

Lycaena phlaeas (LINNAEUS, 1761) – Small Copper



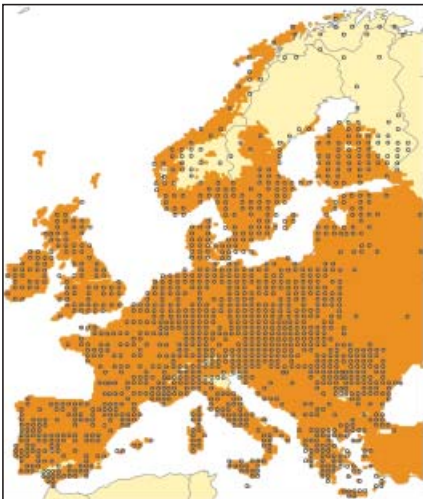
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		Full dispersal	No dispersal
2050	SEDG	-2168 (-9.07%)	-3372 (-14.1%)
	BAMBU	-4048 (-16.93%)	-4602 (-19.25%)
	GRAS	-3923 (-16.41%)	-4776 (-19.97%)
2080	SEDG	-5057 (-21.15%)	-6765 (-28.29%)
	BAMBU	-8526 (-35.66%)	-10086 (-42.18%)
	GRAS	-11453 (-47.9%)	-13177 (-55.11%)

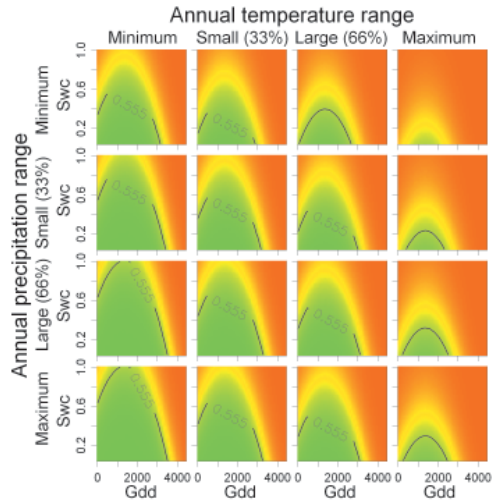
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 23910 cells)

The Small Copper is a very common, widespread butterfly. It is found on all sorts of grasslands and heathlands, roadsides and along the banks of canals. The butterflies often visit flowers, and the males, perched on a tall blade of grass, defend their territory fiercely, flying out at other males of its sort. Eggs are laid on different species of acidic sorrels, mainly Common Sorrel (*Rumex acetosa*). This butterfly species overwinters as a caterpillar. In the north of its range, the Small Copper has two generations a year, whereas in the southern part, it may have three or four.

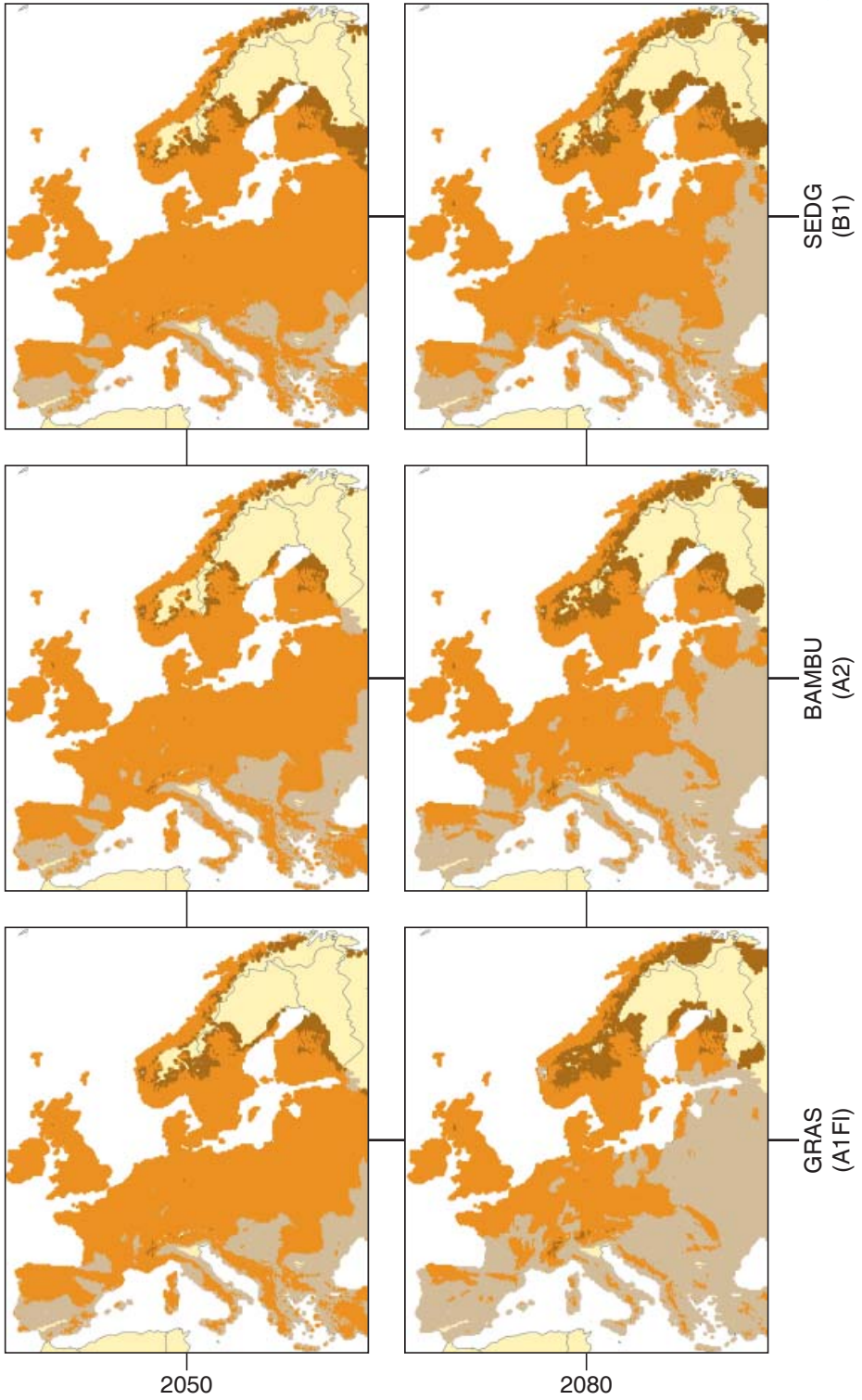
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.65). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena belle ([SCHIFFERMÜLLER], 1775) – Violet Copper



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		Full dispersal	No dispersal
2050	SEDG	159 (6.52%)	-563 (-23.08%)
	BAMBU	229 (9.39%)	-487 (-19.97%)
	GRAS	-41 (-1.68%)	-686 (-28.13%)
2080	SEDG	-197 (-8.08%)	-1073 (-43.99%)
	BAMBU	-36 (-1.48%)	-968 (-39.69%)
	GRAS	-466 (-19.11%)	-1201 (-49.24%)

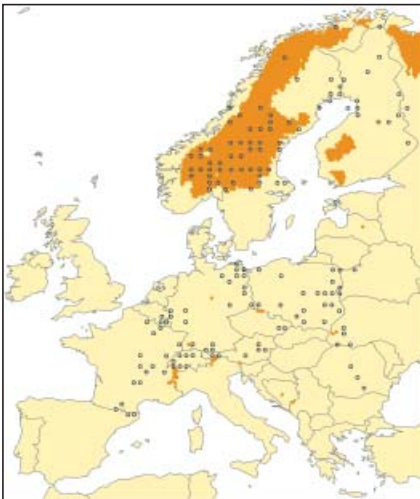
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2439 cells)

The Violet Copper is a rare butterfly and often confined to very small sites (where it may occur in large numbers). It is found in swampy, wet grassland and rough vegetation bordering streams and lakes. In Central Europe, eggs are laid on the underside of the leaves of Bistort (*Polygonum bistorta*). In the north of its range Viviparous Bistort (*Polygonum vivipara*) is also used as larval foodplant. The young caterpillars eat the lower epidermis, thus making the characteristic “windows”. It passes the winter as a pupa. It has one, sometimes two, generations a year.

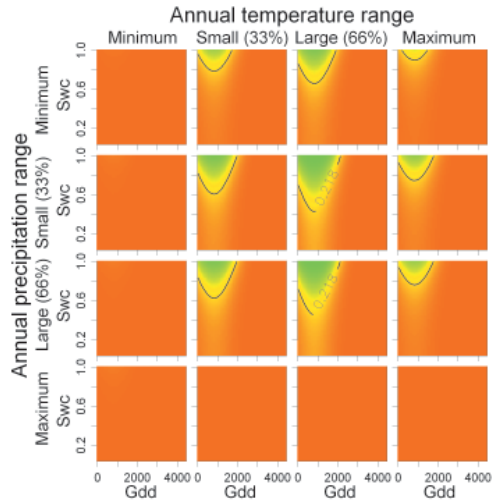
This species is listed in Annexes II and IV of the Habitats’ Directive.

Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.78).

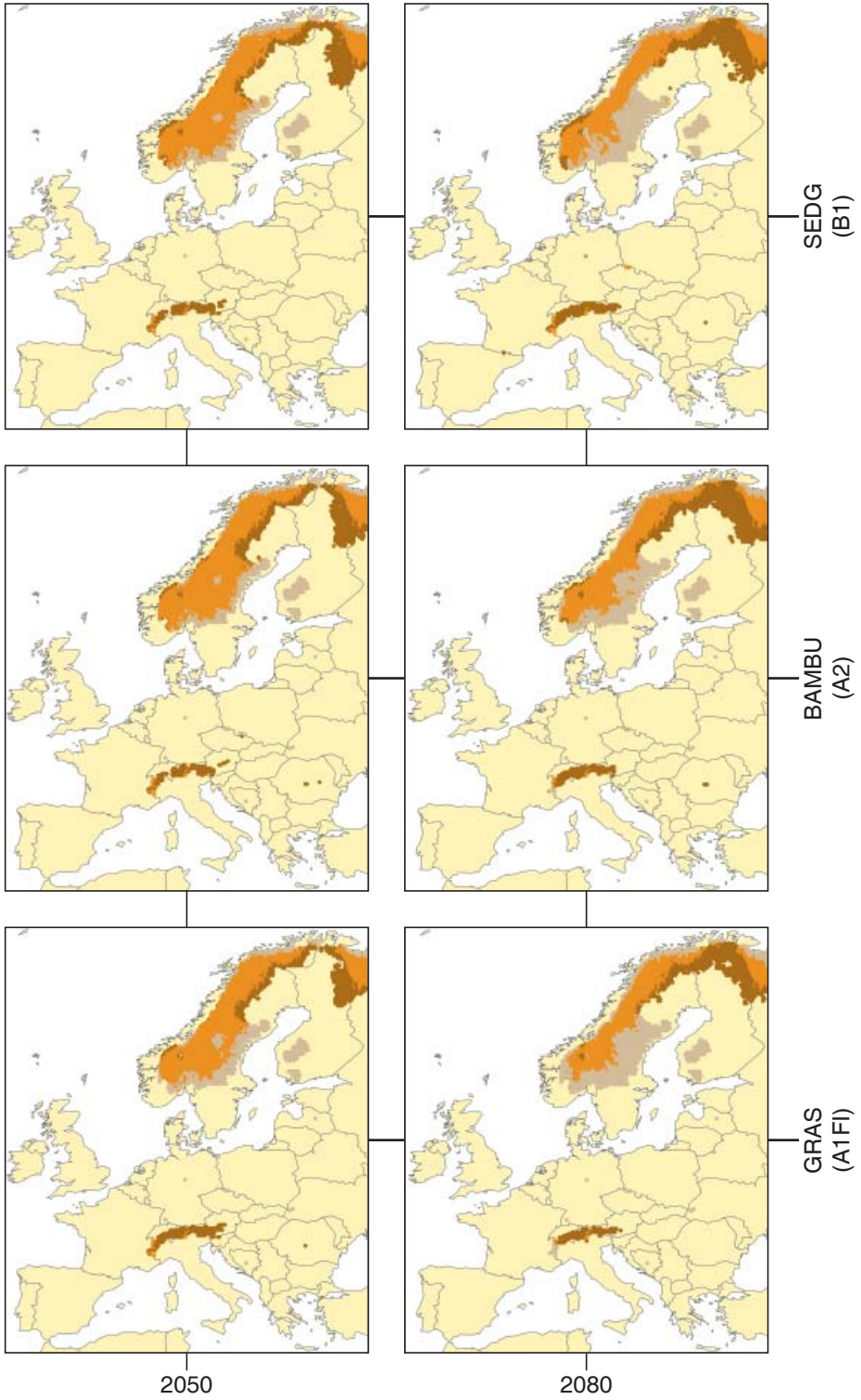
Climate risk category: LR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena dispar (HAWORTH, 1803) – Large Copper



© Josef Settele

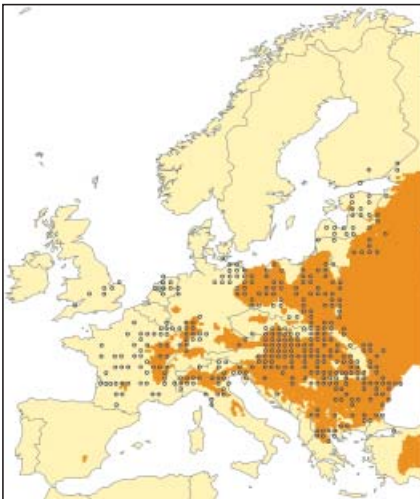
		Full dispersal	No dispersal
2050	SEDG	2192 (27.24%)	-1539 (-19.12%)
	BAMBU	3583 (44.52%)	-1262 (-15.68%)
	GRAS	2980 (37.03%)	-1764 (-21.92%)
2080	SEDG	3656 (45.43%)	-2587 (-32.14%)
	BAMBU	4992 (62.03%)	-3071 (-38.16%)
	GRAS	4375 (54.36%)	-4188 (-52.04%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 8048 cells)

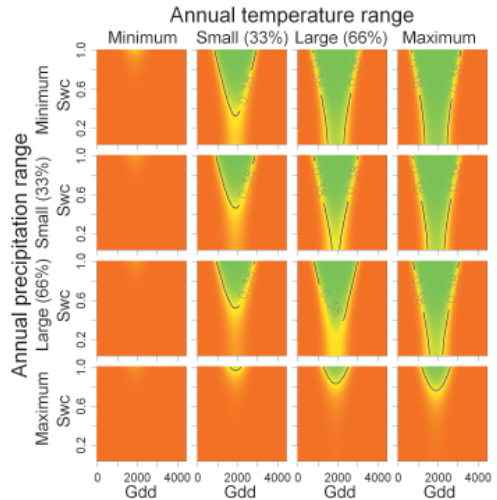
The Large Copper occurs in marshy habitats, and on the peaty banks of lakes, rivers and streams, more to the East also on waste lands. Nectar plants are important for the females, which lay more eggs when there is more food available for them. Eggs are laid on large non-acidic sorrels (like *Rumex crispus*, *R. obtusifolius*, but never *R. acetosa* or *R. acetosella*). The young caterpillars first eat from the underside of the leaves, making the characteristic ‘windows’. Later caterpillars feed on the whole leaf. They hibernate when half-grown between withered leaves at the foot of the foodplant and are sometimes associated with ants (*Myrmica rubra* and *Lasius niger*). The Large Copper has several subspecies in Europe. The subspecies *L. d. batava* has one generation a year, and the others two and sometimes even three. This species is listed in Annexes II and IV of the Habitats’ Directive.

Present distribution can be well explained by climatic variables (AUC = 0.88).

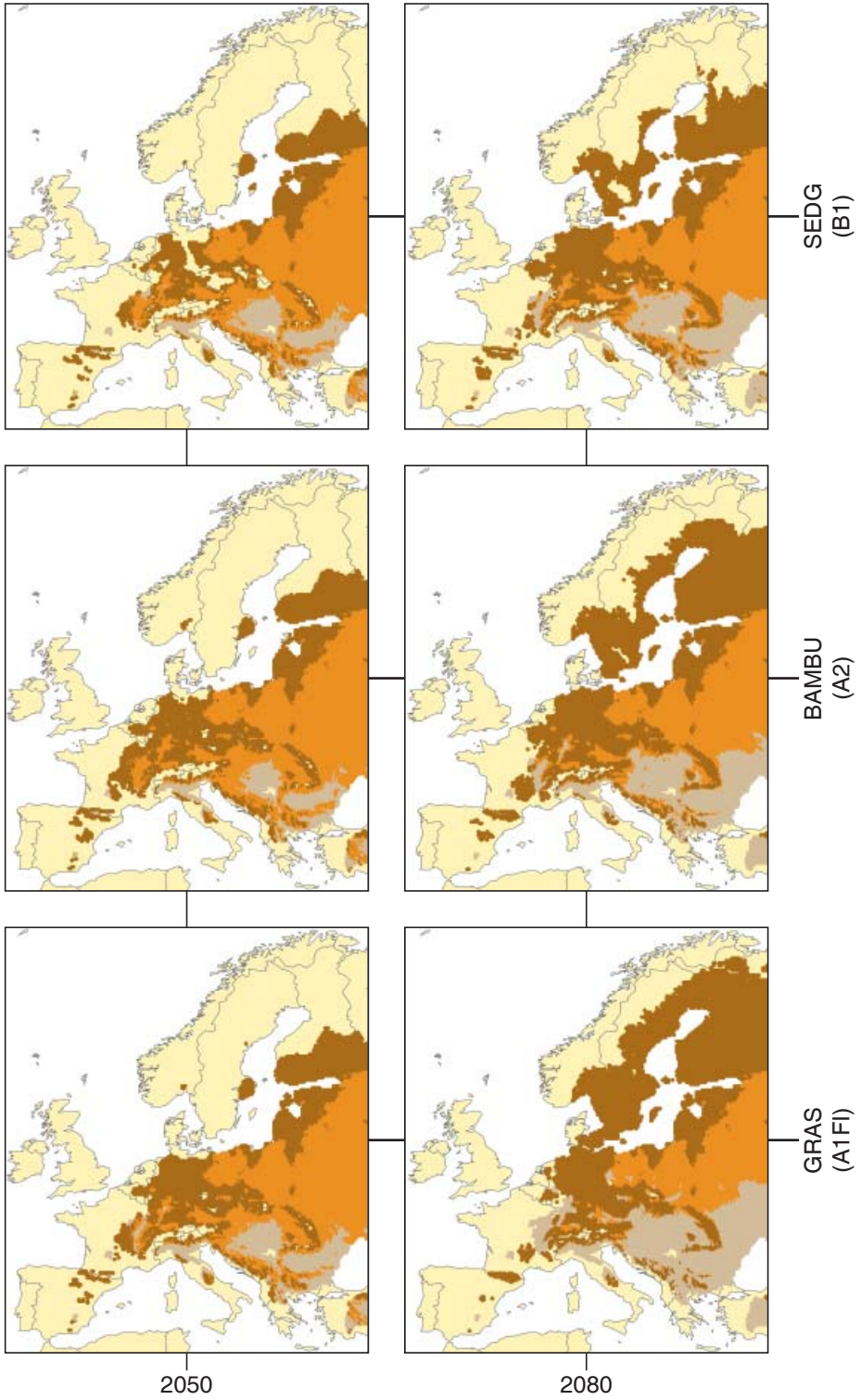
Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena virgaureae (LINNAEUS, 1758) – Scarce Copper



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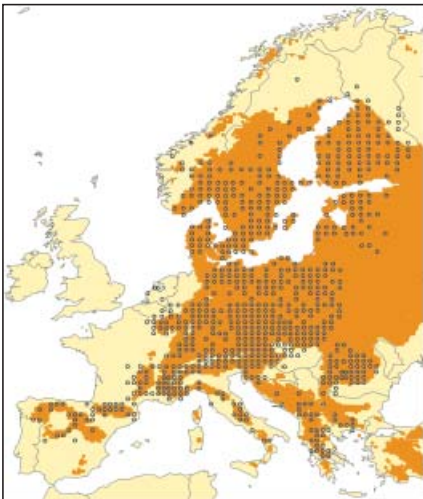
		Full dispersal	No dispersal
2050	SEDG	-780 (-5.26%)	-2762 (-18.63%)
	BAMBU	-2665 (-17.98%)	-3876 (-26.15%)
	GRAS	-3078 (-20.77%)	-4622 (-31.18%)
2080	SEDG	-2694 (-18.18%)	-6097 (-41.13%)
	BAMBU	-5416 (-36.54%)	-8571 (-57.83%)
	GRAS	-7216 (-48.68%)	-10671 (-71.99%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 14822 cells)

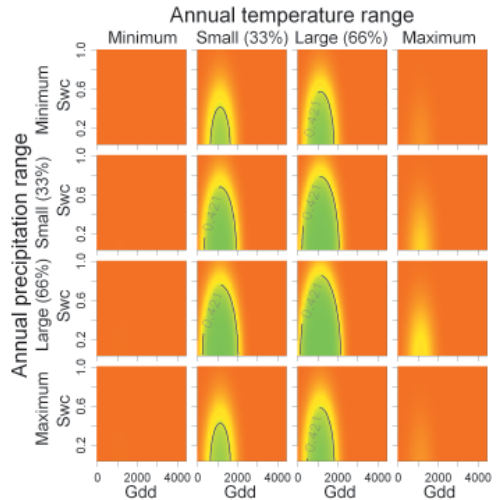
It would be difficult to miss the beautiful and conspicuous Scarce Copper. The white patches on the underside of the hindwing distinguish it from other coppers. It prefers sheltered, flower-rich grassland in or near woods. The female visits a wide range of composites, especially Golden-rod (*Solidago virgaureae*) from where it gets its species name. The female lays her eggs at the base of the flowering stems of acidic sorrels like *Rumex acetosa* and *R. acetosella*. The eggs do not hatch until the following spring when the small caterpillars make a good meal of the new, fresh vegetation. It has one generation a year.

Present distribution can be well explained by climatic variables (AUC = 0.86).

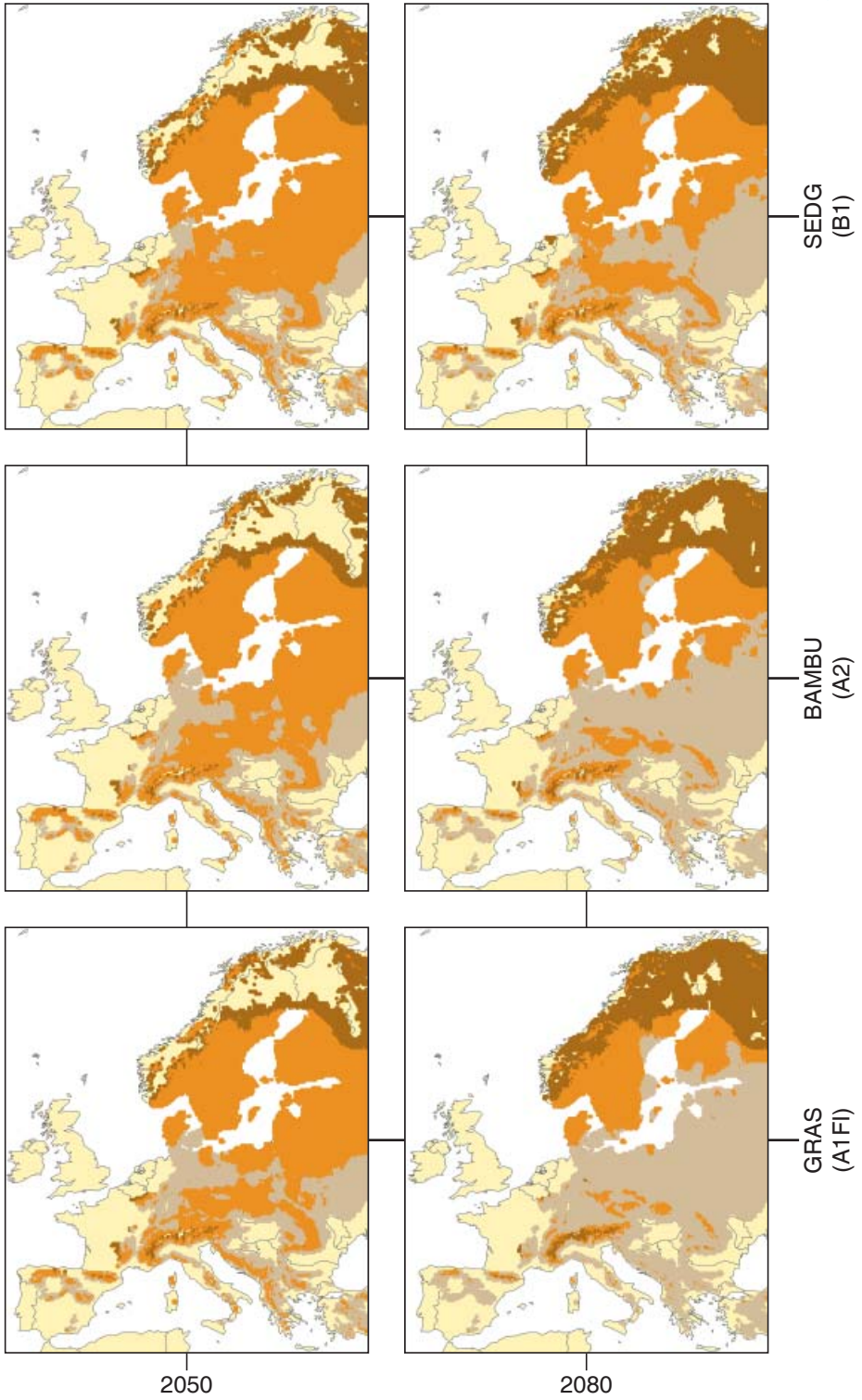
Climate risk category: HR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena ottomana (LEFEBVRE, 1830) – Grecian Copper



© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	103 (21.78%)	-182 (-38.48%)
	BAMBU	72 (15.22%)	-204 (-43.13%)
	GRAS	102 (21.56%)	-247 (-52.22%)
2080	SEDG	264 (55.81%)	-220 (-46.51%)
	BAMBU	-54 (-11.42%)	-346 (-73.15%)
	GRAS	-89 (-18.82%)	-405 (-85.62%)

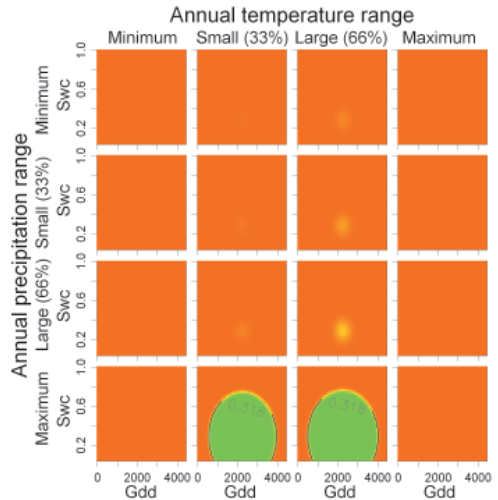
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 473 cells)

The Grecian Copper can be found in low, scrubby vegetation, maquis and woodland clearings and also occurs in dry and moist grassland at the bottom of valleys. It is the males that are usually seen; the females seem to live a more sheltered existence and are difficult to find. However, the males also take cover in trees if disturbed. They fly close to the ground. Sorrel, especially Sheep's Sorrel (*Rumex acetosella*), is used as larval foodplant. This butterfly species has two generations a year.

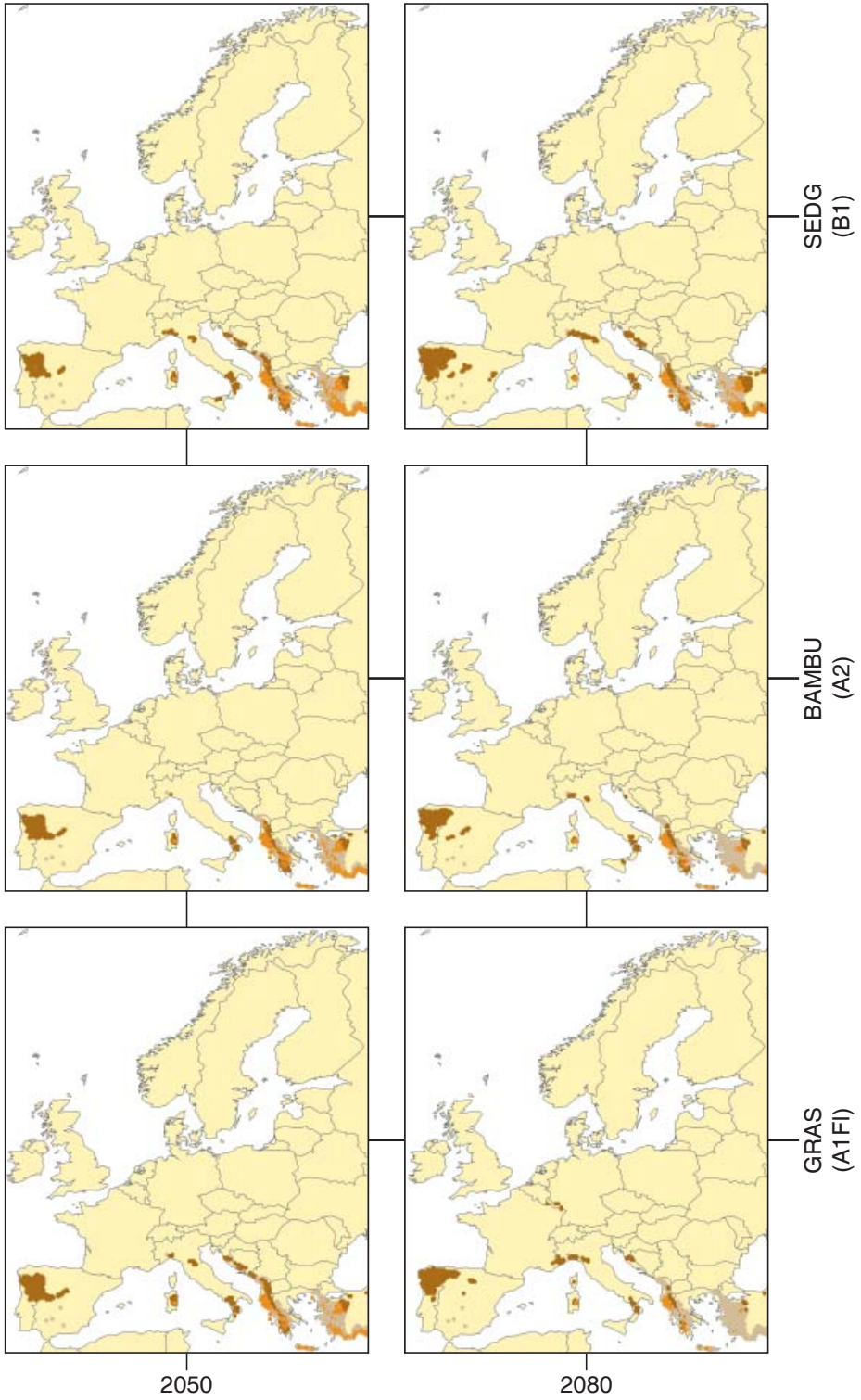
Present distribution can be very well explained by climatic variables (AUC = 0.98).
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena tityrus (PODA, 1761) – Sooty Copper



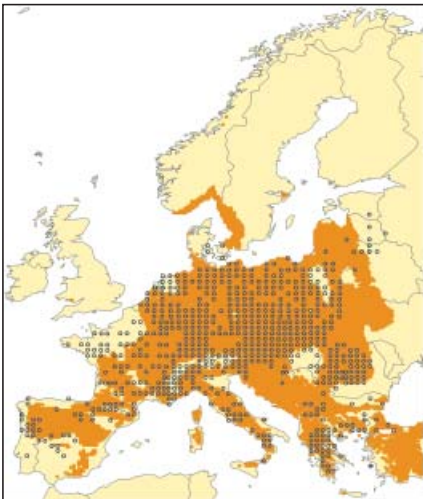
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		Full dispersal	No dispersal
2050	SEDG	119 (1.07%)	-2721 (-24.36%)
	BAMBU	-636 (-5.69%)	-3400 (-30.43%)
	GRAS	-1329 (-11.9%)	-4083 (-36.55%)
2080	SEDG	-2294 (-20.53%)	-5357 (-47.95%)
	BAMBU	-3278 (-29.34%)	-6816 (-61.01%)
	GRAS	-4194 (-37.54%)	-8250 (-73.85%)

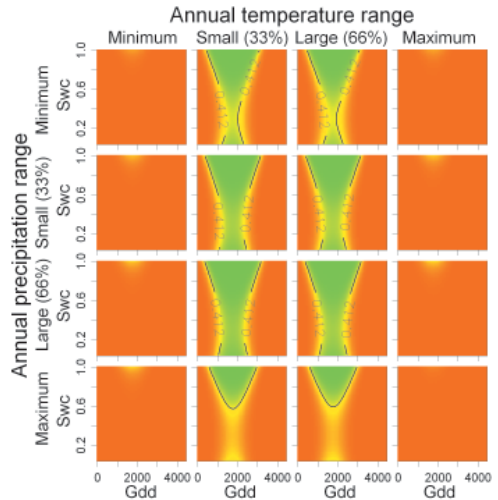
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 11172 cells)

The Sooty Copper is found in a variety of habitats, damp and dry grassland, heathland, bogs, but also scrub and clearings in woodland, mostly in small numbers. Eggs are laid on sorrels (*Rumex* spp.), especially on Common Sorrel (*R. acetosa*). The caterpillar hibernates at the foot of the plant in any of the instars. They pupate in the litter layer. It has up to three generations a year.

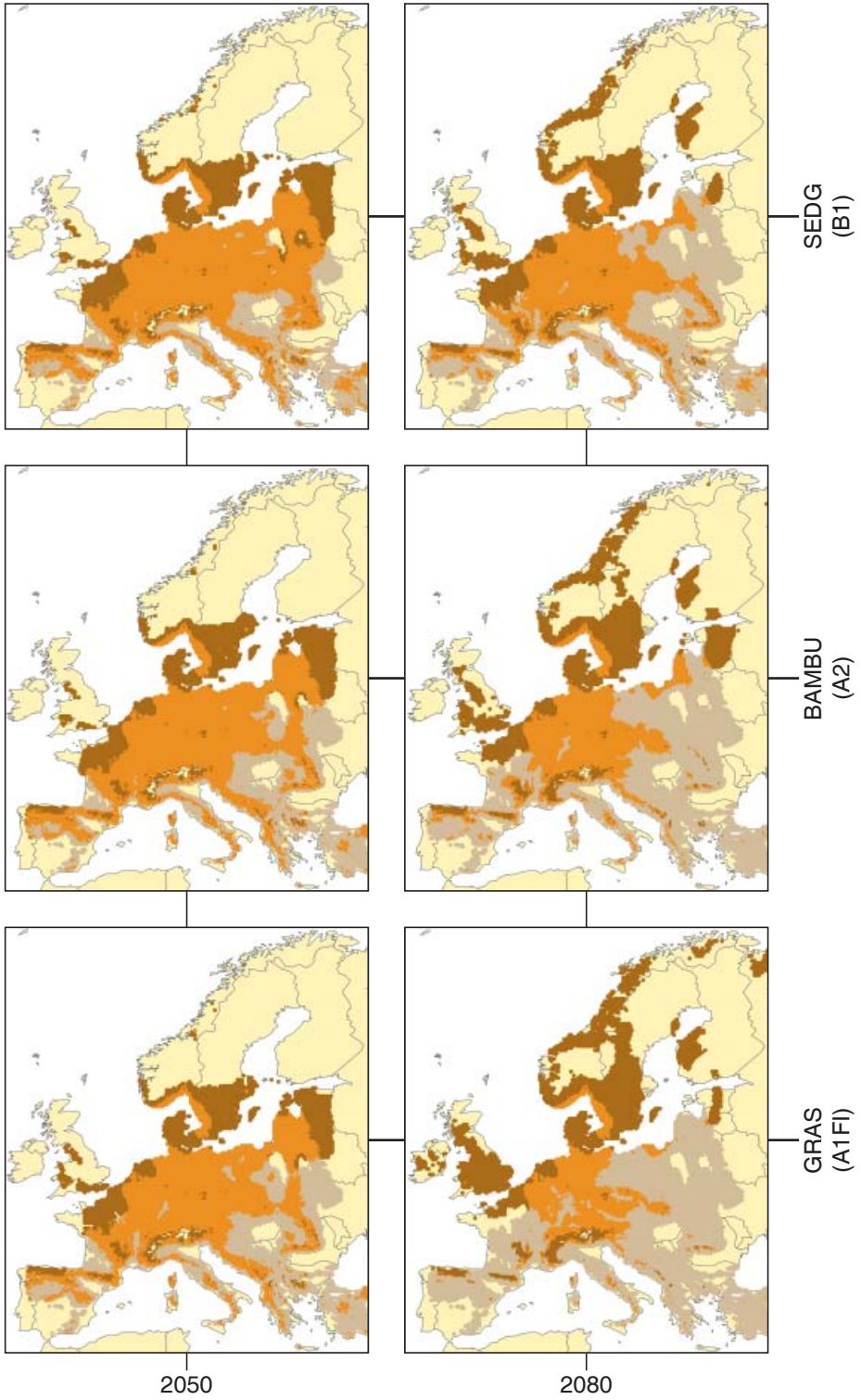
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.82). Climate risk category: HR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena alciphron (ROTTEMBERG, 1775) – Purple-shot Copper



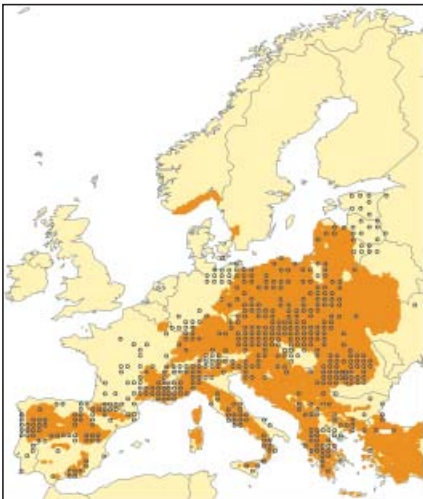
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		Full dispersal	No dispersal
2050	SEDG	-503 (-5.52%)	-2545 (-27.93%)
	BAMBU	-2988 (-32.79%)	-3855 (-42.3%)
	GRAS	-2959 (-32.47%)	-4292 (-47.1%)
2080	SEDG	-1861 (-20.42%)	-5247 (-57.58%)
	BAMBU	-4297 (-47.15%)	-6740 (-73.96%)
	GRAS	-4303 (-47.22%)	-7612 (-83.53%)

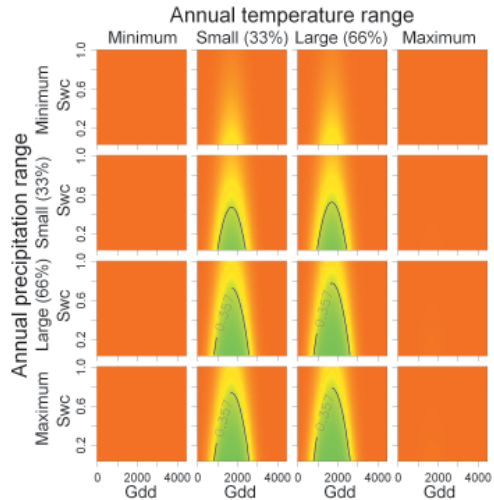
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 9113 cells)

The Purple-shot Copper is found both in damp and dry places on many kinds of flower-rich grassland. Only the male has the beautiful purple sheen on the upperside of its wings. Eggs are laid on sorrels (*Rumex* spp.), mainly Common Sorrel (*R. acetosa*). This butterfly species hibernates as a fully-developed caterpillar in the egg, or in the first instar. The caterpillars are nocturnal. They pupate in the litter layer. It has one generation a year. It hibernates as a caterpillar outside the egg. Across Europe there are different subspecies.

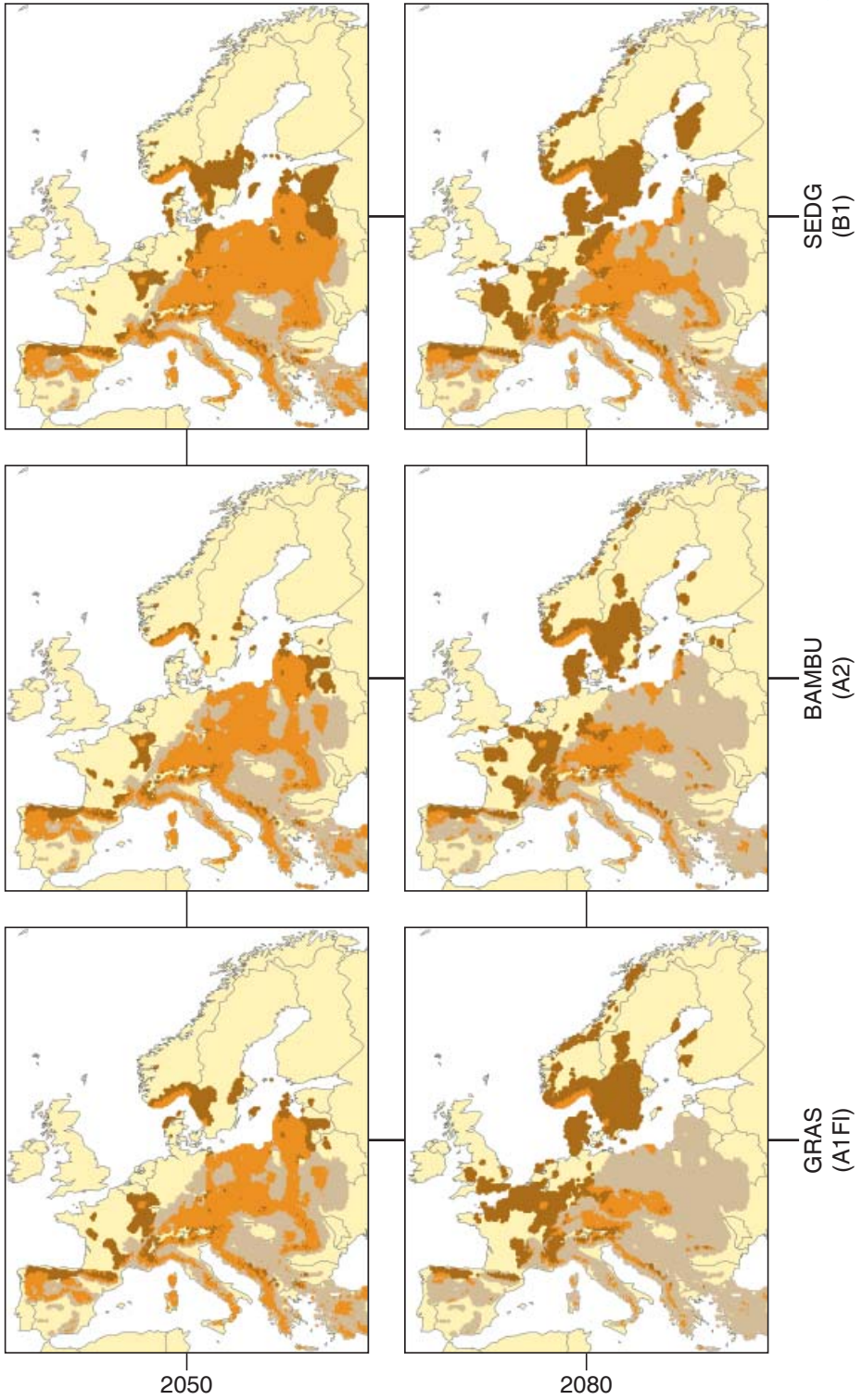
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena hippothoe (LINNAEUS, 1761) – Purple-edged Copper



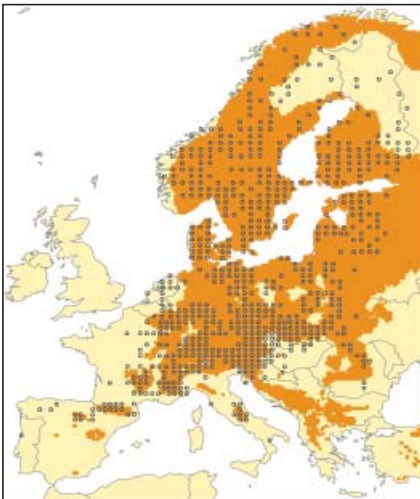
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-4111 (-29.14%)	-5600 (-39.69%)
	BAMBU	-3282 (-23.26%)	-4839 (-34.3%)
	GRAS	-4808 (-34.08%)	-6020 (-42.67%)
2080	SEDG	-5935 (-42.07%)	-7427 (-52.64%)
	BAMBU	-6505 (-46.11%)	-8317 (-58.95%)
	GRAS	-8606 (-61%)	-9862 (-69.9%)

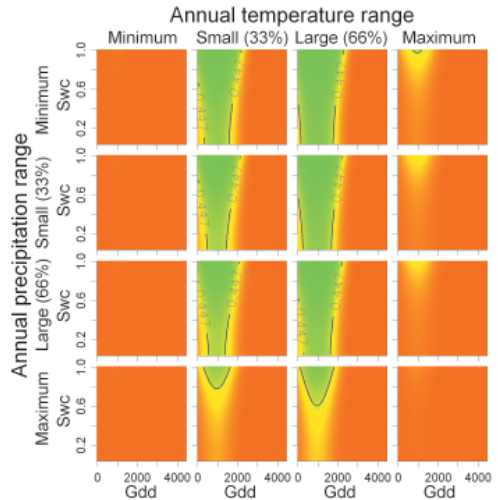
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 14109 cells)

The Purple-edged Copper occurs on wet to damp grasslands, where the male butterflies attract the attention, perched on a tall grass or other plant, watching over their territory. The populations are mostly very local, but in a meadow, the butterflies can often be very numerous. The eggs are laid on various sorrels (*Rumex* spp.). At first the small caterpillar only shaves off a few cell layers on the leaf surface, so making translucent “windows”, but later they feed on the whole leaf. The caterpillar hibernates when still small, and completes its growth in the spring, pupating in the litter layer. It has one brood a year. In southern part of its range the species has two generations and can be found on dry grasslands as well. The Purple-edged Copper has a few subspecies.

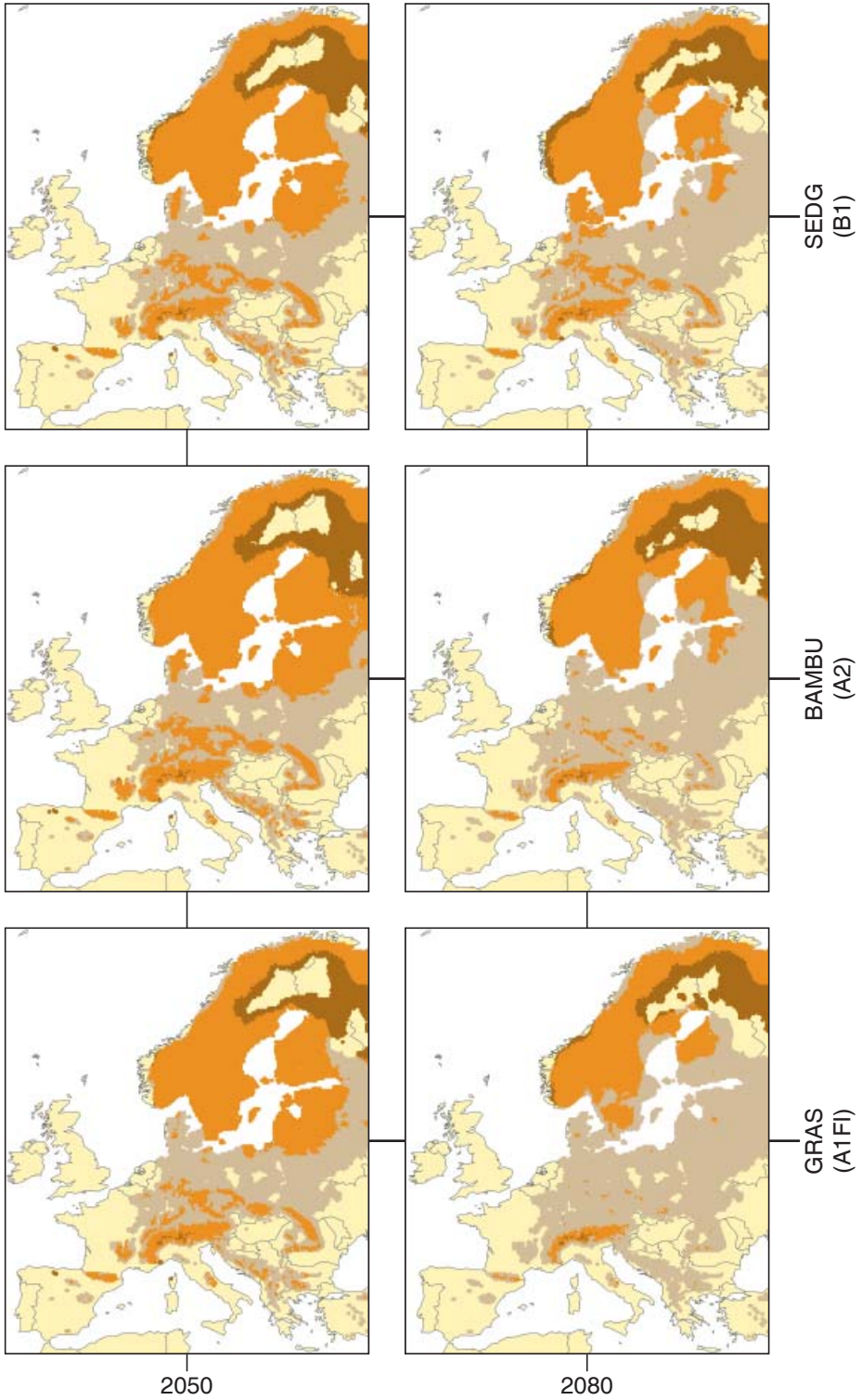
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.85).
Climate risk category: R.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena candens (HERRICH-SCHÄFFER, 1844) – Balkan Copper



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		Full dispersal	No dispersal
2050	SEDG	192 (29.22%)	-289 (-43.99%)
	BAMBU	-161 (-24.51%)	-376 (-57.23%)
	GRAS	-75 (-11.42%)	-414 (-63.01%)
2080	SEDG	70 (10.65%)	-343 (-52.21%)
	BAMBU	-391 (-59.51%)	-564 (-85.84%)
	GRAS	-394 (-59.97%)	-624 (-94.98%)

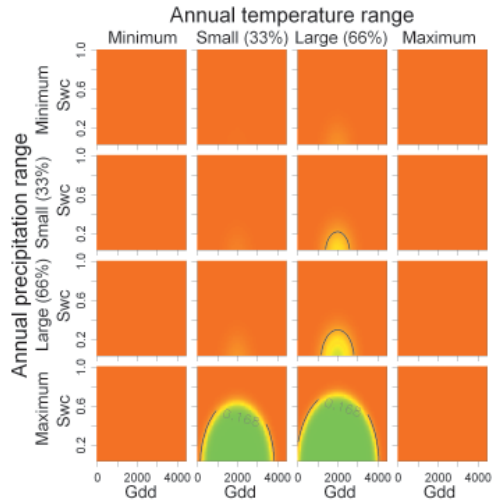
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 657 cells)

The Balkan Copper can be found in damp grassland, sub-alpine and alpine meadows, and in woodland clearings with a well-developed herb layer. Different sorrels (*Rumex* spp.), including Common Sorrel (*R. acetosa*) are used as larval foodplants. It has one generation a year. This butterfly looks very like the Purple-edged Copper (*Lycaena hippothoe*), and used to be classified as a subspecies of it.

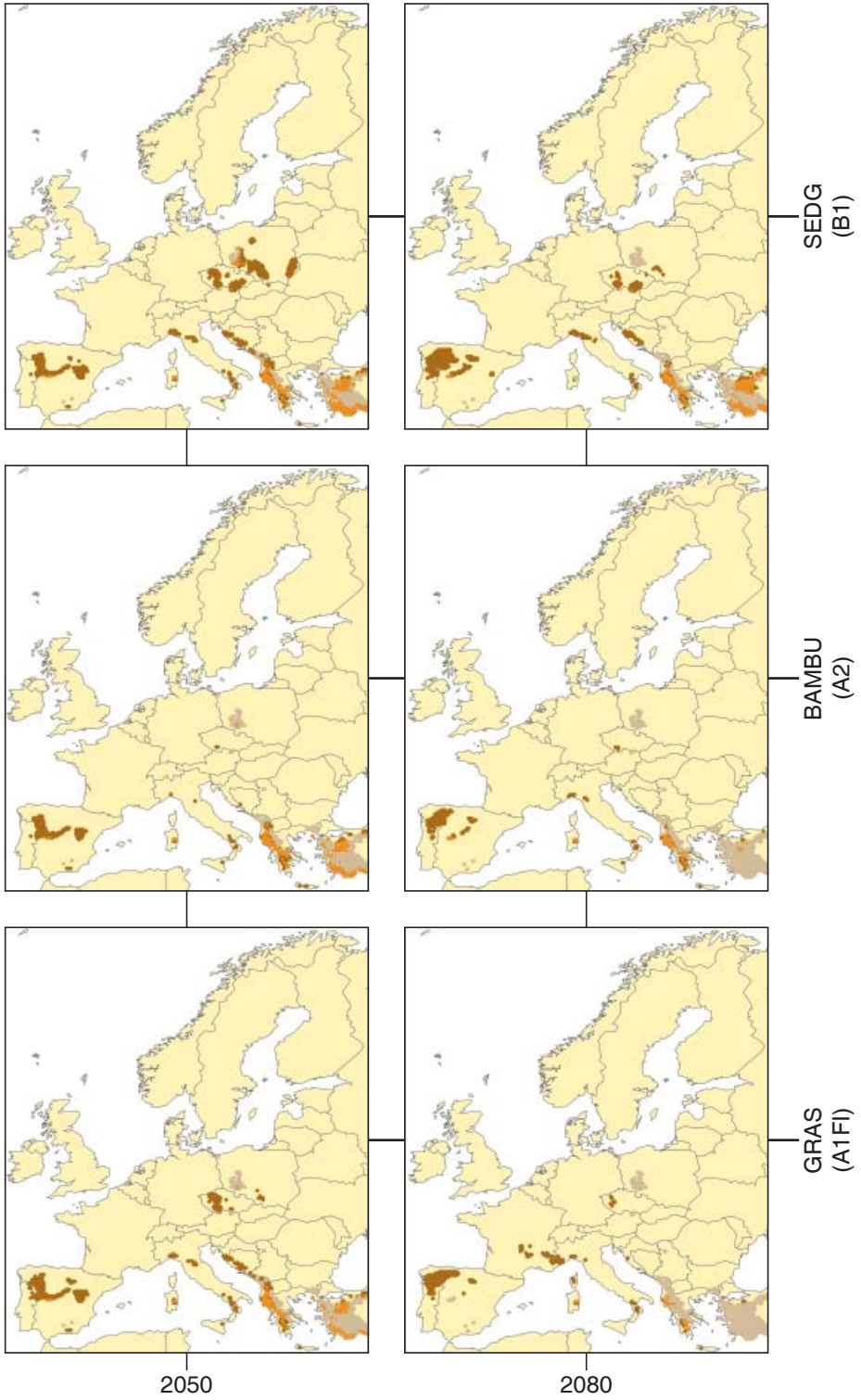
Present distribution can be well explained by climatic variables (AUC = 0.86).
Climate risk category: HHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lycaena thersamon (ESPER, 1784) – Lesser Fiery Copper



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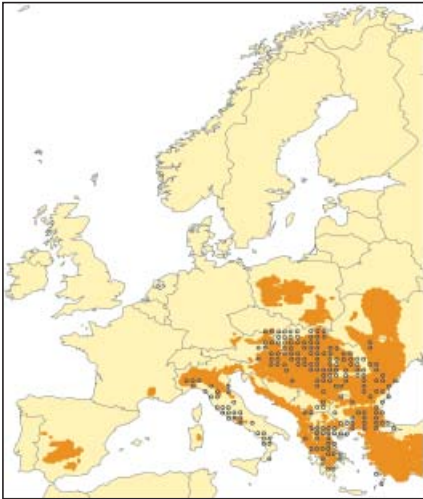
		Full dispersal	No dispersal
2050	SEDG	1838 (40.44%)	-1584 (-34.85%)
	BAMBU	1632 (35.91%)	-1421 (-31.27%)
	GRAS	2941 (64.71%)	-757 (-16.66%)
2080	SEDG	2058 (45.28%)	-3651 (-80.33%)
	BAMBU	574 (12.63%)	-3143 (-69.15%)
	GRAS	2327 (51.2%)	-1739 (-38.26%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 4545 cells)

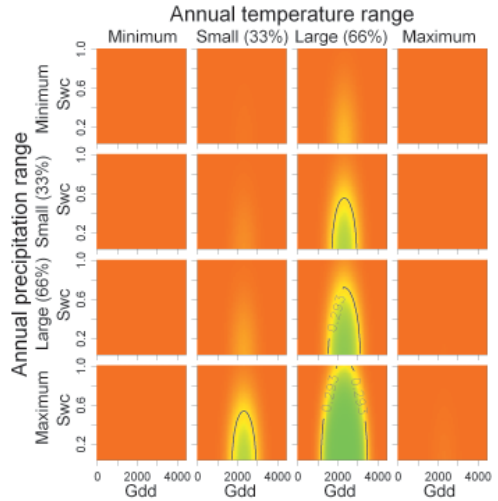
The Lesser Fiery Copper is mostly found on dry, flower-rich grasslands, both on calcareous and acid soils. They are also seen on waste land, very open scrub and rocky slopes. The butterflies are often seen drinking from the flowers of Danewort (*Sambucus ebulus*). Its most important larval foodplant is Knotgrass (*Polygonum aviculare*), although other Polygonaceae species are perhaps also used. The caterpillars feed on both the flowers and the leaves. This butterfly species hibernates as a caterpillar and has several generations a year.

Present distribution can be well explained by climatic variables (AUC = 0.93).

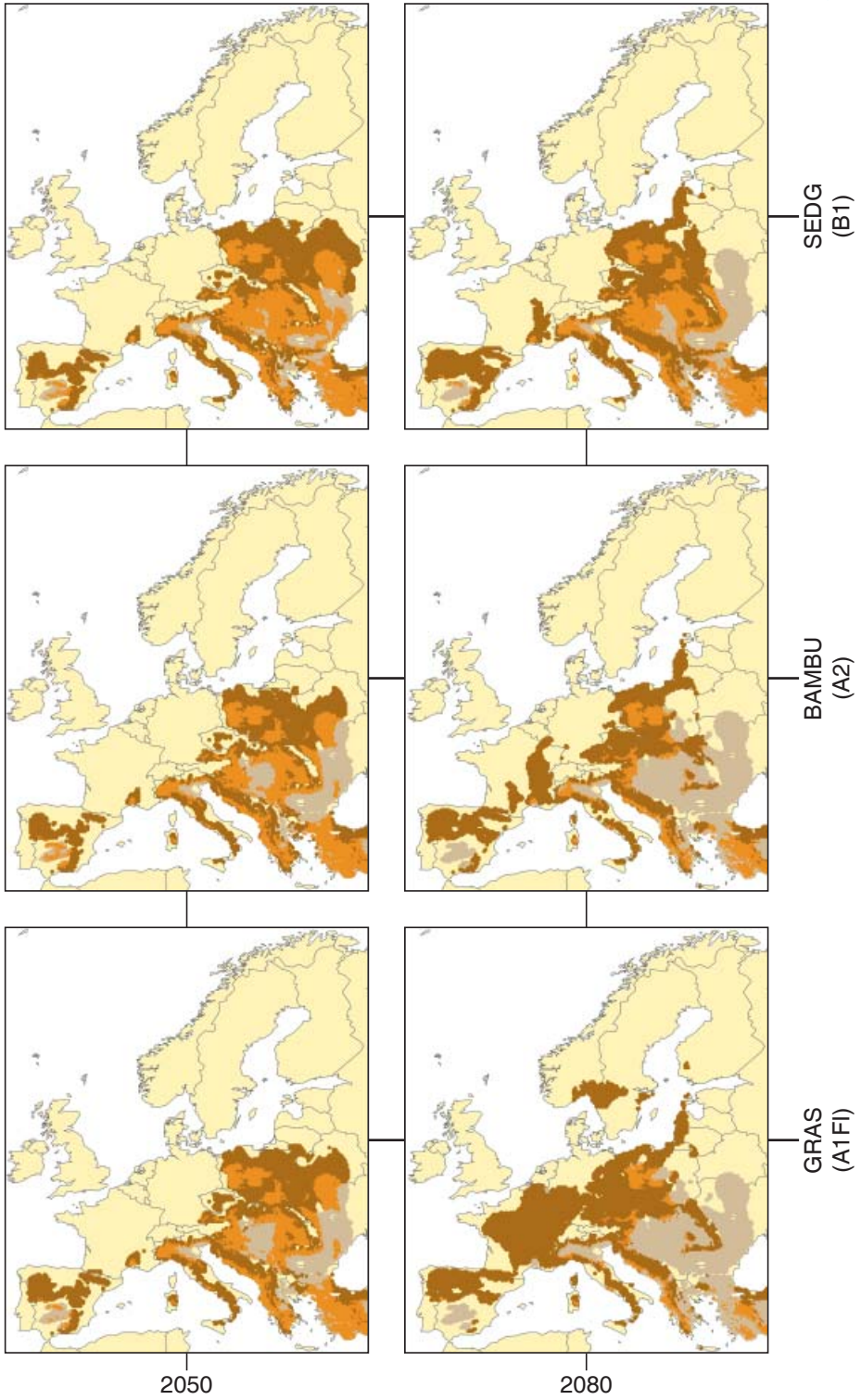
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Thecla betulae (LINNAEUS, 1758) – Brown Hairstreak



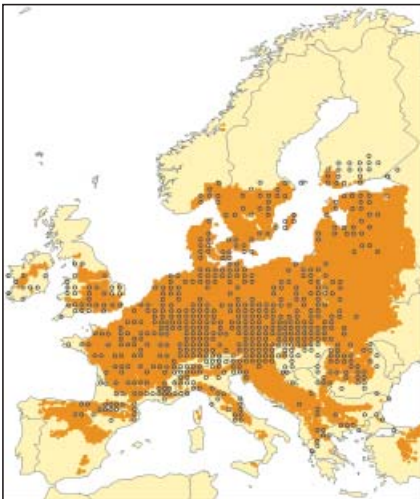
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		Full dispersal	No dispersal
2050	SEDG	-2243 (-17.38%)	-3619 (-28.04%)
	BAMBU	-1298 (-10.06%)	-3214 (-24.9%)
	GRAS	-2925 (-22.66%)	-4462 (-34.57%)
2080	SEDG	-3697 (-28.64%)	-5889 (-45.62%)
	BAMBU	-3110 (-24.09%)	-6912 (-53.55%)
	GRAS	-5029 (-38.96%)	-9532 (-73.85%)

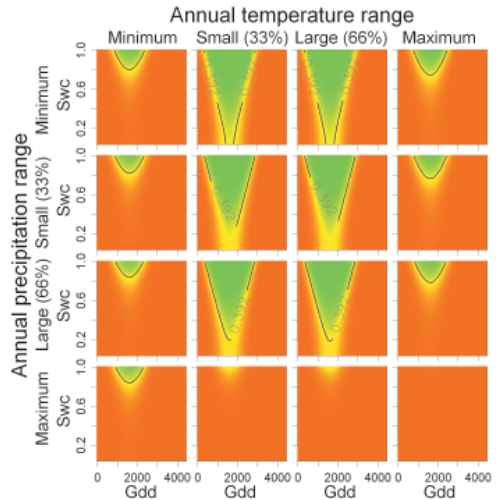
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 12908 cells)

The Brown Hairstreak occurs in scrub, along woodbanks at the edge of deciduous woodland, and in parks, but the butterfly is rarely seen. However, the eggs that are laid at the base of the buds of various *Prunus* species are easy to find. In the winter the pearly-white eggs show up on the bare twigs of the shrubs or trees. The egg, thus, hibernates, hatching in the spring. The small caterpillar bores its way into a bud, hollowing it out, later on also eating the leaves of Blackthorn (*Prunus spinosa*), but also cultivated species of *Prunus*, such as plum and cherry trees. The caterpillars are visited by ants of the genera *Lasius* and *Formica*. They pupate in the shrub layer under the tree serving as foodplant. This butterfly species is single-brooded.

