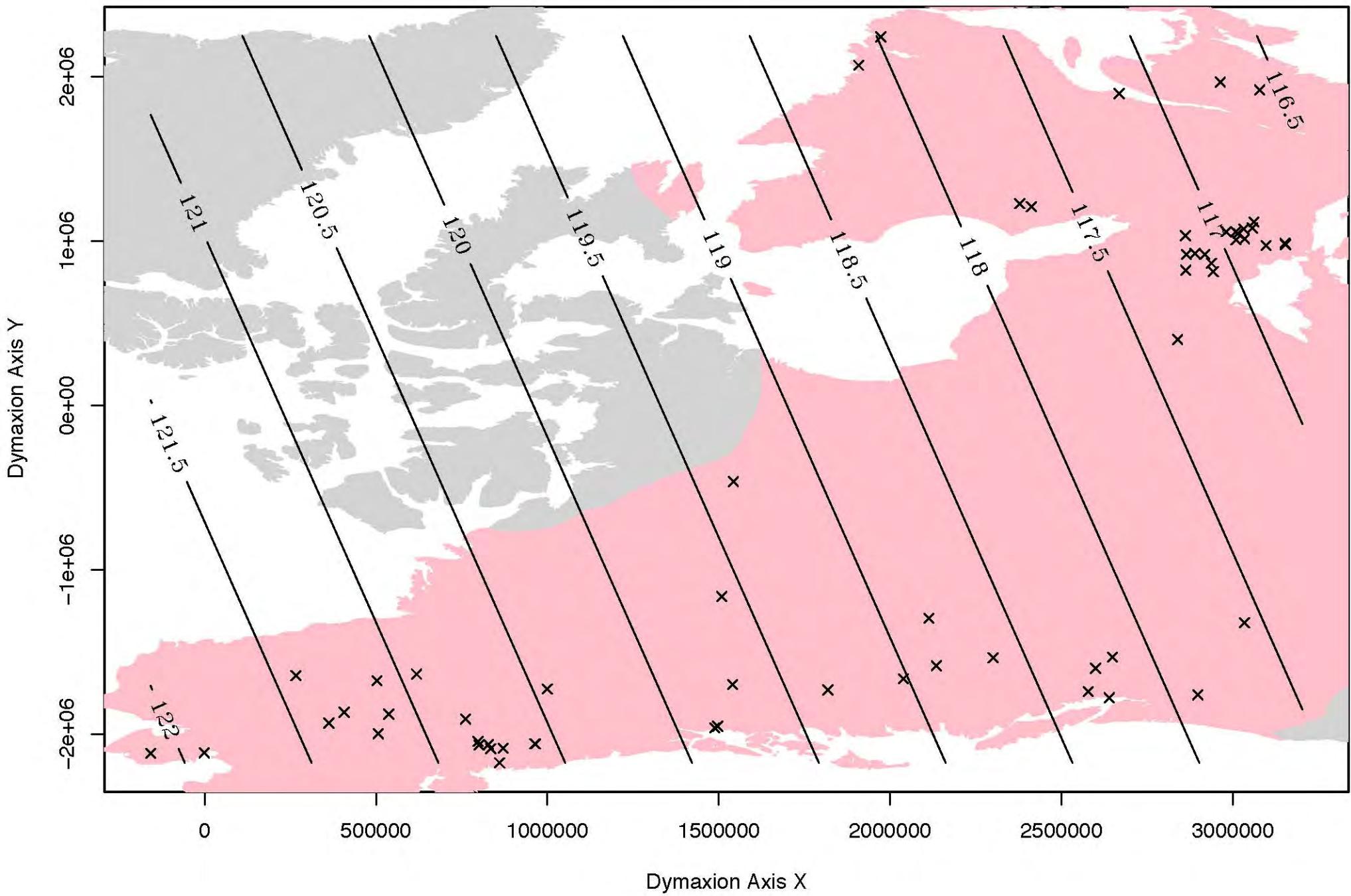
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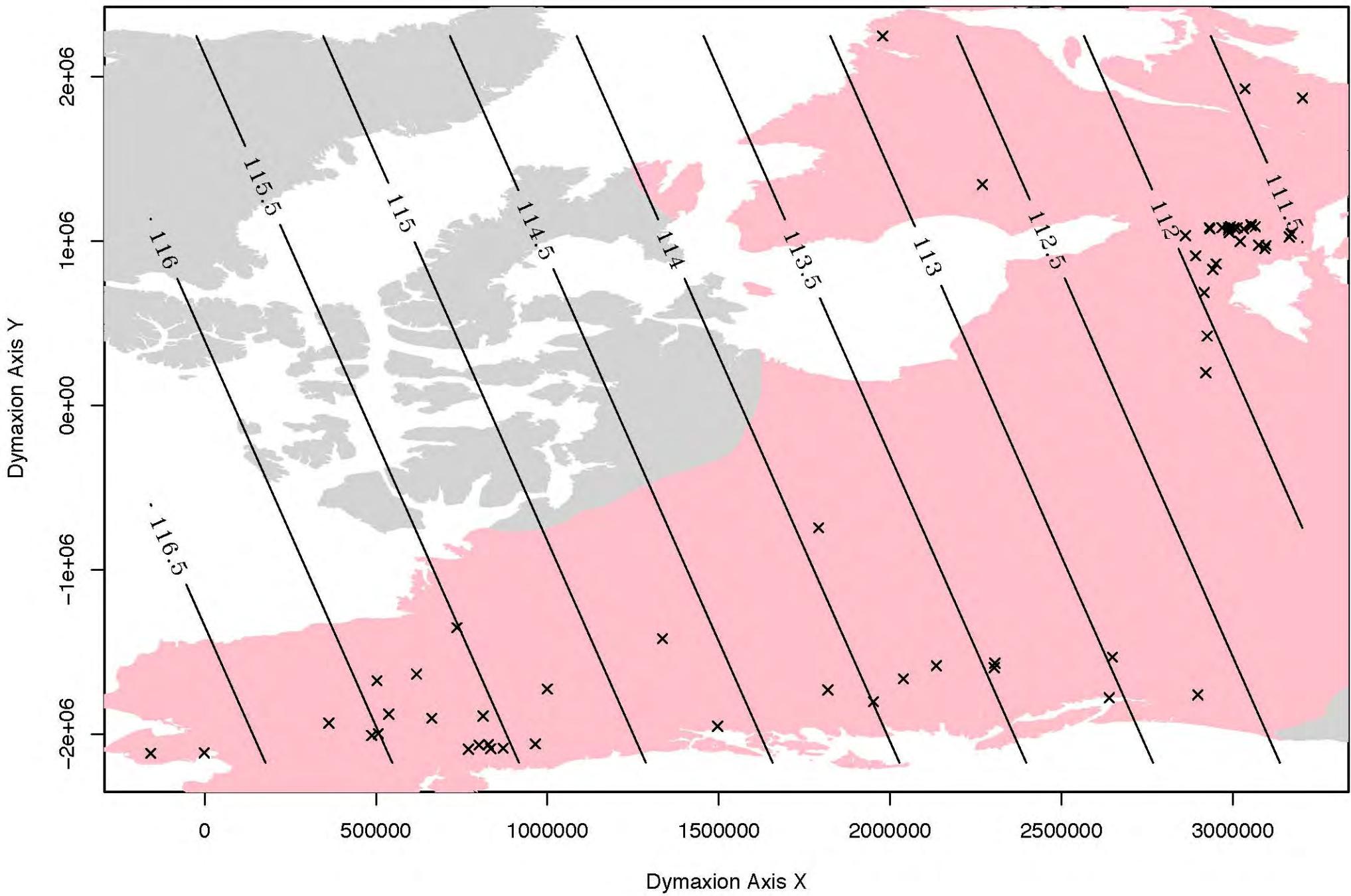
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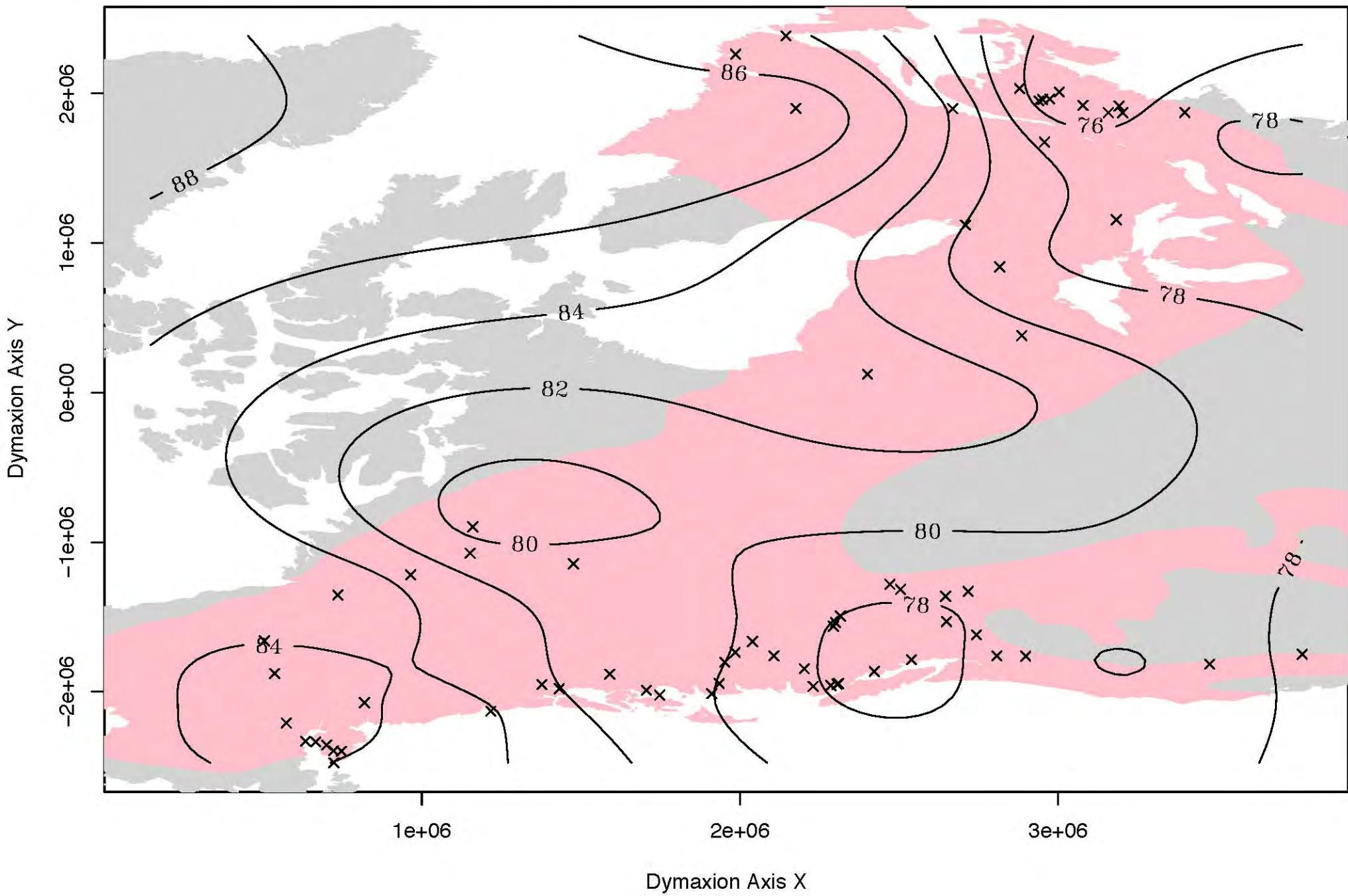
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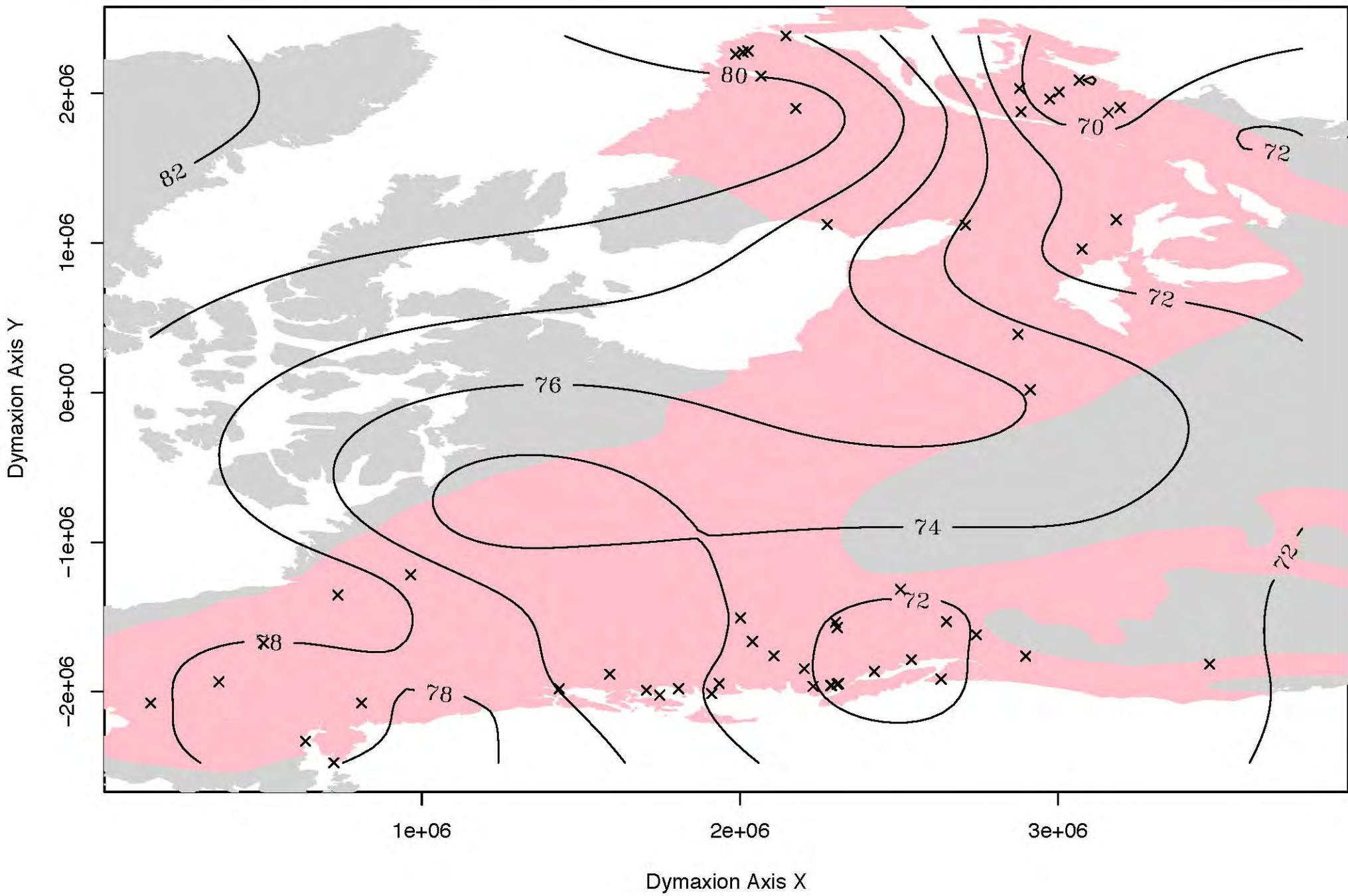
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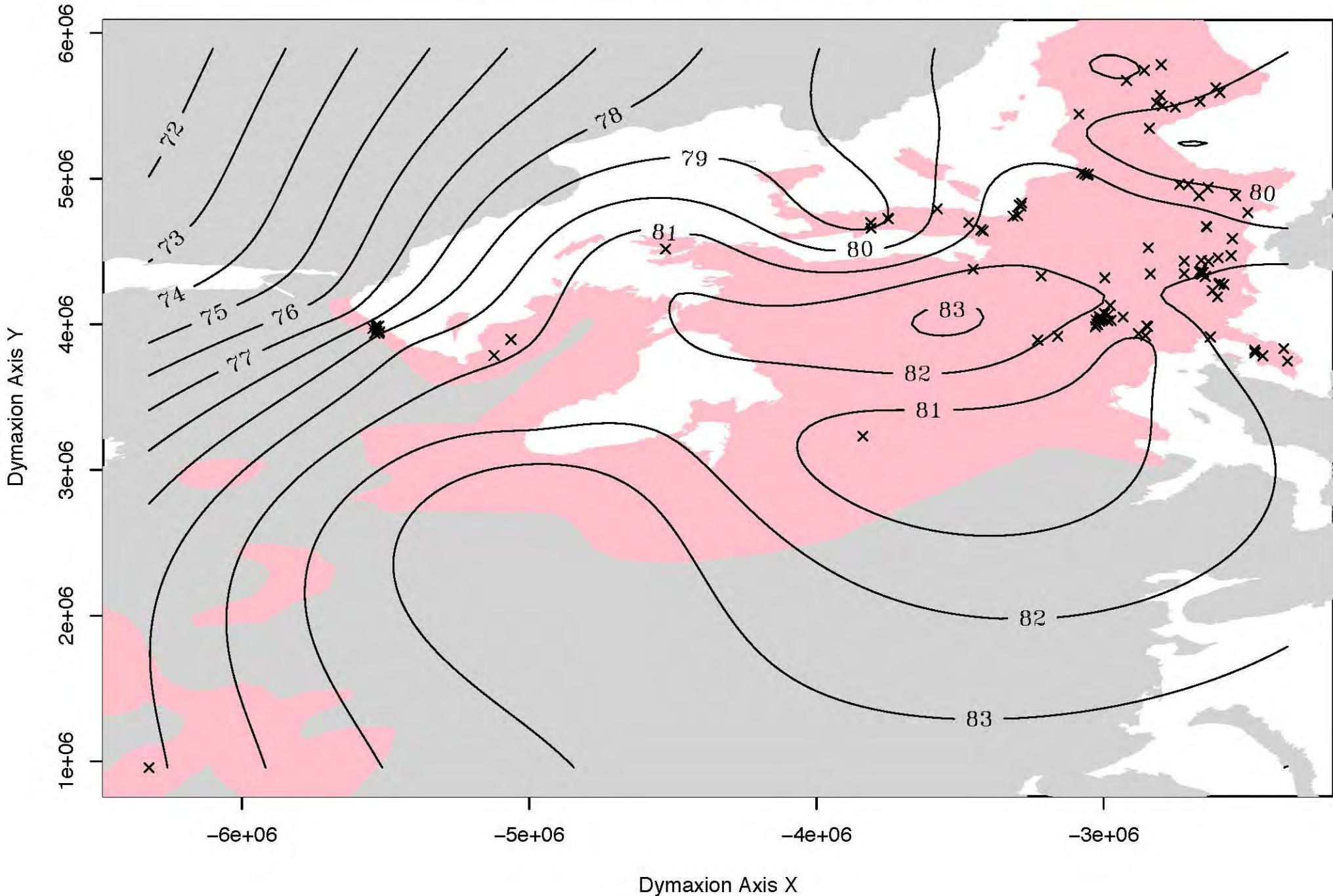
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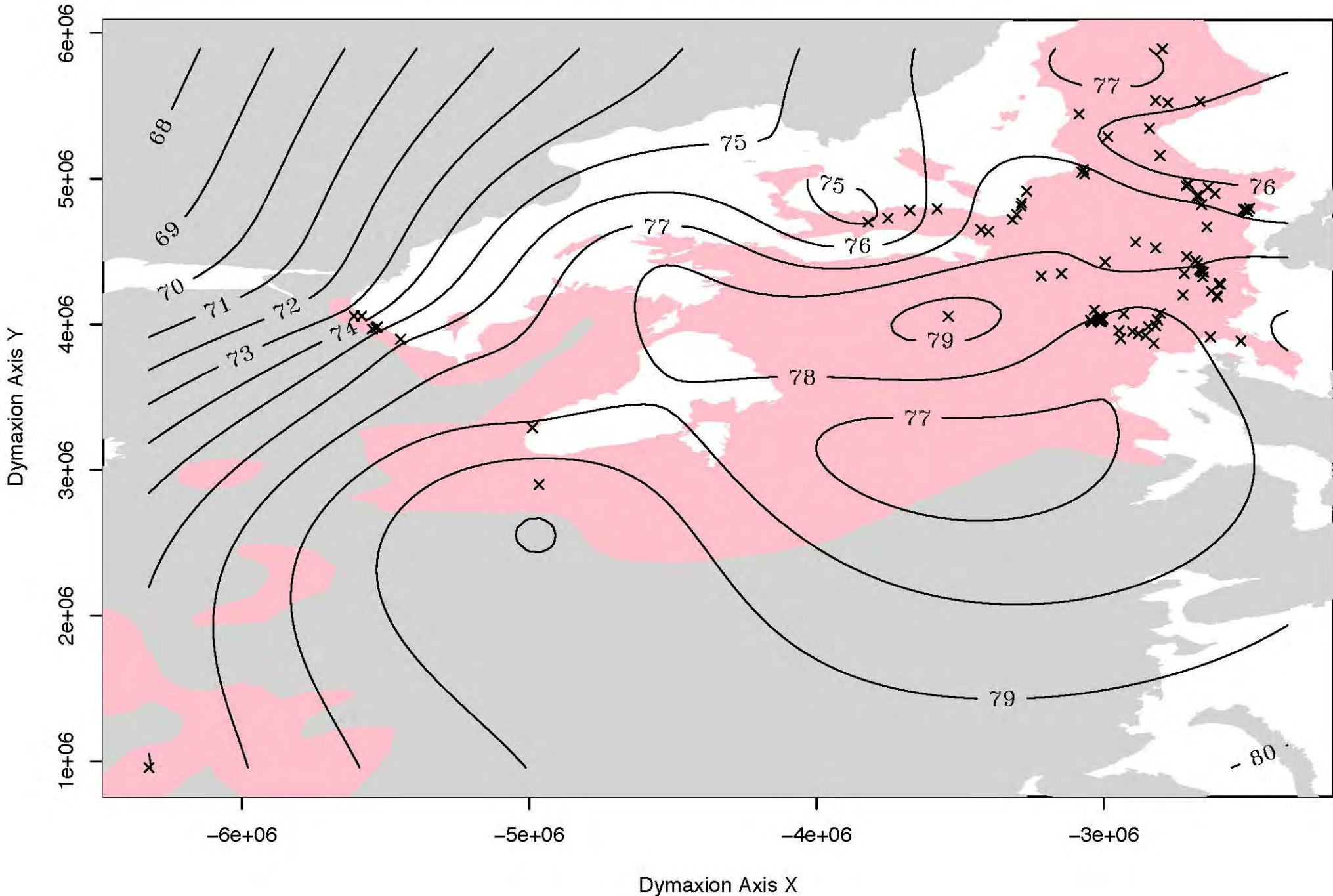
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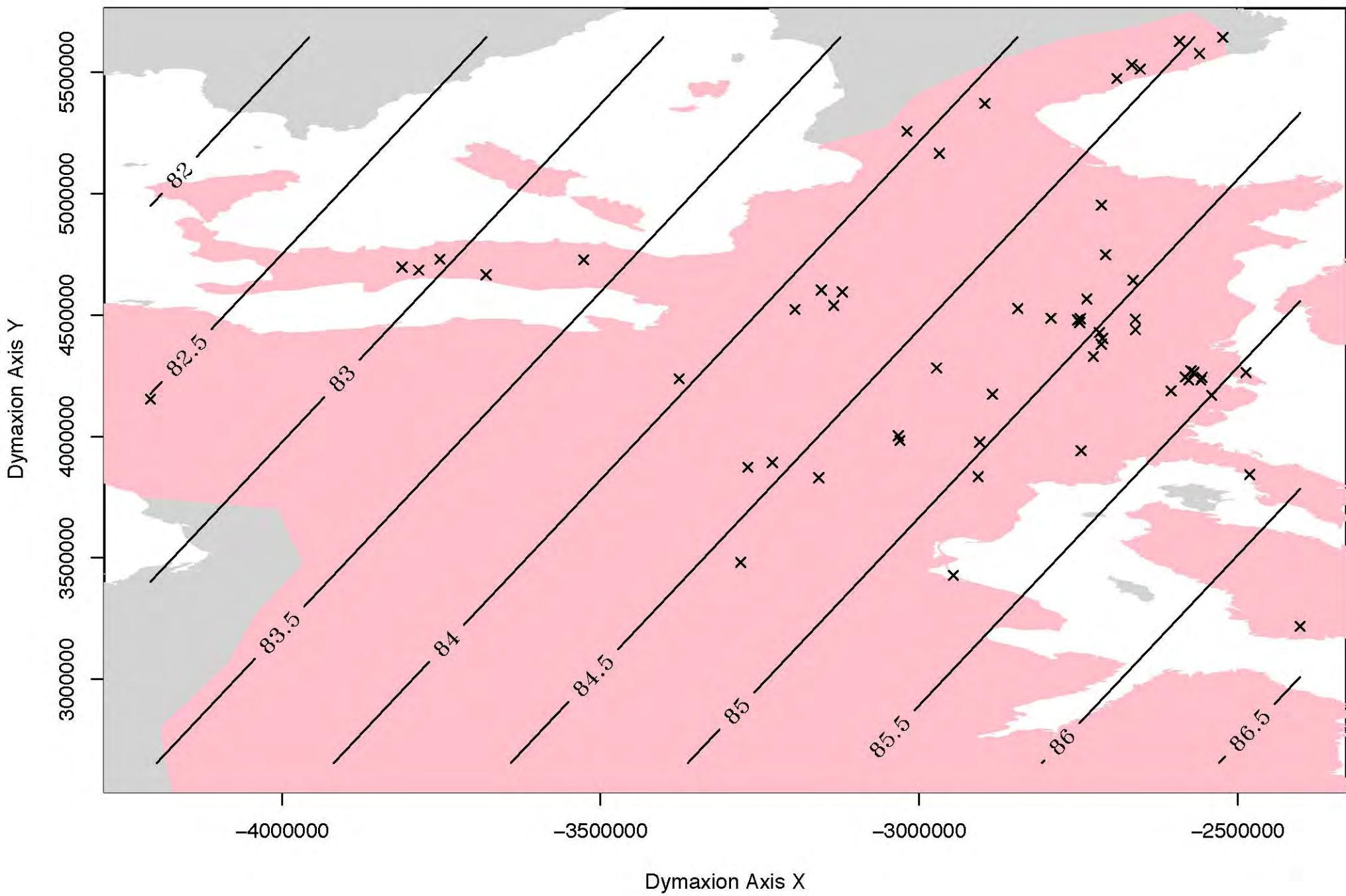
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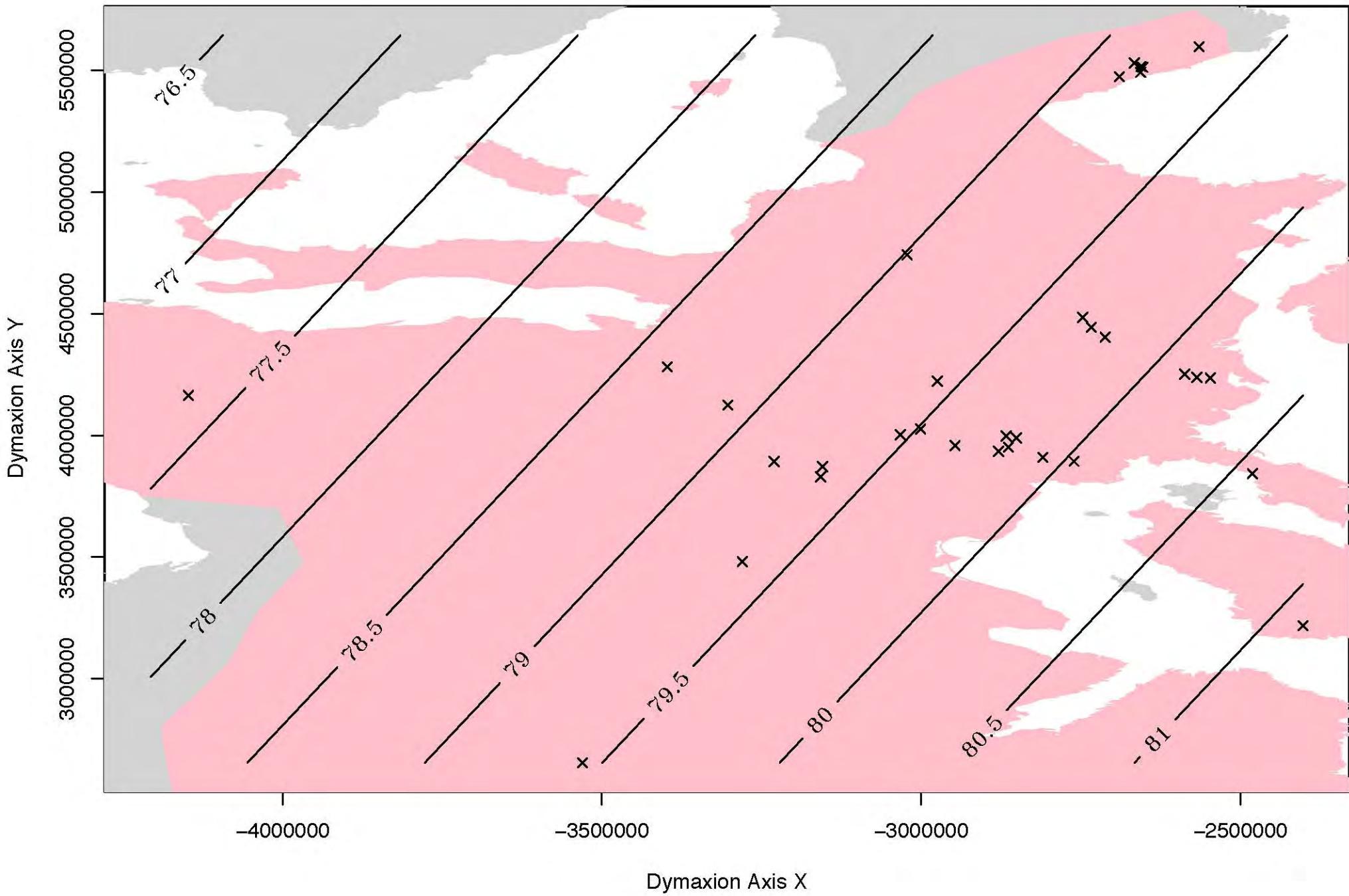
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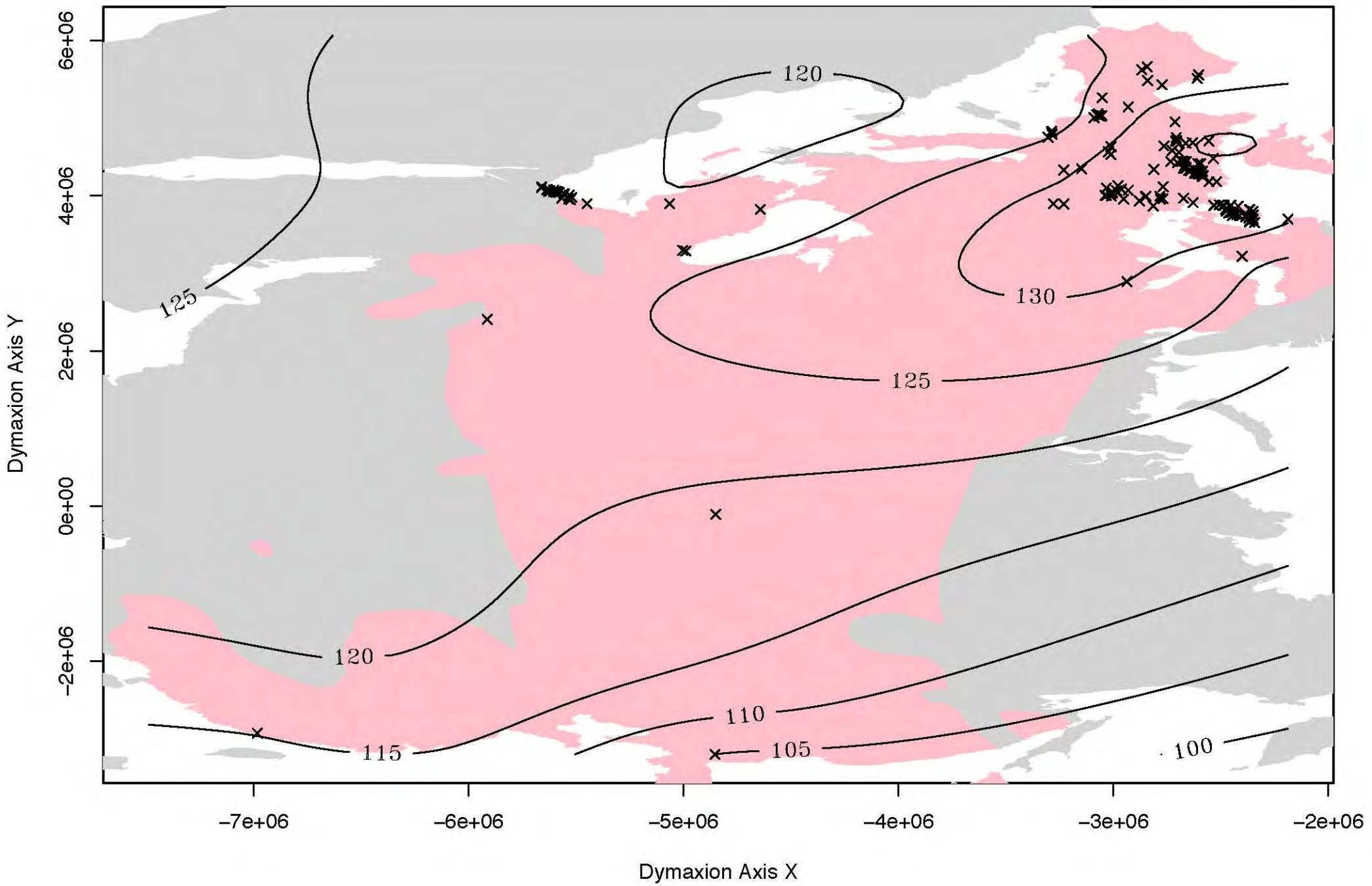
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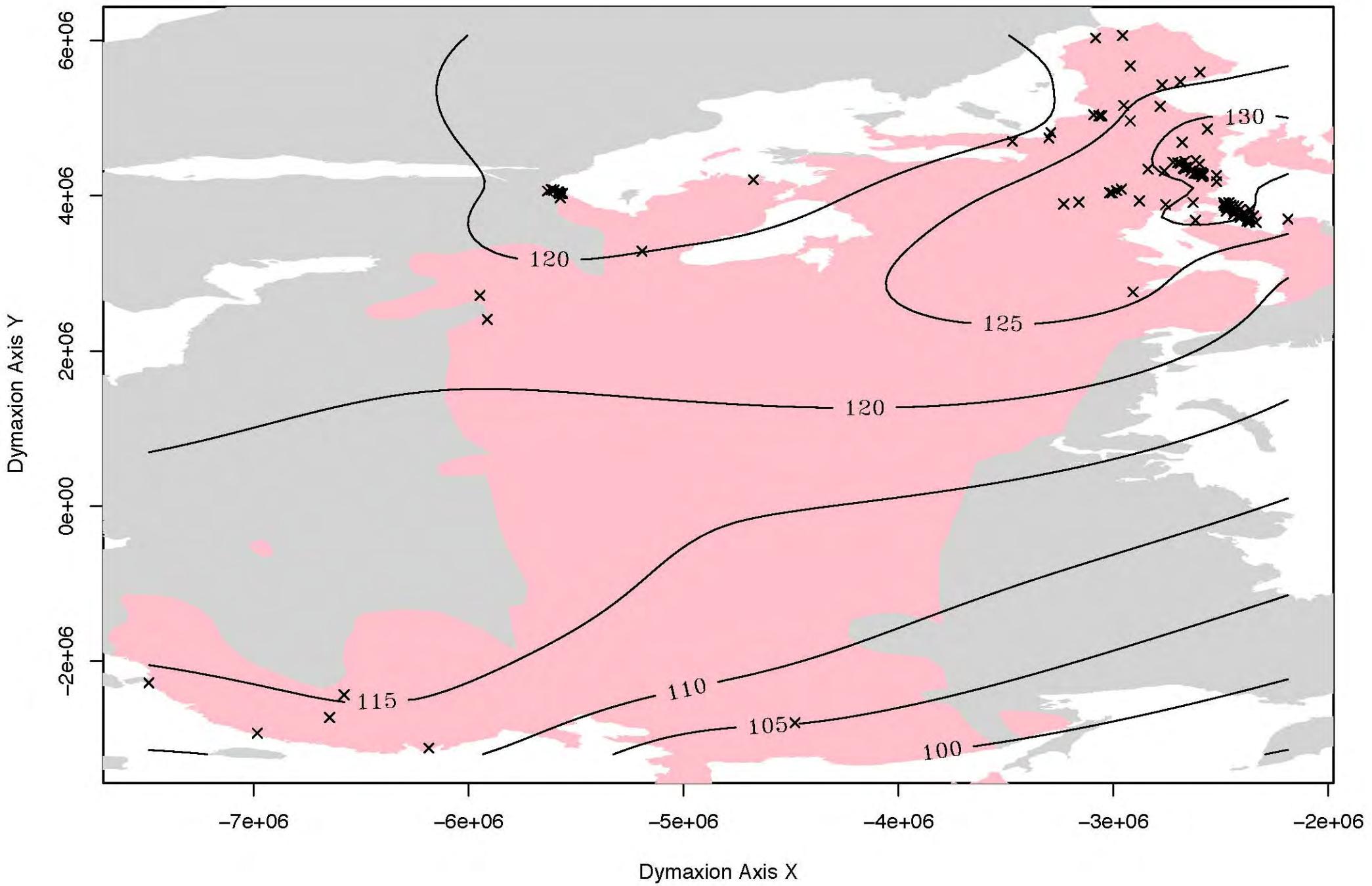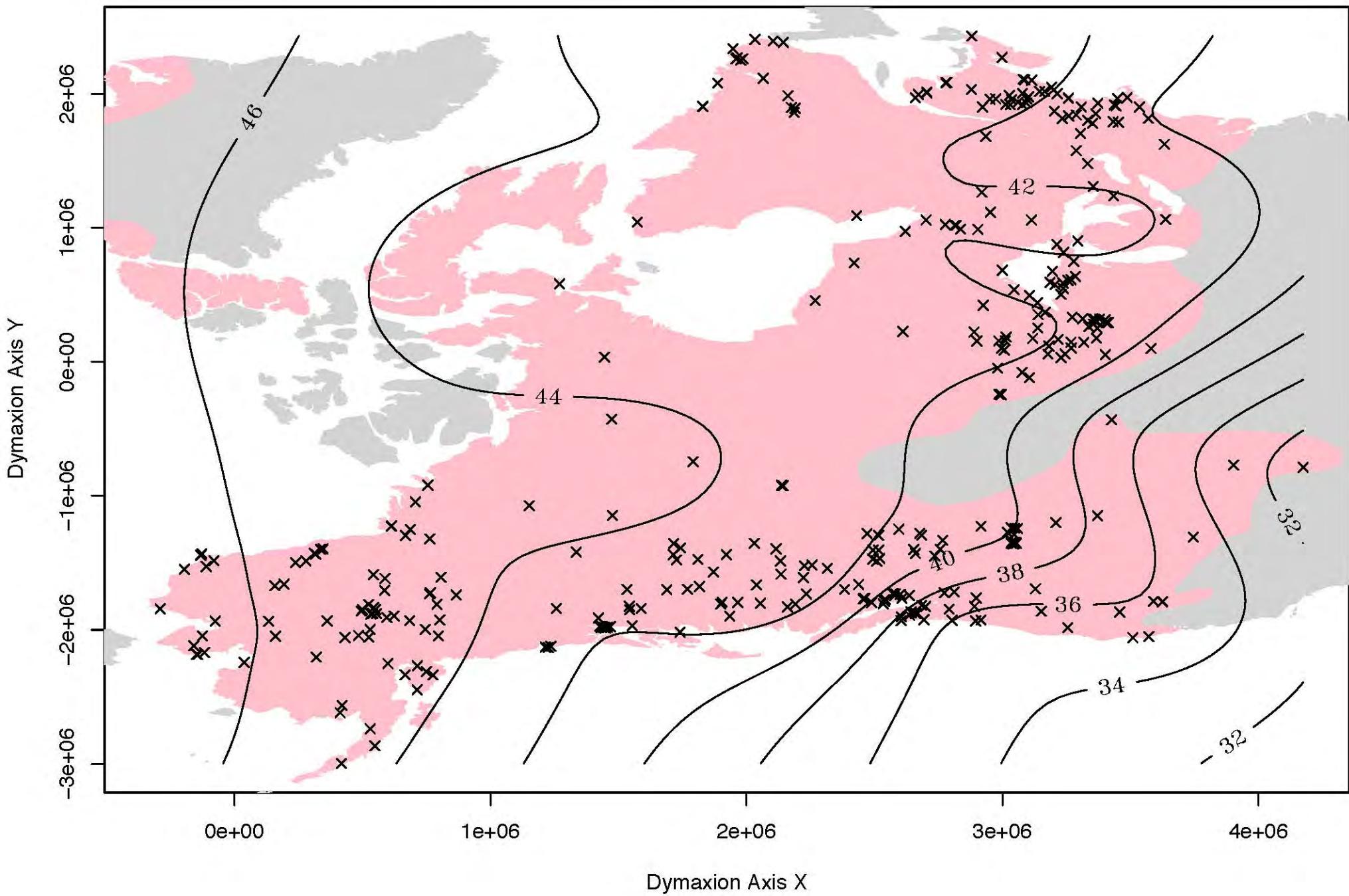
Dymaxion Axis Y

