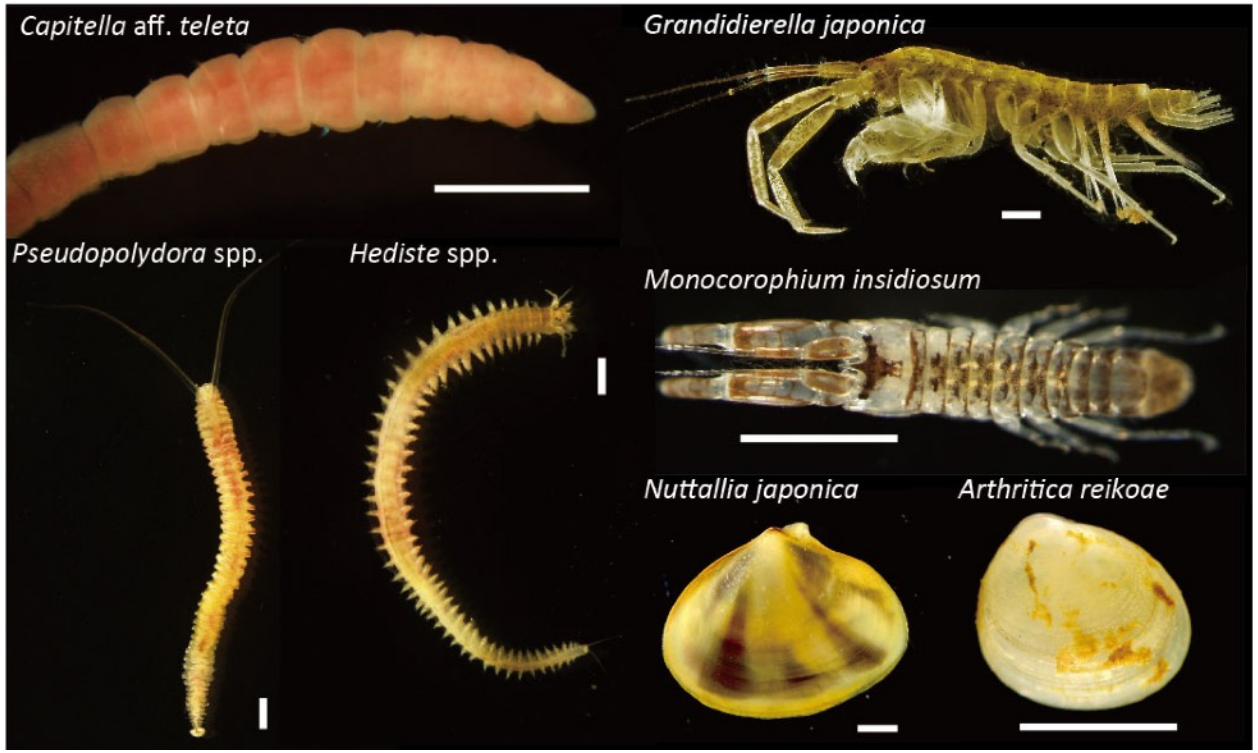
Community structure of macrozoobenthos and its spatio-temporal change in a shallow eutrophic lagoon after the 2011 tsunami



Tomohiko Kondoh, Gai Nakayama & Waka Sato-Okoshi

Introduction: Earthquake & Tsunami

The Great East Japan Earthquake

- 2011. 3 .11
- M 9.0
- Followed tsunami
- A large-scale removal of sediment
- Benthic community suffered serious damage
- Monitoring is required

