

Ecography

ECOG-00836

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Supplementary material

Appendix 1

Table A1. List of climatic variables used for both demographic parameters estimations and species distribution models. Climatic variables were selected as the most important for each study area.

	Number of species	Climatic variables (average over 1960-1990)
France	37	Annual average of minimum temperature, yearly sum of growing degree days, water budget of the year, altitude
Québec	24	Annual sum of precipitation, annual average of minimum temperature, annual proportion of radiation
Switzerland	31	Annual sum of precipitation between April to September precipitation average, May to June sum growing degree days, annual proportion of radiation
Western US	16	Annual sum of precipitation, mean annual temperature, annual proportion of radiation

Table A2. From the left to the right, list of species used in the paper, together with the study area they belonged to, the predictive accuracy of the SDM (value of the Area Under the ROC curve, R^2 of the selected demographic model, which demographic model was selected (*linear* [Equ 3], or multiplicative *-Inter-* [Equ 4]), the % of positive density-dependence (% of positive DD), shade tolerance value (Niinemets and Valladares 2006) and their light-competition class; from left to the right.

Species name	Study area	AUC	R^2	Demo	% positive DD	Shade tolerance	Shade tolerance group
Abies alba	France	0.9	0.16	Inter	0	4.6	Shade tolerant
Acer campestre	France	0.71	0.05	Linear	0	3.18	Moderate shade tolerance
Acer monspessulanum	France	0.86	0.06	Linear	0	4.25	Shade tolerant
Acer opalus	France	0.89	0.05	Linear	0	3.48	Moderate shade tolerance
Acer pseudoplatanus	France	0.83	0.11	Linear	0	3.73	Shade tolerant
Alnus glutinosa	France	0.78	0.07	Linear	0	2.71	Moderate shade tolerance
Arbutus unedo	France	0.98	0.09	Linear	0	2.66	Moderate shade tolerance
Betula pendula	France	0.74	0.07	Linear	0	2.03	Shade intolerant
Carpinus betulus	France	0.85	0.1	Linear	0	3.97	Shade tolerant
Castanea sativa	France	0.78	0.09	Inter	0.6	3.15	Moderate shade tolerance
Corylus avellana	France	0.76	0.05	Linear	0	3.53	Moderate shade tolerance
Fagus sylvatica	France	0.81	0.13	Inter	0	4.56	Shade tolerant
Ilex aquifolium	France	0.8	0.05	Linear	0	3.86	Shade tolerant
Larix decidua	France	0.97	0.11	Linear	0	1.46	Shade intolerant
Picea abies	France	0.9	0.09	Inter	0.7	4.45	Shade tolerant
Pinus halepensis	France	0.98	0.15	Linear	0	1.35	Shade intolerant
Pinus laricio	France	0.8	0.2	Linear	0	2.66	Moderate shade tolerance
Pinus nigra	France	0.84	0.13	Linear	0	2.1	Shade intolerant
Pinus sylvestris	France	0.77	0.04	Linear	0	1.67	Shade intolerant
Pinus uncinata	France	0.99	0.12	Linear	0	1.2	Shade intolerant
Populus tremula	France	0.71	0.06	Linear	0	1.21	Shade intolerant
Pseudotsuga menziesii	France	0.75	0.16	Linear	0	2.78	Moderate shade tolerance
Quercus ilex	France	0.96	0.08	Inter	1.4	3.02	Moderate shade tolerance
Quercus petraea	France	0.77	0.07	Linear	0	2.73	Moderate shade tolerance
Quercus pubescens	France	0.88	0.08	Linear	0	2.31	Shade intolerant
Quercus robur	France	0.75	0.1	Inter	0	2.45	Moderate shade tolerance
Robinia pseudoacacia	France	0.76	0.06	Linear	0	1.72	Shade intolerant
Salix caprea	France	0.72	0.1	Linear	0	1.5	Shade intolerant
Salix cinerea	France	0.78	0.14	Linear	0	1.93	Shade intolerant
Sorbus aria	France	0.83	0.04	Linear	0	1.93	Shade intolerant
Sorbus aucuparia	France	0.89	0.04	Linear	0	2.73	Moderate shade tolerance
Sorbus torminalis	France	0.75	0.11	Linear	0	3.38	Moderate shade tolerance
Tilia cordata	France	0.77	0.1	Linear	0	4.18	Shade tolerant
Tilia platyphyllos	France	0.79	0.14	Inter	11.8	4	Shade tolerant
Ulmus minor	France	0.79	0.14	Inter	8.9	1.2	Shade intolerant
Acer pensylvanicum	Québec	0.81	0.11	Inter	10.3	3.56	Moderate shade tolerance
Acer rubrum	Québec	0.83	0.01	Inter	20.7	3.44	Moderate shade tolerance
Acer saccharum	Québec	0.88	0.01	Inter	2	3.6	Moderate shade tolerance
Acer spicatum	Québec	0.86	0.75	Inter	32.2	3.31	Moderate shade tolerance
Betula alleghaniensis	Québec	0.82	0.08	Inter	2.1	3.17	Moderate shade tolerance
Betula populifolia	Québec	0.96	0.41	Inter	0.9	1.5	Shade intolerant
Fagus grandifolia	Québec	0.89	0.02	Inter	0	4.75	Shade tolerant
Fraxinus americana	Québec	0.96	0.42	Inter	7.8	2.46	Moderate shade tolerance
Fraxinus nigra	Québec	0.83	0.03	Linear	0	2.96	Moderate shade tolerance
Ostrya virginiana	Québec	0.94	0.31	Inter	7.5	4.58	Shade tolerant
Picea mariana	Québec	0.83	0	Inter	52.5	4.08	Shade tolerant
Picea rubens	Québec	0.88	0	Inter	54.9	4.39	Shade tolerant

