

# The maritime industry deals with invasive aquatic species

By Darryl Anderson and Georges LaRoche

**I**nvasive aquatic species (IAS) — via “biofouling” — is one problem that has now been identified by the International Maritime Organization as a significant environmental threat. Biofouling occurs as the result of an accumulation of aquatic organisms such as micro-organisms, plants or animals on surfaces and structures immersed in or exposed to the aquatic environment. Dr. Theofanis Karayannis, an IMO technical officer, recently suggested that hull biofouling could be as severe a cause of the incursion of IAS as ballast water has previously been thought to be.

In this article, we will explore the environmental risks associated with biofouling. It will also present insights into the emerging regulatory framework both globally and in North America so ship operators can help gauge their compliance readiness. It will close with a discussion of some of the challenges and some solutions available for vessel operators.

## Global and regional environmental effects of biofouling

The IMO’s November 2017 legal update provided three major observations regarding aquatic invasive species on a global level:

- Seventy to 80 per cent of IAS introductions occur through biofouling, and new geographic areas are constantly being invaded.
- IAS can cause enormous damage to biodiversity, and the damage they cause is often irreversible.
- The spread of IAS is one of the greatest threats to the ecological and economic well-being of the planet.

The effects of IAS in North America have been felt throughout the Great Lakes, Mississippi, East, West and Gulf Coasts as well as the Arctic. Many non-indigenous species have been introduced to all the North American coasts, including the spread of the very venomous Lionfish on the Florida South Coast. This

*Invasive aquatic species (IAS) — via “biofouling” — is one problem that has now been identified by the International Maritime Organization as a significant environmental threat.*

is a species that, until recently, was native mainly in the South Pacific and Indian oceans.

The Asian Carp has invaded the Mississippi River and is now threatening entry into the Great Lakes as well. Also, the incursions of species such as zebra mussels, gobies and the ruffe have had destructive effects on the Great Lakes ecosystem. The Transport Canada website states that the Great Lakes now have over 170 established aquatic alien invasive species.

Between 2009 to 2012, Fisheries and Oceans Canada (DFO) has conducted surveys on six of Her Majesty’s Canadian ships in the Arctic. A total of 229 hull scrapings were taken before, during and after the Arctic voyages. DFO presented their findings at the 2018 annual Canadian Marine Advisory Committee conference in Ottawa. DFO’s analysis showed that:

A total of 293 species types were identified, including one species that has never before been observed in Canada.

One non-indigenous species was verified as being able to survive in the Arctic region.

## Governance

The *International Convention for the Prevention of Pollution from Ships* (MARPOL) established the *International Convention on the Control of Harmful Anti-Fouling Systems on Ships* in 2001. It prohibits the use of harmful organotin compounds in anti-fouling paints used on vessels. It defines “anti-fouling systems” as “a coating, paint, surface treatment, surface or device that is used on a ship to control or prevent attachment of unwanted organisms.”

The convention called for a global prohibition on the application of organotin compounds in anti-fouling systems on ships by January 1, 2003, and a complete prohibition by January 1, 2008. The convention became valid and enforceable on September 17, 2008. Consequently, ships



**Moving Mountains**

**CHAMBER of SHIPPING**

**Advocating for a safe & competitive marine industry**

[www.cosbc.ca](http://www.cosbc.ca)

[@COSBCTweets](https://twitter.com/COSBCTweets)

## BIOFOULING

### Canada continues to formulate programs and commit considerable resources to tackle the problem of IAS and waterborne toxins.

must remove any harmful coatings or completely seal them with an approved coating. Several new types of coatings have been developed to assist with this issue and are in accordance with the “Guidelines for the Control and Management of Ships’ Biofouling to Minimize the Transfer of Invasive Aquatic Species” in 2011.

More recently, the *International Convention on the Control and Management of Ships’ Ballast Water and Sediments* came into force in September 2017.

Internationally, New Zealand is currently working through the IMO process to bring about revisions to the 2011 requirements. New Zealand may be at the forefront of biofouling protection, having passed various laws including the 1993 New Zealand *Biosecurity Act*, and the 2014 New Zealand *Craft Risk Management Standard*.

The implication for vessel operators entering New Zealand waters is that, as

of May 2018, vessels must arrive with a ‘clean hull.’ This means:

- Vessels staying up to 20 days and only visiting designated ports (places of first arrival) will be allowed a slight amount of biofouling (slime layer, goose barnacles, and up to five per cent cover of early biofouling depending on the area fouled).
- Vessels staying longer than 20 days or visiting places that aren’t places of first arrival will only be allowed a slime layer and goose barnacles.

