Impact of the Great East Japan Earthquake on *Zostera* meadows in the coastal area close to the epicenter

Daisuke Muraoka*, Tomoko Sakami, Goro Yoshida, Masakazu Hori, Hiromori Shimabukuro, Takehisa Yamakita and Hitoshi Tamaki

*Tohoku National Fisheries Research Institute, Fisheries Research Agency, Japan

Photo taken by an employee of Miyako City, Iwate Prefecture

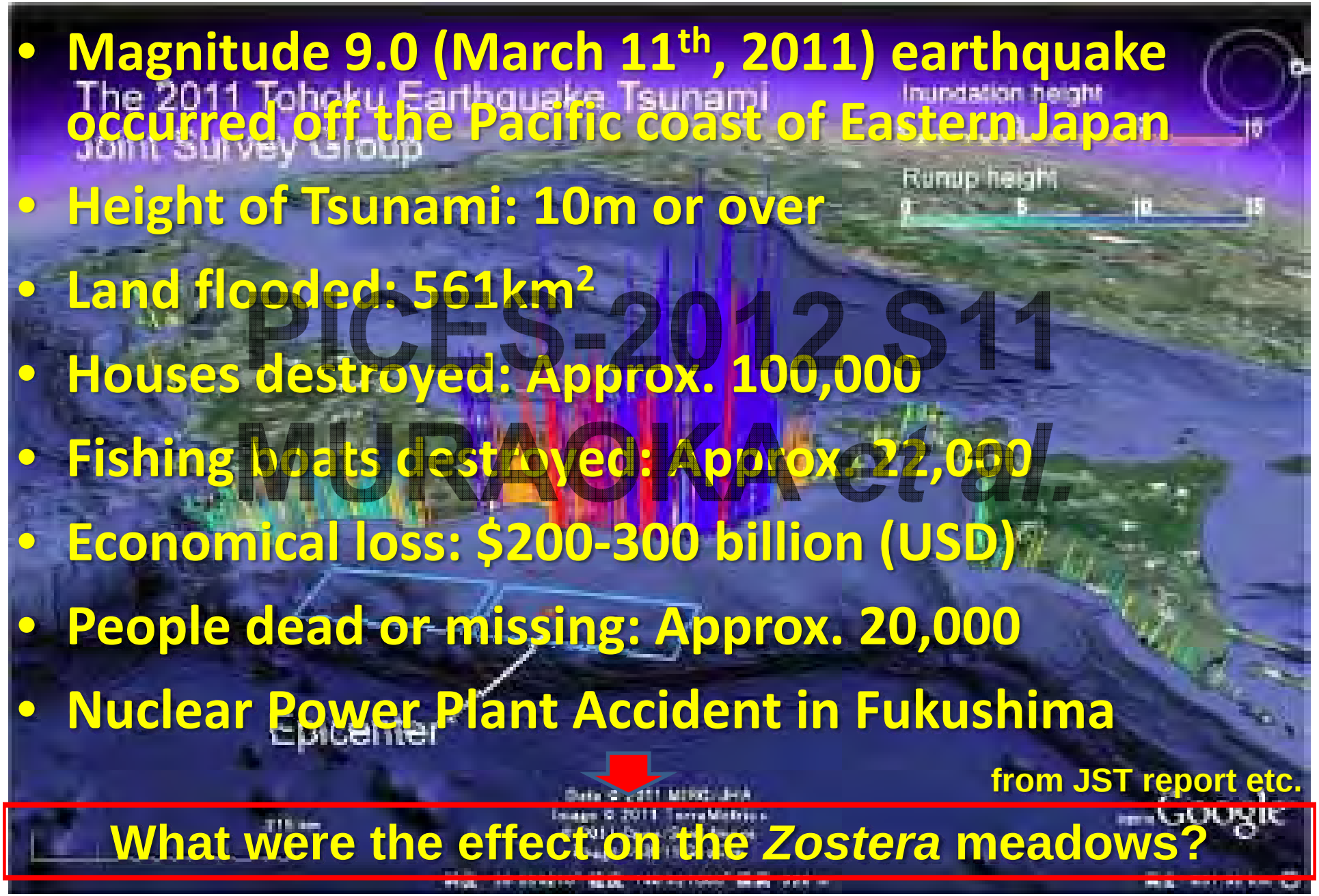
Topics

- General review of the Great East Japan Earthquake →What happened on March 11th, 2011?
- Effects on *Zostera* meadows in an inland bay area (*Zostera marina* community)
- Summary and the future research

Topics

- General review of the Great East Japan Earthquake →What happened on March 11th, 2011?
- Effects on *Zostera* meadows in an inland bay area (*Zostera marina* community)
- Summary and future research

Review of the Great East Japan Earthquake



- Magnitude 9.0 (March 11th, 2011) earthquake occurred off the Pacific coast of Eastern Japan
- Height of Tsunami: 10m or over
- Land flooded: 561km^2
- Houses destroyed: Approx. 100,000
- Fishing boats destroyed: Approx. 22,000
- Economical loss: $200-300 billion (USD)
- People dead or missing: Approx. 20,000
- Nuclear Power Plant Accident in Fukushima

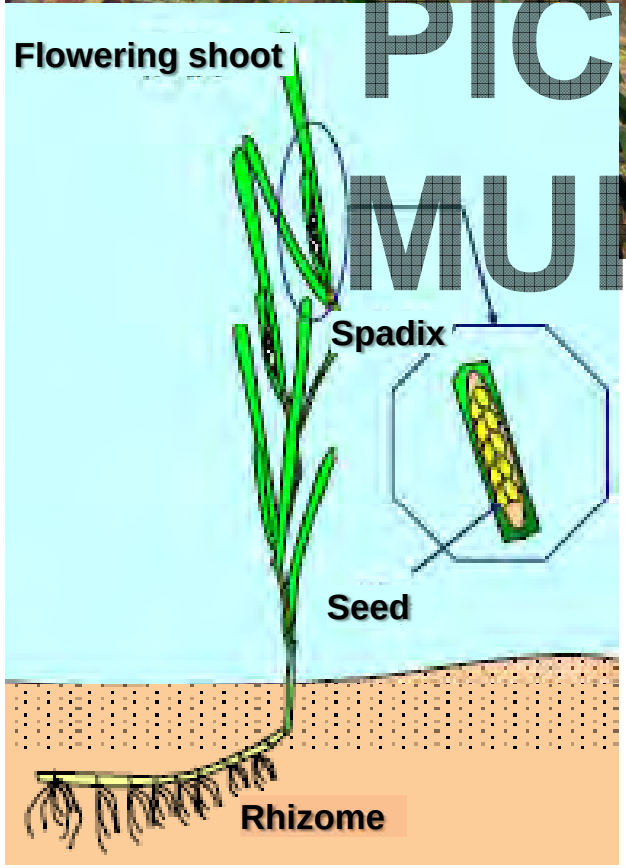
from JST report etc.

