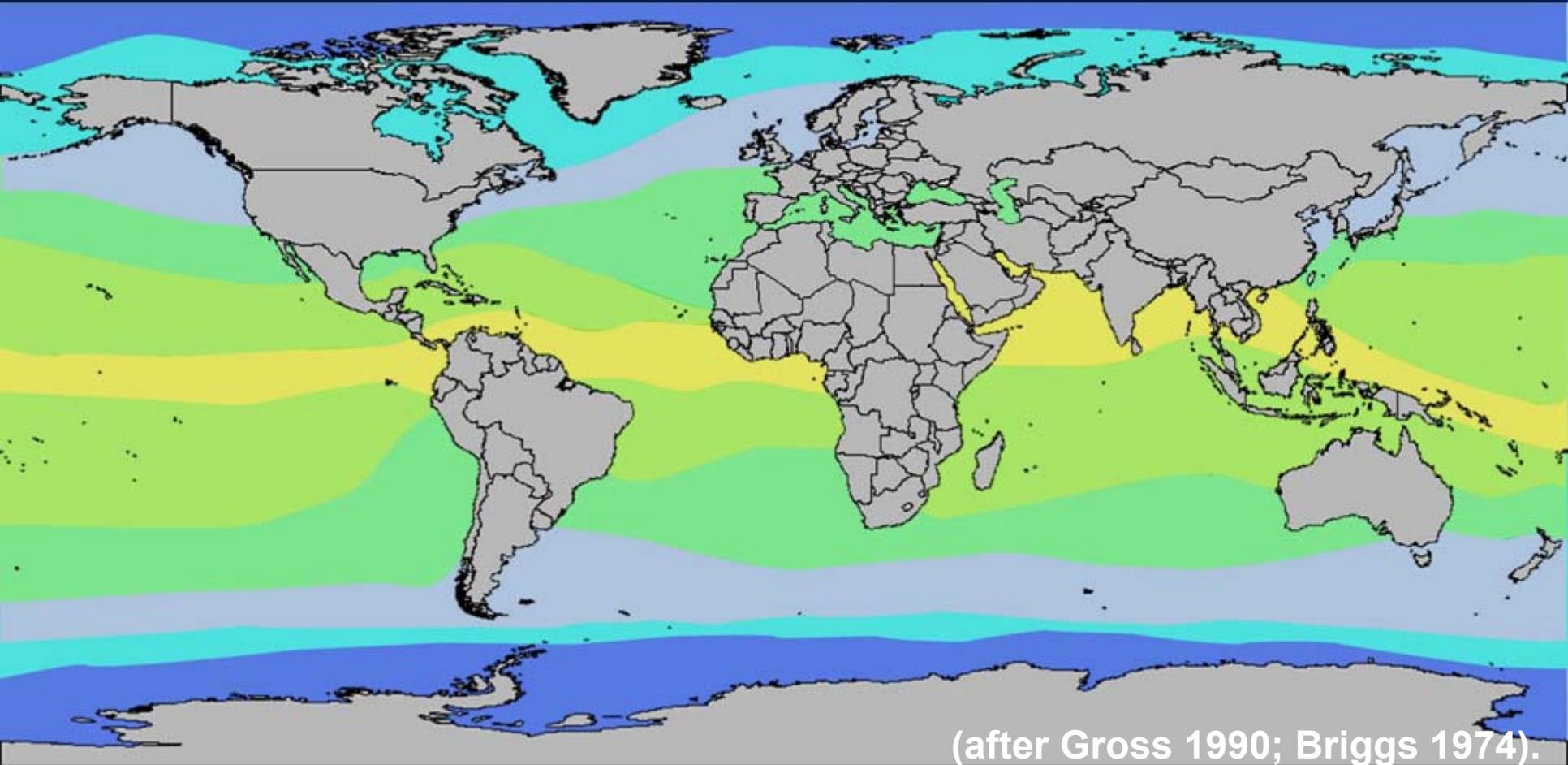


Ballast Water Issue Affecting Tampa Bay



Marine climatic zones



Polar



Subpolar



Temperate



