

HOW DOES TSUNAMI DEBRIS COMPARE TO KNOWN VECTORS OF INVASIVE SPECIES?

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JAPANESE TSUNAMI MARINE DEBRIS

A new transport vector of marine species in the North Pacific



Photo credit: U.S. Navy



Photo credit: Robin Loznak

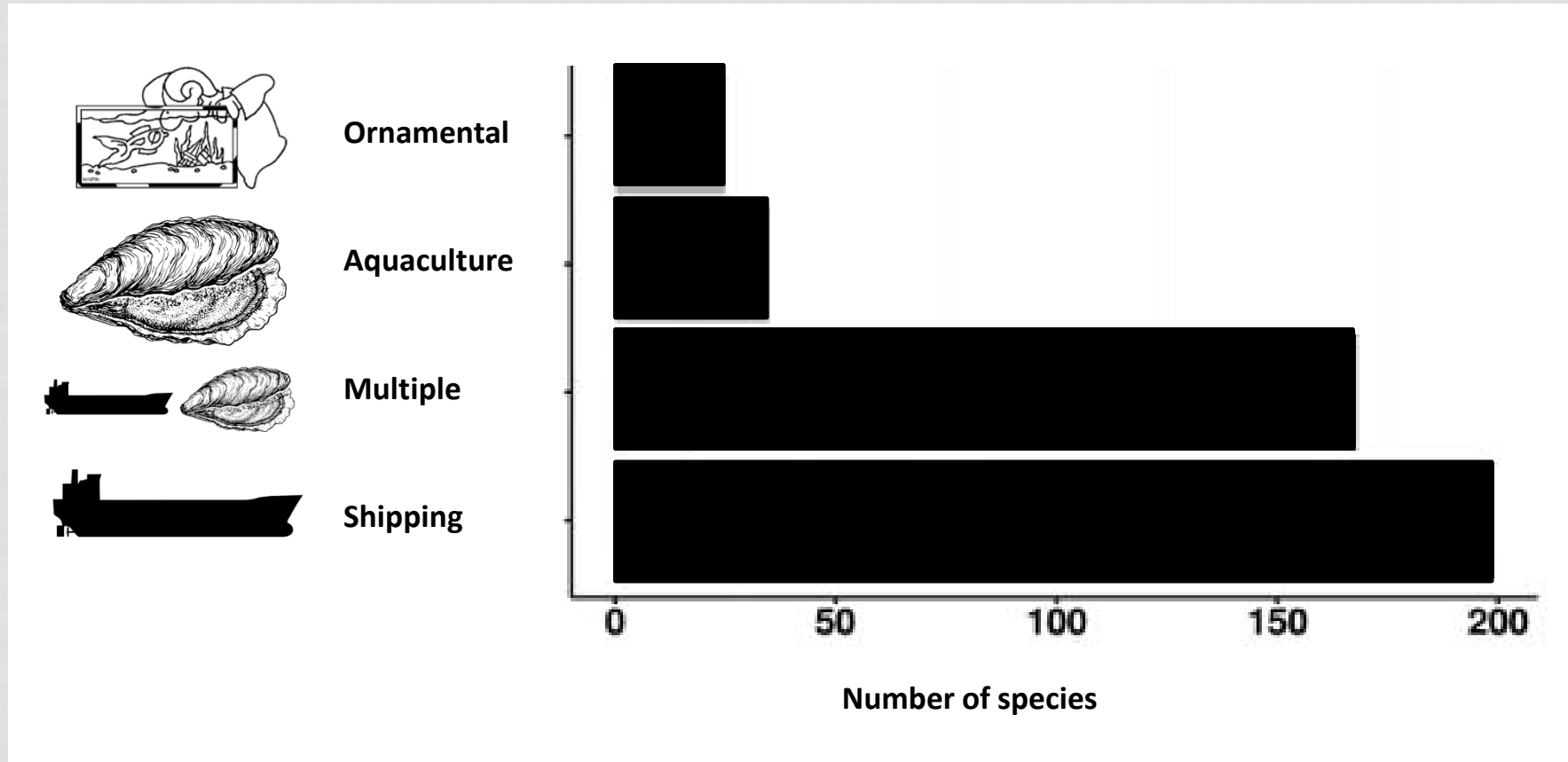
COMMERCIAL SHIPPING