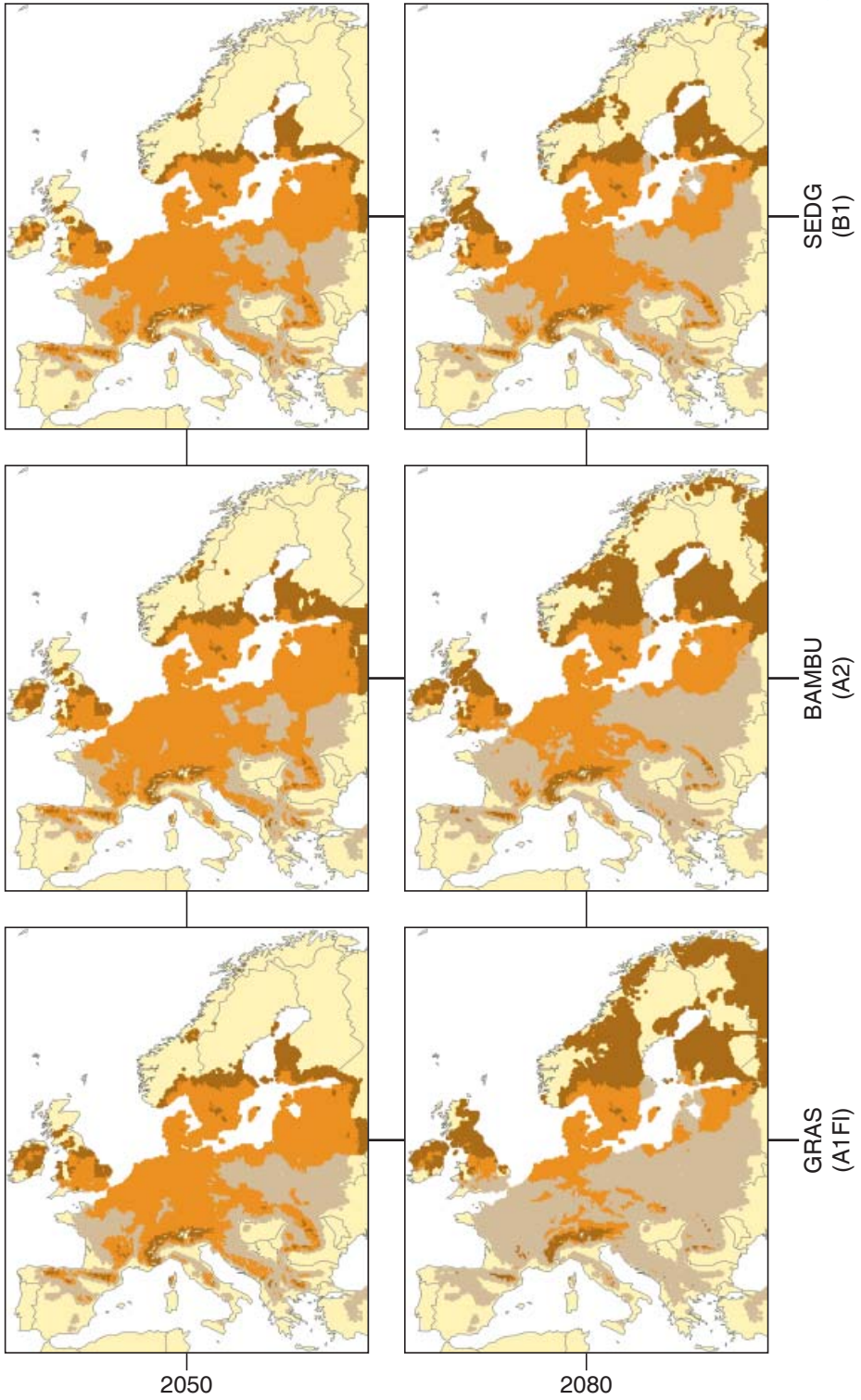
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.79).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Favonius quercus (LINNAEUS, 1758) – Purple Hairstreak



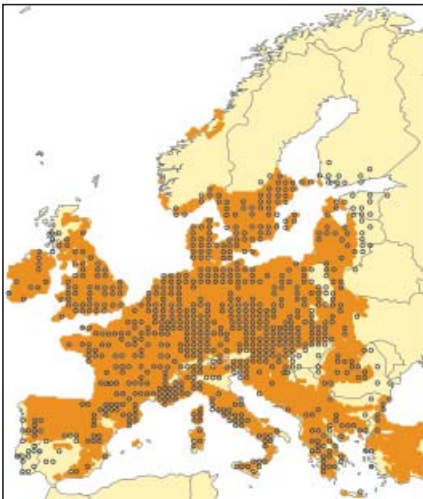
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-2079 (-14.97%)	-3083 (-22.2%)
	BAMBU	-2778 (-20.01%)	-3767 (-27.13%)
	GRAS	-3105 (-22.36%)	-4170 (-30.03%)
2080	SEDG	-4962 (-35.73%)	-5822 (-41.93%)
	BAMBU	-6242 (-44.95%)	-7466 (-53.77%)
	GRAS	-7703 (-55.47%)	-9184 (-66.14%)

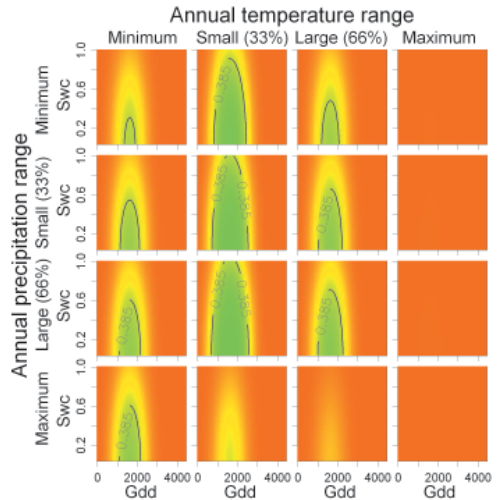
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 13886 cells)

The Purple Hairstreak is only found around oaks, its only foodplant. Although the butterflies need food, they do not visit flowers. Instead, they remain near the tree, looking for leaves with a layer of honeydew left behind by aphids. This sugary secretion is the butterflies' most important source of energy. The eggs are laid at the base of the buds. The small caterpillar has developed by the time winter comes, but it remains in the egg, emerging in the spring to feed on the buds and also on the flowers of the oak. It does not eat the leaves and is sometimes visited by ants of the genus *Lasius*. When mature, the caterpillars leave the foodplant, and pupate in the moss layer. The Purple Hairstreak has one generation a year.

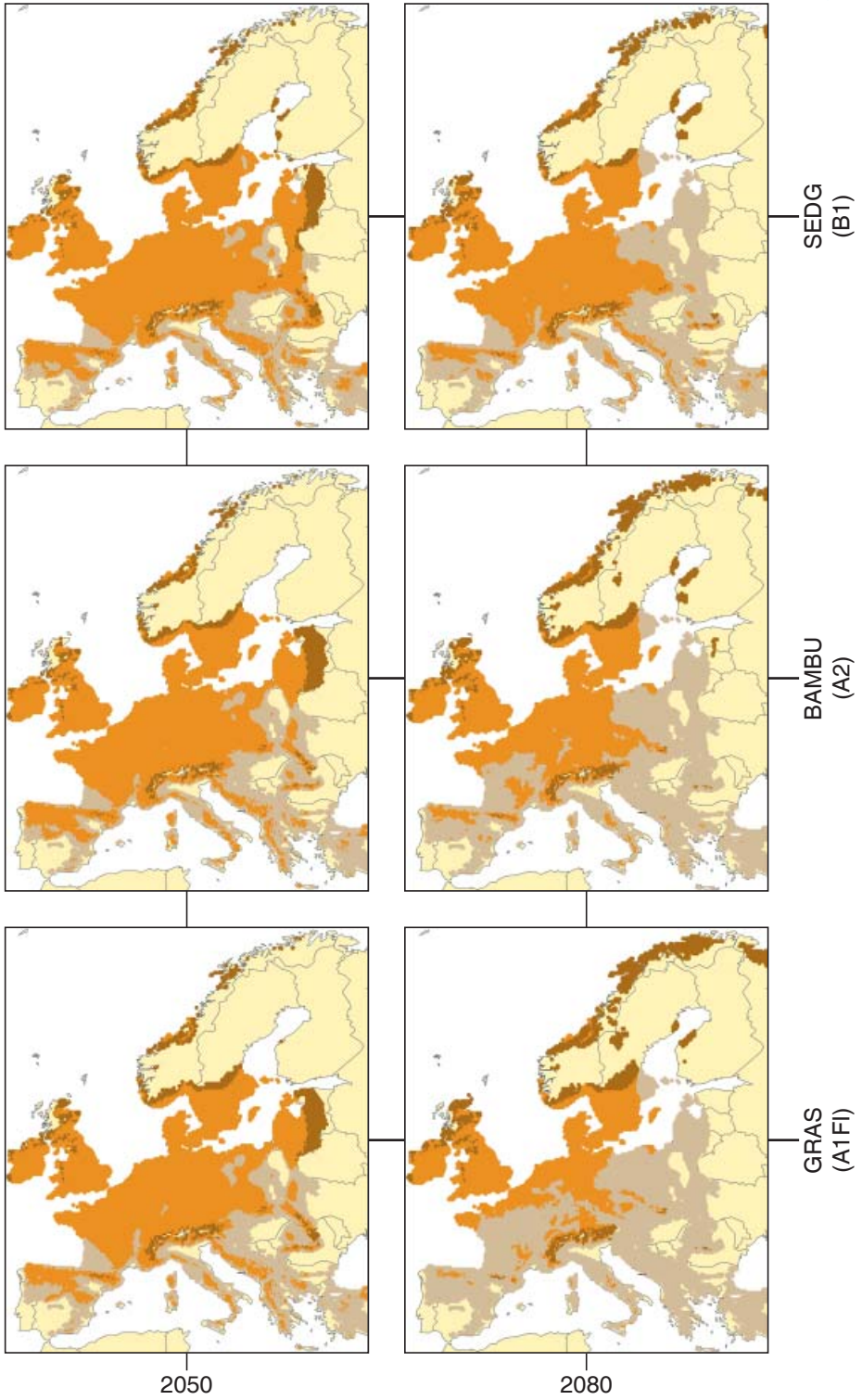
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.72). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Laeosopis roboris (ESPER, 1793) – Spanish Purple Hairstreak



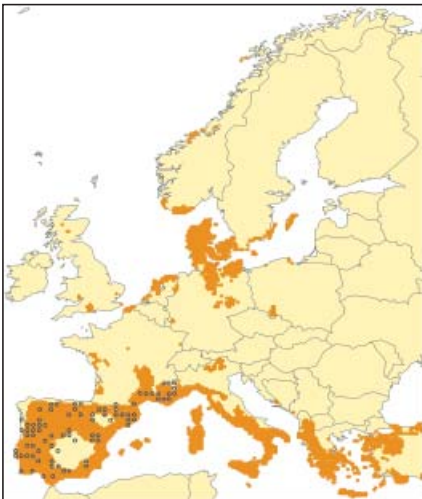
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-912 (-22.66%)	-2173 (-54%)
	BAMBU	-1864 (-46.32%)	-2456 (-61.03%)
	GRAS	-1551 (-38.54%)	-2621 (-65.13%)
2080	SEDG	-1773 (-44.06%)	-2963 (-73.63%)
	BAMBU	-2535 (-63%)	-3335 (-82.88%)
	GRAS	-2757 (-68.51%)	-3709 (-92.17%)

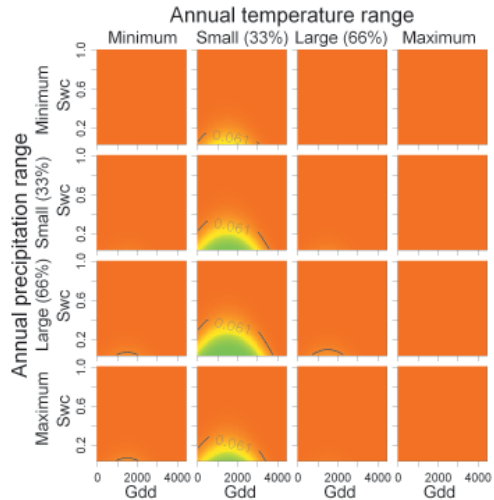
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 4024 cells)

The Spanish Purple Hairstreak occurs in damp, deciduous woods, on rough vegetation beside streams and rivers, and in parkland. The butterflies spend most of their time in the top of ash trees, the larval foodplant, and are difficult to see. The female lays her eggs on Ash (*Fraxinus excelsior*) and other species of *Fraxinus*, and possibly also Common Privet (*Ligustrum vulgare*). The eggs remain on the tree for the rest of the summer, autumn and winter. The small caterpillars that emerge in the spring, feed on the flowers and new leaves of the foodplants. They are visited by ants of the genus *Lasius*. They pupate among the leaf litter. This species has one brood a year.

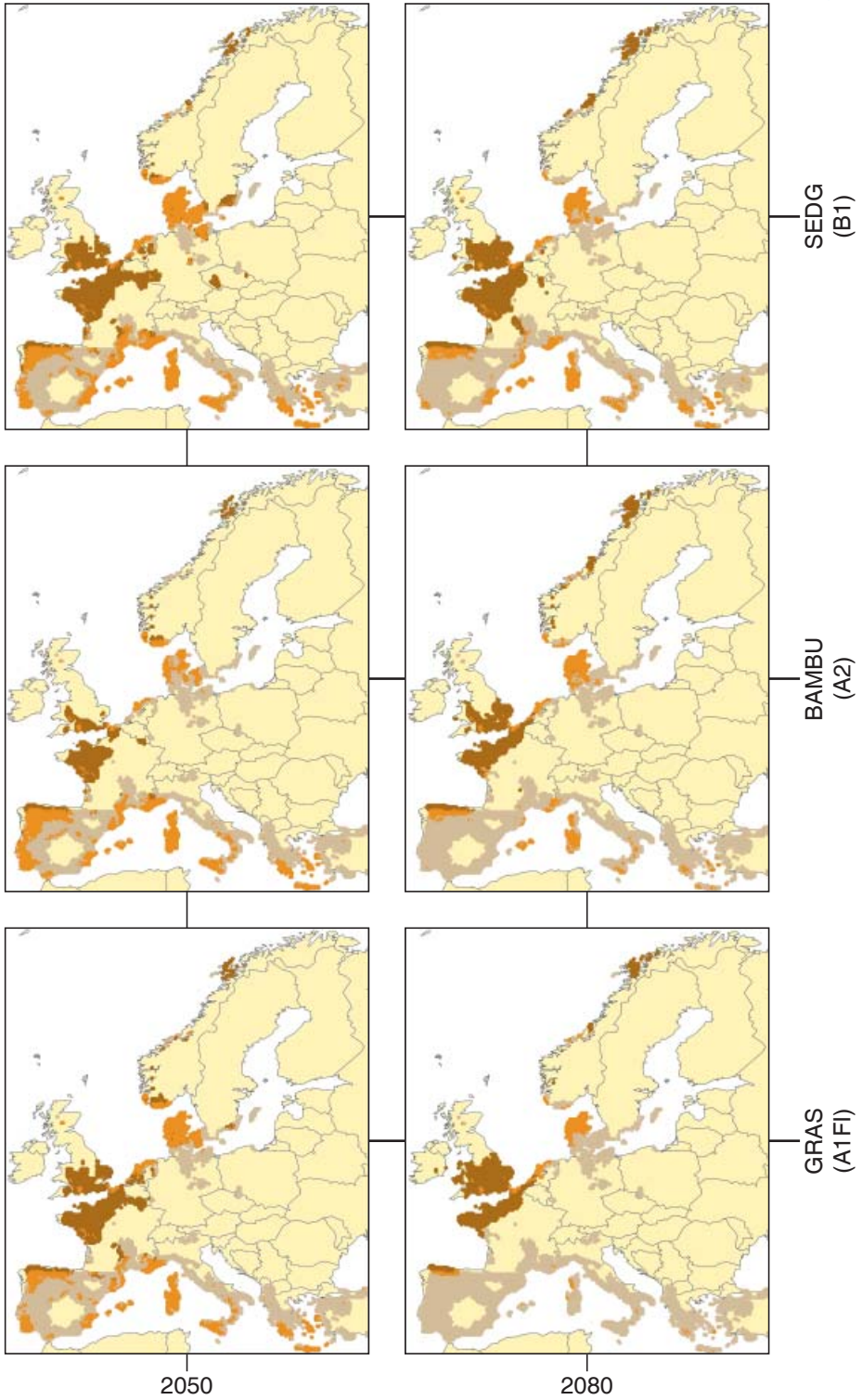
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.81).
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Tomares ballus (FABRICIUS, 1787) – Provence Hairstreak



© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-285 (-71.79%)	-309 (-77.83%)
	BAMBU	-296 (-74.56%)	-315 (-79.35%)
	GRAS	-316 (-79.6%)	-341 (-85.89%)
2080	SEDG	-309 (-77.83%)	-358 (-90.18%)
	BAMBU	-340 (-85.64%)	-368 (-92.7%)
	GRAS	-386 (-97.23%)	-394 (-99.24%)

Changes in climatic niche distribution
(in 10⁴ × 10⁴ grid cells; present niche space: 397 cells)

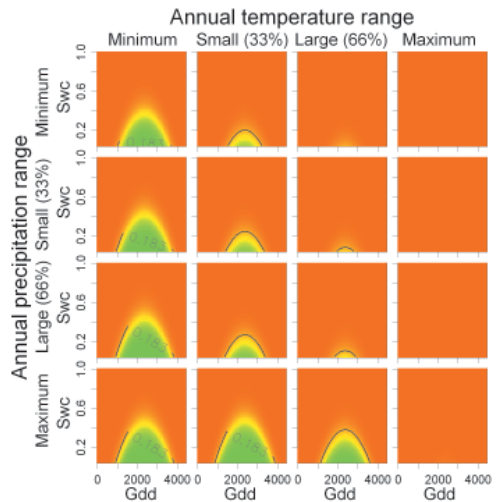
The Provence Hairstreak can be found on abandoned agricultural land, especially on calcareous soils, in abandoned vineyards and bushy areas. Various leguminous plants are used as larval foodplant, including Bladder Vetch (*Anthyllis tetraphylla*), Dorycnium hirsutum, Iberian Milk-vetch (*Astragalus lusitanicus*), Hairy Medick (*Medicago polymorpha*), Black Medick (*M. lupulina*) and birdsfoot-trefoils (*Lotus* spp.). The female deposits her eggs singly on the unopened leaves. The caterpillars are sometimes attended by ants (e.g. *Plagiolepis pygmaea*). This species has one generation a year, and passes the winter as a pupa in the soil.

Present distribution can be well explained by climatic variables (AUC = 0.91).

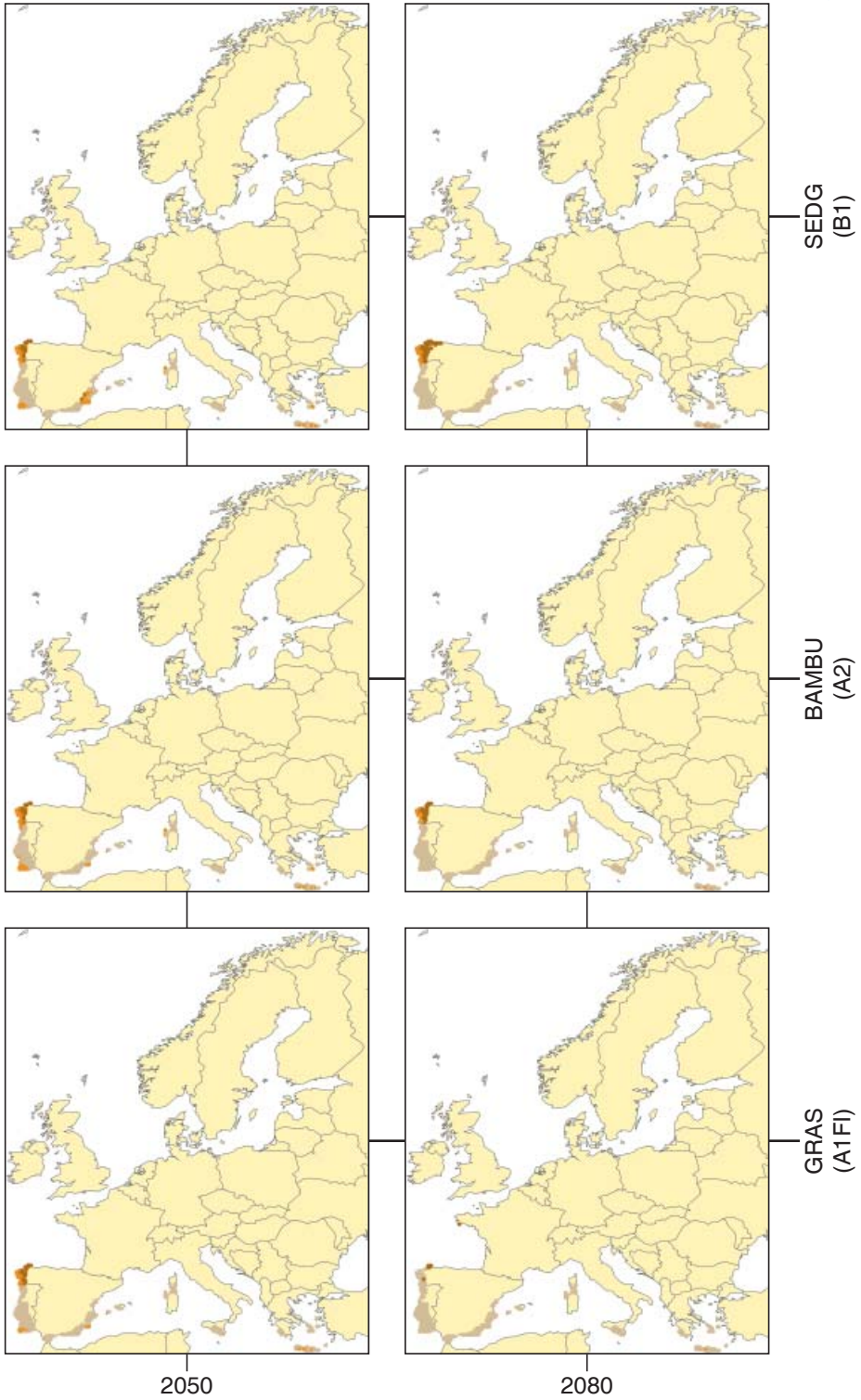
Climate risk category: HHHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Callophrys rubi (LINNAEUS, 1758) – Green Hairstreak



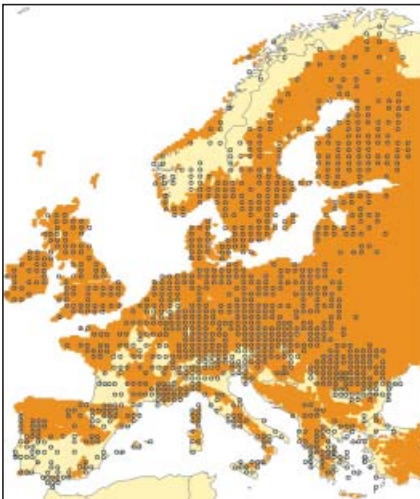
© Peter Ginzinger

		Full dispersal	No dispersal
2050	SEDG	-2600 (-12.16%)	-3401 (-15.91%)
	BAMBU	-3921 (-18.34%)	-4487 (-20.99%)
	GRAS	-4049 (-18.94%)	-4842 (-22.65%)
2080	SEDG	-4212 (-19.7%)	-5250 (-24.56%)
	BAMBU	-7570 (-35.41%)	-8595 (-40.2%)
	GRAS	-10212 (-47.76%)	-11497 (-53.77%)

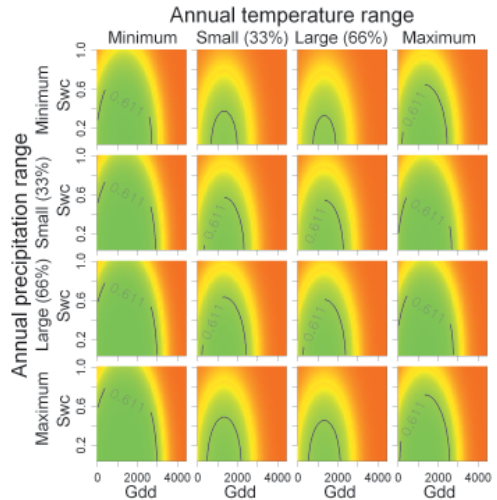
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 21380 cells)

The Green Hairstreak can be found on poor grassland, heathland and at the edges of bogs and marshes. The butterflies like resting in trees and shrubs, such as Alder Buckthorn (*Frangula alnus*), where they are well hidden by their green colour. However, a sharp tap on a branch brings tens of them out into the air. The Green Hairstreak is extremely polyphagous. The eggs are laid on a variety of plants, including Heather (*Erica* spp.), rockroses (*Helianthemum* spp.), and Alder Buckthorn (*Frangula alnus*), leguminous plants and species of Rosaceae. The caterpillars feed on the buds, flowers and young leaves. They pupate in the litter layer and the pupa hibernates. The Green Hairstreak is single-brooded.

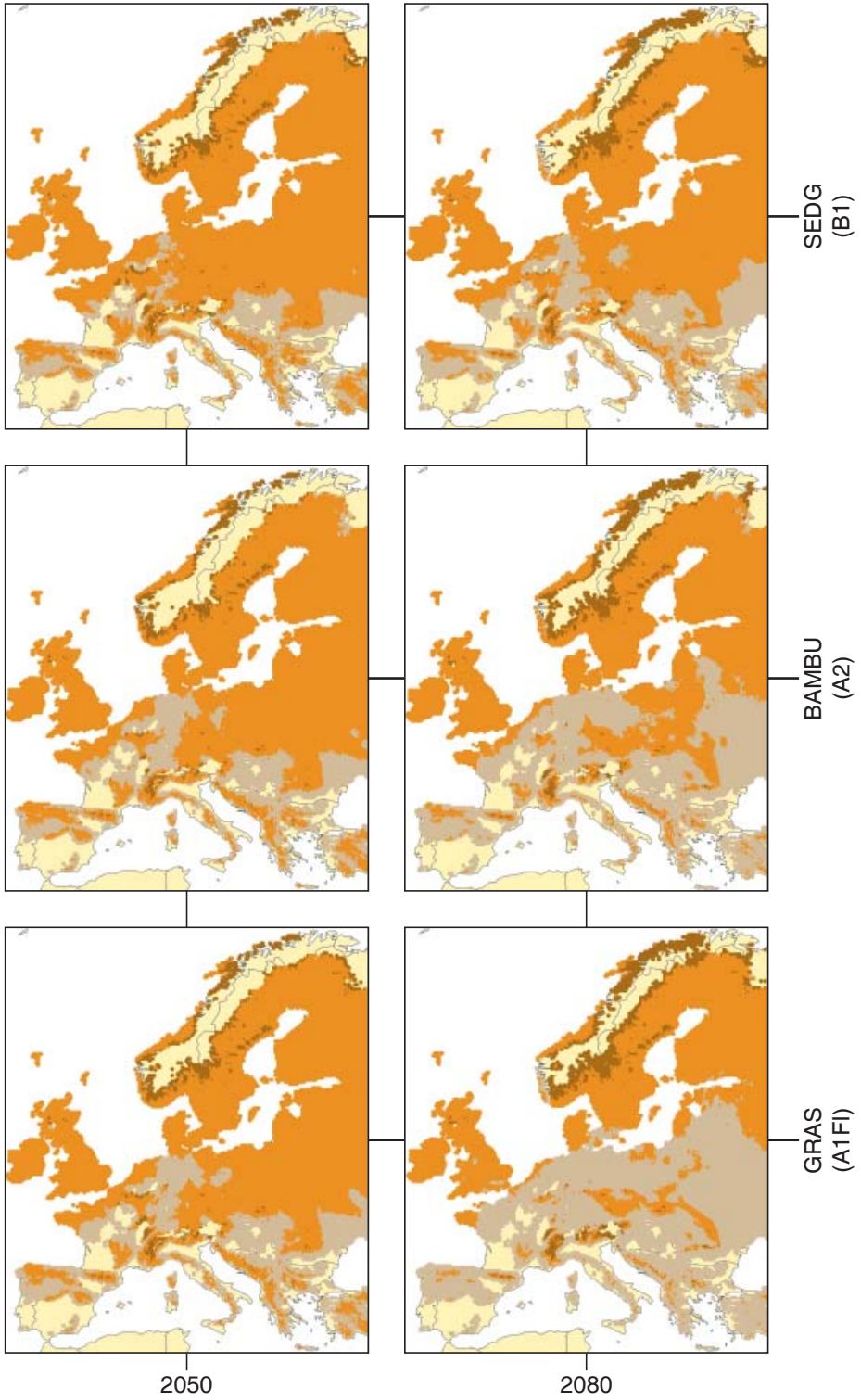
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.63). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Callophrys avis CHAPMAN, 1909 – Chapman’s Green Hairstreak



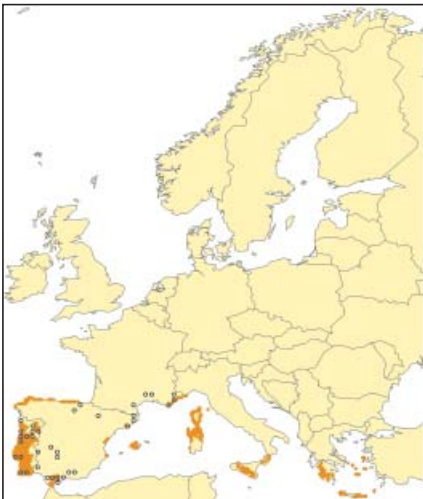
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-283 (-65.36%)	-386 (-89.15%)
	BAMBU	-320 (-73.9%)	-378 (-87.3%)
	GRAS	-275 (-63.51%)	-390 (-90.07%)
2080	SEDG	-294 (-67.9%)	-408 (-94.23%)
	BAMBU	-303 (-69.98%)	-415 (-95.84%)
	GRAS	-243 (-56.12%)	-425 (-98.15%)

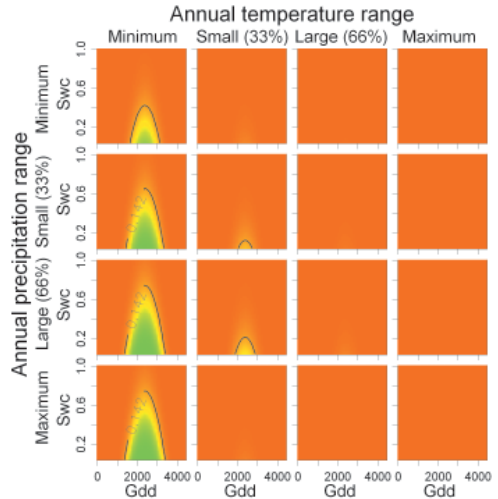
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 433 cells)

Chapman’s Green Hairstreak is mostly found in woods and scrubs where the Strawberry Tree (*Arbutus unedo*) grows. The female chooses the young leaves of the older, larger bushes on which to lay her eggs. *Coriaria myrtifolia* and the broom *Cytisus malacitanus* ssp. *catalaunicus* have also been named as foodplants. It pupates on the ground at the foot of the foodplant. It is single-brooded.

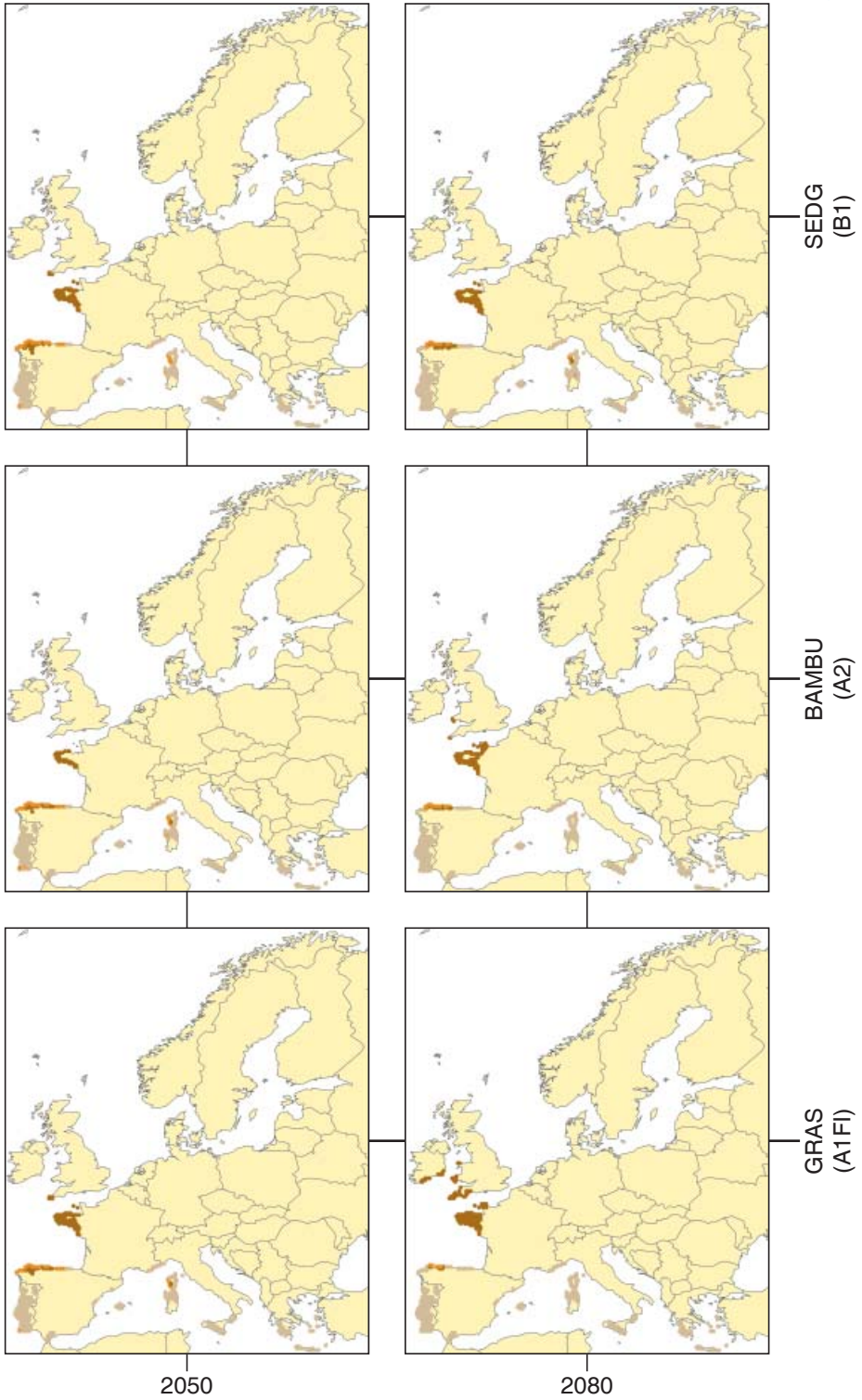
Present distribution can be well explained by climatic variables (AUC = 0.9).
Climate risk category: HHHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tertile, upper tertile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrrium w-album (KNOCH, 1782) – White-letter Hairstreak



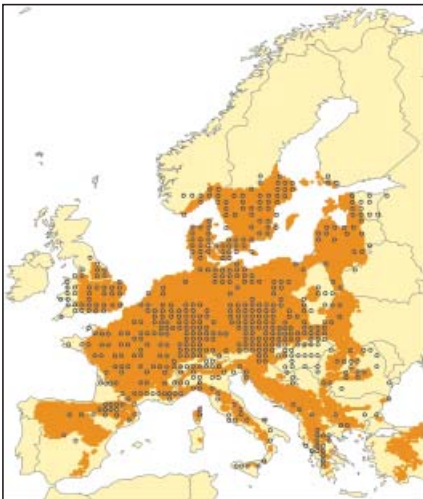
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-1917 (-17.27%)	-2641 (-23.79%)
	BAMBU	-2141 (-19.28%)	-2955 (-26.61%)
	GRAS	-2827 (-25.46%)	-3629 (-32.68%)
2080	SEDG	-4836 (-43.56%)	-5477 (-49.33%)
	BAMBU	-5644 (-50.83%)	-6698 (-60.33%)
	GRAS	-7380 (-66.47%)	-8657 (-77.97%)

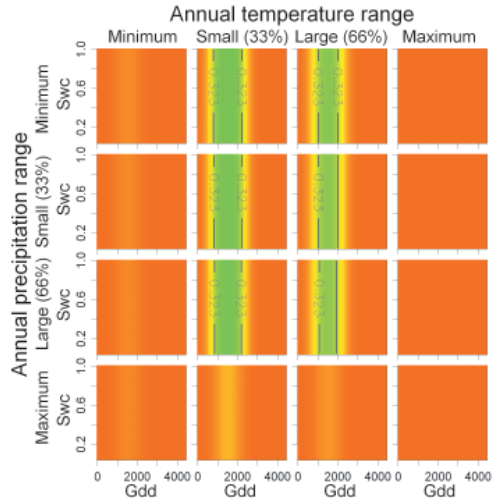
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 11103 cells)

The White-letter Hairstreak usually occurs where there is a group of elm (*Ulmus* spp.) trees, either growing in a wood, or apart, sometimes even in the centre of a large town. However, there are populations known that occupy a solitary tree. The eggs are laid on the wood at the base of the flower buds, the female favouring terminal buds situated at the top of the tree. The small caterpillar stays inside the egg during the winter months, emerging in the spring, boring its way into a flowerbud. It feeds on flowerbuds and flowers, but not on leaves. A non-flowering tree is therefore not a suitable foodplant. The caterpillars are sometimes visited by ants of the genus *Lasius* and *Formica* and pupate in the litter layer under the tree. The White-Letter Hairstreak has one generation a year.

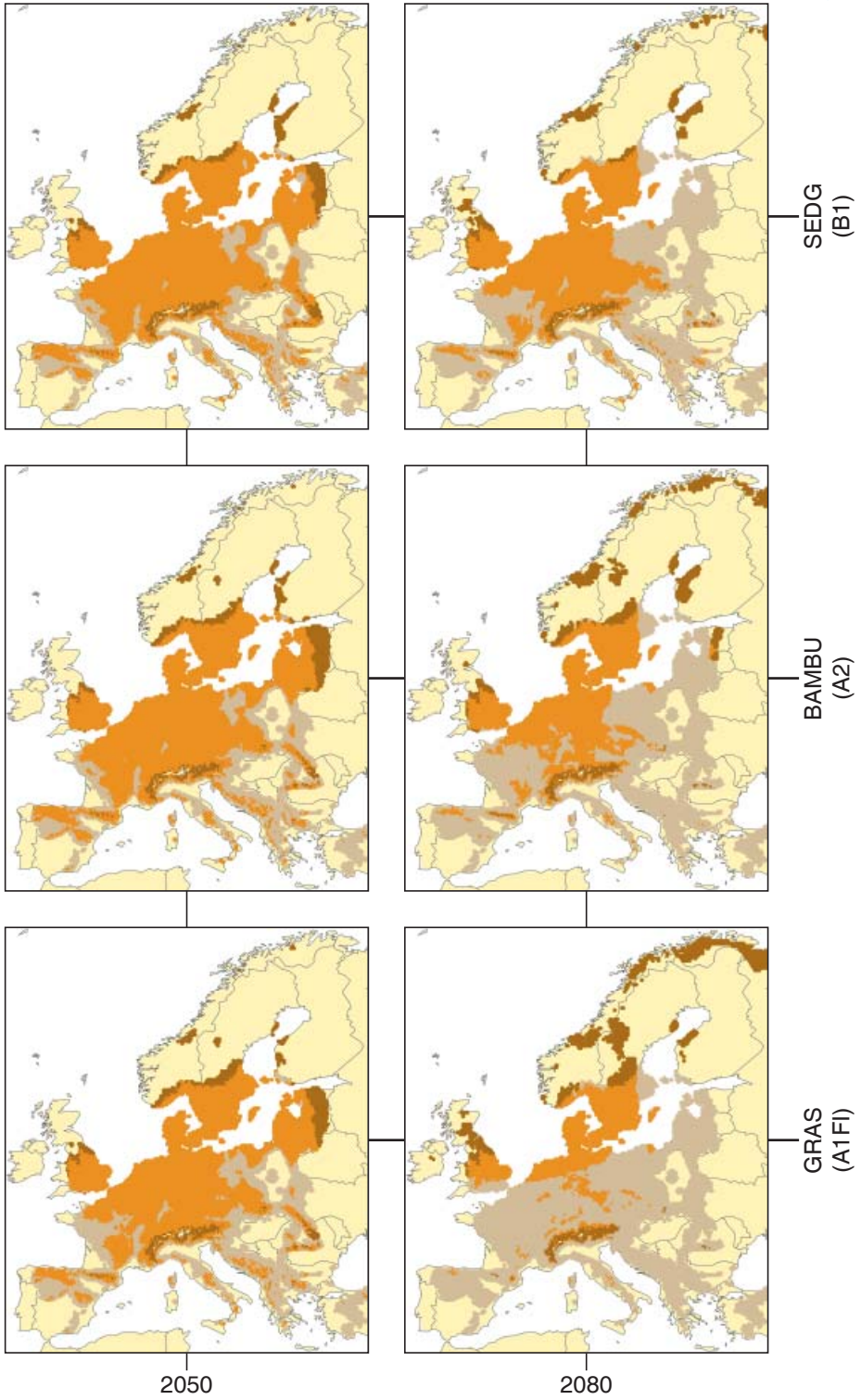
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.78).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrrium pruni (LINNAEUS, 1758) – Black Hairstreak



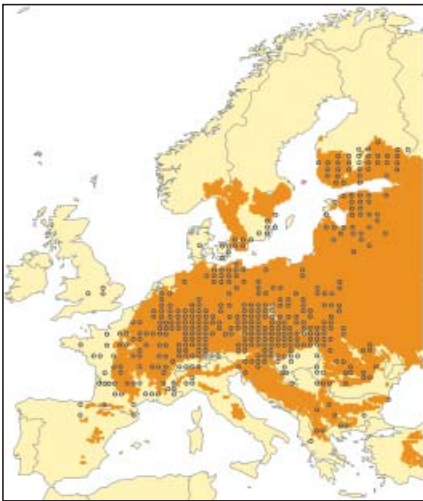
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-289 (-2.36%)	-3101 (-25.27%)
	BAMBU	1089 (8.88%)	-2245 (-18.3%)
	GRAS	-404 (-3.29%)	-3596 (-29.31%)
2080	SEDG	-255 (-2.08%)	-4671 (-38.07%)
	BAMBU	-702 (-5.72%)	-6066 (-49.44%)
	GRAS	-2244 (-18.29%)	-7988 (-65.1%)

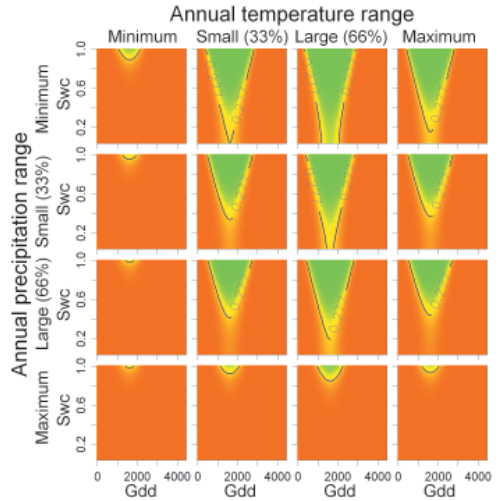
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 12270 cells)

The Black Hairstreak can be found where there are Blackthorn (*Prunus spinosa*) bushes growing. This may be in moderately dry woodland, or in a hedgerow, or on a woodbank, but it also occurs on solitary groups of Blackthorn bushes. Places with brambles are favorable, providing the nectar the butterflies need. The eggs are laid on Blackthorn (*Prunus spinosa*), but sometimes other *Prunus* species are used. The female chooses twigs that will flower the next spring. The small caterpillars that develop, pass the winter in the eggshell. When they emerge, they feed on the buds and flowers. When the caterpillars are fully-grown, they pupate. The black and white pupa, suspended in a silken girdle from a twig, looks very like a bird dropping, an attempt to avoid predation. The Black Hairstreak is single-brooded.

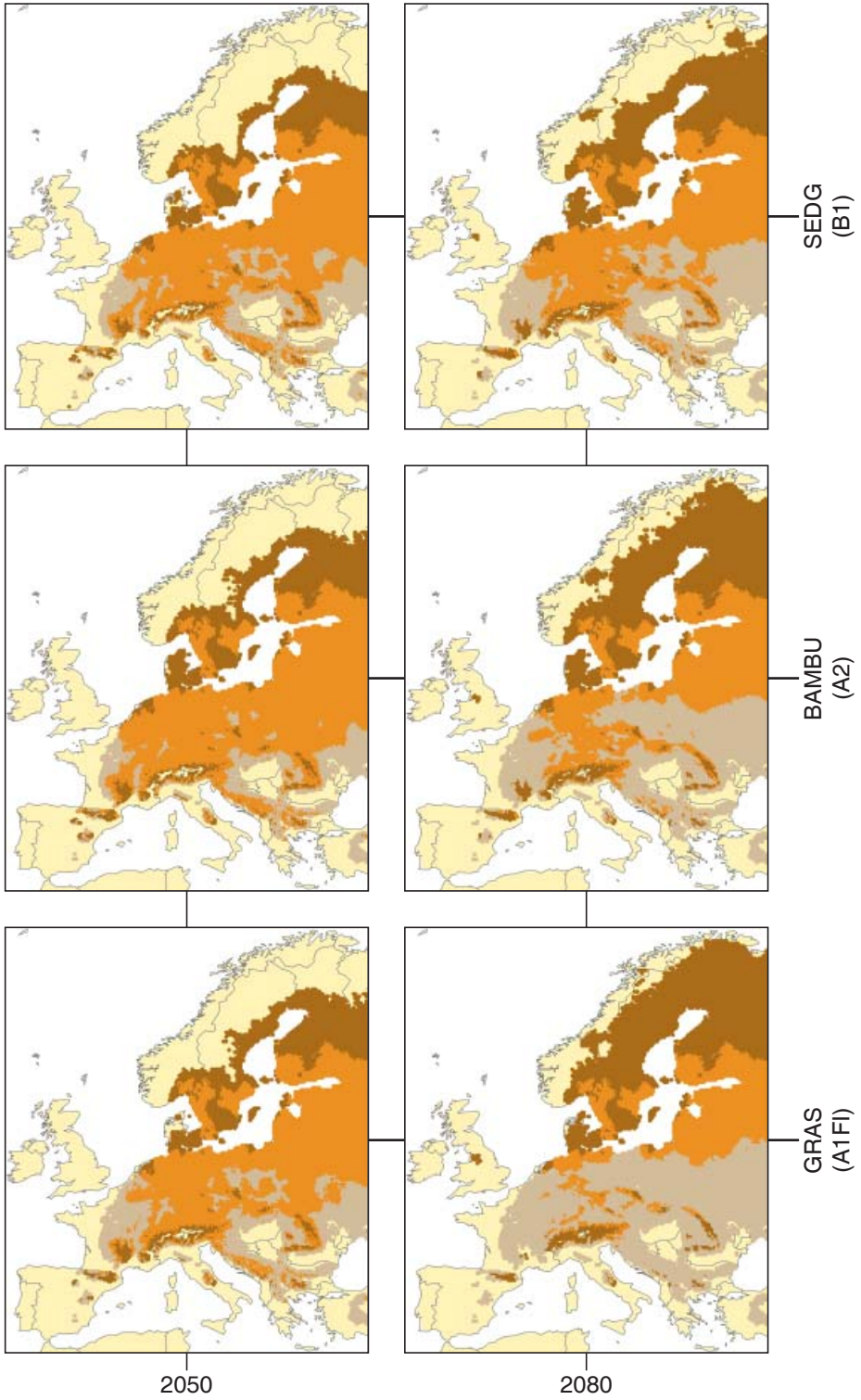
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83). Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrrium spini (FABRICIUS, 1787) – Blue-spot Hairstreak



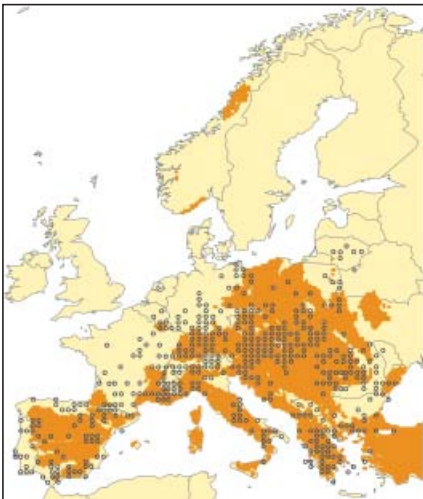
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-1547 (-18.11%)	-3552 (-41.59%)
	BAMBU	-2078 (-24.33%)	-3494 (-40.91%)
	GRAS	5 (0.06%)	-2382 (-27.89%)
2080	SEDG	-1885 (-22.07%)	-6706 (-78.52%)
	BAMBU	-2494 (-29.2%)	-5899 (-69.07%)
	GRAS	-695 (-8.14%)	-4290 (-50.23%)

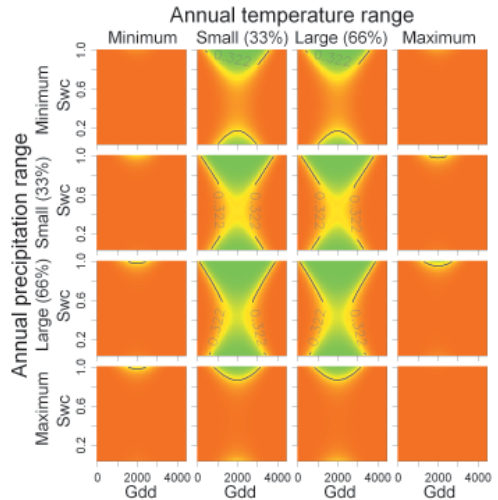
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 8540 cells)

The Blue-spot Hairstreak can be found in sunny, warm places, on groups of bushes, or on scrub at the edge of a wood, with some flowering vegetation as nectar source nearby. The female lays her eggs on various buckthorns (*Rhamnus* spp.), choosing branches situated in the sun. The small caterpillar only emerges in the spring, having passed the winter in the eggshell. It wastes no time in beginning to eat buds and young leaves. Ants of the genera *Lasius* and *Formica* may visit the caterpillar. When fully-grown, it pupates on the foodplant, the pupa suspended by a silken girdle. The Blue-spot Hairstreak has one generation a year.

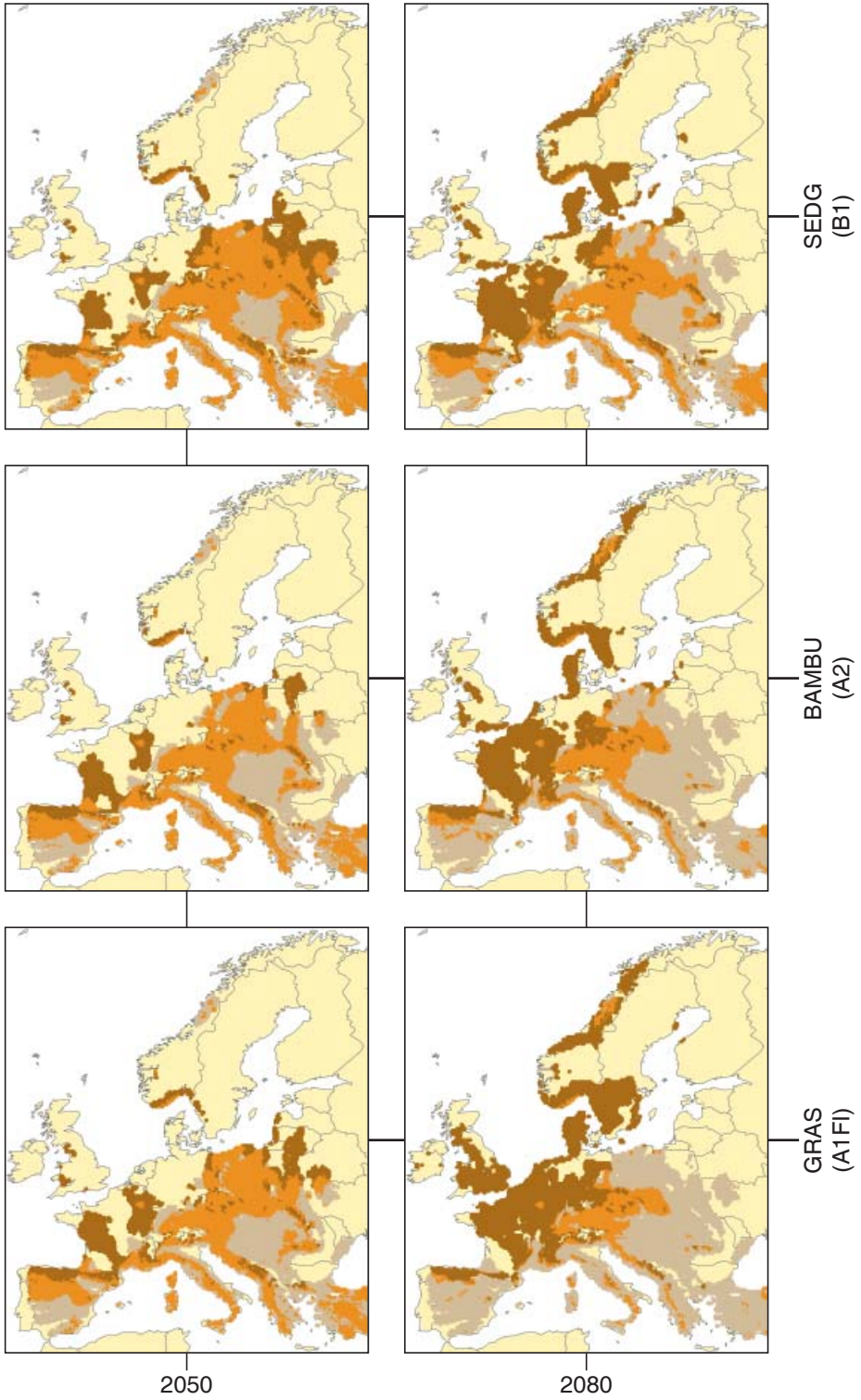
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.71). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrium ilicis (ESPER, 1779) – Ilex Hairstreak



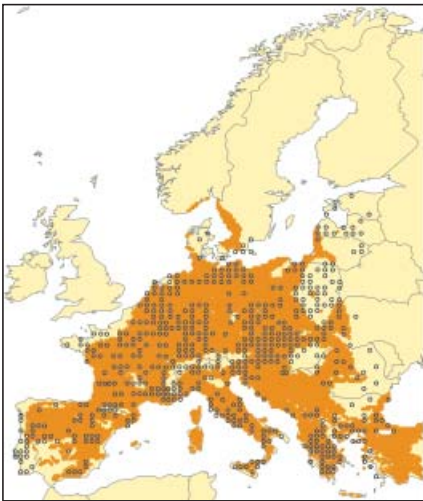
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-164 (-1.51%)	-2441 (-22.49%)
	BAMBU	-613 (-5.65%)	-2924 (-26.93%)
	GRAS	-966 (-8.9%)	-3370 (-31.04%)
2080	SEDG	-2100 (-19.34%)	-4264 (-39.28%)
	BAMBU	-3154 (-29.05%)	-5618 (-51.75%)
	GRAS	-4333 (-39.91%)	-7136 (-65.73%)

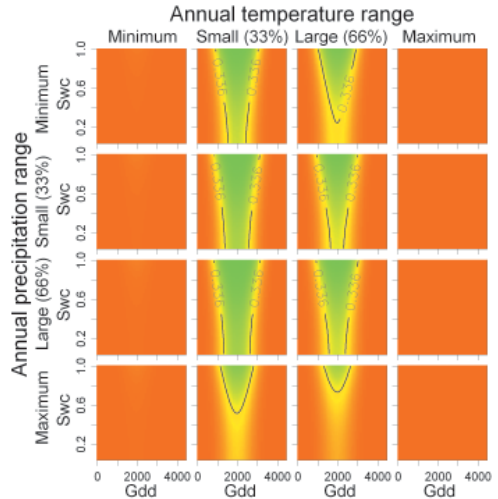
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 10856 cells)

The Ilex Hairstreak occurs locally at woodland edges, and in coppices with warm, dry oak scrub. The female lays her eggs on the rather stunted oak trees, and certainly not on large oaks. The tiny caterpillar hibernates in the egg, or in the first larval instar. It feeds on the young oak leaves, eventually pupating in the litter layer under the foodplant. The caterpillars have been found in association with ants of the genera *Camponotus* and *Crematogaster*. The adult butterflies need nectar, feeding on flowering Common Privet (*Ligustrum vulgare*) and on bramble blossom (*Rubus* spp.). It is single-brooded.