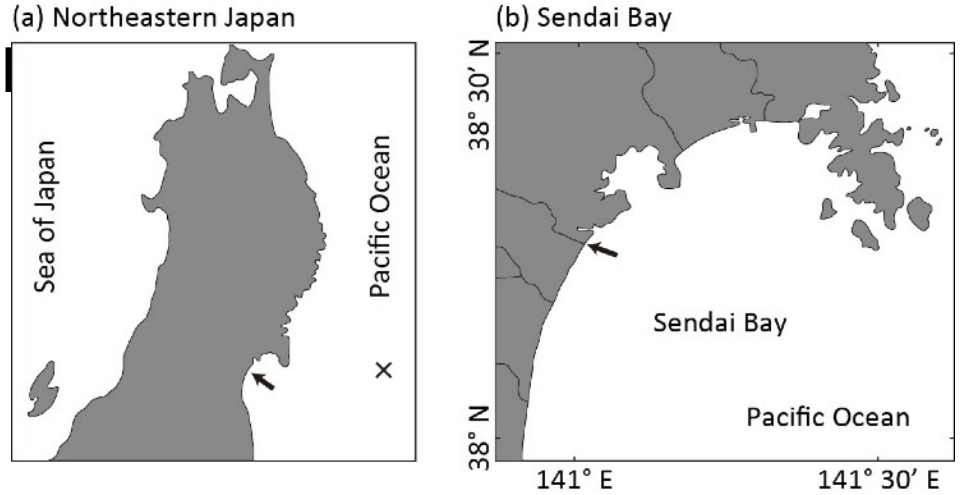


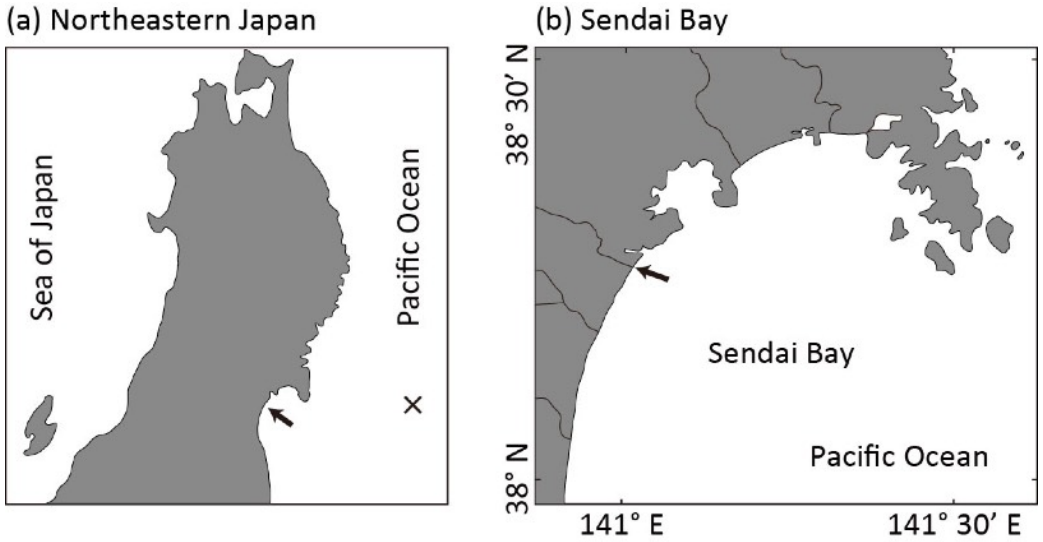
Fig. 1. Map of the study site.

宮城県仙台市荒浜地区における津波の状況（平成23年3月11日16時05分撮影）
（仙台市消防局提供）

平成 23 年版消防白書より

Introduction: Gamo Lagoon

- Locates at the Nanakita Rivermouth
- Length 860 m, width 250 m, area 13 ha
- Great importance to large numbers of invertebrates and fish for their habitats and provides resting and feeding areas to birds.
- From the view point of conservation of coastal environ- ment, it is required to investigate the spatio-temporal variations in benthic community assemblage in Gamo Lagoon after the disturbance.



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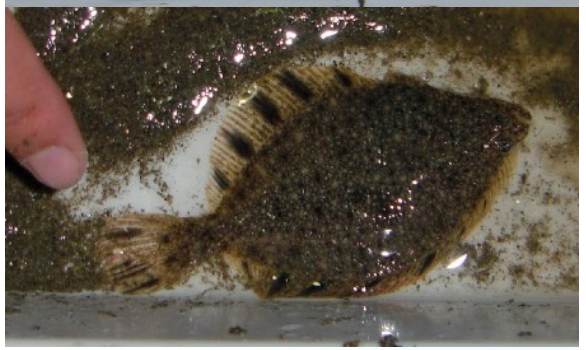

