

Vector analysis and the role of hull fouling in California's invasion history

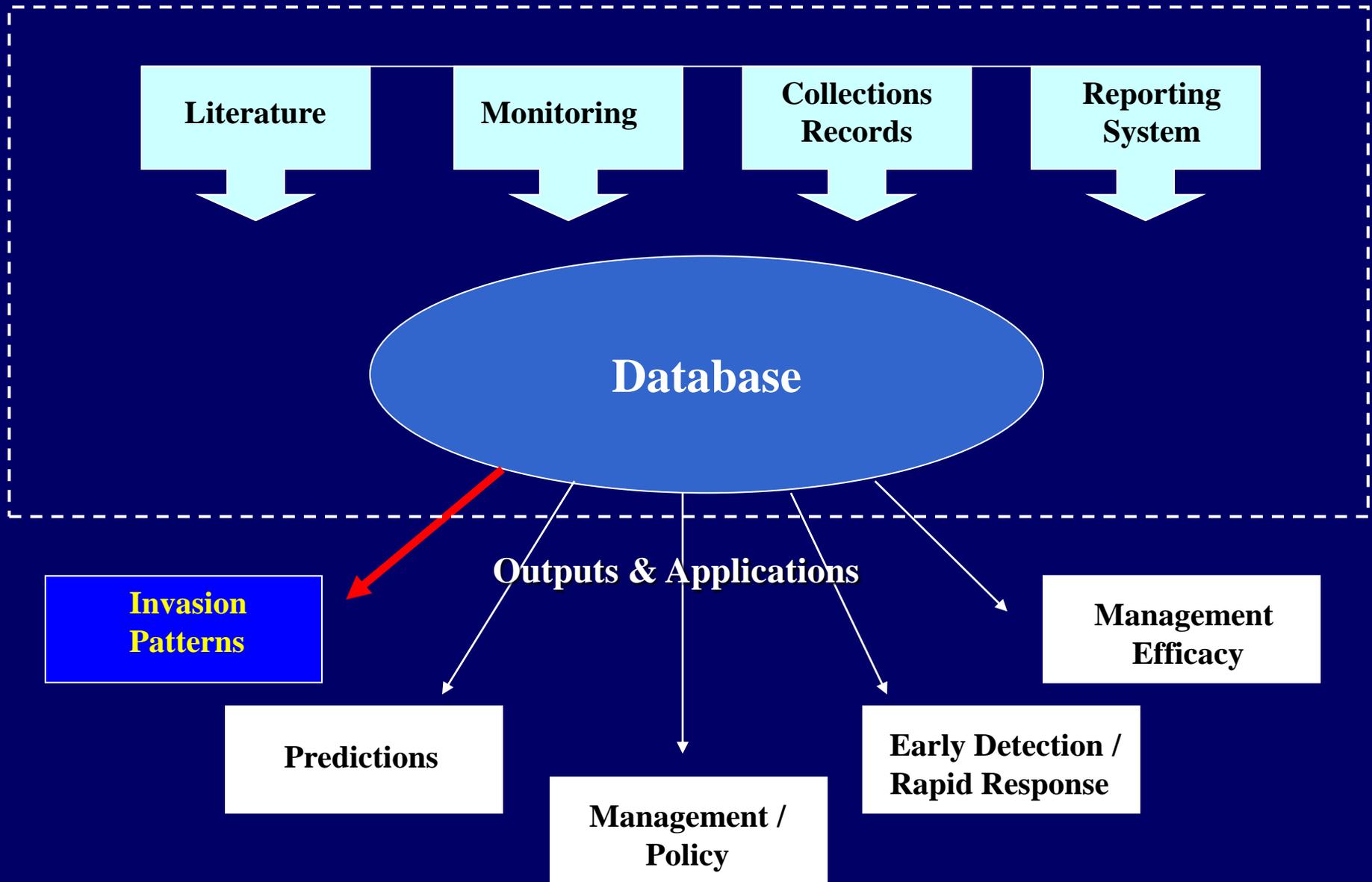
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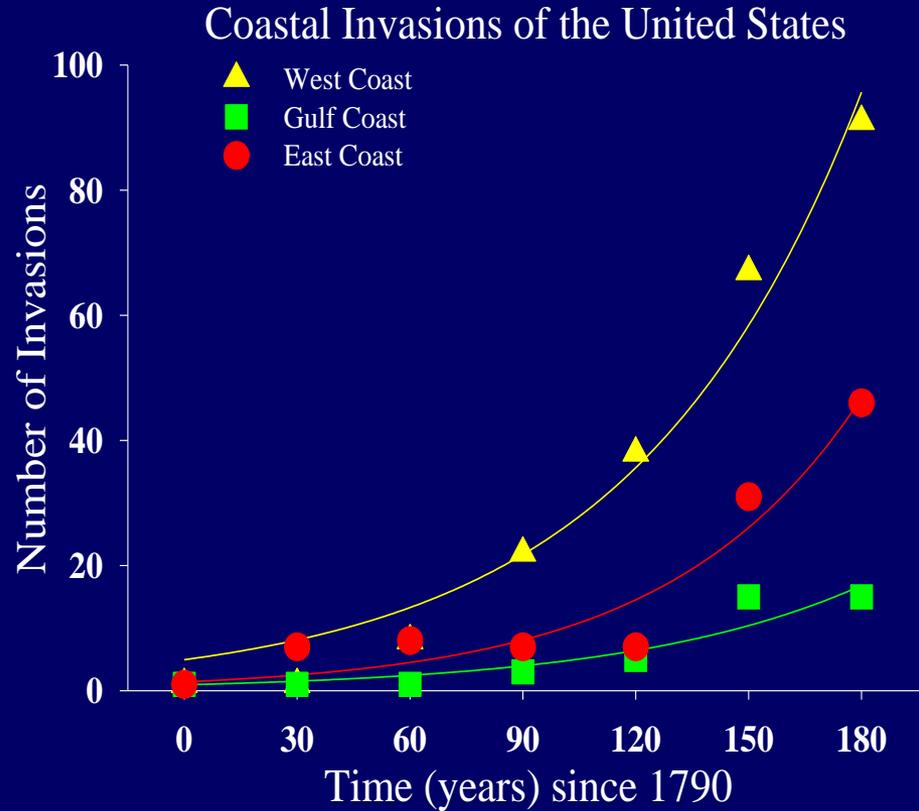


NEMESIS

(National Exotic Marine and Estuarine Species Information System)