<i>Pinus banksiana</i>	Québec	0.84	0	Inter	16	1	Shade intolerant
<i>Pinus resinosa</i>	Québec	0.89	0.09	Inter	8.3	1.89	Shade intolerant
<i>Pinus strobus</i>	Québec	0.87	0.01	Inter	0	3.21	Moderate shade tolerance
<i>Populus balsamifera_</i>	Québec	0.79	0.01	Linear	0	1.27	Shade intolerant
<i>Populus grandidentata</i>	Québec	0.88	0.04	Inter	16.8	1.21	Shade intolerant
<i>Prunus serotina</i>	Québec	0.96	0.46	Inter	20.4	2.34	Moderate shade tolerance
<i>Quercus rubra</i>	Québec	0.95	0.01	Inter	2.9	2.75	Moderate shade tolerance
<i>Sorbus americana</i>	Québec	0.87	0.13	Inter	24.7	2.59	Moderate shade tolerance
<i>Thuja occidentalis</i>	Québec	0.79	0.01	Inter	1.1	3.45	Moderate shade tolerance
<i>Tilia americana</i>	Québec	0.94	0.11	Inter	2.2	3.98	Shade tolerant
<i>Tsuga canadensis</i>	Québec	0.93	0.03	Inter	2.1	4.83	Shade tolerant
<i>Ulmus americana</i>	Québec	0.93	0.14	Inter	42.5	3.14	Moderate shade tolerance
<i>Abies alba_</i>	Switzerland	0.77	0.01	Linear	0	4.6	Shade tolerant
<i>Acer campestre</i>	Switzerland	0.82	0.82	Inter	7.7	3.18	Moderate shade tolerance
<i>Acer opalus</i>	Switzerland	0.87	0.81	Inter	29.6	3.48	Moderate shade tolerance
<i>Acer platanoides</i>	Switzerland	0.73	0.34	Linear	0	4.2	Shade tolerant
<i>Alnus glutinosa</i>	Switzerland	0.8	0.31	Linear	0	2.71	Moderate shade tolerance
<i>Betula pendula</i>	Switzerland	0.83	0.17	Inter	18.8	2.03	Shade intolerant
<i>Carpinus betulus</i>	Switzerland	0.91	0.13	Linear	0	3.97	Shade tolerant
<i>Castanea sativa</i>	Switzerland	0.97	0.05	Inter	12.7	3.15	Moderate shade tolerance
<i>Corylus avellana</i>	Switzerland	0.82	1	Inter	33.3	3.53	Moderate shade tolerance
<i>Fagus sylvatica</i>	Switzerland	0.79	0.01	Inter	0.3	4.56	Shade tolerant
<i>Fraxinus excelsior</i>	Switzerland	0.77	0.19	Inter	0	2.66	Moderate shade tolerance
<i>Juglans regia</i>	Switzerland	0.91	1	Inter	15.4	2.27	Shade intolerant
<i>Larix decidua</i>	Switzerland	0.81	0.05	Inter	5.9	1.46	Shade intolerant
<i>Ostrya carpinifolia</i>	Switzerland	0.99	0.47	Linear	0	3.94	Shade tolerant
<i>Picea abies</i>	Switzerland	0.74	0	Inter	0	4.45	Shade tolerant
<i>Pinus cembra</i>	Switzerland	0.98	0.01	Linear	0	2.87	Moderate shade tolerance
<i>Pinus mugo_arborea</i>	Switzerland	0.88	0.34	Inter	10.5	2	Shade intolerant
<i>Pinus mugo_uncinata</i>	Switzerland	0.92	0.86	Inter	44.4	1.2	Shade intolerant
<i>Pinus strobus</i>	Switzerland	0.9	0.47	Linear	0	3.21	Moderate shade tolerance
<i>Pinus sylvestris</i>	Switzerland	0.8	0	Linear	0	1.67	Shade intolerant
<i>Populus tremula</i>	Switzerland	0.74	0.47	Inter	20	1.21	Shade intolerant
<i>Prunus avium</i>	Switzerland	0.79	0.74	Inter	9.9	3.33	Moderate shade tolerance
<i>Pseudotsuga menziesii</i>	Switzerland	0.95	0.11	Inter	23.1	2.78	Moderate shade tolerance
<i>Quercus petraea</i>	Switzerland	0.86	0.1	Linear	0	2.73	Moderate shade tolerance
<i>Quercus pubescens</i>	Switzerland	0.92	0.54	Linear	0	2.31	Shade intolerant
<i>Quercus robur</i>	Switzerland	0.88	0.06	Inter	13.3	2.45	Moderate shade tolerance
<i>Robinia pseudoacacia</i>	Switzerland	0.94	0.61	Inter	35	1.72	Shade intolerant
<i>Sorbus aria</i>	Switzerland	0.7	0.25	Linear	0	1.93	Shade intolerant
<i>Sorbus aucuparia</i>	Switzerland	0.77	0.97	Inter	9.1	2.73	Moderate shade tolerance
<i>Taxus baccata</i>	Switzerland	0.82	0.61	Linear	0	4.43	Shade tolerant
<i>Tilia cordata</i>	Switzerland	0.84	0.1	Linear	0	4.18	Shade tolerant
<i>Tilia platyphyllos</i>	Switzerland	0.78	0.46	Inter	21.8	4	Shade tolerant
<i>Ulmus glabra</i>	Switzerland	0.74	0.57	Linear	0	3.53	Moderate shade tolerance
<i>Abies concolor</i>	Western US	0.92	0.01	Linear	0	4.33	Shade tolerant
<i>Abies lasiocarpa</i>	Western US	0.96	0.01	Inter	29.5	4.83	Shade tolerant
<i>Acer grandidentatum</i>	Western US	0.97	0.61	Inter	69.6	3	Moderate shade tolerance
<i>Cercocarpus ledifolius</i>	Western US	0.89	0.08	Inter	37.1	1.35	Shade intolerant
<i>Juniperus deppeana_</i>	Western US	0.98	0.07	Linear	0	2	Shade intolerant
<i>Juniperus monosperma</i>	Western US	0.89	0.09	Inter	15.2	2	Shade intolerant
<i>Juniperus osteosperma</i>	Western US	0.91	0.09	Inter	38	1.84	Shade intolerant
<i>Juniperus scopulorum</i>	Western US	0.84	0.28	Linear	0	1.48	Shade intolerant
<i>Picea engelmannii</i>	Western US	0.97	0.02	Inter	39.2	4.53	Shade tolerant
<i>Pinus contorta</i>	Western US	0.96	0.39	Linear	0	1.73	Shade intolerant
<i>Pinus edulis</i>	Western US	0.84	0.02	Inter	7.4	1.44	Shade intolerant
<i>Pinus edulis</i>	Western US	0.96	0.71	Linear	0	1.44	Shade intolerant
<i>Pinus flexilis</i>	Western US	0.92	0.23	Inter	16.7	1.56	Shade intolerant