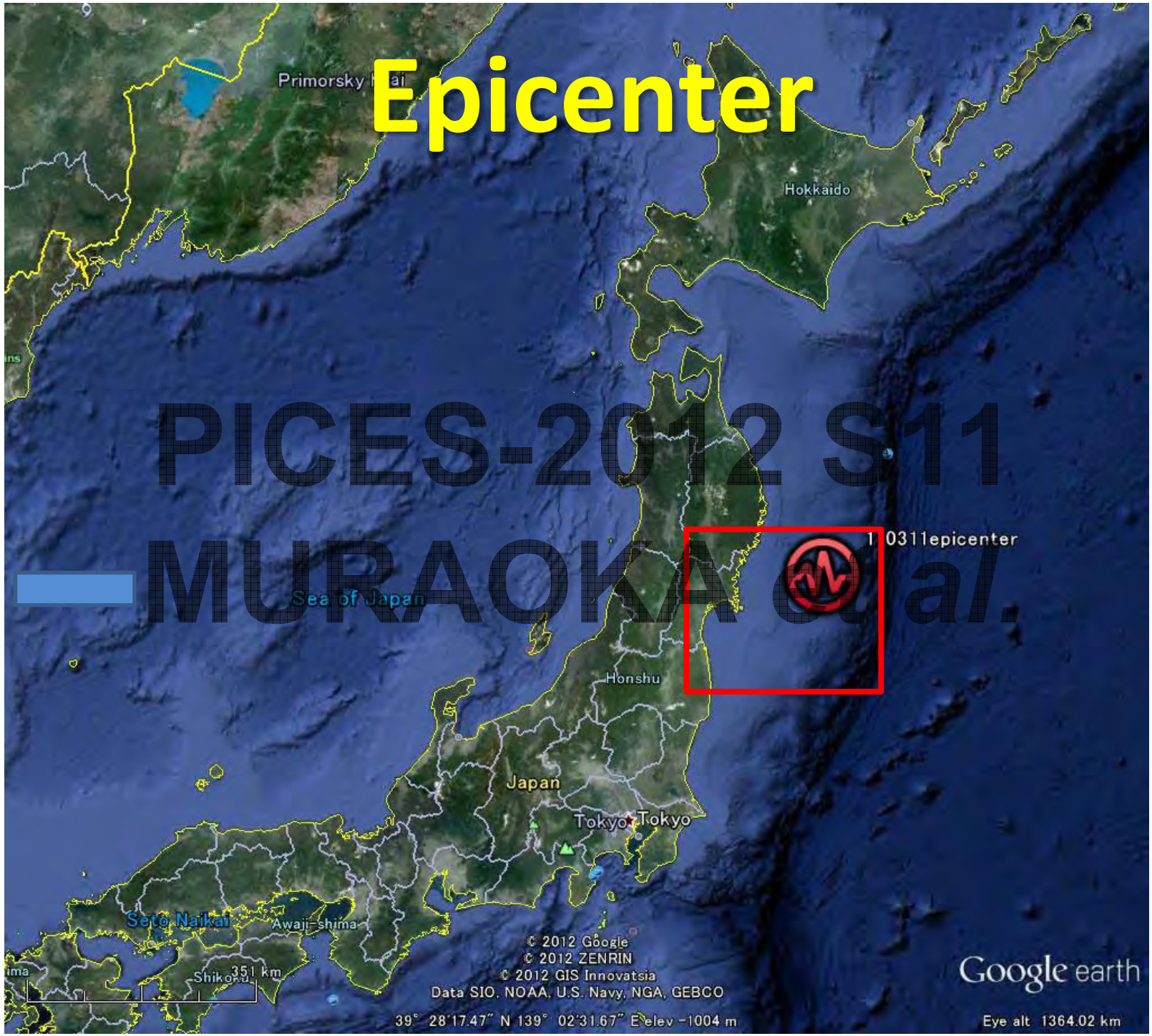
What were the effect on the *Zostera* meadows?

Topics

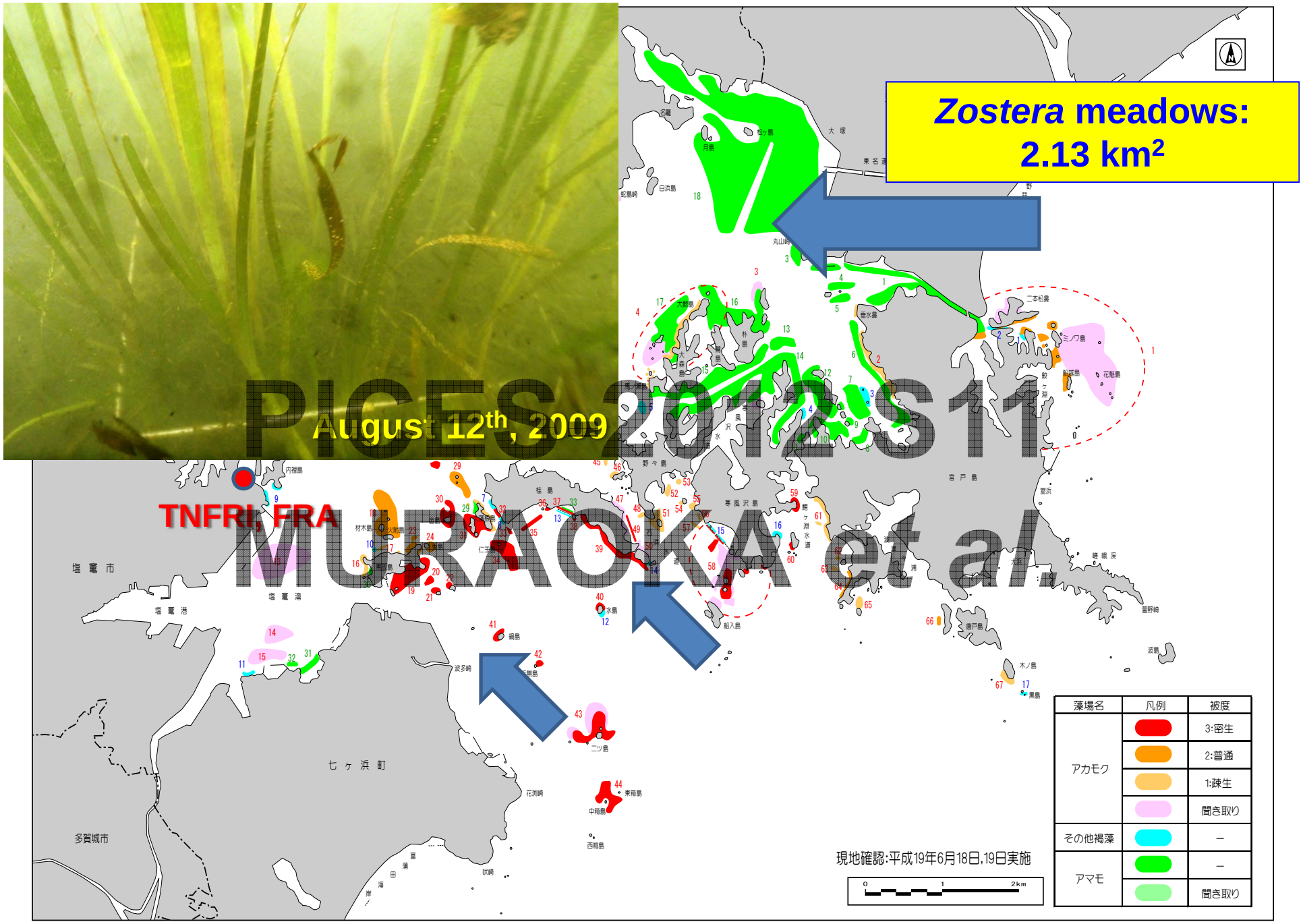
- General review of the Great East Japan Earthquake →What happened on March 11th, 2011?
- Effects on *Zostera* meadows in an inland bay area (*Zostera marina* community)
- Summary and future research

