

NeoBiota

Electronic Supplementary Material

Invasive hornets on the road: motorway-driven dispersal must be considered on management plans of *Vespa velutina*

Authors: Maria João Verdasca¹, Hugo Rebelo^{2,3}, Luísa G. Carvalheiro^{1,4}, Rui Rebelo¹

¹ Centre for Ecology, Evolution and Environmental Changes (cE3c), Faculdade de Ciências da Universidade de Lisboa, C2, Campo Grande, 1749-016 Lisboa, Portugal.

² CIBIO/InBIO, Universidade do Porto, Campus Agrário Vairão, 4485-661 Vairão, Portugal

³ CEABN/InBIO, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal

⁴ Departamento de Ecologia, Universidade Federal de Goiás, Goiânia, Brasil

Corresponding Author: Maria João Verdasca | mjoao.v@gmail.com

1
2 Table S1– Climate, land cover and anthropogenic variables with potential to affect the behaviour
3 and establishment of *Vespa velutina*. The source where each variable was obtained, and its
4 original resolution is indicated in the table.

Type	Original classes	Acronym	Original resolution	Source
Climate	Annual Mean Temperature (°C)	bio1	30s (~1km)	Worldclim
	Temperature annual range (°C)	Bio 7	30s (~1km)	Worldclim
	Precipitation of the wettest month (mm)	bio 13	30s (~1km)	Worldclim
Land Cover	Distance to urban areas (m)	durb	25m	COS2005N5
	Distance to forest (m)	dfor	25m	COS2005N5
	Distance to riparian galleries (m)	dgal	25m	ECRINS; COS2005N5
	Distance to crops (m)	dcrops	25m	COS2005N5
	Distance to shrub and natural meadows (m)	dshr	25m	COS2005N5
Anthropogenic	Distance to motorways (m)	dmo	25m	Open Street Map
	Distance to railways (m)	drail	300m	Forest GIS
	Human Influence Index	hi	30s (1km)	CIENSIN

19 Note: Climatic variables were obtained from Worldclim (Hijmans *et al.*, 2005: 30 s resolution).
20 Land-cover variables were obtained from IGP (COS2007N5, 2010) and European Environment
21 Agency (EEA-ECRINS, 2012) and the respective distance to each class was calculated in ArcGis
22 (ESRI). Anthropogenic variables were obtained from Wildlife Conservation Society - WCS and
23 Center for International Earth Science Information Network - CIESIN (2005), Forest GIS, 2019
24 and OpenStreetMap - ODbL MapCruzin 2019, being the distances to each linear structure also
25 calculated. All layers were clipped to the same extent and scaled to 300 m pixel resolution.

26 **References**

- 27 COS2007N5. (2010). *Carta de Uso e Ocupação do Solo de Portugal Continental para 2017*.
28 *Instituto geográfico Português*.
- 29 EEA. (2012). EEA Catchments and Rivers Network System – ECRINS v1.1: Rationales,
30 building and improving for widening uses to water accounts and WISE applications.
31 <https://doi.org/10.2800/51667>
- 32 Forest_GIS. (2019). Ferrovias de Portugal. Retrieved June 25, 2019, from [http://forest-](http://forest-gis.com/2012/01/portugal-shapefiles-gerais-do-pais.html/)
33 [gis.com/2012/01/portugal-shapefiles-gerais-do-pais.html/](http://forest-gis.com/2012/01/portugal-shapefiles-gerais-do-pais.html/)
- 34 Hijmans, R. J., Cameron, S. E., Parra, J. L., Jones, P. G., & Jarvis, A. (2005). Very high
35 resolution interpolated climate surfaces for global land areas. *International Journal of*
36 *Climatology*, 25(15), 1965–1978. <https://doi.org/10.1002/joc.1276>
- 37 Open_Street_Map (ODbL), & Map_Cruzin. (2019). Portugal Roads. Retrieved March 29, 2019,
38 from <https://mapcruzin.com/free-portugal-arcgis-maps-shapefiles.htm>
- 39 Wildlife Conservation Society - WCS, & Center for International Earth Science Information
40 Network - CIESIN. (2005). Global Human Influence Index.

