

# Do organisms on debris pose a risk to North American ecosystems?

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# Why be Concerned?

- Non-native species can result in the loss of native biodiversity
- They also pose significant socio-economic risks, including significant risks to sustainable fisheries and aquaculture and human health
- Impacts may be exacerbated by climate change
- Globally, introductions continue
- But we need to understand the risks ...



# Why risk assessments?

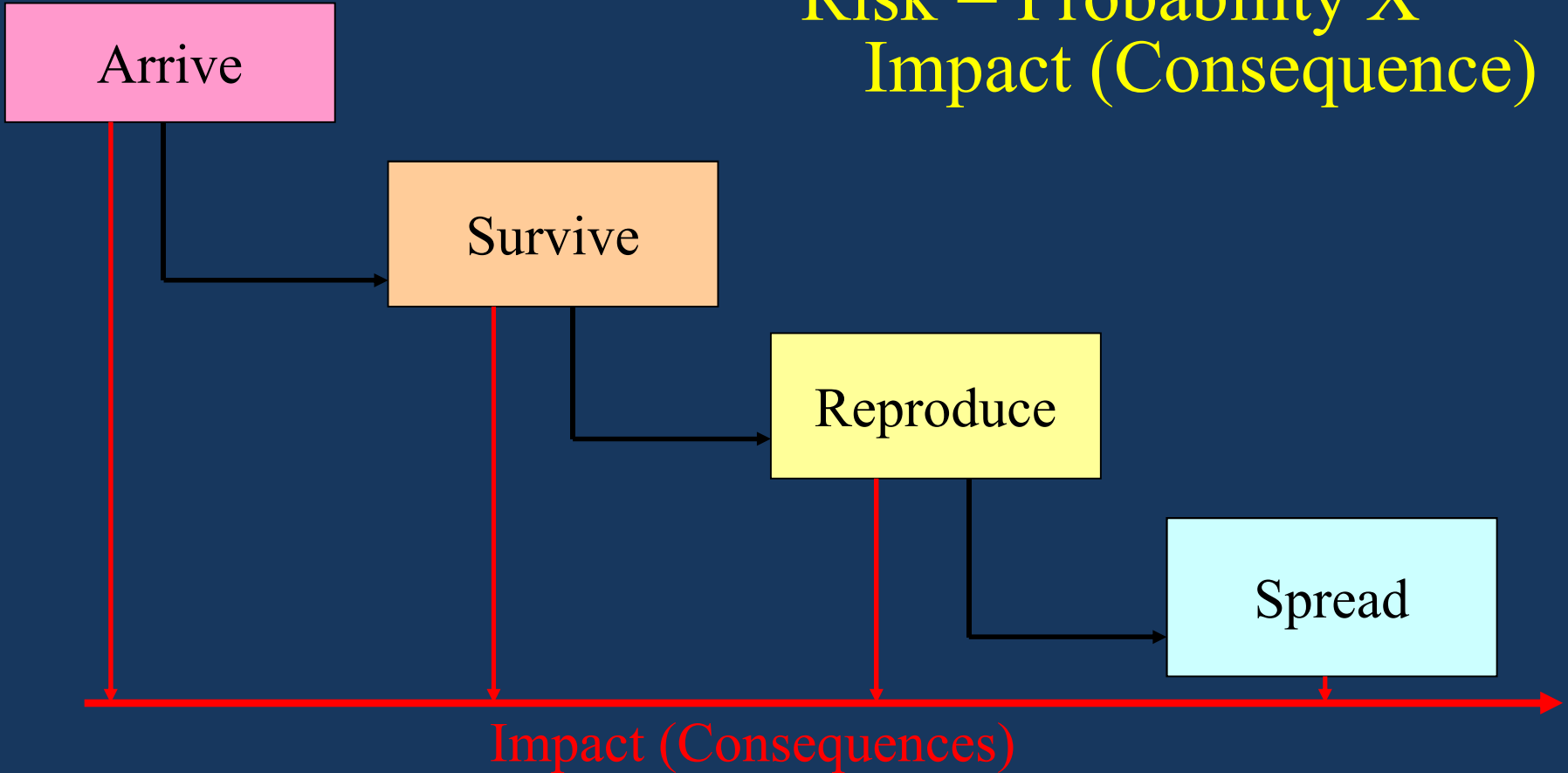
- Different species pose different risks to new ecosystems
- Screening Level Risk Assessment Tools can be applied quickly with available data (which may be limited)
- Score-based tools can prioritize species based on rank scores
- Prioritized species lists for monitoring
- Public species watch lists per ecoregion