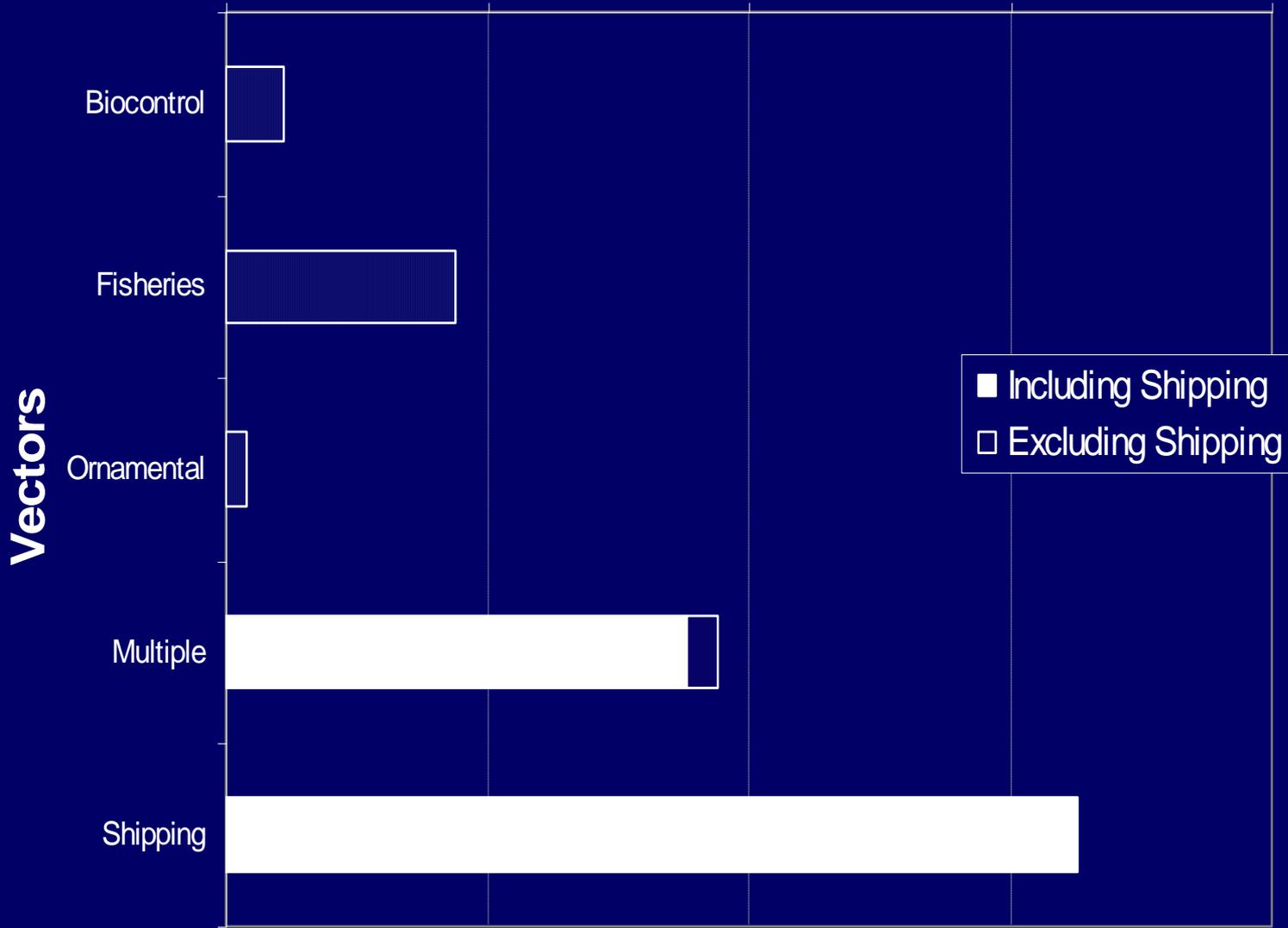


Increasing Discovery Rate



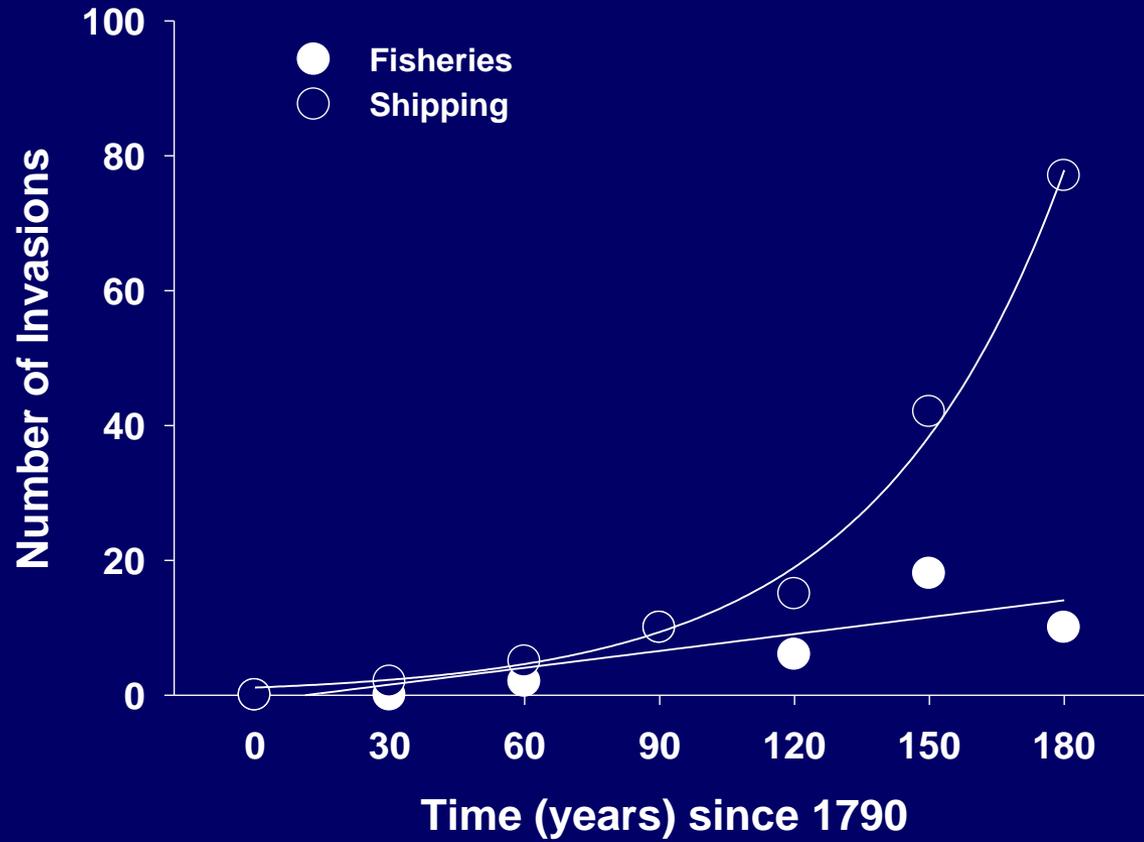
Number of Species

0 50 100 150 200





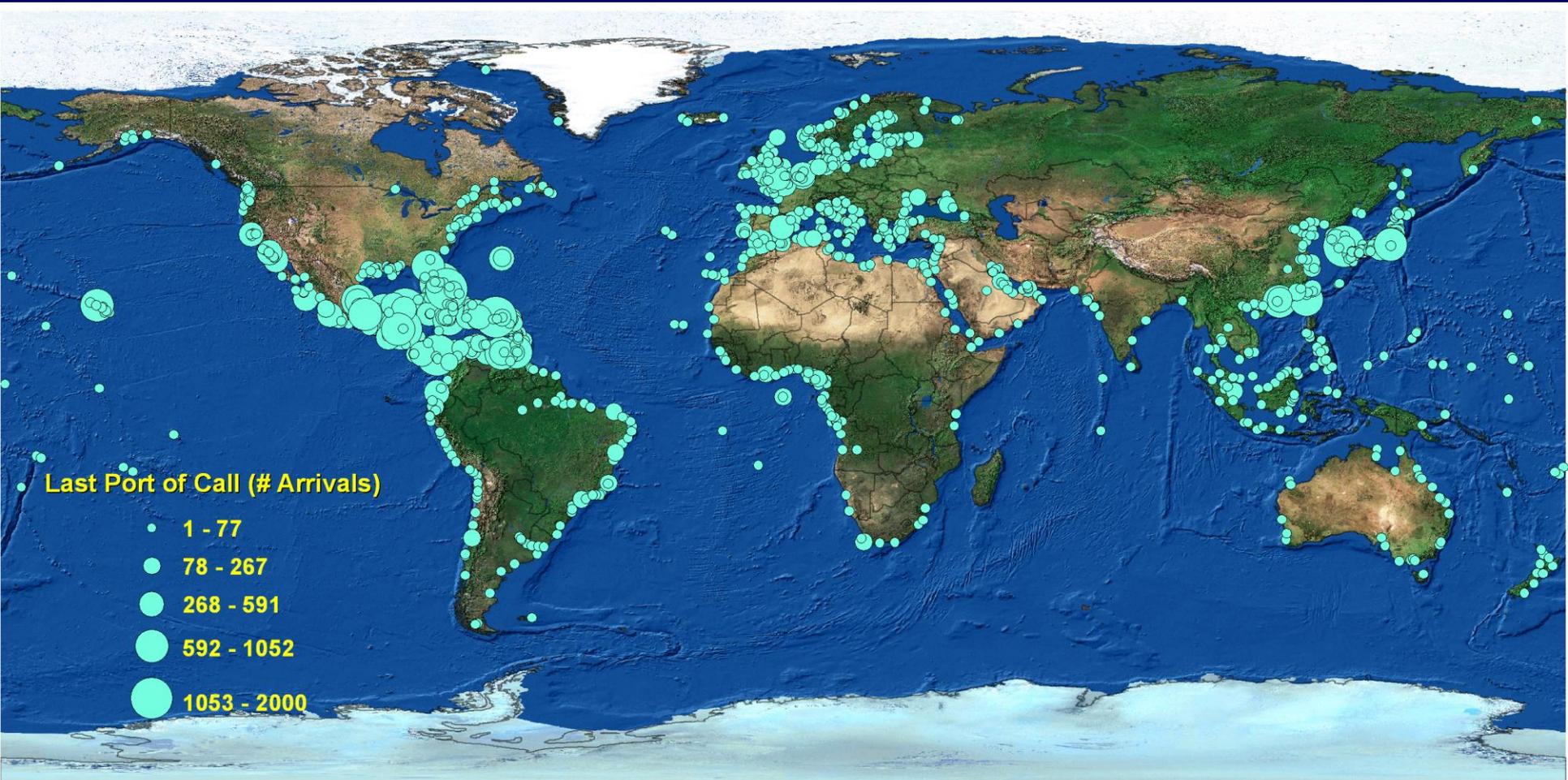
Discovery Rate of Coastal Invasions by Vector



