Movie 1: Examples of trials. Shows movement initiation and obstacle navigation for two different bait objects, one of moderate mass and one very heavy.

Figure S1: Effects of mass per ant and object size on sinuosity at movement initiation (A, B; multiple high-performing models, results included in Table 3) and after hitting an obstacle (C, D; ΔAIC for null model < 2).

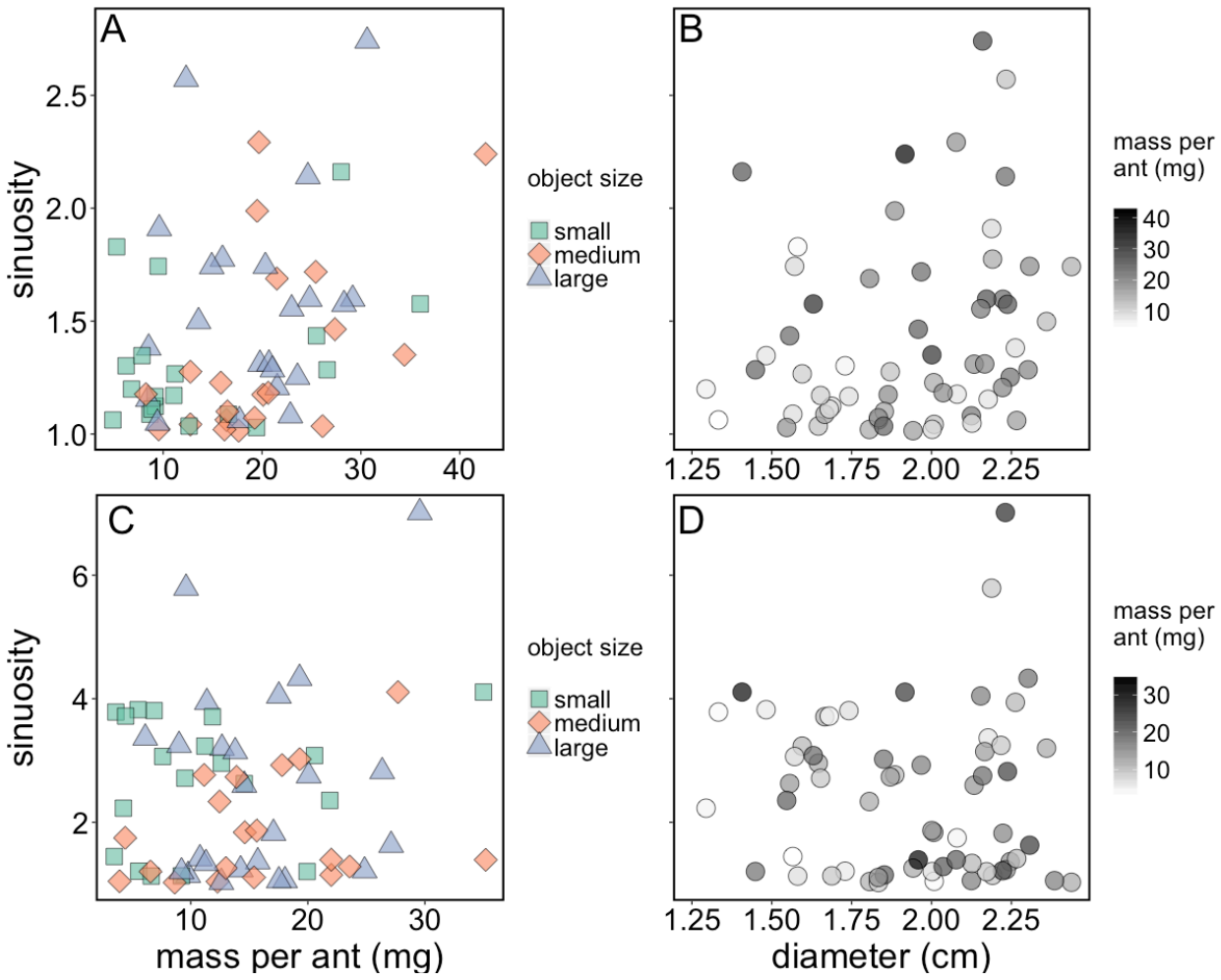

Figure S2: Effects of mass per ant (A) and object size (B) on velocity during obstacle navigation. Multiple models perform well, results included in Tables 3, S1, S2, and S3.

