



# **Biomimetic Robotic Fishes**

*presented by*

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School of Mechanical and Aerospace Engineering

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Taegue, Korea



# Research Team Members

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**Dr. Gerald Seet (MAE)**

**Dr. Chen I-Ming (MAE)**

**Ms. Poea Hui Fong**

**Mr. Christian Eigenmann**



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- Future Applications & Conclusion

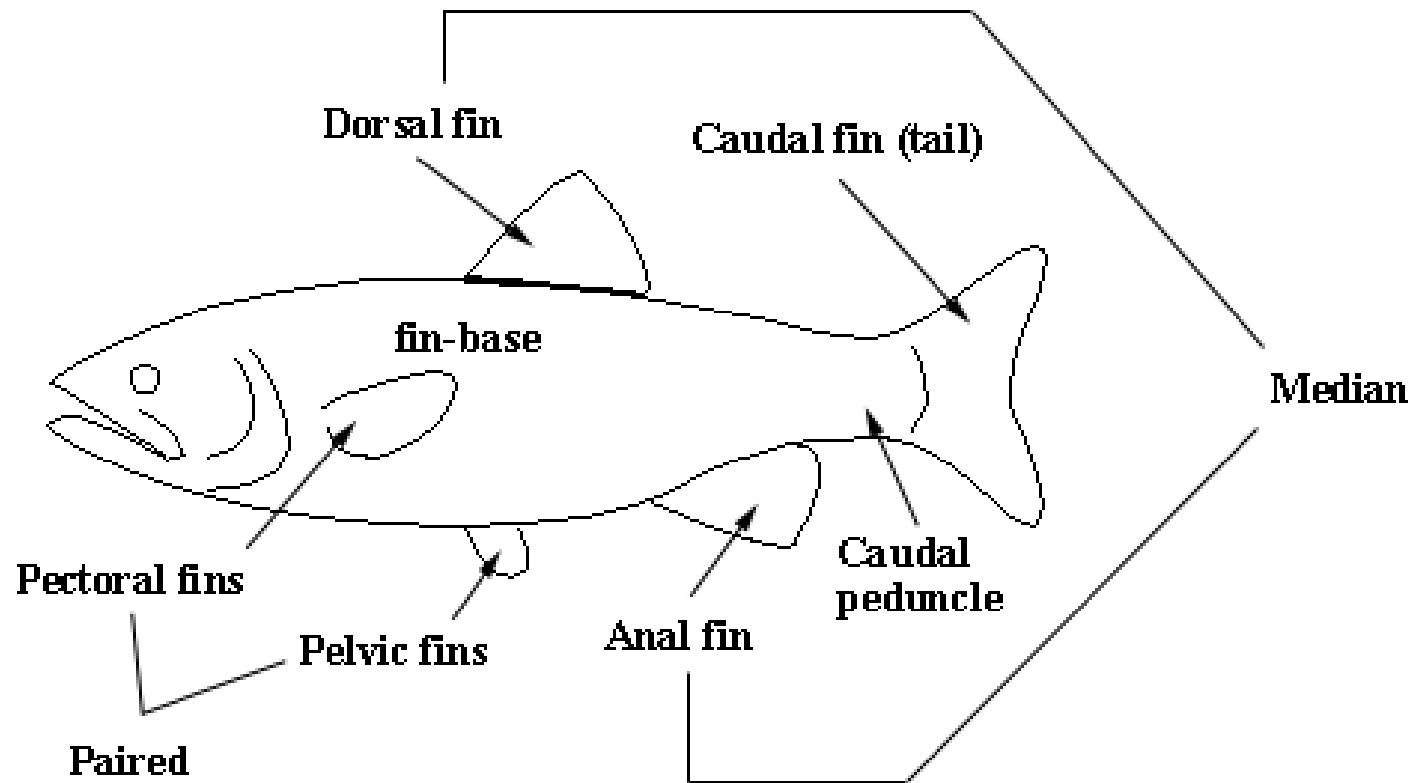


# Introduction

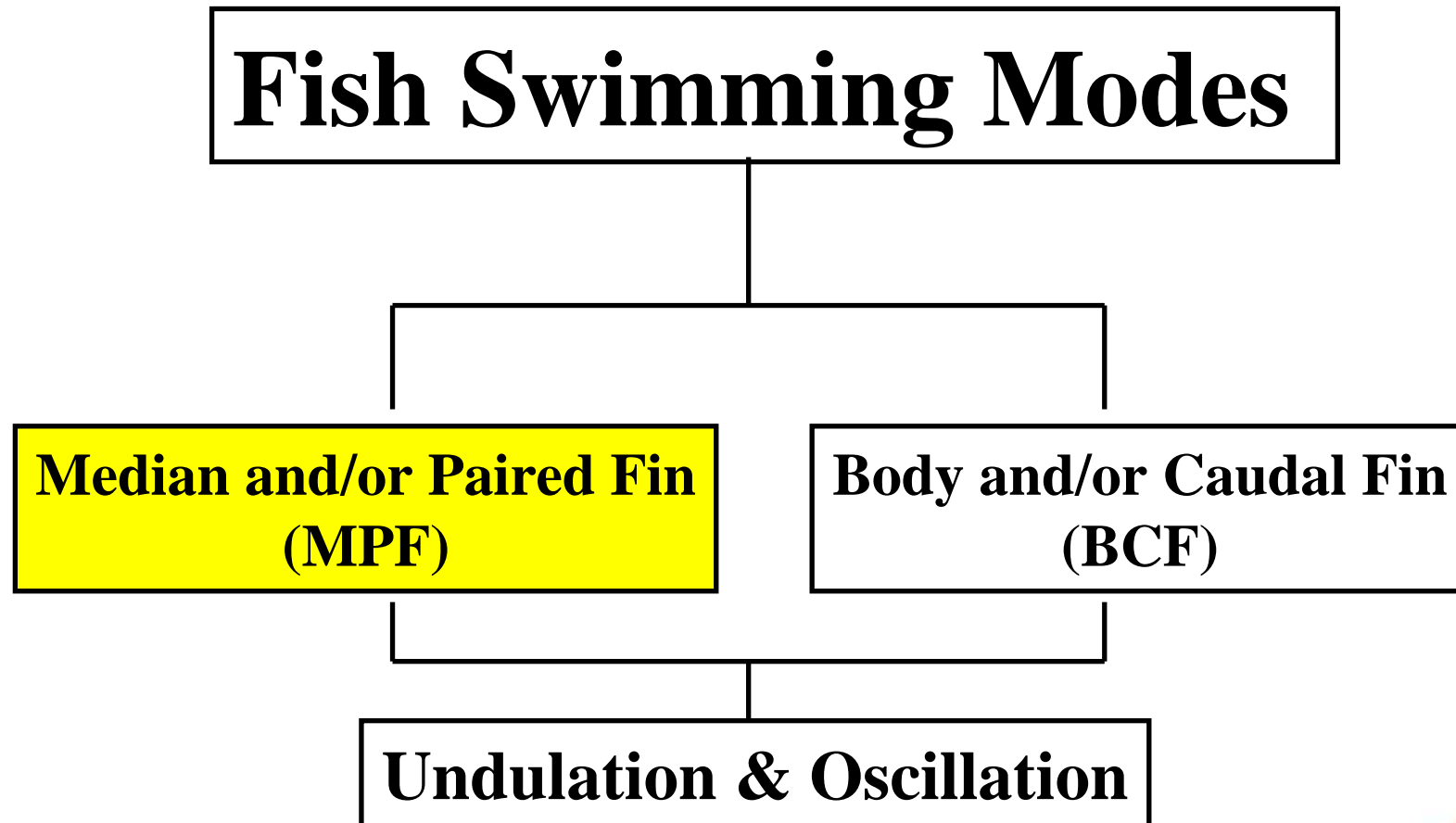
- Trend towards biomimetic robot; to learn from *nature*
- Simulate earth's greatest examples of success, living organisms
- An alternative solution for underwater vehicles - less *noise & pollution*
- Function better in the real world



