



illustrated by Megumi Usuda

Marine Ecosystem Monitoring in Tohoku, Japan after the Tsunami 2011

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2011.3.11



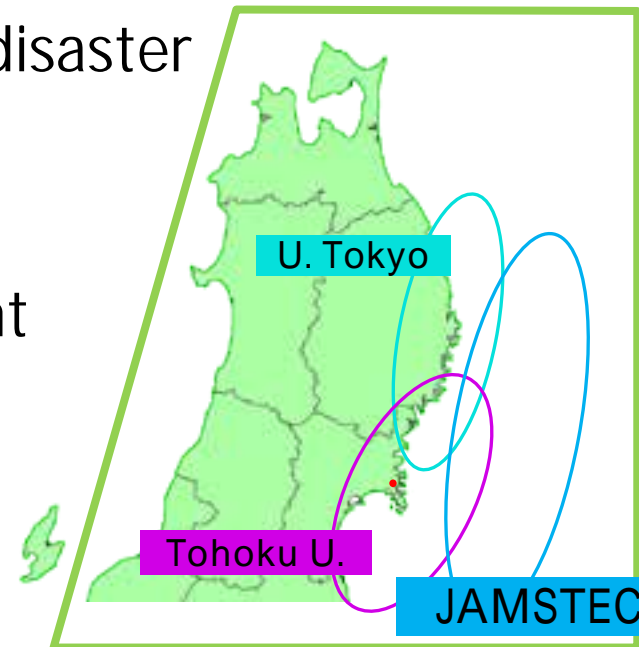


東北マリンサイエンス拠点形成事業
— 海洋生態系の調査研究 —
Tohoku Ecosystem-Associated
Marine Science, since FY2011



To contribute recovery of fishery from the disaster

- a) Effect of earthquake and Tsunami
- b) Dynamics of organisms and environment
- c) Sustainable use of fishery product
- d) Safety from chemical compound





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Habitat mapping team planning to contribute...