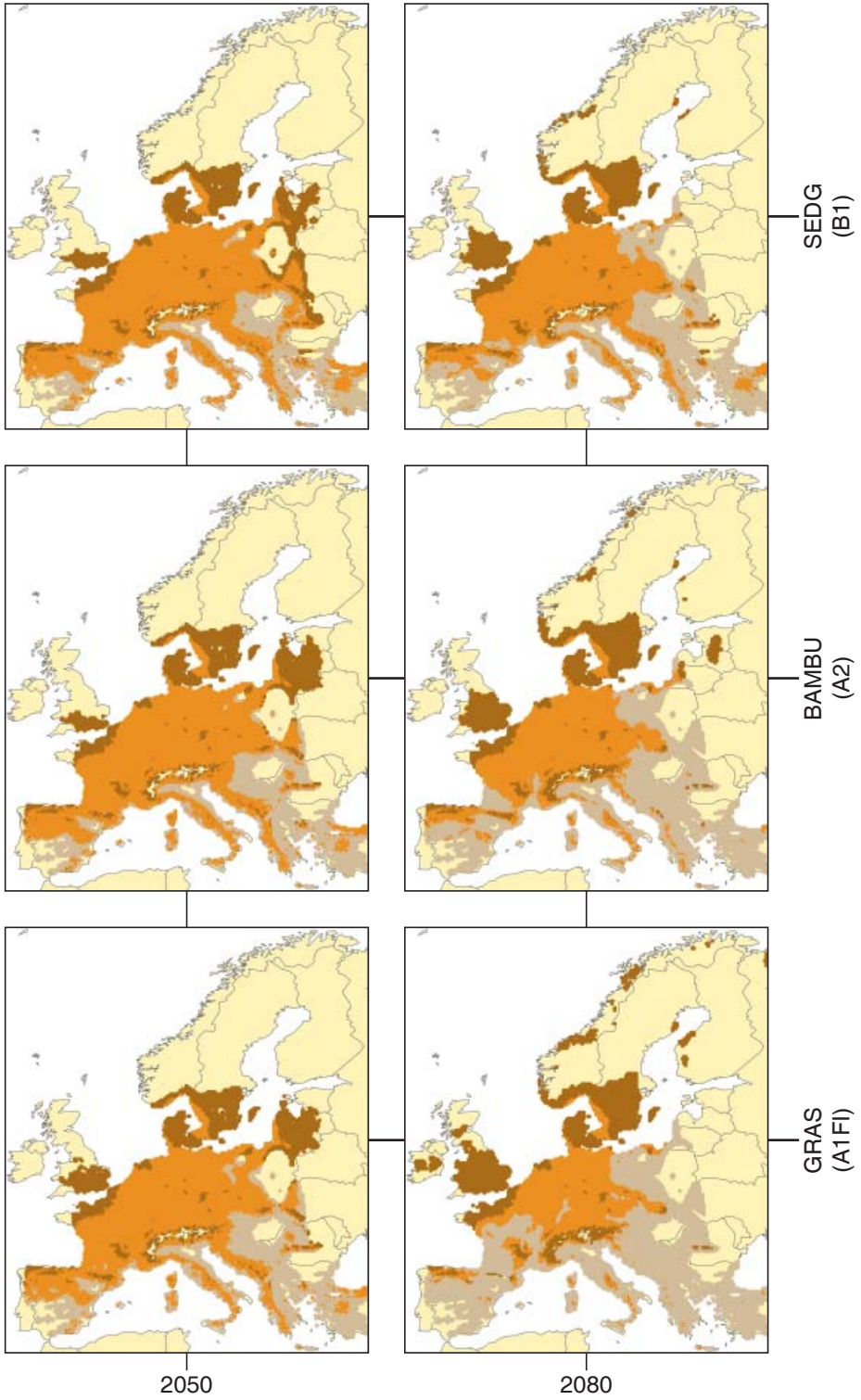
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.71). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tertile, upper tertile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrrium esculi (HÜBNER, 1804) – False Ilex Hairstreak



© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-1000 (-33.22%)	-1760 (-58.47%)
	BAMBU	-1649 (-54.78%)	-1938 (-64.39%)
	GRAS	-1549 (-51.46%)	-2151 (-71.46%)
2080	SEDG	-1726 (-57.34%)	-2448 (-81.33%)
	BAMBU	-2208 (-73.36%)	-2811 (-93.39%)
	GRAS	-2014 (-66.91%)	-2998 (-99.6%)

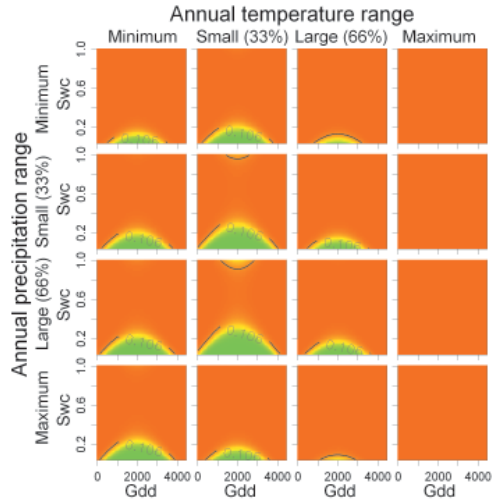
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 3010 cells)

The False Ilex Hairstreak can be found in dry scrub, open, deciduous woodland, or in mixed woodland. The butterflies can often be seen drinking nectar on thyme. The females lay their eggs on various oak species, including the Holm Oak (*Quercus ilex*), Common or Pedunculate Oak (*Q. robur*), Kermes or Holly Oak (*Q. coccifera*), and Pyrenean Oak (*Q. pyrenaica*). The small caterpillars only emerge from the egg the following spring, when they start eating the young oak leaves. The ant *Camponotus cruentatus* has been found in association with them. This species has one brood a year.

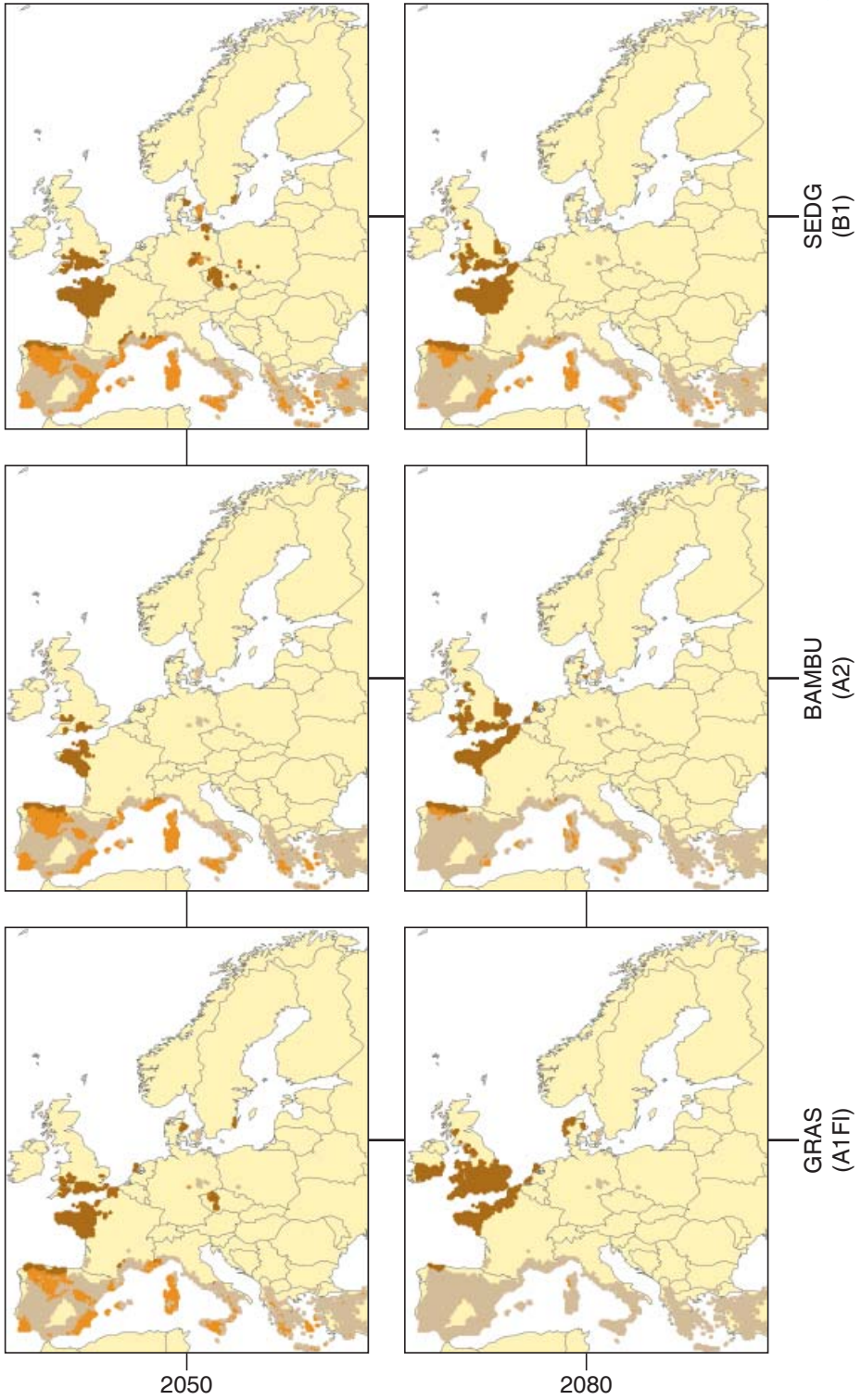
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.82). Climate risk category: HHRH.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Satyrrium acaciae (FABRICIUS, 1787) – Sloe Hairstreak



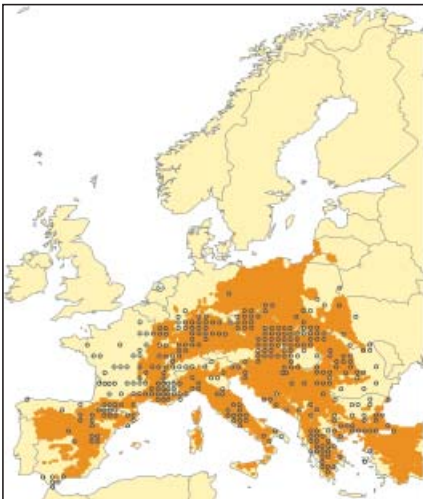
© Martin Wiemers

		Full dispersal	No dispersal
2050	SEDG	1205 (15.48%)	-2303 (-29.59%)
	BAMBU	-492 (-6.32%)	-2953 (-37.94%)
	GRAS	-399 (-5.13%)	-3340 (-42.91%)
2080	SEDG	57 (0.73%)	-3942 (-50.64%)
	BAMBU	-1287 (-16.53%)	-5311 (-68.23%)
	GRAS	-2206 (-28.34%)	-6127 (-78.71%)

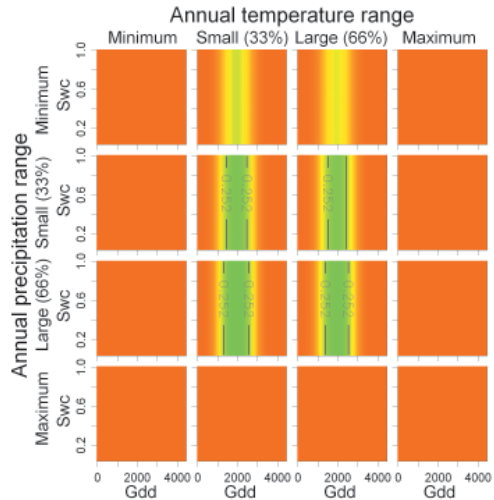
Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 7784 cells)

The Sloe Hairstreak is found in dry scrub in woods, at wood margins, or in the open landscape. They are also seen in abandoned vineyards on calcareous soils. When looking for nectar, the butterflies seem to prefer white flowers. Blackthorn or Sloe (*Prunus spinosa*) is practically the only foodplant of the Sloe Hairstreak, and eggs are laid on branches that are in the sun. The small caterpillars stay in the egg until after the winter, emerging in the spring and feeding on the young Blackthorn leaves. When fully-grown, they leave the foodplant to pupate on the ground in leaf litter.

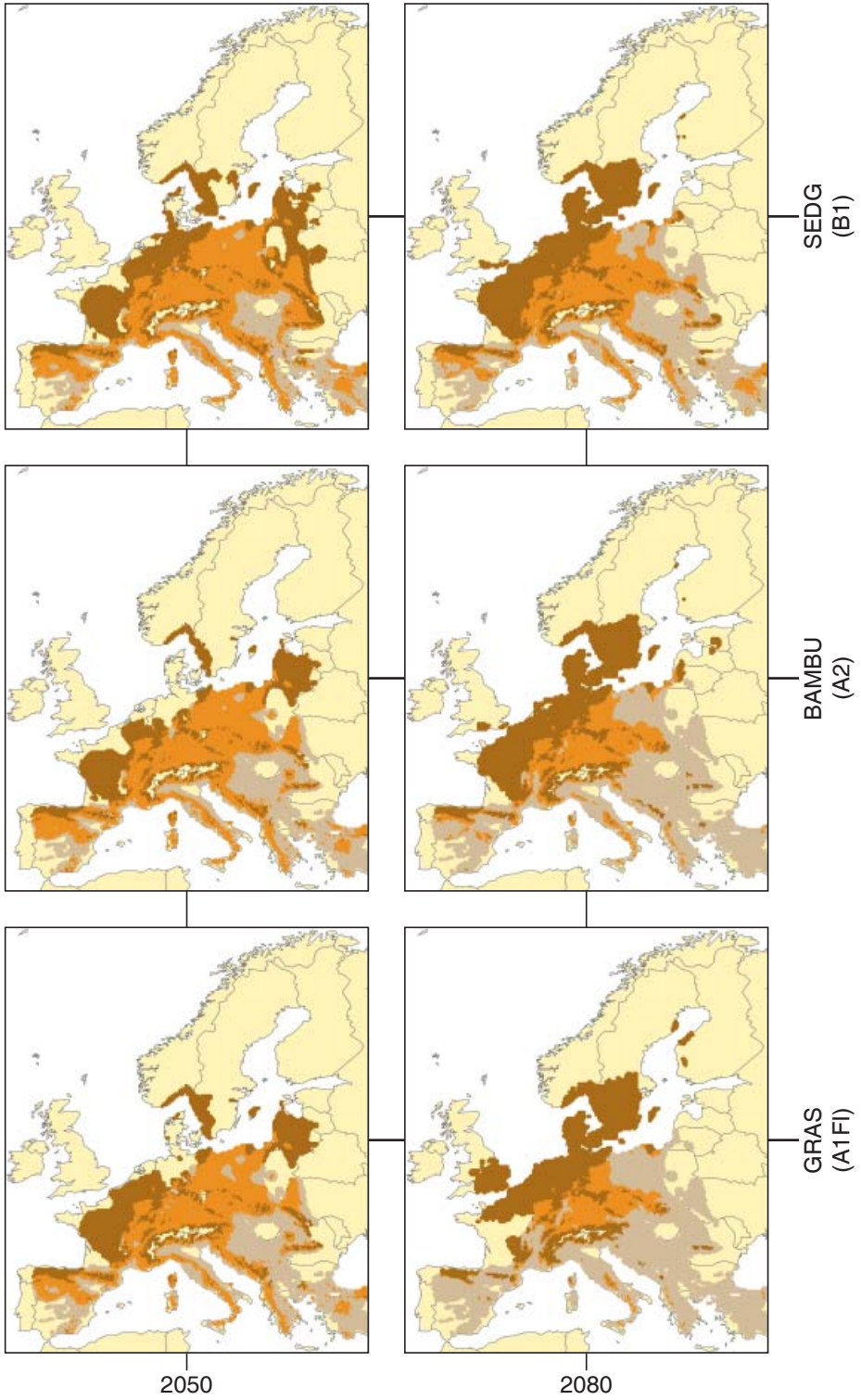
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.76). Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Lampides boeticus (LINNAEUS, 1767) – Long-tailed Blue



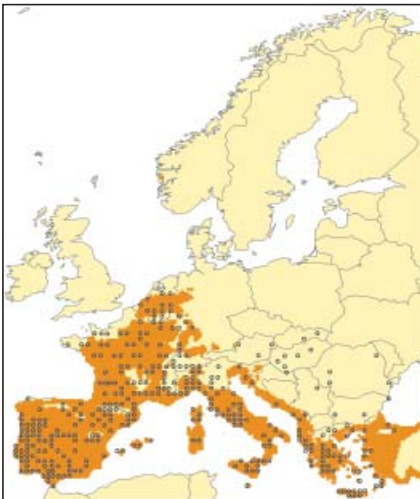
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	950 (14.89%)	-1240 (-19.43%)
	BAMBU	815 (12.77%)	-1156 (-18.12%)
	GRAS	1279 (20.04%)	-1030 (-16.14%)
2080	SEDG	-722 (-11.31%)	-3666 (-57.45%)
	BAMBU	10 (0.16%)	-2770 (-43.41%)
	GRAS	885 (13.87%)	-1663 (-26.06%)

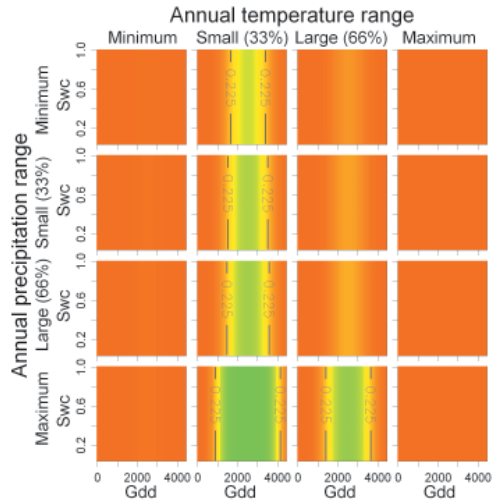
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6381cells)

The underside of the wings of the Long-tailed Blue have an attractive pattern of fine, wavy lines and two striking eye-spots near the rather long little tails on the hindwings. The habitats are typified by the presence of many kinds of leguminous plants that serve as foodplants, and plenty of nectar-rich flowers for the butterflies. The habitats are warm, dry places, sometimes in agricultural areas. The main foodplant is Bladder Senna (*Colutea arborescens*). The caterpillars feed on the ripening seeds and on farms where peas and beans are grown, they can cause outbreaks. In natural situations, the caterpillars are attended by various ant species. The life cycle of the Long-tailed Blue takes four to six weeks. It does not go into hibernation, and can therefore only occur as a resident where it is warm enough for all stages to survive.

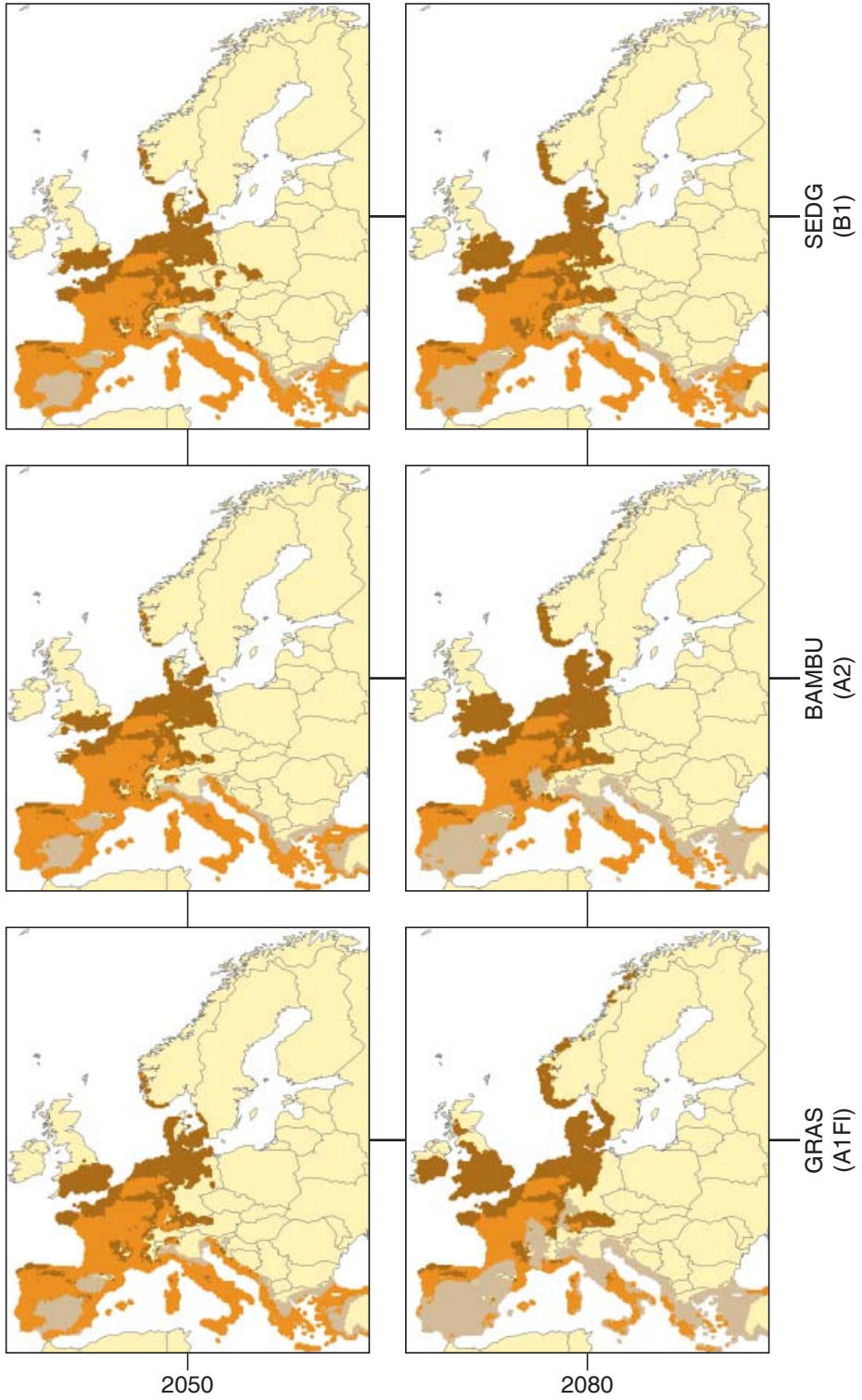
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83). Climate risk category: R.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cacyreus marshalli (BUTLER, 1898) – Geranium Bronze



© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-207 (-25.87%)	-437 (-54.62%)
	BAMBU	-277 (-34.62%)	-464 (-58%)
	GRAS	-310 (-38.75%)	-557 (-69.62%)
2080	SEDG	-661 (-82.62%)	-746 (-93.25%)
	BAMBU	-592 (-74%)	-780 (-97.5%)
	GRAS	-629 (-78.62%)	-800 (-100%)

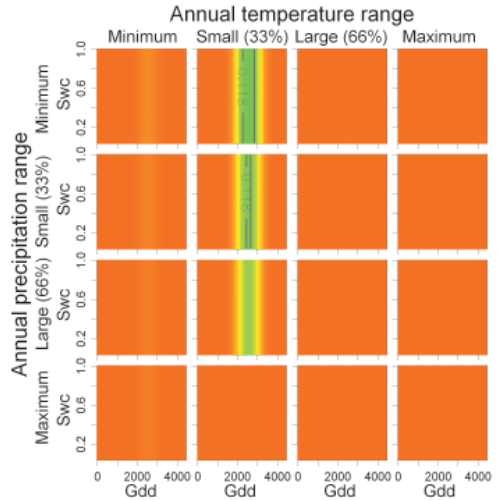
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 800)

Originally a species from southern Africa, the Geranium Bronze had probably been imported on *Pelargonium* cultivars, the ordinary or garden geraniums. From there out, because of the large popularity of these plants, it occurs e.g. in Spain and France, but is about to colonize larger parts of Europe, using the *Pelargonium* cultivars as foodplant. The caterpillars mostly eat the flowers and buds of *Pelargonium*, but also the rest of the plants. In South Africa, the Geranium Bronze uses wild *Geranium* species as foodplant, making it very probable that this butterfly will establish itself in the wild in warm parts of Europe. However, in cooler areas, it would be impossible for it to settle permanently, because it has no diapause, and could not survive the winter. It has numerous generations a year, depending on the temperature.

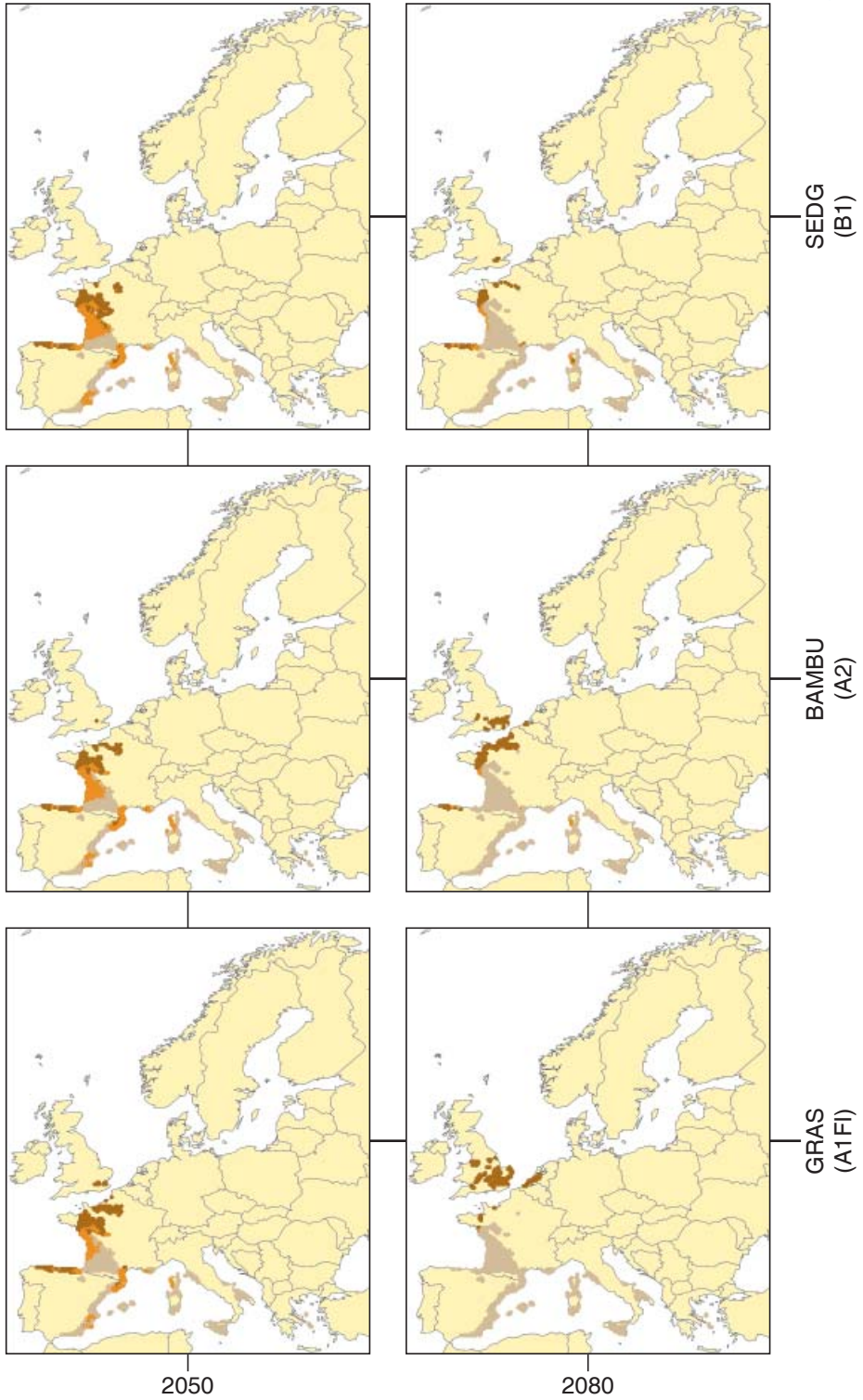
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.85).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Leptotes piritibous (LINNAEUS, 1767) – Lang’s Short-tailed Blue



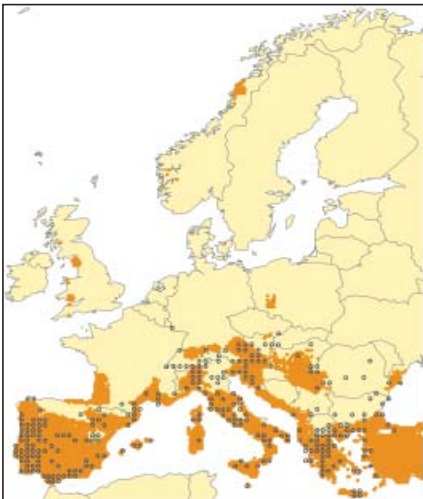
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	998 (18.23%)	-759 (-13.86%)
	BAMBU	259 (4.73%)	-868 (-15.85%)
	GRAS	654 (11.95%)	-1120 (-20.46%)
2080	SEDG	800 (14.61%)	-1775 (-32.42%)
	BAMBU	-30 (-0.55%)	-2922 (-53.37%)
	GRAS	838 (15.31%)	-3855 (-70.41%)

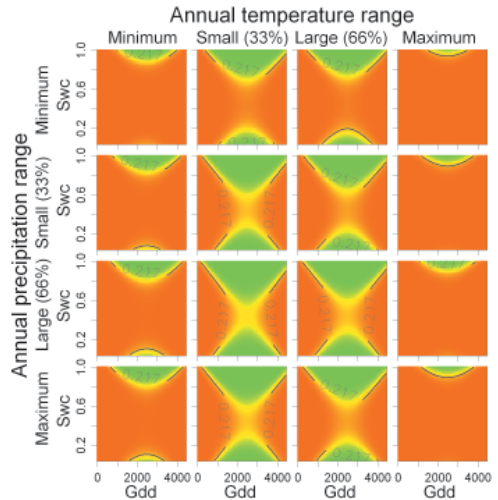
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 5475)

The Lang’s Short-tailed Blue is a small, inconspicuous butterfly that occurs in flower-rich places and on rough vegetation. It is often seen near scrub and on fields of Lucerne (*Medicago sativa*). The eggs are laid on various leguminous plants, such as melilots (*Melilotus* spp.), Purple Loosestrife (*Lythrum salicaria*), and also species of Rosaceae and Plumbaginaeaceae. The caterpillar feeds on the flowers and seeds of the foodplant and has been found in association with ants of the genus *Lasius*. The life cycle of the Lang’s Short-tailed Blue takes four to eight weeks, depending on the temperature. It is not known whether this species enters diapause, but if it does, it should be either in the egg or caterpillar stage.

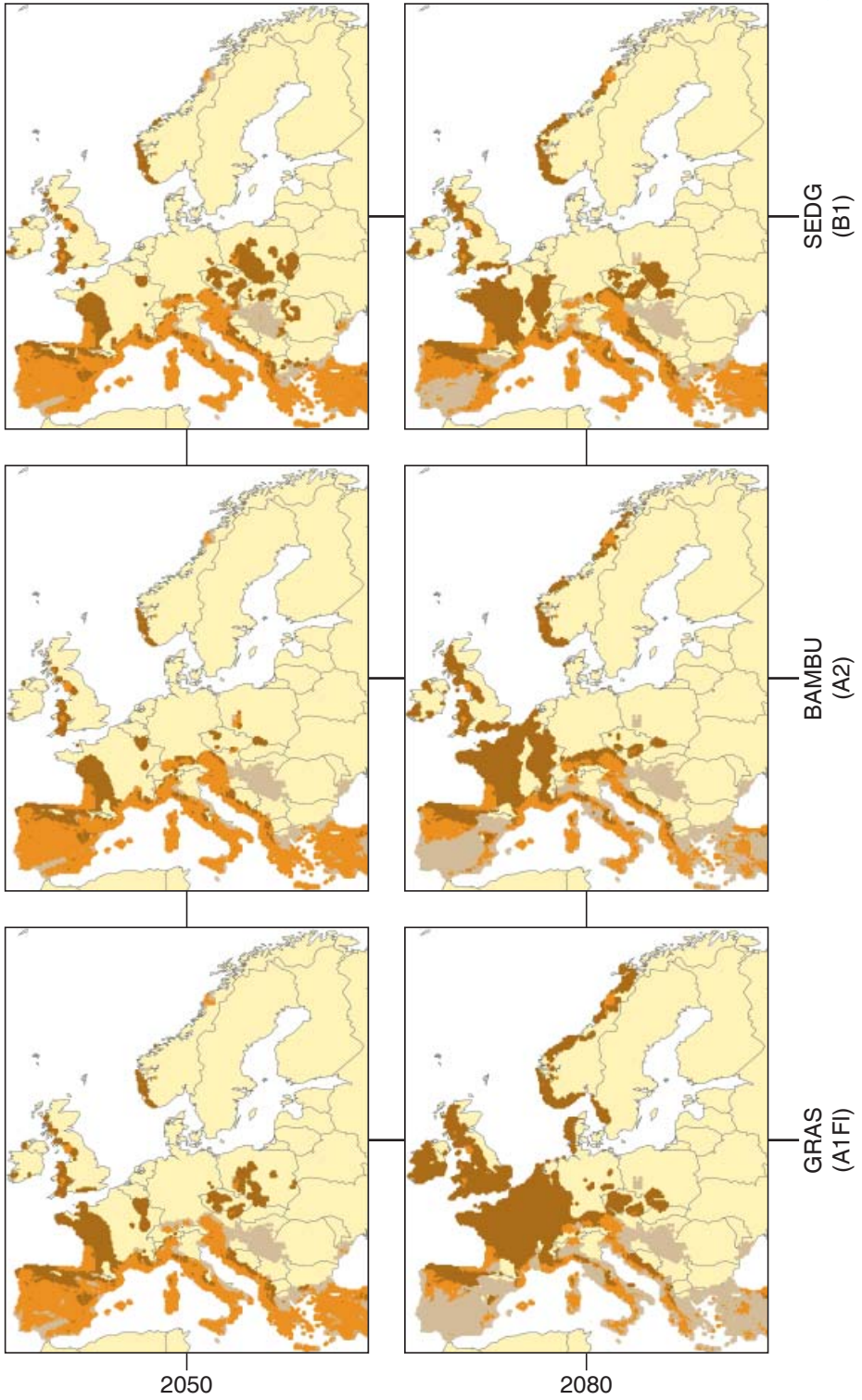
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83).
Climate risk category: HR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Zizeeria knysna (TRIMEN, 1862) – African Grass Blue



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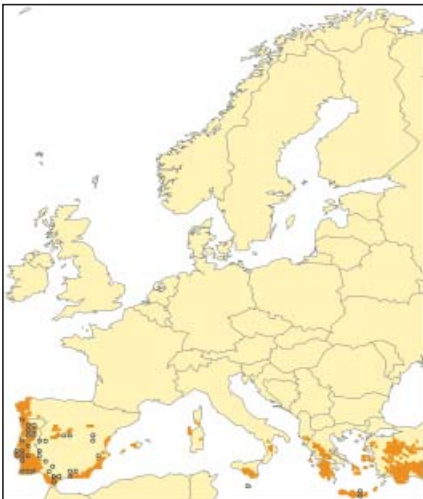
		Full dispersal	No dispersal
2050	SEDG	-528 (-64.23%)	-582 (-70.8%)
	BAMBU	-619 (-75.3%)	-643 (-78.22%)
	GRAS	-619 (-75.3%)	-666 (-81.02%)
2080	SEDG	-575 (-69.95%)	-708 (-86.13%)
	BAMBU	-759 (-92.34%)	-797 (-96.96%)
	GRAS	-711 (-86.5%)	-815 (-99.15%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 822)

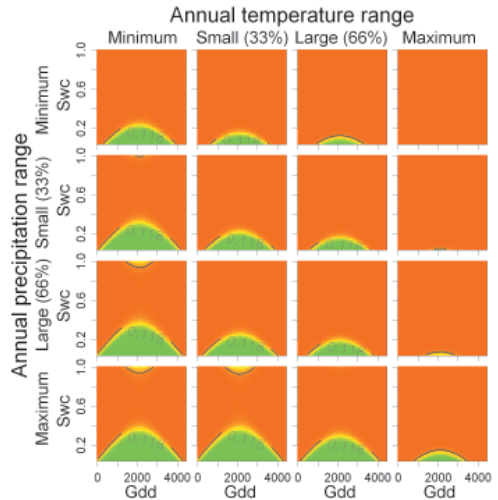
The African Grass Blue is a modest little blue, which flies close to the ground. It is a species of dry grassland, road verges, waste ground, and gardens, but sometimes butterflies are found in damp, shady places. Various medicks, are used as foodplant, such as Lucerne (*Medicago sativa*), Tree Medick (*M. arborea*), Small Medick (*M. minima*), Black Medick (*M. lupulina*), and possibly various *Oxalis* species. The caterpillars are attended by ants of the genus *Pheidole*. The African Grass Blue has two or more generations a year and passes the winter as a caterpillar. There are only a few butterflies in the first generation.

Present distribution can be well explained by climatic variables (AUC = 0.94).

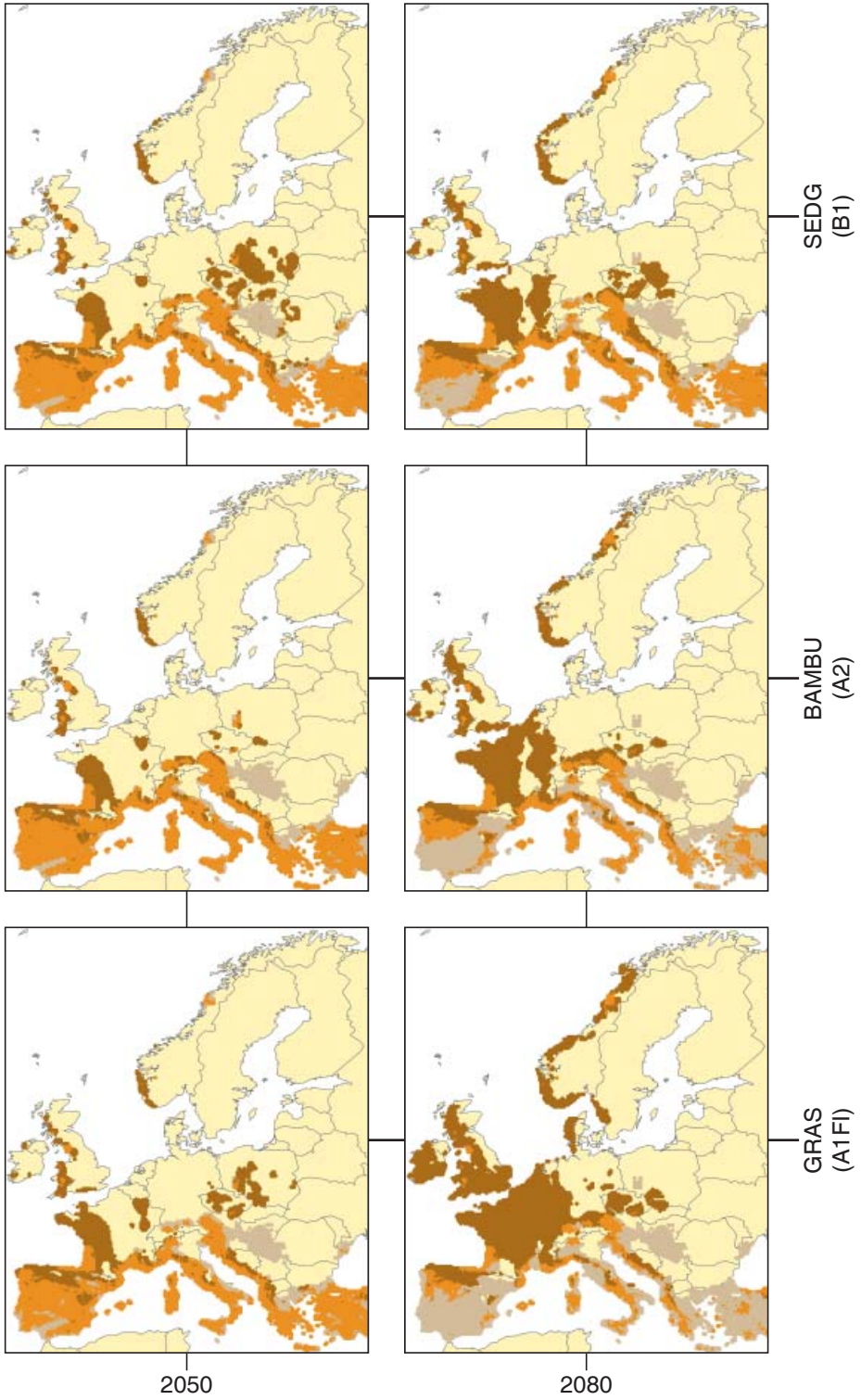
Climate risk category: HHRH.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cupido minimus (FUESSLY, 1775) – Small Blue



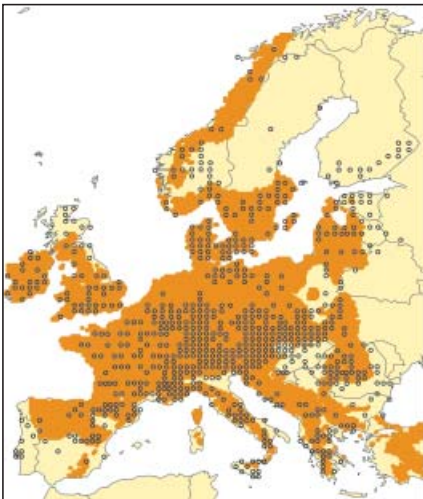
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-2124 (-15.81%)	-3032 (-22.56%)
	BAMBU	-2256 (-16.79%)	-3275 (-24.37%)
	GRAS	-3245 (-24.15%)	-4134 (-30.77%)
2080	SEDG	-4157 (-30.94%)	-5451 (-40.57%)
	BAMBU	-4491 (-33.42%)	-6672 (-49.65%)
	GRAS	-6299 (-46.88%)	-8702 (-64.76%)

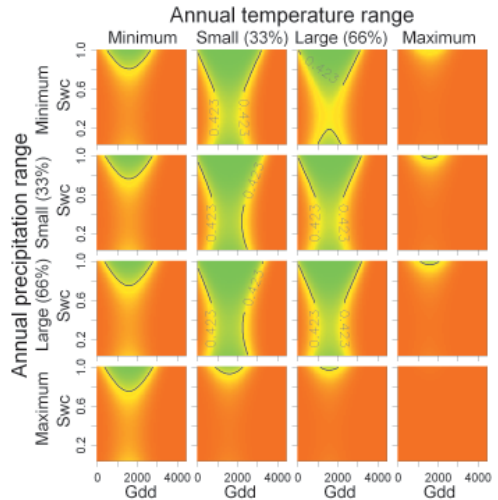
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 13437)

This butterfly is well named. It is very small and its modest colours make it even seem smaller than it really is. The Small Blue can only be found on calcareous soils. Open, mostly rather short vegetation and a warm microclimate typify its habitat. The butterflies may occur in large numbers. They lay their small, white eggs singly between the flowers and the sepals of Kidney-vetch (*Anthyllis vulneraria*), where a practised eye can detect them. The creamy-white caterpillars feed on the flowers and seeds, and are seldom seen. However, workers of various ant species attend them regularly. When fully-grown, the caterpillars hibernate either between the withered petals of dead flowers, or in the litter layer and pupate on the ground. The Small Blue has one or two broods a year.

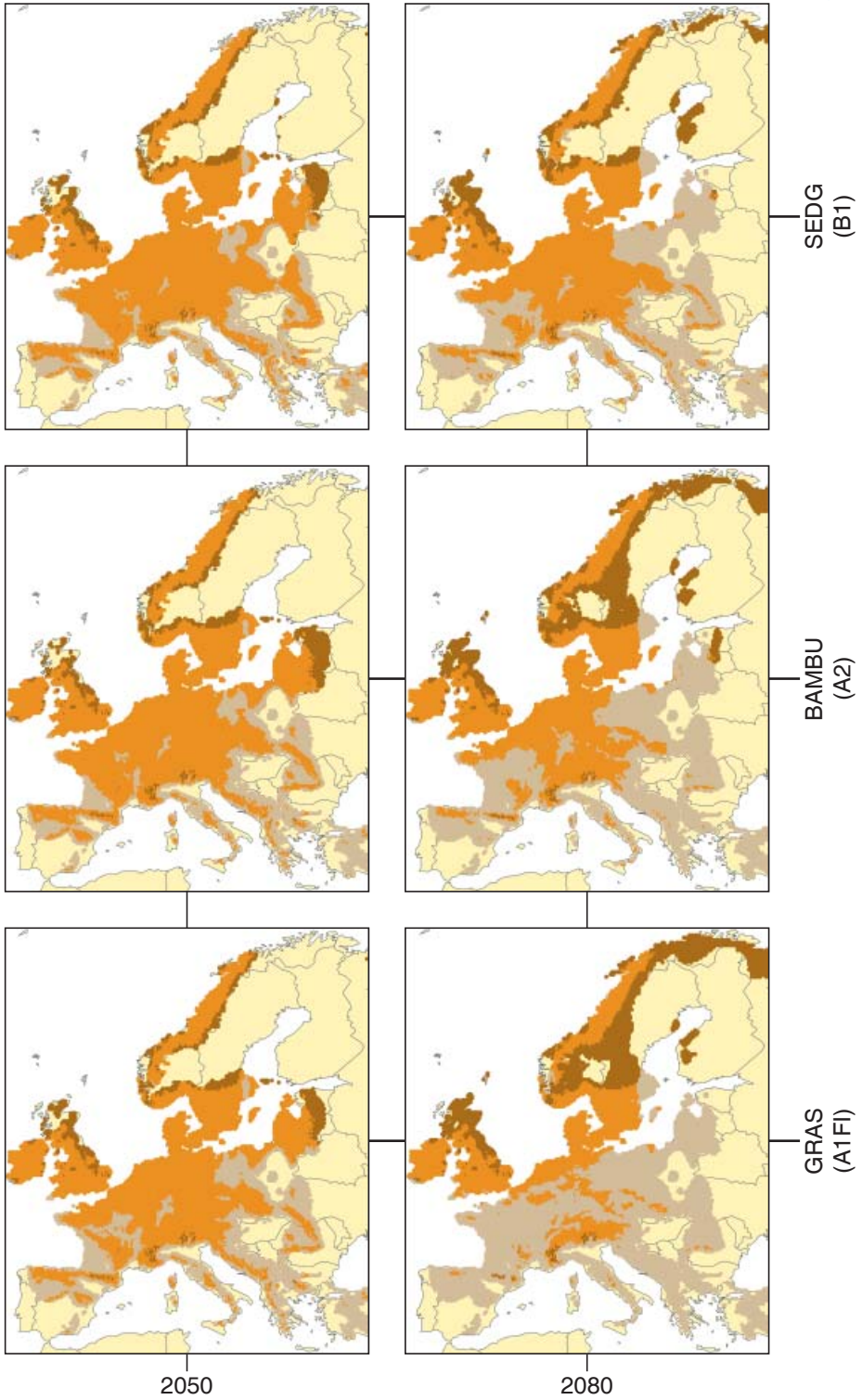
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.71). Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tertile, upper tertile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cupido osiris (MEIGEN, 1829) – Osiris Blue



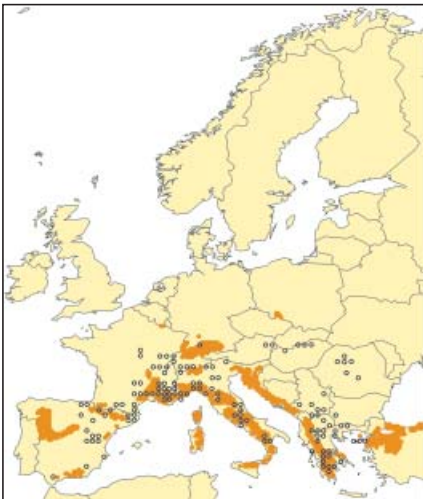
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-470 (-42.11%)	-810 (-72.58%)
	BAMBU	-506 (-45.34%)	-847 (-75.9%)
	GRAS	-566 (-50.72%)	-961 (-86.11%)
2080	SEDG	-154 (-13.8%)	-1003 (-89.87%)
	BAMBU	-427 (-38.26%)	-1039 (-93.1%)
	GRAS	-373 (-33.42%)	-1101 (-98.66%)

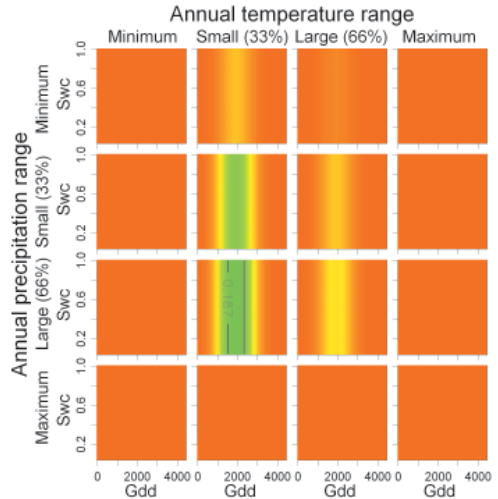
Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 1116)

The Osiris Blue lives on sunny, flower-rich grassland and road verges rich in sainfoin (*Onobrychis* spp.), which it uses for its nectar and as foodplant. The caterpillar feeds on various sainfoins (*Onobrychis* spp.), such as Sainfoin (*O. viciifolia*), Mountain Sainfoin (*O. montana*), and *O. arenaria*. In the literature, other leguminous plants are mentioned, e.g. Bladder Senna (*Colutea arborescens*), Kidney-vetch (*Anthyllis vulneraria*), and Bitter Vetch (*Lathyrus montanus*). The eggs are laid on the flowerheads. The caterpillars feed on both the flowers and developing seeds and are attended by ants (e.g. *Lasius alienus*). The Osiris Blue has one or two broods a year, but the second may only be partial. The caterpillars hibernate and pupate between leaves.

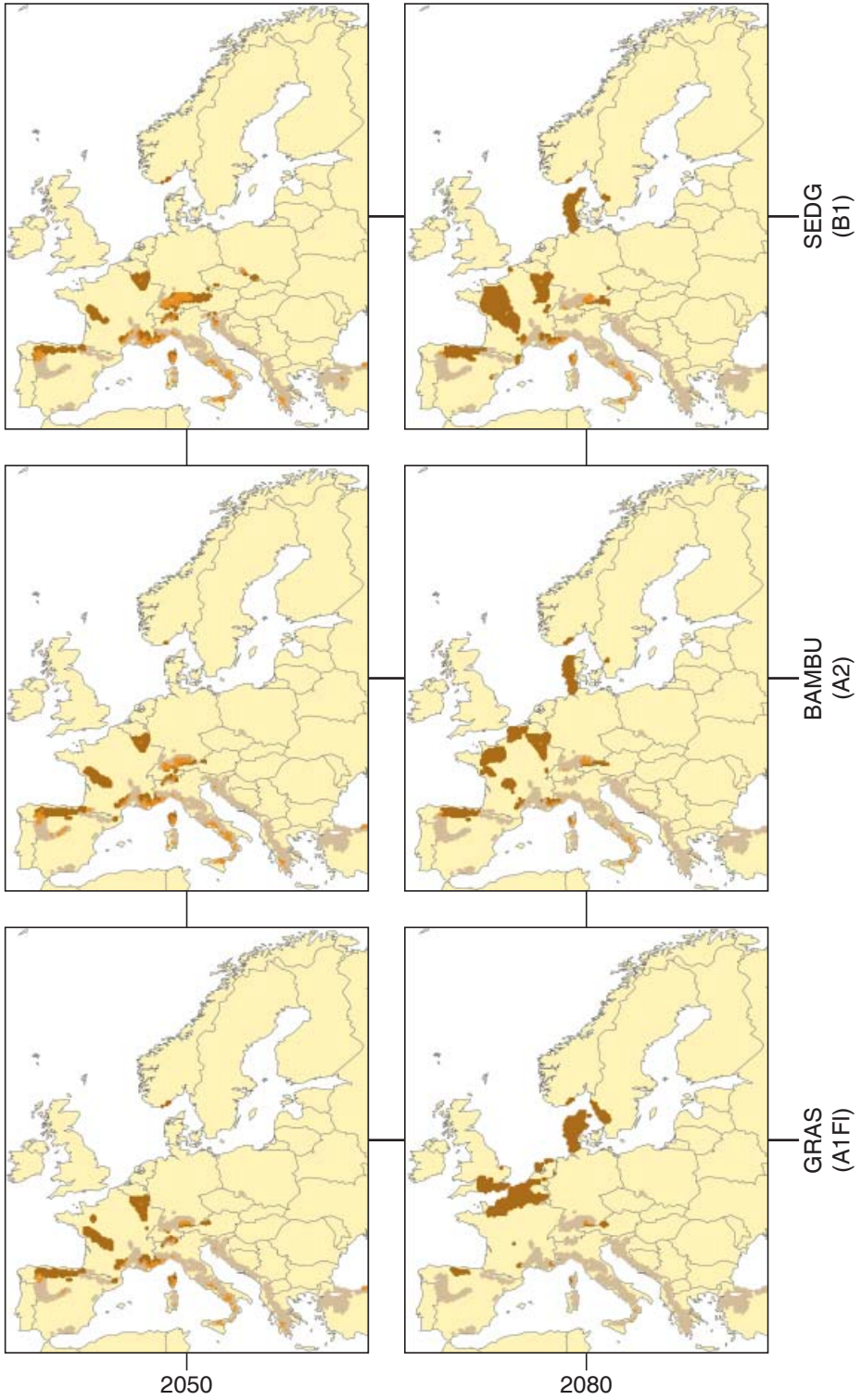
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.76). Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cupido argiades (PALLAS, 1771) – Short-tailed Blue



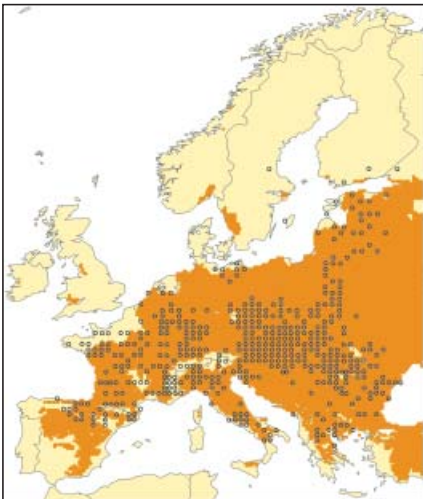
© Josef Settele

		Full dispersal	No dispersal
2050	SEDG	1445 (9.62%)	-1822 (-12.13%)
	BAMBU	1387 (9.23%)	-2139 (-14.24%)
	GRAS	746 (4.96%)	-2692 (-17.92%)
2080	SEDG	1257 (8.37%)	-3979 (-26.48%)
	BAMBU	1482 (9.86%)	-5685 (-37.83%)
	GRAS	626 (4.17%)	-7883 (-52.46%)

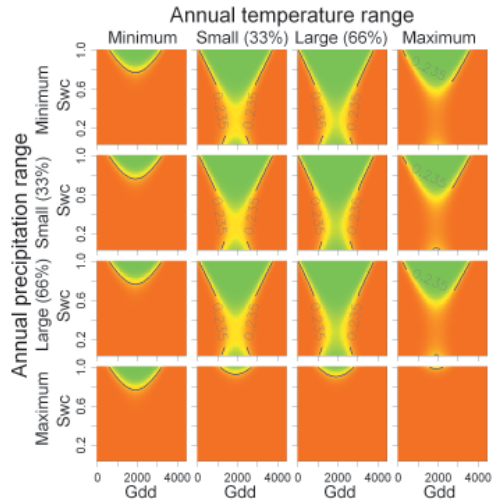
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 15026)

Although the Short-tailed Blue looks rather like the Holly Blue (*Celastrina argiolus*), it has very fine, small tails and prominent eye-spots on the hindwings. The Short-tailed Blue occurs in local populations on damp grassland, heathland and flower-rich verges. It lays its eggs on Lucerne (*Medicago sativa*) and various clovers (*Trifolium* spp.), vetches (*Vicia* spp.), birdsfoot-trefoils (*Lotus* spp.) and melilots (*Melilotus* spp.). When the caterpillars are fully-grown, they leave the foodplant, overwinter, and then pupate in the litter layer. This butterfly species has two to three generations a year.

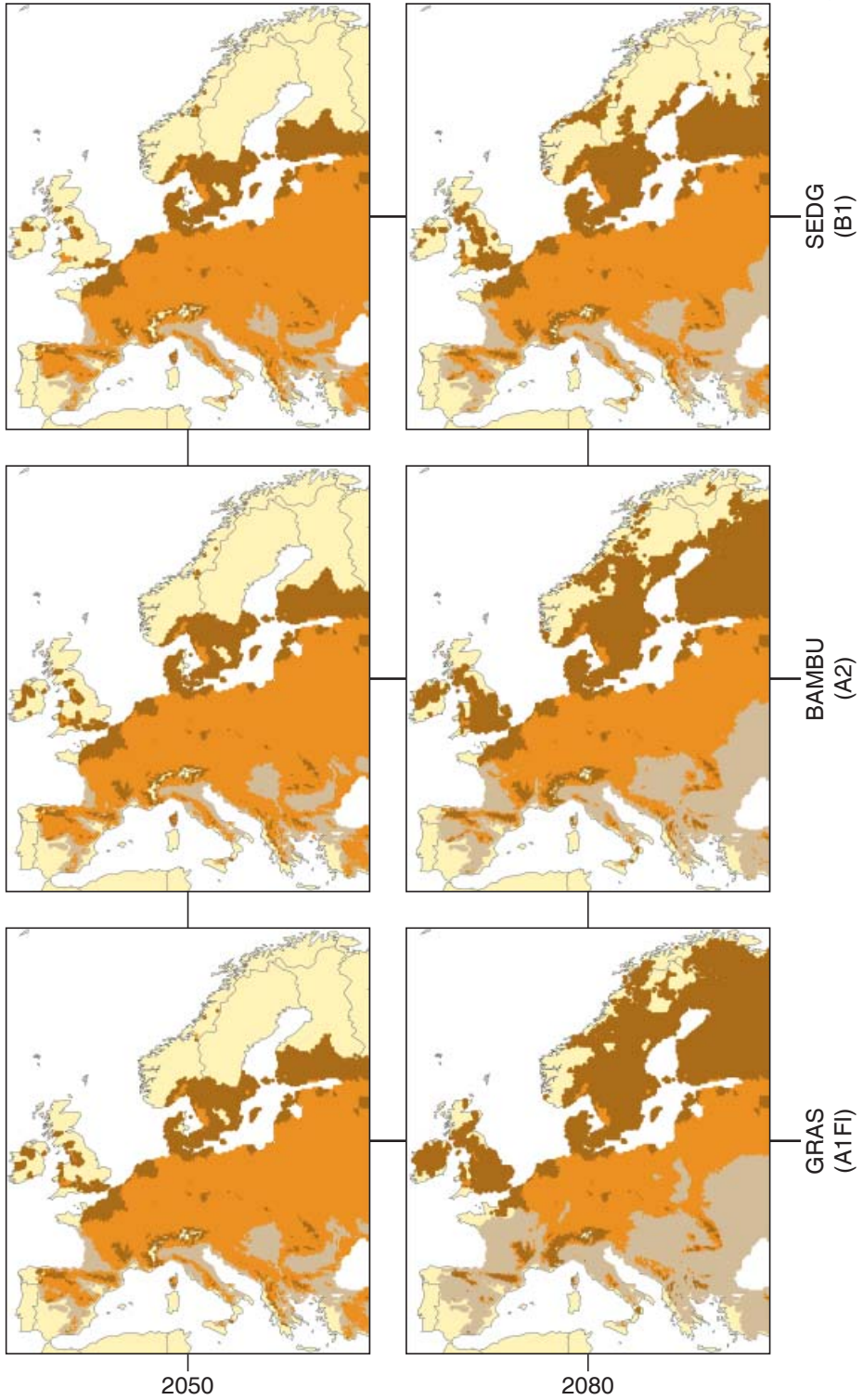
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.81). Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cupido decoloratus (STAUDINGER, 1886) – Eastern Short-tailed Blue



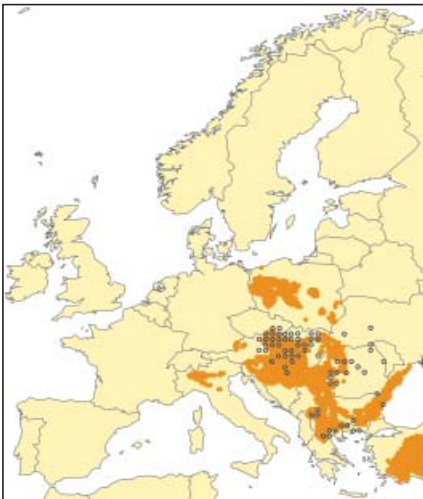
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	775 (37.99%)	-940 (-46.08%)
	BAMBU	-308 (-15.1%)	-1568 (-76.86%)
	GRAS	147 (7.21%)	-1582 (-77.55%)
2080	SEDG	-651 (-31.91%)	-1757 (-86.13%)
	BAMBU	-933 (-45.74%)	-2007 (-98.38%)
	GRAS	-879 (-43.09%)	-2031 (-99.56%)

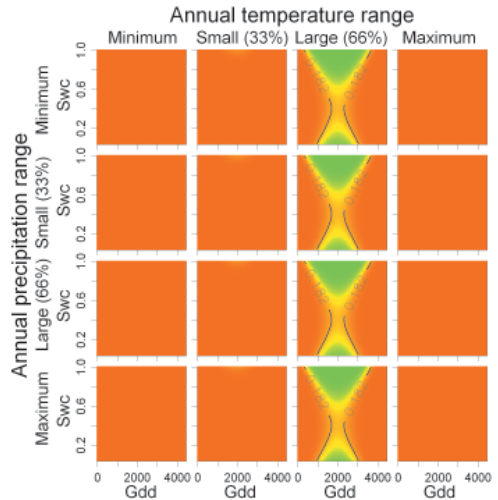
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2040)

The Eastern Short-tailed Blue occurs in clearings in deciduous woodland, and on flower-rich, grassy vegetation with scattered bushes. The caterpillars feed on the flowerheads of Black Medick (*Medicago lupulina*), and Lucerne (*M. sativa*). The Eastern Short-tailed Blue has three generations a year and hibernates as a caterpillar.

