

# Testing and Analysis of Anti-Biofouling Coatings

NSRP Surface Preparation and Coatings Panel Meeting

Bozeman, MT

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Presented by:  
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Hepburn and Sons

# Problem Overview

- Natural waterways contain microorganisms that attach, grow, and spread across surfaces
- This biofouling process can result in micro and macro issues including:
  - Clogged intakes and filters
  - Increased hull drag and corresponding performance decreases
  - Corrosion
- Mechanical removal is effective but can be time and labor intensive
- Legacy anti-fouling treatments often cause environmental damage

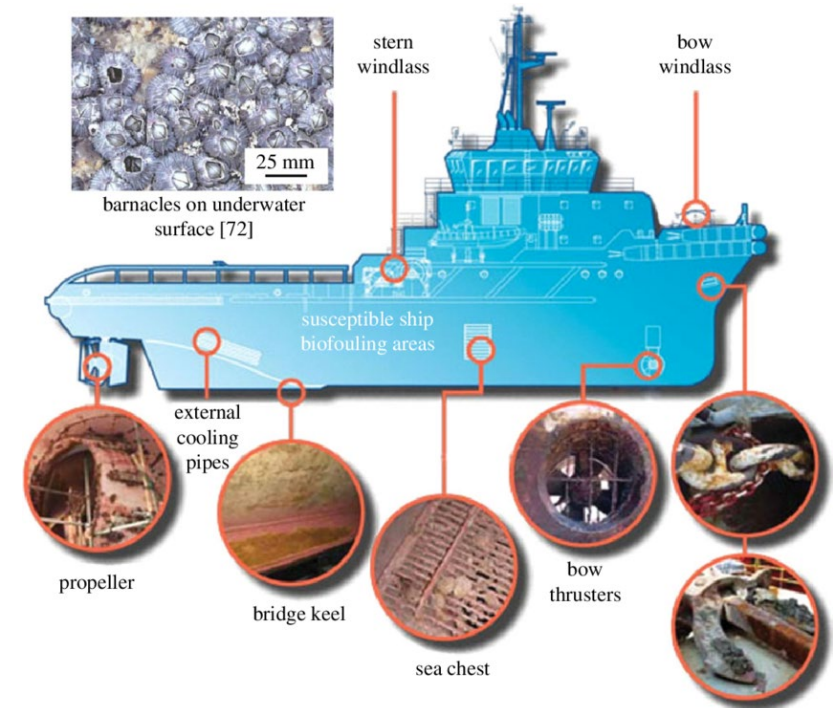
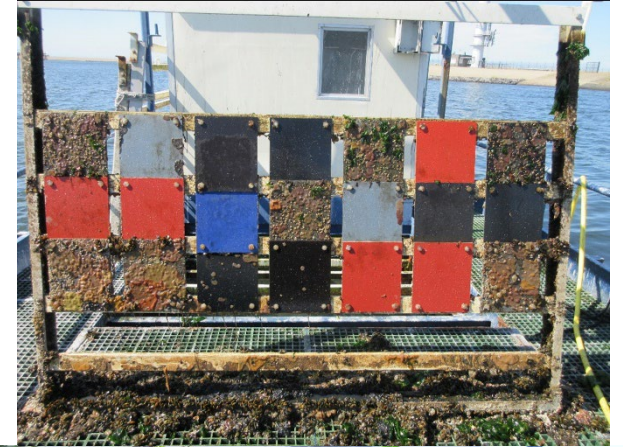


