



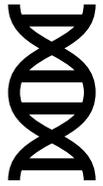
**Dr. Markus Hoffmann, Technical Director - I-Tech AB**

Quantifying the scale of the global barnacle fouling problem

Green Ship Technology

Copenhagen, Denmark– March 12, 2020

# I-Tech AB Company Profile



- A global bio-tech company
- Inventor of the barnacle repelling active agent for marine coatings - Selektope®



- I-Tech supplies Selektope® to the global marine coating market.
- Included in 9 commercially available antifouling (AF) products



- Listed on the Nasdaq First North stock exchange since April 2018.



- I-Tech supplies Selektope® to global marine coating makers
- Included in 9 commercially available antifouling (AF) products



- Hundreds of vessels (400+) using the technology
- Almost all ship types are represented



- Extensive patent portfolio and regulatory approval scheme.

# Focus on biofouling

Heavy barnacle fouling can increase vessel drag up to, and in excess of, 50% which equates to a significant increase in the fuel consumption and emissions.

AF systems reduce fuel bills & carbon dioxide (CO<sub>2</sub>)

- Acknowledged fuel saving potential (10%) across the global fleet corresponding to around 10-15 billion USD.

AF systems reduce exhaust emissions

- >100 million tonnes of CO<sub>2</sub> emissions saving (10% fuel saving) + a lot of SO<sub>x</sub>/NO<sub>x</sub>/PM

AF system reduce spread of invasive species

- Hull biofouling identified as key IAS vector.



UN body adopts climate change strategy for shipping

# Introduction to Selektope®



Barnacle fouling only occurs when a vessel is static, but it does not have to be static for long

***Insurance that ships will stay barnacle-free***

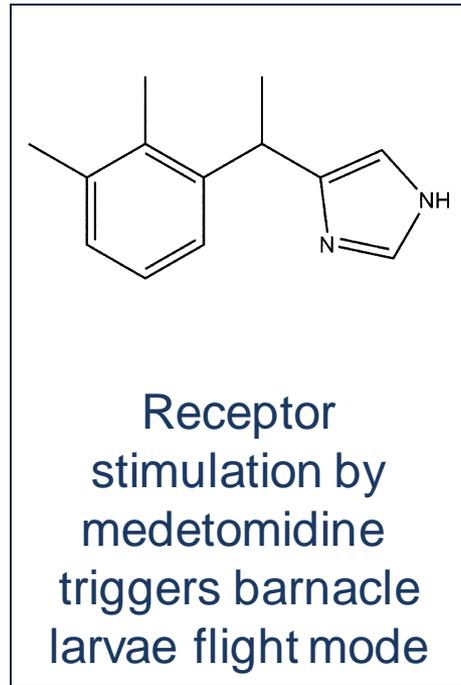
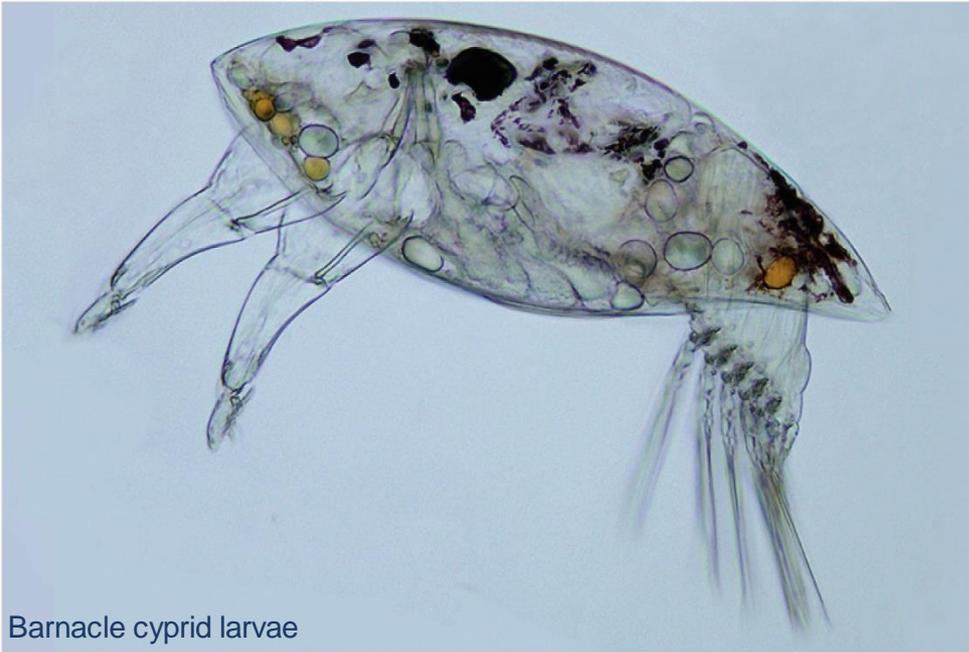
***no-matter where they operate or how long they are idle is required = Selektope® inside***

This is

**selektope®**



# The bio-tech approach: Reversible receptor stimulation



- **Selektope®** is the brand name for **medetomidine** used as an active agent in marine antifouling coatings.
- This novel in its application by I-Tech:
  - Medetomidine is highly selective and links to the barnacle larvae's octopamine receptor transmitting signals.
  - Triggers temporary leg-kicking of barnacle cyprid larvae
  - EU/BPR Approved and similar approvals in all leading shipping markets.
  - No bioaccumulation in organisms

**selektope®**

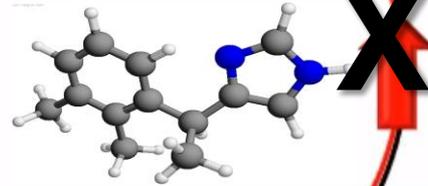
# Triggering flight mode

## Life cycle analysis



Adult barnacle

Settling



Nauplii larvae



Cyprid larvae

Adult barnacles produce larvae that eat and grow.