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55 Tables S2 - Correlation matrix of the climatic, land cover and anthropogenic drivers that have the
 56 potential to affect the behaviour and establishment of *Vespa velutina* in Europe: a) bound records;
 57 b) outposts; c) outposts >18km. One of each pair of correlated variables ($r \geq 0.70$) was excluded
 58 from subsequent analysis.

59

60 a)

Variables	bio1	bio7	bio13	dfor	dgal	dmo	drail	dro	dshrubs	durb	dcrops	hi
bio1 - Annual Mean Temperature	1.00	-0.44	-0.72	0.01	0.22	-0.44	-0.40	-0.42	0.34	-0.43	-0.06	0.31
bio7 - Temperature Annual Range	-0.44	1.00	0.18	0.00	-0.35	0.17	0.33	0.23	-0.05	0.20	-0.15	-0.41
bio13 - Precipitation of wettest month	-0.72	0.18	1.00	-0.02	-0.23	0.33	0.11	0.24	-0.32	0.29	-0.11	0.04
dfor - Distance to Forest	0.01	0.00	-0.02	1.00	0.39	-0.24	-0.25	-0.19	0.29	0.06	-0.10	0.14
dgal - Distance to riparian galleries	0.22	-0.35	-0.23	0.39	1.00	-0.20	-0.16	-0.23	0.19	-0.19	0.10	0.04
dmo - Distance to motorways	-0.44	0.17	0.33	-0.24	-0.20	1.00	0.77	0.57	-0.36	0.48	0.07	-0.40
drail - Distance to railways	-0.40	0.33	0.11	-0.25	-0.16	0.77	1.00	0.49	-0.20	0.30	0.10	-0.59
dro - Distance to road network	-0.42	0.23	0.24	-0.19	-0.23	0.57	0.49	1.00	-0.16	0.17	-0.04	-0.38
dshrubs - Distance to shrubs and natural meadows	0.34	-0.05	-0.32	0.29	0.19	-0.36	-0.20	-0.16	1.00	-0.12	-0.10	-0.04
durb - Distance to urban areas	-0.43	0.20	0.29	0.06	-0.19	0.48	0.30	0.17	-0.12	1.00	0.22	-0.23
dcrops - Distance to crops	-0.06	-0.15	-0.11	-0.10	0.10	0.07	0.10	-0.04	-0.10	0.22	1.00	-0.04
hi - Index of Human Influence	0.31	-0.41	0.04	0.14	0.04	-0.40	-0.59	-0.38	-0.04	-0.23	-0.04	1.00

61

62

63

64 b)

