

Table 1. Statistical properties of measured experimental parameters on diatom movement behaviors. Experimental statistics of behavioral parameters on diatom cells at dSi concentrations of 15 mg/L. n , number of individuals.

parameter	definition	n	mean	unit	Distribution Type	Kolmogorov-Smirnov test		
						mean	sd	p -value
ω	angular velocity	29	0.0902	rad/s	normal	0.0902	0.0084	0.7923
V	translational speed	29	16.236	$\mu\text{m/s}$	normal	16.236	2.391	0.3489
D_θ	rotational diffusivity	29	0.0083	rad^2/s	lognormal	-4.7919	0.4877	0.6130
D_r	translational diffusivity	29	6.1501	$\mu\text{m}^2/\text{s}$	normal	6.1501	1.8165	0.2902
T	reversal interval time	1704	69.750	s	exponential	—	—	—

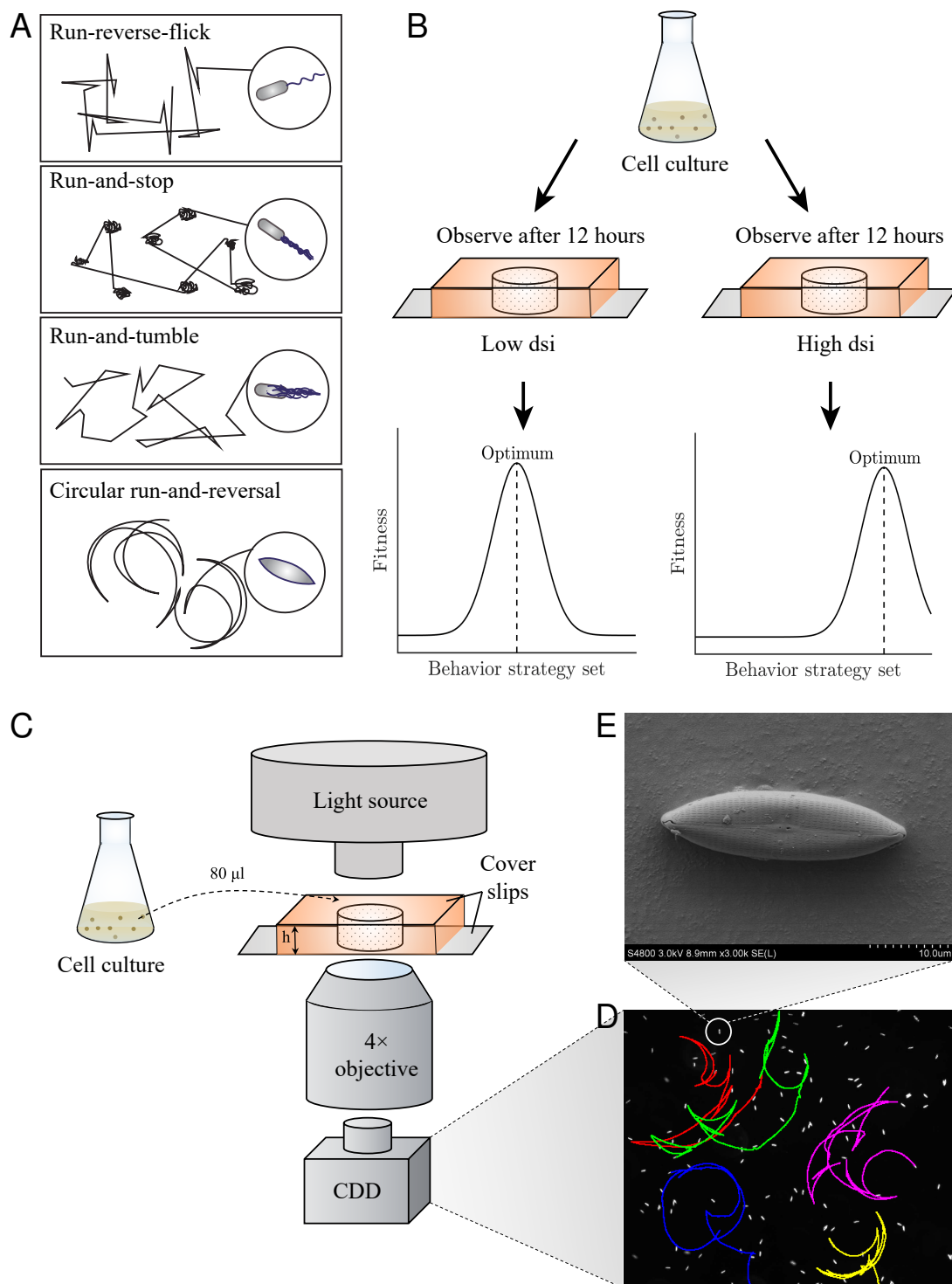


Figure 1. Theoretical hypothesis and experimental setup.