Dymaxion Axis X

Marginal GAM Surface for CBL in male Mustela erminea Nearctic

Marginal GAM Surface for CBL in female Mustela erminea Nearctic
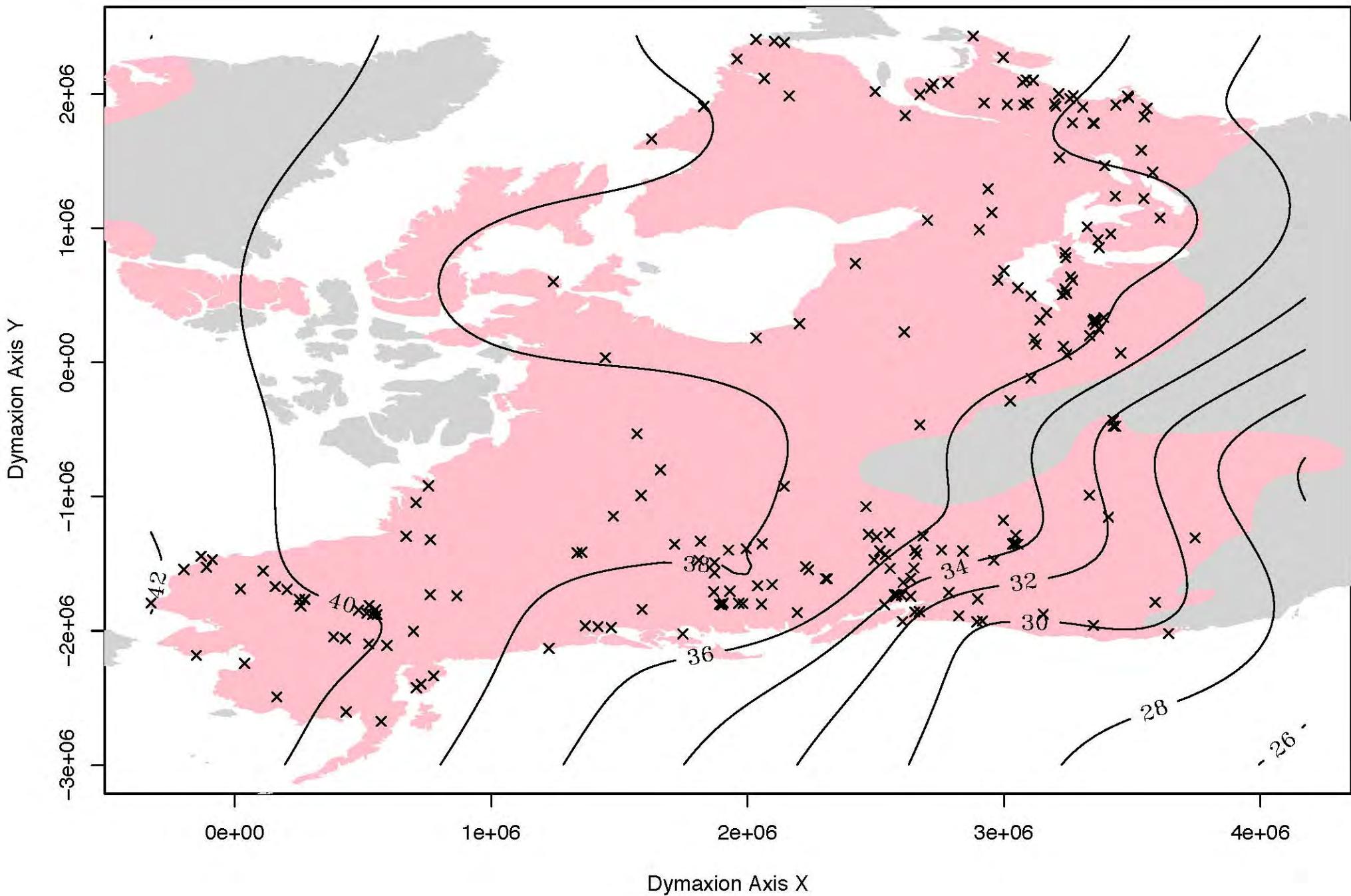
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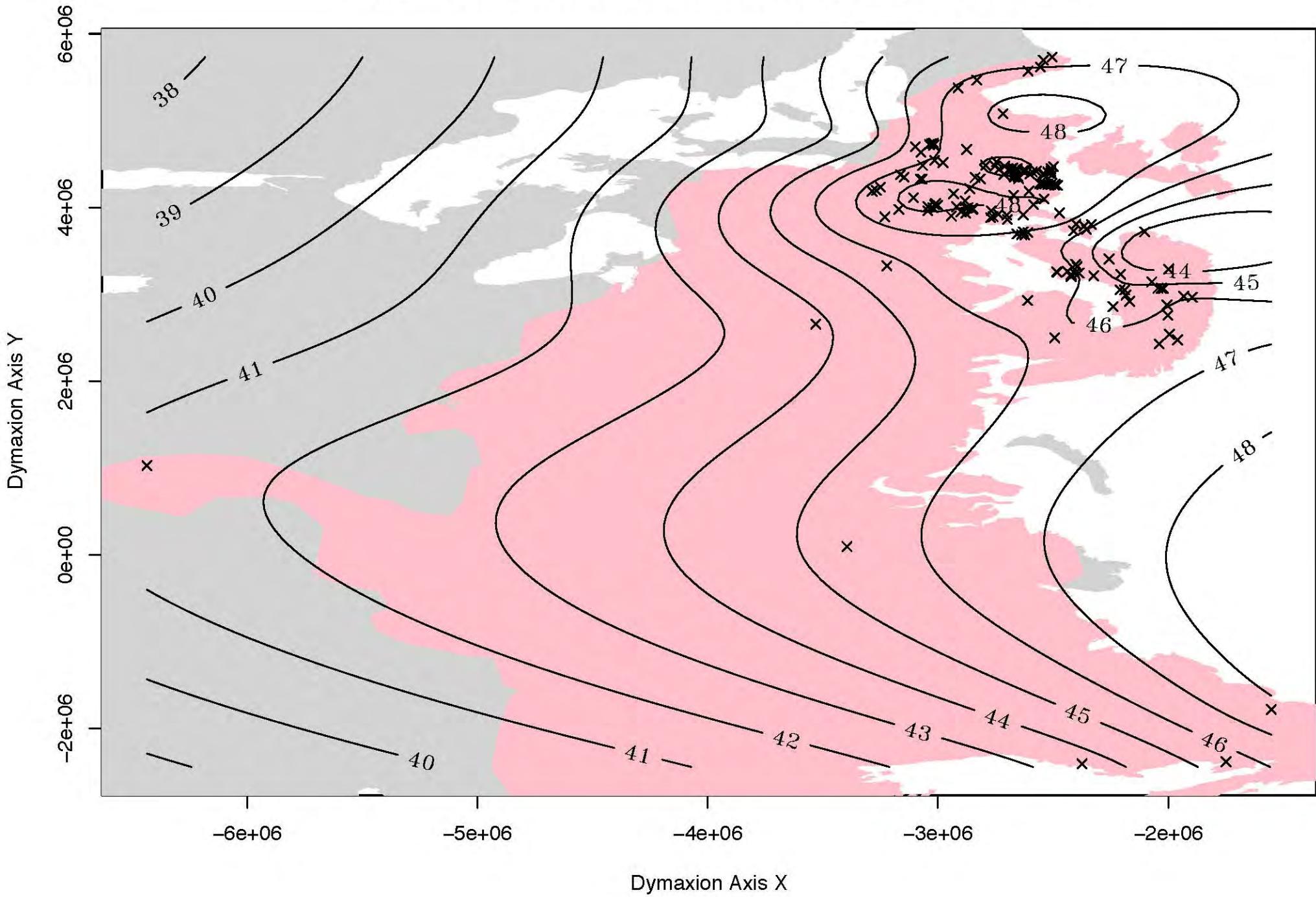
Marginal GAM Surface for CBL in female Mustela erminea Palearctic
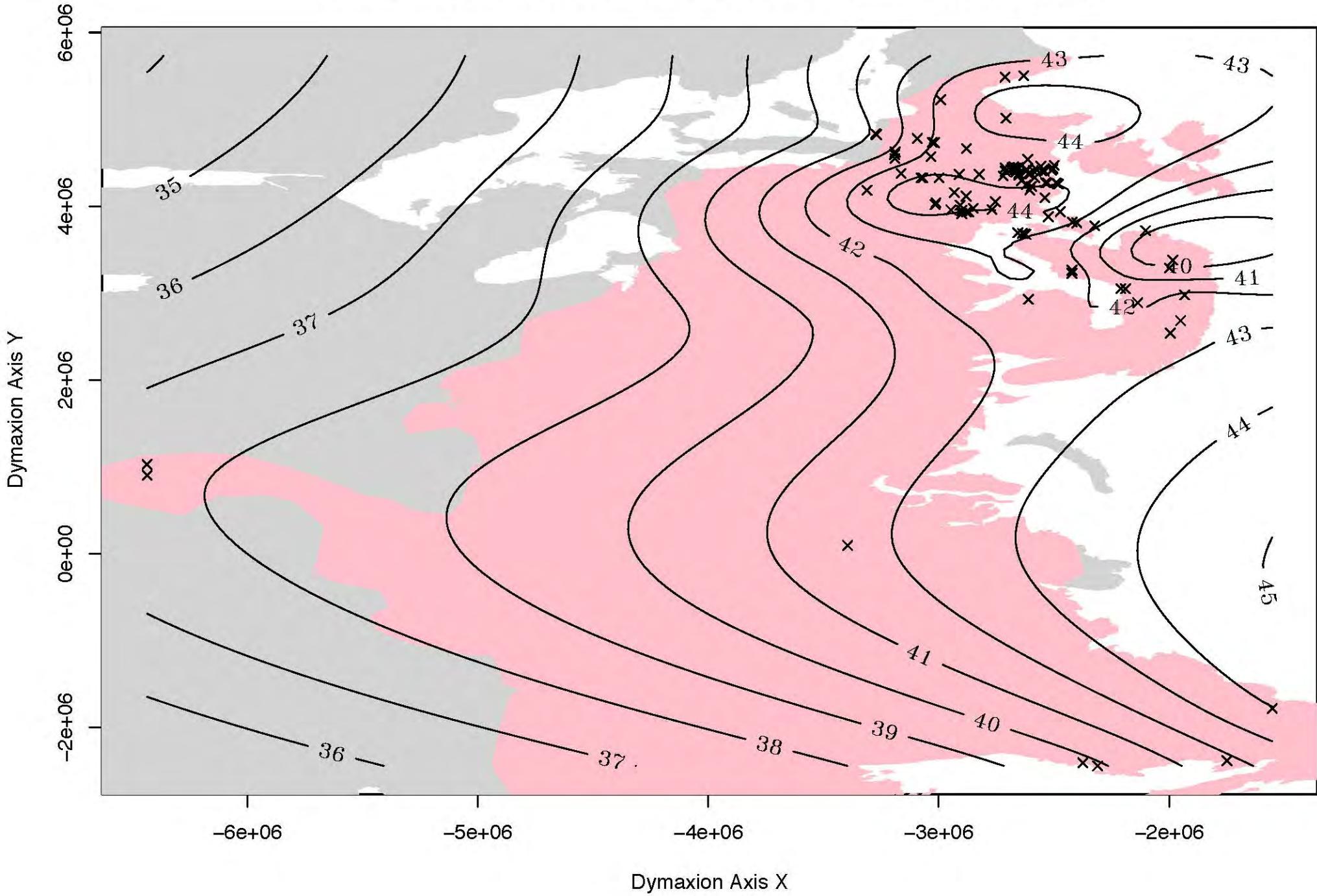
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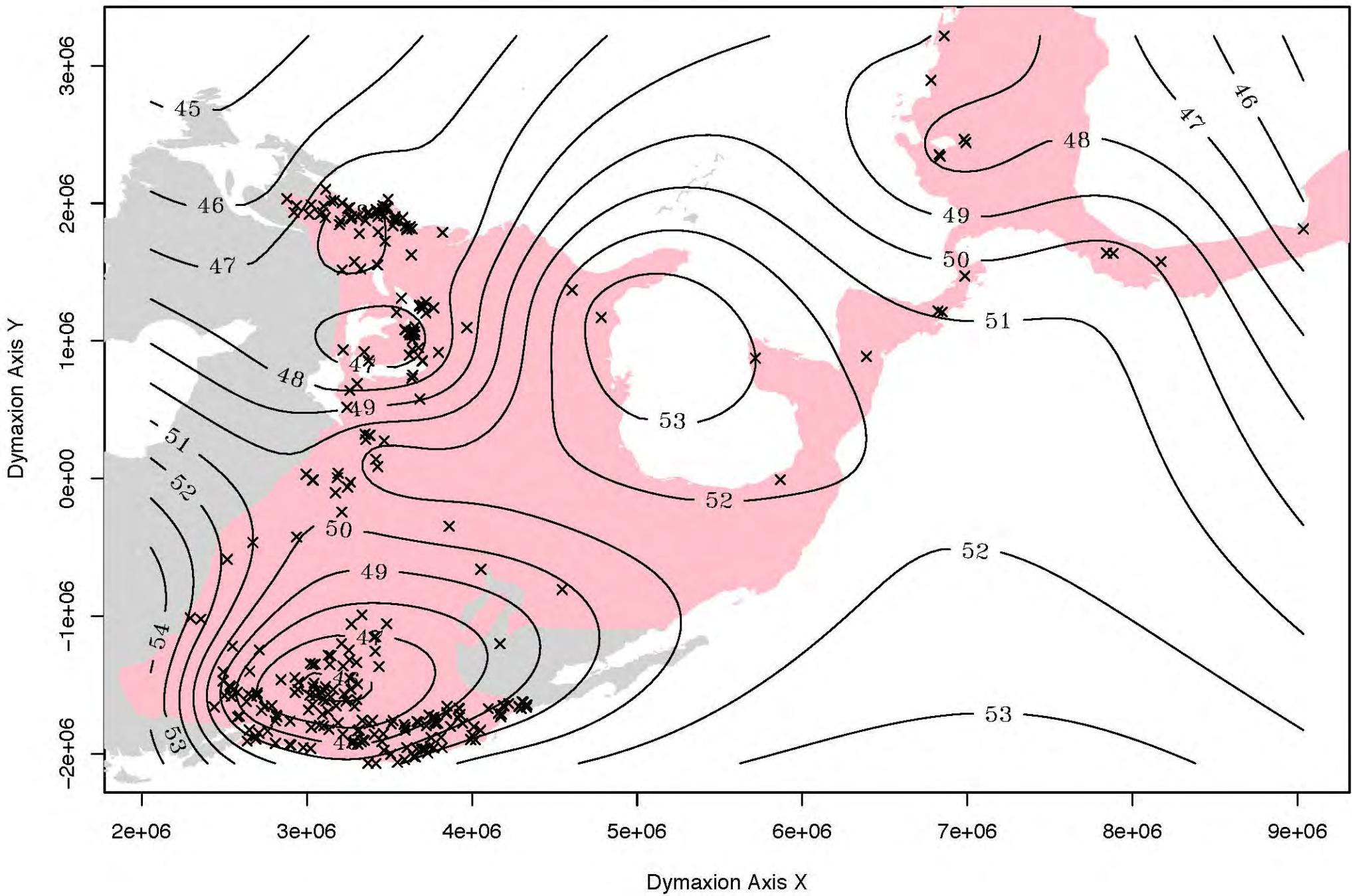
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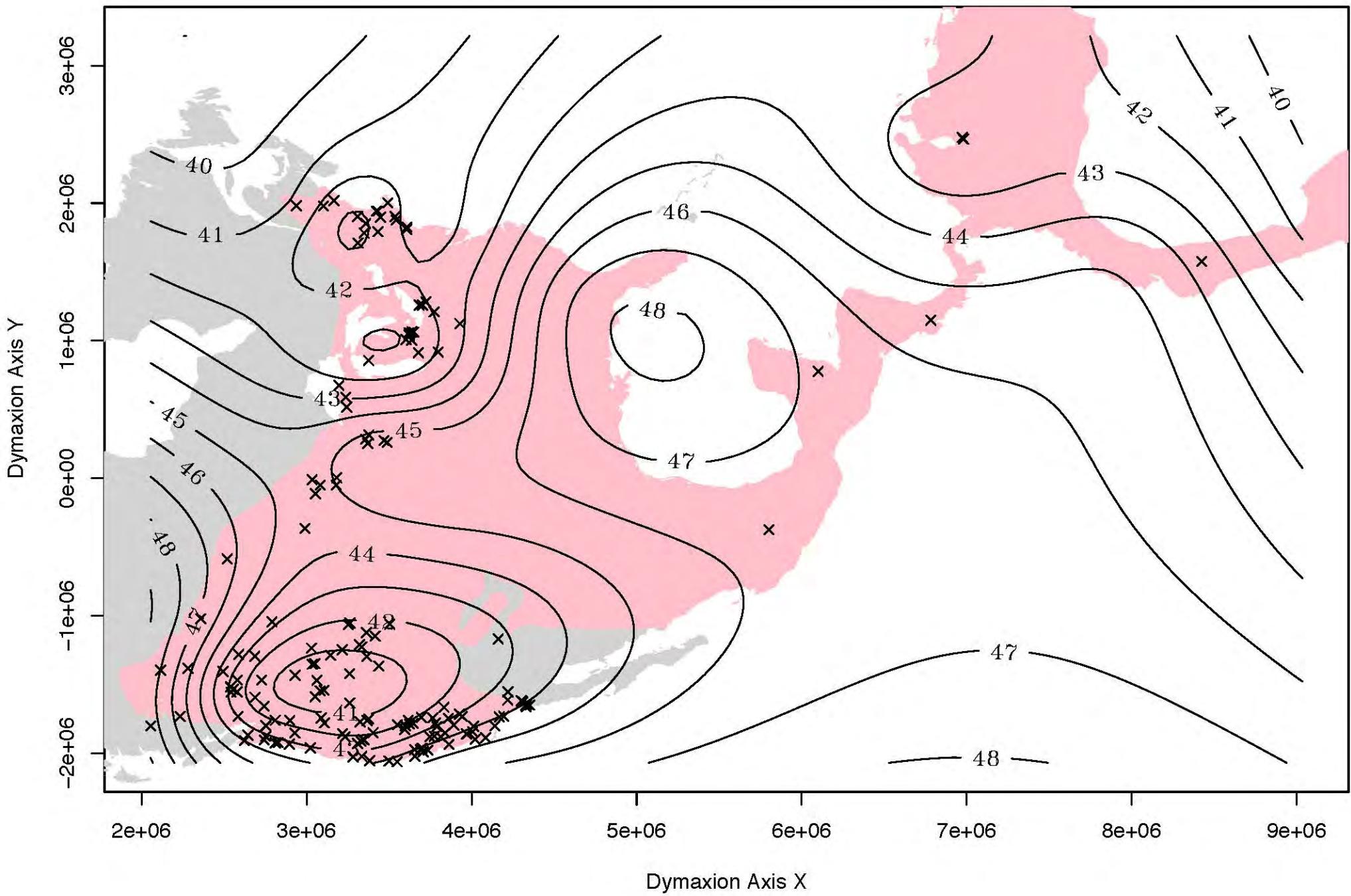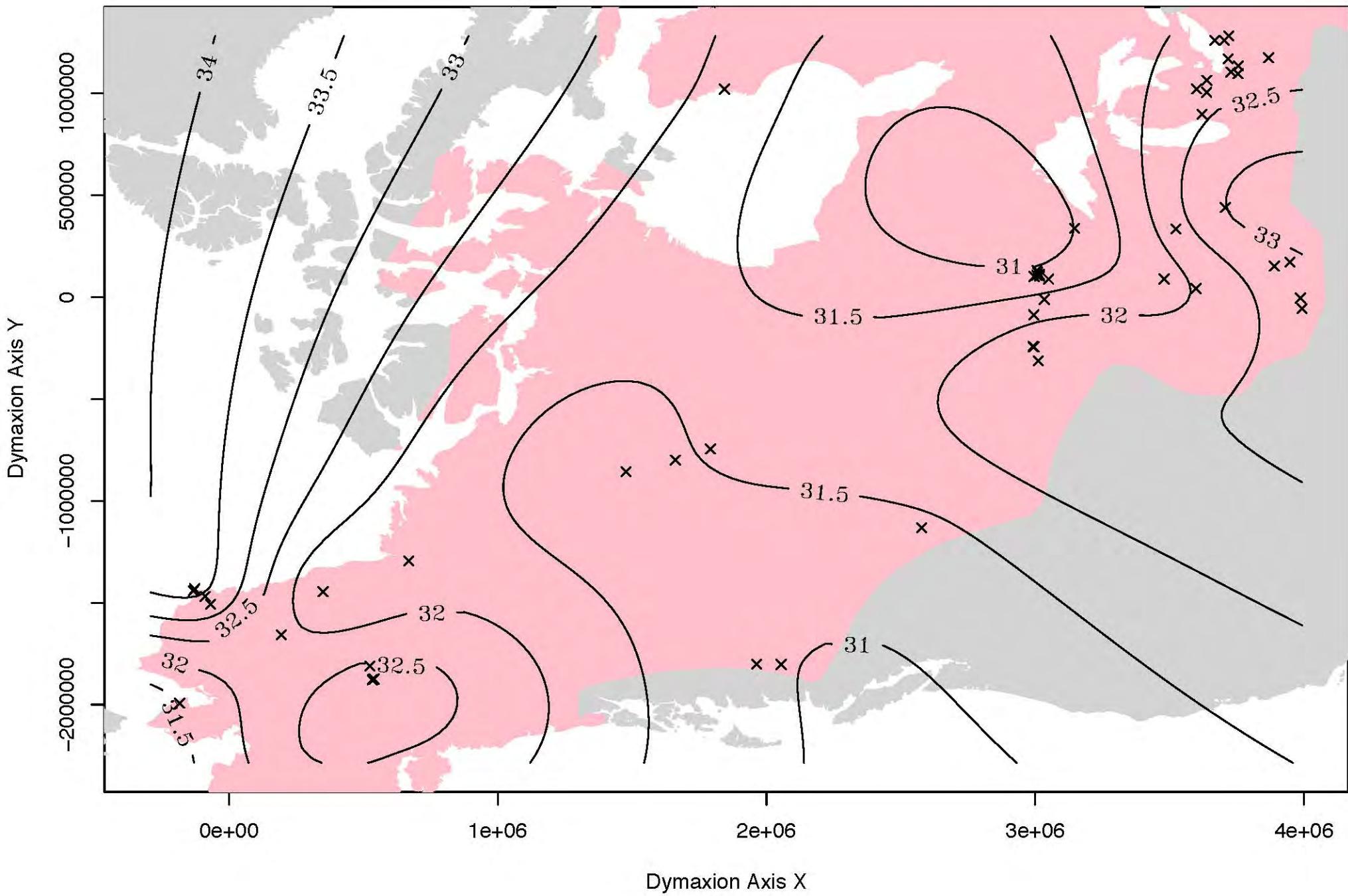
Marginal GAM Surface for CBL in male Mustela nivalis Nearctic