In North America, the United States Coast Guard has required a biofouling management plan (BMP) on board a vessel since June 2012. The State of California established a *Marine Invasive Species Act* in 2003 with the goal of reducing the risk of introducing invasive aquatic species. The State passed legislation entitled *California’s Marine Invasive Species*

*Program* (MISP) and beginning January 1, 2018, California requires stringent reporting and inspection procedures far above national standards and consistent with the best practices found in the IMO biofouling guidelines. The Californian law provides for more extensive reporting and data recording procedures than the USCG requirements.

Canada continues to formulate programs and commit considerable resources to tackle the problem of IAS and waterborne toxins. Efforts to address biofouling include legislative instruments, regulations, policies and practices that are evolving over time. Some of the most important legislation is contained in Canada’s *Oceans Act*, *Species at Risk Act*, *Fisheries Act*, *Aquatic Invasive Species Regulations* and *Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*.

Canadian ports are proactively working to protect marine life. In 2012, the Prince Rupert Port Authority (PRPA) began a partnership with Northwest Community College (NWCC) and the Smithsonian’s

**Al premium**  
SALT AND BRACKISH WATER

**Mg fresh**  
FRESH WATER ONLY

**Zn traditional**  
SALT WATER ONLY

**WHY ALUMINUM?**

Martyr™ Premium Anodes:

- Perform better than Zinc
- Protect **50% longer** than Zinc
- Eco-Friendly, 0 Cadmium
- **50% lighter** than Zinc
- US Military Spec Mil-DTL-24779C(SH)
- **Will save YOU money**

**Martyr**

*Protect your boat, protect our waters.*

[martyranodes.com](http://martyranodes.com)

**Envirolin**  
Canada **ECO-FRIENDLY**  
LUBRICANTS  
DISTRIBUTOR

**COME SEE US  
IN BOOTH # 8**

GREENTECH 2018 | GREEN MARINE  
ENVIRONMENTAL CONFERENCE

**PANOLIN**® + **PROTECT THE ENVIRONMENT**  
Swiss Oil Technology

Providing Safe and Effective Alternative Products for The Marine Industry

- Bio-Hydraulic Fluids
- Bilge and Deck Cleaners
- EAL/ECLs/Bio-Lubricants
- Eco Safe Descaler
- Absorbents
- Solvent Tank Replacement
- AND MORE...

**BNAC**  
Biodegradable Natural Alternative Chemistry  
Environmental Solutions Inc.

**GREEN MARINE**®

P/F: 1-877-566-2622 | E: [INFO@BNAC.CA](mailto:INFO@BNAC.CA) | [WWW.BNAC.CA](http://WWW.BNAC.CA)

Invasive Tunicate Network's Plate Watch program to launch one of only a handful of invasive aquatic species monitoring programs on the B.C. coastline. The program now includes a partnership with DFO and others in the region. The program also includes plankton sampling and trapping for Green Crab.

The Plate Watch program is a collective of researchers and volunteers from various marine science groups that stretch from California to Alaska. Since its formal launch in 2007, Plate Watch has created an online network that was established to share information across the broad network of participating sites. The program utilizes the simple device of a clean, flat PVC plate tied to a brick, which is then deployed from a pier or floating dock. The plate is secured approximately one metre underwater where the largest percentage of target species can be found. It is allowed to collect samples for up to six months before they are pulled up and investigated. Together with NWCC's Applied Coastal Ecology program, approximately 40 plates at four different waterfront sites are monitored.

To date, no invasive species have been detected in the Prince Rupert harbour, while a few have been found in the general area of B.C.'s north coast and the Alaska southeast. However, the Plate Watch program establishes critical baseline data and a registry of species in the region. It also provides the Port Authority with the ability to participate in a larger view of the arrival and spread of invasive species along the North Pacific coast. Participation in the network allows for a greater mobilization of potential management strategies.

Jason Scherr, PRPA's Manager, Environmental Sustainability, stated that "the local program reports its findings to the coast-wide collection of experts and contributes to an early detection system for invasive species not previously present in the Northwest Pacific. Industry has to work with partners and experts to understand the environment in which the port operates and take coordinated action with others. Collaborative projects such as Plate Watch and forums such as the Port Authority's environmental stewardship committee are important for building stakeholder relationships and collaboration."



Volunteers for the Plate Watch program, a joint initiative between the Prince Rupert Port Authority and the Northwest Community College to watch for invasive aquatic species on B.C.'s coastline.

### Impact of biofouling on ship owners

For a ship owner, there are four main concerns regarding biofouling:

- It raises the level of drag and reduces the vessel's maximum speed. Added drag on the vessel causes an increase in voyage time and fuel/power consumption.
- It increases fuel and power consumption, therefore reducing the fuel range.
- It causes greater frequency of maintenance.
- It introduces vessel risk and the possibility of port entry denial or quarantine.

Each of the four impacts results in additional costs due to extra fuel, inspection and maintenance. The risk of delays due to port entry denials or quarantines could have substantial effects on the vessel's voyage costs.