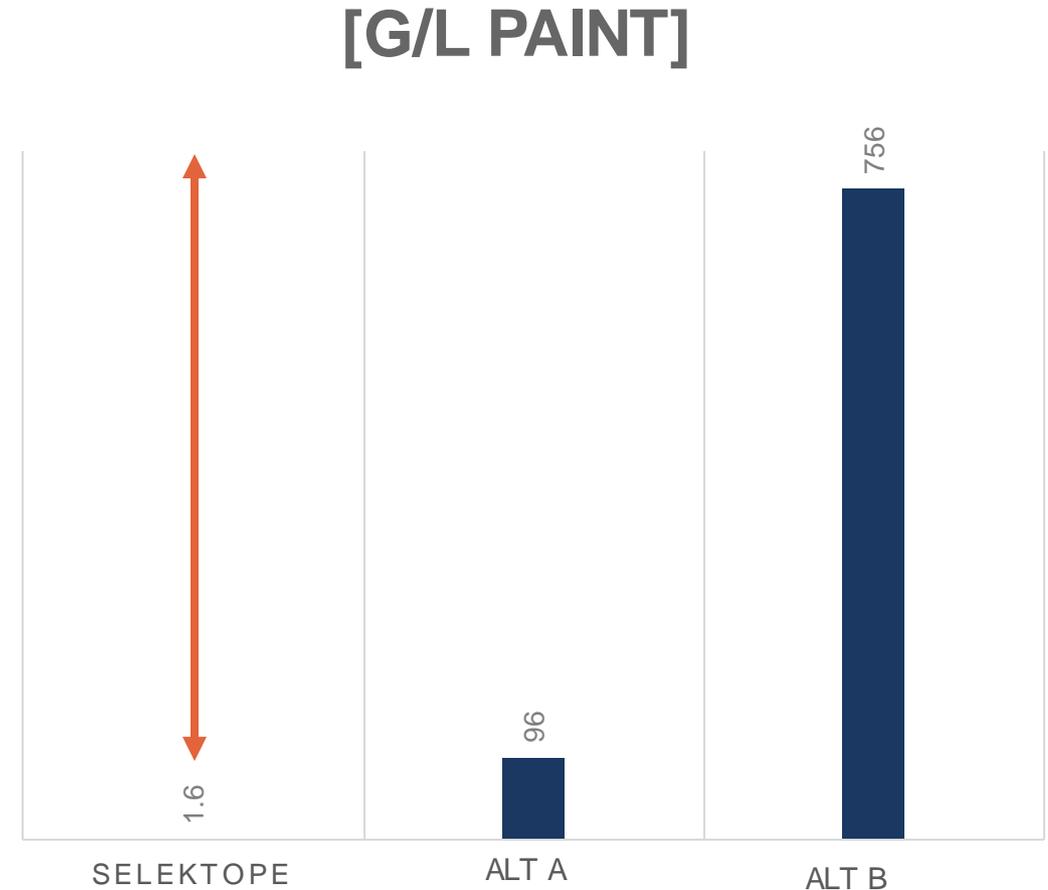
The larvae in the cyprid stage look for a suitable place to settle

The settled larvae metamorphose into juvenal adults.

- Exploratory surface behaviour necessary to settle is blocked.
- Kicking frequency is around 100/min
- Swim speed can be twice its length per second.

# Selektope® - a differentiating agent

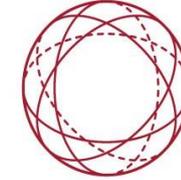
- Powerful enough to replace CuO and flexible enough to boost
- Repellent mode of action (flight mode)
- Used at around 0,1%w/w (a few grams per litre paint)
- Ultra-low leaching; >95% lower than corresponding amounts of CuO for similar barnacle fouling prevention effect.
- Biological degradation (consumed by microorganisms)
- Used only in self polishing AF systems to-date, no foul release incl. Selektope®, yet.