Image per Bixler "Biofouling: lessons from nature", 2015



# Proposed Solution

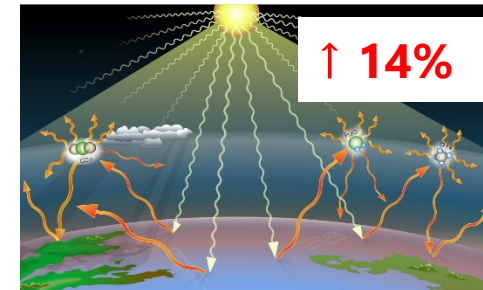
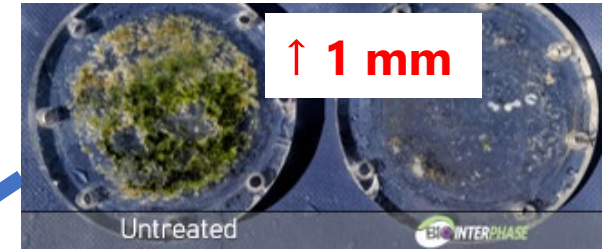
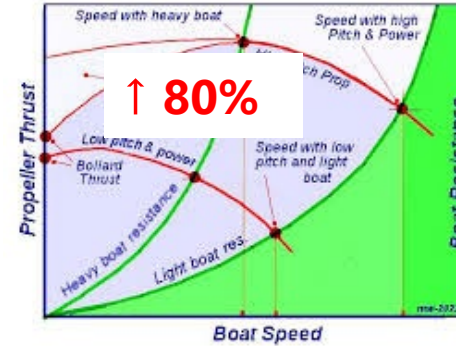
- Novel nano coating technologies have been developed with mission-specific optimization capabilities including:
  - Drag reduction
  - Corrosion prevention
  - Biofouling
- Thin coating layers are typically less than 0.001" and exhibit strong bonding strengths
- Incorporating nano coatings into ship maintenance can reduce cost and schedule while increasing efficiency



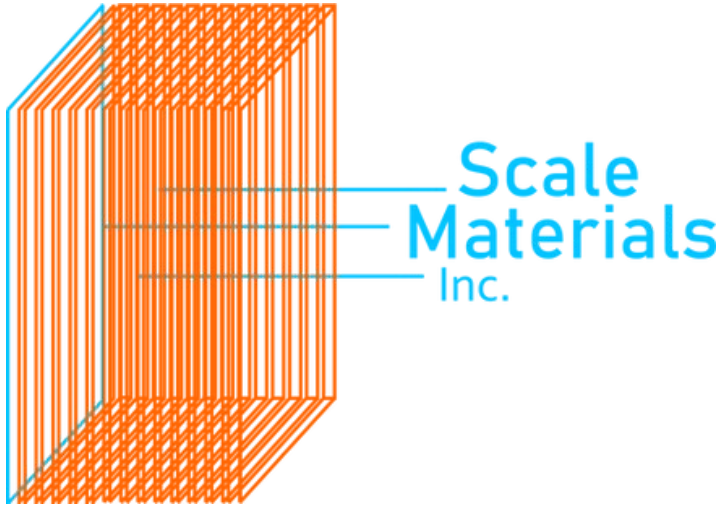
Images per Buitendijk "Tackling biofouling: Hull must be clean for shipping to be green", 2022

# Expected Benefits

- Shipyards and Navy have additional options for mitigating biofouling supported by NRL produced data
- Extend maintenance intervals for subsea components and raw water operating equipment
- ROI evaluations for methods and applications of coatings established