The function of *Zostera* meadows

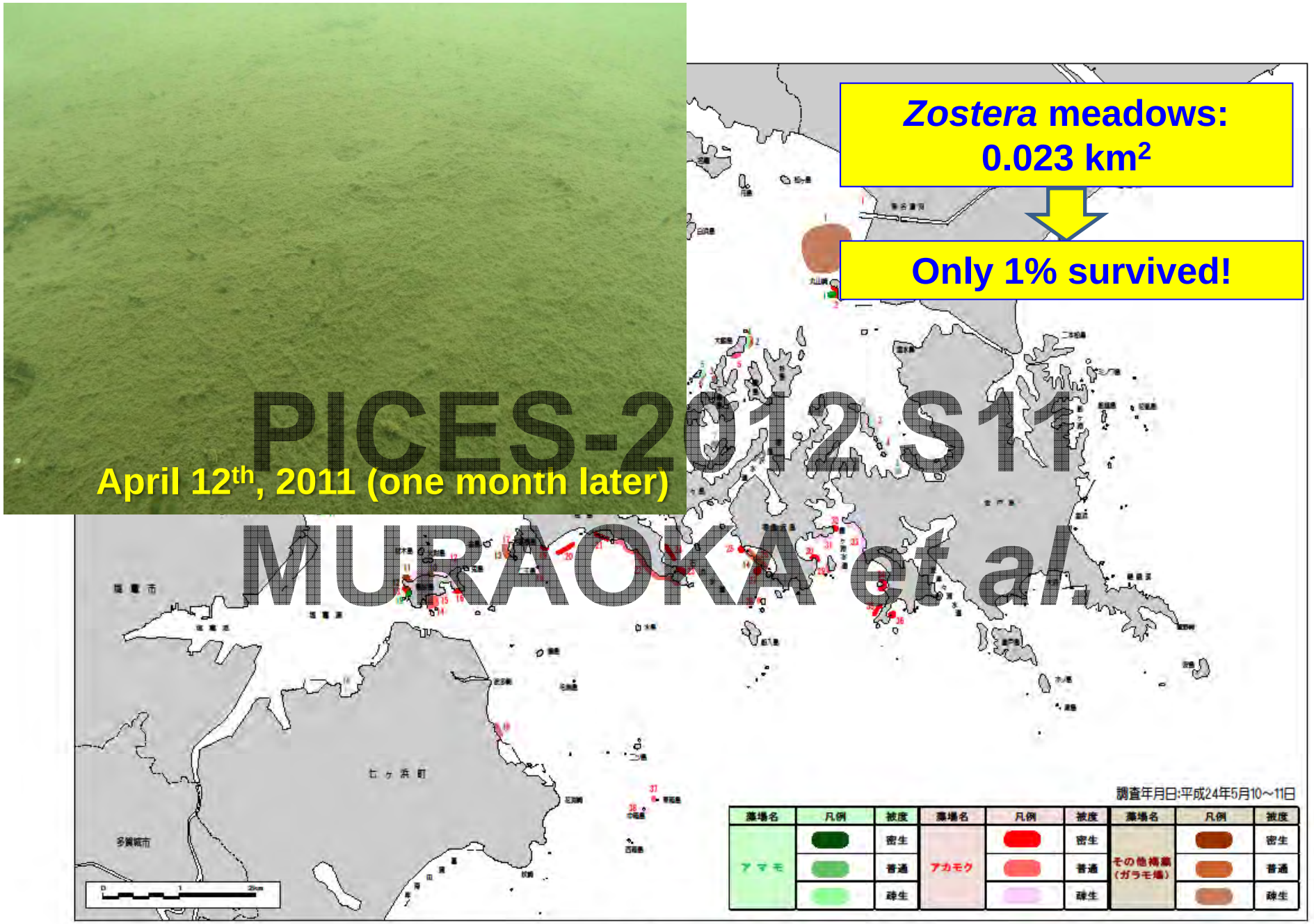





Research points in Miyagi Prefecture
東松島
石巻
③
PICES-2012 S11
松島町
①
②
MURAOKA et al.
多賀城
① Matsushima bay
② Samenoura bay
③ Mangokuura (inland sea)
Data © 2011 MIRC/JHA
© 2011 ZENRIN
Google earth
画像取得日: 2011/4/6
38° 22'07.03" N 14
17'49.85" E 標高 -17 m
高度 44.87 km



Distribution of *Zostera* meadows (before the earthquake, June 2007)