# New barnacle fouling research insights

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- I-Tech contracted Safinah Group for independent research into the scale of the barnacle fouling problem
- 249 vessel DD reports analysed, 263 Drydockings (DD) attended
- 572 observations of fouling condition
- Based on Safinah's historical Dry Dock (DD) attendance reports / inspections from 2015 – 2019

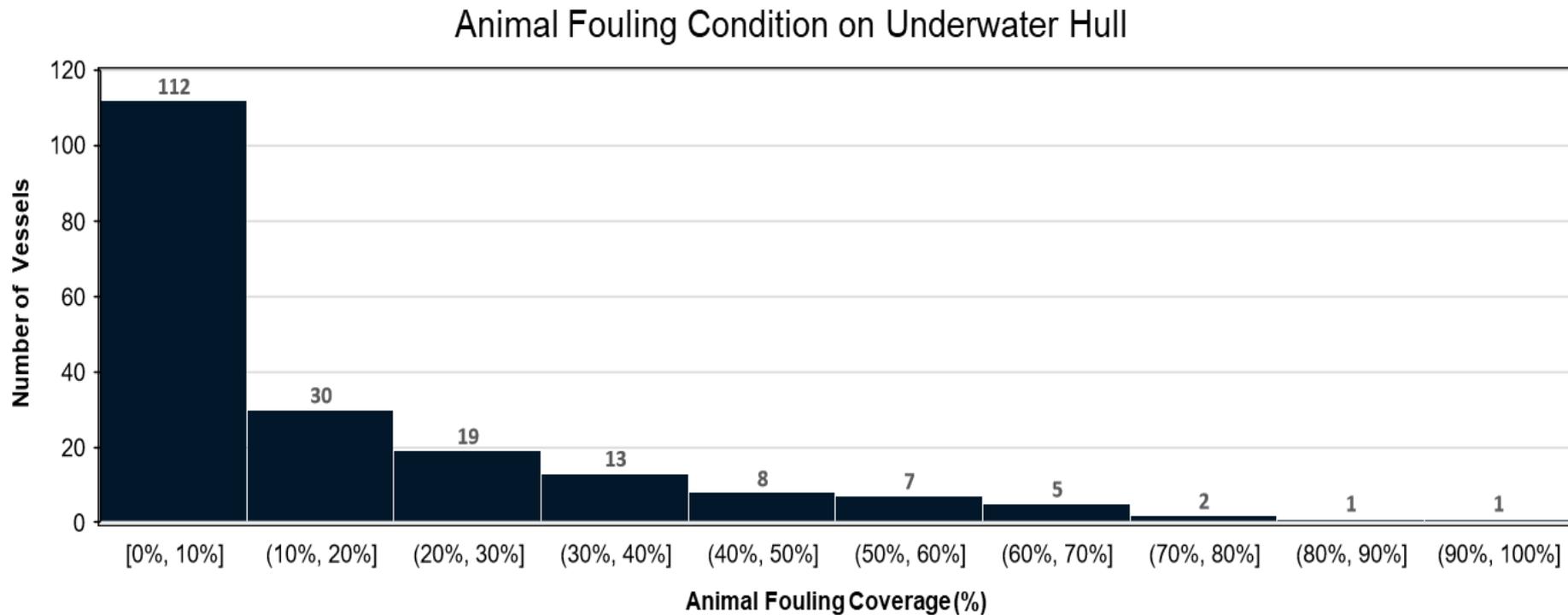


## Safinah Group

360° Coating & Engineering Experts