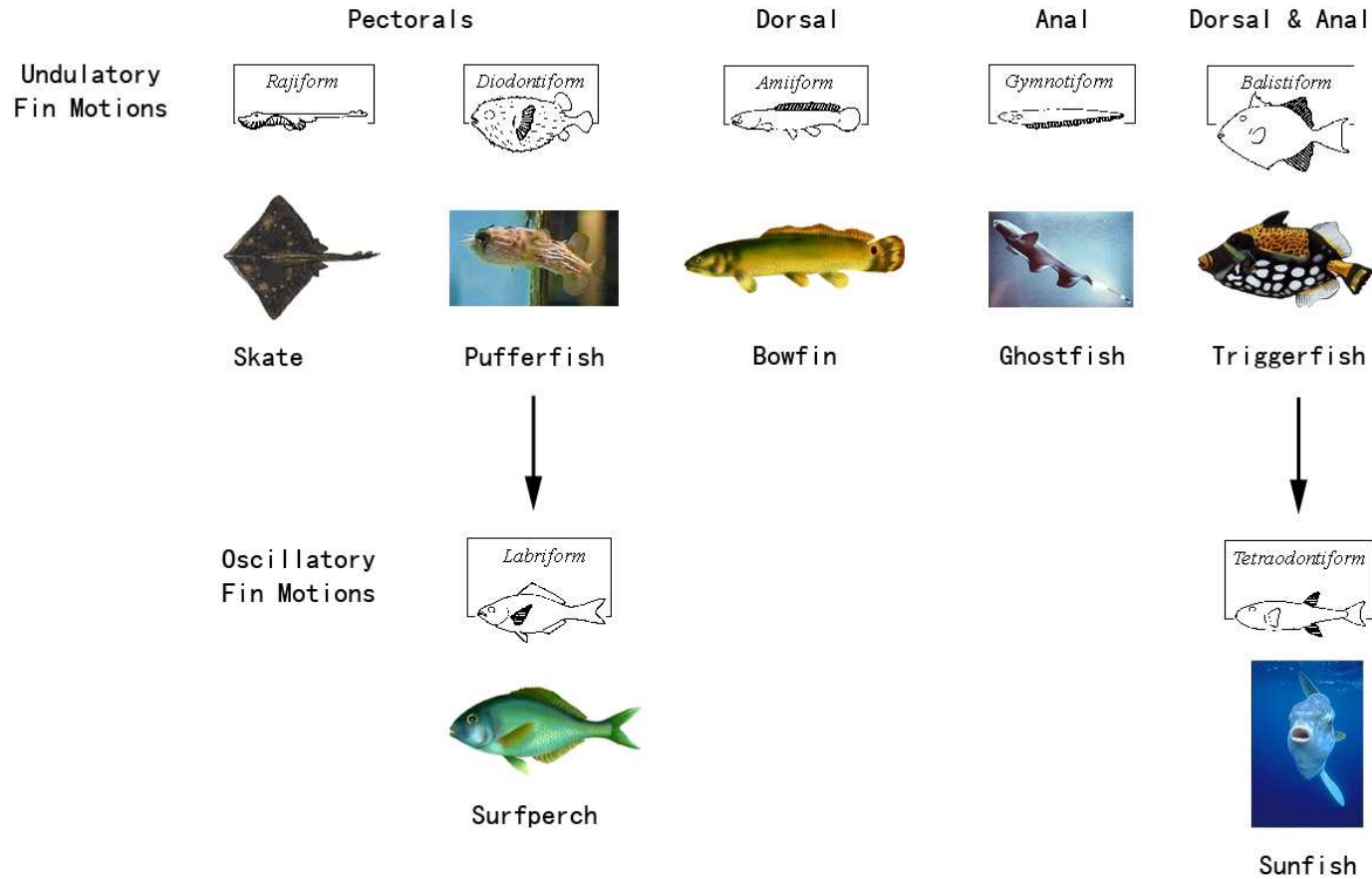
# Fish Morphology



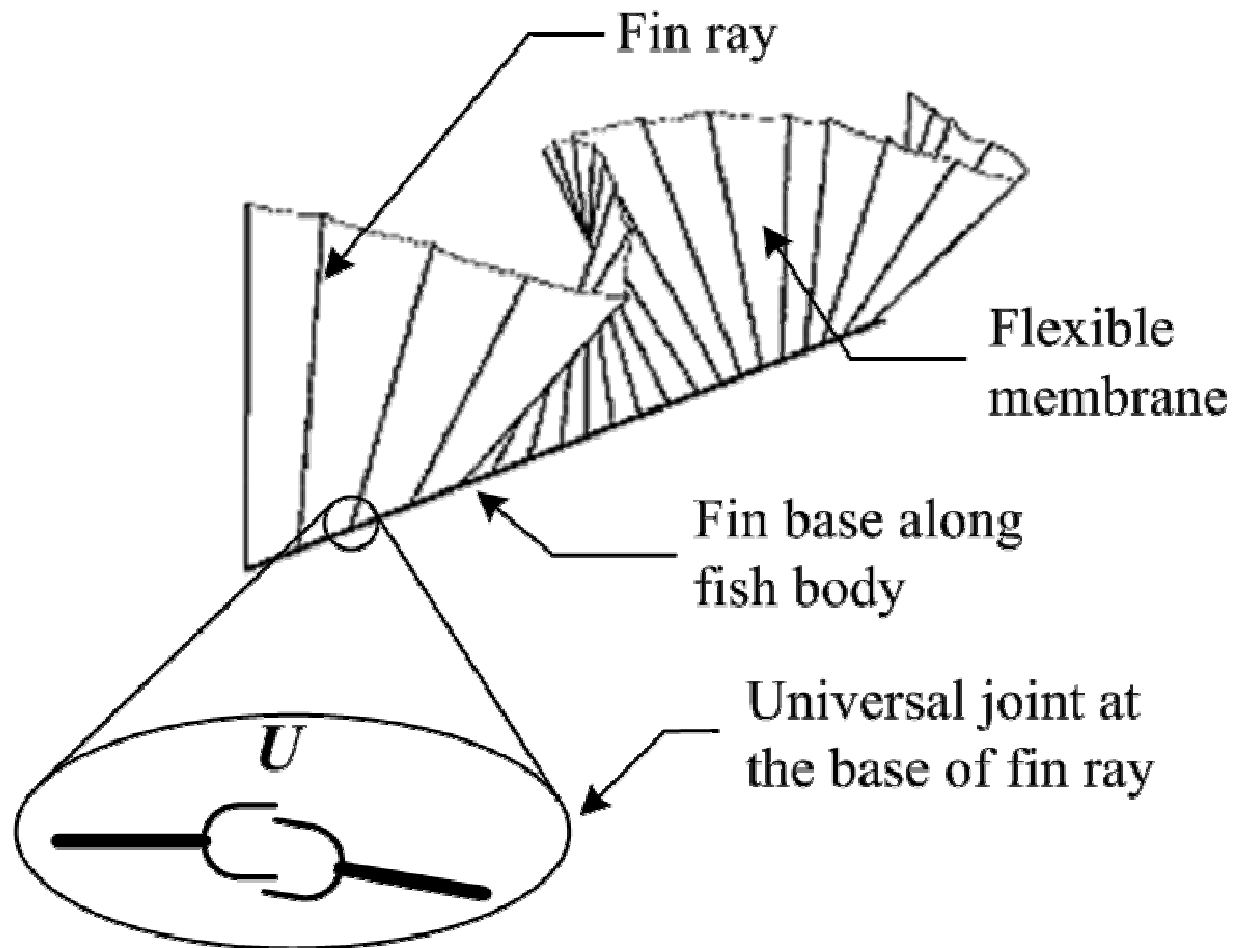
# Fish Swimming Modes



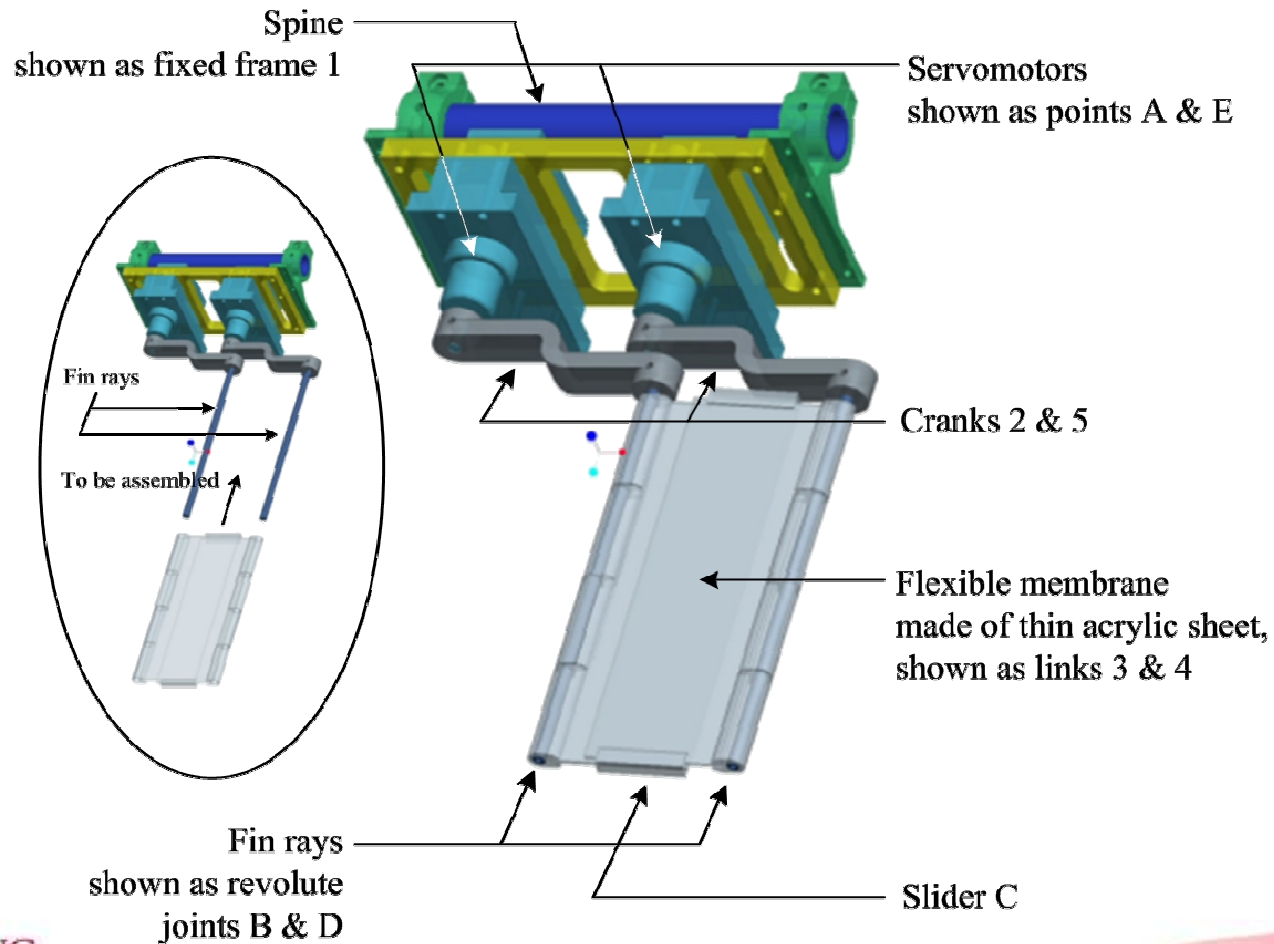
# Median Paired Fin (MPF) Swimming Mode



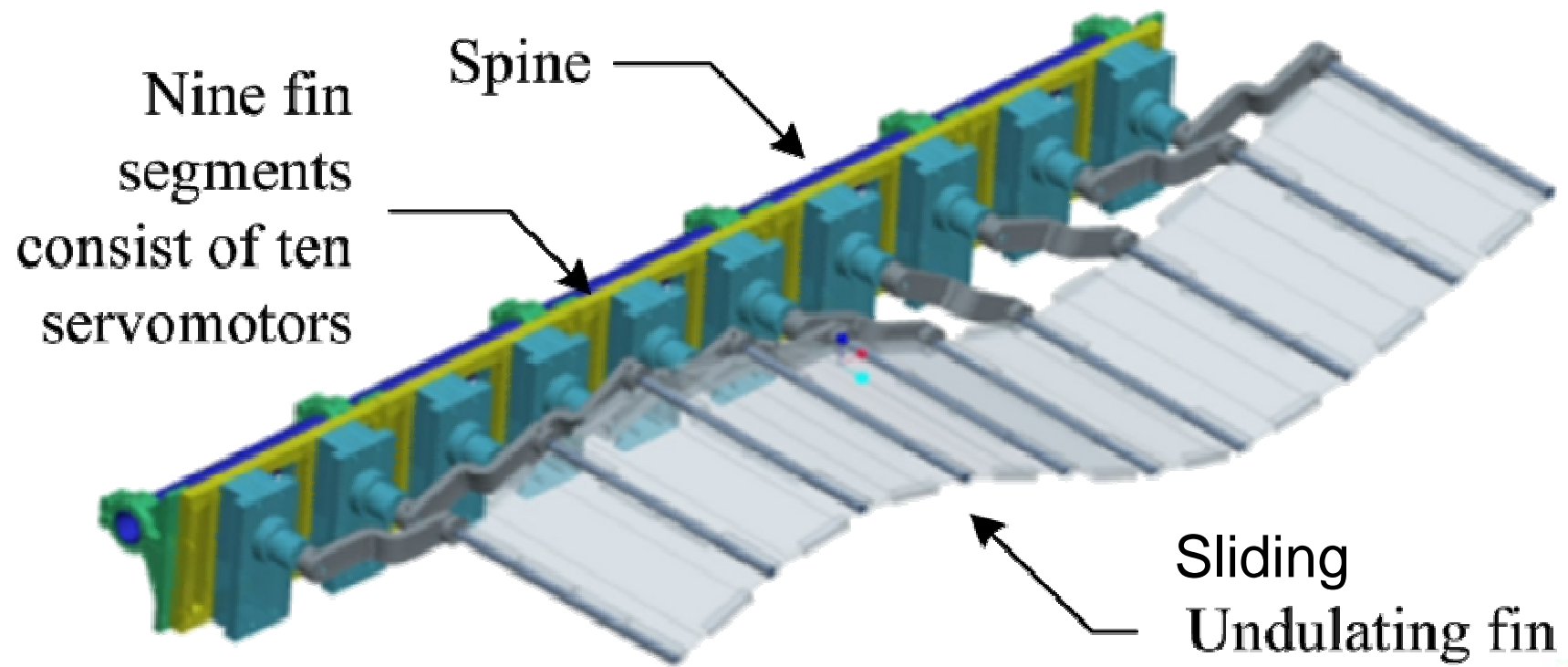