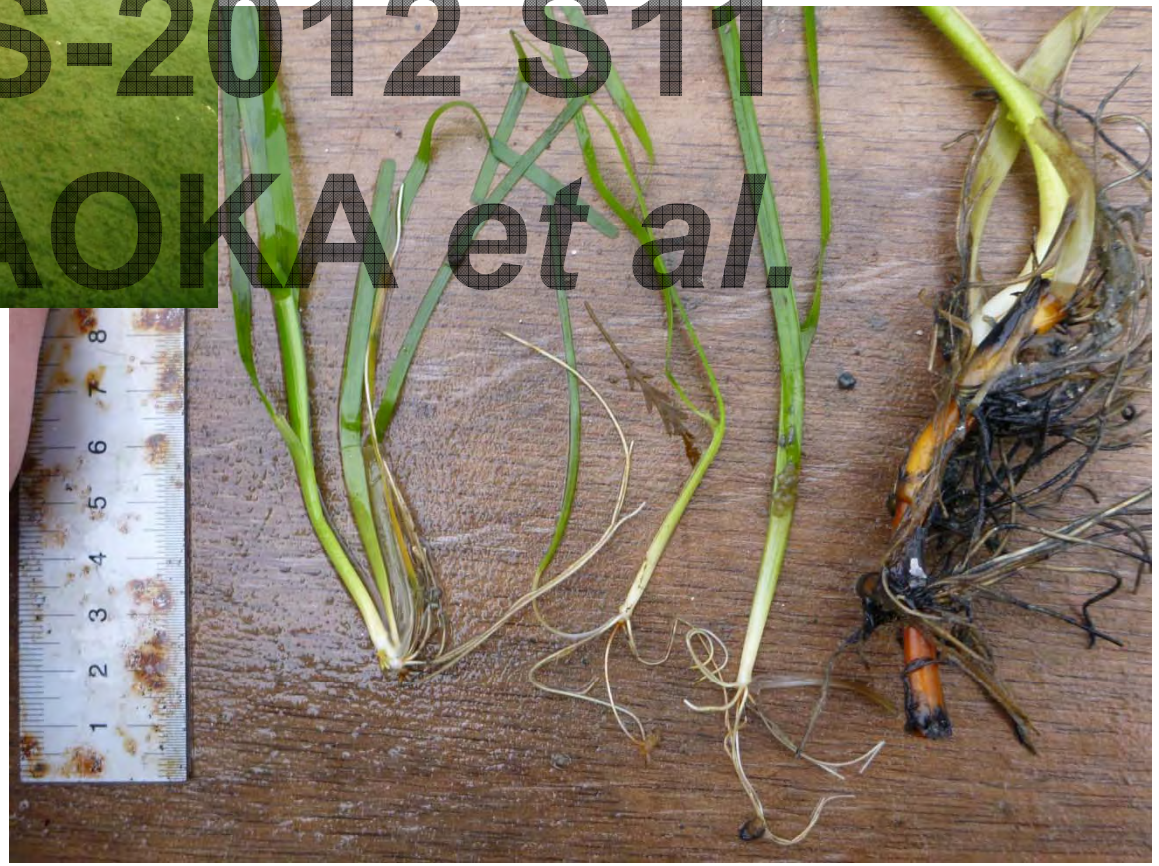


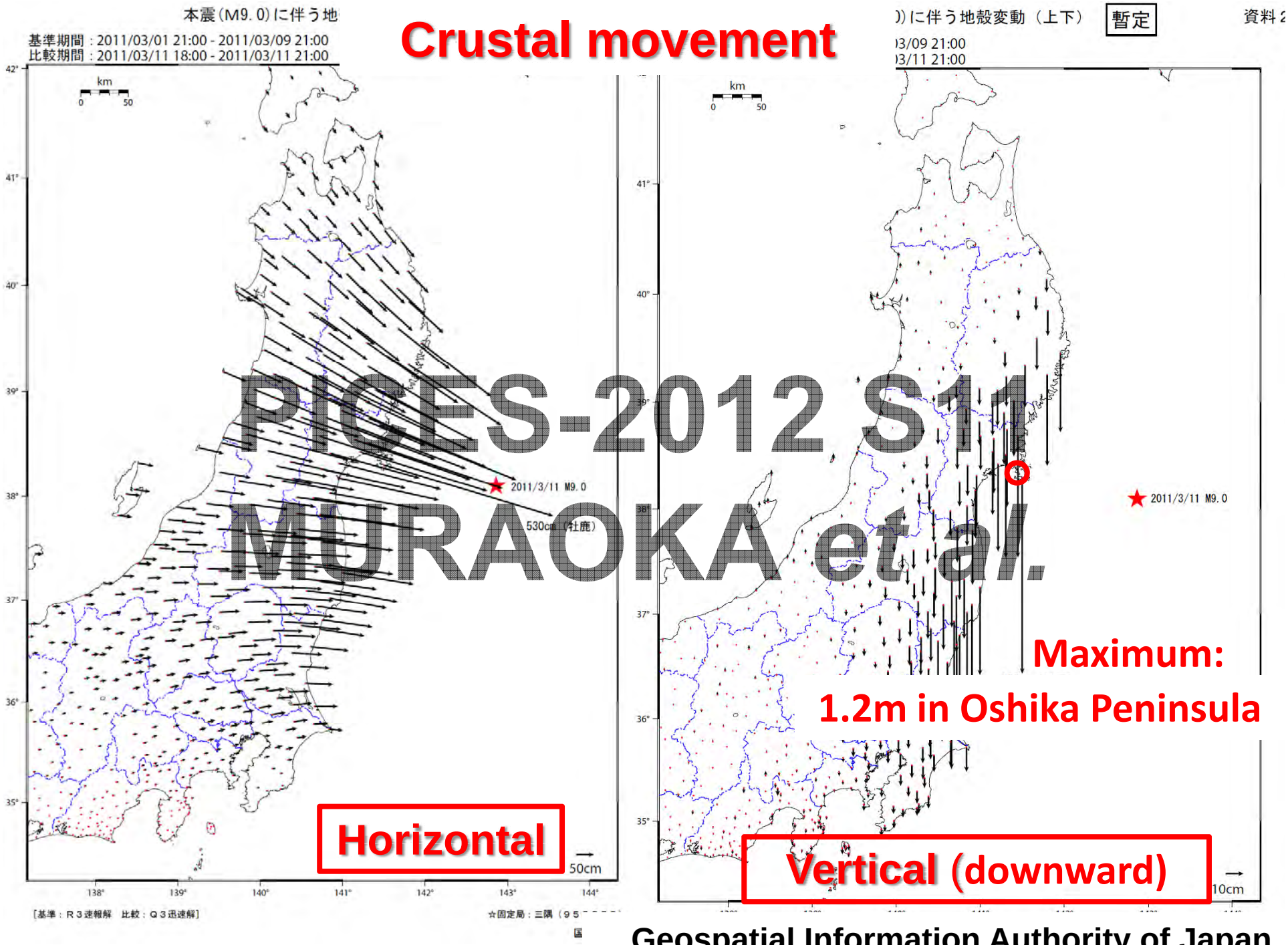
Distribution of *Zostera* meadows (after the earthquake, May 2012; by E-TEC)

Seedlings in Matsushima bay

April 26th, 2012

***Zostera* meadow was destroyed by the Tsunami (1.6m depth)**




Crustal movement
本震(M9.0)に伴う地
基準期間：2011/03/01 21:00 - 2011/03/09 21:00
比較期間：2011/03/11 18:00 - 2011/03/11 21:00
)に伴う地殻変動（上下）
暫定
資料2
3/09 21:00
3/11 21:00
km
0 50
2011/3/11 M9.0
530cm（牡鹿）
PICES-2012 S11
MURAOKA et al.
Maximum:
1.2m in Oshika Peninsula
Horizontal
50cm
Vertical (downward)
10cm
[基準：R3速報解 比較：Q3迅速解]
☆固定局：三隅（9５
Geospatial Information Authority of Japan


A port in Oshika peninsula
PICES-2012 S11
MURAOKA et al.
June 8th, 2011 (after the earthquake)

