

# Assessing sperm quality and competition for paternity success in Delta Smelt (*Hypomesus transpacificus*)

Md. Moshir Rahman<sup>1\*</sup>, Tien-Chieh Hung<sup>1</sup>, Mary E. Badger<sup>2</sup>, Amanda J. Finger<sup>2</sup>, Evan W. Carson<sup>3</sup>

<sup>1</sup> University of California, Davis, Department of Biological and Agricultural Engineering, Fish Conservation and Culture Laboratory, One Shields Ave, Davis, CA 95616

<sup>2</sup> University of California, Davis, Department of Animal Science, Genomic Variation Laboratory; One Shields Ave, Davis, CA 95616

<sup>3</sup> U.S. Fish and Wildlife Service, San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814; \*Correspondence: momrahman@ucdavis.edu

## METHODS

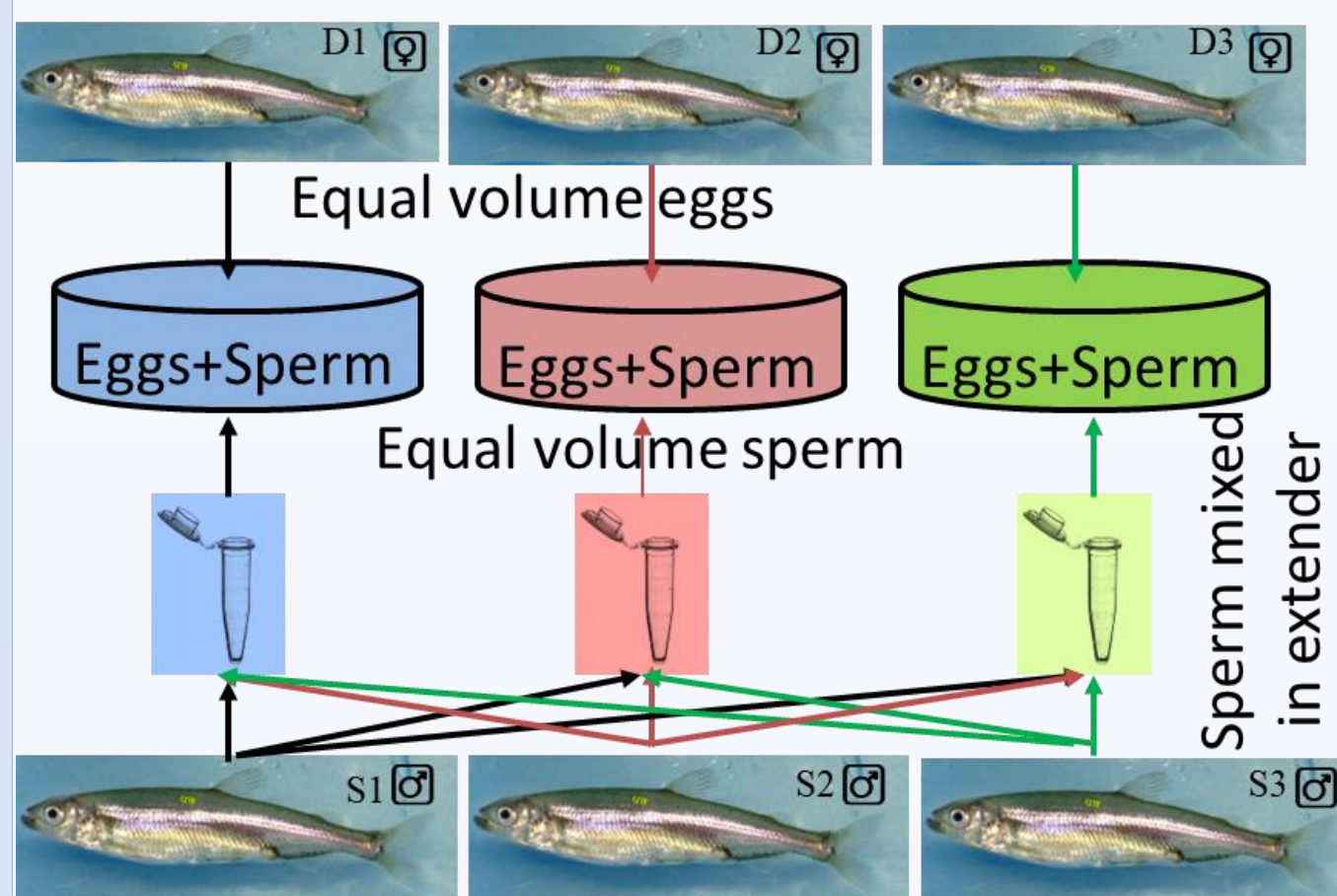


Fig. 1. 3x3 factorial breeding experiment (N=5).