# Modeling of Mechanical Fin



# Median Fin Design



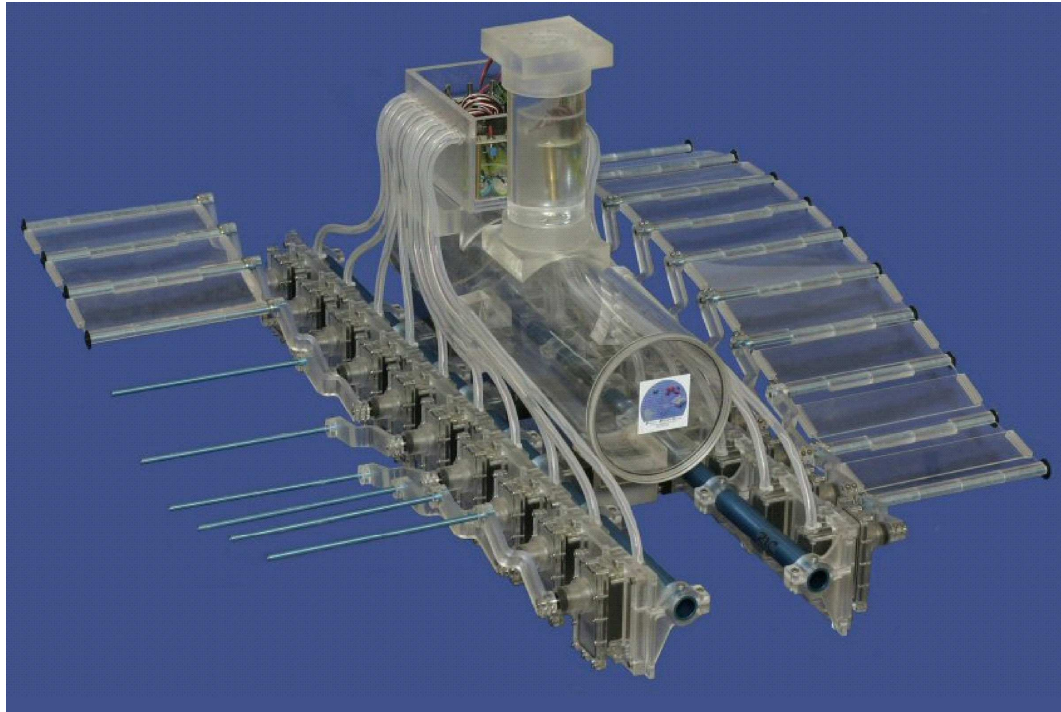
# CAD Model



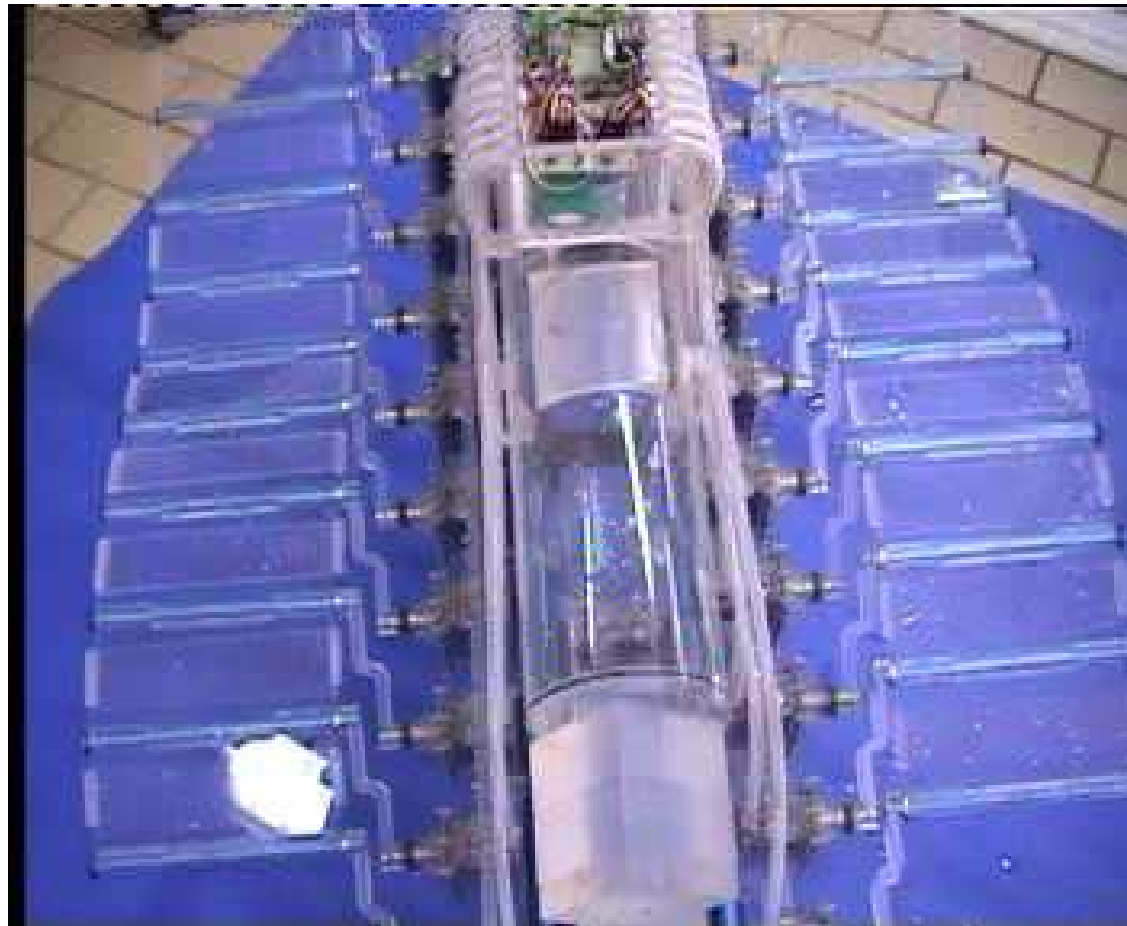
# Stingray



# Stingray Robot



# Undulatory Fin Motion



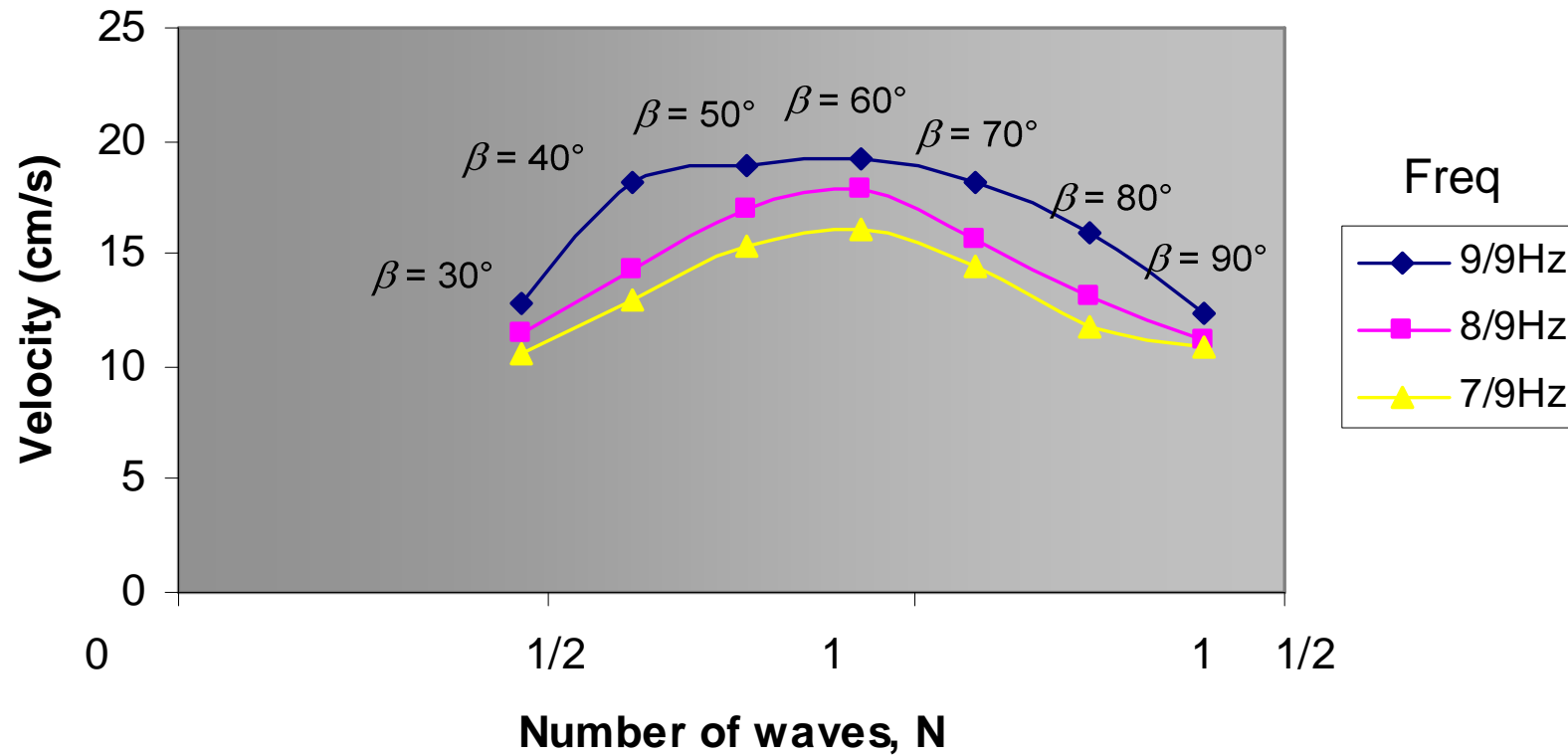
# Quiet and Environmental Friendly Propulsor