<i>Pinus monophylla</i>	Western US	0.77	0.41	Linear	0	2.97	Moderate shade tolerance
<i>Pinus ponderosa</i>	Western US	0.85	0.07	Inter	15.9	1.64	Shade intolerant
<i>Populus tremuloides</i>	Western US	0.95	0.11	Inter	54.4	1.21	Shade intolerant
<i>Pseudotsuga menziesii</i>	Western US	0.85	0	Linear	0	2.78	Moderate shade tolerance
<i>Quercus emoryi</i>	Western US	0.97	0.19	Linear	0	3	Moderate shade tolerance
<i>Quercus gambelii</i>	Western US	0.83	0.78	Inter	39.1	2.09	Shade intolerant

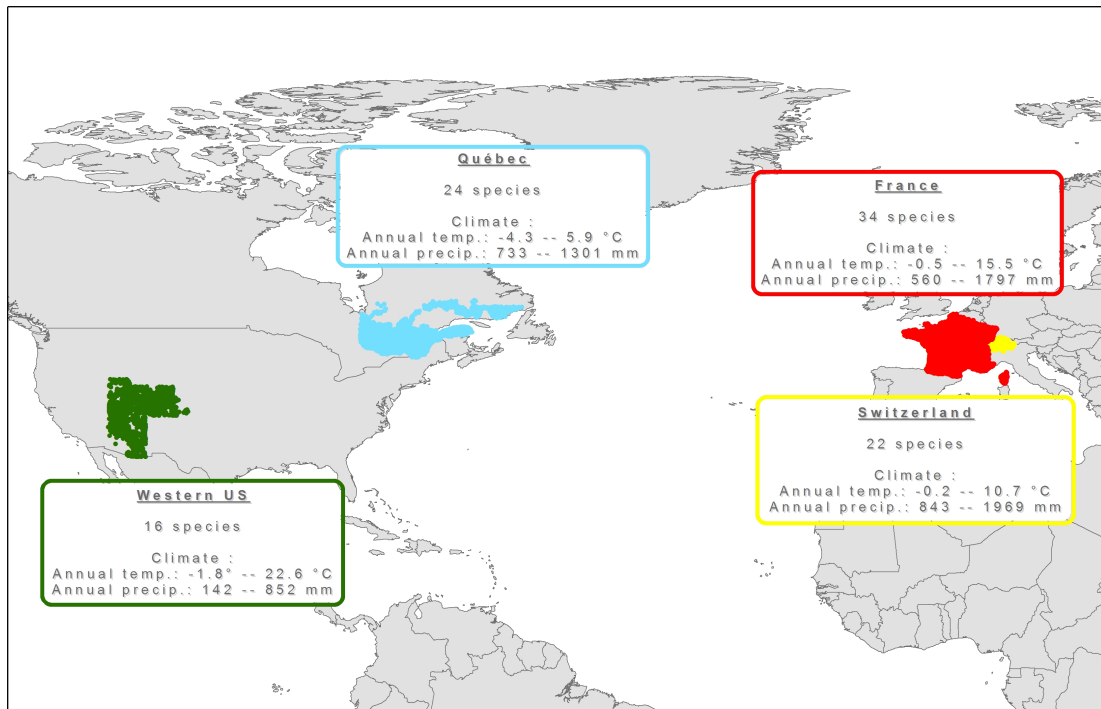


Figure A1 Spatial representation of the four study areas.

