Application of a watch list to inform AIS surveillance in the Laurentian Great Lakes

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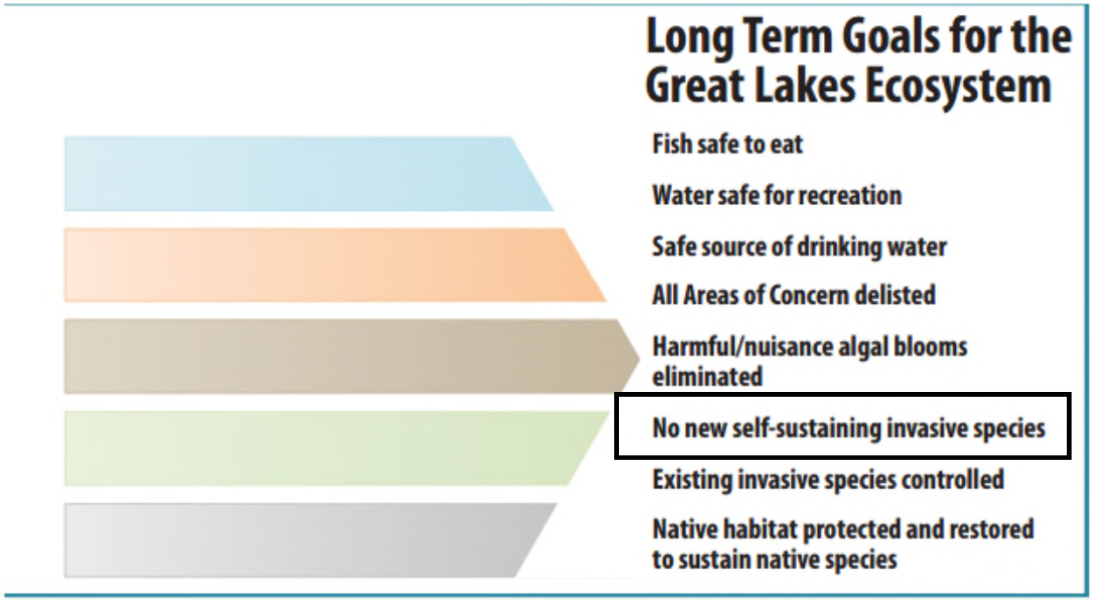
ICAIS

Provided by the SeaWiFS Project, NASA/Goddard Space Flight Center, and ORBIMAGE



	Objectives	Commitments
Invasive Species	Prevent new introductions of invasive species	• Block pathways through which aquatic invasive species can be introduced to the Great Lakes ecosystem • Conduct early detection monitoring activities • Work with Great Lakes states to conduct rapid response actions or exercises
	Control established invasive species	• Implement control projects for GLRI-targeted invasive species
	Develop invasive species control technologies and refine management techniques	• Develop/enhance technologies and methods to prevent the introduction and to control the spread of invasive species • Develop/enhance invasive species specific collaboratives to support rapid responses and communicate the latest control and management techniques

"establish a comprehensive program for detecting and tracking newly identified aquatic invasive species"

Aquatic Invasive Species Interstate Surveillance Framework for the U.S. Waters of the Great Lakes

(a) Develops a species watch list.

(b) Identifies priority locations for surveillance.

(c) Develops monitoring protocols for surveillance.

(d) Provides recommendations for sharing information.

- What species are we looking for? What taxa?
- How will they get here/spread?
- Where will we find them?

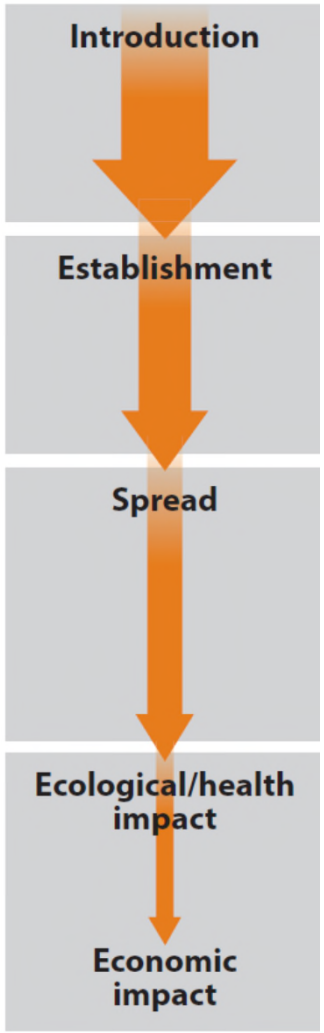
METHODS

Compiling a list of candidate species

- Regulated species lists
- GLANSIS watch list, non-indigenous + range expanders
- FWS ERSS (available online)
- DFO (fish, mollusk, plants)
- Internal
  - GLWQA Annex 6 assessment
  - Erie Canal assessment

N= 353

Filtering the watch list



Lodge et al. 2017

Filtering the watch list

353

211

Sources:

USGS NAS, FishBase, USACE National Wetland Plant List, ISSG GISD, USFWS ERSS, etc.

Excluded:

- Viruses & Bacteria
- Reptiles, Amphibians, Mammals
- Widespread
- Marine
- Tropical
- FACU

Filtering the watch list

353

Establishment?

211

Impact?

