Biosecurity Risks of In-Water Cleaning of Vessels

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Vessel In-Water Cleaning Meeting       June 22 2015 Honolulu, HI
Biofouling reduction

• Fuel efficiency
• Maintenance (prop polishing, etc.)
• Biosecurity
• Regulatory requirements
Biofouling reduction

- First line of defense: fouling prevention
- Anti-fouling paint applied in drydock ~5 yrs
- Fouling builds up in unpainted and “niche” areas

Before and after cleaning

Photos: Franmarine
Biofouling reduction

• Limited performance after ~18 months
• Periodic cleaning to remove biofouling, refresh paint
• Typically done in-water (IWC)
IWC also presents some risks

- contaminant release (copper, other toxins)
- release of non-native biota
- may damage paint, encouraging further growth
Assessing biosecurity risk posed by IWC of fouled vessels

Baseline risk factors:
- Species present
- Species condition
- Level of fouling

Baseline risk
- Release of adult organisms, propagules, fragments

-Adapted from Hopkins & Forrest 2008
Baseline biosecurity risk

Baseline risk factors:
- Species present
- Species condition
- Level of fouling

Baseline risk
- Release of adult organisms, propagules, fragments

- Does vessel travel strictly in Hawaii?
  *If yes, minimizes baseline risk*

- Condition of species?
  *Often difficult to determine*

- Level of fouling?
  *More fouling, higher risk*
Options for managing biofouling risk

Baseline risk factors:
- Species present
- Species condition
- Level of fouling

Baseline risk
- Release of adult organisms, propagules, fragments

Options:
- No management
- Haul out/dry dock
- In-water cleaning
No-management option

Baseline risk
- Release of adult organisms, propagules, fragments

- Does vessel travel strictly in Hawaii?
  *If yes, minimizes baseline risk*
- Condition of species?
  *Often difficult to determine*
- Level of fouling?
  *More fouling, higher risk*
- Time spent in HI?
  *Less time, lower risk*
- Movements within HI?
  *Fewer stops, lower risk*

No management
Dry dock/haul out option
Dry dock/haul out option

Removal from water

1. Release of mobile animals, fragments, propagules

Cleaning

2. Release of adults, propagules, fragments from waste water

If not full containment of solid debris

Filtration, effluent release

2,3. Release of tiny organisms, propagules from waste water

If not full capture, filtration, treatment of process water

Residual biofouling

Incompletely cleaned patches

Remaining organisms: reduced survival

Dry dock/haul out option

Incompletely cleaned patches

Remaining organisms: reduced survival?
IWC option
IWC option

Vessel set up/dive ops

Release of mobile animals, fragments, propagules

Cleaning

- No containment: 100% debris lost
- With containment 3-12% debris lost

Release of mobile animals, fragments, propagules

Filtration, effluent release

For capture systems

Release of tiny organisms, propagules from waste water

Residual biofouling

- 5-21% surface area missed

In general, IWC = greater survival

- Woods et al. 2012 comparison methods
- Floerl et al. 2003, 70% of organisms survived and viable following IWC
Minimizing risk of IWC

• Hopkins & Forrest 2008 (NZ)
  - recognized that risks of IWC might outweigh not managing biofouling
  - Recommended careful assessment of options
Minimizing risk of IWC

- Floerl et al. 2010 (Australia) recommended:
  - Allow IWC only on vessels with non-biocidal coatings and slime layer only
  - OK on heavier fouling if local origin
  - Cleaning method must not damage paint
  - Proactive maintenance of niche areas
  - Development of capture technologies
Minimizing risk of IWC

• Inglis et al. 2012 (NZ) reviewed various scenarios of vessel type, fouling and stays in NZ
• recommended against IWC as a management option for most non-compliant (fouled) vessels unless debris could be contained
Options for managing biofouling risk

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- Species condition
- Level of fouling

Baseline risk:
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No management

Haul out/dry dock

- Does vessel travel strictly in HI?
  - If yes, minimizes baseline risk
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  - More fouling, higher risk
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In-water cleaning

Baseline risk:
- Release of adult organisms, propagules, fragments

Residual risk

Residual risk
Risk comparison

- Does vessel travel strictly in Hawaii?  
  *If yes, minimizes baseline risk*

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  *More fouling, higher risk*

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