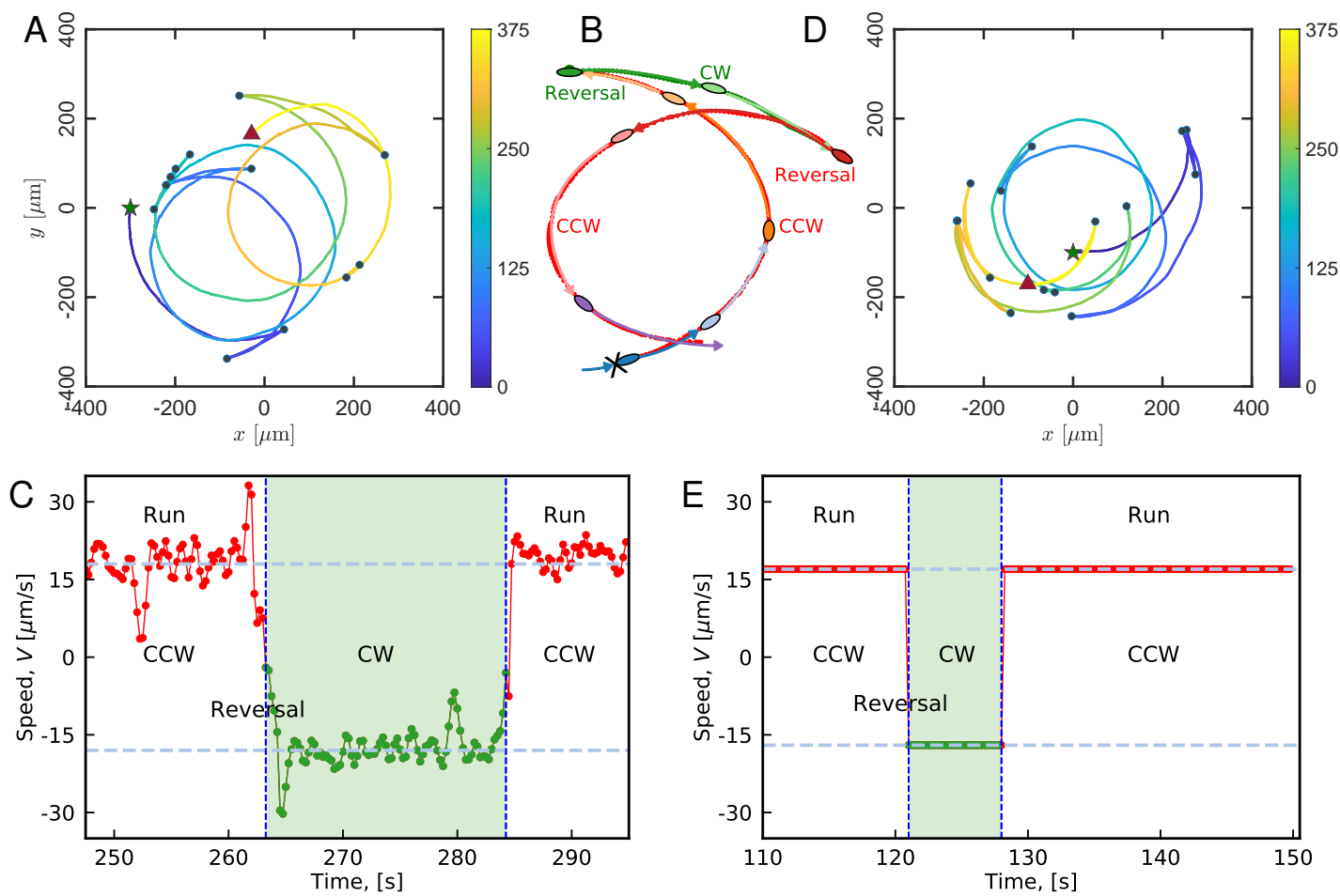


Figure 2. Experimental observations and theoretical predictions of the circular-run-and-reversal behaviors of diatom *Navicula arenaria* var. *rostellata*.

