Journal of Avian Biology

JAV-02358
Martin, R., Rochefort, J., Mundry, R. and Segelbacher, G. 2020. On the relative importance of ecology and geographic isolation as drivers for differentiation of call types of red crossbill *Loxia curvirostra* in the Palearctic. – J. Avian Biol. 2020: e02358

Supplementary material

10 Supplementary material

10.1 Tables

Table S1: Sources for crossbill recordings

Source	Number of recordings
avocet.zoology.msu.edu/	2
www.club300.de	2
www.ornitho.ch	12
www.ornitho.de	47
www.otus-bayern.de/	16
www.soundcloud.com	2
www.tarsiger.com	5
Waarneming.nl / waarnemingen.bl / observation.org	1373
www.xeno-canto.org	1159
Private donors (see also 10.6)	10014

Table S2: Areas and their dominating conifer species following San-Miguel-Ayanz, et al. (2016) and own observations.

Area	Included regions	Dominating conifer species
North-western France	Haut de France, Île-de-France, Normandie, Bretagne	*Larix spp., Picea abies, P. sitchensis and Pinus nigra, P. pinaster, P. sylvestris, Pseudotsuga menziesii*
Morvan mountains	Morvan	*Larix* spp., *Picea abies, Pinus nigra, P. sylvestris, Pseudotsuga menziesii*
Massive Central	Forez, Parc Naturel Régional du Pilat, Mont Lozère, Monts de La Madeleine	*Abies alba, Larix* spp., *Picea abies, Pinus halepensis, P. mugo, P. nigra, P. pinaster, P. pinea, P. sylvestris, Pseudotsuga menziesii*
French Alps	Vercors, Massiv du Beaufortin, Massif de la Chartreuse, Bugey	*Larix* spp., *Picea abies, Pinus cembra, P. mugo, P. nigra, P. sylvestris, Pseudotsuga menziesii*
Eastern France & Black Forest	Jura, Vosges, Black Forest (Germany)	*Abies alba, Larix* spp., *Picea abies, Pinus mugo, P. sylvestris, Pseudotsuga menziesii*

Table S3: Stability of the model testing the decisions of a given call type in relation to all other call types to feed in a given conifer species in dependency of site and season (see 3.2).

	original	Min.	max.
Intercept	-1.91	-2.69	-1.40
Observation level	0.96	0.82	1.07
Conifer species	1.07	0.00	1.20
Season	1.22	0.95	1.43
Site	0.99	0.00	1.33

Table S4: Number of decisions of birds of different call types to feed in a given tree species at a given site.

	sample size [n]
N02	170
N03	167
N04	1108
N07	578
N08	392
N10	1070
N11	768
North-western France	724
Morvan mountains	1180
Massive Central	1199
French Alps	392
Eastern France & Black Forest	758
Season 06/2013 - 05/2014	313
Season 06/2014 - 05/2015	1375
Season 06/2015 - 05/2016	1767
Season 06/2016 - 05/2017	424
Season 06/2017 - 05/2018	374
Abies alba	51
Larix spp.	1004
Picea abies	2159
Picea sitchensis	206
Pinus nigra	325
Pinus sylvestris	60
Pinus mugo	448

Table S5: *Number of recorded individuals of the different groups of calls classified by the J. Rochefort and R. Martin (the same persons, who clustered calls in Martin et al. (2019)) east of 60°E and maximum geographical and temporal distance between them. The last column lists the countries in which they have been recorded. The conditions set in Martin et al. (2019) (calls uttered by at least five birds with more than 10 km of distance between the recordings) were fulfilled, however calls were only clustered by J. Rochefort and R. Martin, while they were also clustered by five reliability coders in the previous study and excitement calls were only available for E1 and E2.*

Group	Number of individuals with flight and excitement calls recorded	Number of individuals with flight or excitement calls recorded	Maximal distance between the recordings [km]	Maximal period of time between the recordings [days]	Countries with individuals recorded (ISO 3166 ALPHA-2)
E1	7	163	2,930	2,612	CN, KG, KZ, RU
E2	1	49	131	1,739	BT, IN
E3	-	23	1,914	2,522	JP, RU
E4	-	5	2,972	526	CN, MN, JP

Table S6: Categories of fructification used by the ICP (International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests. www.icp-forests.net)

Category (fructification index)	Description
0 = absent	fructification is absent or inconsiderable. Even reasonably lengthy observation of the crown with binoculars yielded no signs of fruiting
1 = scarce	sporadic occurrence of fruiting, not noticeable at first sight. It must be looked for on purpose with binoculars
2 = common	fruiting is clearly visible, can be observed with the naked eye. The appearance of the conifer is influenced but not dominated by fructification
3 = abundant	fruiting dominates the appearance of the conifer, immediately meets the eye, determines the conifers appearance

Table S7: Stability of the model in 3.5 of a given call type in relation to all recorded Red Crossbills in the invasion area in dependency of fructification in the core breeding area. This model included just a mean fructification index.

	original	min.	max.
Intercept (N1)	-2.34	-2.65	-2.10
Mean fructification index	-3.63	-5.52	-2.58
Call type N7	0.59	0.46	1.25
Call type N11	1.14	0.69	1.68
Season	0.67	0.46	0.75

Table S8: *Stability of the model in 3.5 of a given call type in relation to all recorded Red Crossbills in the invasion area in dependency of fructification in the core breeding area. This model included an interaction between the fructification of Picea abies and Larix decidua*

	original	min.	max.
Intercept (N1)	-2.52	-2.68	-2.44
Mean fructification *Larix* spp.	-1.96	-2.23	-1.40
Mean fructification *Picea abies*	-0.76	-0.83	-0.30
Call type N7	1.26	1.14	1.47
Call type N11	1.66	1.51	2.08
Interaction mean fructification *Larix* spp. and *Picea abies*	-3.25	-4.06	-2.76
Season	0.00	0.00	0.00

Table S9: Sources of fructification data

Contact Person	Country	Period
Vladislav Apuhtin, Estonian Environment Information Centre	Estonia	2010-2017
Anton Burkart, Eidg. Forschungsanstalt WSL	Switzerland	2010-2017
Petra-Elena Dühnelt, Thünen-Institute	Germany	2010-2017
Tatu Hokkanen, Natural Resources Institute Finland (Luke)	Finland	2010-2017
David Jardine	Great Britain	2010
Wladyslaw Kantorowicz	Poland	2010-2017
Till Kirchner, ICP Forests	Belgium, Bulgaria, Denmark, Germany, Estonia, Finland, Italy, Lithuania, Netherlands, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey	2010-2014
Ulfstand Wennström, Skogforsk - Forestry Research Institute of Sweden	Sweden	2010-2017
Dr. András Koltay, Forest Research Institute	Hungary	2012-2016
Dagmar Bednárová, National Forest Centre - Forest Research Istitute Zvolen	Slovakia	2012-2017

10.2 Call types in the eastern Palearctic region

We found four potential call types which are not included in Martin et al. (2019) (Figure S25 and

05). All four call types occurred only in the eastern Palearctic region (for discussion about further call types in the Palearctic region

06 see 10.4).

10.3 Figures

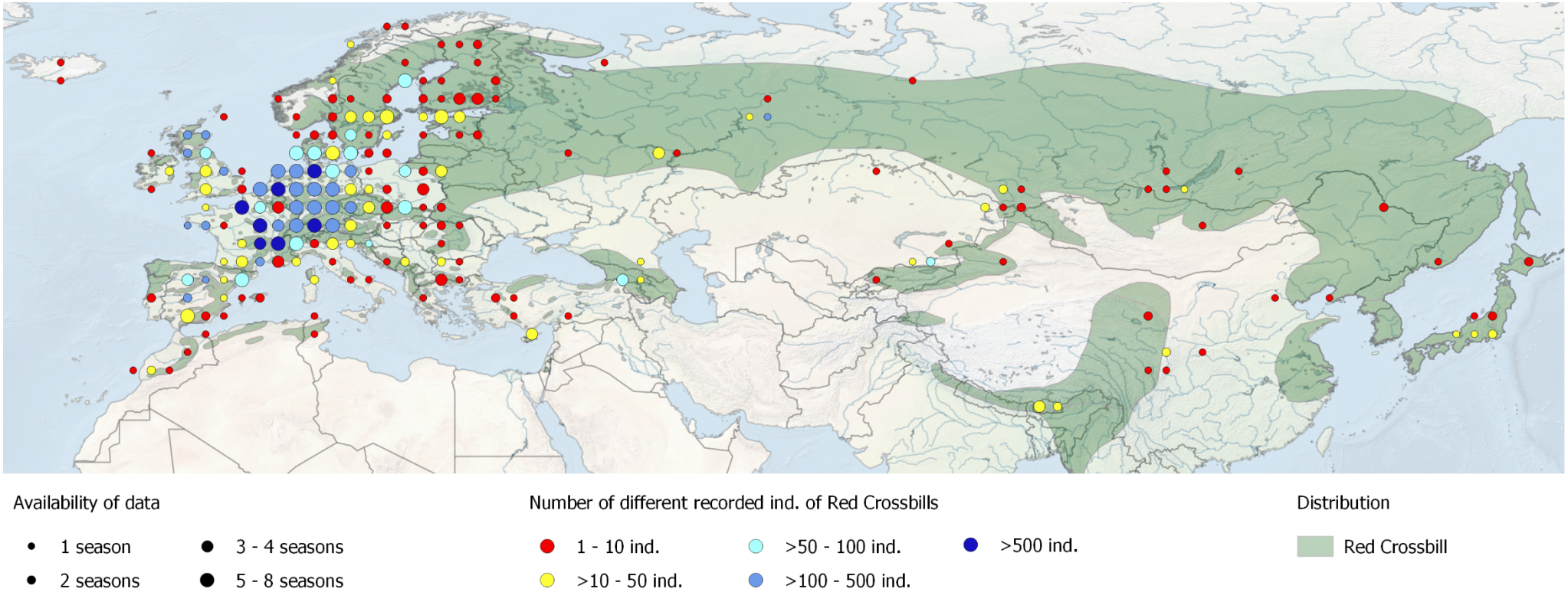

Figure S1: *Distribution of the recordings of Red Crossbill (Loxia curvirostra), used for the analysis in 3.4. Distribution data are from BirdLife International and the Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

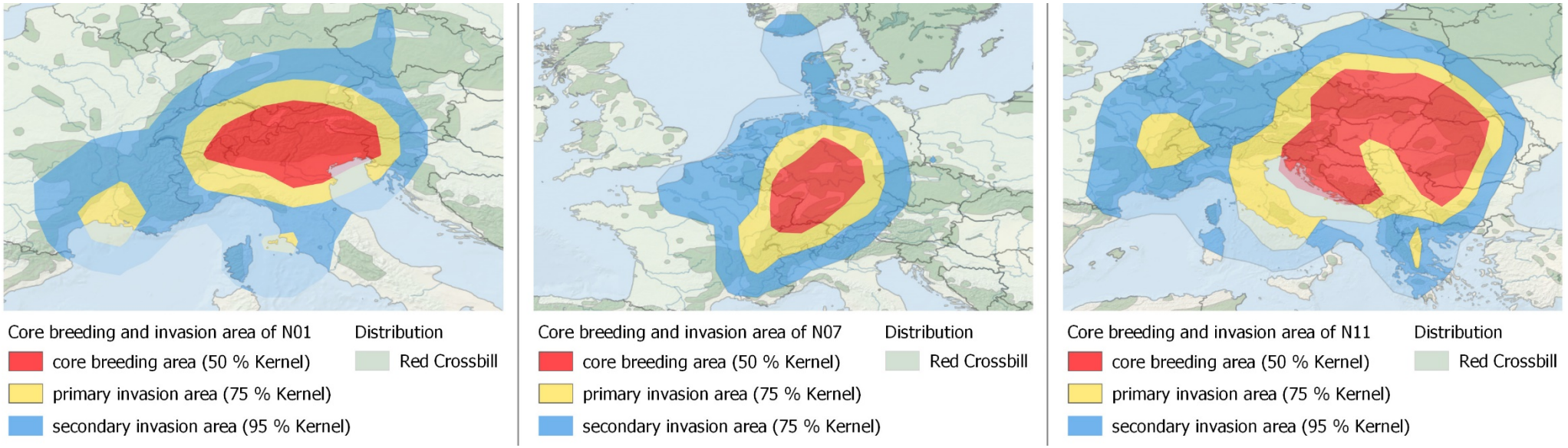

Figure S2: *Core breeding area and invasion area of N1, N7 and N11, the three call types used for the analysis in 3.5. For the analysis, we used fructification data from the 50% Kernel, and compared it with the occurrence data in the area between the 95 % Kernel and 75 % Kernel. For the figure, areas, which lie in the sea where softened. Distribution data are from BirdLife International and the Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