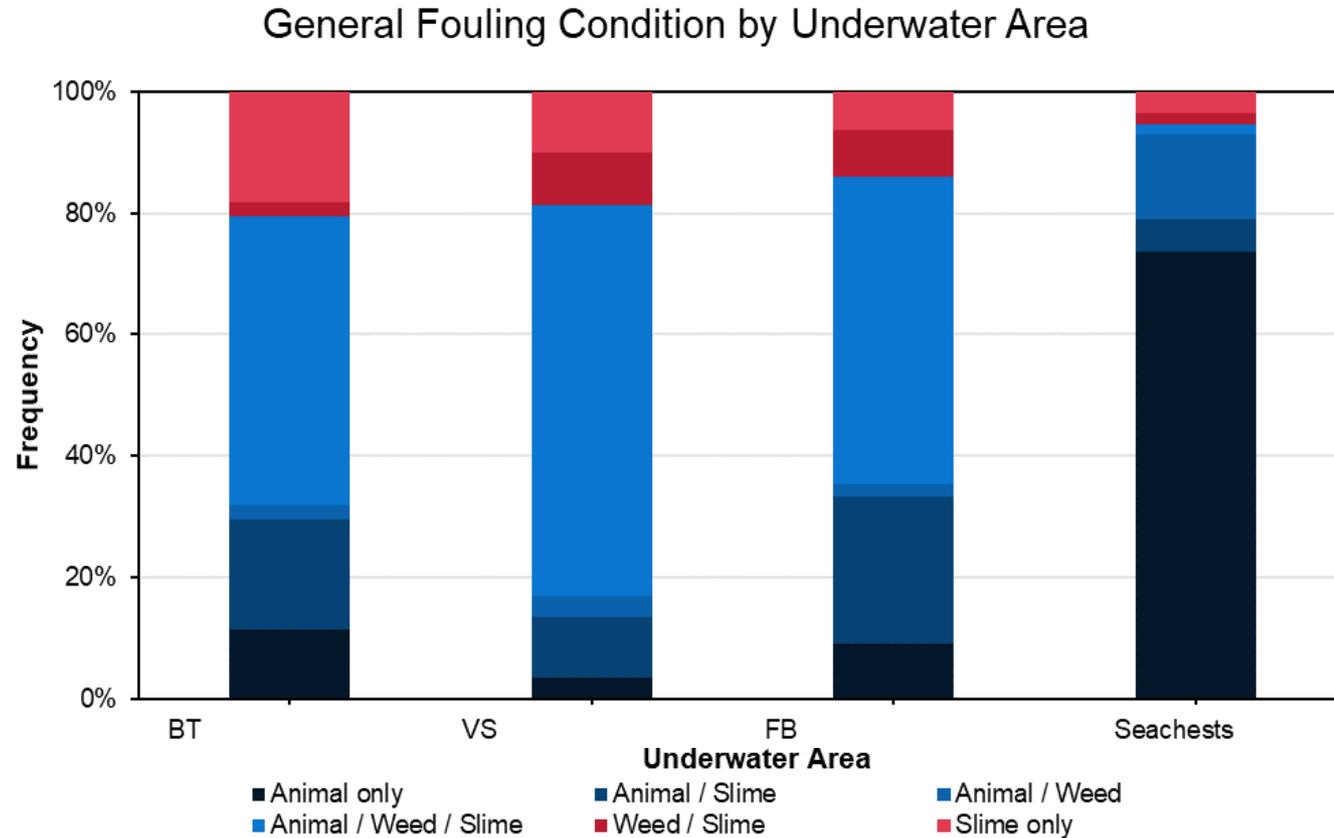
## selektope®

# Percentage of barnacle fouling



44 % of vessels surveyed had between more than 10 % barnacle fouling coverage on the hull.

# Barnacle fouling by location

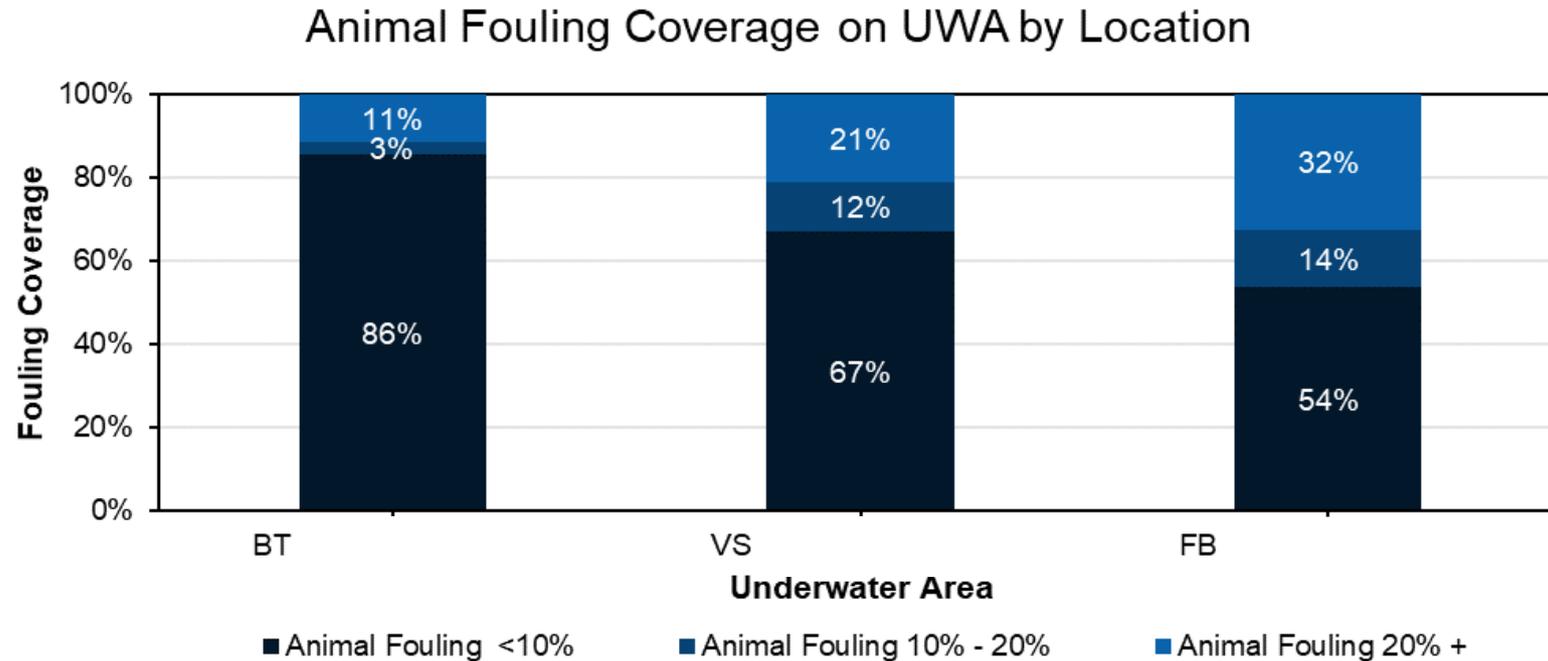


Barnacle fouling was present on the majority of the observations for all locations (Boottop, vertical sides, flat bottom and seachests).

- Dominant fouling combination for BT, VS and FB does include barnacle fouling with weed and slime.