Source:

Great Lakes Aquatic Nonindigenous Species Risk Assessment (GLANSRA) framework

Davidson et al. 2017 "Development of a risk assessment framework to predict invasive species establishment for multiple taxonomic groups and vectors of introduction" Mgmt Biol Inv Vol 8

Environmental Impacts	Socioeconomic Impacts
Toxicity/facilitation of parasitism or viral/bacterial infections	Human health
Competition	Infrastructural damage
Trophic alteration	Degradation of water quality related to human use
Genetic effects	Harm to economic sectors
Degradation of water quality	Harm to recreational potential
Degradation of physical habitat	Diminishment of aesthetic quality

Filtering the watch list

353

211

141

Excluded:

- Low impact
- Unknown impact

Scoring		
Score	# U	**Impact**
>5	Any	**High**
2-5	Any	**Moderate**
0	0-1	**Low**
1	0	
0	≥2	**Unknown**
1	≥1	

Filtering the watch list

353

Establishment?

211

Impact?

141

Introduction?

Source:
GLANSRA framework (Davidson et al. 2017)

POTENTIAL INTRODUCTION VIA UNAUTHORIZED INTENTIONAL RELEASE

3a) Is this species sold at aquarium/pet/garden stores ("brick & mortar" or online), catalogs, biological supply companies, or live markets (e.g., purchased for human consumption, bait, ornamental, ethical, educational, or cultural reasons) and as a result may be released into the Great Lakes basin?

Yes, this species is available for purchase.	100
No, this species this species is rarely/never sold.	0
Unknown	U

3b) How easily is this species obtained within the Great Lakes region (states/provinces)?

This species is widely popular, frequently sold, and/or easily obtained within the Great Lakes region.	Score x 1
This species is widely popular, and although trade, sale, and/or possession of this species is prohibited, it is frequently sold on the black market within the Great Lakes region.	Score x 0.5
This species is not very popular or is not easily obtained within the Great Lakes region.	Score x 0.1
Unknown	U

Filtering the watch list

353

Establishment?

211

Impact?

141

Introduction?

133

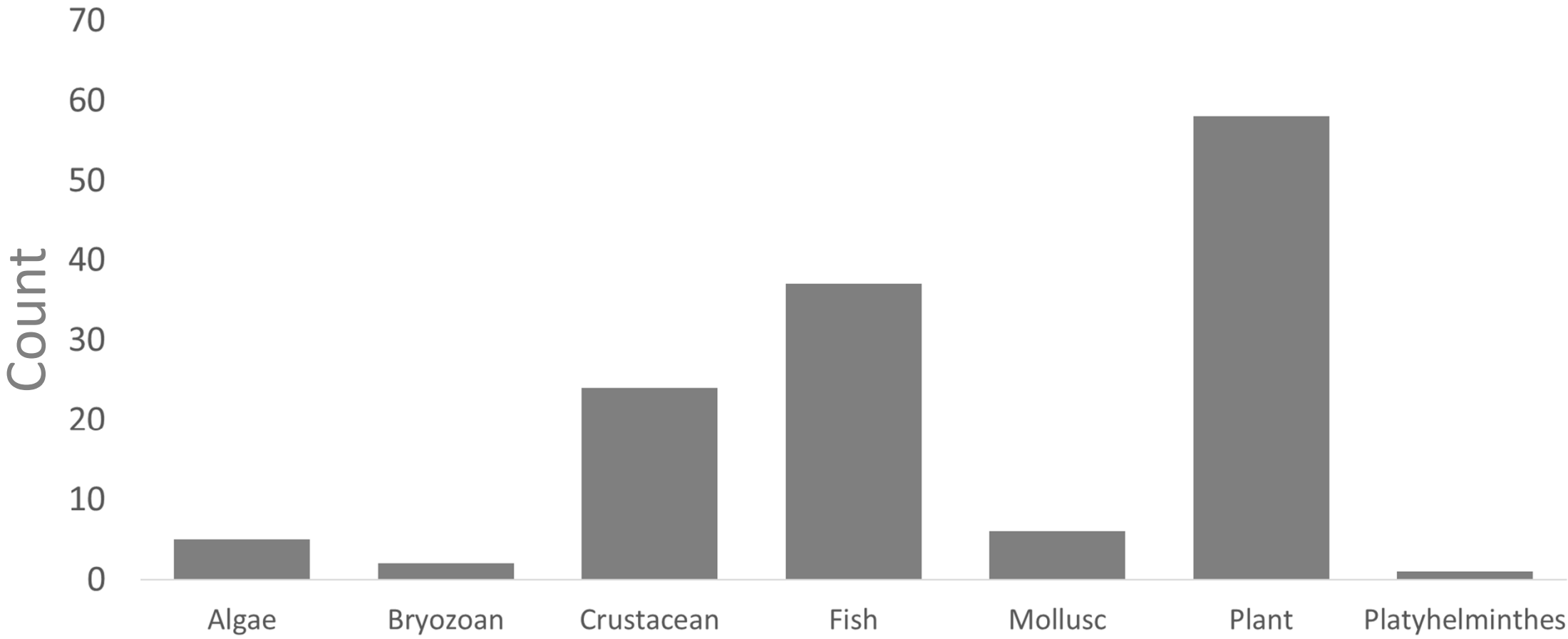
Excluded:

