Appendix 1

Dynamics of species richness and mean weighted traits

In this Appendix, the trajectories through time of the values of species richness (Fig. A1), mean weighted niche breadth (Fig. A2), mean weighted competitiveness (Fig. A3) and mean weighted dispersal (Fig. A4) are represented.

In each figure, four panels are displayed. They correspond to the four cases with different values of dispersal ability and generation overlap. A. random dispersal ability $\delta_s$ and annual survival rate $\psi_s = 0$, B. random dispersal ability $\delta_s$ and annual survival rate $\psi_s = 0.95$, C. dispersal ability $\delta_s = 0.1$ and annual survival rate $\psi_s = 0$, D. dispersal ability $\delta_s = 0.1$ and annual survival rate $\psi_s = 0.95$.

For all panels, the x axis represents the number of time steps (each time step is a full life cycle) and the y axis represents the value of either species richness (Fig. A1), mean weighted niche breadth (Fig. A2), mean weighted competitiveness (Fig. A3) and mean weighted dispersal (Fig. A4). In each panel, three lines are represented, the colours of the lines describing different disturbance rate $T$; red: $T = 0$, green: $T = 0.01$, blue: $T = 0.25$. Each line represents the mean value over 50 replicates.

Figure A1. Values of species richness through time.
Figure A2. Values of the mean weighted niche breadth through time.
Figure A3. Values of the mean weighted competitiveness through time.
Figure A4. Values of the mean weighted dispersal through time.
Figure A1

(A) Species richness over time steps for different values of T (0, 0.01, 0.25).

(B) Species richness over time steps for different values of T (0, 0.01, 0.25).

(C) Species richness over time steps for different values of T (0, 0.01, 0.25).

(D) Species richness over time steps for different values of T (0, 0.01, 0.25).
Figure A2
Figure A3

(A) Competitiveness over time steps for different values of $T$.

(B) Competitiveness over time steps for different values of $T$.

(C) Competitiveness over time steps for different values of $T$.

(D) Competitiveness over time steps for different values of $T$. 
Figure A4

(A) Graph showing dispersal over time steps for different time points T = 0, T = 0.01, and T = 0.25.

(B) Graph showing dispersal over time steps for different time points T = 0, T = 0.01, and T = 0.25.
Appendix 2

Effect of the number of initial species on the emerging trait strategies

Figure A1. Association of dispersal ability with niche breadth, considering values of species competitiveness and reproductive investment each equals to 1 with (A) 10 species at the beginning of the simulations and (B) 1000 species at the beginning of the simulations. The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The dispersal range is the difference between the 97.5% and 2.5% quantiles of the distribution of dispersal values among the surviving species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A2. Association between competitiveness (log values) and niche breadth, considering values of dispersal ability equals to 0.1 with (A) 10 species at the beginning of the simulations and (B) 1000 species at the beginning of the simulations. The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The competitiveness range is the difference between the 97.5% and 2.5% quantiles of the distribution of competitiveness values among the surviving species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A3. Association between niche breadth and (A, B) dispersal ability (C, D), competitiveness (log values), considering either (A, C) 10 species at the beginning of the simulations or (B, D) 1000 species at the beginning of the simulations. The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The
range is the difference between the 97.5% and 2.5% quantiles of distribution of trait values among the surviving species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A4. Association between dispersal ability and competitiveness (log values) for five categories of niche breadth considering either (A) 10 species at the beginning of the simulations or (B) 1000 species at the beginning of the simulations. The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean values of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).
Figure A1

A

B

Dispersal range

Mean dispersal

surv = 0

surv = 0.95

T = 0

T = 0.1

T = 0.25

surv = 0

surv = 0.95

T = 0

T = 0.1

T = 0.25
Figure A2

(A) T = 0
- solid line: surv = 0
- dotted line: T = 0.1
- dashed line: T = 0.25

(B) T = 0
- solid line: surv = 0
- dotted line: T = 0.1
- dashed line: T = 0.25

Competitiveness range
Mean competitiveness
Figure A3
Appendix 3

Effect of spatial autocorrelation on emerging trait strategies

Figure A1. Association between dispersal ability and niche breadth, considering species competitiveness and reproductive investment each equals to 1. (A) with moderate spatial autocorrelation (α = 5) and (B) with strong spatial autocorrelation (α = 10). The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The dispersal range is the difference between the 97.5% and 2.5% quantiles of the distribution of dispersal values among the surviving species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A2. Association between competitiveness (log values) and niche breadth, considering values of dispersal ability equals to 0.1 (A) with moderate spatial autocorrelation (α = 5) and (B) with strong spatial autocorrelation (α = 10). The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The competitiveness range is the difference between the 97.5% and 2.5% quantiles of the distribution of competitiveness values among the surviving species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A3. Association between niche breadth and (A, B) dispersal ability, (C, D) competitiveness (log values), considering either (A, C) moderate spatial autocorrelation (α = 5) or (B, D) strong spatial autocorrelation (α = 10). The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The range is the difference between the 97.5% and 2.5% quantiles of distribution of trait values among the surviving
species. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean and range value of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).

