



The Role of Marine Science in Supporting the New Canadian Aquatic Invasive Species Regulations

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Background

- Despite the threat invasive species pose to native biodiversity Canada does NOT have a general *Biosecurity Act* (e.g., New Zealand)
- Although it has always been illegal to introduce fish under the *Fisheries Act* General Regulations there was a desire to develop and implement AIS Regulations in the *Fisheries Act* due to the increased risk of new invaders (e.g., Asian carps in Great Lakes)



Background

- Canadian Council of Fisheries and Aquaculture Ministers – Aquatic Invasive Species Task Group developed the National Action Plan on Invasive Species (2004) and its Implementation Strategy that had three major elements:
 - Early detection/rapid response
 - Risk assessment
 - Engaging Canadians



Aquatic Invasive Species (AIS) Regulation in the Canadian *Fisheries Act*

- Published in Canadian *Gazette* June 17, 2015
- <http://gazette.gc.ca/rp-pr/p2/2015/2015-06-17/html/sor-dors121-eng.php>
- Designed to be enabling so do not come with dedicated funding



AIS Regs: Prohibited Species

- The regulation prohibits import, transport, possession and release of specific species listed in Part 2
- Prohibited list of species includes name of species, which prohibitions apply, and in which geographic area
- List indicates if prohibition applies to live organisms, or both live and dead, or have a requirement for evisceration





AIS Regs: Prohibited Species

- Risk assessments to be used to inform decision making regarding which species and geographic boundaries to consider for listing
- Thus, the intent is to invoke prohibitions only when certain risk tolerance thresholds are exceeded
- DFO Science informed the listing of species/areas in the AIS Regulations and can inform any potential amendments



Prohibited Species List

➤ Asian carp (four species):

- prohibited from import, possession, transport and release in Canada unless dead and eviscerated

➤ Invasive fish under the *Ontario Fishery Regulations*:

- prohibited from live possession, transport and release in Ontario

➤ Prohibited species under the *Manitoba Fishery Regulations*:

- prohibited from live possession, transport and release in Manitoba

➤ Zebra and Quagga Mussels:

- prohibited from import across Canada; possession, transport and release, live or dead, in British Columbia, Alberta, Saskatchewan, and Manitoba



Prohibited Species List: Potential Gaps

- Initial list of Prohibited Species will be expanded over time (through regulatory amendment) according to risk and capacity to administer and enforce prohibitions
- British Columbia's lists were excluded from initial listing process, specifically:
 - Pacific Fisheries Regulation Schedule VIII
 - Controlled Alien Species Regulation in the British Columbia Wildlife Act



AIS Regs: Control Species

- The regulation also includes a list of 14 species (Part 3) that are NOT prohibited but for which control activities may be undertaken where they are not indigenous and may cause harm
- List includes tunicates, green crab, and species such as smallmouth bass and walleye which are native to some parts of Canada but are considered invasive elsewhere





AIS Regs: Control Species

- Species listed are the ones for which DFO has completed risk assessments and the outcome was moderate to high risk
- Currently, this list only includes species that have already invaded at least one location in Canada
- Thus, the intent is to provide a regulatory framework to undertake control measures if desired



Control Species List

- **Marine Species**
 - **Club Tunicate**
 - **Vase Tunicate**
 - **Golden Star Tunicate**
 - **Violet Tunicate**
 - **Carpet Tunicate**
 - **European Green Crab**
 - **Chinese Mitten Crab**
- **Freshwater Species**
 - **Bloody Red Shrimp**
 - **Smallmouth Bass**
 - **Largemouth Bass**
 - **Northern Pike**
 - **Pumpkinseed**
 - **Yellow Perch**
 - **Walleye**





AIS Regs: General Prohibition

- The regulation also contains a general prohibition against the introduction of species where they are not indigenous unless authorized under federal or provincial law
- **NOTE:** It was already illegal to introduce fish to fish-bearing waters under the *Fisheries Act* General Regulations





NEW Control & Eradication

- The regulation allows prescribed Ministers to authorize the deposit of deleterious substances to control or eradicate AIS:
 - Conditions such as not compromising public safety and taking into account impact and alternative measures have to be followed
 - Only approved drug and pest control products can be used



NEW Control & Eradication

- Control and eradication activities may be *authorized* for species listed in the regulation (Parts 2 or 3 of the Schedule), as well as any aquatic species where it is not indigenous and may cause harm
- Additional research will be required to inform control measures for freshwater and marine AIS
- Additional products will need to be approved for use in aquatic systems



Risk Assessments to Inform Regulations

- As noted, detailed-level risk assessments were the basis for listing species in the AIS Regulations.
- Generally these are quite time-consuming and not clear if detailed-level risk assessments would be required to inform listing species in AIS Regulations – maybe screening-level risk assessments are suitable?



