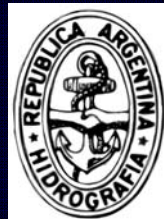


# Hull fouling on domestic vessels and the regional spread of marine NIS



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# Introduction

- Hull fouling on transoceanic vessels is a well recognized vector for coastal introductions
- While domestic shipping is not involved in primary introduction of nonindigenous species (NIS) it plays a role in secondary spread
- We assessed hull fouling communities on an oceanographic vessel serving routes from Brazil to the Antarctica

## Objectives:

1. To assess the potential of hull fouling on domestic vessels to spread NIS regionally
2. To compare in-water vs. dry-dock sampling methods

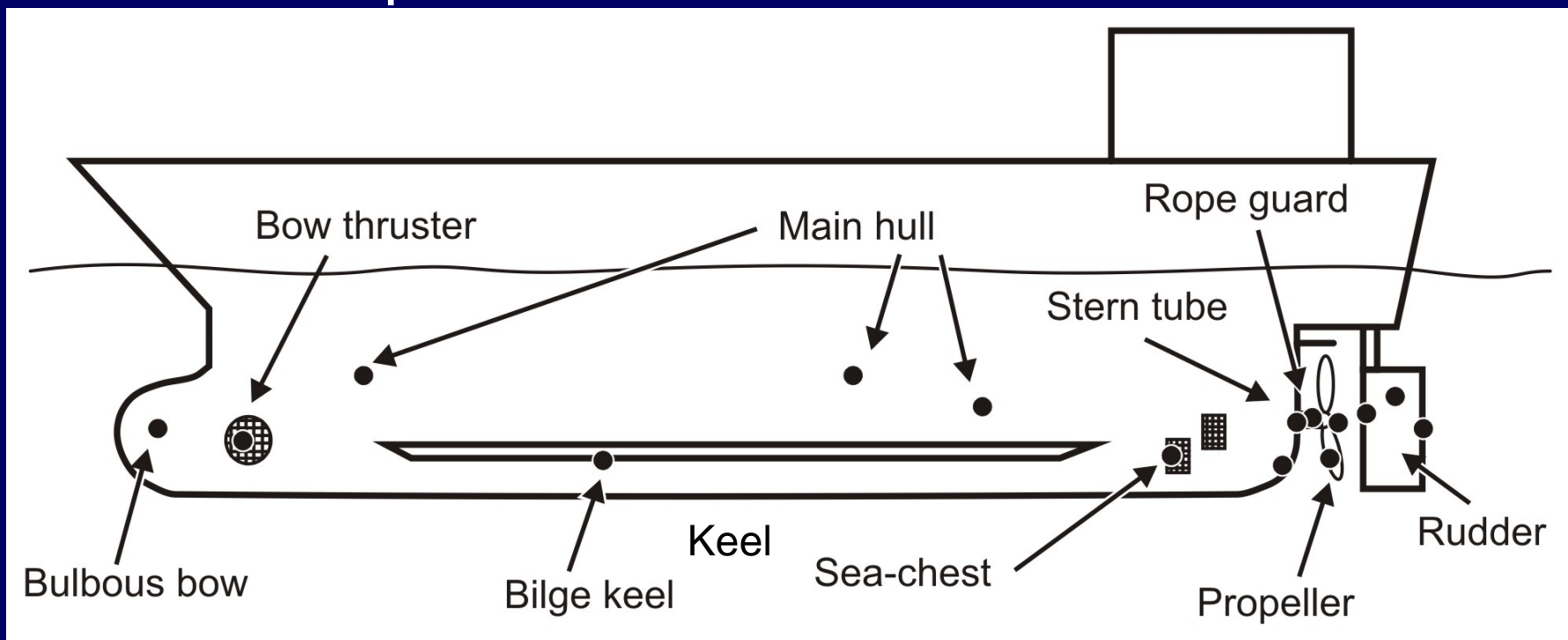
# Hull fouling sampling in Mar del Plata

- Navy divers collected samples from hull underwater locations in the spring and winter of 2011
- Scraped 20x20 cm quadrats and videotaped
- Water samples from the dock also taken