A number of methods have been used by ship owners to reduce biofouling on a ship's hull. Anti-fouling paints have traditionally been used to coat the bottoms of ships to prevent invasive aquatic species and other organisms from attaching themselves to the ship's hull. However, some of the most effective older anti-fouling paints were found to contain the organotin tributyltin (TBT) which has been proven to be leaching into the marine environments and causing damage to aquatic life. This type of coating must now be removed or

sealed before entering the various ports and territorial waters.

The added fuel being consumed by vessels where excessive fouling occurs not only depletes the planet's natural resources at a greater rate, but also increases the level of emissions being released into the atmosphere. The build up of hull fouling on vessels also causes an increase in the level of underwater noise which is causing concern over its effects on marine species in the vicinity of the sound.

After progressing from the old coatings (where lime and arsenic were used to prevent biofouling) to using metallic compounds, it was discovered that elevated levels of the organotin tributyltin (TBT) were leaking into the water and causing significant damage to marine life, initially being proven to cause deformations and even sex changes in various shellfish. Research has shown that these toxins persist in the marine environment and continue to kill sea life and cause further damage. New authorized coatings are available and can be found listed on several government and international websites (for example, <http://pr-rp.bc-sc.gc.ca/ls-re/index-eng.php> lists registered coatings on the Canadian Government site).

Cleaning in drydock can be effectively controlled but dockside cleaning becomes complicated and risky when the vessel is afloat. The main complication with past systems (for example, wire brushes and

*Scientists, governments and shipping company officials are becoming ever more aware that biofouling of a ship hull has to become a significant priority...*

blasting) was that they tended to release the organisms and paint toxins into the water during the cleaning process. Quite often, they would remove but not kill the unwanted creatures and in the process, damage existing coatings.

Mechanical or electronic systems are being used to prevent biofouling and the maintenance of affected ships. For example, on March 2018 Sidney, B.C.-based EMCS Industries received purchase orders for its anti-fouling NoXX system from ferry builder Damen Shipyards Group. The NOXX™ LFP (Low

Frequency Pulse) Anti Fouling system uses extremely low power, adds very little weight to the vessel and is a tried-and-tested solution in fresh and salt water. The system works regardless of the material used in the hull or onboard applications. The electronic devices are being installed on two new B.C. Ferries vessels currently being built in Romania.

Several new tools have been developed such as encapsulation (wrapping the ship and killing all organisms), heat treatment (doesn't clean but kills existing organisms) and the underwater "clean

and contain" systems such as Whale Shark/All-Sea (Canada), Franmarine EnviroCart (Australia), and the Trident-Maersk Trident V TechHullClean system (Spain and Canada).

The main challenge with these systems at present seems to be non-widespread availability and a relatively high and thus more prohibitive cost in comparison to old methods.

### Conclusion

The effects of biofouling on the Pacific and Atlantic coasts, Arctic and Great Lakes are already being experienced. Scientists, governments and shipping company officials are becoming ever more aware that biofouling of a ship hull has to become a significant priority in the management and prevention of marine invasive species.

Consequently, biofouling is a substantial global challenge and will soon, if not already, take centre stage in the prevention of IAS. Internationally and regionally, solutions to ballast water management are in their late stages so the focus will now begin shifting to this problem. Through its unique monitoring program, PRPA is working collaboratively with partners in Prince Rupert and across the West Coast of North America to understand better how we can collectively keep our coastline healthy and free from potentially harmful organisms. The Watch Plate program demonstrates that wise stakeholders have been proactive in dealing with biofouling.

For ship owners, the issues are more than avoiding costly maintenance in the future. The cost of trying to manage IAS infiltration into various regions is significant. The whole research, regulatory and application processes that are required to remedy this problem has been, and will prove to be, quite costly to both stakeholders and governments.

*Darryl Anderson is a strategy, trade development, logistics and transportation consultant. His blog Shipping Matters focuses exclusively on maritime transportation and policy issues.*

*Georges LaRoche is a cargo consultant at LaRoche Consulting. He has over 30 years' experience managing gearless and self-unloading dry-bulk carrier operations on the Great Lakes, St. Lawrence, and Atlantic regions and internationally.*

# B.C.'S MARINE OIL SPILL RESPONSE ORGANIZATION

## Ready to Protect Canada's West Coast



HONOURING  
**40**  
YEARS OF SPILL RESPONSE  
1976 - 2016

**WCMRC**  
Western Canada Marine  
Response Corporation

Call our 24-hour spill emergency line: 1-855-294-9116

South Coast | Burnaby: 604.293.2384 North Coast | Prince Rupert: 250.624.5666

Vancouver Island | Duncan: 250.746.9443 Head Office | Burnaby: 604.294.6001