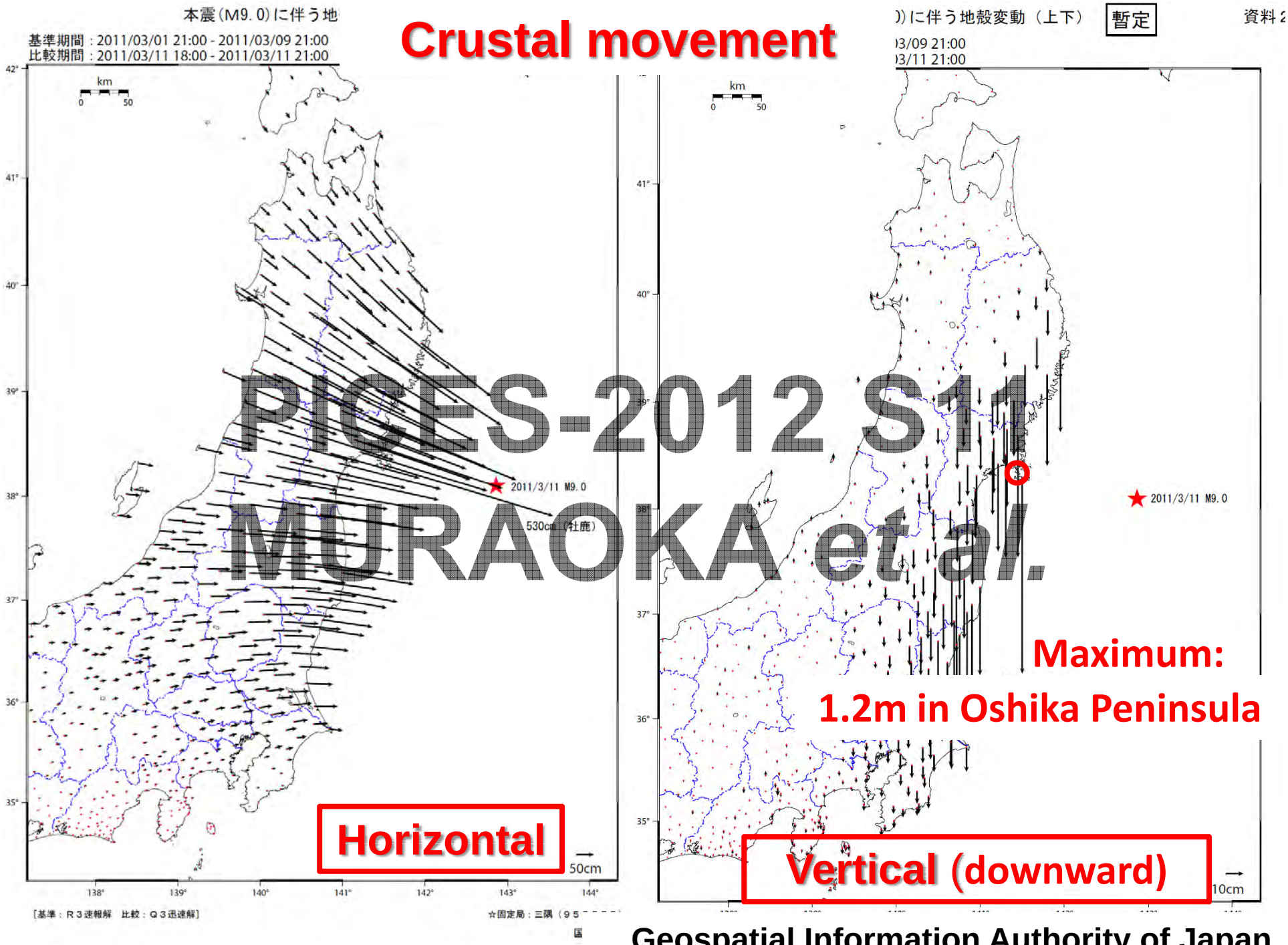

② Samenoura bay
PICES-2012 S11
MURAOKA et al.
800 m
© 2011 ZENRIN
© 2011 Geocentre Consulting
Google
画像取得日: 2011/4/6
2007
38° 22'26.48" N 141° 30'09.74" E 標高 0 m
高度 3.59 km


June 2nd, 2010 (before the earthquake)
PICES-2012 S11
MURAOKA et al.


Sept. 8th, 2011 (after the earthquake)
PICES-2012 S11
MURAOKA et al.


PICES-2012 S11
MURAOKA et al.
August 9th, 2011
(after the earthquake)

Crustal movement



PICES-2012 S11

MURAOKA *et al.*

Horizontal

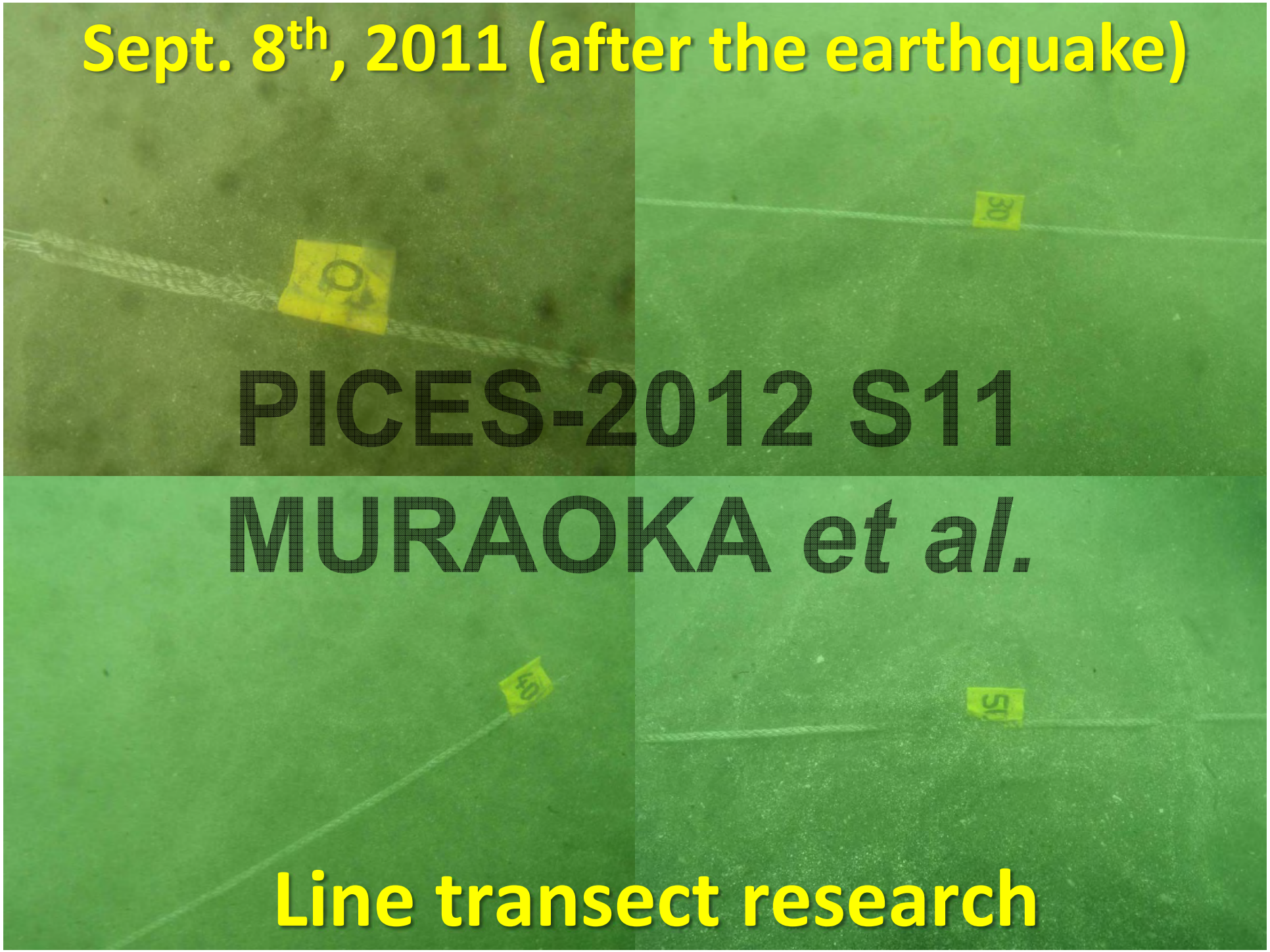
Vertical (downward)