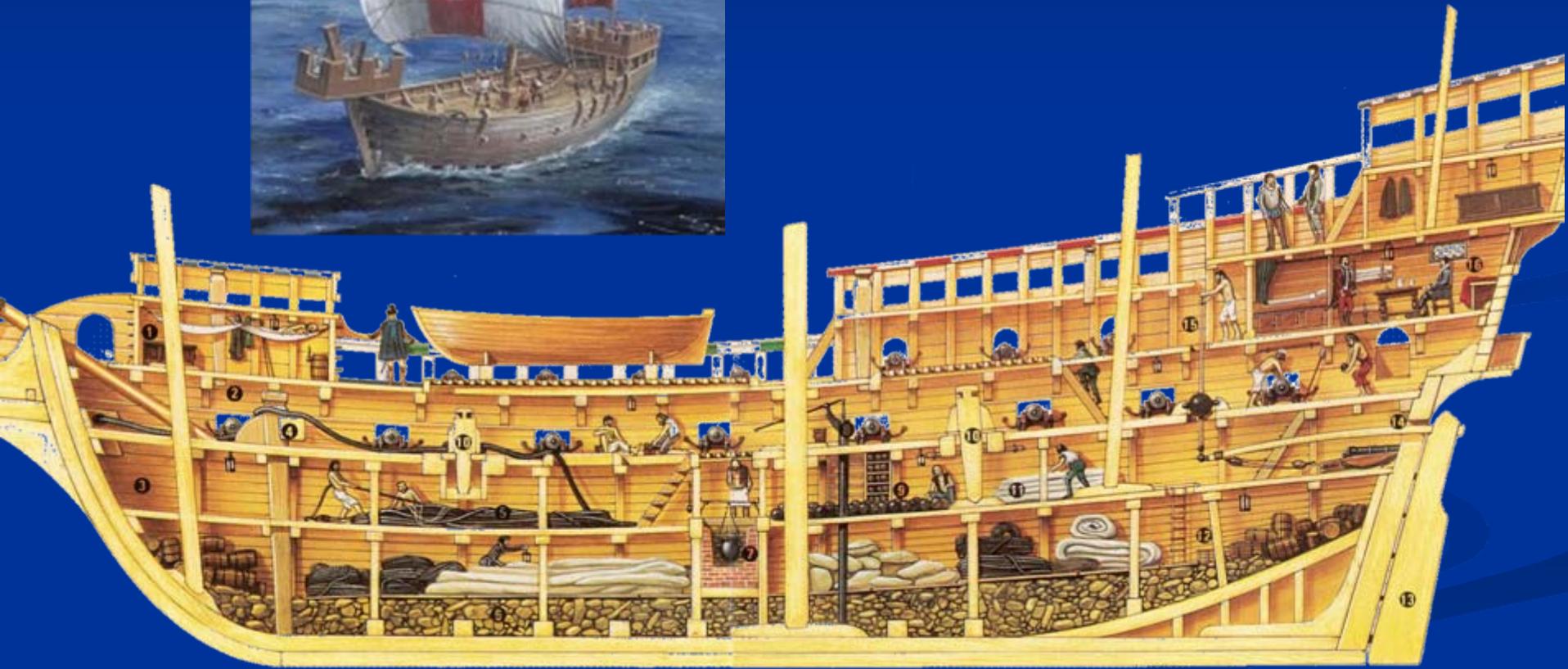
Subtropical



Tropical

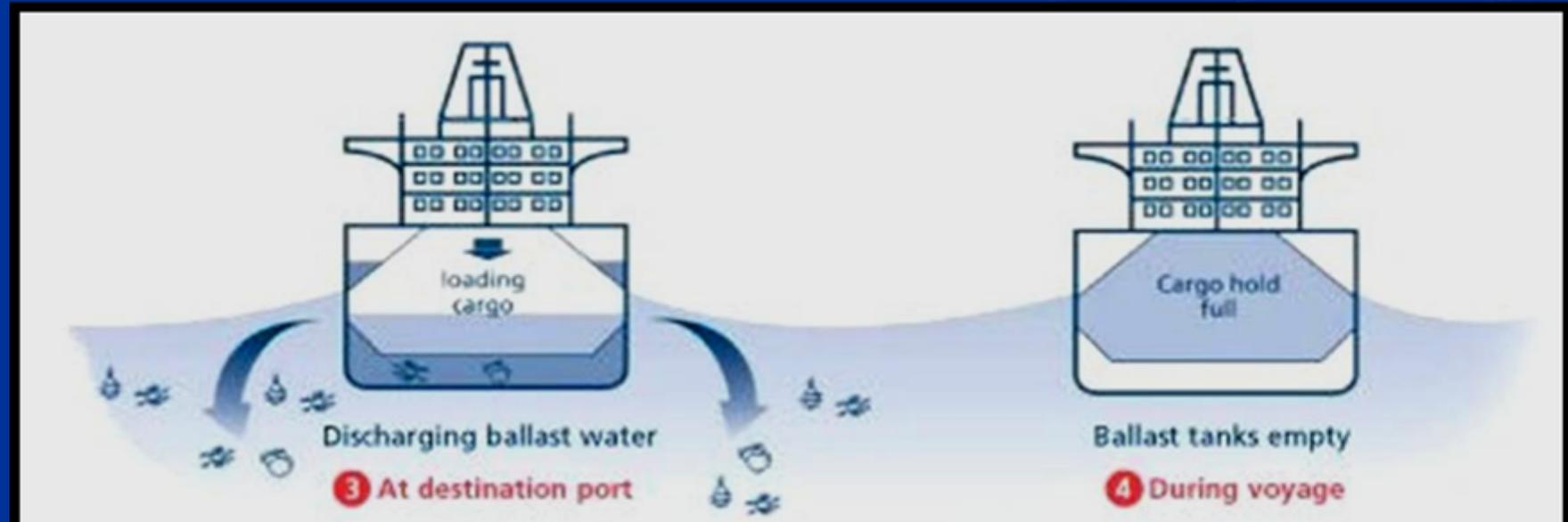
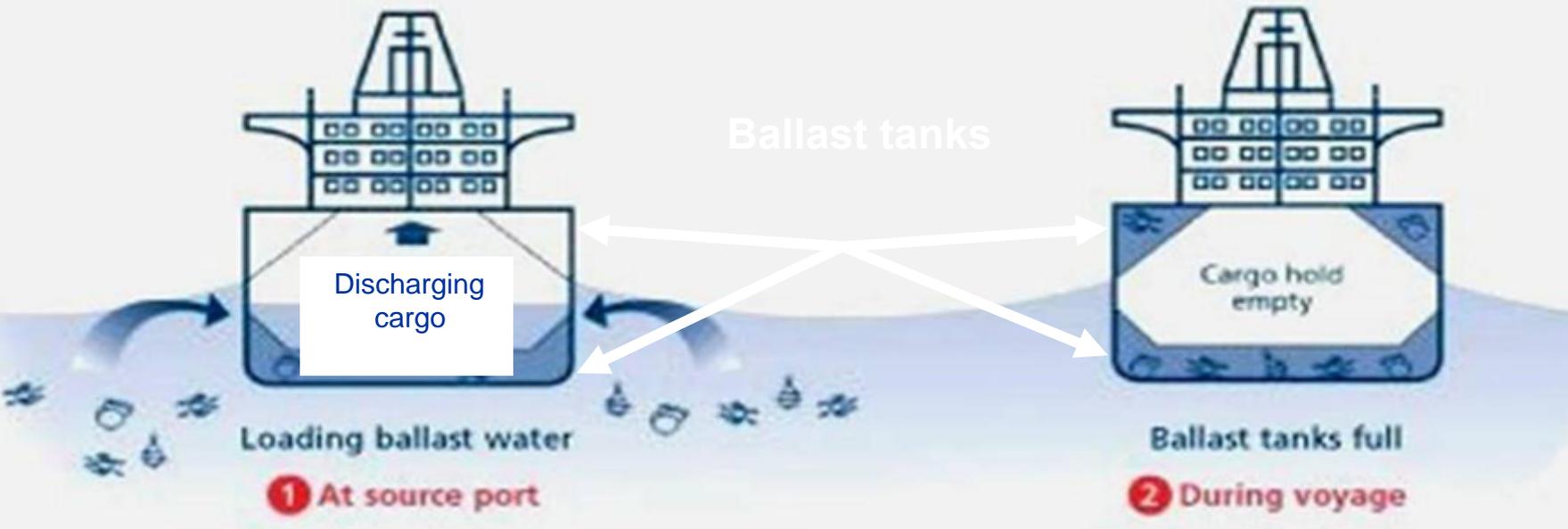


Equatorial



Source: www.boundingmain.com

Ballast tanks



It has been estimated that more than 7,000 species are being carried daily in ships' ballast tanks around the world.