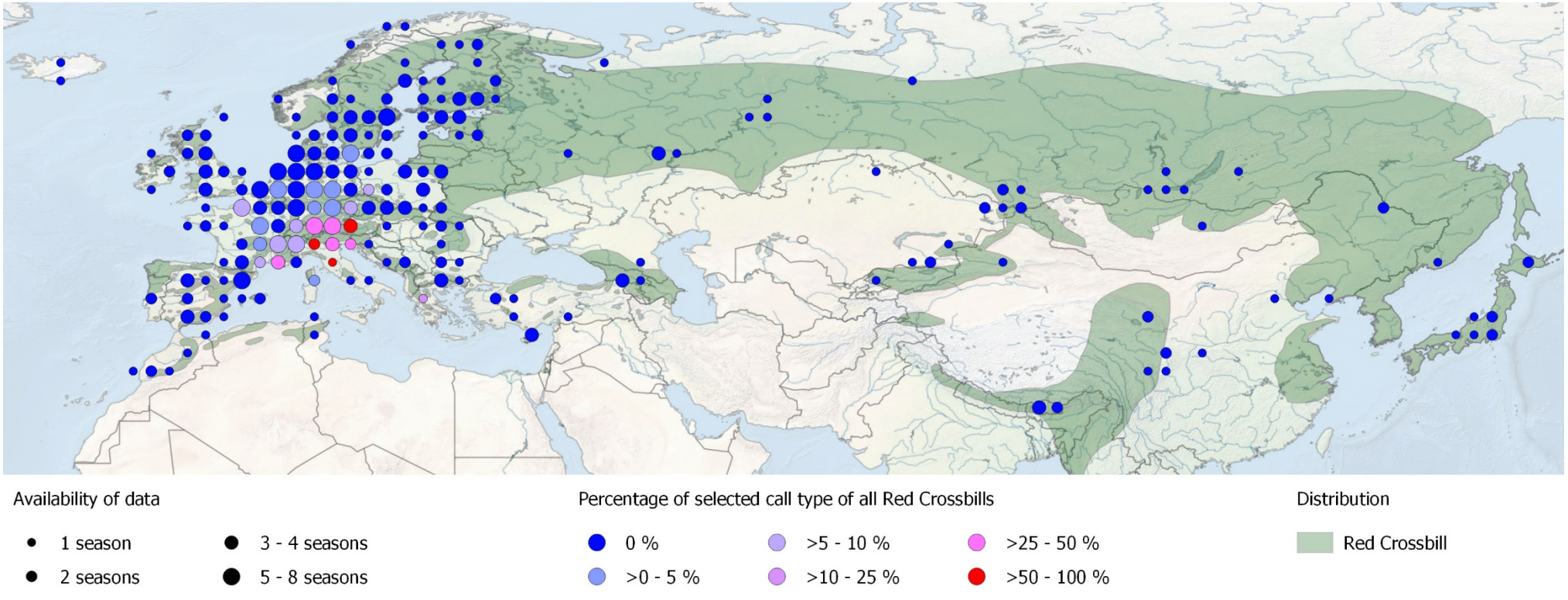

Figure S3: *Proportion of call type N1 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

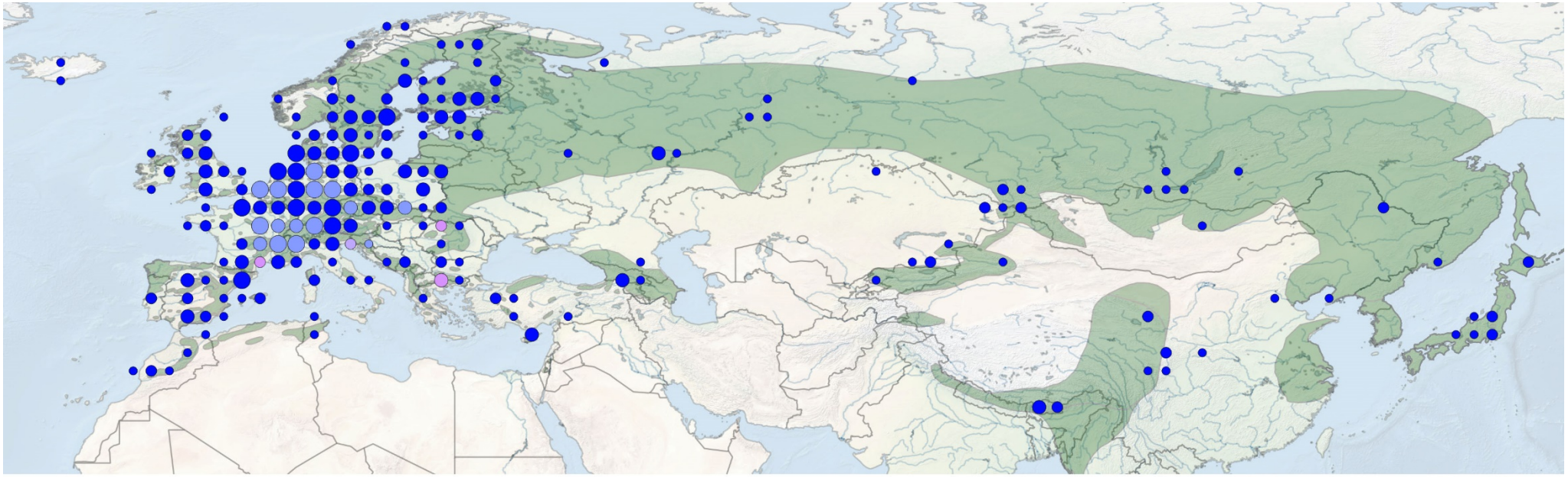

Figure S4: *Proportion of call type N2 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

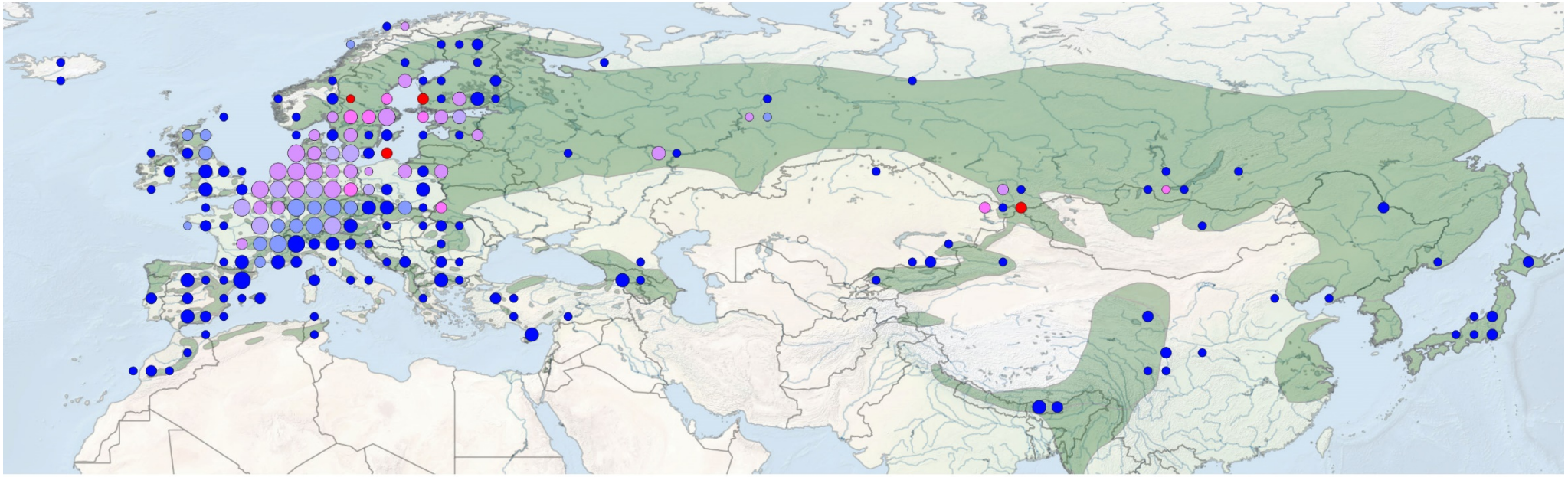

Figure S5: *Proportion of call type N3 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

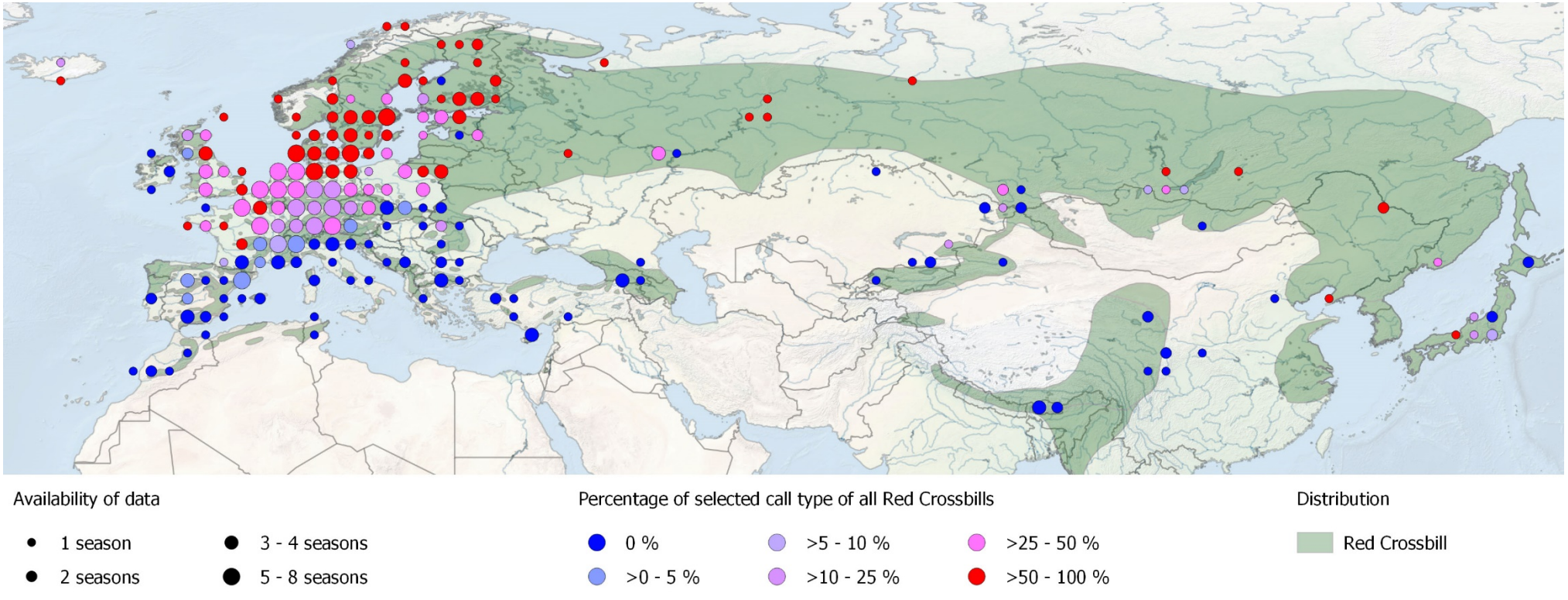

Figure S6: *Proportion of call type N4 within all recorded crossbills Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

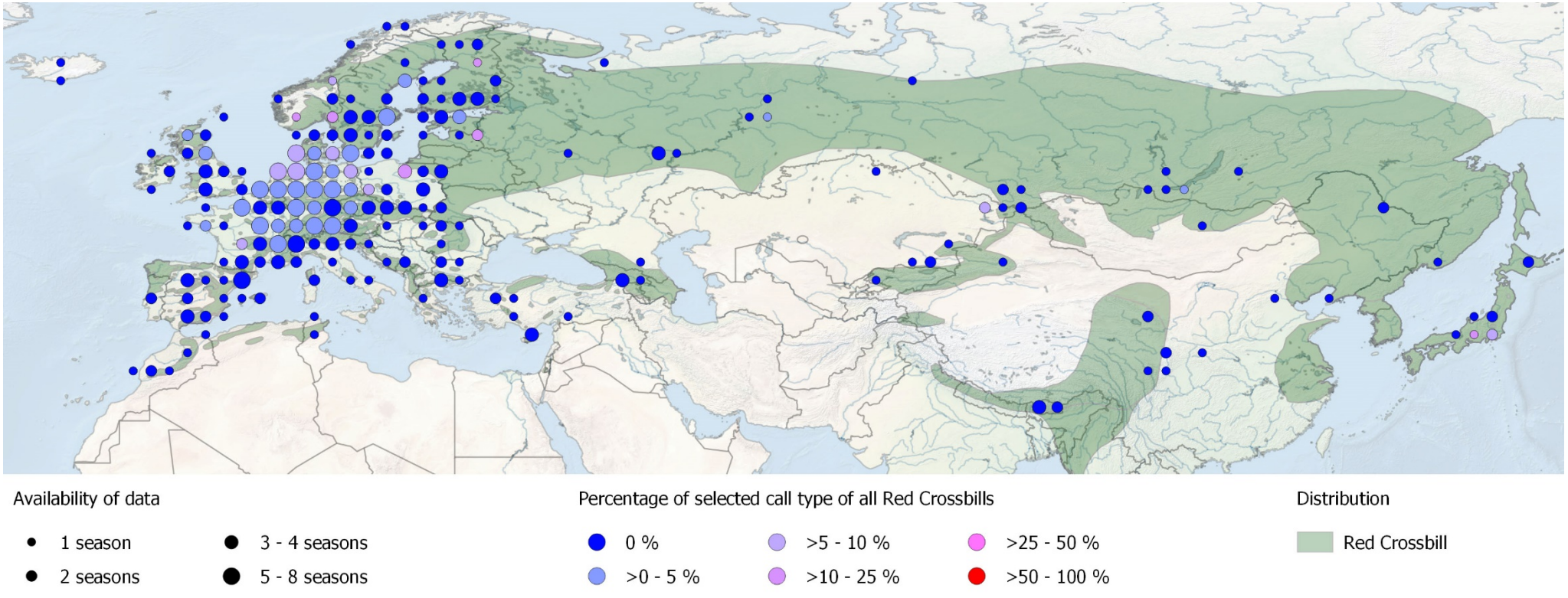

Figure S7: *Proportion of call type N5 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