Variables	bio1	bio7	bio13	dfor	dgal	dmo	drail	dro	dshrubs	durb	dcrops	hi
bio1 - Annual Mean Temperature	1.00	-0.29	-0.82	0.05	-0.07	-0.39	-0.40	-0.01	0.02	-0.16	-0.15	0.24
bio7 - Temperature Annual Range	-0.29	1.00	0.11	0.09	0.06	0.09	0.03	0.06	-0.13	0.31	0.14	-0.15
bio13 - Precipitation of wettest month	-0.82	0.11	1.00	-0.11	-0.14	0.57	0.41	0.22	0.07	0.00	0.04	-0.22
dfor - Distance to Forest	0.05	0.09	-0.11	1.00	0.15	-0.09	-0.16	-0.18	-0.10	-0.01	-0.17	0.41
dgal - Distance to riparian galleries	-0.07	0.06	-0.14	0.15	1.00	-0.07	0.00	-0.09	-0.11	-0.11	0.15	0.09
dmo - Distance to motorways	-0.39	0.09	0.57	-0.09	-0.07	1.00	0.77	0.64	0.05	-0.06	-0.15	-0.24
drail - Distance to railways	-0.40	0.03	0.41	-0.16	0.00	0.77	1.00	0.45	0.04	0.00	-0.05	-0.47
dro - Distance to road network	-0.01	0.06	0.22	-0.18	-0.09	0.64	0.45	1.00	0.18	0.04	-0.12	-0.29
dshrubs - Distance to shrubs and natural meadows	0.02	-0.13	0.07	-0.10	-0.11	0.05	0.04	0.18	1.00	0.02	0.24	-0.08
durb - Distance to urban areas	-0.16	0.31	0.00	-0.01	-0.11	-0.06	0.00	0.04	0.02	1.00	0.01	-0.23
dcrops - Distance to crops	-0.15	0.14	0.04	-0.17	0.15	-0.15	-0.05	-0.12	0.24	0.01	1.00	-0.06
hi - Index of Human Influence	0.24	-0.15	-0.22	0.41	0.09	-0.24	-0.47	-0.29	-0.08	-0.23	-0.06	1.00

65

66

67

68 c)

Variables	bio1	bio7	bio13	dfor	dgal	dmo	drail	dro	dshrubs	durb	dcrops	hi
bio1 - Annual Mean Temperature	1.00	-0.25	-0.81	0.10	-0.09	-0.34	-0.32	-0.05	0.00	-0.20	-0.17	0.21
bio7 - Temperature Annual Range	-0.25	1.00	0.10	0.01	0.04	0.07	-0.02	0.10	-0.11	0.31	0.22	-0.18
bio13 - Precipitation of wettest month	-0.81	0.10	1.00	-0.16	-0.12	0.55	0.31	0.30	0.10	0.05	0.02	-0.17
dfor - Distance to Forest	0.10	0.01	-0.16	1.00	0.14	-0.14	-0.26	-0.17	-0.09	-0.03	-0.16	0.45
dgal - Distance to riparian galleries	-0.09	0.04	-0.12	0.14	1.00	-0.09	-0.01	-0.11	-0.12	-0.13	0.21	0.07
dmo - Distance to motorways	-0.34	0.07	0.55	-0.14	-0.09	1.00	0.73	0.74	0.08	-0.02	-0.10	-0.20
drail - Distance to railways	-0.32	-0.02	0.31	-0.26	-0.01	0.73	1.00	0.61	0.06	0.09	-0.01	-0.46
dro - Distance to road network	-0.05	0.10	0.30	-0.17	-0.11	0.74	0.61	1.00	0.17	0.03	-0.11	-0.32
dshrubs - Distance to shrubs and natural meadows	0.00	-0.11	0.10	-0.09	-0.12	0.08	0.06	0.17	1.00	0.03	0.26	-0.08
durb - Distance to urban areas	-0.20	0.31	0.05	-0.03	-0.13	-0.02	0.09	0.03	0.03	1.00	0.02	-0.28
dcrops - Distance to crops	-0.17	0.22	0.02	-0.16	0.21	-0.10	-0.01	-0.11	0.26	0.02	1.00	-0.07
hi - Index of Human Influence	0.21	-0.18	-0.17	0.45	0.07	-0.20	-0.46	-0.32	-0.08	-0.28	-0.07	1.00