Trade by Ships

- Global Scale
- Ships carry >90% world trade
- > 85,000 ships in world fleet
- > 5.4 billion tonnes cargo / year
- Underpins global economic development
- Modern society is shipping dependant
- Continuing to increase

Last Ports of Call to US Ports and Places (Jan 2004 – Dec 2005)

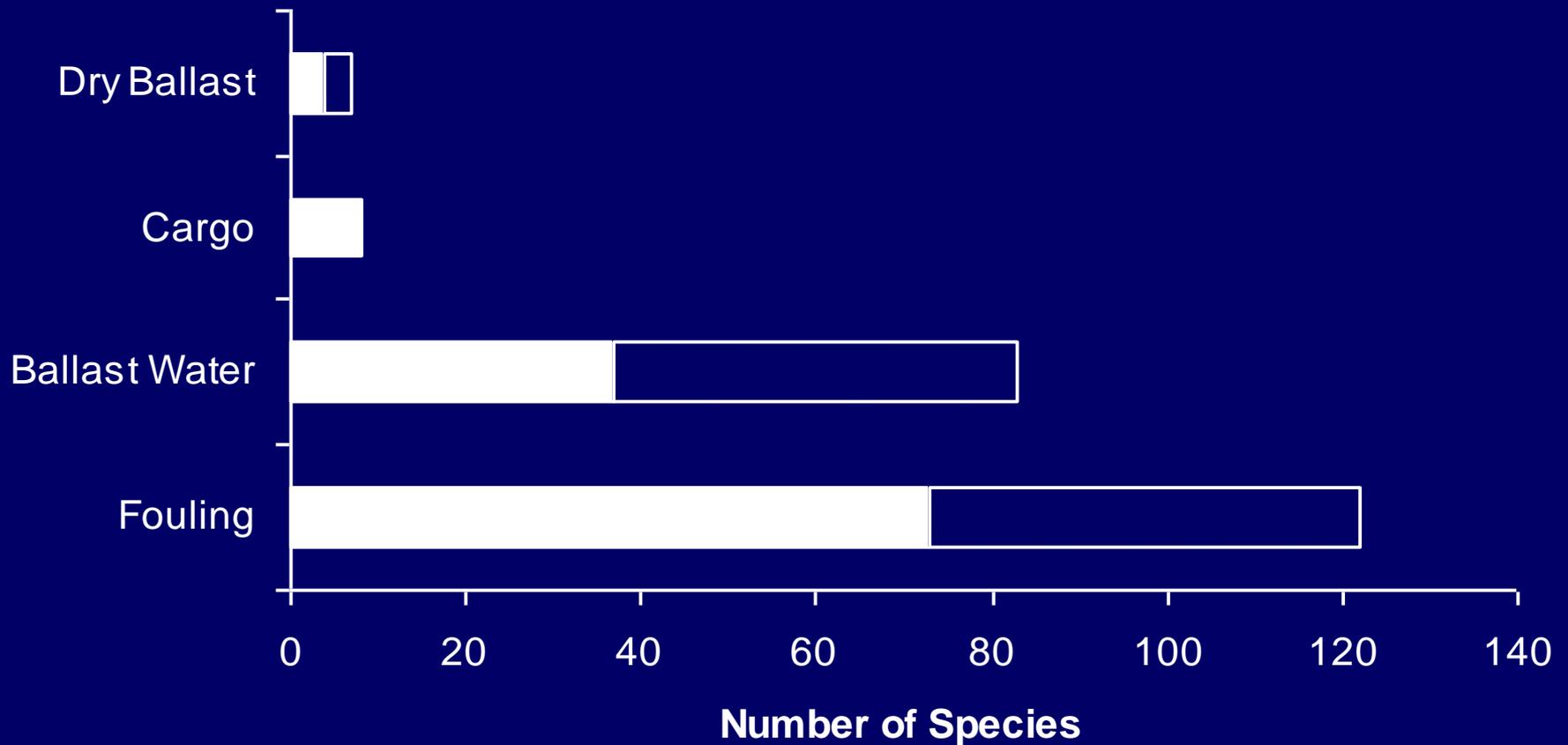




Ships as Vectors: Ballast Water or Hull Fouling?



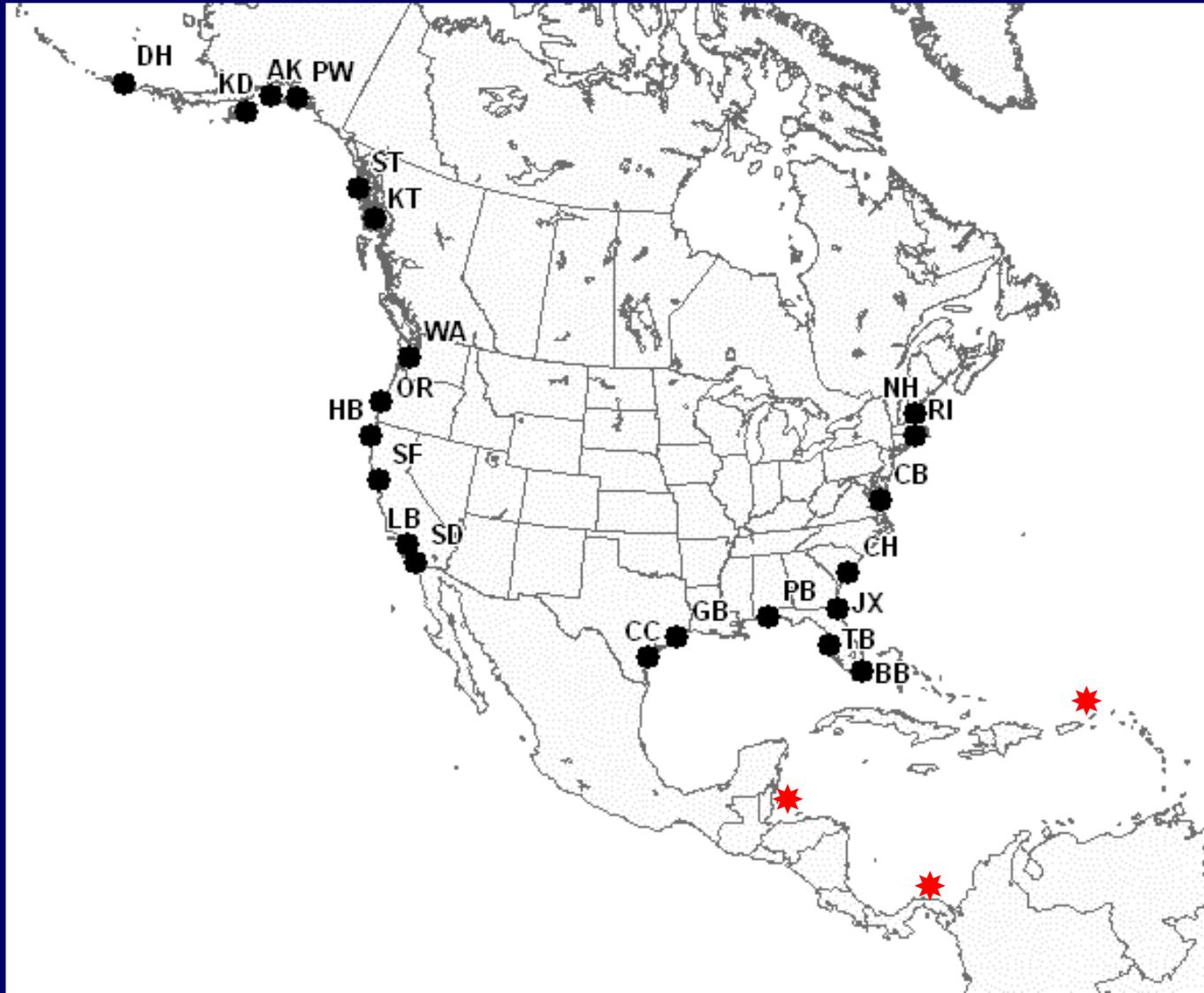
Vector(s) for coastal species introduced to North America by shipping (n=171)



