Electronic Supplementary Information

Can self-propelled objects escape from compression stimulation?

Masaki Yoshikai,[a] Muneyuki Matsuo,[ab] Nobuhiko J. Suematsu,[cd] Hiraku Nishimori[cd] and Satoshi Nakata*[a]

[a]*Graduate School of Science, Hiroshima University, 1-3-1 Kagamiyama, Higashi-Hiroshima, Hiroshima 739-8526, Japan. Email: nakatas@hiroshima-u.ac.jp*

[b]*Graduate School of Arts and Sciences, The University of Tokyo, 3-8-1 Komaba, Meguro, Tokyo 153-8902, Japan.*

[c]*Meiji Institute for Advanced Study of Mathematical Sciences (MIMS), Meiji University, 4-21-1 Nakano, Nakano-ku, Tokyo 164-8525, Japan.*

[d]*Graduate School of Advanced Mathematical Sciences, Meiji University, 4-21-1 Nakano, Nakano-ku, Tokyo 164-8525, Japan.*

*To whom correspondence should be addressed. Tel. & fax: +81-824-24-7409

E-mail: nakatas@hiroshima-u.ac.jp

1. Movies on self-propulsion of eight CPs and eight MCPs corresponding to Figure 2

Movie S1 corresponding to Figure 2a: Top view, real time of speed

Movie S2 corresponding to Figure 2b: Top view, real time of speed

2. Snapshots for CPs at t = 11 s and MCPs at t = 19.5 s

We added snapshots for CPs at t = 11 s and MCPs at t = 19.5 s.

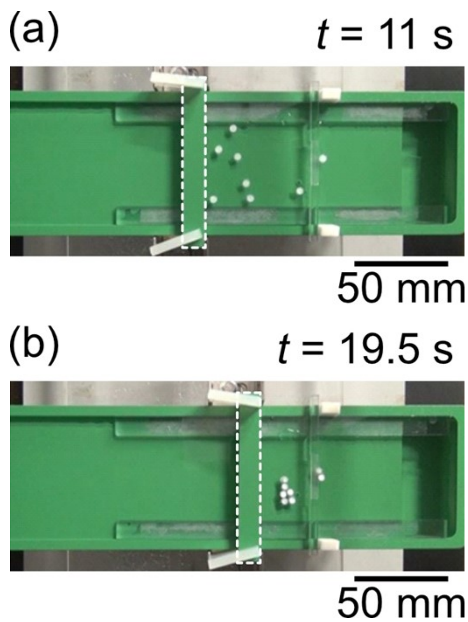

Figure S1. Snapshots of (a) eight CPs at t = 11 s and (b) eight MCPs at t = 19.5 s under a decrease in the surface area of C_{in} at W_g = 25 mm.

3. The time (t_1) when the first CP or MCP escaped to C_{out}.

We added a table (Tables S1) on the time (t_1) when the first CP or MCP escaped to C_{out} obtained from Figure 3-1 or 3-2.

Table S1. The time (t_1) when the first CP and MCP escaped to C_{out}.

	W_g / mm	t_1 / s
CPs	5	14.5 ± 3.0
	25	4.30 ± 3.84
	40	0.506 ± 0.947
MCPs	5	
	25	13.9 ± 4.63
	40	4.13 ± 3.08

4. Relationship between $-(A_{in}/2)\ln(1-2N_{out}(t)/N_{total})$ and t for different values of W_g at $A_{in} = A_{out}$ and 8 CPs

The relationship between $-(A_{in}/2)\ln(1-2N_{out}(t)/N_{total})$ and t was analyzed to estimate the value of a for different values of W_g based on eqn (4). Here, eight CPs were floated on C_{in} as the initial condition and $A_{in} = A_{out} = 3920$ mm^2, as indicated in Figure S2a. The relaxation time (t_e) is the time from the initial value of N_{out} (= 8) at $A = A_{in\text{-}i}$ to reach the value under the equilibrium at $A_{in} = A_{in\text{-}f}$, i.e., $N_{out} = 8 \times A_{out}/(A_{in\text{-}f} + A_{out}) = 8 \times 0.7407 \sim 6$. a_0 was estimated from the relationship between a and W_g based on eqn (5), as shown in Figure S2b.