a) Detect changes of environments

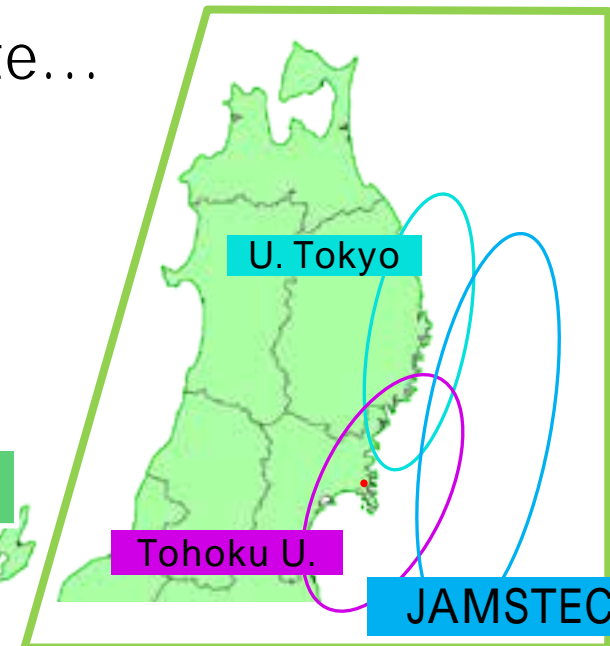
Changes of debris distribution

b) Create a potential map of recovery

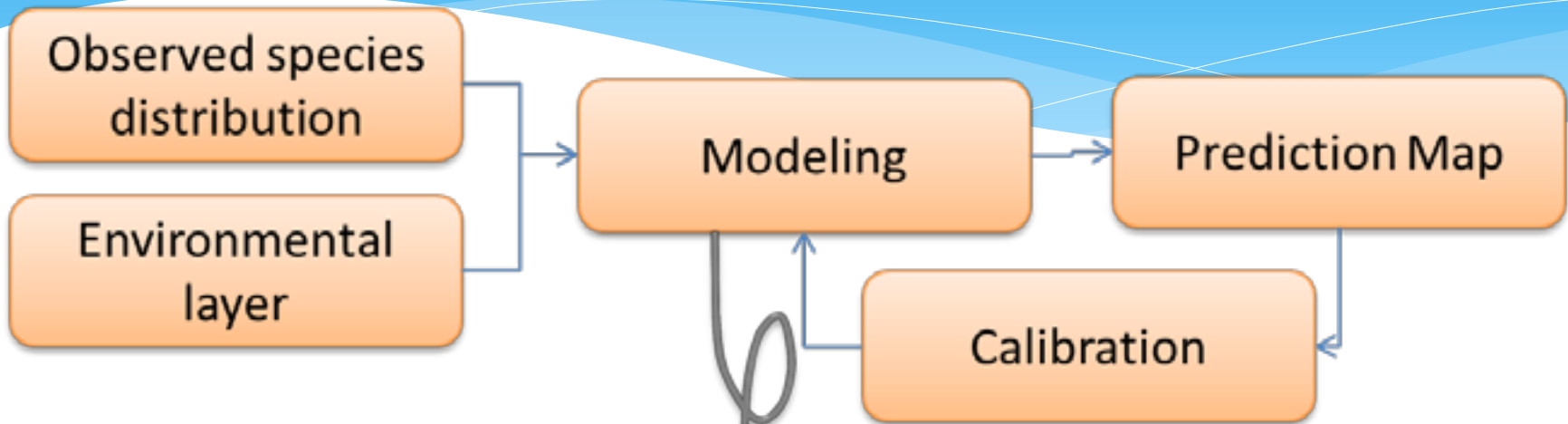
Distribution of two types of coastal benthic organisms

c) Suggest important area for biodiversity

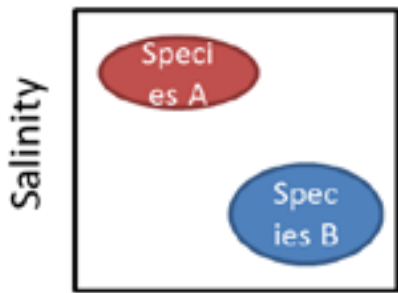
Potential distribution of seagrass species diversity



Method : Species Distribution Modeling



Ecological niche



Example of the coefficient of each environmental variables

Environment	Mean sea	depths above	offshore	shallow	depth
depth	19.88	0.00	0.00	0.00	0.00
salinity	0.10	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00
depth	0.00	0.00	0.00	0.00	0.00
salinity	0.00	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00
depth	0.00	0.00	0.00	0.00	0.00
salinity	0.00	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00
depth	0.00	0.00	0.00	0.00	0.00
salinity	0.00	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00
depth	0.00	0.00	0.00	0.00	0.00
salinity	0.00	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00
depth	0.00	0.00	0.00	0.00	0.00
salinity	0.00	0.00	0.00	0.00	0.00
temp	0.00	0.00	0.00	0.00	0.00