Marginal GAM Surface for CBL in female Mustela nivalis Nearctic
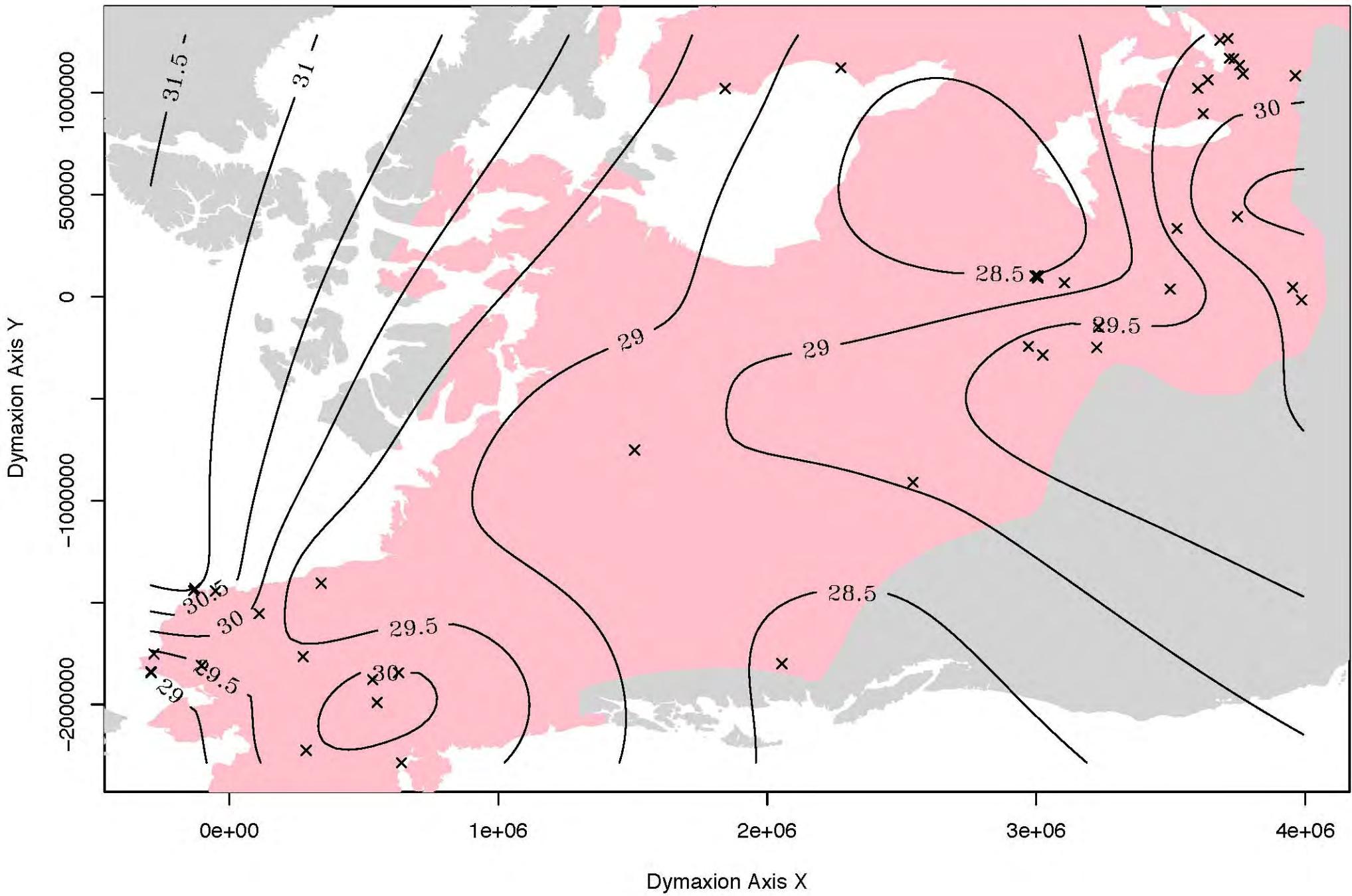
Marginal GAM Surface for CBL in male Mustela nivalis Palearctic
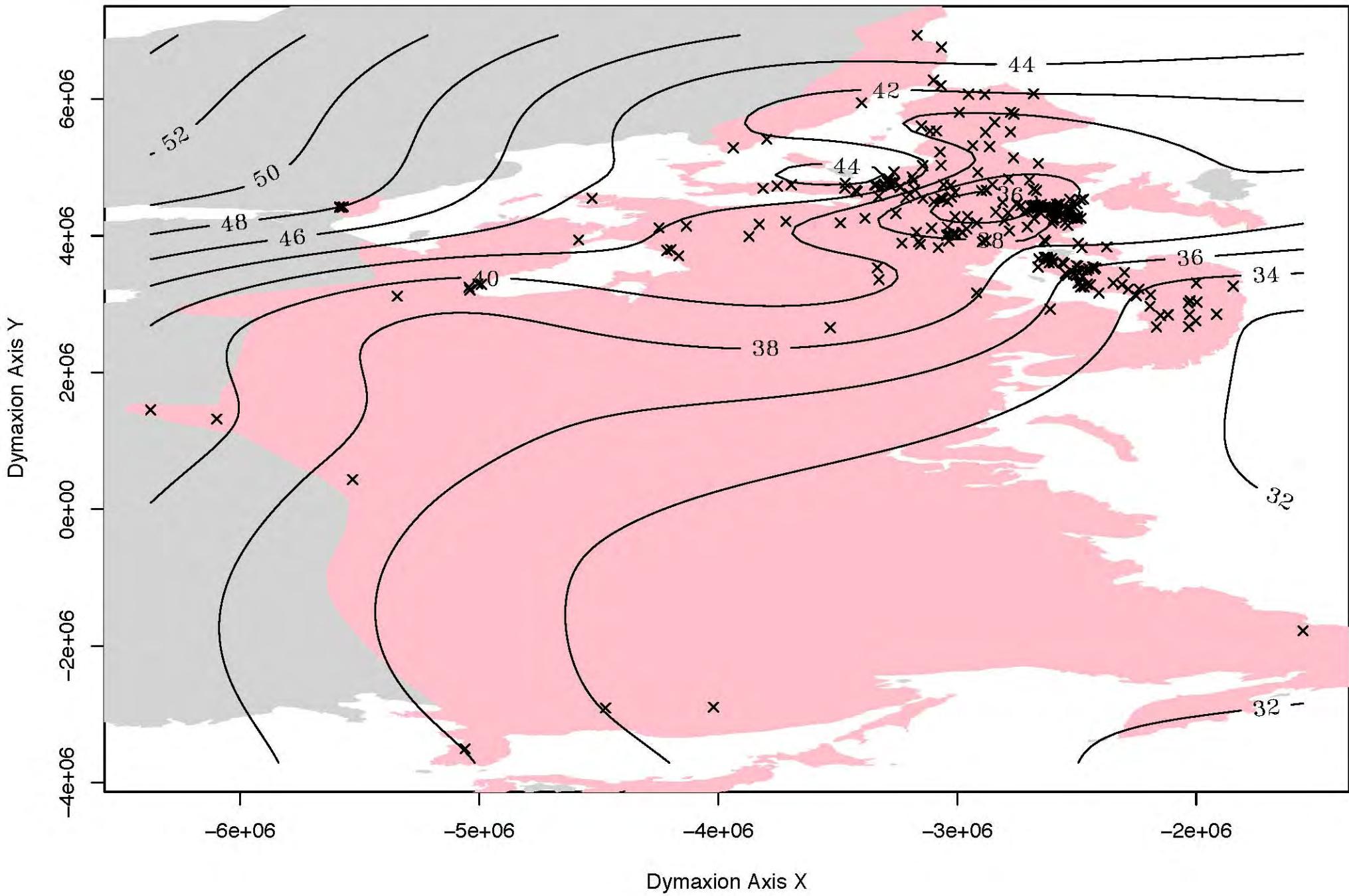
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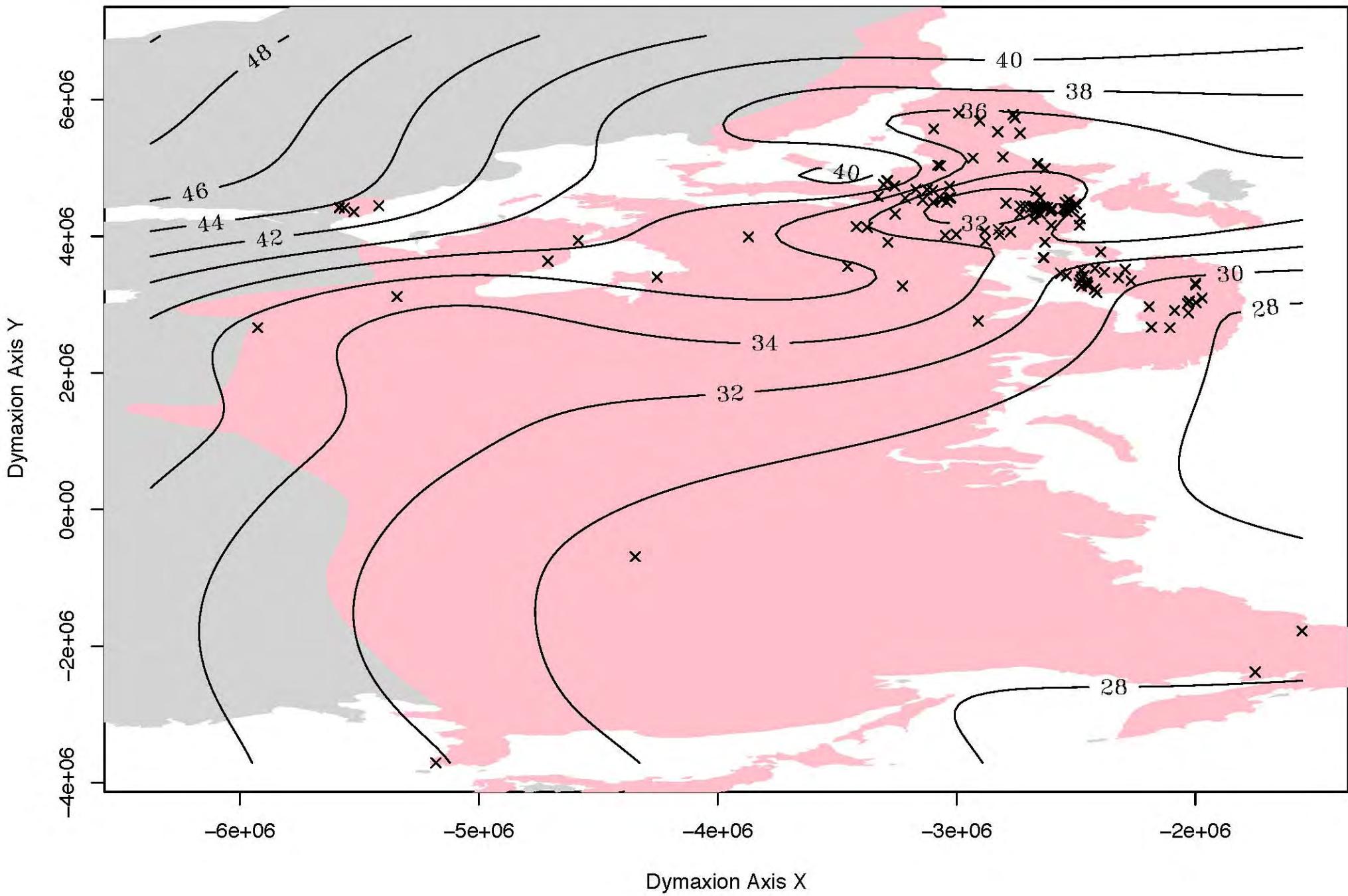
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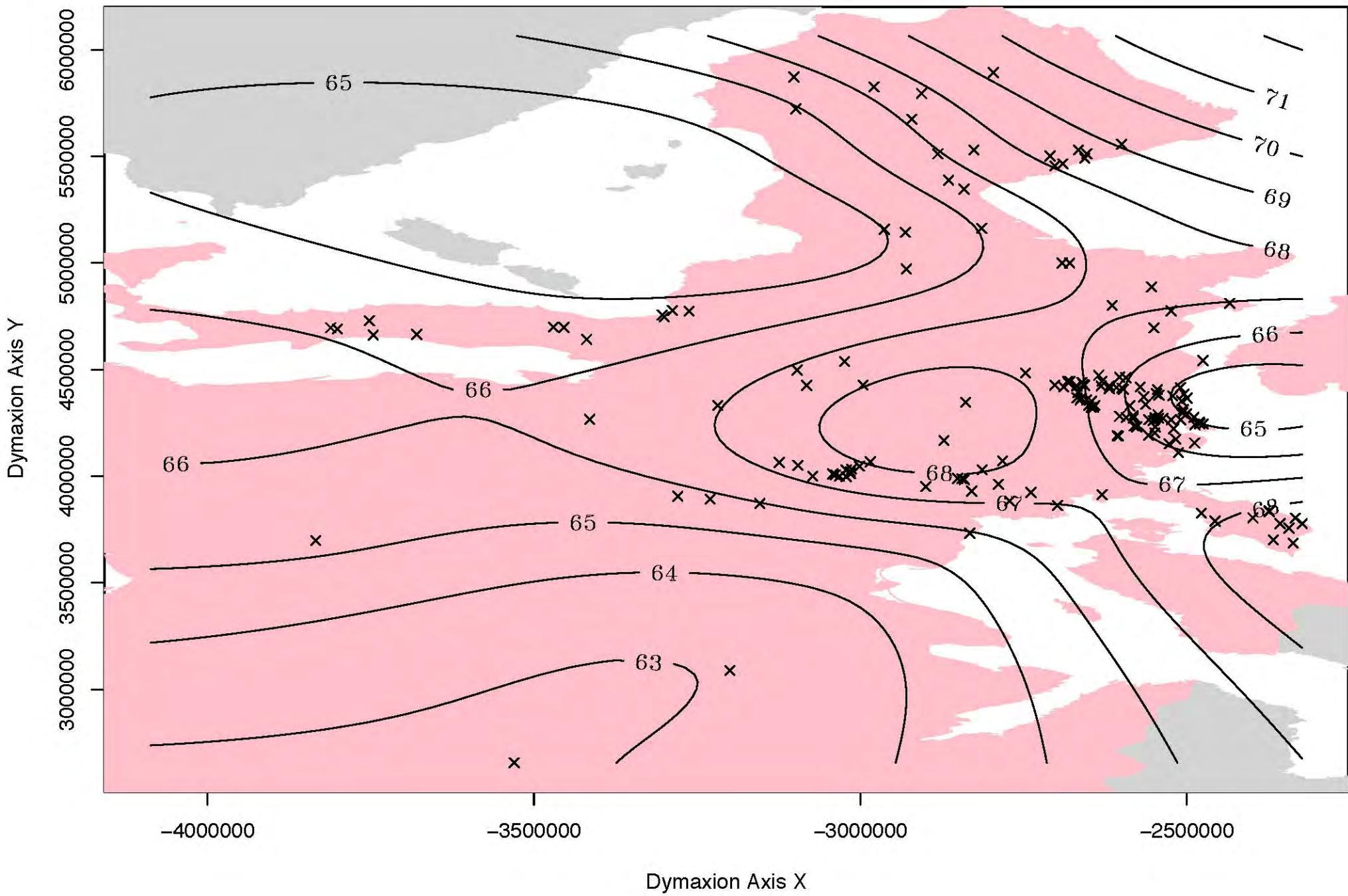
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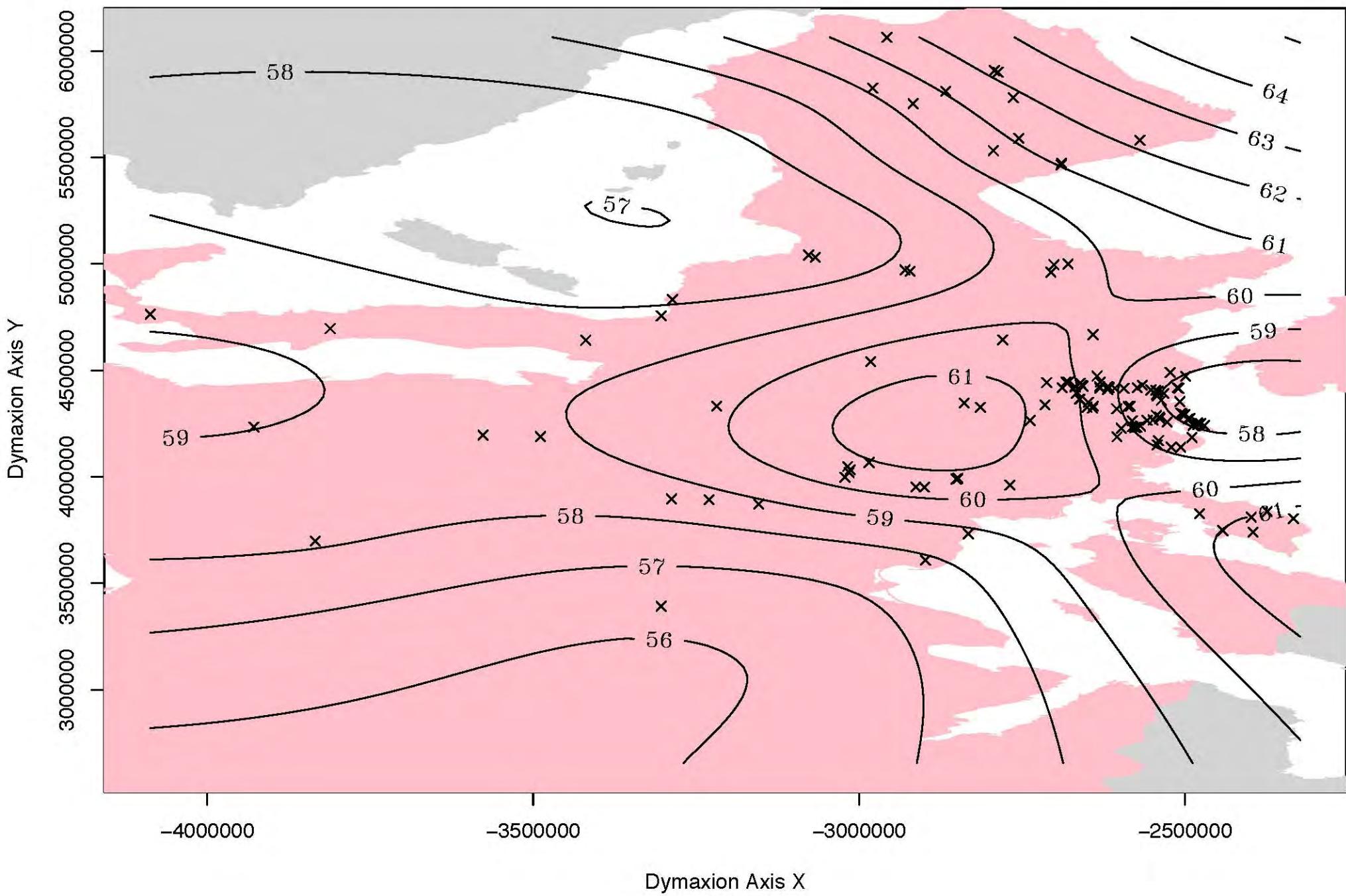
Marginal GAM Surface for CBL in male Mustela vison
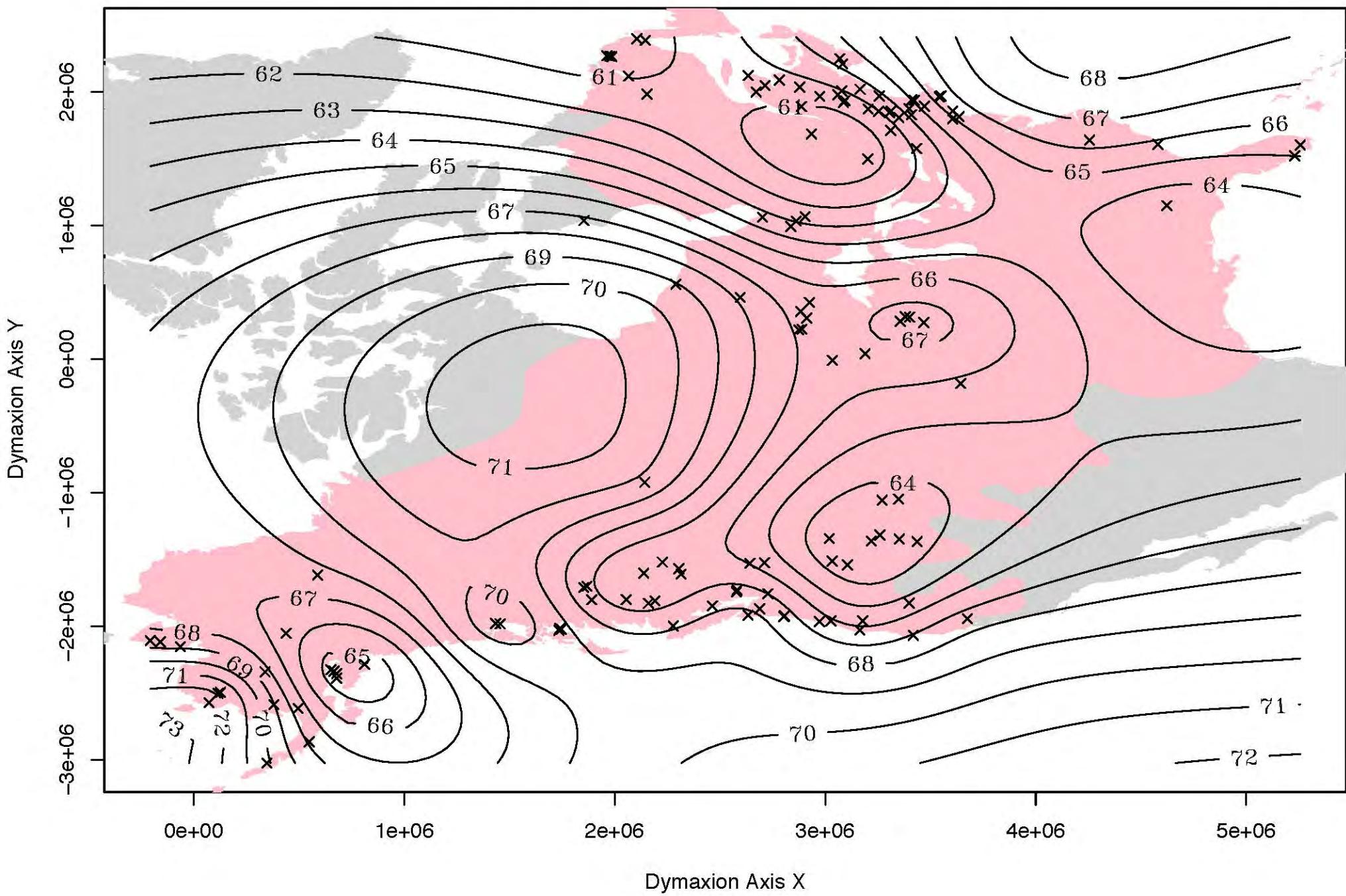
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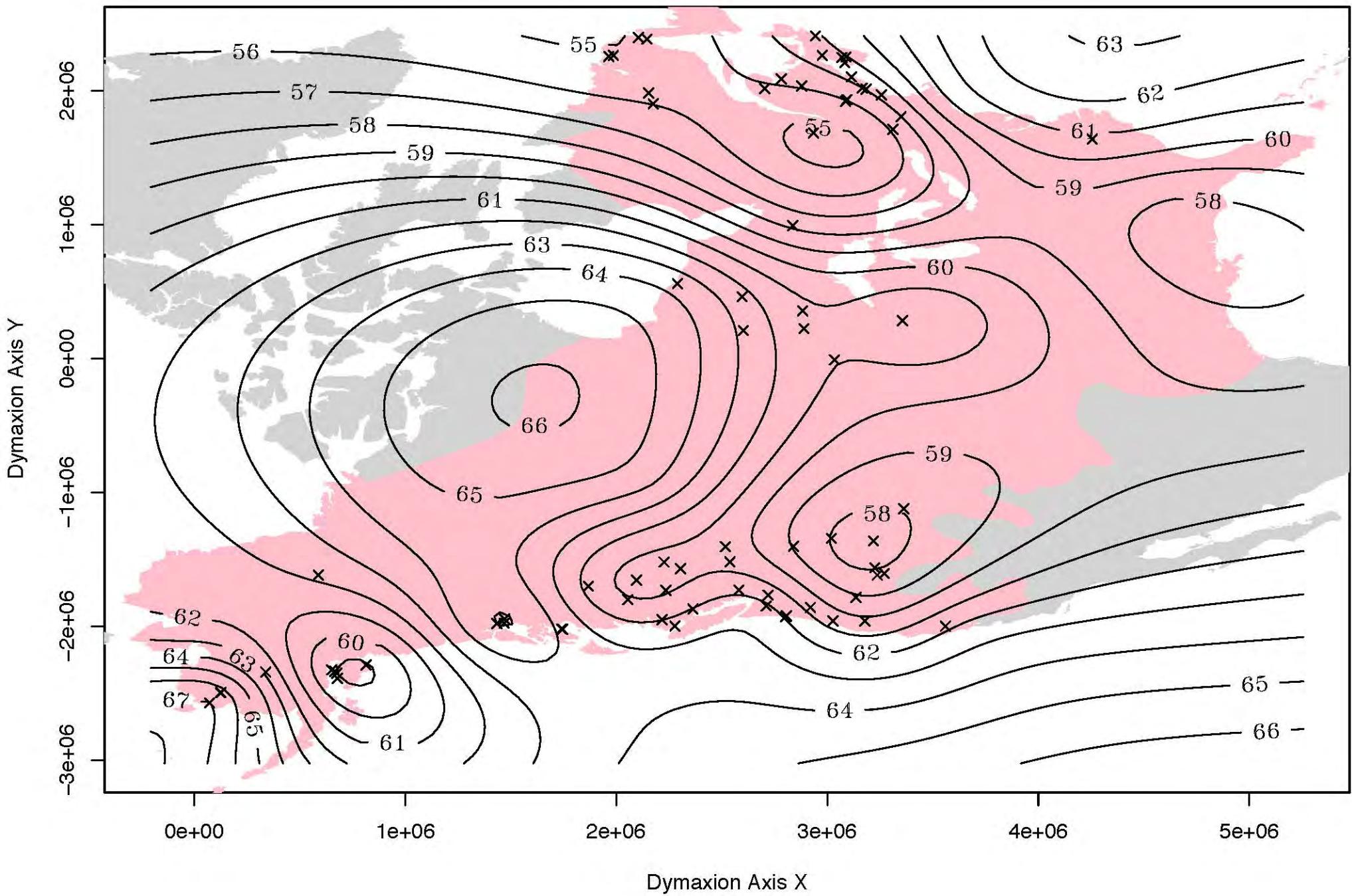
Marginal GAM Surface for CBL in male Paradoxurus hermaphroditus
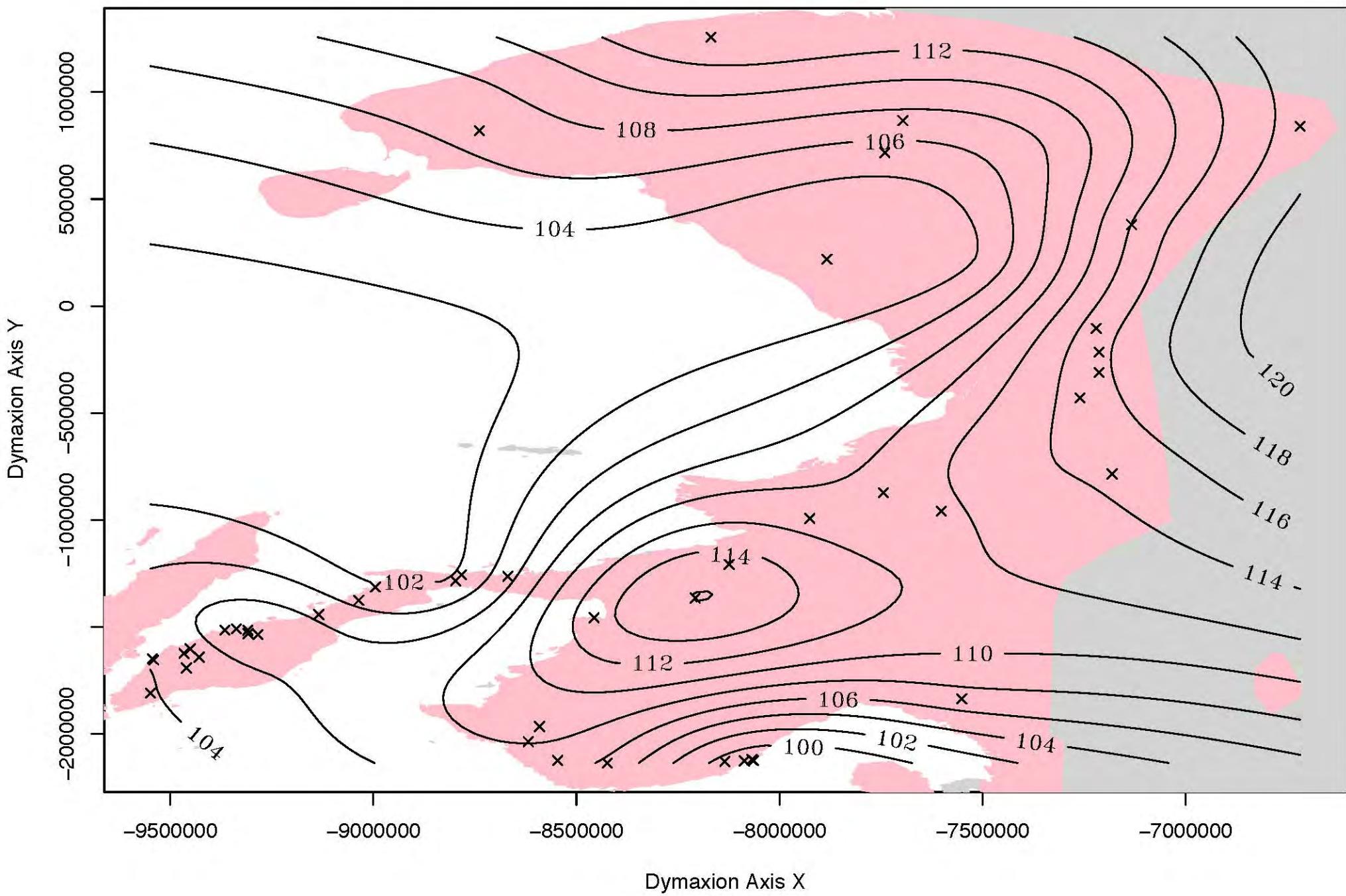
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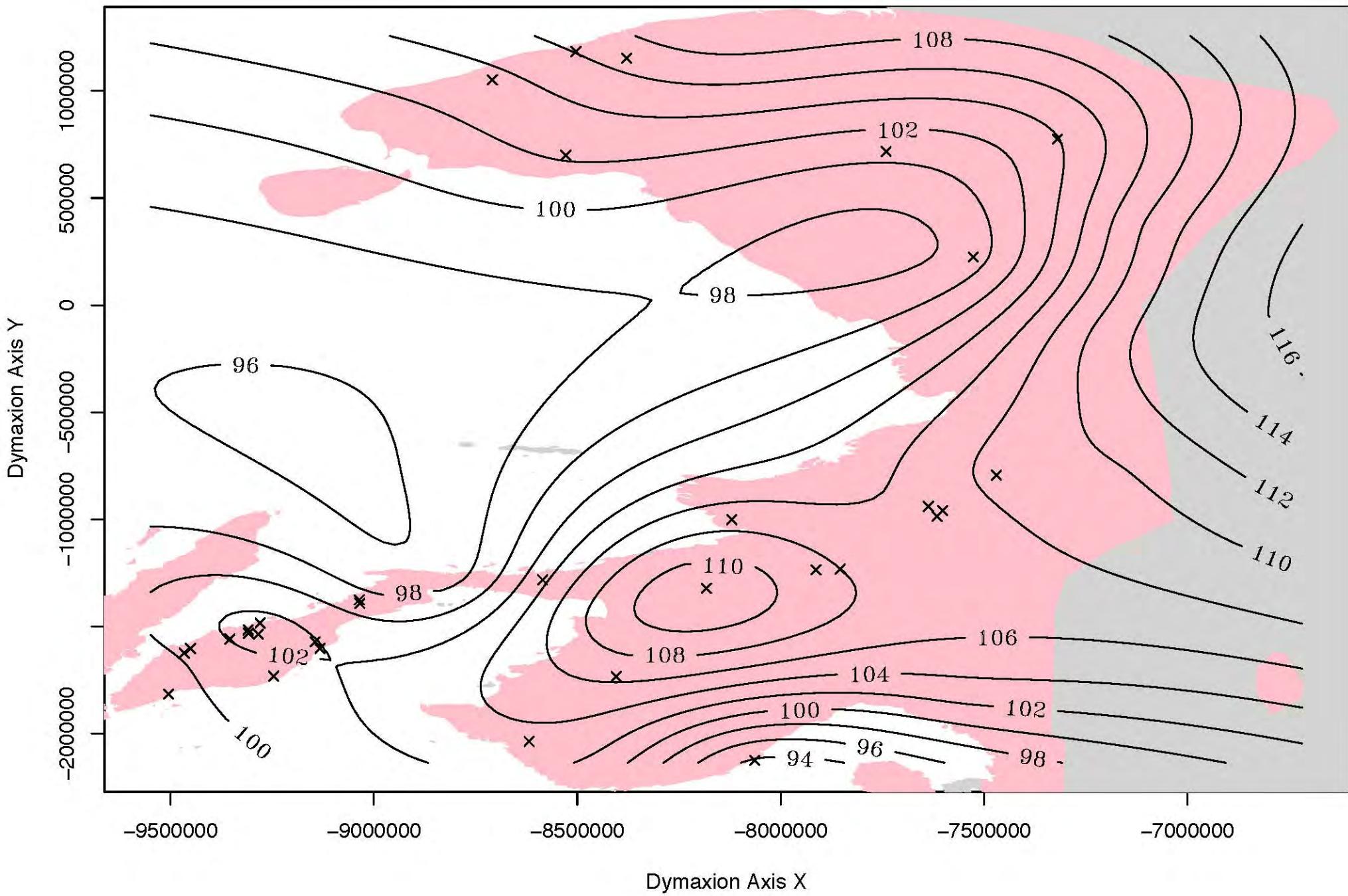
Marginal GAM Surface for CBL in male Procyon lotor
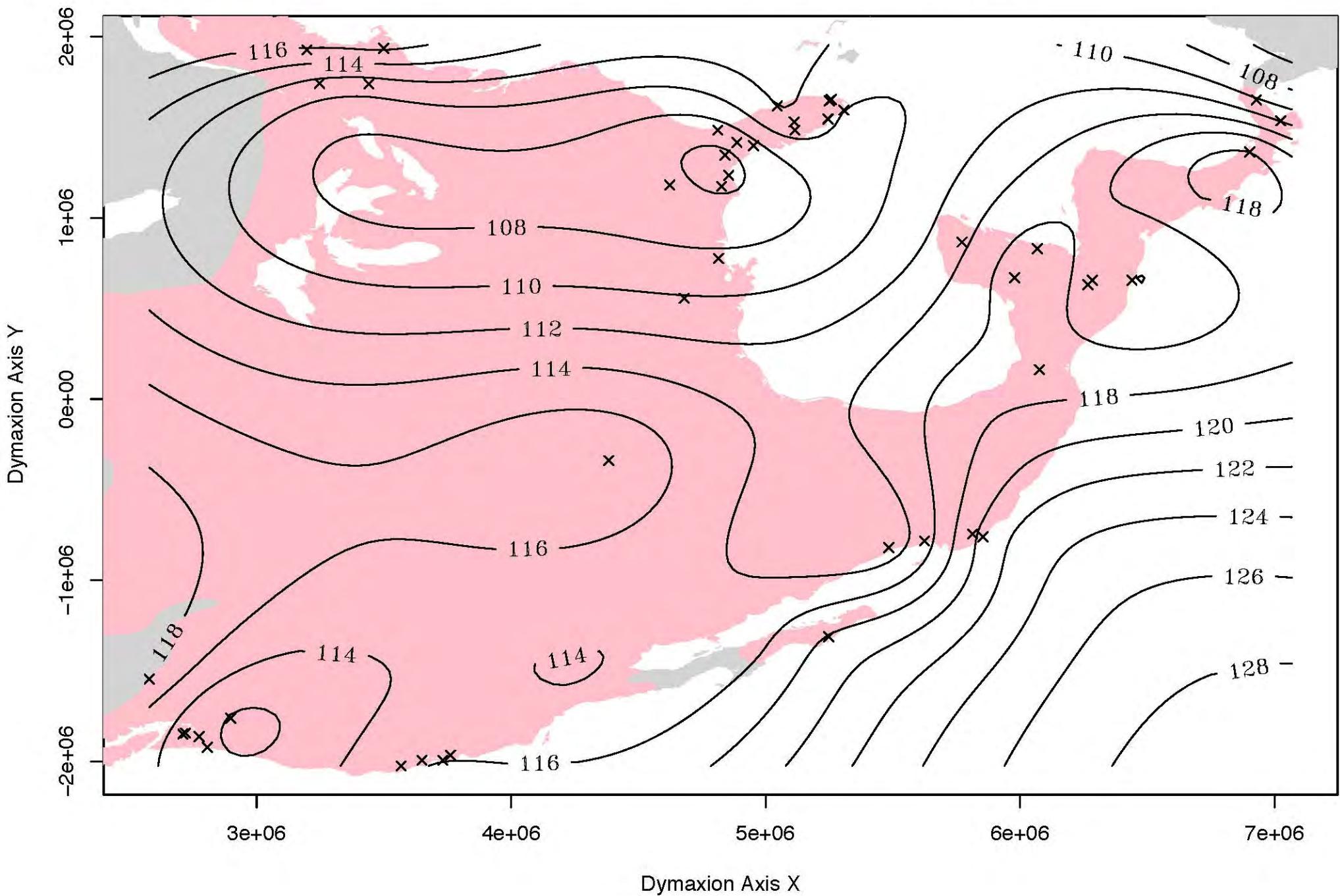
