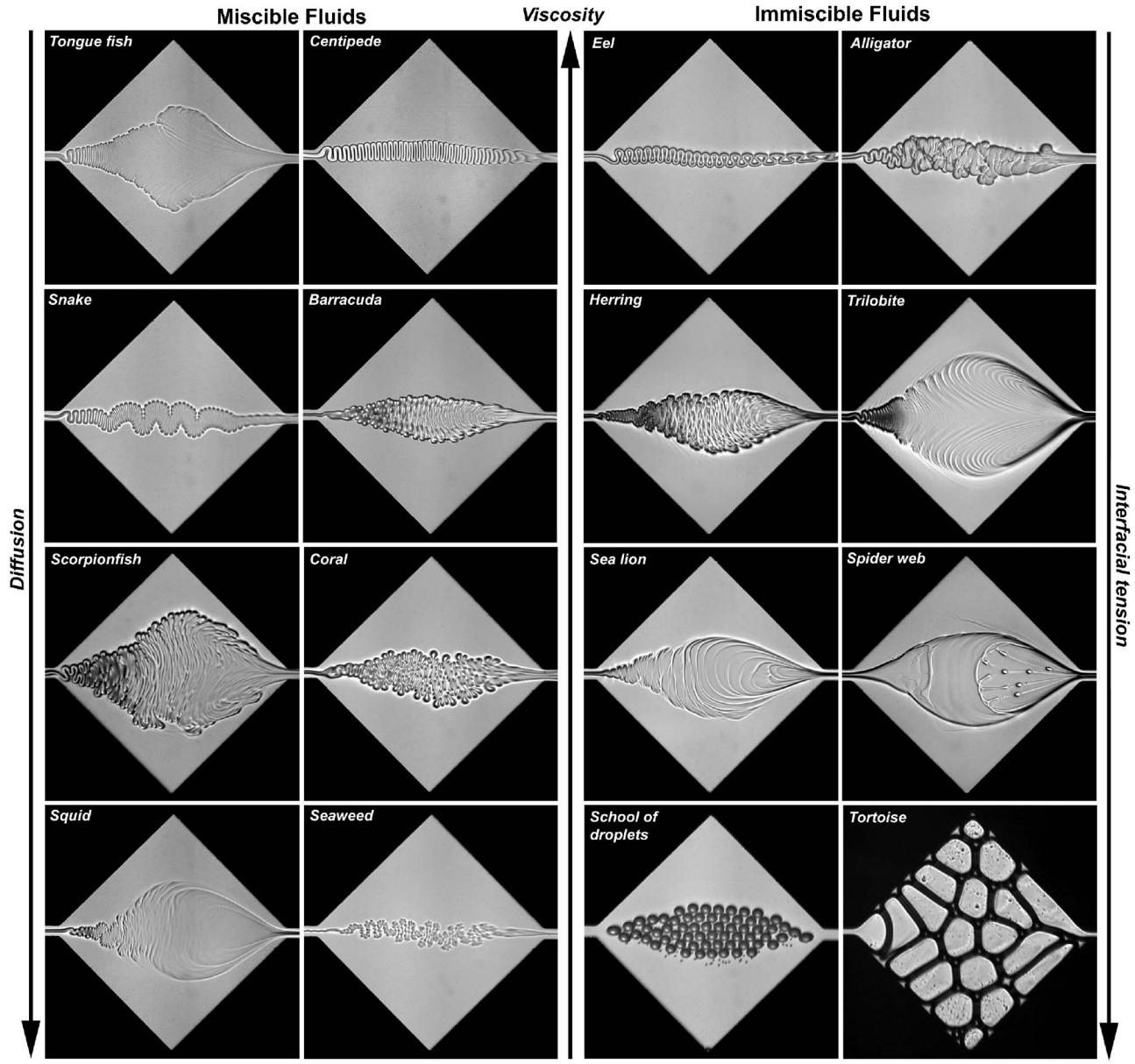

FIG. 1. Two-fluid flow morphologies in a slit diamond channel (height $h=100$ μm, width $w=2$ mm). Upstream (left side of each panel), fluids are injected into a square microchannel after hydrodynamic focusing in a cross channel with fluid L1 from the central channel and fluid L2 from the side channels. Fluids: silicone oils (polydimethylsiloxane, i.e., PDMS) with different viscosities η (in cP), isopropanol (I), mineral oil (M), water with SDS (W), and air (A). Miscible fluids (PDMS): Tongue fish, $\eta_1=4865$, $\eta_2=19$; centipede, $\eta_1=4865$, $\eta_2=9.35$; snake, $\eta_1=4865$, $\eta_2=9.35$; barracuda, $\eta_1=500$, $\eta_2=6$; scorpion fish, $\eta_1=500$, $\eta_2=0.82$; coral, $\eta_1=500$, $\eta_2=0.82$; squid, $\eta_1=500$, $\eta_2=0.5$; seaweed, $\eta_1=500$, $\eta_2=0.82$. Immiscible fluids: *Eel*, $\eta_1=4865$ (PDMS), $\eta_2=2.27$ (I); alligator, $\eta_1=500$ (PDMS), $\eta_2=2.27$ (I); herring, $\eta_1=143$ (M), $\eta_2=0.82$ (PDMS); trilobite, $\eta_1=143$ (M), $\eta_2=0.82$ (PDMS); sea lion, $\eta_1=50$ (PDMS), $\eta_2=2.27$ (I); spider web, $\eta_1=143$ (M), $\eta_2=9.35$ (PDMS); school of droplets, $\eta_1=9.35$ (PDMS), $\eta_2=1$ (W); tortoise, $\eta_1=0.018$ (A), $\eta_2=1$ (W).

A microfluidic aquarium

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A visual map of two-fluid flows in a diamond-shaped diverging-converging slit microchannel is presented. The pictures in Fig. 1 are positioned on the diagram to show the influence of the fluid properties on the microflow morphologies. The channel's diamond shape provides an experimental framework for investigating the interplay between various physicochemical phenomena (mixing, coalescence, and wetting) and mechanical effects (buckling and lubrication). The symmetric channel provides a means for examining the degree of reversibility of two-fluid Stokes flows. To help identify the complex shapes, we use primarily aquatic animal names.