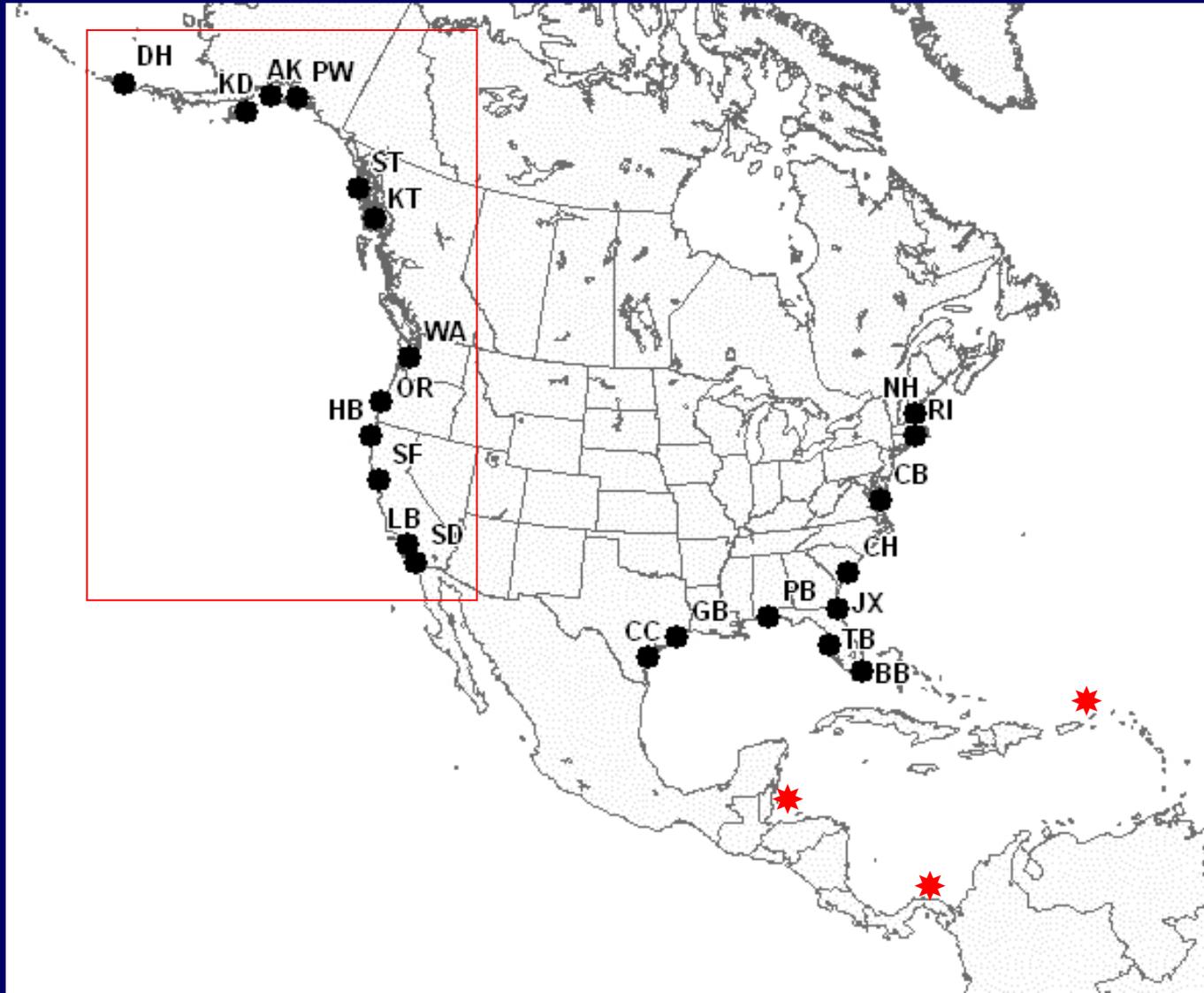
Overview

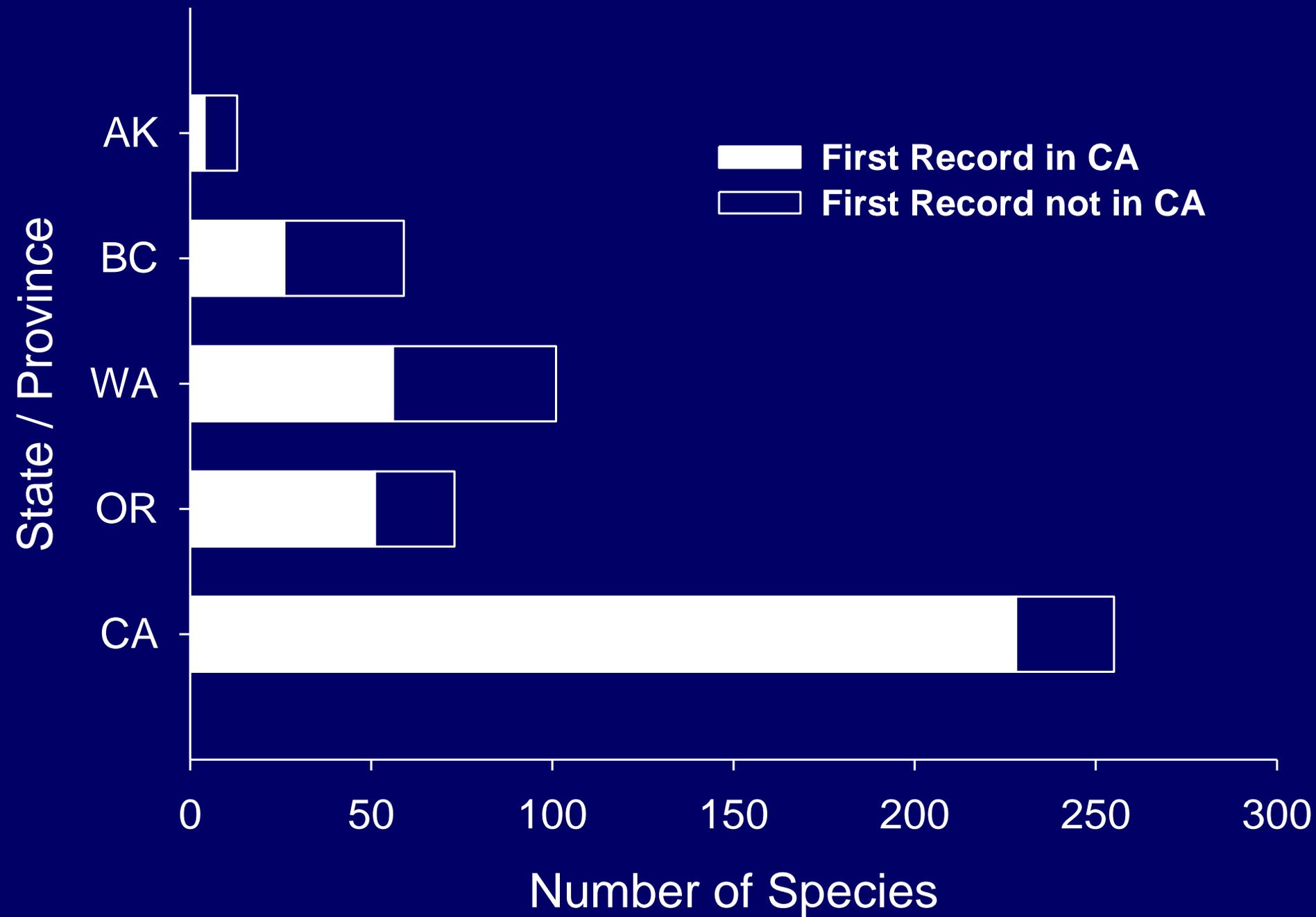
- Historical role of California & SF Bay as a beachhead for invasions in western North America
- Current state of knowledge about vectors for California invasions
- Potential importance of hull fouling for initial introduction and subsequent spread