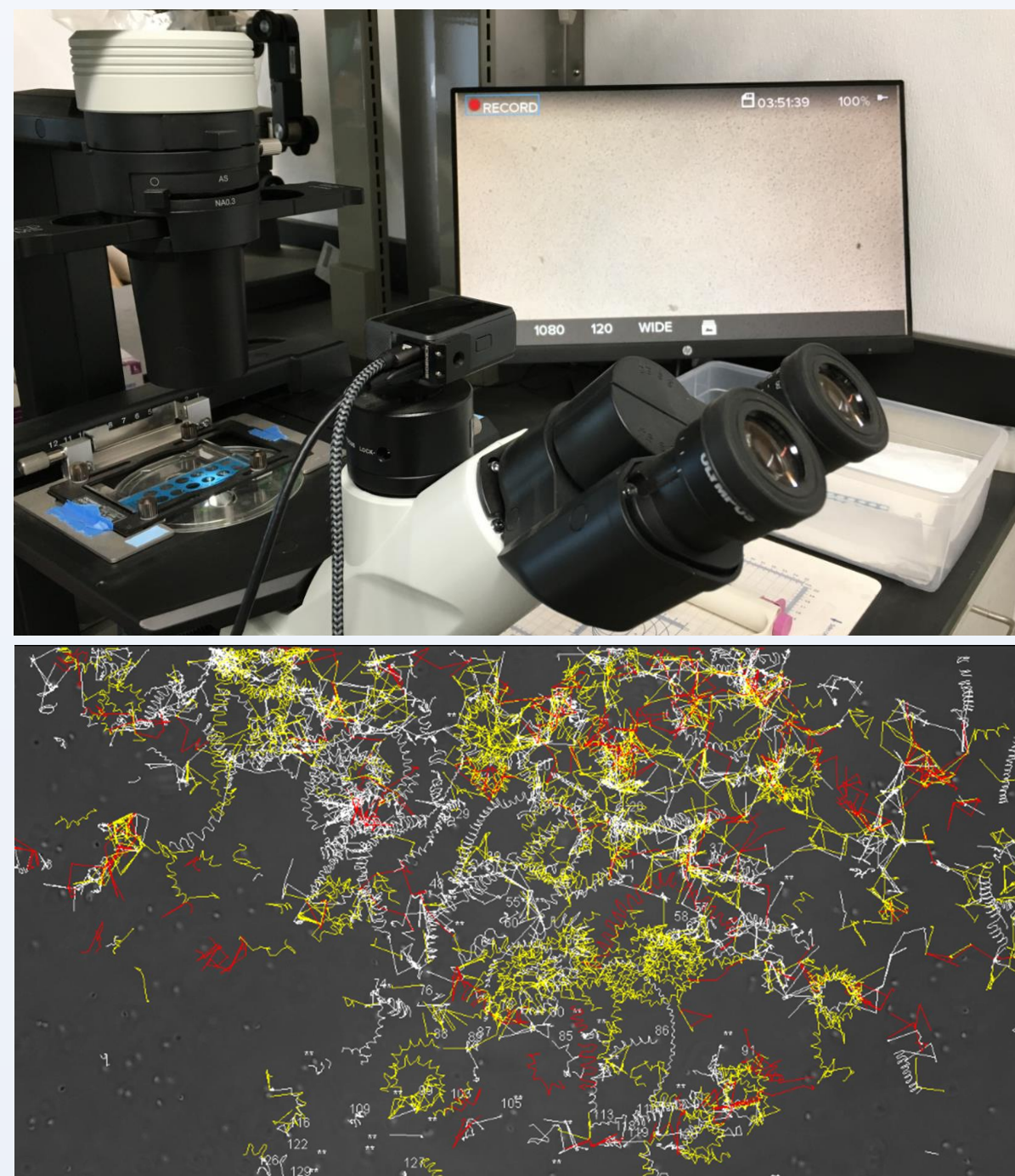


Fig. 2. Sperm tracking using GoPro video and OpenCASA. Red tracks indicate sperm movement