Proactive Cleaning Without Capture What Are We Afraid Of?

IMarEST Biofouling Management Expert Group

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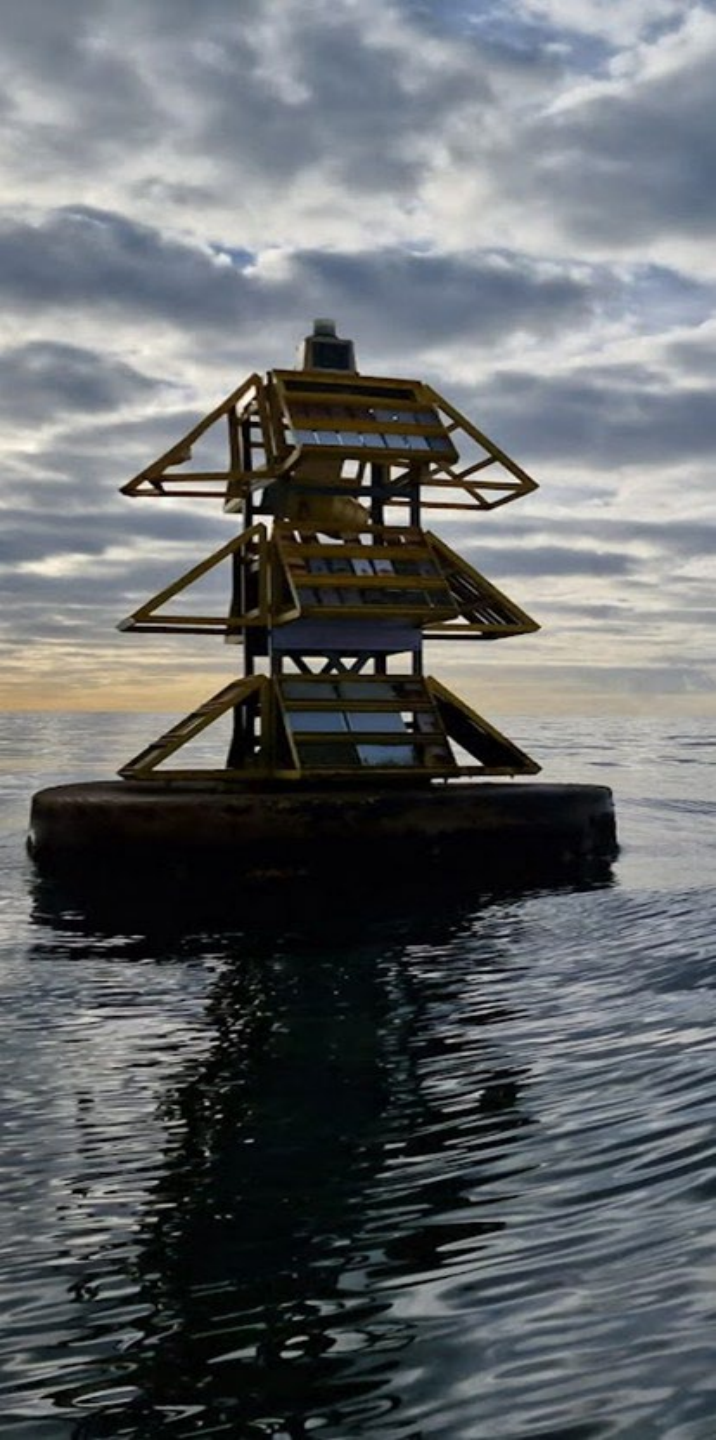


PML Applications

Independent, impartial marine environmental consultancy

Four Business Units:

- Centre for Coastal Technologies – marine autonomy & sensors
- Centre for Environmental Solutions – marine survey & eDNA
- Centre for Geospatial Applications – geospatial data made easy
- Centre for Marine Biofouling and Corrosion – test-house

Shareholder - Plymouth Marine Laboratory Research Charity

Primary Purpose:

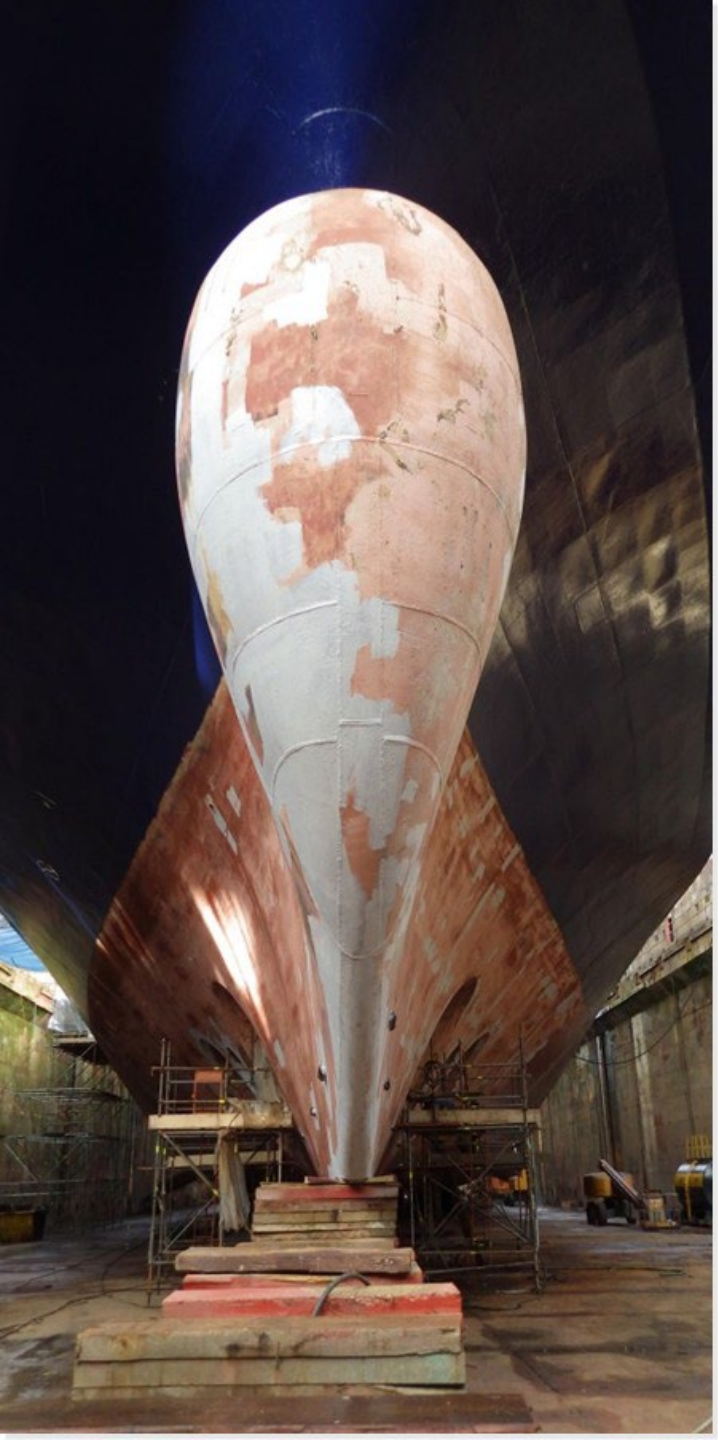
- Understand how the seas function to provide societal benefit from sustainable oceans

Funding & Staff

- Competitive public funding - 160 staff

Areas of focus:

- Ecosystem modelling
- Ecology and biodiversity
- Satellite data processing and interpretation
- Socioeconomics



The BMEG – Biofouling Management Expert Group

- IMarEST Special Interest Group - 2013
- 13 committee members representing 6 different countries

- *Promote practical, effective and globally consistent biofouling management to reduce environmental impacts*