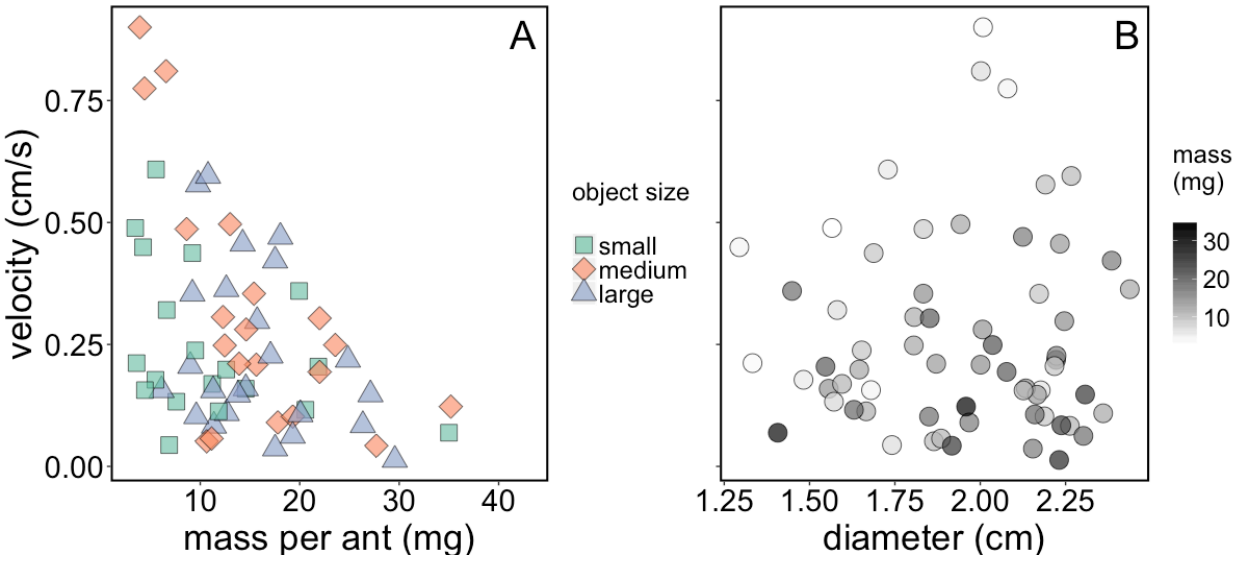

Figure S3: Proportion of time stalled at movement initiation and during obstacle navigation. Points are jittered. Black points are trials with no stalls in either external context (n = 47), blue points show trials in which there was at least one stall either at the start or during obstacle navigation (n = 13), and red points show trials with at least one stall in both phases (n = 3). Stalls were rare, and there were too few examples for statistical analysis.

