TEAMS: Cooperation between science and regional communities towards better restoration of coastal lives and fisheries

Hiroshi KITAZATO*, Akihiro KIJIMA, Kazuhiro KOGURE and Katsunori FUJIKURA

* TEAMS, Tokyo University of Marine Science and Technology

Time-series of earthquake epicenter and Magnitudes

March 11, 2011, 7:00～22:00

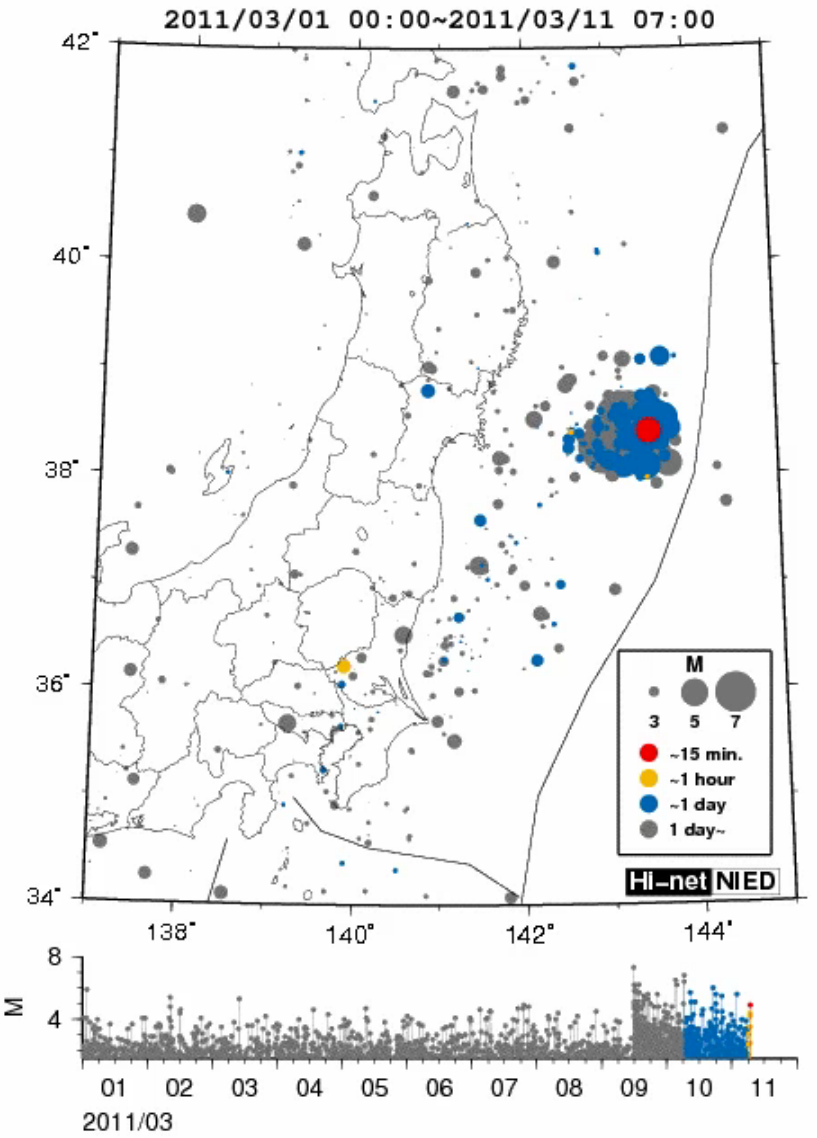
M3 M5 M7

～15 min

～1 hour

～1 day

1 day ～



防災科学技術研究所Hi-net

Off Tohoku Earthquake and Tsunamis

dead	15,894
missing	2,562
total	18,456

99% were dead by Tsunamis

March 11, 15:56

（共同通信）

http://www.boston.com/bigpicture/2011/03/massive_earthquake_hits_jap

Tsunami inundation heights sometimes reaches at 40m high in altitude and destroyed coastal infrastructures and wash everything out.