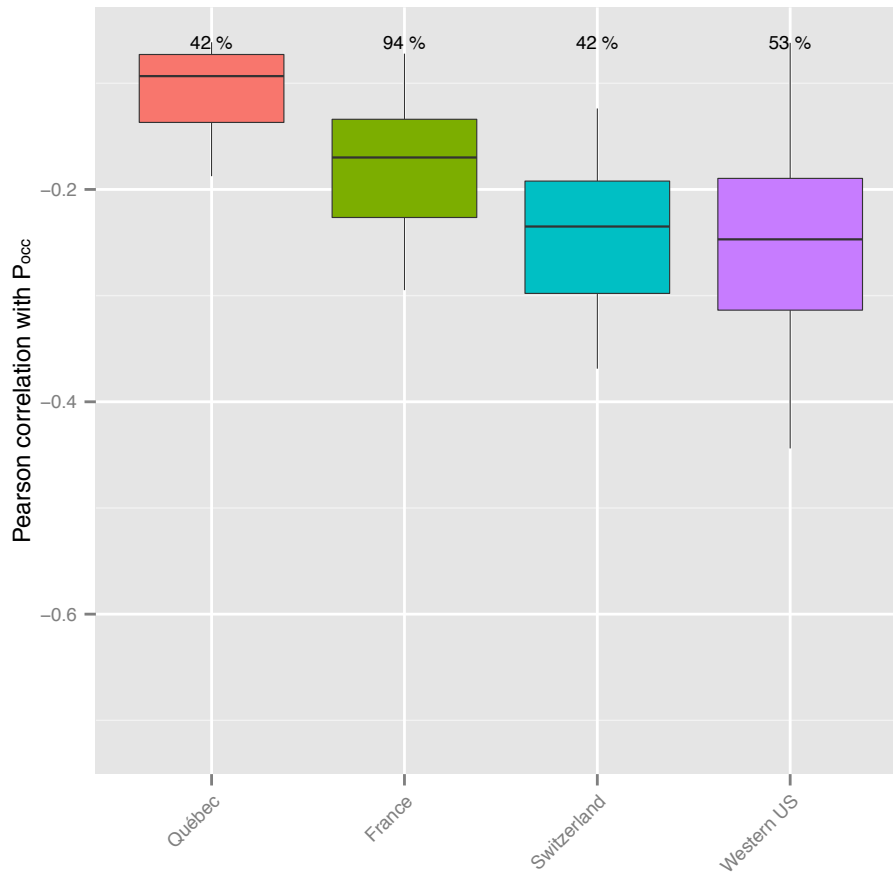


Figure A2 Pearson's correlation between observed proportional change in density (between first and second census) and density at the first census. % on the top of each bar corresponds to % of significant correlation at $p < 0.05$ controlled by false discovery rate

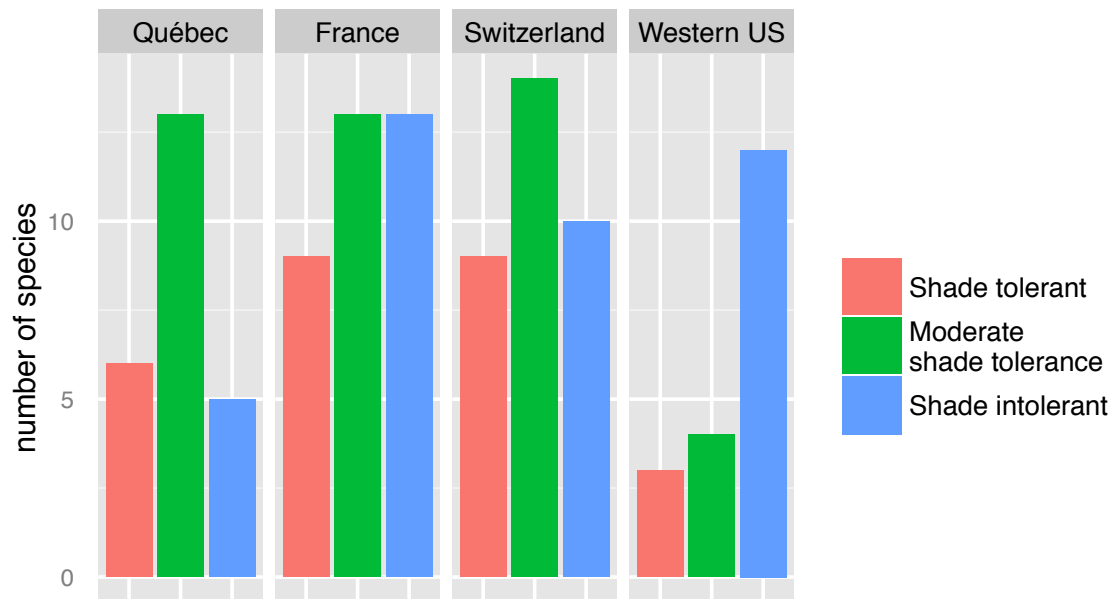


Figure A3: Representation of the species' light-competition strategy within each study area.