- Low probability & High Confidence

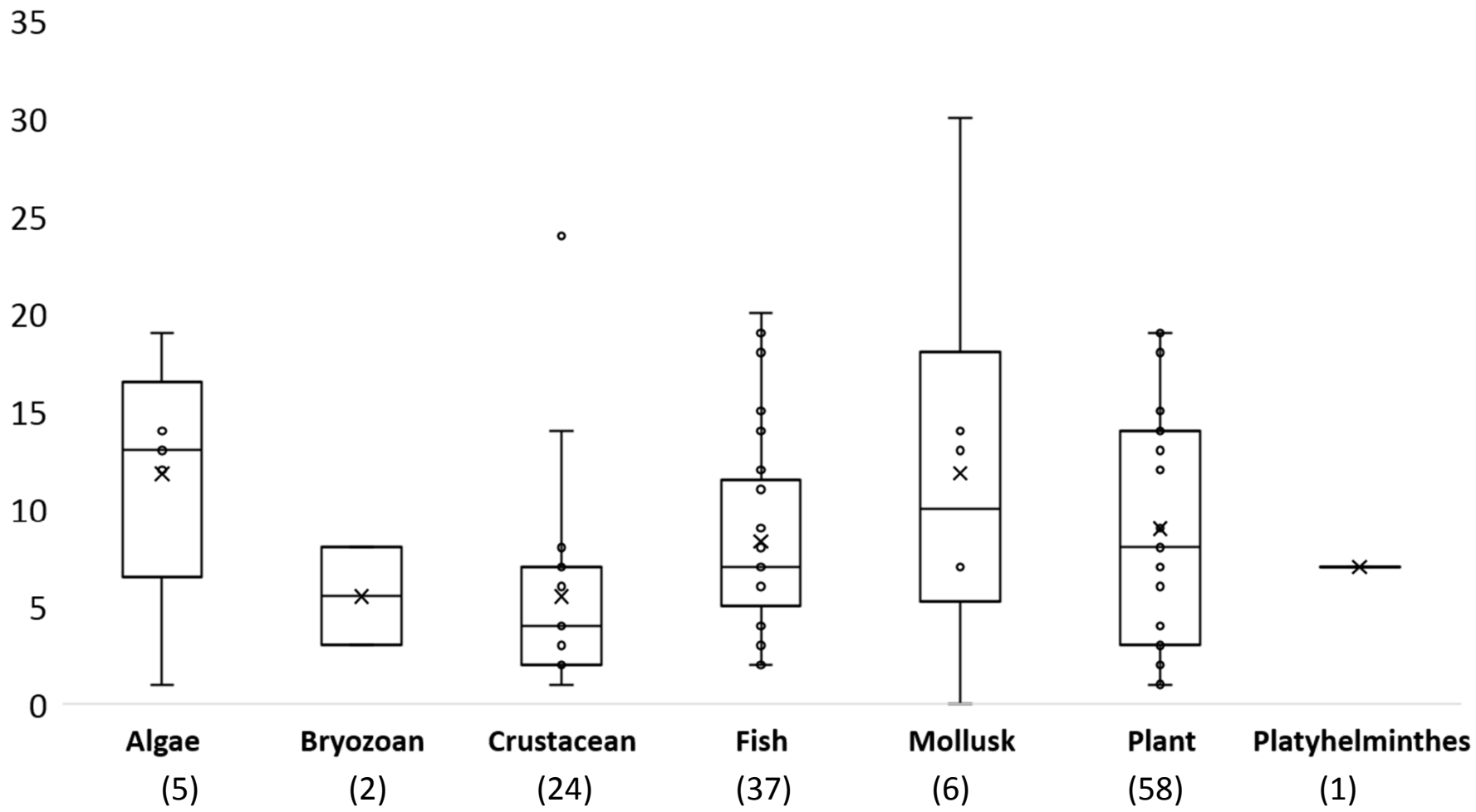
Scoring	
Points (per vector)	**Probability for Introduction**
80-100	High
40-79	Moderate
0-39	Low
# of Unknowns (overall)	**Confidence Level**
0	High
1-2	Moderate
3-5	Low
>5	Very low