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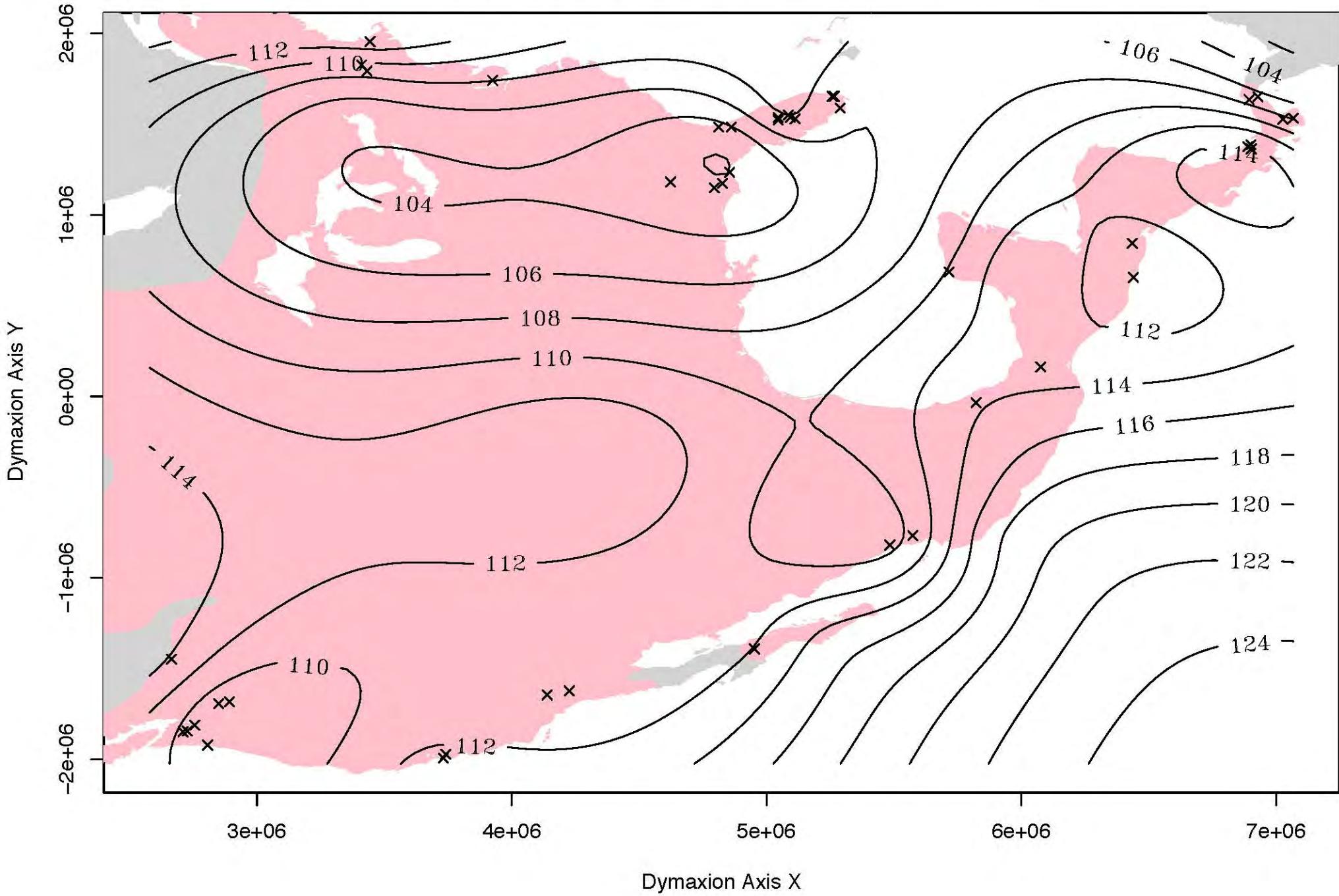
Marginal GAM Surface for CBL in male Spilogale gracilis
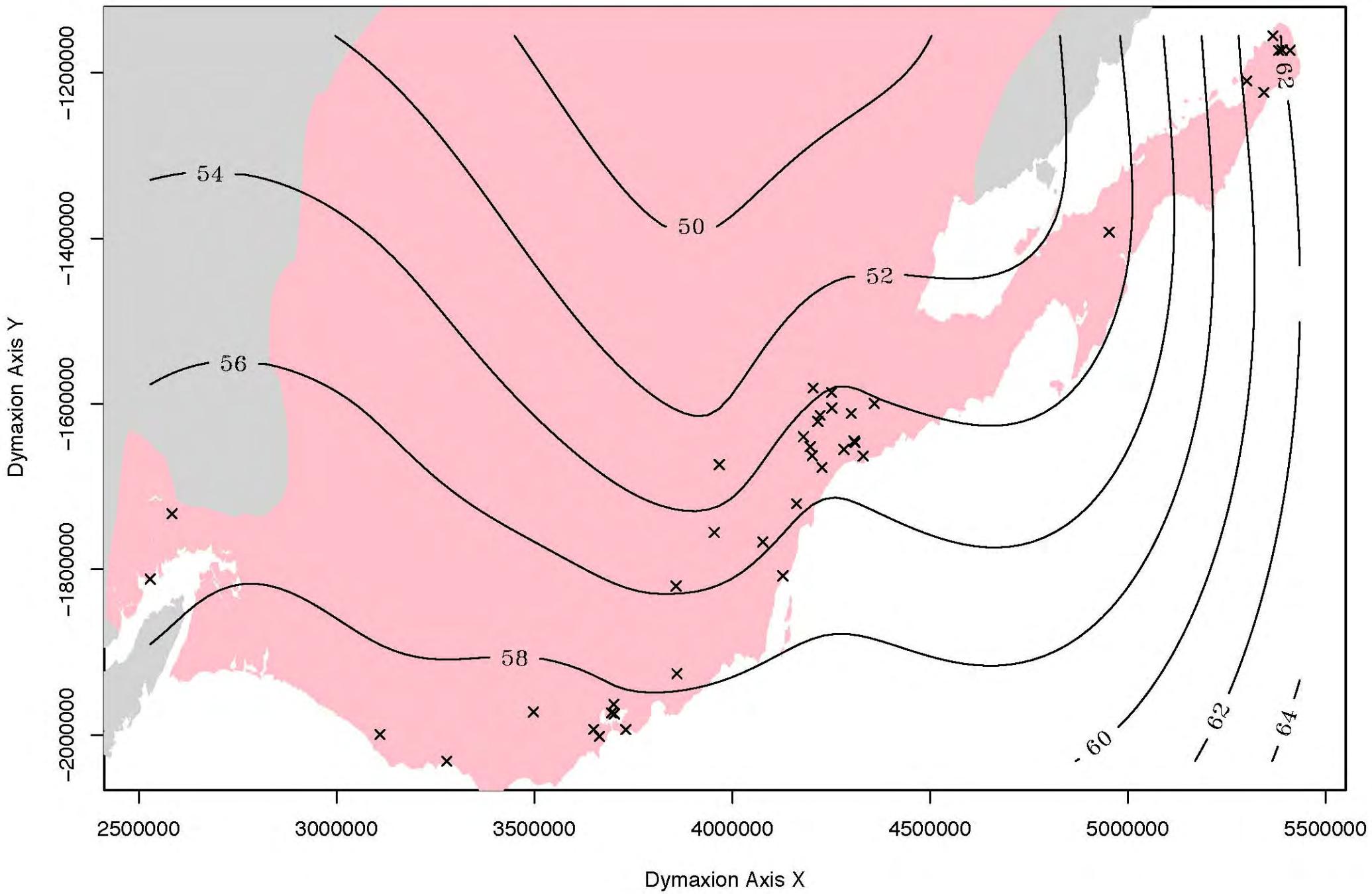
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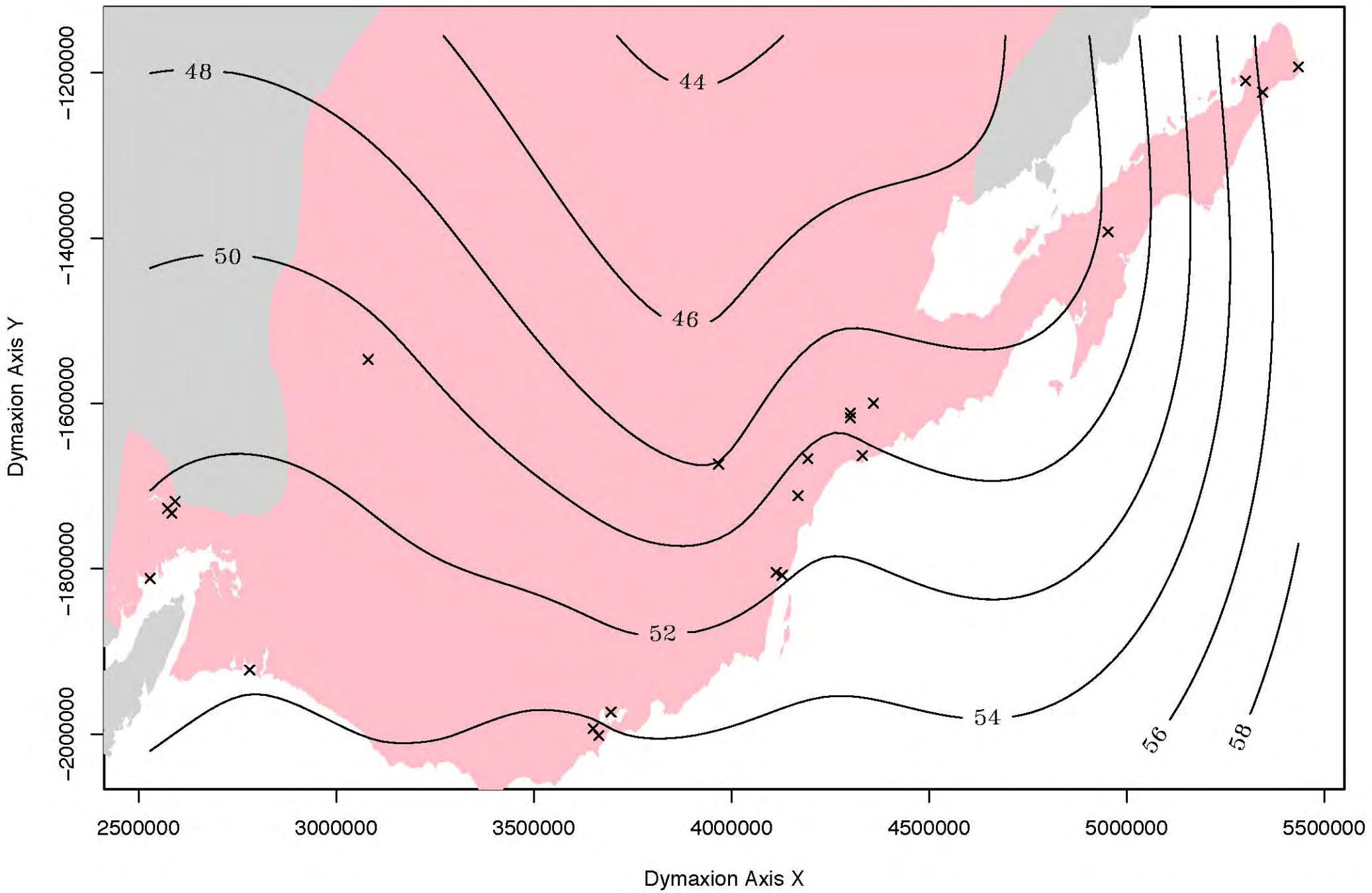
Marginal GAM Surface for CBL in male Urocyon cinereoargenteus
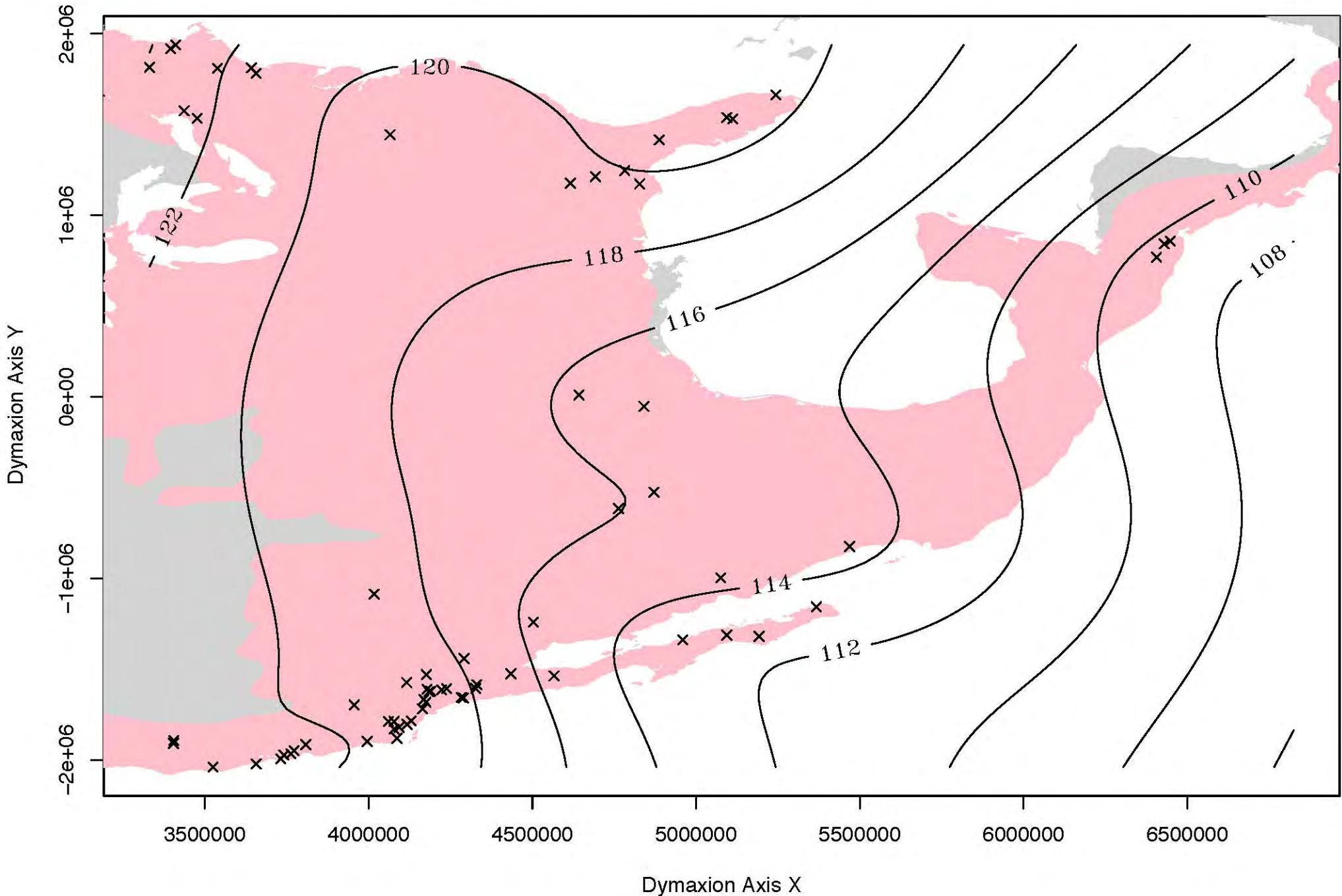
# Marginal GAM Surface for CBL in female Urocyon cinereoargenteus
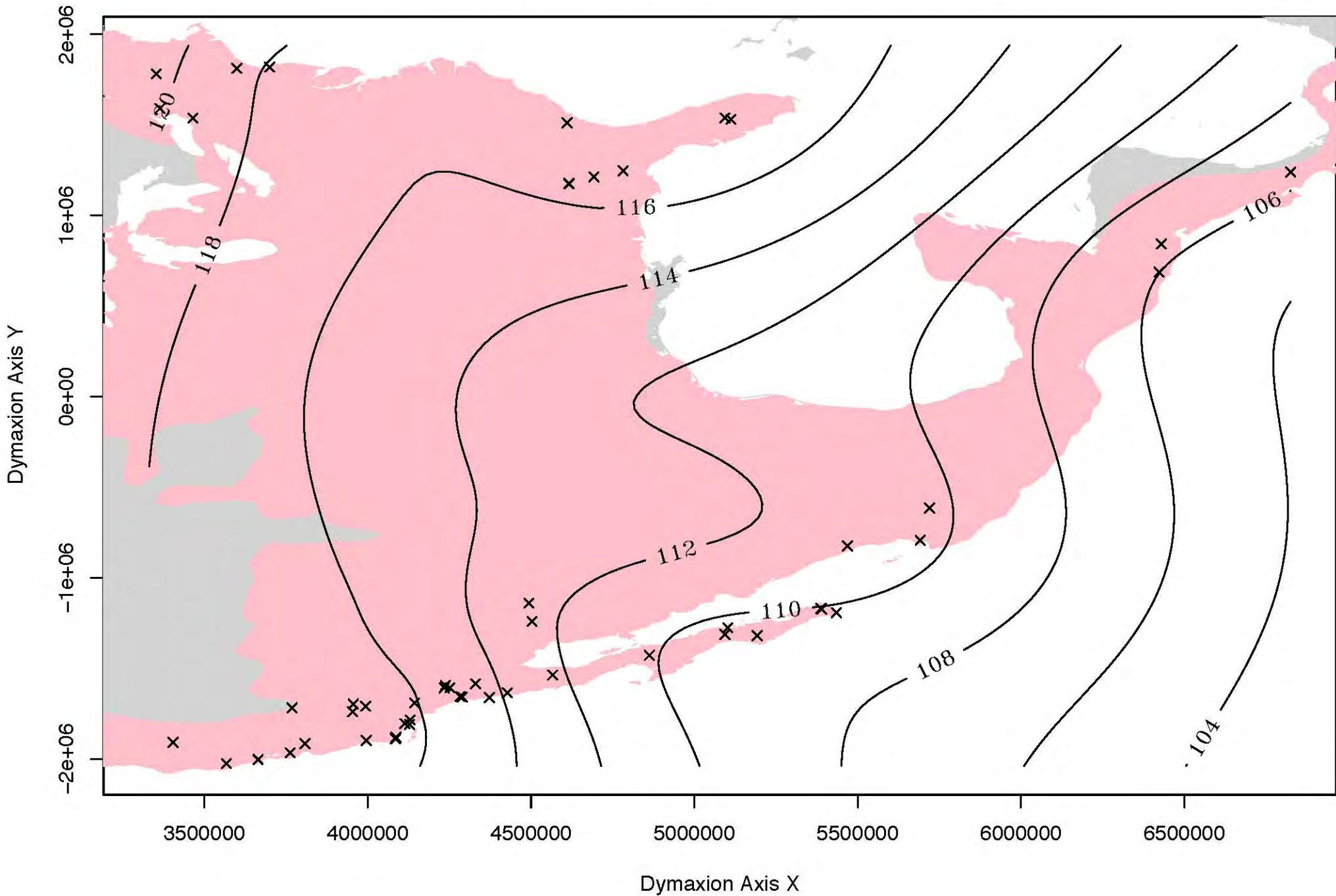
Marginal GAM Surface for CBL in male Ursus arctos
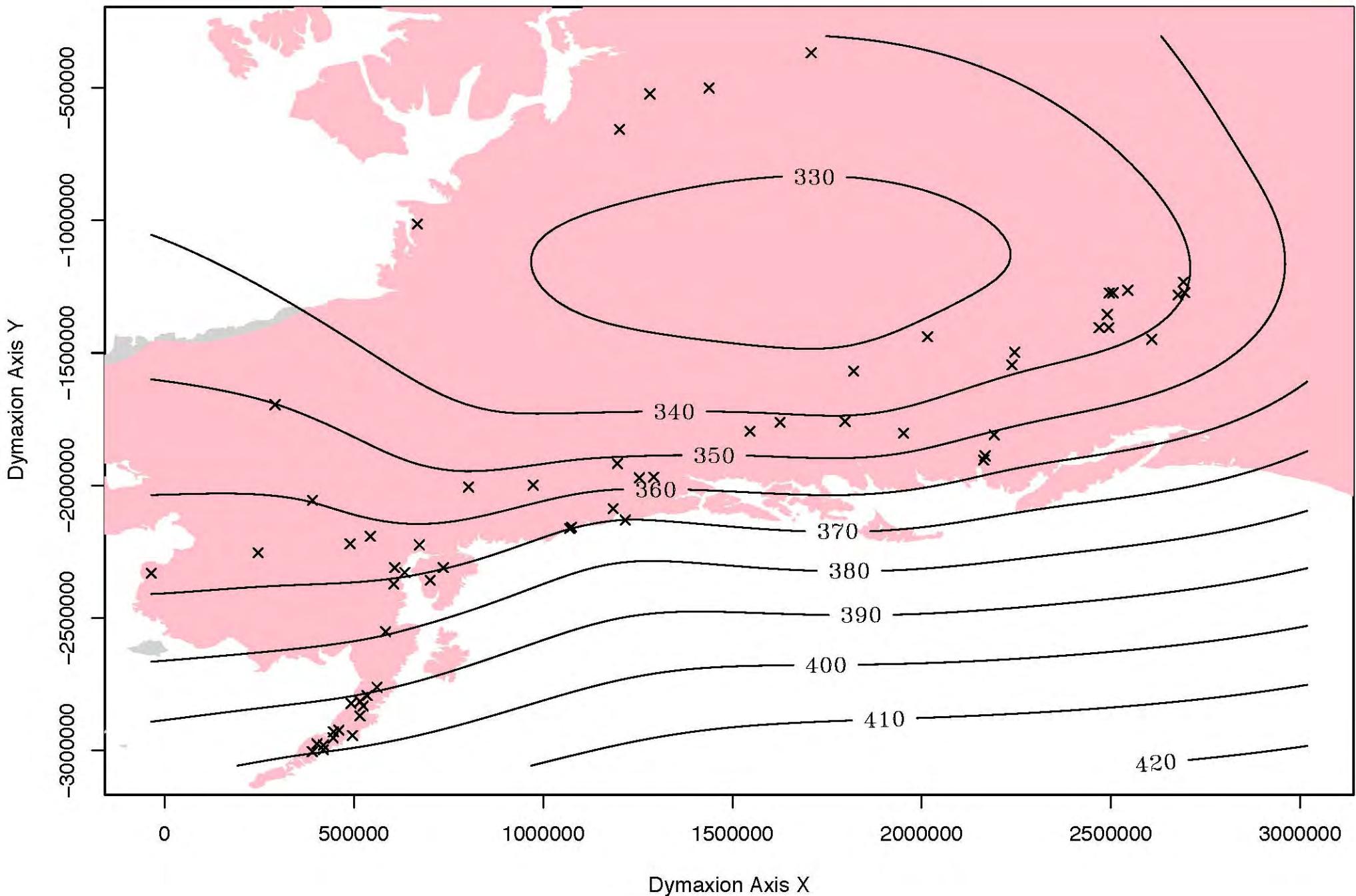
Marginal GAM Surface for CBL in female Ursus arctos
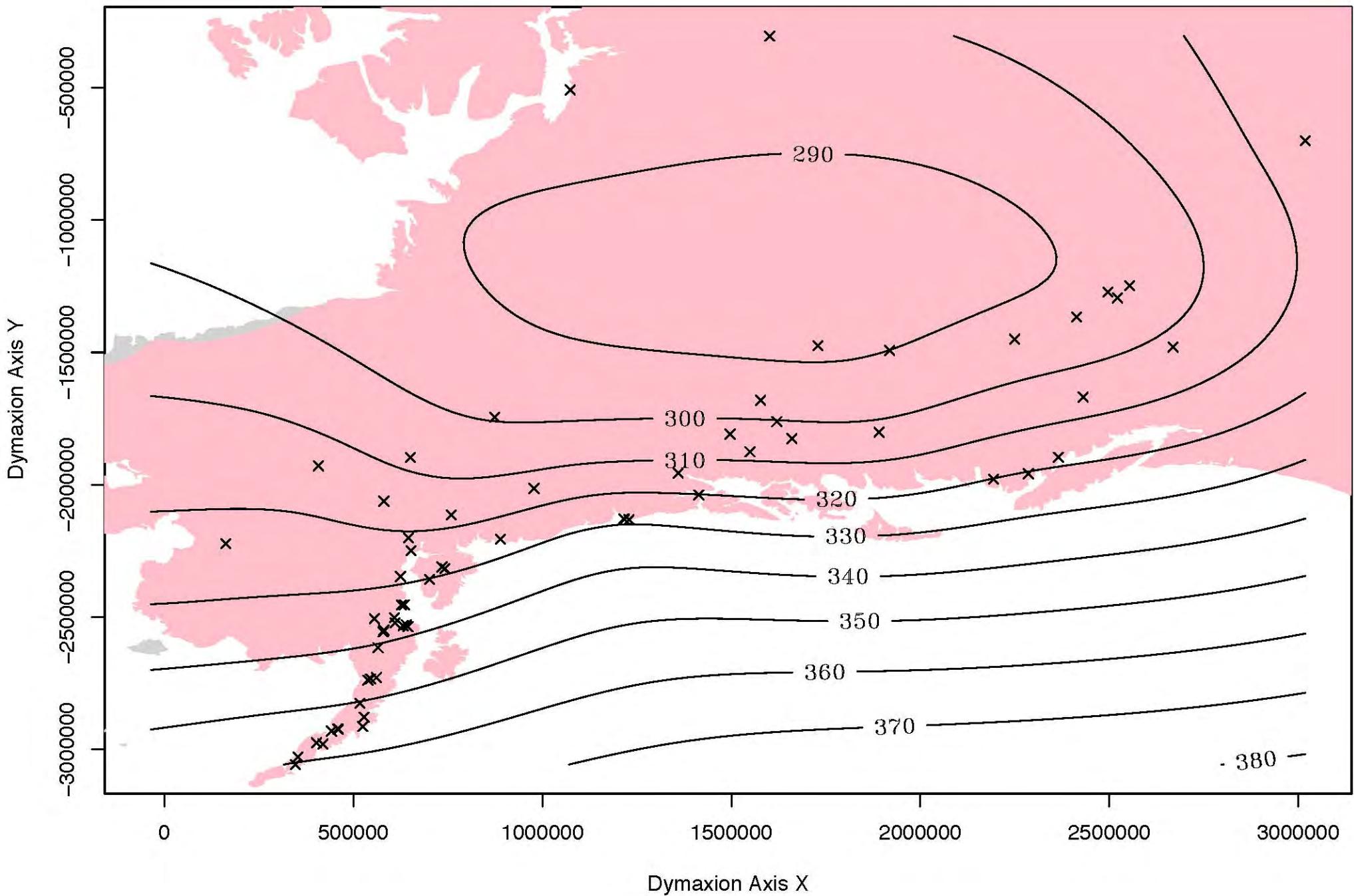
Marginal GAM Surface for CBL in male Viverricula indica
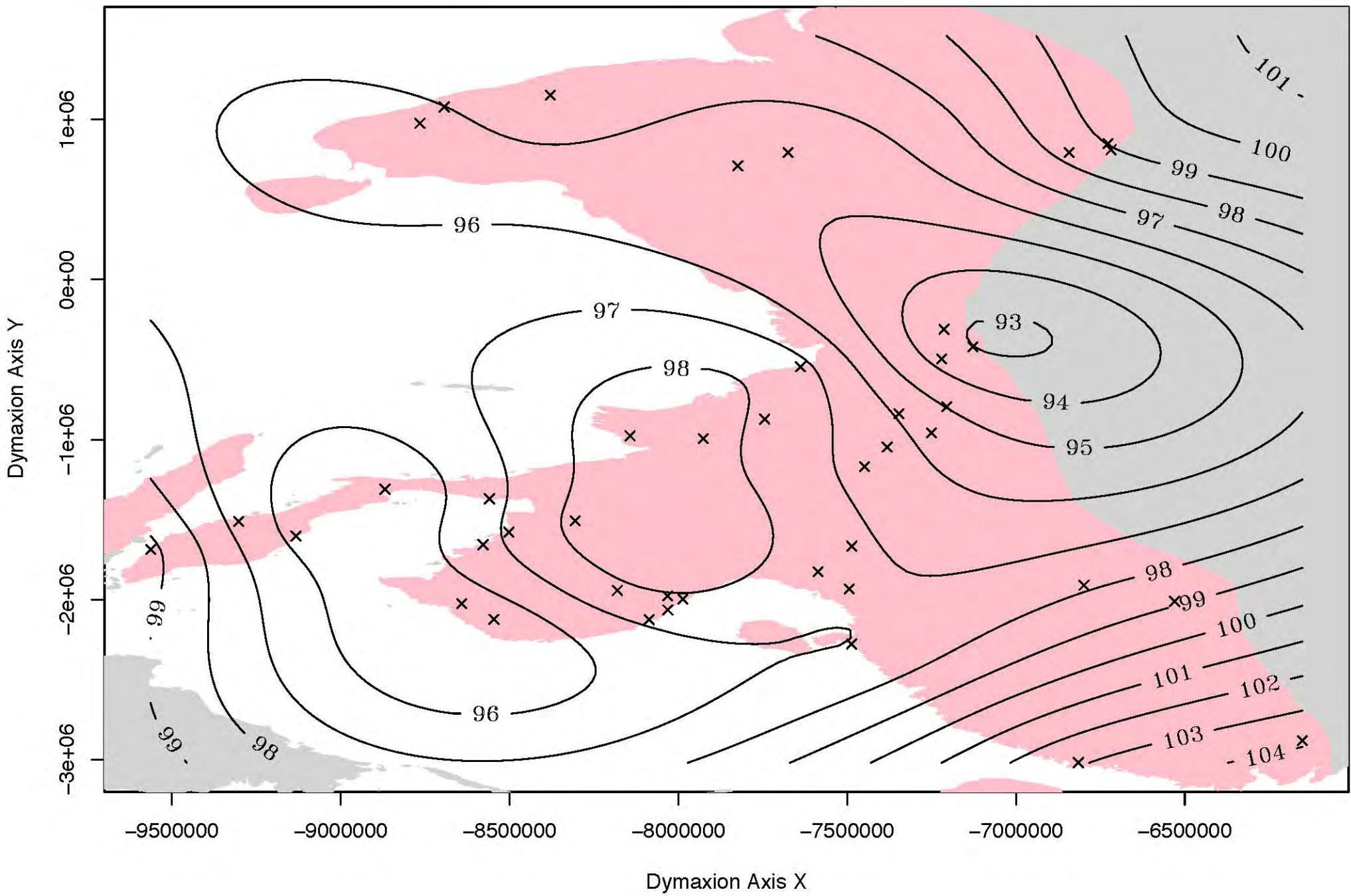
Marginal GAM Surface for CBL in female Viverricula indica
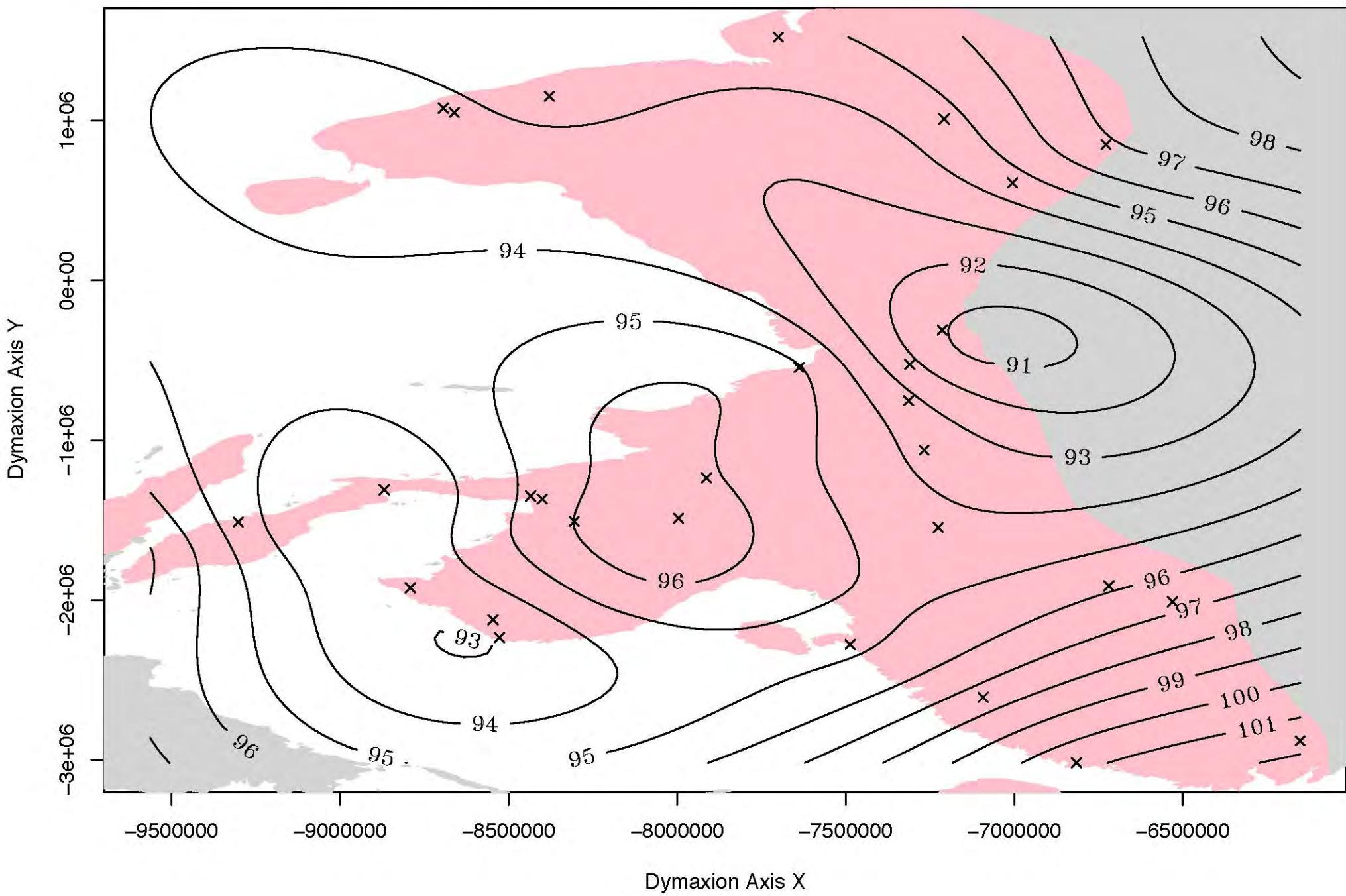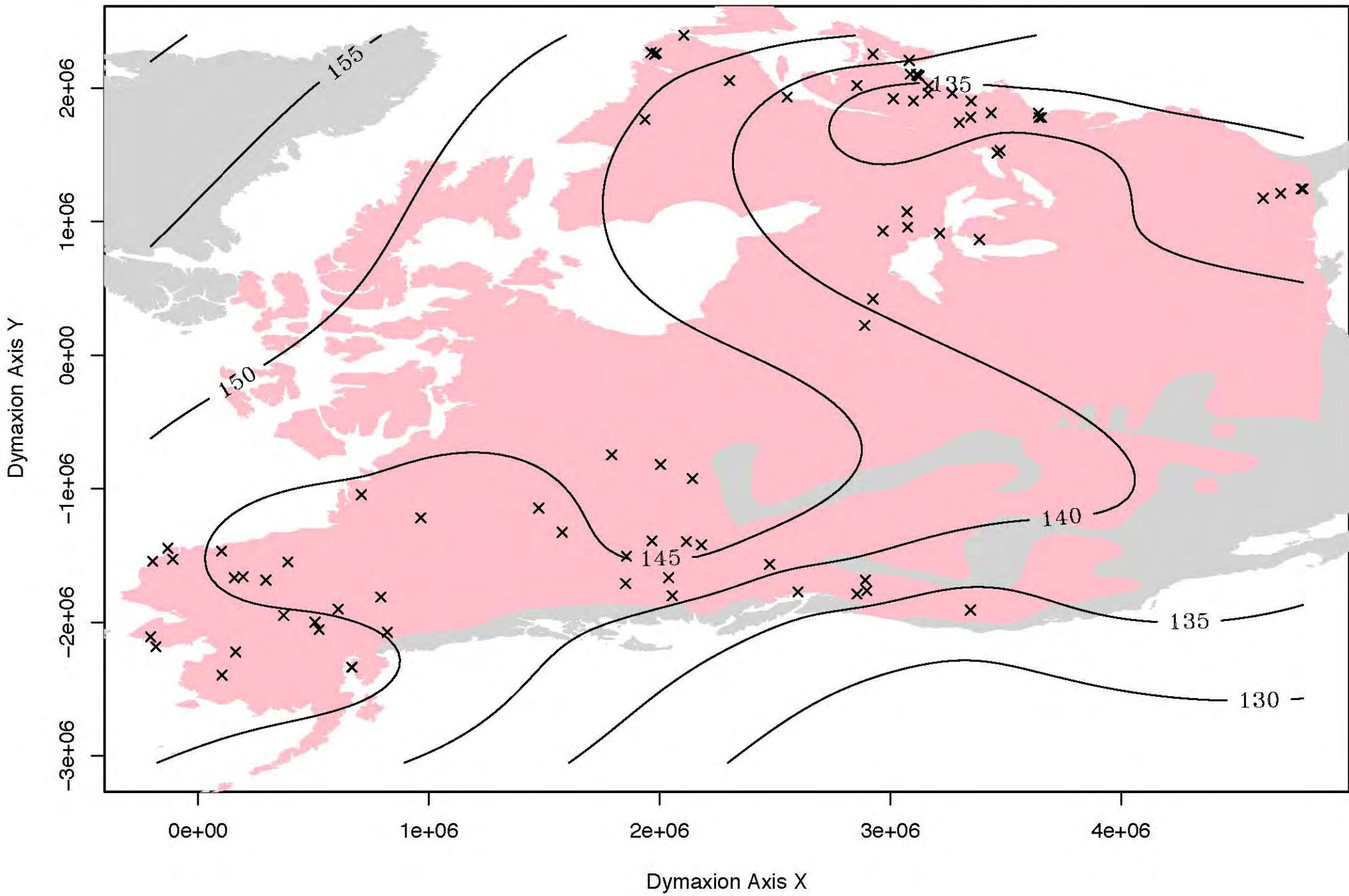
Marginal GAM Surface for CBL in male Vulpes vulpes Nearctic