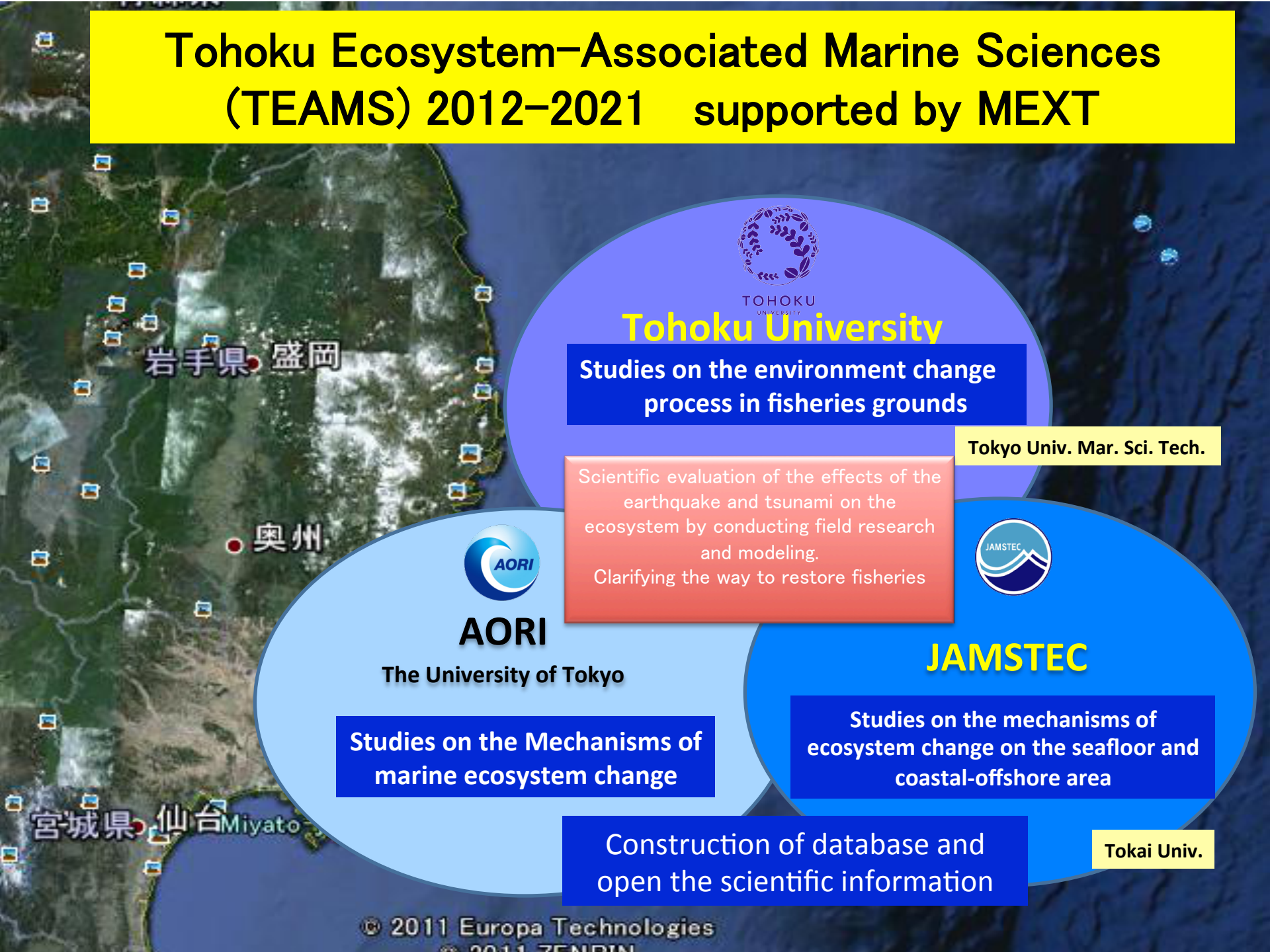
They also strongly disturbed coastal to offshore ecosystems of the Northeast Japan.

岩手県宮古市。第一波が防潮堤を越え、黒々とした濁流が港からあふれて、車や漁船を押し流した。日本の進んだ津波対策も、予測をはるかに超える大津波には歯が立たなかった。

Photograph by Jiji Press/AFP/Getty Images

時事通信

Tohoku Ecosystem-Associated Marine Sciences (TEAMS) 2012-2021 supported by MEXT



TOHOKU UNIVERSITY

Tohoku University

Studies on the environment change process in fisheries grounds

Tokyo Univ. Mar. Sci. Tech.

Scientific evaluation of the effects of the earthquake and tsunami on the ecosystem by conducting field research and modeling.
Clarifying the way to restore fisheries

AORI

AORI

The University of Tokyo

Studies on the Mechanisms of marine ecosystem change

JAMSTEC

JAMSTEC

Studies on the mechanisms of ecosystem change on the seafloor and coastal-offshore area

Tokai Univ.

Construction of database and open the scientific information

Task of TEAMS

Carry out monitoring researches of disturbances and recovery processes of coastal environments and ecosystems by earthquake and tsunamis,

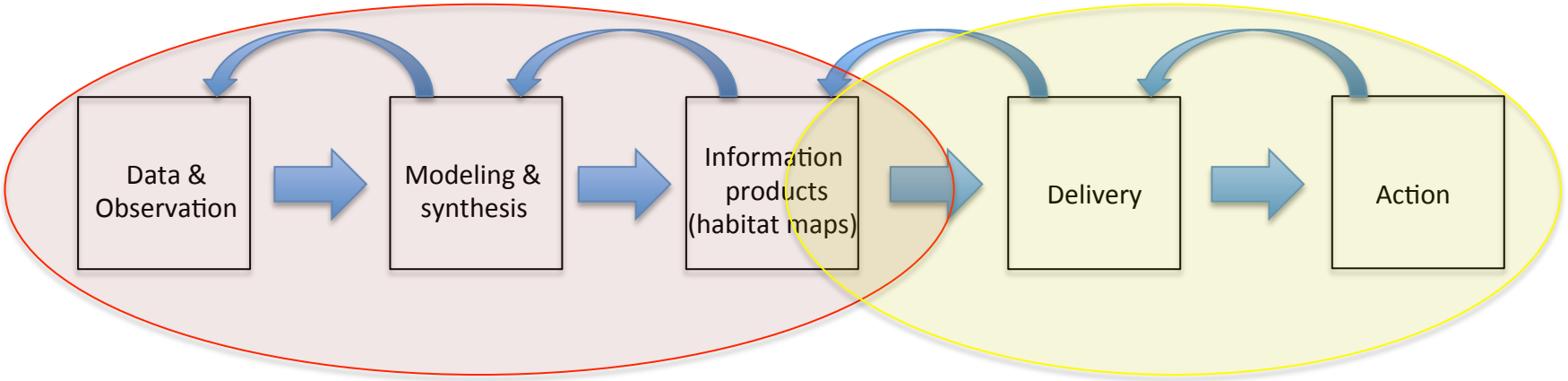
transfer scientific knowledge and results to fishermen, citizens and stakeholders for better restoration of their lives and regional economy (=fishery) !