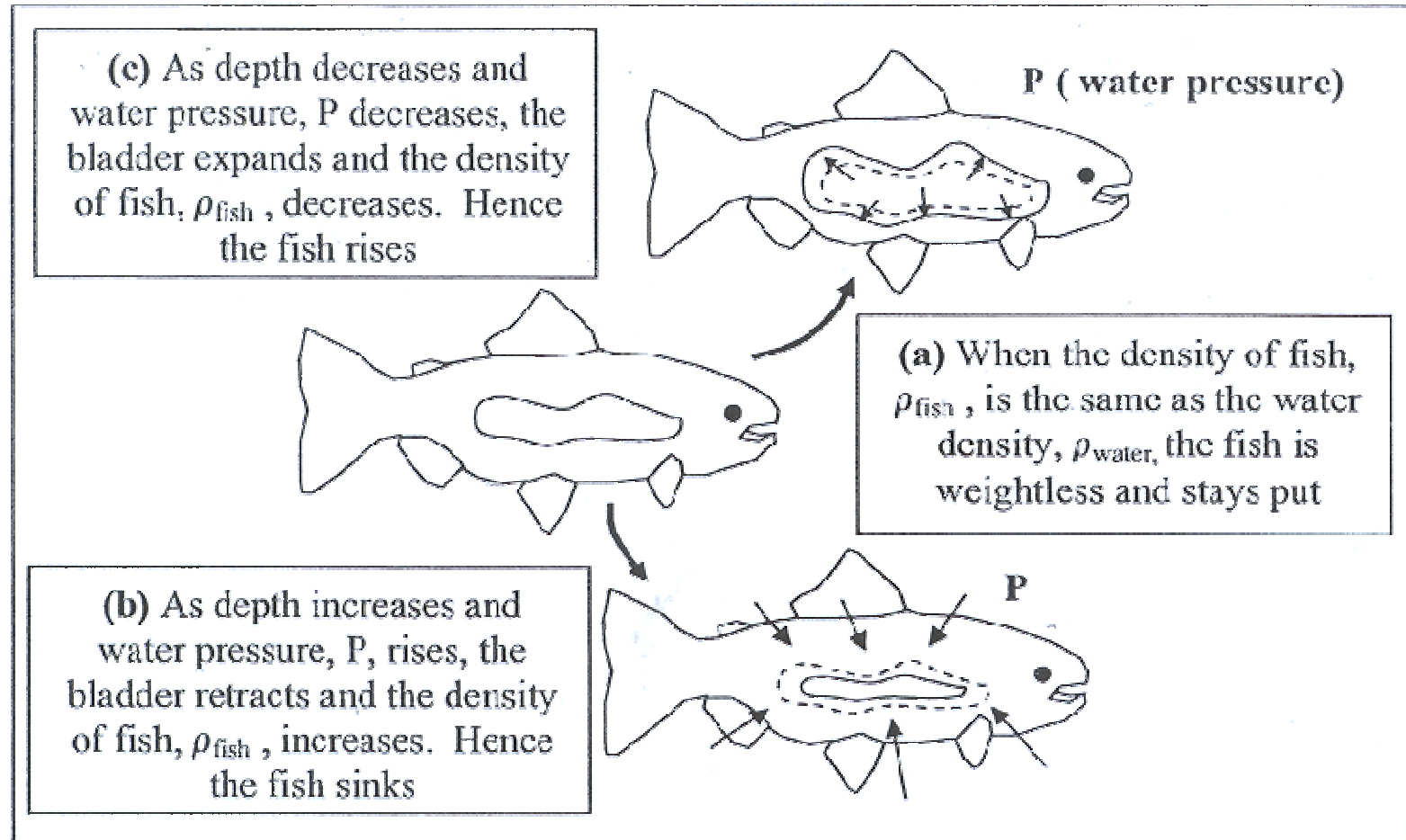
# Stingray Robot – Swimming Pool Test



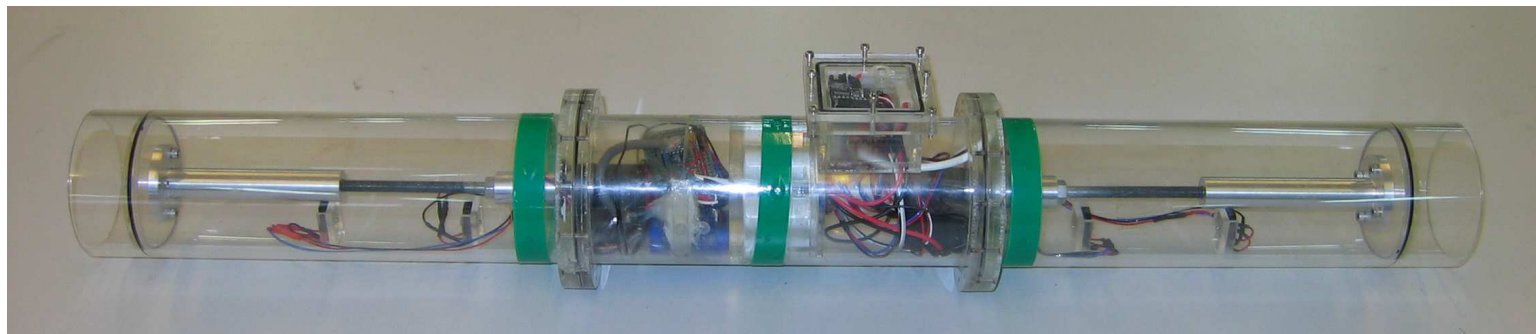
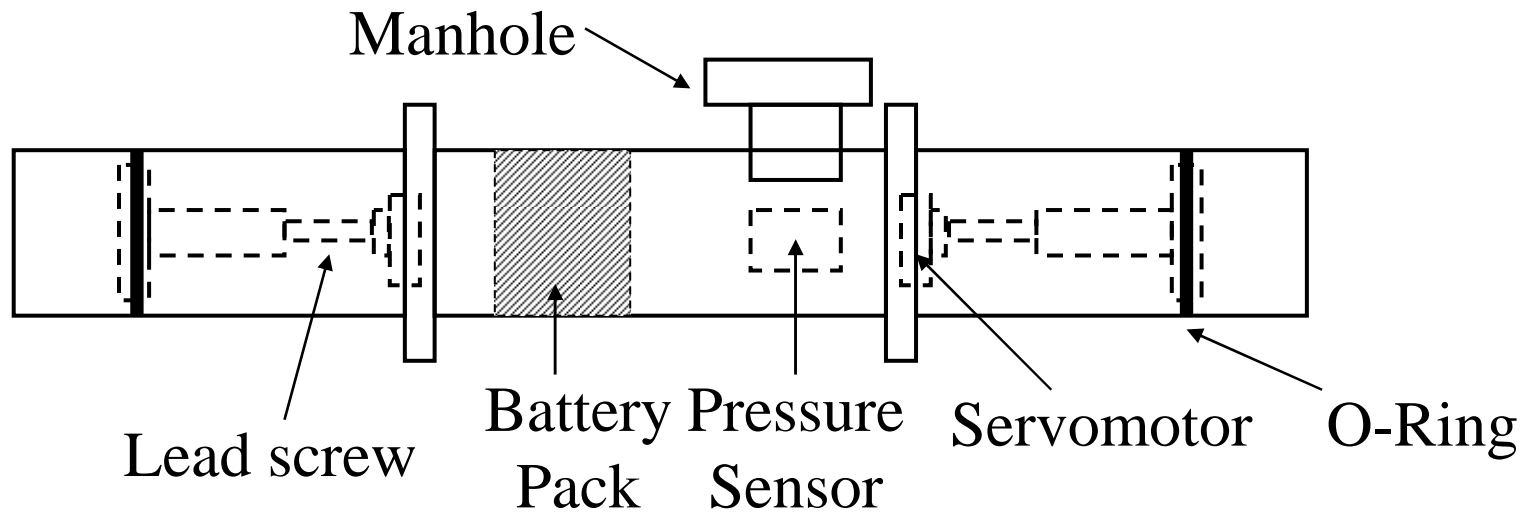
# Experimental Results (Swimming Efficiency)