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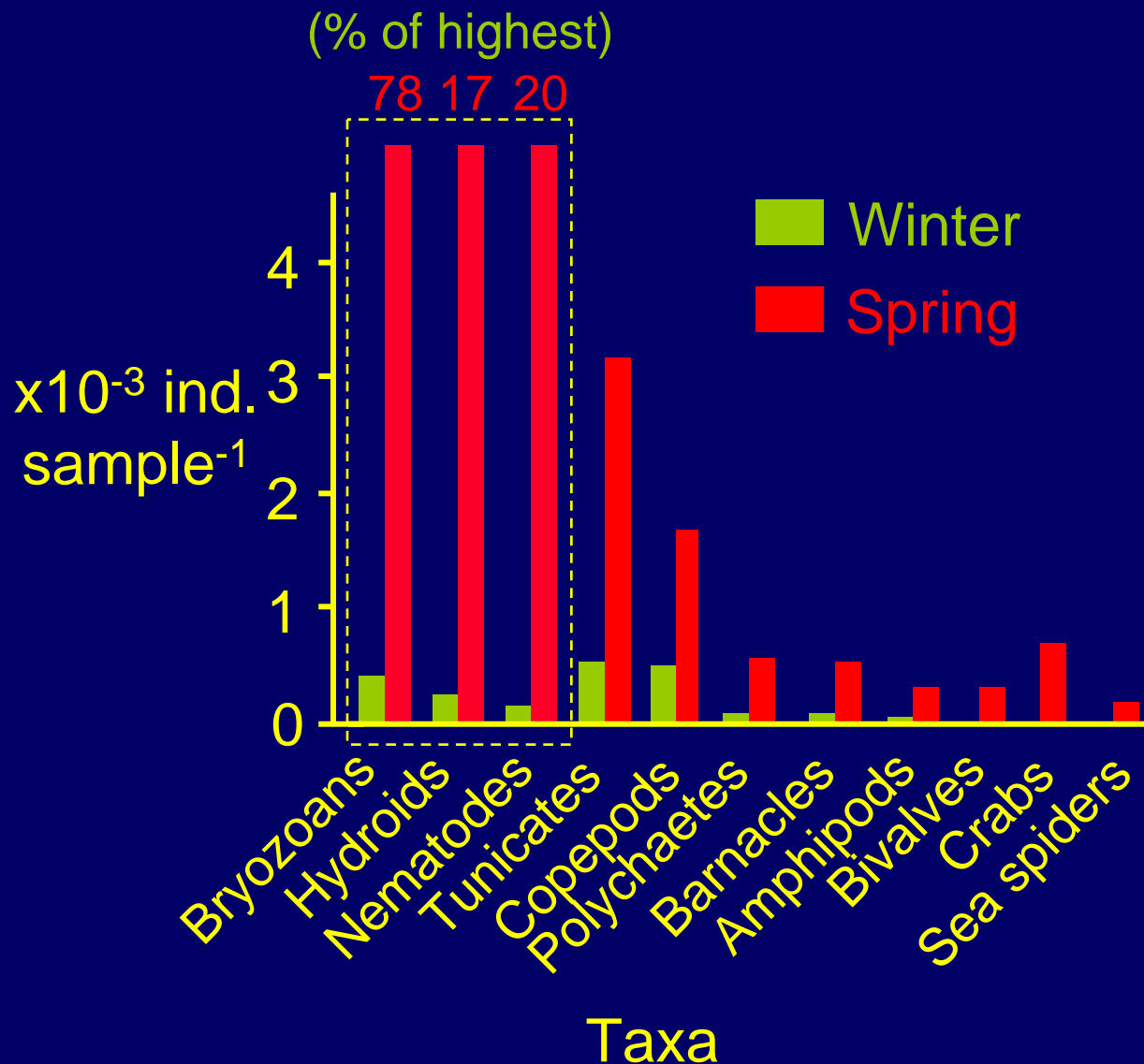
Modified from Coutts & Taylor (2004), Sylvester & MacIsaac (2010) *D&D*



Dry-dock sampling of the same locations was conducted right after the spring sampling