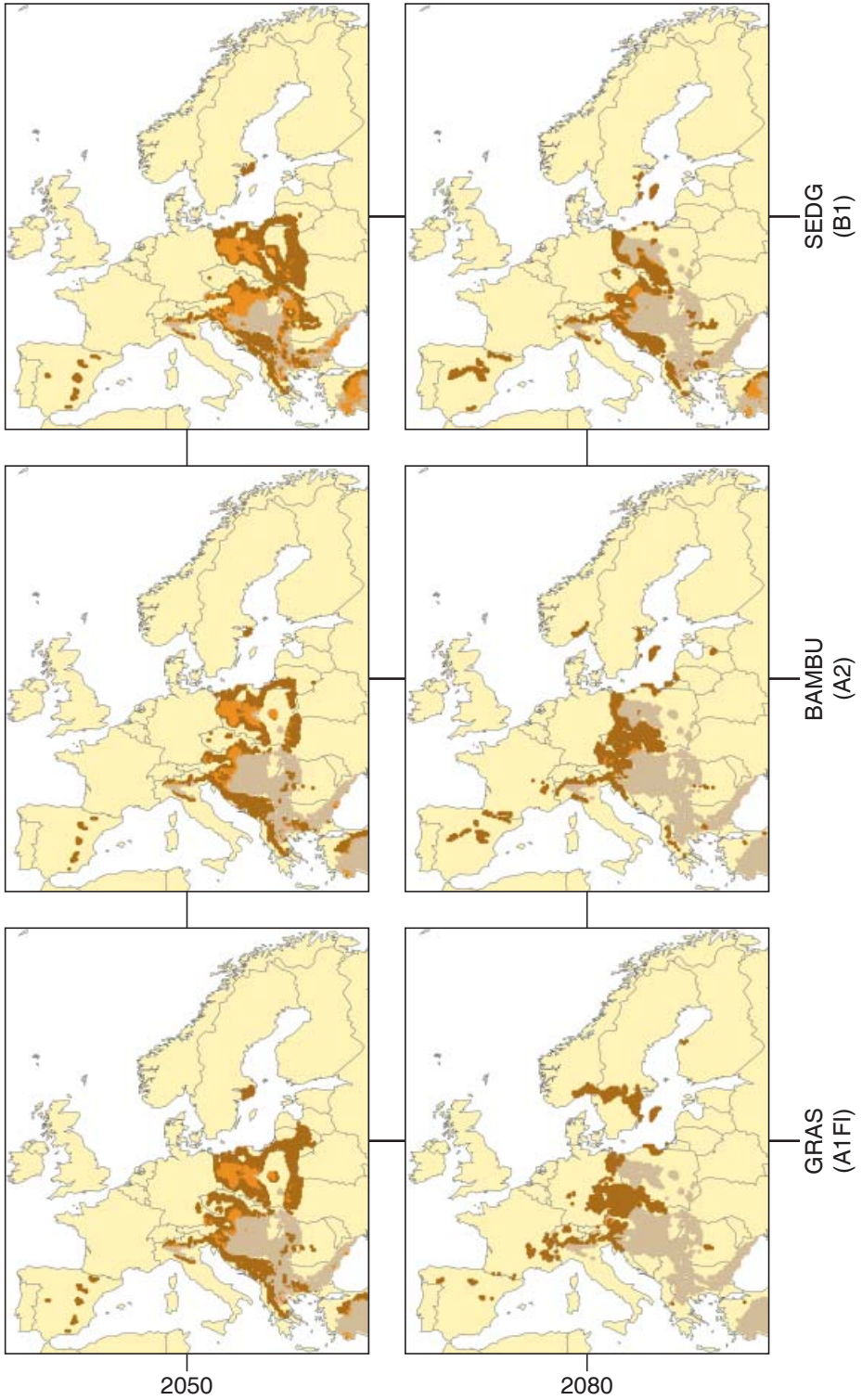
Present distribution can be well explained by climatic variables (AUC = 0.93).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cupido alcetas (HOFFMANSEGG, 1804) – Provençal Short-tailed Blue



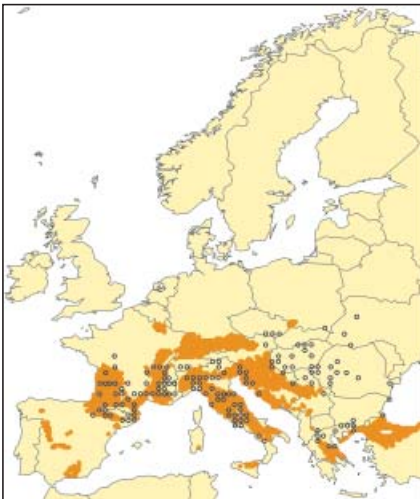
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	321 (14.54%)	-714 (-32.34%)
	BAMBU	796 (36.05%)	-717 (-32.47%)
	GRAS	473 (21.42%)	-933 (-42.26%)
2080	SEDG	1589 (71.97%)	-1036 (-46.92%)
	BAMBU	1782 (80.71%)	-1328 (-60.14%)
	GRAS	1325 (60.01%)	-1785 (-80.84%)

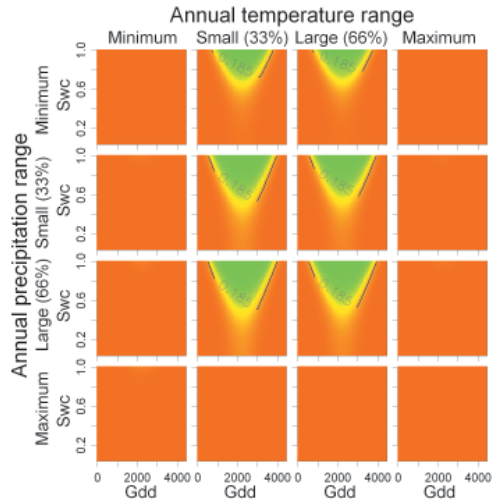
Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 2208)

The Provençal Short-tailed Blue occurs in woodland clearings, at the edges of woods, on grassy vegetation near bushes, and along the banks of streams and edges of ditches. Goat's-rue (*Galega officinalis*) and Crown Vetch (*Coronilla varia*) are its most important foodplants, but other leguminous plants, such as Common Birdsfoot-trefoil (*Lotus corniculatus*), Common Vetch (*Vicia sativa*), and Lucerne (*Medicago sativa*) are also used. The caterpillars feed mostly on the flowers, but also on the leaves, and are attended by ants (e.g. of the genus *Formica*). This butterfly species has two to three generations a year and hibernates as a caterpillar.

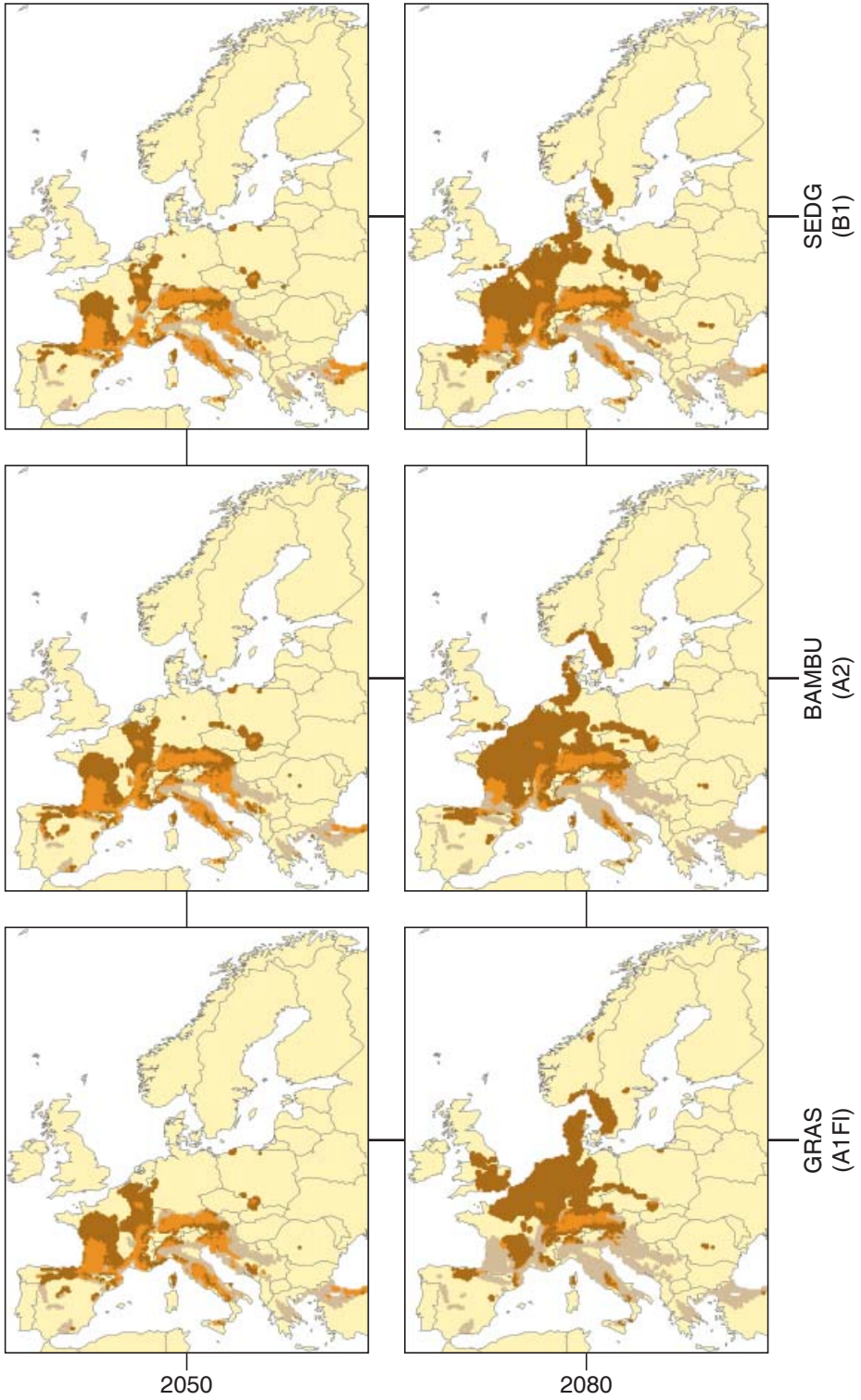
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.77). Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tertile, upper tertile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Celastrina argiolus (LINNAEUS, 1758) – Holly Blue



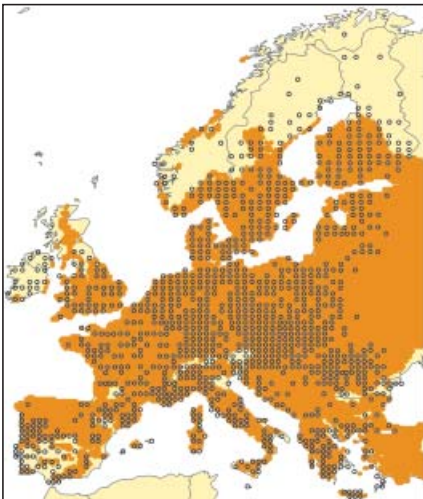
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-1703 (-8.34%)	-3387 (-16.59%)
	BAMBU	-2646 (-12.96%)	-3670 (-17.97%)
	GRAS	-2795 (-13.69%)	-4341 (-21.26%)
2080	SEDG	-2427 (-11.88%)	-4943 (-24.2%)
	BAMBU	-5101 (-24.98%)	-7524 (-36.84%)
	GRAS	-6682 (-32.72%)	-10036 (-49.14%)

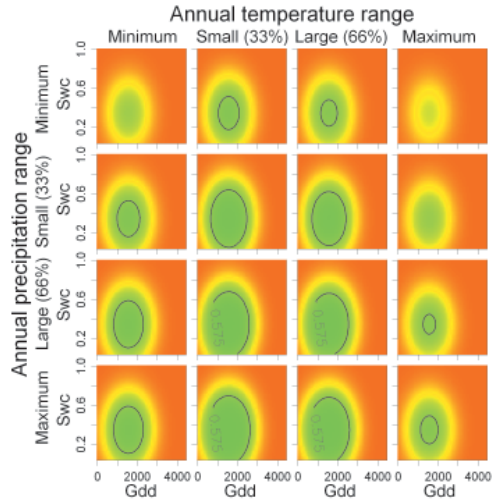
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 20422)

The Holly Blue is widespread, although the populations are always small. This small butterfly is very often seen in parks and gardens, as well as at woodland edges, and in bushy places. The eggs are laid on the calyx or stem of the flowerbuds or on the ripe fruits of various sorts of plants, including Holly (*Ilex aquifolium*), Ivy (*Hedera helix*), Spindle-tree (*Euonymus europaeus*), Alder Buckthorn (*Frangula alnus*), brambles (*Rubus* spp.) and heathers (*Calluna vulgaris* and *Erica* spp.). At first, the caterpillars feed on the buds and fruits of the foodplant, only later eating leaves. They are attended by ants of different genera. The Holly Blue has two broods a year, and hibernates in the pupal stage.

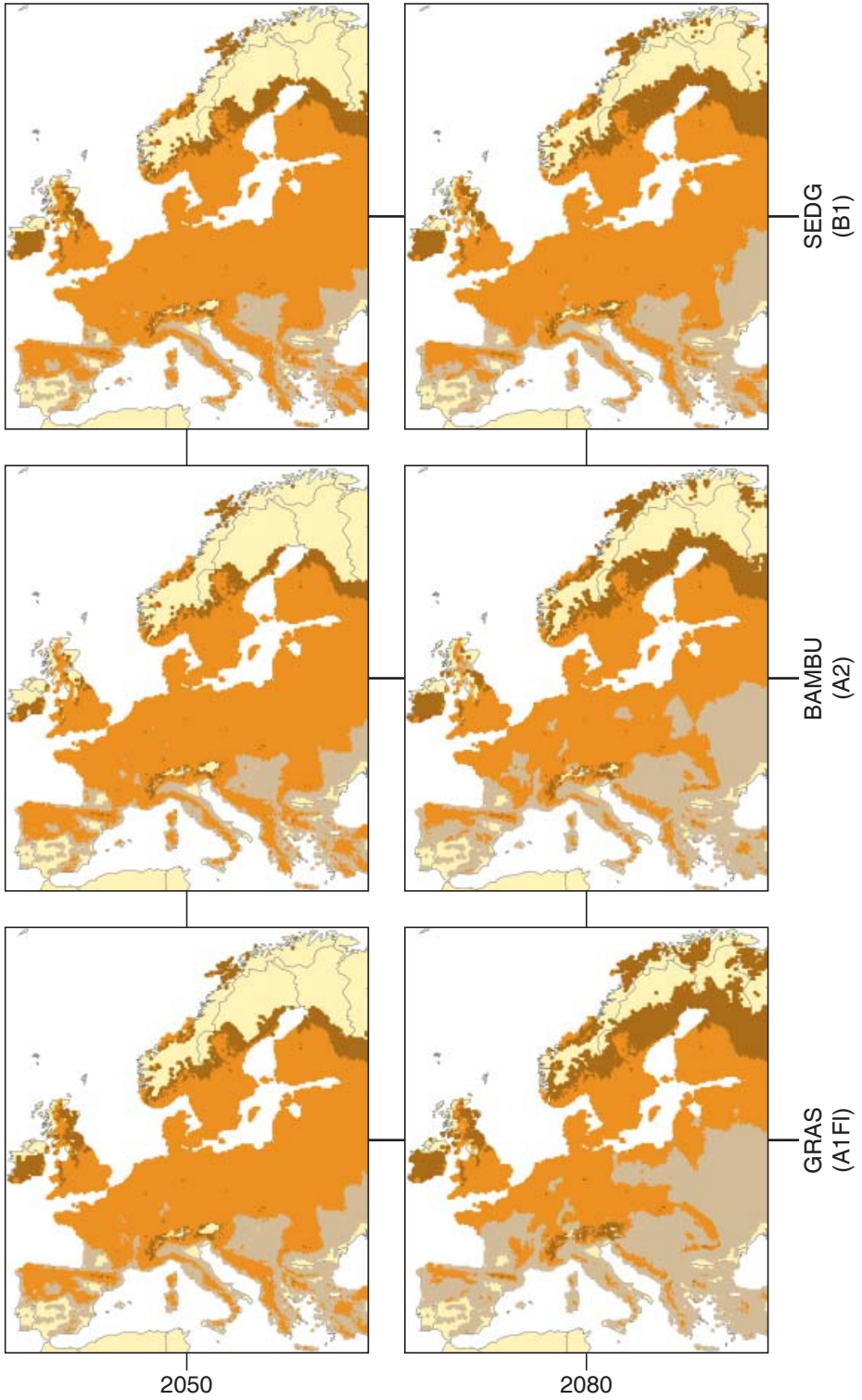
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.66). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides baton (BERGSTRÄSSER, 1779) – Baton Blue



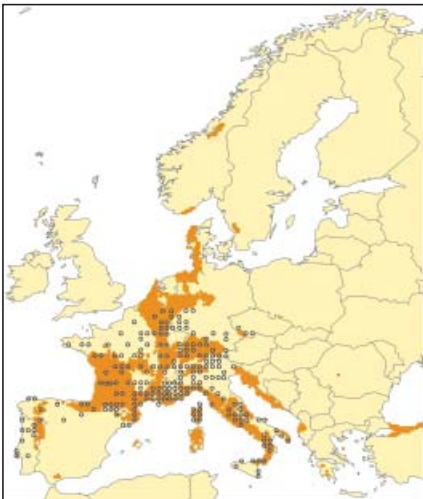
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-226 (-8.55%)	-1037 (-39.24%)
	BAMBU	15 (0.57%)	-964 (-36.47%)
	GRAS	-401 (-15.17%)	-1295 (-49%)
2080	SEDG	-81 (-3.06%)	-1179 (-44.61%)
	BAMBU	-88 (-3.33%)	-1433 (-54.22%)
	GRAS	-847 (-32.05%)	-2209 (-83.58%)

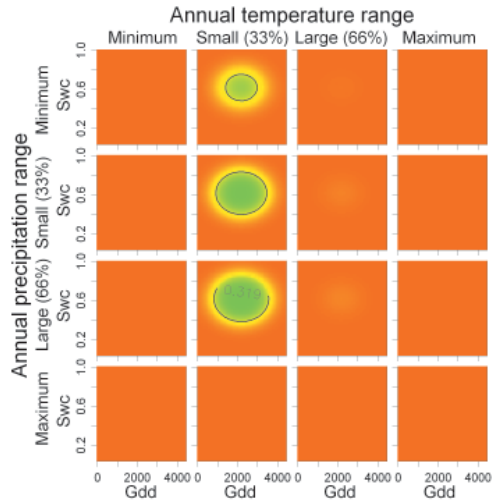
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2643)

The Baton Blue can be found on dry, grassy, and flower-rich vegetation, especially on warm patches. The butterflies are often seen on flowers, drinking nectar. The females lay their eggs on the flowers and leaf stalks of various species of thyme (*Thymus* spp.), savory (*Satureja* spp.), lavender (*Lavandula* spp.), and mint (*Mentha* spp.). The caterpillars feed on the flowers and developing seeds of the foodplant. They are attended by ants (e.g. *Myrmica scabrinodis* and *Lasius alienus*). The Baton Blue passes the winter as a caterpillar or a pupa, and has two generations a year.

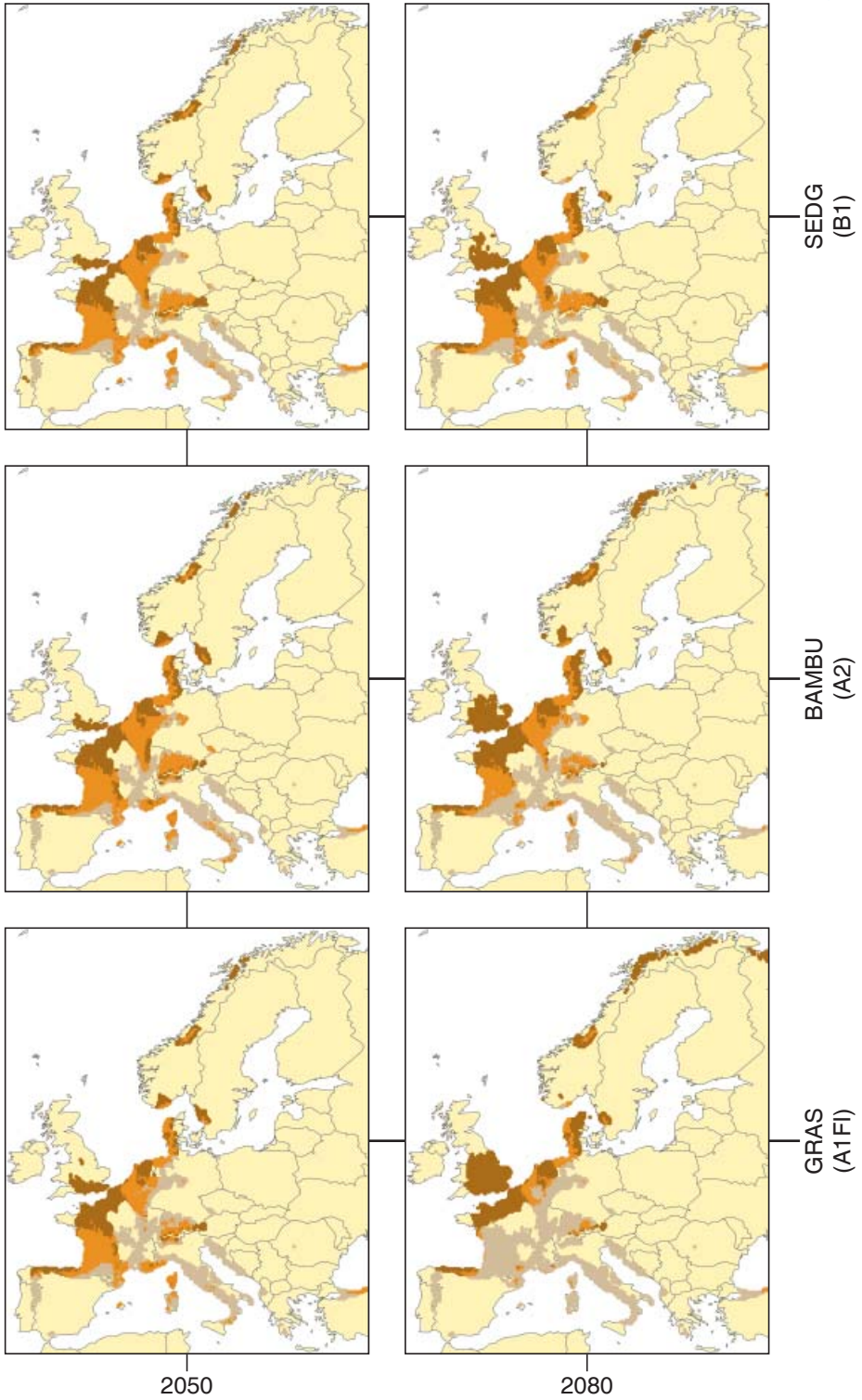
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83). Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides vicrama (MOORE, 1865)



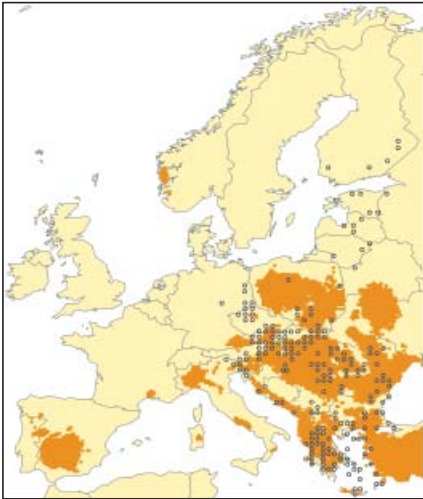
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	2985 (55.35%)	-353 (-6.55%)
	BAMBU	383 (7.1%)	-1599 (-29.65%)
	GRAS	1968 (36.49%)	-962 (-17.84%)
2080	SEDG	2198 (40.76%)	-1457 (-27.02%)
	BAMBU	309 (5.73%)	-2974 (-55.15%)
	GRAS	2622 (48.62%)	-3135 (-58.13%)

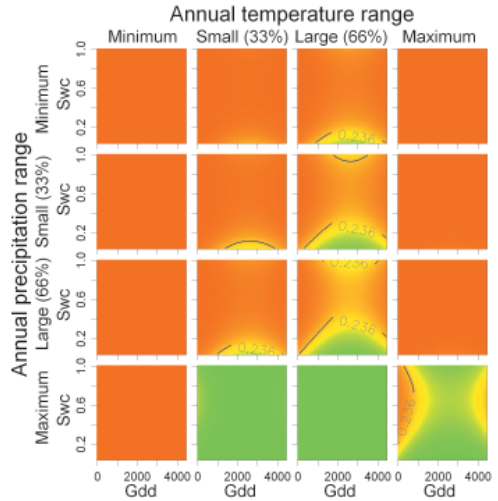
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 5393)

This blue is found on dry grassland on sandy or stony soils, south-facing slopes with grassy vegetation, on steep slopes, in rocky gullies, on railway embankments, on road verges and in scrub. Various sorts of thyme (*Thymus* spp.) and savory (*Satureja* spp.) are used as foodplant, the eggs being mostly laid on the flowerheads. The caterpillars feed on the flowers and ripening seeds, and are often found with ants (e.g. *Myrmica sabuleti*). This butterfly species is double-brooded.

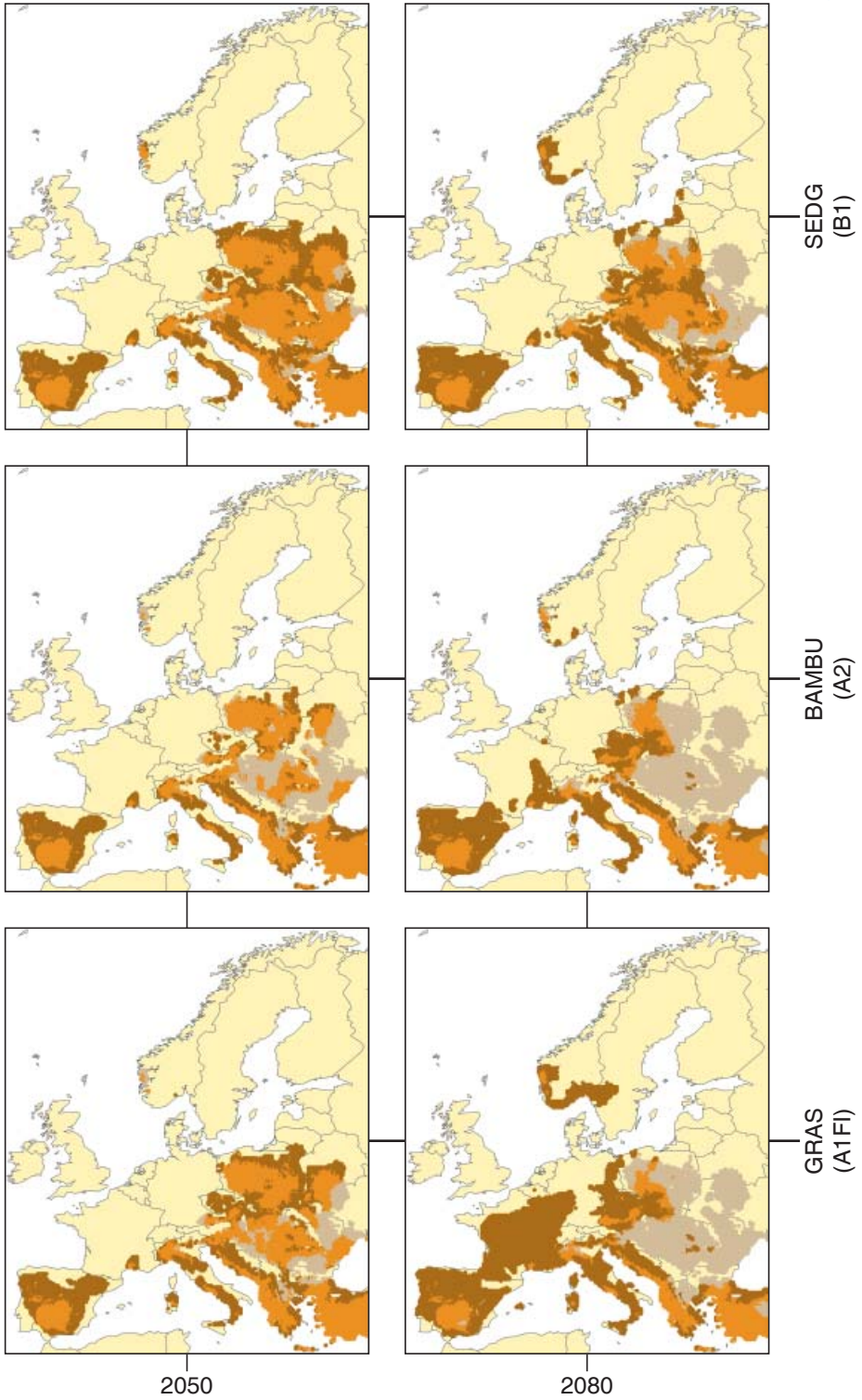
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.85). Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides abencerragus (PIERRET, 1837) – False Baton Blue



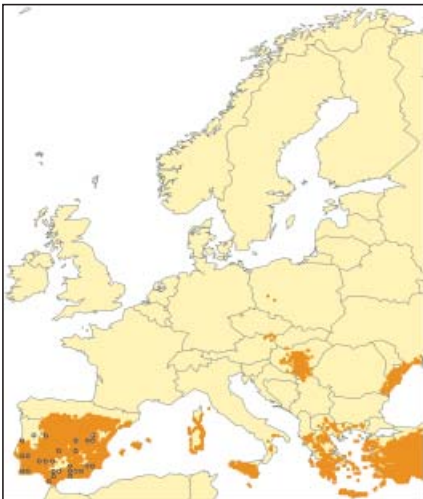
© Bernard Fransén

		Full dispersal	No dispersal
2050	SEDG	-567 (-21.16%)	-1068 (-39.87%)
	BAMBU	-1287 (-48.04%)	-1366 (-50.99%)
	GRAS	-1074 (-40.09%)	-1454 (-54.27%)
2080	SEDG	-1568 (-58.53%)	-1822 (-68.01%)
	BAMBU	-2301 (-85.89%)	-2392 (-89.29%)
	GRAS	-2531 (-94.48%)	-2614 (-97.57%)

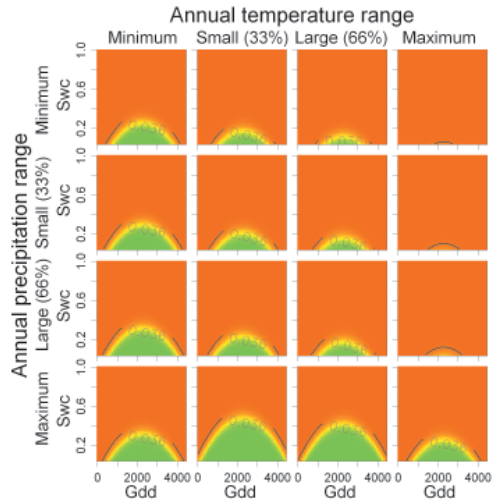
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2679)

The False Baton Blue is restricted to the Iberian Peninsula and is found in stony areas with flower-rich vegetation and scrub. Different plants are given in the literature, such as Thyme (*Thymus vulgaris*), Green Heather (*Erica scoparia*), and the labiate annual *Cleonia lusitanica*. It is on the leaves of *Cleonia lusitanica* that the female lays her eggs, although the caterpillars feed on the flowers. The False Baton Blue hibernates as a caterpillar, and is single-brooded in Europe.

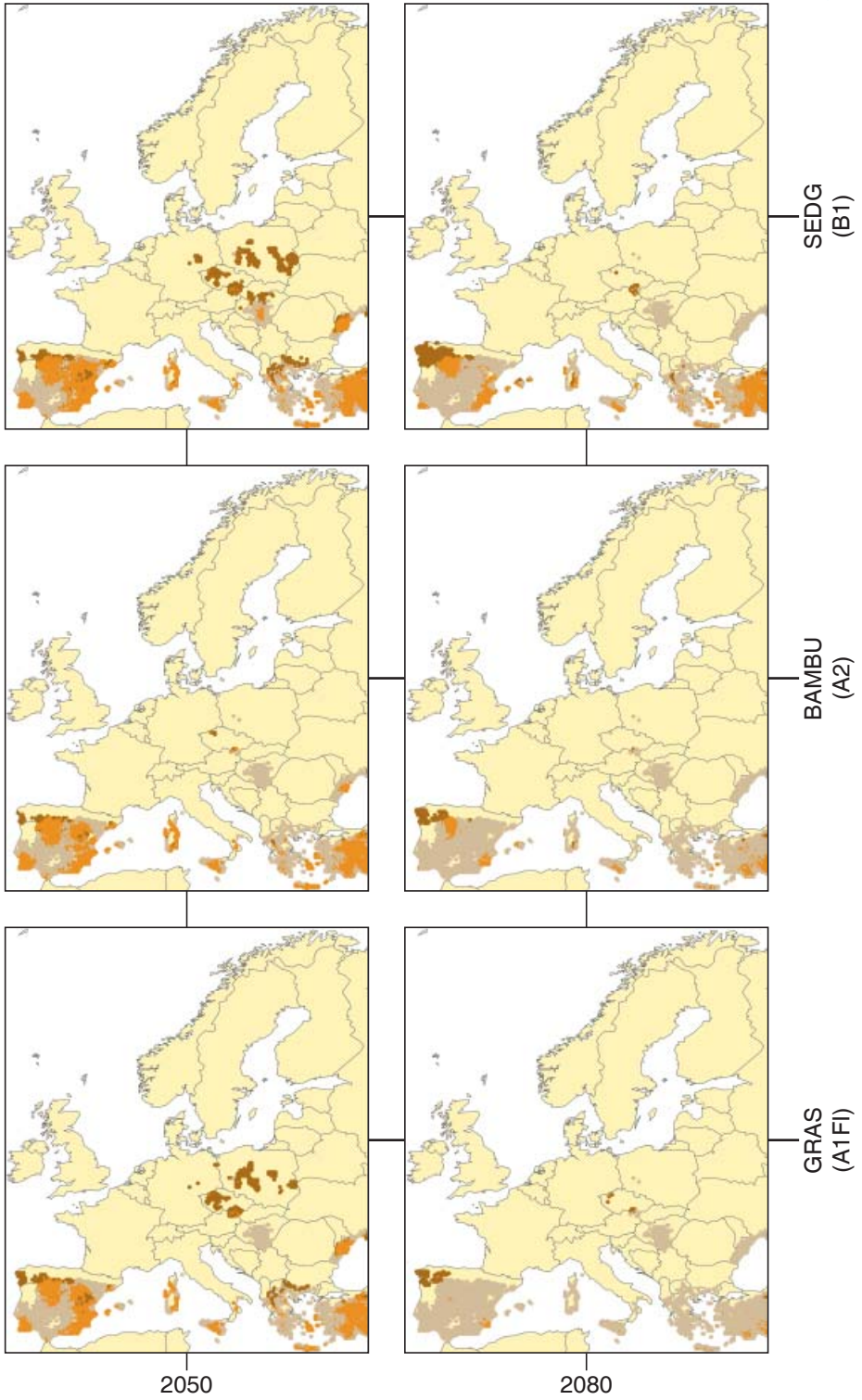
Present distribution can be well explained by climatic variables (AUC = 0.94).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides bavius (EVERSMANN, 1832) – Bavius Blue



© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	142 (33.18%)	-170 (-39.72%)
	BAMBU	36 (8.41%)	-182 (-42.52%)
	GRAS	74 (17.29%)	-210 (-49.07%)
2080	SEDG	307 (71.73%)	-230 (-53.74%)
	BAMBU	-124 (-28.97%)	-331 (-77.34%)
	GRAS	-70 (-16.36%)	-406 (-94.86%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 428)

The Bavius Blue occurs often on flower-rich, dry grassland, on dry, stony slopes, and on open patches in shrub and in vineyards on calcareous soil. Various species of *Salvia* are used as foodplant, including Sage (*S. officinalis*), *S. nutans*, *S. verbenaca*, and Whorled Clary (*S. verticillata*). The caterpillars feed mostly on the flowers, but sometimes also on the leaves. They are frequently found with ants. The Bavius Blue is single-brooded. The pupa overwinters.

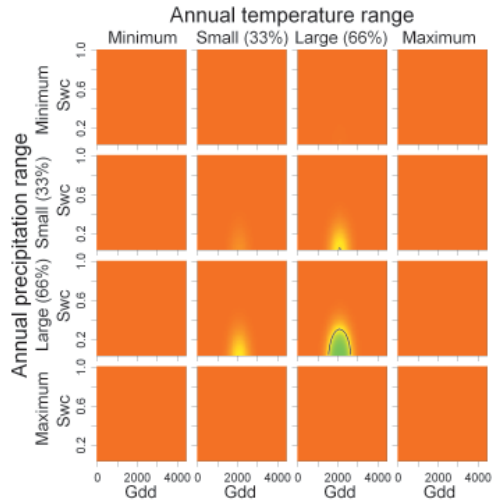
This species is listed in Annexes II and IV of the Habitats' Directive.

Present distribution can be well explained by climatic variables (AUC = 0.86).

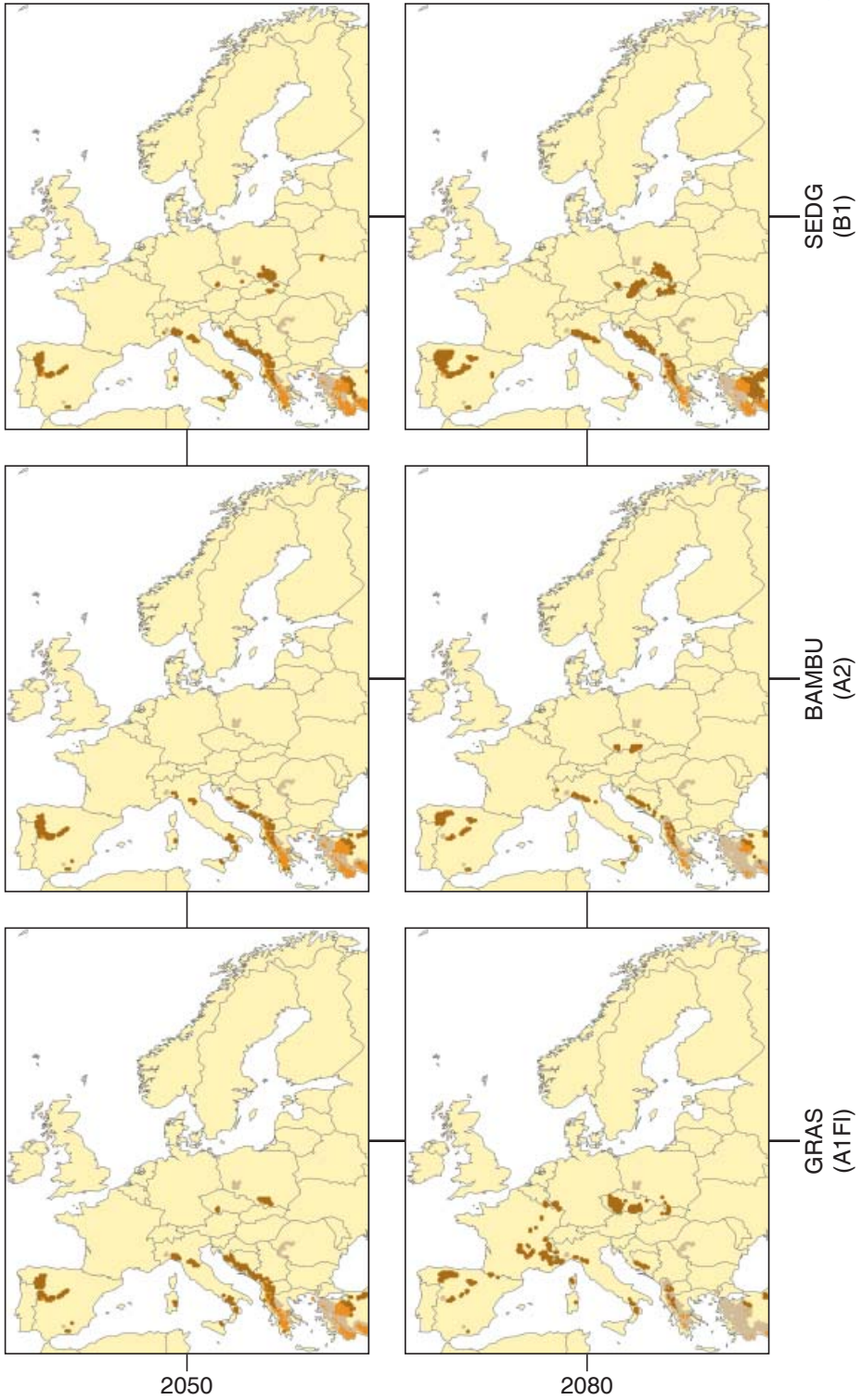
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides orion (PALLAS, 1771) – Chequered Blue



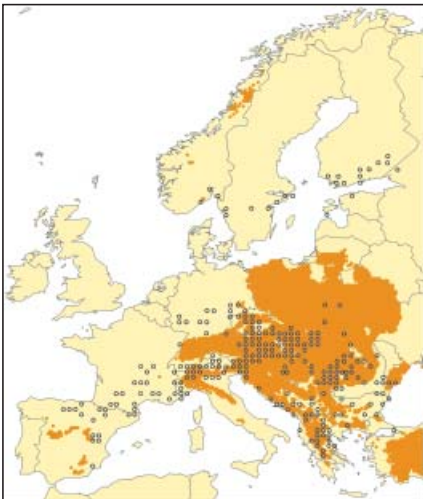
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-24 (-0.38%)	-1835 (-29.27%)
	BAMBU	-1291 (-20.59%)	-2663 (-42.47%)
	GRAS	-1532 (-24.43%)	-2699 (-43.05%)
2080	SEDG	-1446 (-23.06%)	-3844 (-61.31%)
	BAMBU	-2659 (-42.41%)	-4917 (-78.42%)
	GRAS	-2649 (-42.25%)	-5527 (-88.15%)

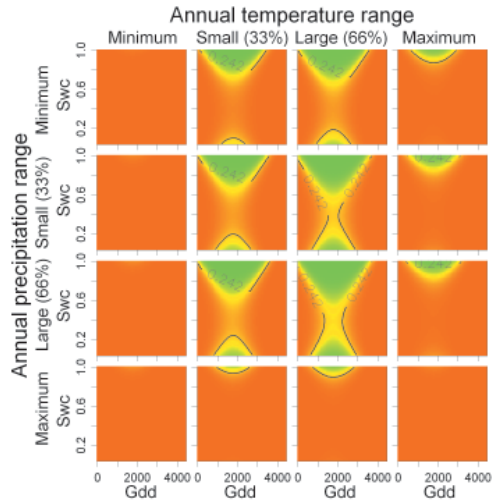
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6270)

The Chequered Blue, a small but conspicuous butterfly, can be seen on warm, and rocky slopes and narrow ledges, where there is little vegetation, apart from its foodplants White Stonecrop (*Sedum album*) and Orpine (*Sedum telephium*). The females lay their eggs on the leaves of the foodplant near the stem. The caterpillars are often found with different ants. The pupa overwinters, and is often hidden under stones or in small hollows in the ground near the foodplant. The Chequered Blue produces one or two generations a year, depending on its geographical position.

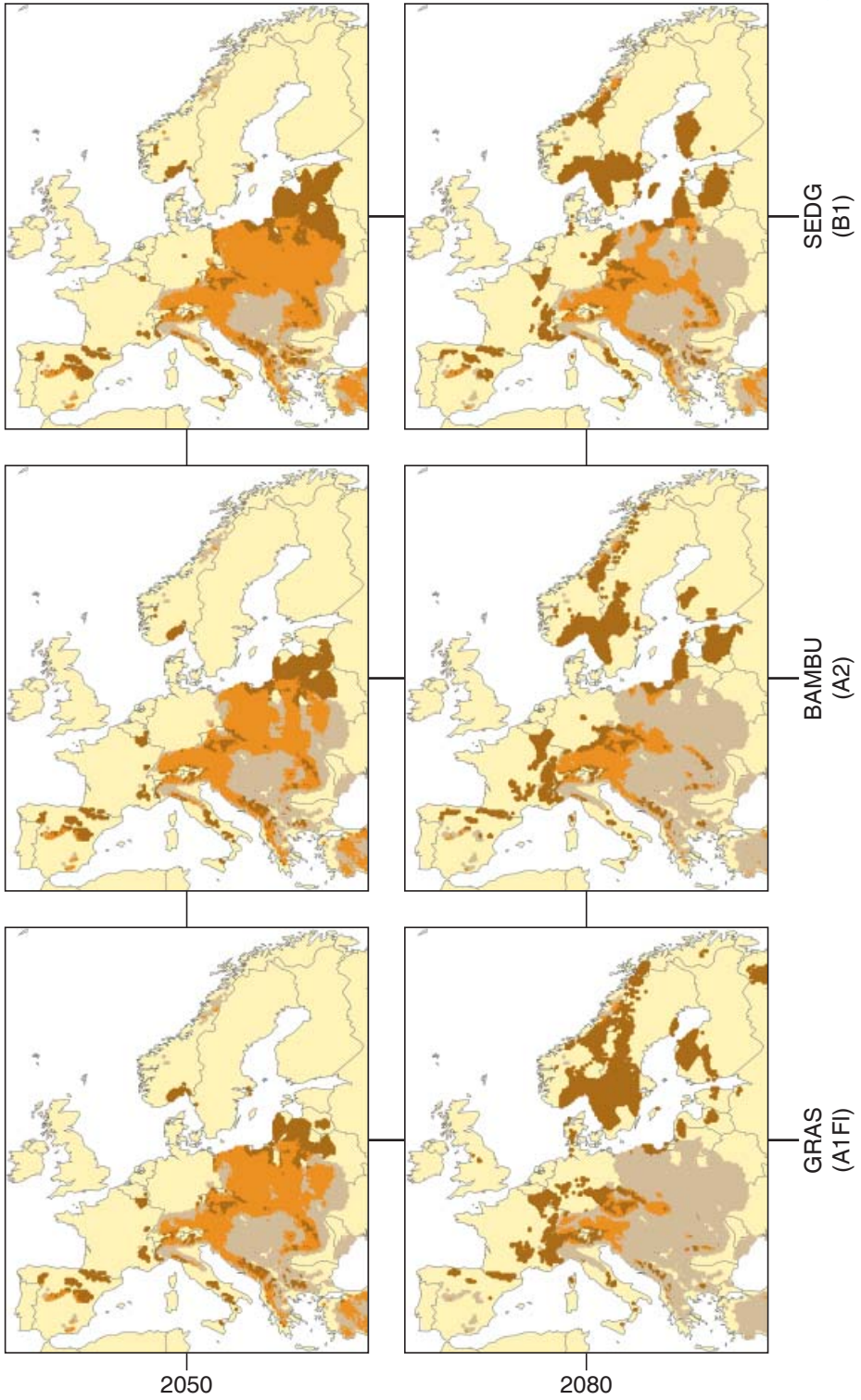
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.78). Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Scolitantides panoptes (HÜBNER, 1813) – Panoptes Blue



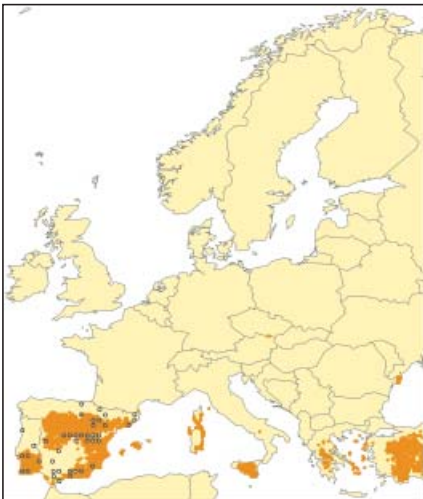
© Bernard Fransén

		Full dispersal	No dispersal
2050	SEDG	-867 (-58.07%)	-971 (-65.04%)
	BAMBU	-1124 (-75.28%)	-1130 (-75.69%)
	GRAS	-1146 (-76.76%)	-1207 (-80.84%)
2080	SEDG	-1324 (-88.68%)	-1344 (-90.02%)
	BAMBU	-1493 (-100%)	-1493 (-100%)
	GRAS	-1493 (-100%)	-1493 (-100%)

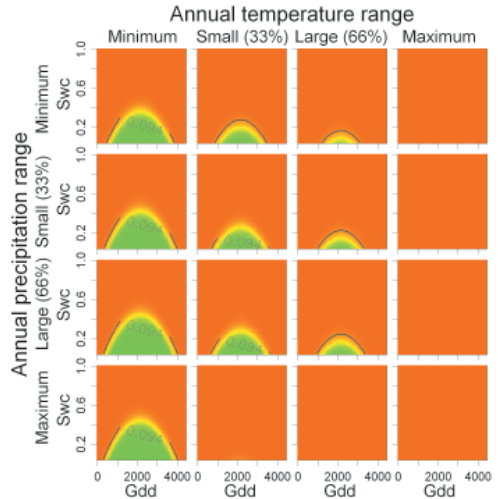
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 1493)

At present the species is widespread in the Iberian Peninsula. It lives on dry grasslands between 200 and 1900m elevation. The caterpillars are visited by ants of the genus *Camponotus*. The species has two generations and one can find adults on the wing from March until August. Larval foodplants are *Thymus* and *Saturja* species. The taxonomic status (whether subspecies of *S. baton* or a separate species) is under discussion.

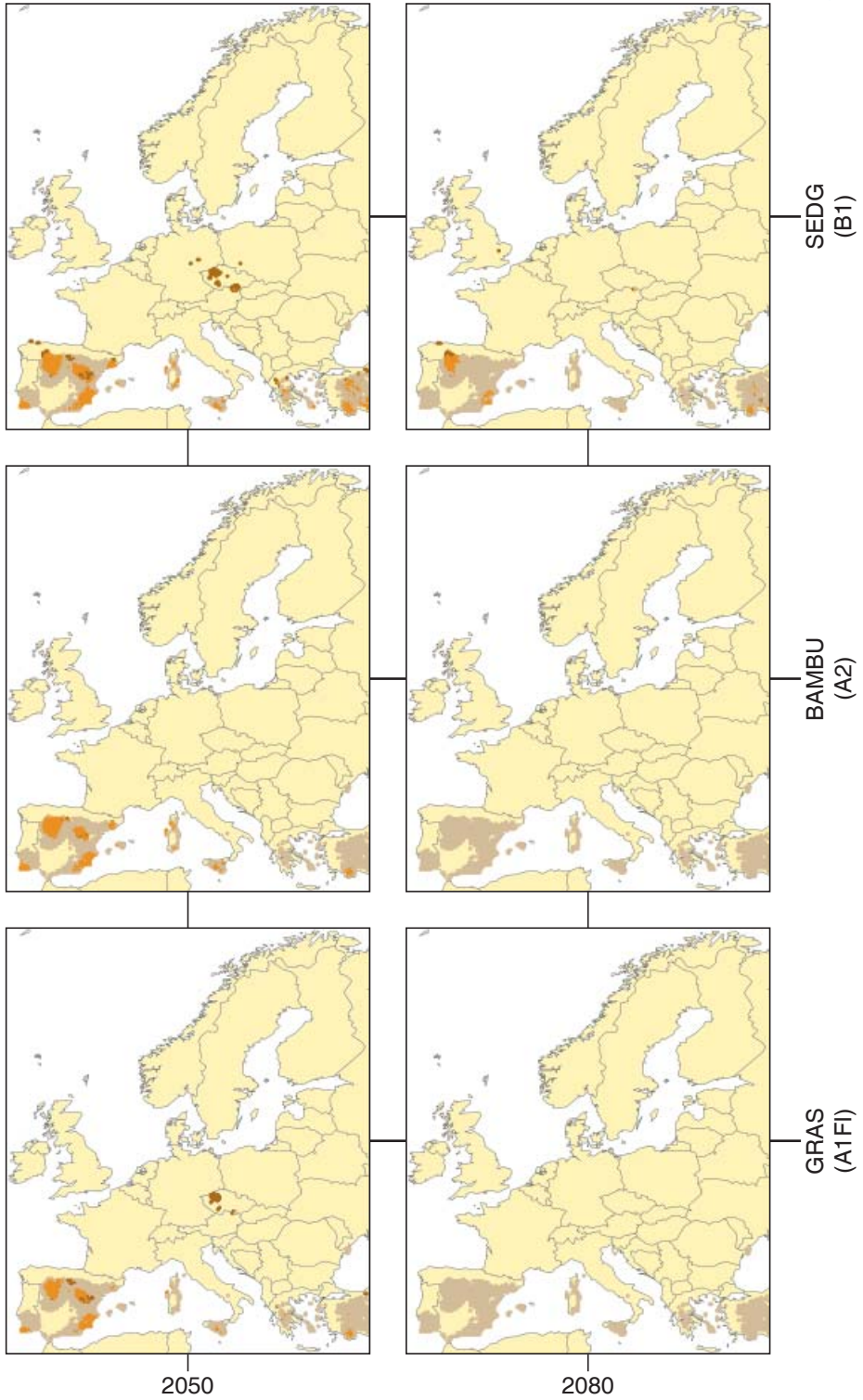
Present distribution can be well explained by climatic variables (AUC = 0.87).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Glaucopsyche alexis (PODA, 1761) – Green-underside Blue



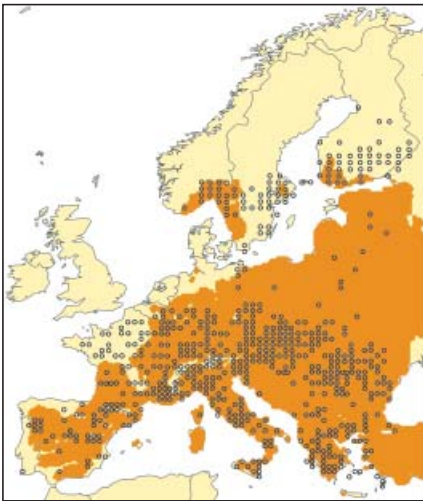
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	2477 (15.8%)	-1128 (-7.2%)
	BAMBU	2034 (12.98%)	-1448 (-9.24%)
	GRAS	1267 (8.08%)	-2065 (-13.17%)
2080	SEDG	3155 (20.13%)	-2810 (-17.93%)
	BAMBU	1588 (10.13%)	-5095 (-32.5%)
	GRAS	1591 (10.15%)	-6785 (-43.28%)

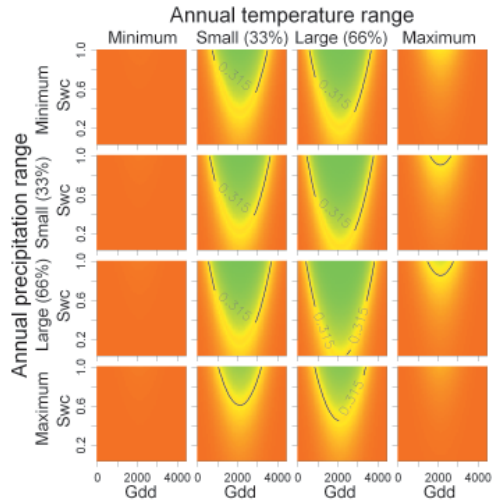
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 15676)

The Green-underside Blue is a pretty sight on both dry and damp flower-rich grassy vegetation, such as meadows and woodland clearings. The females lay their eggs between the flowers of different leguminous plants, including Sainfoin (*Onobrychis viciifolia*), brooms (*Cytisus* spp.), vetches (*Vicia* spp.), Crown Vetch (*Coronilla varia*), *Genista* spp., and melilots (*Melilotus* spp.). The caterpillars feed on the leaves and are frequently attended by the workers of various ants. Hibernation takes place as a pupa. The Green-underside Blue is single-brooded.

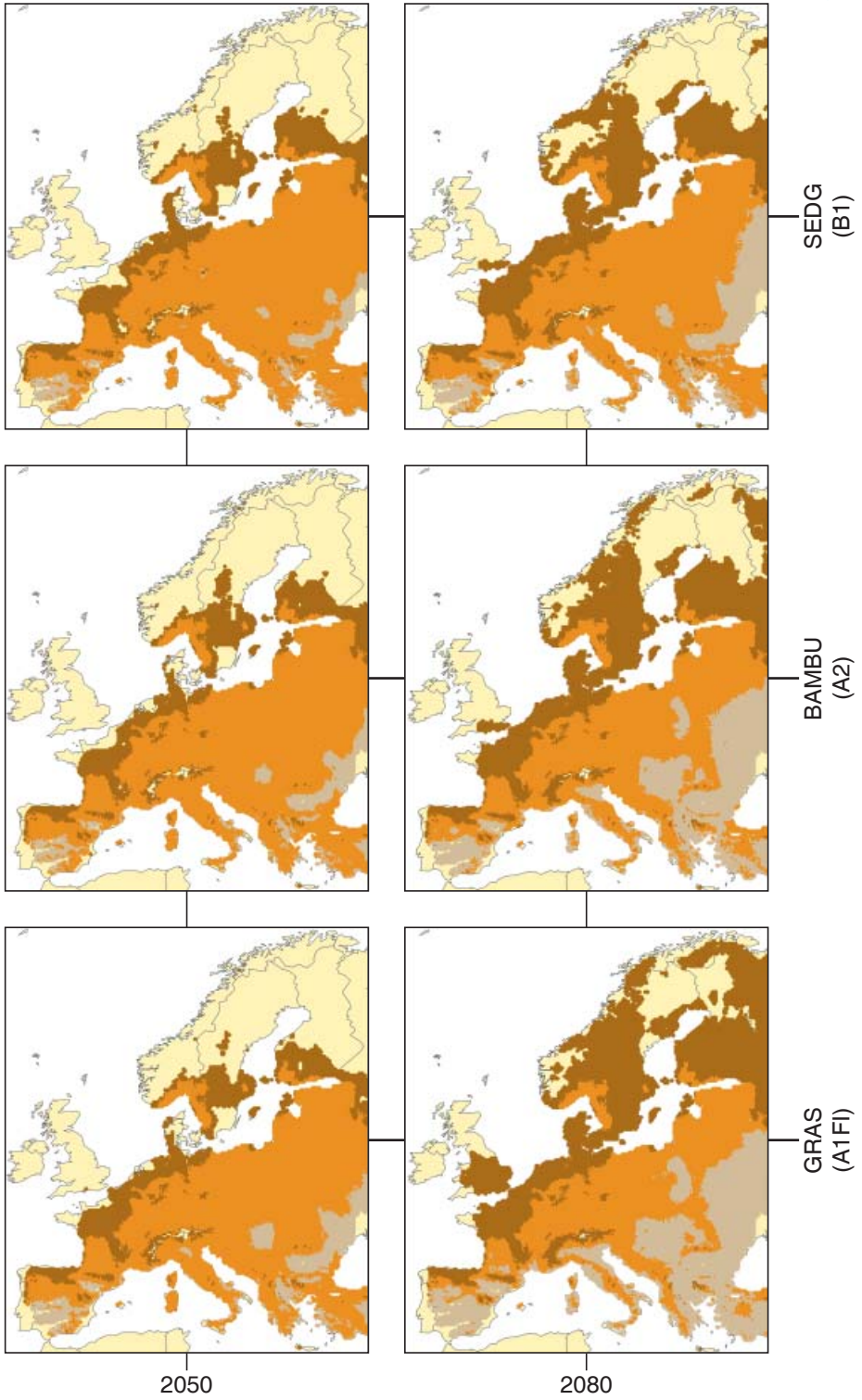
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.7). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Glaucopteryx melanops (BOISDUVAL, 1828) – Black-eyed Blue



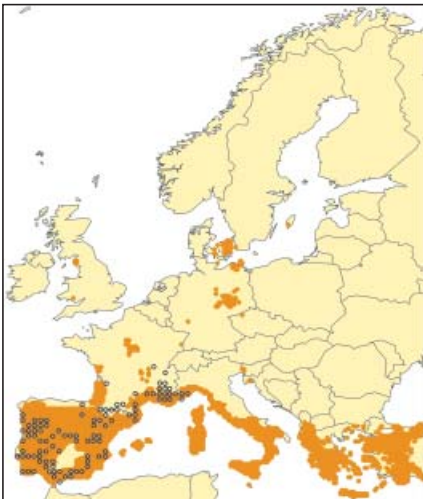
© Albert Vliegthart

		Full dispersal	No dispersal
2050	SEDG	-720 (-20.13%)	-2069 (-57.84%)
	BAMBU	-1708 (-47.75%)	-2238 (-62.57%)
	GRAS	-1333 (-37.27%)	-2464 (-68.88%)
2080	SEDG	-1767 (-49.4%)	-2884 (-80.63%)
	BAMBU	-2319 (-64.83%)	-3287 (-91.89%)
	GRAS	-2032 (-56.81%)	-3524 (-98.52%)

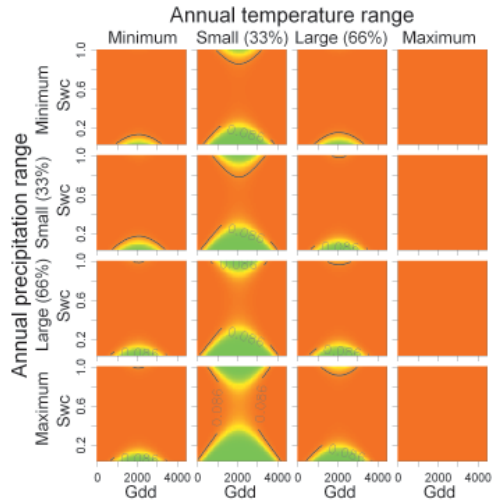
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 3577)

The Black-eyed Blue occurs in open shrub, or open woodland, especially where *Genista* or large bushes of broom (*Cytisus* spp.) are growing. Eggs are laid on the flowers of various leguminous plants, such as *Dorycnium* spp., Birdsfoot-trefoils (*Lotus* spp.), *Anthyllis* spp., brooms (*Cytisus* spp.) and *Genista* spp.. The caterpillars feed on the flowers and are attended by ants of the genus *Camponotus*. The Black-eyed Blue hibernates in the pupal stage. It usually has one generation a year.