# Buoyancy Control in Fish

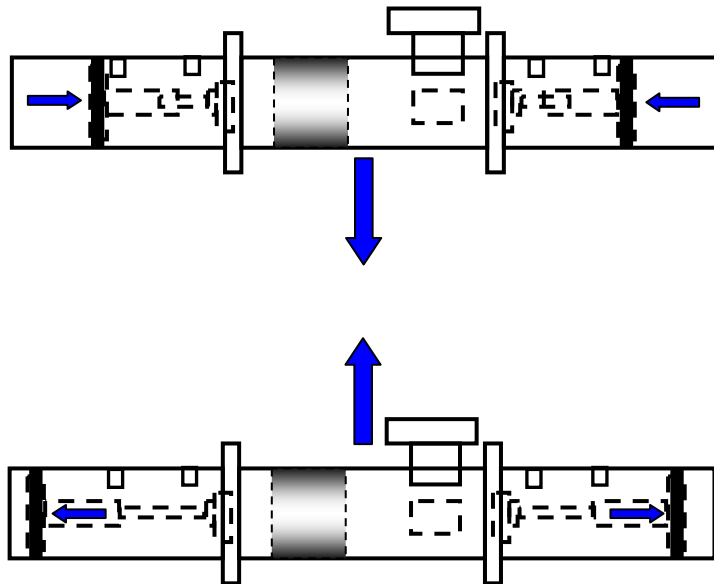


# Buoyancy Tank - Design

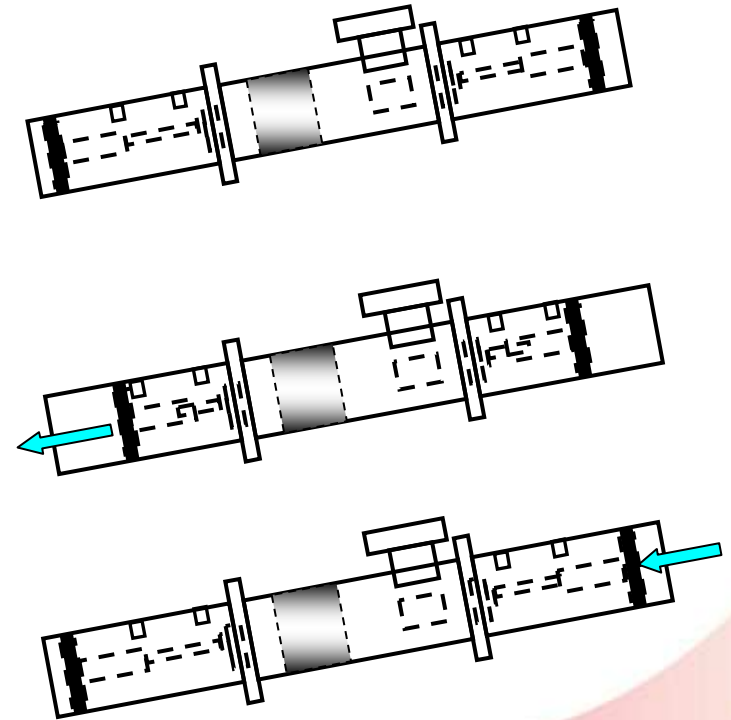


# Buoyancy Tank – Operating Principal

Depth Control Operation



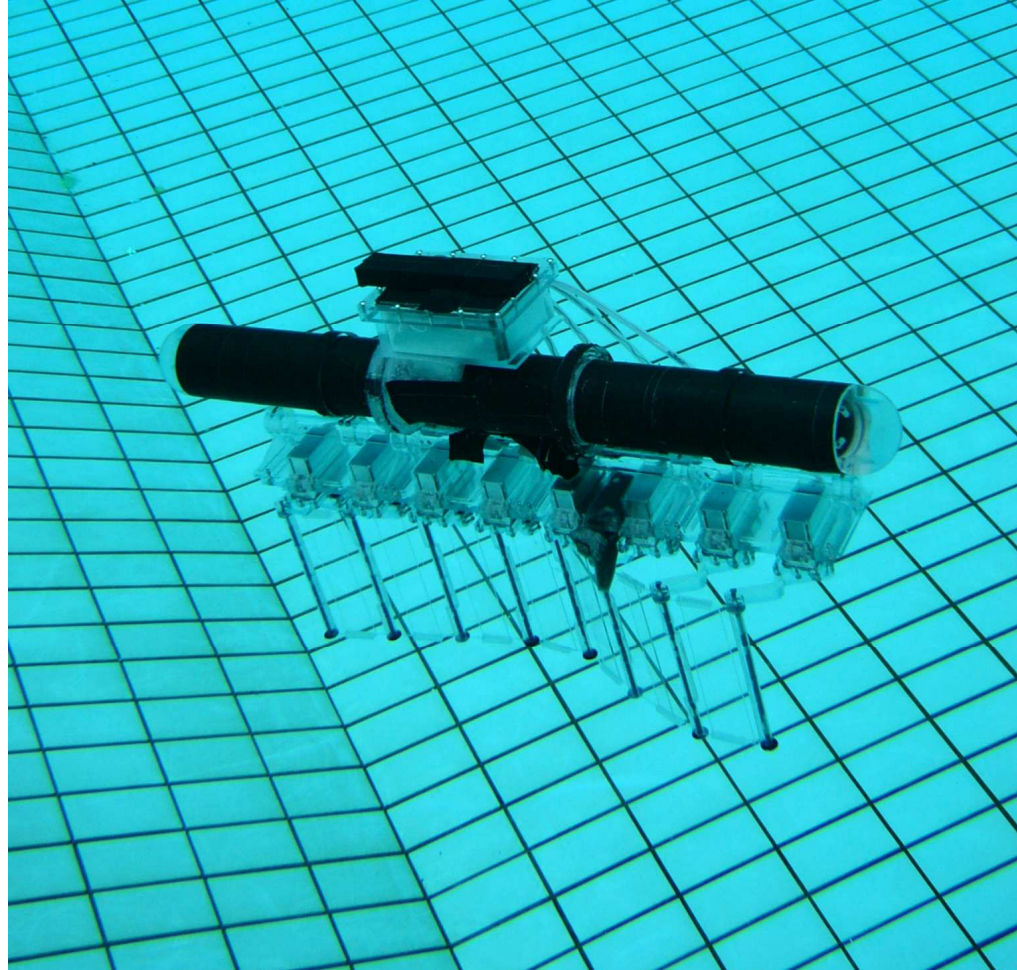
Tilt Control Operation



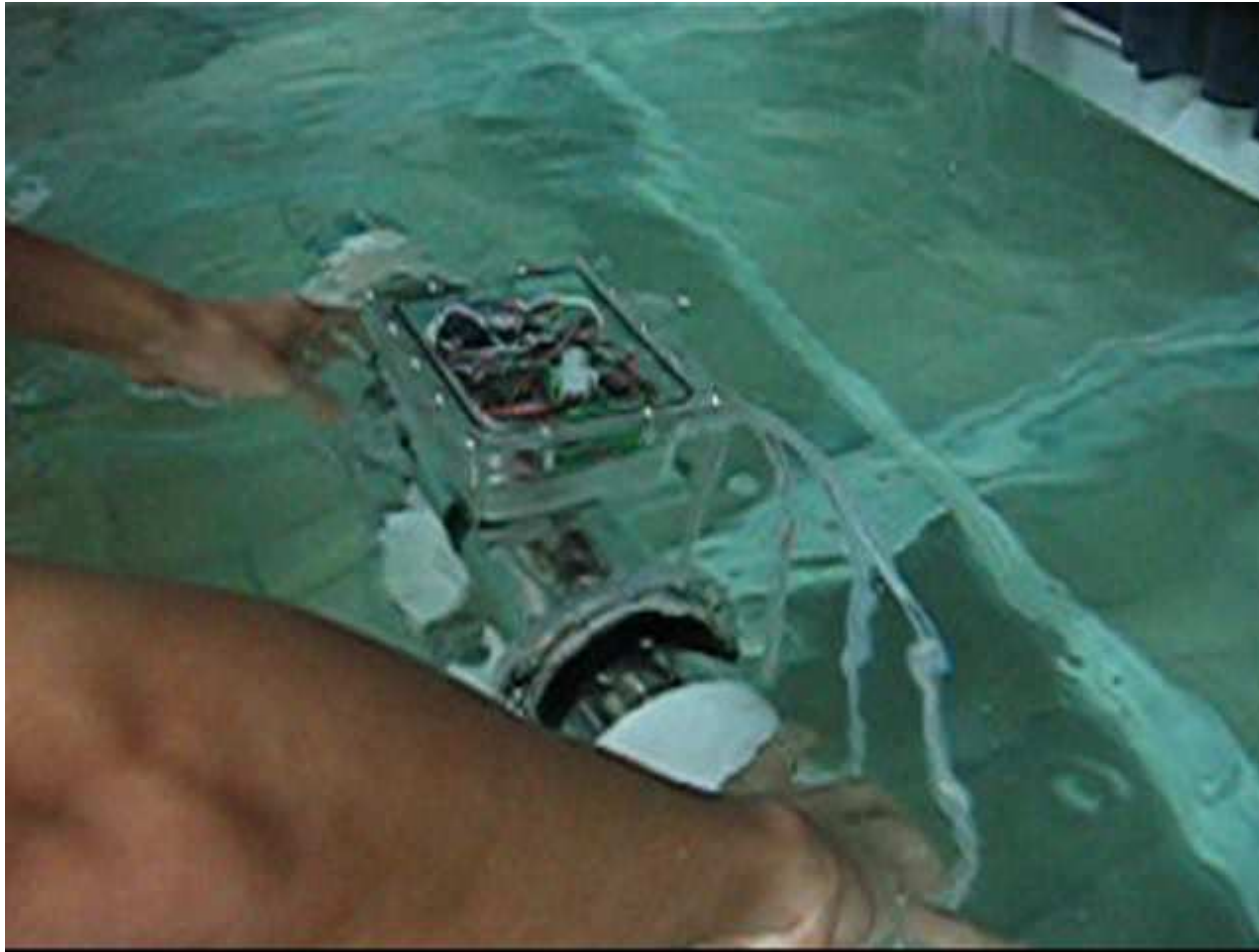
# Black Ghost Knife-fish



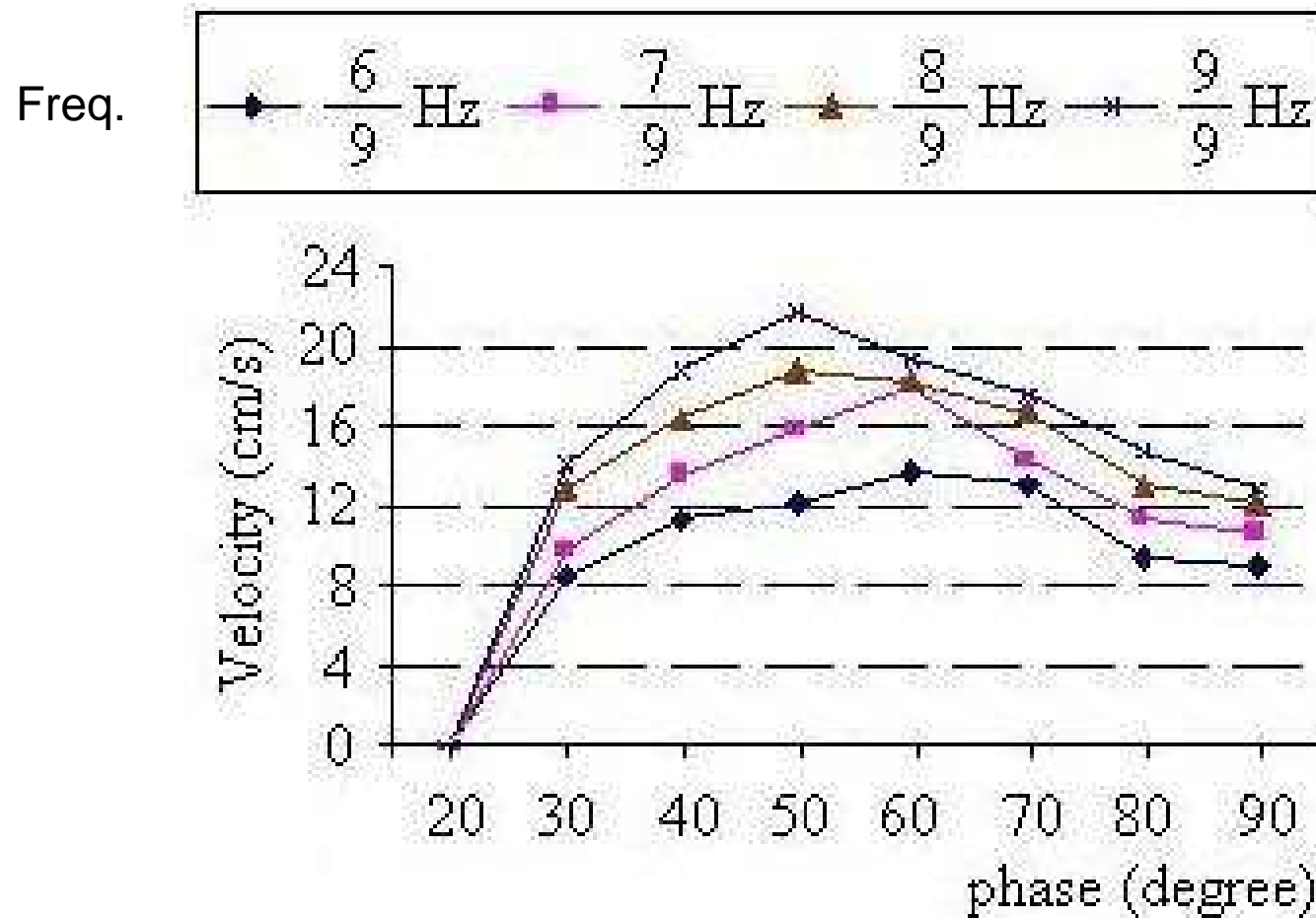
# Knifefish Robot



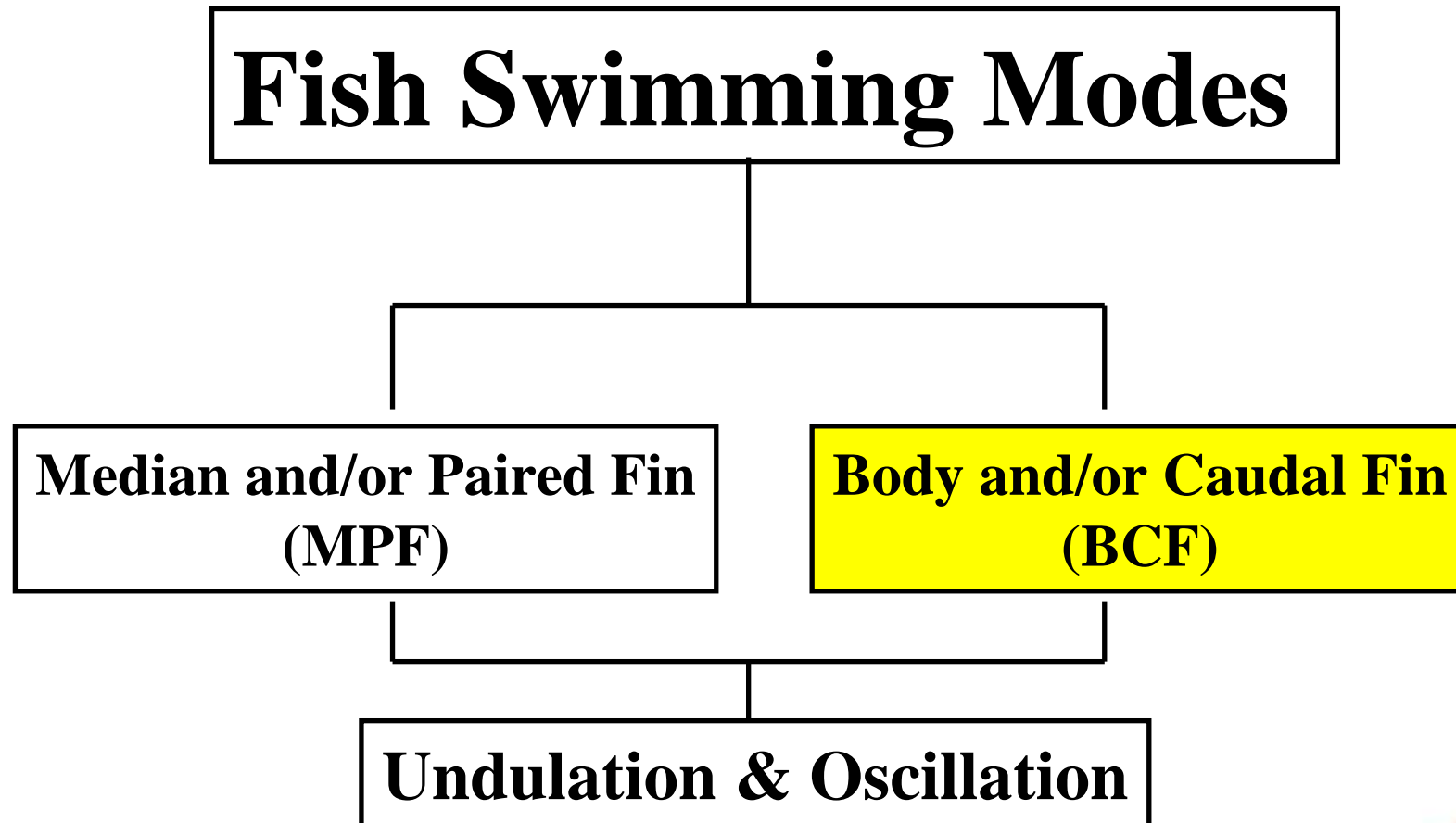
# Knifefish Robot – Lab and Swimming Pool Test