Photo: US Navy

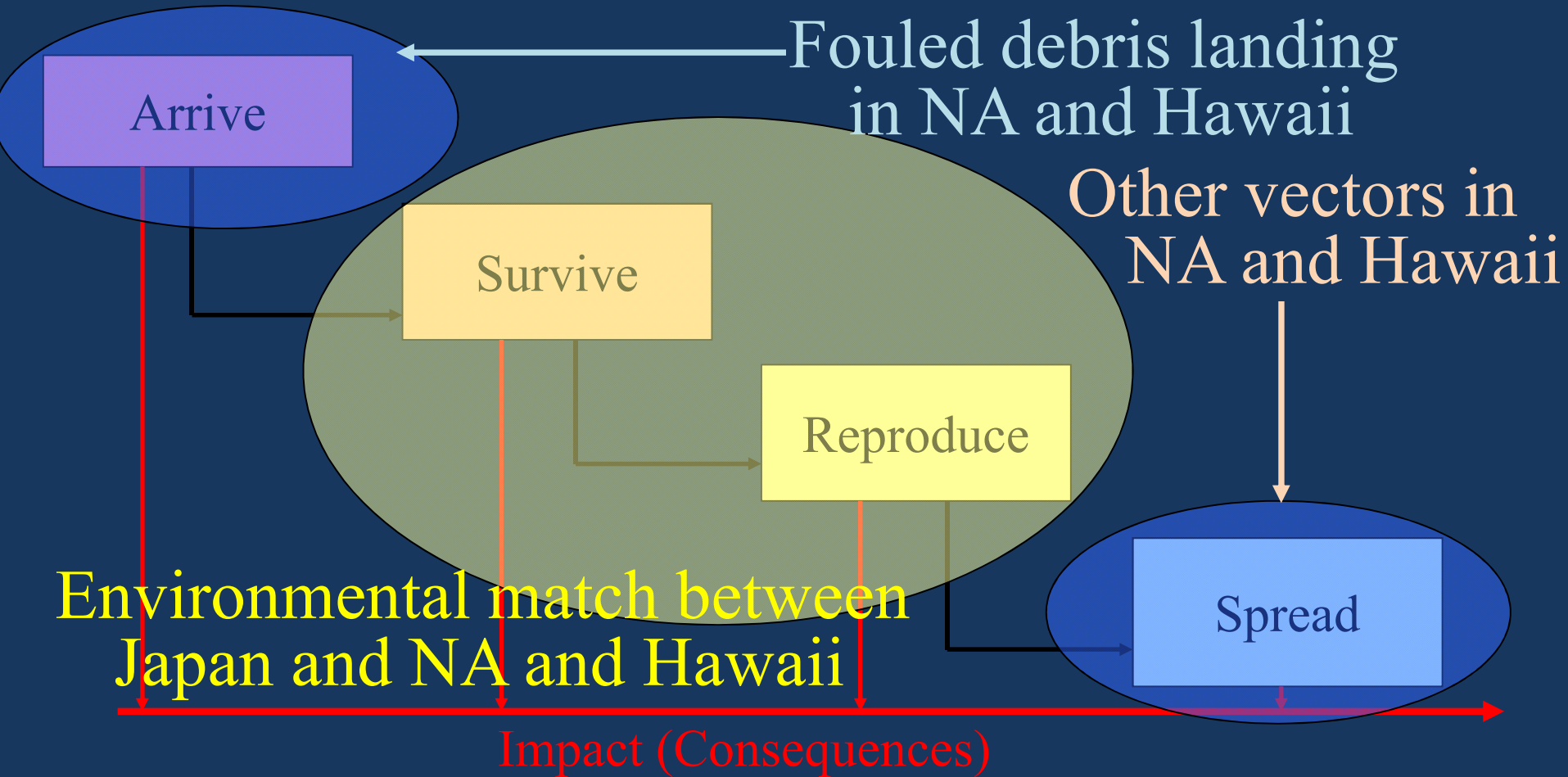


# The General Invasion Process

Risk = Probability X  
Impact (Consequence)