Screening-Level RA Tools (SLRA)

- SLRA tools can be applied quickly with available data (which may be limited)
- Score-based tools can prioritize AIS based on rank score
- SLRAs provide a risk-based approach that could be used to add species to the AIS Regulations



Screening Level RA Tool (CMIST)

- We developed the Canadian Marine Invasive Screening Tool (CMIST)
- 17 questions are generalized to the invasion process and resulting impacts, therefore this tool could be applied to other taxa and at different spatial scales
- Guidance document ensures standardized application
- Explicitly captures assessor uncertainty in the final risk score *via* a Monte Carlo procedure



Screening Level RA Tool (CMIST)

- Breakdown of the 17 CMIST Questions:
 - Likelihood of Invasion: 8 questions
 - Likelihood of Impact: 9 questions
- Scores range from 1 (low) to 3 (high)
- Uncertainty for each question also scored 1 (uncertain) to 3 (certain)
- Scores multiplied to obtain overall risk with uncertainty used to adjust this score

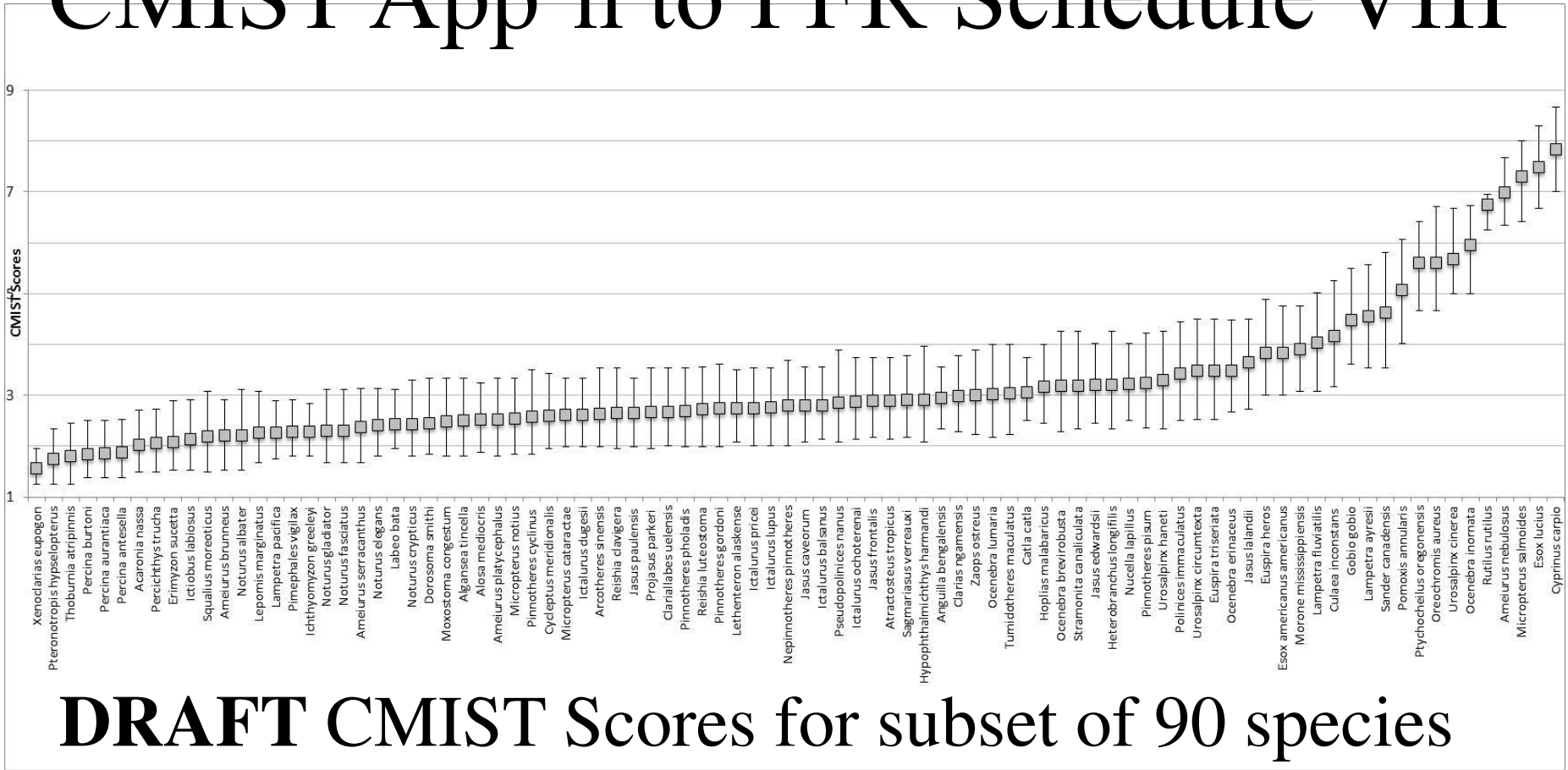


Pacific Region CMIST Application

- Currently applying CMIST to British Columbia Pacific Fisheries Regulations Schedule VIII
- BC PFR includes primarily FW fish (1161 sp.) and marine invertebrates (375 sp.)
- Screening is using combination of climate and CMIST: temperate species will be assessed with CMIST while tropical ones will not



