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CORRIGENDUM

Spontaneous locomotion of a symmetric squirmer – CORRIGENDUM

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In our paper (Cobos, Khair & Schnitzer 2024), we demonstrated through axisymmetric numerical simulations that fore-aft symmetric squirmers can exhibit symmetry-breaking locomotion beyond a critical Reynolds number.

We have identified errors in the implementation of our numerical scheme which effectively reversed the prescribed surface velocity, as well as the arrows in figures 3 and 4 depicting the directions of the flow and particle motion. As a consequence, results and conclusions stated for quadrupolar pushers and quadrupolar pullers are flipped throughout the paper. In particular, it is the quadrupolar pushers that exhibit steady self-propulsion above a critical *Re*, whereas the quadrupolar pullers are stable (at least under axisymmetric perturbations and over the examined *Re* range). We are grateful to Dr Zhenyu Ouyang of Ningbo University for alerting us to the possibility of an error in our results.

We replace figures 1, 3 and 4 in Cobos *et al.* (2024) by figures 1, 2 and 3 herein, respectively. We replace ‘puller’ by ‘pusher’ (or ‘pullers’ by ‘pushers’) on line 9 of the abstract; lines 1 and 2 of paragraph 4, line 1 of paragraph 5 and line 2 of paragraph 6 of § 4; on line 2 of paragraph 1; line 2 of § 5; line 1 of item (i) and line 2 of item (ii) in § 5; and in the caption of figure 2. Similarly, we replace ‘pusher’ by ‘puller’ (or ‘pushers’ by ‘pullers’) on line 2 of paragraph 2, line 1 of paragraph 3 and lines 3 and 5 of paragraph 4 of § 4; and in the caption of figure 2. We replace ‘upstream’ by ‘downstream’ in the last sentence of the second paragraph of § 4. We replace the sentence starting ‘The downstream…’ (lines 9–12 of paragraph 4 of § 4) by ‘We note the upstream recirculation generated by the squirmer’s motion, which contrasts the downstream recirculation observed in the puller case.’ For clarity, the sentence following (2.2) is rewritten as ‘Here, the sign is that of B_2 – thus the plus or minus indicates a puller or pusher, respectively – and…’

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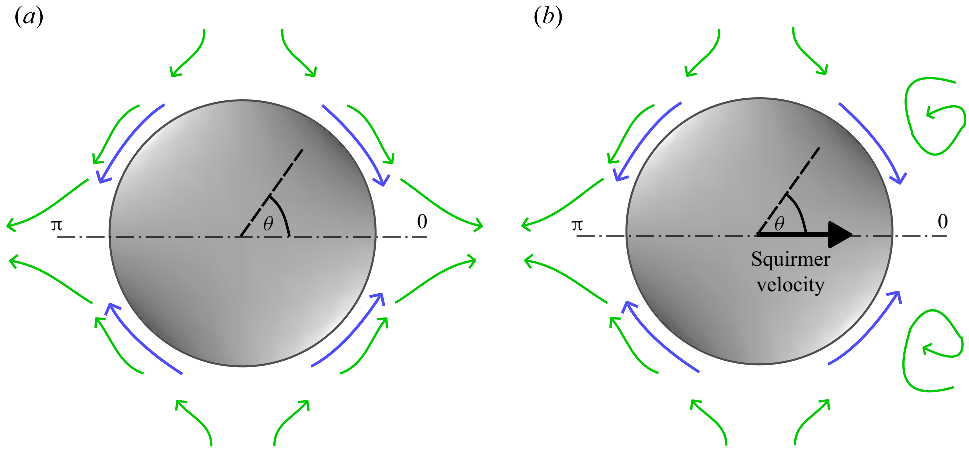

Figure 1. Schematic of spontaneous symmetry breaking of a fore-aft symmetric squirmer. (*a*) Symmetric steady state, wherein the squirmer is stationary. (*b*) Symmetry-broken steady state, wherein the squirmer swims. Blue arrows: symmetrically prescribed surface-slip velocity (we show equator-to-poles squirming as in the case of a quadrupolar pusher). Green arrows: induced flow in a frame comoving with the squirmer.