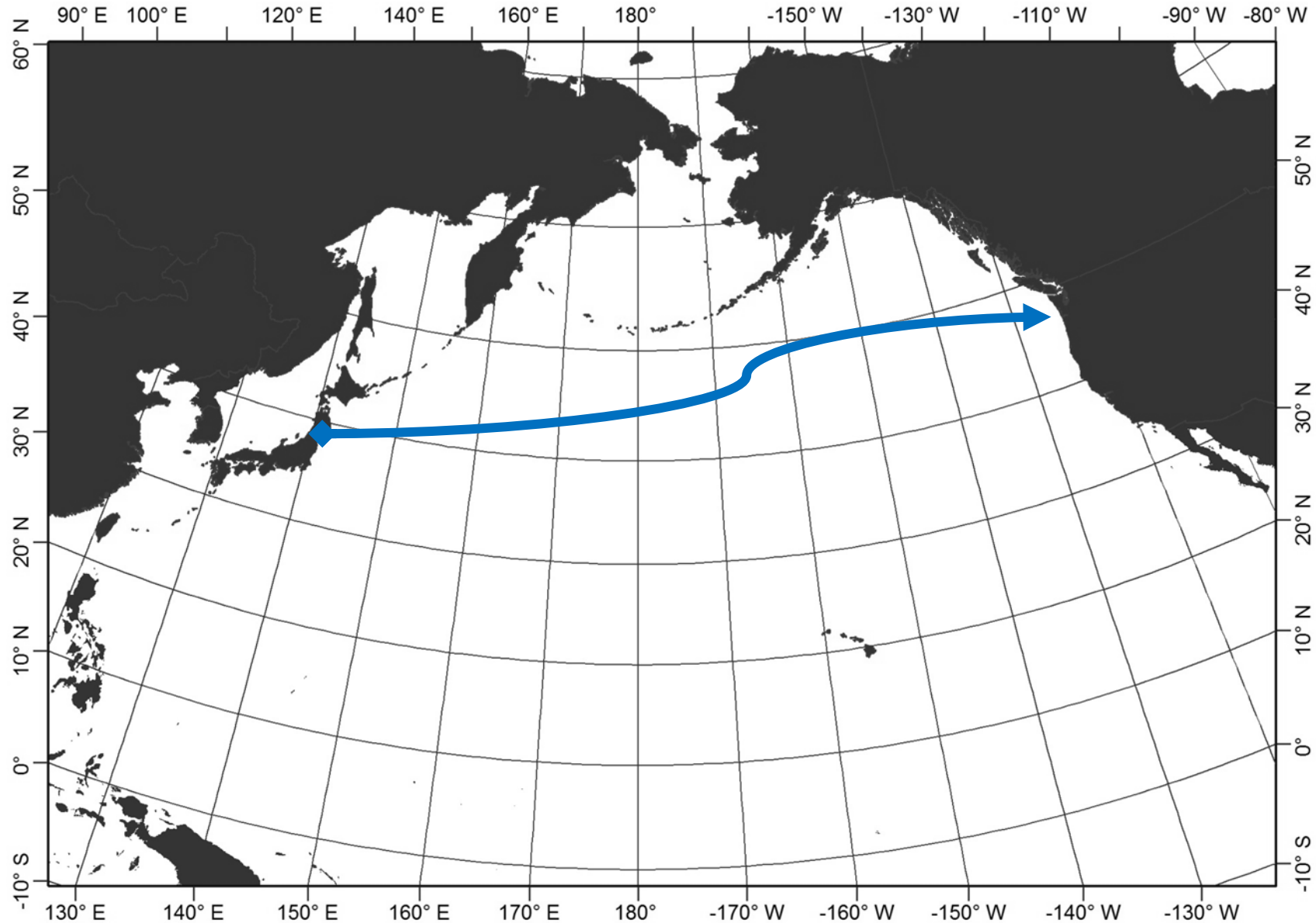
AQUACULTURE



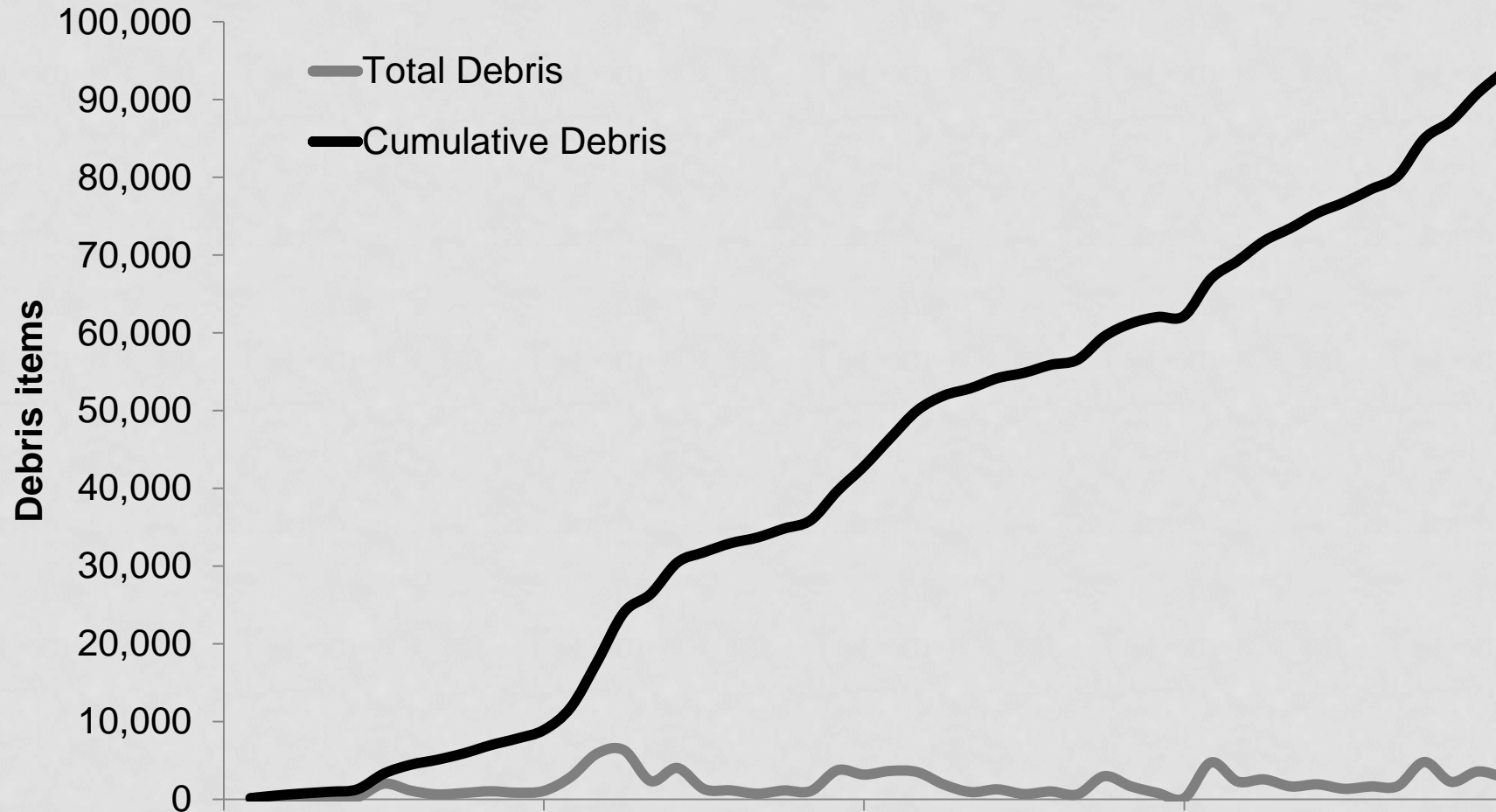
MORE THAN 400 SPECIES HAVE ALREADY BEEN INTRODUCED BY OTHER ACTIVITIES