that exceeds the motility threshold.

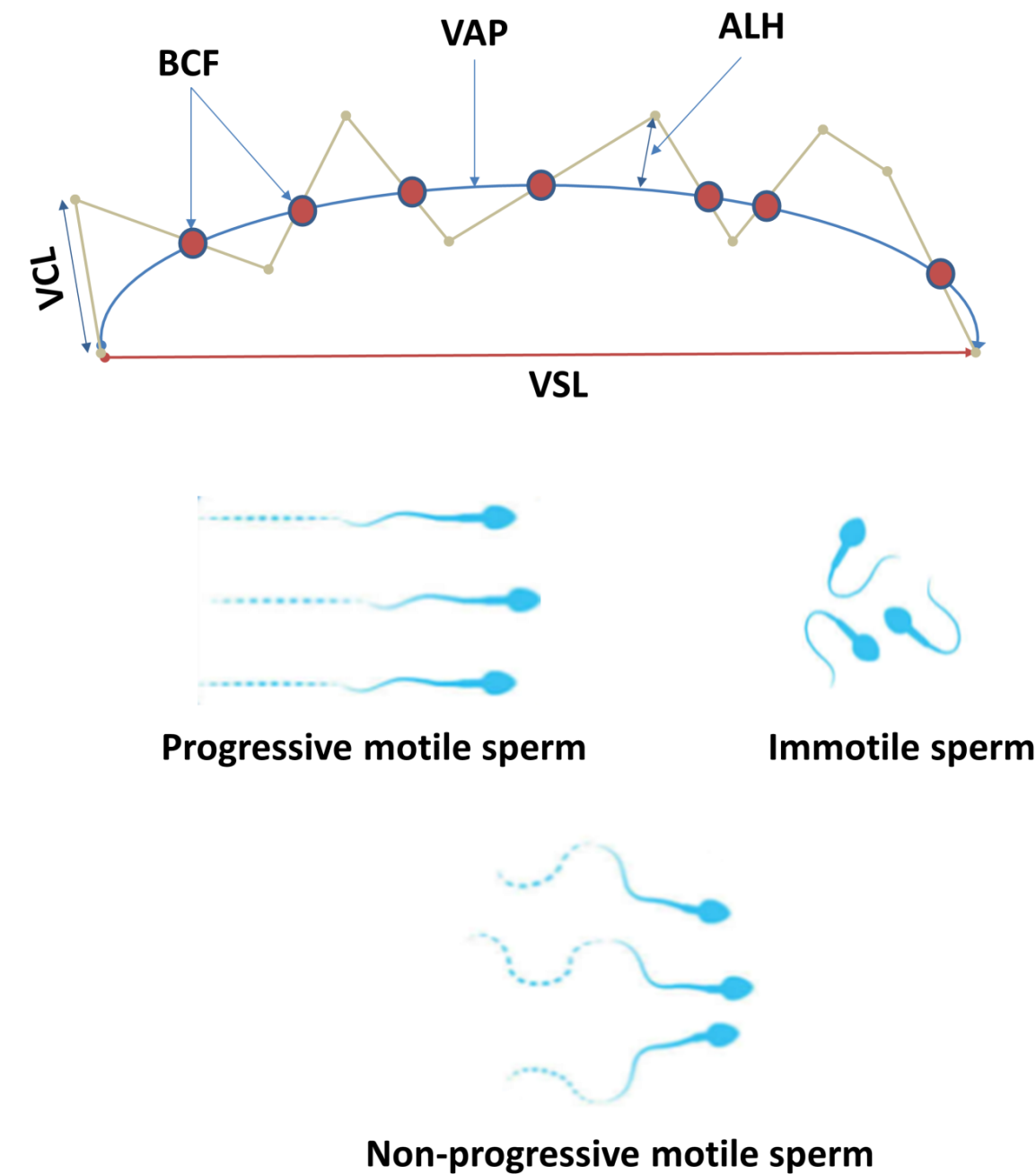


Fig. 3. Sperm traits assessed by OpenCASA.