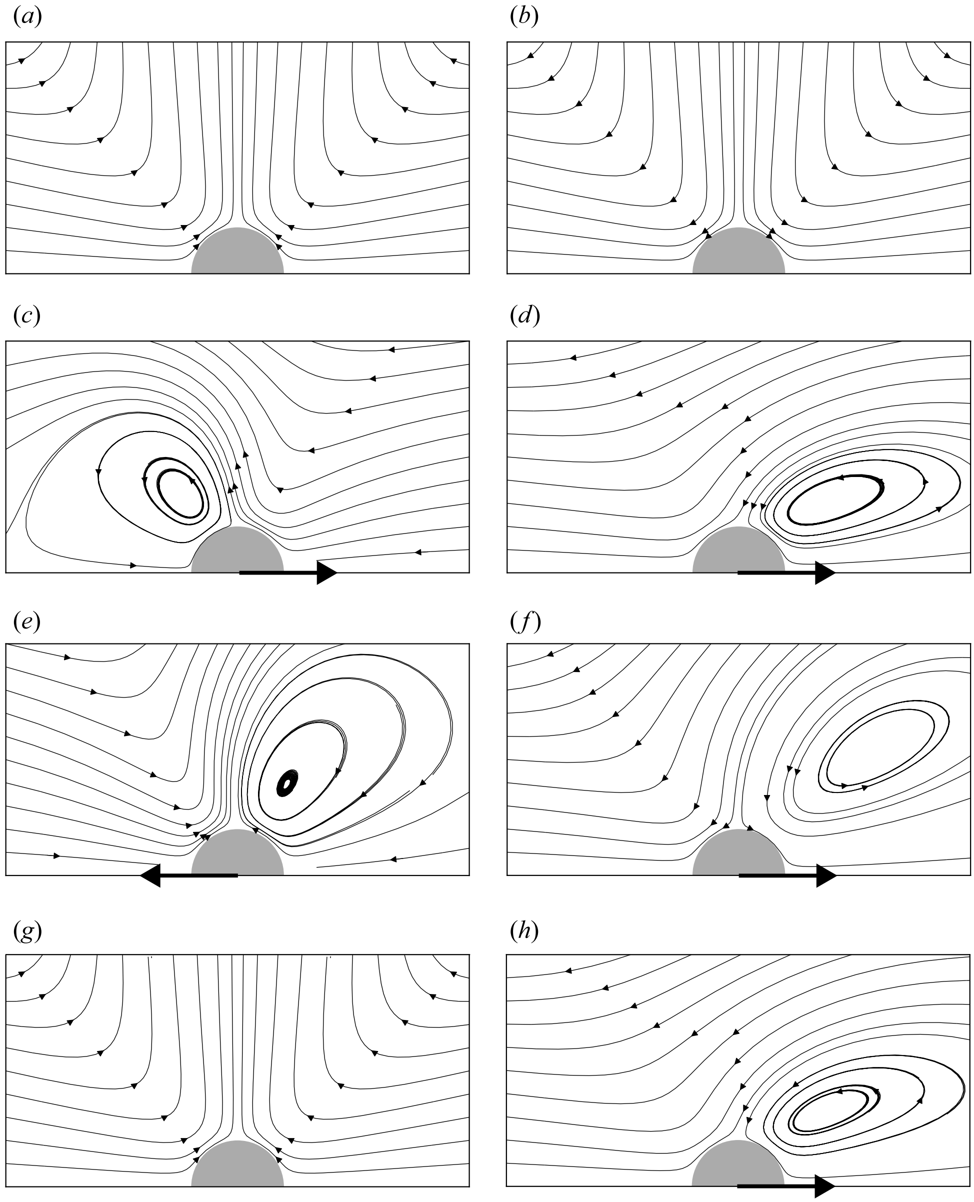

Figure 2. Time evolution of streamlines corresponding to time-dependent simulations as in figure 2 of Cobos *et al.* (2024), for $Re = 20$. The dipolar perturbation is maximum at $t = 0.5$ and negligible at the other times. The streamlines at $t = 100$ are indicative of the steady-state flow patterns. (*a*) Puller, $t = 0$; (*b*) pusher, $t = 0$; (*c*) puller, $t = 0.5$; (*d*) pusher, $t = 0.5$; (*e*) puller, $t = 2$; (*f*) pusher, $t = 2$; (*g*) puller, $t = 100$; (*h*) pusher, $t = 100$.

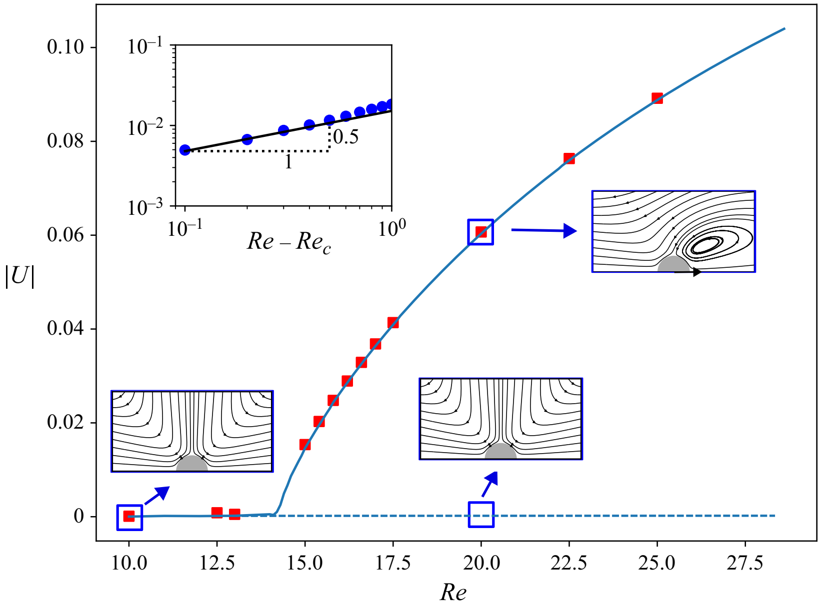

Figure 3. Steady swimming velocity U vs Re for a quadrupolar-pusher squirmer. Blue curves: steady-state computations employing a fore-aft asymmetric (solid) and symmetric (dashed) initial guess. Red squares: final velocity in the time-dependent simulations. The insets show the streamlines at the indicated Re and confirm the $|U| \propto (Re - Re_c)^{1/2}$ behaviour near the swimming threshold, which is canonical of a pitchfork bifurcation.

Reference

COBOS, R., KHAIR, A.S. & SCHNITZER, O. 2024 Spontaneous locomotion of a symmetric squirmer. *J. Fluid Mech.* **983**, R3.