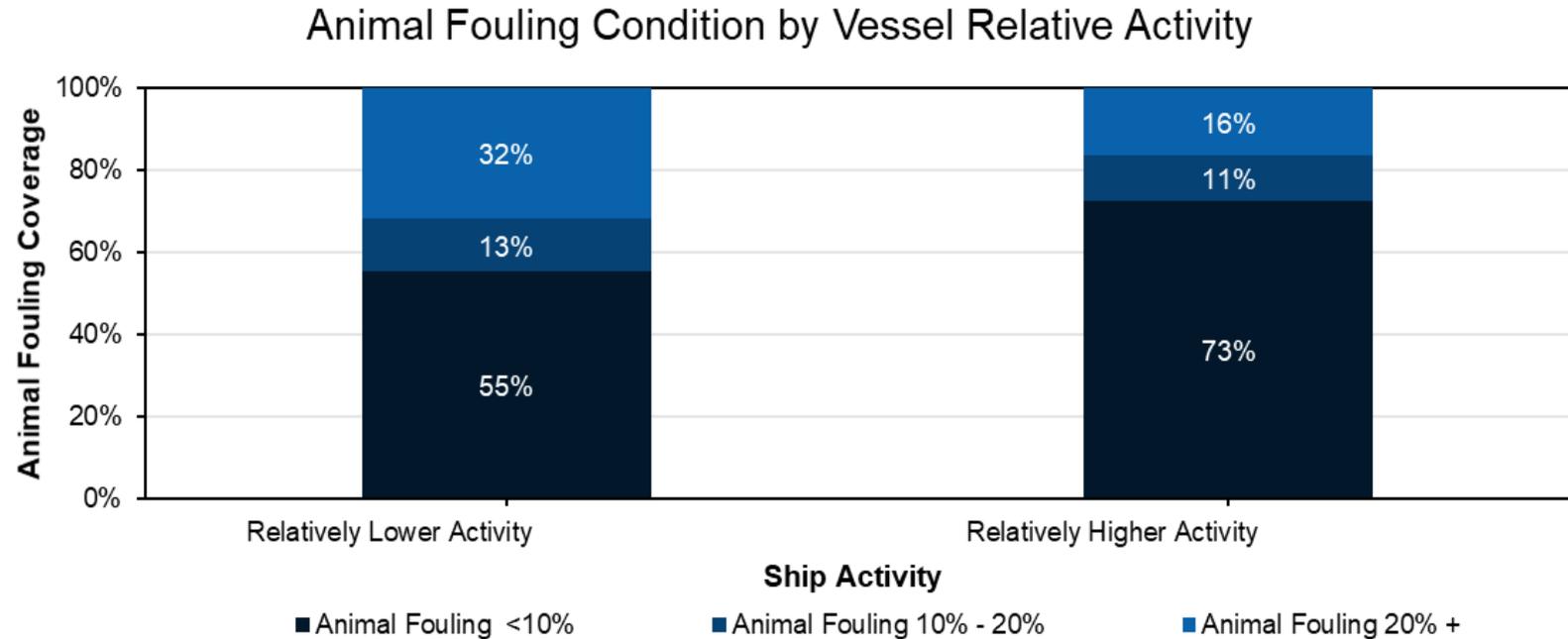
Approx. 74% of observations found barnacle fouling in seachests = niche areas are a huge problem area for barnacle fouling.

# Barnacle fouling percentage coverage by location



Barnacle fouling coverage is significantly greater across the flat bottom compared to the vertical sides and boottop

