Appendix 1: Extended sensitivity analysis

To test the impact of the assumed parameters of our model (Table A1), we ran a sensitivity analysis in which we implemented parameter at half and at double the reference value. We compare these evolutionary dynamics and metapopulation sizes with the model outcomes reported in the main body of this article. Overall, doubling or halving any of these assumed parameters do not change the qualitative outcomes of our model. Habitat choice affects these dynamics in similar ways and the difference between departure and settlement choice remains unchanged. However, with larger resource growth (R_G), a larger maximum encounter rate (a_{max}) and a larger resource conversion factor (σ) metapopulation size does not decrease with niche width but follows a unimodal pattern with a metapopulation size optimum at an intermediary niche width (resp. fig. A1.2, lower right; fig. A1.13, lower right; fig. A1.18, lower right). For those cases, we provide an additional graph covering an extended range of tested niche widths (0-1, resp. fig. A1.3, fig. A1.14, fig. A1.19). In parallel, this affects metapopulation size in scenarios of fixed dispersal where generalism is selected. This effect is explained by similar phenomena on both sides of the specialism-generalism continuum. On the one hand, generalists tend to form smaller metapopulations because their lower resource gathering capacities (in optimal habitat) give them a higher chance of having no offspring, while these generalist's consumed resources are removed. These lost resources result in smaller metapopulations. In scenarios with more resources coming into the system (higher R_G) or with resources resulting in a higher expected number of offspring (σ), this effect of decreasing is smaller. On the other hand, specialists tend to overshoot their carrying capacity (i.e. demand more resources than are locally present). In each patch, the individual that demands more resources than the resources left by its conspecifics will fail to produce offspring while consuming this left-over amount of resources. Similarly, these lost resources result in smaller metapopulations. This is illustrated by metapopulation size under fixed niche width (e.g. fig. A1.18, bottom centre and right), which shows a, respectively, stabilisation and decrease in metapopulation size towards the metapopulations with (extreme) specialist, deviating from the expected increase. With increasing a_{max}, specialists exceed local resources even more, resulting in more resources lost and lower amount of total individuals in the next generations (fig. A1.18, bottom right). So in fig. A1.17 (lower right), metapopulations evolving generalism do not grow larger than expected, but metapopulations evolving specialism all grow smaller.

Table A1: Assumed parameters

R_G	Optimal resource growth rate	0.25
K_G	Resource carrying capacity	1
h	Handling time	0.2
a_{max}	Maximum encounter rate	0.05
ct	Cost of generalism	1
	mutation rate	0.01 generation^{-1}
dr	Dispersal range	2
σ	Resource conversion factor	300

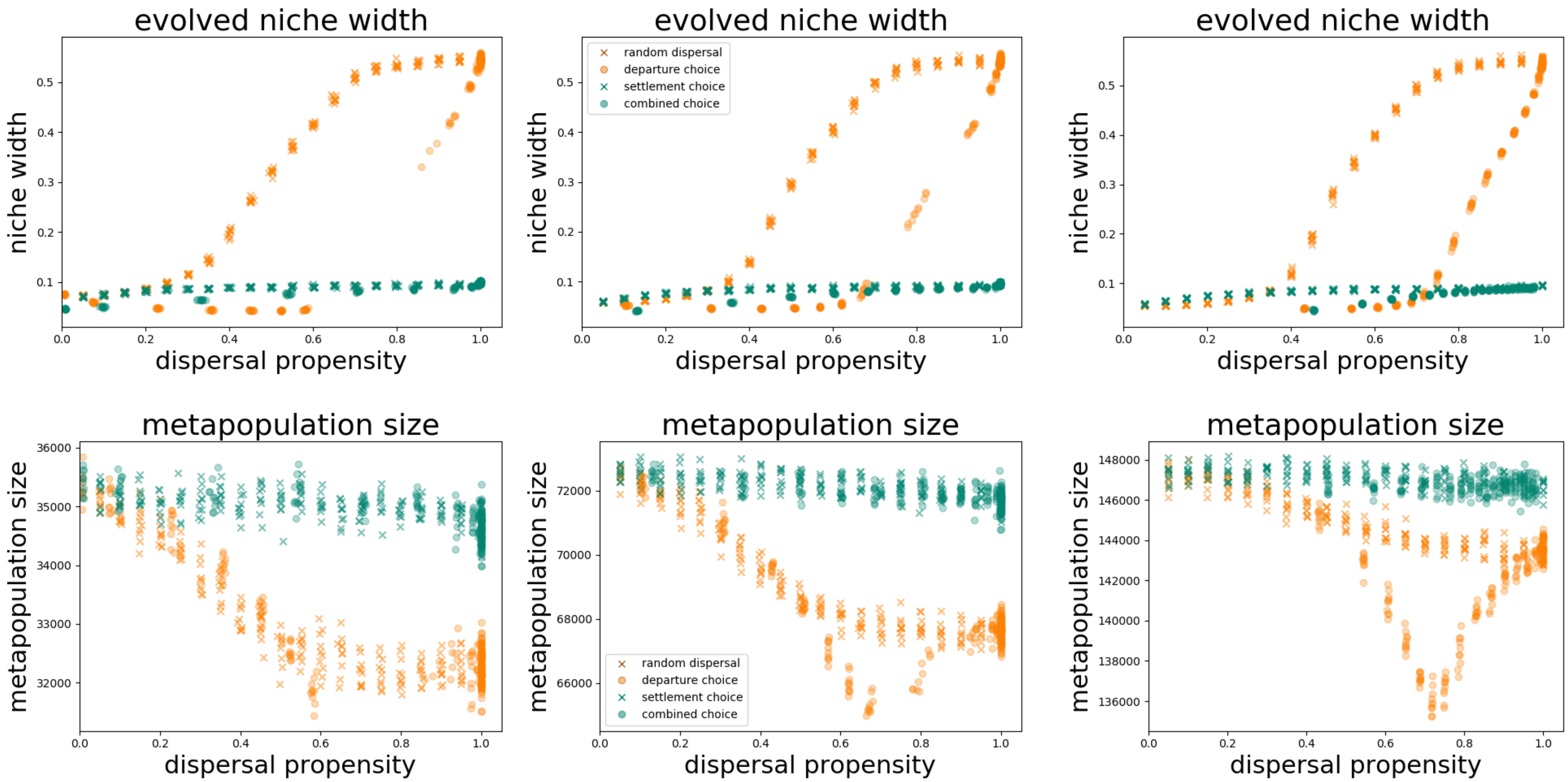

Figure A1.1: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Resource growth rate (R_G) at 0.125 (left), 0.25 (middle) or 0.5 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

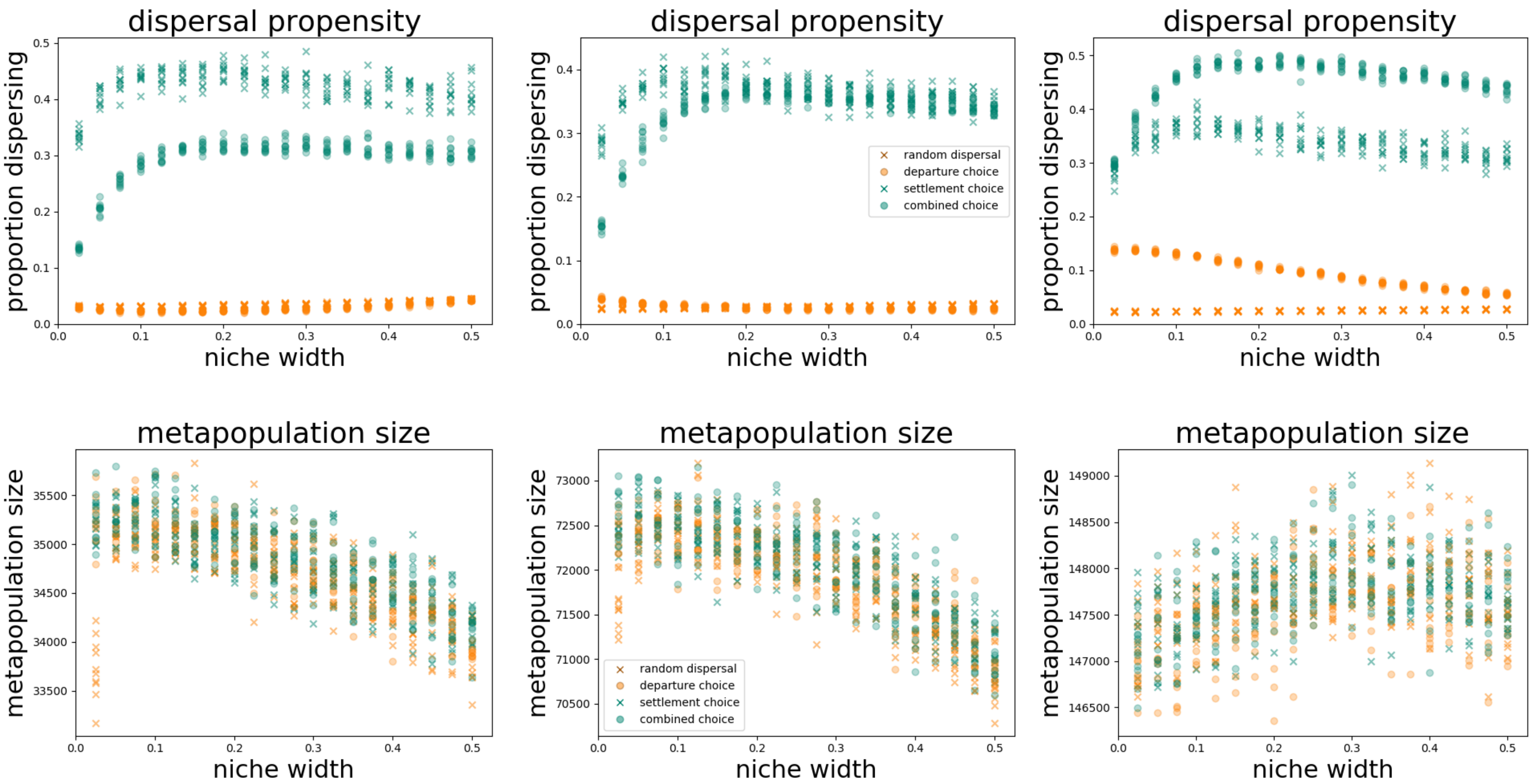

Figure A1.2: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Resource growth rate (R_G) at 0.125 (left), 0.25 (middle) or 0.5 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

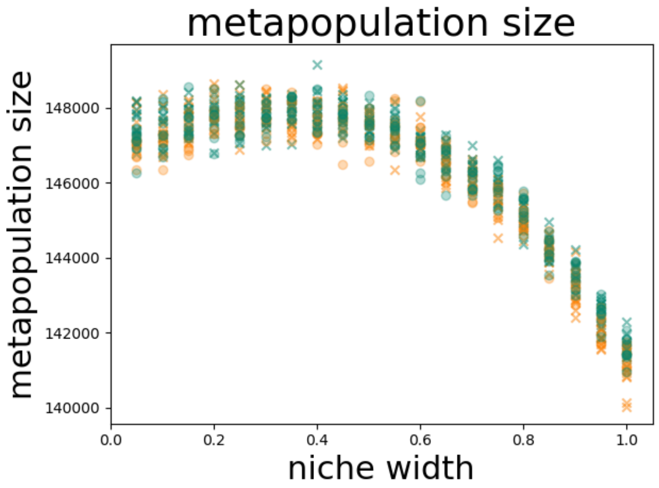

Figure A1.3: Metapopulation size in relation to niche width ranging from 0-1. Resource growth rate (R_G) at 0.5. Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