Marginal GAM Surface for CBL in female Vulpes vulpes Nearctic
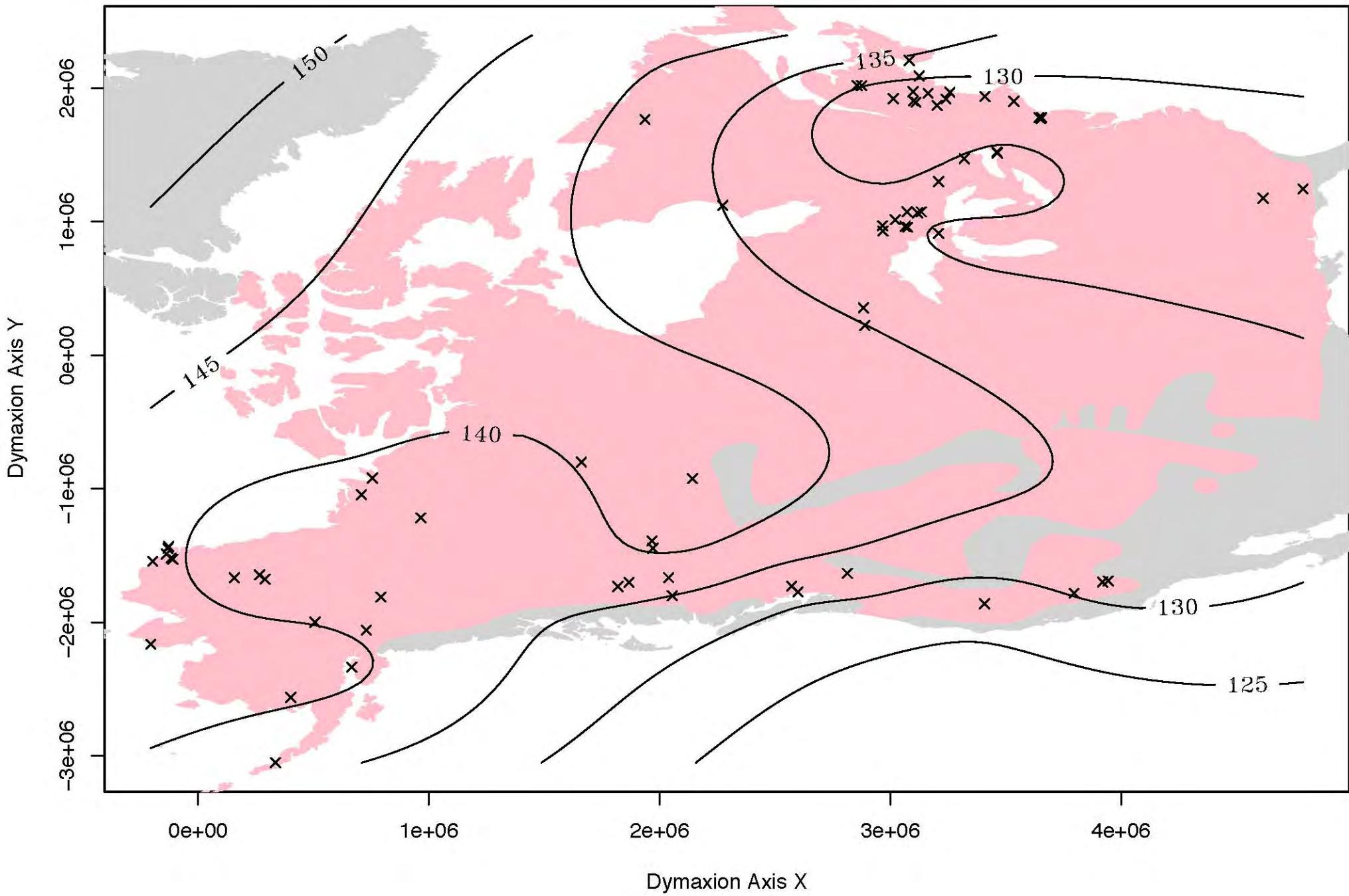
Marginal GAM Surface for CBL in male Vulpes vulpes Palearctic
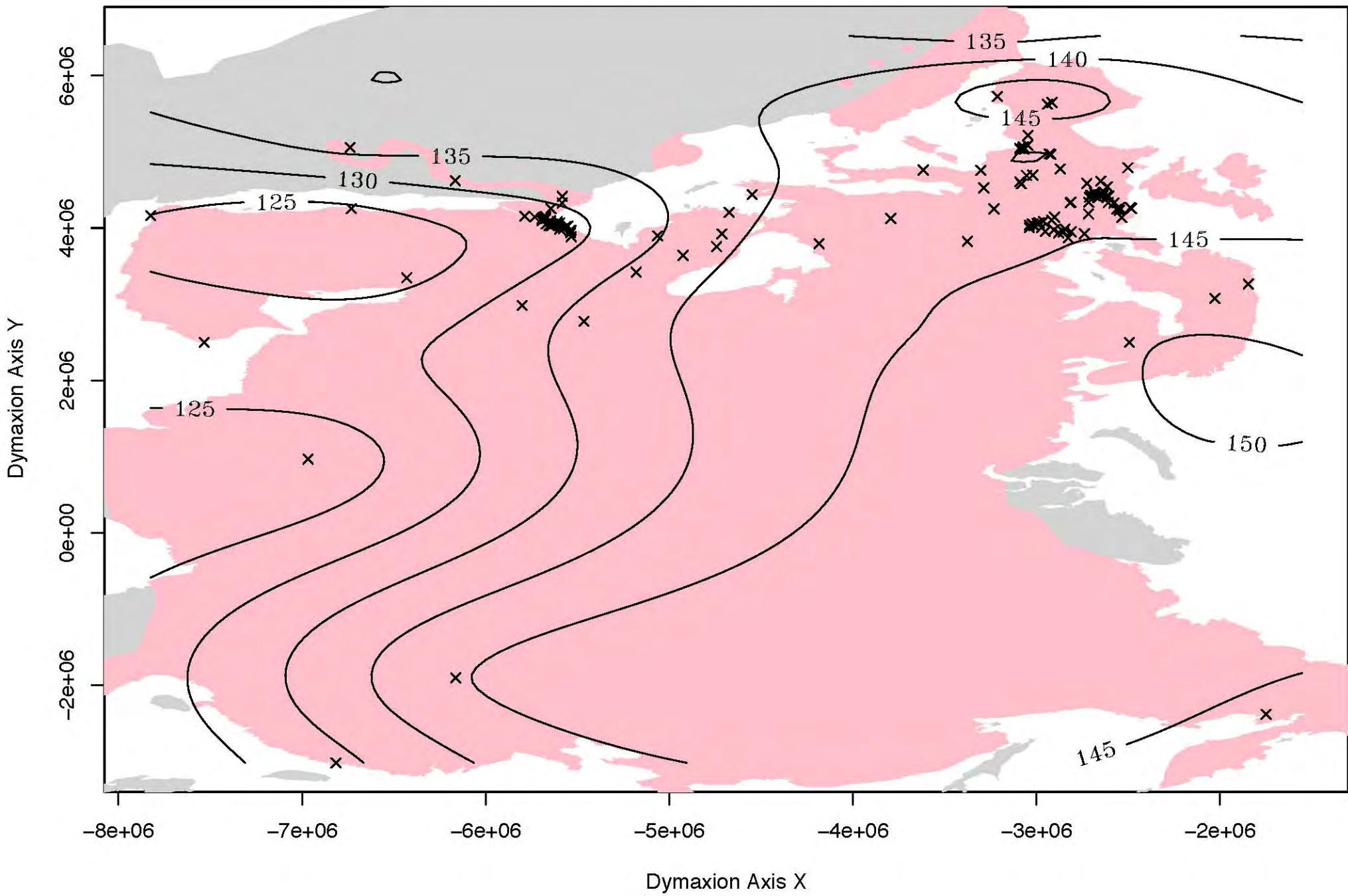
Marginal GAM Surface for CBL in female Vulpes vulpes Palearctic
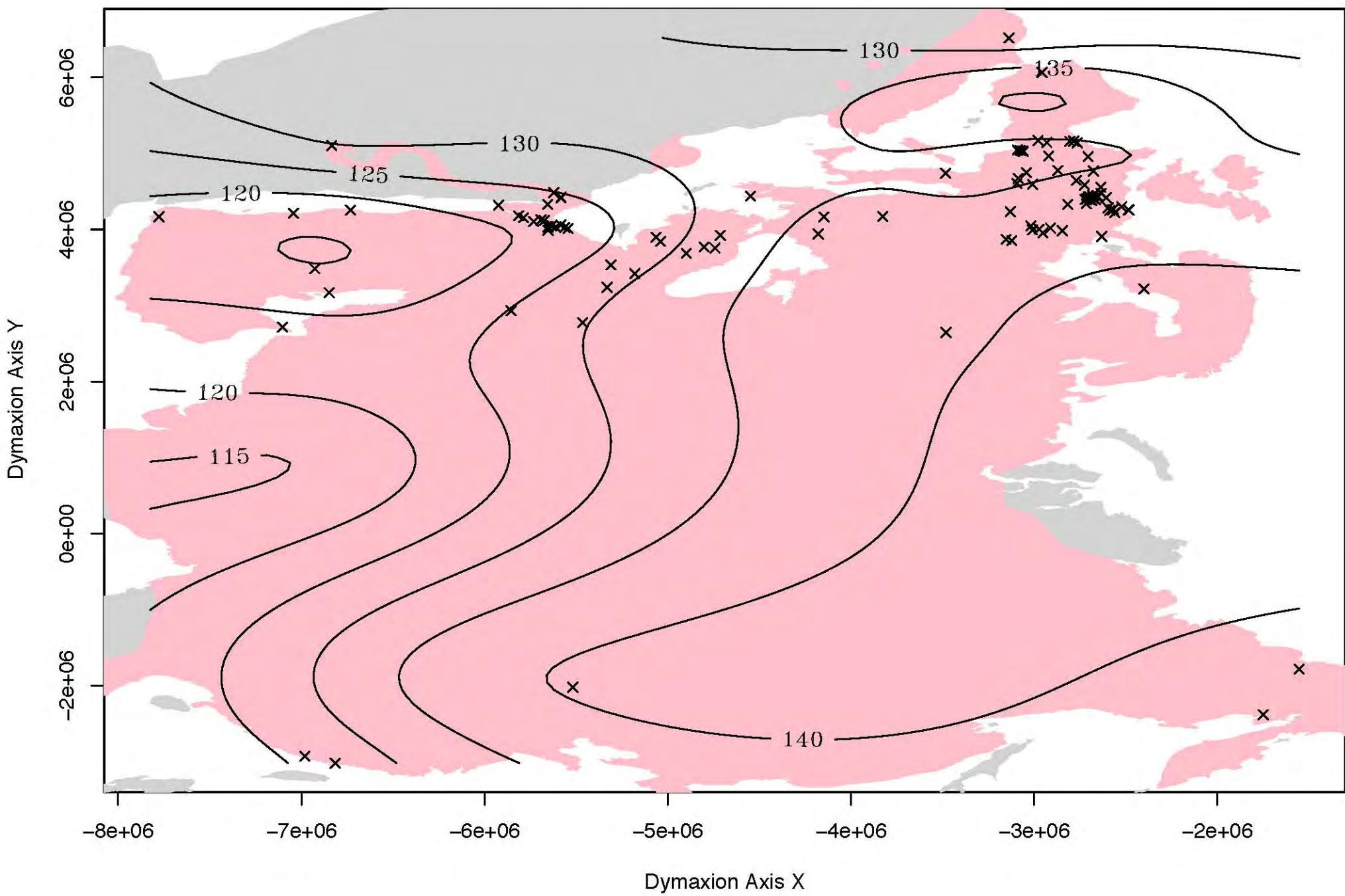
Appendix 4A

