

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Spatial organization and Synchronization in collective swimming of *Hemigrammus bleheri* BENJAMIN THIRIA, RAMIRO GODOY-DIANA, INTESAAF ASHRAF, TUNG HA THANH, HANAE BRADSHAW, PMMH-ESPCI, FLYING SWIMMING GROUP ESPCI TEAM — In this work, we study the collective swimming of *Hemigrammus bleheri* fish using experiments in a shallow swimming channel. We use high-speed video recordings to track the midline kinematics and the spatial organization of fish pairs and triads. Synchronizations are characterized by observance of "out of phase" and "in phase" configurations. We show that the synchronization state is highly correlated to swimming speed. The increase in synchronization led to efficient swimming based on Strouhal number. In case of fish pairs, the collective swimming is 2D and the spatial organization is characterized by two characteristic lengths: the lateral and longitudinal separation distances between fish pairs. For fish triads, different swimming patterns or configurations are observed having three dimensional structures. We performed 3D kinematic analysis by employing 3D reconstruction using the Direct Linear Transformation (DLT). We show that fish still keep their nearest neighbor distance (NND) constant irrespective of swimming speeds and configuration. We also point out characteristic angles between neighbors, hence imposing preferred patterns. At last we will give some perspectives on spatial organization for larger population.

Benjamin Thiria
PMMH-ESPCI

Date submitted: 25 Oct 2016

Electronic form version 1.4