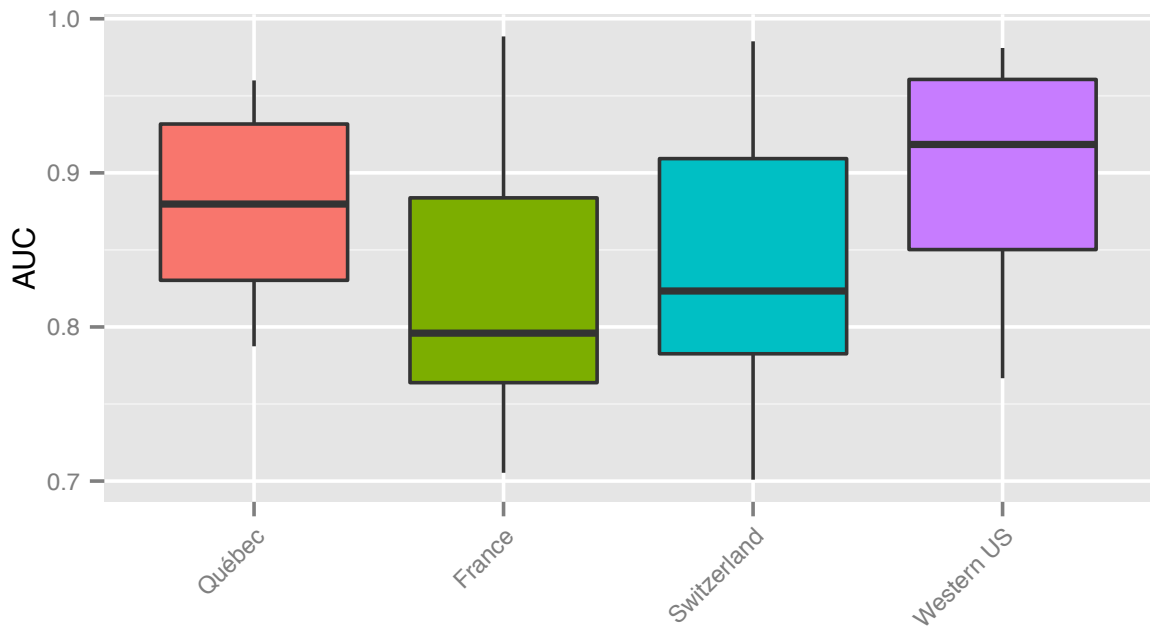


Figure A4 Predictive accuracy of the species distribution models for each study area. Only species kept in the final analyses are shown (AUC>0.7).