An estimated 792 – 1,820 billion gallons of ballast water (BW) are moved internationally each year.

BW exchange in ports and harbors worldwide has been shown to be a primary vector for the introduction of nonnative harmful microorganisms, and the introduction of invasive marine species has been identified as one of the four greatest threats to the world's oceans.

65 known, suspected or likely nonnative species have either successfully invaded the Tampa Bay ecosystem or are in a position to do so (Baker et al. 2004).

BW and ship fouling are possible routes for several recent invasive species (e.g. green mussel, Asian kelp, red-tide algae).

Foreign export in bulk cargo ships constitutes a major source of foreign introduced ballast water.

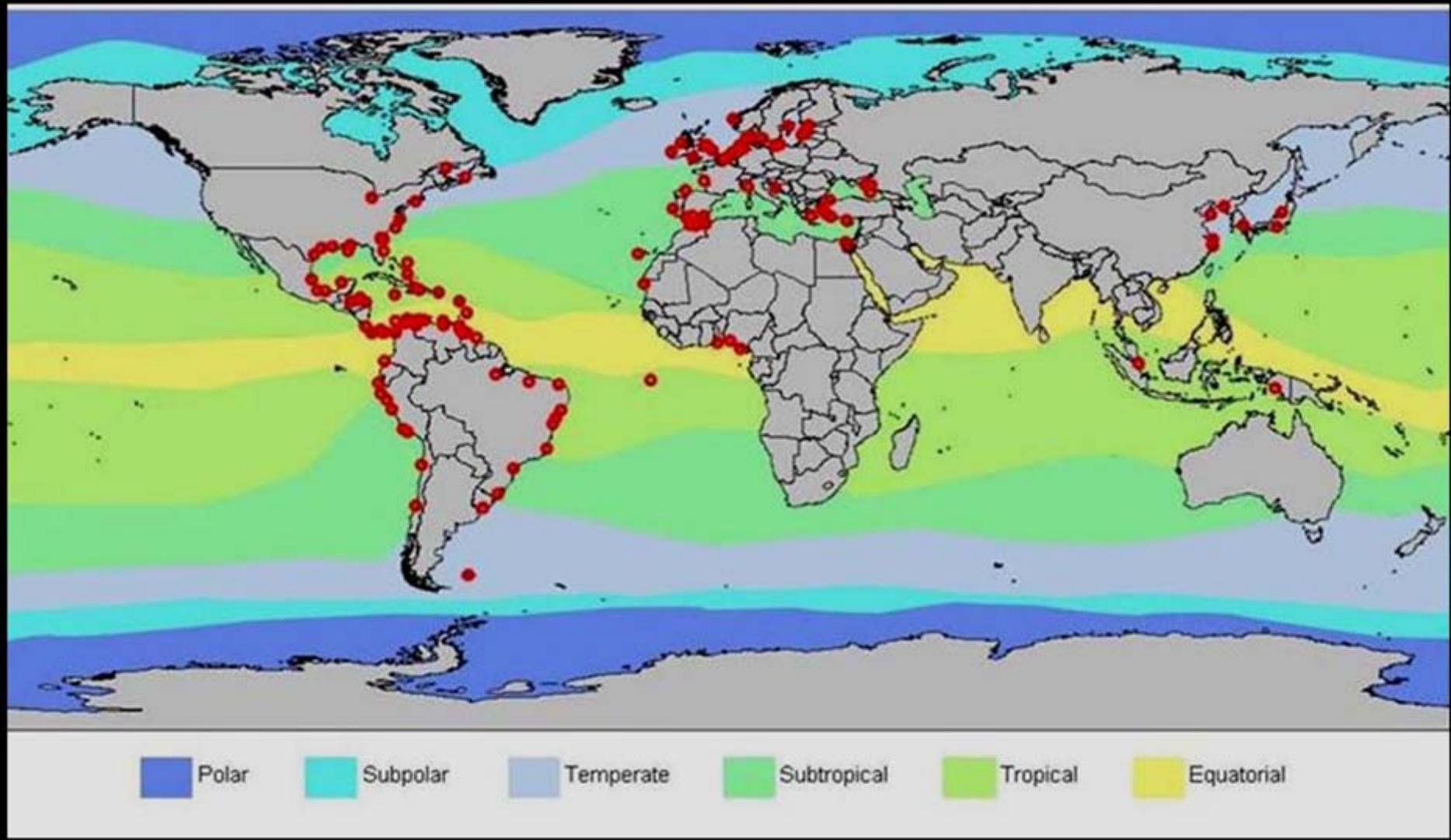
Virtually all marine species have a planktonic (free-floating) phase in their life cycle.