Materials & Methods

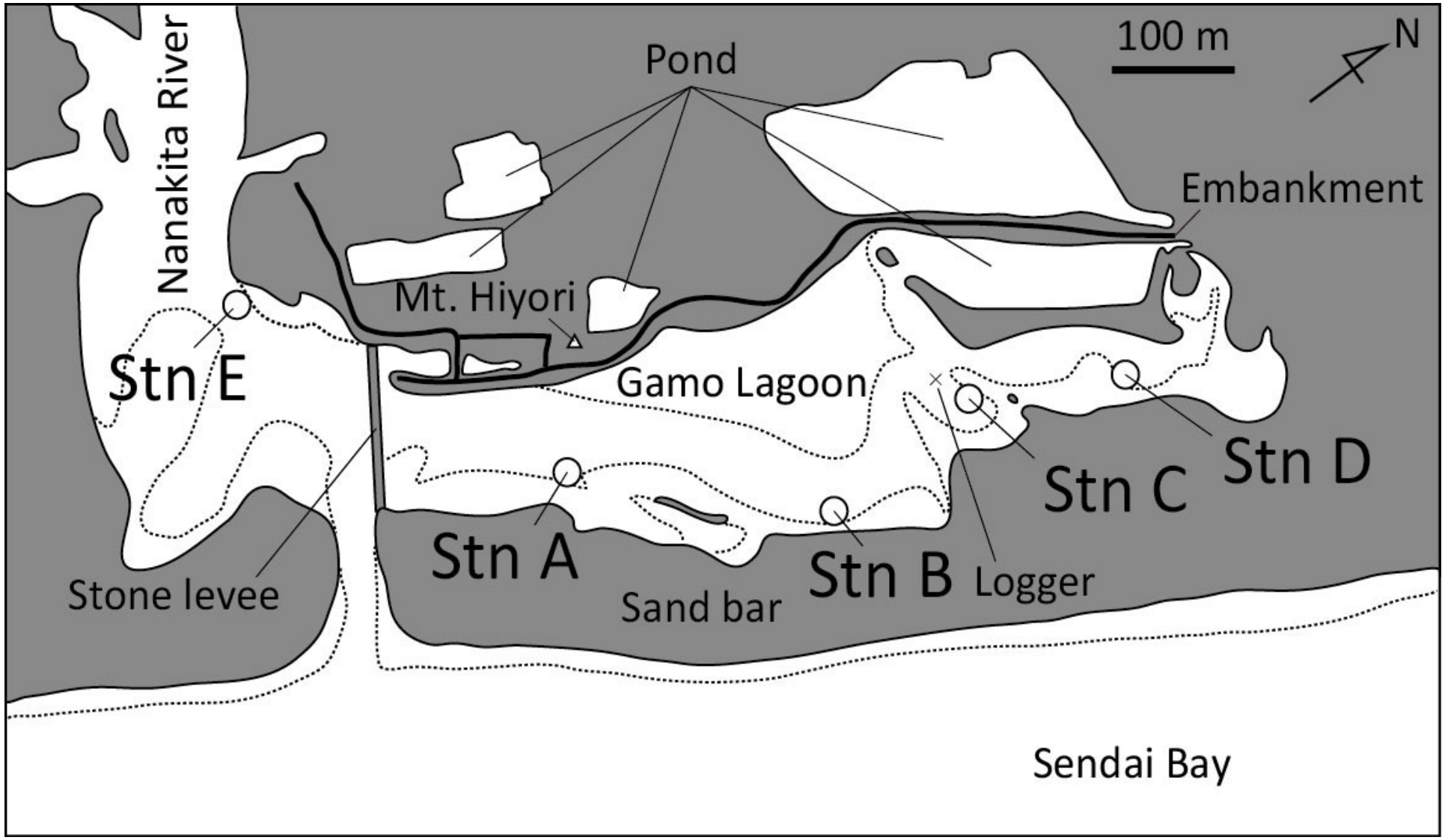

Fig. 2. Map of the study site. Black dashed lines show shoreline of low water

Materials & Methods

Environmental data
- Water Depth
- Water Temperature
- Mud Temperature
- Salinity
- DO
- Chl *a* conc. in water
- Chl *a* conc. in mud
- Grain size
- COD
- Oxidation-reduction potential

Benthos sampling

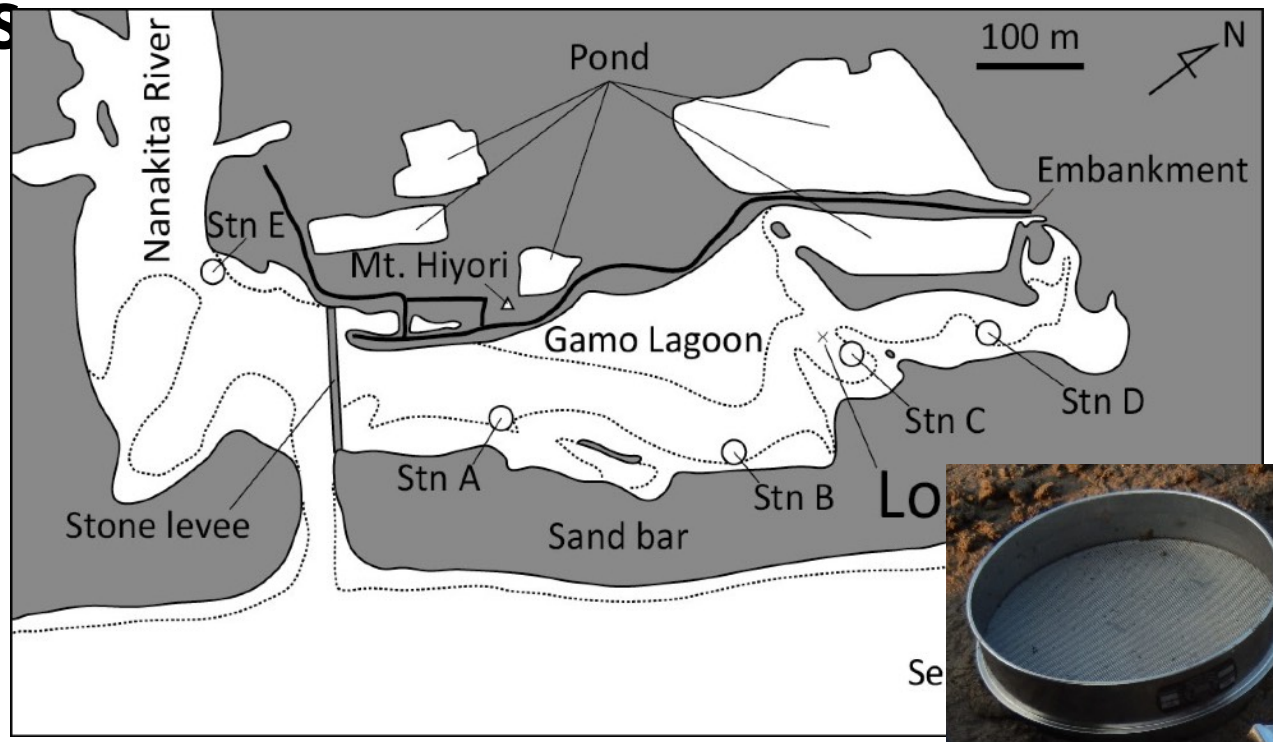

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Fig. **Ekman-Birge** grab.