# Participants



*Highborn and Sons LLC*



**Newport News Shipbuilding**  
A Division of HII



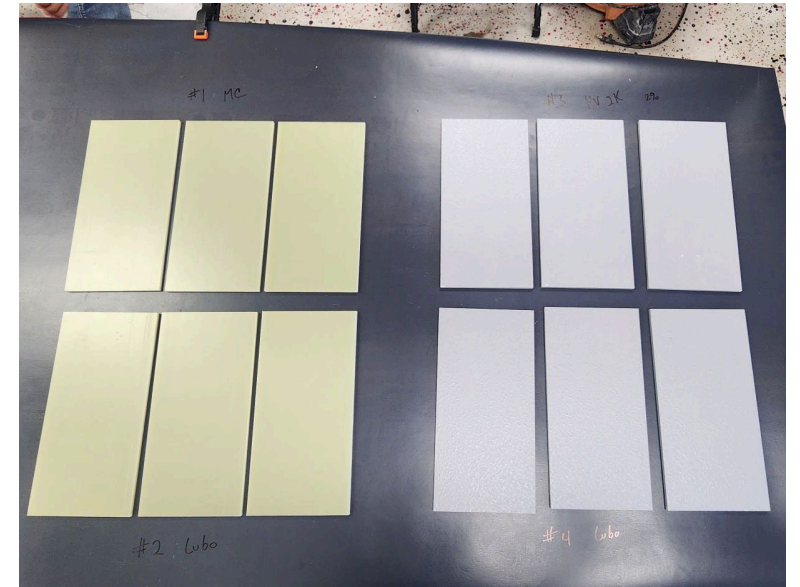
# Evaluation Methods, Milestones and Schedule

- Develop test plan in combination with vendors and NRL
- Enable coating formulation optimization
- Evaluate performance using variation on MIL-PRF-24647E paragraph 4.4.1
- Expose panels for 6 months in vertical orientation
- Flow-test to evaluate final fouling state

	FEB-MAR 2024	APR-MAY 2024	JUN-JUL 2024	AUG-SEP 2024	OCT-NOV 2024	DEC24-JAN25	FEB-MAR 2025
<b>Tasking</b>	Test Plan Development	Coupon Procurement and Preparation	Coating and Curing	Testing			Evaluation and Reporting
<b>Engagement</b>	△ Kick Off	△ Test Plan	△ Sample Delivery	△ Test Start	△ Status Report	△ Status Report	△ Test Report
		△ Status Report					△ Final Reporting