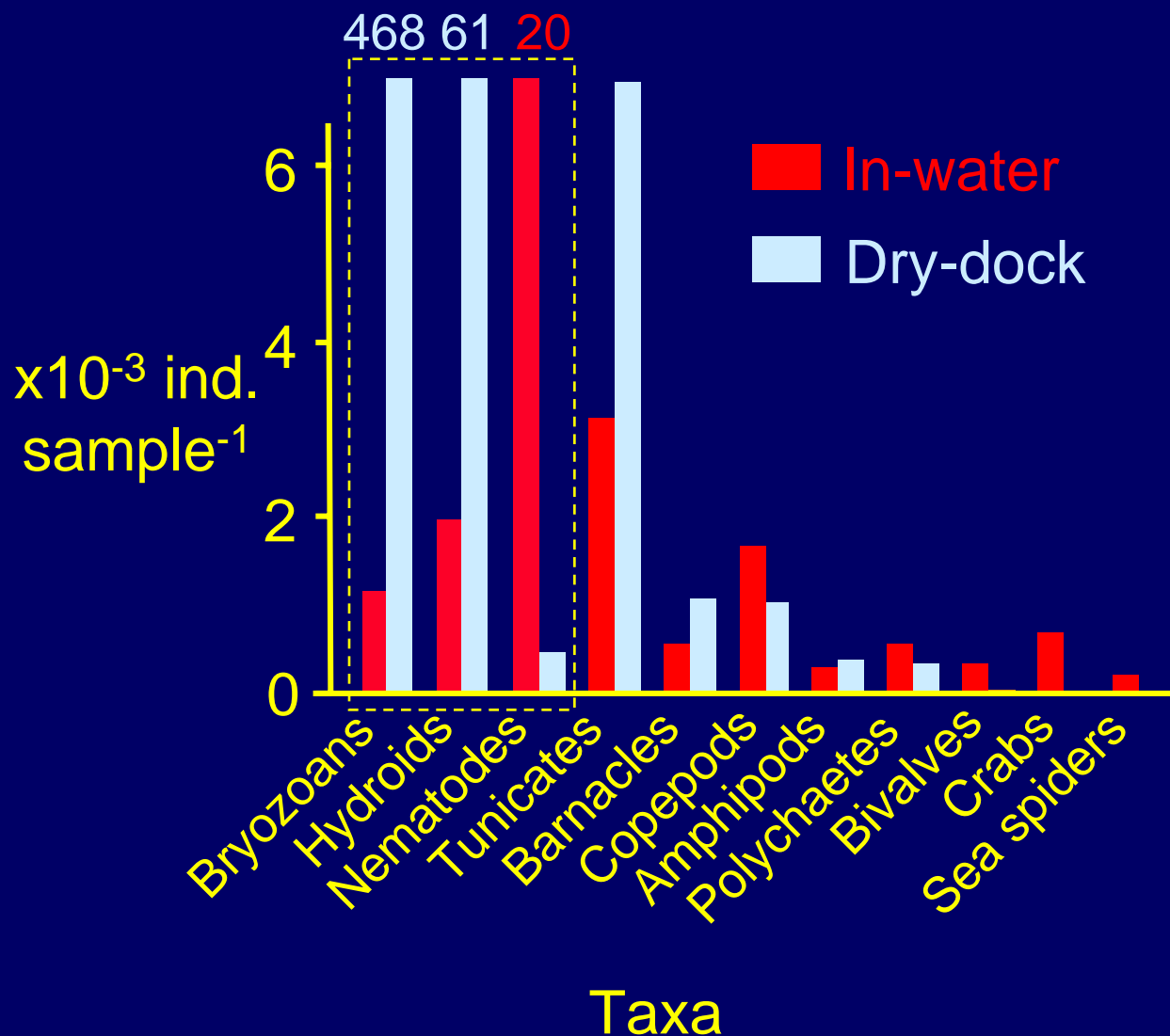


# Taxonomic abundances collected during in-water sampling (four locations)



- A total of 19 taxa
- Rare taxa included cladocerans, isopods, tanaidaceans, gastropod, etc.
- Colonial species, dominated abundances
- Hull fouling extent was considerably higher in the spring (30 x10<sup>-3</sup> ind. sample<sup>-1</sup>) than winter (2x10<sup>-3</sup>)