RESULTS

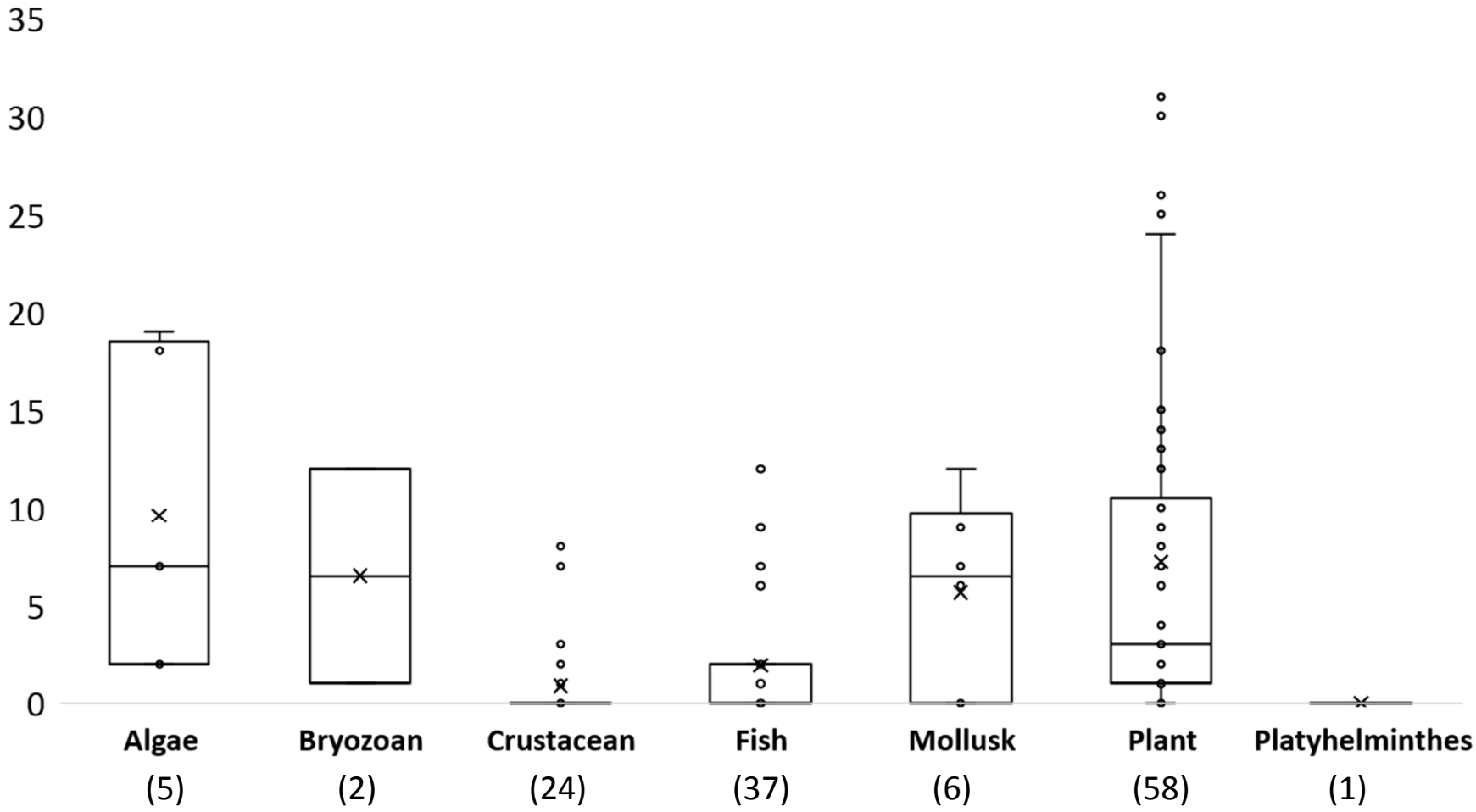
What species/taxa?



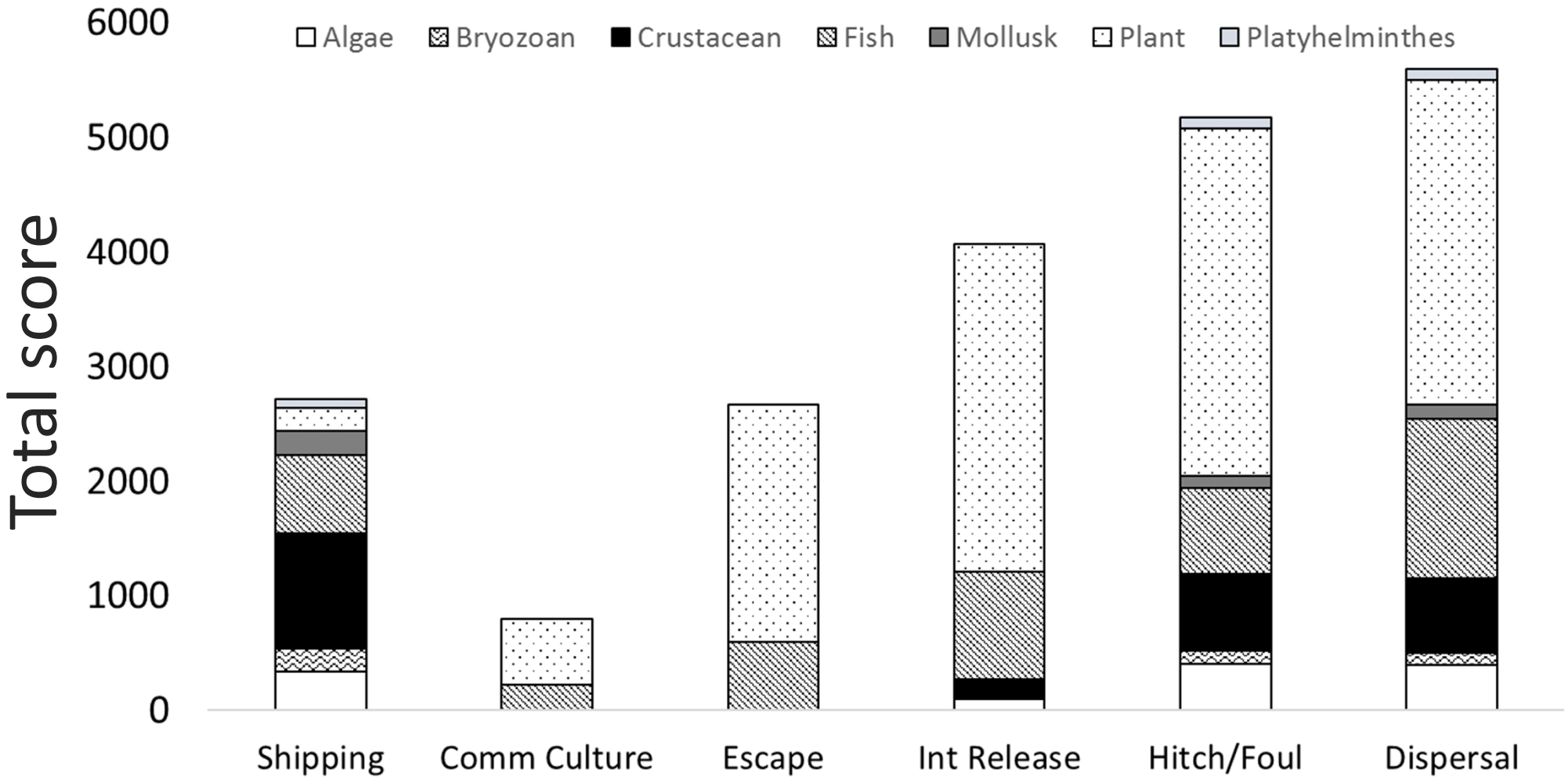
Environmental Impact Scores (max possible = 36)