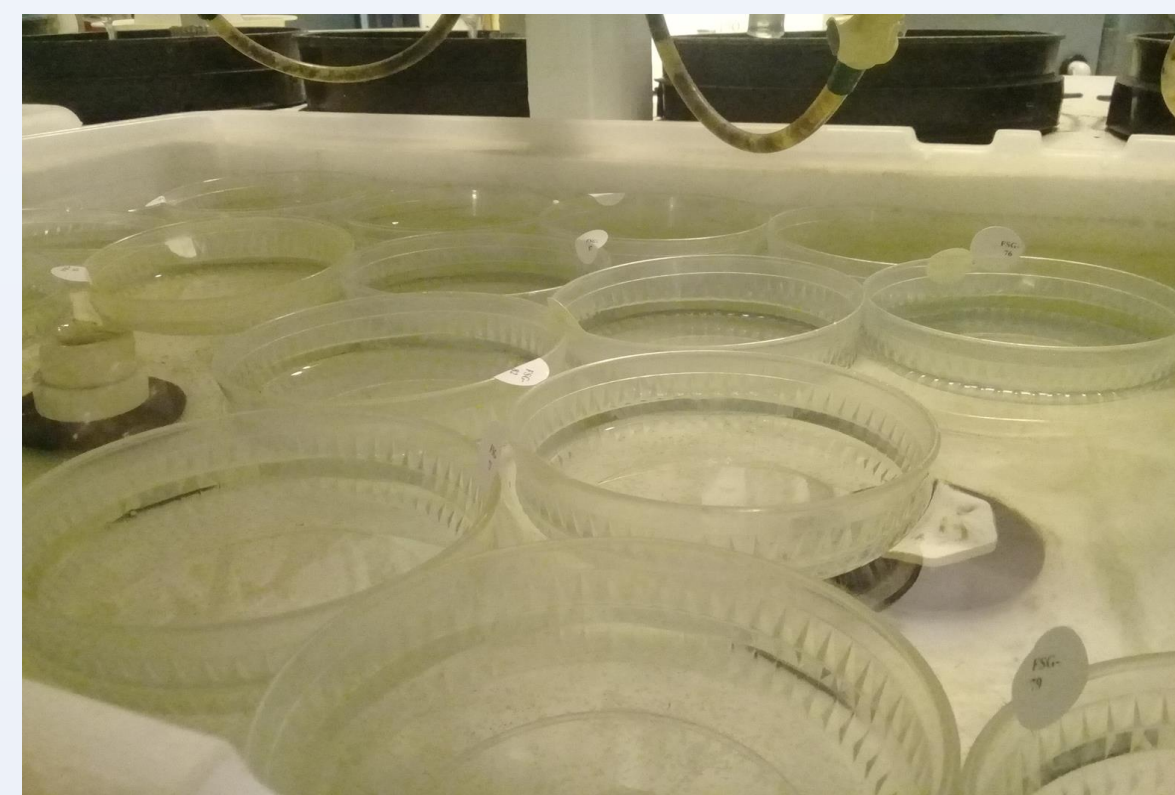


Fig. 4. Incubation of fertilized eggs.

## RESULTS

- All sperm traits (n=15) were significantly positively correlated.
- Relationships between sperm quality and fertilization rate were significantly positive.
- It is predicted from a preliminary analysis (n=2 families) that paternity success will correlate positively with sperm quality.