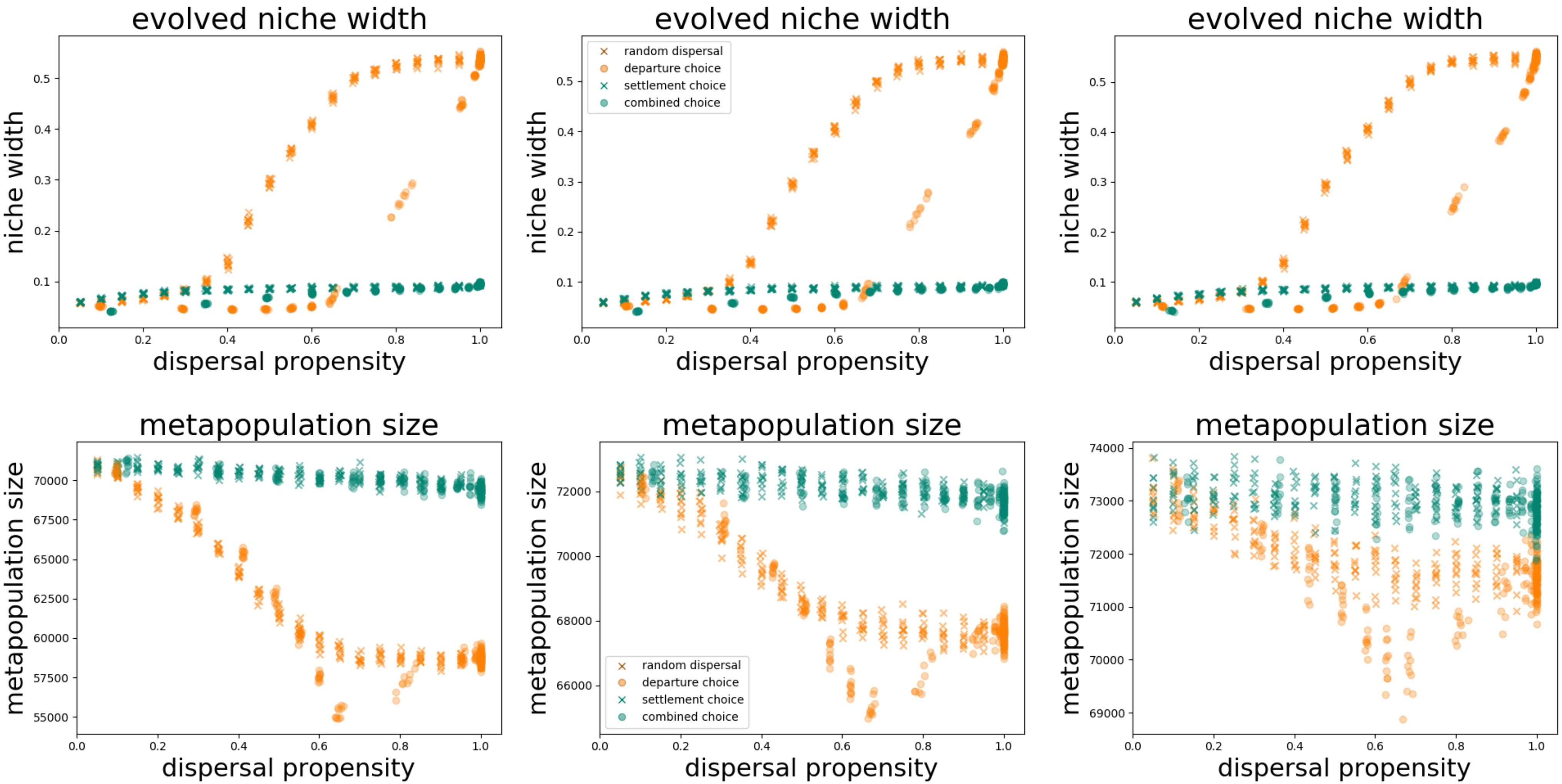

Figure A1.4: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Resource carrying capacity (K_G) at 0.5 (left), 1.0 (middle) or 2.0 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

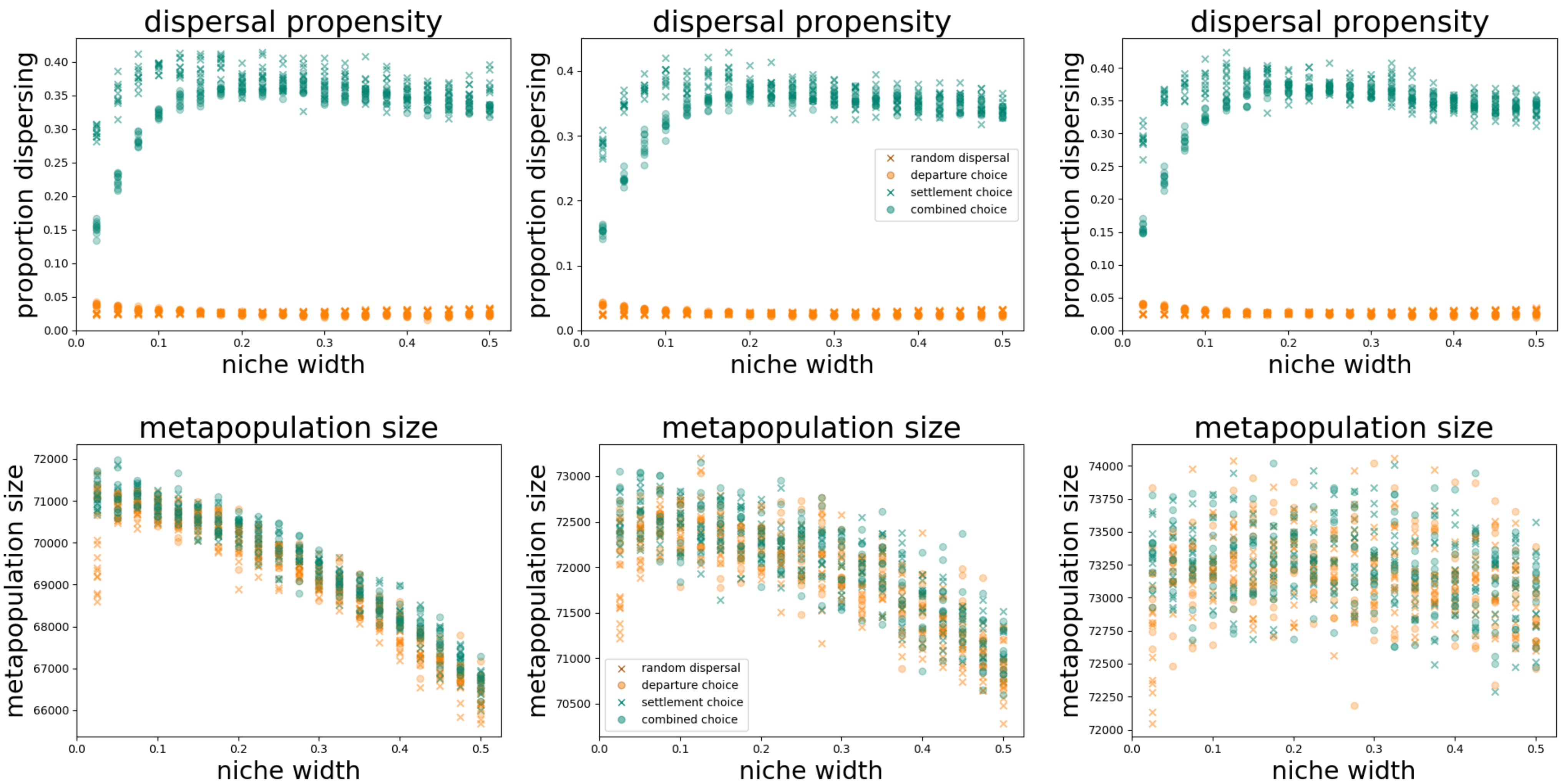

Figure A1.5: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Resource carrying capacity (K_G) at 0.5 (left), 1.0 (middle) or 2.0 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

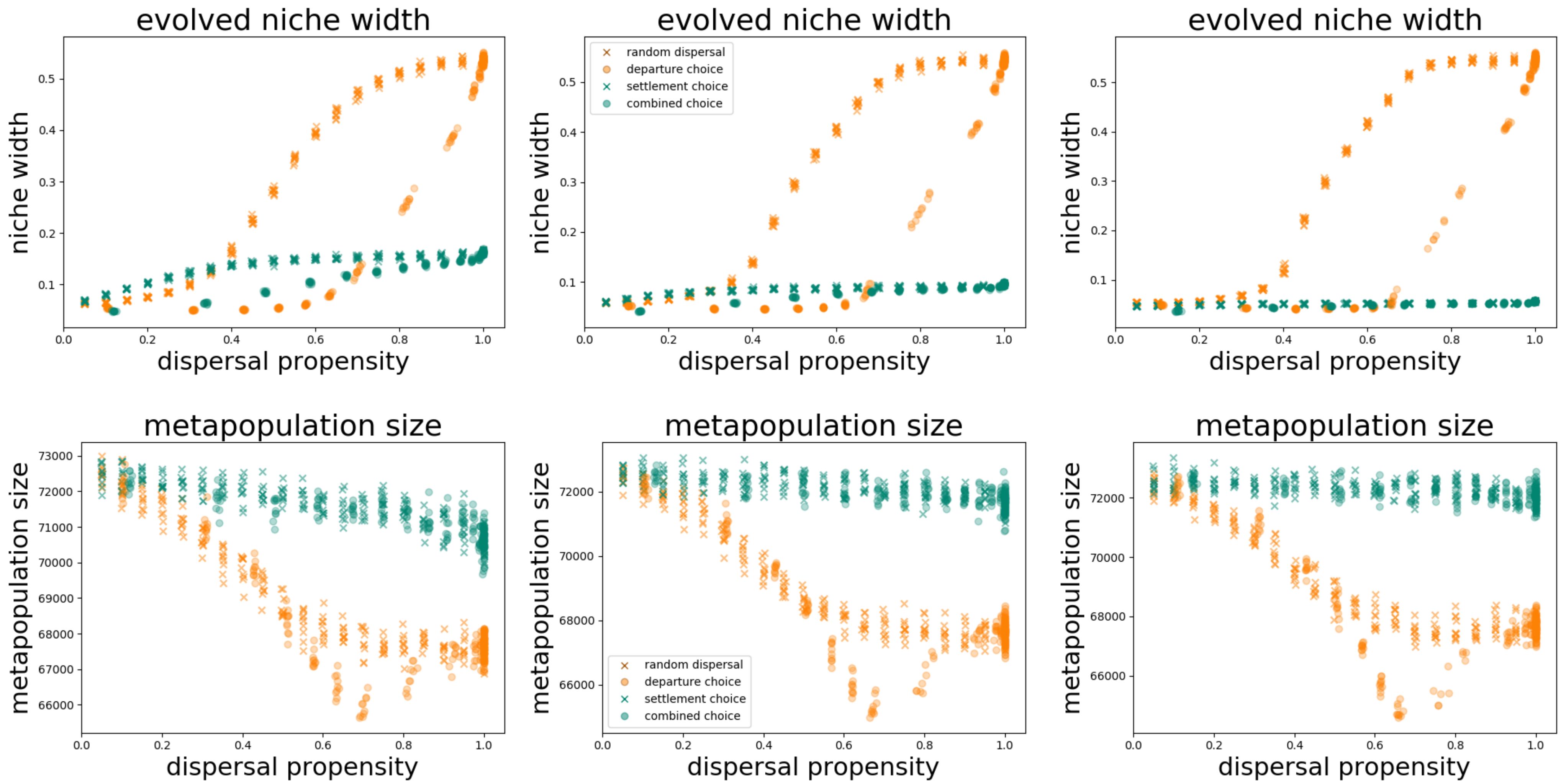

Figure A1.6: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Dispersal range (dr) at 1 (left), 2 (middle) or 4 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