69

70

71

72

73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
94
96
97
98
99
100
101

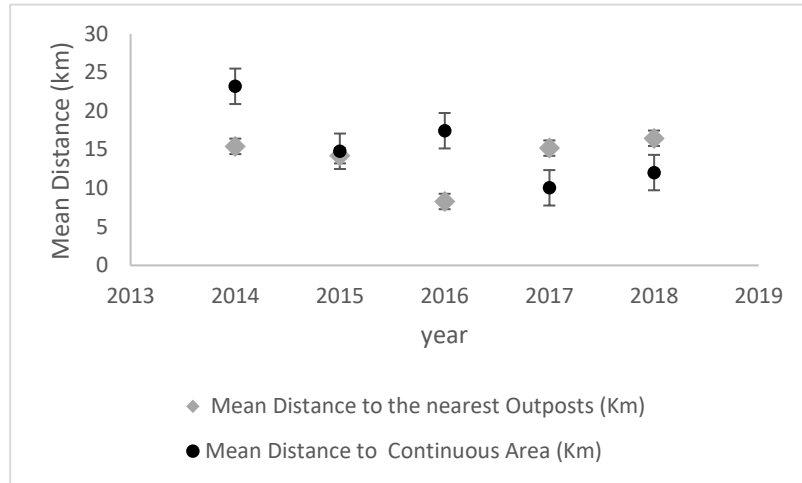


Fig. S1 - Variation of the mean distance of the new records within a given year to the nearest potential source: continuous area or outpost. Error bars depict standard errors.

Table S3 - Relation between dispersion distance (to south and east) vs time either for self mediated or jump dispersal by testing through t-test the significance of the slope of the regression line when compared to zero (H0: the slope of the regression line is 0).

Curve	Equation	R ²	p value
Outposts South Distance to the nearest source	$y = 0.4748x - 924.73$	0,0015	0,78
Outposts East Distance to the nearest source	$y = -2.725x + 5522.2$	0,1166	0,25
Distance to south between the limits of consecutive years	$y = -x + 2060.3$	0,0344	0,77
Distance to east between the limits of consecutive years	$y = 0.19x - 363.62$	0,0005	0,97

102 Table S4 – Effects of climatic, land cover and anthropogenic variables on the dispersal of *V.*
 103 *velutina*". Distance to the previous continuous distribution (as a proxy of dispersion) was used as
 104 dependent variable in the GLMM. The results were obtained by averaging model predictions with
 105 $\Delta AIC < 2$.

Multivariate model (bound records)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	25070	20580	21120	1.187	0.2351
bio13 - Precipitation of wettest month	-256.3	102.2	105	2.441	0.0147 *
bio7 - Temperature annual range	163.6	64.81	66.56	2.457	0.014 *
Distance to shrubs and natural meadows	9.954	4.194	4.308	2.311	0.0209 *
Index of Human Influence	-22.37	87.41	88.84	0.252	0.8012
Distance to riparian galleries	-0.1786	0.7877	0.8023	0.223	0.8238
Distance to urban areas	-0.6487	3.323	3.391	0.191	0.8483
Distance to motorways	-0.01772	0.09452	0.09647	0.184	0.8543
Distance to forest	-0.1087	2.324	2.387	0.046	0.9637
Distance to crops	-0.01713	0.5781	0.5939	0.029	0.977
Multivariate model (all outposts)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	149500	21780	22020	6.792	<2e-16 ***
bio13 - Precipitation of wettest month	-684.1	104.7	106	6.453	<2e-16 ***
Distance to forest	-11.86	18.06	18.16	0.653	0.514
Index of Human Influence	-86.04	172.9	173.9	0.495	0.621
Distance to urban areas	1.736	4.762	4.794	0.362	0.717
Distance to riparian galleries	0.4945	1.757	1.771	0.279	0.78
bio7 - Temperature annual range	10.79	46.86	47.24	0.228	0.819
Distance to shrubs and natural meadows	-0.7866	2.754	2.775	0.283	0.777
Distance to motorways	0.01336	0.1079	0.109	0.123	0.902
Distance to crops	-0.01868	0.7344	0.7438	0.025	0.98
Multivariate model (>18km outposts)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	1.47E+05	2.49E+04	2.53E+04	5.834	<2e-16 ***
bio13 - Precipitation of wettest month	-6.46E+02	1.29E+02	1.30E+02	4.957	7.00E-07 ***
Index of Human Influence	-1.25E+02	2.06E+02	2.07E+02	0.603	0.546
Distance to forest	-9.11E+00	1.72E+01	1.74E+01	0.525	0.6
Distance to urban areas	1.61E+00	4.79E+00	4.83E+00	0.332	0.74
Distance to shrubs and natural meadows	-7.58E-01	2.78E+00	2.80E+00	0.271	0.786
Distance to riparian galleries	5.26E-01	1.86E+00	1.88E+00	0.281	0.779
bio7 - Temperature annual range	9.47E+00	4.89E+01	4.94E+01	0.192	0.848
Distance to motorways	1.29E-02	1.08E-01	1.10E-01	0.118	0.906
Distance to crops	1.85E-02	8.68E-01	8.80E-01	0.021	0.983