CBL (=condylo-basal length, in mm) as a function of sex (male CBL minus female CBL), latitude, longitude and (log) distance to range edge. Distance to range edge treated as a continuous predictor. For sample sizes see Table 1.

species	factor	Estimate	Std. Error	t	p
Alopex lagopus	distance to range edge	0.087	0.690	0.126	0.900
Alopex lagopus	Intercept	118.860	9.543	12.455	<0.0001
Alopex lagopus	Latitude	0.031	0.193	0.162	0.872
Alopex lagopus	Longitude	0.017	0.028	0.610	0.543
Alopex lagopus	sex	4.378	0.607	7.211	<0.0001
Canis aureus	distance to range edge	-1.255	0.871	-1.441	0.153
Canis aureus	Intercept	152.670	3.273	46.650	<0.0001
Canis aureus	Latitude	0.197	0.072	2.752	0.007
Canis aureus	Longitude	-0.148	0.030	-4.924	<0.0001
Canis aureus	sex	5.058	1.400	3.612	0.0005
Canis latrans	distance to range edge	-0.251	0.759	-0.331	0.741
Canis latrans	Intercept	168.128	2.841	59.171	<0.0001
Canis latrans	Latitude	0.440	0.049	8.903	<0.0001
Canis latrans	Longitude	0.097	0.026	3.759	0.0002
Canis latrans	sex	6.586	1.116	5.904	<0.0001
Canis lupus	distance to range edge	3.879	1.008	3.849	0.0002
Canis lupus	Intercept	199.302	6.675	29.860	<0.0001
Canis lupus	Latitude	0.185	0.155	1.195	0.234
Canis lupus	Longitude	-0.163	0.056	-2.898	0.004
Canis lupus	sex	7.774	1.341	5.797	<0.0001
Gulo gulo	distance to range edge	-0.201	0.501	-0.401	0.689
Gulo gulo	Intercept	119.515	4.896	24.413	<0.0001
Gulo gulo	Latitude	0.157	0.087	1.794	0.075
Gulo gulo	Longitude	-0.045	0.029	-1.555	0.123
Gulo gulo	sex	10.233	0.961	10.651	<0.0001
Herpestes edwardsii	distance to range edge	0.751	0.545	1.377	0.172
Herpestes edwardsii	Intercept	69.673	3.078	22.634	<0.0001
Herpestes edwardsii	Latitude	-0.063	0.045	-1.413	0.161
Herpestes edwardsii	Longitude	0.060	0.038	1.584	0.116
Herpestes edwardsii	sex	4.535	0.561	8.081	<0.0001
Lontra canadensis	distance to range edge	-1.868	0.454	-4.112	0.0001
Lontra canadensis	Intercept	108.656	2.516	43.190	<0.0001
Lontra canadensis	Latitude	-0.018	0.063	-0.287	0.774
Lontra canadensis	Longitude	-0.039	0.016	-2.492	0.014

Species	Variable				
Lontra canadensis	sex	2.974	0.726	4.097	0.0001
Lutra lutra	distance to range edge	-1.128	0.689	-1.637	0.105
Lutra lutra	Intercept	110.660	3.278	33.761	<0.0001
Lutra lutra	Latitude	0.025	0.063	0.396	0.693
Lutra lutra	Longitude	-0.061	0.023	-2.613	0.010
Lutra lutra	sex	7.630	0.990	7.703	<0.0001
Lynx canadensis	distance to range edge	-0.145	0.452	-0.321	0.748
Lynx canadensis	Intercept	103.386	2.361	43.797	<0.0001
Lynx canadensis	Latitude	0.126	0.061	2.048	0.042
Lynx canadensis	Longitude	-0.032	0.015	-2.114	0.036
Lynx canadensis	sex	5.195	0.477	10.890	<0.0001
Martes americana	distance to range edge	-0.678	0.200	-3.398	0.001
Martes americana	Intercept	55.362	1.668	33.188	<0.0001
Martes americana	Latitude	0.400	0.037	10.679	<0.0001
Martes americana	Longitude	0.017	0.008	2.110	0.036
Martes americana	sex	5.892	0.375	15.727	<0.0001
Martes foina	distance to range edge	-0.190	0.269	-0.704	0.482
Martes foina	Intercept	69.034	1.355	50.942	<0.0001
Martes foina	Latitude	0.178	0.030	5.942	<0.0001
Martes foina	Longitude	0.012	0.013	0.906	0.366
Martes foina	sex	3.900	0.277	14.080	<0.0001
Martes martes	distance to range edge	0.232	0.491	0.473	0.637
Martes martes	Intercept	70.158	3.758	18.670	<0.0001
Martes martes	Latitude	0.190	0.071	2.668	0.009
Martes martes	Longitude	-0.063	0.038	-1.671	0.097
Martes martes	sex	5.288	0.539	9.812	<0.0001
Meles meles	distance to range edge	0.730	0.388	1.881	0.061
Meles meles	Intercept	107.612	2.128	50.578	<0.0001
Meles meles	Latitude	0.406	0.038	10.608	<0.0001
Meles meles	Longitude	-0.083	0.015	-5.645	<0.0001
Meles meles	sex	3.101	0.532	5.831	<0.0001
Mustela erminea (N)	distance to range edge	0.199	0.081	2.469	0.014
Mustela erminea (N)	Intercept	23.875	0.493	48.394	<0.0001
Mustela erminea (N)	Latitude	0.310	0.012	24.890	<0.0001
Mustela erminea (N)	Longitude	0.033	0.003	9.854	<0.0001
Mustela erminea (N)	sex	5.285	0.151	34.992	<0.0001
Mustela erminea (P)	distance to range edge	0.256	0.171	1.497	0.135
Mustela erminea (P)	Intercept	44.254	1.035	42.738	<0.0001
Mustela erminea (P)	Latitude	-0.032	0.018	-1.790	0.074
Mustela erminea (P)	Longitude	-0.007	0.003	-2.007	0.045
Mustela erminea (P)	sex	3.811	0.238	15.980	<0.0001
Mustela frenata	distance to range edge	-0.589	0.137	-4.285	<0.0001
Mustela frenata	Intercept	43.609	0.645	67.568	3.54443721801929e-311

Mustela frenata	Latitude	-0.029	0.012	-2.443	0.015
Mustela frenata	Longitude	-0.013	0.005	-2.749	0.006
Mustela frenata	sex	5.294	0.206	25.728	<0.0001
Mustela nivalis (N)	distance to range edge	-0.473	0.135	-3.495	0.001
Mustela nivalis (N)	Intercept	30.156	0.791	38.124	<0.0001
Mustela nivalis (N)	Latitude	-0.045	0.029	-1.559	0.121
Mustela nivalis (N)	Longitude	-0.023	0.011	-2.155	0.033
Mustela nivalis (N)	sex	2.673	0.238	11.221	<0.0001
Mustela nivalis (P)	distance to range edge	-1.492	0.120	-12.476	<0.0001
Mustela nivalis (P)	Intercept	52.654	0.615	85.660	<0.0001
Mustela nivalis (P)	Latitude	-0.336	0.011	-29.804	<0.0001
Mustela nivalis (P)	Longitude	0.003	0.005	0.703	0.482
Mustela nivalis (P)	sex	4.507	0.181	24.908	<0.0001
Mustela putorius	distance to range edge	1.380	0.263	5.241	<0.0001
Mustela putorius	Intercept	53.468	2.626	20.359	<0.0001
Mustela putorius	Latitude	0.081	0.050	1.610	0.108
Mustela putorius	Longitude	-0.081	0.034	-2.359	0.019
Mustela putorius	sex	7.235	0.322	22.450	<0.0001
Mustela vison	distance to range edge	0.211	0.197	1.072	0.285
Mustela vison	Intercept	51.641	1.534	33.664	<0.0001
Mustela vison	Latitude	0.016	0.033	0.491	0.624
Mustela vison	Longitude	-0.072	0.007	-10.764	<0.0001
Mustela vison	sex	5.423	0.372	14.558	<0.0001
Paradoxurus hermaphroditus	distance to range edge	3.181	0.915	3.477	0.001
Paradoxurus hermaphroditus	Intercept	103.081	9.514	10.835	<0.0001
Paradoxurus hermaphroditus	Latitude	0.063	0.091	0.689	0.493
Paradoxurus hermaphroditus	Longitude	-0.067	0.085	-0.786	0.434
Paradoxurus hermaphroditus	sex	4.428	1.250	3.543	0.001
Procyon lotor	distance to range edge	0.902	0.582	1.551	0.123
Procyon lotor	Intercept	98.462	2.508	39.263	<0.0001
Procyon lotor	Latitude	-0.120	0.043	-2.798	0.006
Procyon lotor	Longitude	-0.131	0.028	-4.750	<0.0001
Procyon lotor	sex	4.119	0.839	4.910	<0.0001
Spilogale gracilis	distance to range edge	-1.839	0.566	-3.249	0.002
Spilogale gracilis	Intercept	59.494	17.668	3.367	0.001
Spilogale gracilis	Latitude	-0.123	0.113	-1.083	0.282
Spilogale gracilis	Longitude	0.011	0.179	0.061	0.951
Spilogale gracilis	sex	4.830	0.726	6.650	<0.0001
Urocyon cinereoargenteus	distance to range edge	-0.063	0.537	-0.118	0.906
Urocyon cinereoargenteus	Intercept	106.911	2.430	44.000	<0.0001
Urocyon cinereoargenteus	Latitude	0.443	0.045	9.811	<0.0001
Urocyon cinereoargenteus	Longitude	0.057	0.017	3.264	0.001
Urocyon cinereoargenteus	sex	3.051	0.593	5.141	<0.0001
Ursus arctos	distance to range edge	-8.817	1.815	-4.857	<0.0001