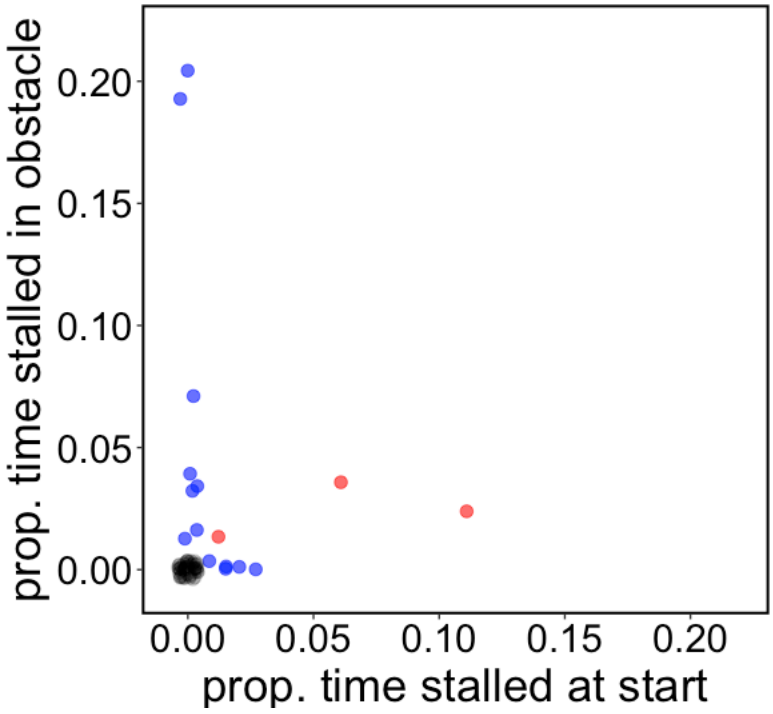

Figure S4: Reproduction of Figure 2a, on log-log scale. Because *Paratrechina longicornis* are monomorphic, group size is proportional to the total mass of the porter group.

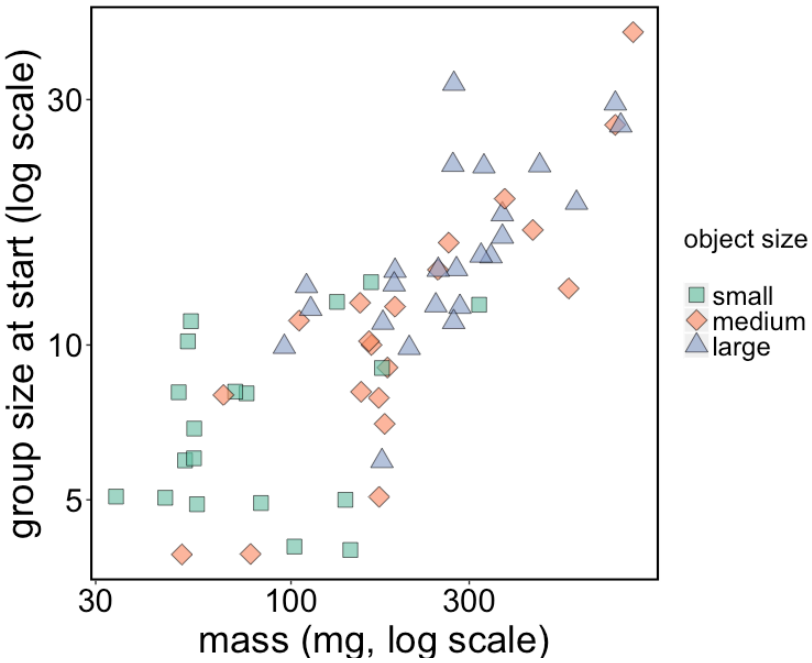

Table S1: ΔAICc and Akaike weights for all models tested as part of all statistical analyses. For comparisons among candidate models, models were fit using maximum likelihood. Final models were refit with restricted maximum likelihood. Table continues onto second page.

Predictors	ΔAICc	Akaike Weight
Group Size: *During movement initiation*		
Mass + Size	0	0.760
Mass + Size + Mass:Size	2.33	0.237
Mass	11.0	0.003
Size	40.7	0.000
Null	67.1	0.000
Group Size: *During obstacle navigation*		
Mass + Size	0	0.754
Mass + Size + Mass:Size	2.25	0.245
Mass	13.4	0.001
Size	22.3	0.000
Null	50.7	0.000
Group Size: *Initiation vs obstacle navigation*		
Trial type (initiation vs obstacle)	0	1
Null	26.1	0
Coordination time: *During movement initiation*		
Mass per ant (MPA) + Size	0	0.754
MPA + Size + MPA:Size	2.35	0.233
MPA	8.91	0.009
Size	10.6	0.004
Null	21.6	0.000
Coordination time: *During obstacle navigation*		
MPA + Size + MPA:Size	0	0.402
MPA	0.174	0.369
MPA + Size	1.12	0.229
Null	58.2	0.000
Size	60.0	0.000
Coordination time: *Initiation vs obstacle navigation*		
Trial type (initiation vs obstacle)	0	1
Null	56.4	0
Sinuosity: *During movement initiation*		
MPA	0	0.461
MPA + Size	0.949	0.287
Size	3.56	0.086
MPA + Size + MPA:Size	3.40	0.084
Null	3.43	0.083
Sinuosity: *During obstacle navigation*		
Size	0	0.384
Null	0.636	0.280
MPA + Size	1.63	0.170
MPA	2.70	0.100
MPA + Size + MPA:Size	3.50	0.067
Sinuosity: *Initiation vs obstacle navigation*		
Trial type (initiation vs obstacle)	0	1
Null	29.5	0