Learn from civil engineering

Disaster Risk Managements flow chart (Prevention, Reduction, Mitigation and Restoration)

Inter-disciplinarity

Stakeholders



Science activities

Trans-disciplinarity

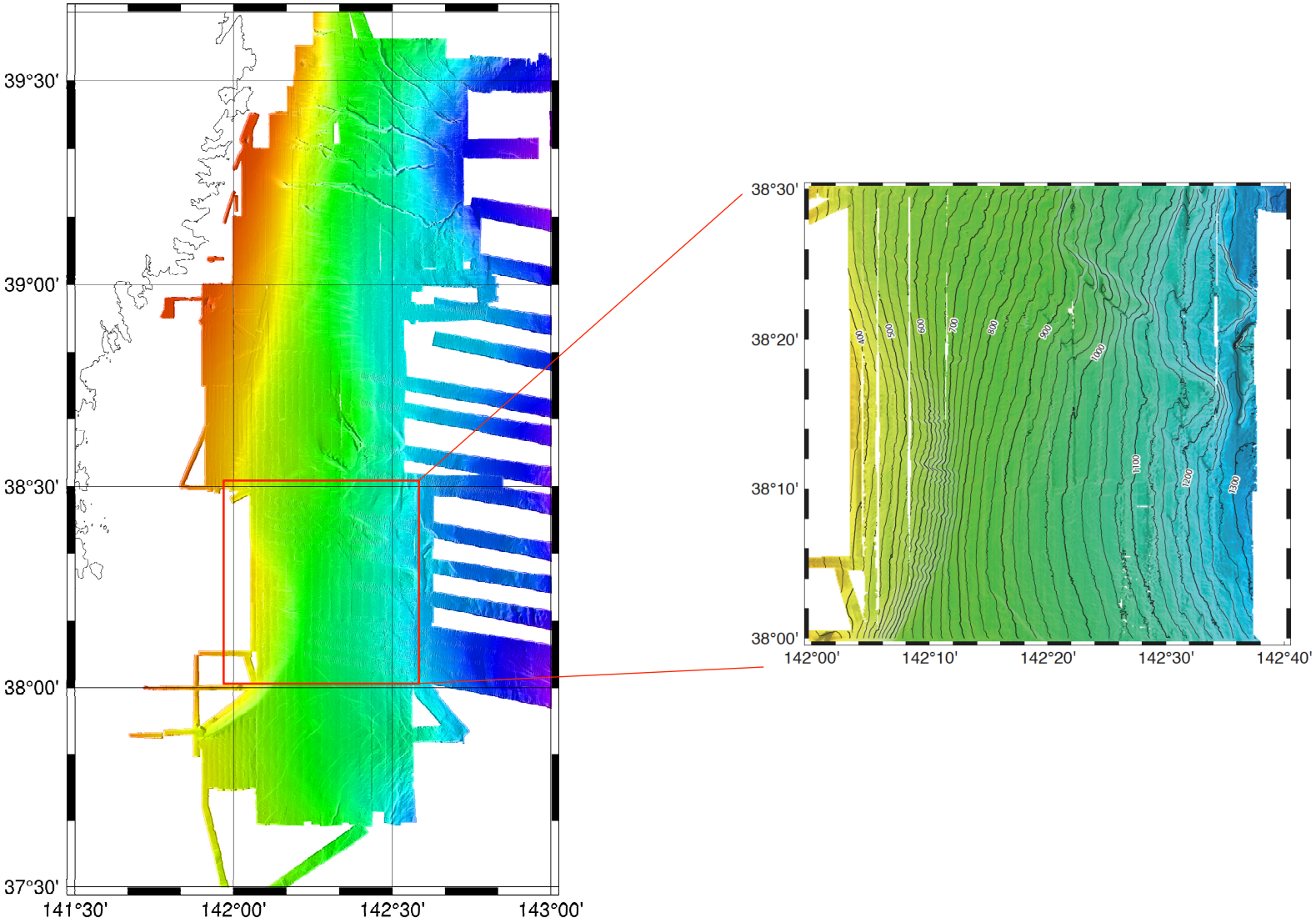
Social Application of Scientific results

(ex. Coastal ecosystem managements, socio-ecological restoration、advanced fisheries and others)