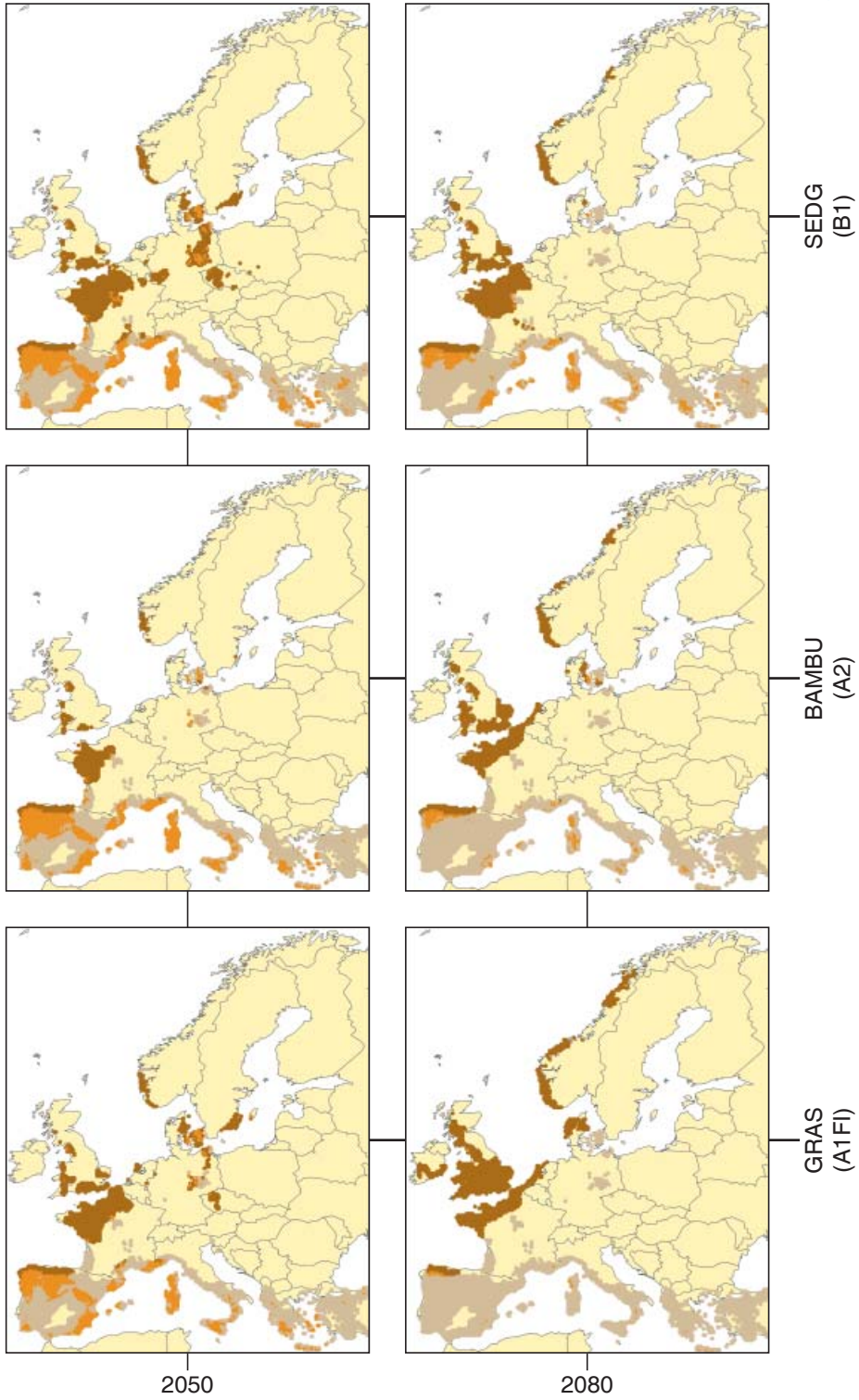
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8). Climate risk category: HHRH.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Iolana iolas (OCHSENHEIMER, 1816) – Iolas Blue



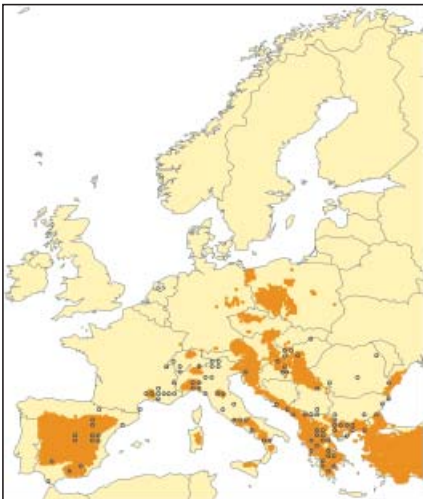
© Rudi Verovnik

		Full dispersal	No dispersal
2050	SEDG	-102 (-3.08%)	-1371 (-41.46%)
	BAMBU	-1610 (-48.68%)	-1909 (-57.73%)
	GRAS	-974 (-29.45%)	-1849 (-55.91%)
2080	SEDG	-1564 (-47.29%)	-2149 (-64.98%)
	BAMBU	-2625 (-79.38%)	-2938 (-88.84%)
	GRAS	-2596 (-78.5%)	-3186 (-96.34%)

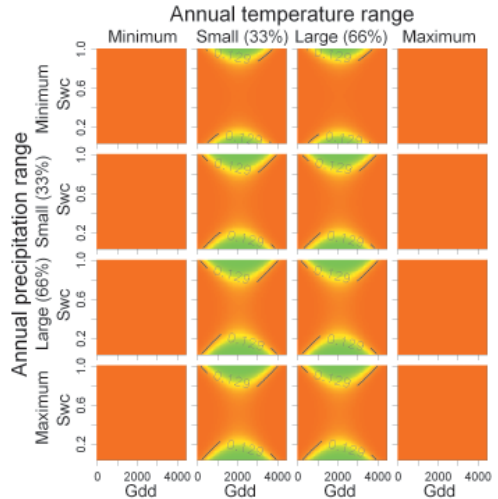
Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 3307)

The Iolas Blue is Europe’s largest blue. It occurs locally on calcareous soil, where shrubs of its foodplant Bladder Senna (*Colutea arborescens*) are growing. In Greece, *C. cilicica* is also used. This plant is practically the most important source of nectar for the butterflies. At times, the males can be seen some distance away from their habitat, but the females stay near the foodplants. They lay their eggs, usually several at a time, on the inside of the calyx and inside the bladder-like fruits. The caterpillars feed on the seeds and are visited frequently by ants (e.g. *Tapinoma erraticum* and *Camponotus cruentatus*). Usually, they can easily be seen by holding a pod up to the light. When fully-grown, the caterpillars pupate at the foot of the foodplant, passing the winter as a pupa. The Iolas Blue mostly has only one generation a year.

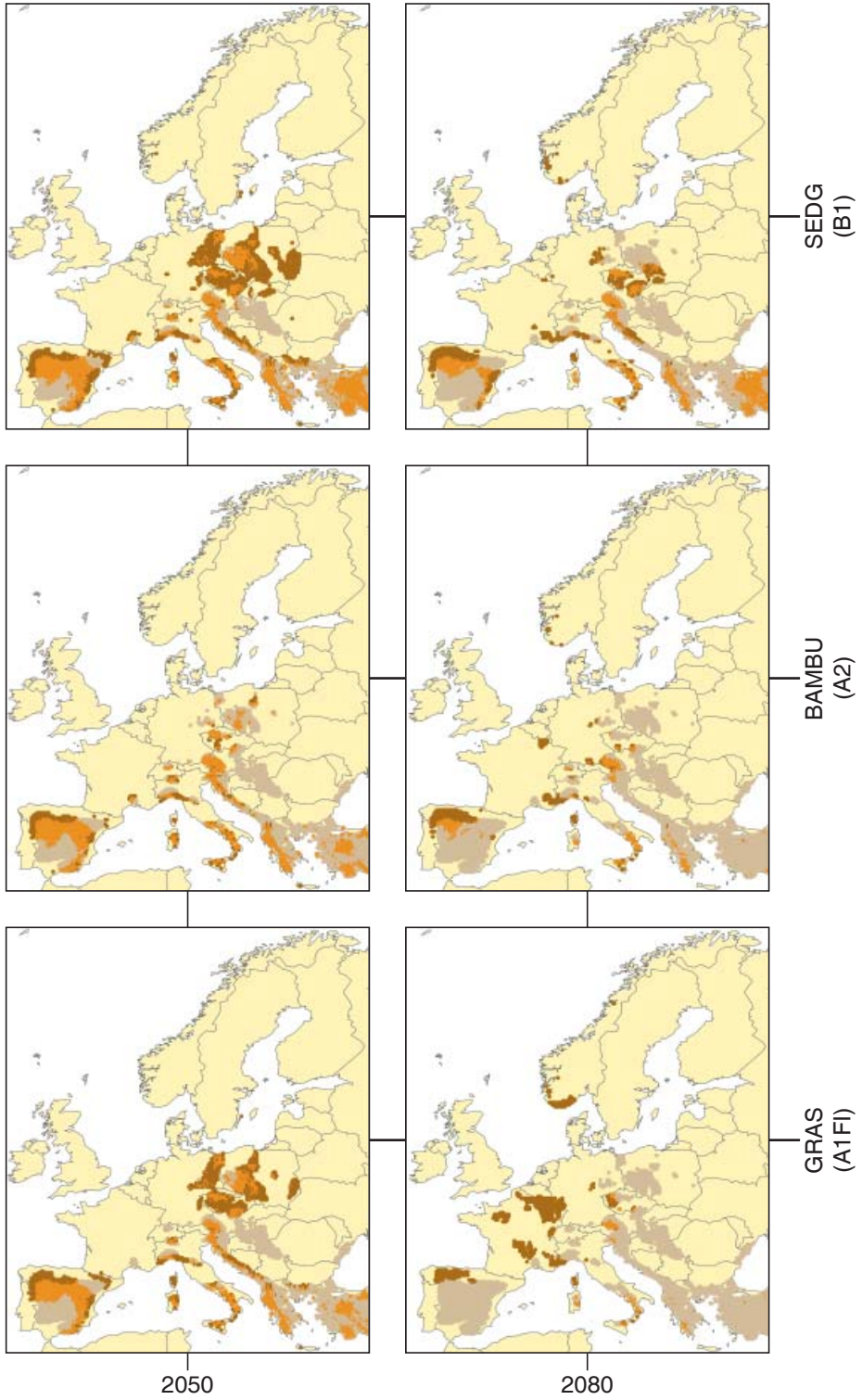
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.82). Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Phengaris arion (LINNAEUS, 1758) – Large Blue



© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-992 (-7.49%)	-3076 (-23.23%)
	BAMBU	-330 (-2.49%)	-2858 (-21.58%)
	GRAS	-2206 (-16.66%)	-4172 (-31.51%)
2080	SEDG	-1865 (-14.08%)	-5421 (-40.94%)
	BAMBU	-1732 (-13.08%)	-6599 (-49.83%)
	GRAS	-3006 (-22.7%)	-8692 (-65.64%)

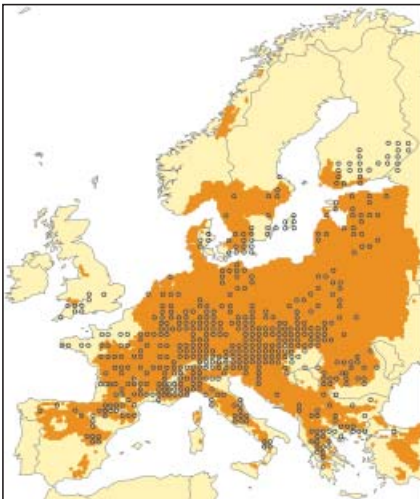
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 13242)

The Large Blue occurs locally on dry, open grasslands on limestone. It is one of the larger, more conspicuous blues. The females lay their eggs on Marjoram (*Origanum vulgare*) and different species of thyme (*Thymus* spp.). The caterpillars feed on the buds and flowers of the foodplant until they reach the last larval instar. They then leave their foodplant, and allow themselves to be taken by workers of *Myrmica sabuleti*, and sometimes of *M. scabrinodis*, to the ants' nest. The caterpillars feed on the ant grubs, hibernating and pupating in ants' nests as well.

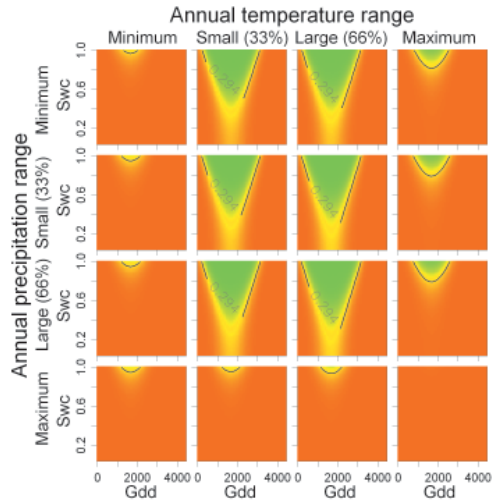
This species is listed in Annex IV of the Habitats' Directive.

Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.77).

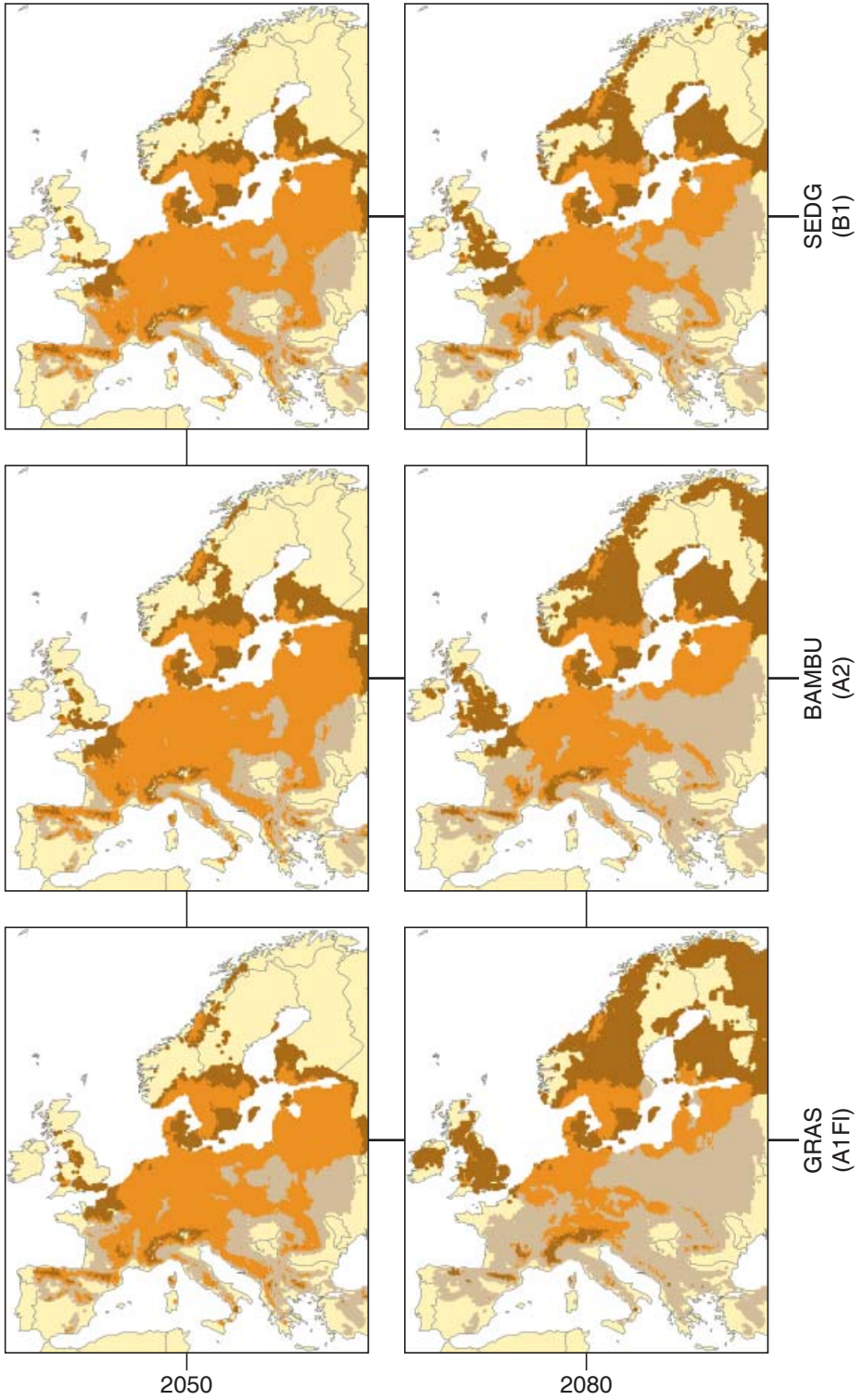
Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Phengaris teleius (BERGSTRÄSSER, 1779) – Scarce Large Blue



© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-35 (-0.54%)	-2184 (-33.69%)
	BAMBU	-551 (-8.5%)	-2612 (-40.29%)
	GRAS	-1537 (-23.71%)	-3224 (-49.73%)
2080	SEDG	-1008 (-15.55%)	-3984 (-61.45%)
	BAMBU	-1587 (-24.48%)	-4723 (-72.85%)
	GRAS	-2476 (-38.19%)	-5731 (-88.4%)

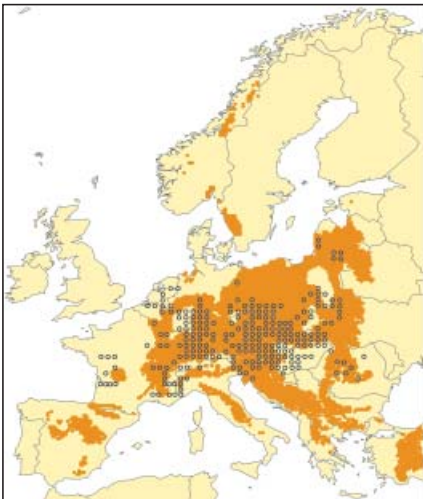
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6483)

The Scarce Large Blue can be found in moderately nutrient-rich meadows where its foodplant Great Burnet (*Sanguisorba officinalis*) is growing. In northern Europe, it occurs in open, short vegetation, but in the warm, southern parts, it is also found in rough vegetation. The butterflies tend to keep near the foodplants. The small caterpillars only feed on the flowerheads for two or three weeks. They then go down to the ground where they wait to be picked up by worker ants of the genus *Myrmica* and carried off to the ants' nest. There they feed on ant grubs. The caterpillars also hibernate and pupate in the ants' nest. The species of host ant varies in different parts of its range. The Scarce Large Blue is single-brooded.

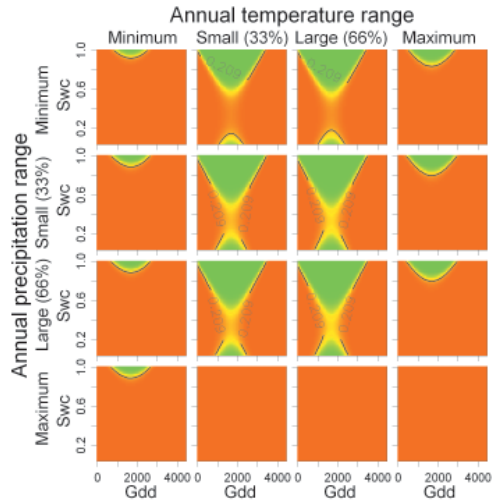
This species is listed in Annexes II and IV of the Habitats' Directive.

Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.84).

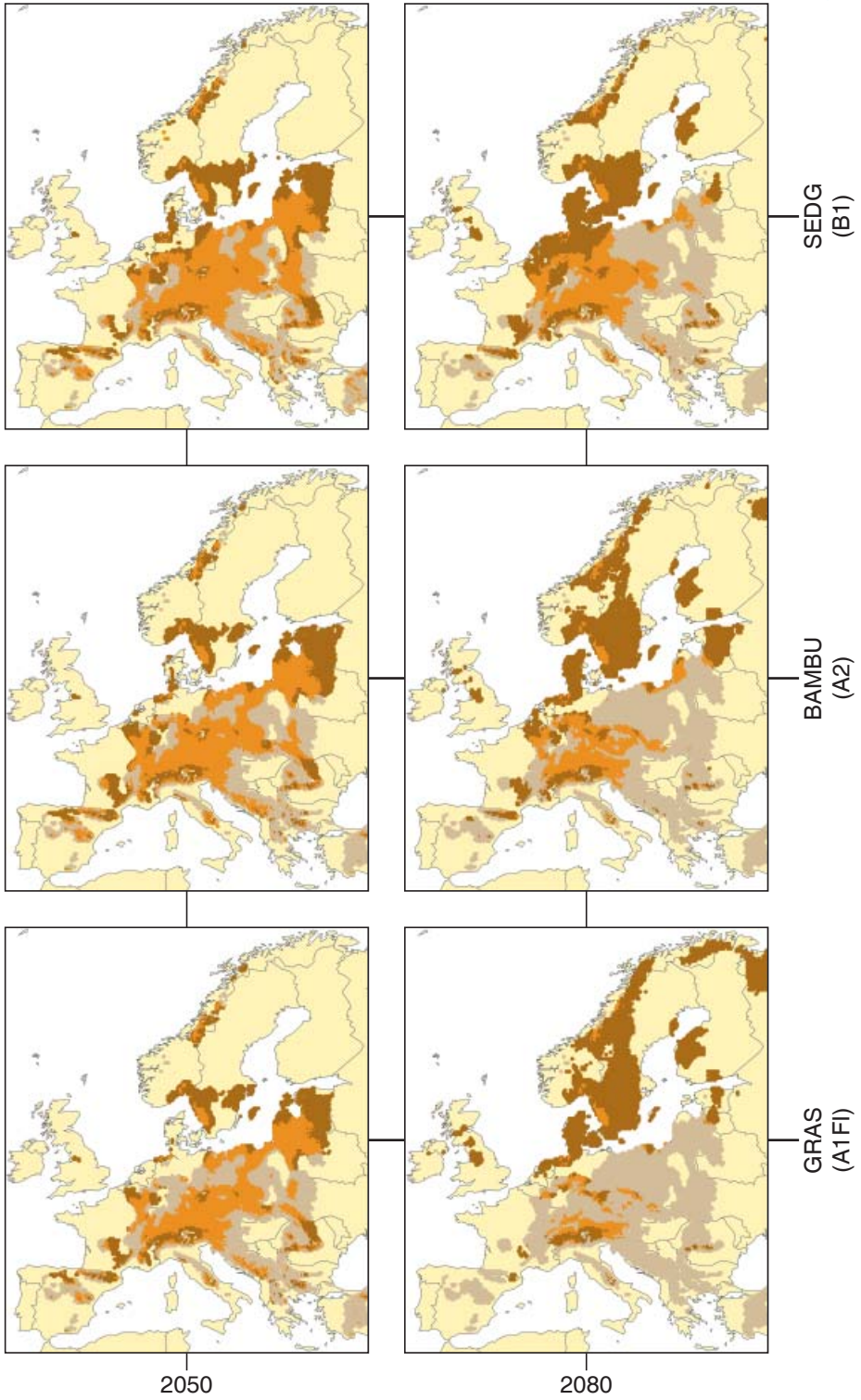
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Phengaris nausithous (BERGSTRÄSSER, 1779) – Dusky Large Blue



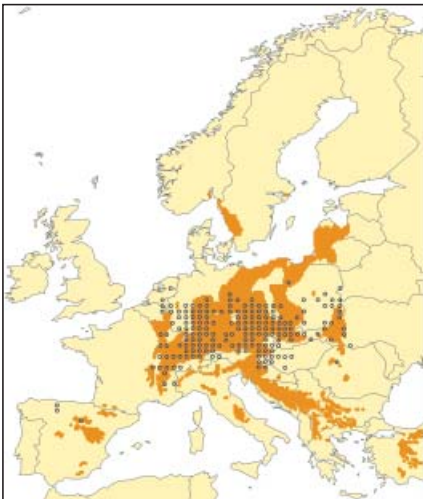
© Josef Settele

		Full dispersal	No dispersal
2050	SEDG	-830 (-22.93%)	-1999 (-55.24%)
	BAMBU	-699 (-19.31%)	-1960 (-54.16%)
	GRAS	-1451 (-40.09%)	-2501 (-69.11%)
2080	SEDG	-789 (-21.8%)	-2643 (-73.03%)
	BAMBU	-1716 (-47.42%)	-3061 (-84.58%)
	GRAS	-2334 (-64.49%)	-3460 (-95.61%)

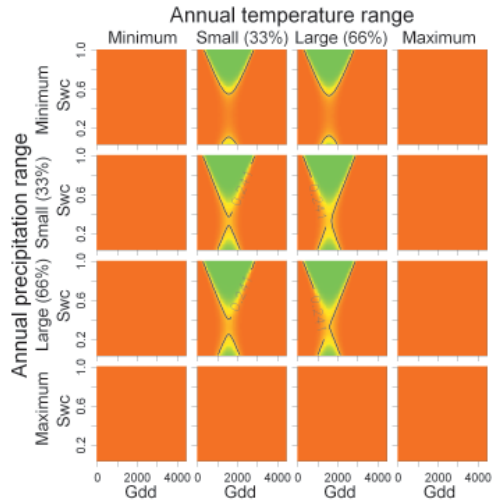
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 3619)

The Dusky Large Blue occurs on damp, moderately nutrient-rich grassland and rough vegetation. The butterflies are usually found on or near the foodplant Great Burnet (*Sanguisorba officinalis*). Having lived on the flowerheads of this plant for a few weeks, the small caterpillars go down to the ground, in order to be carried away by workers of the ant *Myrmica rubra* to an ant nest. There, they remain feeding on ant grubs, hibernating and pupating in the early summer. The newly-emerged butterflies leave the nest. The Dusky Large Blue is one of the most specialized of the “ant blues” being most adapted to one species of host ant. It is single-brooded. This species is listed in Annexes II and IV of the Habitats’ Directive.

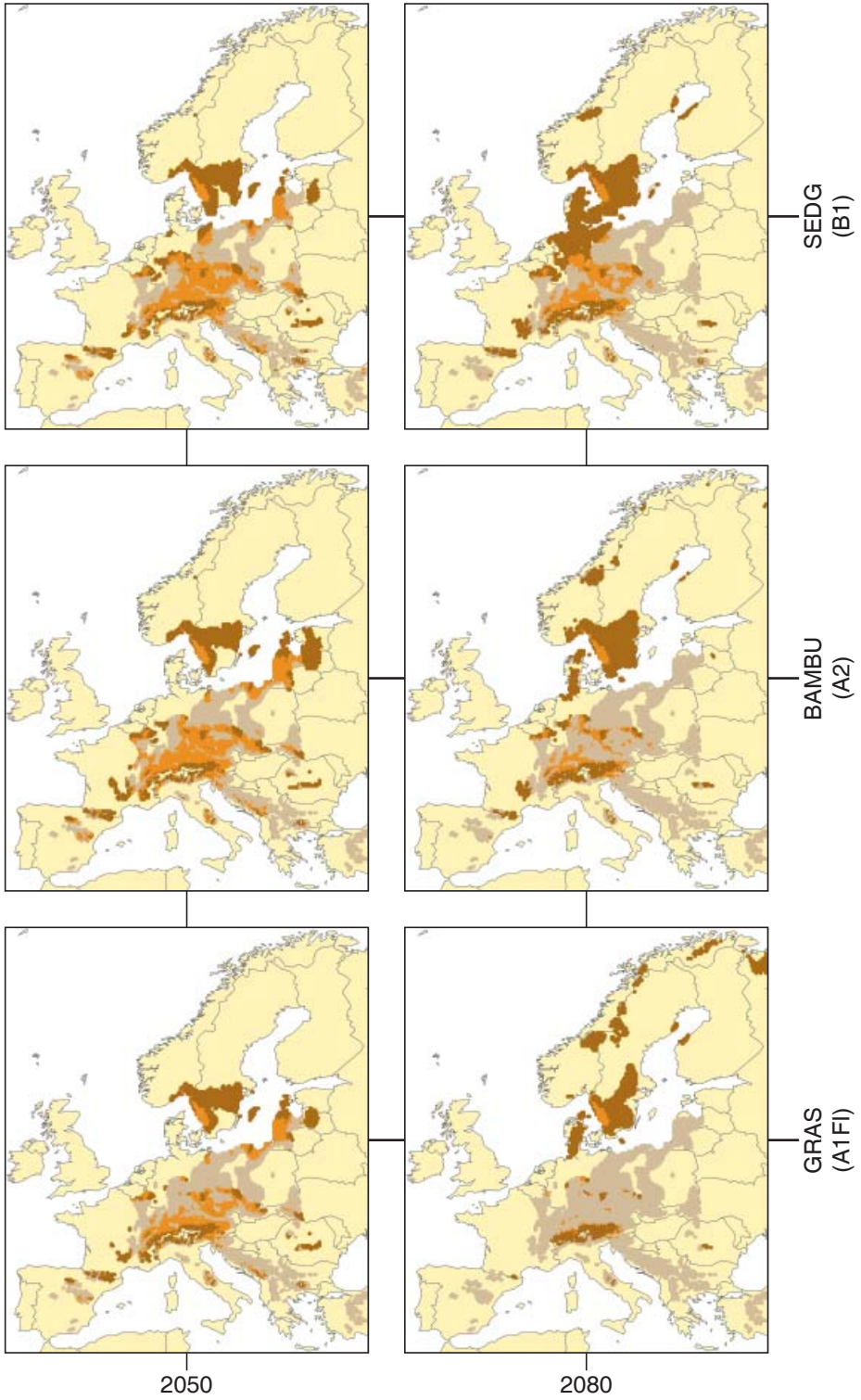
Present distribution can be well explained by climatic variables (AUC = 0.91).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Phengaris alcon ([SCHIFFERMÜLLER], 1775) – Alcon Blue



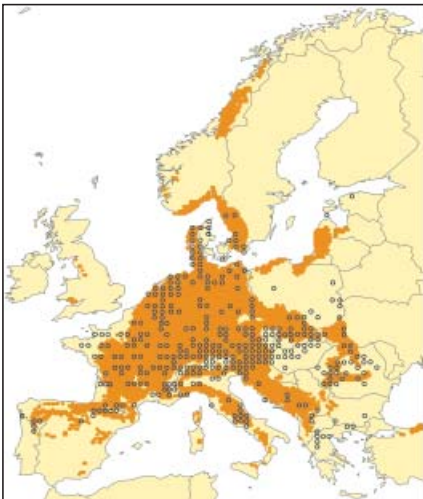
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-800 (-12.04%)	-2001 (-30.12%)
	BAMBU	375 (5.65%)	-1448 (-21.8%)
	GRAS	-1388 (-20.89%)	-2689 (-40.48%)
2080	SEDG	-741 (-11.15%)	-2794 (-42.06%)
	BAMBU	-1062 (-15.99%)	-3525 (-53.06%)
	GRAS	-2097 (-31.57%)	-4883 (-73.51%)

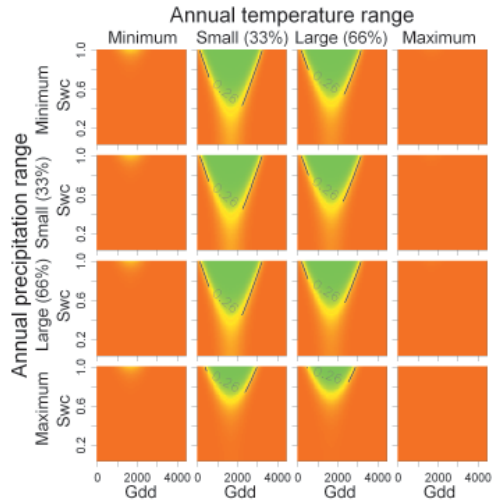
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6643)

The Alcon Blue occurs in local, scattered populations. Oftentimes it is referred to as two distinct species: *P. alcon* on low-lying wet heathland, on moist fen meadows and bogs, and *P. rebeli* on dry as well as sub-alpine calcareous grasslands. Usually, only a few butterflies are seen. The bright, white eggs are easy to find. Depending on the habitat, they are laid on the flowers and sepals of Marsh Gentian (*Gentiana pneumonanthe*), Willow Gentian (*G. asclepiadea*), and Cross Gentian (*G. cruciata*). At first, the small caterpillars feed on the ovaries of the foodplant, but they pass the last instar in the nests of various *Myrmica* ants, which they parasitize by living like young cuckoos, being fed by the worker ants. They hibernate and pupate in the ant nests. The Alcon Blue has one generation a year.

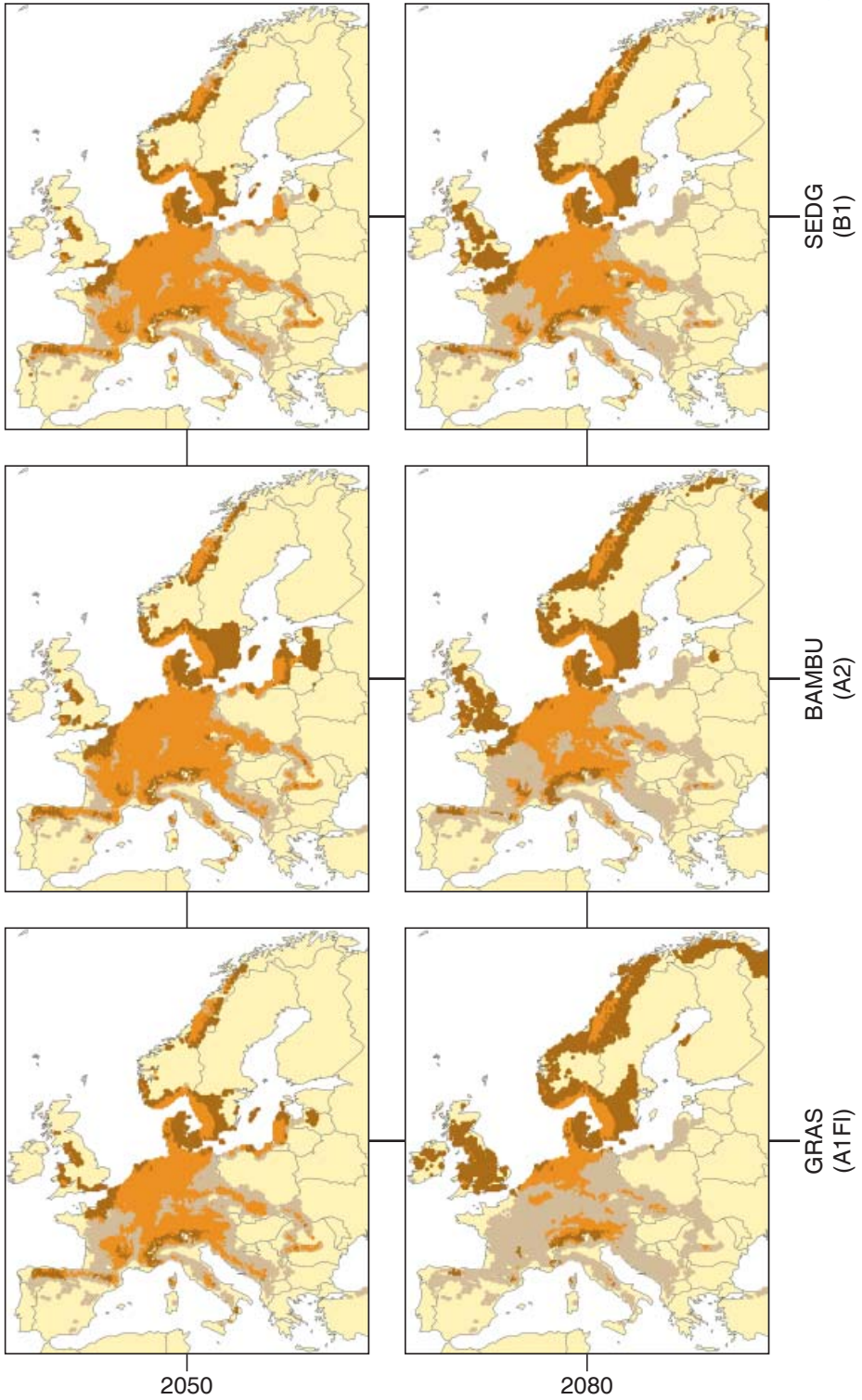
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus argus (LINNAEUS, 1758) – Silver-studded Blue



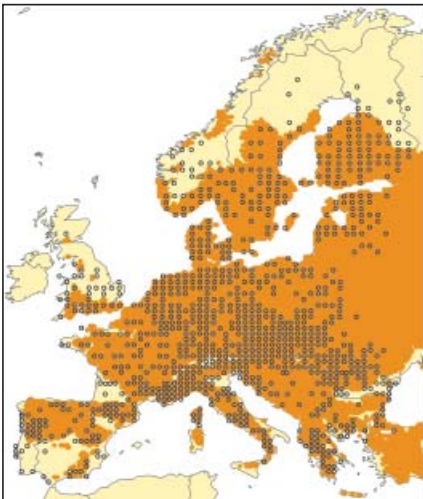
© Martin Wiemers

		Full dispersal	No dispersal
2050	SEDG	-889 (-4.65%)	-3151 (-16.49%)
	BAMBU	-1803 (-9.44%)	-3361 (-17.59%)
	GRAS	-2138 (-11.19%)	-4148 (-21.71%)
2080	SEDG	-865 (-4.53%)	-5024 (-26.29%)
	BAMBU	-3038 (-15.9%)	-7385 (-38.65%)
	GRAS	-4123 (-21.58%)	-9598 (-50.23%)

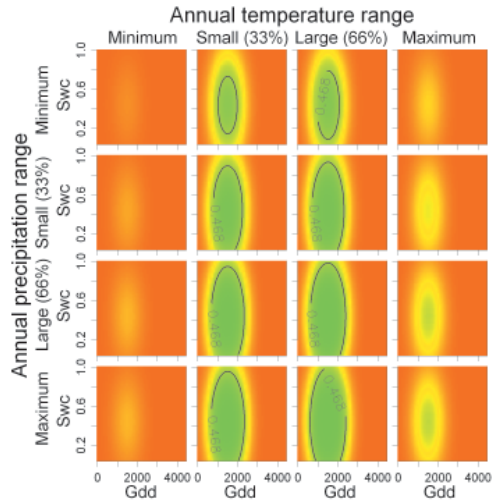
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 19107)

The Silver-studded Blue can be found in warm places on short vegetation, ranging from dry to quite damp, such as heath and poor grassland. Especially impressive are the roosting places with enormous groups, sometimes of hundreds of butterflies, asleep in a very small area. The eggs are laid on Cross-leaved Heath (*Erica tetralix*), and on a wide range of leguminous plants. Usually, the eggs are deposited low down on the foodplant or on its woody parts. The egg hibernates. The caterpillars live on the leaves of the foodplants. They are often tended by ants of the genus *Lasius*. Pupation often takes place in the outer passages of the ant nests. The ants also give the pupa a lot of attention. Depending on the geographical position and altitude of occurrence, the Silver-studded Blue has one or two generations a year.

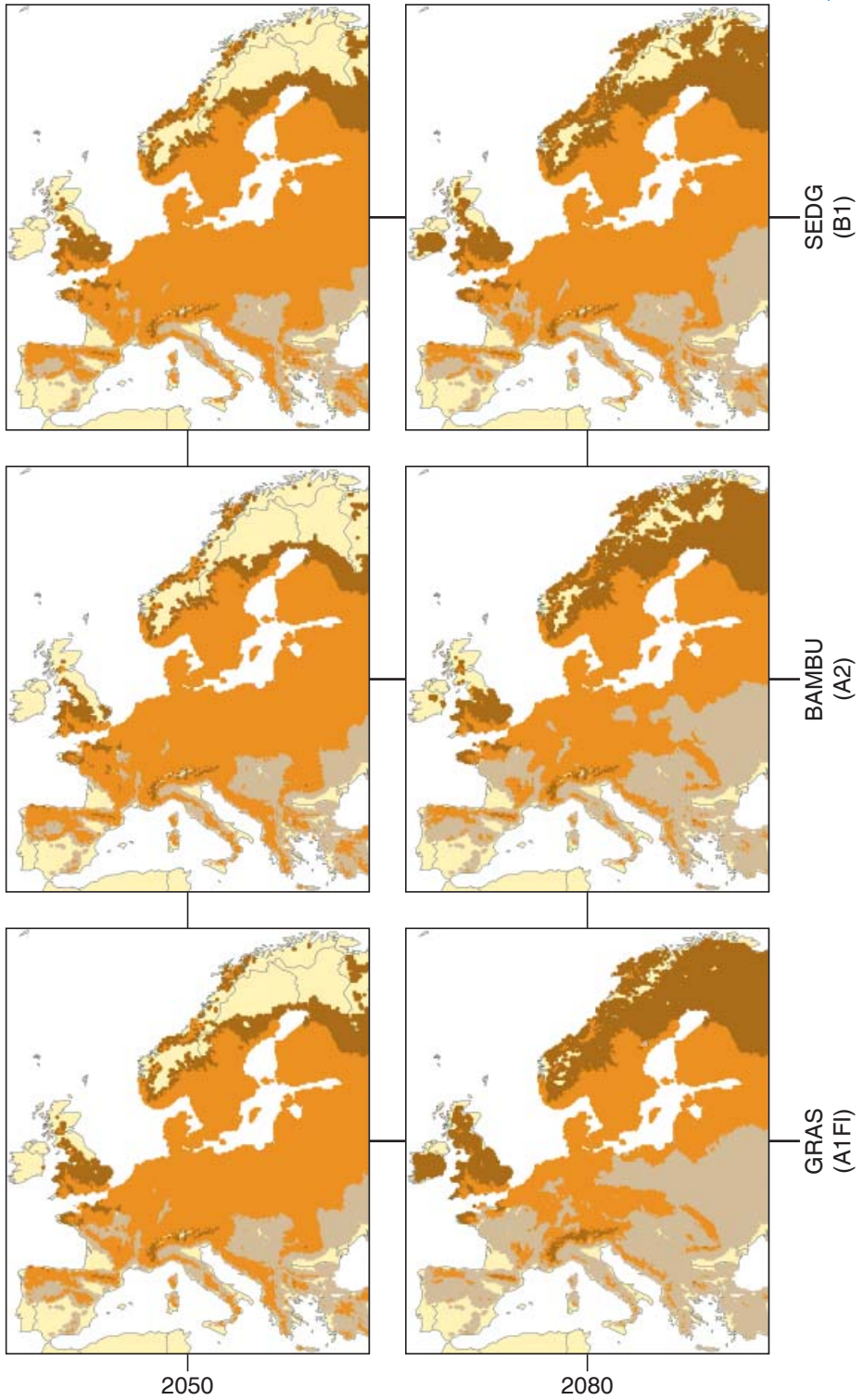
Present distribution can be explained by climatic variables to only a moderate extent (AUC = 0.69). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus idas (LINNAEUS, 1761) – Idas Blue



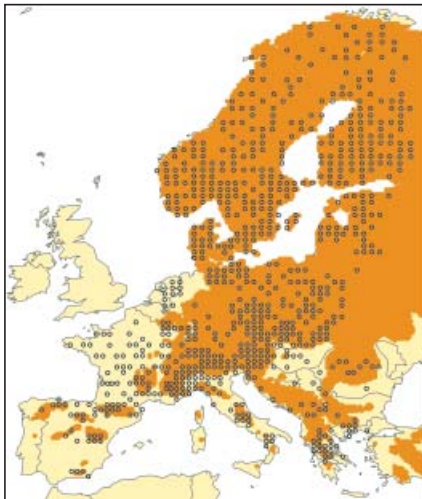
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-3965 (-21.5%)	-3996 (-21.67%)
	BAMBU	-4401 (-23.87%)	-4419 (-23.97%)
	GRAS	-5296 (-28.72%)	-5309 (-28.79%)
2080	SEDG	-6083 (-32.99%)	-6192 (-33.58%)
	BAMBU	-7986 (-43.31%)	-8006 (-43.42%)
	GRAS	-9992 (-54.19%)	-10023 (-54.36%)

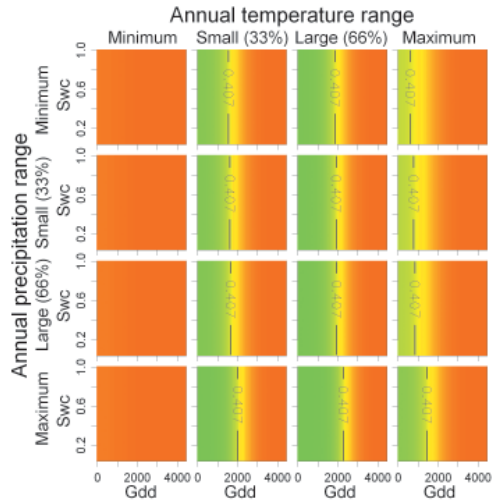
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 18438)

The Idas Blue can be found on poor grassland and heath rich in herbaceous plants, both in open places and woodland. Eggs are laid on many different species of leguminous plants, such as Broom (*Cytisus scoparius*), Hairy Greenweed (*Genista pilosa*), Common Birdsfoot-trefoil (*Coronilla varia*), White Melilot (*Melilotus alba*), and the Ericaceae, Ling or Heather (*Calluna vulgaris*) and Bog Whortleberry (*Vaccinium uliginosum*), and the Yellow Rockrose (*Helianthemum oelandicum*). The female deposits the egg onto a woody part of the foodplant where the egg then hibernates. The caterpillars are attended a lot by ants, especially those of the genera *Formica* and *Lasius*. When fully grown, the caterpillar crawls into the passages of the ant nest to pupate. Depending on the geographical location the Idas Blue produces one or two generations a year.

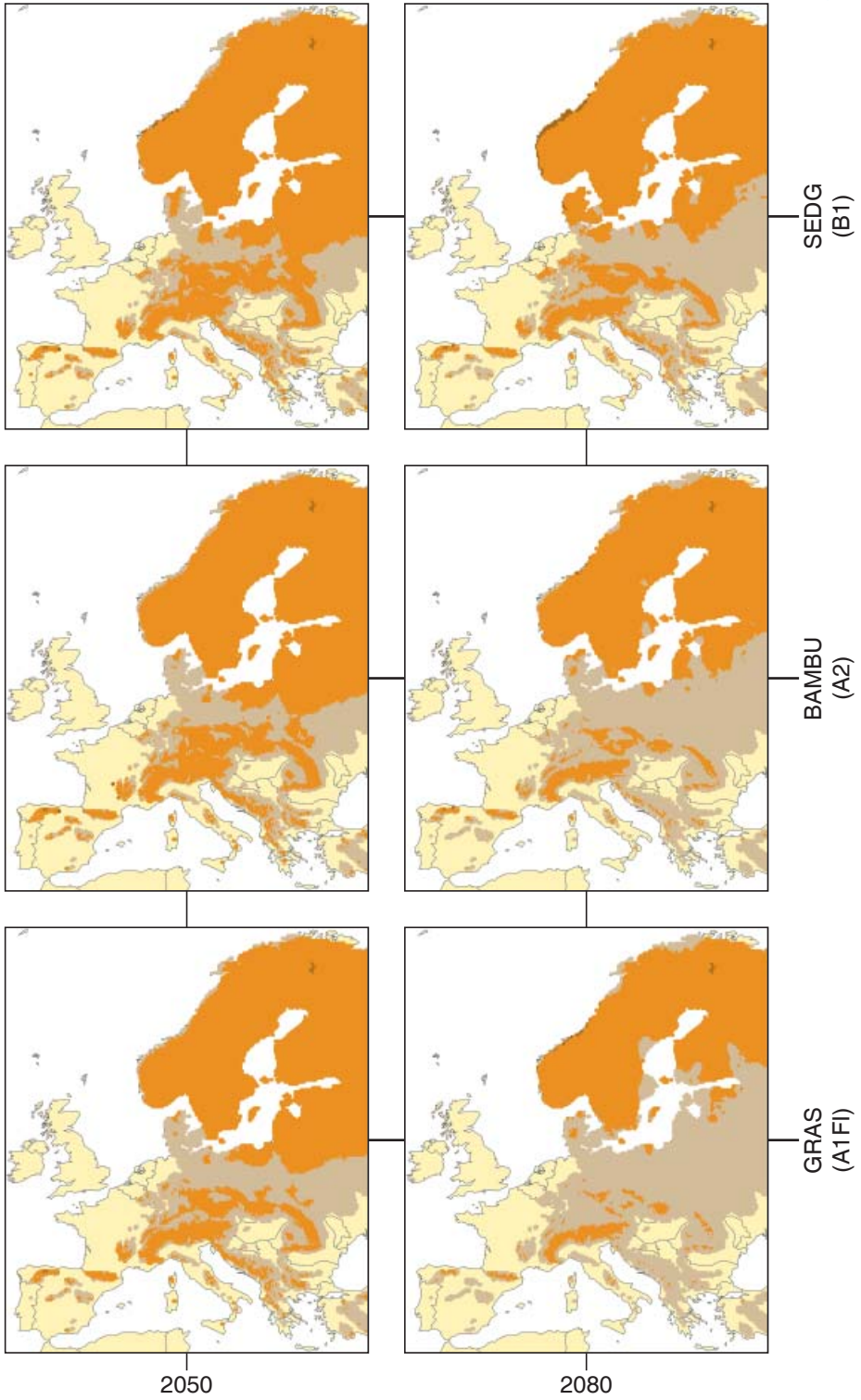
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.74). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus argyrognomon (BERGSTRÄSSER, 1779) – Reverdin’s Blue



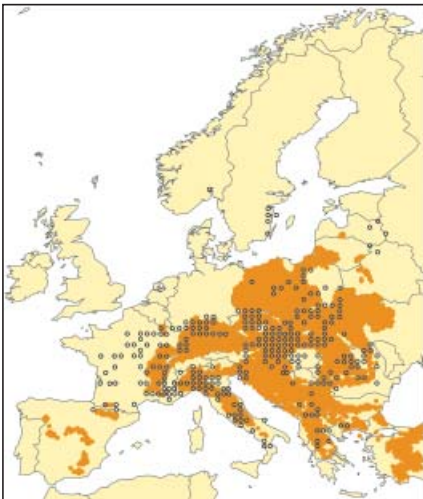
© Albert Vliegthart

		Full dispersal	No dispersal
2050	SEDG	995 (17.81%)	-1883 (-33.7%)
	BAMBU	1176 (21.05%)	-2065 (-36.95%)
	GRAS	267 (4.78%)	-2681 (-47.98%)
2080	SEDG	760 (13.6%)	-3178 (-56.87%)
	BAMBU	297 (5.31%)	-4064 (-72.73%)
	GRAS	-655 (-11.72%)	-4776 (-85.47%)

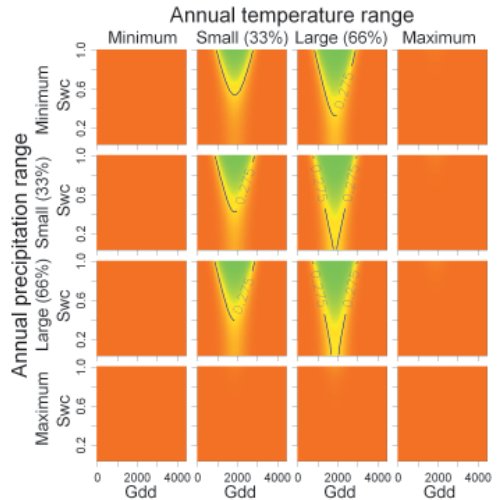
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 5588)

Reverdin’s Blue can be found on poor grassland in places ranging from dry to moist at the edges of woodland or scrub. Eggs are laid on Crown Vetch (*Coronilla varia*) and Milk-vetch (*Astragalus glycyphyllos*). The female mostly chooses a woody part of the plant, where the egg may hibernate. The small caterpillars feed on the young leaves. They are attended by *Lasius* and *Myrmica* as well as *Formica* and *Camponotus* ants, and pupate deep down in the vegetation. Except in Scandinavia where it is single-brooded, the Reverdin’s Blue has two generations a year.

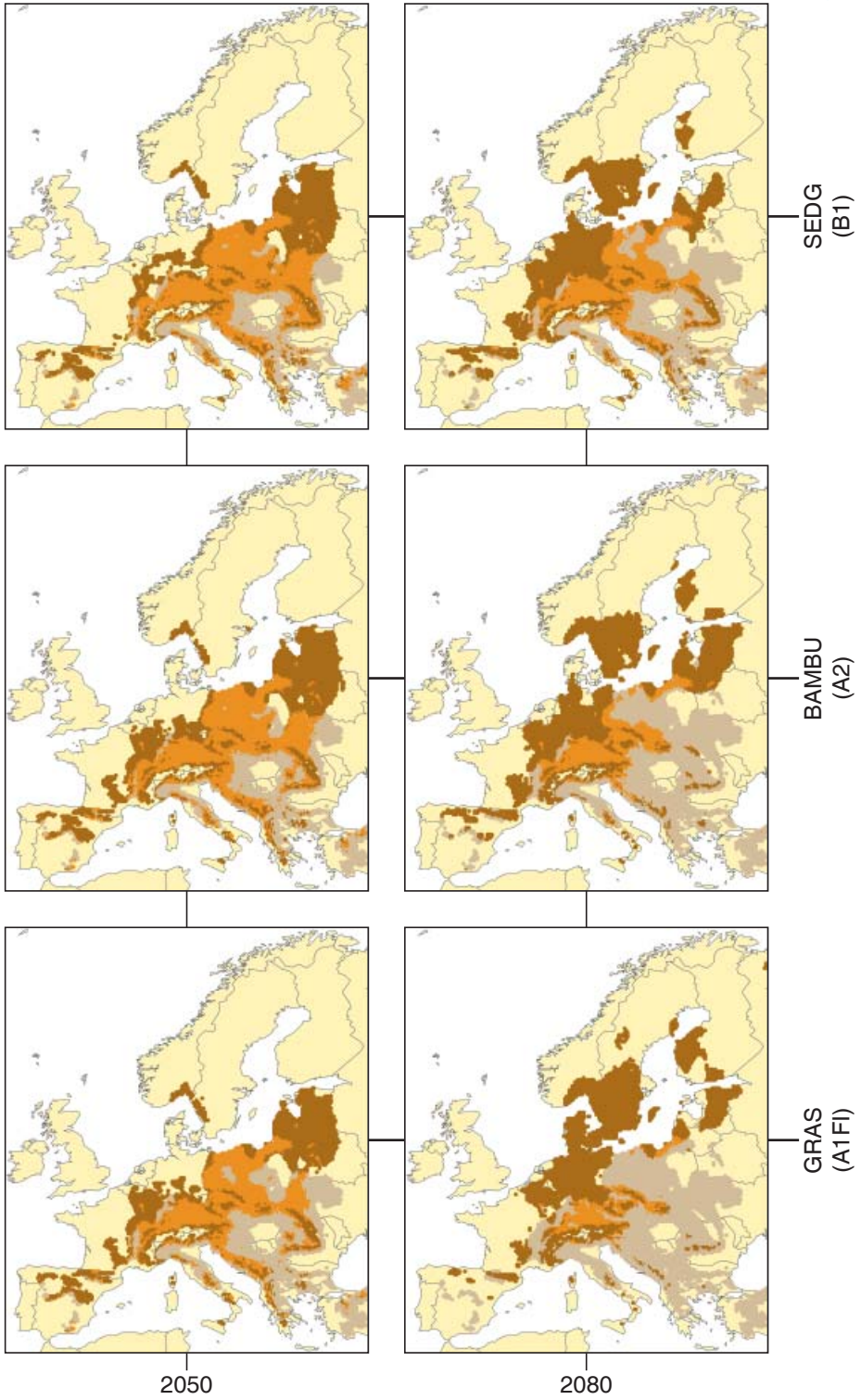
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8). Climate risk category: HHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tertile, upper tertile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus optilete (KNOCH, 1781) – Cranberry Blue



© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-2975 (-29.48%)	-3104 (-30.76%)
	BAMBU	-2803 (-27.77%)	-2907 (-28.8%)
	GRAS	-3065 (-30.37%)	-3153 (-31.24%)
2080	SEDG	-4367 (-43.27%)	-4580 (-45.38%)
	BAMBU	-4949 (-49.04%)	-5057 (-50.11%)
	GRAS	-6135 (-60.79%)	-6209 (-61.52%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 10092)

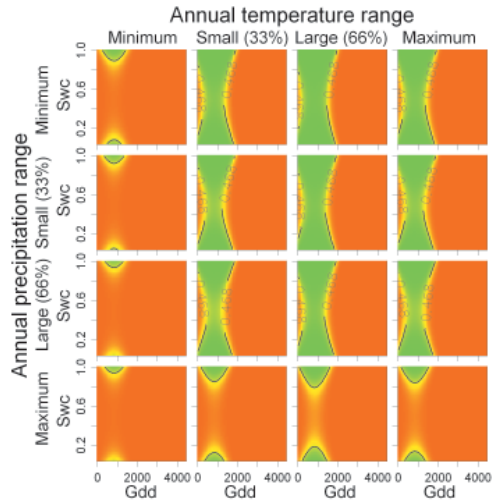
The Cranberry Blue occurs on raised bogs, heath and also in woodland clearings, where dwarf shrubs are growing. Although populations are at times extremely small, they can also have considerable numbers of butterflies. Eggs are laid on Marsh Andromeda (*Andromeda palustris*), *Erica tetralix*, *Empetrum nigrum*, and a small number of *Vaccinium* species, including Cranberry (*V. oxycoccus*). The caterpillars eat both the flowers and leaves of the foodplants, moving from one plant to another. When they are half-grown, they move into the litter layer and hibernate. However, they pupate on the plant, spinning a silken girdle in which the pupa hangs. The Cranberry Blue has one generation a year.

Present distribution can be well explained by climatic variables (AUC = 0.9).

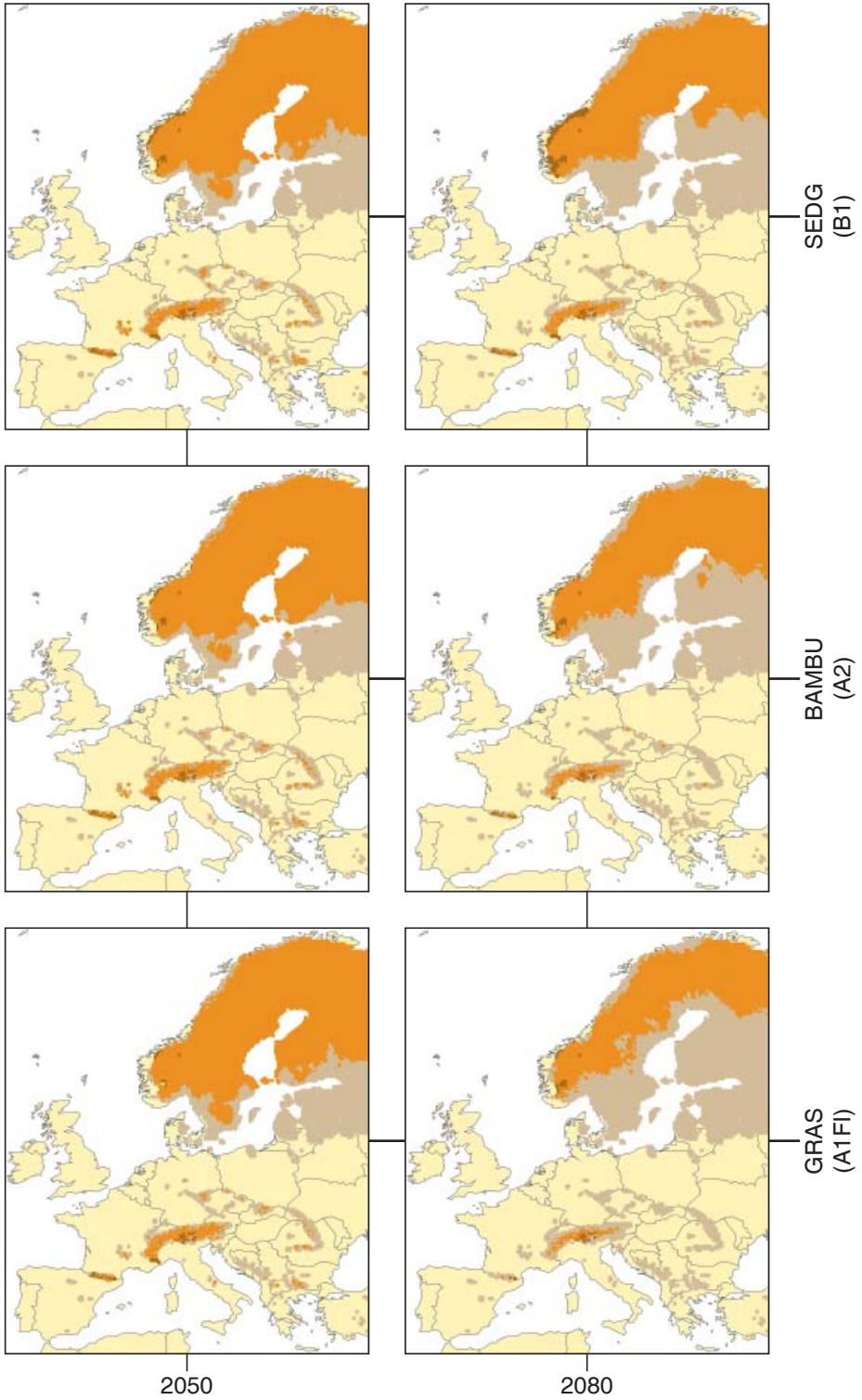
Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus glandon (PRUNNER, 1798) – Glandon Blue



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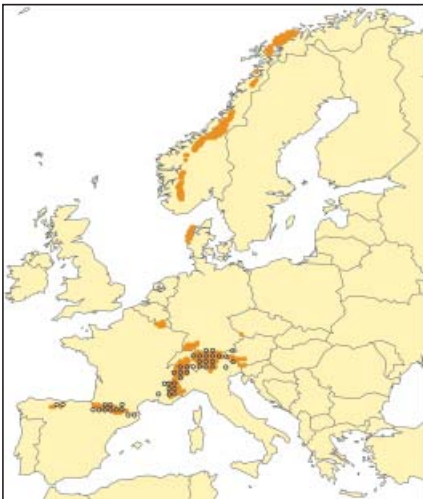
		Full dispersal	No dispersal
2050	SEDG	14 (3.29%)	-229 (-53.88%)
	BAMBU	94 (22.12%)	-189 (-44.47%)
	GRAS	-2 (-0.47%)	-237 (-55.76%)
2080	SEDG	-221 (-52%)	-348 (-81.88%)
	BAMBU	-93 (-21.88%)	-283 (-66.59%)
	GRAS	-235 (-55.29%)	-363 (-85.41%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 425)

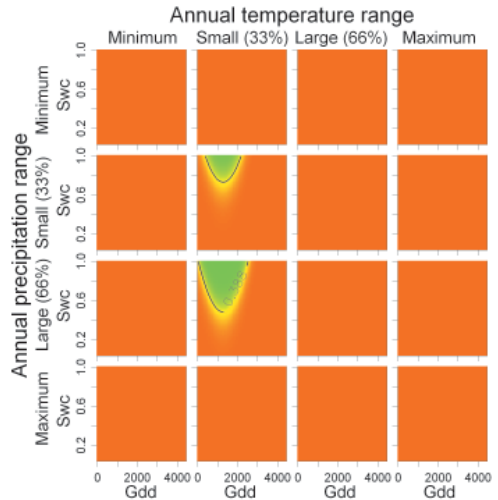
In Central Europe, the Glandon Blue is found up to the snow-line on grassy vegetation, where the foodplants grow on open patches. On calcareous soils, *Androsace chamaejasme* is used, and on non-calcareous soils, the caterpillars feed on *A. obtusifolia* and *Vitaliana primuliflora*. The caterpillars feed on the leaves and sometimes the flowers of the foodplants. The Glandon Blue hibernates as a caterpillar, and in all parts of its range has one generation a year. We treat *Plebejus glandon* as separate from *P. aquilo* (BOISDUVAL, 1832) (see next species) and *P. zuellichi* (HEMMING, 1933) (which is endemic to the Sierra Nevada and was not modelled here due to its restricted distribution), while other authors split the species into three subspecies.