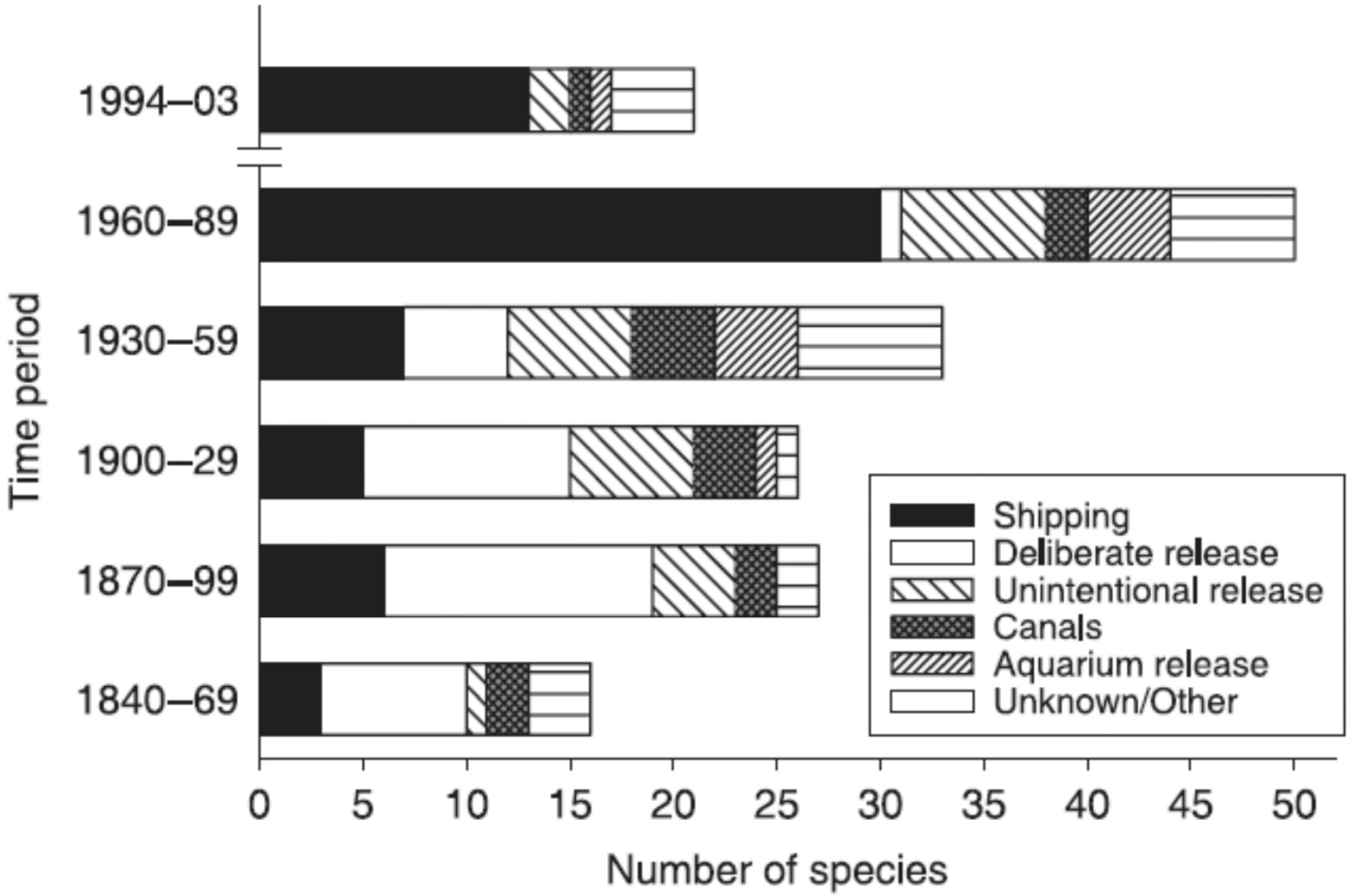


Socio-Economic Impact Scores (max possible = 36)