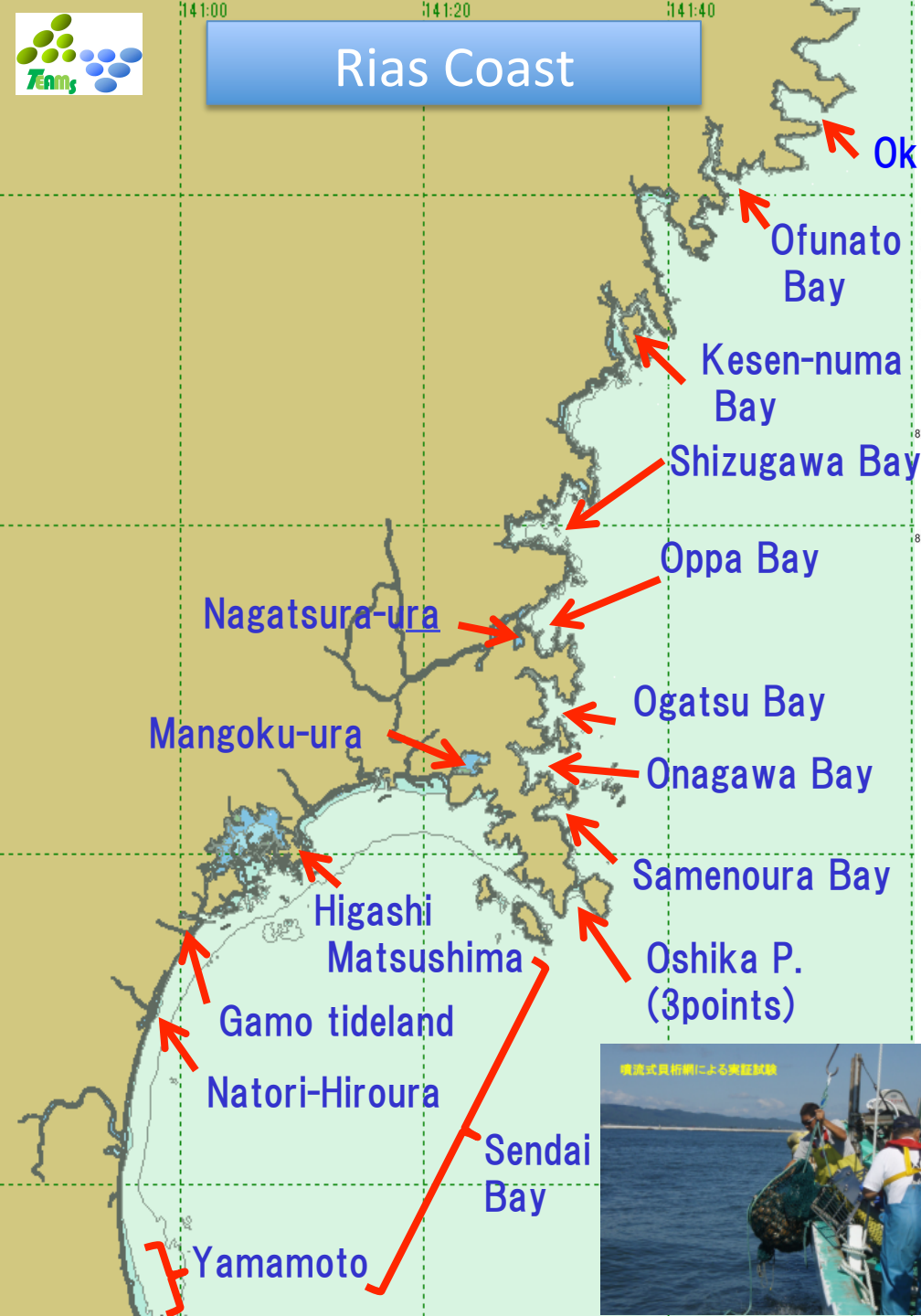
＊ Application of TEAMS results for restoration of damaged fisheries and coastal societies need knowledge of either liberal arts or social sciences. We have started series of dialogue among TEAMS, social science community and regional stakeholders.

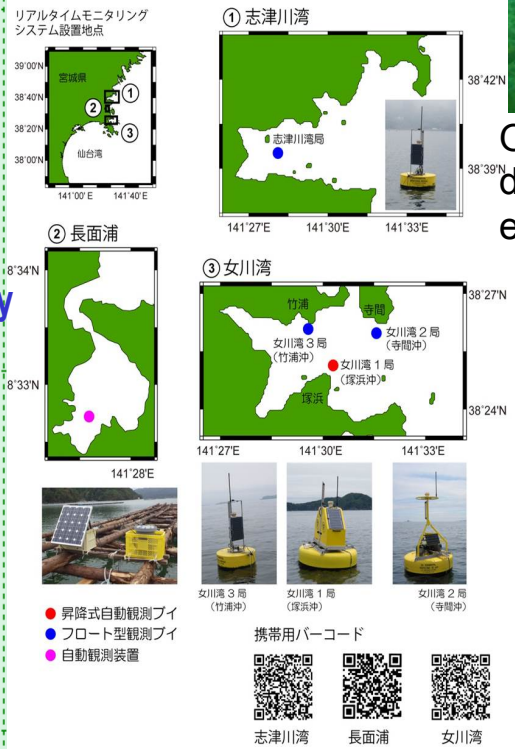
Data and observations → share data with stakeholders

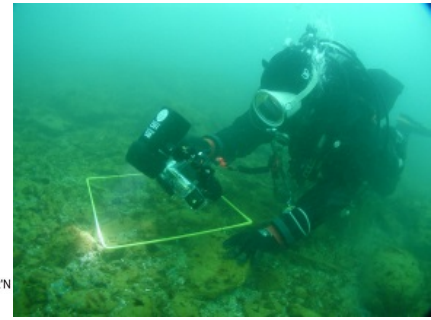
Draw offshore topographic maps by MBES (2011 ~ 2017)