Ursus arctos	Intercept	261.545	22.946	11.398	<0.0001
Ursus arctos	Latitude	-1.112	0.336	-3.307	0.001
Ursus arctos	Longitude	-0.977	0.098	-9.959	<0.0001
Ursus arctos	sex	42.688	2.881	14.815	<0.0001
Viverricula indica	distance to range edge	-1.201	0.539	-2.230	0.028
Viverricula indica	Intercept	83.858	3.075	27.268	<0.0001
Viverricula indica	Latitude	0.169	0.050	3.398	0.001
Viverricula indica	Longitude	0.105	0.026	3.952	0.0001
Viverricula indica	sex	2.009	0.716	2.806	0.006
Vulpes vulpes (N)	distance to range edge	-0.332	0.470	-0.706	0.481
Vulpes vulpes (N)	Intercept	115.039	1.916	60.038	<0.0001
Vulpes vulpes (N)	Latitude	0.284	0.049	5.813	<0.0001
Vulpes vulpes (N)	Longitude	-0.042	0.017	-2.459	0.015
Vulpes vulpes (N)	sex	6.904	0.720	9.595	<0.0001
Vulpes vulpes (P)	distance to range edge	0.747	0.613	1.218	0.224
Vulpes vulpes (P)	Intercept	106.366	2.087	50.973	<0.0001
Vulpes vulpes (P)	Latitude	0.581	0.043	13.640	<0.0001
Vulpes vulpes (P)	Longitude	-0.021	0.016	-1.334	0.183
Vulpes vulpes (P)	sex	6.628	0.736	9.006	<0.0001

Appendix 4B

CBL (=condylo-basal length, in mm) as a function of sex (male CBL minus female CBL), latitude, longitude, (log) distance to range edge, and its squared term. Distance to range edge treated as a continuous predictor. For sample sizes see Table 1.

species	factor	Estimate	Std. Error	t	p
Alopex lagopus	Distance	2.412	1.578	1.529	0.128
Alopex lagopus	Distance Squared	-1.365	0.834	-1.637	0.104
Alopex lagopus	Intercept	116.058	9.642	12.036	<0.0001
Alopex lagopus	Latitude	0.072	0.193	0.374	0.709
Alopex lagopus	Longitude	0.021	0.028	0.740	0.461
Alopex lagopus	Sex	4.425	0.604	7.321	<0.0001
Canis aureus	Distance	0.318	3.190	0.100	0.921
Canis aureus	Distance Squared	-0.577	1.125	-0.513	0.609
Canis aureus	Intercept	152.476	3.306	46.119	<0.0001
Canis aureus	Latitude	0.180	0.079	2.288	0.024
Canis aureus	Longitude	-0.149	0.030	-4.929	<0.0001
Canis aureus	Sex	5.155	1.418	3.635	0.0004
Canis latrans	Distance	-4.345	2.568	-1.692	0.092
Canis latrans	Distance Squared	1.502	0.900	1.668	0.097
Canis latrans	Intercept	170.307	3.114	54.693	<0.0001
Canis latrans	Latitude	0.440	0.049	8.959	<0.0001
Canis latrans	Longitude	0.100	0.026	3.888	0.0001
Canis latrans	Sex	6.552	1.110	5.903	<0.0001
Canis lupus	Distance	-0.137	3.943	-0.035	0.972
Canis lupus	Distance Squared	1.462	1.388	1.053	0.294
Canis lupus	Intercept	201.525	6.998	28.797	<0.0001
Canis lupus	Latitude	0.114	0.169	0.676	0.500
Canis lupus	Longitude	-0.186	0.060	-3.083	0.002
Canis lupus	Sex	7.895	1.346	5.868	<0.0001
Gulo gulo	Distance	2.632	2.302	1.143	0.255
Gulo gulo	Distance Squared	-1.113	0.883	-1.261	0.210
Gulo gulo	Intercept	120.013	4.900	24.493	<0.0001
Gulo gulo	Latitude	0.162	0.087	1.853	0.066
Gulo gulo	Longitude	-0.035	0.029	-1.201	0.232
Gulo gulo	Sex	10.136	0.962	10.541	<0.0001
Herpestes edwardsii	Distance	3.037	2.134	1.423	0.158
Herpestes edwardsii	Distance Squared	-0.705	0.636	-1.108	0.271
Herpestes edwardsii	Intercept	67.383	3.705	18.187	<0.0001
Herpestes edwardsii	Latitude	-0.063	0.045	-1.419	0.159
Herpestes edwardsii	Longitude	0.070	0.039	1.789	0.077
Herpestes edwardsii	Sex	4.530	0.561	8.081	<0.0001
Lontra canadensis	Distance	-3.952	1.616	-2.446	0.016
Lontra canadensis	Distance Squared	0.843	0.627	1.343	0.181
Lontra canadensis	Intercept	110.179	2.753	40.020	<0.0001

Lontra canadensis	Latitude	-0.032	0.064	-0.502	0.616
Lontra canadensis	Longitude	-0.037	0.016	-2.376	0.019
Lontra canadensis	Sex	2.969	0.724	4.101	0.0001
Lutra lutra	Distance	-2.473	2.774	-0.892	0.375
Lutra lutra	Distance Squared	0.453	0.903	0.501	0.618
Lutra lutra	Intercept	111.655	3.843	29.051	<0.0001
Lutra lutra	Latitude	0.021	0.064	0.334	0.739
Lutra lutra	Longitude	-0.062	0.024	-2.647	0.009
Lutra lutra	Sex	7.549	1.007	7.493	<0.0001
Lynx canadensis	Distance	-2.315	1.699	-1.363	0.175
Lynx canadensis	Distance Squared	0.758	0.572	1.325	0.187
Lynx canadensis	Intercept	104.962	2.639	39.773	<0.0001
Lynx canadensis	Latitude	0.111	0.062	1.791	0.075
Lynx canadensis	Longitude	-0.033	0.015	-2.201	0.029
Lynx canadensis	Sex	5.222	0.477	10.959	<0.0001
Martes americana	Distance	2.298	0.861	2.668	0.008
Martes americana	Distance Squared	-1.277	0.360	-3.549	0.0004
Martes americana	Intercept	51.847	1.913	27.099	<0.0001
Martes americana	Latitude	0.464	0.041	11.337	<0.0001
Martes americana	Longitude	0.020	0.008	2.518	0.012
Martes americana	Sex	5.857	0.368	15.923	<0.0001
Martes foina	Distance	-2.304	1.030	-2.237	0.026
Martes foina	Distance Squared	0.718	0.338	2.126	0.034
Martes foina	Intercept	71.510	1.780	40.176	<0.0001
Martes foina	Latitude	0.152	0.032	4.724	<0.0001
Martes foina	Longitude	0.004	0.013	0.320	0.749
Martes foina	Sex	3.933	0.276	14.272	<0.0001
Martes martes	Distance	-1.598	2.224	-0.719	0.474
Martes martes	Distance Squared	0.595	0.705	0.844	0.400
Martes martes	Intercept	72.241	4.499	16.058	<0.0001
Martes martes	Latitude	0.171	0.075	2.295	0.023
Martes martes	Longitude	-0.074	0.040	-1.854	0.066
Martes martes	Sex	5.289	0.539	9.804	<0.0001
Meles meles	Distance	1.227	1.556	0.789	0.431
Meles meles	Distance Squared	-0.178	0.538	-0.330	0.742
Meles meles	Intercept	107.240	2.411	44.472	<0.0001
Meles meles	Latitude	0.408	0.039	10.543	<0.0001
Meles meles	Longitude	-0.082	0.015	-5.389	<0.0001
Meles meles	Sex	3.116	0.534	5.830	<0.0001
Mustela erminea (N)	Distance	0.334	0.347	0.962	0.336
Mustela erminea (N)	Distance Squared	-0.050	0.125	-0.400	0.689
Mustela erminea (N)	Intercept	23.716	0.633	37.453	<0.0001
Mustela erminea (N)	Latitude	0.312	0.014	22.002	<0.0001
Mustela erminea (N)	Longitude	0.033	0.003	9.684	<0.0001
Mustela erminea (N)	Sex	5.287	0.151	34.977	<0.0001
Mustela erminea (P)	Distance	0.464	0.636	0.729	0.466
Mustela erminea (P)	Distance Squared	-0.079	0.233	-0.339	0.735
Mustela erminea (P)	Intercept	44.197	1.050	42.091	<0.0001
Mustela erminea (P)	Latitude	-0.033	0.018	-1.811	0.071
Mustela erminea (P)	Longitude	-0.007	0.003	-2.017	0.044

Species	Parameter				
Mustela erminea (P)	Sex	3.816	0.239	15.952	<0.0001
Mustela frenata	Distance	0.749	0.543	1.380	0.168
Mustela frenata	Distance Squared	-0.463	0.182	-2.548	0.011
Mustela frenata	Intercept	42.252	0.835	50.614	<0.0001
Mustela frenata	Latitude	-0.025	0.012	-2.140	0.033
Mustela frenata	Longitude	-0.018	0.005	-3.527	0.0004
Mustela frenata	Sex	5.305	0.205	25.873	<0.0001
Mustela nivalis (N)	Distance	-0.801	0.618	-1.296	0.197
Mustela nivalis (N)	Distance Squared	0.120	0.220	0.543	0.588
Mustela nivalis (N)	Intercept	30.516	1.033	29.543	<0.0001
Mustela nivalis (N)	Latitude	-0.051	0.031	-1.643	0.103
Mustela nivalis (N)	Longitude	-0.024	0.011	-2.209	0.029
Mustela nivalis (N)	Sex	2.668	0.239	11.168	<0.0001
Mustela nivalis (P)	Distance	-0.145	0.483	-0.300	0.764
Mustela nivalis (P)	Distance Squared	-0.494	0.171	-2.881	0.004
Mustela nivalis (P)	Intercept	52.297	0.624	83.768	<0.0001
Mustela nivalis (P)	Latitude	-0.341	0.011	-30.030	<0.0001
Mustela nivalis (P)	Longitude	0.003	0.004	0.580	0.562
Mustela nivalis (P)	Sex	4.495	0.180	24.946	<0.0001
Mustela putorius	Distance	0.510	0.962	0.530	0.597
Mustela putorius	Distance Squared	0.329	0.350	0.940	0.347
Mustela putorius	Intercept	53.458	2.627	20.353	<0.0001
Mustela putorius	Latitude	0.090	0.051	1.761	0.079
Mustela putorius	Longitude	-0.092	0.036	-2.537	0.011
Mustela putorius	Sex	7.238	0.322	22.456	<0.0001
Mustela vison	Distance	1.264	0.865	1.461	0.145
Mustela vison	Distance Squared	-0.412	0.330	-1.250	0.212
Mustela vison	Intercept	51.012	1.614	31.616	<0.0001
Mustela vison	Latitude	0.026	0.034	0.768	0.443
Mustela vison	Longitude	-0.071	0.007	-10.470	<0.0001
Mustela vison	Sex	5.363	0.375	14.288	<0.0001
Paradoxurus hermaphroditus	Distance	8.592	2.885	2.978	0.004
Paradoxurus hermaphroditus	Distance Squared	-2.424	1.227	-1.975	0.051
Paradoxurus hermaphroditus	Intercept	100.073	9.507	10.526	<0.0001
Paradoxurus hermaphroditus	Latitude	0.219	0.120	1.825	0.071
Paradoxurus hermaphroditus	Longitude	-0.066	0.084	-0.784	0.435
Paradoxurus hermaphroditus	Sex	4.087	1.245	3.283	0.001
Procyon lotor	Distance	0.797	2.014	0.396	0.693
Procyon lotor	Distance Squared	0.050	0.910	0.055	0.956
Procyon lotor	Intercept	98.470	2.521	39.056	<0.0001
Procyon lotor	Latitude	-0.121	0.044	-2.736	0.007
Procyon lotor	Longitude	-0.131	0.029	-4.594	<0.0001
Procyon lotor	Sex	4.117	0.843	4.885	<0.0001
Spilogale gracilis	Distance	1.112	1.895	0.587	0.559
Spilogale gracilis	Distance Squared	-1.524	0.934	-1.631	0.106
Spilogale gracilis	Intercept	61.933	17.583	3.522	0.001
Spilogale gracilis	Latitude	-0.100	0.113	-0.879	0.382
Spilogale gracilis	Longitude	0.046	0.178	0.255	0.799
Spilogale gracilis	Sex	4.803	0.720	6.667	<0.0001
Urocyon cinereoargenteus	Distance	1.015	1.800	0.564	0.574
Urocyon cinereoargenteus	Distance Squared	-0.409	0.652	-0.628	0.531

Urocyon cinereoargenteus	Intercept	106.204	2.682	39.596	<0.0001
Urocyon cinereoargenteus	Latitude	0.445	0.045	9.812	<0.0001
Urocyon cinereoargenteus	Longitude	0.056	0.018	3.194	0.002
Urocyon cinereoargenteus	Sex	3.034	0.595	5.099	<0.0001
Ursus arctos	Distance	-5.017	6.737	-0.745	0.458
Ursus arctos	Distance Squared	-1.620	2.765	-0.586	0.559
Ursus arctos	Intercept	268.989	26.274	10.238	<0.0001
Ursus arctos	Latitude	-1.142	0.341	-3.350	0.001
Ursus arctos	Longitude	-0.931	0.125	-7.463	<0.0001
Ursus arctos	Sex	42.600	2.892	14.731	<0.0001
Viverricula indica	Distance	1.280	1.754	0.730	0.467
Viverricula indica	Distance Squared	-0.877	0.590	-1.485	0.141
Viverricula indica	Intercept	83.215	3.088	26.949	<0.0001
Viverricula indica	Latitude	0.167	0.049	3.388	0.001
Viverricula indica	Longitude	0.098	0.027	3.681	0.0004
Viverricula indica	Sex	2.113	0.715	2.953	0.004
Vulpes vulpes (N)	Distance	-0.028	1.872	-0.015	0.988
Vulpes vulpes (N)	Distance Squared	-0.114	0.678	-0.168	0.867
Vulpes vulpes (N)	Intercept	114.834	2.274	50.491	<0.0001
Vulpes vulpes (N)	Latitude	0.285	0.049	5.776	<0.0001
Vulpes vulpes (N)	Longitude	-0.042	0.017	-2.459	0.015
Vulpes vulpes (N)	Sex	6.907	0.721	9.576	<0.0001
Vulpes vulpes (P)	Distance	-0.763	2.281	-0.335	0.738
Vulpes vulpes (P)	Distance Squared	0.515	0.749	0.687	0.492
Vulpes vulpes (P)	Intercept	107.288	2.482	43.221	<0.0001
Vulpes vulpes (P)	Latitude	0.579	0.043	13.563	<0.0001
Vulpes vulpes (P)	Longitude	-0.022	0.016	-1.388	0.166
Vulpes vulpes (P)	Sex	6.654	0.738	9.021	<0.0001

Appendix 4C
comparison of models with and without quadratic terms
AIC scores are for the full models with sex, latitude, longitude, (log) distance and, for AIC (Quadratic model) only, squared (log) distance.
F and p values are output of an ANOVA comparing the quadratic and linear models.

Species	AIC (Linear model)	AIC (Quadratic model)	Δ AIC	F	p-value
Alopex lagopus	1590.549	1579.966	10.584	12.594	0.0004
Canis aureus	3744.190	3737.869	6.321	8.302	0.004
Canis latrans	3366.006	3361.490	4.516	6.490	0.011
Canis lupus	1180.250	1177.665	2.585	4.520	0.034
Gulo gulo	718.866	716.816	2.050	3.899	0.051
Herpestes edwardsii	1206.553	1205.695	0.858	2.783	0.097
Lontra canadensis	843.393	842.630	0.763	2.679	0.104
Lutra lutra	542.344	541.557	0.787	2.659	0.106
Lynx canadensis	590.802	590.491	0.311	2.207	0.141
Martes americana	895.864	895.997	-0.133	1.805	0.181
Martes foina	1038.512	1038.710	-0.198	1.755	0.187
Martes martes	793.424	793.768	-0.343	1.589	0.210
Meles meles	2184.635	2185.052	-0.417	1.562	0.212
Mustela erminea (N)	504.450	505.155	-0.705	1.227	0.271
Mustela erminea (P)	1244.716	1245.570	-0.854	1.110	0.294
Mustela frenata	2470.720	2471.825	-1.105	0.884	0.347
Mustela nivalis (N)	747.040	748.299	-1.259	0.712	0.400
Mustela nivalis (P)	1966.720	1968.238	-1.518	0.473	0.492
Mustela putorius	968.103	969.696	-1.593	0.394	0.531
Mustela vison	1299.641	1301.284	-1.643	0.343	0.559
Paradoxurus hermaphroditus	536.137	537.830	-1.693	0.295	0.588
Procyon lotor	739.345	741.067	-1.722	0.263	0.609
Spilogale gracilis	640.880	642.615	-1.734	0.251	0.618
Urocyon cinereoargenteus	5636.335	5638.174	-1.839	0.160	0.689
Ursus arctos	2009.156	2011.040	-1.884	0.115	0.735
Viverricula indica	1951.454	1953.344	-1.889	0.109	0.742
Vulpes vulpes (N)	1469.998	1471.969	-1.971	0.028	0.867
Vulpes vulpes (P)	785.874	787.871	-1.997	0.003	0.956

Appendix 4D

CBL as a function of sex, latitude, longitude and distance to range edge categories. Distance to range edge treated as a categorical 3-level predictor (edge, sub-edge and core)

For each species categories of edge, sub-edge and interior were based either on:

1. Equal distances. Based on the distance of the specimen furthest from the edge: specimens 0-1/3 of this distance are classified as edge specimens, those 1/3 to 2/3 of this distance are sub-edge, and the rest are interior.

2. Equal numbers of specimens. The third of the specimens closest to the edge are classified as edge, the third most distant are classified as interior specimens, and the rest are classified as sub-edge. In case of ties specimens were classified as edge or interior specimens in preference to sub-edge.

For sample sizes see Table 1

Edge specimens are compared to either 1, interior ones, or 2, sub-edge ones.

1. Equal distances

Species	factor	Estimate	Std. Error	t	p
Alopex lagopus	edge vs. interior specimens	-1.070	1.782	-0.601	0.549
Alopex lagopus	edge vs. sub-edge specimens	0.870	0.798	1.090	0.277
Alopex lagopus	Intercept	118.396	9.464	12.510	<0.0001
Alopex lagopus	Latitude	0.023	0.192	0.119	0.906
Alopex lagopus	Longitude	0.011	0.029	0.386	0.700
Alopex lagopus	sex	4.462	0.608	7.338	<0.0001
Canis aureus	edge vs. interior specimens	-2.078	1.919	-1.083	0.281
Canis aureus	edge vs. sub-edge specimens	-2.111	2.056	-1.027	0.307
Canis aureus	Intercept	151.372	3.047	49.678	<0.0001
Canis aureus	Latitude	0.224	0.082	2.739	0.007
Canis aureus	Longitude	-0.145	0.031	-4.737	<0.0001
Canis aureus	sex	4.973	1.416	3.512	0.001
Canis latrans	edge vs. interior specimens	0.481	1.575	0.305	0.760
Canis latrans	edge vs. sub-edge specimens	-1.023	1.486	-0.688	0.492
Canis latrans	Intercept	168.505	2.836	59.423	<0.0001

Canis latrans	Latitude	0.431	0.049	8.889	<0.0001
Canis latrans	Longitude	0.098	0.026	3.788	0.0002
Canis latrans	sex	6.451	1.121	5.752	<0.0001
Canis lupus	edge vs. interior specimens	7.844	2.271	3.454	0.001
Canis lupus	edge vs. sub-edge specimens	3.947	3.218	1.227	0.222
Canis lupus	Intercept	200.463	6.872	29.171	<0.0001
Canis lupus	Latitude	0.245	0.153	1.603	0.111
Canis lupus	Longitude	-0.139	0.055	-2.533	0.012
Canis lupus	sex	7.873	1.351	5.827	<0.0001
Gulo gulo	edge vs. interior specimens	0.166	1.170	0.141	0.888
Gulo gulo	edge vs. sub-edge specimens	0.468	1.616	0.290	0.772
Gulo gulo	Intercept	118.904	4.945	24.047	<0.0001
Gulo gulo	Latitude	0.153	0.088	1.751	0.082
Gulo gulo	Longitude	-0.047	0.029	-1.603	0.111
Gulo gulo	sex	10.243	0.965	10.618	<0.0001
Herpestes edwardsii	edge vs. interior specimens	2.341	1.613	1.451	0.150
Herpestes edwardsii	edge vs. sub-edge specimens	2.660	1.654	1.609	0.111
Herpestes edwardsii	Intercept	67.577	3.395	19.907	<0.0001
Herpestes edwardsii	Latitude	-0.080	0.046	-1.749	0.084
Herpestes edwardsii	Longitude	0.081	0.038	2.148	0.034
Herpestes edwardsii	sex	4.578	0.561	8.154	<0.0001
Lontra canadensis	edge vs. interior specimens	-3.947	0.893	-4.421	<0.0001
Lontra canadensis	edge vs. sub-edge specimens	-0.797	0.955	-0.835	0.405
Lontra canadensis	Intercept	106.839	2.630	40.624	<0.0001
Lontra canadensis	Latitude	-0.003	0.063	-0.055	0.956
Lontra canadensis	Longitude	-0.042	0.016	-2.691	0.008
Lontra canadensis	sex	3.024	0.718	4.212	<0.0001
Lutra lutra	edge vs. interior specimens	-1.610	1.433	-1.123	0.264
Lutra lutra	edge vs. sub-edge specimens	0.337	1.426	0.237	0.814
Lutra lutra	Intercept	108.323	3.408	31.784	<0.0001
Lutra lutra	Latitude	0.045	0.064	0.698	0.487
Lutra lutra	Longitude	-0.059	0.024	-2.489	0.014
Lutra lutra	sex	7.735	0.995	7.773	<0.0001
Lynx canadensis	edge vs. interior specimens	-0.906	0.995	-0.911	0.363
Lynx canadensis	edge vs. sub-edge specimens	-2.346	1.578	-1.486	0.139
Lynx canadensis	Intercept	104.189	2.409	43.259	<0.0001
Lynx canadensis	Latitude	0.119	0.061	1.938	0.054
Lynx canadensis	Longitude	-0.033	0.015	-2.208	0.028
Lynx canadensis	sex	5.190	0.476	10.909	<0.0001
Martes americana	edge vs. interior specimens	-2.062	0.420	-4.911	<0.0001
Martes americana	edge vs. sub-edge specimens	0.767	0.523	1.466	0.144

Species	Parameter				
Martes americana	Intercept	52.637	1.780	29.567	<0.0001
Martes americana	Latitude	0.476	0.040	11.885	<0.0001
Martes americana	Longitude	0.030	0.008	3.673	0.0003
Martes americana	sex	6.010	0.360	16.674	<0.0001
Martes foina	edge vs. interior specimens	-0.778	0.580	-1.342	0.181
Martes foina	edge vs. sub-edge specimens	-1.308	0.615	-2.127	0.034
Martes foina	Intercept	70.926	1.628	43.565	<0.0001
Martes foina	Latitude	0.149	0.033	4.586	<0.0001
Martes foina	Longitude	0.007	0.013	0.564	0.573
Martes foina	sex	3.958	0.277	14.307	<0.0001
Martes martes	edge vs. interior specimens	-0.338	1.114	-0.303	0.762
Martes martes	edge vs. sub-edge specimens	-0.700	1.230	-0.569	0.570
Martes martes	Intercept	72.199	4.240	17.027	<0.0001
Martes martes	Latitude	0.167	0.077	2.179	0.031
Martes martes	Longitude	-0.061	0.038	-1.624	0.107
Martes martes	sex	5.224	0.540	9.674	<0.0001
Meles meles	edge vs. interior specimens	1.618	0.748	2.162	0.031
Meles meles	edge vs. sub-edge specimens	0.362	0.692	0.524	0.601
Meles meles	Intercept	108.142	2.099	51.528	<0.0001
Meles meles	Latitude	0.405	0.038	10.604	<0.0001
Meles meles	Longitude	-0.084	0.015	-5.707	<0.0001
Meles meles	sex	3.024	0.533	5.673	<0.0001
Mustela erminea (N)	edge vs. interior specimens	0.412	0.173	2.383	0.017
Mustela erminea (N)	edge vs. sub-edge specimens	-0.161	0.216	-0.743	0.458
Mustela erminea (N)	Intercept	24.162	0.519	46.539	<0.0001
Mustela erminea (N)	Latitude	0.304	0.013	23.622	<0.0001
Mustela erminea (N)	Longitude	0.031	0.003	9.313	<0.0001
Mustela erminea (N)	sex	5.295	0.151	35.116	<0.0001
Mustela erminea (P)	edge vs. interior specimens	0.171	0.352	0.484	0.628
Mustela erminea (P)	edge vs. sub-edge specimens	0.394	0.406	0.971	0.332
Mustela erminea (P)	Intercept	44.592	1.022	43.646	<0.0001
Mustela erminea (P)	Latitude	-0.033	0.018	-1.853	0.065
Mustela erminea (P)	Longitude	-0.008	0.004	-2.187	0.029
Mustela erminea (P)	sex	3.806	0.239	15.912	<0.0001
Mustela frenata	edge vs. interior specimens	-0.831	0.287	-2.896	0.004
Mustela frenata	edge vs. sub-edge specimens	-0.757	0.314	-2.414	0.016
Mustela frenata	Intercept	43.841	0.797	55.041	<0.0001
Mustela frenata	Latitude	-0.033	0.012	-2.707	0.007
Mustela frenata	Longitude	-0.009	0.006	-1.630	0.104
Mustela frenata	sex	5.294	0.207	25.538	<0.0001
Mustela nivalis (N)	edge vs. interior specimens	-1.141	0.341	-3.343	0.001
Mustela nivalis (N)	edge vs. sub-edge	-0.827	0.418	-1.979	0.050

	specimens				
Mustela nivalis (N)	Intercept	30.330	0.928	32.681	<0.0001
Mustela nivalis (N)	Latitude	-0.053	0.030	-1.752	0.082
Mustela nivalis (N)	Longitude	-0.026	0.011	-2.368	0.019
Mustela nivalis (N)	sex	2.658	0.239	11.109	<0.0001
Mustela nivalis (P)	edge vs. interior specimens	-2.680	0.240	-11.171	<0.0001
Mustela nivalis (P)	edge vs. sub-edge specimens	-0.744	0.248	-2.996	0.003
Mustela nivalis (P)	Intercept	51.606	0.597	86.431	<0.0001
Mustela nivalis (P)	Latitude	-0.333	0.011	-29.727	<0.0001
Mustela nivalis (P)	Longitude	-0.003	0.005	-0.726	0.468
Mustela nivalis (P)	sex	4.445	0.179	24.842	<0.0001
Mustela putorius	edge vs. interior specimens	2.358	0.502	4.695	<0.0001
Mustela putorius	edge vs. sub-edge specimens	1.390	0.515	2.699	0.007
Mustela putorius	Intercept	55.720	2.477	22.493	<0.0001
Mustela putorius	Latitude	0.046	0.049	0.943	0.346
Mustela putorius	Longitude	-0.053	0.033	-1.607	0.109
Mustela putorius	sex	7.183	0.325	22.113	<0.0001
Mustela vison	edge vs. interior specimens	0.197	0.410	0.481	0.631
Mustela vison	edge vs. sub-edge specimens	-0.398	0.590	-0.674	0.501
Mustela vison	Intercept	52.279	1.529	34.181	<0.0001
Mustela vison	Latitude	0.005	0.034	0.141	0.888
Mustela vison	Longitude	-0.074	0.007	-10.706	<0.0001
Mustela vison	sex	5.443	0.374	14.567	<0.0001
Paradoxurus hermaphroditus	edge vs. interior specimens	6.404	2.042	3.136	0.002
Paradoxurus hermaphroditus	edge vs. sub-edge specimens	2.593	1.752	1.480	0.142
Paradoxurus hermaphroditus	Intercept	109.181	9.194	11.875	<0.0001
Paradoxurus hermaphroditus	Latitude	-0.003	0.120	-0.027	0.978
Paradoxurus hermaphroditus	Longitude	-0.108	0.083	-1.303	0.196
Paradoxurus hermaphroditus	sex	4.186	1.280	3.269	0.001
Procyon lotor	edge vs. interior specimens	0.745	1.140	0.653	0.515
Procyon lotor	edge vs. sub-edge specimens	1.310	0.991	1.322	0.189
Procyon lotor	Intercept	99.324	2.492	39.858	<0.0001
Procyon lotor	Latitude	-0.105	0.045	-2.350	0.020
Procyon lotor	Longitude	-0.120	0.029	-4.192	0.0001
Procyon lotor	sex	4.102	0.845	4.854	<0.0001
Spilogale gracilis	edge vs. interior specimens	-2.575	0.764	-3.369	0.001
Spilogale gracilis	edge vs. sub-edge specimens	1.875	0.759	2.469	0.015
Spilogale gracilis	Intercept	53.139	15.981	3.325	0.001
Spilogale gracilis	Latitude	-0.141	0.102	-1.384	0.170
Spilogale gracilis	Longitude	-0.037	0.162	-0.227	0.821