Present distribution can be very well explained by climatic variables (AUC = 0.99).

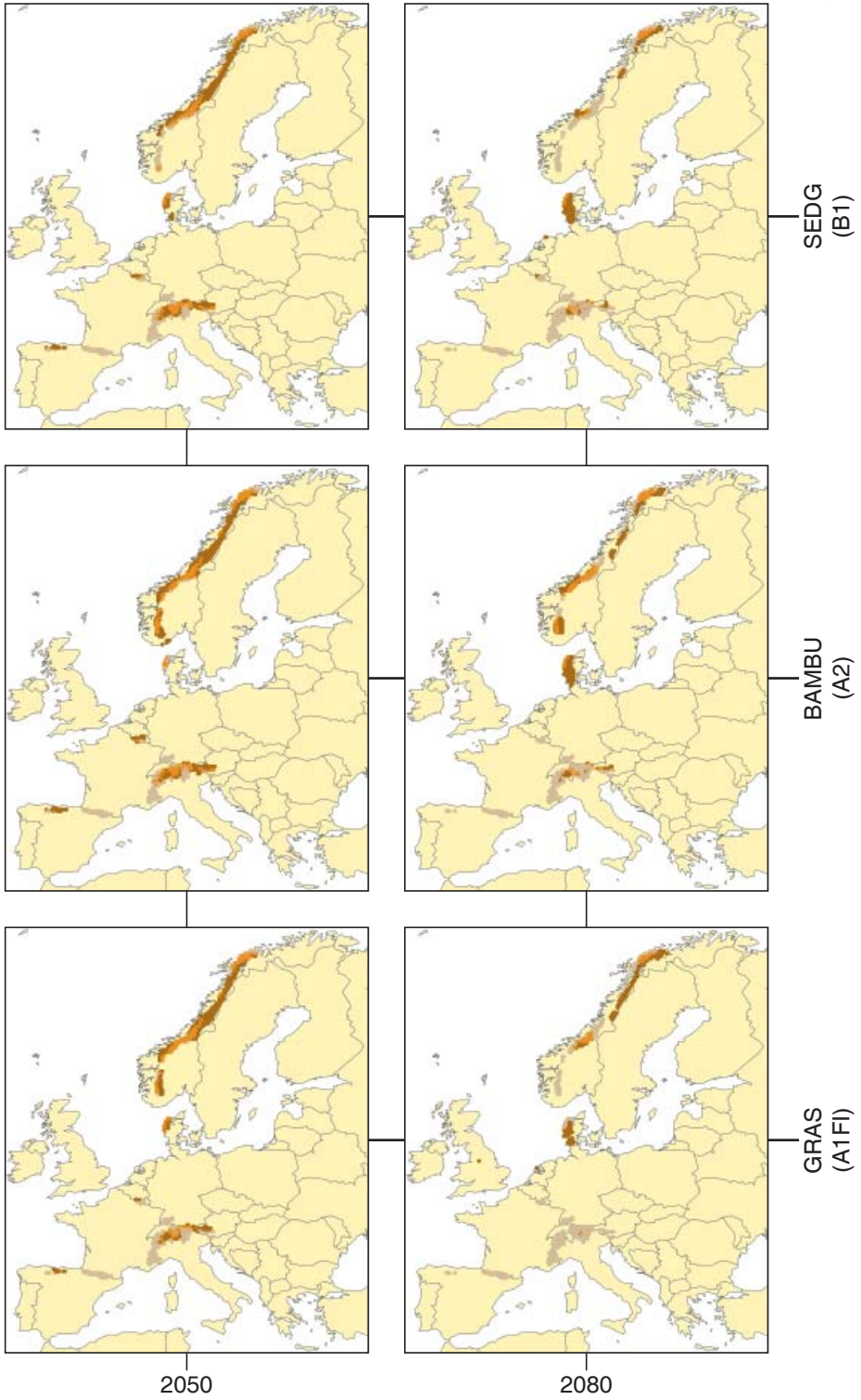
Climate risk category: HHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus aquilo (BOISDUVAL, 1832) – Arctic Blue



© Bernard Fransén

		Full dispersal	No dispersal
2050	SEDG	-462 (-66.47%)	-529 (-76.12%)
	BAMBU	-479 (-68.92%)	-537 (-77.27%)
	GRAS	-497 (-71.51%)	-553 (-79.57%)
2080	SEDG	-562 (-80.86%)	-637 (-91.65%)
	BAMBU	-646 (-92.95%)	-685 (-98.56%)
	GRAS	-682 (-98.13%)	-695 (-100%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 695)

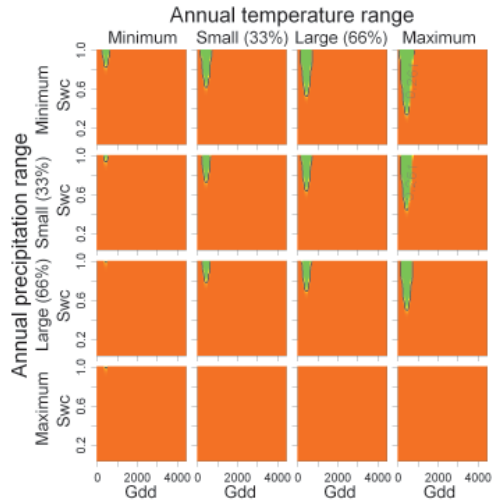
This species occurs exclusively in Northern Fennoscandia. It occurs on slate and shale rocks with patches of grassy vegetation and with Crowberry (*Empetrum nigrum*), especially in areas sheltered from the northwestern wind. It lives in elevations between 0 and 900 m asl. Larval foodplants are *Saxifraga aizoides* and *S. oppositifolia*. The small larvae feed on the flower buds and hibernate. Later the larvae feed on the leaves. The species has one generation which is on the wing from late June until early August. It is often considered as a subspecies of *Plebejus glandon*.

Present distribution can be very well explained by climatic variables (AUC = 1).

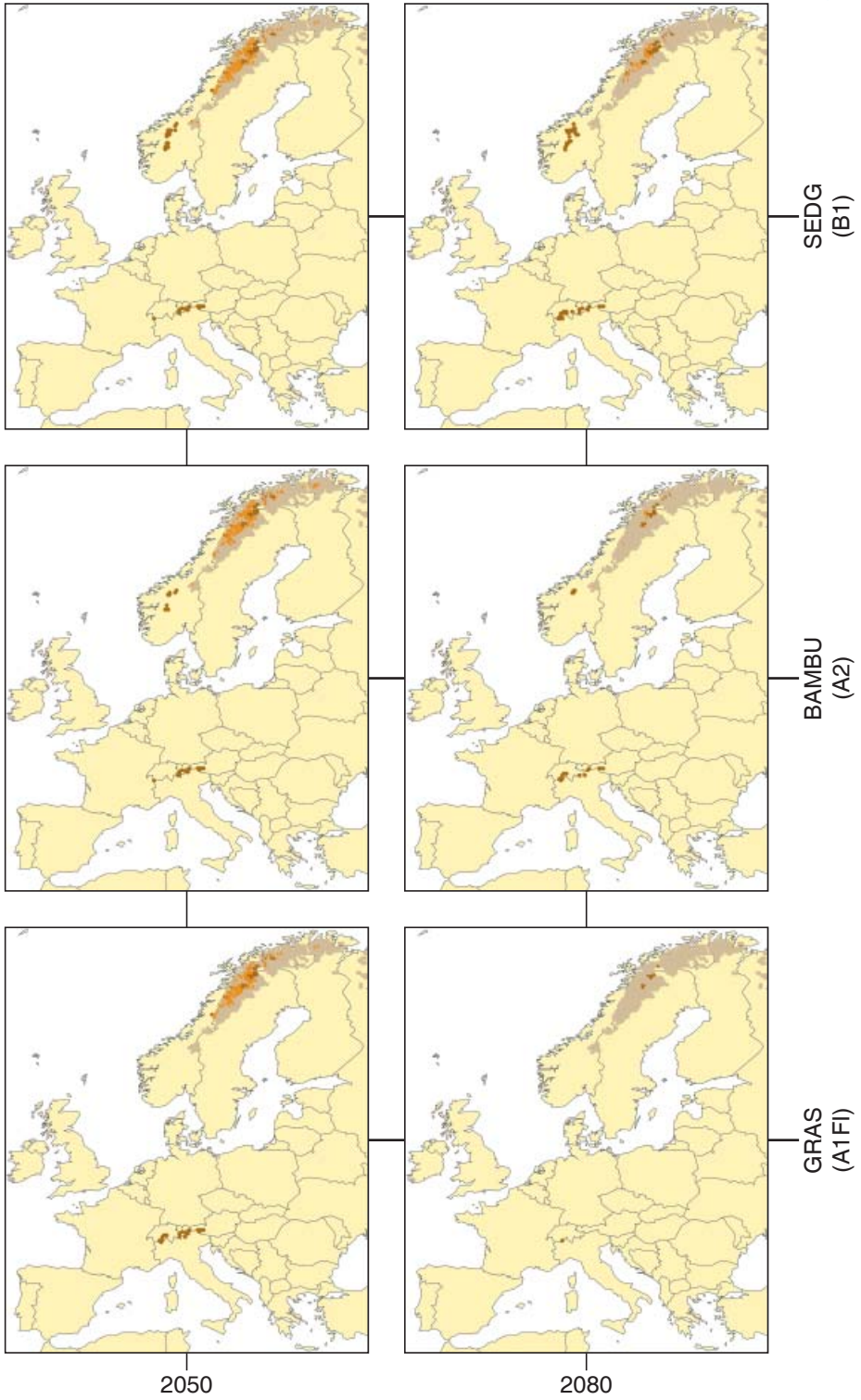
Climate risk category: HHRH.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus orbitulus (PRUNNER, 1798) – Alpine Blue



© Martin Wiemers

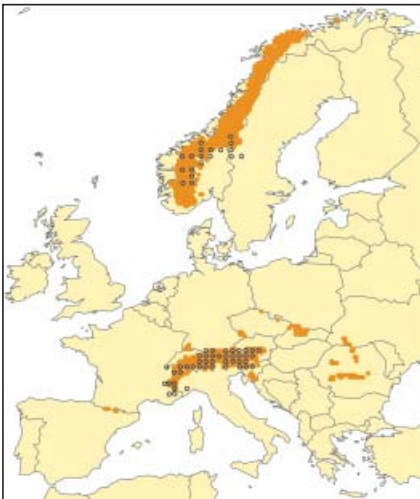
		Full dispersal	No dispersal
2050	SEDG	-234 (-18.84%)	-356 (-28.66%)
	BAMBU	-226 (-18.2%)	-333 (-26.81%)
	GRAS	-299 (-24.07%)	-397 (-31.96%)
2080	SEDG	-352 (-28.34%)	-505 (-40.66%)
	BAMBU	-365 (-29.39%)	-489 (-39.37%)
	GRAS	-493 (-39.69%)	-615 (-49.52%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 1242)

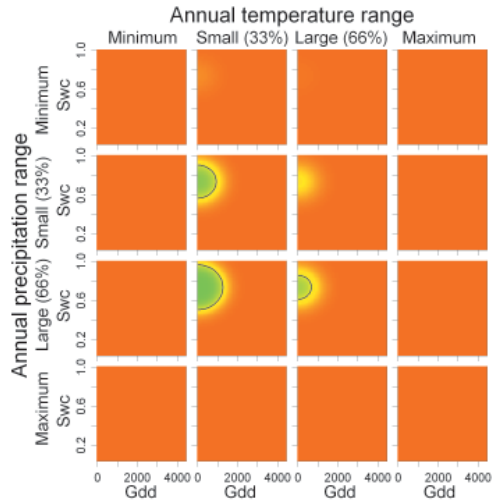
In the Alps, the Alpine Blue is mostly found on sunny, rocky slopes, scree slopes with patches of flower-rich vegetation, and often on the rough vegetation growing beside streams. These butterflies usually fly to lower-lying areas in search of nectar. The foodplants are Alpine Milk-vetch (*Astragalus alpinus*), Alpine Sainfoin (*Hedysarum hedysaroides*), and probably Mountain Beaked Milk-vetch (*Oxytropis jacquinii*). In Scandinavia, this blue occurs in the mountains on open, damp slate slopes where its foodplant Alpine Milk-vetch grows. The Alpine Blue hibernates as a small caterpillar and has one generation a year.

Present distribution can be very well explained by climatic variables (AUC = 0,98).

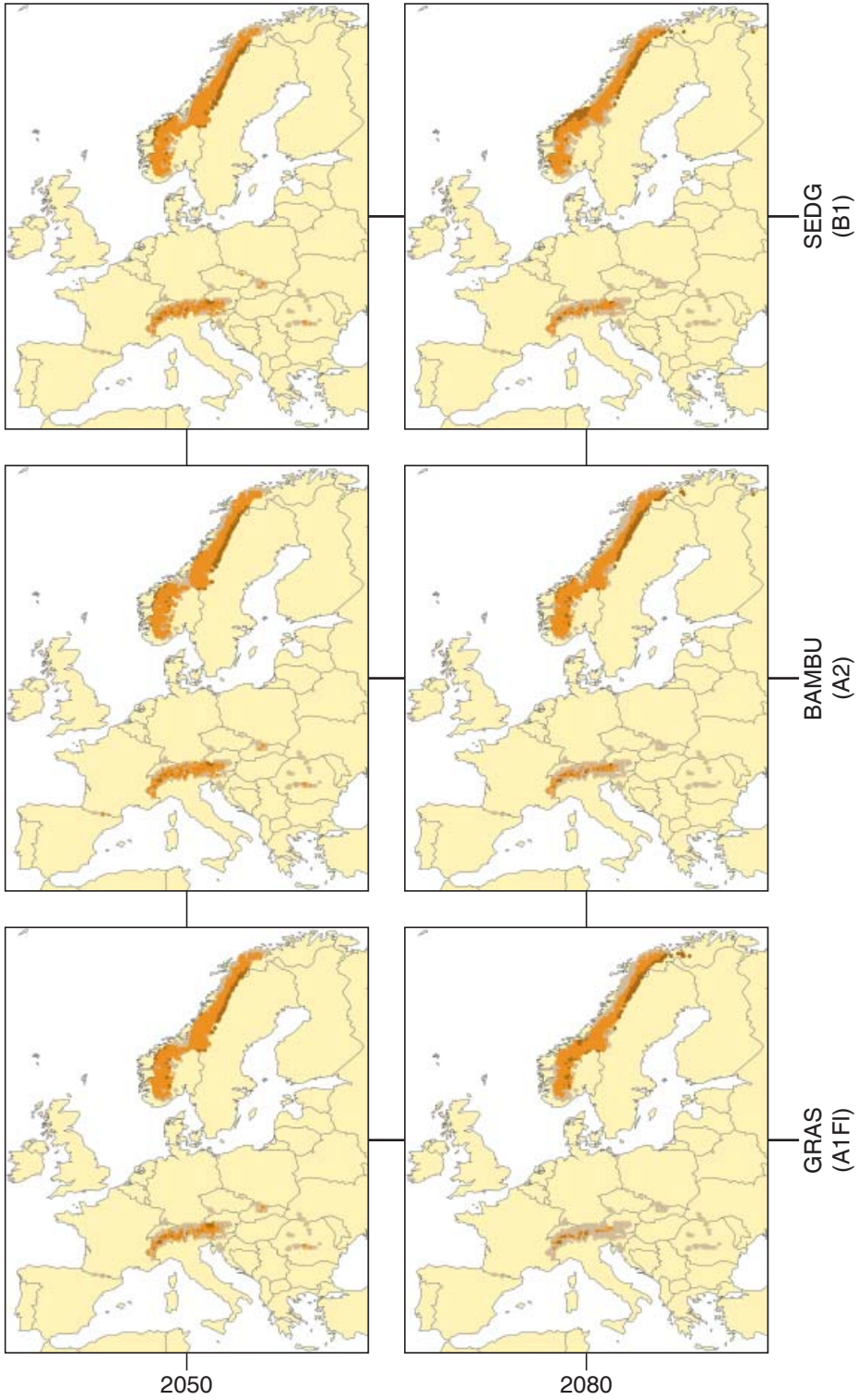
Climate risk category: LR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Plebejus sephirus (FRIVALDSZKY, 1835)



© Kars Veling

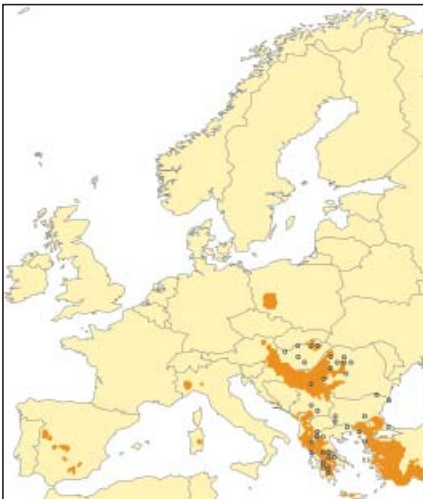
		Full dispersal	No dispersal
2050	SEDG	3 (0.25%)	-833 (-70.06%)
	BAMBU	-143 (-12.03%)	-760 (-63.92%)
	GRAS	743 (62.49%)	-676 (-56.85%)
2080	SEDG	-100 (-8.41%)	-1115 (-93.78%)
	BAMBU	-441 (-37.09%)	-1020 (-85.79%)
	GRAS	330 (27.75%)	-853 (-71.74%)

Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 1189)

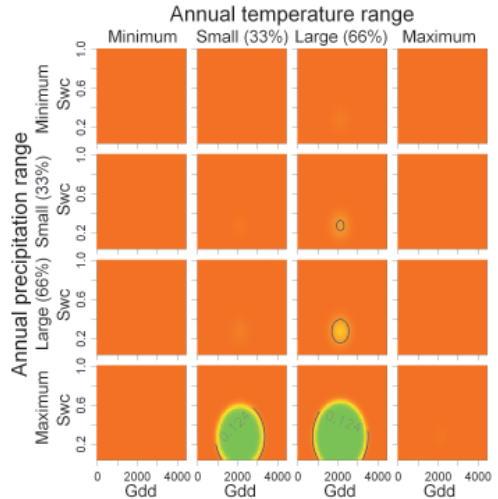
By some authors this species, described from Bulgaria, is treated as a subspecies of *Plebejus pylaon* (FISCHER, 1832) and as a distinct species by others. Other taxa besides *P. pylaon*, which are closely related to *P. sephirus*, are *P. hespericus* (RAMBUR, 1839) from Spain and the Alpine *P. trappi* (VERTY, 1927). All of them are not treated here due to their limited distributions. It occurs eastwards of the river Danube to the Dnepr region and southwards through Transylvania to the Balkans. Its habitats are loess steppes and calcareous terrains in the forest steppe belt from sea level to 1600 m. Larval host-plants are *Astragalus* species. The caterpillars are facultatively myrmecophilous and are guarded by many different ant species. It has one short generation in May, June or July, depending on altitude and latitude. It hibernates as a small larva.

Present distribution can be well explained by climatic variables (AUC = 0.93).

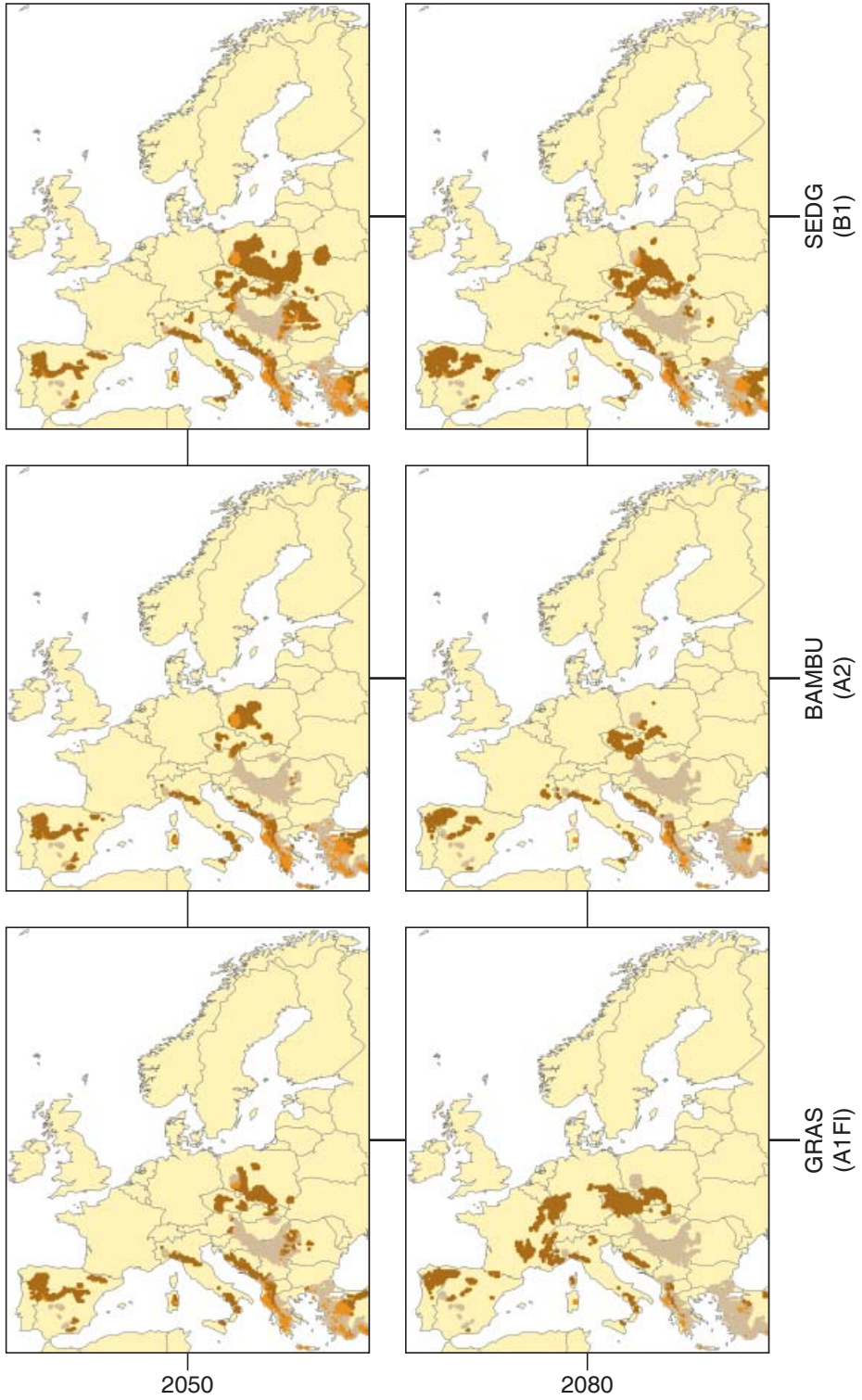
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia eumedon (ESPER, 1780) – Geranium Argus



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		Full dispersal	No dispersal
2050	SEDG	-3820 (-28.53%)	-4459 (-33.3%)
	BAMBU	-4609 (-34.42%)	-5017 (-37.47%)
	GRAS	-5616 (-41.94%)	-6091 (-45.49%)
2080	SEDG	-3967 (-29.63%)	-4888 (-36.51%)
	BAMBU	-6493 (-48.5%)	-7131 (-53.26%)
	GRAS	-7151 (-53.41%)	-7854 (-58.66%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 13389)

The Geranium Argus occurs locally, in meadows, stream valleys, and at woodland edges.

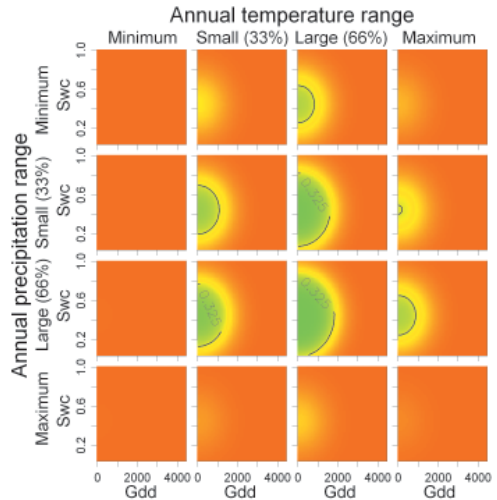
The female lays her eggs in the flowers of crane's-bills (*Geranium* spp.), at the base of the ovary into which the small caterpillar bores its way on hatching out. It stays there for a little more than a week. It then starts feeding on leaves, first gnawing on the stems, which causes them to wilt. When half-grown, the caterpillars hibernate in the litter layer, but pupate on the foodplant. They are sometimes attended by ants of the genera *Myrmica*, *Lasius* and *Tapinoma*. The Geranium Argus has only one generation a year.

Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8).

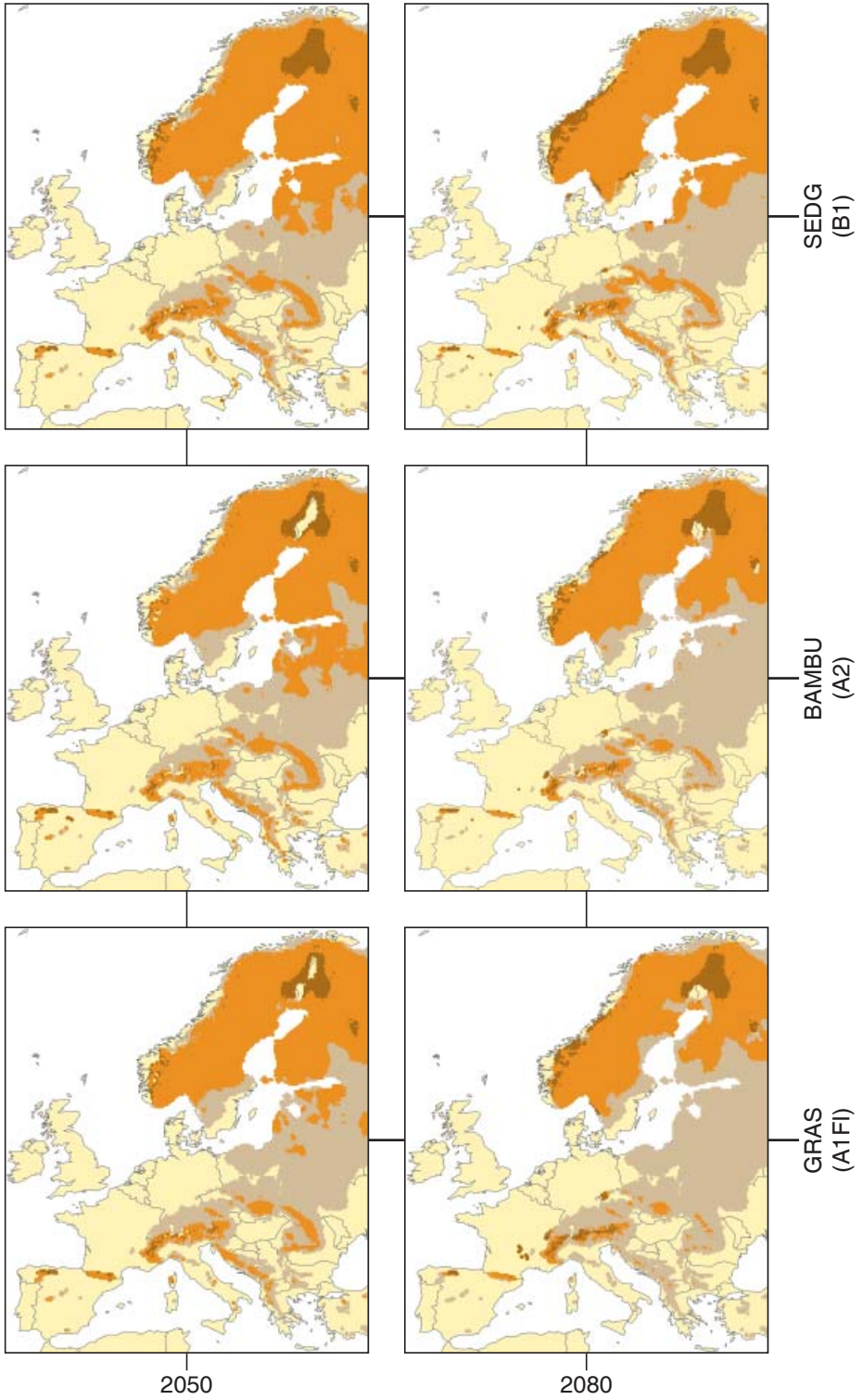
Climate risk category: R.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia cramera (ESCHSCHOLTZ, 1821)



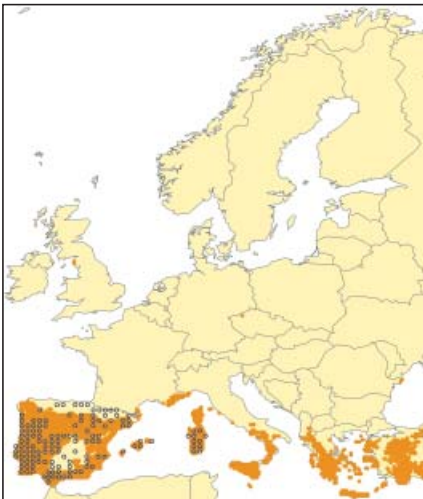
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-1273 (-51.52%)	-1505 (-60.91%)
	BAMBU	-1563 (-63.25%)	-1648 (-66.69%)
	GRAS	-1591 (-64.39%)	-1843 (-74.59%)
2080	SEDG	-1692 (-68.47%)	-2033 (-82.27%)
	BAMBU	-2054 (-83.12%)	-2346 (-94.94%)
	GRAS	-1950 (-78.92%)	-2448 (-99.07%)

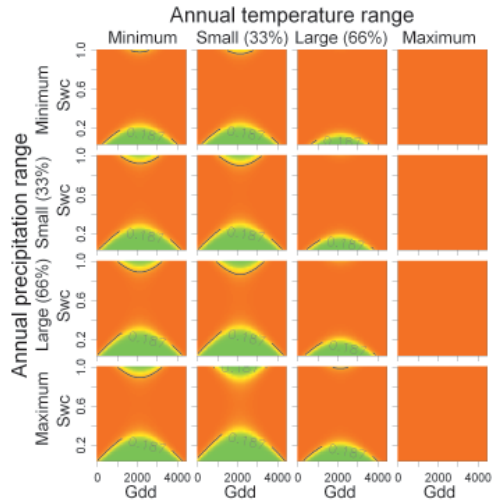
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2471)

This butterfly species can be found in flower-rich, places, in scrub or at woodland edges. The most important foodplants are stork's-bills (*Erodium* spp.) and crane's-bills (*Geranium* spp.), of which the caterpillars eat the leaves. Knapweeds (*Centaurea* spp.), rockroses (*Helianthemum* spp.), and Leguminous plants, such as clovers (*Trifolium* spp.) and brooms (*Cytisus* spp.) have also been mentioned. This species has two to three generations a year and is often found together with ants of the genera *Myrmica* and *Lasius*. Hibernation takes place as larva.

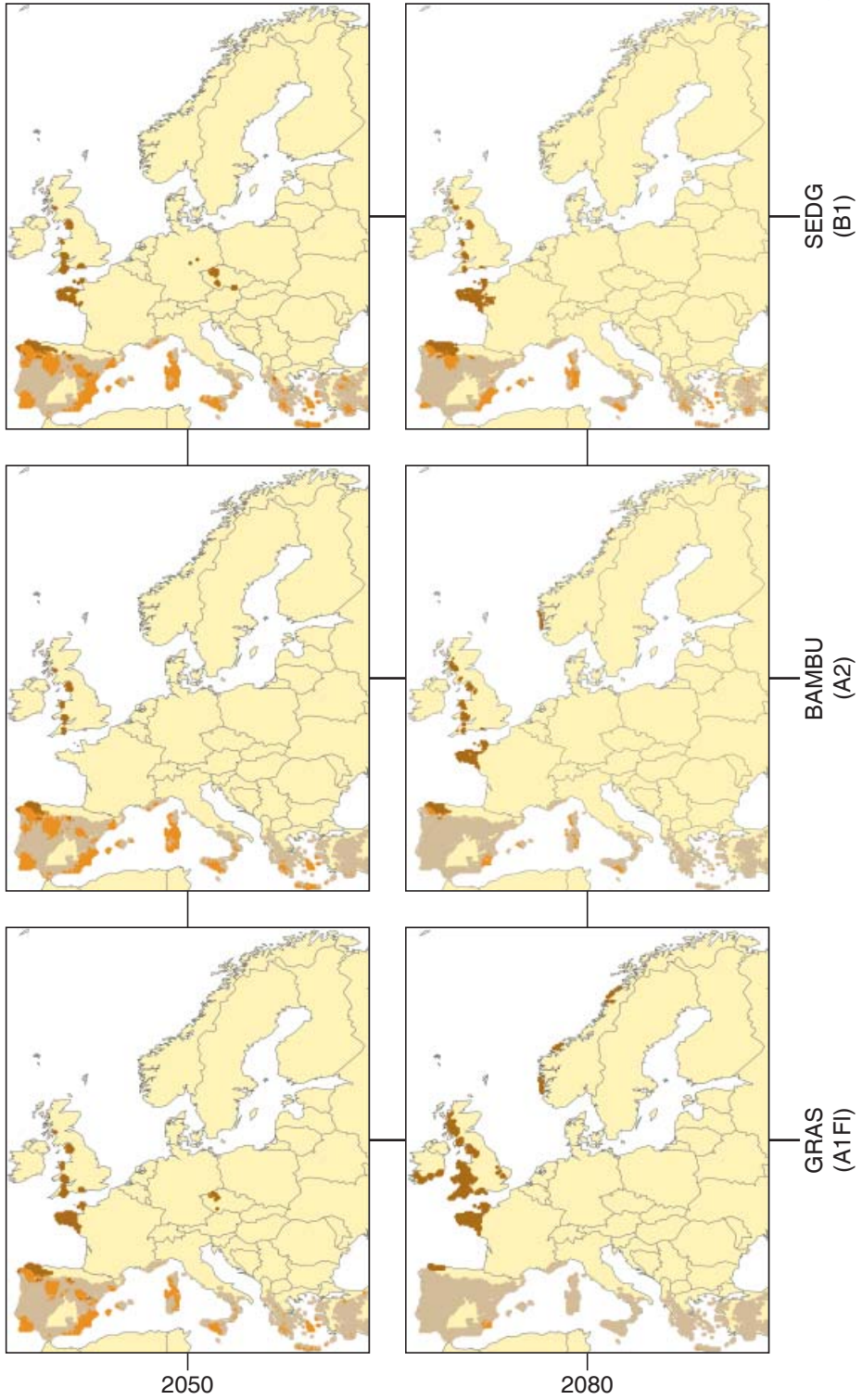
Present distribution can be well explained by climatic variables (AUC = 0.91).
Climate risk category: HHRH.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia agestis ([SCHIFFERMÜLLER], 1775) – Brown Argus



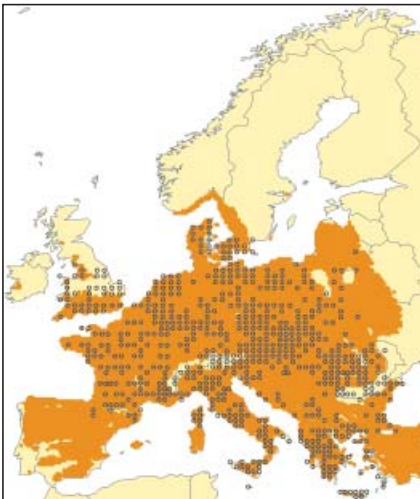
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	299 (1.96%)	-2499 (-16.38%)
	BAMBU	-354 (-2.32%)	-3124 (-20.48%)
	GRAS	-837 (-5.49%)	-3631 (-23.81%)
2080	SEDG	-2279 (-14.94%)	-4933 (-32.34%)
	BAMBU	-3463 (-22.7%)	-6939 (-45.49%)
	GRAS	-4787 (-31.38%)	-8715 (-57.14%)

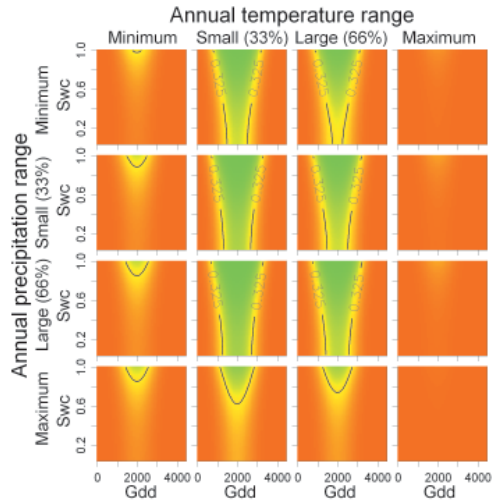
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 15253)

The Brown Argus occurs on warm grasslands, in heaths, and in dunes. It can also be found on sandy, pioneer vegetation, as for example in sand-pits, or where houses are being built. It lays its eggs on small crane’s-bill (*Geranium* spp.) and rockroses (*Helianthemum* spp.). It may build up numerous, small populations. At first, the small caterpillars only scrape off the undermost layer of the leaves making little “windows” in the leaves. Later, the bigger caterpillars feed on the whole leaf. They are often attended by *Lasius* and *Myrmica* ants. The caterpillars can hibernate at any stage. Pupation takes place in the litter layer. The Brown Argus has two to three generations depending on the geographical location.

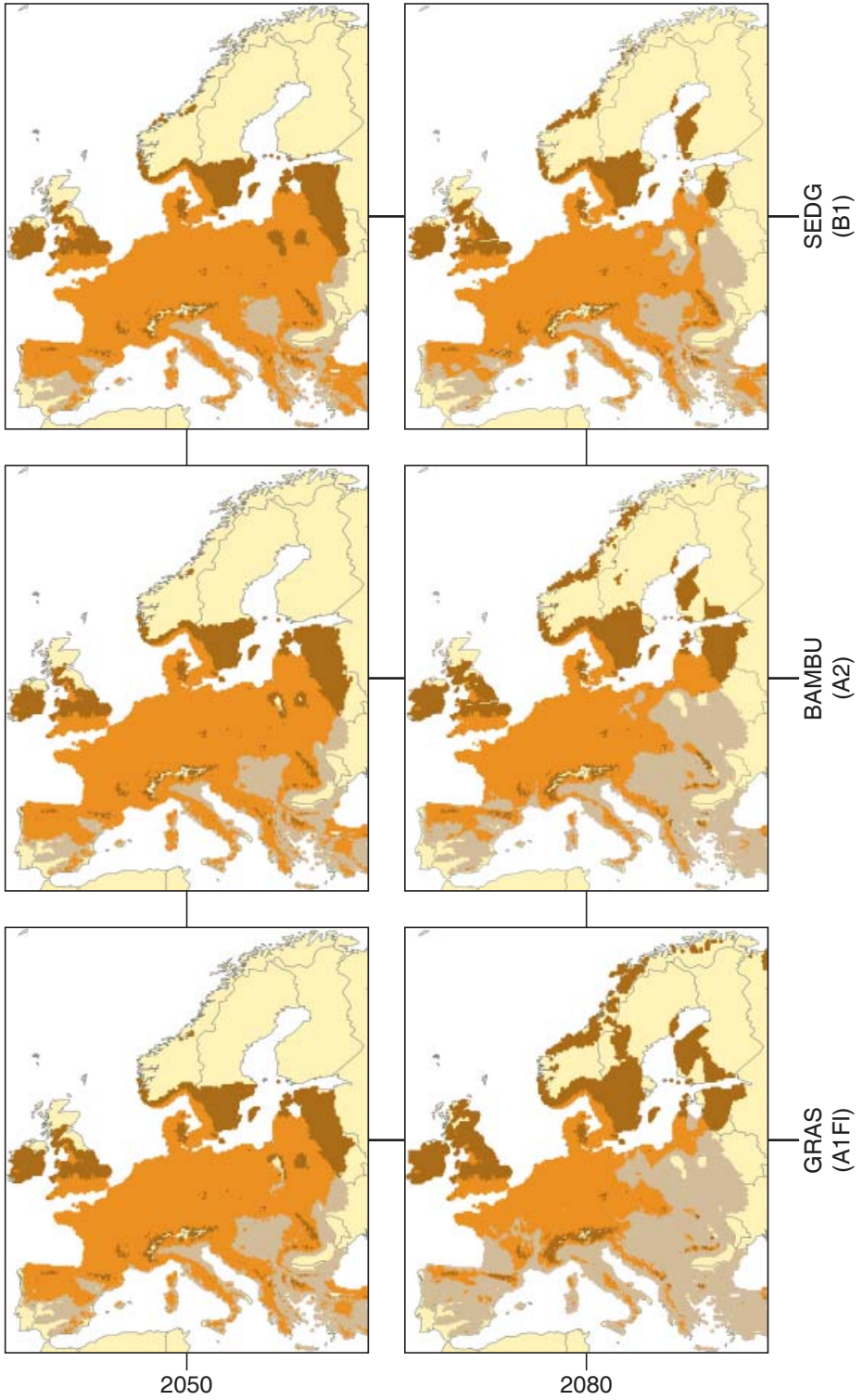
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.7). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia artaxerxes (FABRICIUS, 1793) – Northern Brown Argus



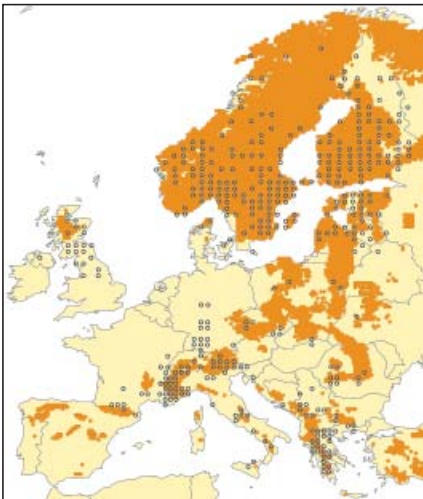
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-3340 (-34.55%)	-3708 (-38.35%)
	BAMBU	-4891 (-50.59%)	-4985 (-51.56%)
	GRAS	-4476 (-46.3%)	-4601 (-47.59%)
2080	SEDG	-4943 (-51.13%)	-5186 (-53.64%)
	BAMBU	-7110 (-73.54%)	-7262 (-75.11%)
	GRAS	-7886 (-81.57%)	-8037 (-83.13%)

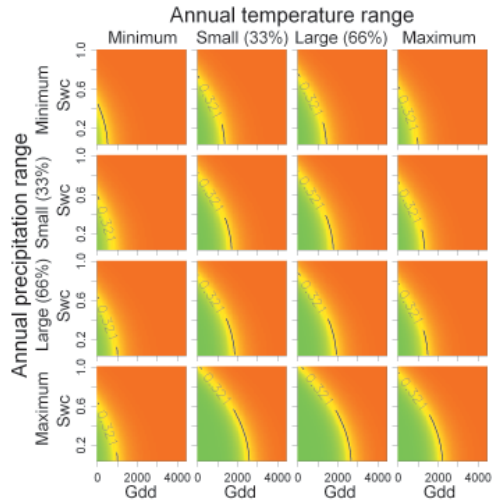
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 9668)

The Northern Brown Argus likes open grasslands or dry vegetation at the edges of woods. It is more closely bound to calcareous soil than the Brown Argus. The eggs are laid on various rockroses (*Helianthemum* spp.), as well as on various crane's-bills (*Geranium* spp.). The caterpillars feed on the leaves, often attended by *Lasius* ants. When the caterpillars are half-grown, they hibernate. Pupation takes place in the litter layer. There is always only one generation.

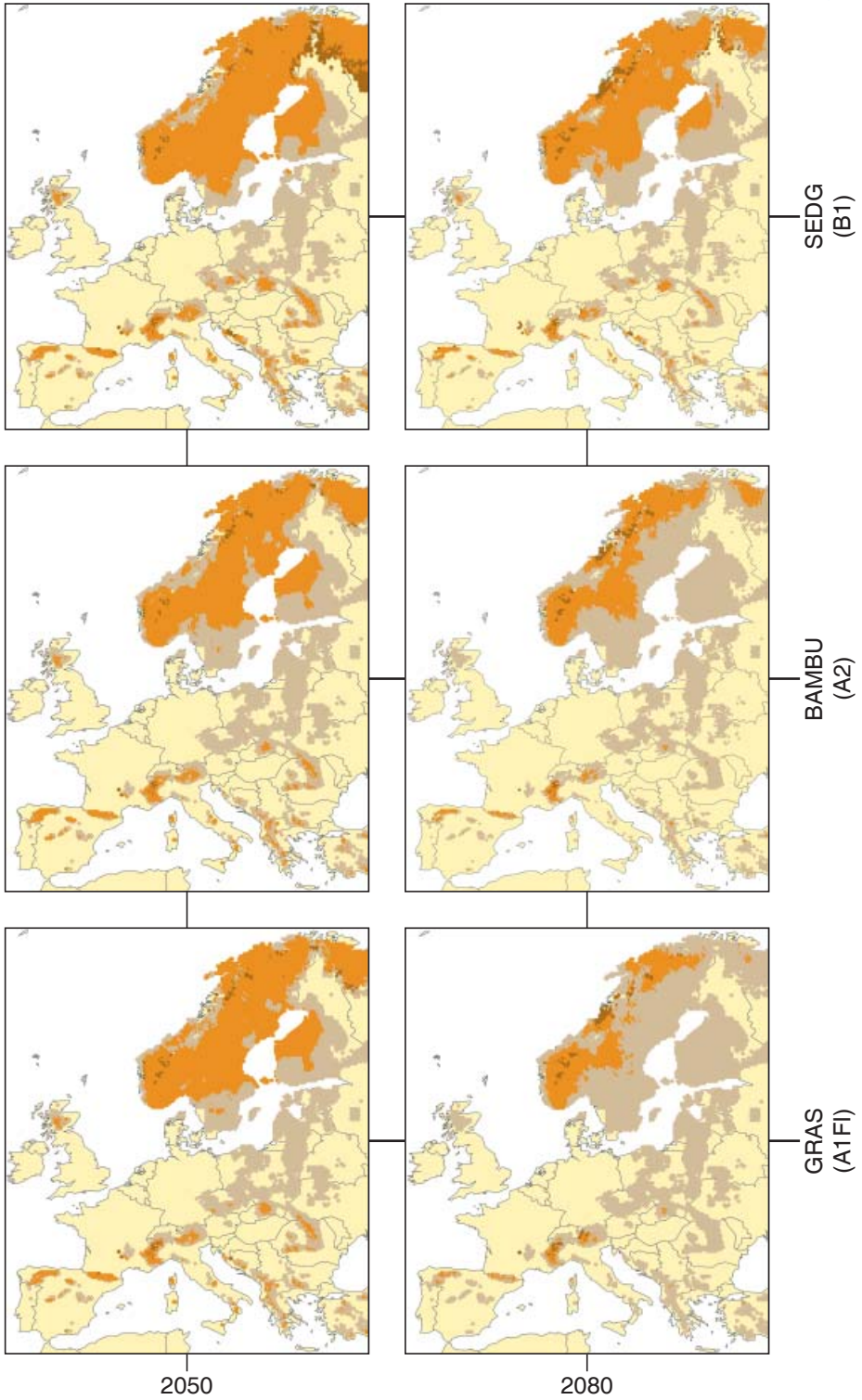
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.72). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia montensis (VERITY, 1928) – Southern Mountain Argus



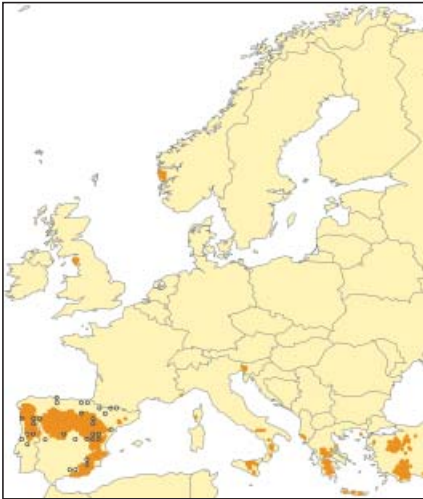
© Matt Rowlings

		Full dispersal	No dispersal
2050	SEDG	-458 (-53.32%)	-618 (-71.94%)
	BAMBU	-606 (-70.55%)	-683 (-79.51%)
	GRAS	-593 (-69.03%)	-755 (-87.89%)
2080	SEDG	-591 (-68.8%)	-804 (-93.6%)
	BAMBU	-605 (-70.43%)	-819 (-95.34%)
	GRAS	-464 (-54.02%)	-840 (-97.79%)

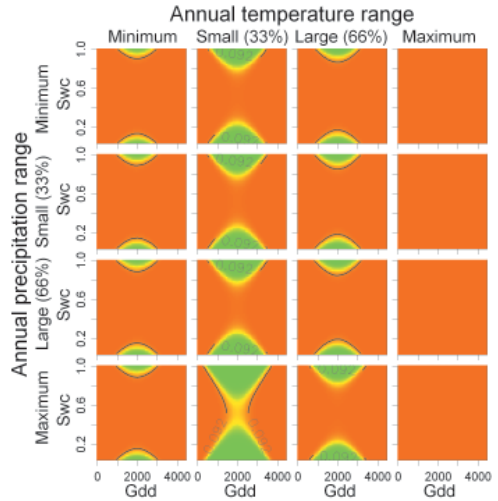
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 859)

The taxonomic relationship of several *Aricia* species is not yet clear. *Aricia montensis* is often regarded as a subspecies of *A. artaxerxes*. In the context of this atlas the species has been modeled independently, but there also would have been good reasons to keep it within *A. artaxerxes*. It occurs on the mountains south of the range of *A. artaxerxes*, it has no white spots on the upperside of the wings and distinct black spots underneath them (like the subspecies *A. a. allous*, but it is bigger than those).

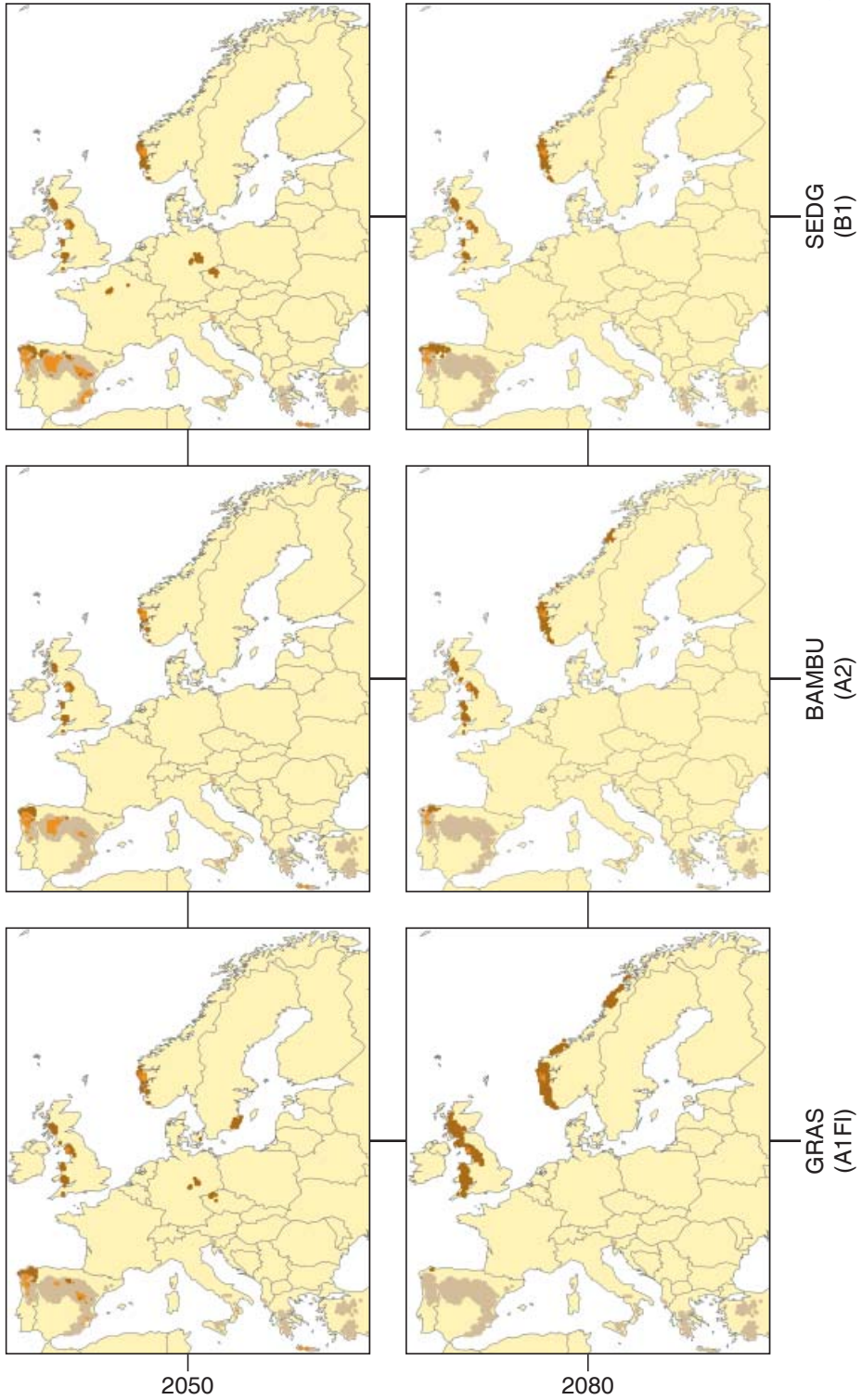
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.7). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia anteros (FREYER, 1838) – Blue Argus



© Rudi Verovnik

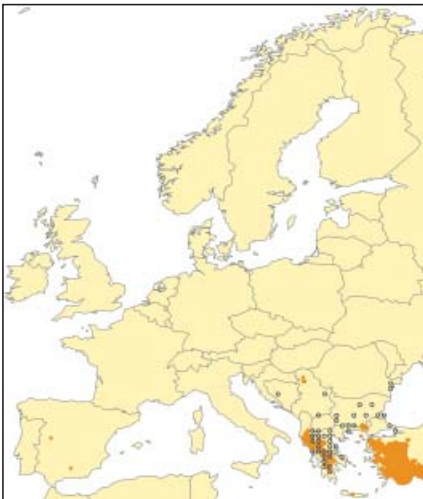
		Full dispersal	No dispersal
2050	SEDG	63 (12.52%)	-252 (-50.1%)
	BAMBU	-64 (-12.72%)	-300 (-59.64%)
	GRAS	-70 (-13.92%)	-335 (-66.6%)
2080	SEDG	113 (22.47%)	-285 (-56.66%)
	BAMBU	-300 (-59.64%)	-445 (-88.47%)
	GRAS	-355 (-70.58%)	-488 (-97.02%)

Changes in climatic niche distribution
(in 10⁴ × 10⁴ grid cells; present niche space: 503)

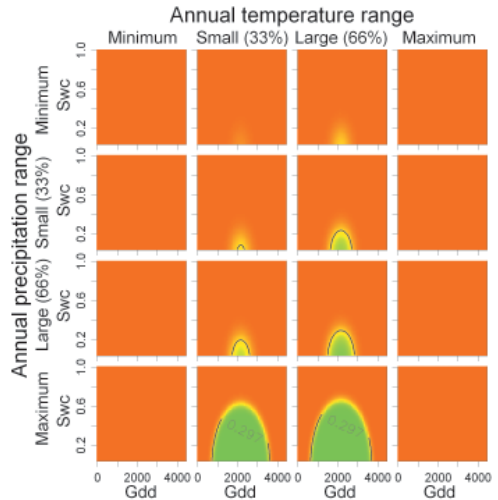
The Blue Argus is a species of flower-rich grasslands and rocky slopes with grassy vegetation. Sometimes, they are also seen on scrub or in woodland clearings. This butterfly is often found where the soil is calcareous. Various sorts of crane’s-bills (*Geranium* spp.) are used as foodplant, including *G. asphodeloides*, Bloody Crane’s-bill (*G. sanguineum*), and Rock Crane’s-bill (*G. macrorrhizum*). The caterpillars feed on the leaves and are attended by ants. Depending on the altitude, the Blue Argus has one to three generations a year.

Present distribution can be very well explained by climatic variables (AUC = 0.96).