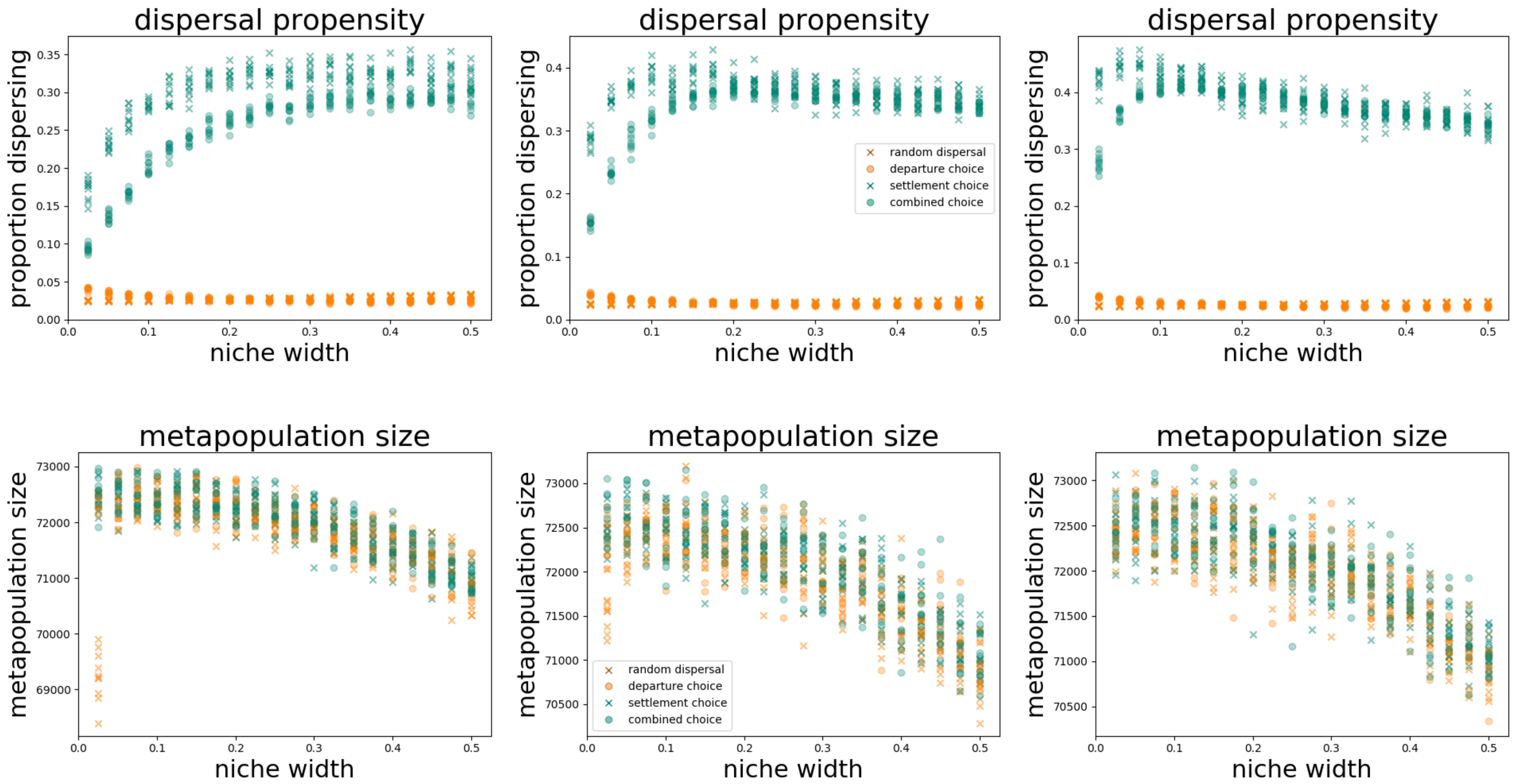

Figure A1.7: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Dispersal range (dr) at 1 (left), 2 (middle) or 4 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

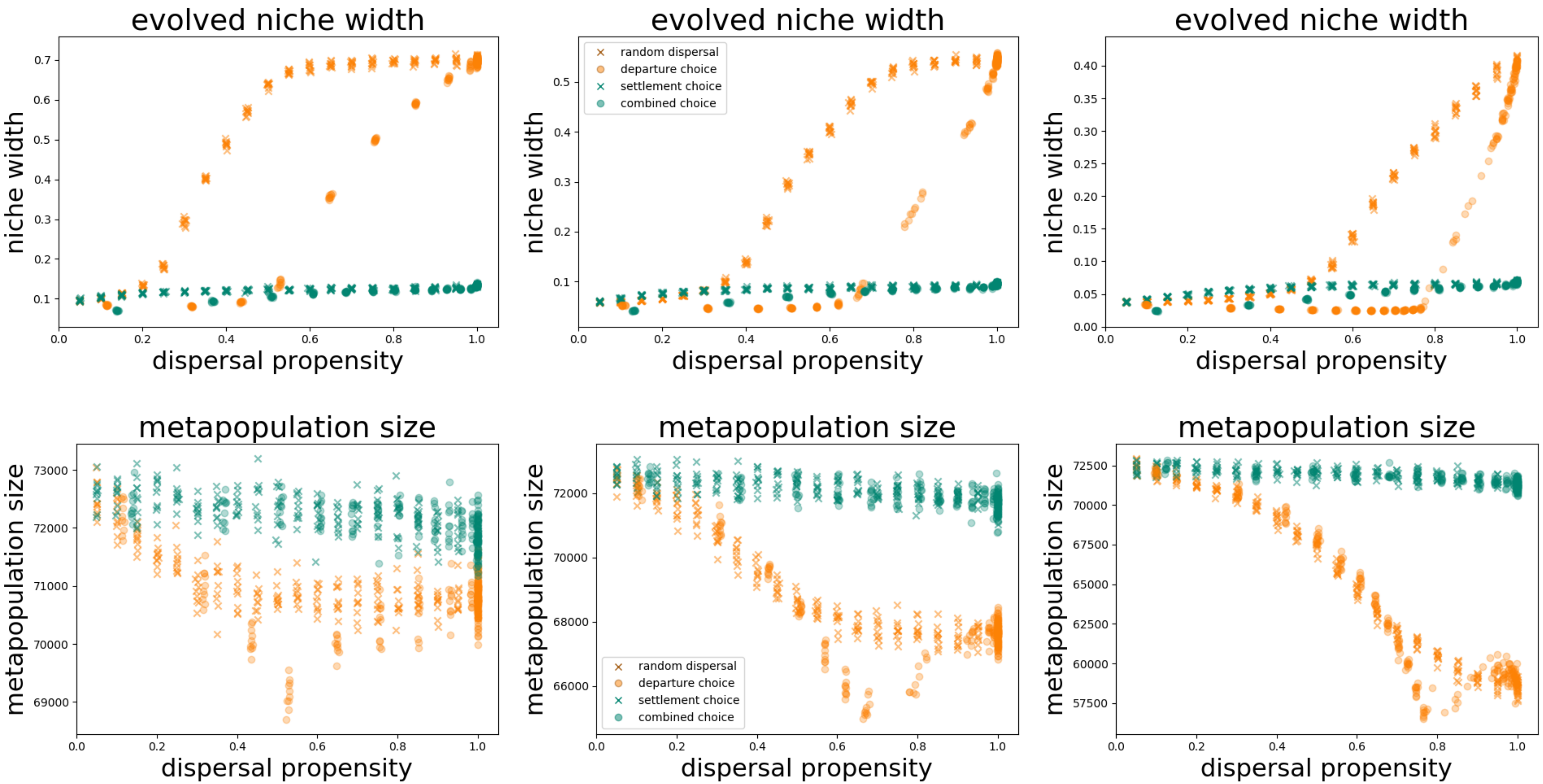

Figure A1.8: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Cost of generalism (ct) at 0.5 (left), 1 (middle) or 2 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

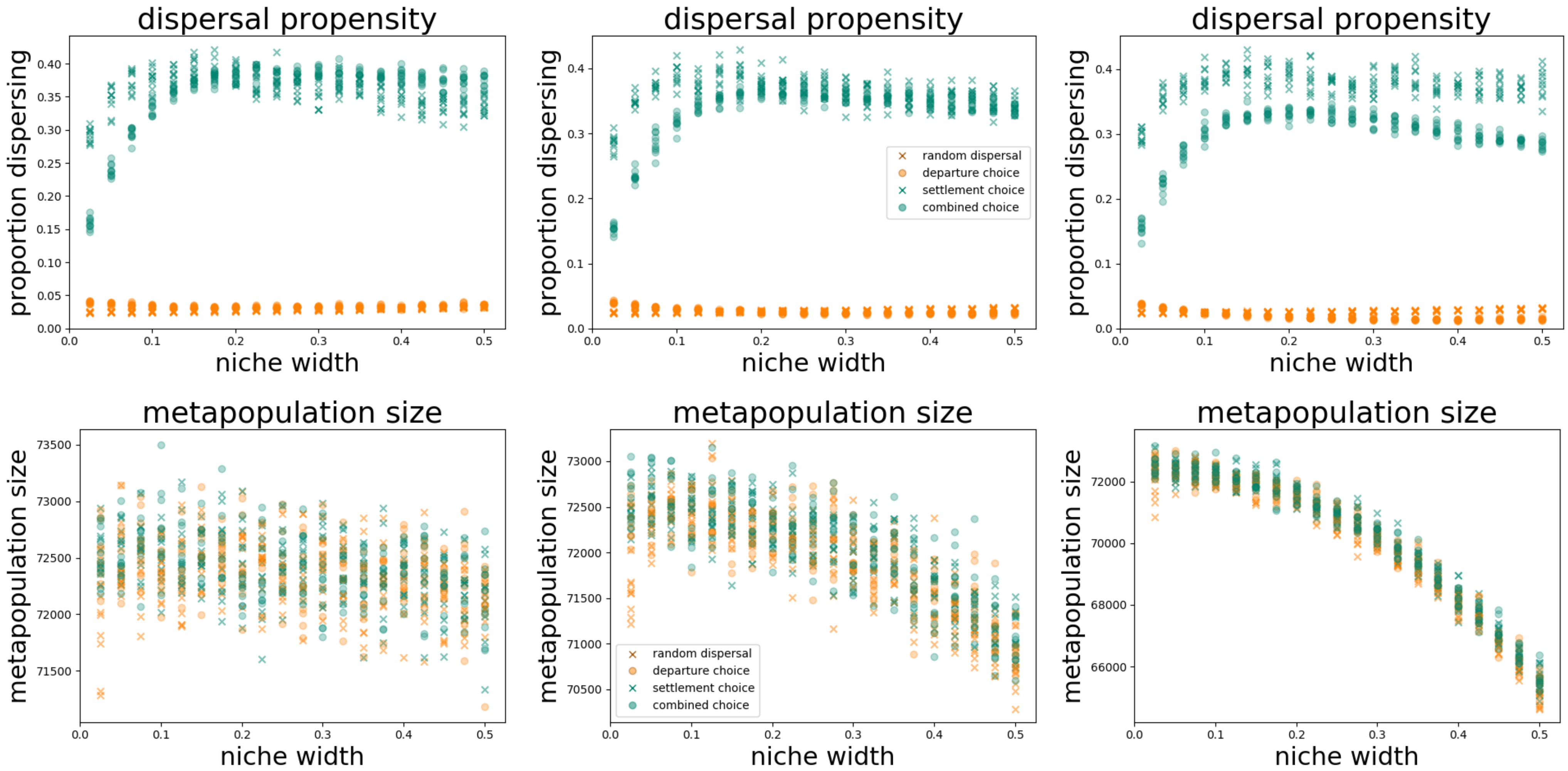

Figure A1.9: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Cost of generalism (ct) at 0.5 (left), 1 (middle) or 2 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