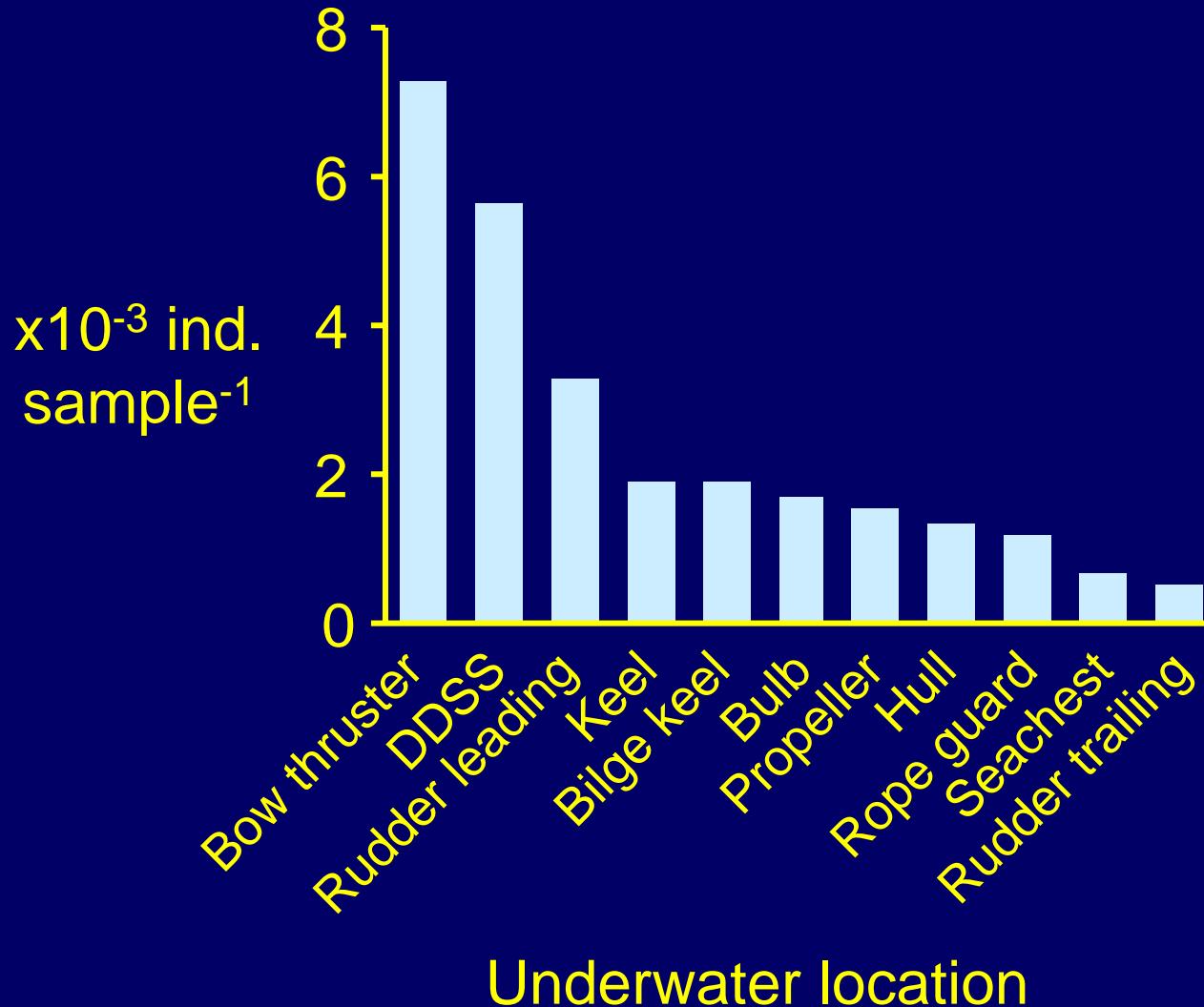
# Taxonomic abundances collected during spring in-water and dry-dock sampling



- Colonial species and tunicates had considerably higher retrieval rates in dry-dock ( $140 \times 10^{-3}$  ind. sample<sup>-1</sup>) vs. in-water sampling
- The opposite was true for nematodes
- For other groups both sampling methods were approximately equivalent

# Abundance patterns across the hull

(dry-dock dataset)