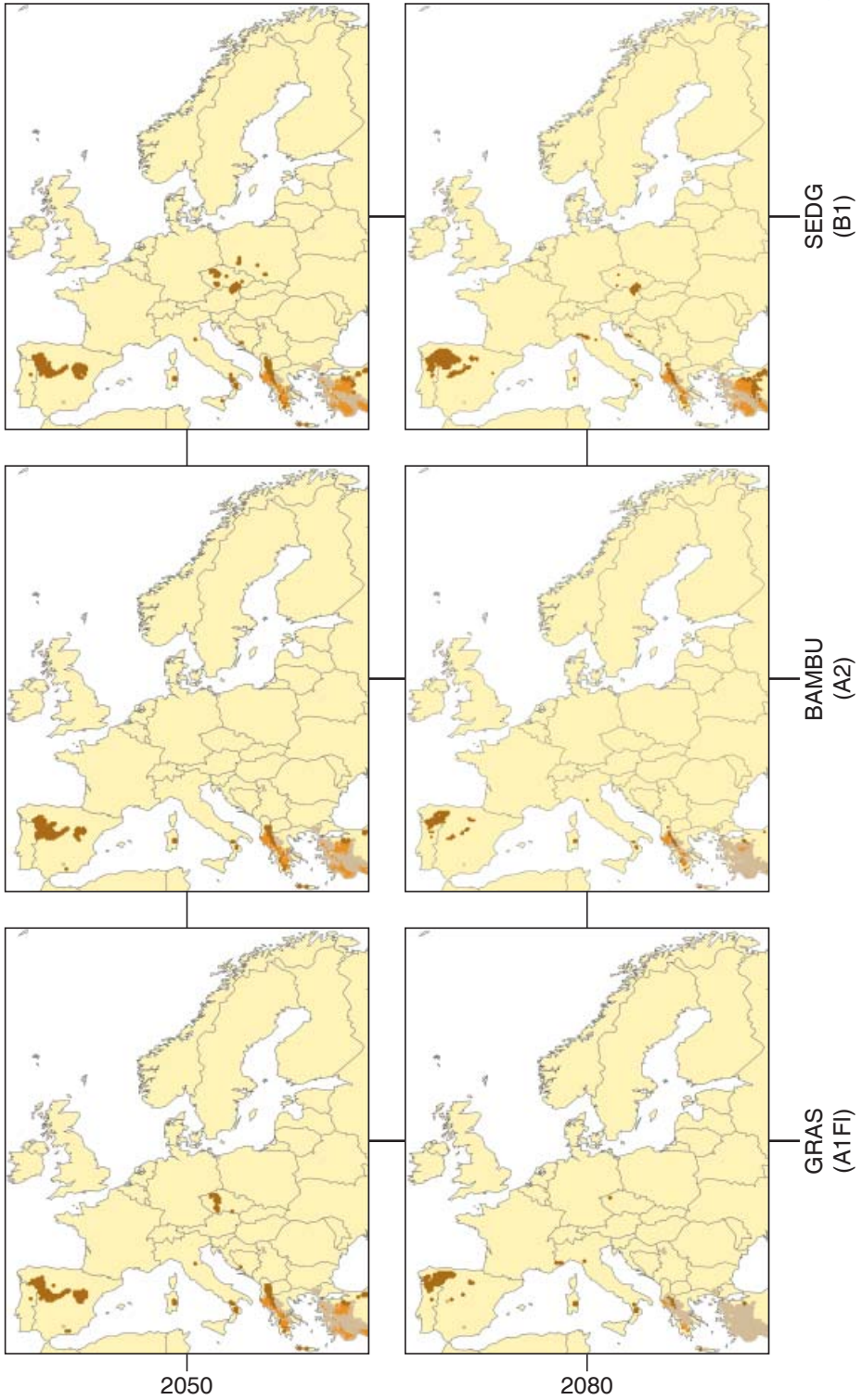
Climate risk category: HHRH.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Aricia nicias (MEIGEN, 1829) – Silvery Argus



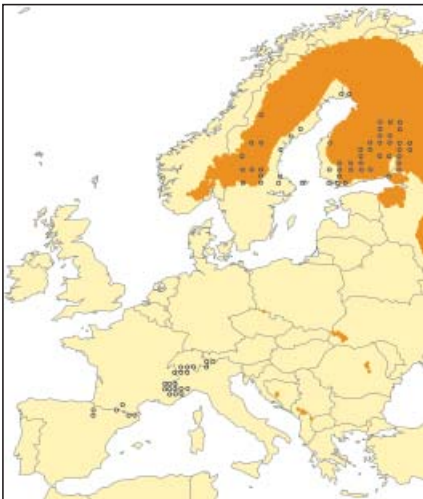
© Bernard Franssen

		Full dispersal	No dispersal
2050	SEDG	-434 (-10.09%)	-814 (-18.93%)
	BAMBU	-1380 (-32.09%)	-1528 (-35.53%)
	GRAS	-1255 (-29.18%)	-1467 (-34.11%)
2080	SEDG	-207 (-4.81%)	-1031 (-23.97%)
	BAMBU	-1611 (-37.46%)	-2242 (-52.13%)
	GRAS	-1952 (-45.38%)	-2625 (-61.03%)

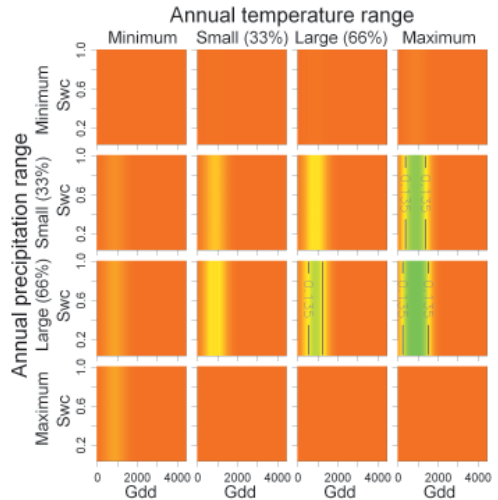
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 4301)

The Silvery Argus occurs on flower-rich grasslands with some bushes or trees, in grass along the hedges, at the edge of woodland, and in sunny, grassy woodland clearings. The grassland on which the Silvery Argus occurs is usually damp with rather tall vegetation, but it is also seen on dry grassland. The female lays her eggs on the flowers of Wood Crane’s-bill (*Geranium sylvaticum*) and Meadow Crane’s-bill (*G. pratense*). The caterpillars eat the leaves as well as the flowers. They are attended by ants. This butterfly hibernates as a larva, but in Scandinavia it is said to overwinter in the egg stage.

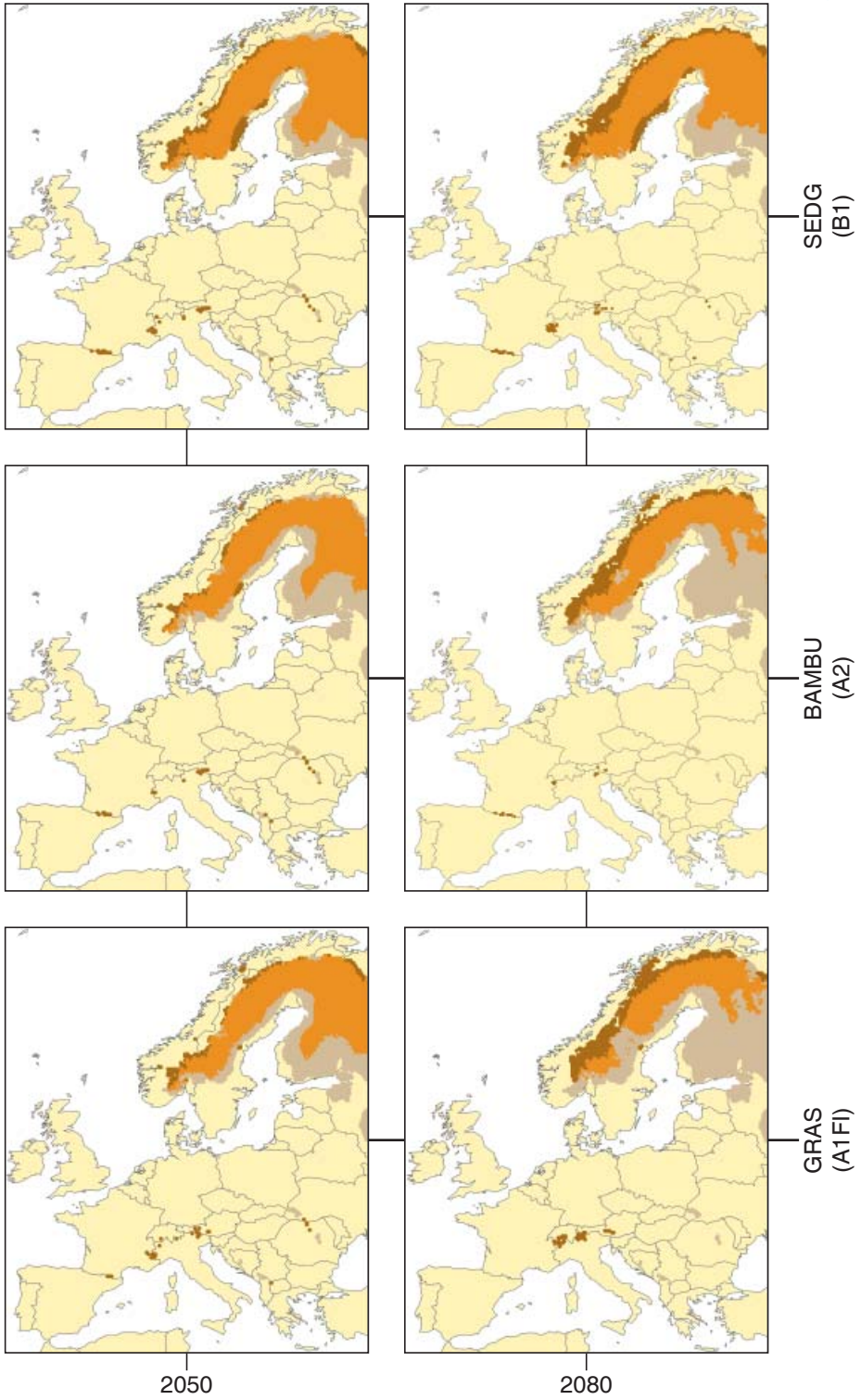
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.82).
Climate risk category: R.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Cyaniris semiargus (ROTTEMBURG, 1775) – Mazarine Blue



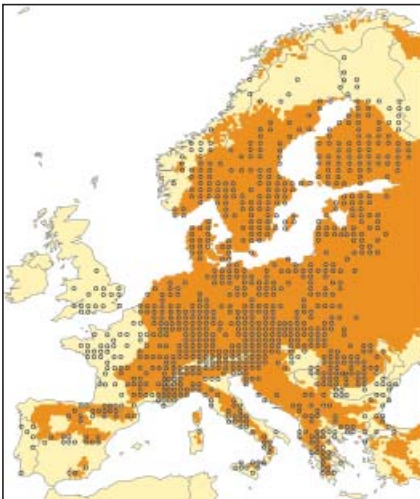
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-131 (-0.75%)	-2574 (-14.83%)
	BAMBU	-349 (-2.01%)	-2498 (-14.39%)
	GRAS	-1510 (-8.7%)	-3763 (-21.68%)
2080	SEDG	-792 (-4.56%)	-4238 (-24.41%)
	BAMBU	-2792 (-16.08%)	-6166 (-35.52%)
	GRAS	-4868 (-28.04%)	-8323 (-47.95%)

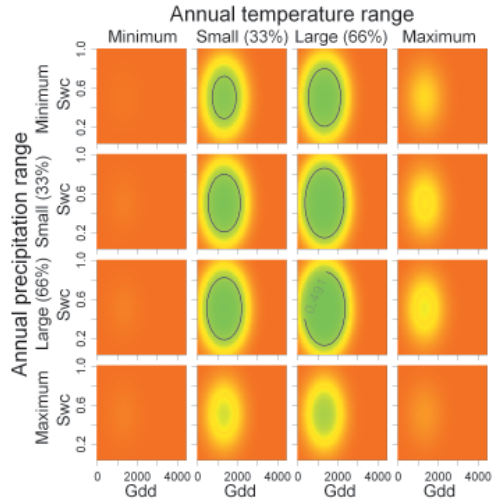
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 17359)

The Mazarine Blue usually occurs on quite damp vegetation in flower-rich meadows and pastures and at the edges of woodland. These butterflies are fond of basking together in groups and are then easy to find and to be observed. The female deposits her eggs on the flowerheads of Red Clover (*Trifolium pratense*), eating the unopened buds. The first instar caterpillar only feeds on buds and flowers, later stages also feed on leaves. The colours of the caterpillars are well adapted to their surroundings, with pink in the first instar and then green in later stages. The caterpillars can hardly be seen while feeding on the foodplants. Ants of the genera *Lasius* and *Camponotus* attend the caterpillars. Depending on the altitude and position in the range, the Mazarine Blue has one to three generations a year. The hibernation takes place as a larva.

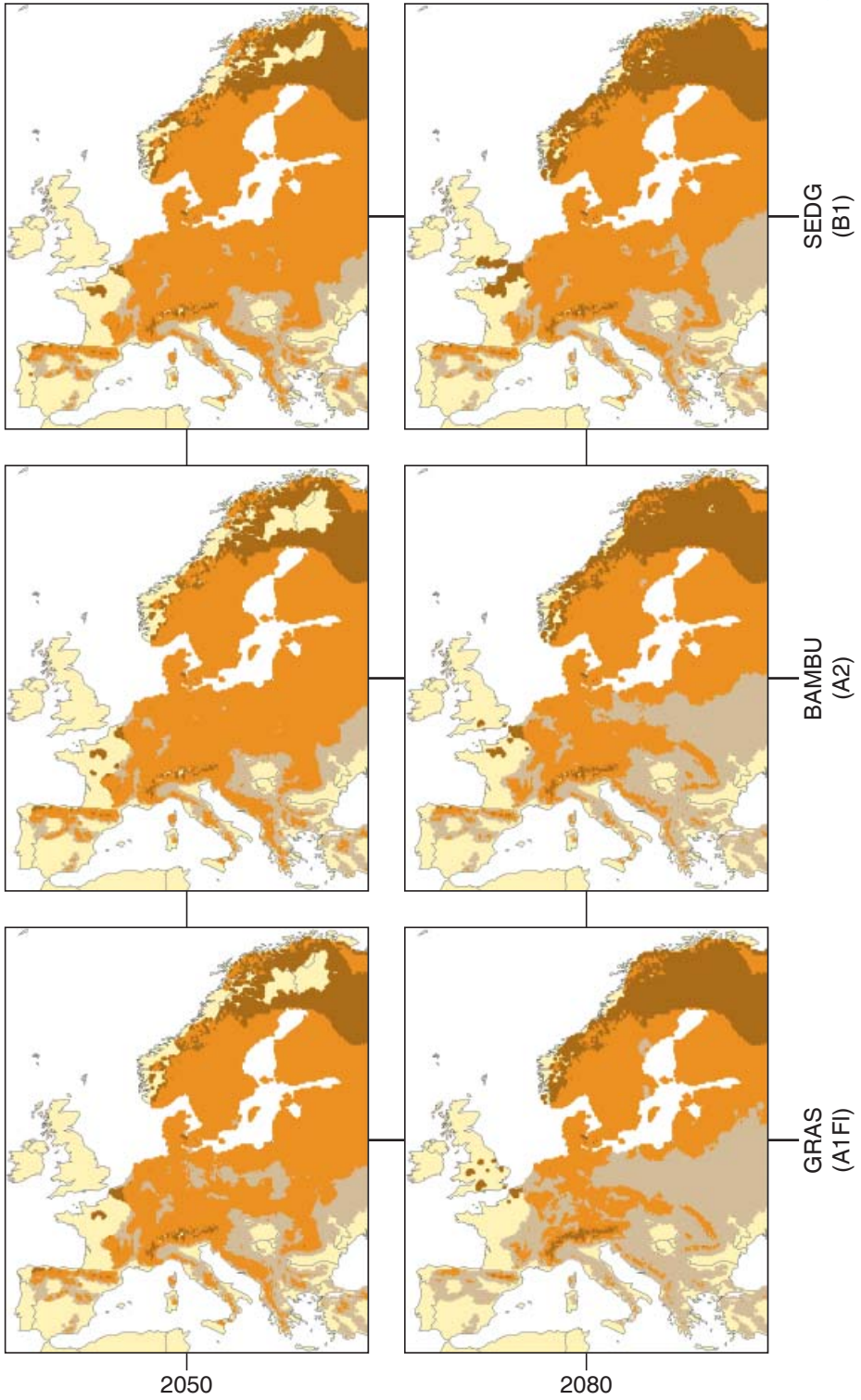
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.76). Climate risk category: LR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus escheri (HÜBNER, 1823) – Escher’s Blue



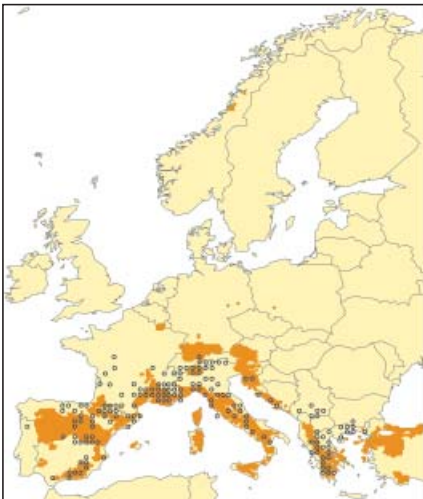
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-889 (-38.48%)	-1562 (-67.62%)
	BAMBU	-1061 (-45.93%)	-1633 (-70.69%)
	GRAS	-1243 (-53.81%)	-1873 (-81.08%)
2080	SEDG	-788 (-34.11%)	-1988 (-86.06%)
	BAMBU	-1188 (-51.43%)	-2116 (-91.6%)
	GRAS	-1178 (-51%)	-2268 (-98.18%)

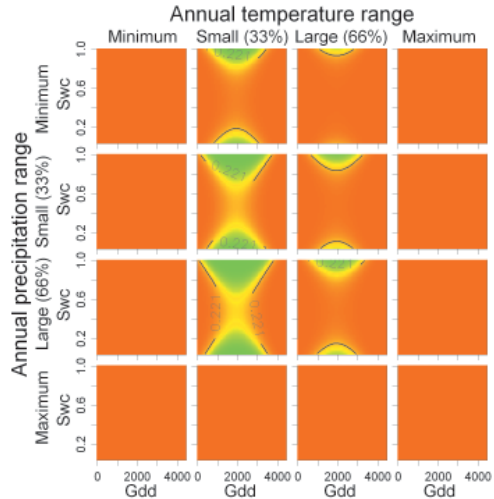
Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 2310)

Escher’s Blue occurs on dry, and flower-rich grassland, damp rough vegetation, in flower-rich rocky places, on scrub and at woodland edges, and on agricultural land. The females lay their eggs singly on milk-vetches (*Astragalus* spp.), in particular *A. monspessulanus*. *Qxytropis helvetica* may also be a foodplant. When still small, the caterpillar goes into hibernation, and in the spring completes its growth, feeding on the leaves and flowerbuds of the foodplants. When fully grown, it leaves the foodplant and pupates under stones. Both caterpillars and pupae are attended by ants of different genera including *Myrmica*, *Formica*, *Lasius* and *Plagiolepis*. Escher’s Blue is single-brooded. It hibernates as a larva.

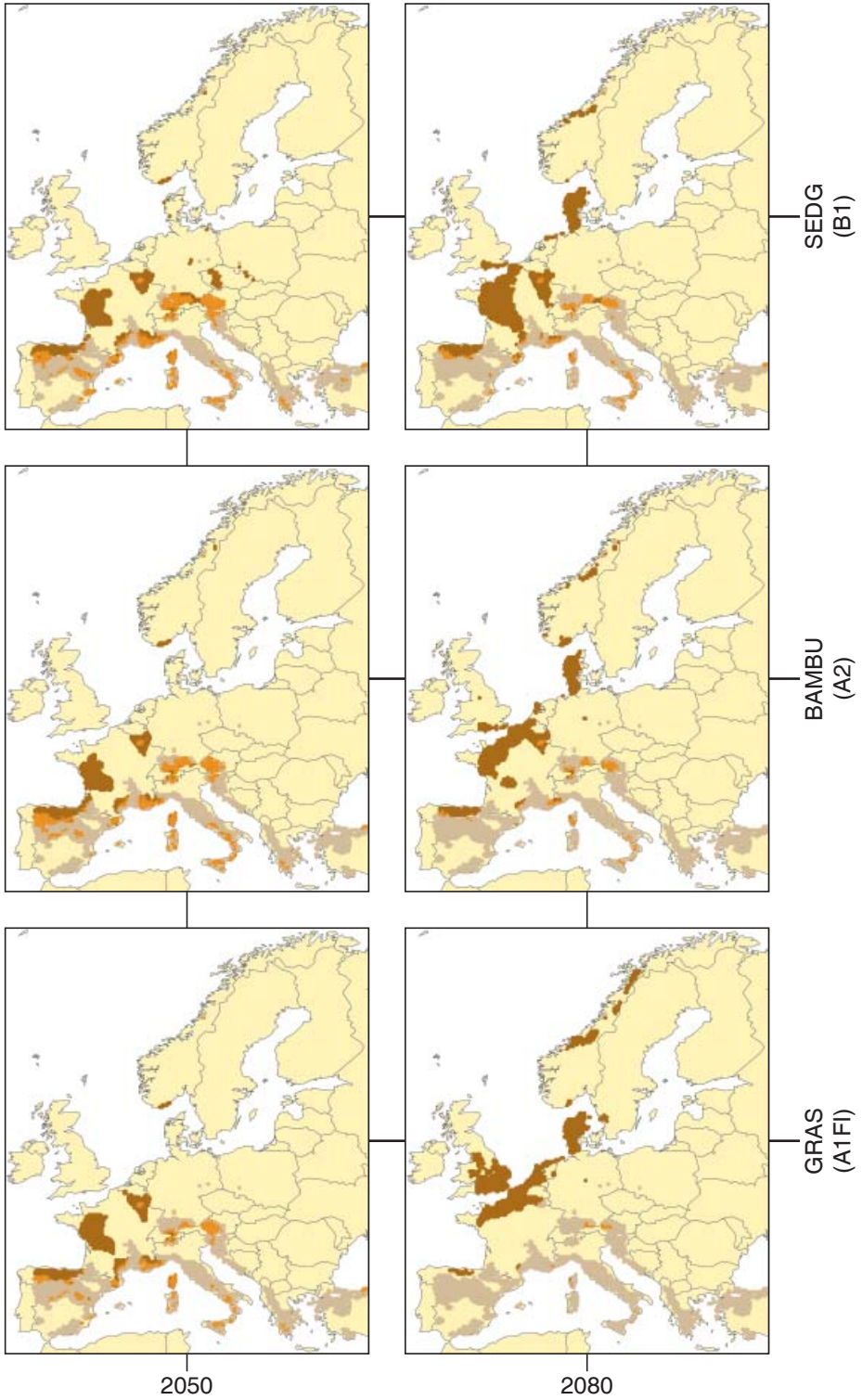
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8). Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus dorylas ([SCHIFFERMÜLLER], 1775) – Turquoise Blue



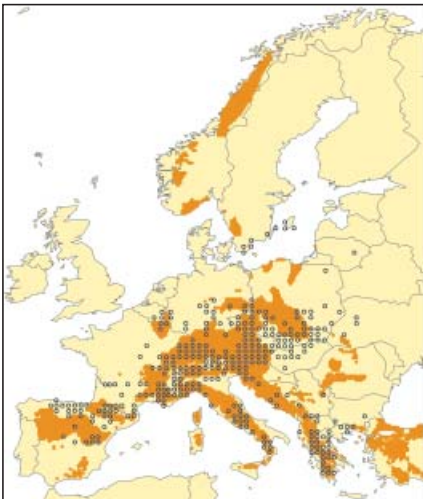
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-949 (-21%)	-2030 (-44.91%)
	BAMBU	-1526 (-33.76%)	-2328 (-51.5%)
	GRAS	-1804 (-39.91%)	-2684 (-59.38%)
2080	SEDG	-372 (-8.23%)	-2706 (-59.87%)
	BAMBU	-1383 (-30.6%)	-3262 (-72.17%)
	GRAS	-1903 (-42.1%)	-3725 (-82.41%)

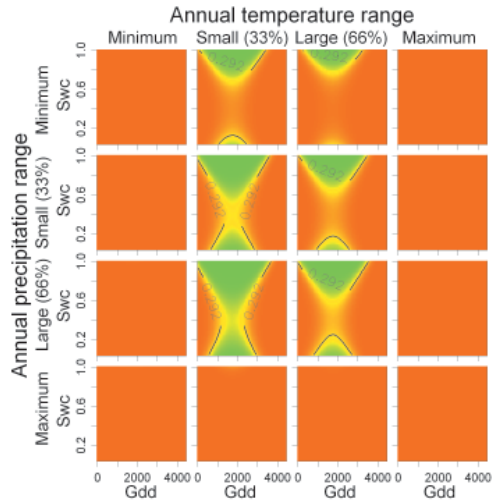
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 4520)

The Turquoise Blue likes the warmth, occurring on dry, flower-rich slopes and calcareous grassland, often where there is shelter from a wood or from bushes. The butterflies are nearly always seen on calcareous ground. The populations are usually small in mountainous areas. The female lays her eggs on Kidney-vetch (*Anthyllis vulneraria*), depositing them onto the underside of the leaves and also on the sepals. The newly-hatched caterpillars feed by scraping off the undermost layer of cells, so making little “windows” in the leaves. Later, they feed on the whole leaf. They are attended by various ant species, including those belonging to the genera *Myrmica*, *Lasius*, and *Formica*. The caterpillars pupate in the litter layer. The Turquoise Blue mostly has two generations, but at higher altitudes and in the north of its range, it is single-brooded. Hibernation takes place as a small larva.

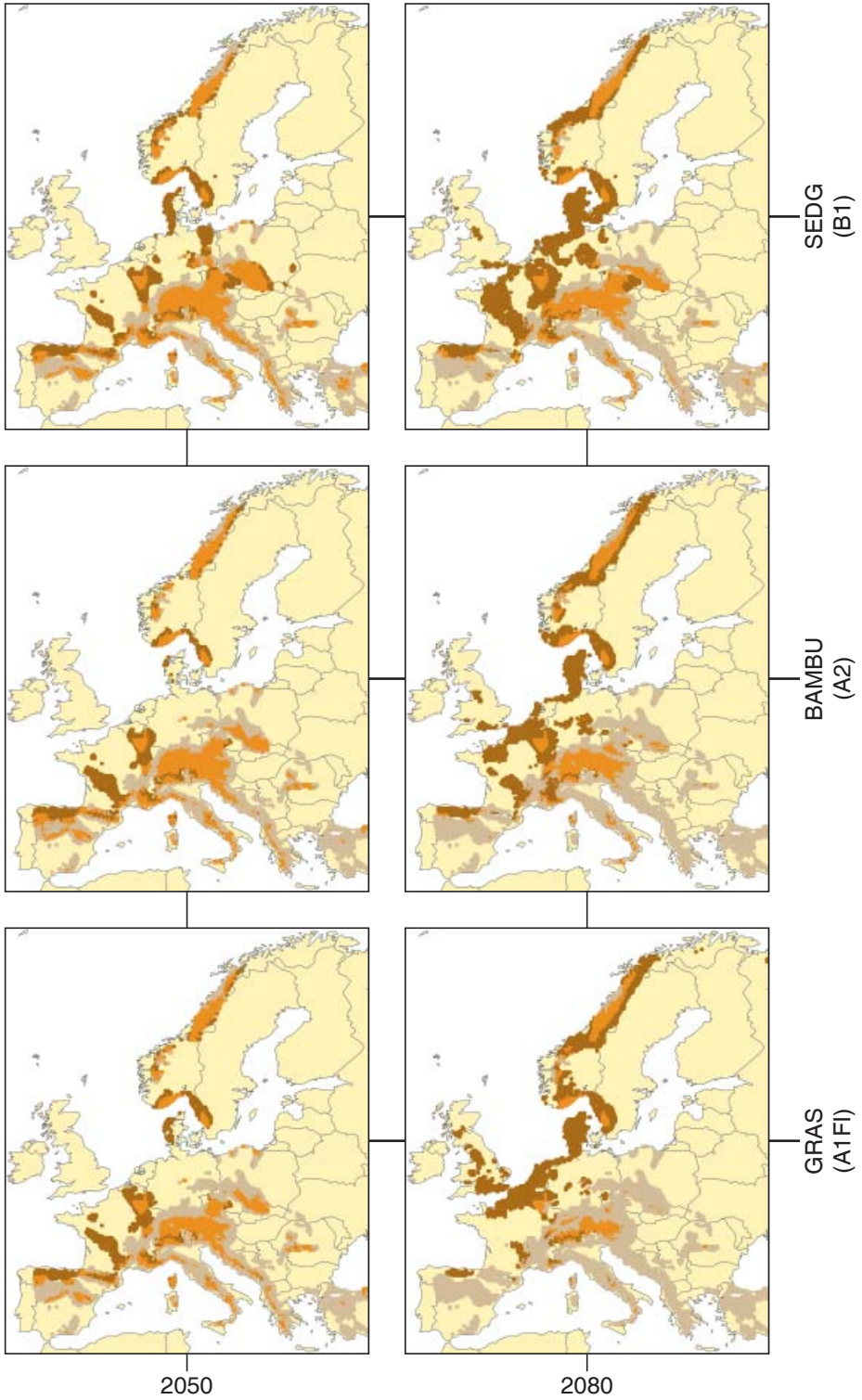
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.81).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus nivescens (KEFERSTEIN, 1851) – Mother-of-pearl Blue



© Hermann Haas

		Full dispersal	No dispersal
2050	SEDG	-378 (-80.94%)	-392 (-83.94%)
	BAMBU	-434 (-92.93%)	-434 (-92.93%)
	GRAS	-446 (-95.5%)	-448 (-95.93%)
2080	SEDG	-466 (-99.79%)	-466 (-99.79%)
	BAMBU	-467 (-100%)	-467 (-100%)
	GRAS	-467 (-100%)	-467 (-100%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 467)

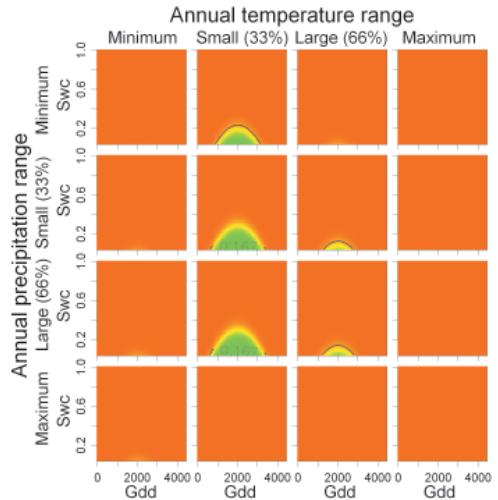
The Mother-of-pearl Blue occurs in flower-rich grasslands and on warm, dry chalk rocks with scattered patches of grassy vegetation and an occasional bush. The female lays her eggs on the leaves of Kidney-vetch (*Anthyllis vulneraria*), seeming to prefer smaller plants. Other leguminous plants, such as clovers (*Trifolium* spp.) and birdsfoot-trefoils (*Lotus* spp.) are possibly also used as foodplants. The small caterpillars go into hibernation, and after feeding and growing further, they pupate at the end of the spring on the ground. The caterpillars are attended by ants of the species *Tapinoma erraticum*. The Mother-of-pearl Blue has one generation a year.

Present distribution can be very well explained by climatic variables (AUC = 0.98).

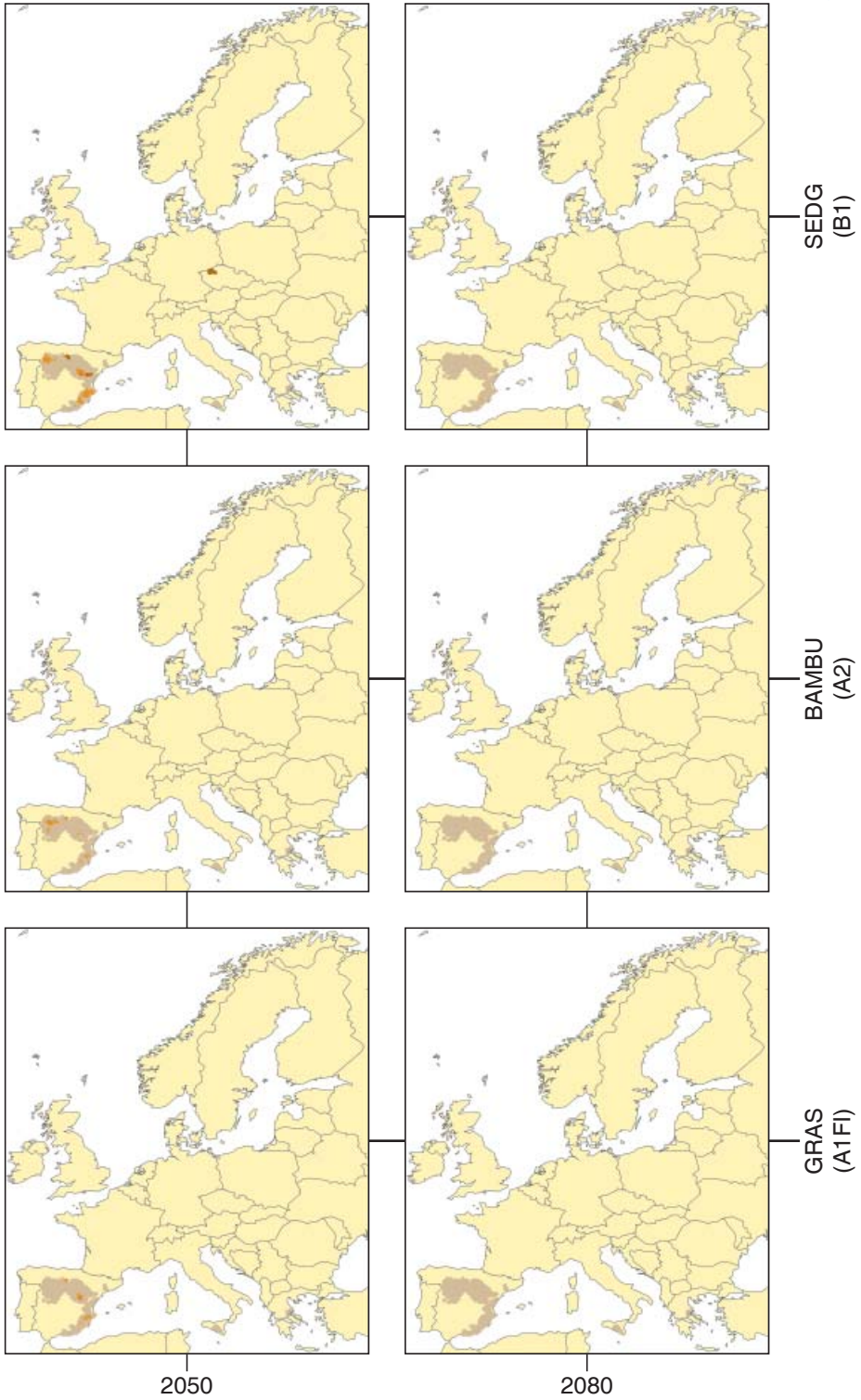
Climate risk category: HHRH.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus amandus (SCHNEIDER, 1792) – Amanda’s Blue



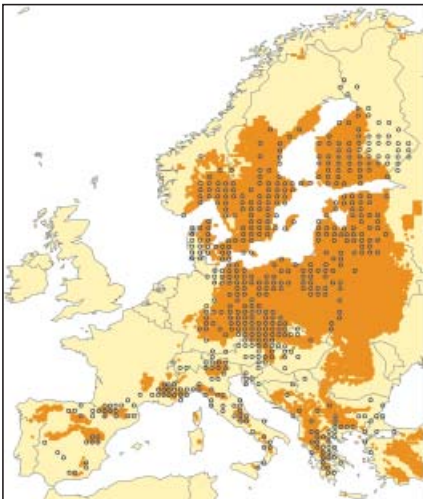
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	-2889 (-28.64%)	-3583 (-35.52%)
	BAMBU	-5353 (-53.07%)	-5575 (-55.27%)
	GRAS	-4505 (-44.66%)	-5013 (-49.7%)
2080	SEDG	-6907 (-68.47%)	-7321 (-72.58%)
	BAMBU	-8257 (-81.86%)	-8426 (-83.53%)
	GRAS	-8935 (-88.58%)	-9088 (-90.1%)

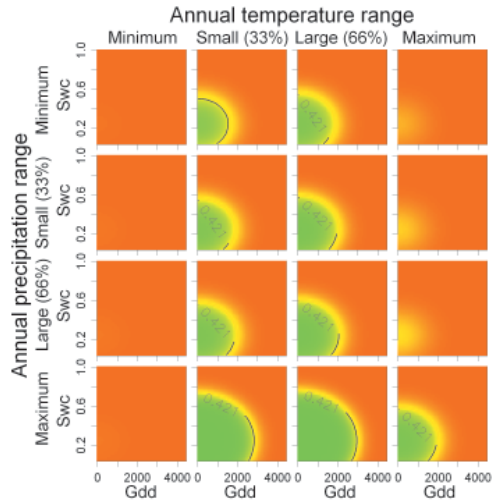
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 10087)

The German name for this butterfly, “Prächtiger Blauling” (Magnificent Blue), is well chosen, if only for the colour of the males. They are a bright sky-blue, and they also attract attention by their territorial behaviour. The females’ are modest brown in most of their distribution area and have a greenish-blue sheen. Amanda’s Blue occurs on flower-rich grassland with damp patches, that has some shelter from bushes or a nearby woodland edge. The female lays her eggs on the leaves of vetches (*Vicia* spp.) and possibly also vetchlings (*Lathyrus* spp.). The caterpillars hibernate in the litter layer and are attended by ants of the genera *Lasius*, *Myrmica*, *Formica*, and *Tapinoma*. They also pupate in the litter layer. Amanda’s Blue is single-brooded.

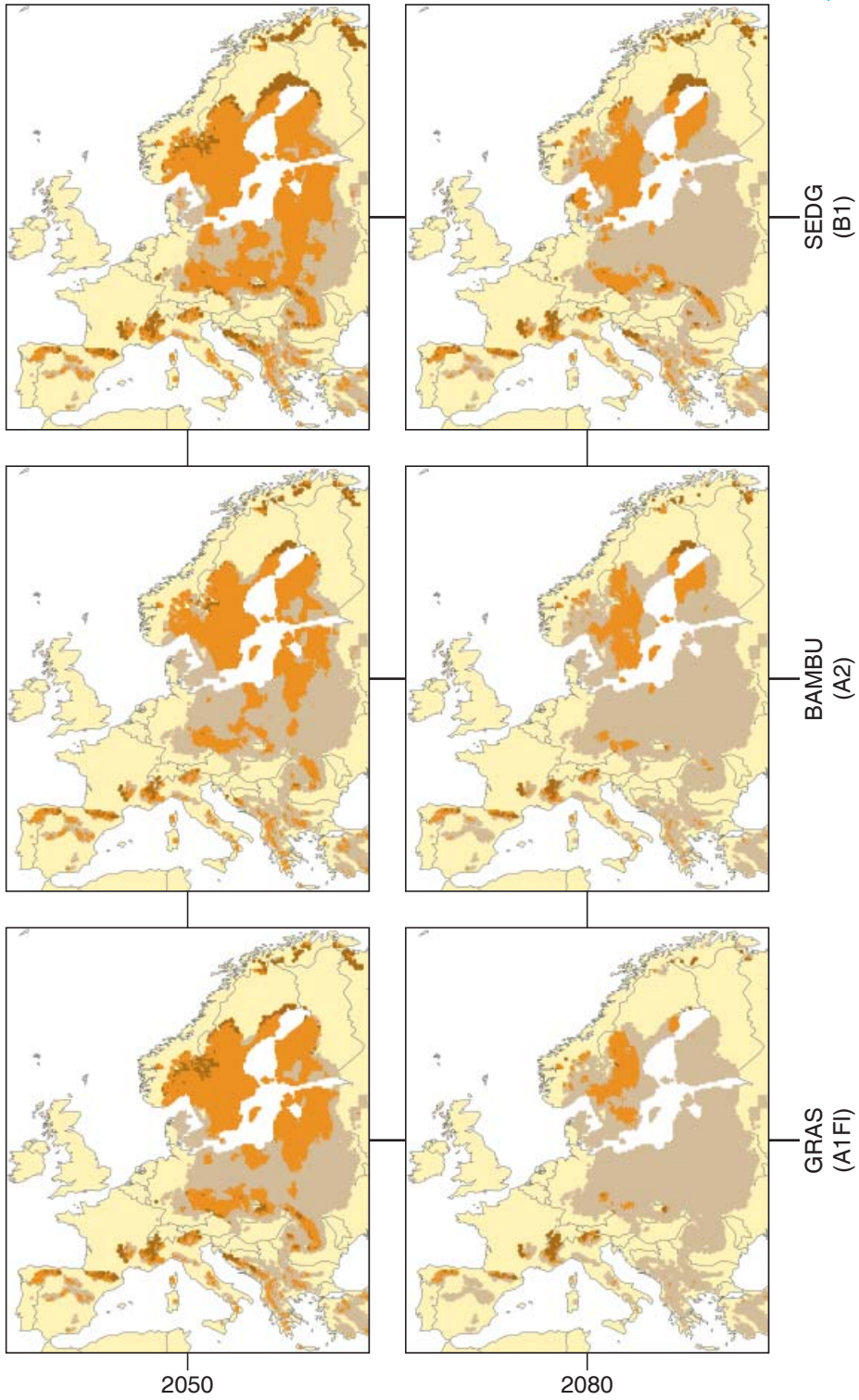
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.83).
Climate risk category: HHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus thersites (CANTENER, 1834) – Chapman’s Blue



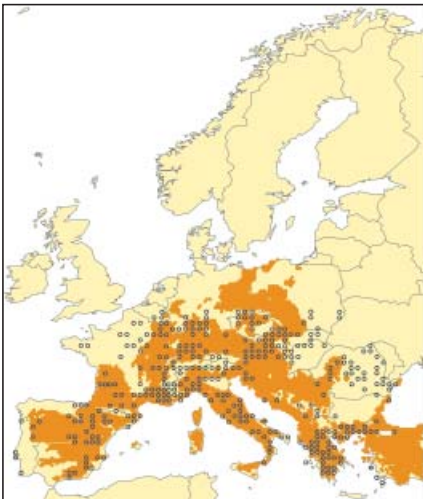
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	787 (11.31%)	-2140 (-30.75%)
	BAMBU	-278 (-3.99%)	-2569 (-36.92%)
	GRAS	-140 (-2.01%)	-2824 (-40.58%)
2080	SEDG	279 (4.01%)	-3388 (-48.69%)
	BAMBU	-746 (-10.72%)	-4622 (-66.42%)
	GRAS	-1437 (-20.65%)	-5673 (-81.52%)

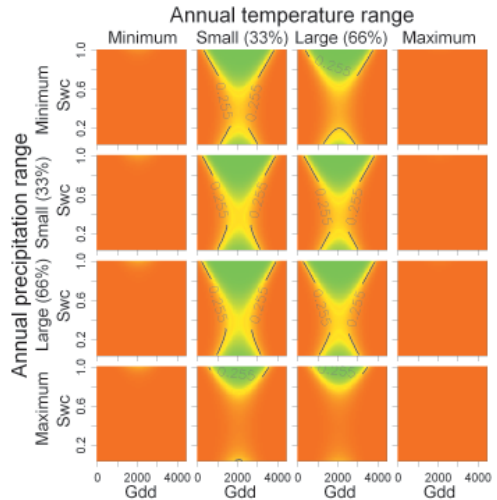
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6959)

The Chapman’s Blue looks very much like the Common Blue (*P. icarus*). However, the two black spots in the cell on the underside of the forewing are absent. It occurs in warm, dry places, such as calcareous and poor grasslands, fields of sainfoin, and abandoned agricultural land. Eggs are laid on Sainfoin (*Onobrychis viciifolia*), and in Greece also on Cockscomb Sainfoin (*O. caput-galli*). The caterpillars feed on soft parts of the leaflets, leaving the veins. The small caterpillars go into hibernation, and in those parts of the range with hot climates, the egg or undeveloped larva possibly goes into aestivation. The caterpillars are attended by ants of the genera *Lasius*, *Formica*, *Myrmica*, and *Tapinoma*, and hide themselves in the litter layer and pupate. The Chapman’s Blue usually has two generations a year, but in the south of the range also three.

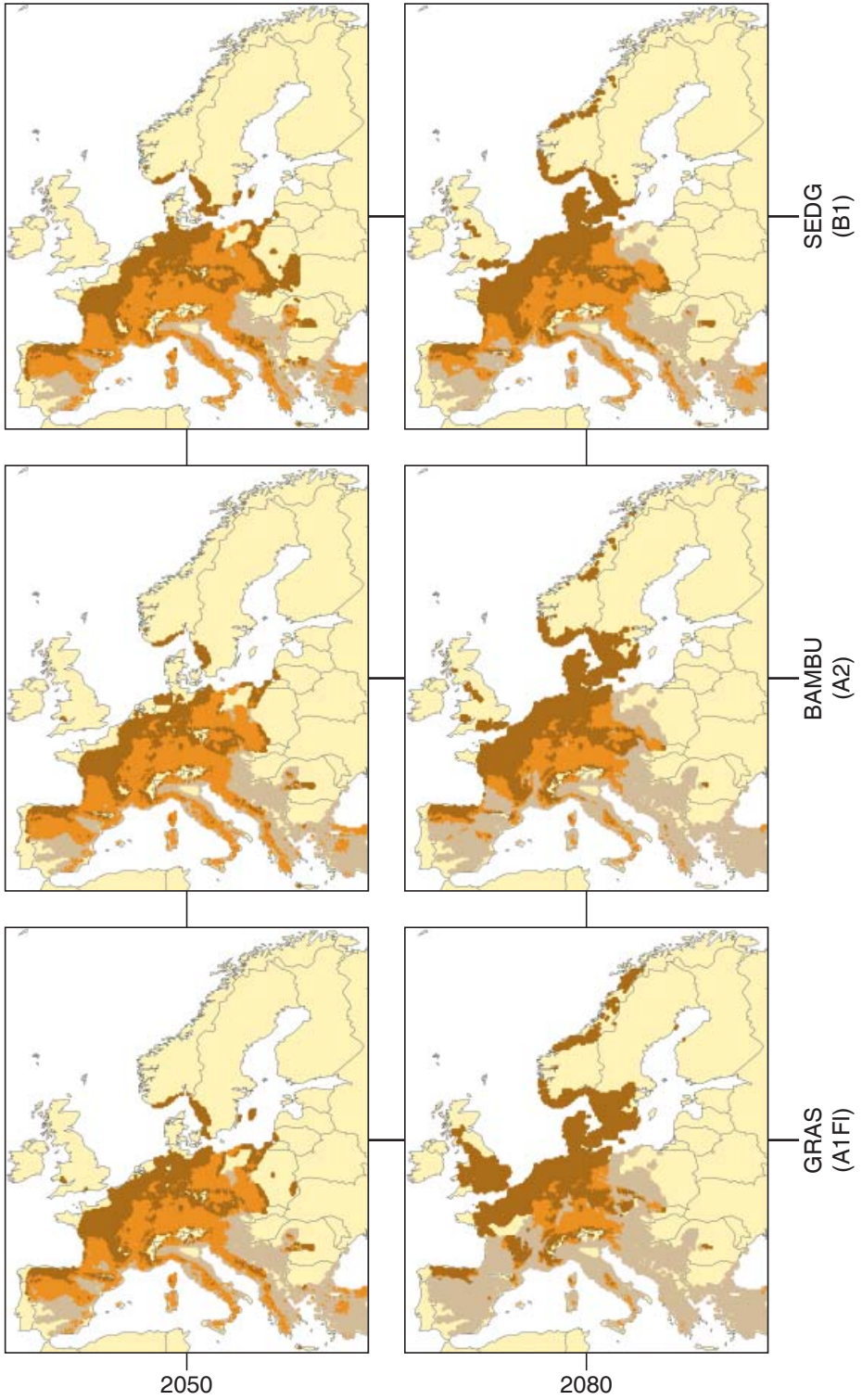
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.75). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus icarus (ROTTEMBURG, 1775) – Common Blue



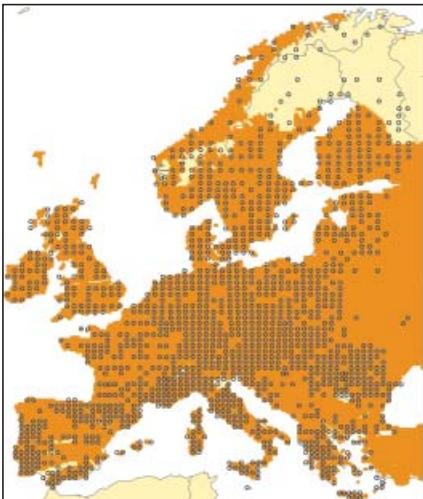
© Martin Wiemers

		Full dispersal	No dispersal
2050	SEDG	-1508 (-5.96%)	-3252 (-12.84%)
	BAMBU	-2902 (-11.46%)	-3836 (-15.15%)
	GRAS	-3054 (-12.06%)	-4374 (-17.27%)
2080	SEDG	-2279 (-9%)	-5242 (-20.7%)
	BAMBU	-5208 (-20.57%)	-7950 (-31.4%)
	GRAS	-7231 (-28.56%)	-10608 (-41.9%)

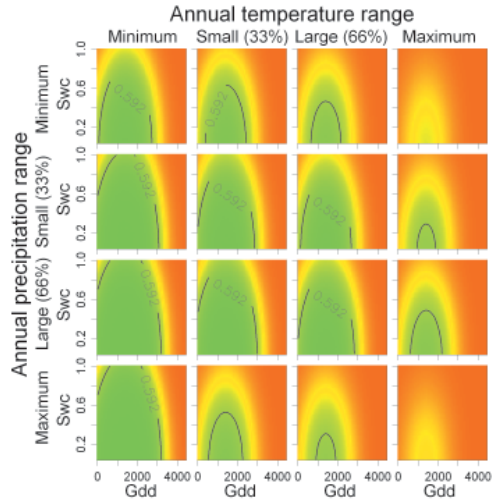
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 25320)

The Common Blue is a very common butterfly. It looks rather like Chapman’s Blue (*P. thersites*), but the two black spots on the underside of its front wings distinguish it in most specimens. It can be found on most types of grassy vegetation, ranging from quite dry, poor grassland to moderately damp meadows. The female lays her eggs on a variety of leguminous plants, including Common Birdsfoot–trefoil (*Lotus corniculatus*). The caterpillars feed on the leaves. They are attended by ants of the genera *Lasius*, *Formica*, *Myrmica*, *Tapinoma*, and *Plagiolepis*. When half-grown, the caterpillars may hibernate in the litter layer. In hot climates, aestivation possibly also takes place, in the egg or larval stage. The caterpillars pupate in the litter layer. Depending on the geographical position and altitude of the breeding ground, the Common Blue has one to three (or even more) generations a year.

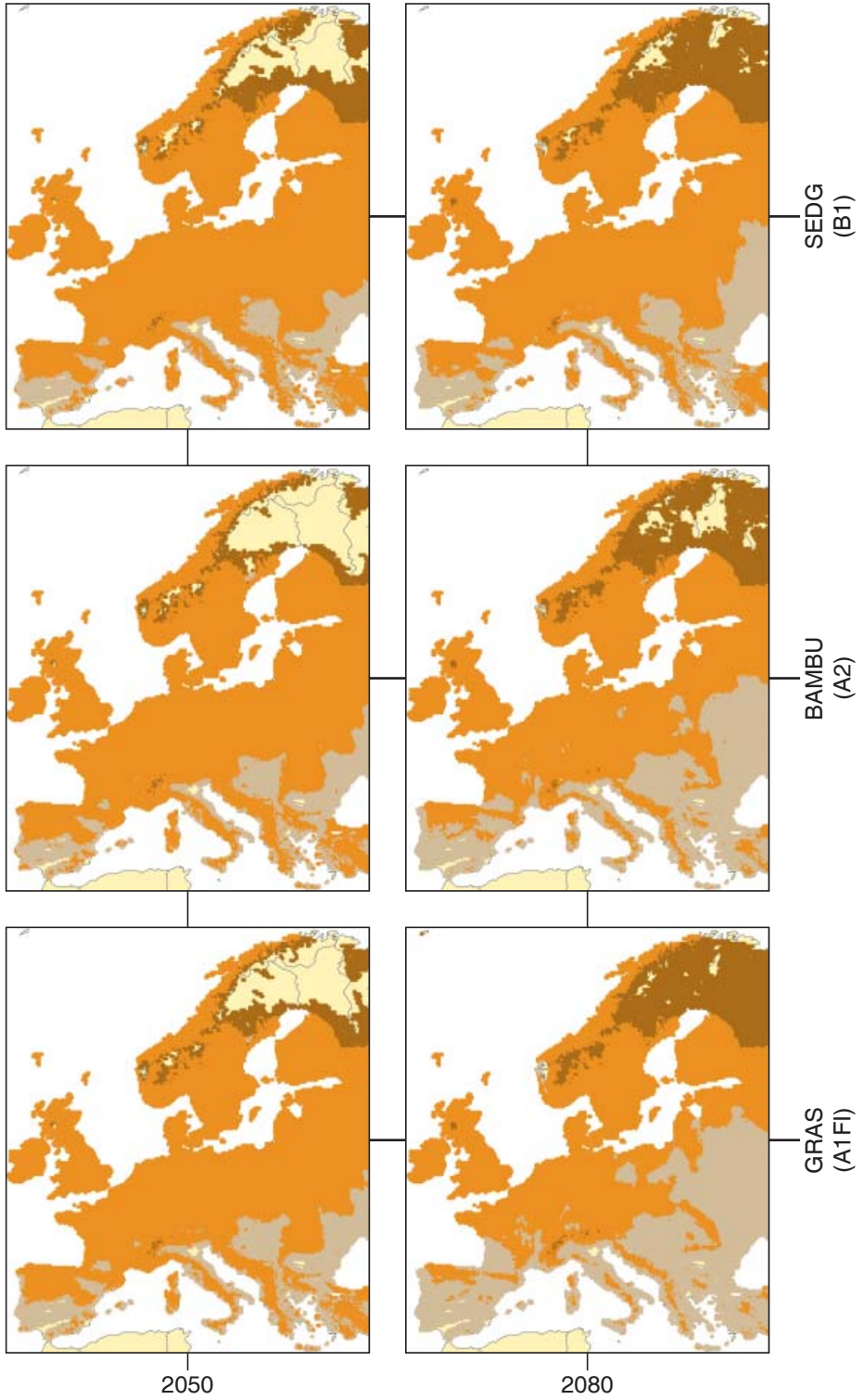
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.65). Climate risk category: PR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus eros (OCHSENHEIMER, 1808) – Eros Blue



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		Full dispersal	No dispersal
2050	SEDG	-880 (-33.2%)	-1087 (-41%)
	BAMBU	-968 (-36.51%)	-1130 (-42.63%)
	GRAS	-1162 (-43.83%)	-1322 (-49.87%)
2080	SEDG	-1071 (-40.4%)	-1530 (-57.71%)
	BAMBU	-1167 (-44.02%)	-1570 (-59.22%)
	GRAS	-1399 (-52.77%)	-1855 (-69.97%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2651)

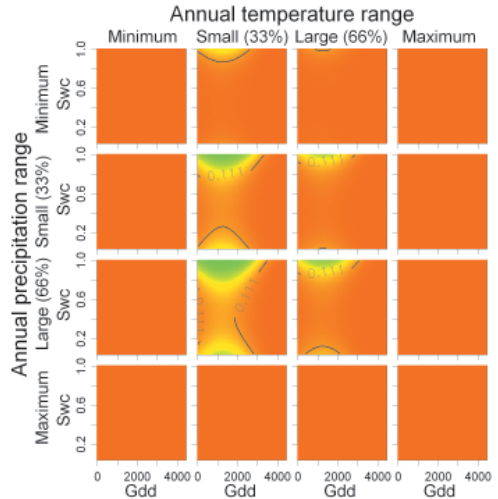
The Eros Blue is a mountain butterfly occurring on sub-alpine and alpine grasslands, on rocky places with flower-rich vegetation and on scree slopes. Purple Beaked Milk-vetch (*Oxytropis halleri*) and *O. fetida* are probably the major foodplants but other leguminous plants such as *Astragalus sempervirens*, *A. leontinus*, and Common Birdsfoot-trefoil (*Lotus corniculatus*) have also been named. The caterpillars feed on the leaves of the foodplant and hibernate on it. In spring, they grow further and when fully grown, pupate at the foot of the foodplants. They are attended by ants of the genera *Myrmica*, *Formica* and *Camponotus*. The Eros Blue has one generation a year.

Polyommatus eroides, which is listed in the Annexes II and IV of the Habitats' Directive, is also included here.

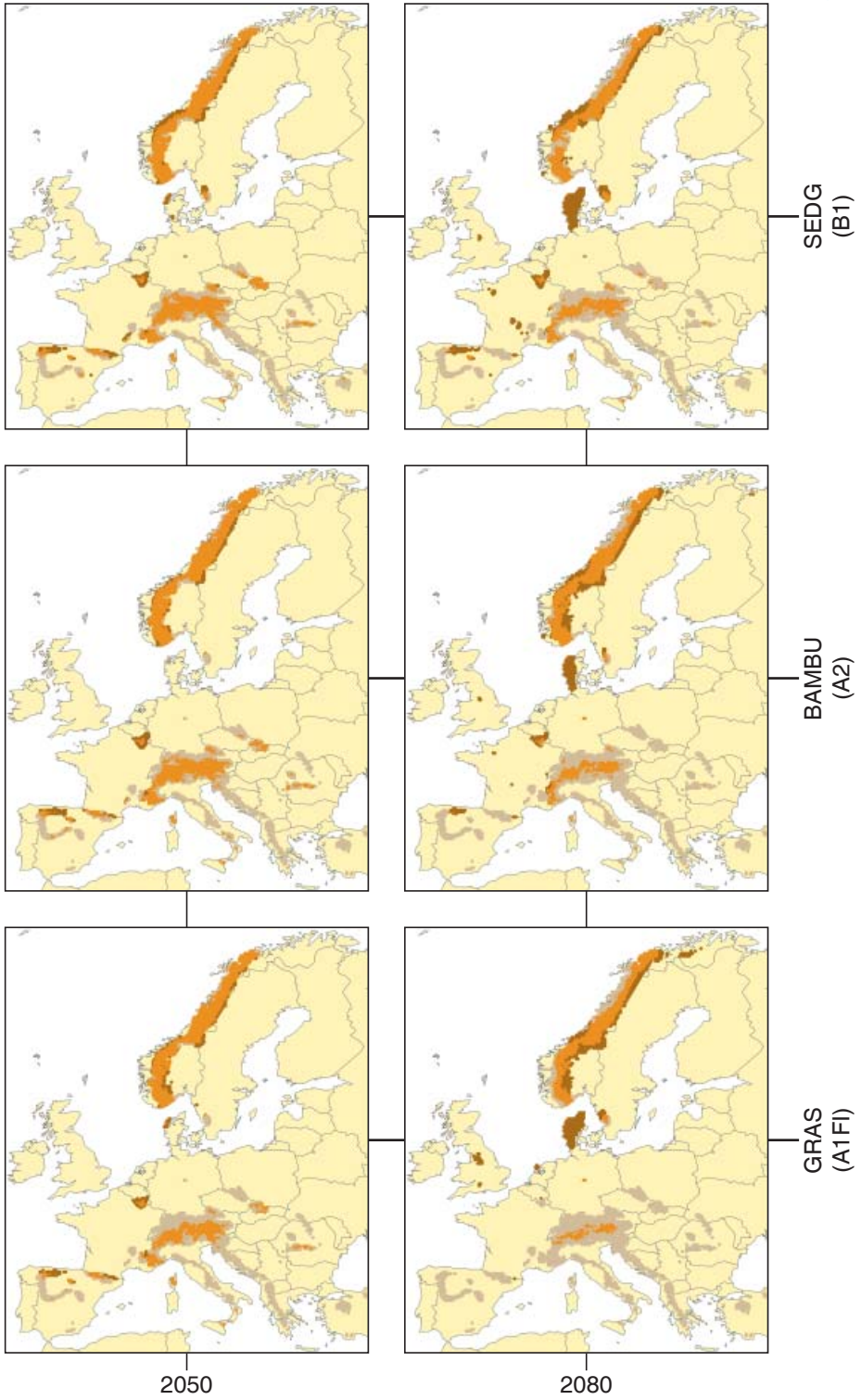
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.71). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus daphnis ([SCHIFFERMÜLLER], 1775) – Meleager’s Blue



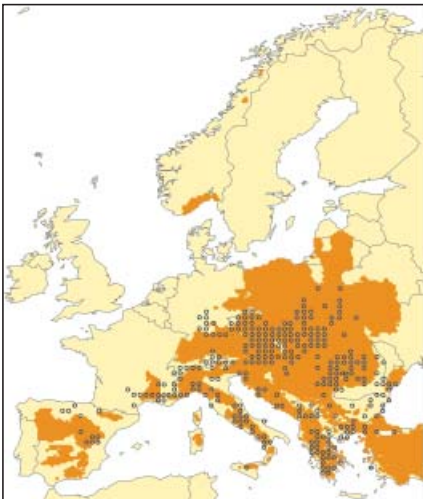
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-599 (-7.06%)	-2243 (-26.44%)
	BAMBU	-3054 (-36%)	-3575 (-42.14%)
	GRAS	-2615 (-30.83%)	-3487 (-41.11%)
2080	SEDG	-2162 (-25.49%)	-4723 (-55.68%)
	BAMBU	-4525 (-53.34%)	-6338 (-74.71%)
	GRAS	-3937 (-46.41%)	-7016 (-82.71%)

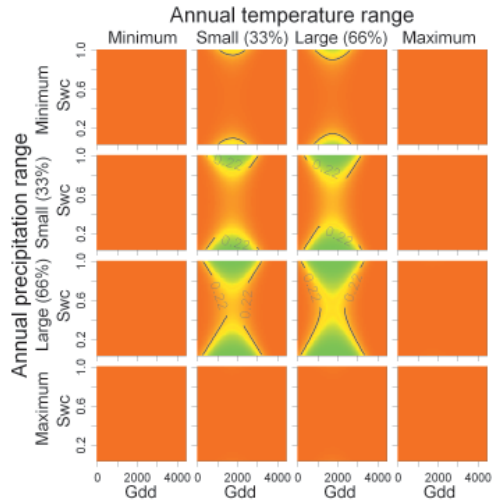
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 8483)

The Meleager’s Blue is a local butterfly that occurs on poor, rough vegetation and poor grassland often near woods. The populations are usually small. The scalloped edge of the hindwing of the female distinguishes this species from all other blues. The female lays her eggs on Horseshoe Vetch (*Hippocrepis comosa*) and Crown Vetch (*Coronilla varia*), favouring plants that grow in the shade provided by rocks or woodland. The caterpillars are attended by ants, including species of *Lasius*, *Formica*, and *Tapinoma*. Either the egg or the small caterpillar hibernates, and pupation takes place in the litter layer. The Meleager’s Blue has one generation a year.