Figure A4. Association between dispersal ability and competitiveness (log values) for five categories of niche breadth considering either (A) moderate spatial autocorrelation (α = 5) or (B) strong spatial autocorrelation (α = 10). The mean values are the average over the 50 replicates of the values observed in all surviving individuals. The numbers correspond to the five niche breadth categories from the most specialist species to the most generalist species: 1: 0.0–0.1; 2: 0.1–0.2; 3: 0.2–0.4; 4: 0.4–0.6; 5: 0.6–1.0. The cross shows the mean values of the metacommunity at the initial stage of the simulations. Plain lines: no disturbance (T = 0), dotted lines: intermediate disturbance rate (T = 0.01), dashed lines: high disturbance rate (T = 0.25). In black, non-overlapping generations (survival rate ψs = 0) and in grey overlapping generations (survival rate ψs = 0.95).
**Figure A1**

**A**
- T = 0
- T = 0.1
- T = 0.25
- surv = 0
- surv = 0.95

**B**
- T = 0
- T = 0.1
- T = 0.25
- surv = 0
- surv = 0.95
Figure A2

A

- T = 0
- T = 0.1
- T = 0.25

B

- T = 0
- T = 0.1
- T = 0.25

Median competitiveness range

surv = 0
surv = 0.95
Figure A4

A

B

Mean dispersal

Mean competitiveness

T = 0

T = 0.1

T = 0.25

surv = 0

surv = 0.95

Figure A4
Appendix 4

Relationship between niche breadth and niche optimum

Figure A1. Relationship between niche breadth and niche optimum, with variable dispersal ability, and competitiveness and reproductive investment each equals to 1. (A) without disturbance (T = 0) and non-overlapping generations (survival rate ψs = 0), (B) with low disturbance rate (T = 0.01) and non-overlapping generations (survival rate ψs = 0), (C) with high disturbance rate (T = 0.25) and non-overlapping generations (survival rate ψs = 0), (D) without disturbance (T = 0) and overlapping generations (survival rate ψs = 0.95), (E) with low disturbance rate (T = 0.01) and overlapping generations (survival rate ψs = 0.95), (F) with high disturbance rate (T = 0.25) and overlapping generations (survival rate ψs = 0.95). The size of each point is proportional to the relative abundance of the species.

Figure A2. Relationship between niche breadth and niche optimum, with dispersal ability equals to 0.1, and variable competitiveness and reproductive investment. (A) without disturbance (T = 0) and non-overlapping generations (survival rate ψs = 0), (B) with low disturbance rate (T = 0.01) and non-overlapping generations (survival rate ψs = 0), (C) with high disturbance rate (T = 0.25) and non-overlapping generations (survival rate ψs = 0), (D) without disturbance (T = 0) and overlapping generations (survival rate ψs = 0.95), (E) with low disturbance rate (T = 0.01) and overlapping generations (survival rate ψs = 0.95), (F) with high disturbance rate (T = 0.25) and overlapping generations (survival rate ψs = 0.95). The size of each point is proportional to the relative abundance of the species.

Figure A3. Relationship between niche breadth and niche optimum, with variable dispersal ability and species competitiveness and reproductive investment. (A) without disturbance (T = 0) and non-overlapping generations (survival rate ψs = 0), (B) with low disturbance rate (T = 0.01) and non-overlapping generations (survival rate ψs = 0), (C) with high disturbance rate (T = 0.25) and non-overlapping generations (survival rate ψs = 0), (D) without disturbance (T = 0) and overlapping generations (survival rate ψs = 0.95), (E) with low disturbance rate (T = 0.01) and overlapping generations (survival rate ψs = 0.95), (F) with high disturbance rate (T = 0.25) and overlapping generations (survival rate ψs = 0.95). The size of each point is proportional to the relative abundance of the species.
Figure A3

(A) Niche breadth vs. niche optimum

(B) Niche breadth vs. niche optimum

(C) Niche breadth vs. niche optimum

(D) Niche breadth vs. niche optimum

(E) Niche breadth vs. niche optimum

(F) Niche breadth vs. niche optimum