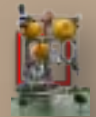

Realized distribution

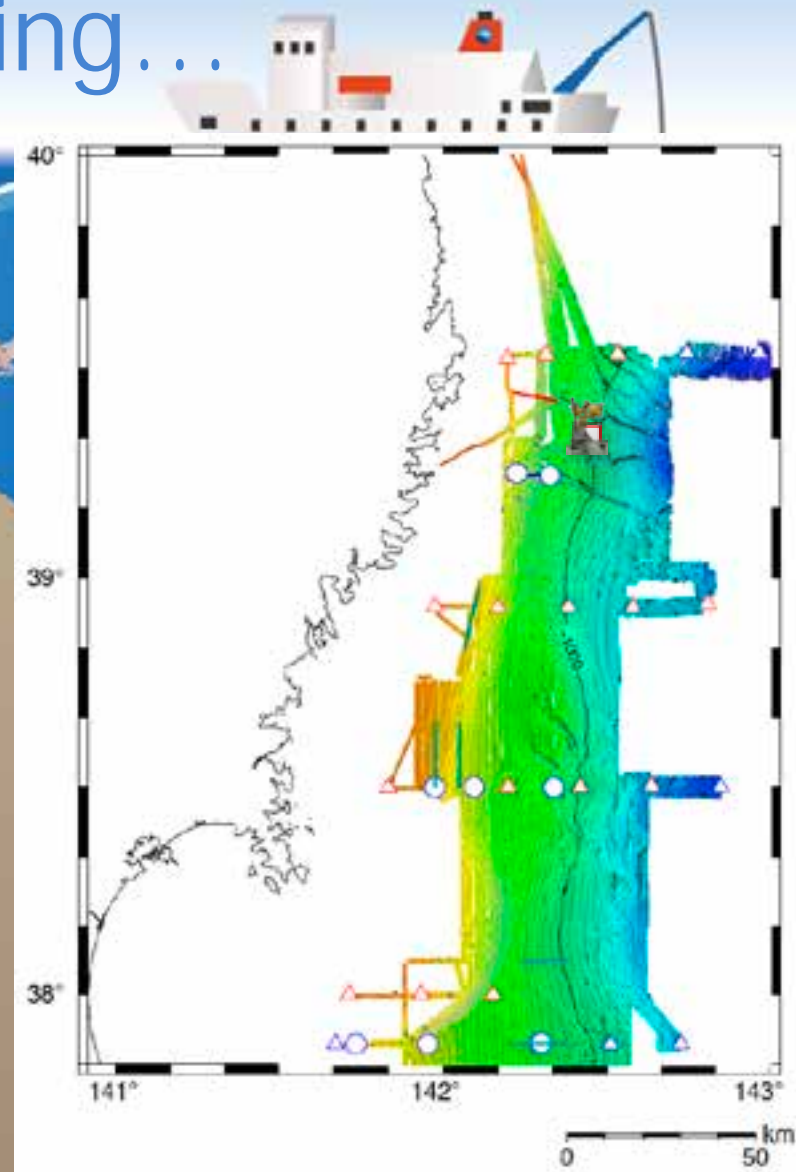


Environment variables

We collecting...