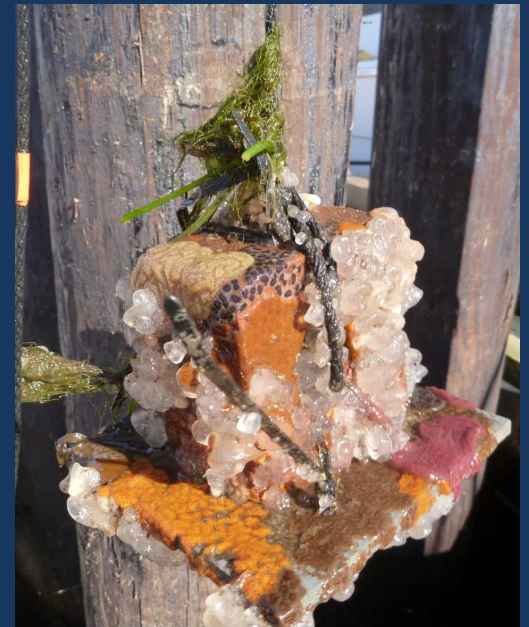


# So for Japanese Tsunami Debris

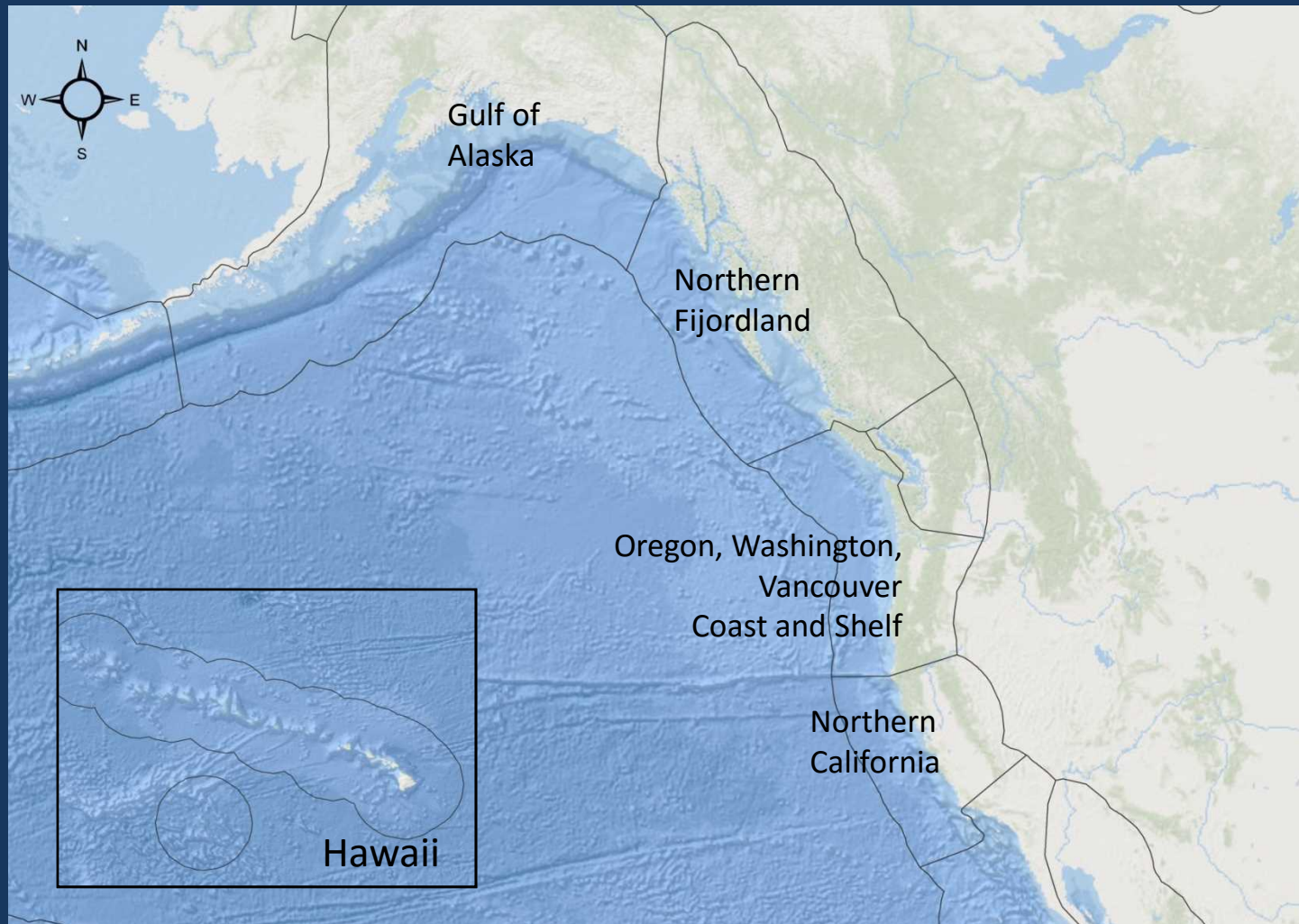


# Canadian Marine Invasive Screening Tool (CMIST)

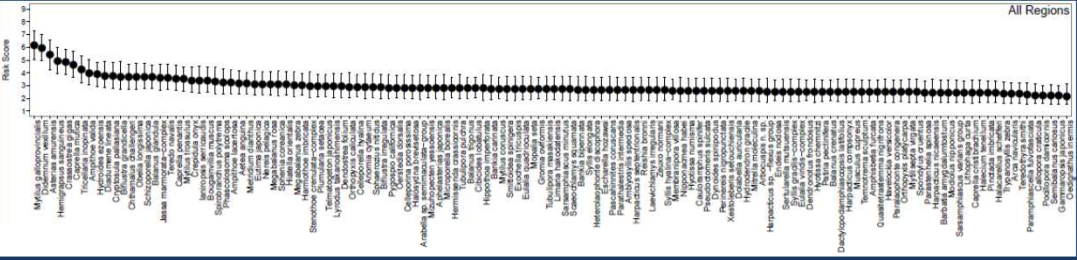
- Screening tool that evaluates risk based on invasion likelihood and impacts
- 17 Questions scored from low (1) to high risk (3):
  - Present status in the area
  - Rate of introduction
  - Survival
  - Establishment
  - Spread
  - Impact
- Captures assessor uncertainty
- We applied to 132 invertebrates on debris