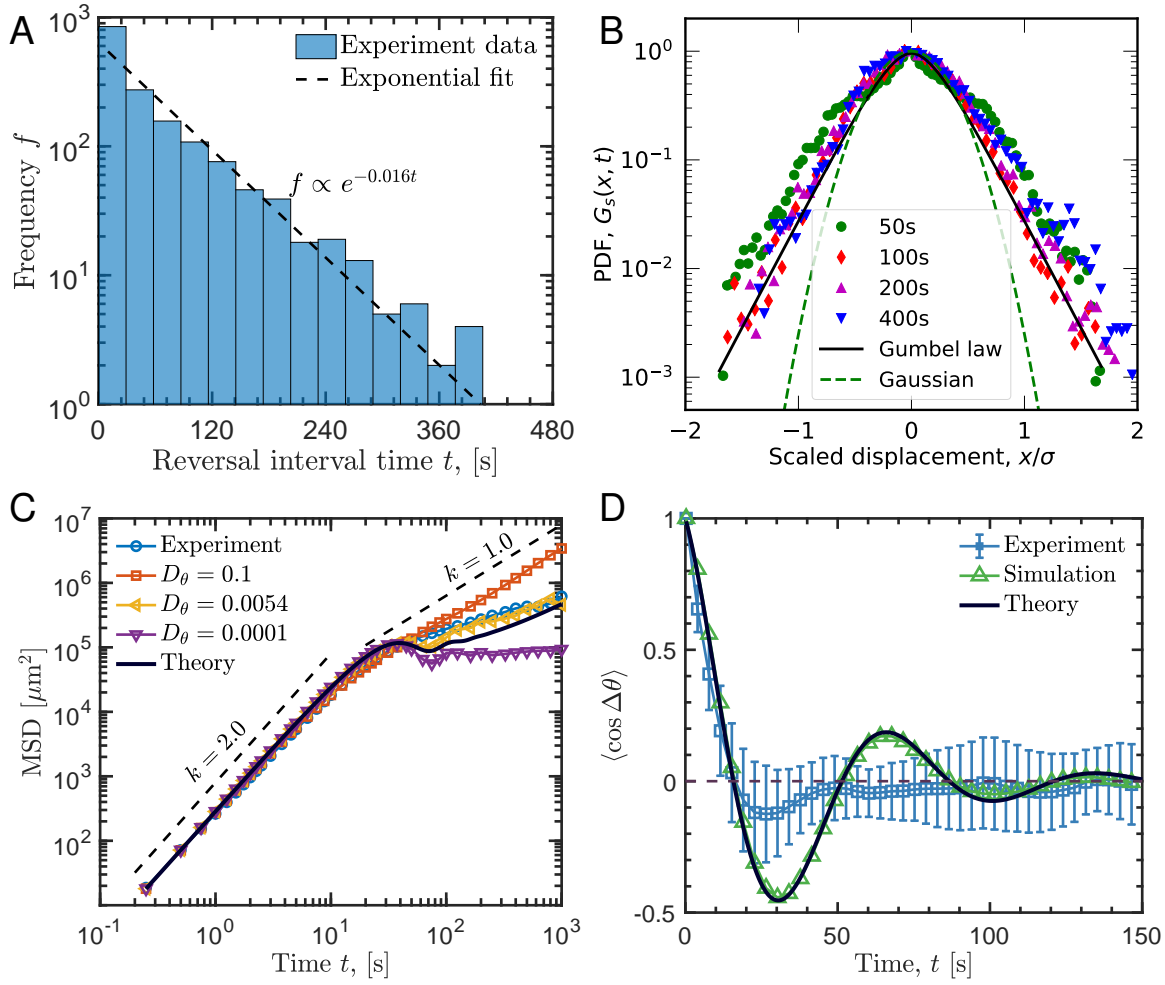


Figure 3. Comparing the laboratory measurements and simulation results with theoretical (analytical) predictions on diffusion behaviors of diatom cells.