Topography Changes

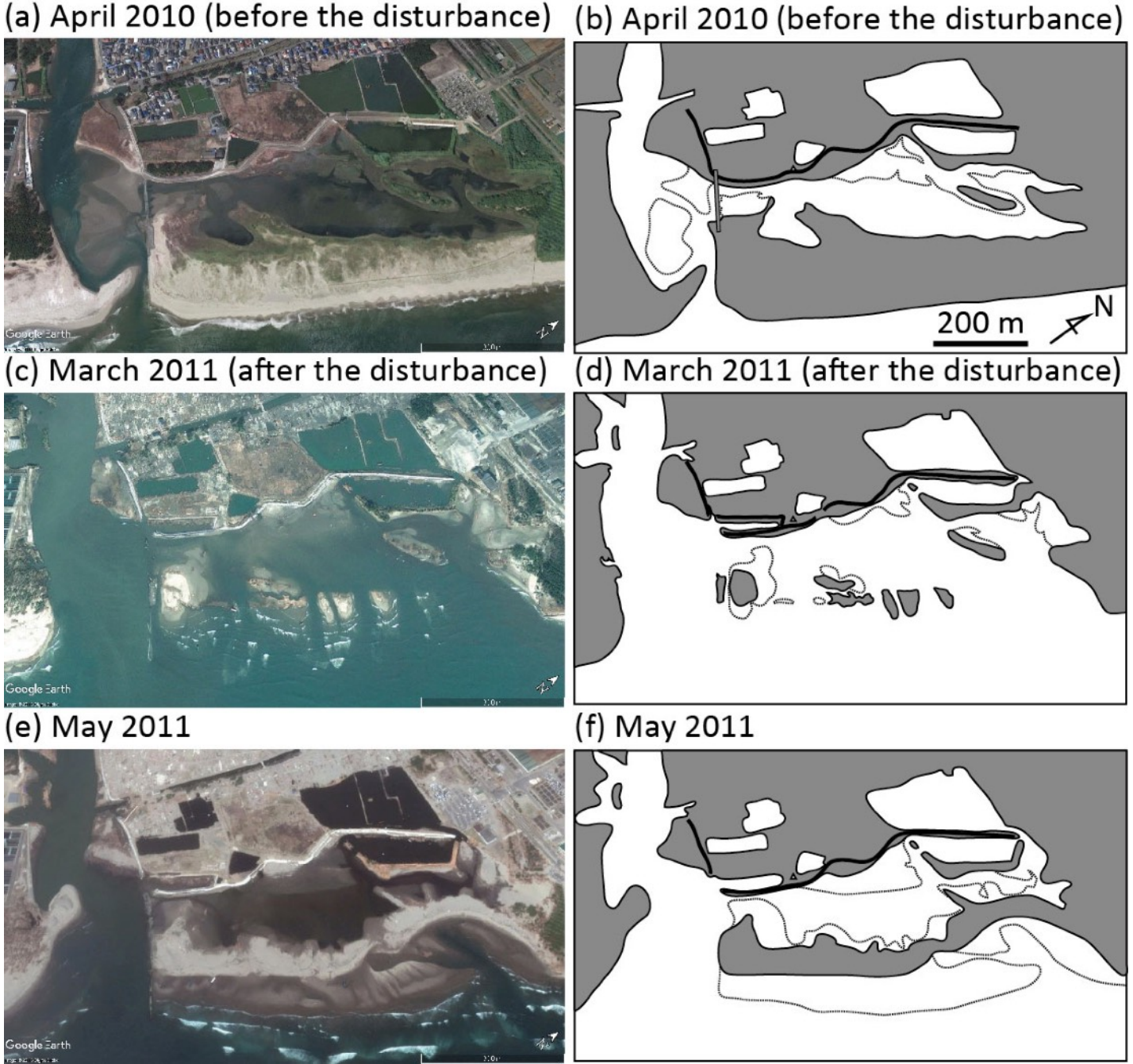
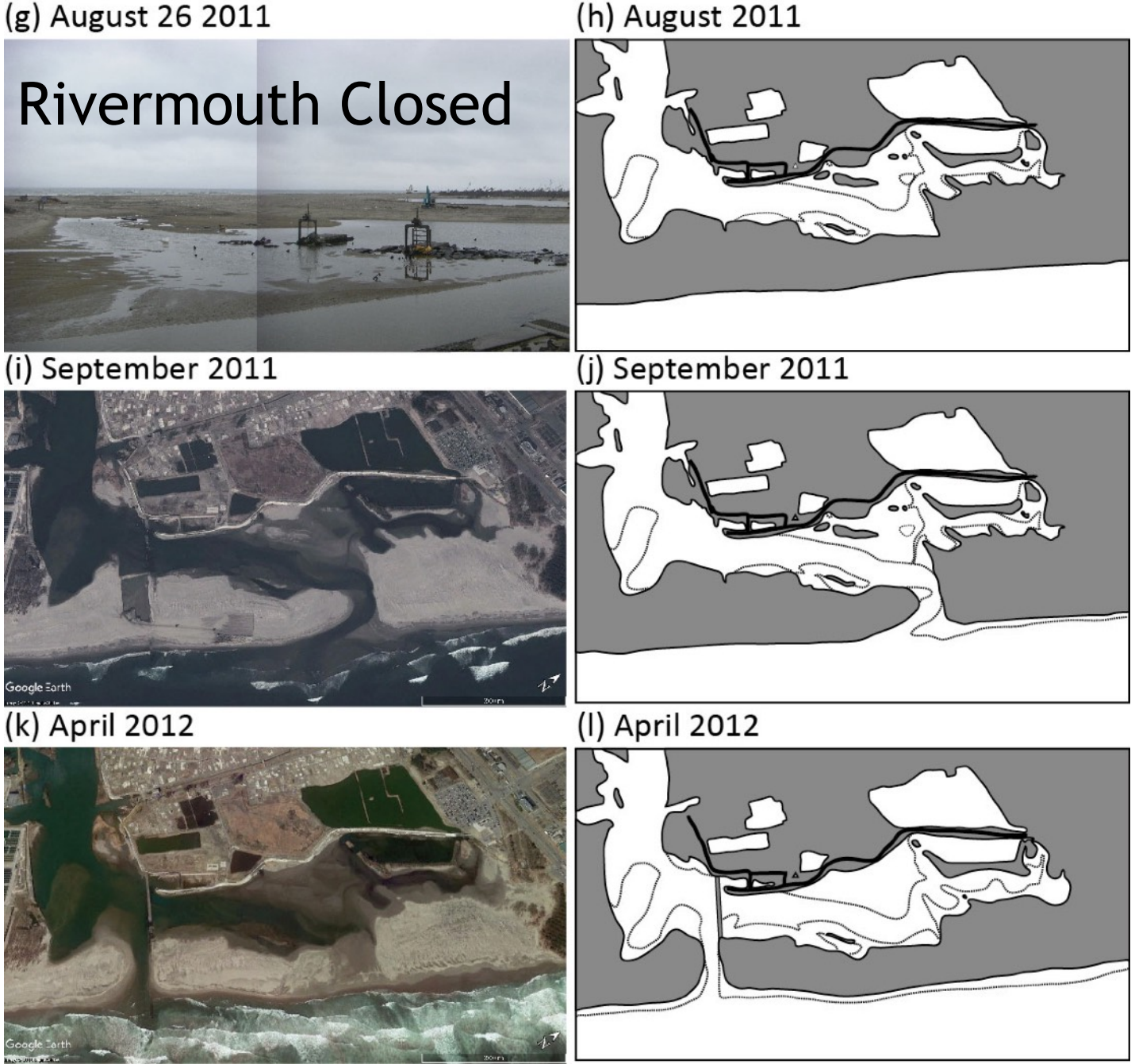