# Spatial Scale for Assessments

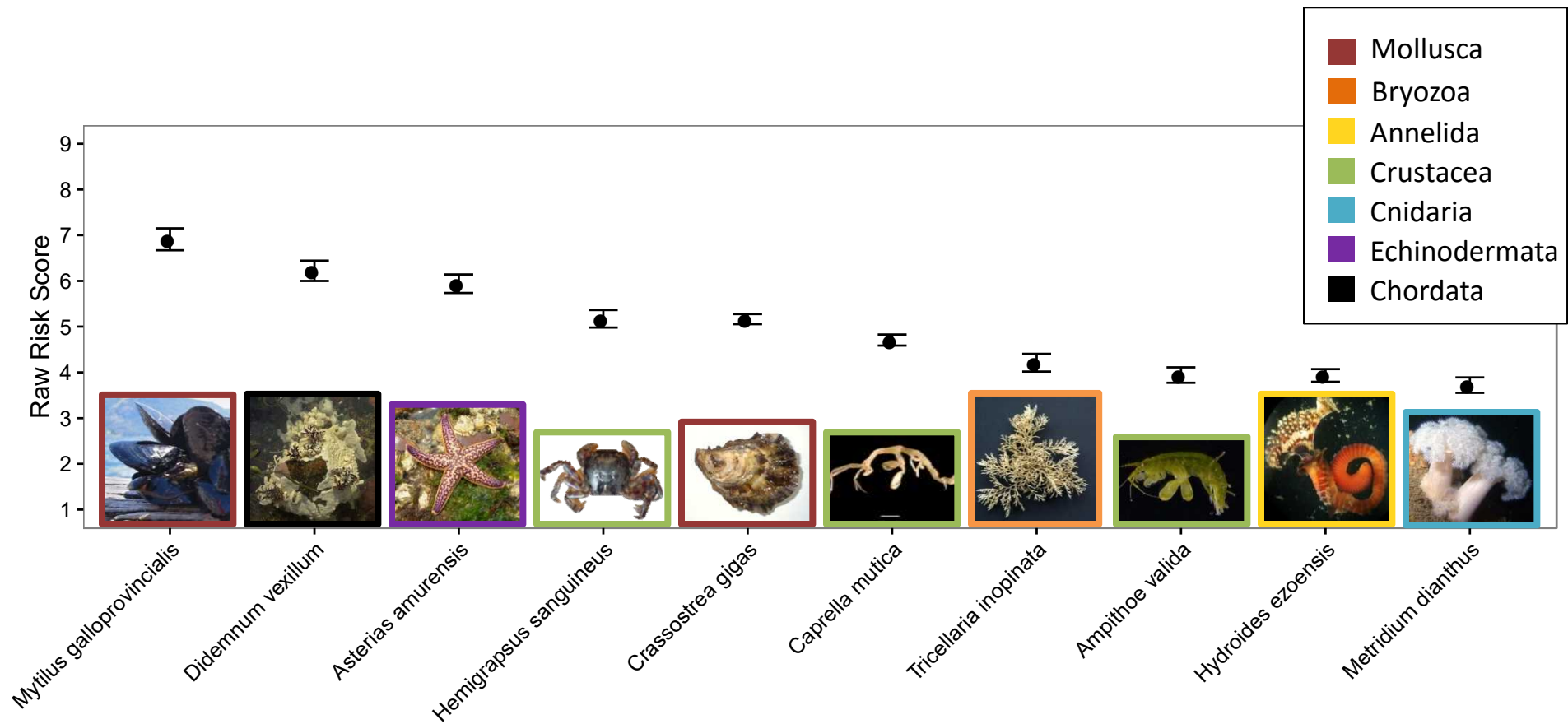


# CMIST Results – All Species and Regions

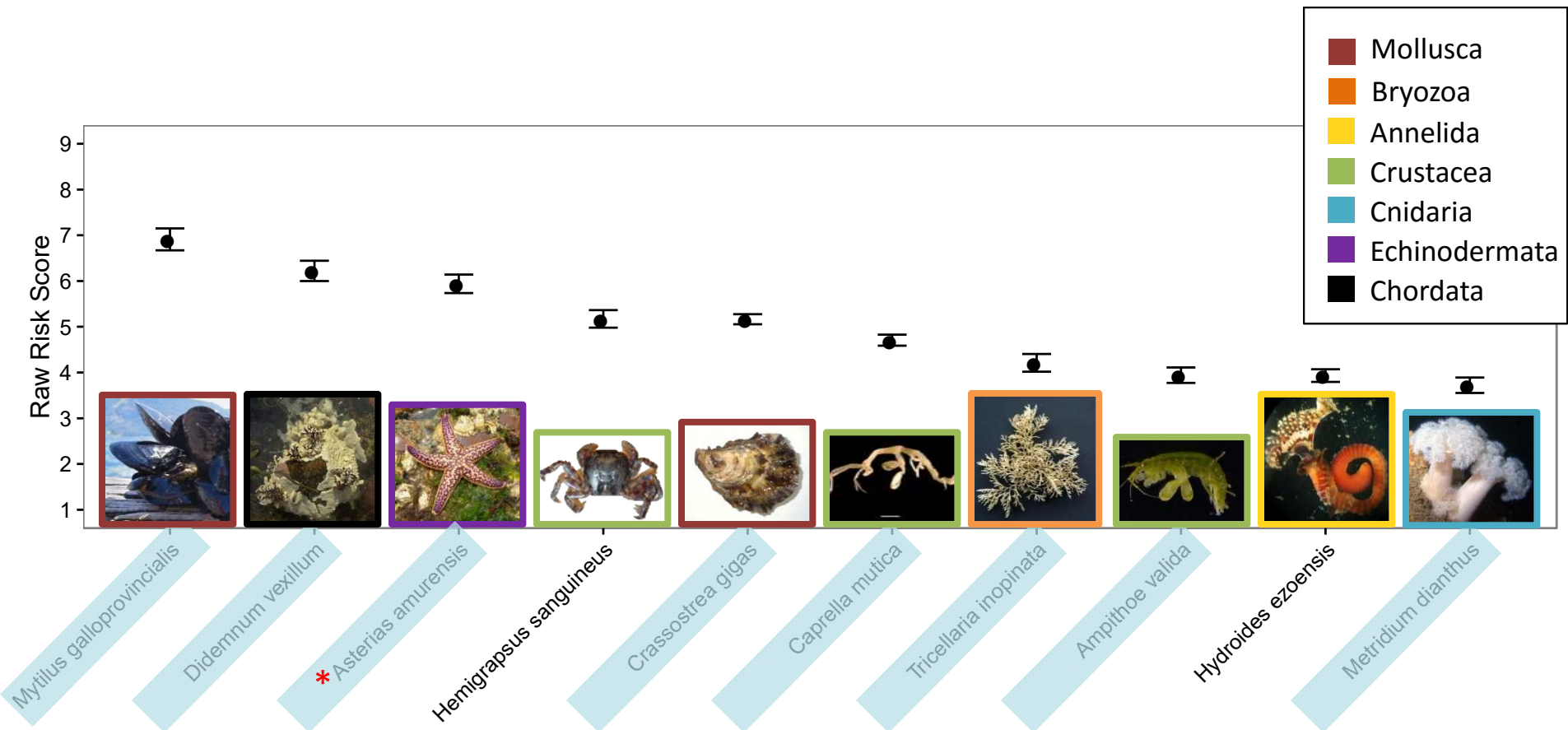