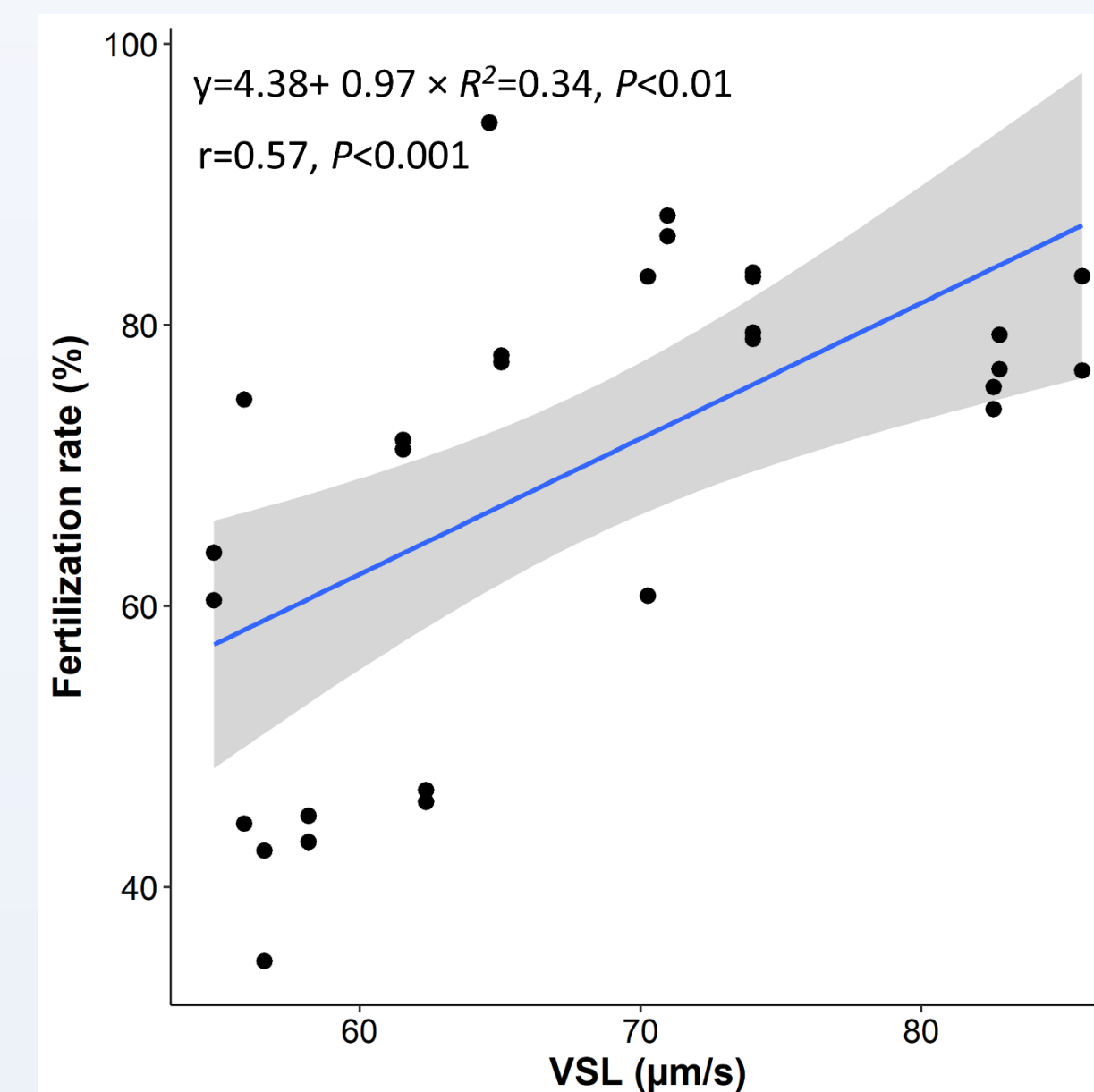


Fig. 5. Relationships between fertilization rate (%) and straight-line velocity, VSL (μm/s)