Fig. Images of changing topography of Gamo Lagoon before and after the Great East Japan Earthquake and tsunami. Black dashed lines show shoreline of low water.

Topography Changes



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第 1 章：地形の変化

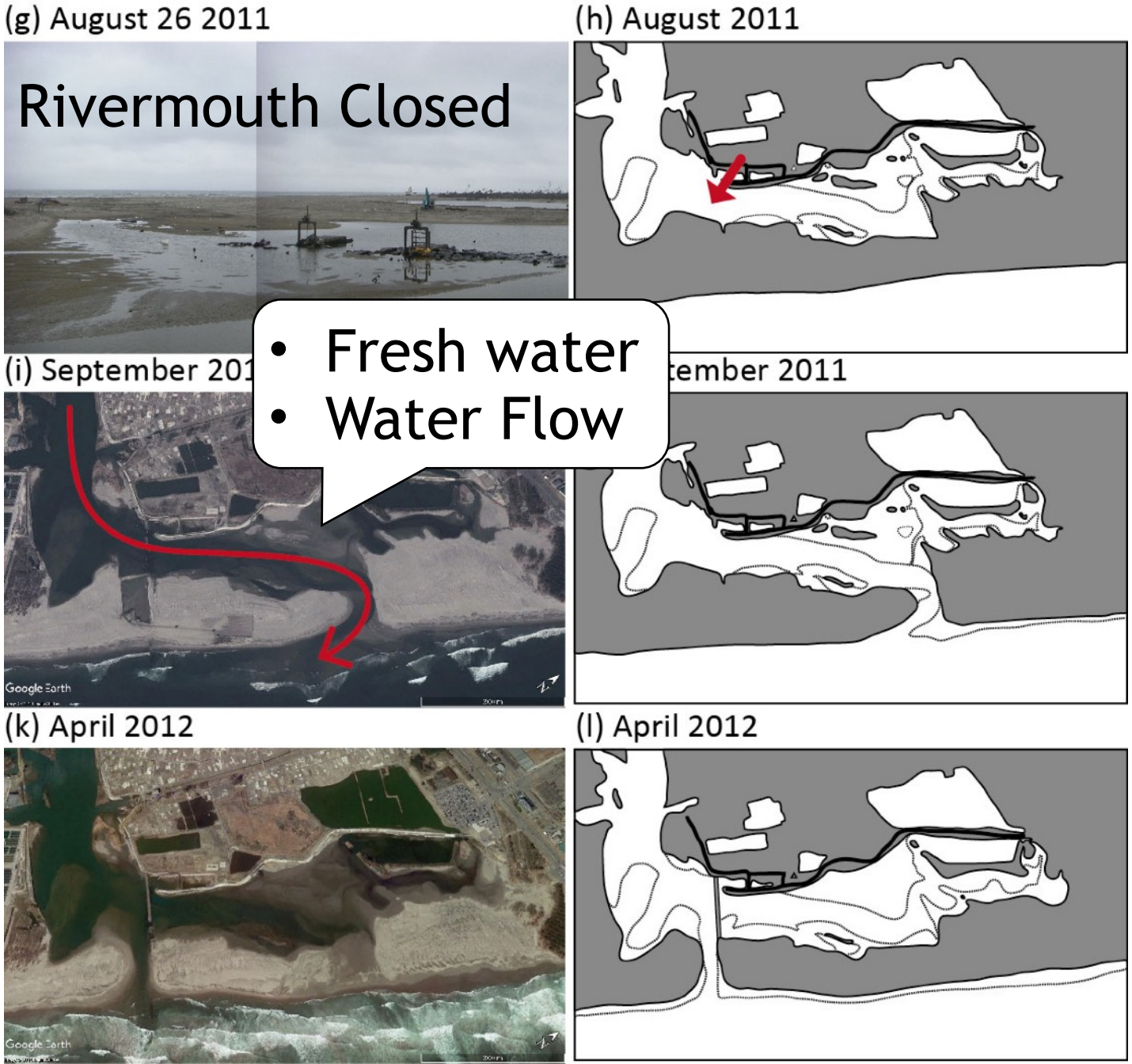
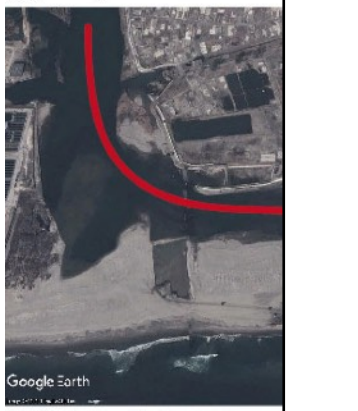


Fig. Images of changing topography of Gamo Lagoon before and after the Great East Japan Earthquake and tsunami. Black dashed lines show shoreline of low water.