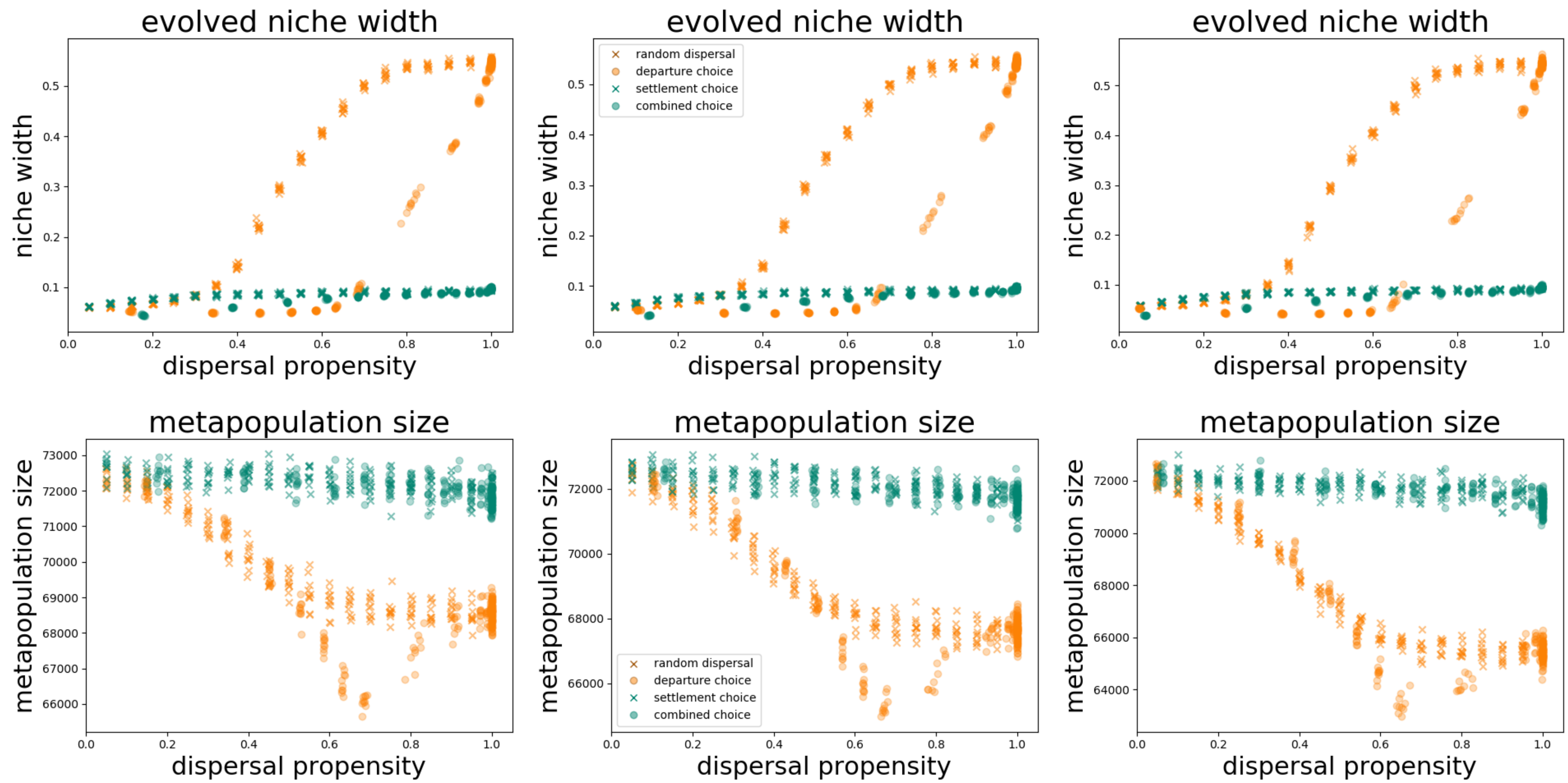

Figure A1.10: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Cost of generalism (h) at 0.1 (left), 0.2 (middle) or 0.4 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

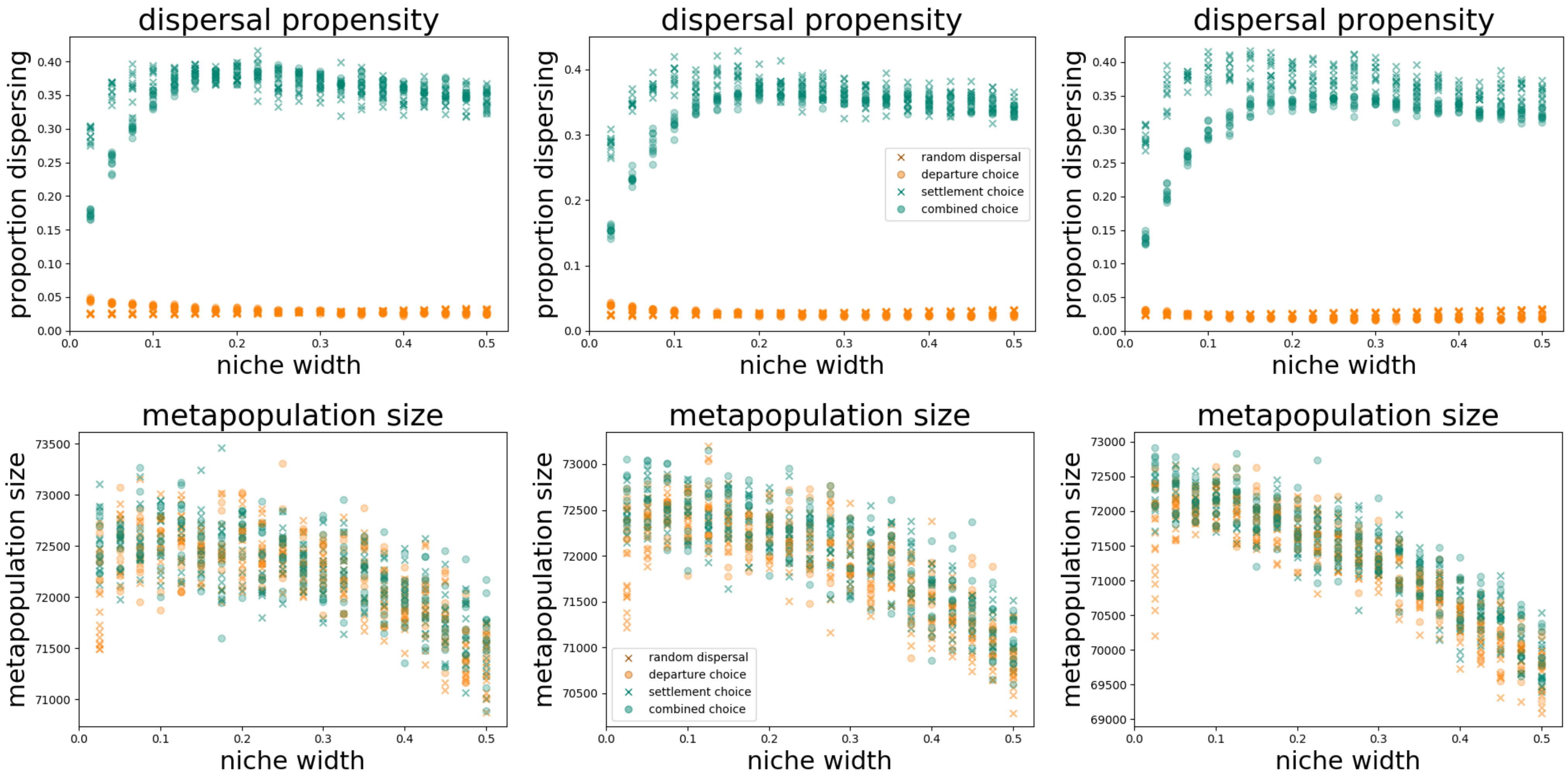

Figure A1.11: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Cost of generalism (h) at 0.1 (left), 0.2 (middle) or 0.4 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

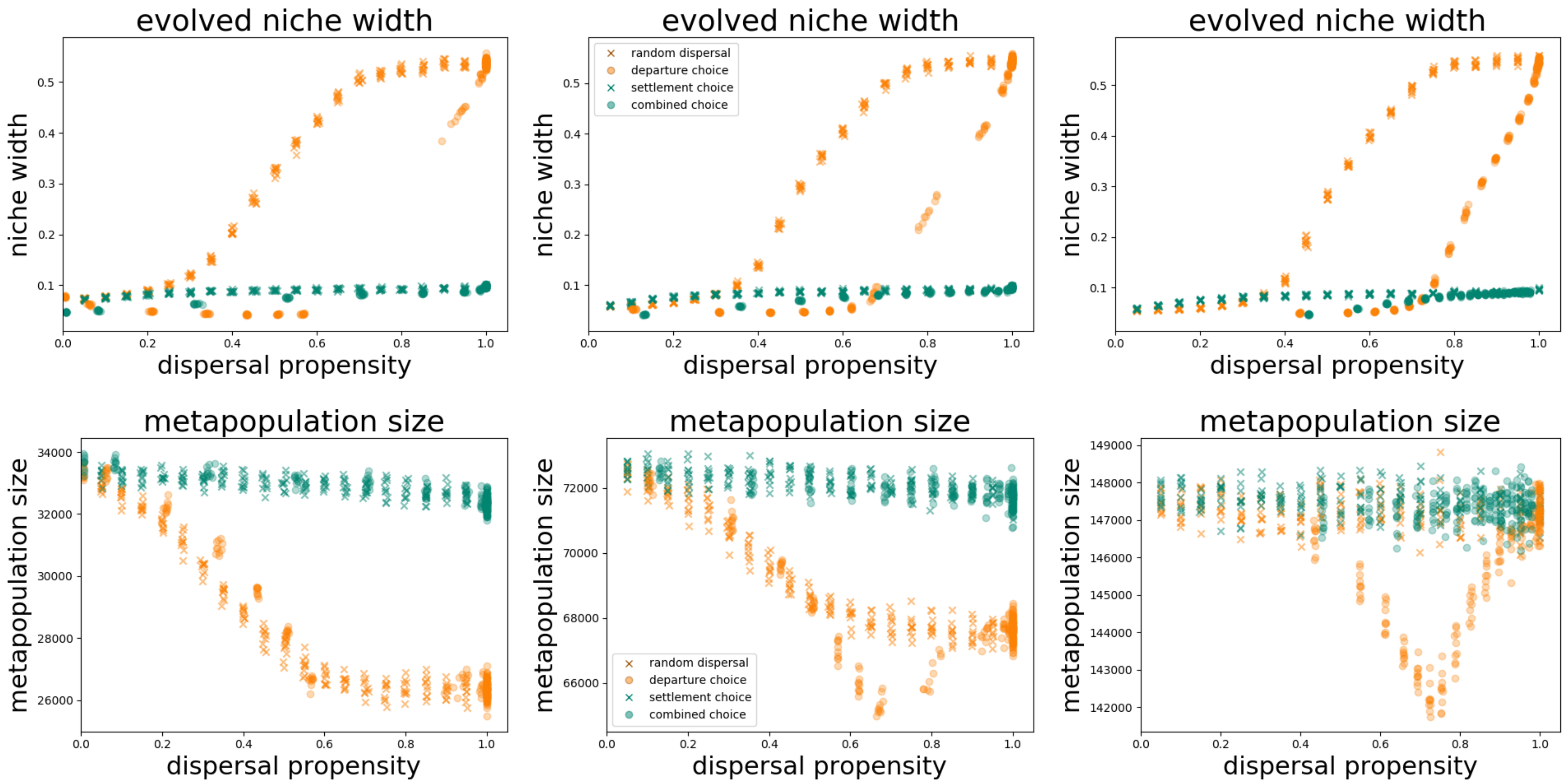

Figure A1.12: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. With the resource conversion factor (σ) at 150 (left), 300 (middle) or 600 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

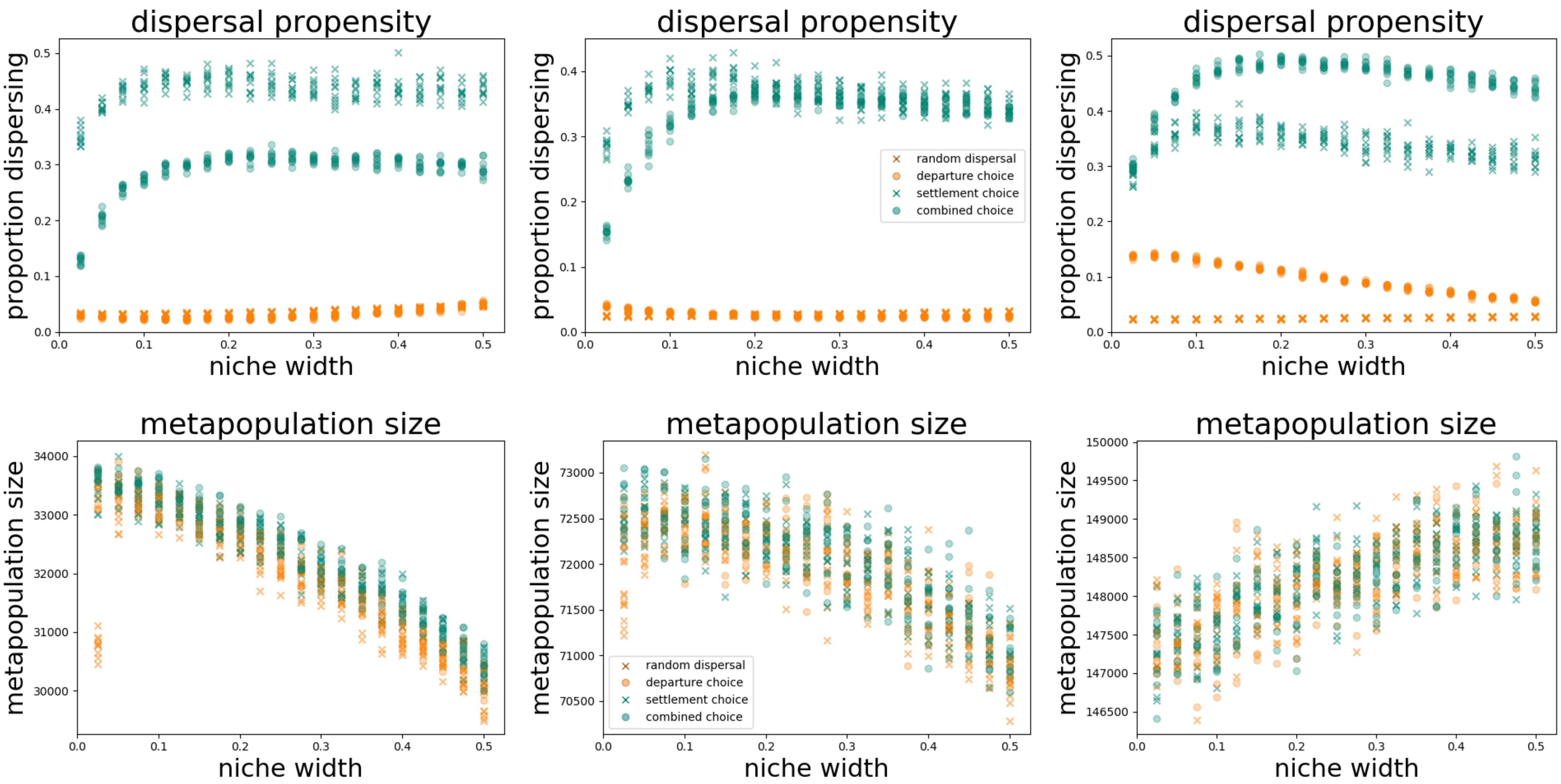

Figure A1.13: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. With the resource conversion factor (σ) at 150 (left), 300 (middle) or 600 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