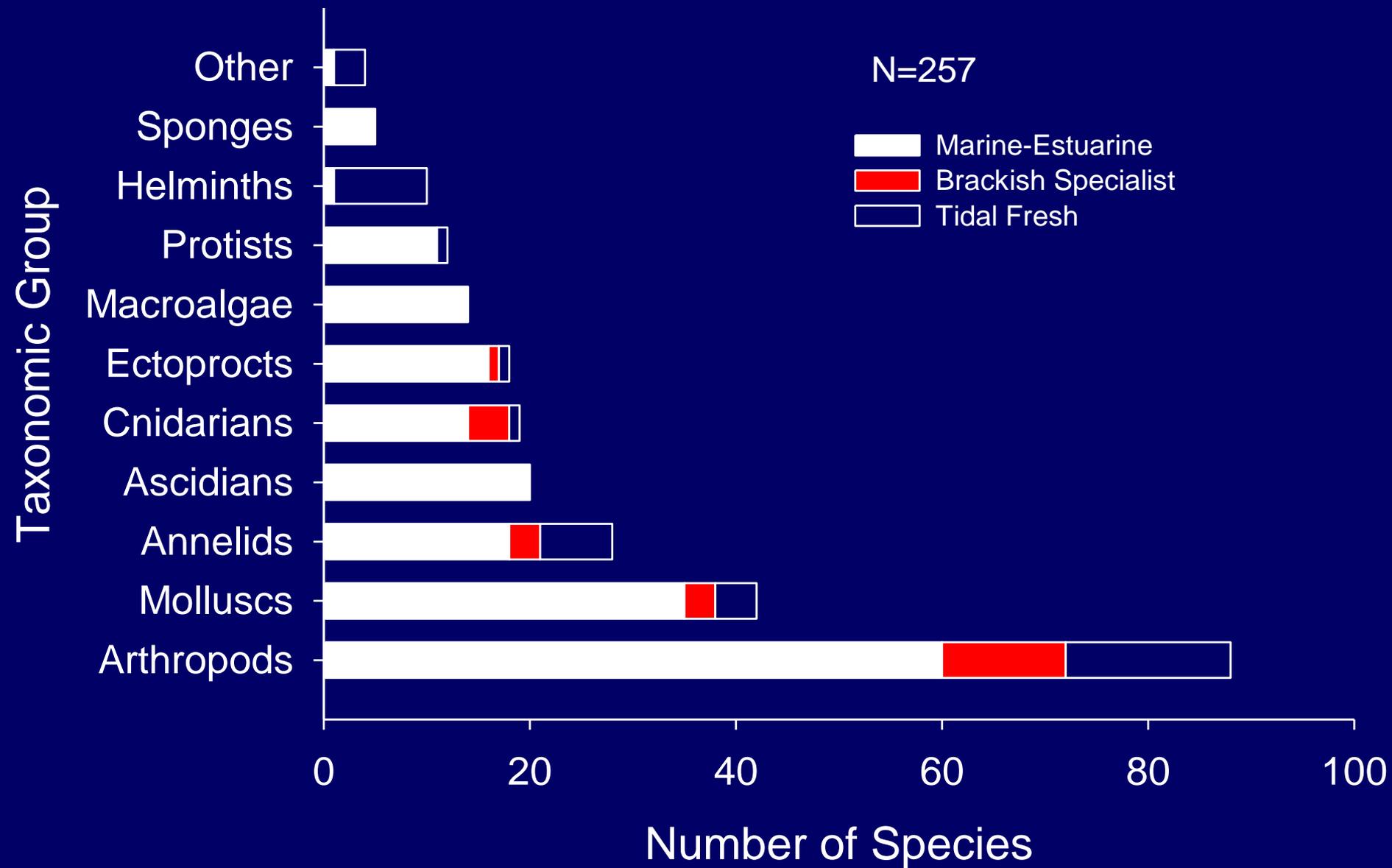
Standardized Surveys: Sessile Invertebrate Community