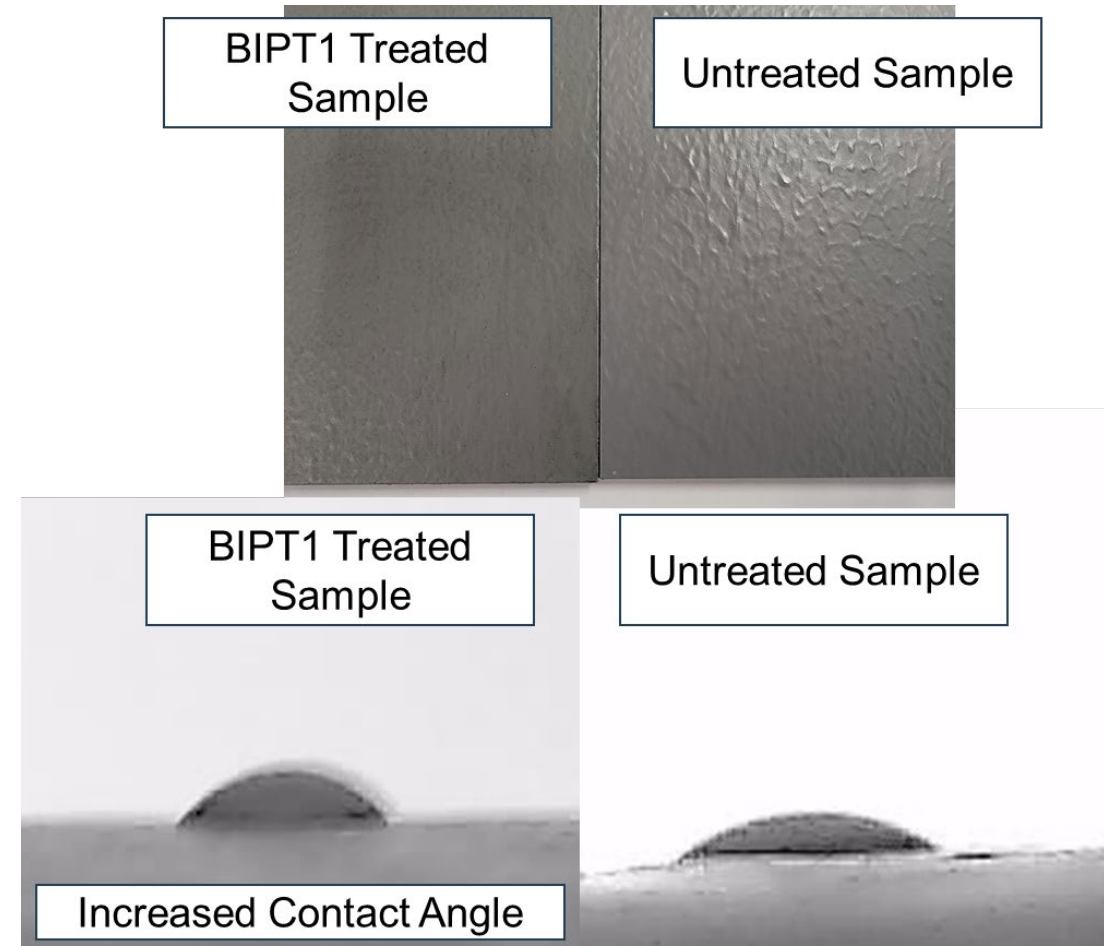
# Test Overview

- Fiberglass panels for exposure (12"x6"x0.25")
- 12 panels per vendor
  - 4 variations of coating allowable
- Evaluated simultaneously against Interspeed 640, Intersleek 1100SR
- Uncaged, horizontal submersion in Biscayne Bay
- Flow testing at NRL Key West facility at conclusion



# Approach

- Coval Technologies
  - Covalent bonding of polysiloxane
  - Hardness and durability of urethane
- BIOINTERPHASE
  - Bio-based polymer
  - Surface tension and biocatalysts
- Scale Materials
  - Zwitterions for AF
  - Customizable for targeted application

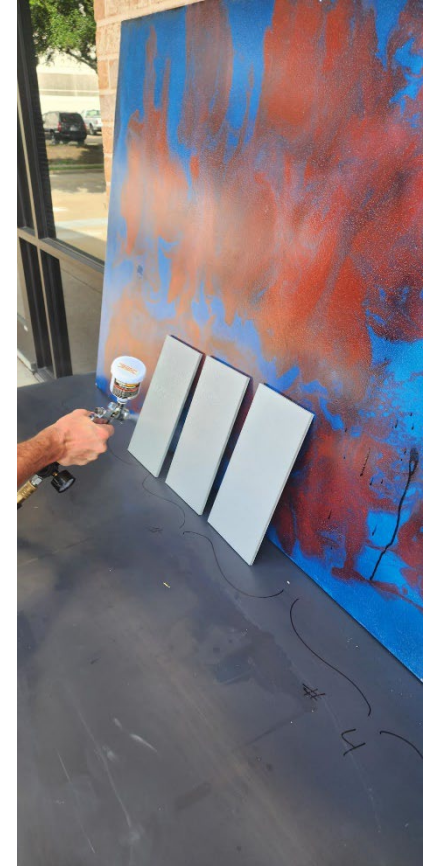


Evaluation of wetting contact surface angle alteration on panels by BIOINTERPHASE



# Status

- 2 of 3 panel vendors have completed coating and panels at NRL
- Remaining vendor supply chain challenge delayed panel completion – Ship to NRL 11SEP
- Testing start latter half of SEP with an inspection at 3-month exposure



Application of coating to panels at Coval Technologies provided by Jason Dixon

# Path Forward

- Remaining panels will be submitted to NRL
- Panels will be loaded on test barge and exposed for 3 months
- At conclusion of nominal 6-month exposure, samples will be removed and transported in seawater to Key West for flow testing and evaluation
- Final test results will be shared with team and explore additional application and validation opportunities

# Questions?