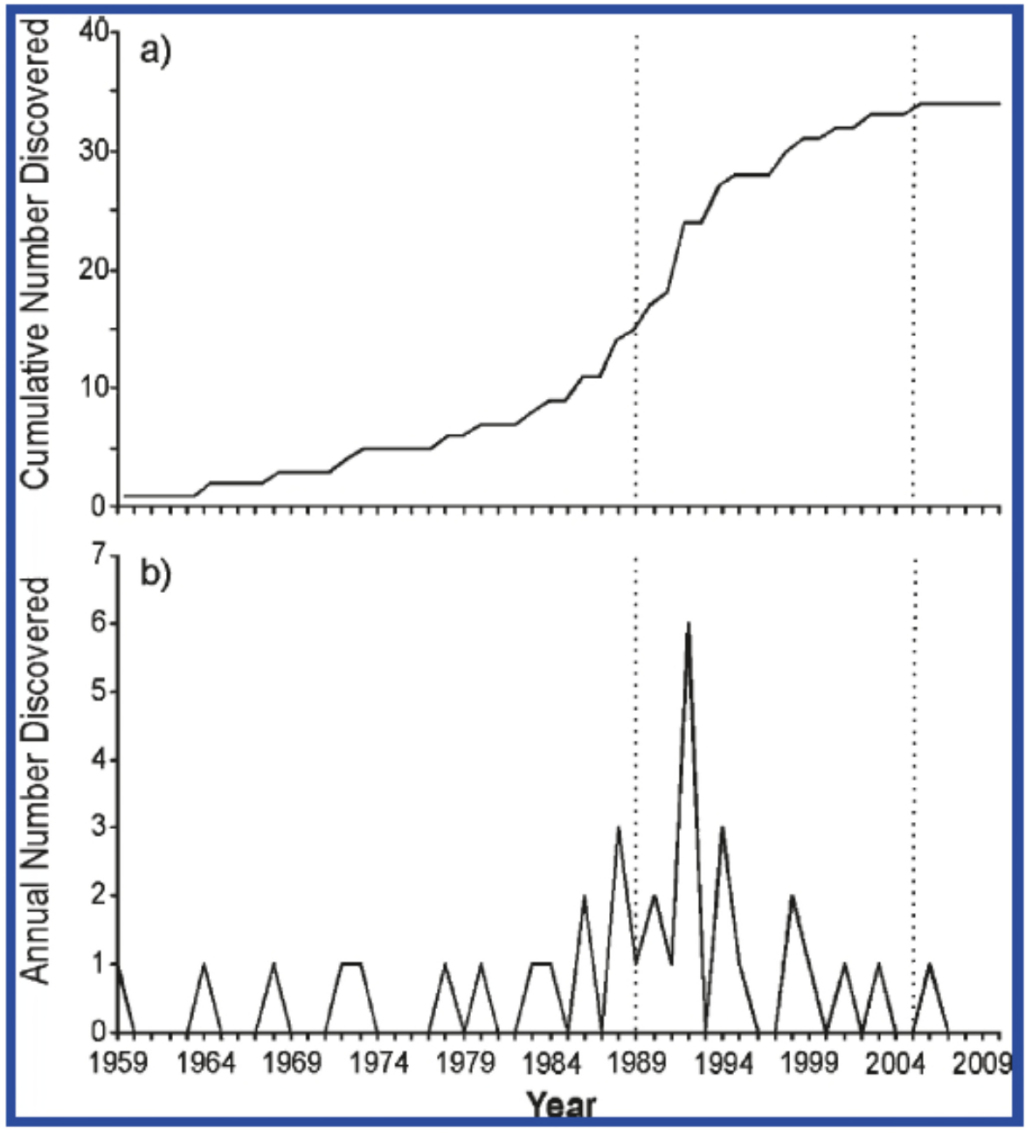


How will they arrive & spread?