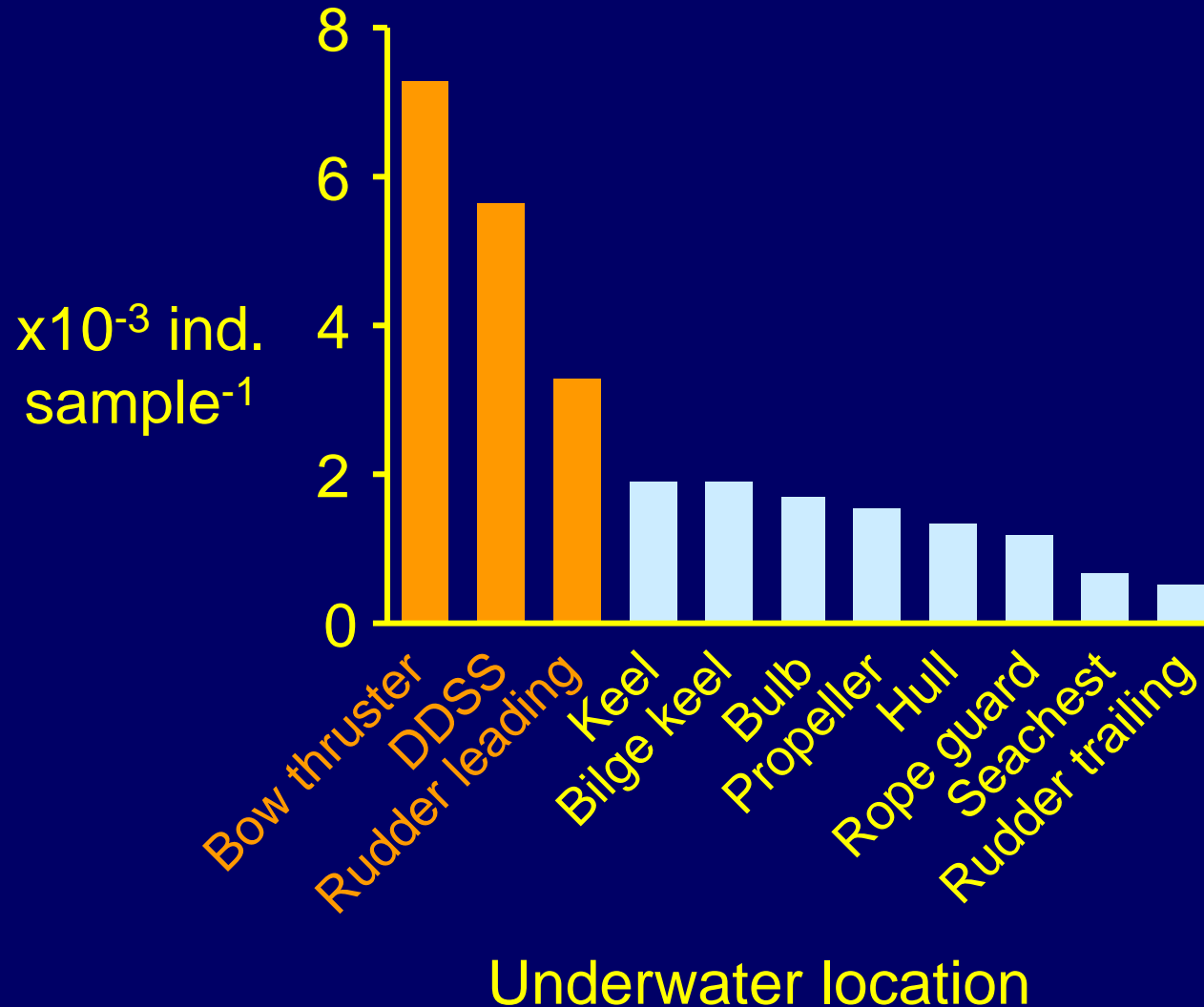


- Niche locations can transport up to 7000 propagules per 20x20cm quadrat
- Up to 400,000 when bryozoans, hydroids, and nematodes were included



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(dry-dock sampling)