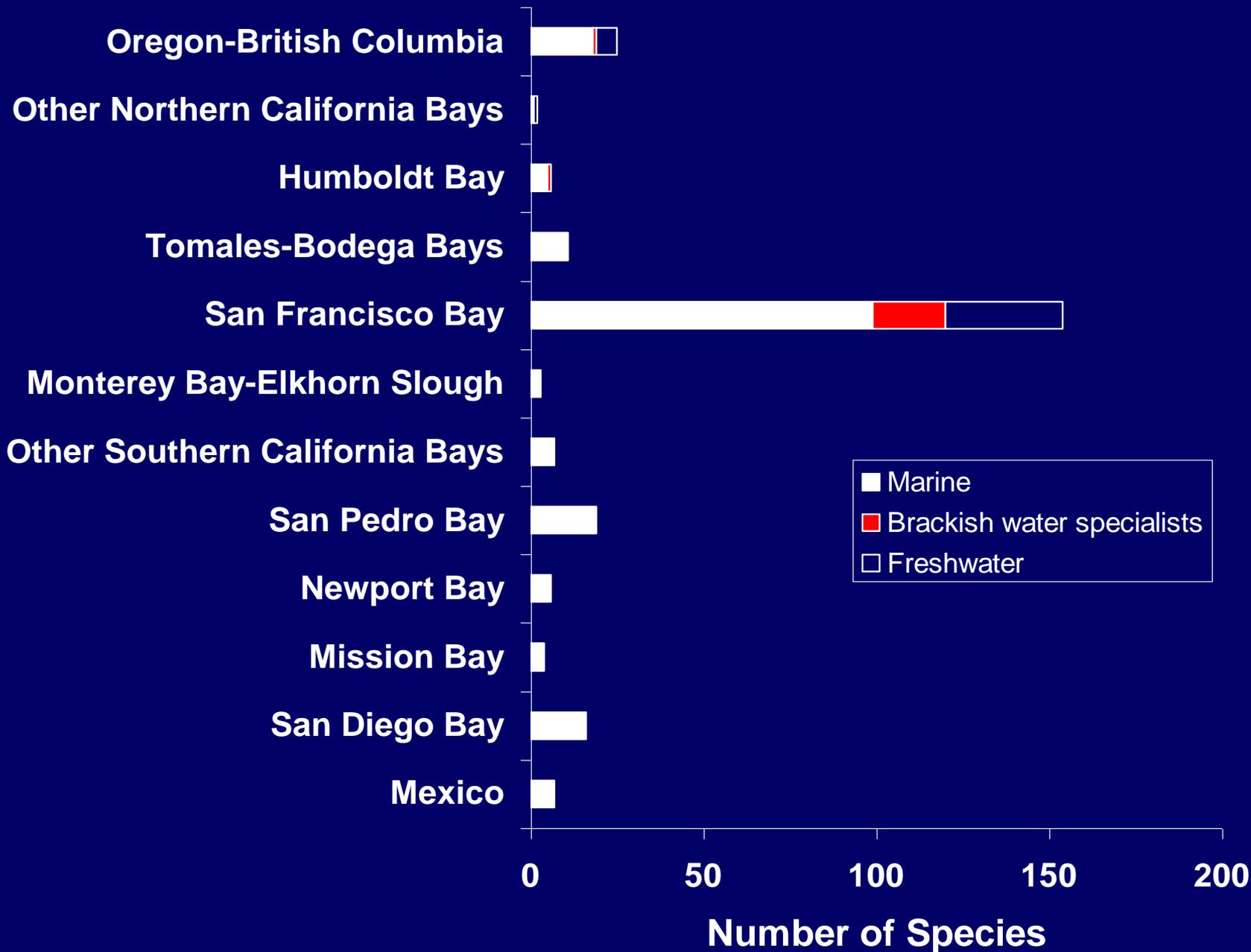


Standardized Surveys: Sessile Invertebrate Community



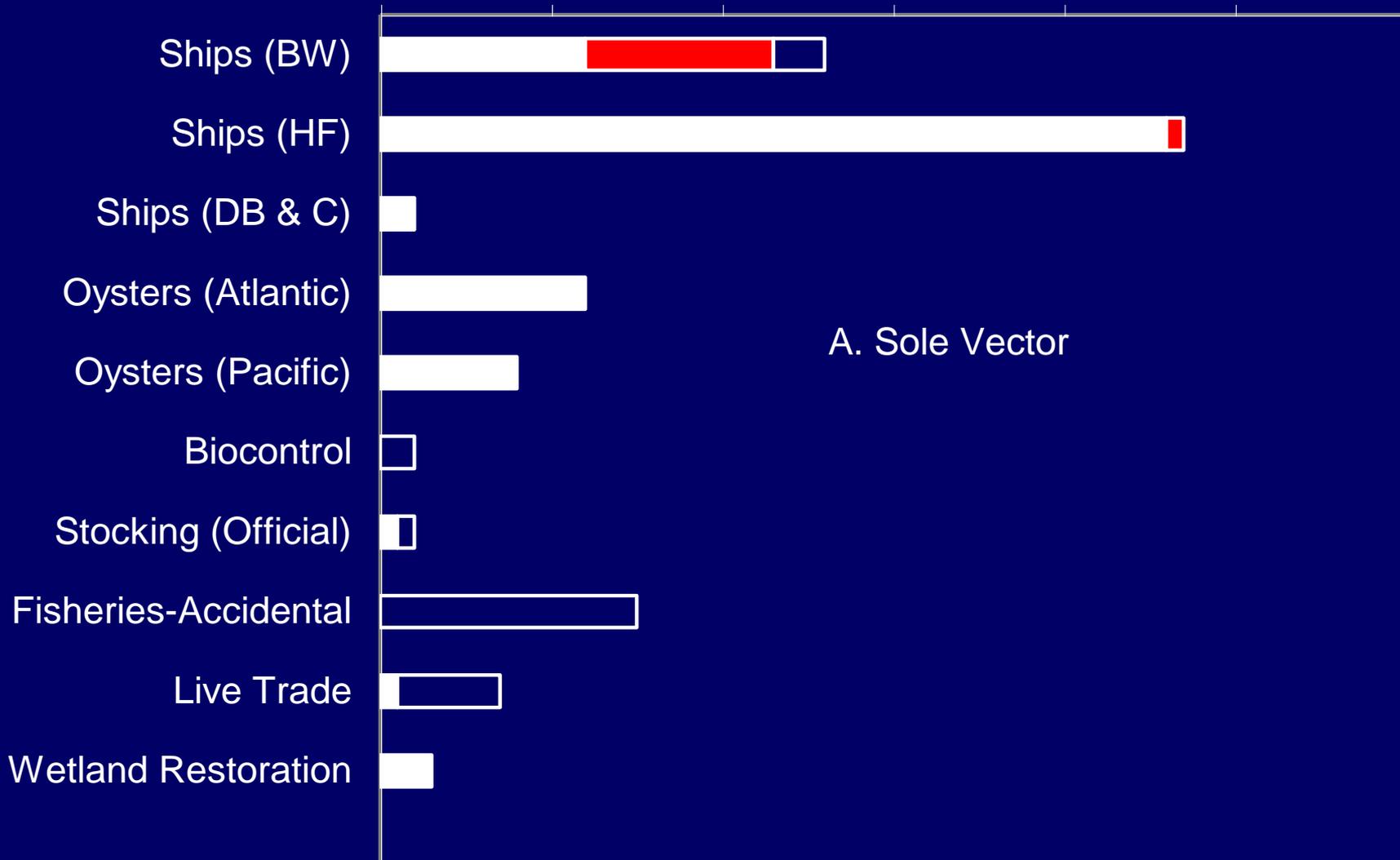






Number of Species

0 10 20 30 40 50 60

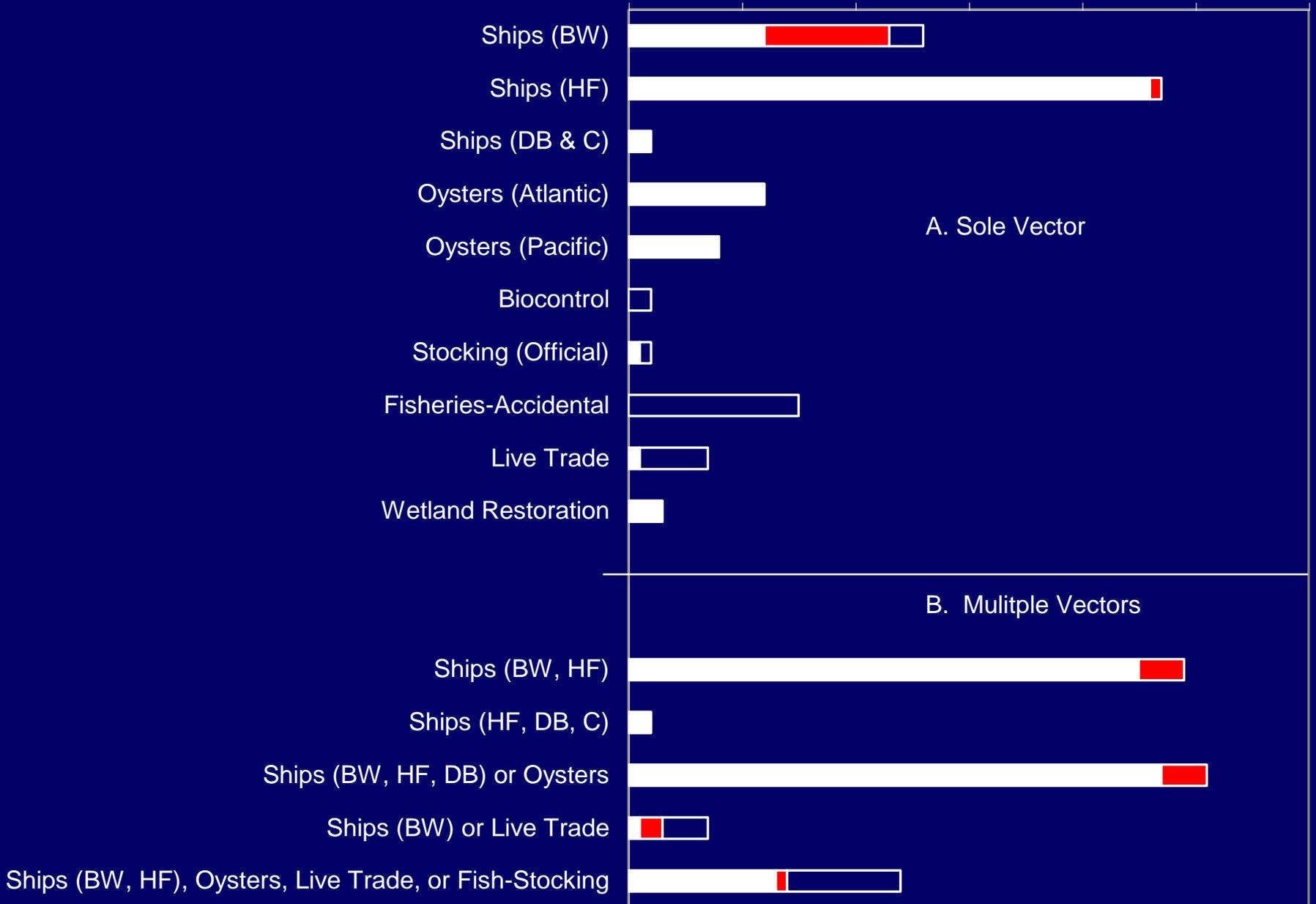


Multiple Vectors are Possible for Many Species