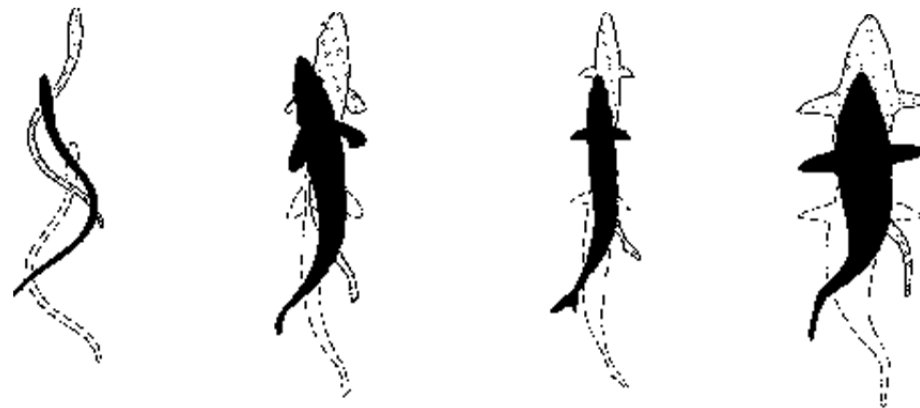
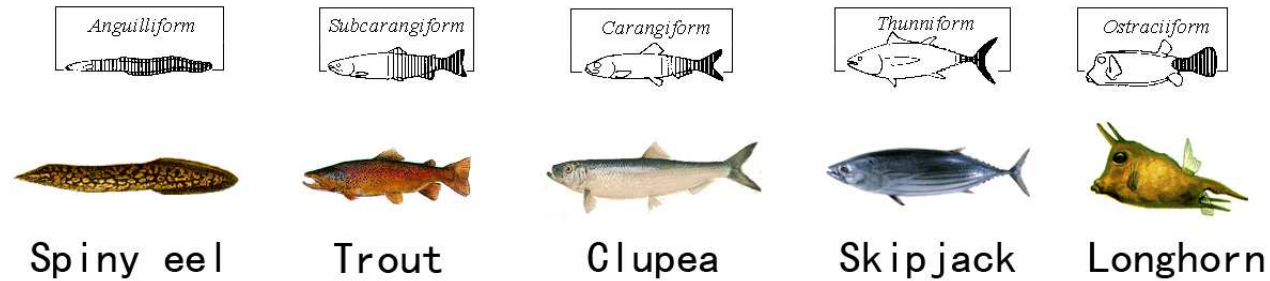
# Experimental Results