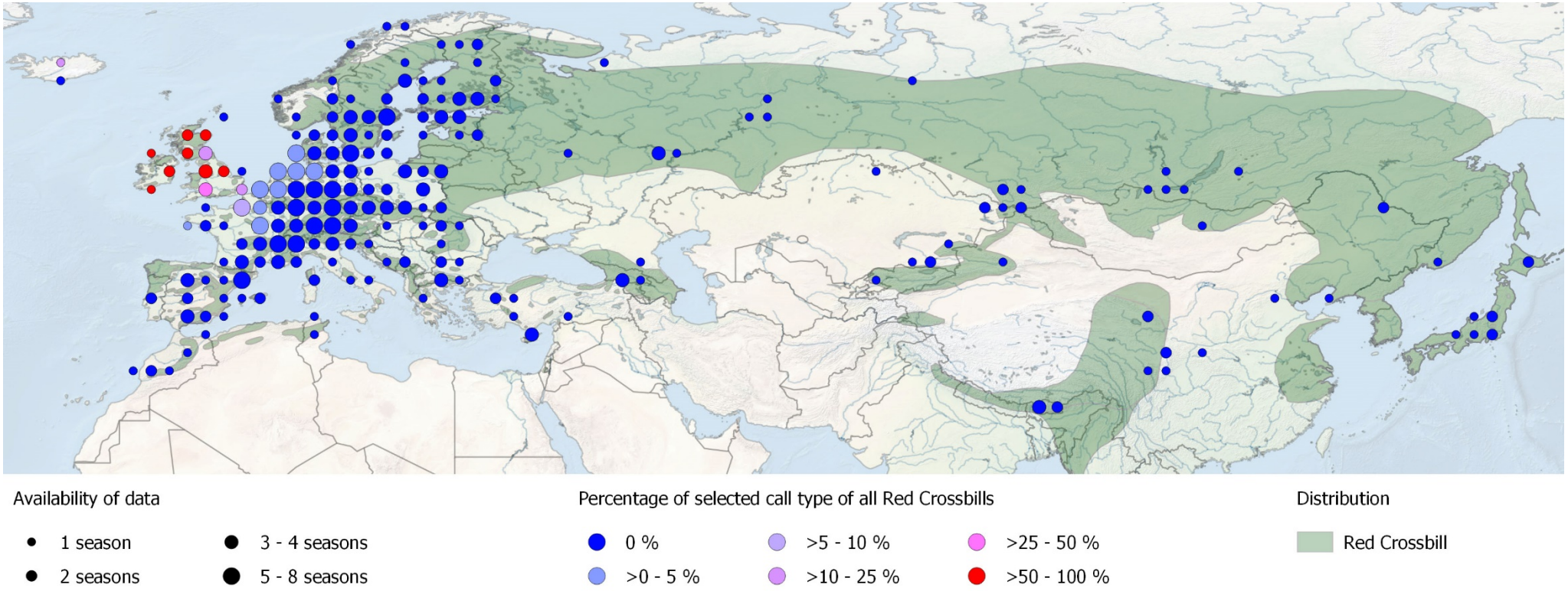

Figure S8: *Proportion of call type N6 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

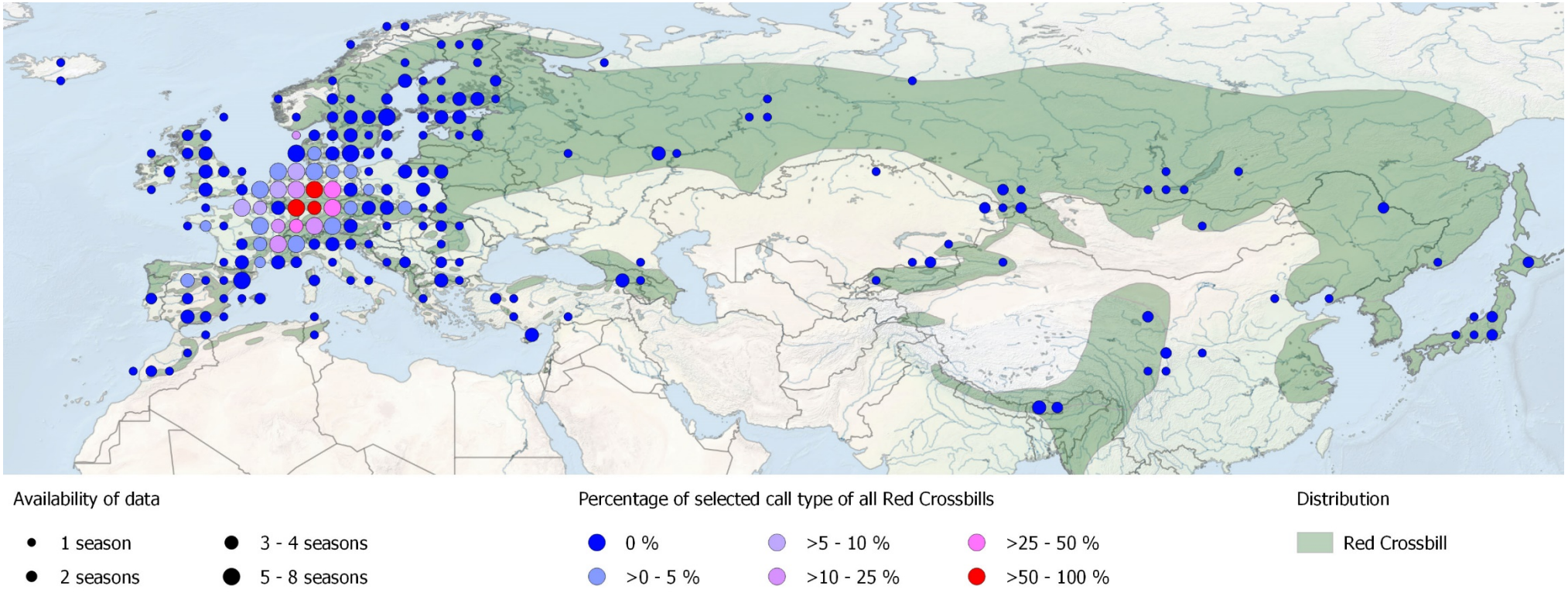

Figure S9: *Proportion of call type N7 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

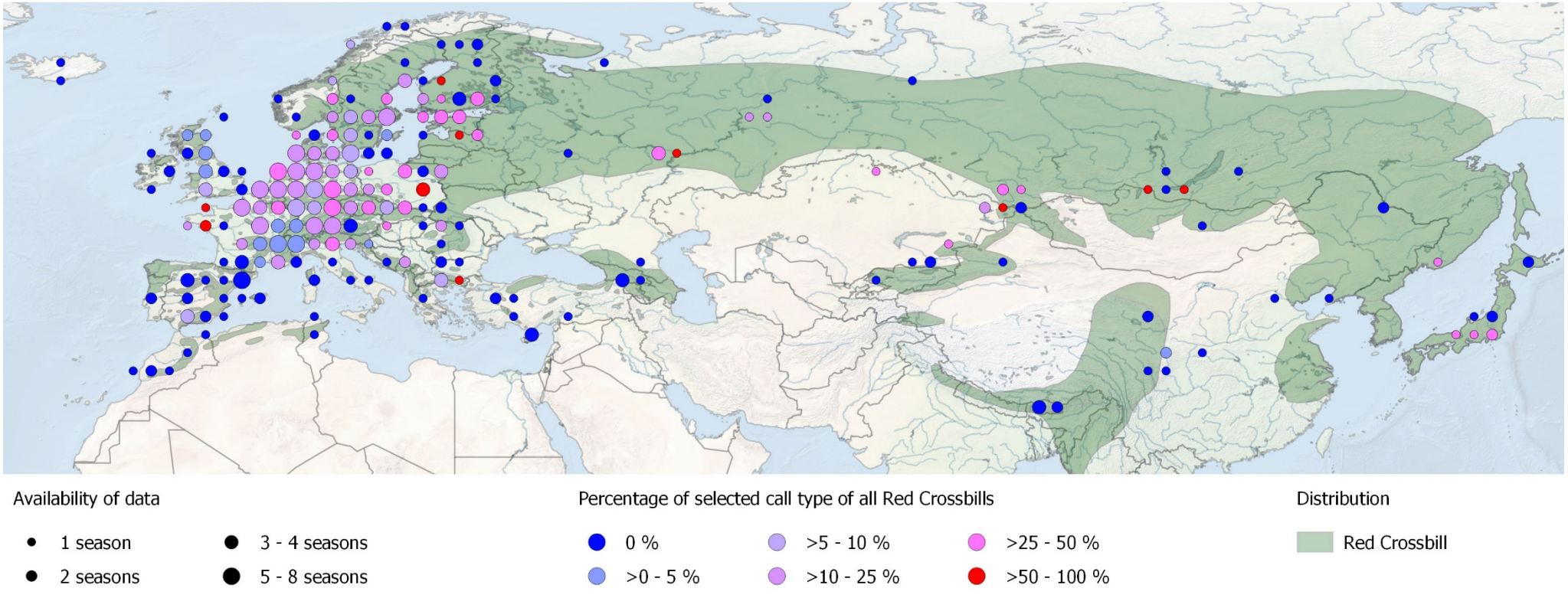

Figure S10: *Proportion of call type N8 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

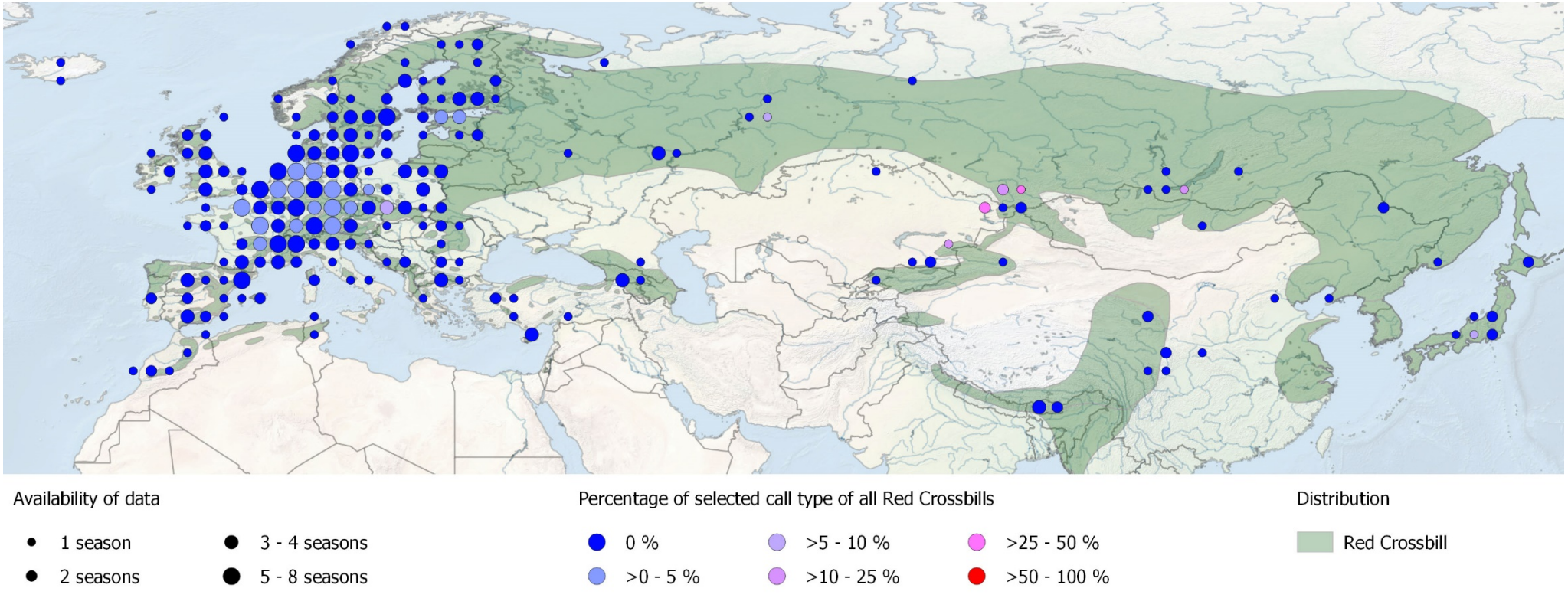

Figure S11: *Proportion of call type N9 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