(g) August 26 2011

(i) September 2



(k) April 2012

Sediment dynamics balance of erosion and deposition was lost;
Secondary disturbance occurred
⇒ Biggest environmental changes occurred in 2011-2013

Environmental Change

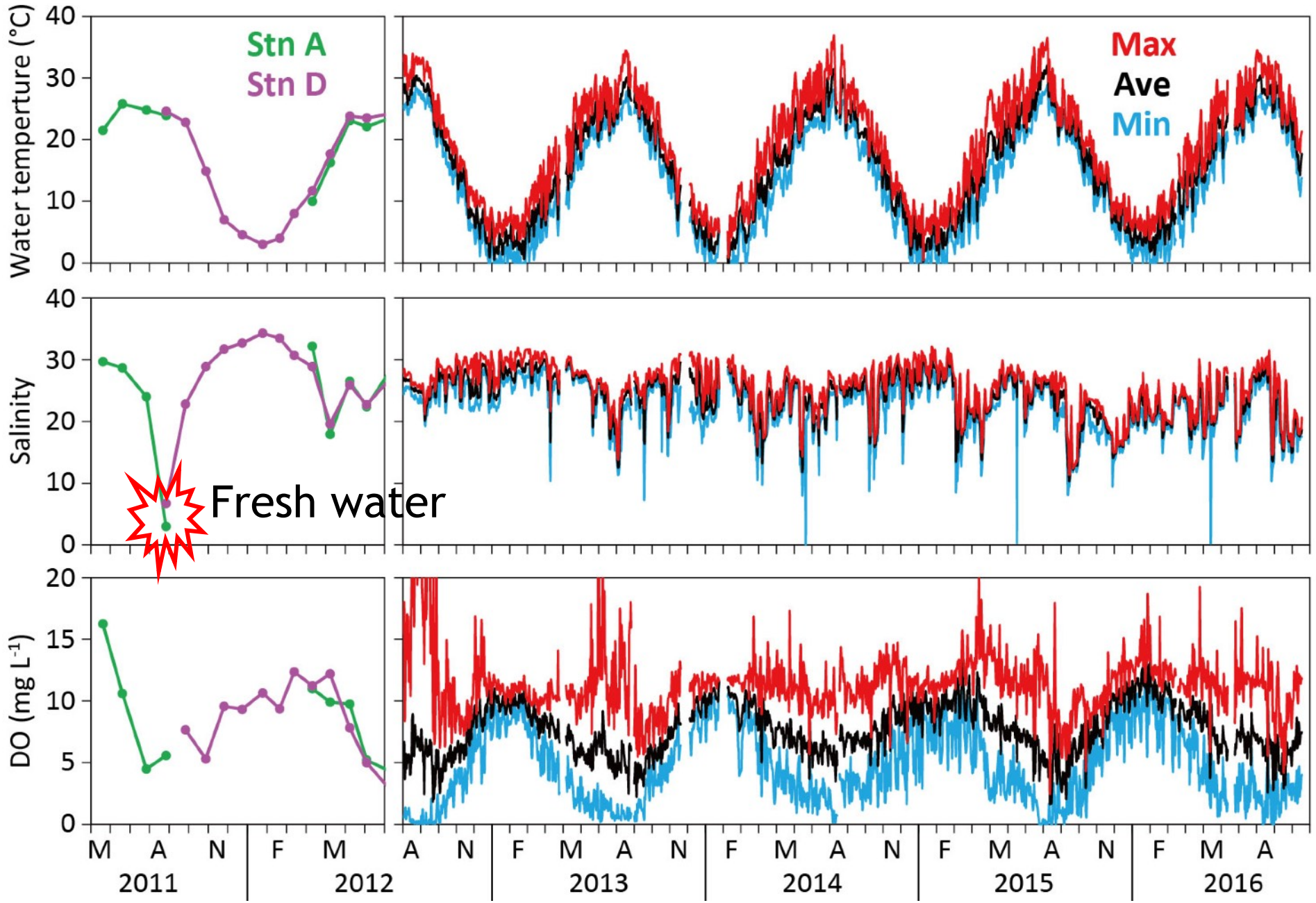
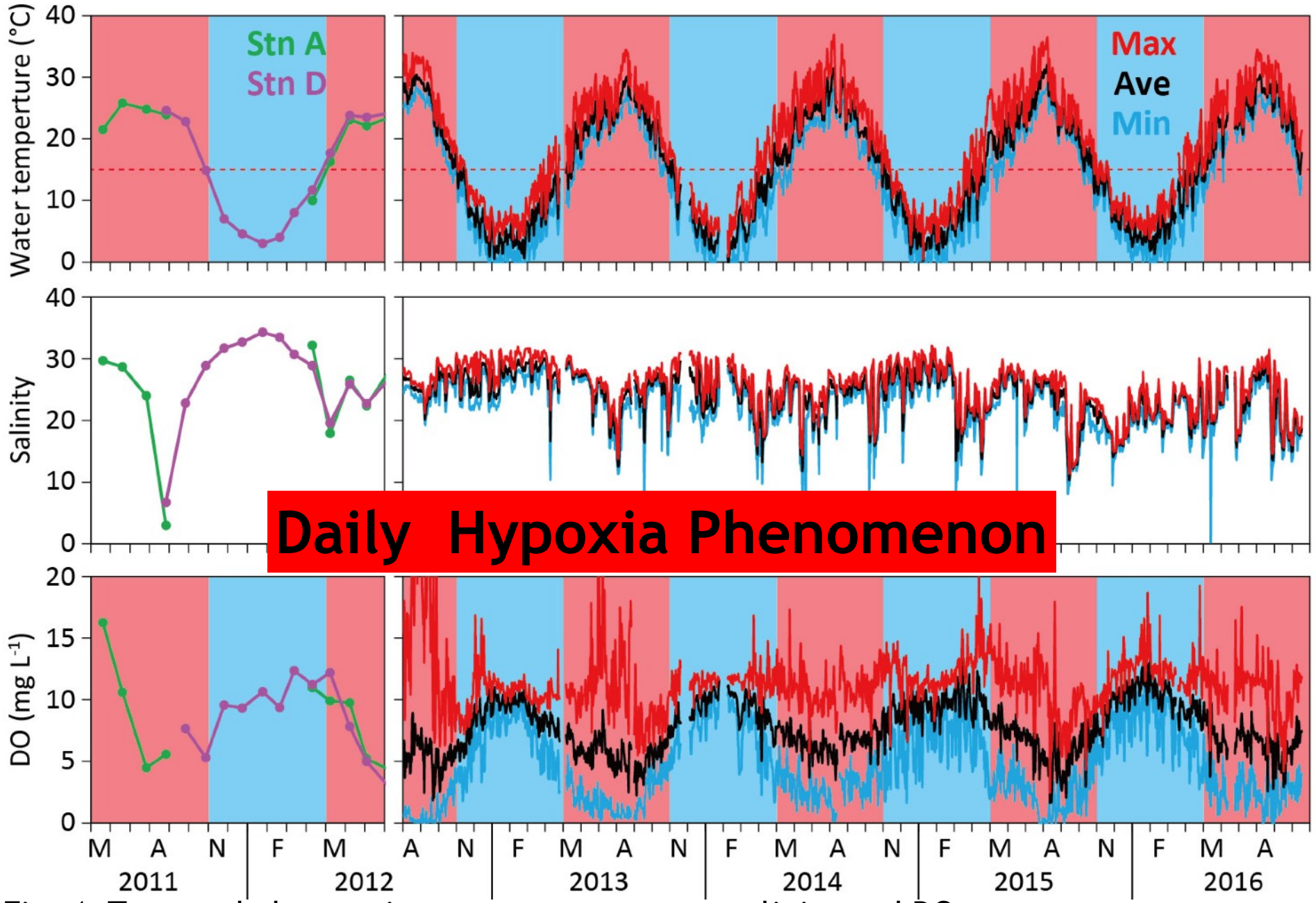