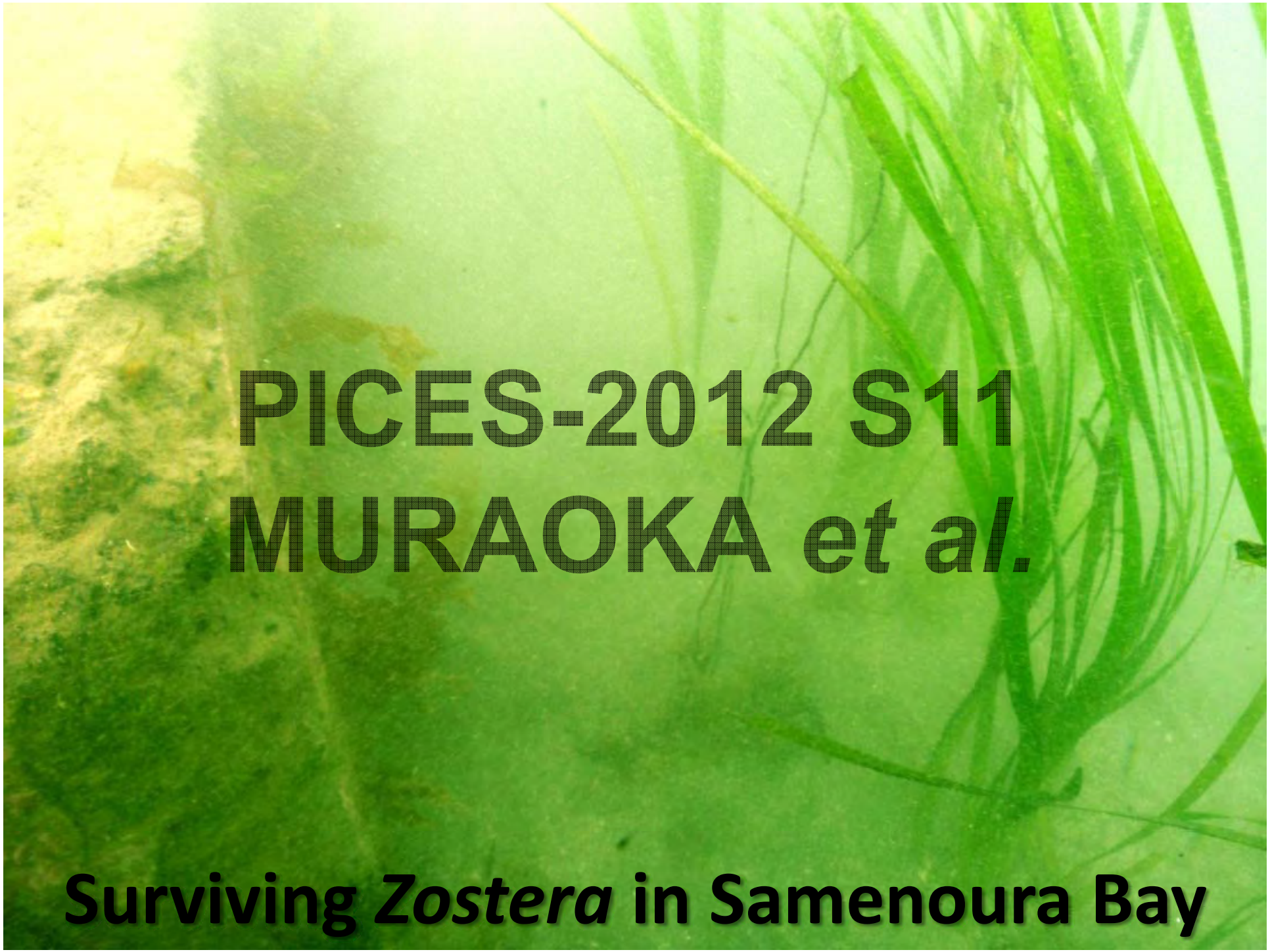
Maximum:

1.2m in Oshika Peninsula

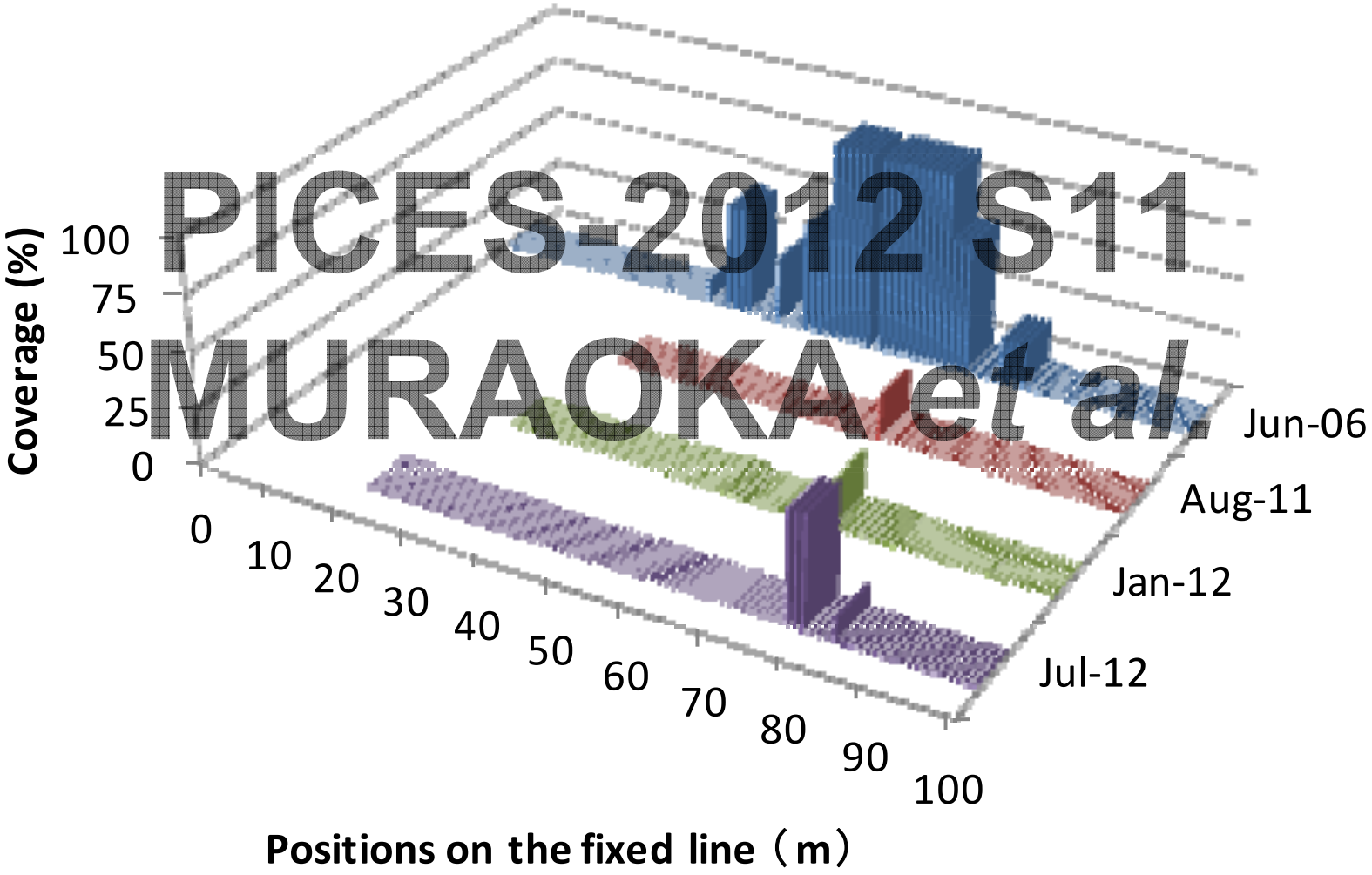
Geospatial Information Authority of Japan