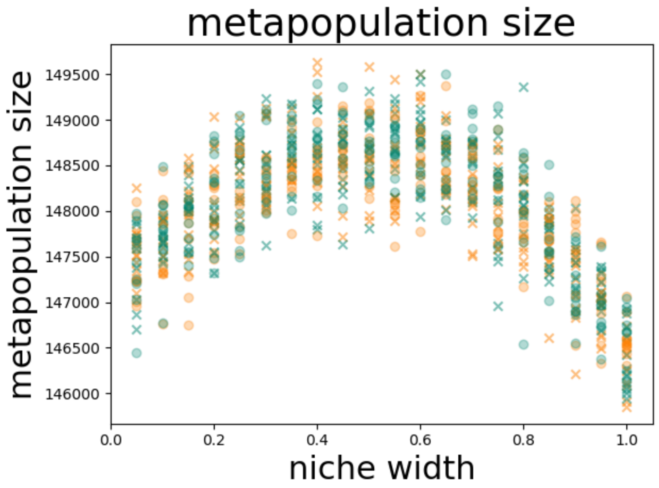

Figure A1.14: Metapopulation size in relation to niche width ranging from 0-1. Resource conversion factor (σ) at 600. Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

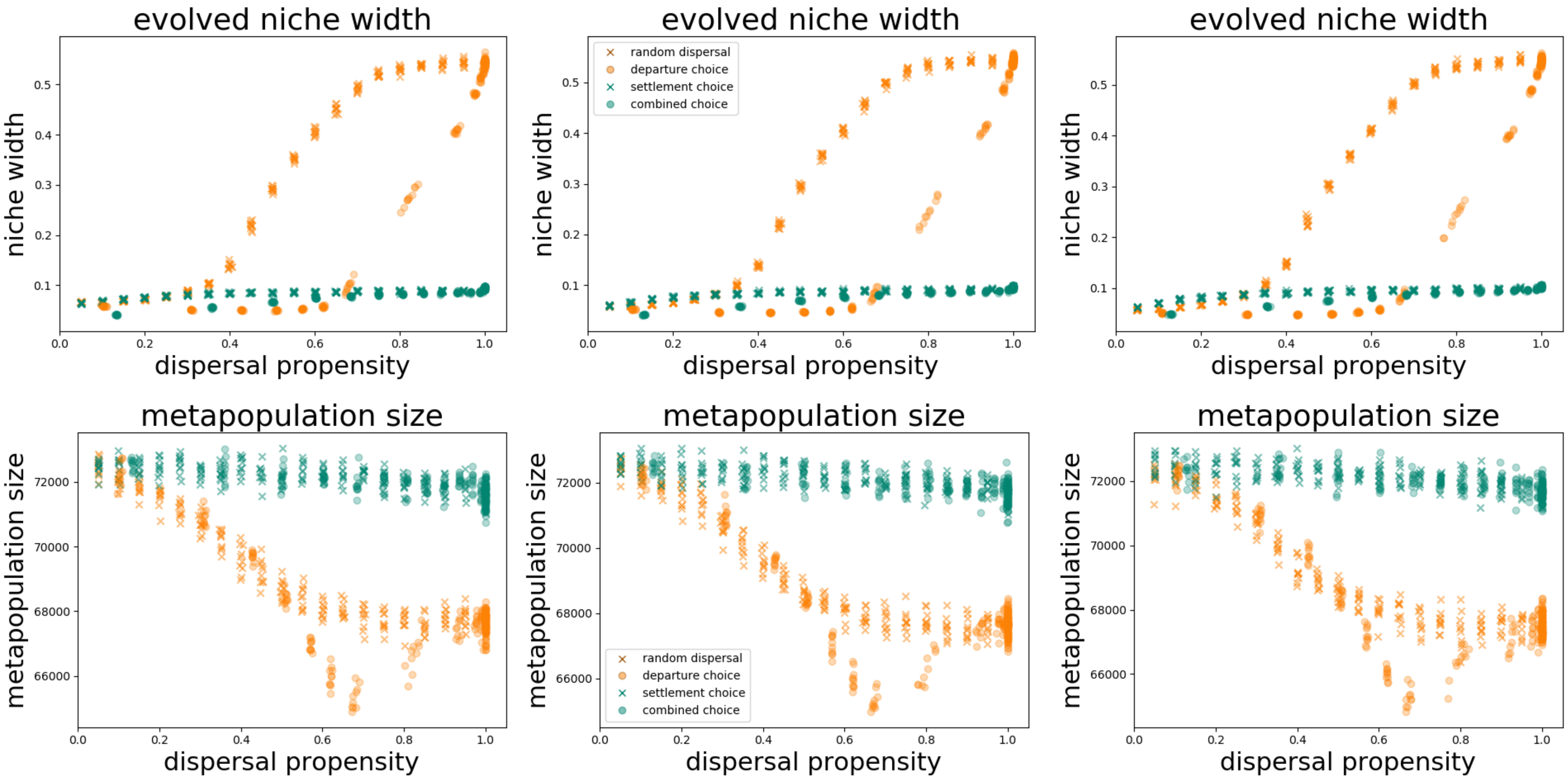

Figure A1.15: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Mutation rate at 0.005 (left), 0.01 (middle) or 0.02 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

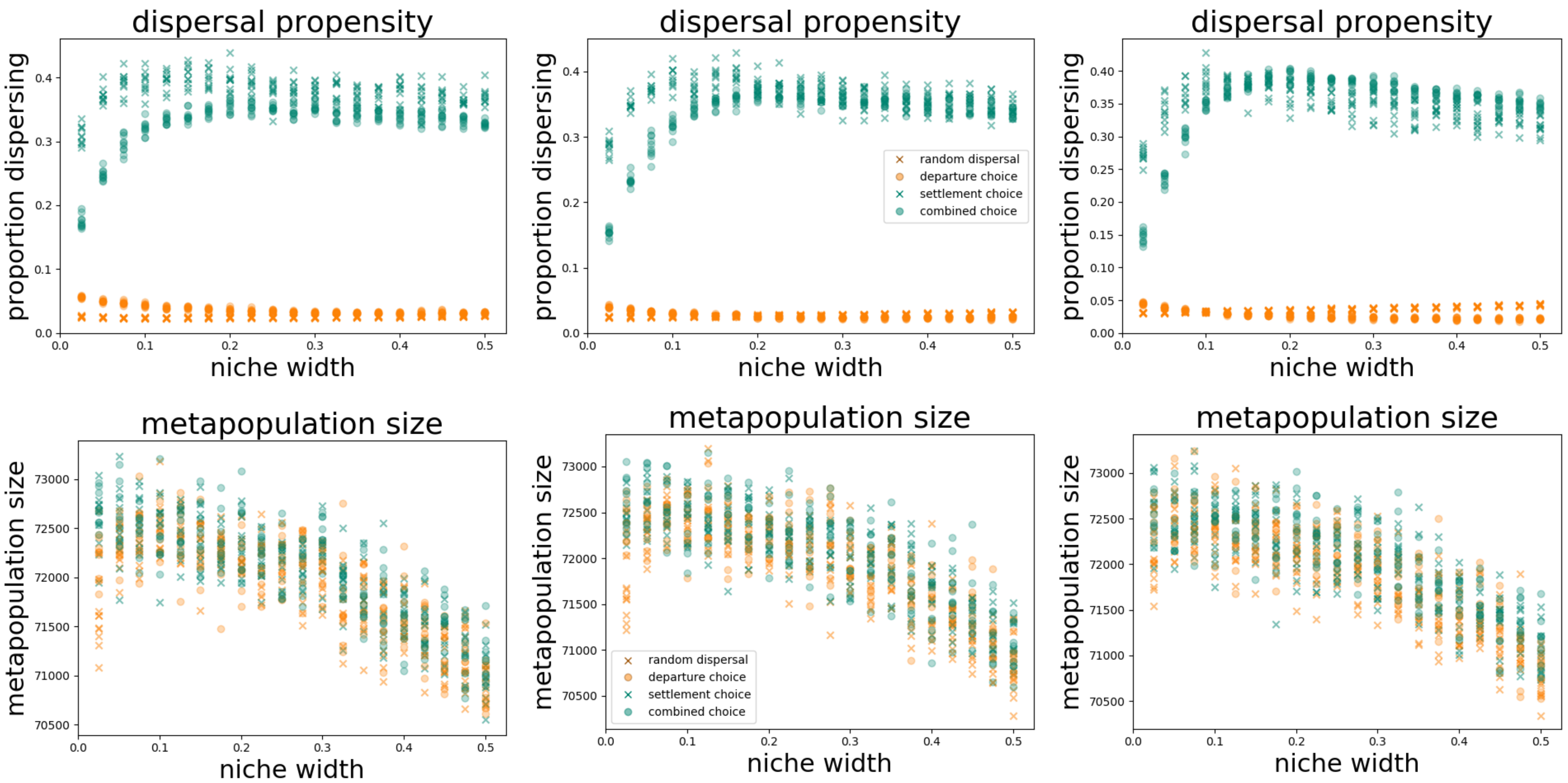

Figure A1.16: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Mutation rate at 0.005 (left), 0.01 (middle) or 0.02 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