106
 107
 108
 109
 110
 111

112 Table S5 - Effects of the different land cover and anthropogenic predictors on the dispersion of
 113 *V. velutina*, considering the predictor distance to the entire road network, instead of distance to
 114 motorways in bound records and both sets of outposts. Distance to the previous continuous
 115 distribution (as a proxy of dispersion) was used as dependent variable in the GLMM. The
 116 presented results were obtained by averaging model predictions with $\Delta AIC < 2$.
 117

Multivariate model (bound records)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	14400	4551	4652	3.096	0.001964 **
Distance to road network	0.6752	0.5598	0.5688	1.187	0.235211
Distance to shrubs and natural meadows	14.95	4.181	4.292	3.483	0.000496 ***
Distance to riparian galleries	-0.7513	1.479	1.498	0.501	0.616105
Distance to urban areas	-1.881	5.264	5.341	0.352	0.724676
Distance to crops	-0.0299	0.5218	0.5353	0.056	0.95546
Index of Human Influence	-2.722	52.69	54.07	0.05	0.959852
Distance to forest	0.04941	2.138	2.196	0.023	0.982043
Multivariate model (all outposts)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	44580	8695	8785	5.074	4.00E-07 ***
Distance to forest	-28.12	25.56	25.75	1.092	0.275
Distance to riparian galleries	5.266	4.547	4.581	1.149	0.25
Distance to urban areas	2.446	6.153	6.196	0.395	0.693
Distance to road network	-0.145	0.4167	0.4195	0.346	0.73
Index of Human Influence	25.9	116.2	117.1	0.221	0.825
Distance to shrubs and natural meadows	-0.1495	1.627	1.646	0.091	0.928
Distance to crops	-0.09848	1.283	1.298	0.076	0.94
Multivariate model (> 18 km outposts)	Estimate	Std. Error	Adjusted SE	z value	Pr(> z)
(Intercept)	52778.442	8491.2861	8585.3193	6.148	<2e-16 ***
Distance to riparian galleries	3.2727	4.1678	4.197	0.78	0.436
Distance to forest	-9.1976	18.6108	18.7305	0.491	0.623
Distance to road network	-0.2759	0.5535	0.5573	0.495	0.621
Distance to urban areas	0.8934	3.9733	4.0111	0.223	0.824
Index of Human Influence	-35.498	130.1473	131.2565	0.27	0.787
Distance to shrubs and natural meadows	-0.2286	1.9015	1.9237	0.119	0.905
Distance to crops	0.1175	1.5016	1.5209	0.077	0.938

118
 119
 120
 121
 122
 123
 124
 125

126 Table S6 – Set of best models with climatic and land variables according to the different datasets
 127 (1. bound records; 2. all outpost and 3. outpost 18 km). Only the models with $\Delta AIC < 2$ are shown.
 128 Nomenclatures: bio 7 – temperature annual range; bio 13 – precipitation of the wettest month;
 129 dfor – distance to forests; dmo – distance to motorways; dcrps – distance to crops; dgal -
 130 distance to riparian galleries; dshrubs – distance to shrubs; hi – index of human influence.