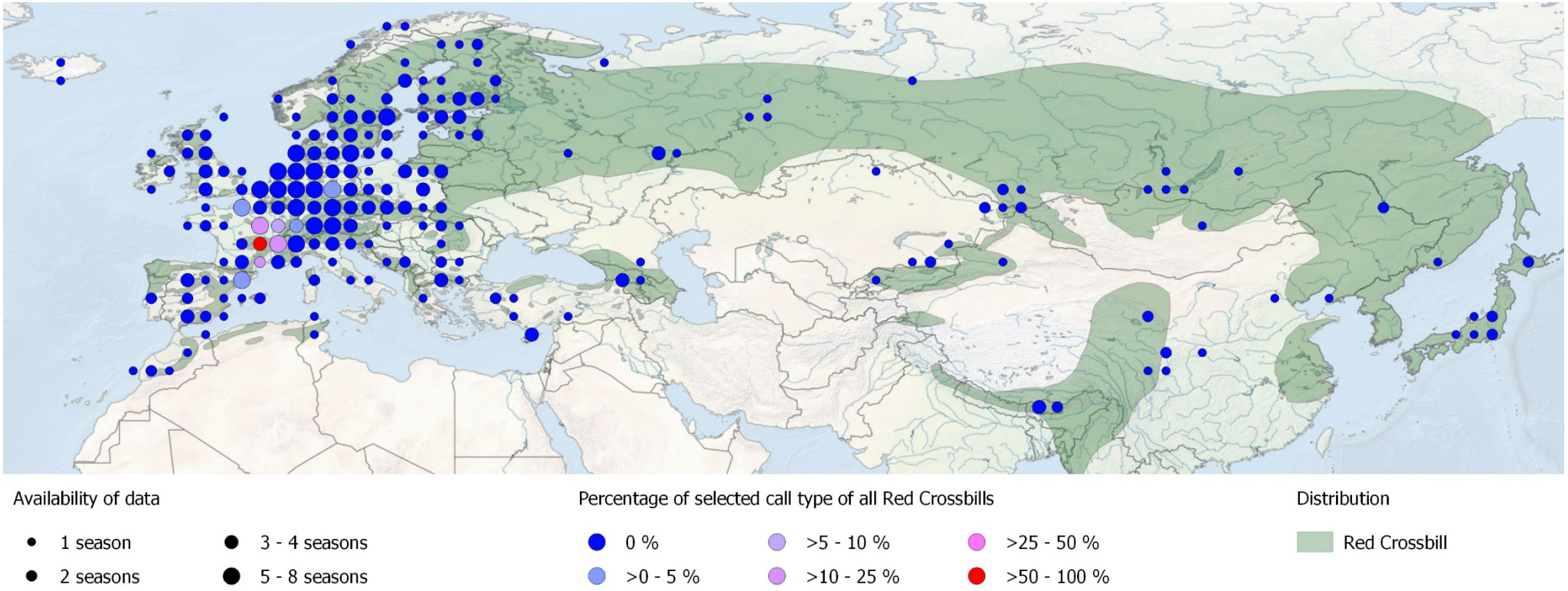

Figure S12: *Proportion of call type N10 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

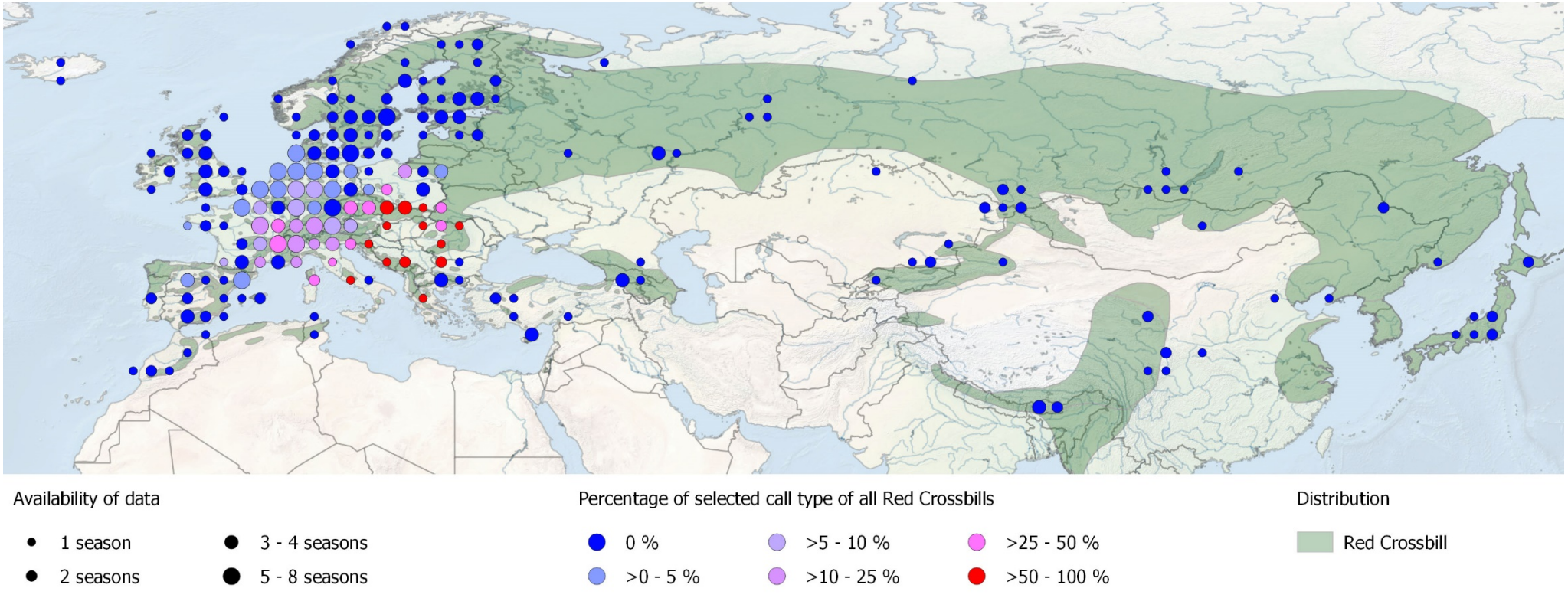

Figure S13: *Proportion of call type N11 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

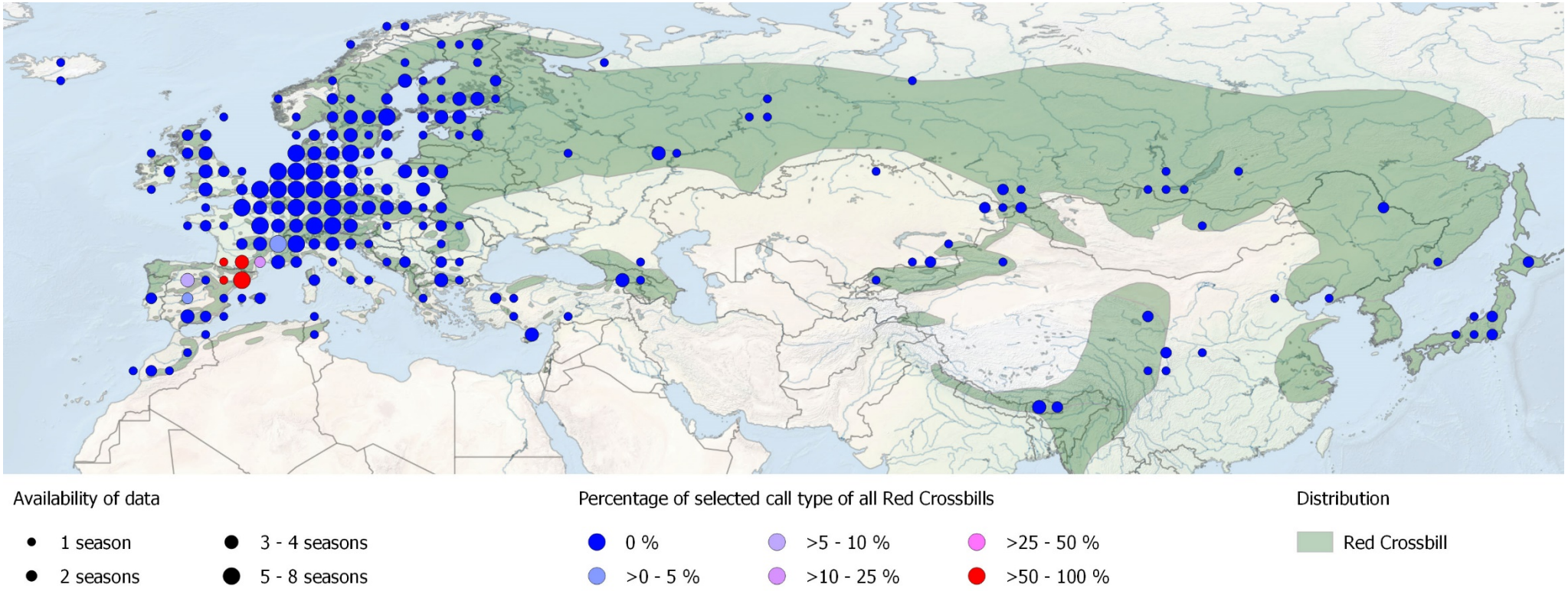

Figure S14: *Proportion of call type N12 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

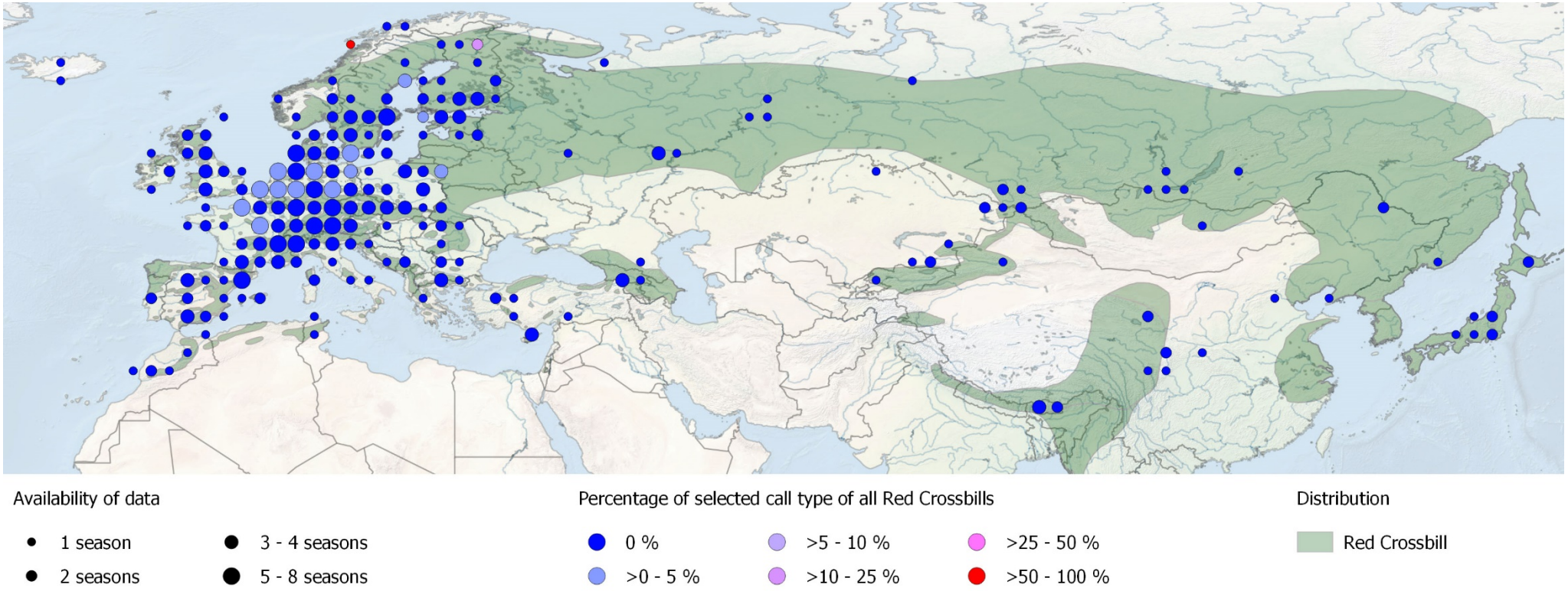

Figure S15: *Proportion of call type N13 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

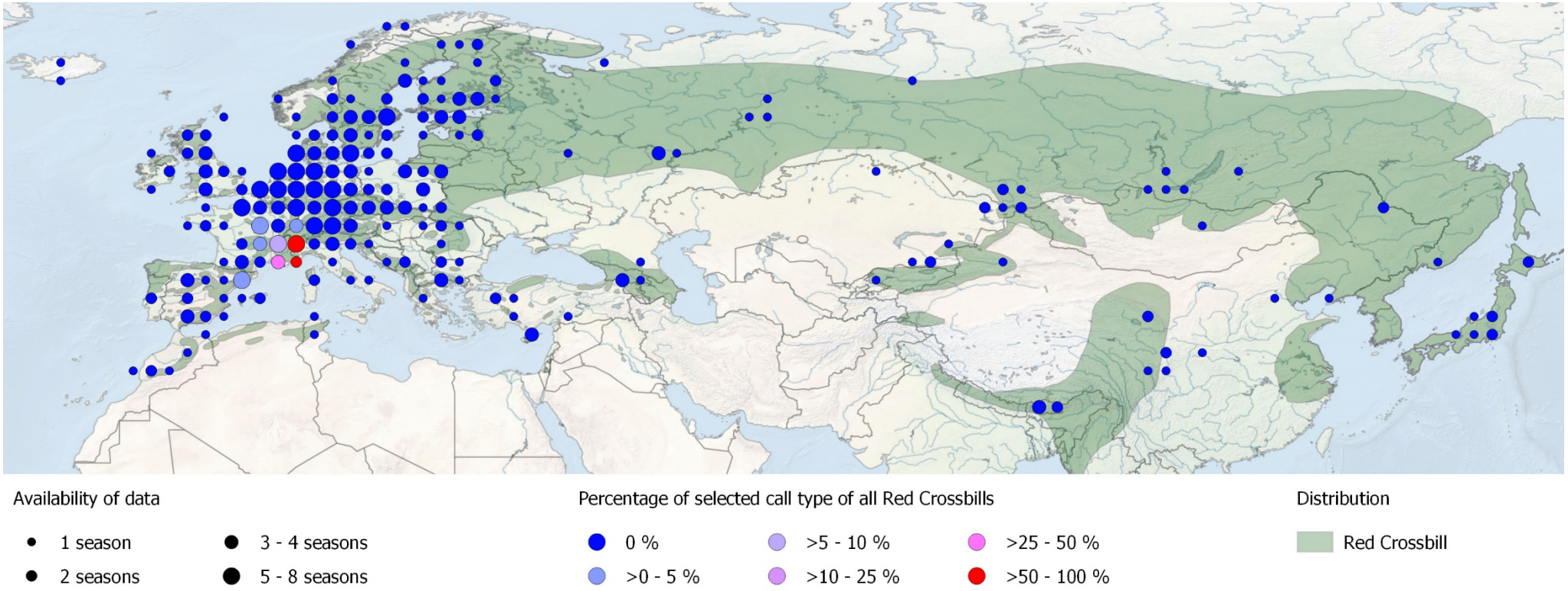

Figure S16: *Proportion of call type N14 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