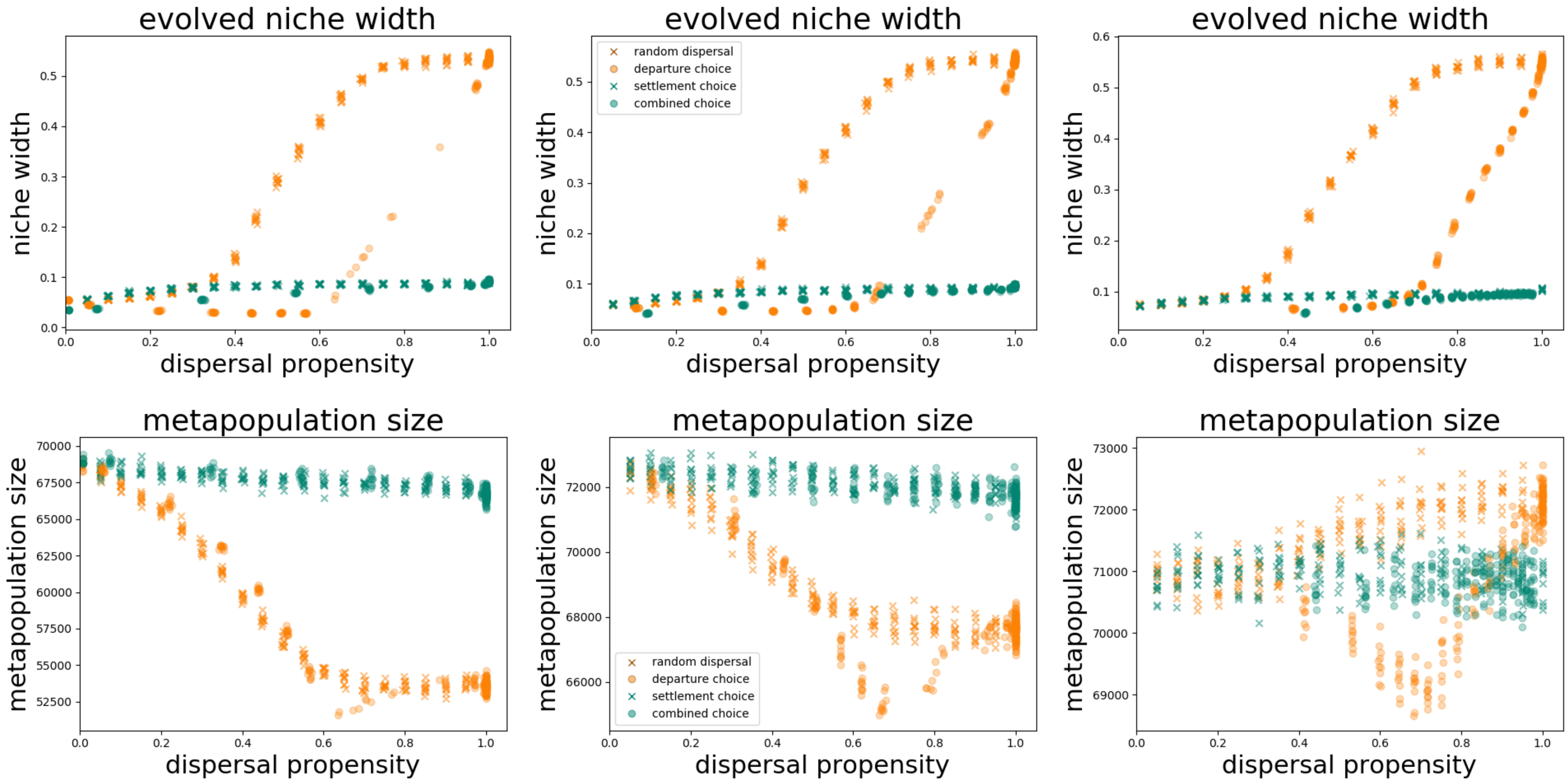

Figure A1.17: Niche width evolution (top) and metapopulation size (bottom) in relation to effective dispersal propensity. Maximum encounter rate (a_{max}) at 0.025 (left), 0.05 (middle) or 0.1 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

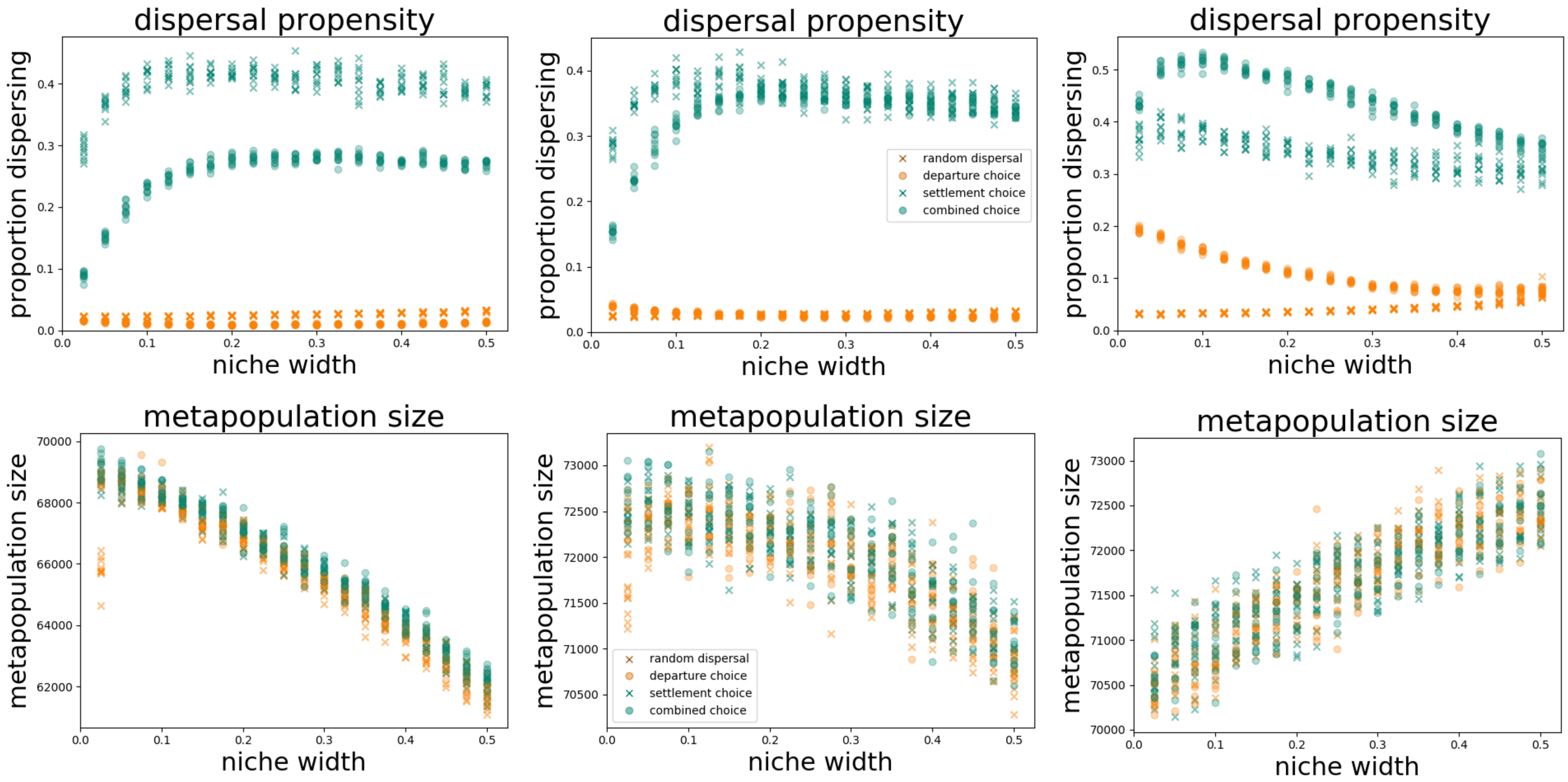

Figure A1.18: Dispersal propensity (top) and metapopulation size (bottom) in relation to niche width. Maximum encounter rate (a_{max}) at 0.025 (left), 0.05 (middle) or 0.1 (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

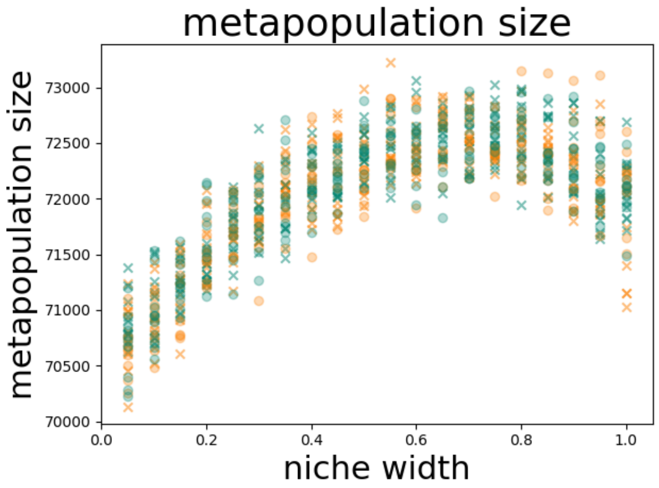

Figure A1.19: Metapopulation size in relation to niche width ranging from 0-1. Resource conversion factor (a_{max}) at 0.1. Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

Appendix 2: Imperfect habitat choice

We modelled Imperfect choice as a probability, at each decision point, that the individual chooses randomly instead of in an informed way. Note that imperfect information can be modelled in many ways (e.g. as sampling errors in Bocedi et al. (2012)). The following plots show scenarios of imperfect settlement choice, with 0.5 accuracy, together with scenarios of perfect settlement choice and random settlement, all with random departure, and either niche width evolution or dispersal evolution (fig. A2.1). Additionally, we show the plots comparing imperfect departure choice with an accuracy of 0.5 with perfect departure choice and random departure, all with random settlement (fig. A2.2). Imperfect choice results in intermediate model outcomes to those of the perfect and no-choice scenario, except in the local population variability (α) for imperfect settlement scenarios with fixed dispersal (fig. A2.1, lower left). With a high level of fixed dispersal, imperfect habitat choice results in the highest variability. This results from the additive effects of high levels of asymmetric dispersal because of the proportion of individuals choosing that generation and the evolution of higher niche widths because of the proportion of random dispersers resulting in less locally adapted individuals. .

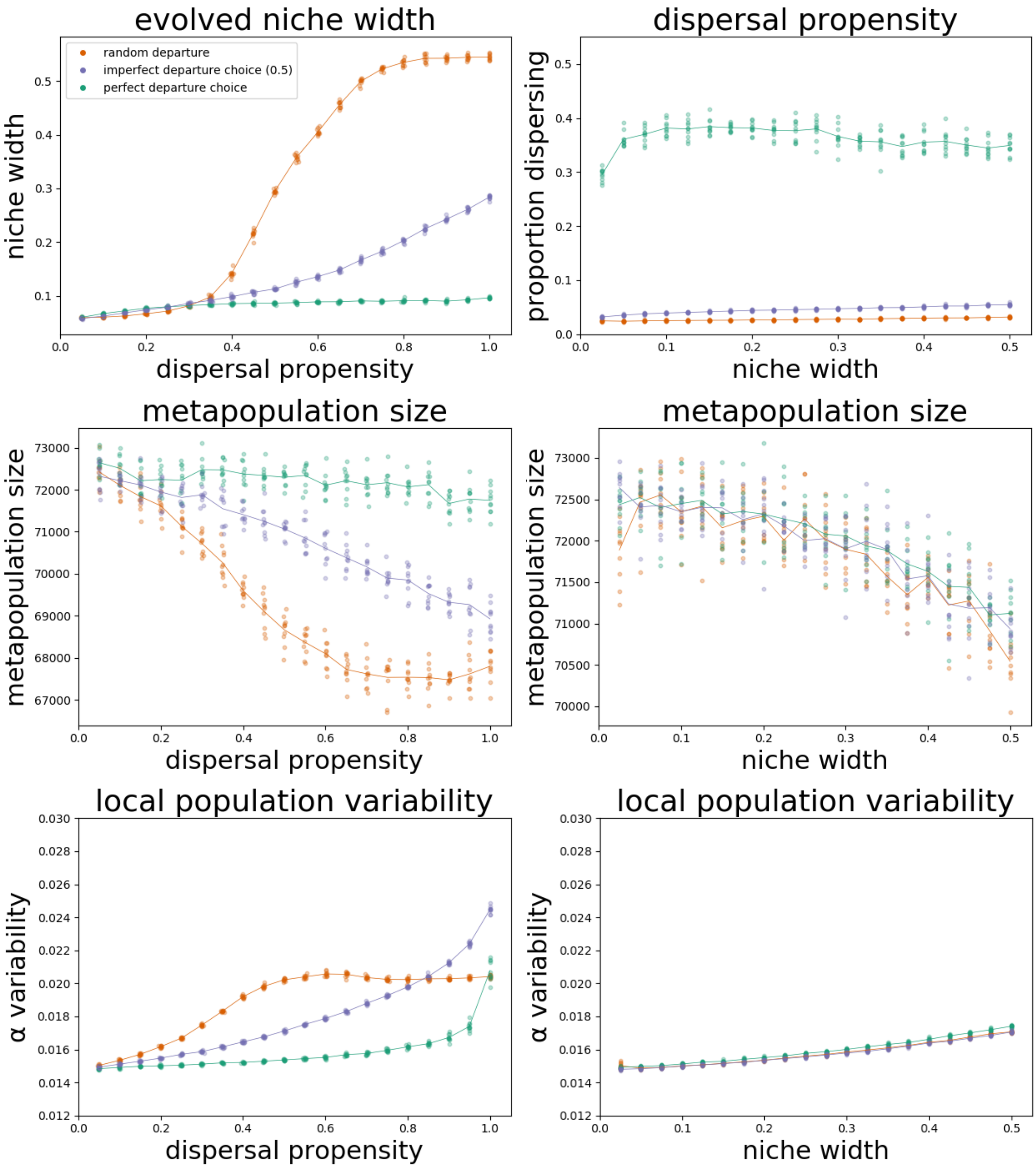

Figure A2.1: comparison of scenarios of imperfect settlement choice with a 0.5 accuracy (purple) with perfect settlement choice (green) and random settlement and departure (orange). Scenarios with evolving niche widths (left column) and dispersal trait evolution (right column)