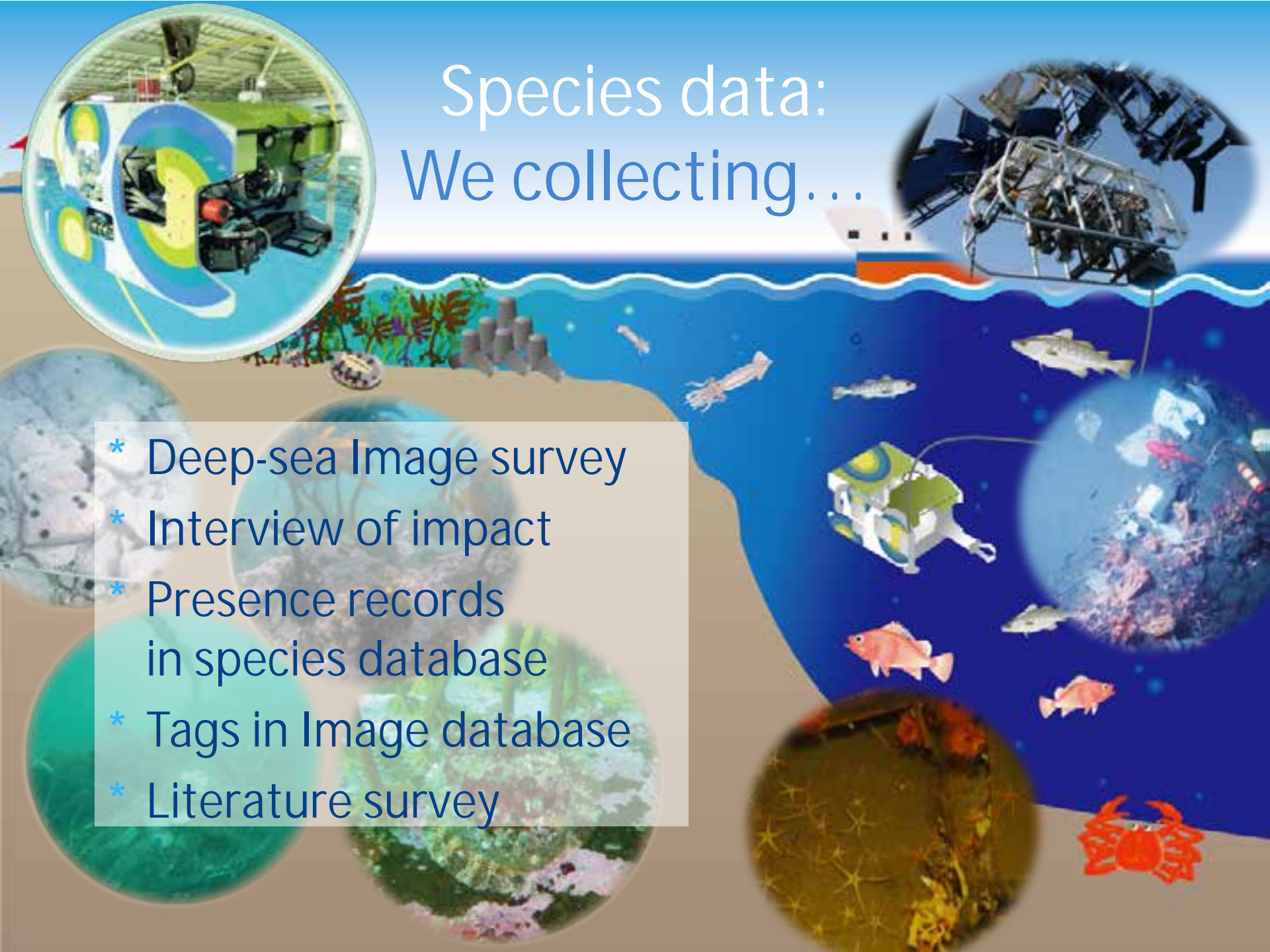


-  Bottom Images Deep tow camera system
 -  CTD/Other Senses/Water sampler
 -  Long-term monitoring using Lander system
 -  Sediment sample by Multiple corer
- ...Side-Scan images, Sub bottom survey, Acoustic senses ...etc



Species data: We collecting...

- * Deep-sea Image survey
- * Interview of impact
- * Presence records in species database
- * Tags in Image database
- * Literature survey



Data Integration

Dive points

previous data
are obtained from
the dives before
Mar. 2011
(pink circle)

Temperature

Chlorophyll a

Topography

- * Data management team in TEAMS
- * Data base in Institute (JAMSTEC)
- * Public dataset

→ Merging into Geo-database in a PC



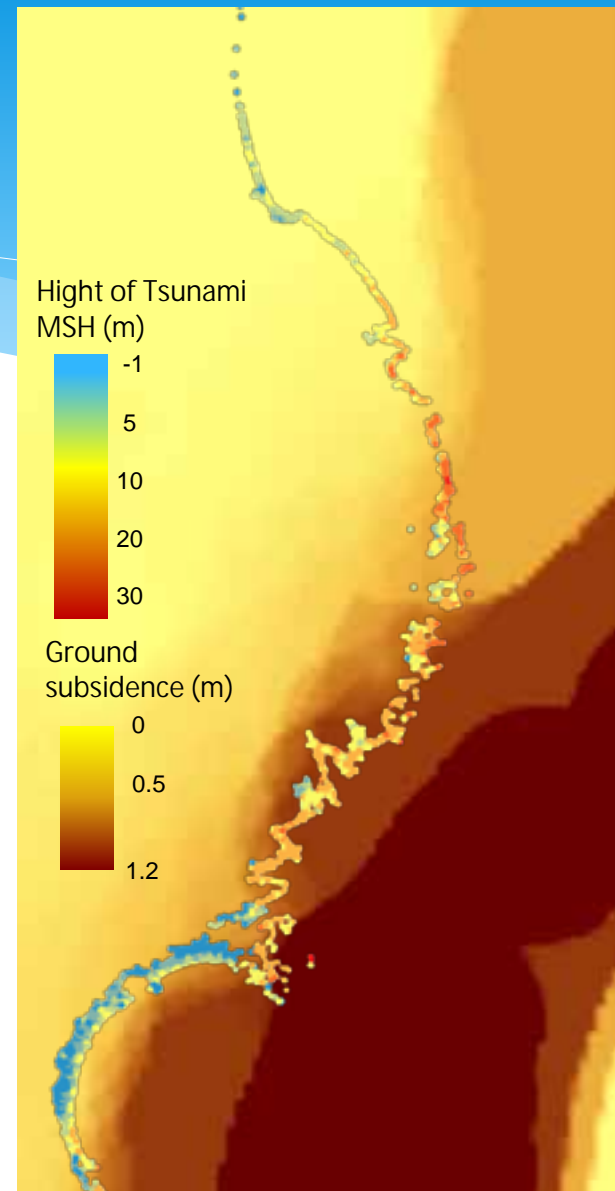
example1: Debris distribution



example 2:

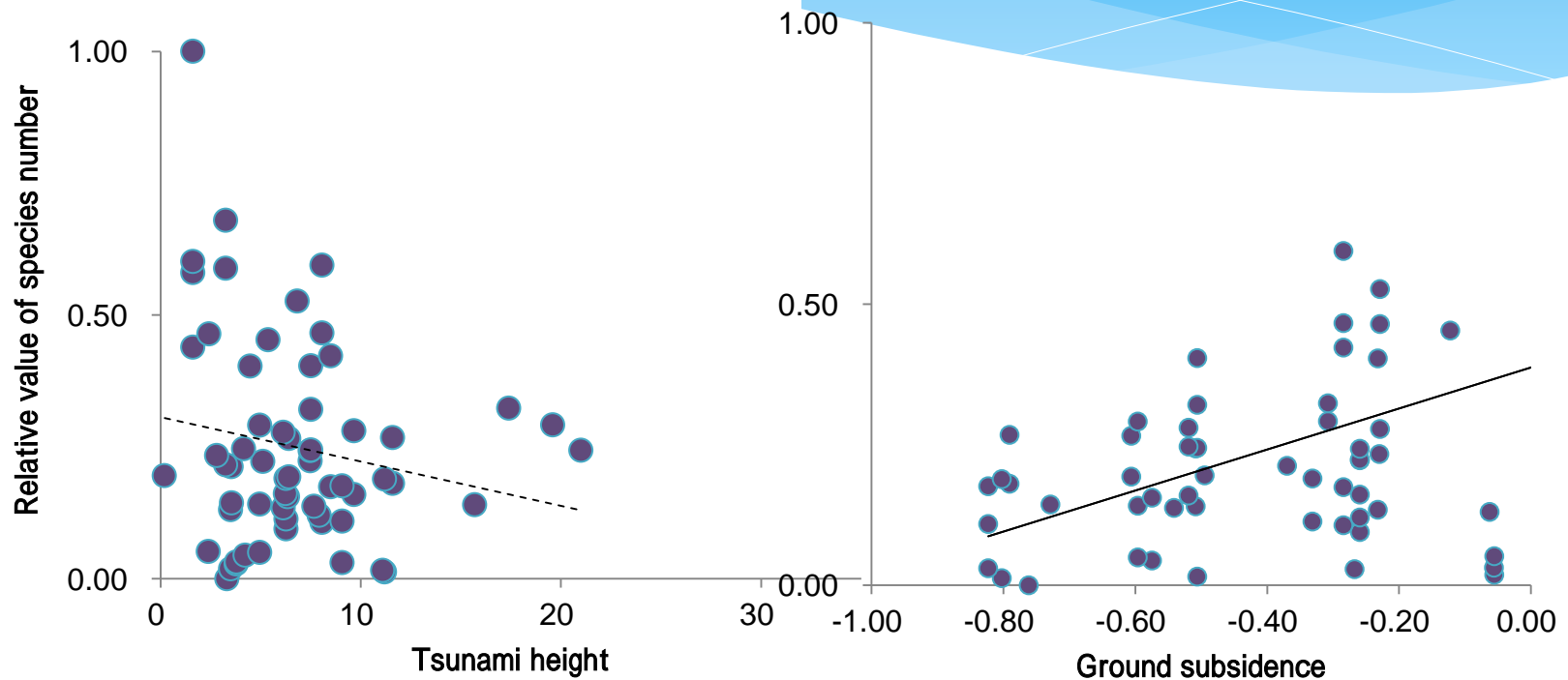
Coastal Benthic species

- * We compared species number along coast line
 - * Correlated with height of Tsunami and ground subsidence
- * We compared species number of widely distributed species*
 - * (observed over 1/4 location)