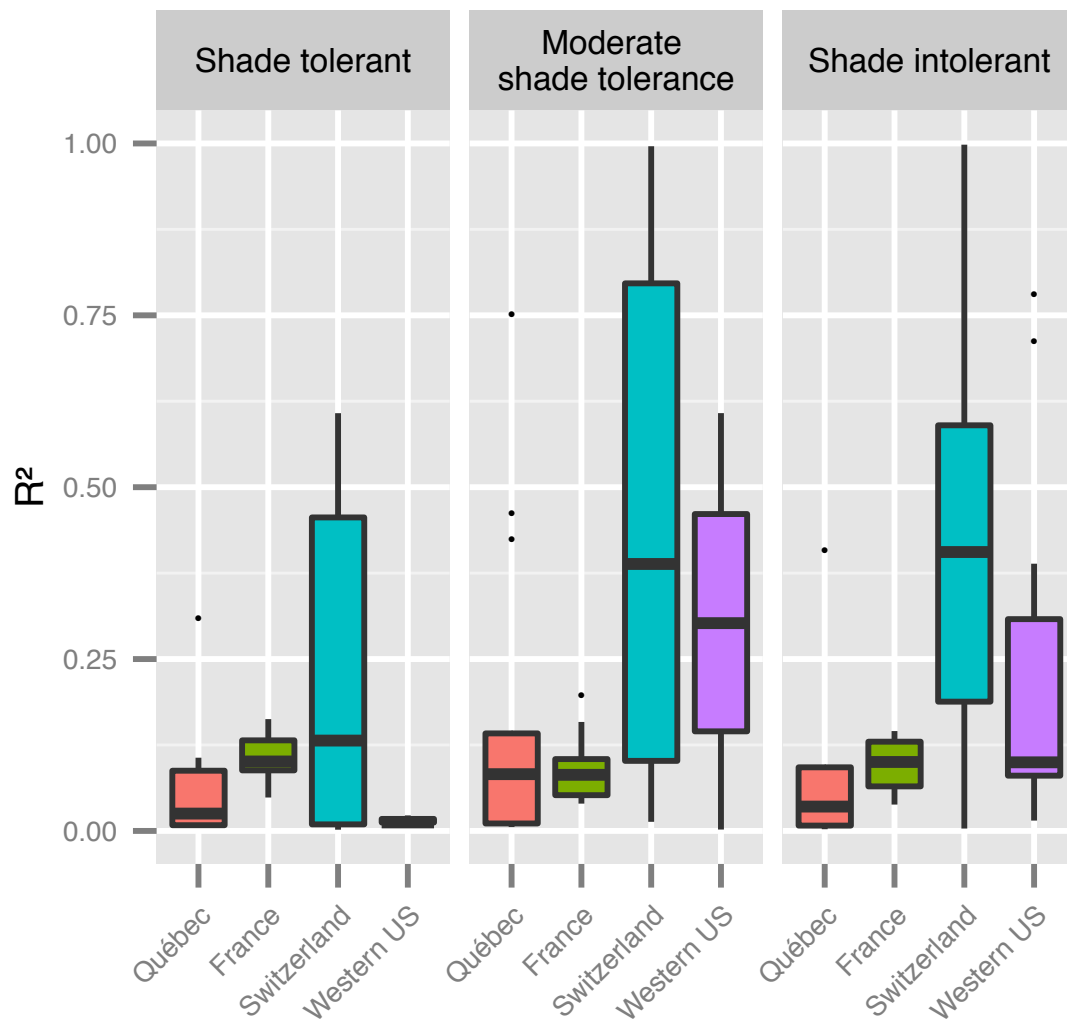


Figure A5 Goodness-of-fit of the demographic models used to model r and K from observed change in density between the two censuses for each species and each dataset. For western US, Québec and Switzerland, since mixed-effect models were used, we extracted conditional R^2 , which corresponds to the goodness-of-fit estimated considering both fixed and random effects, respectively. For