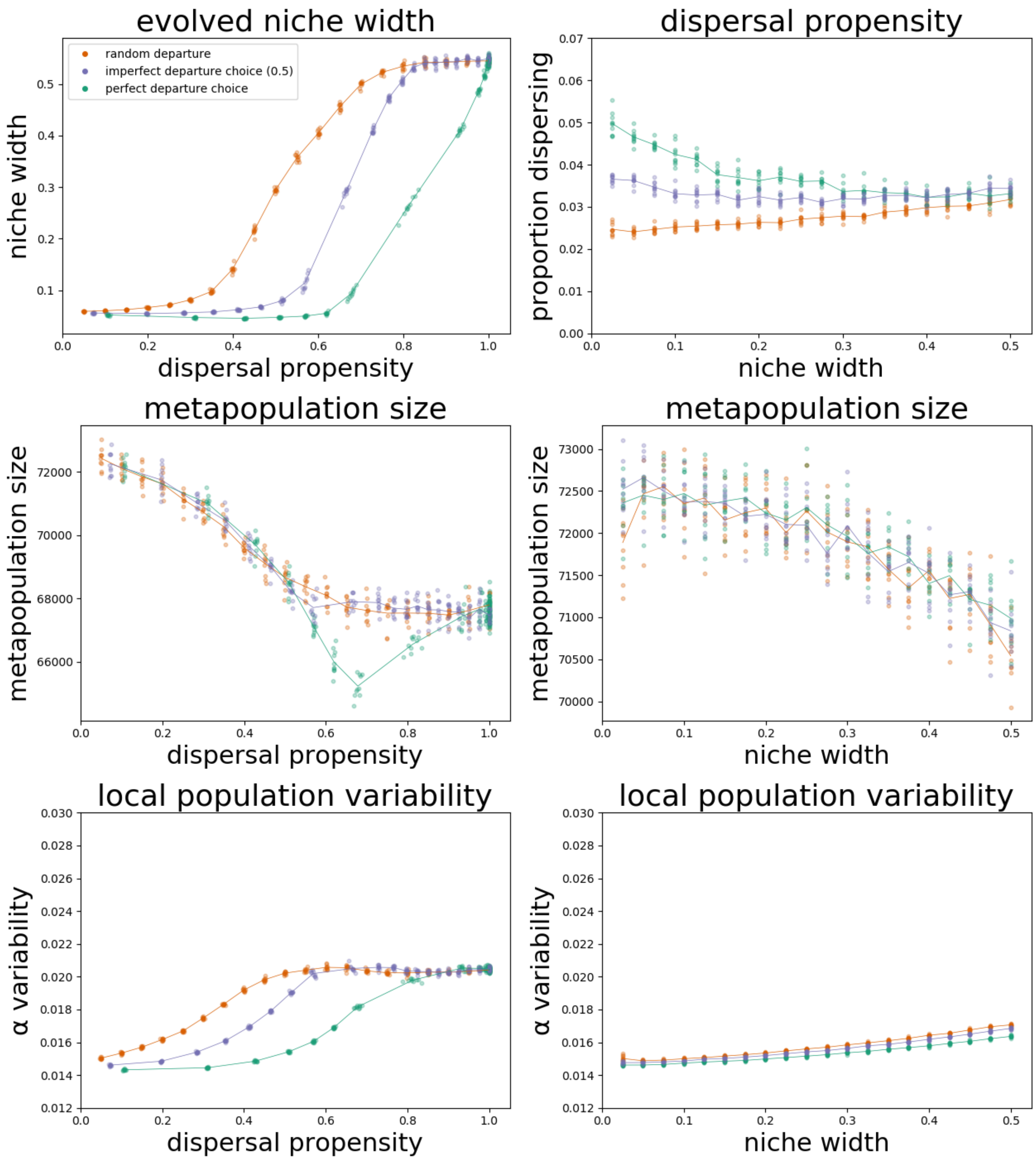

Figure A2.2: comparison of scenarios of imperfect departure choice with a 0.5 accuracy (purple) with perfect departure choice (green) and random departure and settlement (orange). Scenarios with evolving niche widths (left column) and dispersal trait evolution (right column)

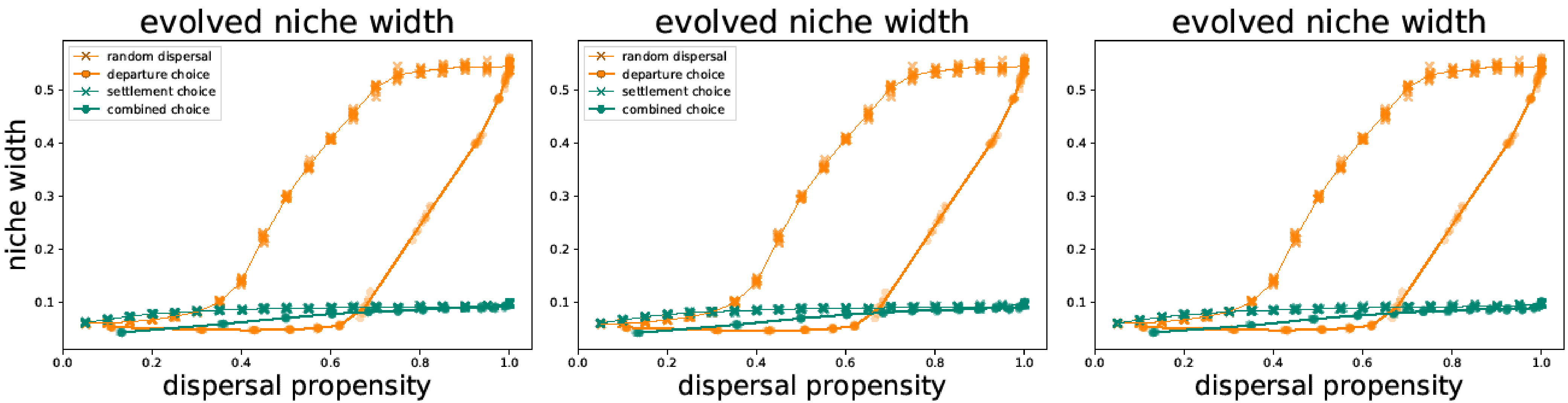

Figure A3.1: Dispersal propensity in relation to effective dispersal propensity. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

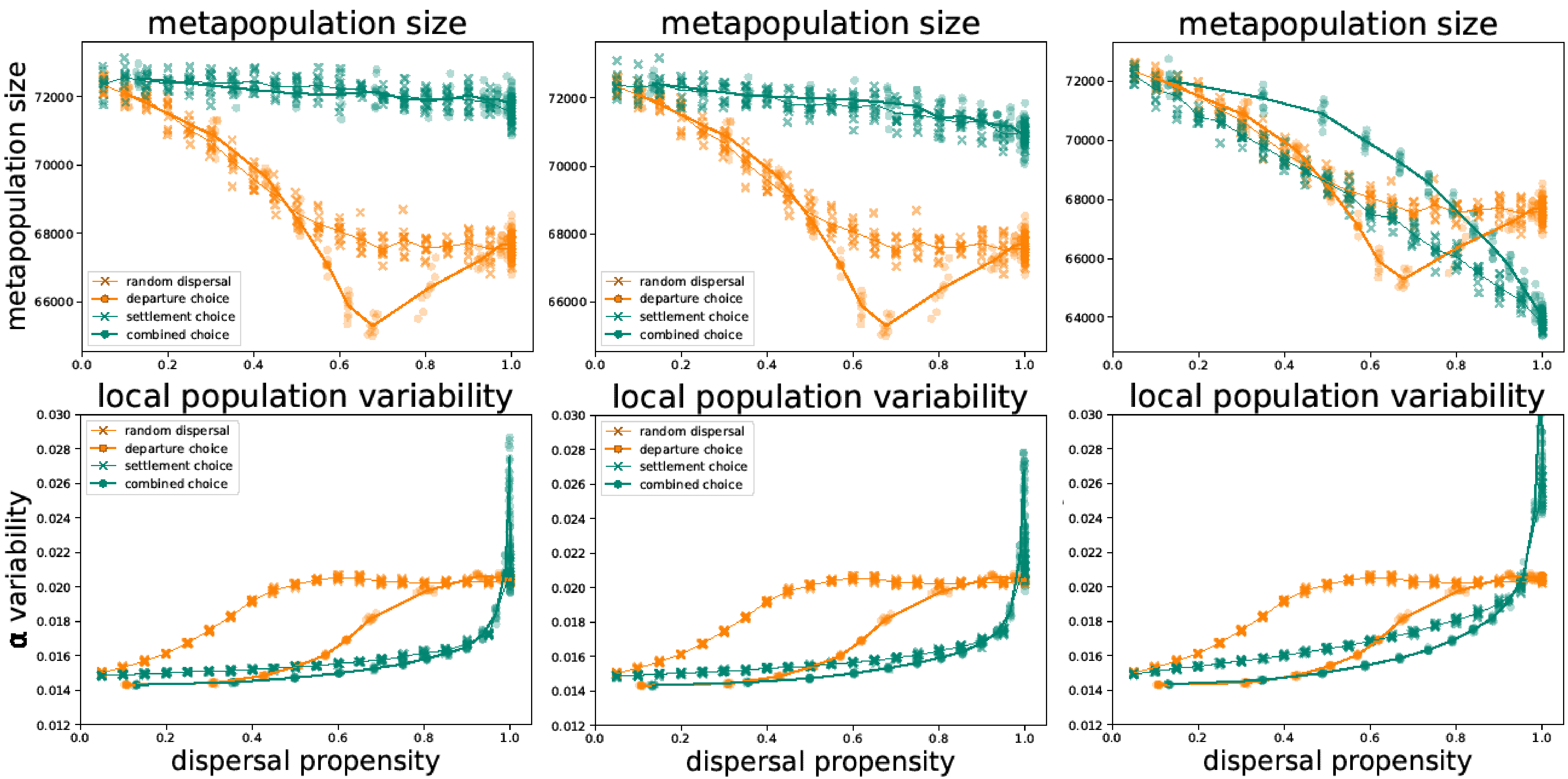

Figure A3.2: Metapopulation size (top) and local population variability (bottom) in relation to niche width. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