Rias Coast







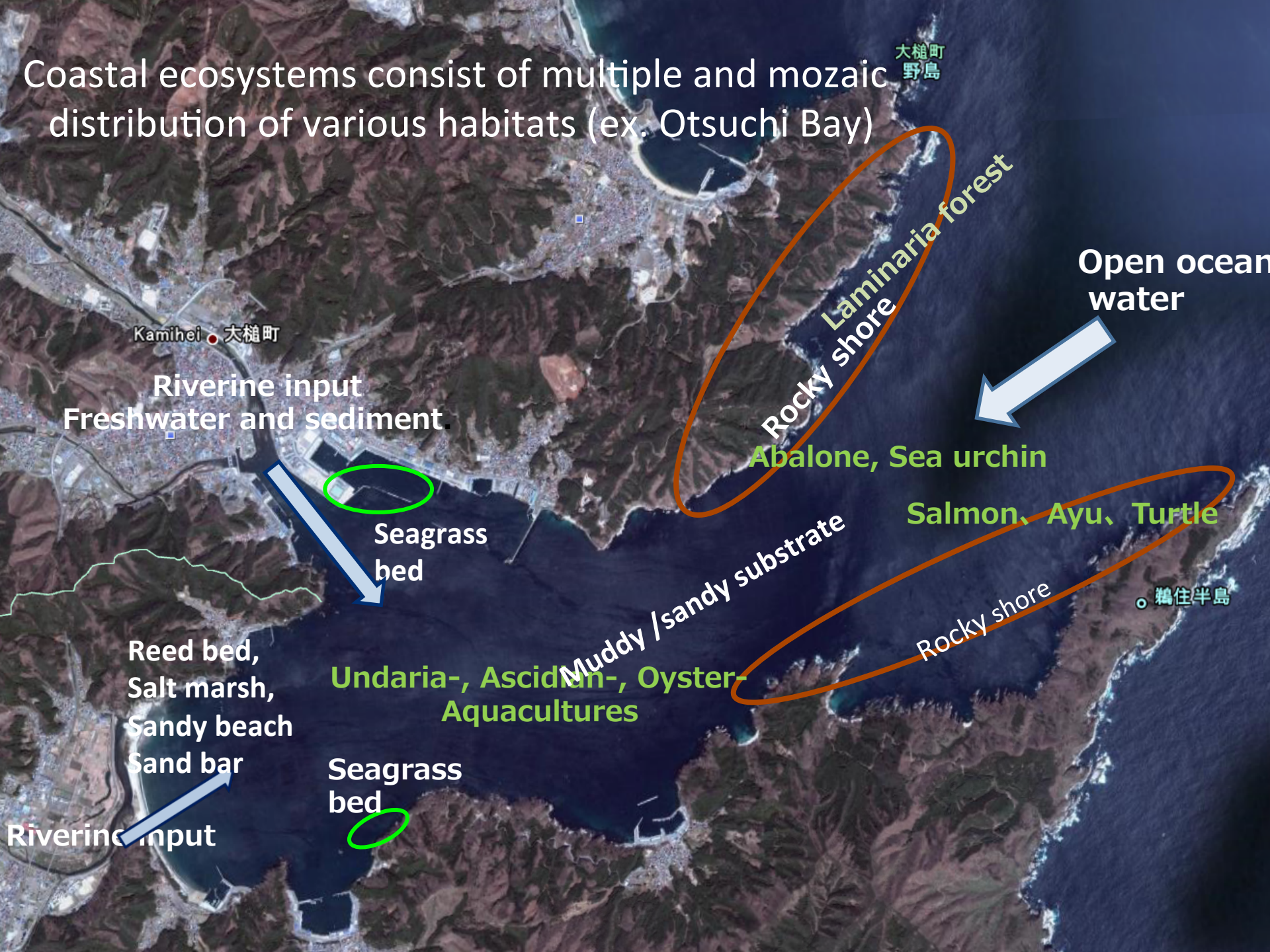
Observation of the damage for coastal ecosystem by diving

Seaweed communities are getting back to the original. However, sea urchins was born in large quantities, it is going to be a rocky shore crisis. In order to achieve both production and environmental protection, sea urchins are collected and culture separately.

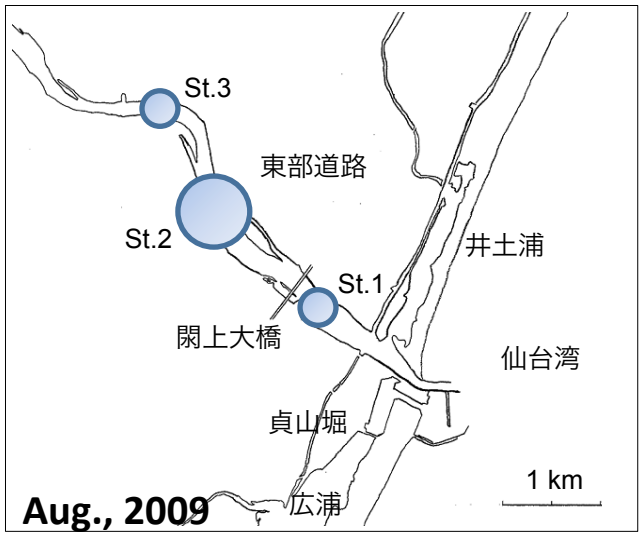
Real time information of the marine condition

Development of the new fishing gear for reconstruction of Sakhaline surf clam fishery in Yamamoto town.

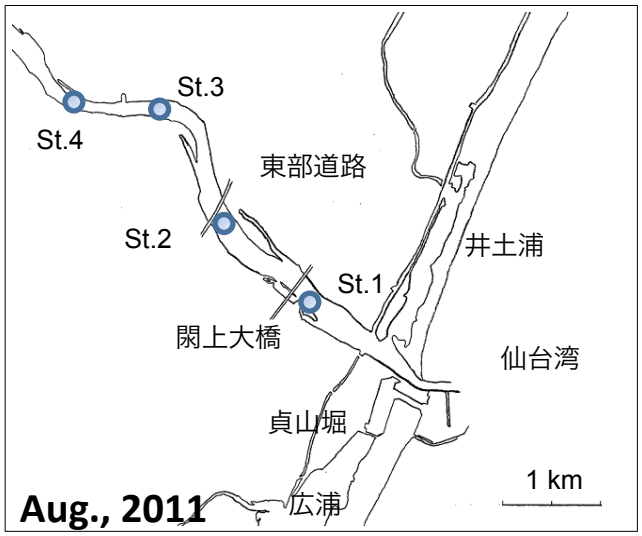
Genetic analyses of the damage on divergence level