Predictors	ΔAICc	Akaike Weight
Velocity: *During movement initiation*		
MPA + Size	0	0.568
MPA	1.65	0.250
MPA + Size + MPA:Size	2.28	0.182
Size	40.9	0.000
Null	45.1	0.000
Velocity: *During obstacle navigation*		
MPA	0	0.601
MPA + Size	1.97	0.224
MPA + Size + MPA:Size	2.51	0.172
Null	11.2	0.002
Size	13.4	0.001
Velocity: *Initiation vs obstacle navigation*		
Trial type (initiation vs obstacle)	0	1
Null	24.0	0

Table S2: Combined Akaike weights of models including each predictor (predictor weights). Weights calculated using the full suite of models of each analysis.

Akaike weight for predictor		Mass	Size	Interaction
Group Size:	*Movement initiation*	1.00	0.997	0.237
	Obstacle navigation	1.00	0.999	0.245
		Mass per ant	**Size**	**Interaction**
Coordination time:	*Movement initiation*	0.996	0.991	0.233
	Obstacle navigation	1.00	0.631	0.402
Sinuosity:	*Movement initiation*	0.832	0.457	0.084
	Obstacle navigation	0.337	0.621	0.067
Velocity:	*Movement initiation*	1.00	0.750	0.182
	Obstacle navigation	0.997	0.397	0.172

Table S3: Detailed statistical results for all analyses, including details of all models with ΔAICc < 2. All estimates are reported on log scale. Table continues onto 4 pages total.

		Std. dev. *(for random effects)*	**Estimate**
Group size: movement initiation			
Mass + Size (final model): *Linear mixed-effects model fit by restricted maximum likelihood (REML), 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	0.144	-
	Residual	0.298	-
Fixed effects	Intercept	-	2.36
	Mass	-	1.84
	Size	-	0.596
Group size: obstacle navigation			
Mass + Size (final model): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	0.0769	-
	Residual	0.298	-
Fixed effects	Intercept	-	2.62
	Mass	-	1.25
	Size	-	0.625
Group size: initiation vs obstacle navigation			
Trial type (start or obstacle), final model: *Linear mixed-effects model fit by REML, 126 observations, 63 trials nested within 6 colonies, DF = 62*			
Random effects (acting on intercept)	Colony	0.137	-
	Trial	0.435	-
	Residual	0.238	-
Fixed effects	Intercept	-	2.36
	Obstacle	-	0.25
Coordination time: movement initiation			
Mass per ant (MPA) + Size (final model): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	5.87 e-5	-
	Residual	1.05	-
Fixed effects	Intercept	-	3.38
	MPA	-	62.1
	Size	-	1.61