# Ten highest risk species



# Many of these are already present



But all have a history of invasion

# Ten highest risk species



*Mytilus galloprovincialis*

# Ten highest risk species



\* *Asterias amurensis*

\* Native to parts of Gulf of Alaska

# So still risky if already here?

## YES

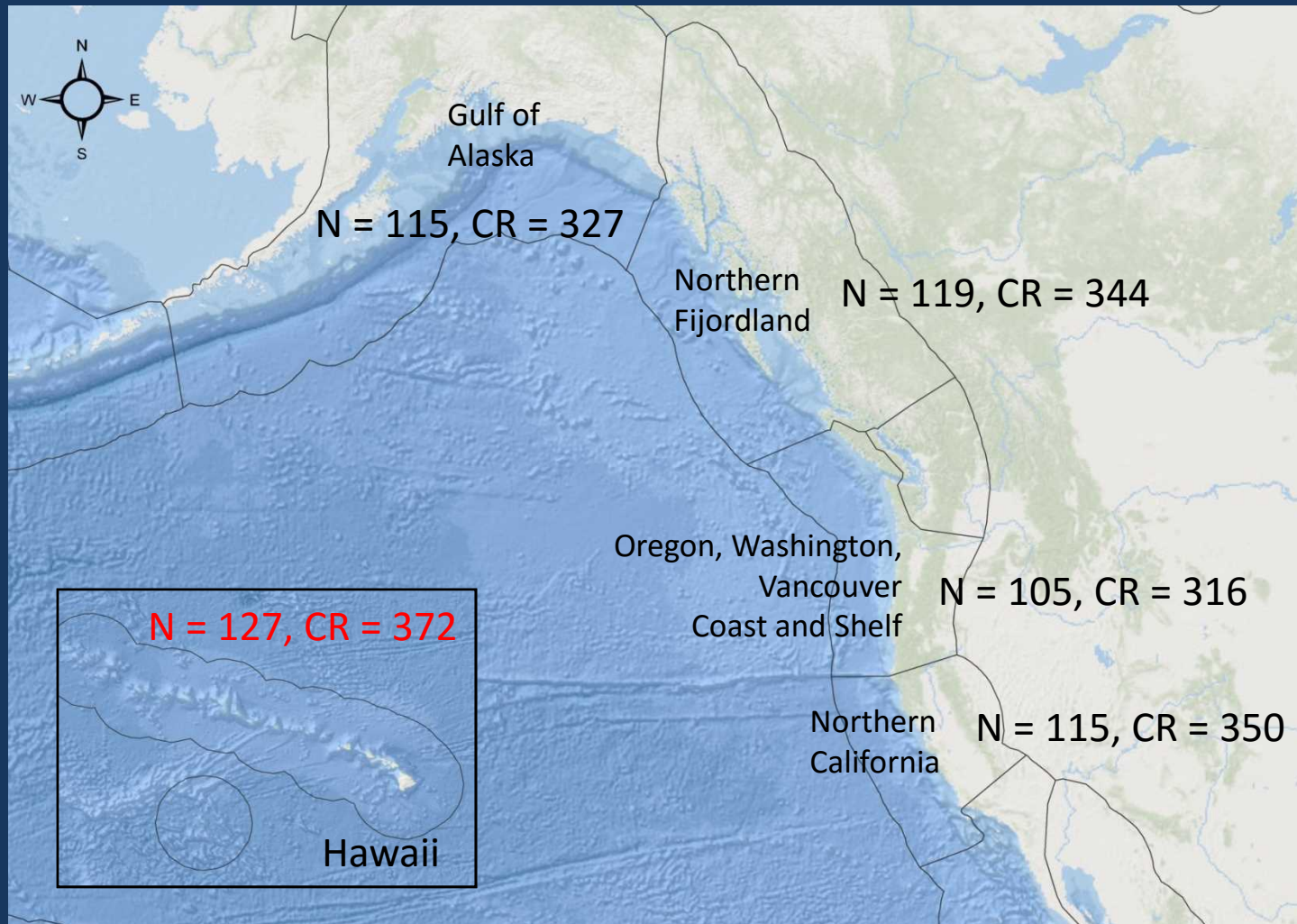
- New genetic material can increase invasiveness in NA/Hawaii