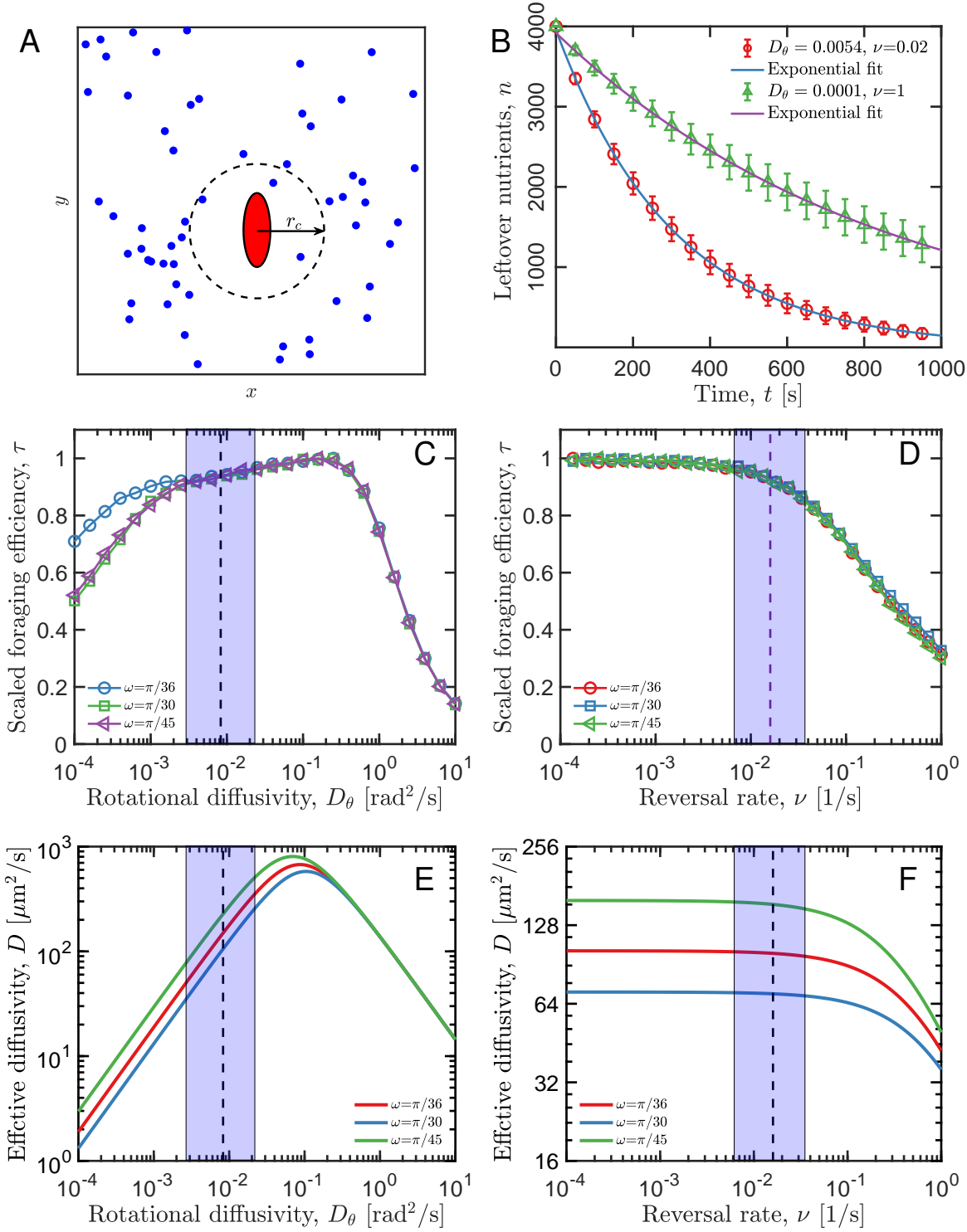


Figure 4. Theoretical prediction of optimal foraging strategies with spatially randomized nutrient targets.