Coastal ecosystems consist of multiple and mozaic distribution of various habitats (ex. Otsuchi Bay)
大槌町
野島
Laminaria forest
Rocky shore
Open ocean water
Kamihei
大槌町
Riverine input
Freshwater and sediment
Abalone, Sea urchin
Salmon、Ayu、Turtle
Seagrass bed
Muddy /sandy substrate
Rocky shore
鵜住半島
Reed bed,
Salt marsh,
Sandy beach
Sand bar
Undaria-, Ascidian-, Oyster-
Aquacultures
Seagrass bed
Riverine input

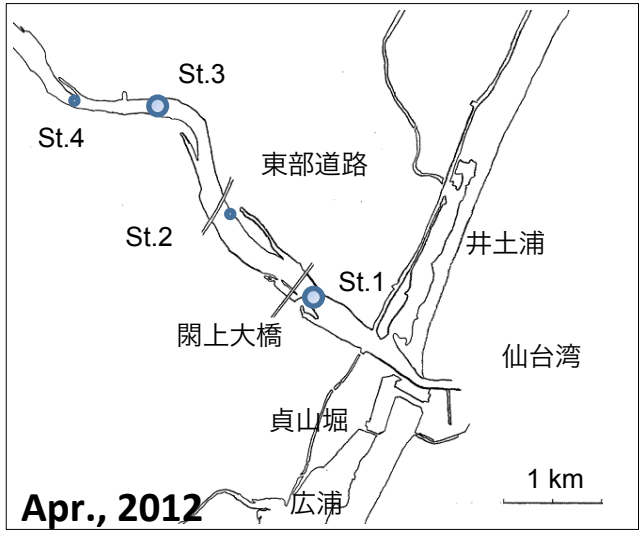
Changes in density distribution of *Corbicula* clam after Tsunami at Natori River



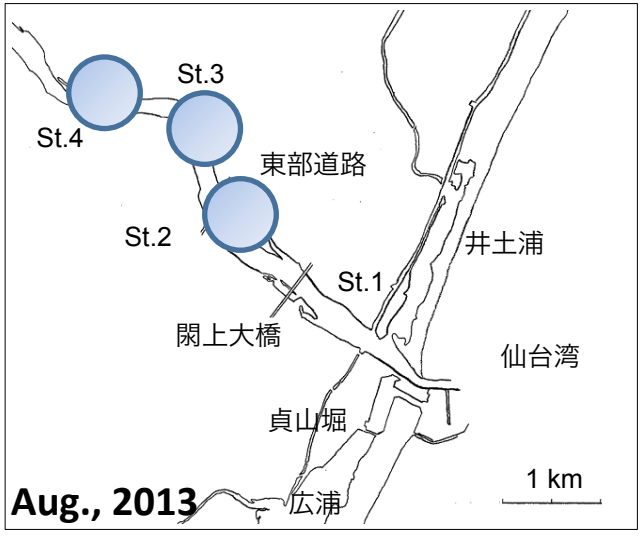
before disaster



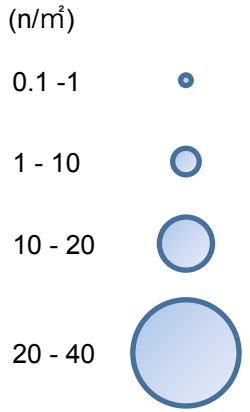
After 5 months from disaster



After 1 year from disaster



After 2-y 5 months from disaster



After Tsunami, the distribution area change to upstream area (about 1 Km) because of app. 1m land subsidence at coastal area by GEJE

work together with fishermen

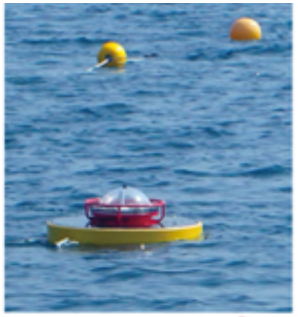
Coastal oceanic monitoring system (ex. Otsuchi)