  - Greater impacts
  - Increased range

## BUT

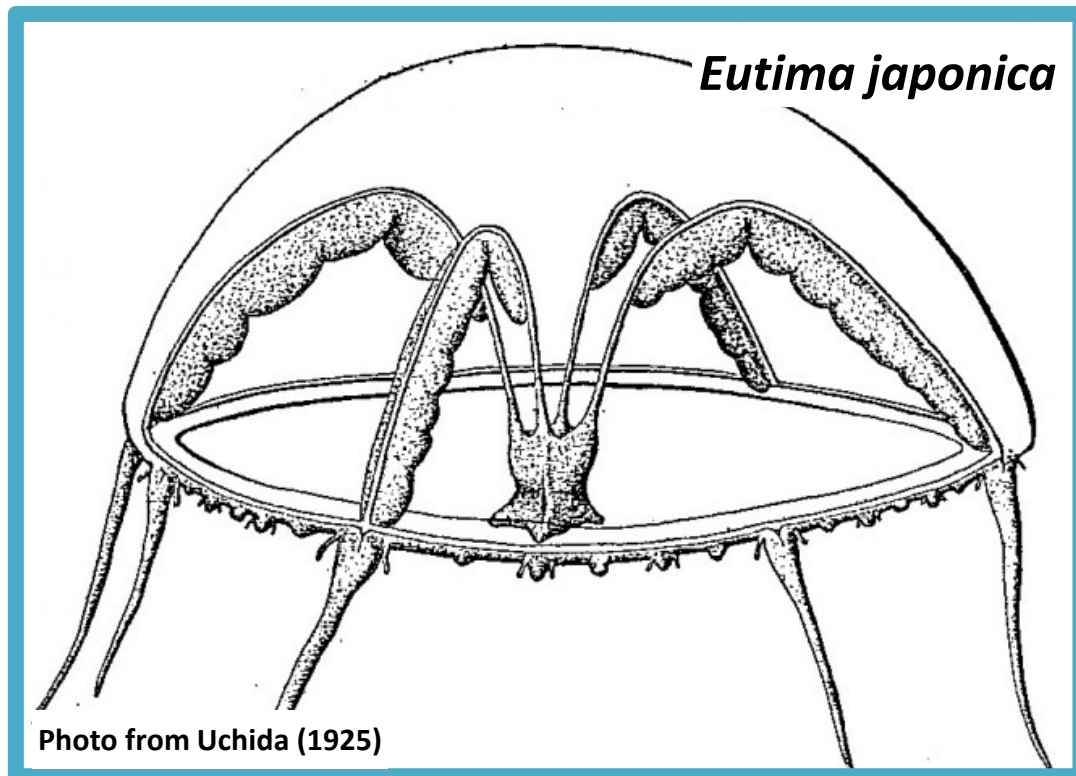
- Shows other vectors still important
- Invasions are complex