THE INVASION PROCESS



NUMBER OF ITEMS



SURVIVAL

Photo: Robin Loznak



2012



2016

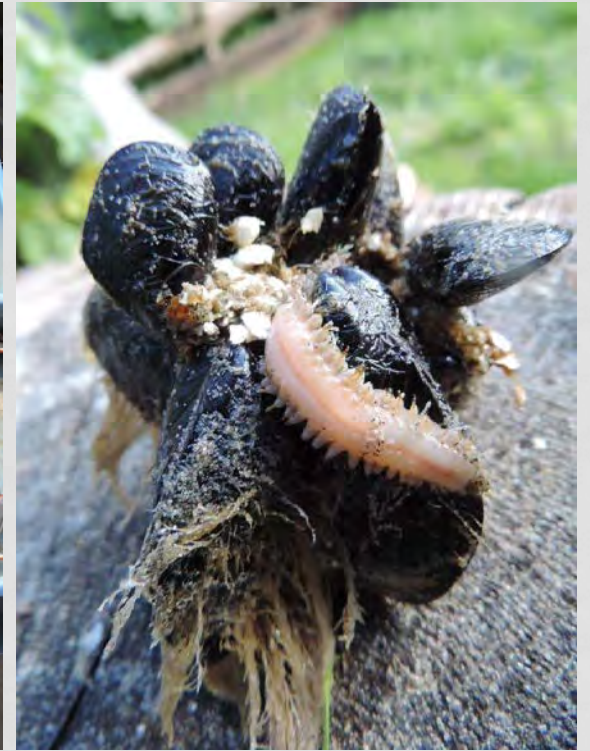
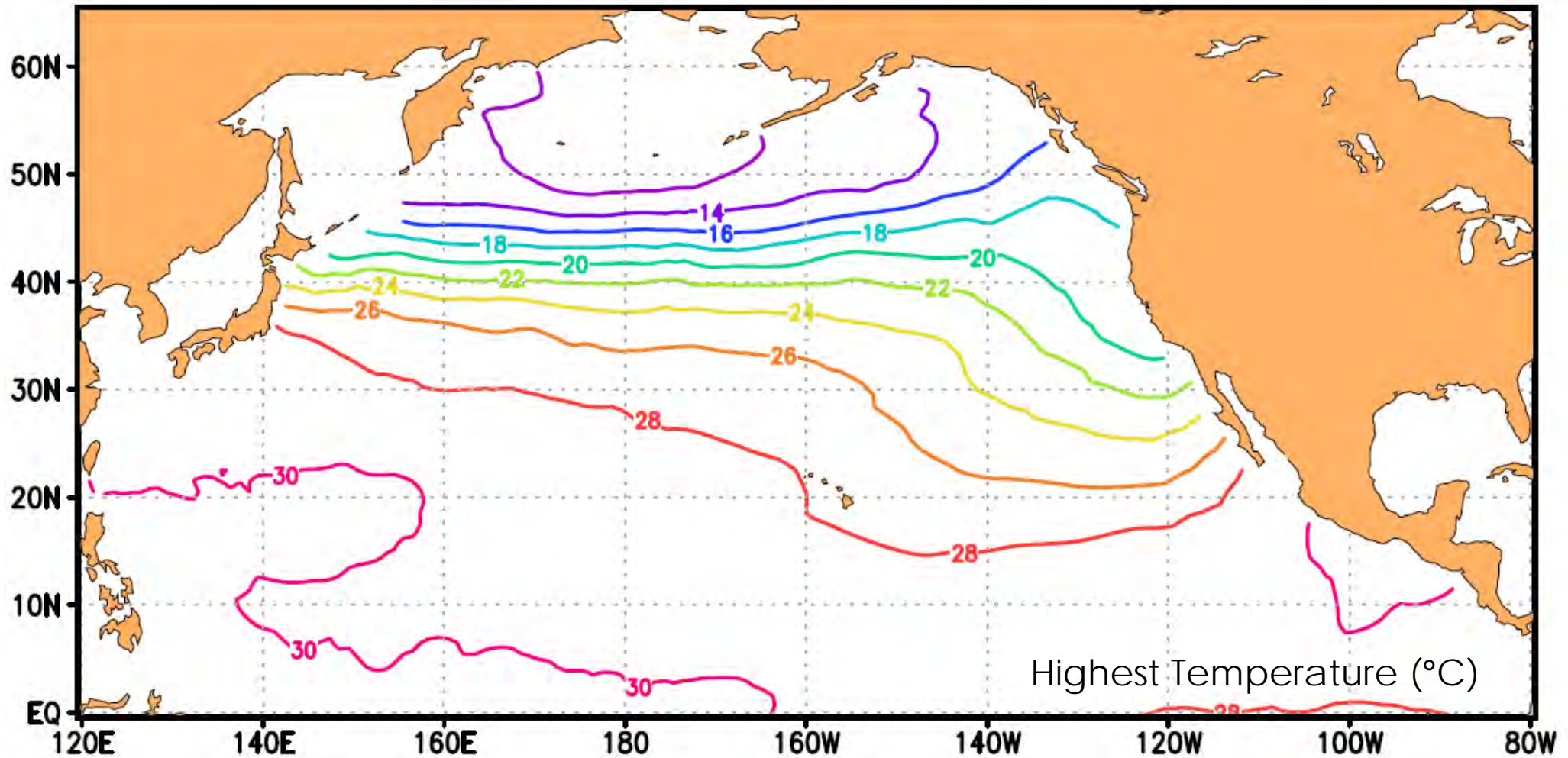


