Biofouling management in CA: Recent practices, research, proposed regulations, and future goals

Chris Scianni
CSLC – Marine Invasive Species Program
Pacific Ballast Water Group
April 15, 2015 – Seattle, WA
Topics to cover

1. Recent vessel practices
2. Biofouling research
3. Proposed regulations
4. Future goals
Topic 1: Recent Vessel Practices

California State Lands Commission
Marine Invasive Species Program
Hull Husbandry Reporting Form
Public Resources Code - 71205(e) and 71205(f)
June 6, 2008
Part I: Reporting Form

Vessel Name: ____________________________
Official / IMO Number: ____________________
Responsible Officer's Name and Title: ____________________
Date Submitted (Day/Month/Year): ____________

Hull Husbandry Information

1. Since delivery, has this vessel ever been removed from the water for maintenance?
   - Yes [ ]
   - No [ ]

   a. If Yes, enter the date and location of the most recent out-of-water maintenance:
      
      Last date out of water (Day/Month/Year): ____________
      Port or Position: ____________________
      Country: ____________________

   b. If No, enter the delivery date and location where the vessel was built:
      Delivery date (Day/Month/Year): ____________
      Port or Position: ____________________
      Country: ____________________

2. Were the submerged portions of the vessel coated with an anti-fouling treatment or coating during the out-of-water maintenance or shipbuilding process listed above?
   - Yes, full coat applied [ ]
   - Yes, partial coat [ ]
   - Date last full coat applied (Day/Month/Year): ____________
   - Date last partial coat applied (Day/Month/Year): ____________
   - No coat applied [ ]

3. For the most recent full coat application of anti-fouling treatment, what type of anti-fouling treatment was applied and to which specific sections of the submerged portion of the vessel was it applied?

   Manufacturer/Company: ____________________
   Product Name: ____________________

   Applied on (Check all that apply): Hull Sides [ ], Hull Bottom [ ], Sea Chests [ ], Sea Chest Gratings [ ], Propeller [ ], Rope Guard/Propeller Shaft [ ], Previous Docking Blocks [ ], Thrusters [ ], Rudder [ ], Bilge Keels [ ]

Floerl and Coutts (2009)
Great Recession Impacts on Maritime Shipping

Figure 5 - Baltic Dry Index, 2000-2009 (Monthly Value). Source: The Baltic Exchange.

Source: De Monie et al. 2011. Chapter 2 in Integrating Seaports and Trade Corridors
Great Recession Impacts on Maritime Shipping

Figure 6: Monthly Total Container Traffic at Selected Ports (Jan 2005=100)

Source: De Monie et al. 2011. Chapter 2 in Integrating Seaports and Trade Corridors
Prolonged Residency Periods

Cargo Ships Treading Water Off Singapore, Waiting for Work

Meersk Line, which has been taking delivery of a large number of container carriers, and is considered the world’s largest operator of such tonnage, plans to lay up 25 vessels because of an unprecedented drop in demand. Photo courtesy of Maersk.

The idled fleet of container ships around the world rose to 506 vessels representing 1.34 million TEUs of capacity, at the end of April, according to AXS-Alphaliner, a Paris-based shipping consultant. The idled vessels represent about 10.6 percent of the world container fleet and it is estimated that the top 20 container ship operators may report losses exceeding $4 billion for this year’s first quarter alone, the largest ever quarterly loss in the industry’s history. Nevertheless, they will also be taking delivery of more capacity, with 44 vessels of 8,000 TEU capacity or greater scheduled to come on line this year and many more ships to follow between 2010 and 2012.

http://www.nytimes.com/2009/05/13/business/global/13ship.html?pagewanted=all&_r=0#
Prolonged Residency Periods

• Negatively affects coating performance
  – Floerl et al., 2005. Biological Invasions 7, 459-475
Prolonged Residency Periods

• Negatively affects coating performance
  – Floerl et al., 2005. Biological Invasions 7, 459-475

• Positive relationship: residency period and propagule interaction with vessel
  – Coutts, 1999. Australian Maritime College, Tasmania
  – Floerl and Inglis, 2005. Biological Invasions 7, 589-606
  – Inglis et al., 2008. MAFBNZ Report, New Zealand
HHRF Data: Residency Periods

California State Lands Commission
Marine Invasive Species Program
Hull Husbandry Reporting Form
Public Resources Code \(57205(e)\) and \(71205(f)\)
June 6, 2008
Part I: Reporting Form

- Vessel Name:
- Official / IMO Number:
- Responsible Officer’s Name and Title:
- Date Submitted (Day/Month/Year):

Hull Husbandry Information

1. Since delivery, has this vessel ever been removed from the water for maintenance?
   - Yes ☐
   - No ☐
   - If Yes, enter the date and location of the most recent out-of-water maintenance:
     - Last date out of water (Day/Month/Year):
     - Port of Position: Country:

2. Were the submerged portions of the vessel coated with an anti-fouling treatment or coating during the out-of-water maintenance or shipbuilding process listed above?
   - Yes, full coat applied ☐
   - Yes, partial coat ☐
   - Date last full coat applied (Day/Month/Year):
   - No coat applied ☐
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3. For the most recent full coat application of anti-fouling treatment, what type of anti-fouling treatment was applied and to which specific sections of the submerged portion of the vessel was it applied?
   - Manufacturer/Company:
   - Applied on (Check all that apply): Hull Sides ☐, Hull Bottom ☐, Sea Chests ☐, Sea Chest Gratings ☐, Propeller ☐, Rope Guard/Propeller Shaft ☐, Previous Docking Blocks ☐, Thrusters ☐, Rudder ☐, Bilge Keels ☐.

Floerl and Coutts (2009)
Prolonged Residency Periods, 10+ Days

Year of HHRF Submission

Number of Prolonged Stationary Periods, HHRFs
Normalized to Number of Vessels Submitting HHRFs
Prolonged Residency Periods, 10+ Days

Number of Prolonged Stationary Periods, Normalized to Number of Vessels Submitting HHRFs

Year of HHRF Submission

2008 2009 2010 2011 2012 2013

75%
Prolonged Residency Periods, 10+ Days

Year of HHRF Submission

- 2008
- 2009
- 2010
- 2011
- 2012
- 2013

Number of Prolonged Stationary Periods, Normalized to Number of Vessels Submitting HHRFs

- 120+ days
- 105 - < 120 days
- 90 - < 105 days
- 75 - < 90 days
- 60 - < 75 days
- 45 - < 60 days
- 30 - < 45 days
- 20 - < 30 days
- 10 - < 20 days

Percentage Increase:
- 114%
- 107%
- 70%
Prolonged Residency Periods, 10+ Days

Percent Change from 2008 to 2013 in Residency Periods of 10+ Days

Vessel Type
- Auto
- Container
- Tank
- Unmanned Barge
- General
- Bulk
- Passenger
- Other

-50% to 300%
Traveling Speed

The shipping industry
Slow steaming, uphill

Aug 1st 2012, 11:19 by I.C.

IT NEVER rains but it pours for the shipping industry. Since the great recession began in 2009 its troubles have multiplied: first came a price war among operators of container lines; then a slump in rates for chartering the giant bulk vessels that transport coal, iron and grain around the world; and now it has to cope with a glut of all types of vessels, as ships ordered in the boom times are launched into the slump.

Ocean shipping lines cut speed to save fuel costs

'Slow steaming' upsets some customers, who worry about delays in delivery. But it also keeps more ships in service and cuts emissions.

July 31, 2010 | By Ronald D. White, Los Angeles Times

On the high seas, full speed ahead is being replaced by slow and steady.

Easier to cut fuel costs, ocean shipping lines have ordered their sea captains to throttle back the engines for what is quality


The New York Times

February 17, 2010

Slow Trip Across Sea Aids Profit and Environment

By ELISABETH ROSENTHAL

It took more than a month for the container ship Ebba Maersk to steam from Germany to Guangzhou, China, last month. The trip took nearly twice as long as the normal 40 days or so that it would have taken in the boom years of 2005-07.

But for the owner, the Danish shipping giant Maersk, that counts as progress.


THE WALL STREET JOURNAL

December 30, 2012, 4:11 p.m. ET

Container Ships Bulk Up, and Slow Down

By INTI LANAURO

ZEEBRUGGE, Belgium—The new Marco Polo ship can load 16,000 containers and reach a speed cruising back to China at 14 knots.

The Marco Polo's size and pace on the Europe-to-Asia route show an interesting dynamic at a capacity and declining shipping fares, companies such as CMA CGM of France, owner of the biggest possible ships so they can benefit from economies of scale, and run them at moderate speed to reduce costs.

http://online.wsj.com/article/SB10001424127887323300404578207320544238546.html
Traveling Speed

- Slower speeds = greater survivorship
  - Greater % cover and diversity compared to faster speeds
    - Coutts et al. 2010b. Biofouling 26(5): 539-553
### HHRF Data: Traveling Speed

**California State Lands Commission**
**Marine Invasive Species Program**
**Hull Husbandry Reporting Form**

**Public Resources Code - 71265(e) and 71295(f)**

**June 6, 2008**

**Part I: Reporting Form**

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Traveling Speed

2008 median = 16 knots
Traveling Speed

Average Traveling Speed (knots)

Fraction of Vessels Sampled

2008  2009

5  10  15  20  25
Traveling Speed

Fraction of Vessels Sampled vs. Average Traveling Speed (knots) for the years 2008, 2009, and 2010.
Traveling Speed