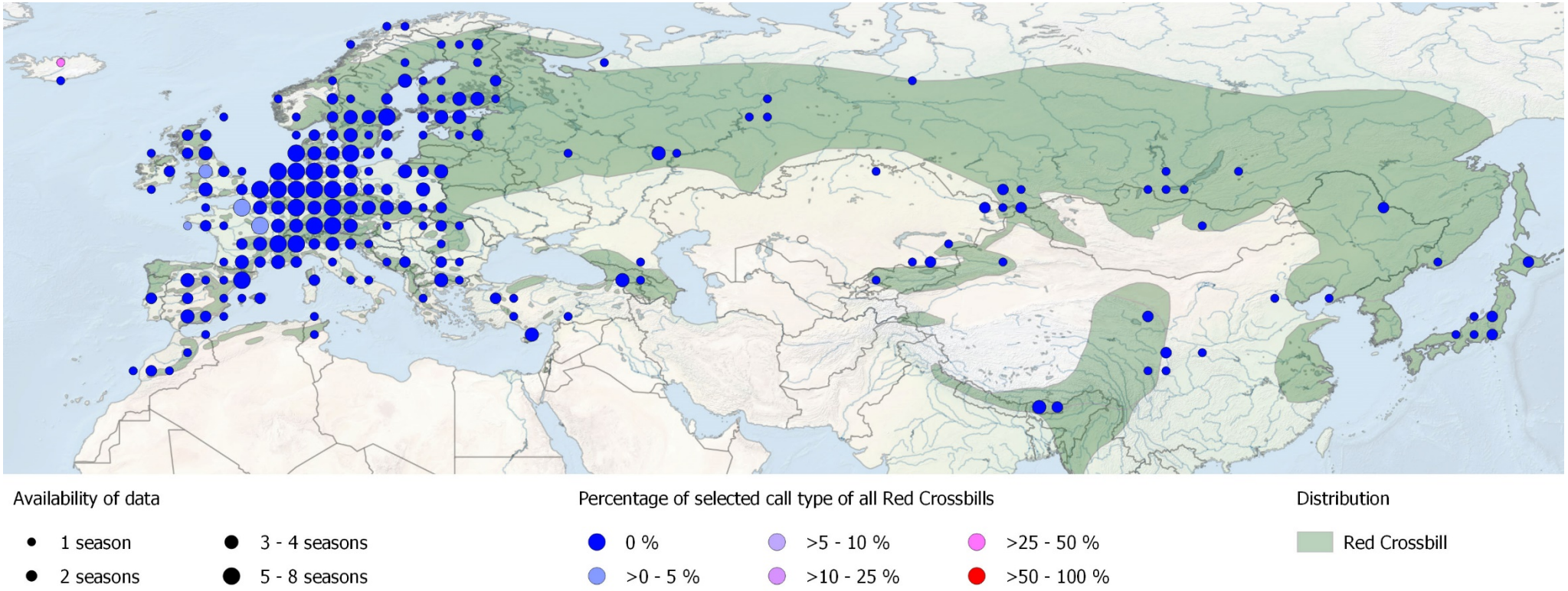

Figure S17: *Proportion of call type N15 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

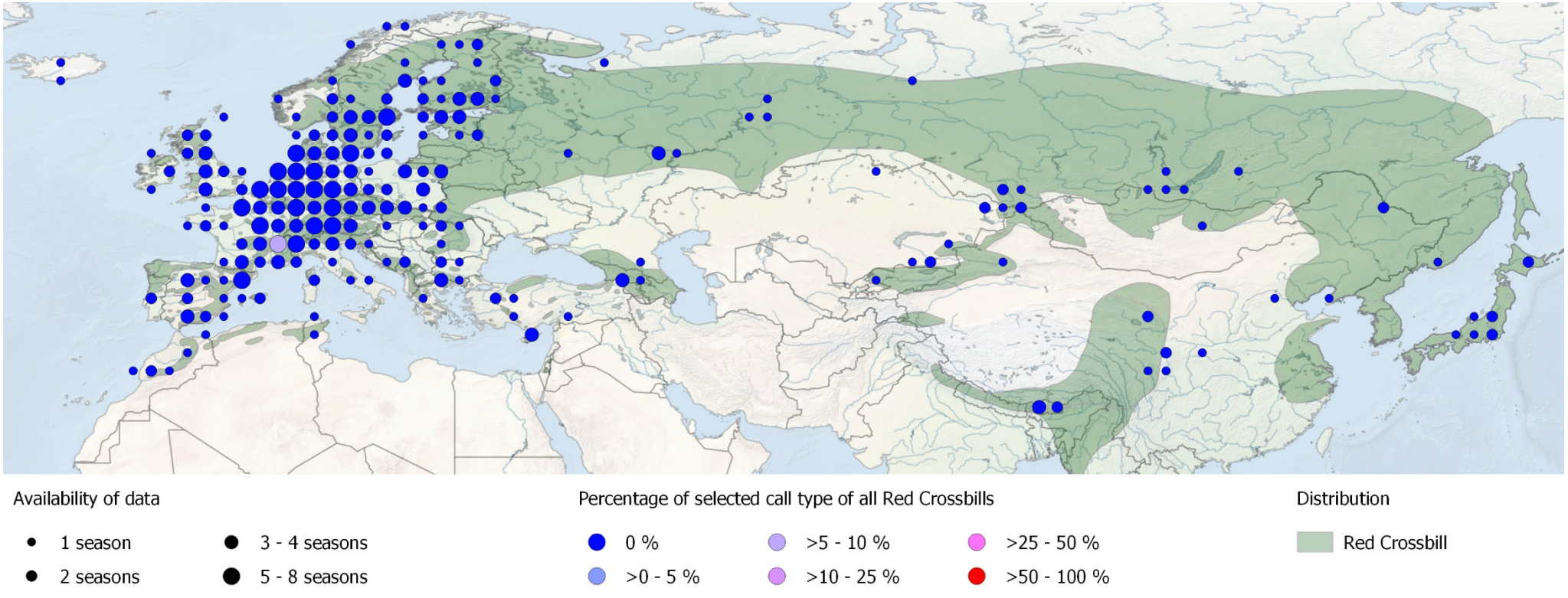

Figure S18: *Proportion of call type N17 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

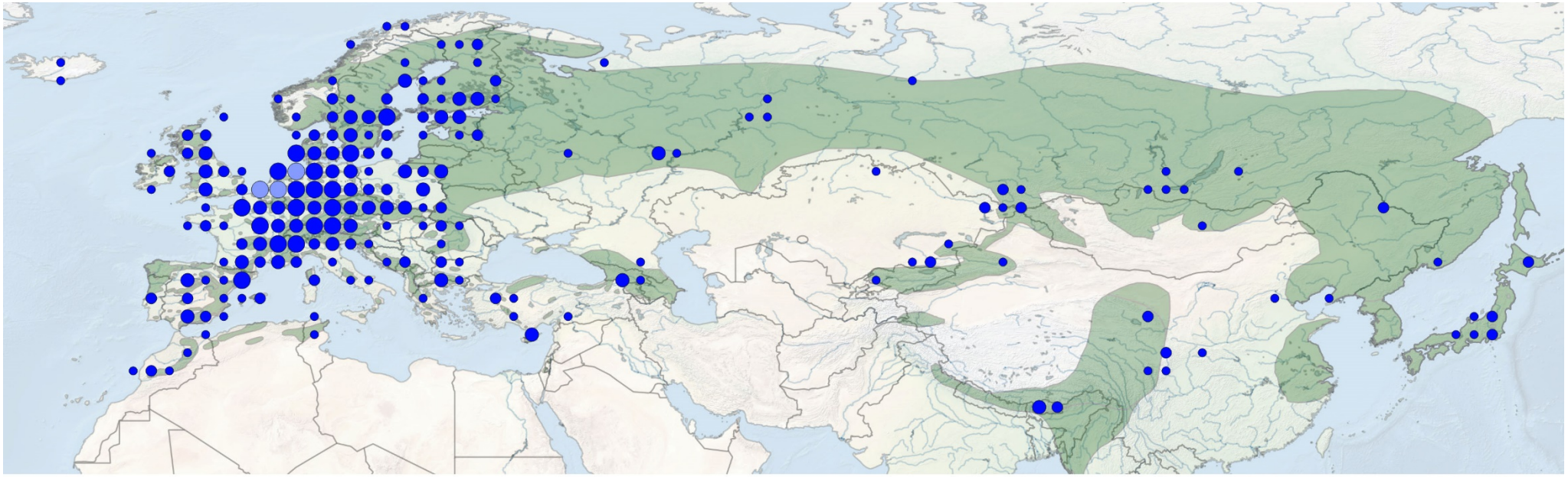

Figure S19: *Proportion of call type N23 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

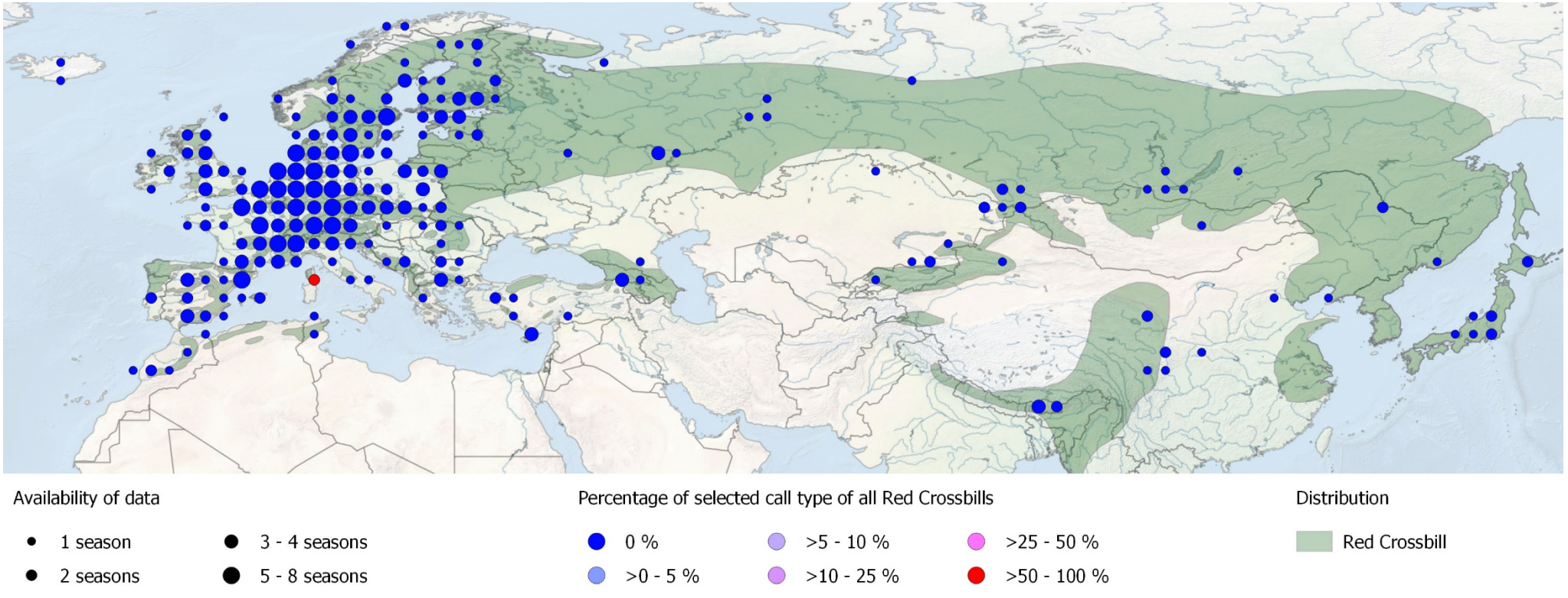

Figure S20: *Proportion of call type S2 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