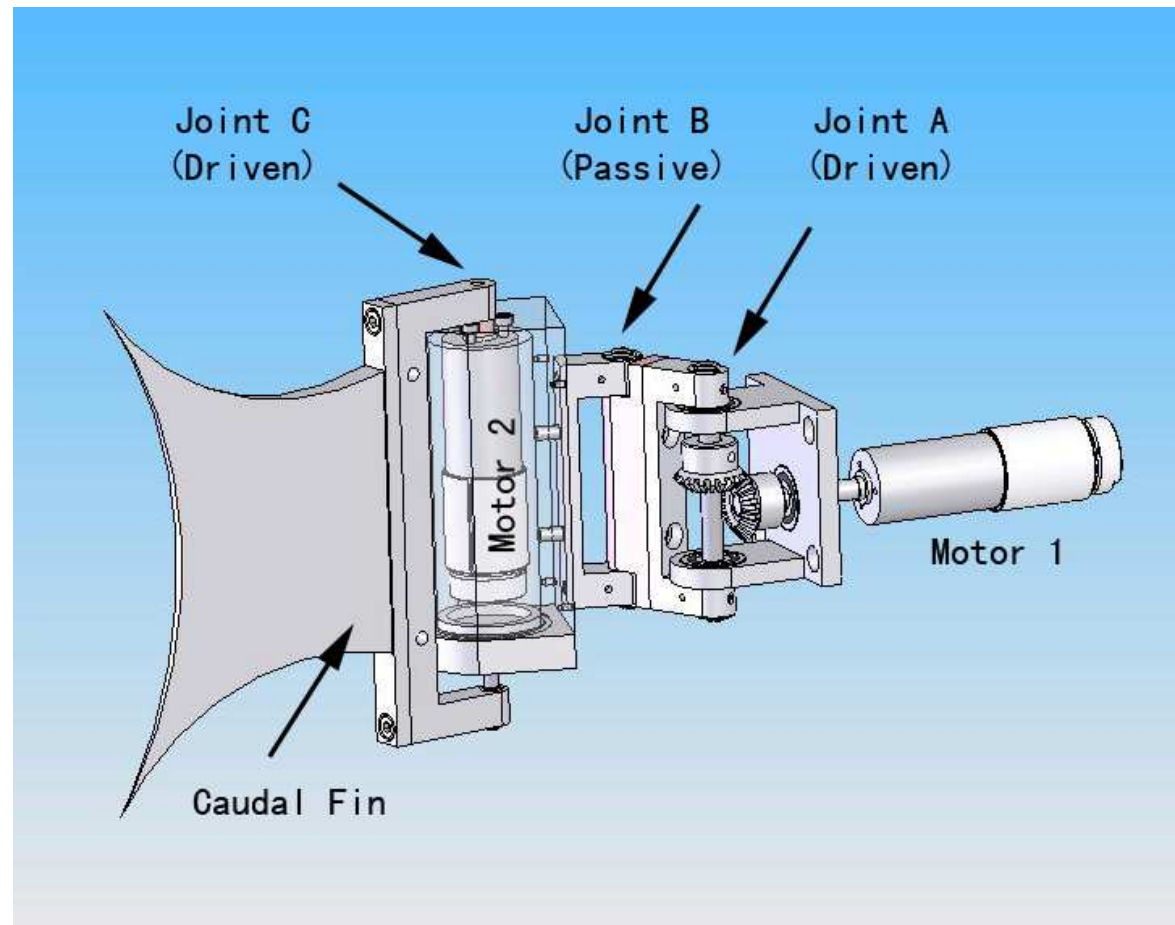
# Fish Swimming Modes



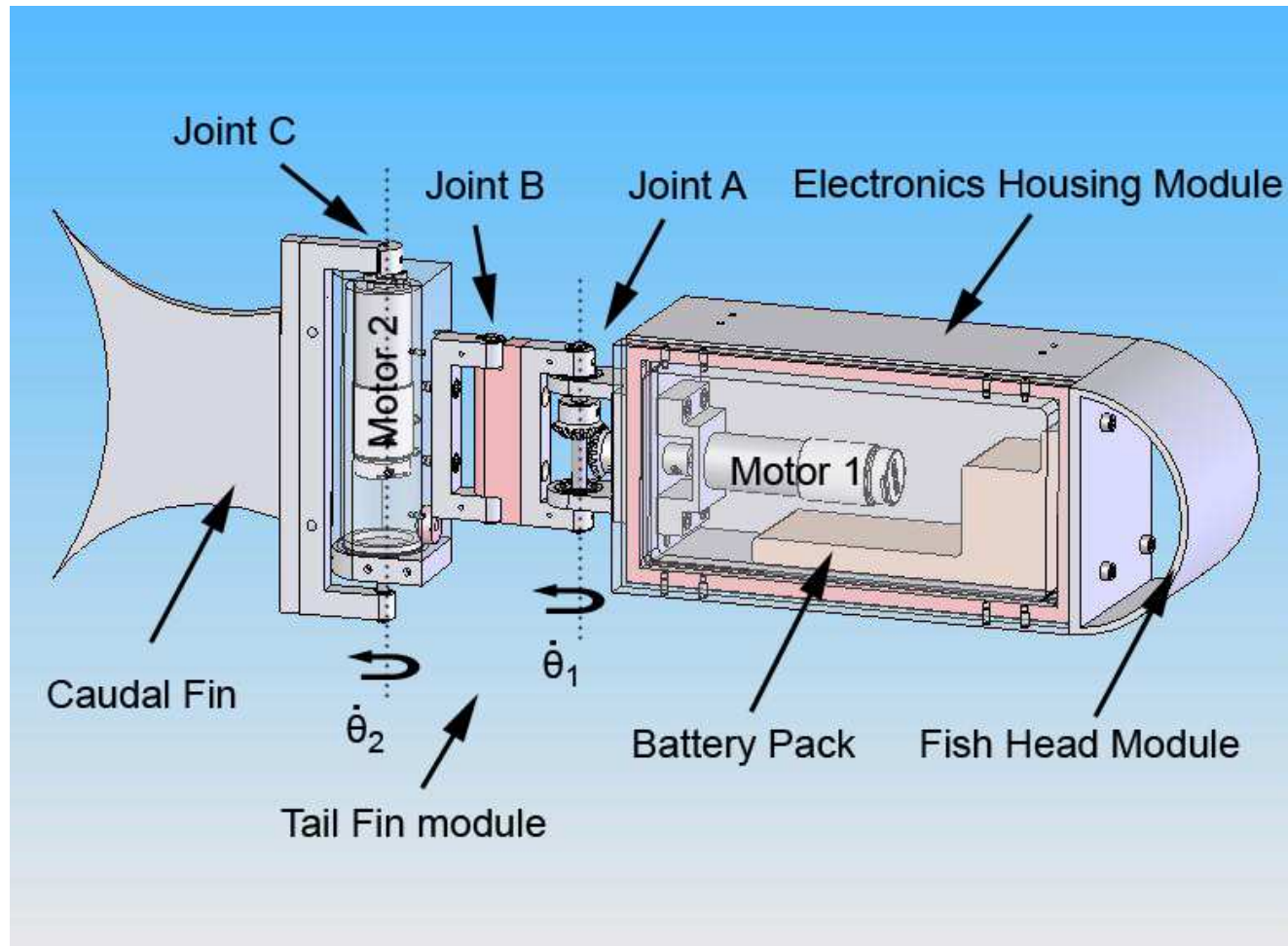
# Body Caudal Fin (BCF) Swimming Mode



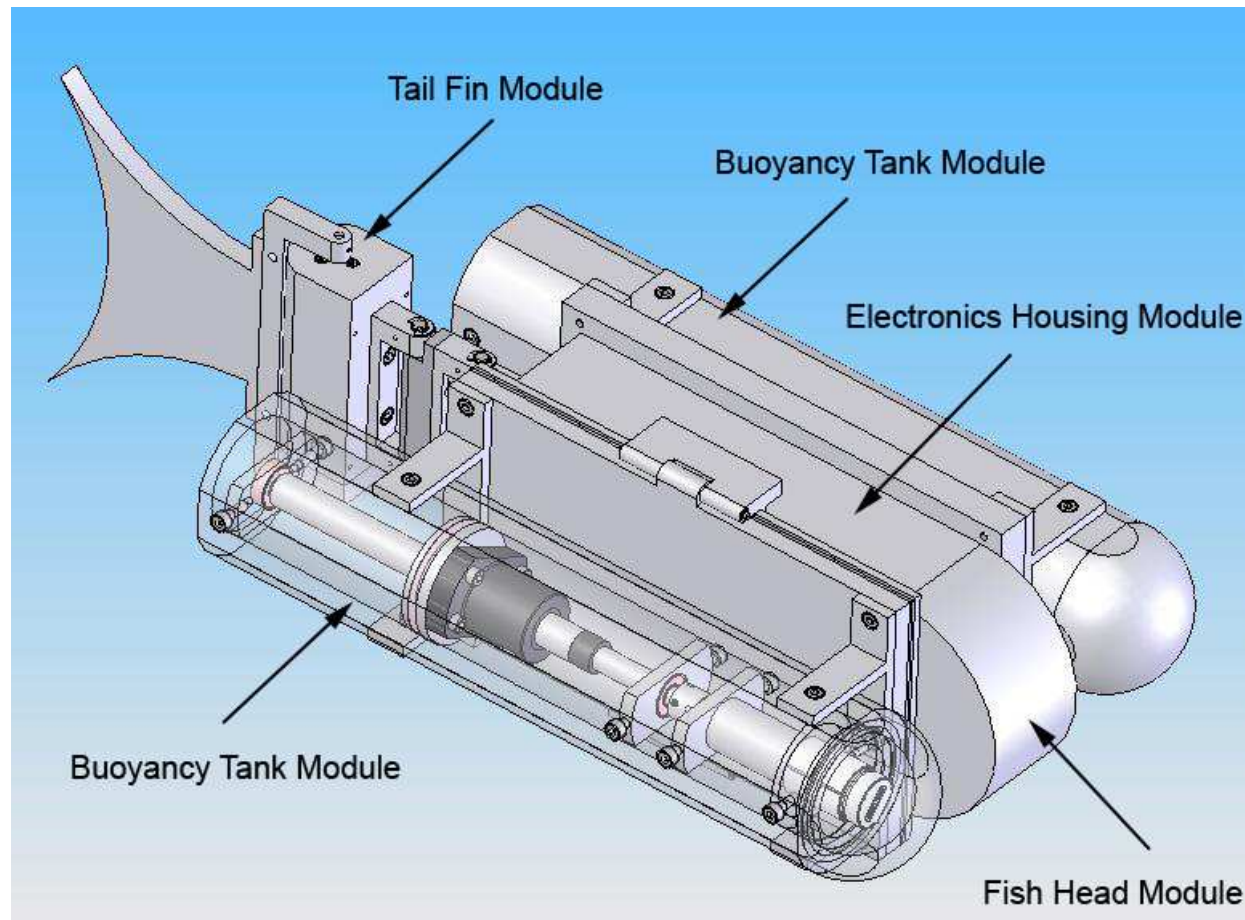
# CAD Model – Caudal Fin Design



# Conceptual Design



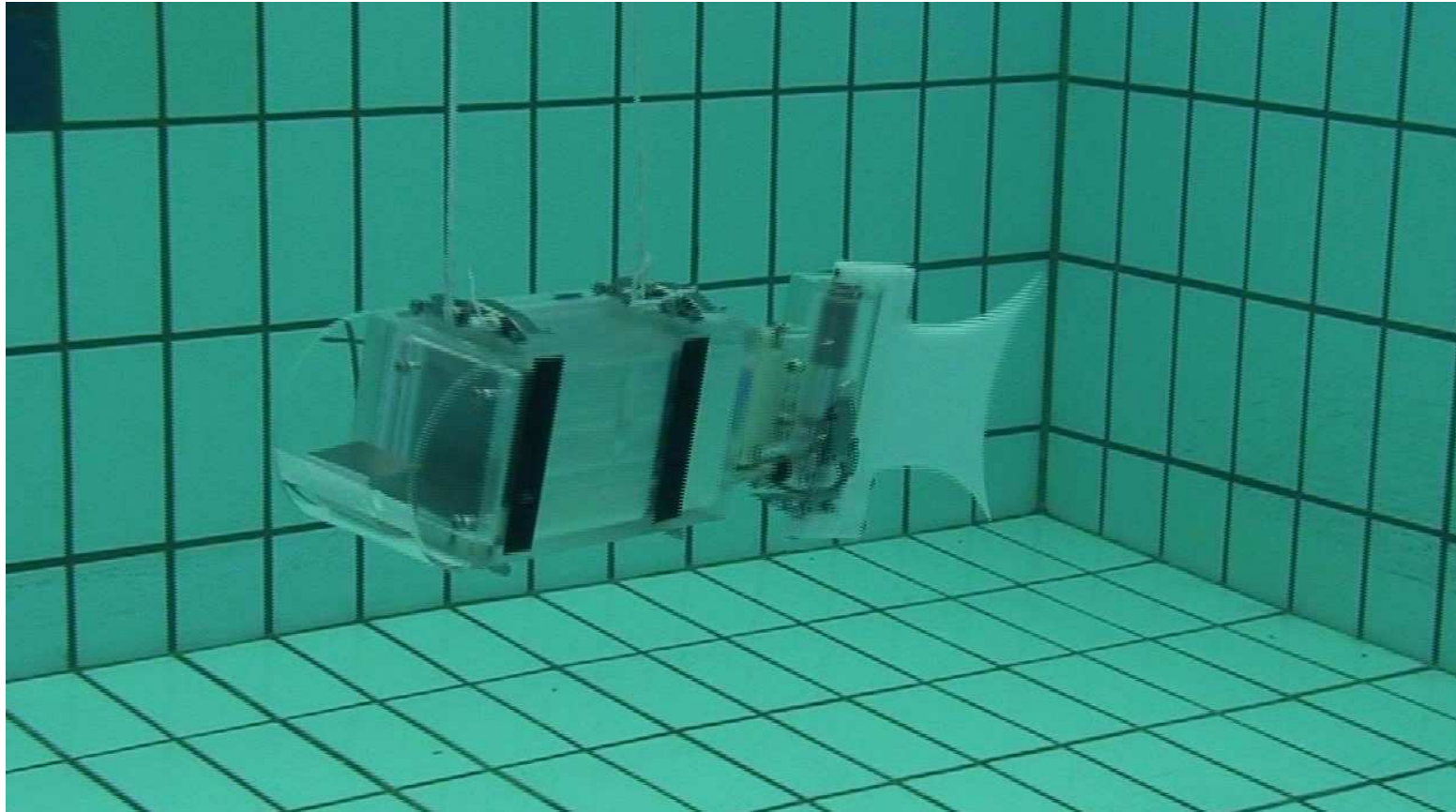
# Conceptual Design with Buoyancy Tank Module