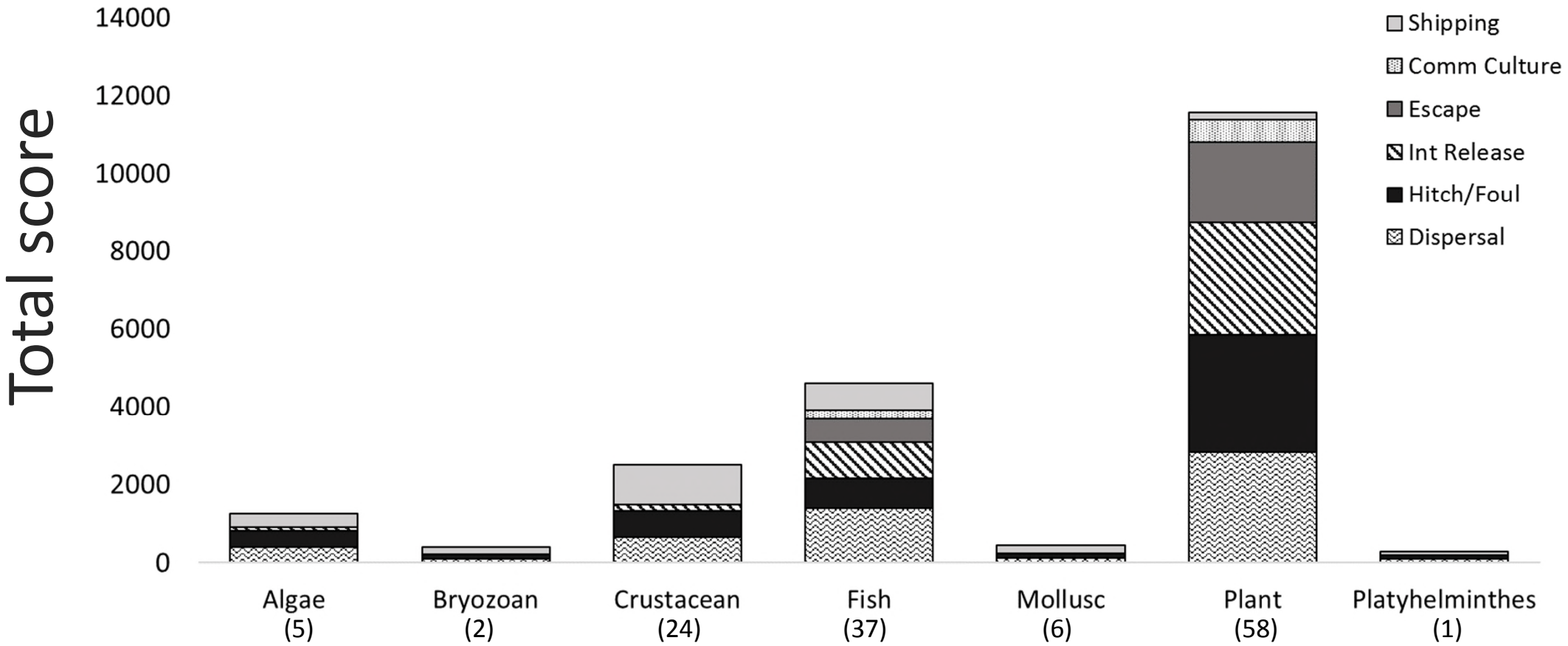


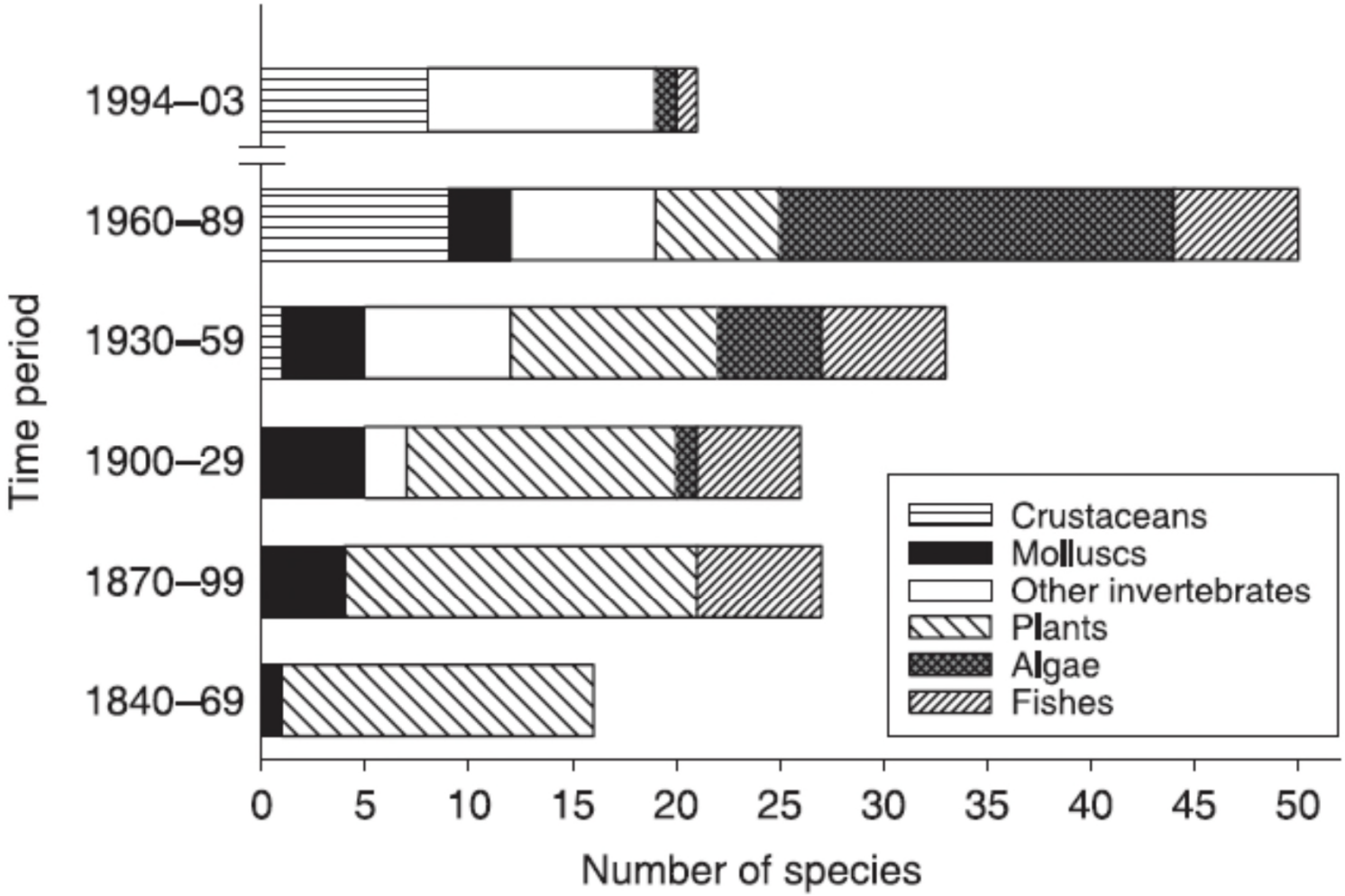
Ricciardi 2006. Div & Dist 12



Bailey et al. 2011. Environ Sci Technol 45

Introduction potential (scores by taxa)

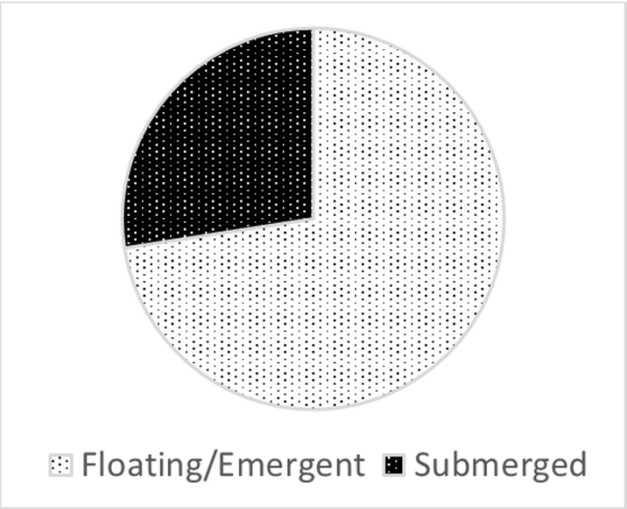




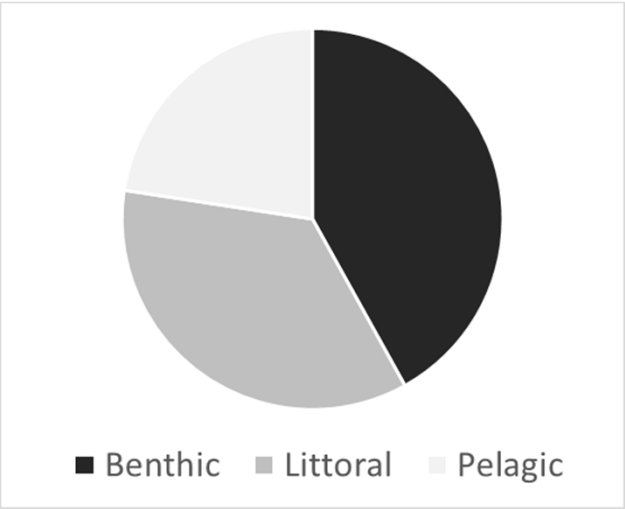
Ricciardi 2006. Div & Dist 12

Where will we find them?

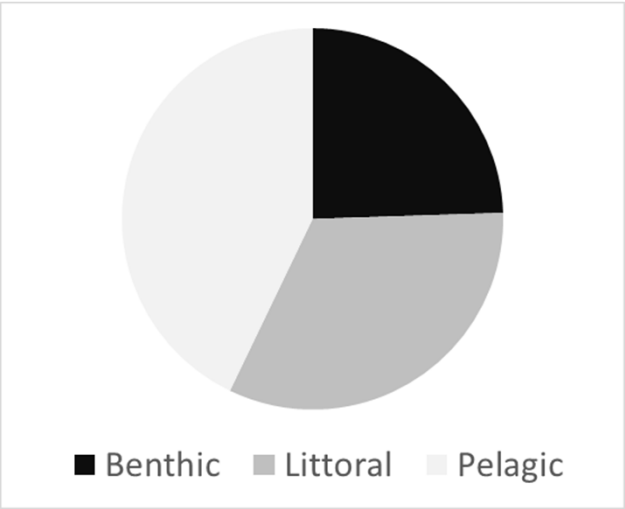
Plants



Crustaceans



Fish



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DOI 10.3391/ai.2009.4.4.10

Research article

Exploiting habitat and gear patterns for efficient detection of rare and non-native benthos and fish in Great Lakes coastal ecosystems

Anett S. Trebitz*, John R. Kelly, Joel C. Hoffman, Gregory S. Peterson and Corlis W. West

Sampling Design for Early Detection of Aquatic Invasive Species in Great Lakes Ports

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Summary

- What species/taxa?
  - A preponderance of Plants
  - …though algae and mollusks may pose the greatest risk on a per species basis
- What pathways?
  - The relative risk of non-shipping vectors as pathways of introduction will probably increase
- What habitats?
  - Habitat associations will likely vary by taxa, but key habitats for any group could be identified through quantitative approaches and adaptive sampling
- Continuous improvement and re-evaluation is needed

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