Species	factor	Estimate	Std. Error	t	p
Spilogale gracilis	sex	4.317	0.662	6.523	<0.0001
Urocyon cinereoargenteus	edge vs. interior specimens	-0.233	1.063	-0.219	0.827
Urocyon cinereoargenteus	edge vs. sub-edge specimens	0.815	1.032	0.790	0.431
Urocyon cinereoargenteus	Intercept	105.430	2.499	42.186	<0.0001
Urocyon cinereoargenteus	Latitude	0.454	0.045	9.995	<0.0001
Urocyon cinereoargenteus	Longitude	0.051	0.017	2.903	0.004
Urocyon cinereoargenteus	sex	3.088	0.588	5.253	<0.0001
Ursus arctos	edge vs. interior specimens	-23.372	4.285	-5.454	<0.0001
Ursus arctos	edge vs. sub-edge specimens	-6.714	3.633	-1.848	0.067
Ursus arctos	Intercept	273.849	23.869	11.473	<0.0001
Ursus arctos	Latitude	-1.045	0.333	-3.140	0.002
Ursus arctos	Longitude	-0.847	0.113	-7.493	<0.0001
Ursus arctos	sex	43.410	2.852	15.223	<0.0001
Viverricula indica	edge vs. interior specimens	-1.044	1.206	-0.866	0.389
Viverricula indica	edge vs. sub-edge specimens	1.721	1.200	1.434	0.155
Viverricula indica	Intercept	82.590	2.765	29.868	<0.0001
Viverricula indica	Latitude	0.143	0.048	2.947	0.004
Viverricula indica	Longitude	0.101	0.025	4.077	0.0001
Viverricula indica	sex	2.171	0.695	3.124	0.002
Vulpes vulpes (N)	edge vs. interior specimens	-1.004	0.953	-1.054	0.293
Vulpes vulpes (N)	edge vs. sub-edge specimens	-0.857	1.079	-0.794	0.428
Vulpes vulpes (N)	Intercept	115.289	1.914	60.229	<0.0001
Vulpes vulpes (N)	Latitude	0.280	0.049	5.697	<0.0001
Vulpes vulpes (N)	Longitude	-0.043	0.017	-2.516	0.013
Vulpes vulpes (N)	sex	6.935	0.722	9.603	<0.0001
Vulpes vulpes (P)	edge vs. interior specimens	2.132	1.219	1.749	0.081
Vulpes vulpes (P)	edge vs. sub-edge specimens	0.942	1.195	0.788	0.431
Vulpes vulpes (P)	Intercept	106.782	2.152	49.629	<0.0001
Vulpes vulpes (P)	Latitude	0.569	0.043	13.179	<0.0001
Vulpes vulpes (P)	Longitude	-0.021	0.016	-1.301	0.194
Vulpes vulpes (P)	sex	6.696	0.737	9.090	<0.0001

2. Equal numbers of specimens

Species	factor	Estimate	Std. Error	t	p
Alopex lagopus	edge vs. interior specimens	0.504	0.821	0.614	0.540
Alopex lagopus	edge vs. sub-edge specimens	-1.539	1.828	-0.842	0.401
Alopex lagopus	Intercept	120.622	9.766	12.352	<0.0001
Alopex lagopus	Latitude	-0.012	0.196	-0.064	0.949
Alopex lagopus	Longitude	0.009	0.029	0.302	0.763
Alopex lagopus	sex	4.367	0.608	7.187	<0.0001

Canis aureus	edge vs. interior specimens	-2.909	2.020	-1.440	0.153
Canis aureus	edge vs. sub-edge specimens	-1.685	1.784	-0.945	0.347
Canis aureus	Intercept	152.472	3.182	47.924	<0.0001
Canis aureus	Latitude	0.179	0.079	2.265	0.026
Canis aureus	Longitude	-0.149	0.031	-4.862	<0.0001
Canis aureus	sex	5.079	1.416	3.586	0.001
Canis latrans	edge vs. interior specimens	0.182	1.442	0.126	0.900
Canis latrans	edge vs. sub-edge specimens	-1.392	1.423	-0.979	0.329
Canis latrans	Intercept	168.431	2.788	60.417	<0.0001
Canis latrans	Latitude	0.442	0.051	8.734	<0.0001
Canis latrans	Longitude	0.100	0.026	3.862	0.0002
Canis latrans	sex	6.464	1.119	5.777	<0.0001
Canis lupus	edge vs. interior specimens	5.274	1.833	2.877	0.005
Canis lupus	edge vs. sub-edge specimens	1.668	1.752	0.952	0.342
Canis lupus	Intercept	207.347	6.659	31.137	<0.0001
Canis lupus	Latitude	0.168	0.167	1.002	0.318
Canis lupus	Longitude	-0.152	0.059	-2.603	0.010
Canis lupus	sex	8.391	1.369	6.128	<0.0001
Gulo gulo	edge vs. interior specimens	-0.268	1.134	-0.236	0.814
Gulo gulo	edge vs. sub-edge specimens	0.757	1.210	0.625	0.533
Gulo gulo	Intercept	118.790	4.955	23.975	<0.0001
Gulo gulo	Latitude	0.156	0.087	1.792	0.076
Gulo gulo	Longitude	-0.047	0.029	-1.623	0.107
Gulo gulo	sex	10.125	0.971	10.422	<0.0001
Herpestes edwardsii	edge vs. interior specimens	0.082	0.723	0.114	0.910
Herpestes edwardsii	edge vs. sub-edge specimens	-0.185	0.697	-0.266	0.791
Herpestes edwardsii	Intercept	70.188	3.292	21.323	<0.0001
Herpestes edwardsii	Latitude	-0.073	0.047	-1.577	0.118
Herpestes edwardsii	Longitude	0.076	0.039	1.934	0.056
Herpestes edwardsii	sex	4.546	0.573	7.939	<0.0001
Lontra canadensis	edge vs. interior specimens	-3.331	0.933	-3.571	0.0005
Lontra canadensis	edge vs. sub-edge specimens	-2.102	0.900	-2.335	0.021
Lontra canadensis	Intercept	108.274	2.622	41.301	<0.0001
Lontra canadensis	Latitude	-0.016	0.065	-0.254	0.800
Lontra canadensis	Longitude	-0.033	0.016	-2.140	0.034
Lontra canadensis	sex	3.045	0.735	4.141	0.0001
Lutra lutra	edge vs. interior specimens	-1.214	1.181	-1.028	0.306
Lutra lutra	edge vs. sub-edge specimens	0.583	1.266	0.461	0.646
Lutra lutra	Intercept	108.072	3.417	31.626	<0.0001
Lutra lutra	Latitude	0.043	0.066	0.655	0.514
Lutra lutra	Longitude	-0.059	0.024	-2.489	0.014

Lutra lutra	sex	7.796	1.010	7.722	<0.0001
Lynx canadensis	edge vs. interior specimens	0.398	0.584	0.681	0.496
Lynx canadensis	edge vs. sub-edge specimens	0.333	0.645	0.517	0.606
Lynx canadensis	Intercept	102.751	2.571	39.972	<0.0001
Lynx canadensis	Latitude	0.128	0.064	1.990	0.048
Lynx canadensis	Longitude	-0.031	0.015	-2.069	0.040
Lynx canadensis	sex	5.231	0.478	10.943	<0.0001
Martes americana	edge vs. interior specimens	-1.900	0.436	-4.354	<0.0001
Martes americana	edge vs. sub-edge specimens	-0.114	0.480	-0.238	0.812
Martes americana	Intercept	53.782	1.807	29.768	<0.0001
Martes americana	Latitude	0.433	0.040	10.833	<0.0001
Martes americana	Longitude	0.020	0.008	2.523	0.012
Martes americana	sex	5.868	0.368	15.927	<0.0001
Martes foina	edge vs. interior specimens	0.447	0.410	1.090	0.277
Martes foina	edge vs. sub-edge specimens	0.180	0.375	0.480	0.632
Martes foina	Intercept	69.926	1.532	45.642	<0.0001
Martes foina	Latitude	0.149	0.033	4.490	<0.0001
Martes foina	Longitude	0.006	0.013	0.459	0.646
Martes foina	sex	3.908	0.277	14.083	<0.0001
Martes martes	edge vs. interior specimens	0.451	0.647	0.698	0.486
Martes martes	edge vs. sub-edge specimens	-0.422	0.709	-0.595	0.553
Martes martes	Intercept	71.399	3.459	20.643	<0.0001
Martes martes	Latitude	0.172	0.071	2.434	0.016
Martes martes	Longitude	-0.060	0.037	-1.608	0.110
Martes martes	sex	5.320	0.538	9.897	<0.0001
Meles meles	edge vs. interior specimens	1.844	0.632	2.916	0.004
Meles meles	edge vs. sub-edge specimens	0.144	0.647	0.222	0.824
Meles meles	Intercept	108.294	2.062	52.507	<0.0001
Meles meles	Latitude	0.402	0.038	10.599	<0.0001
Meles meles	Longitude	-0.084	0.015	-5.757	<0.0001
Meles meles	sex	2.984	0.529	5.638	<0.0001
Mustela erminea (N)	edge vs. interior specimens	0.479	0.173	2.762	0.006
Mustela erminea (N)	edge vs. sub-edge specimens	0.438	0.171	2.557	0.011
Mustela erminea (N)	Intercept	23.985	0.516	46.487	<0.0001
Mustela erminea (N)	Latitude	0.307	0.013	23.906	<0.0001
Mustela erminea (N)	Longitude	0.032	0.003	9.872	<0.0001
Mustela erminea (N)	sex	5.294	0.151	35.016	<0.0001
Mustela erminea (P)	edge vs. interior specimens	0.396	0.284	1.394	0.164
Mustela erminea (P)	edge vs. sub-edge specimens	-0.210	0.287	-0.732	0.465
Mustela erminea (P)	Intercept	44.039	1.037	42.474	<0.0001
Mustela erminea (P)	Latitude	-0.020	0.019	-1.067	0.286

Species	Variable				
Mustela erminea (P)	Longitude	-0.008	0.004	-2.159	0.031
Mustela erminea (P)	sex	3.766	0.239	15.779	<0.0001
Mustela frenata	edge vs. interior specimens	-0.922	0.251	-3.672	0.0003
Mustela frenata	edge vs. sub-edge specimens	-0.573	0.235	-2.442	0.015
Mustela frenata	Intercept	42.990	0.672	63.932	<0.0001
Mustela frenata	Latitude	-0.030	0.012	-2.545	0.011
Mustela frenata	Longitude	-0.015	0.005	-2.912	0.004
Mustela frenata	sex	5.278	0.207	25.544	<0.0001
Mustela nivalis (N)	edge vs. interior specimens	-1.008	0.335	-3.006	0.003
Mustela nivalis (N)	edge vs. sub-edge specimens	-0.745	0.387	-1.925	0.056
Mustela nivalis (N)	Intercept	29.897	0.910	32.836	<0.0001
Mustela nivalis (N)	Latitude	-0.042	0.031	-1.362	0.175
Mustela nivalis (N)	Longitude	-0.023	0.011	-2.094	0.038
Mustela nivalis (N)	sex	2.669	0.242	11.040	<0.0001
Mustela nivalis (P)	edge vs. interior specimens	-2.611	0.194	-13.445	<0.0001
Mustela nivalis (P)	edge vs. sub-edge specimens	-1.725	0.204	-8.470	<0.0001
Mustela nivalis (P)	Intercept	51.884	0.593	87.498	<0.0001
Mustela nivalis (P)	Latitude	-0.340	0.011	-30.576	<0.0001
Mustela nivalis (P)	Longitude	-0.001	0.004	-0.308	0.758
Mustela nivalis (P)	sex	4.429	0.179	24.726	<0.0001
Mustela putorius	edge vs. interior specimens	2.274	0.428	5.318	<0.0001
Mustela putorius	edge vs. sub-edge specimens	0.850	0.388	2.190	0.029
Mustela putorius	Intercept	54.471	2.522	21.596	<0.0001
Mustela putorius	Latitude	0.088	0.051	1.728	0.085
Mustela putorius	Longitude	-0.089	0.035	-2.556	0.011
Mustela putorius	sex	7.278	0.323	22.557	<0.0001
Mustela vison	edge vs. interior specimens	0.902	0.439	2.053	0.041
Mustela vison	edge vs. sub-edge specimens	-0.229	0.443	-0.515	0.607
Mustela vison	Intercept	51.766	1.504	34.429	<0.0001
Mustela vison	Latitude	0.015	0.033	0.459	0.647
Mustela vison	Longitude	-0.072	0.007	-10.709	<0.0001
Mustela vison	sex	5.507	0.371	14.825	<0.0001
Paradoxurus hermaphroditus	edge vs. interior specimens	4.687	2.083	2.250	0.027
Paradoxurus hermaphroditus	edge vs. sub-edge specimens	4.003	1.623	2.467	0.015
Paradoxurus hermaphroditus	Intercept	110.148	8.997	12.243	<0.0001
Paradoxurus hermaphroditus	Latitude	0.076	0.117	0.656	0.514
Paradoxurus hermaphroditus	Longitude	-0.123	0.084	-1.463	0.147
Paradoxurus hermaphroditus	sex	4.277	1.277	3.349	0.001
Procyon lotor	edge vs. interior specimens	0.946	1.052	0.900	0.370
Procyon lotor	edge vs. sub-edge specimens	1.745	1.046	1.668	0.098
Procyon lotor	Intercept	99.163	2.569	38.593	<0.0001

Procyon lotor	Latitude	-0.097	0.045	-2.138	0.034
Procyon lotor	Longitude	-0.118	0.030	-3.978	0.0001
Procyon lotor	sex	4.100	0.841	4.873	<0.0001
Spilogale gracilis	edge vs. interior specimens	-2.479	0.763	-3.247	0.002
Spilogale gracilis	edge vs. sub-edge specimens	1.904	0.769	2.477	0.015
Spilogale gracilis	Intercept	52.035	16.064	3.239	0.002
Spilogale gracilis	Latitude	-0.146	0.103	-1.420	0.159
Spilogale gracilis	Longitude	-0.047	0.162	-0.289	0.773
Spilogale gracilis	sex	4.369	0.665	6.568	<0.0001
Urocyon cinereoargenteus	edge vs. interior specimens	-0.779	0.713	-1.093	0.276
Urocyon cinereoargenteus	edge vs. sub-edge specimens	0.523	0.777	0.673	0.502
Urocyon cinereoargenteus	Intercept	105.589	2.485	42.490	<0.0001
Urocyon cinereoargenteus	Latitude	0.459	0.046	9.928	<0.0001
Urocyon cinereoargenteus	Longitude	0.050	0.018	2.745	0.007
Urocyon cinereoargenteus	sex	3.120	0.588	5.307	<0.0001
Ursus arctos	edge vs. interior specimens	-20.920	4.369	-4.788	<0.0001
Ursus arctos	edge vs. sub-edge specimens	-9.028	3.540	-2.551	0.012
Ursus arctos	Intercept	258.706	23.457	11.029	<0.0001
Ursus arctos	Latitude	-0.998	0.339	-2.944	0.004
Ursus arctos	Longitude	-0.933	0.111	-8.436	<0.0001
Ursus arctos	sex	42.868	2.901	14.779	<0.0001
Viverricula indica	edge vs. interior specimens	-2.448	0.956	-2.561	0.012
Viverricula indica	edge vs. sub-edge specimens	-1.848	0.996	-1.856	0.066
Viverricula indica	Intercept	85.320	3.357	25.415	<0.0001
Viverricula indica	Latitude	0.150	0.048	3.131	0.002
Viverricula indica	Longitude	0.089	0.029	3.072	0.003
Viverricula indica	sex	2.056	0.719	2.859	0.005
Vulpes vulpes (N)	edge vs. interior specimens	-0.178	0.871	-0.204	0.839
Vulpes vulpes (N)	edge vs. sub-edge specimens	-1.502	0.876	-1.715	0.088
Vulpes vulpes (N)	Intercept	115.312	1.807	63.820	<0.0001
Vulpes vulpes (N)	Latitude	0.285	0.049	5.861	<0.0001
Vulpes vulpes (N)	Longitude	-0.038	0.017	-2.242	0.026
Vulpes vulpes (N)	sex	6.879	0.719	9.561	<0.0001
Vulpes vulpes (P)	edge vs. interior specimens	0.227	0.940	0.241	0.810
Vulpes vulpes (P)	edge vs. sub-edge specimens	-0.899	0.902	-0.996	0.320
Vulpes vulpes (P)	Intercept	107.587	2.035	52.873	<0.0001
Vulpes vulpes (P)	Latitude	0.590	0.043	13.874	<0.0001
Vulpes vulpes (P)	Longitude	-0.023	0.016	-1.434	0.153
Vulpes vulpes (P)	sex	6.626	0.737	8.989	<0.0001

Appendix 4E
CBL as a function of sex, latitude, longitude and distance to range edge. Distance to range edge treated as a continuous predictor. Only specimens closer to an inland rather than to a coastal range edge are used. Minimum sample size per species: n = 20. For sample sizes see Table 3.

Species	factor	Estimate	Std. Error	t	p
Herpestes edwardsii	distance to range edge	0.603	1.067	0.565	0.575
Herpestes edwardsii	intercept	58.860	6.116	9.623	<0.0001
Herpestes edwardsii	latitude	0.362	0.185	1.962	0.055
Herpestes edwardsii	longitude	0.043	0.060	0.711	0.480
Herpestes edwardsii	sex	4.695	0.767	6.123	<0.0001
Martes americana	distance to range edge	-1.669	2.390	-0.698	0.488
Martes americana	intercept	60.533	5.715	10.593	<0.0001
Martes americana	latitude	0.247	0.135	1.825	0.074
Martes americana	longitude	-0.040	0.057	-0.689	0.494
Martes americana	sex	4.764	0.929	5.126	<0.0001
Meles meles	distance to range edge	6.744	2.228	3.027	0.008
Meles meles	intercept	132.387	6.152	21.520	<0.0001
Meles meles	latitude	-0.449	0.215	-2.088	0.052
Meles meles	longitude	-0.161	0.043	-3.713	0.002
Meles meles	sex	3.111	1.343	2.317	0.033
Mustela erminea (N)	distance to range edge	-1.996	0.530	-3.767	0.0002
Mustela erminea (N)	intercept	22.177	3.745	5.922	<0.0001
Mustela erminea (N)	latitude	0.643	0.059	10.969	<0.0001
Mustela erminea (N)	longitude	0.121	0.026	4.628	<0.0001
Mustela erminea (N)	sex	4.445	0.417	10.670	<0.0001
Mustela erminea (P)	distance to range edge	5.091	2.251	2.261	0.031
Mustela erminea (P)	intercept	34.085	9.014	3.781	0.001
Mustela erminea (P)	latitude	-0.037	0.251	-0.146	0.885
Mustela erminea (P)	longitude	-0.074	0.042	-1.773	0.086
Mustela erminea (P)	sex	4.113	0.799	5.147	<0.0001
Mustela frenata	distance to range edge	-0.869	0.403	-2.157	0.033
Mustela frenata	intercept	41.795	2.275	18.369	<0.0001
Mustela frenata	latitude	0.054	0.025	2.147	0.034
Mustela frenata	longitude	-0.014	0.018	-0.792	0.430
Mustela frenata	sex	4.999	0.574	8.702	<0.0001

Mustela nivalis (N)	distance to range edge	0.399	1.025	0.389	0.701
Mustela nivalis (N)	intercept	32.713	4.154	7.874	<0.0001
Mustela nivalis (N)	latitude	-0.059	0.111	-0.529	0.602
Mustela nivalis (N)	longitude	0.012	0.057	0.218	0.829
Mustela nivalis (N)	sex	2.647	0.591	4.477	0.0002
Mustela nivalis (P)	distance to range edge	-0.644	3.369	-0.191	0.851
Mustela nivalis (P)	intercept	60.279	6.398	9.422	<0.0001
Mustela nivalis (P)	latitude	-0.508	0.400	-1.272	0.220
Mustela nivalis (P)	longitude	-0.052	0.092	-0.560	0.582
Mustela nivalis (P)	sex	5.152	1.320	3.903	0.001
Mustela vison	distance to range edge	-11.607	2.428	-4.780	0.0001
Mustela vison	intercept	29.125	10.804	2.696	0.013
Mustela vison	latitude	0.944	0.189	4.994	<0.0001
Mustela vison	longitude	-0.117	0.055	-2.129	0.044
Mustela vison	sex	6.560	1.115	5.883	<0.0001
Viverricula indica	distance to range edge	2.435	2.488	0.979	0.337
Viverricula indica	intercept	55.524	12.536	4.429	0.0002
Viverricula indica	latitude	1.063	0.340	3.124	0.004
Viverricula indica	longitude	0.037	0.062	0.587	0.562
Viverricula indica	sex	2.727	1.495	1.824	0.080
Vulpes vulpes (N)	distance to range edge	-3.145	1.982	-1.587	0.117
Vulpes vulpes (N)	intercept	127.226	6.280	20.258	<0.0001
Vulpes vulpes (N)	latitude	0.631	0.121	5.220	<0.0001
Vulpes vulpes (N)	longitude	0.153	0.069	2.209	0.030
Vulpes vulpes (N)	sex	8.129	1.126	7.216	<0.0001

Appendix 5
Species level data

species	Mean CBL (mm)	standard deviation of CBL (mm)	mean distance (log km)	standard deviation of distance (log km)	slope	standardized slope	log mass (g)	CBL CV, females	CBL CV, males	log range size (maps)
Alopex lagopus	121.20	4.31	0.60	0.44	-0.039	-0.004	3.48	2.82	3.24	6.70
Canis aureus	150.83	9.37	1.72	0.86	-1.411	-0.129	3.96	6.52	5.35	7.39
Canis latrans	178.46	9.68	1.61	0.73	-0.154	-0.012	4.03	5.36	4.65	7.16
Canis lupus	244.79	10.31	2.17	0.68	4.319	0.286	4.54	3.73	4.13	7.13
Gulo gulo	141.21	7.36	1.84	0.89	-0.240	-0.029	3.96	3.08	4.16	7.02
Herpestes edwardsii	76.89	3.66	1.93	0.52	0.747	0.106	3.13	3.62	3.66	6.49
Lontra canadensis	110.63	4.93	1.43	0.79	-2.038	-0.329	3.92	3.98	4.39	7.13
Lutra lutra	112.36	6.66	1.70	0.67	-1.166	-0.117	3.92	4.61	4.96	7.56
Lynx canadensis	116.38	4.57	2.16	0.52	-0.127	-0.014	3.94	3.62	2.65	7.03
Martes americana	77.08	4.77	1.42	0.87	-0.825	-0.150	3.00	5.68	4.65	6.92
Martes foina	79.42	3.08	1.94	0.55	-0.177	-0.031	3.1	3.16	2.91	6.88
Martes martes	82.51	4.04	2.05	0.55	0.255	0.035	3.11	4.07	3.66	6.86
Meles meles	128.71	6.97	1.55	0.64	0.783	0.072	3.98	5.43	5.22	7.36
Mustela erminea (N)	40.73	3.92	1.73	0.83	0.218	0.046	2.35	7.43	7.49	7.06
Mustela erminea (P)	45.16	3.03	1.80	0.63	0.264	0.055	2.35	6.55	4.63	7.34
Mustela frenata	46.34	3.56	1.79	0.67	-0.653	-0.123	2.38	6.56	5.17	7.06
Mustela nivalis (N)	31.24	1.98	1.54	0.94	-0.521	-0.247	1.91	3.81	5.57	6.98
Mustela nivalis (P)	35.98	4.18	1.74	0.64	-1.646	-0.252	1.91	9.05	10.33	7.44
Mustela putorius	63.80	4.98	1.73	0.61	1.521	0.187	3.01	6.01	5.13	6.80
Mustela vison	63.69	5.06	1.57	0.87	0.205	0.035	3.00	5.40	7.29	7.11
Paradoxurus hermaphroditus	104.52	7.38	1.47	0.76	3.527	0.363	3.54	6.51	6.97	6.77
Procyon lotor	110.47	5.47	1.22	0.68	1.033	0.129	3.95	4.20	4.97	6.99
Spilogale gracilis	55.24	4.18	1.12	0.55	-2.212	-0.290	2.68	5.25	6.86	6.47
Urocyon cinereoargenteus	116.86	5.06	1.64	0.52	-0.081	-0.008	3.57	4.20	4.02	6.86

	mean distance		Slope	CV			Log masses			Log range size
Ursus arctos	345.75	33.81	1.42	0.90	-10.173	-0.270	5.51	7.49	8.71	7.01
Viverricula indica	97.31	4.37	1.62	0.69	-1.372	-0.217	3.34	4.67	4.17	6.86
Vulpes vulpes (N)	137.61	7.75	1.73	0.73	-0.380	-0.036	3.74	4.78	5.16	7.15
Vulpes vulpes (P)	135.90	9.53	1.82	0.60	0.803	0.051	3.74	6.39	6.62	7.62

mean distance is the mean of the log transformed distances from range edge (km) for all specimens.

Slope is the slope of the distance from range edge/CBL relationship (from table 1 and Appendix 4A)

Log masses (in grams) are from Meiri et al. (2005e)

CV is the coefficient of variation in CBL

Log range size (km^2) is from the range maps in Appendix 1.