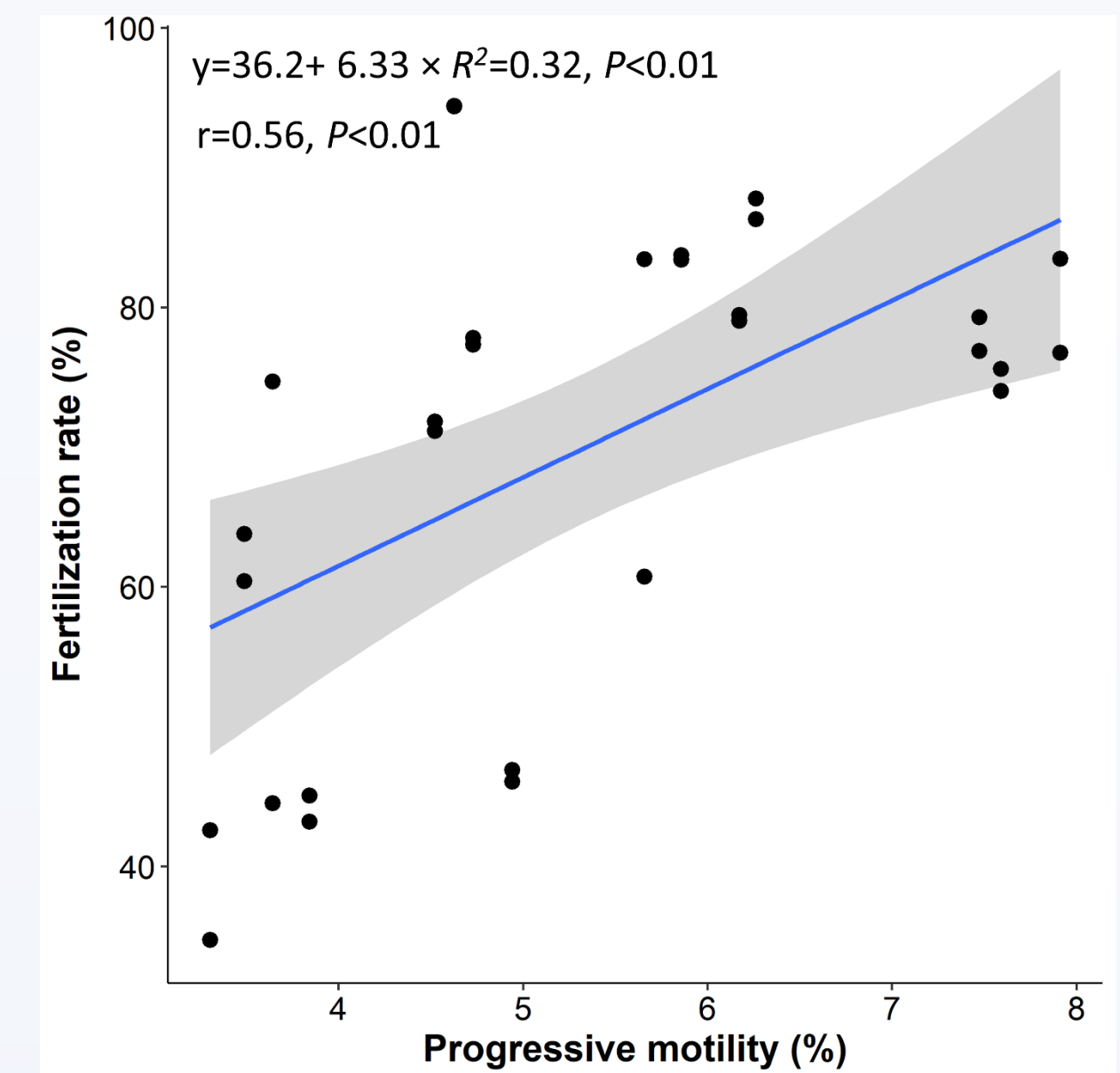


Fig. 6. Relationships between fertilization rate (%) and progressive motility (%).

## CONCLUSION

Our study demonstrates that reproductive outcomes of Delta Smelt can differ significantly depending on sperm quality and competition. This contribution will facilitate identification of a spawning strategy to 1) support production and conservation genetic requirements for Delta Smelt supplementation and 2) facilitate increased larval production for associated conservation purposes.

This study was informed by two other studies at the IEP. Use the QR code to visit them now!