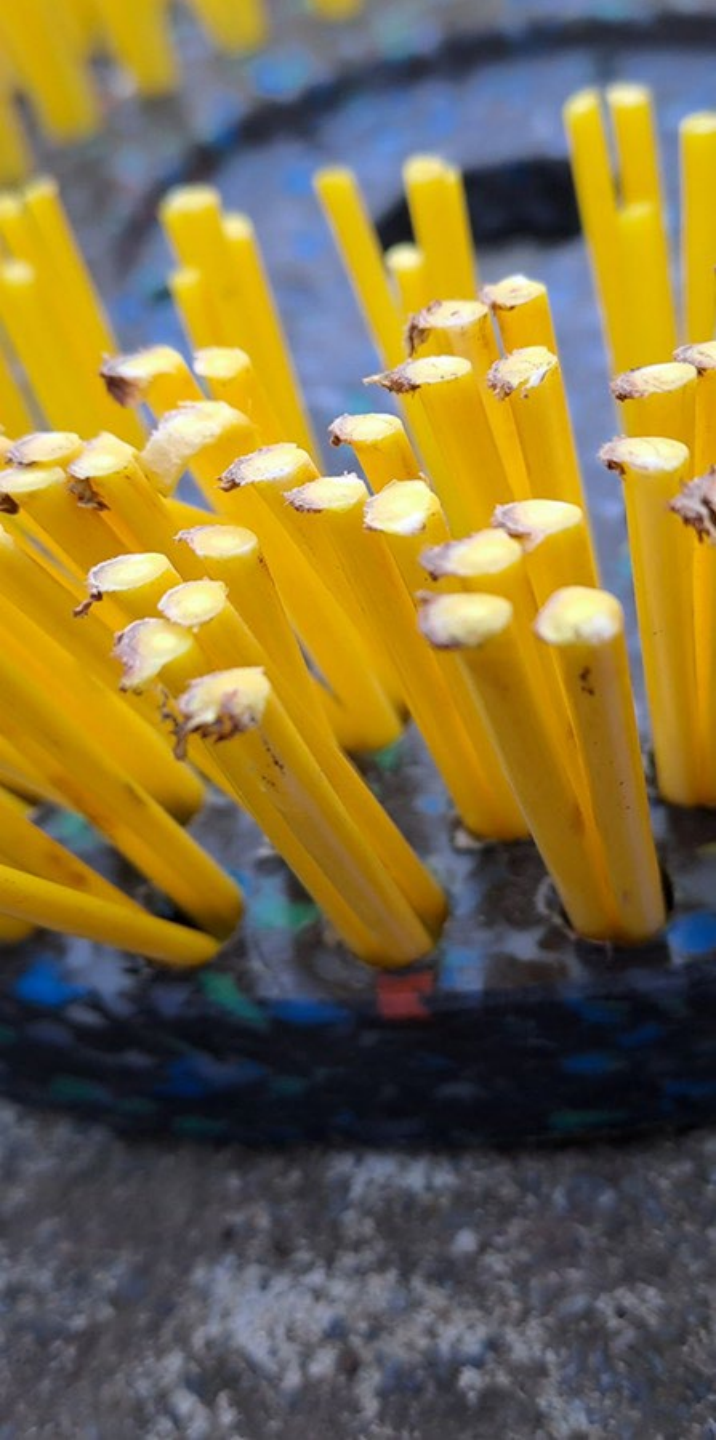
- Commercially unbiased
- Extensive practical experience
- Open discussion – optimistic about technology performance, major opportunities to reduce GHG emissions.
- Output: Technical reviews, presentations, policy advice, papers, IMO support, webinar series – Biocide Balance.

More Cleaning Expected……

Antifouling coatings - very impressive – when duty cycle matched & correctly applied

- Increasing demands on performance – longevity, biocide restrictions, VOCs, ease of application etc..
- Increasing attention on Biosecurity - Port Authorities
- Increasing focus on stack emissions - 2023 IMO GHG Strategy, EEDI
- Increasing use of hull performance monitoring systems

Chirona hameri on foul release coating, Orkney, Scotland



Reactive Cleaning With Capture

- Always going to be required

- Some very impressive technologies available – 100%?
- Multiple additional data collection opportunities
- The only real way of dealing with macrofouling known to pose a biosecurity threat

Key considerations are:

- Coating compatibility tests
- Specific settings used for the clean - crucial
- Experience and skill of the operator - crucial

- Challenges concerning cost, logistics, availability of hardware, potential for coating damage, performance standards.