BW released into the Port of Tampa in 1996 was estimated to average ~1 gallon/minute, 24/7.

**2003-2006 FL Fish and Wildlife Conservation
Commission survey of ships entering
Tampa and Manatee ports to sample BW
for the presence of potentially harmful
microorganisms**



Potential Ballast Cyst Sources



Locations of last five ports of call of vessels sampled

RESULTS

- 63 ships sampled, majority were bulk and cargo carriers
- Live phytoplankton in ballast water
 - 36% of ships and 42% of tanks had live algae
 - 9 nonnative species were found
 - 83 species were recorded
 - 1 nonnative harmful species (*Dictyocha fibula*) was found
- Cysts (resting stage) in ballast water
 - 39% of ships and 46% of tanks contained cysts
 - 0-418 cysts per sample
 - 2,969 cysts were isolated and incubated; 21% germinated
 - 2 potentially nonnative species were established in culture



International Standards

Existing, but not yet adopted by U.S.

- IMO (International Maritime Organization) (2004)
 - **Regulation D1:** mandatory BW management, e.g. exchange at least 50 miles from land & in water 200m deep, or other techniques to achieve a 95% volumetric exchange
 - **Regulation D2:**
 - <10 viable organisms/m³ (for organisms \geq 50 μ m)
 - <10 viable organisms/ml (for organisms 10-50 μ m)Sets a max. concentration of discharge of *Vibrio*, *E. coli*, and *Enterococci* (for human health protection)

Table 1: Status of Ratification of the IMO BWM Convention

(As of 15 April 2011)

States	% Tonnage	Parties to the Convention:
Needed: 30	Needed: 35%	Albania, Antigua and Barbuda, Barbados, Brazil, Canada, Cook Islands, Croatia, Egypt, France, Iran, Kenya, Kiribati, Republic of Korea, Liberia, Malaysia, Maldives, Marshall Islands, Mexico, Netherlands, Nigeria, Norway, Saint Kitts and Nevis, Sierra Leone, South Africa, Spain, Sweden, Syrian Arab Republic and Tuvalu.
Currently: 28	Currently: 25.43%	

Existing Regulations

Current US Coast Guard (marine waters)

Requires all vessels equipped with BW tanks bound for ports or places within the US to:

- Perform complete BW exchange no less than 200 miles from any shore after operating outside the Exclusive Economic Zone; or
- Retain ballast water on board; or
- Use another method of BW management approved by the US Coast Guard; and
- Record exchange time, place, amount, etc. and report the info to the Smithsonian Institute



Estimated Economic and Environmental Effects of Existing US Coast Guard Regulations

7,420 US vessels affected

Annual cost of \$15.8 million (\$2,130/vessel/year avg.)