1. Climatic + Land cover model selection table - bound records dataset														
	(Intrc)	bio13	bio7	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
68	23430	-258.60	167.30					10.05			6	1153.6	0	0.055
324	35110	-277.80	152.40					9.09		-162	7	1155	1.39	0.028
84	29110	-261.70	148.70			-1.34		10.69			7	1155	1.45	0.027
196	19960	-240.70	173.90					10.04	-5.19		7	1155.2	1.59	0.025
100	20720	-232.70	167.50				-0.15	9.57			7	1155.2	1.64	0.024
76	23370	-258.50	168.00		-1.057			10.19			7	1155.6	1.98	0.02
72	23820	-258.60	166.20	-0.17				10.04			7	1155.6	1.99	0.02

2. Climatic + Land cover model selection table - all outposts dataset														
	(Intrc)	bio13	bio7	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
10	149200	-667.3			-26.52						5	2310.8	0	0.03
258	160400	-706								-291.1	5	2310.9	0.07	0.03
2	147100	-671.7									4	2310.9	0.11	0.02
138	147800	-670.8			-26			8.04			6	2311.6	0.78	0.02
130	145800	-675.2						8.30			5	2311.6	0.84	0.02
26	144700	-651.2			-29.13	3.22					6	2311.9	1.07	0.02
12	130000	-688.5	98.12		-27.34						6	2311.9	1.12	0.02
74	151000	-668.4			-27.34			-4.84			6	2311.9	1.14	0.02
322	162800	-708.9						-5.01		-305.1	6	2312	1.15	0.01
266	157700	-692.2			-18.73					-200.7	6	2312	1.2	0.01
4	129500	-691.3	90.19								5	2312.2	1.38	0.01
274	156900	-694.1				2.71				-300.4	6	2312.2	1.4	0.01
66	148700	-672.8						-4.44			5	2312.2	1.4	0.01
386	157500	-703.8							6.15	-250.3	6	2312.2	1.4	0.01
154	142400	-652.5			-28.98	3.78			9.15		7	2312.3	1.5	0.01
18	143600	-659.9				2.44					5	2312.4	1.58	0.01
260	145400	-719.7	72.55							-273.5	6	2312.4	1.6	0.01
34	152100	-714.7					0.1752				5	2312.6	1.82	0.01
42	152600	-698.3			-25.74		0.126				6	2312.7	1.85	0.01
202	149600	-672			-26.83			-4.99	8.21		7	2312.7	1.85	0.01
290	163300	-734.1					0.1189			-281.5	6	2312.7	1.94	0.01
14	149700	-667.9		-0.62	-26.88						6	2312.8	1.98	0.01

3. Climatic + Land cover model selection table - Outpost 18km dataset														
	(Intrc)	bio13	bio7	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
258	157200	-661.5								-324	5	2087.5	0	0.03
2	142600	-625.9									4	2087.8	0.28	0.03
10	146400	-633.5			-27.27						5	2087.9	0.34	0.02
130	142500	-639.5						9.03			5	2088.5	0.96	0.02
322	160000	-666.4						-5.43		-338.8	6	2088.5	1.01	0.02
138	146100	-646			-26.29				8.55		6	2088.7	1.14	0.02
274	152600	-642.1				2.89				-334.9	6	2088.8	1.31	0.02
266	155700	-656.9			-17.54					-238.1	6	2088.9	1.35	0.01
386	155000	-665.6							6.25	-277.1	6	2088.9	1.4	0.01
74	148600	-637			-28.15			-5.20			6	2088.9	1.44	0.01
26	140900	-610.4			-29.88	3.32					6	2089	1.45	0.01
66	144600	-628.9						-4.82			5	2089	1.52	0.01
4	123800	-640	91.74								5	2089.2	1.7	0.01
18	138100	-607.5				2.57					5	2089.3	1.75	0.01
260	144000	-668.2	59.25							-303.6	6	2089.3	1.76	0.01
12	127800	-647.2	89.95		-27.11						6	2089.3	1.77	0.01
290	161700	-701.8					0.15			-314.9	6	2089.3	1.83	0.01
154	139800	-621			-29.17	3.81			9.54		7	2089.5	1.96	0.01
34	149200	-681.5					0.21				5	2089.5	1.97	0.01
262	156600	-660.2		0.53						-321.9	6	2089.5	1.99	0.01