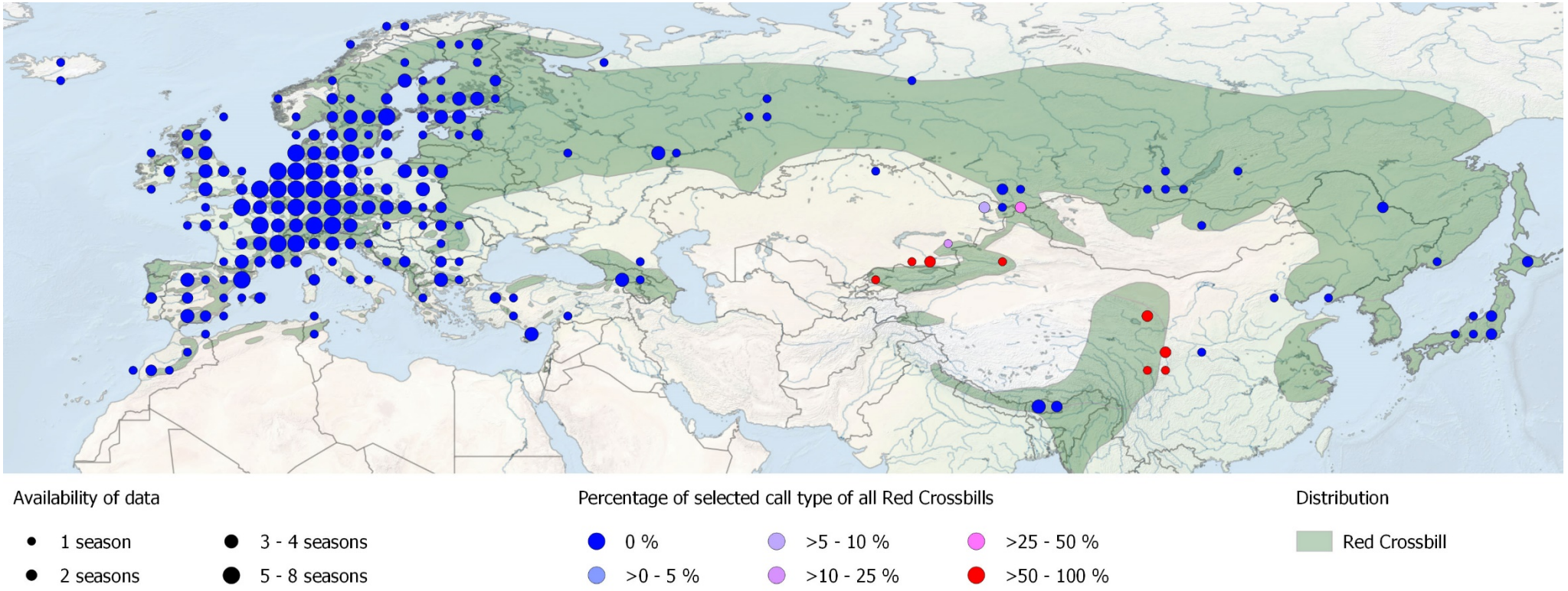

Figure S21: *Proportion of call type E1 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

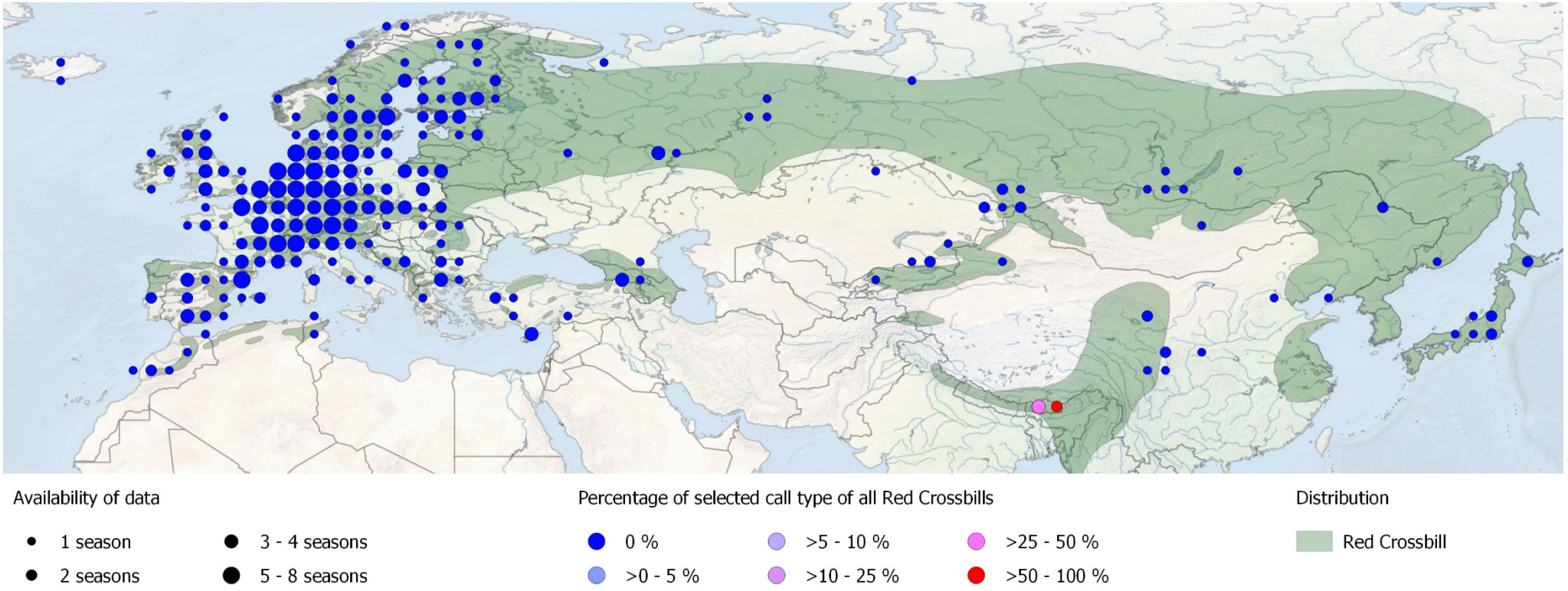

Figure S22: *Proportion of call type E2 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

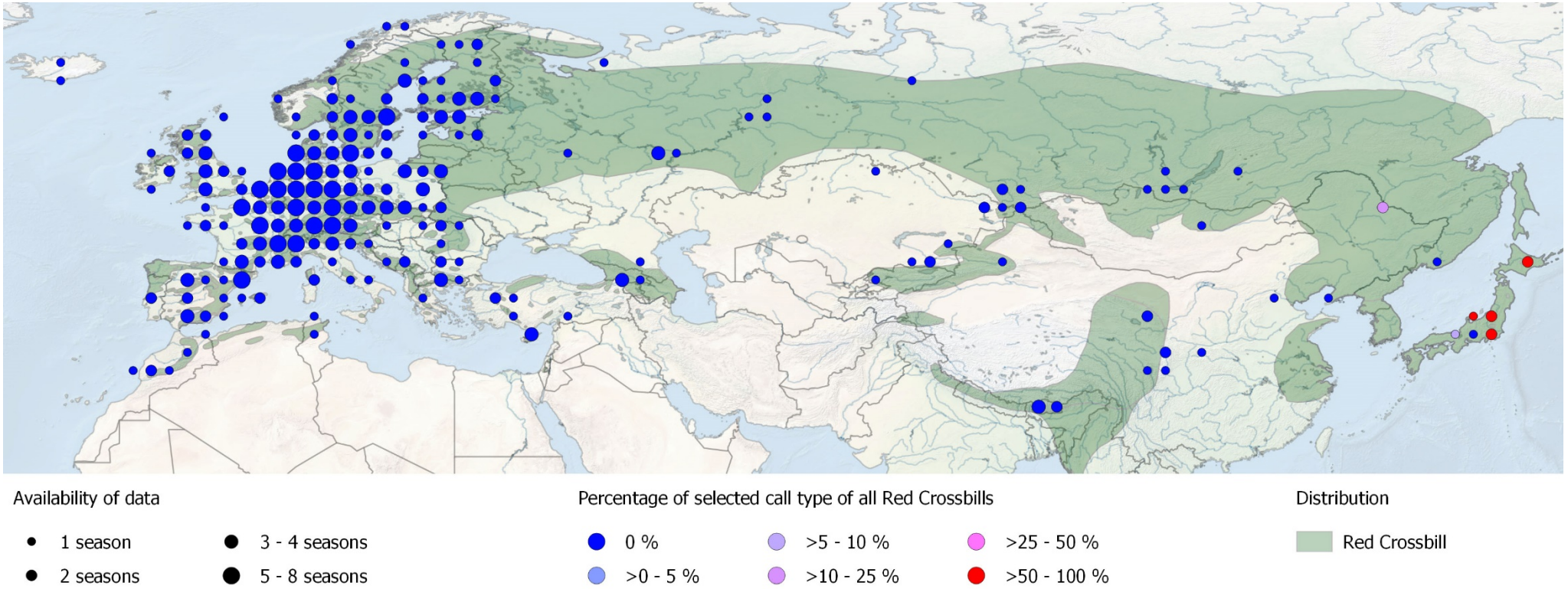

Figure S23: *Proportion of call type E3 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

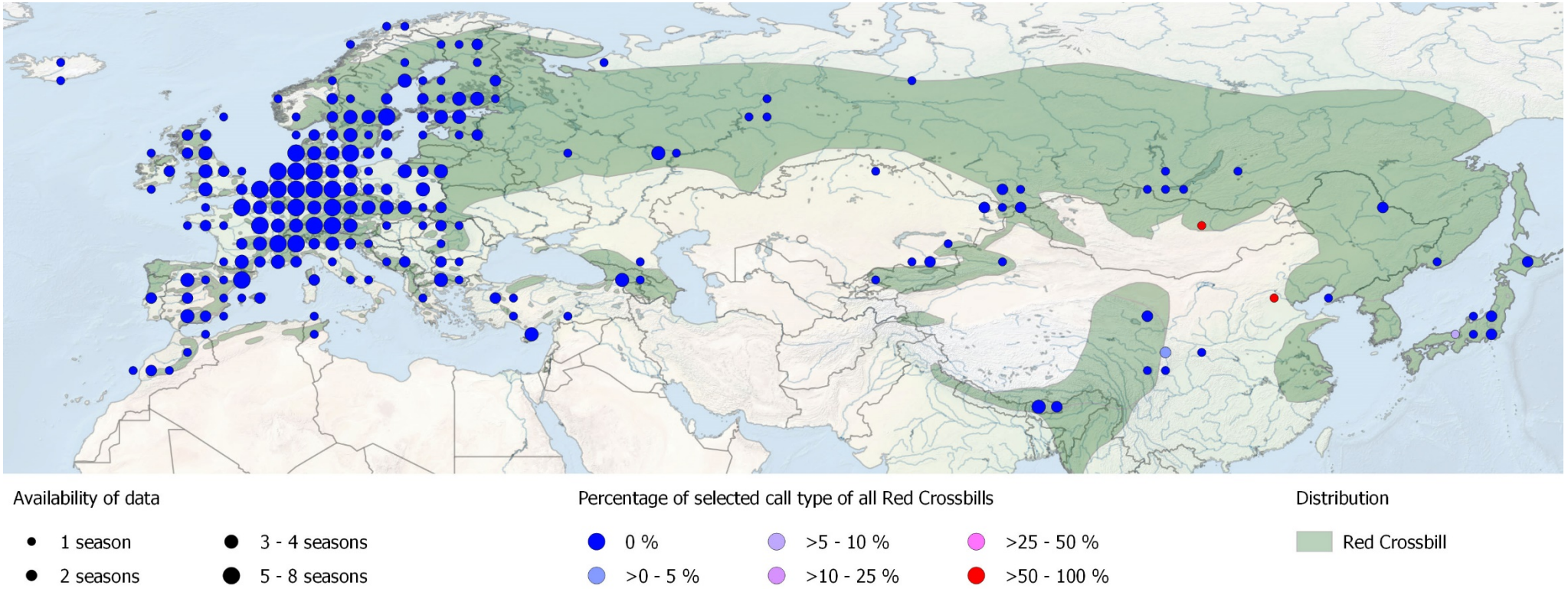

Figure S24: *Ratio of call type E4 within all recorded Red Crossbills per grid cell. Distribution data is from BirdLife International and Handbook of the Birds of the World (2017). Maps are from Natural Earth (2018).*