Fraction of Vessels Sampled vs. Average Traveling Speed (knots)

- 2008
- 2009
- 2010
- 2011

Average Traveling Speed (knots)
Traveling Speed

Average Traveling Speed (knots)

Fraction of Vessels Sampled

2008  2009  2010  2011  2012
Traveling Speed

2008 median = 16 knots
2013 median = 13.75 knots
Traveling Speed – Auto Carrier Vessels

Fraction of Auto Carriers Sampled

Average Traveling Speed (knots)

2008  2009  2010  2011  2012  2013
Traveling Speed – Container Vessels

- 2008 median = 21 knots
- 2013 median = 17.5 knots
Traveling Speed – Tank Vessels

![Graph showing the average traveling speed of tank vessels from 2008 to 2013. The x-axis represents the average traveling speed (knots), and the y-axis represents the fraction of tankers sampled. Each year is represented by a different color and symbol, showing the trend of average speed over the years.](image-url)
Great Recession Impacts on NIS

Introduction Risk
Evaluating ship biofouling and emerging management tools for reducing biofouling-mediated species incursions

Final Report
December 2014

By
Ian Davidson, Chris Scianni, Lina Ceballos, Chela Zabin, Gail Ashton, and Greg Ruiz

Aquatic Bioinvasion Research & Policy Institute
A partnership between Portland State University & the Smithsonian Environmental Research Center
Thruster sub-niches

- G = Thruster rim
- H = Grates
- I = Tunnel
- J = Propeller blades*
- K = Thruster assembly

*not always accessible
Rudder sub-niches
A = Trailing edge
B = Bottom edge
C = Leading edge
D = Hinge gap
E = Side face
F = Articulation*

*not always accessible
Copper Tolerance
Topic 3: Proposed Biofouling Management Regulations

- Recordkeeping and reporting
- Best preventive practices
- Targeting high-risk ships
Proposed Biofouling Regulations: Recordkeeping and reporting

- Biofouling Management Plan
- Biofouling Record Book
- Hull Husbandry Reporting Form
Proposed Biofouling Regulations: Biofouling Management – Niche Areas

- Manage in some way
- Document management actions
Proposed Biofouling Regulations: Biofouling Management - Hulls

• Codify best preventive practices:
  – Anti-fouling or foul-release coatings within effective lifespan

• If not using best preventive practices, 5% cover threshold
Proposed Biofouling Regulations: Obviously Excessively Biofouling

• Biofouling above 15% cover
  – Excessive drag, fuel, emissions
  – Greater risk of NIS introduction

• Hints at ineffective planning and/or coating

• Biofouling must be reduced to 5% cover or less
Proposed Biofouling Regulations: Extended Residency Periods

- Remaining in one location for 45+ days
- Greater likelihood of heavy biofouling accumulation

- Should inspect and clean (if necessary) prior to arrival at CA
  - Biofouling must be at or below 5% cover

Floerl and Coutts (2009)
Proposed Biofouling Regulations: Alternatives and Emergency Exemptions

• Alternatives:
  – Blueprint for how to petition for alternative ways of achieving the goals of the regulations

• Emergency Exemptions:
  – Specific criteria for exemptions under emergency situations
Proposed Biofouling Regulations: Public Rulemaking Process

• Publication of proposed rule [expected May 1, 2015]

• 45-day public comment period

• Public hearing
  – Port of Long Beach
  – Date: TBD [mid June]

• Mailing list
  – Raya.Nedelcheva@slc.ca.gov
  – Chris.Scianni@slc.ca.gov

• Availability of rulemaking documents
  – www.slc.ca.gov
  – CSLC offices – Sacramento and Long Beach
Topic 4: Future Goals

• Regulatory guidance document
  – Translate regulatory language - “Cliffs Notes”
  – Sample BF Management Plan and Record Book

• ROV-based Biofouling Compliance Assessment Protocols
Future Goals

- CSU COAST (Council on Ocean Affairs, Science, and Technology) Internship projects
  - Waterline biofouling
  - Coatings database expansion
Future Goals

• Manuscripts for publication
  – Disconnect between biofouling management for operational efficiency and NIS prevention purposes (SERC, MERC, NRL, NSWC, Univ. Waikato)
  – Impacts of Great Recession on risk of introducing NIS
  – Analysis of coatings used for vessels arriving at CA
Future Goals

- Continue to engage EPA, CA State Water Board, CA Regional Water Boards, and CA ports on responsible in-water cleaning (recapture and treatment)

***No Endorsement implied***
Future Goals

• Biofouling Research
  – Copper tolerance
    • Inter- and intra-specific variability
    • Vessel traffic
    • Background pollution (Cu)
    • Facilitates successful transfer
  – Stationary periods and biofouling development
    - Port
    - Coating type
    - Season
Thank You

chris.scianni@slc.ca.gov