131 Table 7 – Set of best models with climatic variables according to the different datasets (1. bound
 132 records; 2. all outpost and 3. outpost 18 km) Only the models with $\Delta AIC < 2$ are shown.
 133 Nomenclatures: bio 7 – temperature annual range; bio 13 – precipitation of the wettest month.

134

1. Climatic model selection table - bound records dataset							
	(Intrc)	bio13	bio7	df	AIC	delta	weight
4	40880	-363.6	188	5	1156.90	0	0.91

135

136

2. Climatic model selection table - all outposts dataset							
	(Intrc)	bio13	bio7	df	AIC	delta	weight
2	147100	-671.7		4	2310.9	0	0.65
4	129500	-691.3	90.19	5	2312.20	1.27	0.35

137

138

139

3. Climatic model selection table - Outpost 18km Dataset							
	(Intrc)	bio13	bio7	df	AIC	delta	weight
2	142600	-625.9		4	2087.8	0	0.67
4	123800	-640	91.74	5	2089.2	1.42	0.33

140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159

160 Table S8 – Set of best models with land variables according to the different datasets (1. bound
 161 records; 2. all outpost and 3. outpost 18 km). Only the models with $\Delta AIC < 2$ are shown.
 162 Nomenclatures: dfor – distance to forests; dmo – distance to motorways; dcrps – distance to
 163 crops; dgal - distance to riparian galleries; dshrubs – distance to shrubs; hi – index of human
 164 influence.

1. Land cover model selection table - bound records dataset												
	(Intrc)	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
17	15790					13.80			4	1158.6	0	0.06
21	18320			-2.57		14.97			5	1158.7	0.11	0.05
89	31440				-0.43	10.37		-336.9	6	1159.1	0.46	0.05
29	22280			-2.89	-0.31	13.12			6	1159.1	0.51	0.04
93	32830			-2.58	-0.46	11.56		-288.6	7	1159.2	0.6	0.04
25	18710				-0.24	12.22			5	1159.6	1.02	0.03
81	21690					13.47		-189.5	5	1159.7	1.05	0.03
53	19970			-2.85		14.66	-7.73		6	1159.9	1.28	0.03
49	16790					13.48	-5.61		5	1160.2	1.56	0.03
85	22160			-2.28		14.69		-133.6	6	1160.3	1.66	0.02
18	16400	-0.57				13.70			5	1160.5	1.91	0.02
19	15920		-1.32			14.00			5	1160.6	1.97	0.02
##	25460					12.79	-9.01	-256.7	6	1160.6	1.99	0.02