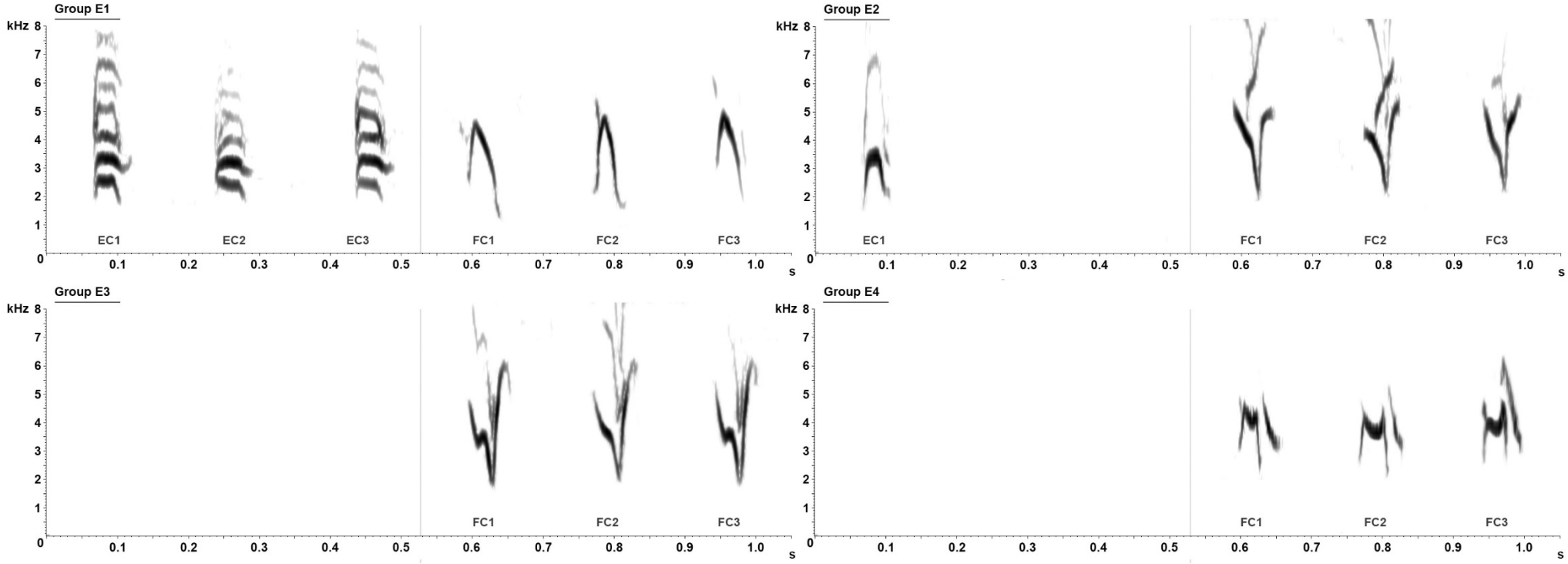

Figure S25: *Spectrograms of the four call types of Red Crossbill found in the Palearctic region east of 60°E. For each group, excitement calls are shown on the left and flight calls on the right. For each call group, excitement and flight calls of three different individuals are shown (if available in decent quality). However, just for two of these four call types, excitement and flight calls were available, for the other two only flight calls. Recording data:* ***E1, excitement calls, 1:*** *Grigorievka, Kyrgyzstan, 04.06.2015, R. Martin;* ***2:*** *Grigorievka, Kyrgyzstan, 04.06.2015, R. Martin;* ***3:*** *Grigorievka, Kyrgyzstan, 04.06.2015, R. Martin;* ***flight calls, 1:*** *Almaty, Kazakhstan, 13.05.2014, R. Martin;* ***2:*** *Qiujixiang, Sichuan, China, 01.06.2015, M. Nelson;* ***3:*** *Grigorievka, Kyrgyzstan, 03.06.2015, R. Martin;* ***E2, excitement calls, 1:*** *Sengor, Bhutan, 06.04.2015, P. Holt;* ***flight calls, 1:*** *Tongsa, Bhutan, 04.11.2012, M. Nelson;* ***2:*** *Sengor, Bhutan, 14.04.2013, A. Lindholm;* ***3:*** *Sengor, Bhutan, 15.04.2013, A. Lindholm;* ***E3, flight calls, 1:*** *Oketo, Japan, 02.06.2015, P. Boesman;* ***2:*** *Sadovoye, Amur, Russia, 19.05.2016, T. Wulf;* ***3:*** *Takara Bokujo, Japan, 05.11.2017, A. Torimi;* ***E4, flight calls, 1:*** *near Ulanbaatar, Mongolia, 10.06.2016, J. Lidster;* ***2:*** *Beijing, China, 08.11.2017, P. Holt;* ***3:*** *Takashima, Japan, 18.11.2017, Anon Torimi.*

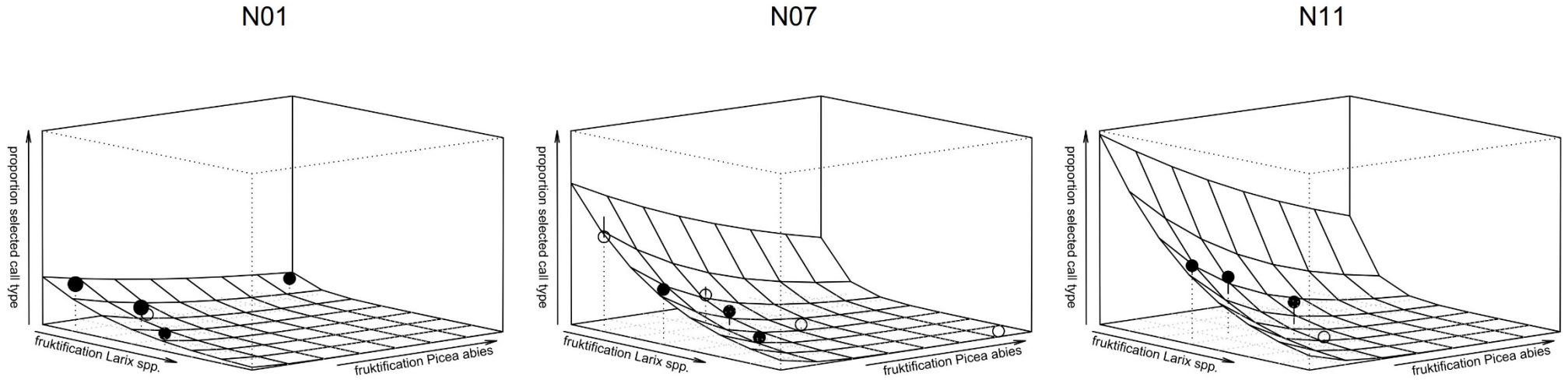

Figure S26: Relationship of the proportion of three call types (N1, N7 and N11) in their respective invasion area, in dependency of fructification of Picea abies and Larix spp. as well as their interaction.

10.4 Description of the distribution of the different call types

N1: This was the most common call type in the central Alps (Figure S3), suggesting a core breeding area there. Individuals with this call type were found in a large radius around the Alps, from Corsica, Northern France, Northern Germany and Poland to Czech Republic.

N2: We had no conclusive data for this call type (Figure S4). It was found in low proportions from France to the Ukraine.

N3: High proportions could be especially found in Sweden and Finland (Figure S5), but data were not conclusive, as this was one of the most widespread types within the Palearctic with recordings present from France to Lake Baikal (Russia). It was mainly distributed in northern areas. It has typically a quite high proportion of the crossbills invading central Europe during the big crossbill influxes like in 2013/2014 and 2017/2018. *Pinus sylvestris* has a similar occurrence but is also common in the Mediterranean where we did not find this call type.

N4: No conclusive data for this call type, as it was the most common one within the northern Palearctic (Figure S6) with recordings from Iceland to Japan and high proportions anywhere, especially in northern areas. This call type is together with N3 and especially N8 typically responsible for the big influxes of crossbills in central Europe (for example 2013/2014 and 2017/2018). The distribution of *Picea abies* and *P. obovata* in combination (both hybridising in the contact zone) roughly coincides with the occurrence of this call type. Our analysis of proportions of the respective call types within an area does probably not work in such an abundant call type, as it is everywhere very common.

N5: No conclusive data. A widespread call type with records from France and Great Britain to Japan (Figure S7), but it was everywhere uncommon. No conifer species has a similar distribution range.

N6: High proportions could be found over several seasons all over Great Britain (Figure S8) except the south-east (but few data present for this area). Therefore, a core breeding area is suspected there (see also the abundant occurrence of this call type in Scotland from 1996 to 2003 (Summers 2004)). All records of this call type were close to Great Britain and Ireland with rare records of birds in north-western France, the Netherlands, north-western Germany and Iceland. Overall distribution resembles the distribution of *Picea sitchensis* but is not identical as *Picea sitchensis* is common along the channel and the coast of the North Sea, however N6 is not. *P. sitchensis* was also planted in other regions (San-Miguel-Ayanz et al. 2016), were N6 does not occur.

N7: High proportions of this call type were always present in the low mountains of Germany (Figure S9), which suggests a core breeding area there. The type was more or less restricted to areas north of the Alps with extreme recordings in Spain (to the

west) to Slovakia (to the east). Surprisingly almost no records in the Alps albeit its geographical proximity. No conifer species has a similar distribution range.

N8: No conclusive data, as it was one of the most common and widespread call types with records from Spain to Japan (Figure S10). High proportions were found especially in northern areas. This call type is together with N3 and especially N4 typically responsible for the big influxes of crossbills in central Europe (for example 2013/2014 and 2017/2018). No conifer species has a similar distribution range. Our analysis to localize the core breeding areas does probably not work for such an abandunt call type (see N4).

N9: No clear results for this type (Figure S11). Very widespread with recordings from France to Japan, but at least in Europe very rare and except one recording with four birds together (01.01.2011 in NW-France, J. Rochefort) always just single birds or pairs. Quite high proportions in the Russian and Kazakh Altai mountains indicate a core breeding area there or nearby, but more data is needed for confirmation. If localisation of the core breeding area is true, this call type might represent *L. c. altaiensis*. No conifer species has a similar distribution range.

N10: Very high proportions of this type were found for many seasons in the French Massif Central and in the Morvan mountains (Figure S12), where the core breeding area is suspected to be. Most records of this call type were close to these areas with extremes in Spain and eastern Germany and a likely record in the Netherlands (but recording not sufficient for an unquestionable identification). No conifer species has a similar distribution range.

N11: High proportions were especially found in the eastern Alps, the Tatras and the Carpathians down to Montenegro (Figure S13) and suggest a core breeding area on the Balkan. This call type occurred all over mainland Europe south of Scandinavia. No conifer species has a similar distribution range.

N12: Very high proportions of this call type were found in the Pyrenees (Figure S14) where the core breeding area is presumed. Extremes were records in the south-western Alps and central Spain. In Spain, identification of this call type is difficult, as there are many birds with similar calls present (Martin et al. 2019), so it might be more common there. No conifer species has a similar distribution range.

N13: No conclusive data (Figure S15). Very rare and most records were in northern Europe close to the coasts. Almost all records concern single birds or pairs with only two groups found, one at the German coast in season 2013/2014 by P. Schleef and one on a Norwegian isle in January 2015 by G. van Duin.

N14: High proportions in a small area in the south-western Alps for several seasons (Figure S16) suggests a core breeding area there. Few records aside this area, just nearby in France, Switzerland and northern Spain. Distribution resembles the

distribution of *Pinus mugo uncinata*, however it was found mainly in areas with *Larix* spp. and most times seen feeding in these conifers. *Pinus mugo uncinata* is also common on the western side of the south-western Alps (Vercors) and in the Pyrenees while this call type is not. The core breeding area is very close to the one of N1. They are probably separated by similar features as N14 and N17 (for more information, see the latter one).

N15: No conclusive data (Figure S17). Very few records which are all from north-western Europe (France, Iceland, Great Britain)

N17: Only found in a very small area on the western side of the south-western Alps, north and south-west of Grenoble (Figure S18), where we suspect the core breeding area is. Common there (about 30% of the recorded birds at two sites), but this is hardly visible in the evaluation as the grid is too coarse. No conifer species has a similar distribution range. The survival of N17 within such a small area without any records beyond requires a very regular food supply. In the core breeding area of N17, *Pinus mugo uncinata* and *Picea abies* is growing in large areas and the first one has a quite reliable fructification (additionally, conifers seem to have more regular fructification within their natural distribution area (Harper 1977) and in southern locations, as fructification of conifers decreases with latitude (Koenig & Knops 2000)). At this site, also *Picea abies* is growing in large areas and in different elevations, enabling N17 to switch to a different food resource if necessary. The core breeding area of N17 is very close to the one of N14 (eastern side of the south-western Alps), however both are separated by the Alpine massive. In the valleys, connecting both sides of the alps, there are mainly broadleaved trees growing (own observation). If there was *Picea abies*, it was more or less restricted to the high elevation close to the tree line, which implies worse and irregular fructification (Mencuccini et al. 1995). These differences in regularity of food supply seem to be sufficient for a separation of both call types.

N23: Only recorded in the Netherlands and Belgium but in low proportions (Figure S19). As it was present in this area for several seasons, a nearby but small core breeding area is presumed.

E1: High proportions of this call type in the Tien Shan in Kyrgyzstan and Kazakhstan (Figure S20) suggest a core breeding area there and therefore, this call type may represent *L. c. tianschanica*. Other records of this call type (Altai Mountains, Sichuan (China)) concerned mainly single birds but very few data is available. Distribution is similar to the one of *Picea schrenkiana*, however not enough data available from the region to conclude a dependence and the call type also occurred in areas without *P. schrenkiana* growing.

E2: High proportions of this call type in Bhutan and nearby India indicate a core breeding area there (Figure S21). Therefore, this call type might represent *L. c. himalayensis*. In this area, there are a lot of endemic conifer species, however we have not enough data of crossbills available from the region to compare with the distribution of conifers in detail.

E3: Only found in easternmost Russia and Japan (Figure S22). Therefore, this call type might represent ssp. *japonica*, but not enough data available. Data basis is also too low to compare with the distribution of conifers.

E4: A call type with very few records, all near to China. Not enough data to conclude anything

S2: Only found on the French isle Corsica (Figure S24). Therefore, it might represent *L. c. corsicana*. No conifer species has a similar distribution range.

10.5 Are there further call types within the Palearctic region?

While analysing recordings from the Eastern Palearctic, we found only four call types which did not fit within the call types defined in Martin et al. (2019). These are likely further call types, as calls could be clearly assigned to the same group, they were found to be used by more than five individuals and at distant sites in different seasons. Although the eastern part of the Palearctic is about twice as large as Europe, Europe today comprises more fragmented forests with a smaller scaled mountainous landscape, contrasting to the huge boreal forest and conifer forests connecting most mountain ranges in the Eastern Palearctic. Therefore, Europe is likely able to hold more call types within a comparatively small area, which is reflected in at least nine of the 22 core breeding areas of Red Crossbill within the western part of Europe. But we might have not discovered all call types from Siberia yet. It is likely that there are further call types in the Himalayan region or southern central China. And there might be a further call type in Vietnam (outside of our study area; one recording available on www.xeno-canto.org).