**Prevent two invasions by non-indigenous species into
US every three weeks (estimated)**

**Annual cost of damage by invasive species estimates
vary greatly (2007):**

- Fish \$5.7 billion**
- Zebra mussels \$1.06 billion**
- Asian clams \$1.06 billion**
- Green crab \$47 million**
- Aquatic plants \$215 million**

Proposed Regulations

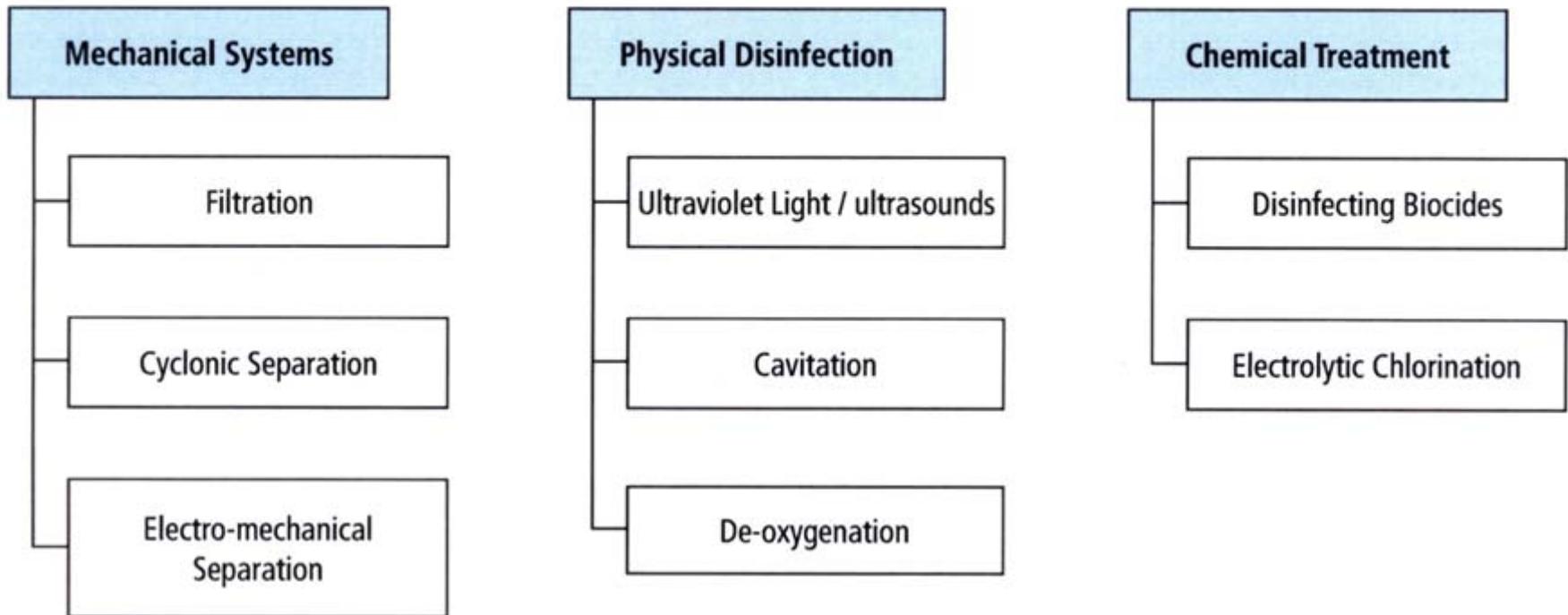
US Coast Guard (marine waters)

- Phase 1 – ~same as IMO D2
 - requires treatment and testing
- Phase 2 – 10 fold reduction for organisms >10um
 - puts limit on organisms <10um
 - stricter for indicator microbes
 - requires treatment to attain standards

EPA proposal – not yet available;
due out in Nov. 2011

Treatment Types

Figure 1: Treatment Technology Types



Source: ABS Ballast Water Advisory

Estimated Economic and Environmental Effects of Proposed US Coast Guard Regulation

(from Federal Register notice of proposed rule)

Phase 1 Costs (same as IMO D2): Average \$167 million/ year of phase-in for US vessels (for 4,758 vessels = ~\$280,000/vessel average)

Phase 2 Costs – none provided; expect it to be substantially less (will already have the equipment in place)

Phase 1 Benefits (damages/costs avoided) \$13.3-\$596 million/ year, based upon invasion of 6-7 species into all US waters over 10 years

Recommendations

- **Recognize the existing regulations on ballast water management (a complete open water exchange, or no release, or alternative treatment; same as IMO D1)**
- **Await further information on the potential costs and benefits of the proposed US Coast Guard regulations before recommending installation of treatment equipment**