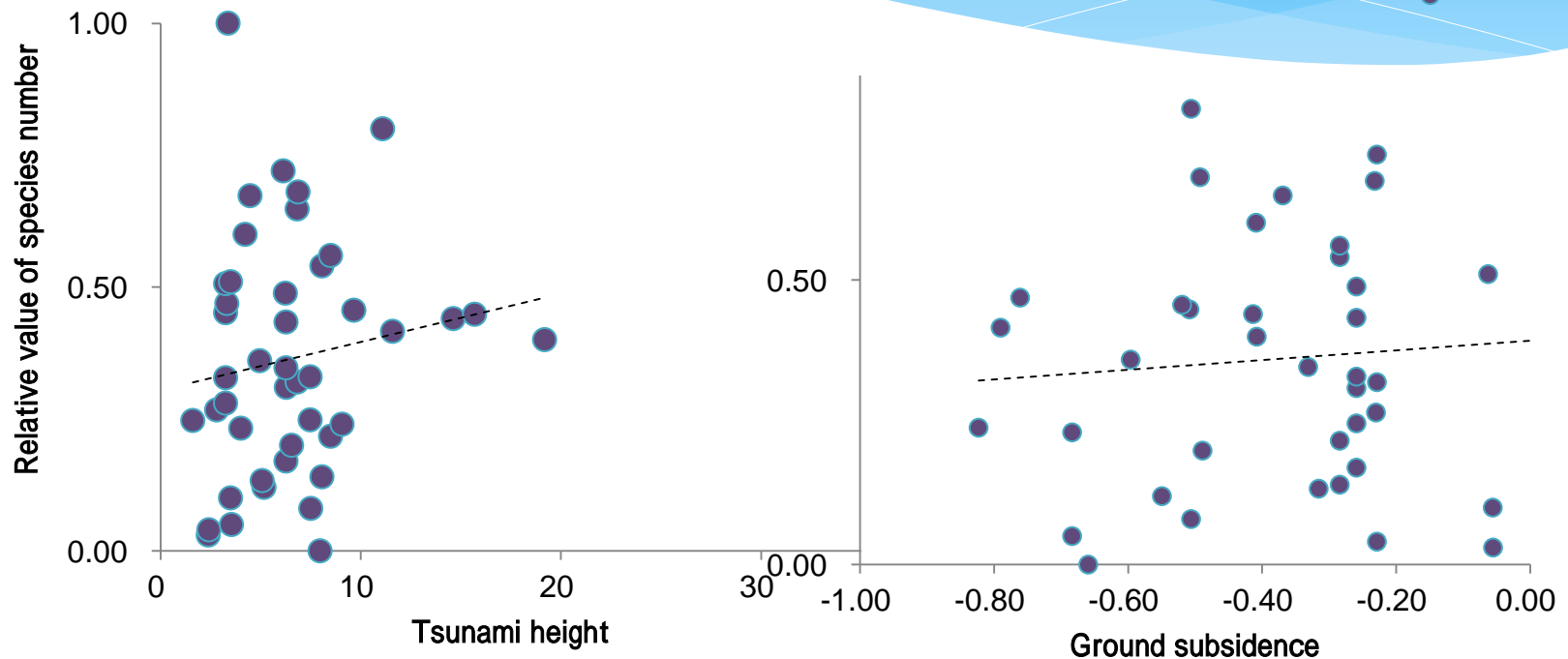


from Yamakita et al. 2013 Abstract booklet of 60th meeting of Ecological Society of Japan

Species number vs. disturbance intensity



In the case of widely distributed Species



example 3:

Potential map of seagrass richness

- * Importance of seagrass
 - High primary production
 - nursery area for juvenile of commercially fishes
 - Sediment stabilization
 - Recent decrease

see Yamakita 2011 Ecography for detail



Squid and eggs



Zostera caulescens:

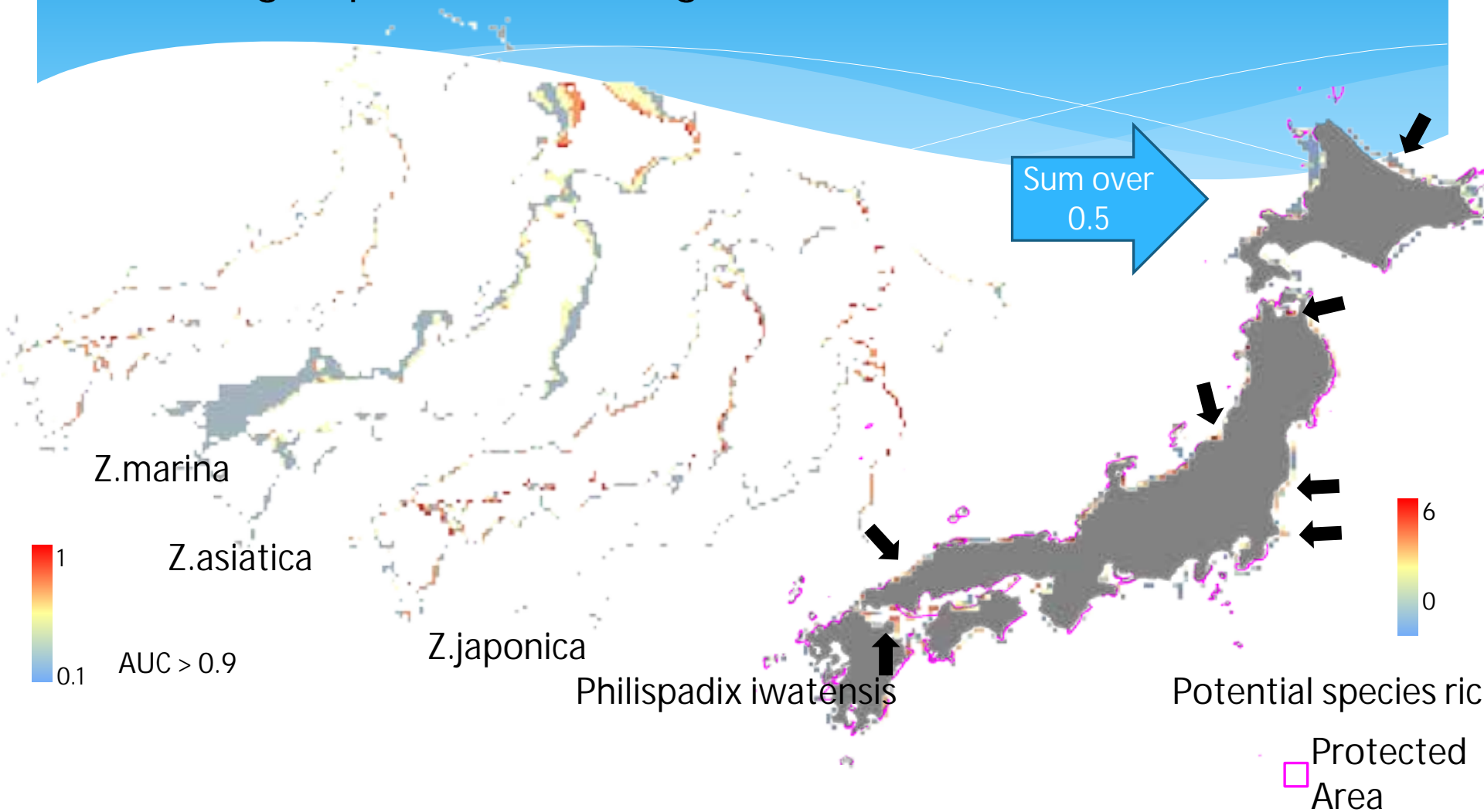
The largest seagrass in the world

Photo by Dr. Massa Nakaoka

Akkeshi Marine Station, Hokkaido Univ.



8minits grid potential of seagrass distribution



Future perspectives

- * Effect of debris on species, ...especially in the persistent materials
- * Correlate species types and intensity of disturbance
- * Higher resolution mapping and create good surrogate
- * Immediate update and correspondence of problems ...such as MPA candidate prioritization vs. rapid seawall construction
- * Make more functional Geodatabase