# Risk by Ecoregion



# Other Higher risk species – BC, Washington, and Oregon



■ Cnidaria

# Data Cautions

- Impact of invasion scoring was based on known impacts. Thus, species without known impacts, due to lack of previous invasion history or lack of study, were scored lower but they could still have impacts in new ecosystems.
- Of the almost 400 species encountered thus far, many not known from other invasion vectors like commercial shipping





# Summary

- CMIST risk assessments allowed us to prioritize species for each assessed ecoregion
- Although no **NEW** invasions have been attributed to tsunami debris, higher risk species were transported to NA/Hawaii on debris
- So do organisms on debris pose a risk to North American ecosystems?
  - YES
  - But – not all are high risk and there are differences among ecoregions
- Continued monitoring is required

Photo: Dann Cutter



# Acknowledgements

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CMIST scorers: Danielle Scriven and Lauren Liggan



**PICES**



# CMIST Questions

Is the species established in the assessment area?

- [1] No
- [2] Observed but not reported as established
- [3] Yes

How frequently and in what numbers is the species expected to arrive into the assessment area?

- [1] Infrequently in low numbers
- [2] Frequently in low numbers or infrequently in high numbers
- [3] Frequently in high numbers

How much of the assessment area offers suitable habitat for the species? [

- 1] Negligible proportion of the assessment area
- [2] Moderate proportion of the assessment area
- [3] Most of the assessment area

How much of the assessment area offers suitable environmental conditions for the species to survive?

- [1] Negligible proportion of the assessment area
- [2] Moderate proportion of the assessment area
- [3] Most of the assessment area

# CMIST Questions

Are the species' reproductive requirements available in the assessment area?

- [1] Almost never
- [2] Sometimes
- [3] Almost always

To what extent could natural control agents slow the species' population growth in the assessment area?

- [1] Likely to severely restrict population growth
- [2] Could slow population growth
- [3] Unlikely to slow population growth

What is the range of the species' potential natural dispersal in the assessment area?

- [1] Very limited range
- [2] Moderate range
- [3] Wide range

What is the range of the species' potential dispersal in the assessment area from anthropogenic mechanisms?

- [1] Very limited range
- [2] Moderate range
- [3] Wide range

# CMIST Questions

What level of impact could the species have on population growth of other species in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

What level of impact could the species have on communities in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

What level of impact could the species have on habitat in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

What level of impact could the species have on ecosystem function in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

# CMIST Questions

What level of impact could the species' associated diseases, parasites, or travellers have on other species in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

What level of genetic impact could the species have on other species in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

What level of impact could the species have on at-risk or depleted species in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

# CMIST Questions

What level of impact could the species have on aquaculture and commercially fished species in the assessment area?

- [1] Low or no impact
- [2] High impact in few areas or moderate impact in many areas
- [3] High impact in many areas

Is the species known or generally considered to be invasive anywhere in the world?

- [1] No
- [2] No, but is noted outside of its native range
- [3] Yes (noted as invasive, or noted outside of native range with impacts)