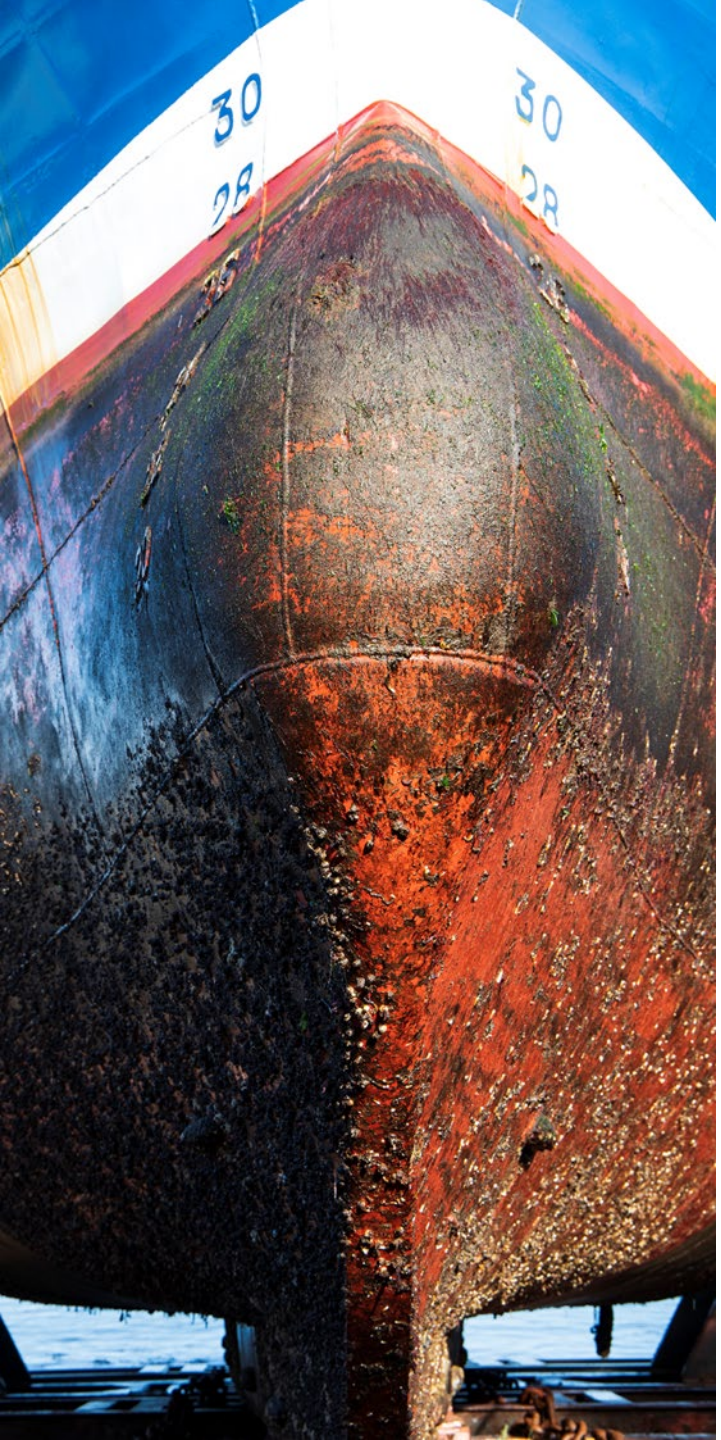
Proactive Cleaning (without capture)

- Very impressive technologies available – microbial only..
- Coating compatibility trials still required
- Some scope for additional data collection / treatments

Advantages include:

- Generally more portable – easier logistics
- Generally easier to operate – vessel owned
- Less potential for coating damage
- Cheaper to purchase and operate
- Mechanically less complex – generally less to go wrong

- Limitations in terms of speed, level of fouling and niche areas
- Capture often not possible



Proactive Cleaning Without Capture – Why Not?