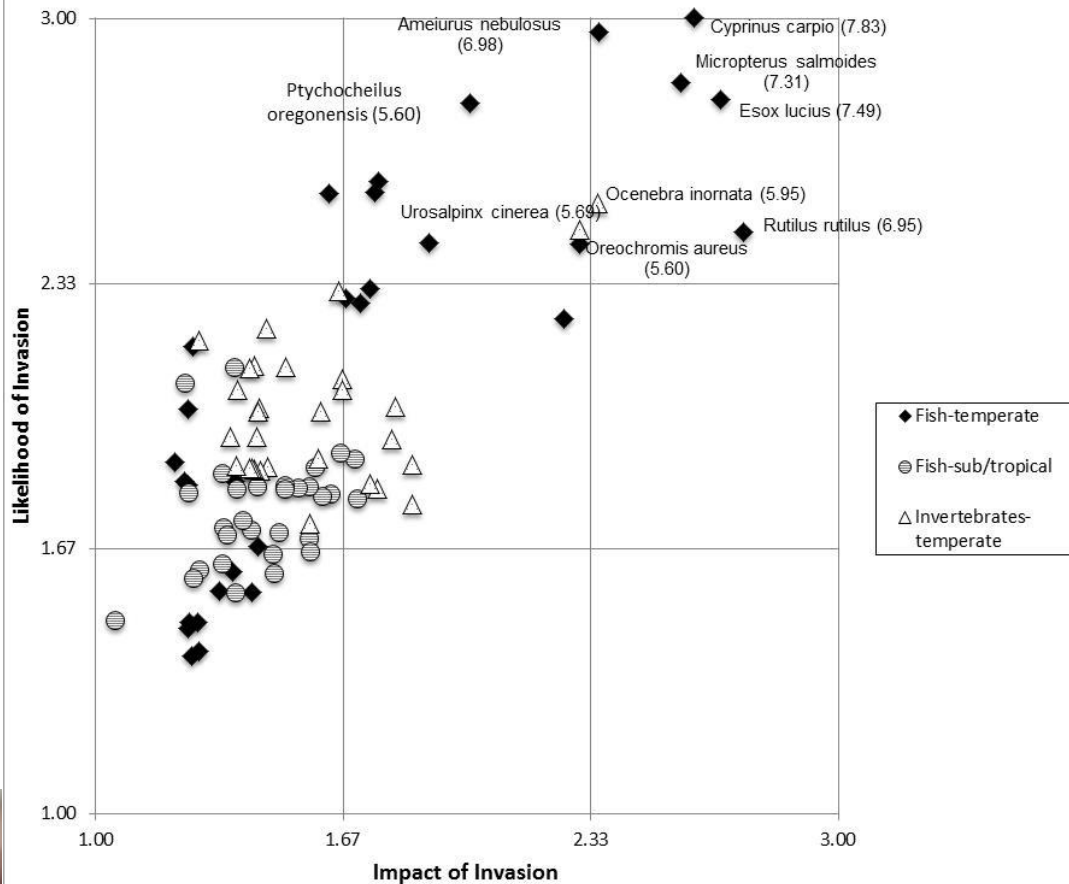
CMIST App'n to PFR Schedule VIII



DRAFT CMIST Scores for subset of 90 species



CMIST App'n to PFR Schedule VIII



Higher risk species are in the upper right and lower risk species are in the lower left



AIS Regulation Amendments

- Application of CMIST to PFR Schedule VIII species (or others) will identify higher risk species that could be considered in future changes to prohibited/control species in the AIS Regulations
- Ecological risk is only one consideration. Also,
 - Socio-economic risk assessment
 - Cost-Benefit Analysis

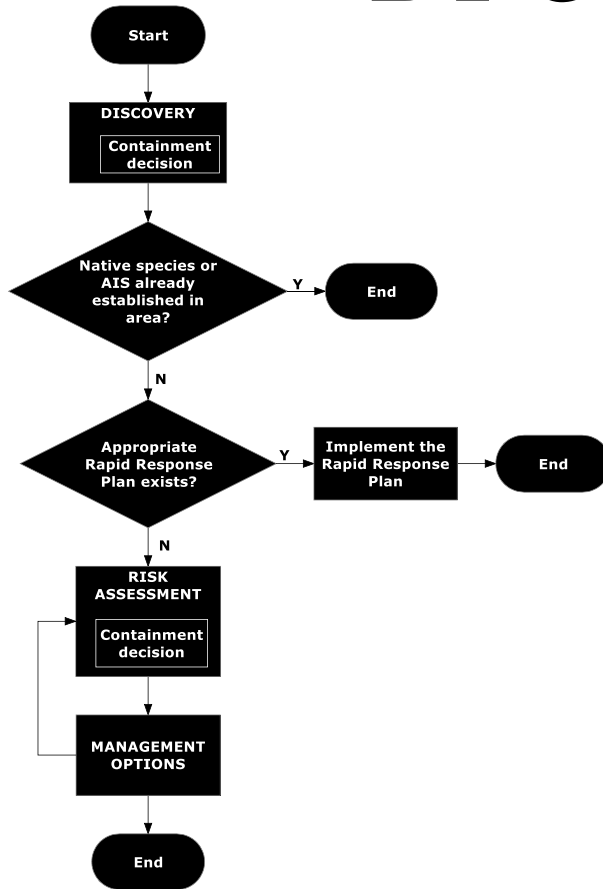


Auditor General (2002 and 2008)

- “responding rapidly to AIS **requires monitoring and early detection**. To be effective, rapid response plans should be in place before a crisis occurs so decisions and actions can be taken quickly.”
- “DFO should apply a systematic risk-based approach to early detection **and develop the ability to respond rapidly** when new invasive species are detected in order to prevent them from becoming established or to control them”



DFO Rapid Response



- Framework is nested set of decision trees (Locke et al. 2011)
- Risk assessment is an integral component of RR Plans and key to informing potential management options
- CMIST scores can inform this process as well