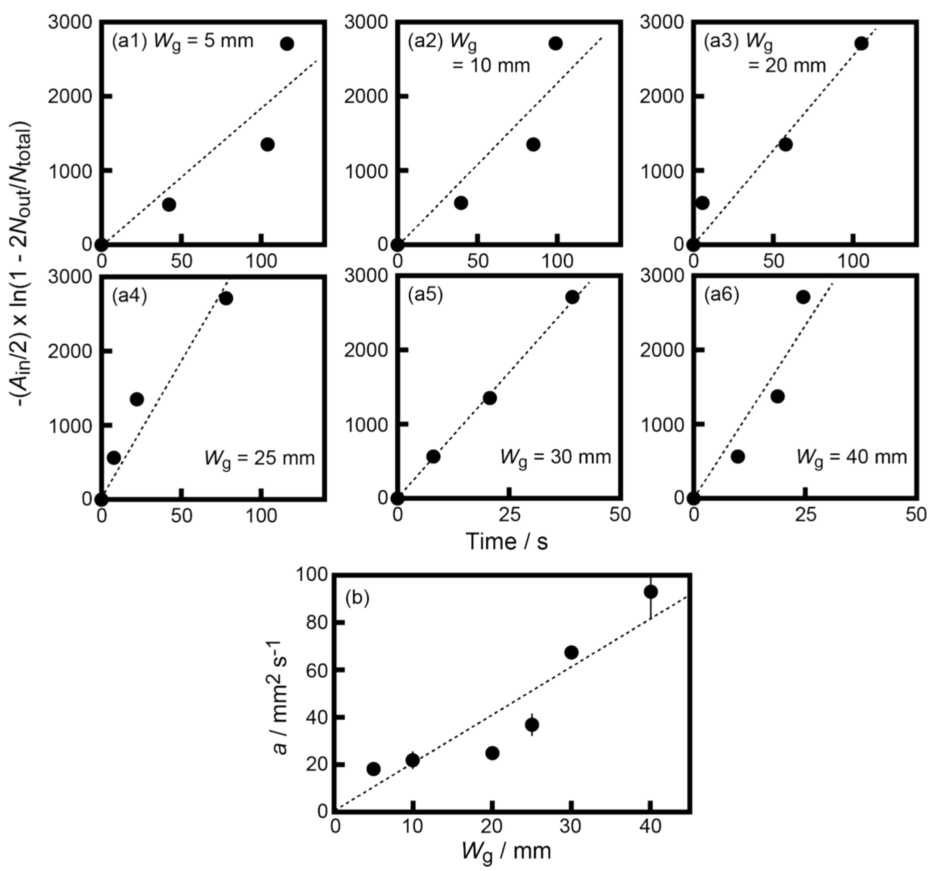

Figure S2. (a) Relationship between $-(A_{in}/2)\ln(1-2N_{out}(t)/N_{total})$ and t for different values of W_g (= (a1) 5, (a2) 10, (a3) 20, (a4) 25, (a5) 30, and (a6) 40 mm) at $A_{in} = A_{out} = 3920$ mm^2 and eight CPs. (b) Relationship between a and W_g. The values of a at different W_g were obtained from (a). The dotted lines in (a) and (b) were obtained from linear approximation of the experimental results.

5. Relationship between $\Delta\gamma$ and $A_{in\text{-}i} - A_{in}$ for eight CPs to estimate b_0 and b_1 in eqn (6)

The relationship between $\Delta\gamma$ and $A_{in\text{-}i} - A_{in}$ for eight CPs was analyzed to estimate b_0 and b_1 in eqn (6) based on the experimental results in Figure 5, as indicate in Figure S3.

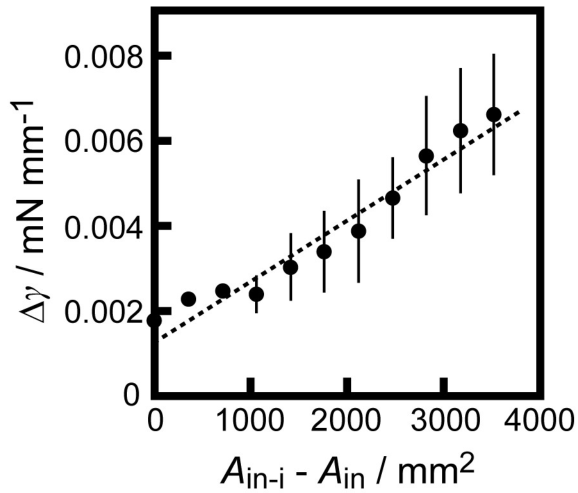

Figure S3. (a) Relationship between $\Delta\gamma$ and $A_{in\text{-}i} - A_{in}$ for eight CPs. The values of $\Delta\gamma$ correspond to those in Figure 5. The dotted line was obtained from linear approximation of the experimental results.

6. Relationship between c_0 and W_g to estimate c_0

c_0 for CPs was individually obtained from eqn (7) at $t = 0$ for each W_g, as indicated in Figure S4. The average values of c_0 were 844 ± 287.

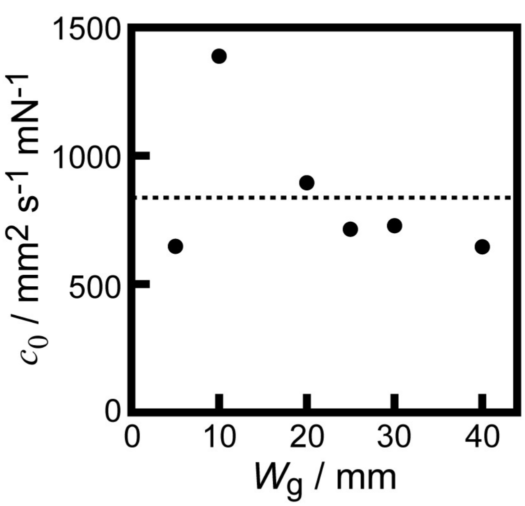

Figure S4. Relationship between c_0, as a function of W_g for eight CPs and W_g. The dotted line was the average value of c_0.