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High speed metachronal swimming by the peacock mantis shrimp. KUVVAT GARAYEV, DAVID MURPHY, University of South Florida — Metachronal rowing is a common swimming technique among organisms with multiple swimming legs in which posterior legs stroke first and are sequentially followed by anterior neighbors. Metachronal rowing leg kinematics have been previously measured for a wide range of swimming speeds, but flow fields near the appendages of freely swimming animals have only been measured for hovering or slowly swimming animals. Here we present time-resolved 2D PIV measurements of the flow generated by a peacock mantis shrimp swimming at speeds of 0.2-1.9 m/s, and advance ratios of 1.1-2.6. Measurements are acquired in sagittal, near-frontal, and transverse planes on an animal with body and pleopod lengths of 114 mm and 15 mm, respectively. Measurements in the animal's sagittal plane show that each stroking pleopod pair creates a vortex which is advected backwards. At these high advance ratios, the vortex created by the anteriormost pleopod pair interacts with and is strengthened by the power stroke of the posteriormost pleopod pair. Flow measurements in the near-frontal plane show a jet of counter-rotating vortices resembling a reverse von Karman vortex street in the animal's wake. Counter-rotating vortex pairs are also seen in the animal's wake in the transverse plane.

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