Proactive – seems promising……

- Minimising coating risks, maximising vessel efficiency
- Potential for platform owned / operated devices

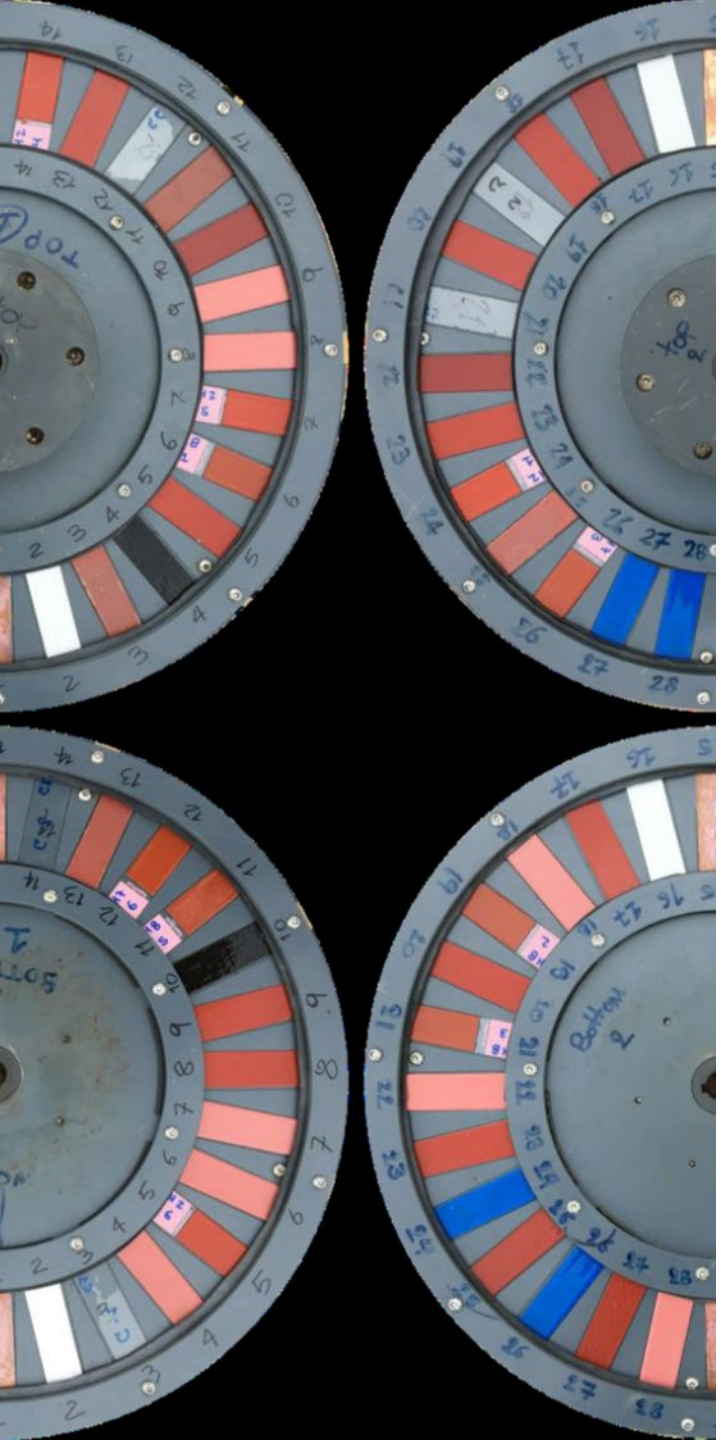
Multiple concerns remain concerning pro-active cleaning without capture…..

Why, and how afraid should we be?

Concerns During Proactive Cleans Without Capture

Seeking answers and dialogue….

- Metal based biocide release into ports / anchorages / sediments
- Microplastic release – soluble binders and paint particles
- Non-native, potentially invasive organisms in biofilms – ecological and human health (pathogens)
- Potential to move above a “no effect” level?
- Others?



What is Released During Proactive Cleans?

Lots of different:

- Cleaning systems
- Cleaning system settings
- Levels of fouling
- Coating types (modes of action)
- Coating condition (age, damage, deterioration)
- Biological variation within biofilms
- Impact of cleaning systems on integrity of cells of biofilm organisms