# High activity versus low activity

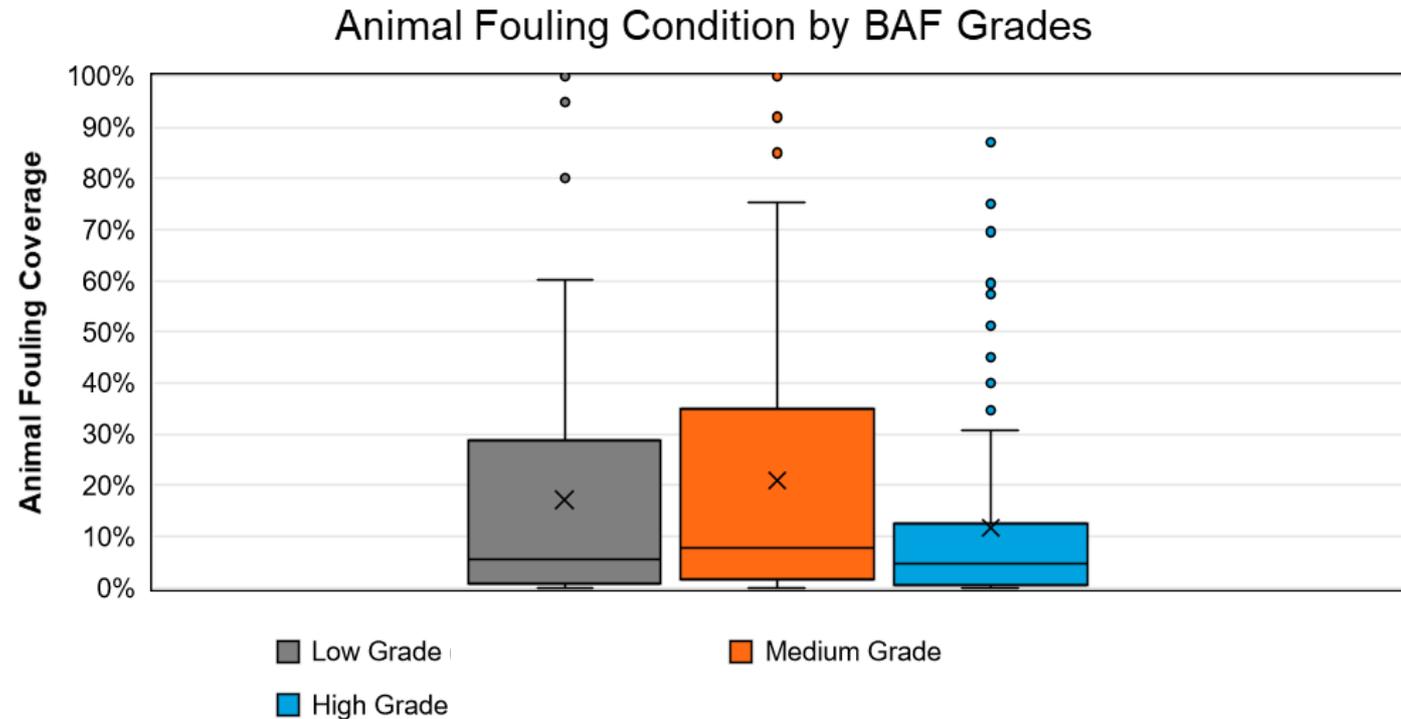


Animal fouling coverage increases for relatively lower activity vessels

- 45% of observations with animal fouling coverage > 10%
- compared to 27% for relatively higher activity vessels.

For all vessels, barnacle fouling is generally higher on the flat bottom and sea chest areas.

# High grade versus low grade antifoulings



Barnacle coverage reduces with coating quality

- 37 % of observations with animal fouling coverage medium grade
  - compared to 12 % for high grade activity vessels.

# Low grade, versus medium grade, versus high grade

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Barnacle fouling can occur on any AF system

Risk of barnacle fouling is linked to:

- AF system type
- Biocides used
- Vessel activity
- Vessel trading patterns

Anti-barnacle insurance needed to protect hull at all time, regardless of variables listed above

**Beware! Barnacle fouling pictures ahead!**



# Low grade AF



Photo 61: Vessel 14a – Flat bottom



Photo 62: Vessel 14a – Under bilge keel



Photo 63: Vessel 14a – Flat bottom



Photo 64: Vessel 14a – Vertical sides



Photo 65: Vessel 14a – Flat bottom



Photo 66: Vessel 14a – Flat bottom

**Vessel Type:** Bulker

**In service period:** 5 Years

**UWH coatings:** Low grade (Copper Oxide, Zineb)

**Barnacle fouling:**

- FB: 1,560m<sup>2</sup> (Total area 3,377m<sup>2</sup>)
- VS: 1,500m<sup>2</sup> (Total area 2,695m<sup>2</sup>)

# Medium grade AF (Copper Oxide, CPT, Zineb)



Photo 34: Vessel 7a – Flat bottom



Photo 35: Vessel 7a – Flat bottom

**Vessel Type:** LNG

**In service period:** 5 Years

**Barnacle fouling:**

- FB: 2,950m<sup>2</sup> (Total area 7,705m<sup>2</sup>)
- VS: 3,000m<sup>2</sup> (Total area 8,169m<sup>2</sup>)

# High grade AF (Copper Oxide, CPT)



Photo 46: Vessel 10a – Boottop



Photo 47: Vessel 10a – Vertical sides

**Vessel Type:** Oil Products Tanker

**In service period:** 5 Years

**Barnacle fouling:**

- BT: 1,770m<sup>2</sup> (Total area 3,450m<sup>2</sup>)
- VS: 1,770m<sup>2</sup> (Total area 3,450m<sup>2</sup>)

# Foul release AF on vertical sides only



Photo 9: Vessel 4 – Vertical sides



Photo 10: Vessel 4 – Vertical sides

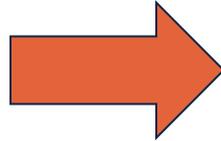
**Vessel Type:** Crude oil tanker

**In service period:** 5 Years

**Barnacle fouling:**

- FB: biocidal antifouling
- VS: 1,500m<sup>2</sup> (Total area 5,138m<sup>2</sup>)

# Niche areas with Selektope® protection DD +16 months - barnacle free



Grating coated with high grade AF of SPC  $\text{Cu}_2\text{O}$  type for coastal LPG carrier (1200DWT) - 15 months

Grating coated with high grade AF of SPC  $\text{Cu}_2\text{O}$  + Selektope® for coastal LPG carrier (1200DWT) - 16 months

Images provided by Chugoku Marine Paints

# MR Tanker DD +49 months – still barnacle free

- Globally trading MR Tanker (*Team Calypso*) coated with Selektope®-powered, copper-free Seaflo Neo CF Premium AF system in 2015
- Average characteristics:
  - activity rate 60, average speed 12knots, Average temperature 25°C, Several long idling periods of 25 days+