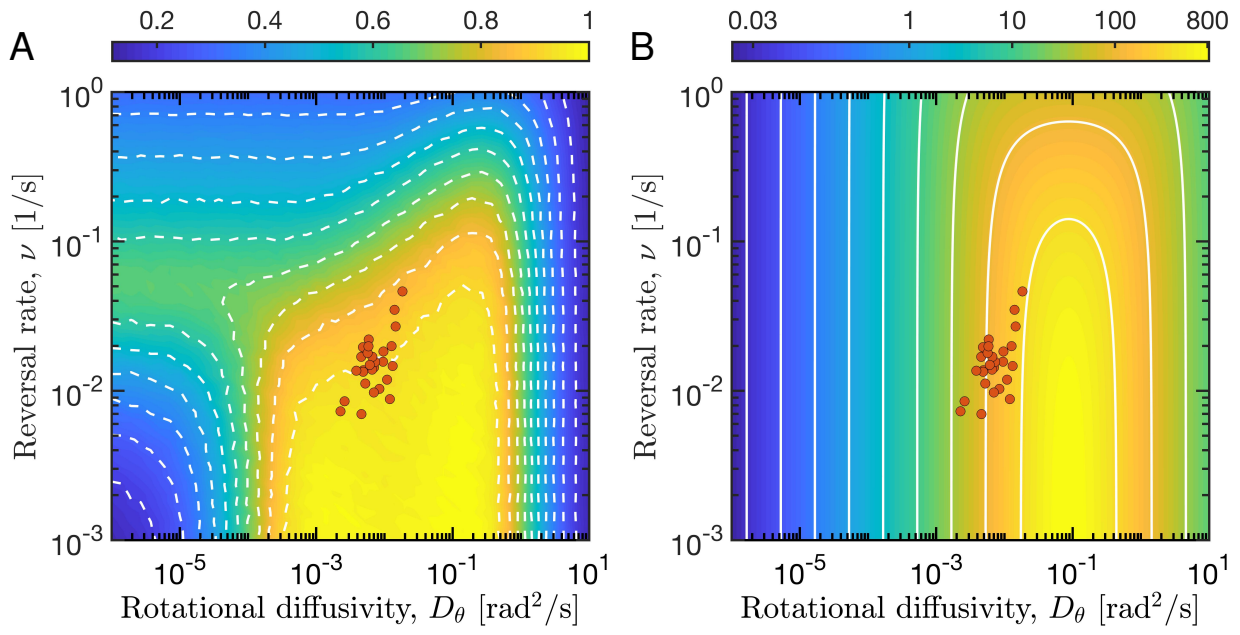


Figure 5. Theoretical and experimental results implicate the emergence of the foraging efficiency for various behavioral strategies.