Real time information available for local people via cellphone

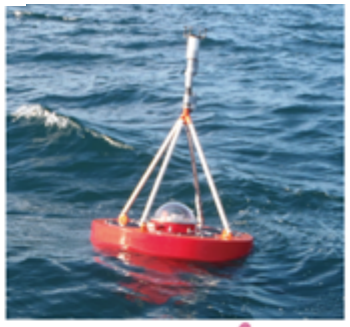
Real time Images

Water temp

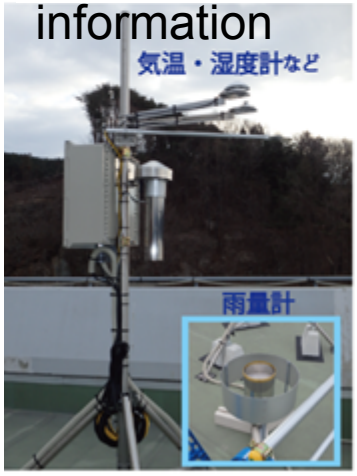
Nutrients

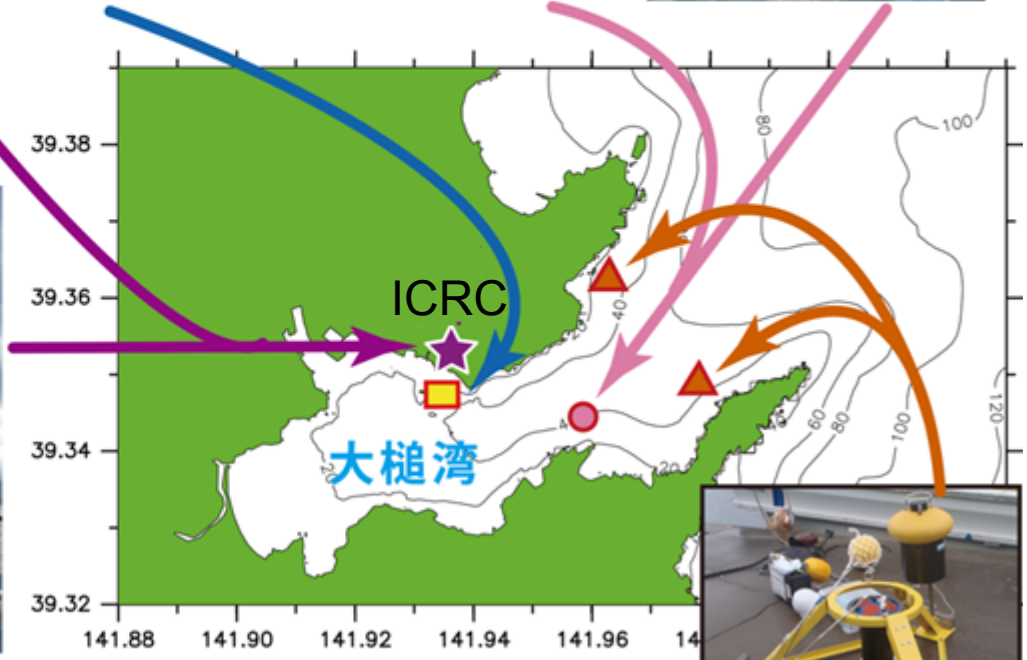


Wave



Meteorological information



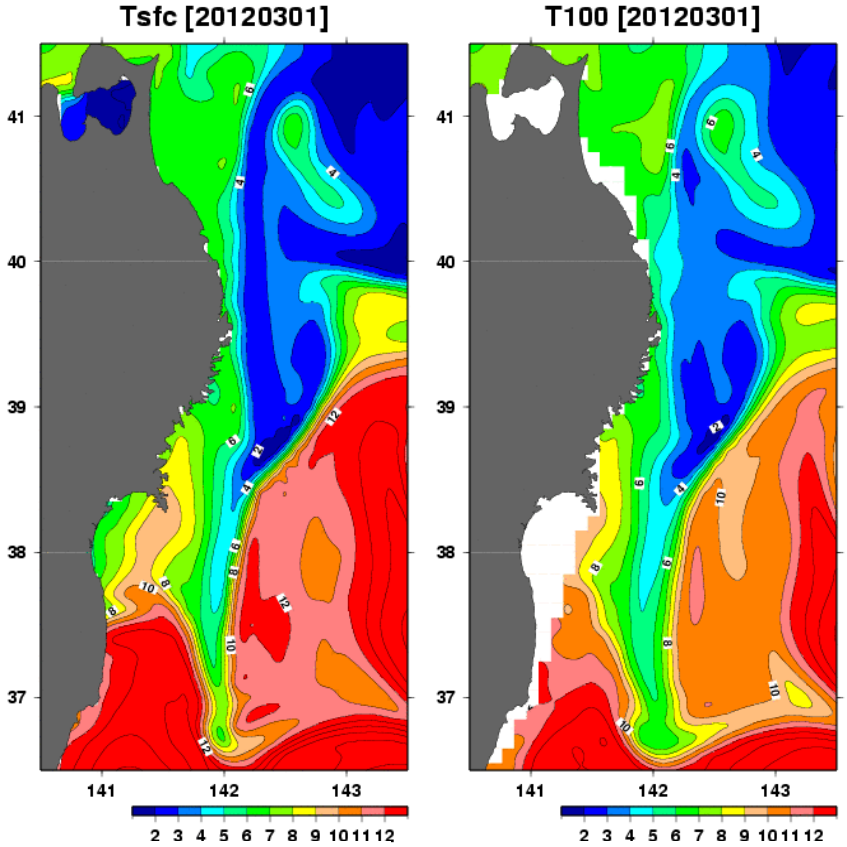


Water current

Coastal ocean forecast toward establishing sustainable fishery

Long-term planning

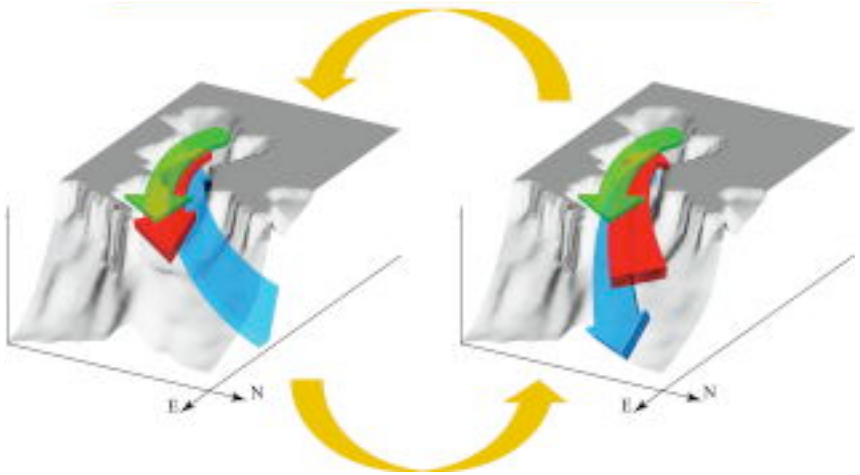
Accumulation of real-time physico-chemical oceanographic data



surface water temp. on March 1, 2012

Water temperature of 100m depth layer on March 1, 2012

Cold water invasion is fatal for aquacultures. Coastal ocean condition forecast is useful for avoiding daily risk.