June 2nd, 2010 (before the earthquake)
PICES-2012 S11
MURAOKA et al.
100m Line

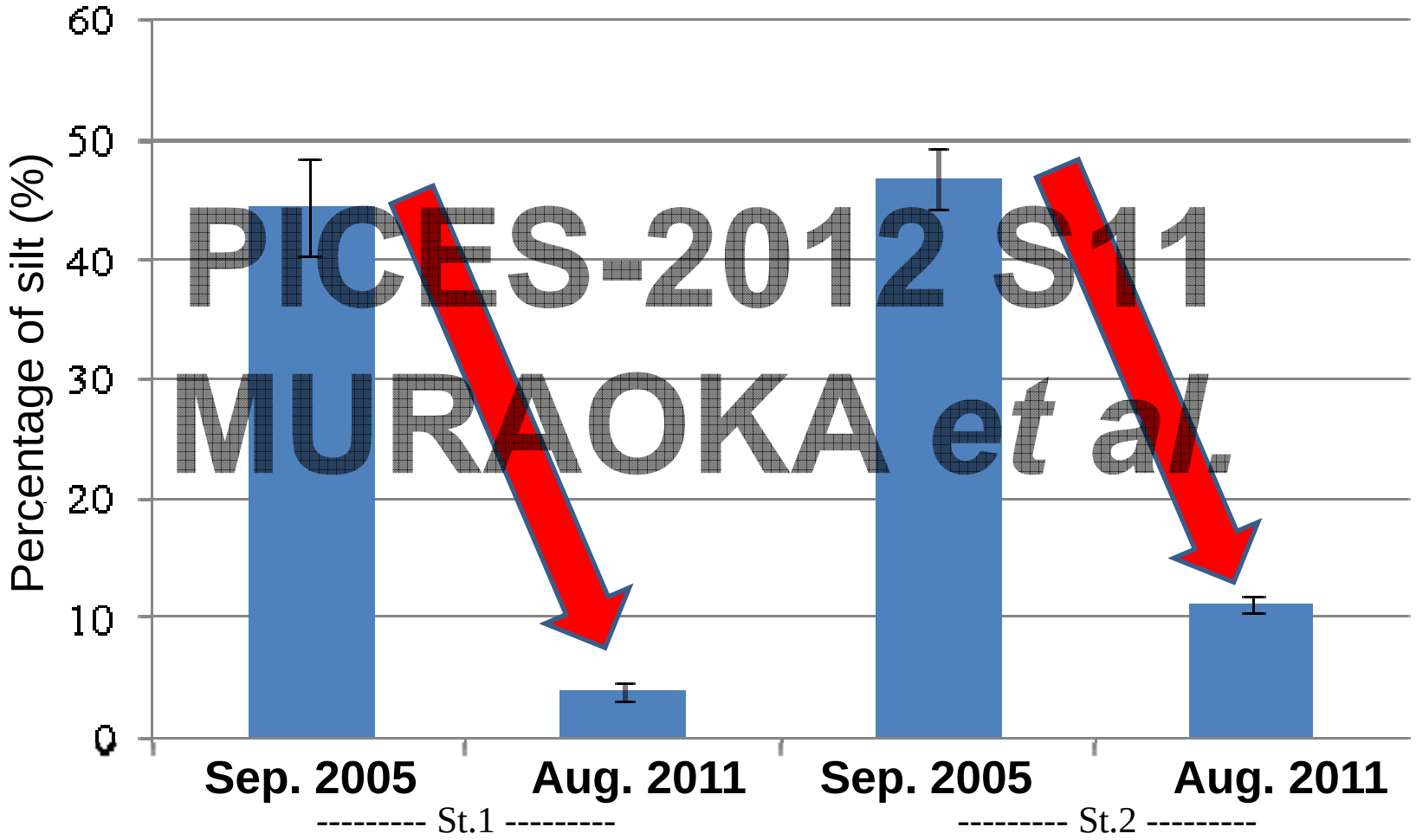

Sept. 8th, 2011 (after the earthquake)
PICES-2012 S11
MURAOKA et al.
Line transect research