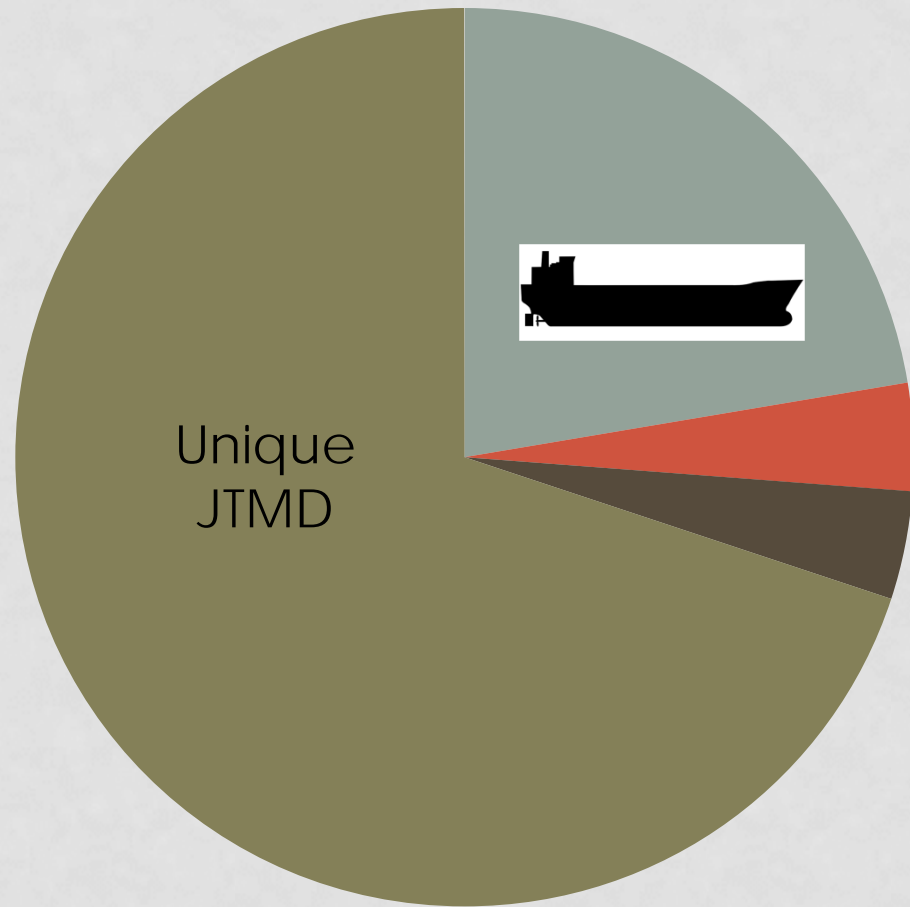
Photo: Russ Lewis

2017

ENVIRONMENTAL MATCH



SPECIES SHARED WITH OTHER VECTORS



Hull fouling & sea chest



Oyster aquaculture



Ballast water & sediment



Unique JTMD

Ornamental



WILL THERE BE AN INVASION?