Number of Species

0 10 20 30 40 50 60



Hull Fouling

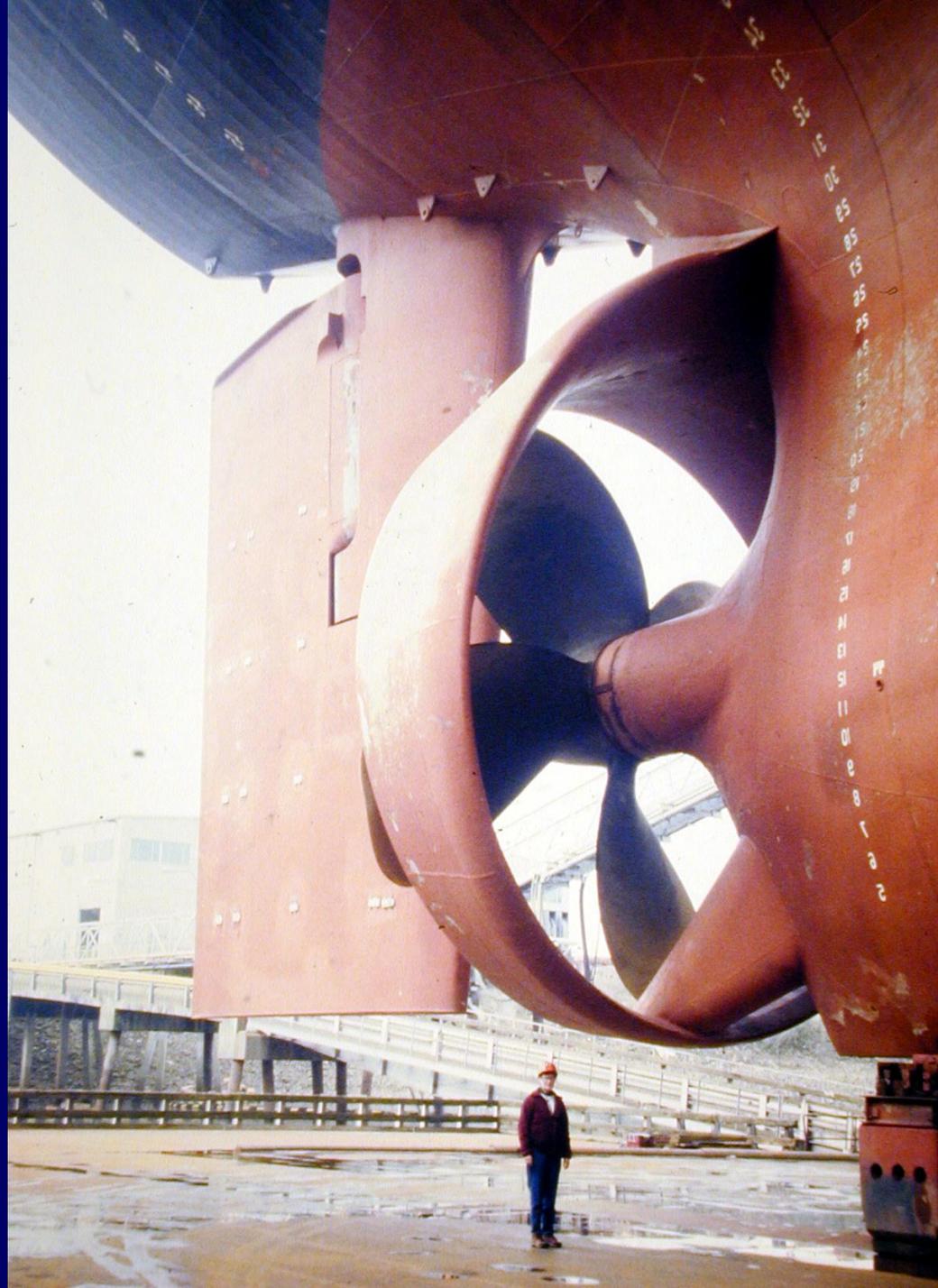
- Important Historically

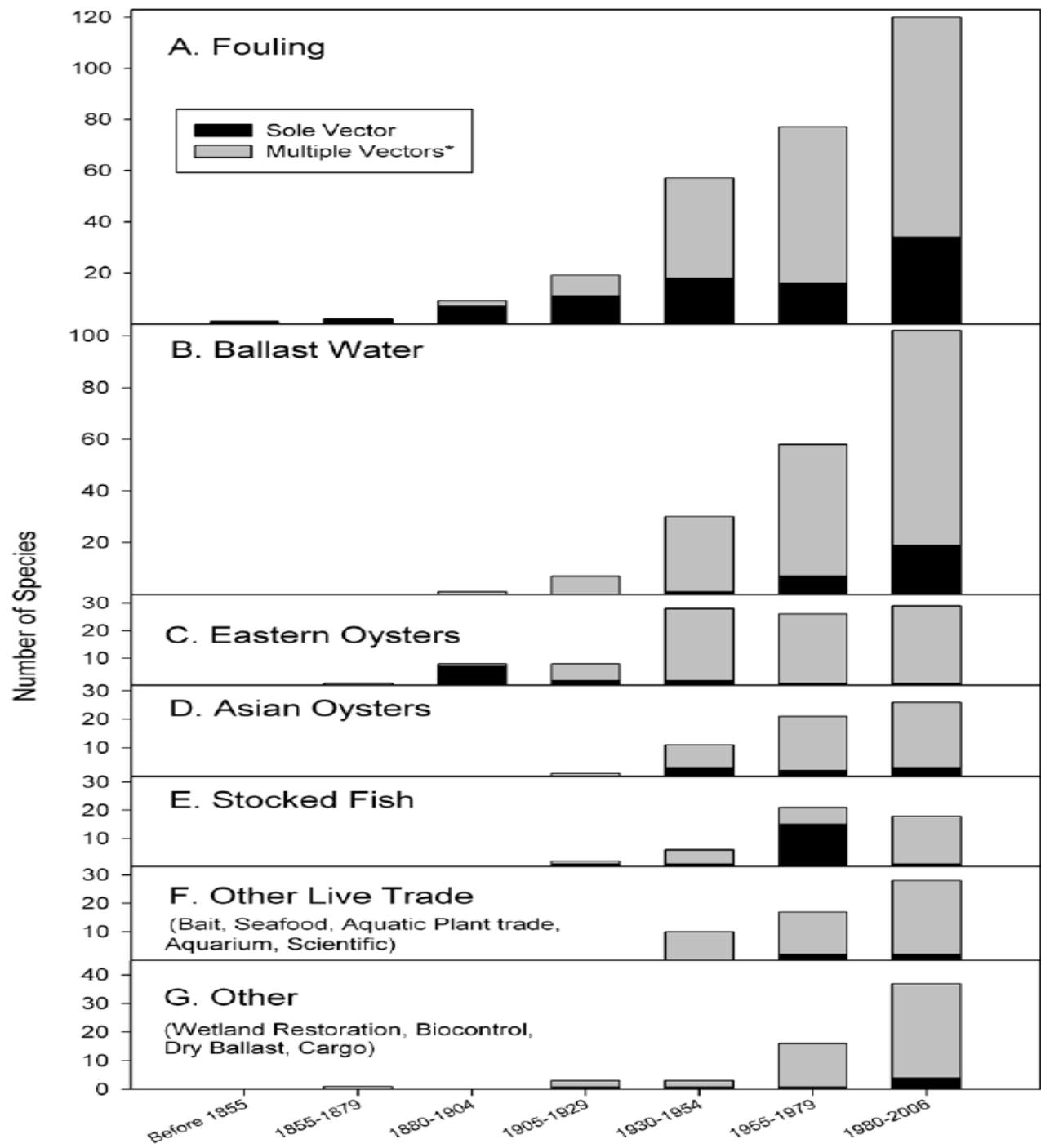


Hull Fouling

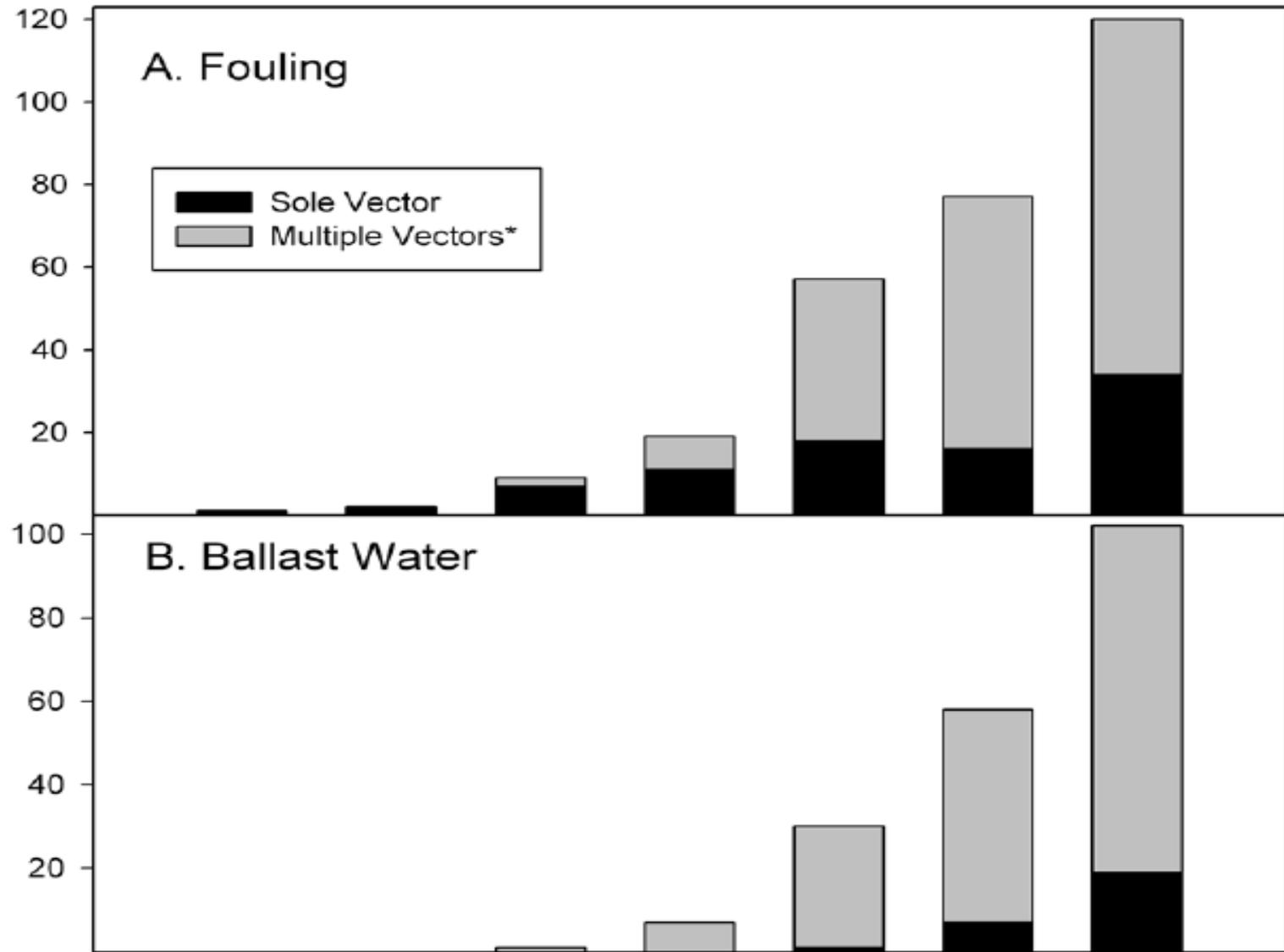
How Important Today?