PICES-2012 S11
MURAOKA *et al.*
Surviving *Zostera* in Samenoura Bay

Coverage change of *Zostera* before and after the earthquake



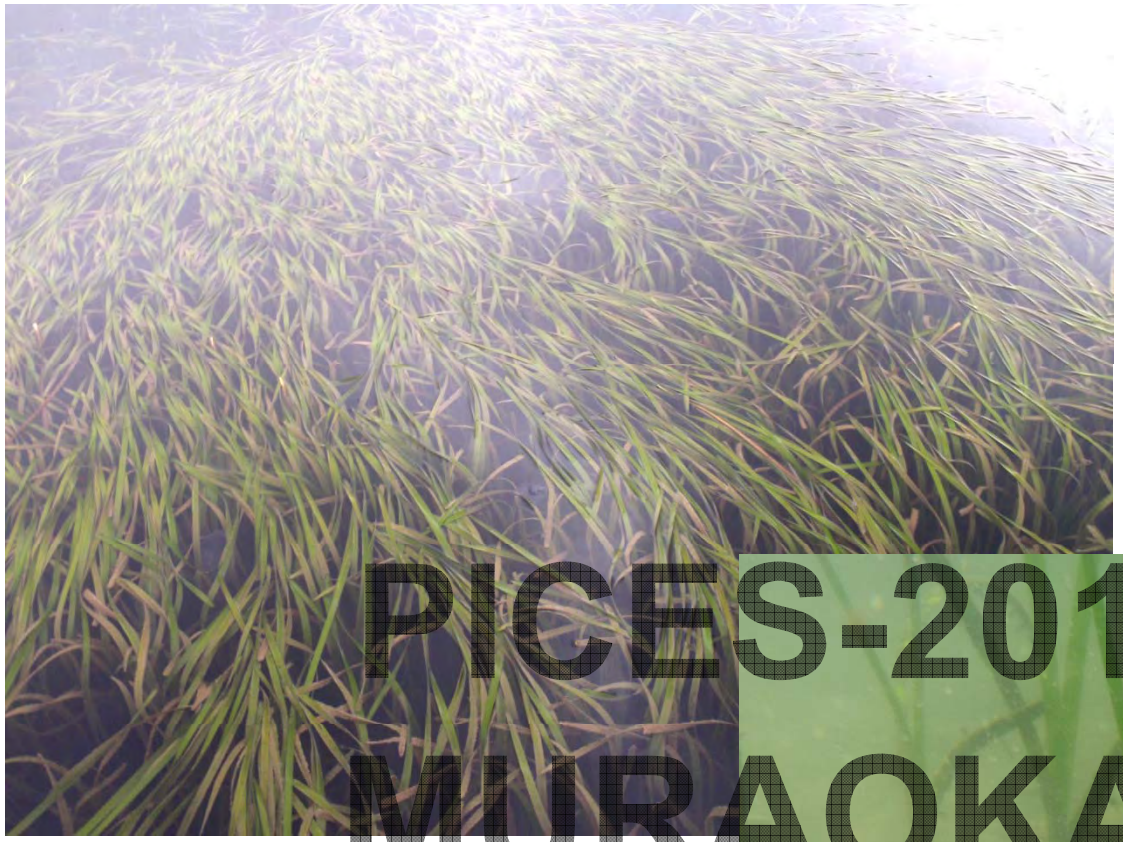
Percentage of silt（<0.075mm）in the sediment before and after the earthquake




Research points in Miyagi Prefecture
石巻
東松島
松島町
多賀城
③
①
②
PICES-2012 S11
MURAOKA et al.
① Matsushima bay
② Samenoura bay
③ Mangokuura (inland sea)
Google earth


Mangokuura
PICES-2012 S11
MURAOKA et al.
M1
M2
M3
M4
M5
M6
1191 m
© 2012 ZENRIN
Google earth
画像取得日: 2011/4/6
38° 25'17.76" N 141° 23'34.90" E 標高 0 m
高度 4.92 km


June 14th, 2011 (after the earthquake)
PICES-2012 S11
MURAOKA et al.



June 15th, 2011

Researched by SCUBA

PICES-2012 S11

MURAOKA *et al.*

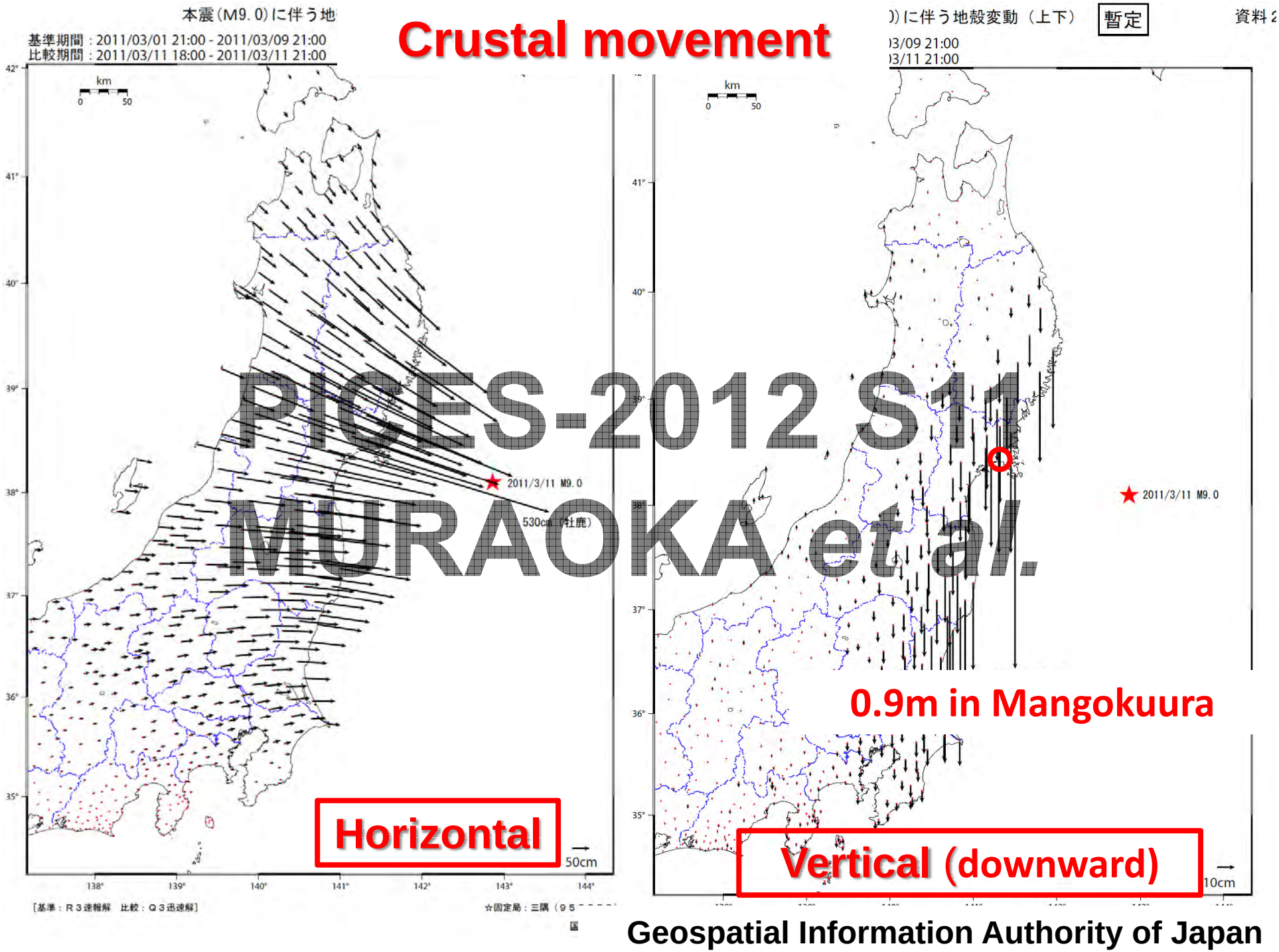
165 shoots/m²
in average

March 19th, 2011 (right after the disaster)

PICES-2012 S1

MURAOKA *et al.*

February 22th, 2012 (about one year later)



Topics

- General review of the Great East Japan Earthquake →What happened on March 11th, 2011?
- Effects on *Zostera* meadows in an inland bay area (*Zostera marina* community)
- **Summary and the future research**

Photo taken by MAINICHI SHINBUN PUBLISHING CO.

Summary

- *Zostera* meadows: destroyed in most areas by Tsunami → self restoration (Seedlings in Matsushima bay etc.)

Environmental changes: downward of the basement, landslide, etc.

Long-term observation is necessary!