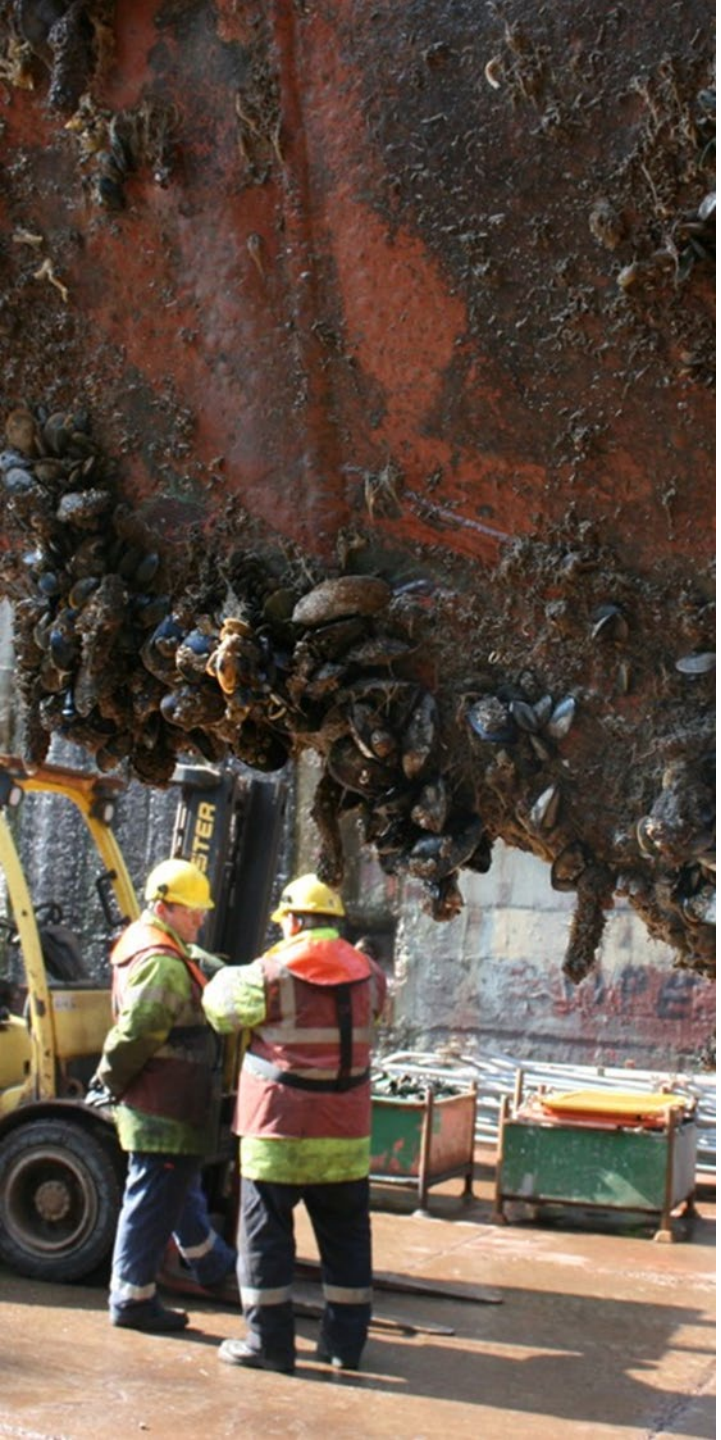
Can anyone say they really know what is released during proactive cleans in general terms?

What Happens to Coatings Normally?

Under normal use (hydrodynamic shear and static passive release) coatings release:

- Biocides
- Microplastic (soluble binders) and paint particle release
- Biofilms – sloughed off (FRC)

Remarkably similar to the list of concerns around proactive cleaning without capture……



Implications of Proactive Restrictions – Capture Only

Restricting proactive cleaning is likely to:

- Cause delays & idle time (coating issues)
- Reduced hull efficiency, fuel consumption, GHGs, biosecurity issues
- Potentially more coating wear
- Potentially more cost

If proactive capture is justified, then no problem, but…

Strong case is required to justify the potential impacts……..

Proactive Without Capture VS “Normal” Coating Use? Knowledge Gaps…..