Sea water circulation in Otsuchi Bay

Physical oceanographic simulations → coastal ocean forecast

Database and their utilities

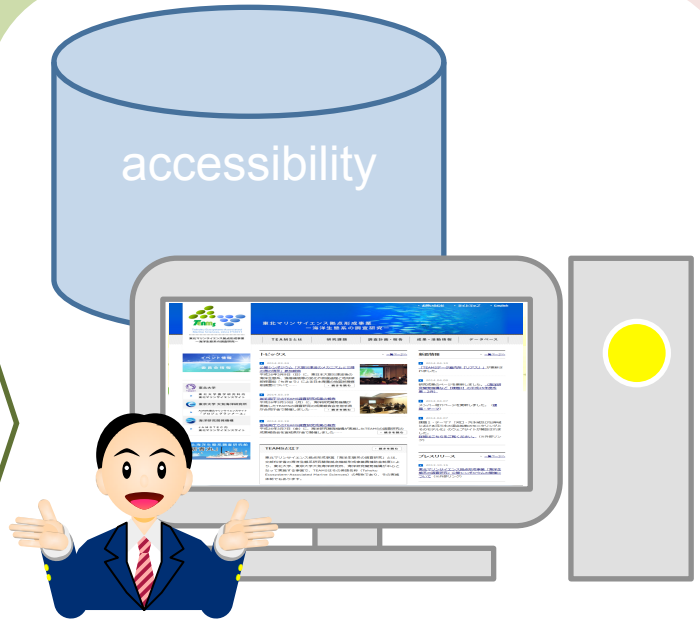
Various data

scientists

(Research Teams)
Tohoku U., Kitasato U., AORI, Univ. Tokyo, Tokyo Univ., Mar. Sci. and Tech., Iwate U., JAMSTEC, Tokai Univ., and others

Monitoring and researches

input



Systems management: Unit 4

- Research data storage, archiving and provide them to the public
- Collect Information and release
- Data flow system construction and others

Comment and request

Collecting research and scientific res and searching for of both fisheries stakeholders

Fishermen

citizens

Release information

teachers

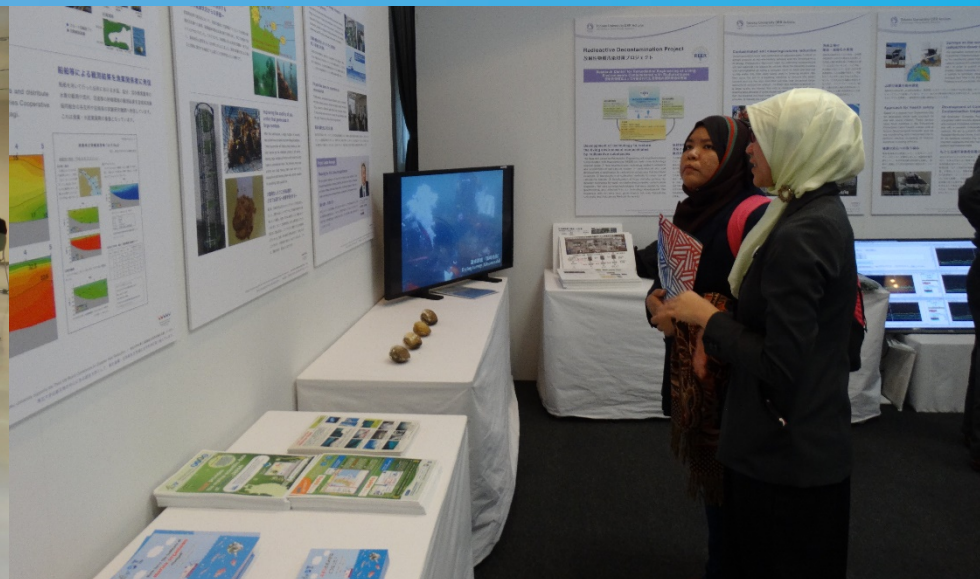
stakeholder

DIAS Data Integration & Analysis System
JODC
OBIS
IODE

Domestic and international project

Share our research results with stakeholders and citizen

TEAMS has been carried out over 100 lecture meetings and a debrief session not only for fishermen, local governments, but for young students and general citizens. Also TEAMS has been published over 100 scientific papers, regarding to the situation of marine environments and ecosystems affected by GEJE.



Transfer and /or share knowledge with other countries:

Joint workshops

Workshop with National Taiwan University at Taipei, Taiwan on June 2016

We will have series of workshops / symposia with countries that are potential to experience of natural hazards, in particular to Earthquake and Tsunamis.

June 2017, Chulalongkorn Univ., Thailand;
November 2017, World BOSAI Forum@Sendai for Disaster Risk Reduction. We try to take action plan for establishing coastal eco-DRR together with scientists from hazardous countries, such as Chile, Indonesia, Thailand and others.

Summary of TEAMS activities

Restoration of coastal livelihood and economy (fisheries) with viewpoint from ecosystem-based disaster risk reduction

- Make research on disturbance and recovery of coastal Ecosystems and Environments and share scientific knowledge with stakeholders (citizens, fishermen and government)
- Design eco-DRR (recovery of natural environment and ecosystems for keeping coastal ecotone; green and blue coast)
- Establish Coastal Ocean Management Systems for promoting sustainable fisheries, local economy, and for creating better coastal livelihood