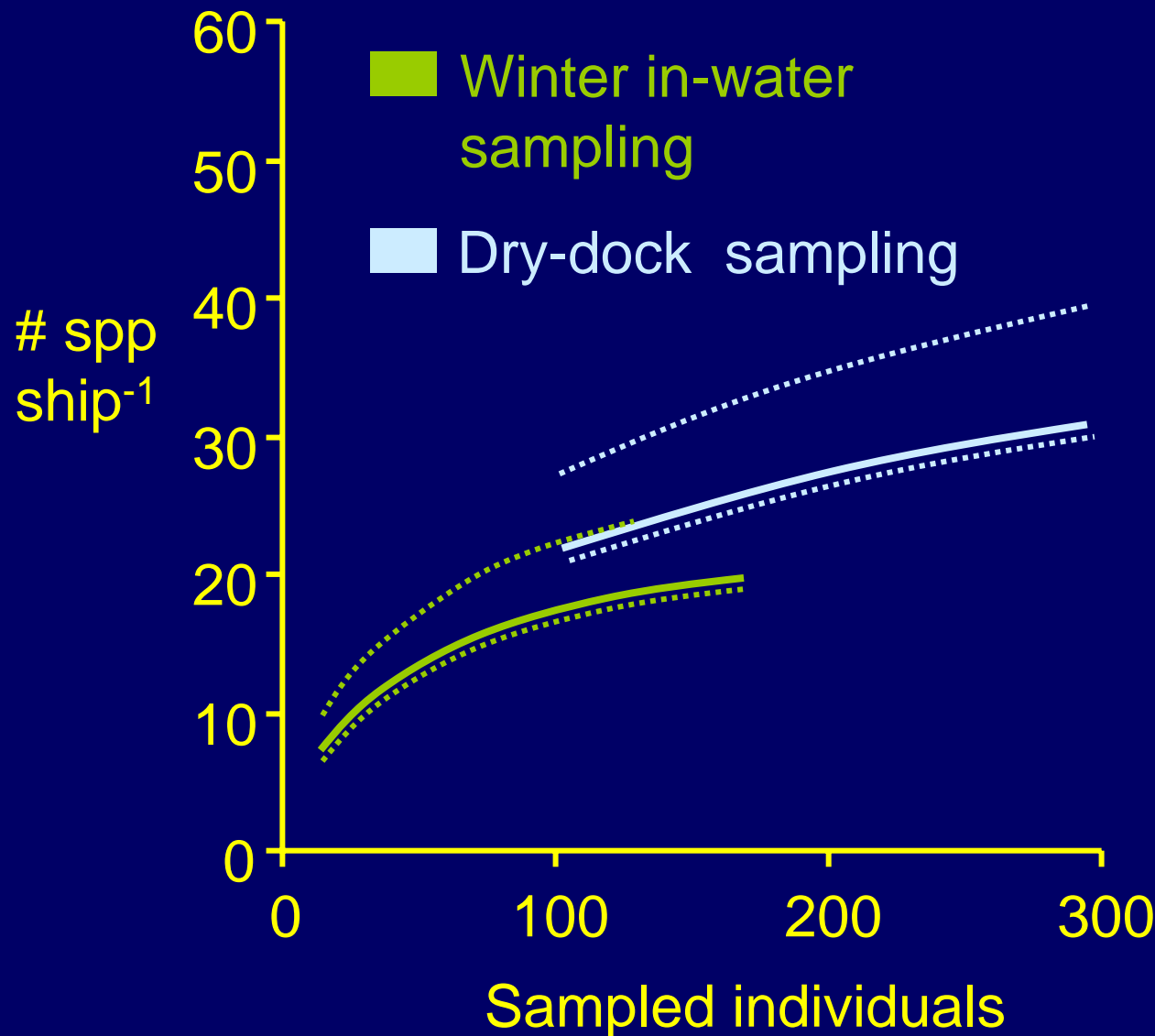
- Niche locations can transport up to 7000 propagules per 20x20cm quadrat
- Up to 400,000 when bryozoans, hydroids, and nematodes were included
- The bow thruster, DDSS, and leading edge of the rudder are hull fouling hotspots

# Hull fouling organisms in niche locations



Polychaetes and ascidians on unpainted areas where the vessel rested while in dry-dock (DDSS) and the bow thruster

# Hull fouling richness (five taxonomic groups)



- Up to 60 bryozoan, hydroid, barnacle, nematode, and polychaete spp (Chao 2-bc)
- Many more expected as identifications are completed
- Spring (dry-dock) samples were significantly richer (Chao 1-bc)