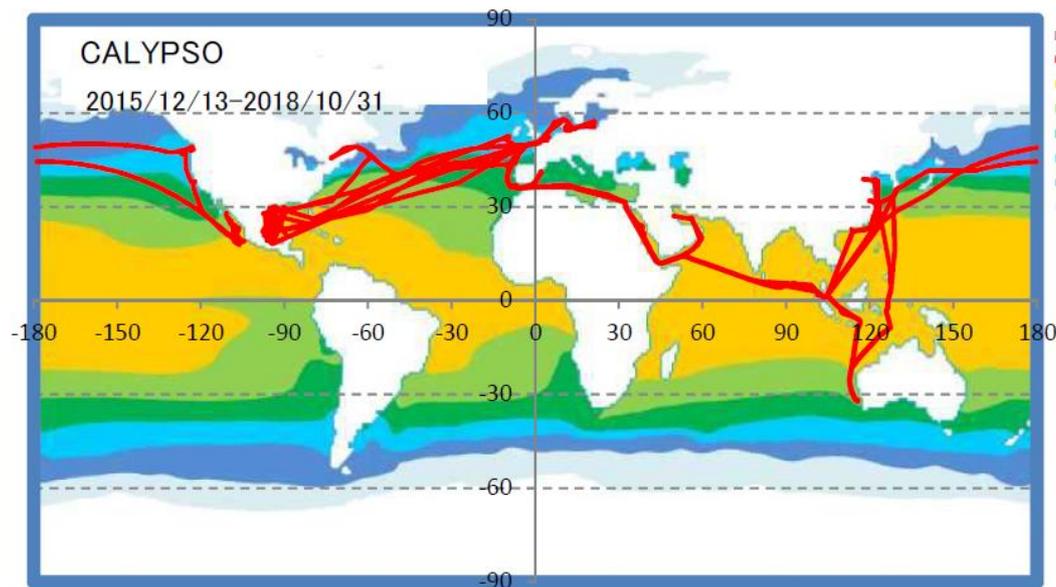


Fig.1 Operating Route

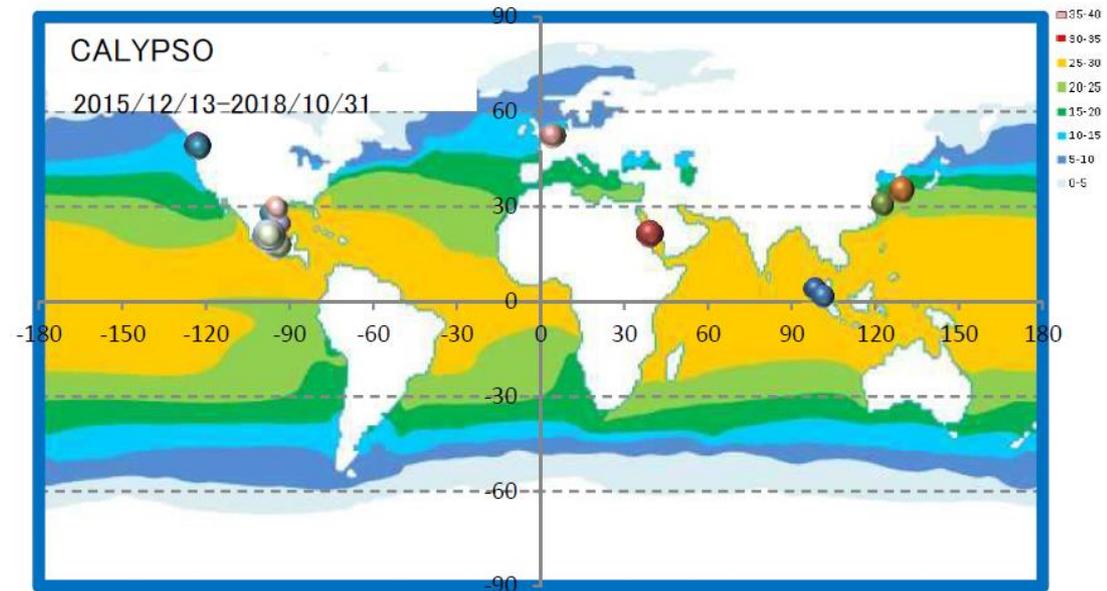
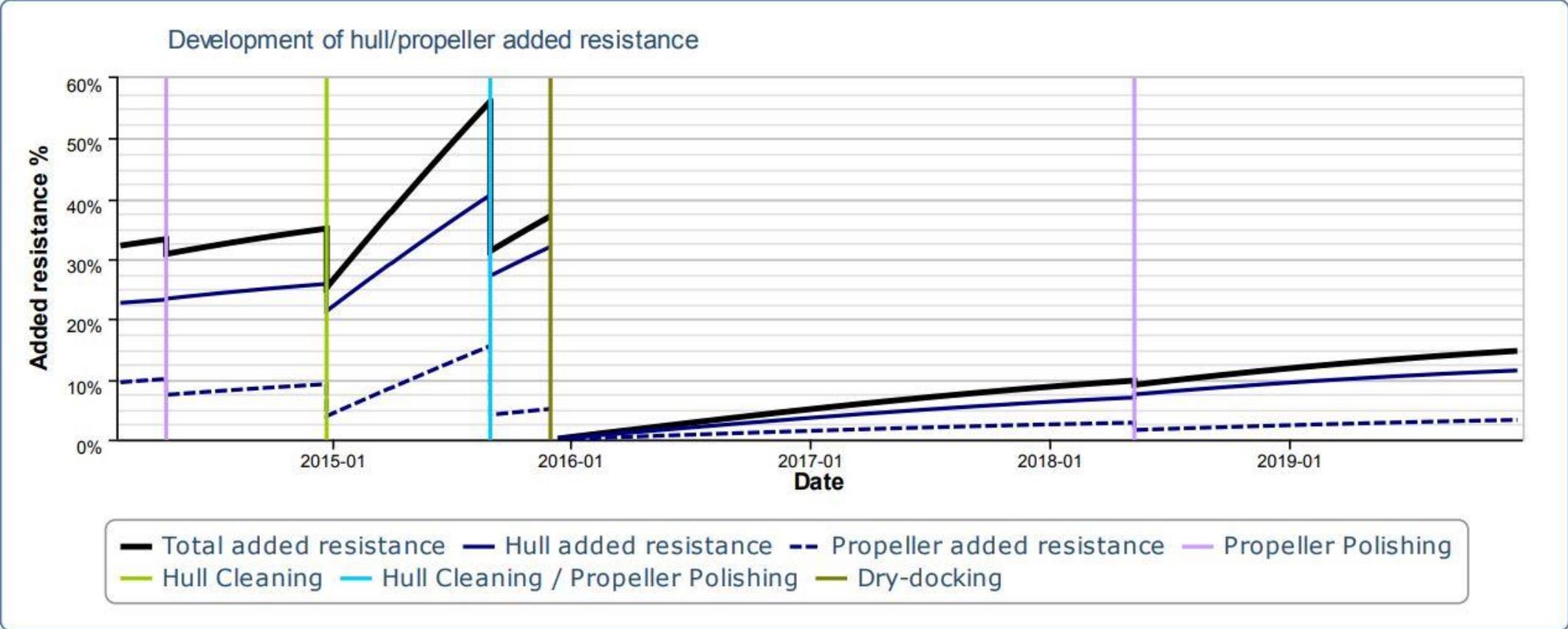