France, goodness-of-fit was simply the R^2 of the linear models.

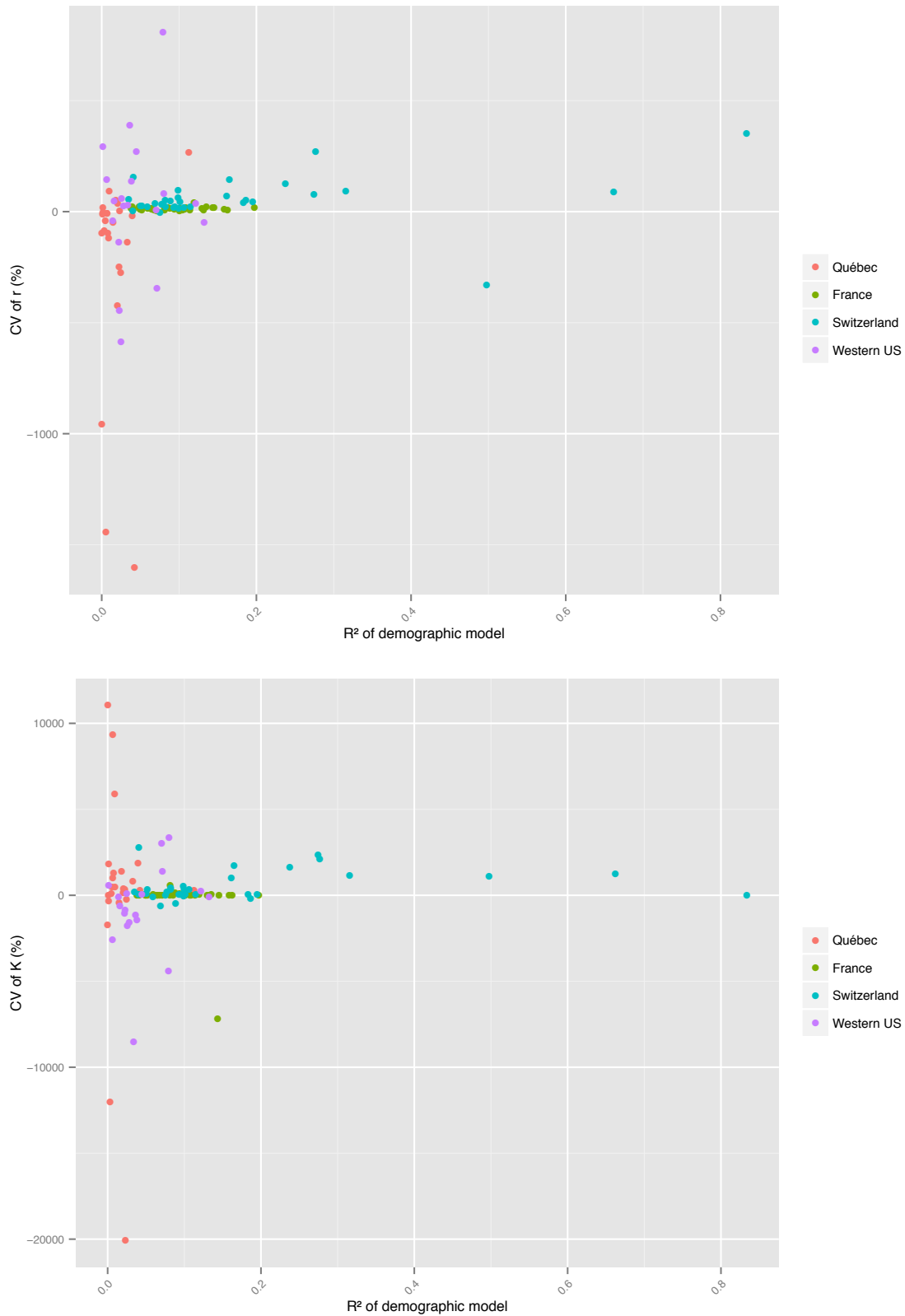


Figure A6. Relationship between the mean coefficient of variation of r and K (from the 1,000 bootstraps) for each species and the goodness-of-fit of the demographic models (R^2). Low R^2 were associated with high uncertainty in the estimation of r and K , especially for Québec and western US.