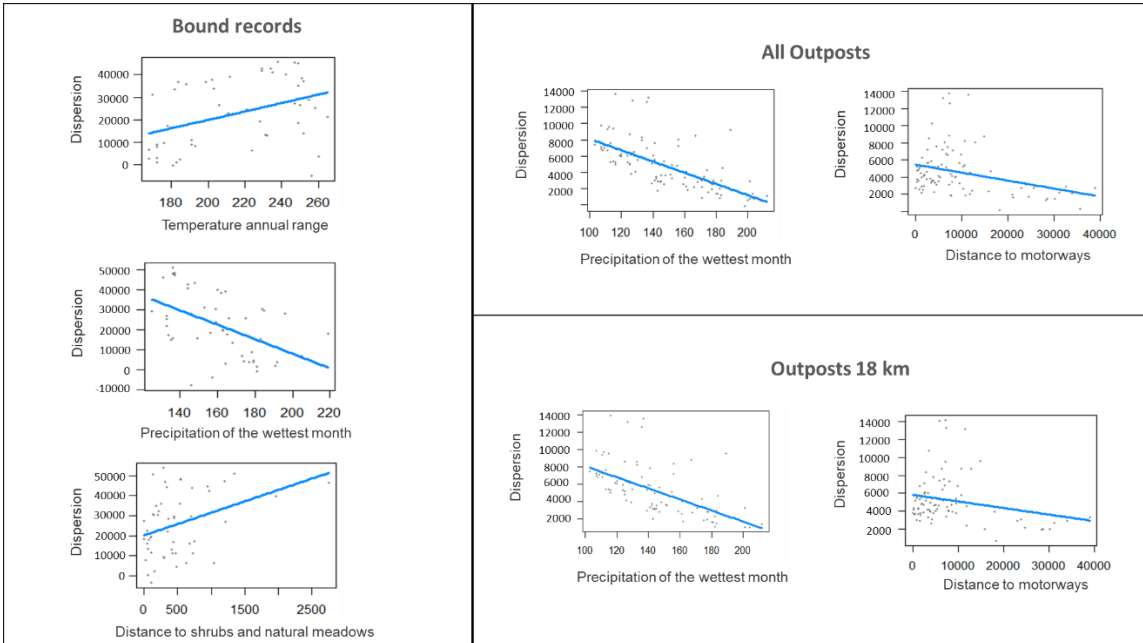
2. Land cover model selection table - all outposts dataset												
	(Intrc)	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
15	54000		-39.71	6.05	-0.93				6	2335.7	0	0.08
11	58030		-34.88		-0.96				5	2336.2	0.55	0.06
9	54180				-0.93				4	2337	1.27	0.04
16	56810	-4.24	-43.07	6.77	-0.97				7	2337	1.27	0.04
47	51970		-39.63	6.48	-0.91		6.83		7	2337	1.35	0.04
13	50370			5.04	-0.90				5	2337.2	1.52	0.04
31	54920		-39.94	5.85	-0.93	-2.43			7	2337.5	1.84	0.03

3. Land cover model selection table - Outposts 18 km Dataset												
	(Intrc)	dcrps	dfor	dgal	dmo	dshrb	durb	hi	df	AIC	delta	weight
15	56880		-34.65	5.75	-0.72				6	2102.7	0	0.05
9	57600				-0.71				4	2102.8	0.12	0.05
11	60880		-30.05		-0.76				5	2102.9	0.25	0.05
13	53760			4.91	-0.67				5	2103.2	0.49	0.04
73	65220				-0.78			-249.1	5	2103.7	1.05	0.03
77	61840			5.21	-0.73			-271.8	6	2103.9	1.2	0.03
47	55010		-34.20	6.13	-0.70		6.43		7	2104.1	1.45	0.03
79	60420		-29.30	5.77	-0.74			-135.2	7	2104.4	1.73	0.02
41	56370				-0.71		5.17		5	2104.5	1.77	0.02
25	58660				-0.71	-3.41			5	2104.5	1.81	0.02
31	57880		-34.83	5.52	-0.71	-2.55			7	2104.5	1.83	0.02
16	58110	-2.02	-36.36	6.13	-0.73				7	2104.5	1.86	0.02
27	62120		-30.60		-0.76	-3.78			6	2104.5	1.86	0.02
45	51820			5.32	-0.66		6.81		6	2104.6	1.88	0.02
43	59720		-29.51		-0.76		4.62		6	2104.6	1.96	0.02

165

166

167 Fig. S2 – Relation between the dispersion of *Vespa velutina* and significant climatic and land
168 cover variables according to the different datasets: bound records, all outposts and outpost 18km
169 (see Table 3 of the main manuscript). Plots were obtained with the visreg R package.
170



171
172
173
174
175
176
177
178
179
180
181