To understand the relative risk associated with proactive cleaning without capture, we need to:

- Compare release (biofilm, biocides, microplastics) under proactive clean conditions and “normal” operation of coatings
- Describe the physical impact of the proactive clean on the biofilm organisms
- Characterise the difference between “native” hull biofilms and “introduced” hull biofilms
- ***Calculate the environmental impact vs the benefit of the clean***

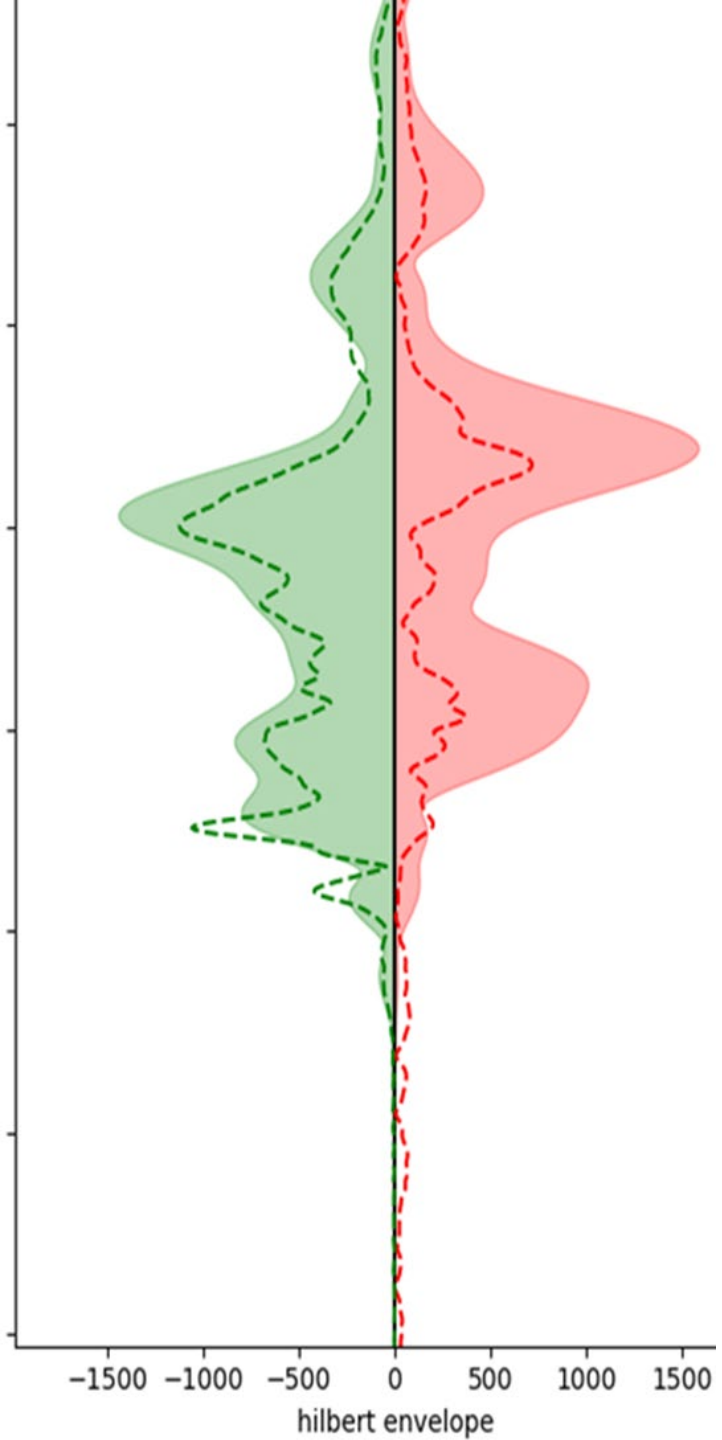
Summary

- Knowledge gaps exist
- Implications of not filling the gaps are considerable…….

- Holistic views on the overall environmental impact (impacts from a clean vs benefits of the clean)

- Open and transparent work to encourage wide acknowledgement and acceptance

- *This group……*



Real Time Biofouling Sensor

Directly and continuously measure biofouling, to correctly schedule hull cleaning.

- Extend the longevity of coating systems and reduce use of biocides.
- Reduce fuel consumption & GHGs.
- Ease industry compliance with a pending IMO Convention on Biofouling.
- Reduce health and safety concerns associated with commercial diving.
- Save money.

Biofouling Sensor – Consultation Phase

- What does industry want from the product?
- What are the design requirements?
- What are the required detection limits?

- Do you want to get involved?

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