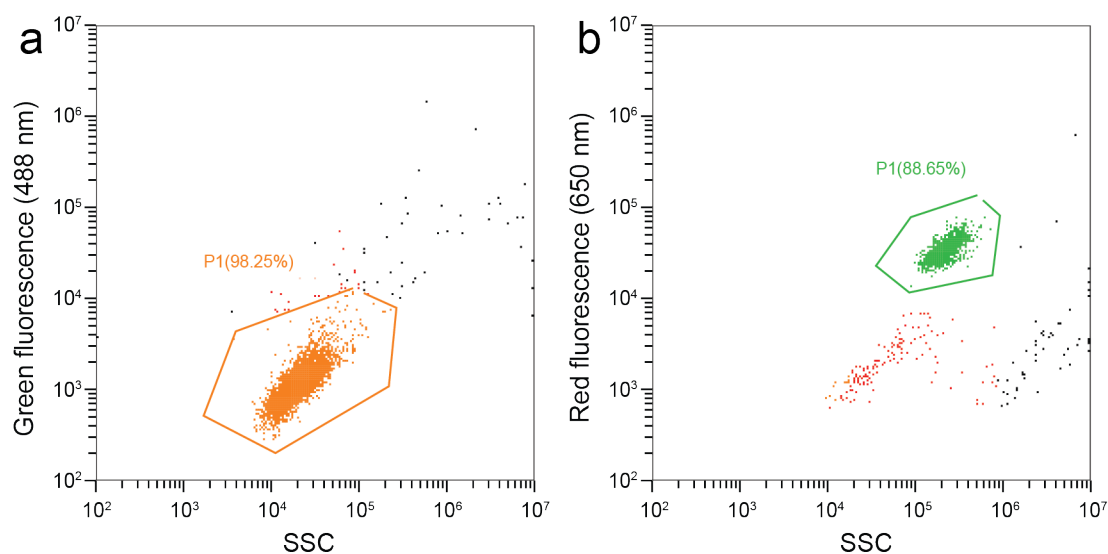


## Supplementary Figure



**Figure S1: Gating strategy used to collect flow cytometry data. (a)** *Marinobacter adhaerens* HP15 population characterized according to side scatter (SSC) and SYBR Green fluorescence. **(b)** *Synechococcus* sp. population characterized according to side scatter (SSC) and red fluorescence (chlorophyll).

## Supplementary Tables

**Table S1:** Kruskal-Wallis and pairwise Wilcoxon tests (two-sided) of the <sup>15</sup>N uptake of *M. adhaerens* HP15 reported in Figure 1b. The p-values were adjusted for multiple comparison using Benjamini-Hochberg. The table is available as a separate Supplementary File.

**Table S2:** Nitrogen containing compounds identified in *Synechococcus* sp. CS-94 RRIMP N1 exudates. At least 70% (24 out of 34) of these compounds can be catabolized by *Marinobacter adhaerens* HP15 based on its genome annotation (<https://www.genome.jp/entry/gn:T01922>). The complete metabolomics dataset is available in Zenodo (DOI: 10.5281/zenodo.7509161). The table is available as a separate Supplementary File.

**Table S3:** Kruskal-Wallis and pairwise Wilcoxon tests (two-sided) of the <sup>13</sup>C uptake of *Synechococcus* sp. reported in Figure 1d. The p-values were adjusted for multiple comparison using Benjamini-Hochberg. The table is available as a separate Supplementary File.

**Table S4:** Organic compounds identified in the exudates *Marinobacter adhaerens* HP15. The complete metabolomics dataset is available in Zenodo (DOI: 10.5281/zenodo.7509161). The table is available as a separate Supplementary File.

**Table S5:** Sums of squares, mean squares, and significance levels for the analyses of variance (ANOVA; one-sided) of the chemotactic responses of *Marinobacter adhaerens* HP15 reported in Extended Data Figure 1. Pairwise comparisons (diff: differences in mean; lower and upper: confidence intervals) adjusted using Bonferroni correction. The table is available as a separate Supplementary File.

**Table S6:** Kruskal-Wallis and pairwise Wilcoxon tests (two-sided) of the  $^{15}\text{N}$  uptake of *M. adhaerens* HP15 reported in Figure 2b. The p-values were adjusted for multiple comparisons using Benjamini-Hochberg. The table is available as a separate Supplementary File.

**Table S7:** Kruskal-Wallis and pairwise Wilcoxon tests (two-sided) of the  $^{13}\text{C}$  uptake of *Synechococcus* sp. reported in Figure 2c. The p-values were adjusted for multiple comparison using Benjamini-Hochberg. The table is available as a separate Supplementary File.

**Table S8:** Minimal model parameters used in the numerical simulations, unless stated otherwise.

<i>Variable</i>	<i>Symbol</i>	<i>Value</i>
DOM diffusivity (glutamate)	$D$	$608 \mu\text{m}^2 \text{s}^{-1}$
DOM leakage rate	$L$	$0.052 \text{ pmol hr}^{-1}$
Phytoplankton radius	$r_0$	$1 \mu\text{m}$
Bacterial radius	$a$	$0.5 \mu\text{m}$
Bacterial swimming speed	$v$	$45 \mu\text{m s}^{-1}$
Bacterial rotational diffusivity	$D_r$	$0.0349 \text{ rad}^2 \text{s}^{-1}$
Bacterial concentration	$B_0$	$10^6 \text{ cells ml}^{-1}$
Mean run time	$\tau_0$	$0.45 \text{ s}$
Adaptation timescale	$t_M$	$1.3 \text{ s}$
Chemotactic precision factor	$\Pi$	$6.6$
Gradient estimation timescale	$T$	$0.1 \text{ s}$
Dimensionless flagellar motor gain	$\Gamma$	$50$
Effective receptor gain	$\kappa$	$50 \mu\text{M}^{-1}$
Number of hotspots	$N$	$250$
Hotspot concentration	$\rho$	$10^3 - 10^5 \text{ cells ml}^{-1}$
Simulation time step	$\Delta t$	$0.10 \text{ s}$

**Table S9:** Summary of repeated-measure ANOVA and simple main effect tests (one-sided) carried out on the *Marinobacter* and *Synechococcus* cell concentrations during the co-culture experiment reported in Extended Data Figure S5a. The p-values were adjusted for multiple comparisons using Bonferroni correction. The table is available as a separate Supplementary File.

**Table S10:** Summary of repeated-measure ANOVA and simple main effect tests (one-sided) carried out on the *Marinobacter* cell concentrations during their growth cycle reported in Extended Data Figure 5b. The p-values were adjusted for multiple comparisons using Bonferroni correction. The table is available as a separate Supplementary File.