10.6 Recordists

Recordists who contributed recordings. Within brackets, the number of contributed recordings is given:

Ari Ahtiainen (1), Alexander Neu (1), Aat Schaftenaar (7), Ad Postma (2), Adri Clements (1), Aidan Place (4), Alan Burbidge (7), Alan Dalton (1), Albert J. de Jong (1), Albert Lastukhin (35), Alexander Devos (1), Alexander Lees (1), Alwin van Lubeck (2), Andre-Willem Faber (2), André Strootman (2), André van Reenen (2), Andreas Stern (1), Andrzej Kosmicki (2), Andy Benson (1), Annette Hamann (1), Anon Torimi (8), Ante Strand (2), Antero Lindholm (116), Antoni Knychala (2), Arend Wassink (2), Arian Overweg (4), Arno Niehof (1), Arnold Berghorst (1), Arnoud van den Bergh (5), Ashley Banwell (2), Benjamin Muis (1), Balduin Fischer (19), Barbara Froehlich-Schmitt (3), Bart Gras (7), Bart Hoekstra (11), Bart ter Beek (2), Bas Klavr (1), Bas Kok (2), Bas van de Meulengraaf (6), Bas Verhoeven (1), Beatrix Saadi-Varchmin (8), Benjamin Drillat (50), Benjamin Gnep (1), Benjamin Simmelink (1), Benjamin Steffen (5), Benno van den Hoek (1), Bernard Bousquet (3), Bert Haamberg (8), Bert Jahnke (3),

Bertrand Dallet (11), Birds In Flight (15), The Sound Approach (1), Bjorn Alards (3), Bodo Sonnenburg (3), Bram Piot (10), Bram Rijksen (3), Bram ter Keurs (5), Bram Vogels (8), Brian Power (1), Bricke Gickel (4), Bruno Keist (32), Carel van der Zanden (1), Caspar Groenewegen (1), Casper Zuyderduyn (3), Cedric Mroczko (22), Cees Struijk (3), Chris Batty (6), Chris Spijkerboer (1), Christian Brinkman (2), Christian Rixen (1), Christian Teule (2), Christoph Klein (4), Christophe Reijman (1), Clement Meriglier (1), Coen van Tuijl (1), Corné Timmers (1), Cornelis Fokker (2), Dimitri Mulder (1), Daan Drukker (19), Dan Slootmaekers (1), Daniel Beuker (2), Daniel Honold (79), Dare Šere (2), David Cooper (2), David Darrell-Lambert (1), David Pennington (6), Dennis de Heer (1), Dennis Heijnens (4), Dick Groenendijk (29), Diederic Kok (5), Diederick Meinen (1), Dietrich Meijer (1), Dirk Eykemans (2), Don Metsemakers (1), Dougie Preston (1), Dries Van de Loock (3), Eddy Scheinpflug (6), Eduard Leinwand (2), Edwin de Weerd (1), Edwin Schuller (1), Eelke Schoppers (3), Eetu Paljakka (5), Elias A. Ryberg (5), Elias Tibax (1), Ellen de Bruin (3), Emo Klunder (4), Enno Ebels (1), Eric Jacobs (1), Eric Menkveld (2), Erik Eggenkamp (5), Erik Ernens (1), Erik Etienne (1), Erik van Boxtel (2), Erik van Dijk (6), Erwin Goutbeek (24), Erwin Hooge (1), Erwin Reinstra (1), Evert Meijer (3), Fabian Anger (31), Fabian Meijer (12), Folkert de Boer (2), Folkert Jan Hoogstra (2), Francesco Sottile (2), Franck Hollander (1), Frank Hidvegi (1), Frank Holzapfel (95), Frank Lambert (5), Frank Neijts (19), Frank Roos (28), Frank Wichmann (13), Fred Hoorn (2), Fred Hustings (7), Gabriel Leite (2), Garry Bakker (2), Geert Colembie (1), Geert Custers (3), George Tanis (5), Ger de Hoog (1), Gerard Kenter (3), Gerbert Strang (3), Gerd-Jan Pontenagel (1), Gerd Wichers (2), Gerjon Gelling (3), Gijsbert Twigt (5), Giuseppe Speranza (2), Graham Catley (4), Grzegorz Jedro (1), Guido Berger (2), Guido Klerk (2), Guido O. Keijl (4), Guido Verhoef (2), Guis van Duin (48), Guus Jeniskens (2), Guus van Duin (21), Henk Noordkamp (1), Henk van den Berg (1), Han Derks (7), Hannie van Gils (1), Hans-Heiner Bergmann (4), Hans de Nobel (2), Hans Groot (5), Hans Matheve (8), Hans Schekkerman (4), Hans Schouwenburg (2), Harry Hussey (5), Harry van der Borg (1), Henk-Jan van der Kolk (1), Henk Bakkenes (1), Herman Bruggink (1), Herman van der Meer (1), Herman van Oosten (16), Herrald Damen (3), Hugo Wieleman (10), Huub ter Haar (4), Ilja Kondratjew (1), Ingmar van der Brugge (1), Ingo Röhl (2), Ingo Rösler (1), Ingo Weiß (3), Ivo Meeuwissen (2), Joram de Gans (2), Jaap de Jong (2), Jaap Dijkhuizen (4), Jacek Betleja (1), Jaco Walhout (1), Jacob Bosma (13), Jacob Lotz (7), Jacob Molenaar (3), James Lidster (1), Jan-Freerk Kloen (2), Jan-Ole Kriegs (2), Jan Borst (5), Jan Erik Kikkert (14), Jan Hartog (1), Jan Hein Van Steenis (2), Jan Severeyns (2), Jan Sohler (24), Jan Verboom (5), Jan Willem den Besten (1), Jarek Matusiak (41), Jaring Roosma (1), Jasper Koster (4), Jean.-Sébastien Rousseau-Piot (2), Jelle Aalders (1), Jelle Jacobsen (6), Jelmer Poelstra (91), Jens Büße (1), Jens Halbauer (316), Jens Kirkeby (4), Jens Loose (1), Jeroen Breidenbach (27), Jeroen de Bruijn (1), Jeroen van Erp (7), Jeroen Veeken (31), Jeroen Verburg (1), Jerome Fischer (24), Jesse Fagan (1), Jillis Roos (9), Joachim Vreeman (1), Jochem Drost (1), Jochem van de Kamp (1), Jochen Roeder (1), Jochen Völlm (1), Joey Braat (3), Johan Barth (3), Johan Buckens (5), Johan Jordaans (7), Johan Roeland (4), Johan van Laerhoven (1), Johanna van Dillen-Staal (1), Johannes Buhl (45), Johannes Honold (313), Johannes Martin (1), Johnny Rommens (2), Jonas Buddemeier (61), Jonas Grahn (364), Jonas Kotlarz (1), Joost de Jong (8), Joost Heeremans (1), Joost Schout (1), Joost van Bruggen (14), Jordi Calvet (7), Jorick van Arneym (1), Jorick van de Westeringh (4), Joris Blokhuis (1), José Carlos

Sires (45), Jan Peter Mollema (1), Juha Honkala (1), Julian Bosch (2), Julien Rochefort (4160), Jurrien van Deijk (4), Justin Jansen (139), Klaus-Dieter Moormann (1), Bram ter Keurs (2), Karel Tjoelker (1), Kasper Hendriks (2), Kathi Folz (2), Kees de Jager (1), Koen Kuiper (2), Koen Stork (3), Krzysztof Deoniziak (11), Lewis Thomson (1), Lance A. M. Benner (2), Lande de Trévise (1), Länsi-Suomen Lääni (1), Lars Buckx (10), Lars Edenius (4), Lars Lachmann (3), Laurens van de Hoef (1), Laurent Van den Bergh (7), Leo Heemskerk (1), Leo Nagelkerke (1), Lily Douglas (1), Livon (3), Lluís Buscà (1), Lonnie Bregman (1), Louis A. Hansen (14), Lucette Roberston-Proot (1), Lucién Brinkhof (4), Lucien Kooistra (1), Luis Ramos (1), Lukas Pelikan (76), Lukas Verboom (1), Marc Dijksterhuis (20), Marc Schweitzer (1), Mark van de Wouw (1), Martin Wettstein (2), Maarten Sluijter (8), Maarten Wielstra (9), Magnus Rahm (1), Malte Seehausen (11), Marc Anderson (3), Marc Förschler (5), Marcel Tenhaeff (12), Marchel Stienstra (1), Marcin Solowiej (8), Marco Dragonetti (12), Marco Pesente (1), Marco van der Velde (1), Marco Zomer (2), Marcus Braun (4), Marieke Berman (2), Mariet Verbeek (4), Marijn Hoogteijling (1), Marijn van Oss (25), Mario Rathgeber (6), Mark Beekhof (1), Mark van Leeuwen (1), Markus Oehler (4), Marnix Jonker (4), Marten Hornsveld (1), Martijn Bot (1), Martijn Bunskoek (1), Martijn Vogels (1), Martin Bonte (50), Martin Goepfert (1), Martin Göpfert (1), Martin Hoffmann (3), Martin Jansen (18), Martin Kühn (2), Martin Olthoff (2), Martin Reimann (152), Martio Rathgeber (2), Massimo Pettavino (2), Mathhias Koster (7), Matt Slaymaker (4), Matthias Bull (12), Matthias Feuersenger (6), Matthias Hemprich (54), Matthieu Plaisier (1), Maurizio Sighele (2), Mayro Pattikava (2), Merijn Loeve (4), Michael Vandeput (1), Michel Clouet (23), Michèle Péron (211), Michiel Wesselink (1), Mikael Litsgård (1), Mike Dooher (1), Mike Kuschereitz (1), Mike Nelson (18), Miklos Heincz (2), Minne Feenstra (1), Morten Bongers (5), Nathaniël Bosch (1), Niall Kelough (6), Niels Goulem (1), Niels Krabbe (5), Niels van Doninck (2), Niels van Pelt (1), Nils-Olof Jerling (2), Nils Agster (5), Nittert van de Water (3), Norbert Uhlhaas (2), Ole Henning (1), Oliver Juhnke (1), Onafhankelyke Vogelaars (2), Onno Bosma (3), Ornitho (2), Phillipe Verbelen (1), P.E. Svahn (1), Pamela C. Rasmussen (1), Parsi Pirinen (1), Pascal Christe (1), Patrick Franke (70), Patrick Snoeken (6), Patrik Åberg (121), Paul Ehlers (4), Paul Gnodde (5), Paul Knolle (1), Paul van Sanden (1), Pawel Butkiewicz (2), Pedro Nicolau (1), Peter Boesman (8), Peter de Rouw (16), Peter Eussen (1), Peter Goedbloed (1), Peter Heuts (1), Peter Kuijper (1), Peter Lindenburg (1), Peter Schleef (307), Peter Spierenburg (1), Peter van de Haar (1), Peter van Vlaardingen (1), Peter Verhelst (1), Peter Zeller (10), Petri Parkko (1), Phillipe Lucas (42), Pierre-André Crochet (4), Piet Groebe (1), Pieter Cox (1), Pieter Geert Gelderblom (19), Pieter Gorissen (2), Pim de Nobel (19), Pim Wolf (1), Piotr Szczypinski (198), Rainier Smabers (8), Ralph Martin (2850), Ran Schols (1), Raoul Beunen (1), Raoul Kima (40), Raphael Nussbaumer (1), Regina Eidner (1), Remco Jousma (7), René Manger (1), René Nijenhuis (1), René Oving (6), Richard Dunn (11), Rick Schonewille (1), Rik Brouwer (2), Rik Wever (9), Rik Winters (2), Rinze Kroeskop (1), Rob Martens (1), Rob Portielje (2), Rob Remmert (1), Rob v. Dorland (1), Rob van Bemmelen (26), Rob Zweers (1), Robbin van Dijk (1), Robert Ekman (1), Robert Raykov (1), Robert van Tiel (3), Robi Koppejan (1), Robin Vermylen (2), Roel Haamberg (1), Roel Schwartz (13), Rolf A. de By (3), Rolf Nessing (2), Romuald Mikusek (12), Ross Ahmed (3), Roy Slaterus (1), Rudy Offereins (2), Ruud Altenburg (7), Ruud van Beusekom (17), Sam Gobin (33), Sander Bot (19), Hietkamp Sander (7), Sander Lagerveld (1),

Sander Schagen (6), Saskia Verberne (4), Seppo Sallinen (1), Simon Elliot (10), Sindre Molværsmyr (1), Sjaak Schilperoort (3), Sjouke Scholten (1), Sönke Tautz (1), Stanislas Wroza (4), Stefan Helmer (1), Stefan Wehr (6), Stefan Werner (191), Stein Ø. Nilsen (5), Steve Klasan (83), Stijn Baeten (1), Stijn Cooleman (3), Stocman François (1), Sune Riis Sørensen (1), Susanne Rieck (5), Sven Kransel (1), Sven Valkenburg (6), Szabolcs Nagy (1), Szymon Plawecki (1), Teet Sirotkin (4), Telpost Strabrecht (1), Terle Kolaas (9), Tero Linjama (7), Teus Luijendijk (2), Theo Bakker (8), Thiemo Karwinkel (5), Thijs Fijen (37), Thomas Luiten (4), Thomas Luther (7), Thomas Lüthi (11), Thomas Sacher (2), Thomas van der Es (1), Tim de Boer (13), Tim Schipper (4), Tim van Oerle (4), Timo Roeke (16), Timo Tschentscher (1), Timo Tschentscher (1), Tohar Tal (1), Tom Beeke (1), Tom Visbeek (1), Tom Wulf (88), Tomasz Watachowski (1), Tomek Tumiel (18), Toon Jansen (2), Torbjörn Johansson (1), Twan Mols (5), Uku Paal (13), Ulf Elman (12), Vadim Ivushkin (6), Valentin Serge van Bergen (1), van Ginkel (2), Vincent de Lenne (4), Vincent Stork (2), Vincent van der Spek (2), Volker Arnold (1), Willy Ramaekers (1), Wiegert Steen (2), Ward de Moor (1), Wieland Henning (1), Will van Berkel (1), Willem Vergoossen (1), William de Jong (4), Wim Bakker (11), Wim Kolber (1), Wim van Zwieten (4), Wojciech Miczajka (1), Wolbert Hermus (5), Wouter Knap (3), Wouter van der Ham (3), Wouter van Gasse (3), Zac Hinchcliffe (1)