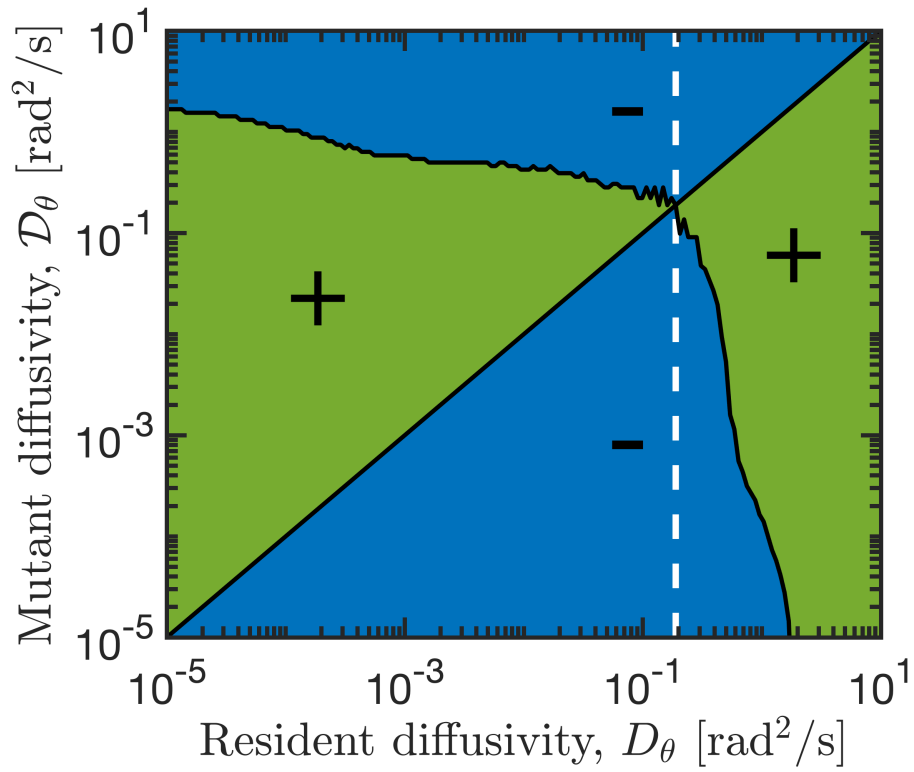


Figure 6. Pairwise invasibility plot (PIP) of behavioral strategy.

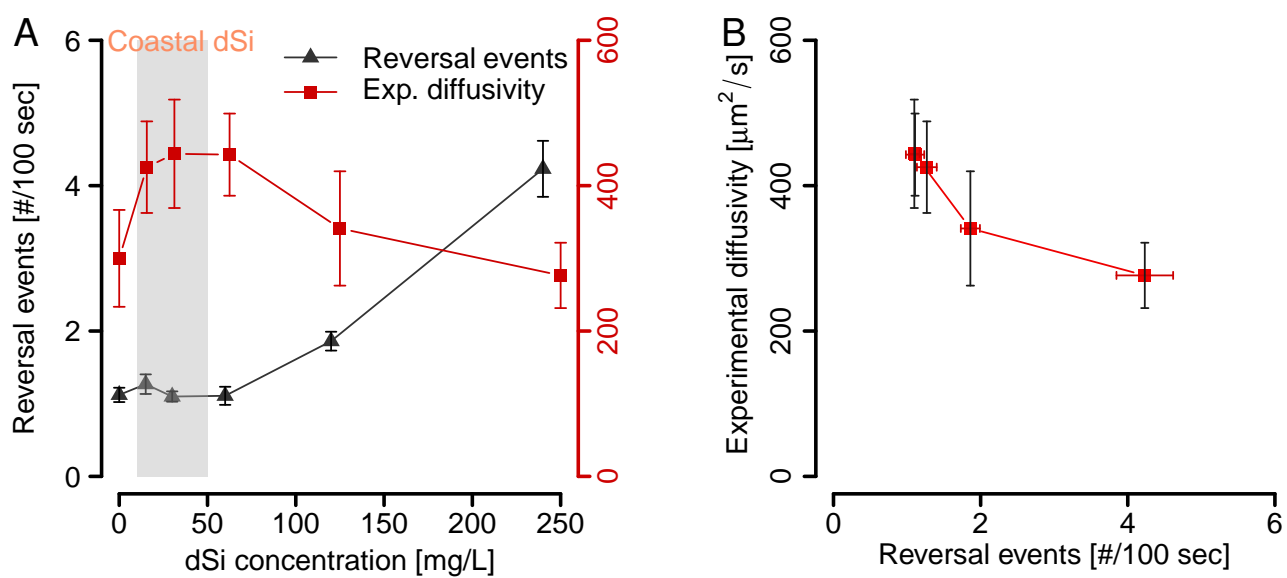


Figure 7. Reversal behaviors depend on the ambient dSi concentration.