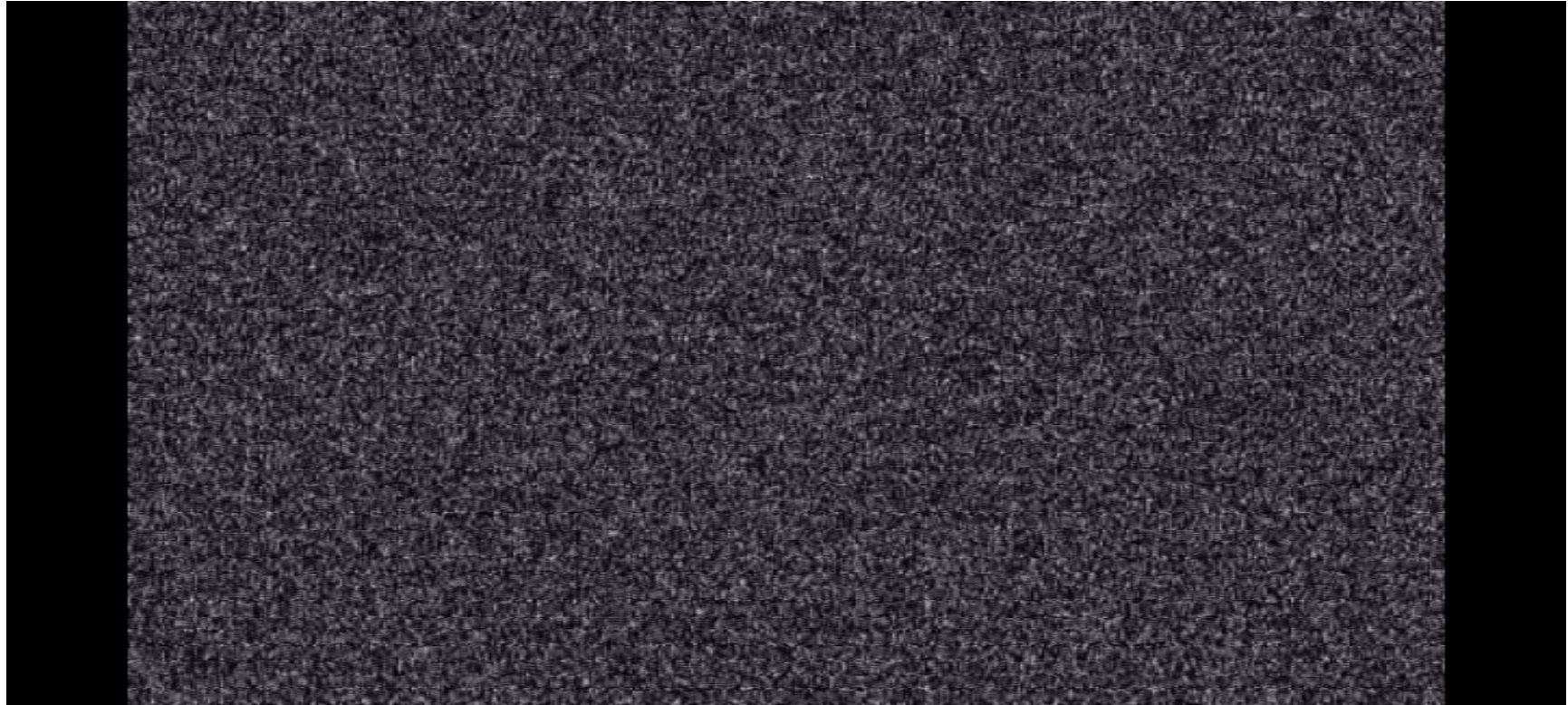
# Asian Arowana



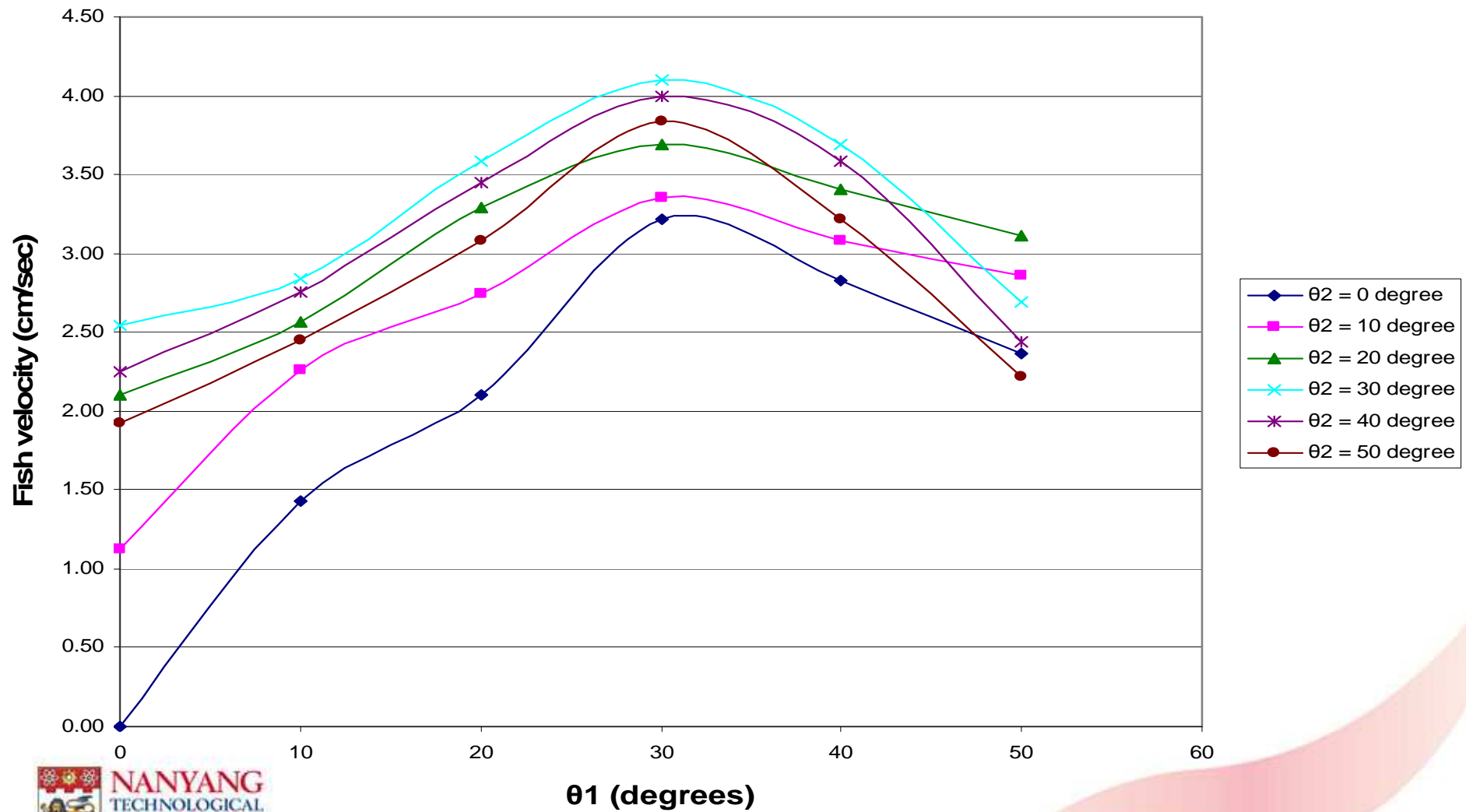
# Arowana Robot



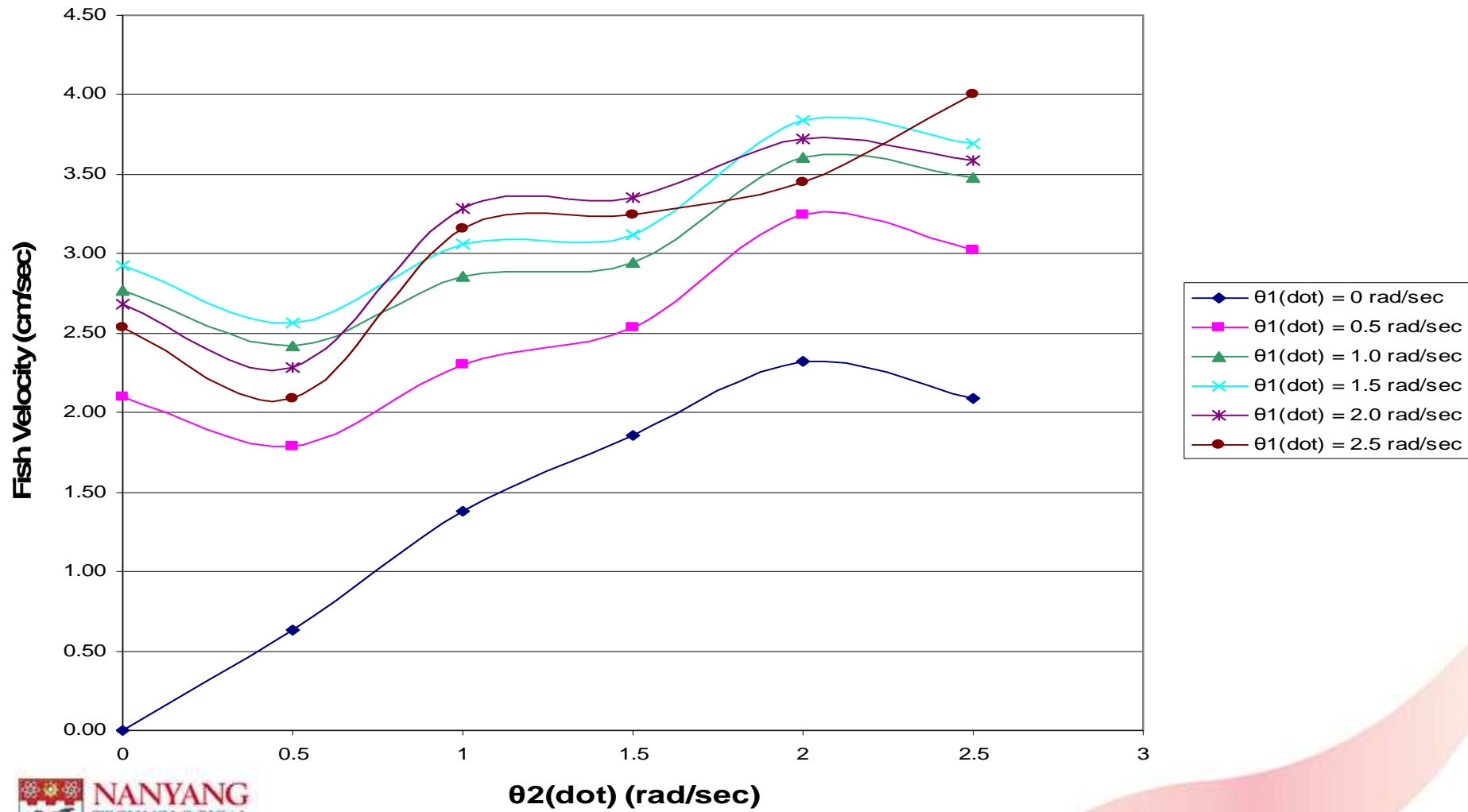
# **Arowana Robot – Lab and Swimming Pool Test**



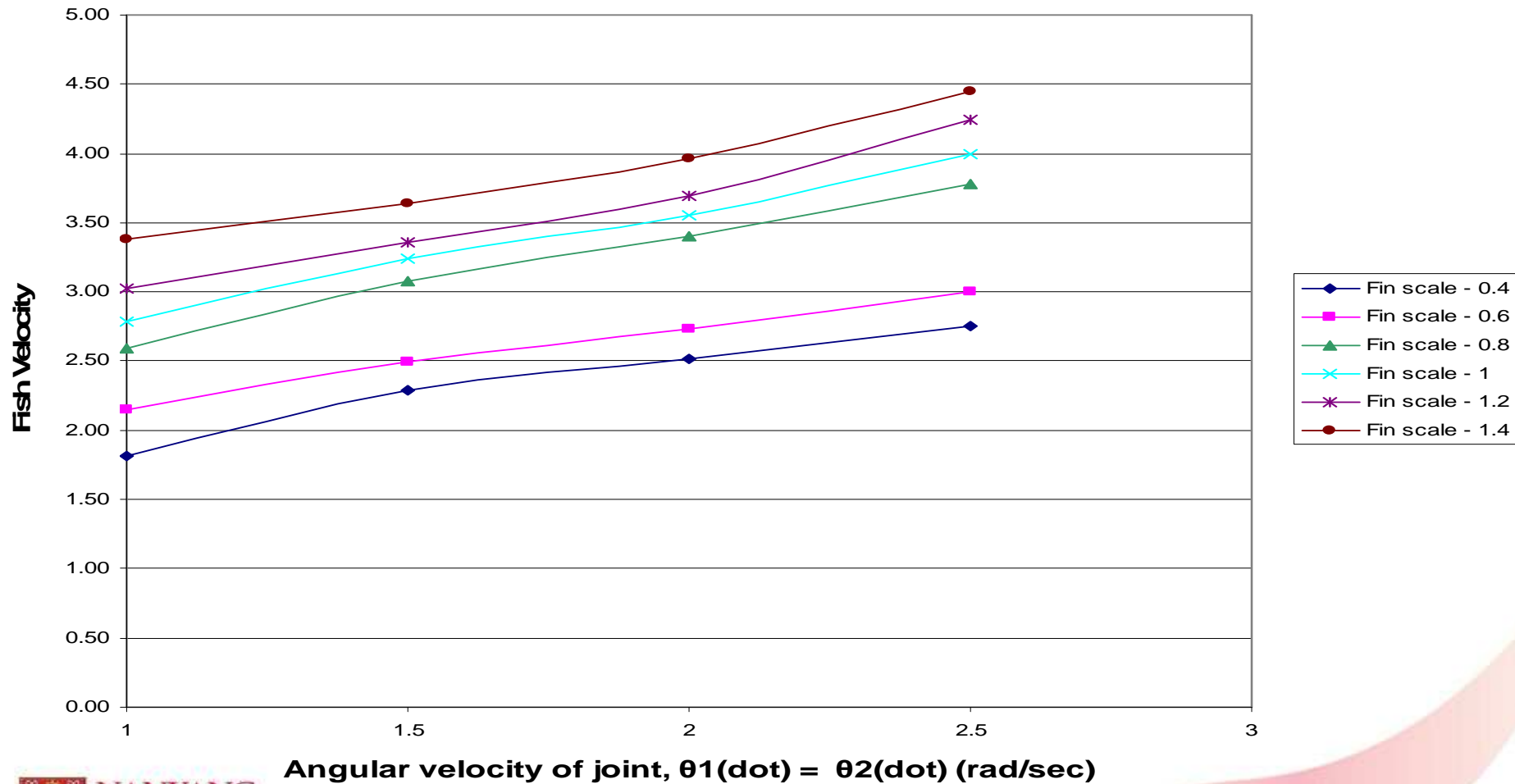
# Effects of Joint Angles on Fish Forward Velocity



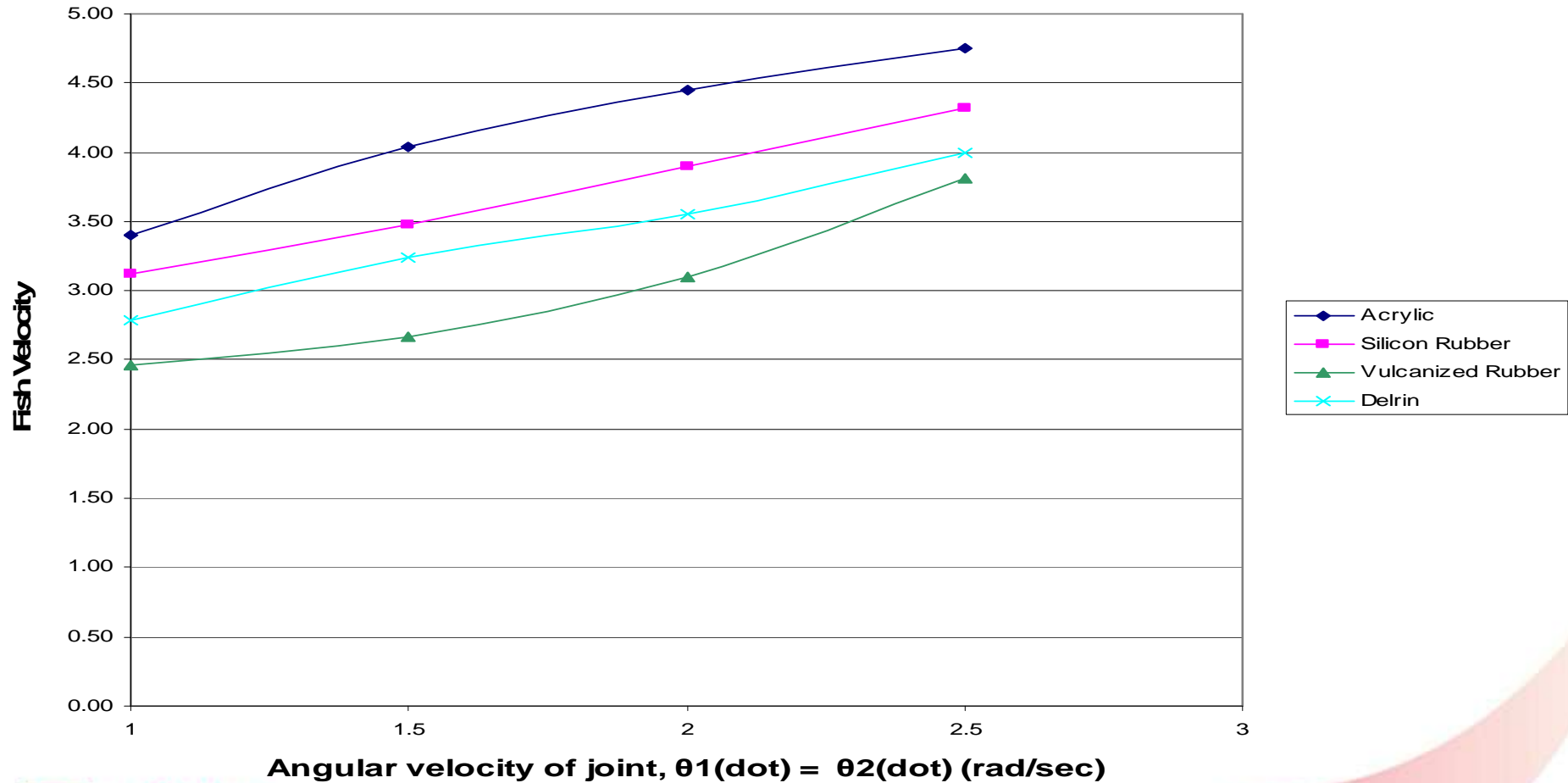
# Effects of Joint Angular Velocities on Fish Forward Velocity



# Effects of Caudal Fin Sizes on Fish Forward Velocity



# Effects of Caudal Fin Material on Fish Forward Velocity



# Future Applications & Conclusion



- Surveillance
- Inspection
- Spying
- De-mining
- Sea Bed Mapping
- Team Mission
- Biological Research

**Issues:** *Compactness, speed, communication, control, etc.*

# Acknowledgements

- Capstone Design Education Center, Seoul National University of Technology (Korea)
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