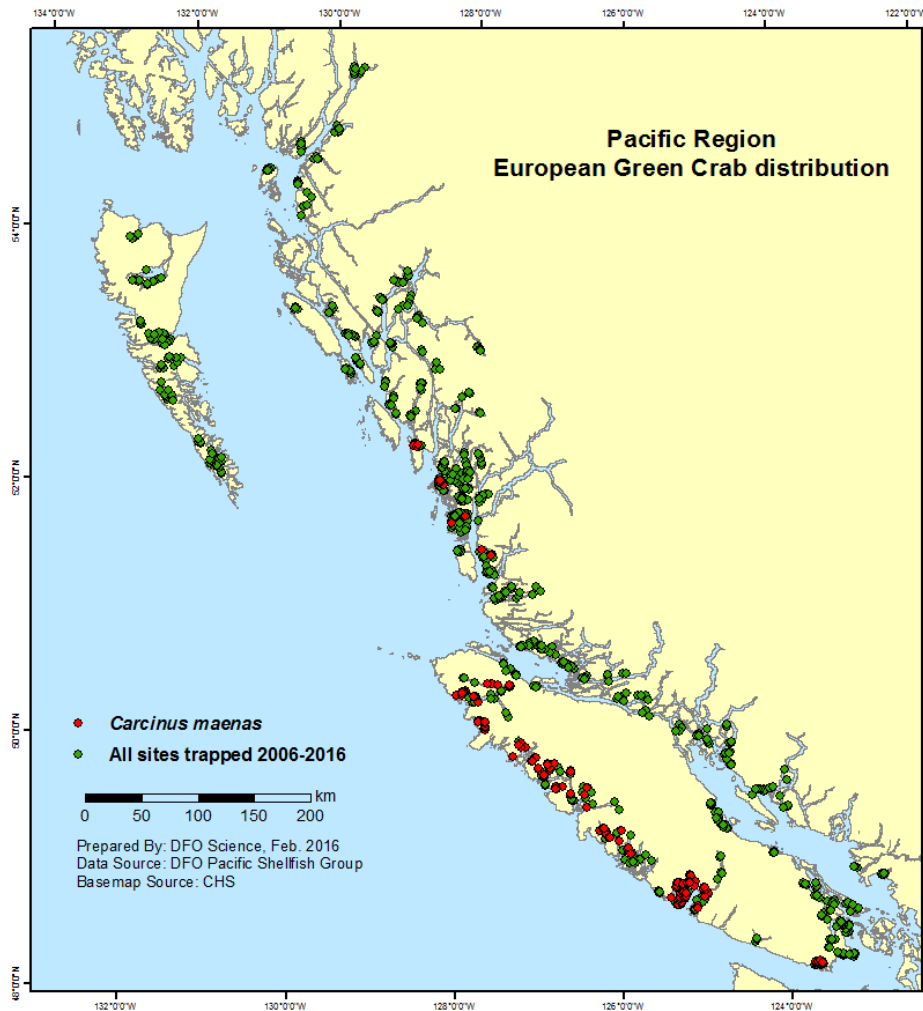


DFO Pacific Region Monitoring

- Early Detection key to successful RR
- Three marine monitoring programs are providing valuable baseline information for coastal marine waters:
 - European Green Crab Trapping
 - Intertidal Monitoring Program (i.e., beach surveys)
 - Subtidal Monitoring Program (i.e., collector plates)



European Green Crab (*Carcinus maenas*)





Intertidal Monitoring





Subtidal Monitoring

NOTE: we now use square PVC tiles to be consistent with other programs like SERC's PlateWatch





DFO Pacific Region Research

- Research to inform AIS Monitoring and Risk Assessment
- Focus on high priority (risky) species (European green crab, tunicates) and important vectors for introduction and/or spread (recreational boats, commercial shipping, Japanese tsunami debris)
- Research to inform Management (e.g., potential control options)



Summary

- Non-native species continue to be re-distributed globally at alarming rates – implications for BC marine and FW
- Prevention should be the primary objective but we can't prevent all introductions
- Agencies don't have the resources to deal with all introductions so these need to be prioritized in a risk-based way
- DFO can't do this alone and needs to work with Provincial/Federal counterparts, First Nations, industry, and stakeholders to deliver



Summary

- SLRA outputs can be used to inform AIS Regulatory amendments, EDRR plans, AIS monitoring programs, and the identification of research gaps
- PFR Schedule VIII assessments will be peer-reviewed via a DFO CSAS process consistent with other science advice within the Department
- Additional species not covered by PFR Schedule VIII should be assessed for risk of invasiveness (e.g., snakeheads)
- DFO Science plays a critical role informing management decision making and policy development



AIS Communications

- AIS Questions
 - Phone: 1-250-756-7394
 - E-mail: Thomas.Therriault@dfo-mpo.gc.ca
- AIS Reporting
 - Phone: 1-888-356-7525 (24/7)
 - E-mail: AISPacific@dfo-mpo.gc.ca
 - Take a picture if possible
 - Record date and location (GPS if possible)
 - Note habitat associated with the potential AIS