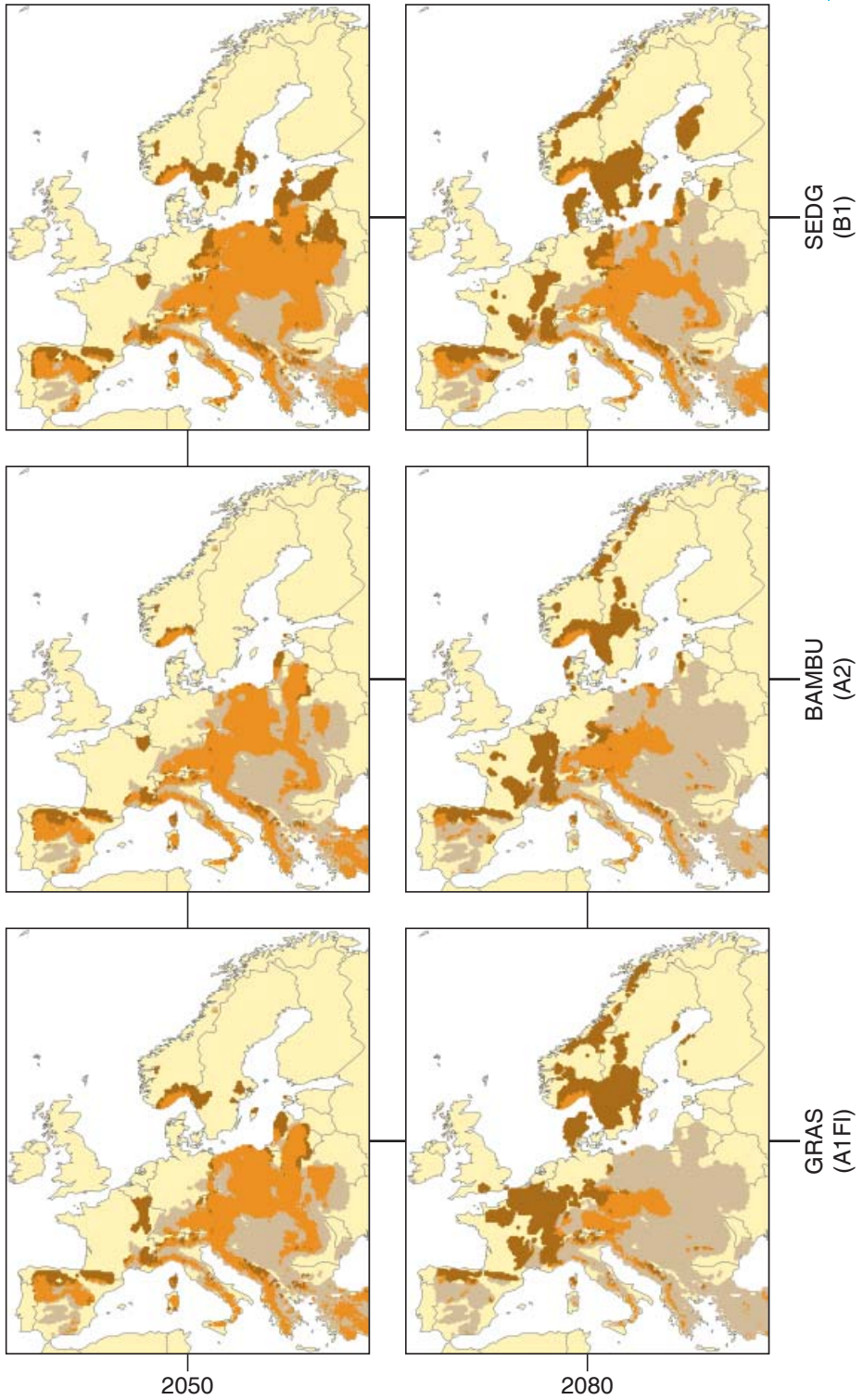
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.84).
Climate risk category: HR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus bellargus (ROTTEMBURG, 1775) – Adonis Blue



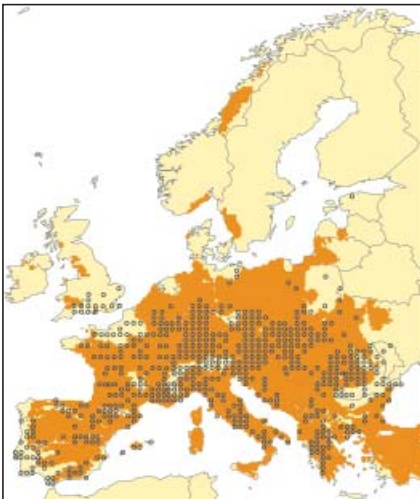
© Peter Ginzinger

		Full dispersal	No dispersal
2050	SEDG	1560 (12.74%)	-2047 (-16.72%)
	BAMBU	1018 (8.31%)	-2600 (-21.23%)
	GRAS	285 (2.33%)	-3061 (-25%)
2080	SEDG	411 (3.36%)	-3601 (-29.41%)
	BAMBU	-405 (-3.31%)	-5496 (-44.88%)
	GRAS	-1117 (-9.12%)	-6854 (-55.97%)

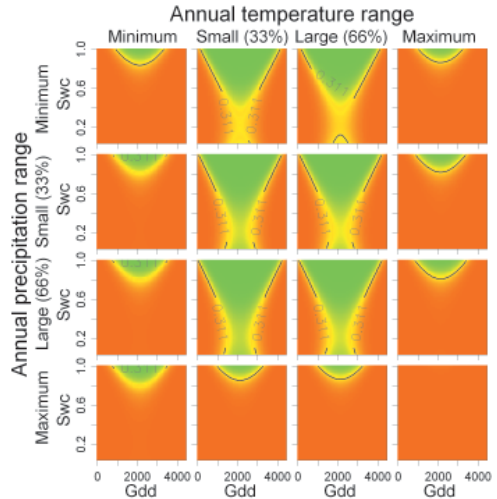
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 12245)

The Adonis Blue is found on calcareous soil on moderately to very sparse grassland, that is often sheltered by neighbouring woods or shrub. Its foodplants are Horseshoe Vetch (*Hippocrepis comosa*) and Crown Vetch (*Coronilla varia*), and the eggs are laid on the leaves. It pupates in the litter layer. The caterpillars are attended by ants of the genera *Myrmica*, *Lasius*, *Plagiolepis*, *Tetramorium*, *Formica*, and *Tapinoma*. The Adonis Blue usually has two generations a year, and the caterpillars of the second brood hibernate. There are also some single-brooded populations in the south of Greece.

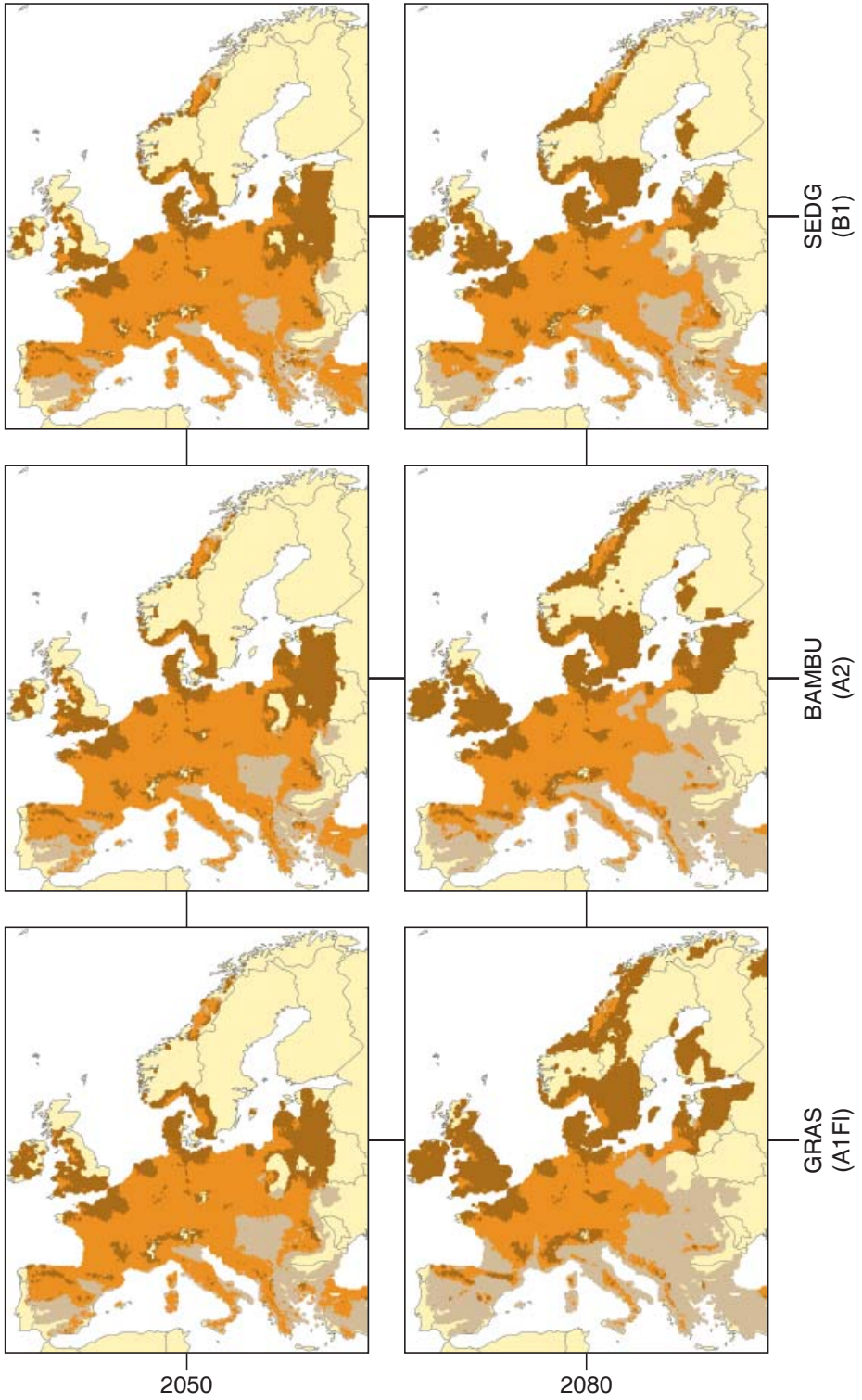
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.72). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus coridon (PODA, 1761) – Chalkhill Blue



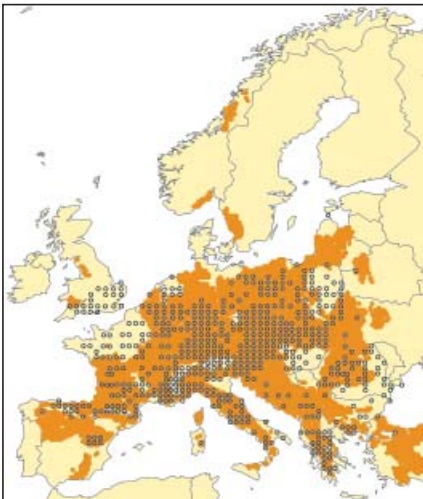
© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	304 (3.45%)	-2524 (-28.66%)
	BAMBU	384 (4.36%)	-2645 (-30.04%)
	GRAS	-917 (-10.41%)	-3587 (-40.73%)
2080	SEDG	-501 (-5.69%)	-4088 (-46.42%)
	BAMBU	-838 (-9.52%)	-5197 (-59.02%)
	GRAS	-1527 (-17.34%)	-6483 (-73.62%)

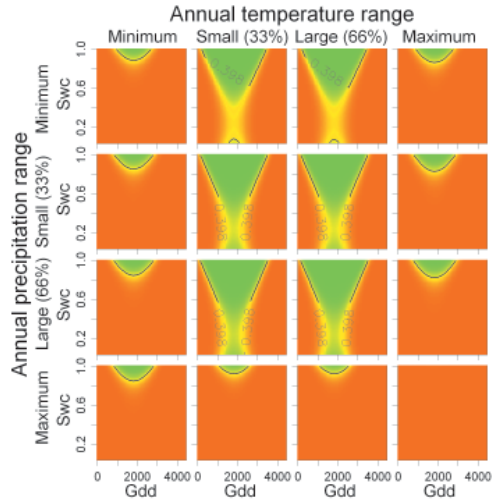
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 8806)

The Chalkhill Blue occurs on calcareous soil in dry, and flower-rich places with a short vegetation. They seem to prefer sheltered places. Sometimes, populations can be extremely large which is especially obvious in the late afternoon when the butterflies come together to roost. Hundreds of butterflies can be seen, their heads pointing downwards into the vegetation, wings upright, the light-coloured underwings gleaming in the evening sun. Horseshoe Vetch (*Hippocrepis comosa*) is its only foodplant, the female laying her eggs on the leaves. The eggs hibernate. The caterpillars are attended by ants of the genera *Myrmica*, *Lasius*, *Formica*, *Plagiolepis*, *Tetramorium*, *Aphaenogaster*, and *Tapinoma*. The Chalk-hill Blue pupates in the litter layer. It usually only has one generation a year.

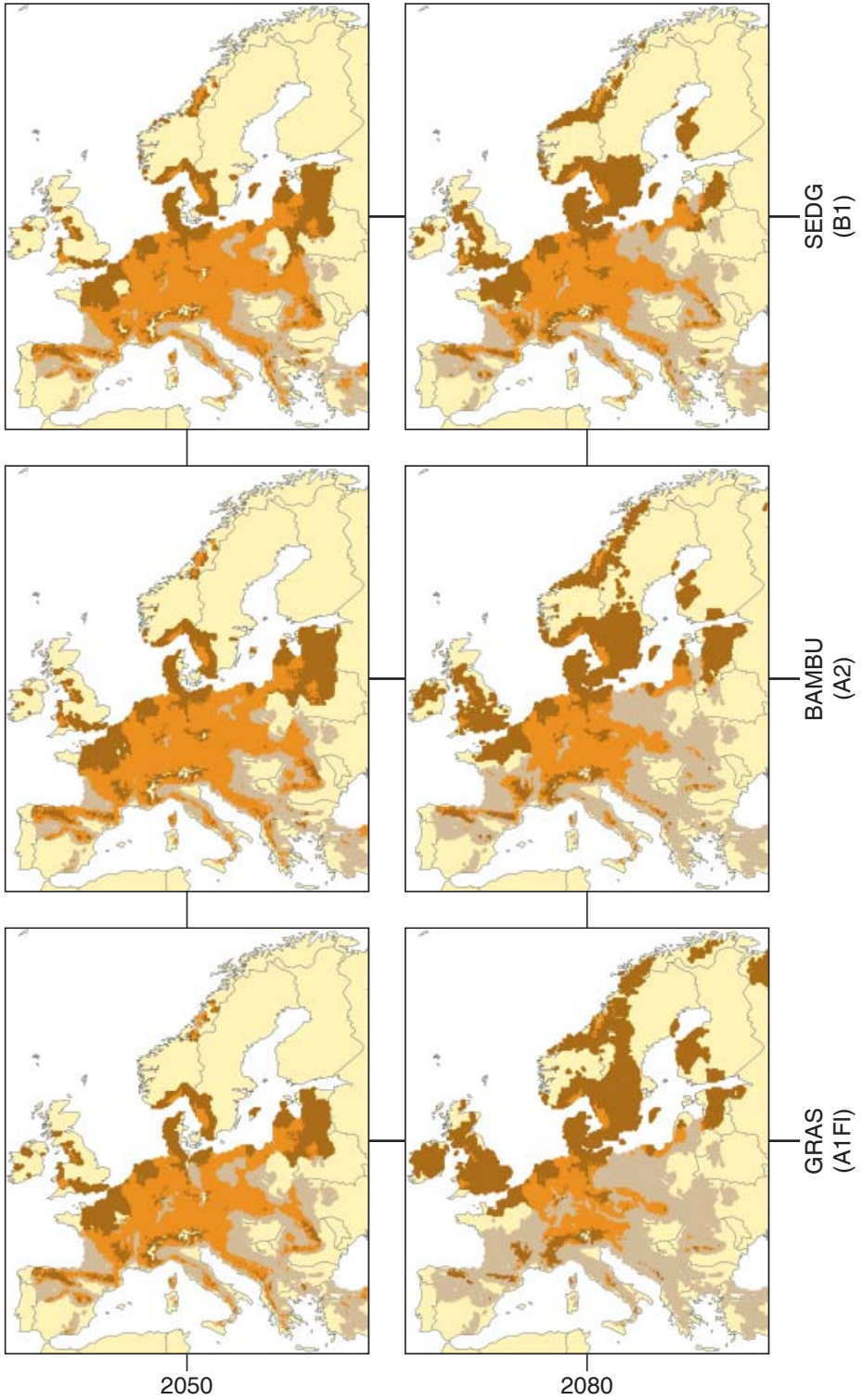
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.82).
Climate risk category: HR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus hispanus (HERRICH-SCHÄFFER, 1851) – Provence Chalkhill Blue



© Kars Veling

		Full dispersal	No dispersal
2050	SEDG	170 (21.46%)	-557 (-70.33%)
	BAMBU	68 (8.59%)	-559 (-70.58%)
	GRAS	145 (18.31%)	-608 (-76.77%)
2080	SEDG	500 (63.13%)	-656 (-82.83%)
	BAMBU	214 (27.02%)	-739 (-93.31%)
	GRAS	151 (19.07%)	-787 (-99.37%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 792)

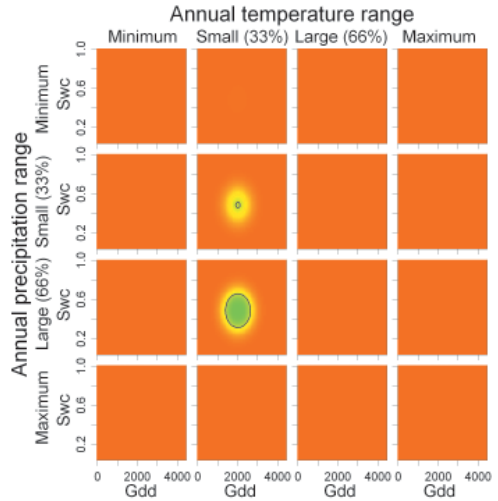
The Provence Chalkhill Blue occurs on dry, calcareous soils covered with a flower-rich grassy vegetation, often with scattered bushes. Eggs are laid on Horseshoe-vetch (*Hippocrepis comosa*). The caterpillars are attended by ants of the genera *Plagiolepis* and *Crematogaster*. The Provence Chalkhill Blue has two generations a year and the butterflies can be seen as late as October.

Present distribution can be well explained by climatic variables (AUC = 0.95).

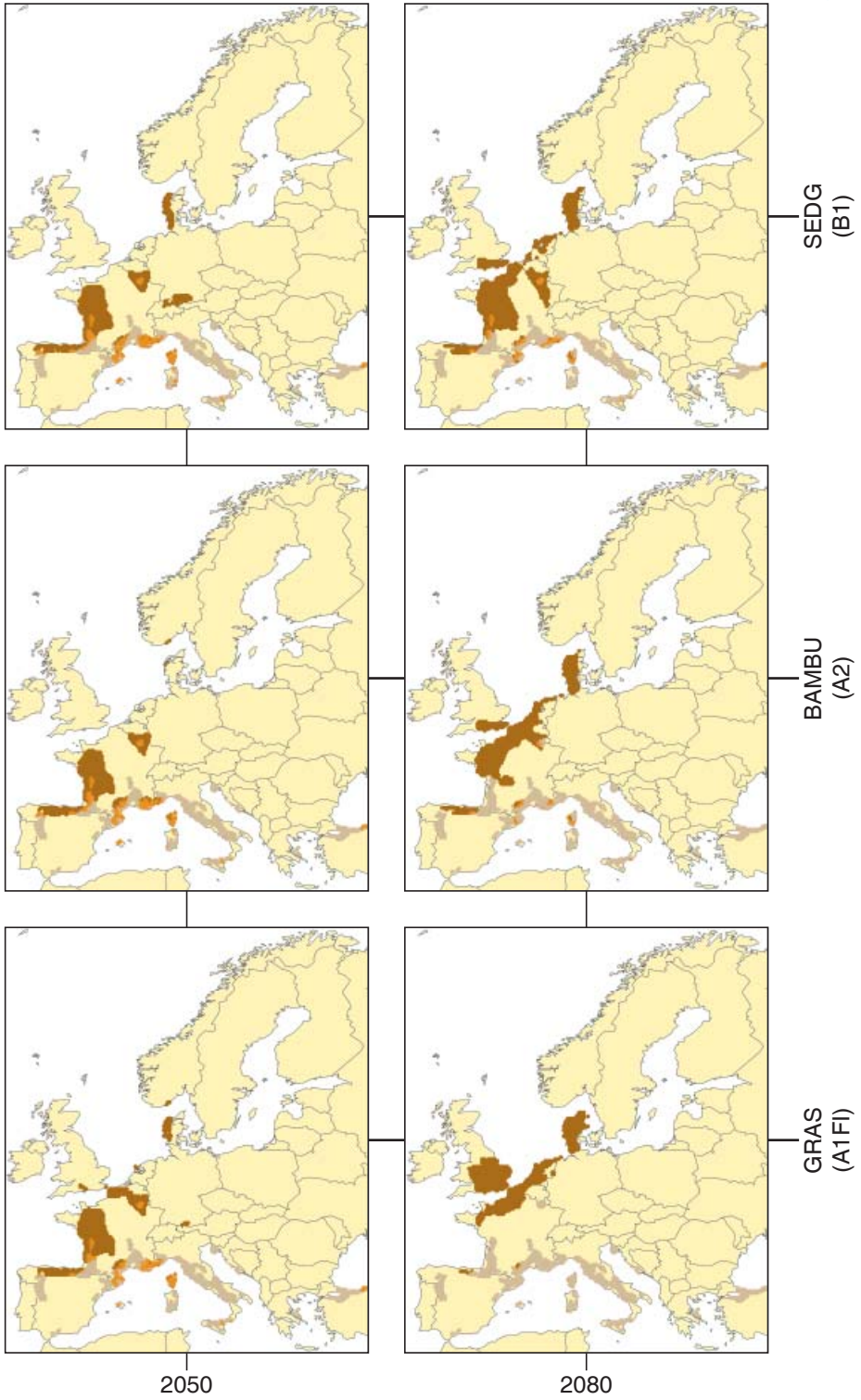
Climate risk category: HHHR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus albicans (HERRICH-SCHÄFFER, 1851) – Spanish Chalkhill Blue



© Kars Veling

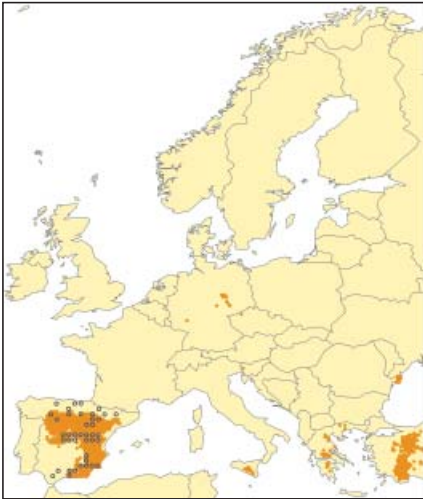
		Full dispersal	No dispersal
2050	SEDG	-457 (-48.11%)	-598 (-62.95%)
	BAMBU	-691 (-72.74%)	-700 (-73.68%)
	GRAS	-498 (-52.42%)	-707 (-74.42%)
2080	SEDG	-924 (-97.26%)	-926 (-97.47%)
	BAMBU	-946 (-99.58%)	-950 (-100%)
	GRAS	-922 (-97.05%)	-950 (-100%)

Changes in climatic niche distribution (in 10'x10' grid cells; present niche space: 950)

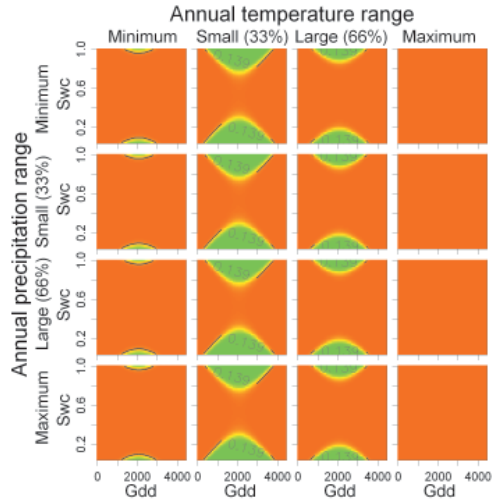
The Spanish Chalkhill Blue can be seen in dry, calcareous rocky places with grassy vegetation, and in dry, open scrub. Its most important foodplant is Horseshoe Vetch (*Hippocrepis comosa*), although *H. multisiliquosa* is possibly also used. The female lays her eggs on the leaves. The caterpillars are often found accompanied by *Tapinoma* ants. This butterfly species is single-brooded.

Present distribution can be well explained by climatic variables (AUC = 0.88).

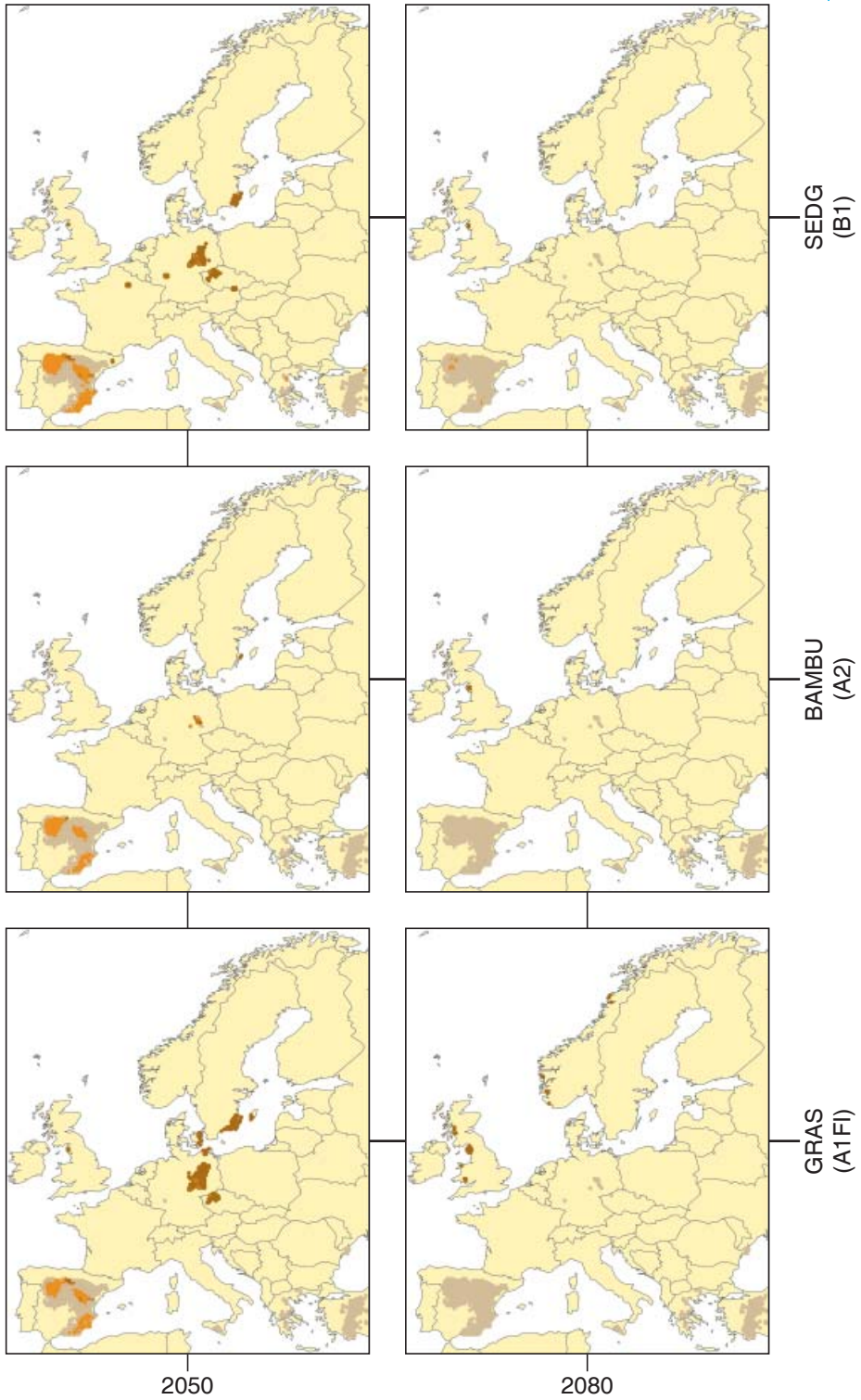
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus admetus (ESPER, 1785) – Anomalous Blue



© Chris van Swaay

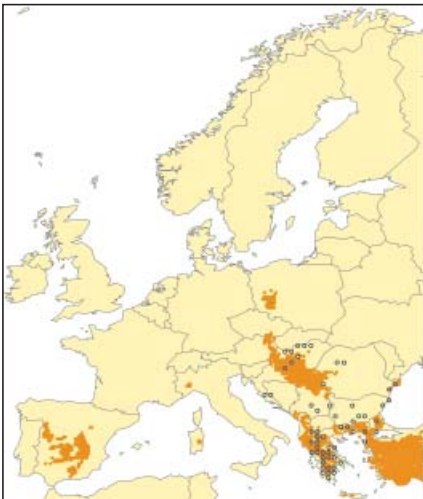
		Full dispersal	No dispersal
2050	SEDG	568 (36.96%)	-842 (-54.78%)
	BAMBU	-452 (-29.41%)	-1020 (-66.36%)
	GRAS	-39 (-2.54%)	-1076 (-70.01%)
2080	SEDG	-150 (-9.76%)	-1016 (-66.1%)
	BAMBU	-1004 (-65.32%)	-1357 (-88.29%)
	GRAS	-915 (-59.53%)	-1464 (-95.25%)

Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 1537)

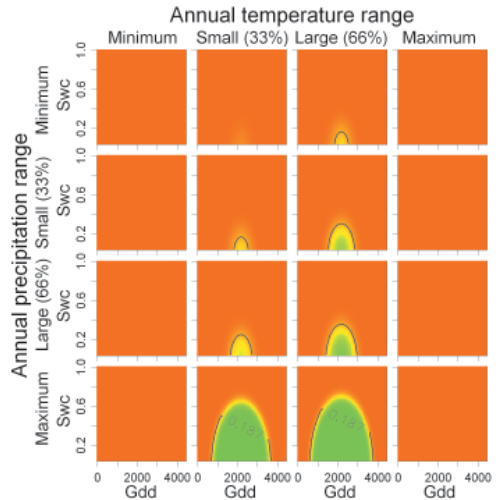
The Anomalous Blue occurs in woodland clearings, open scrub, on sheltered slopes and in agricultural areas. All the places are warm and have a flower-rich grassy vegetation. The females lay their eggs on the flowers of Sainfoin (*Onobrychis vicifolia*) and Cockscomb Sainfoin (*O. caput-galli*). The caterpillars are attended by ants of the genera *Crematogaster*, *Camponotus*, and *Tapinoma*. The Anomalous Blue has one generation a year and hibernation takes place on the ground, the small caterpillars hiding under stones.

Present distribution can be well explained by climatic variables (AUC = 0.88).

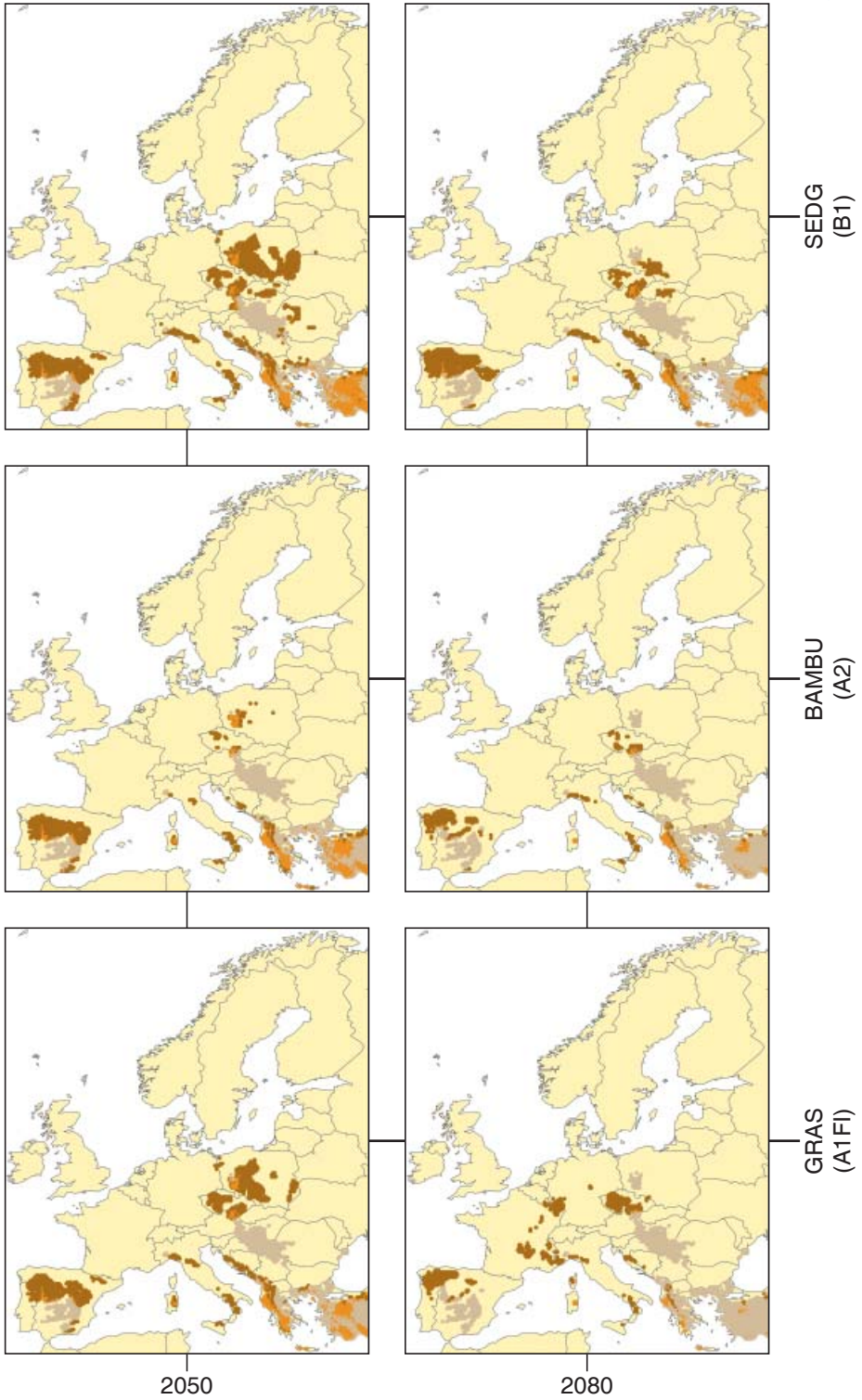
Climate risk category: HHRH.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus ripartii (FREYER, 1830) – Ripart’s Anomalous Blue



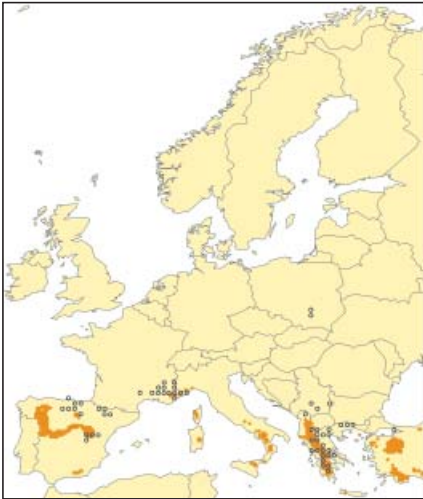
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-290 (-63.04%)	-336 (-73.04%)
	BAMBU	-342 (-74.35%)	-372 (-80.87%)
	GRAS	-349 (-75.87%)	-384 (-83.48%)
2080	SEDG	-359 (-78.04%)	-408 (-88.7%)
	BAMBU	-406 (-88.26%)	-433 (-94.13%)
	GRAS	-447 (-97.17%)	-456 (-99.13%)

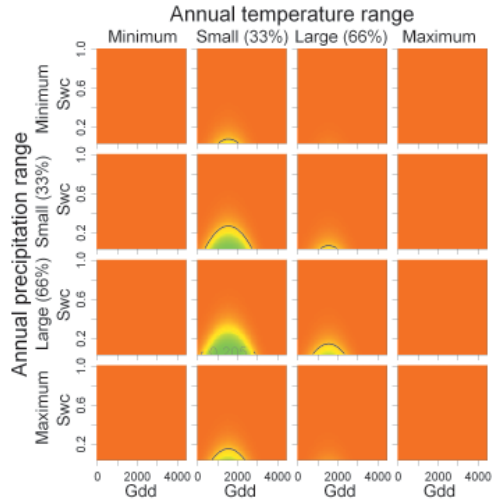
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 460)

Ripart’s Anomalous Blue is mostly found on dry, grassy places with bushes. Different sainfoins are used as foodplant, such as Sainfoin (*Onobrychis vicifolia*), *O. arenaria*, Rock Sainfoin (*O. saxatilis*), and *O. alba*. The female lays her eggs on the flowers. The caterpillars hibernate when still small. They are often attended by ants of the genera *Crematogaster*, *Camponotus*, and *Lasius*. The Ripart’s Anomalous Blue has one generation a year.

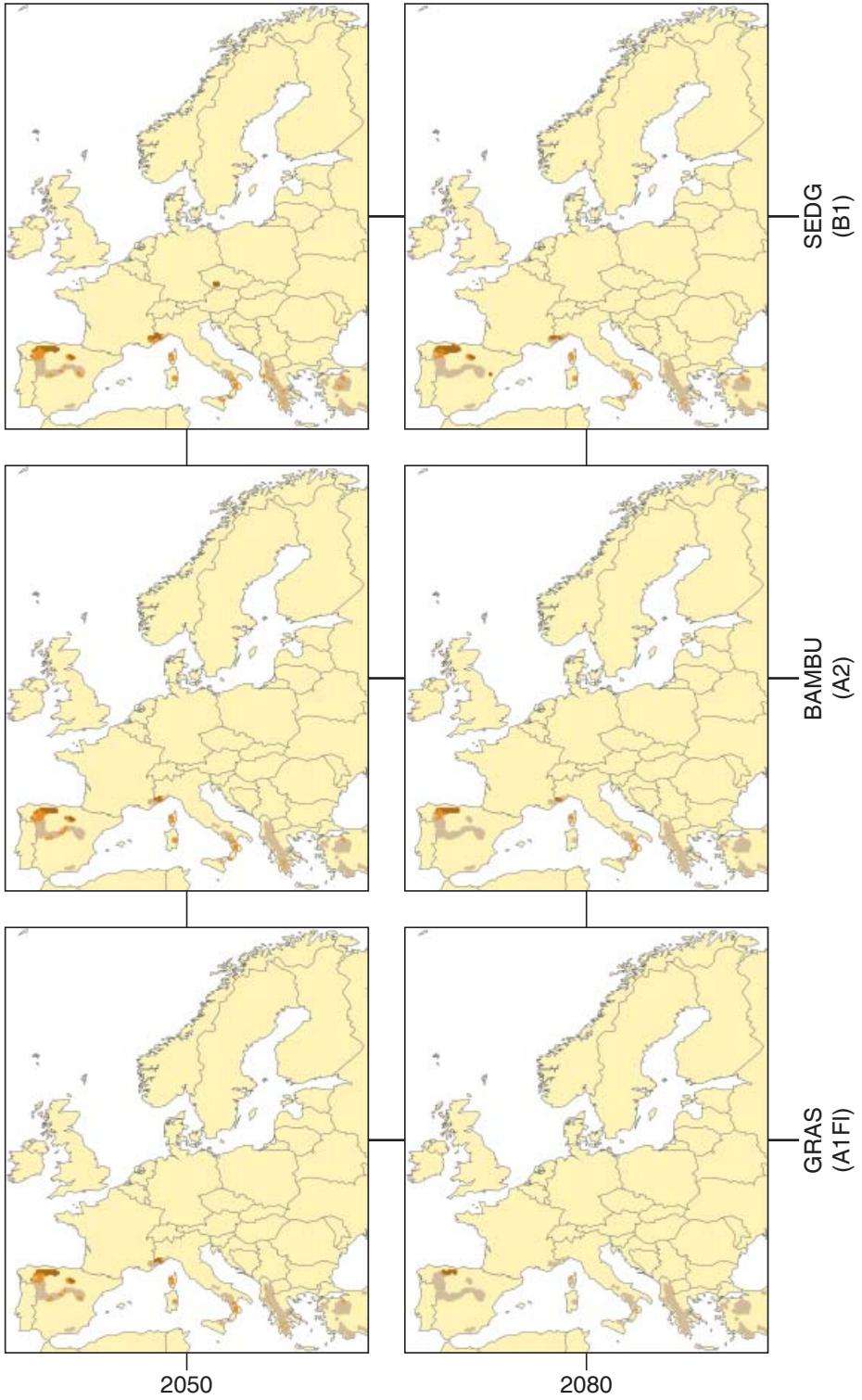
Present distribution can be explained by climatic variables to only a limited extent (AUC = 0.75). Climate risk category: PR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus dolus (HÜBNER, 1823) – Furry Blue



© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-58 (-27.1%)	-190 (-88.79%)
	BAMBU	-90 (-42.06%)	-192 (-89.72%)
	GRAS	-34 (-15.89%)	-202 (-94.39%)
2080	SEDG	105 (49.07%)	-208 (-97.2%)
	BAMBU	-97 (-45.33%)	-214 (-100%)
	GRAS	-79 (-36.92%)	-214 (-100%)

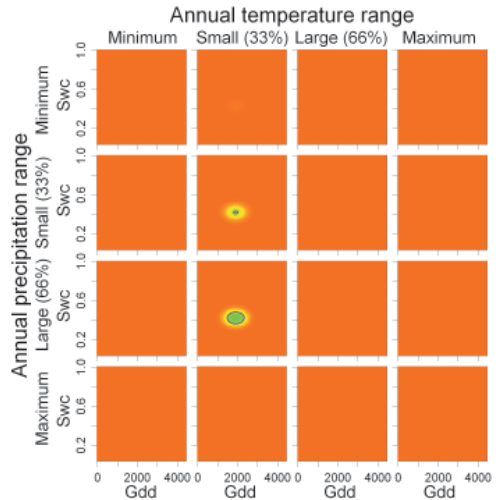
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 214)

The Furry Blue occurs on dry, flower-rich, grassy vegetation with scrub, on waste ground, and in clearings in deciduous or coniferous woods. The female lays her eggs on Sainfoin (*Onobrychis vicifolia*). The butterflies are attended by ants. Hibernation takes place when the caterpillars are still small.

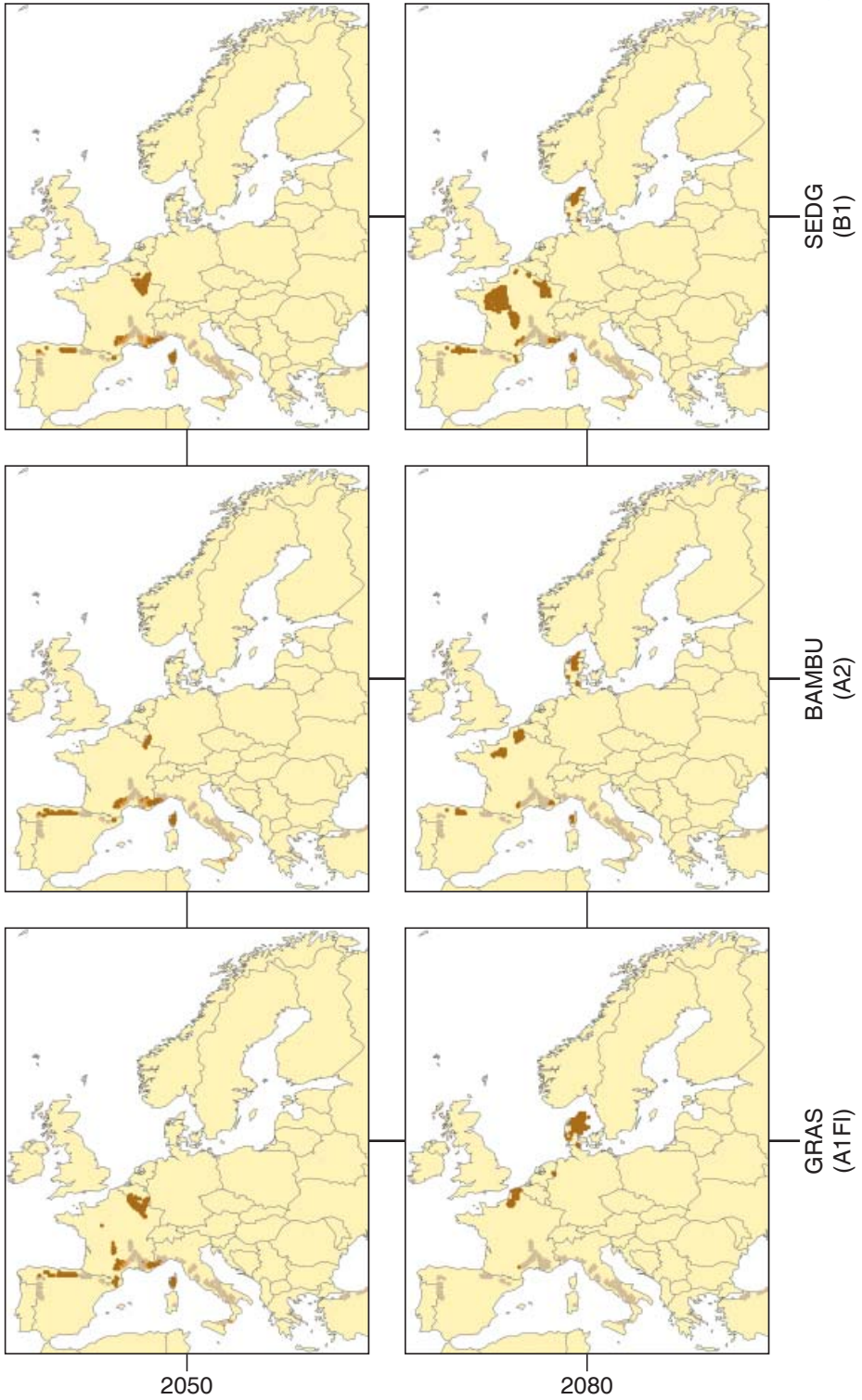
Present distribution can be very well explained by climatic variables (AUC = 0.97).
Climate risk category: HHHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Polyommatus damon ([SCHIFFERMÜLLER], 1775) – Damon Blue



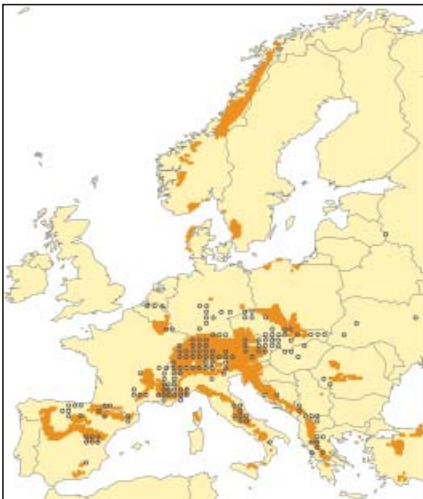
© Albert Vliegenthart

		Full dispersal	No dispersal
2050	SEDG	-660 (-28.23%)	-1169 (-50%)
	BAMBU	-850 (-36.36%)	-1277 (-54.62%)
	GRAS	-1112 (-47.56%)	-1526 (-65.27%)
2080	SEDG	-857 (-36.66%)	-1653 (-70.7%)
	BAMBU	-1091 (-46.66%)	-1769 (-75.66%)
	GRAS	-1409 (-60.27%)	-2009 (-85.93%)

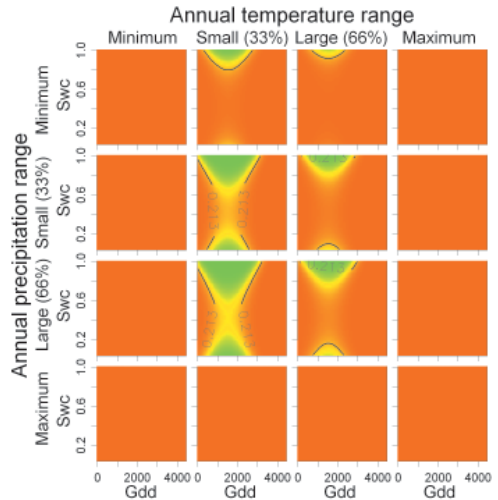
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 2338)

The Damon Blue is found on calcareous soil, on grasslands, rough vegetation, such as small patches at the edge of scrub or woodland, and also on abandoned Sainfoin (*Onobrychis vicifolia*) fields. It lays its eggs on different species of *Onobrychis*, including Sainfoin (*Onobrychis vicifolia*). The caterpillars seem to like being between the flowers and only start to feed late in the afternoon. They are often attended by ants of the genera *Lasius* or *Formica*. They pupate in the litter layer. The Damon Blue has one generation a year.

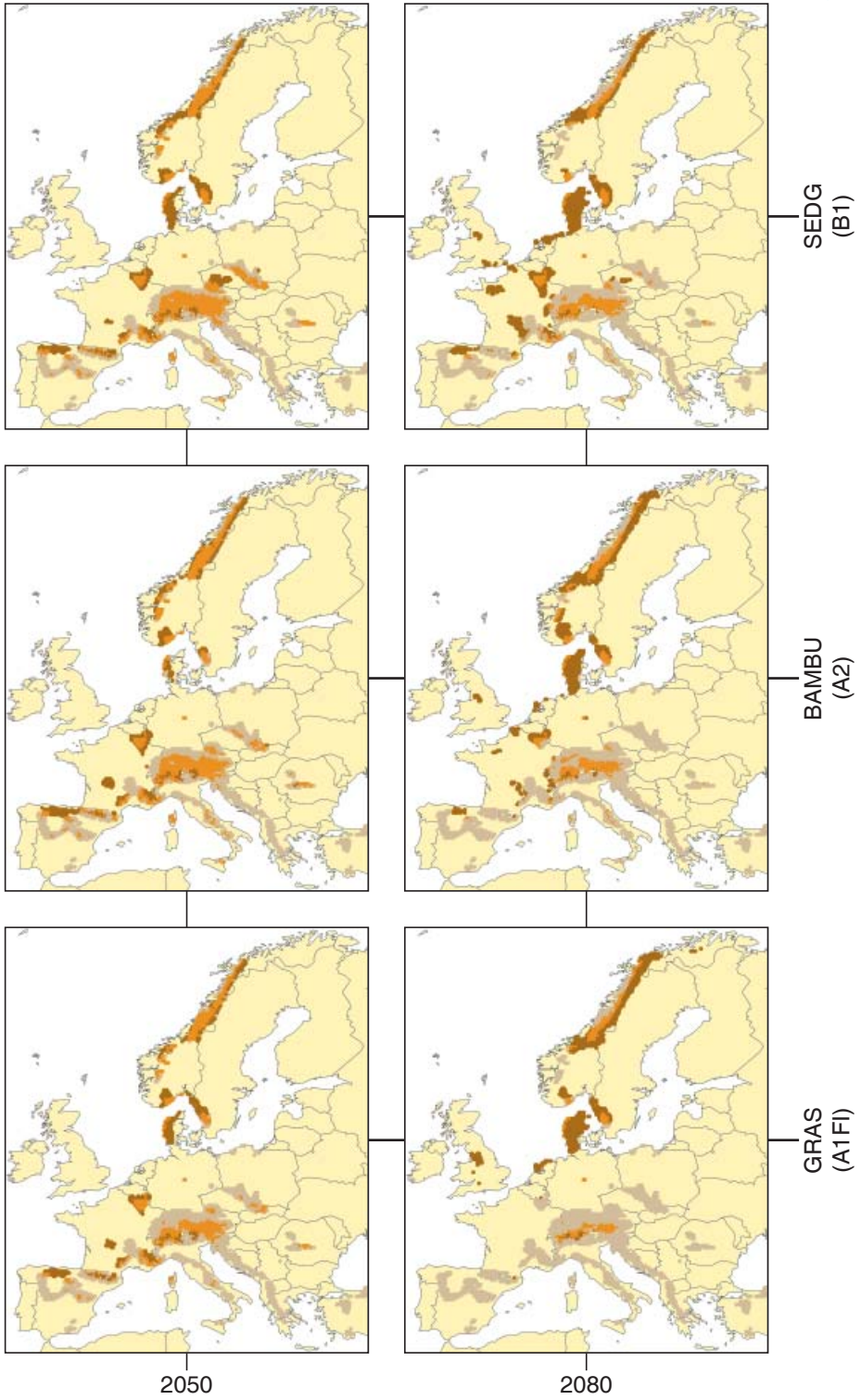
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.85). Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Hamearis lucina (LINNAEUS, 1758) – Duke of Burgundy Fritillary



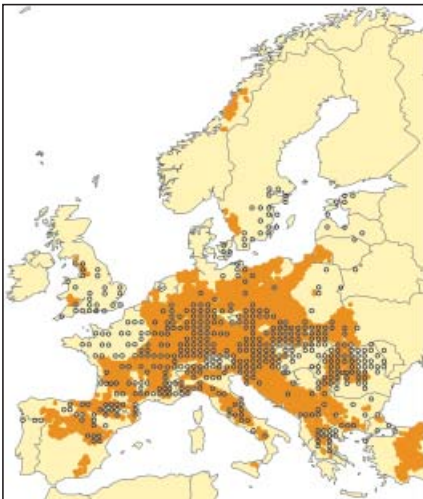
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	55 (0.89%)	-2192 (-35.31%)
	BAMBU	529 (8.52%)	-2161 (-34.82%)
	GRAS	-686 (-11.05%)	-2928 (-47.17%)
2080	SEDG	-249 (-4.01%)	-3222 (-51.91%)
	BAMBU	-452 (-7.28%)	-4008 (-64.57%)
	GRAS	-1480 (-23.84%)	-5148 (-82.94%)

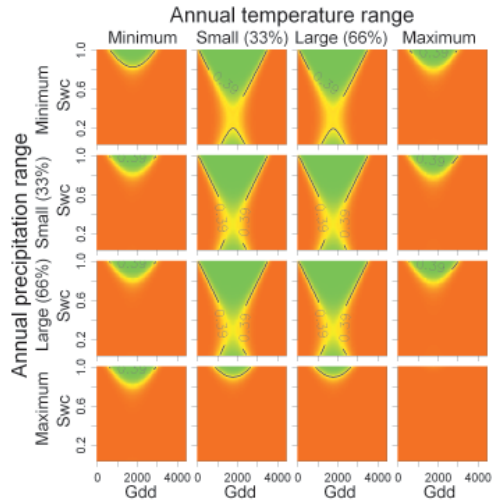
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 6207)

The Duke of Burgundy Fritillary occurs in woodland clearings, along the edges of paths in the woods, and at woodland edges. Although the populations are often very local, the numbers of butterflies can be considerable. Eggs are laid on the underside of the leaves of *Primula* species. The caterpillars feed at night, hiding themselves during the day by lying along the main nerve of the *Primula* leaf. They leave the larval foodplants to hibernate in the litter layer. Mostly, it has only one generation a year, but in warm areas, there may be a second generation late in the year.

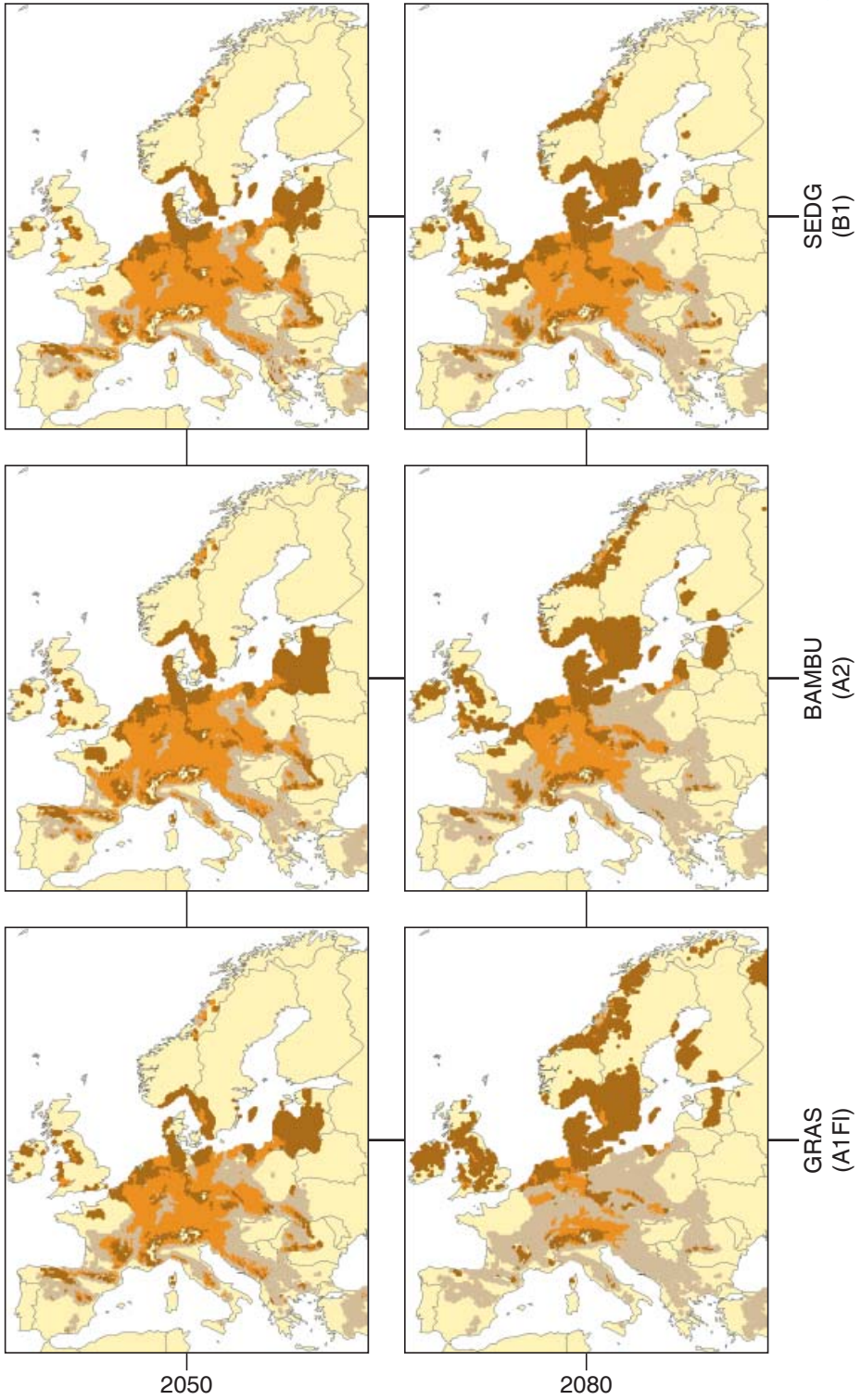
Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.77). Climate risk category: HR.



Observed species distribution (50 × 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold



Libythea celtis (LAICARTING, 1782) – Nettle-tree Butterfly



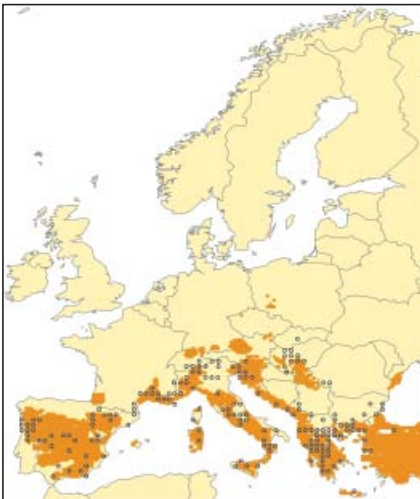
© Chris van Swaay

		Full dispersal	No dispersal
2050	SEDG	-582 (-15.8%)	-1642 (-44.57%)
	BAMBU	-1280 (-34.74%)	-1946 (-52.82%)
	GRAS	-1165 (-31.62%)	-2165 (-58.77%)
2080	SEDG	-813 (-22.07%)	-2341 (-63.55%)
	BAMBU	-1635 (-44.38%)	-3068 (-83.28%)
	GRAS	-1312 (-35.61%)	-3409 (-92.54%)

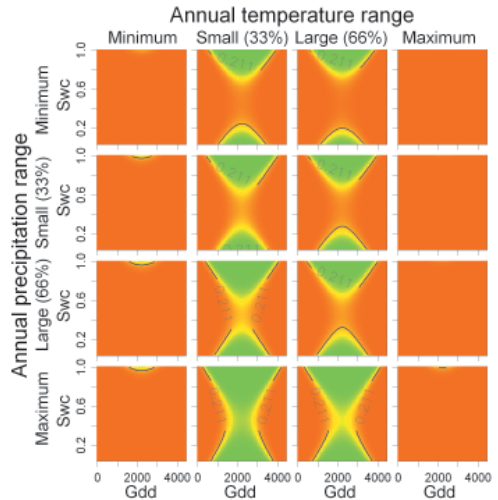
Changes in climatic niche distribution
(in 10'x10' grid cells; present niche space: 3684)

The Nettle-tree Butterfly is one of the snout butterflies, so-called because of its long maxillary palps, which point forward seemingly forming a snout. They are often found in scrub or woods, where the major foodplant, the Nettle Tree (*Celtis australis*) grows. The eggs are laid singly on the leaf buds, early in the year because this butterfly hibernates in the adult stage, appearing again in March. The green or brown caterpillars keep mostly to the underside of the leaves, and also pupate there. The Nettle-tree Butterfly has one generation a year. The adult enters hibernation sometimes as soon as August. The brown underside of its wings provides a good camouflage in the dense undergrowth where it spends the winter looking very much like a dead leaf.

Present distribution can be explained by climatic variables to a moderate extent (AUC = 0.8).
Climate risk category: HHR.



Observed species distribution (50 x 50 km² UTM grid; black circles) and modelled actual distribution of climatic niche (orange areas)



Multidimensional climatic niche. Occurrence probability defined by accumulated growing degree days until August (Gdd) and soil water content (Swc) for combinations of minimum, lower tercile, upper tercile and maximum values of annual temperature range and annual precipitation range. Climatic conditions: orange – unsuitable; green – hostile; black line – modelled threshold