# Some taxa found suggest this vector contributes to NIS dispersal...

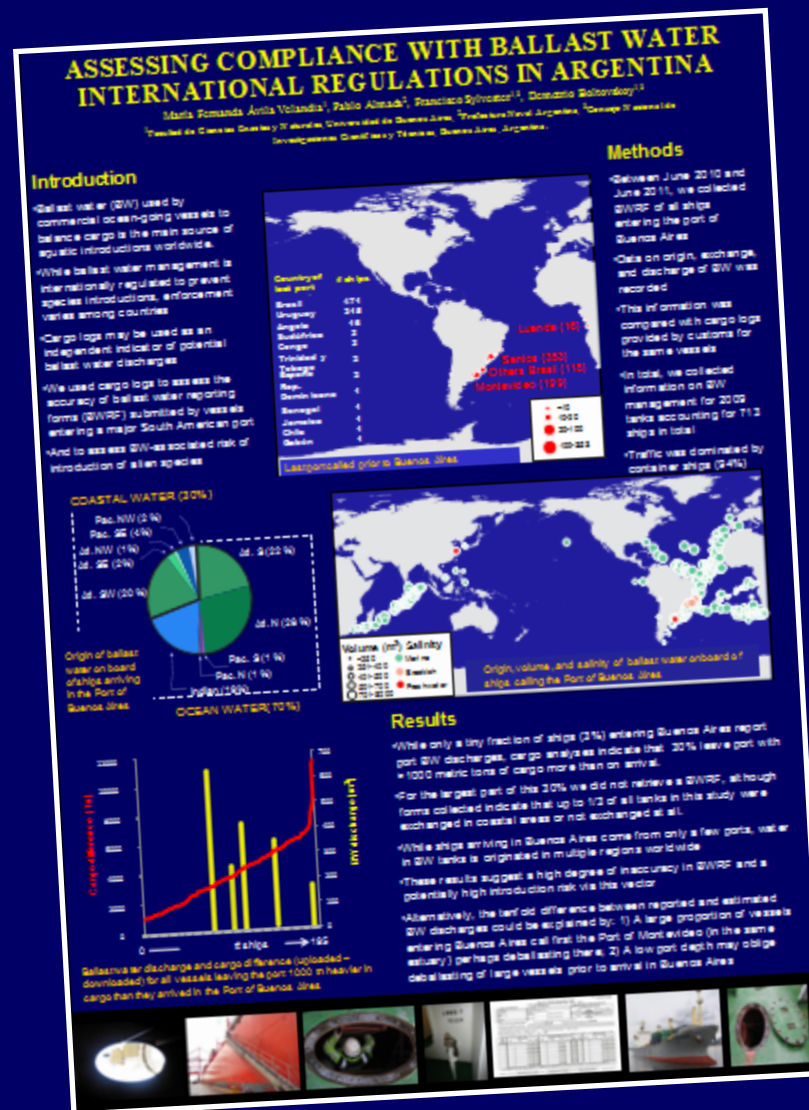
- Isopod *Paracerceis sculpta*: First record in Argentina, likely introduced via hull fouling
- *Dynamene* sp.: First record in the South Atlantic, likely a new species or NIS to the region
- *Hydroides elegans* is a cryptogenic polychaete native to the Southeast of Australia
- **Bryozoans**: At least four established NIS and one cryptogenic
- *Gonothyraea loveni* is an established hydroid never found in the wild along the Patagonian coast
- **More NIS are to be expected, as only a fraction of the samples have been identified**

# Preliminary conclusions

- Once a marine NIS has been introduced, domestic traffic can serve as vector for spread into other ports
- Hull fouling abundances and diversities might develop swiftly following long mooring and visits to other ports
- Niche locations such as the bow-thruster, dry-dock blocks, and the leading edge of the rudder should be management priorities
- While in-water studies provide a good estimation of hull fouling richness, dry-dock surveys are more effective to determine species identities (45 vs. 25 spp and 188 vs. 1079 ind. detected in dry-dock and in-water sampling)



# Ballast water risk assessment for the same coast in today's poster session!



# Thank you!



Access to samples was provided by the Argentine Navy, M/V Puerto Deseado divers and crews; Funding by UBA X-020, 20020100100035, PICT 1968 to DB, and PICT 0729 to FS