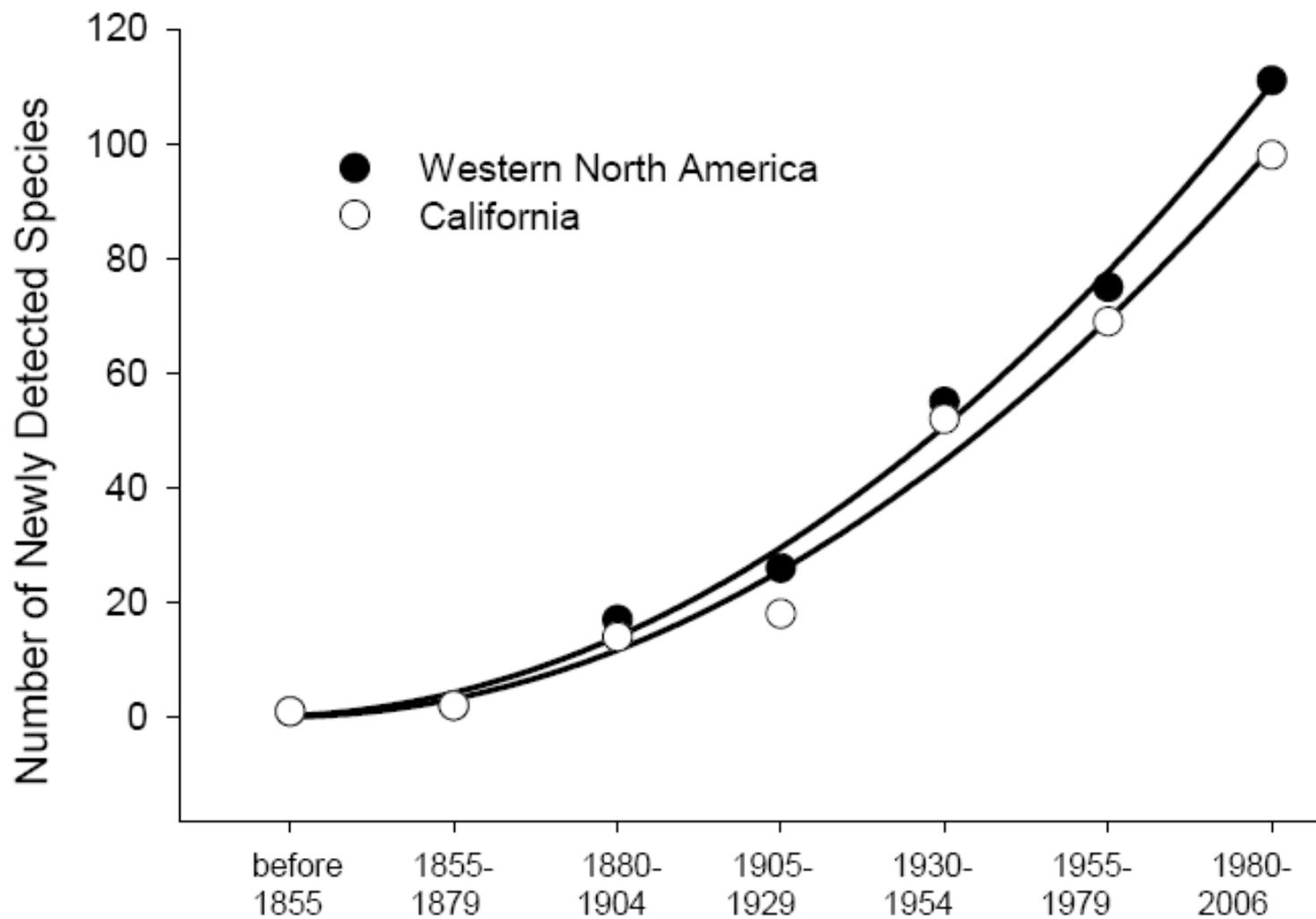
- bigger ships
- travel farther, faster
- better husbandry
- WSA = ~335M sq meters/yr from overseas vessels



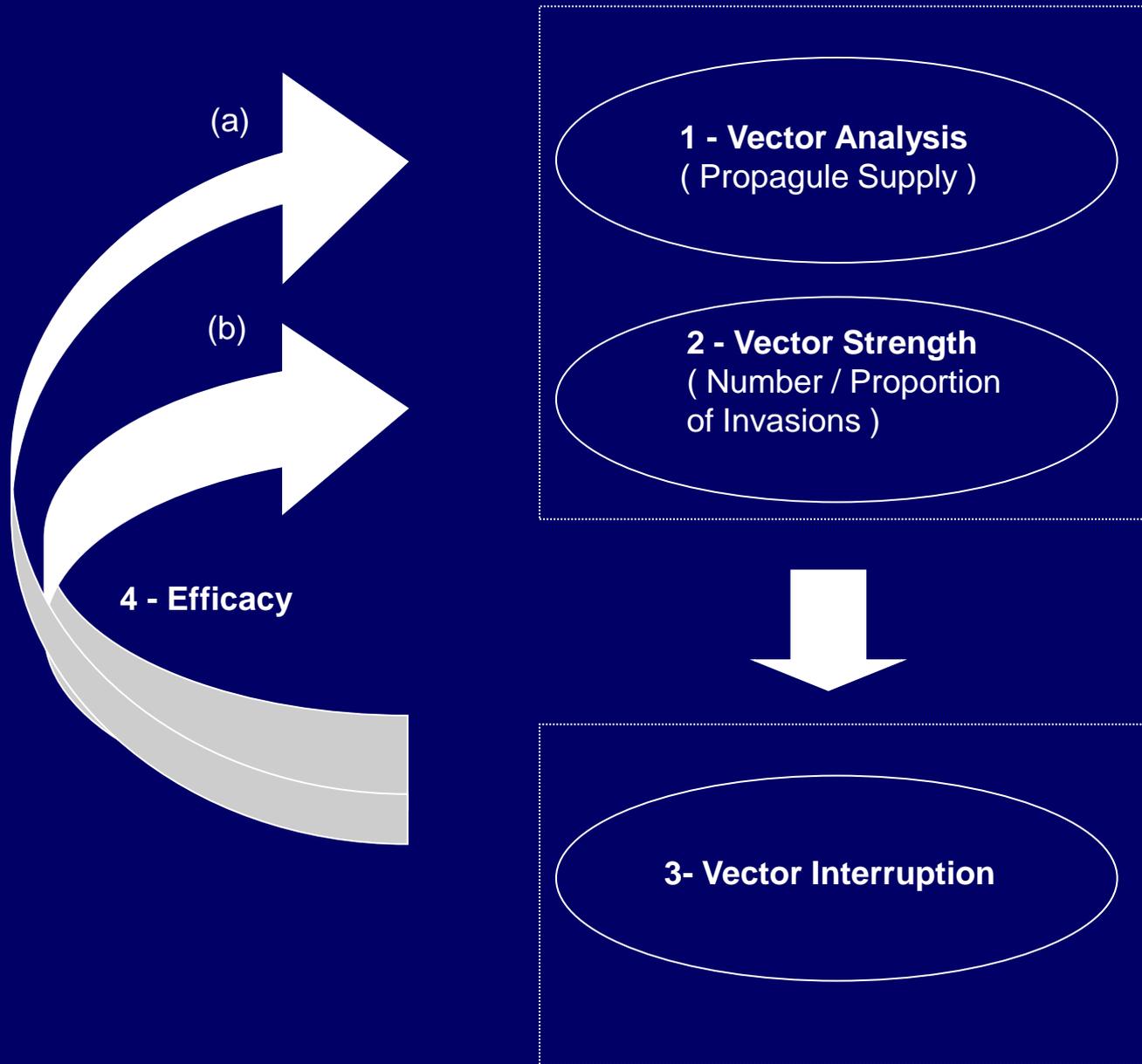


Relative Importance of BW vs HF?



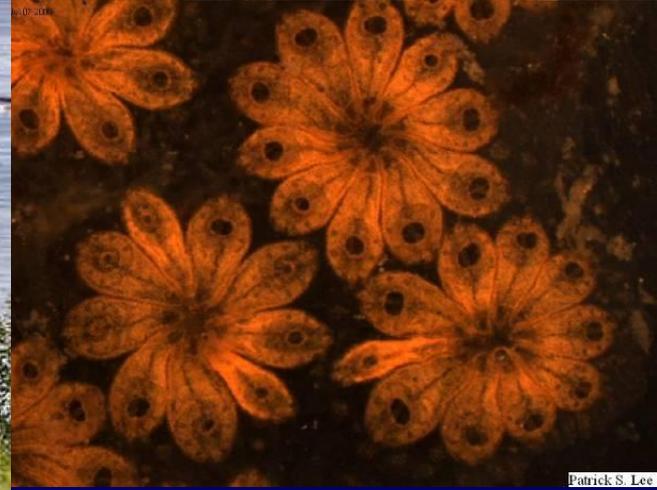


COMPONENTS OF VECTOR MANAGEMENT



Collaborators

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Sponsors:

- Cal Dept Fish & Game
- National Sea Grant
- Prince William Sound RCAC
- Smithsonian Institution
- US Coast Guard
- US Fish and Wildlife Service