BASELINE DETECTION



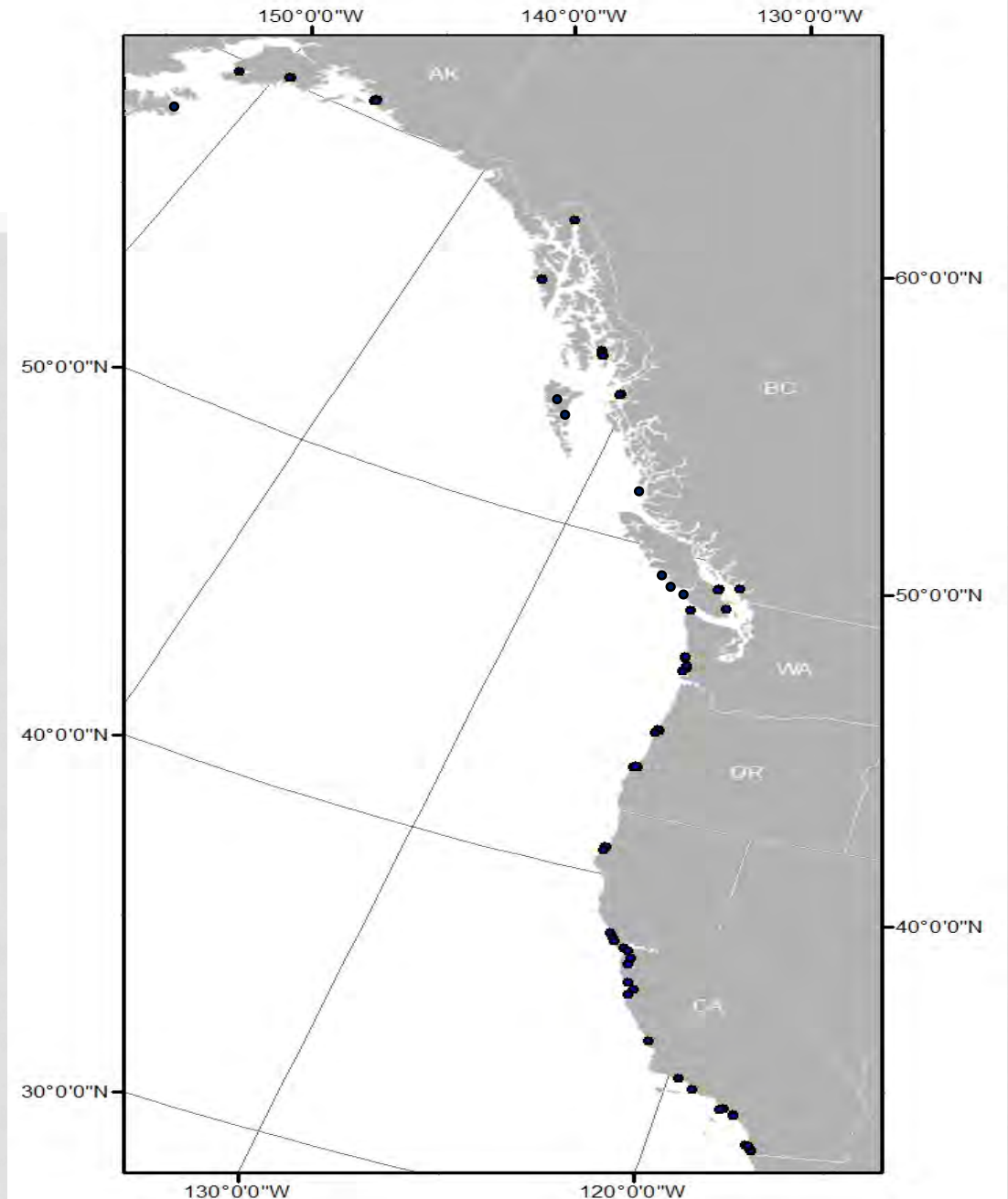
Invertebrate surveys
- 600 panels at 73 sites



Seaweed surveys
- 30 sites



Mussel parasite surveys
- 4000 mussels at 30 sites



TSUNAMI DEBRIS LOWER RISK

However... potential to introduce high risk species will require monitoring



KEY AQUATIC INVASIVE SPECIES WATCH

Japanese Tsunami Marine Debris in the Eastern Pacific



WAKAME KELP—**INVADER!** (*Undaria pinnatifida*)

An edible kelp species native to Japan, *U. pinnatifida* can be highly invasive and disruptive to native kelp ecosystems. In addition to its occurrence on larger tsunami debris, it may recruit in the natural environment on existing docks, pier pilings, or rock in newly disturbed areas. *Undaria* has lobes or finger-like projections on its blade margin and two highly ruffled sporophylls at its base. (Gayle Hansen, OSU)

- Size range: blades can grow to 3 m long (see image on page 9 of the long blades of *Undaria pinnatifida* attached to the dock that washed ashore at Agate Beach, Oregon, 15 months after being washed out to sea by the 2011 Japanese tsunami)



NORTHERN PACIFIC SEASTAR—**INVADER!** (*Asterias amurensis*)

This species of sea star is predominantly light purple in color, and is often seen with purple or red detail on its upper surface. There are numerous small spines with sharp edges on the upper body surface. On the underside of the body, these spines line the groove in which the tube feet lie, and join up at the mouth in a fan-like shape. The underside is a uniform yellow in color. It is normally found in shallow water, but it can also be found from the intertidal area through to the subtidal as deep as 200 m. (New Zealand Ministry for Primary Industries)

- Size range: can reach 40 to 50 cm in diameter



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The PICES ADRIFT project has been a rare and exciting interdisciplinary study and we are extremely grateful to the Ministry of Environment and the people of Japan for their vision and support.

どうもありがとうございます

Thank you very much