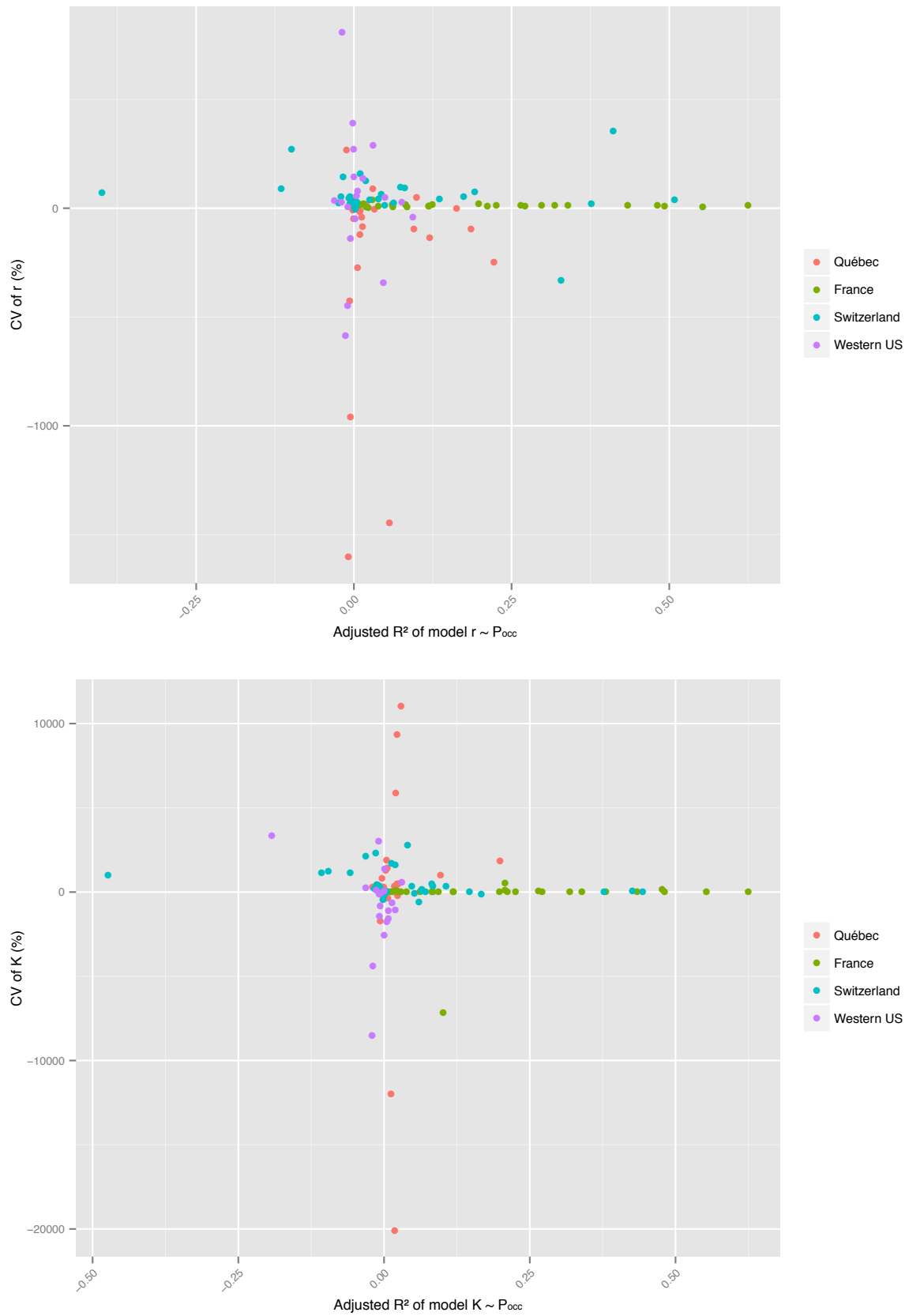


Figure A7. Relationship between the mean coefficient of variation of r and K (from the 1,000 bootstraps) for each species and the goodness-of-fit of the relationships between r and K with

probability of occurrence (P_{occ}). Low association between demographic parameters and P_{occ} were linked with high uncertainty in the estimation of r and K .