		Std. dev. *(for random effects)*	Estimate
Coordination time: obstacle navigation			
MPA + Size + MPA:Size (ΔAICc = 0): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 54*			
Random effect (acting on intercept)	Colony	0.379	-
	Residual	0.428	-
Fixed effects	Intercept	-	2.04
	MPA	-	78.8
	Size	-	-0.236
	MPA:Size	-	-43.2
MPA (ΔAICc = 0.174): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 56*			
Random effect (acting on intercept)	Colony	0.392	-
	Residual	0.438	-
Fixed effects	Intercept	-	2.02
	MPA	-	80.3
MPA + Size (ΔAICc = 1.12): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	0.396	-
	Residual	0.436	-
Fixed effects	Intercept	-	2.02
	MPA	-	82.4
	Size	-	-0.24
Coordination time: initiation vs obstacle navigation			
Trial type (start or obstacle), final model: *Linear mixed-effects model fit by REML, 126 observations, 63 trials nested within 6 colonies, DF = 62*			
Random effects (acting on intercept)	Colony	0.281	-
	Trial	0.611	-
	Residual	0.829	-
Fixed effects	Intercept	-	3.41
	Obstacle	-	-1.43
Sinuosity: movement initiation			
MPA (ΔAICc = 0): *Linear mixed-effects model fit by REML, 61 observations across 6 colonies, DF = 54*			
Random effect (acting on intercept)	Colony	0.111	-
	Residual	0.219	-
Fixed effects	Intercept	-	0.327
	MPA	-	8.49
MPA + Size (ΔAICc = 0.949): *Linear mixed-effects model fit by REML, 61 observations across 6 colonies, DF = 53*			
Random effects (acting on intercept)	Colony	0.104	-
	Residual	0.219	-
Fixed effects	Intercept	-	0.326
	MPA	-	7.81
	Size	-	0.119

		Std. dev. *(for random effects)*	Estimate
Sinuosity: obstacle navigation			
Size (ΔAICc = 0): *Linear mixed-effects model fit by REML, 62 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	0.234	-
	Residual	0.479	-
Fixed effects	Intercept	-	0.763
	Size	-	-0.392
Null model (ΔAICc = 0.636): *Linear mixed-effects model fit by REML, 62 observations across 6 colonies, DF = 56*			
Random effect (acting on intercept)	Colony	0.201	-
	Residual	0.492	-
Fixed effects	Intercept	-	0.757
MPA + Size (ΔAICc = 1.63): *Linear mixed-effects model fit by REML, 62 observations across 6 colonies, DF = 54*			
Random effect (acting on intercept)	Colony	0.233	-
	Residual	0.481	-
Fixed effects	Intercept	-	0.765
	MPA	-	7.24
	Size	-	-0.432
Sinuosity: initiation vs obstacle navigation			
Trial type (start or obstacle), final model: *Linear mixed-effects model fit by REML, 123 observations, 63 trials nested within 6 colonies, DF = 59*			
Random effects (acting on intercept)	Colony	0.166	-
	Trial	9.76 e-5	-
	Residual	0.384	-
Fixed effects	Intercept	-	0.338
	Obstacle	-	0.416
Velocity: movement initiation			
MPA + Size (ΔAICc = 0): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	1.34 e-5	-
	Residual	0.507	-
Fixed effects	Intercept	-	-1.10
	MPA	-	-62.2
	Size	-	-0.45
MPA (ΔAICc = 1.65): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 56*			
Random effect (acting on intercept)	Colony	1.73 e-5	-
	Residual	0.519	-
Fixed effects	Intercept	-	-1.10
	MPA	-	-65.6

		Std. dev. *(for random effects)*	Estimate
Velocity: obstacle navigation			
MPA (ΔAICc = 0): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 56*			
Random effect (acting on intercept)	Colony	0.204	-
	Residual	0.734	-
Fixed effects	Intercept	-	-1.66
	MPA	-	-48.1
MPA + Size (ΔAICc = 1.97): *Linear mixed-effects model fit by REML, 63 observations across 6 colonies, DF = 55*			
Random effect (acting on intercept)	Colony	0.225	-
	Residual	0.735	-
Fixed effects	Intercept	-	-1.66
	MPA	-	-49.9
	Size	-	0.234
Velocity: initiation vs obstacle navigation			
Trial type (start or obstacle), final model: *Linear mixed-effects model fit by REML, 126 observations, 63 trials nested within 6 colonies, DF = 62*			
Random effects (acting on intercept)	Colony	0.232	-
	Trial	0.543	-
	Residual	0.545	-
Fixed effects	Intercept	-	-1.11
	Obstacle	-	-0.549