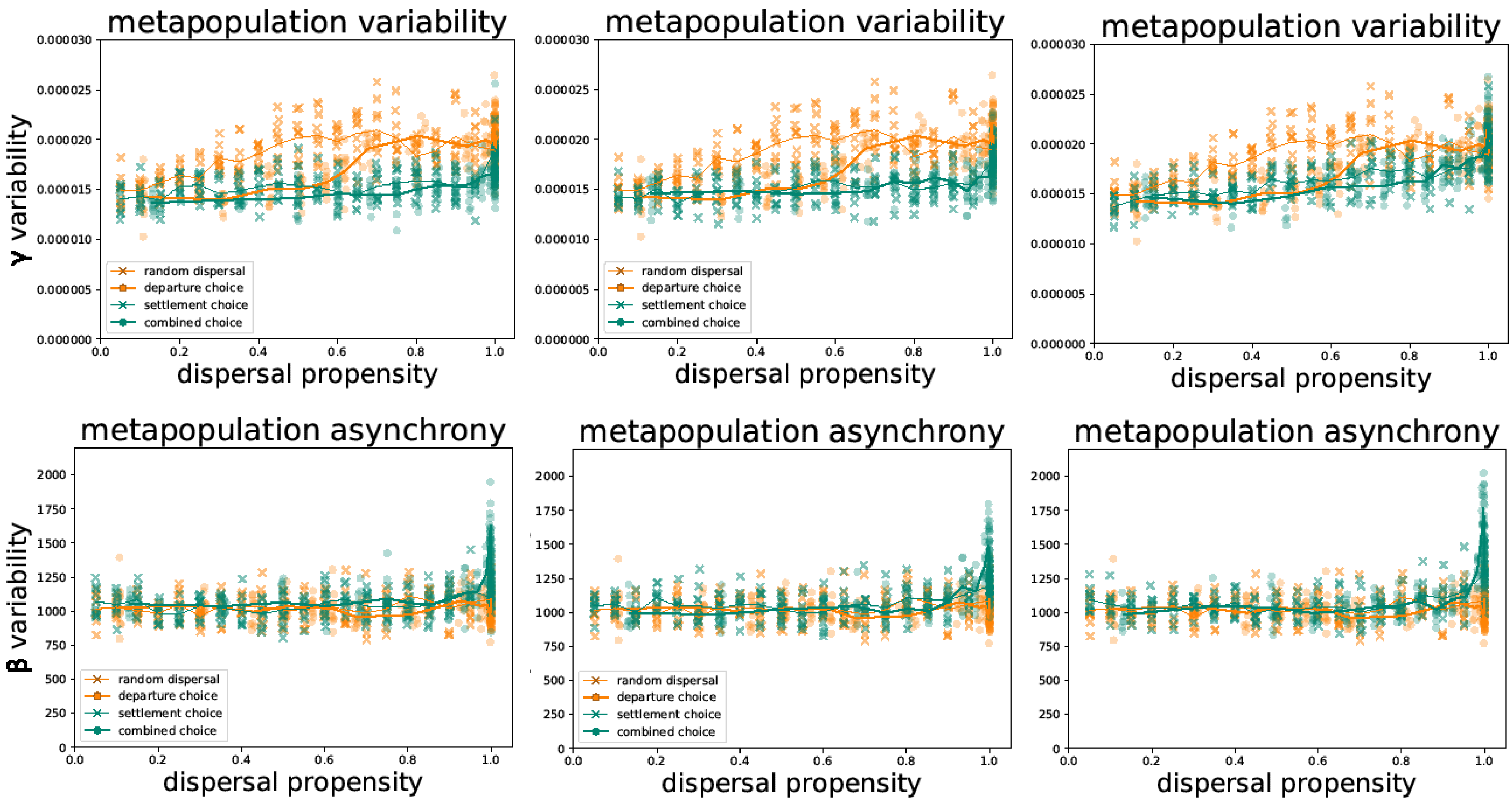

Figure A3.3: Metapopulation variability (top) and asynchrony (bottom) in relation to effective dispersal propensity. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

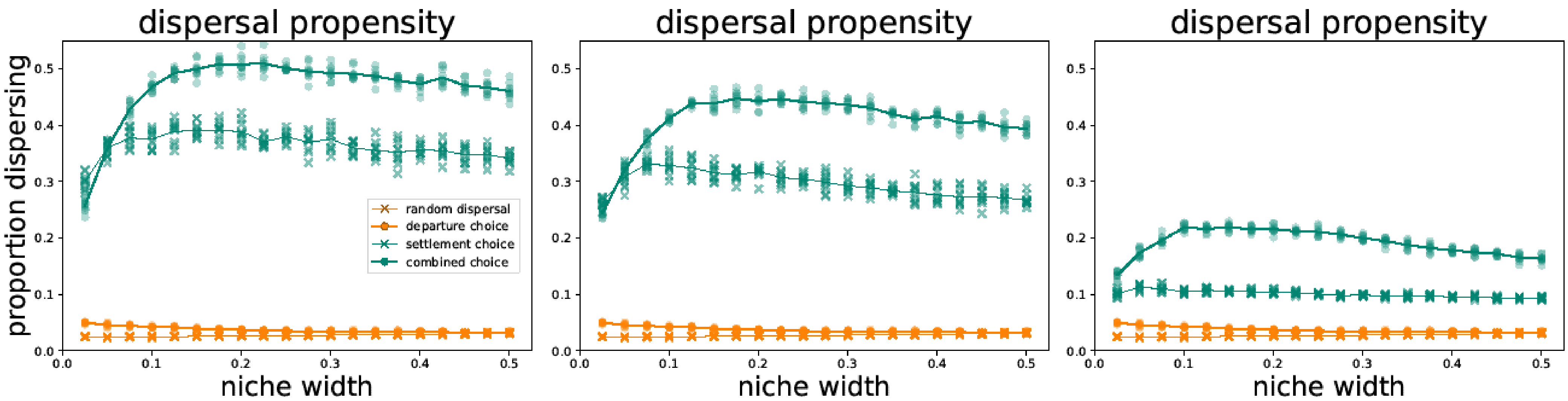

Figure A3.4: Dispersal propensity in relation to niche width. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

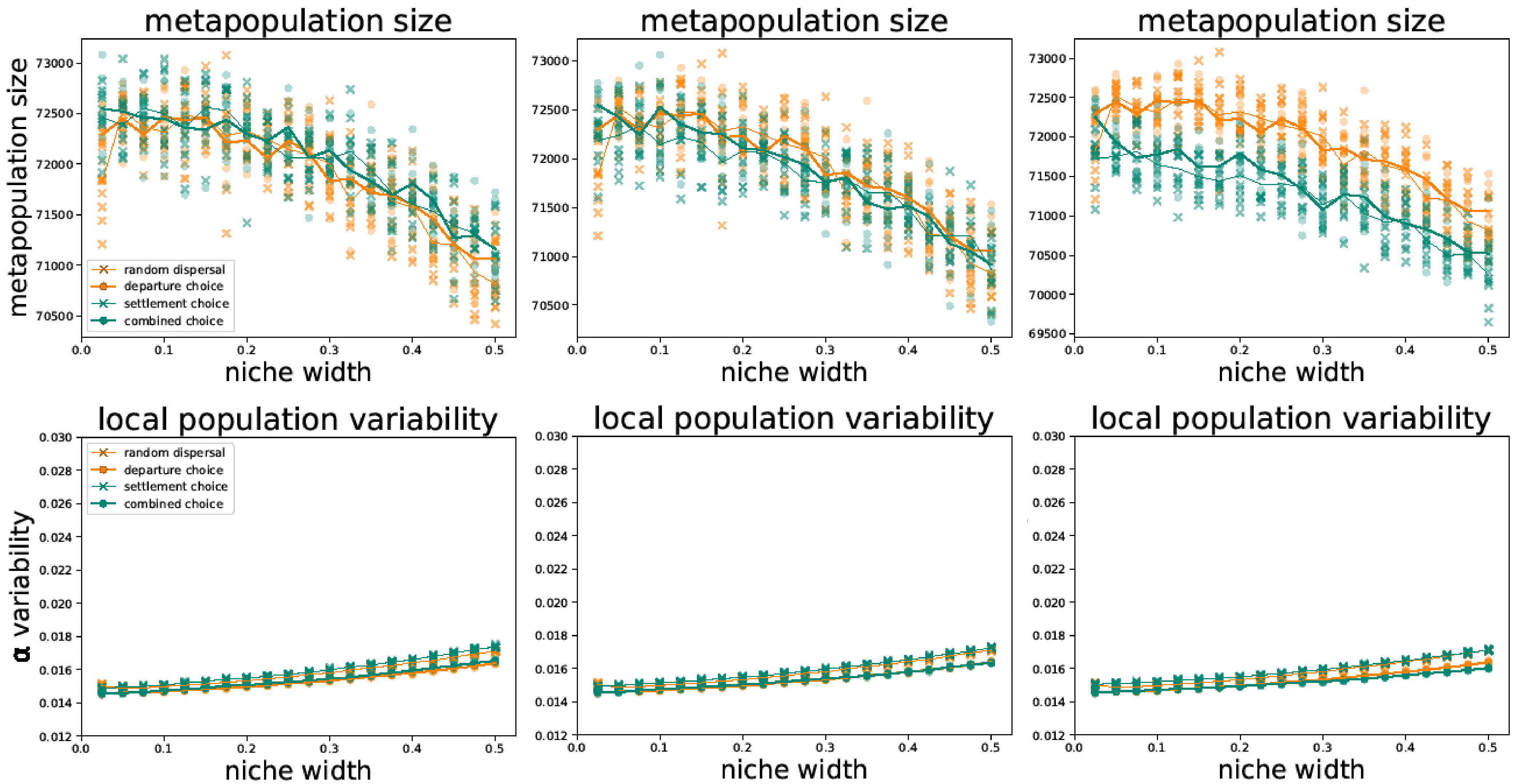

Figure A3.5: Metapopulation size (top) and local population variability (bottom) in relation to niche width. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.

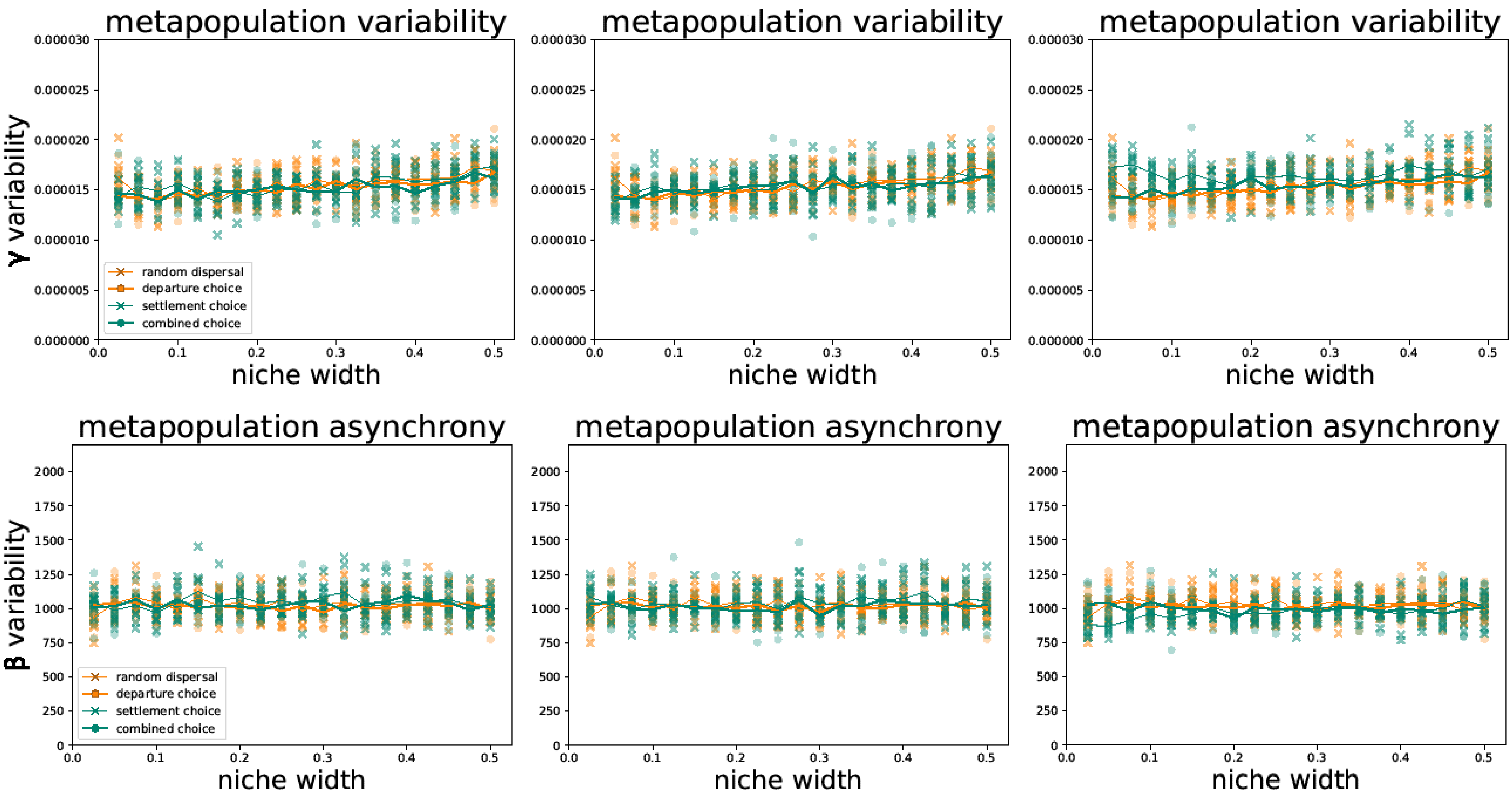

Figure A3.6: Metapopulation variability (top) and asynchrony (bottom) in relation to niche width. Settlement choice costs are either not present (left), low (0.01 of fitness, middle) or high (right). Scenarios of random (×) and informed (○) departure combined with random (orange) or informed (green) settlement.