Fig.2 Long stay in port

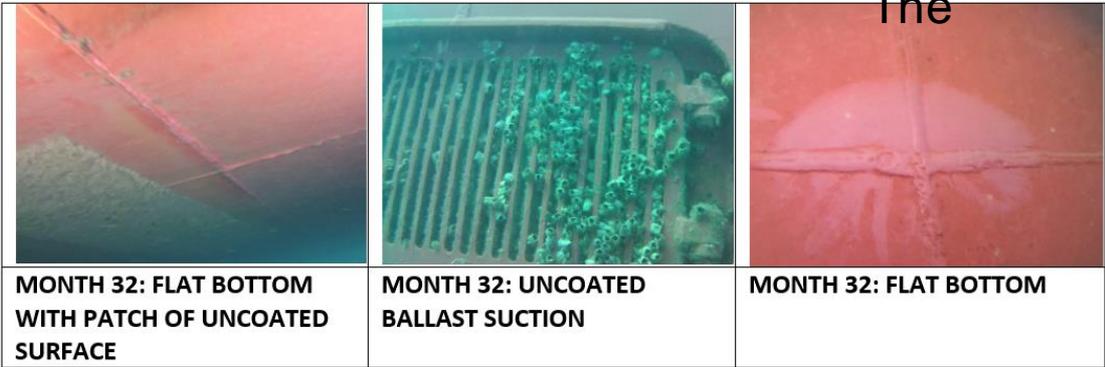
# Results proven by 3rd party data analysis



# Dive inspections show the power of Selektope®



- 27 months:
- Vertical sides clean
  - 6% added hull resistance



- 32 months
- Vertical sides clean
  - 8% added hull resistance



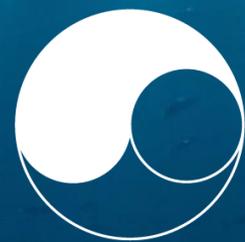
- 36 months
- Vertical sides clean
  - 8% added hull resistance

Month 49: only 15% added hull & propeller resistance

# Summary

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- Independent analysis of 249 vessels confirms animal (barnacle) fouling is clearly a problem.
- Approximately 30% of all vessels have barnacle coverage >20% of the total underwater hull area.
- Dominant fouling condition on BT, VS and FB includes barnacle fouling as a mixture of barnacle fouling, weed and slime.
- Flat bottom and sea chests is a problem area of barnacle fouling.
- Whilst the higher performance products show improved resistance to barnacle fouling there is still significant evidence of barnacle fouling on these products.
- DD data set clearly points to a need for further improvement of the current fouling control range in resisting animal fouling.
- Independent data showing antifouling coatings pigmented with Selektope® delivering improved and longer fouling protection during extended static periods would be a real benefit to ship operators.



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