Fig. Temporal changes in water temperature, salinity and DO.

Environmental Change



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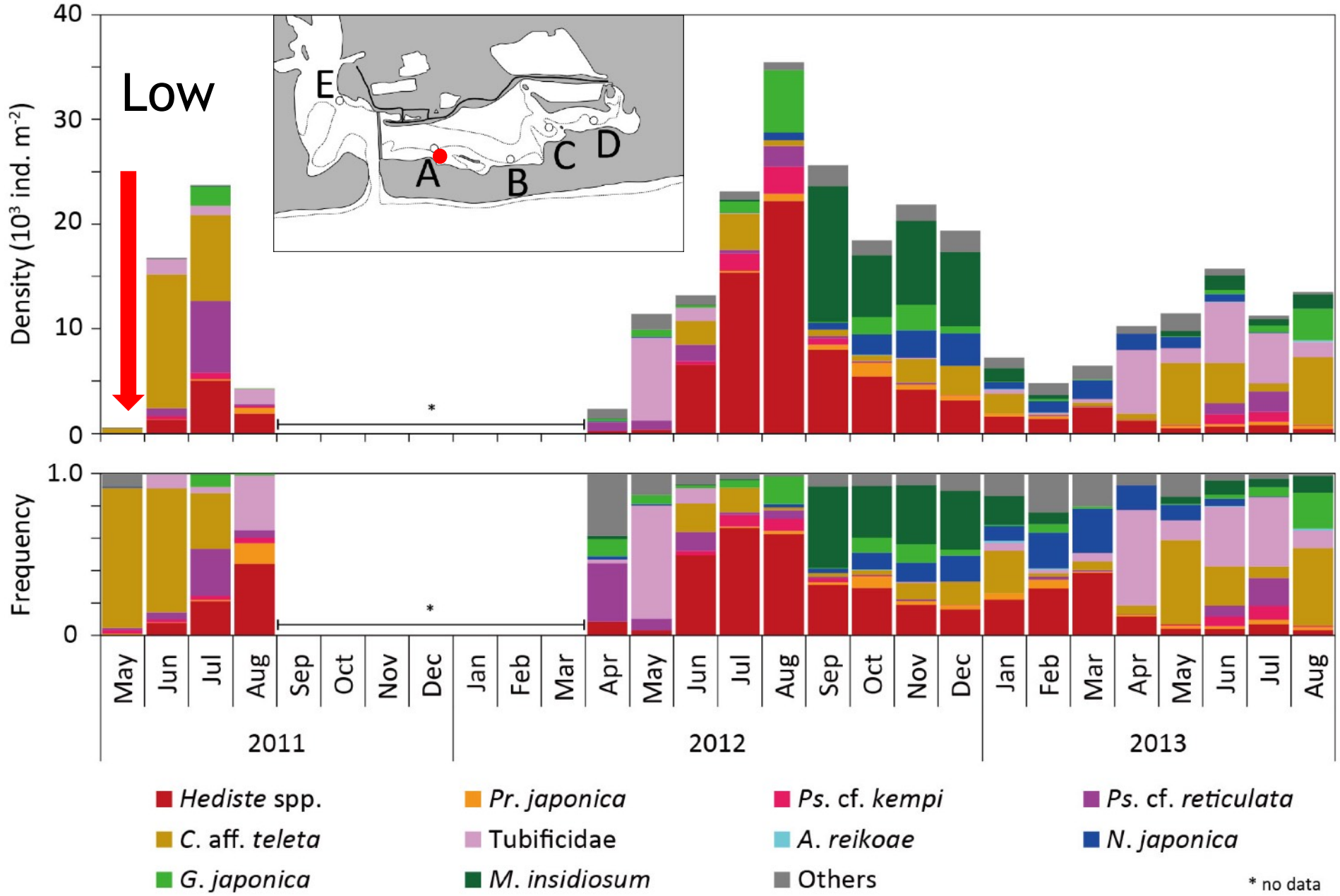
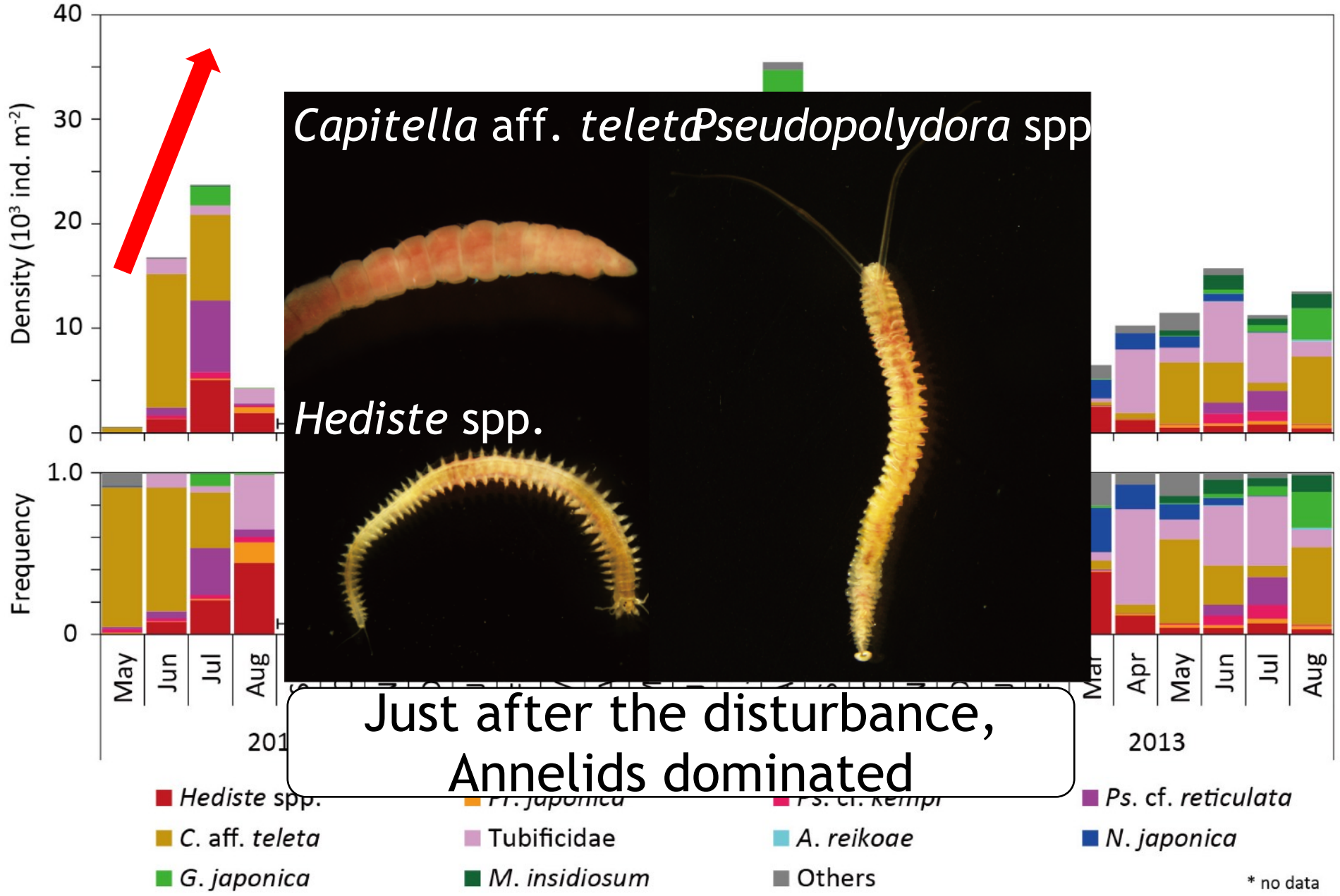


Fig. Temporal change of macrozoobenthic community at Stn A.



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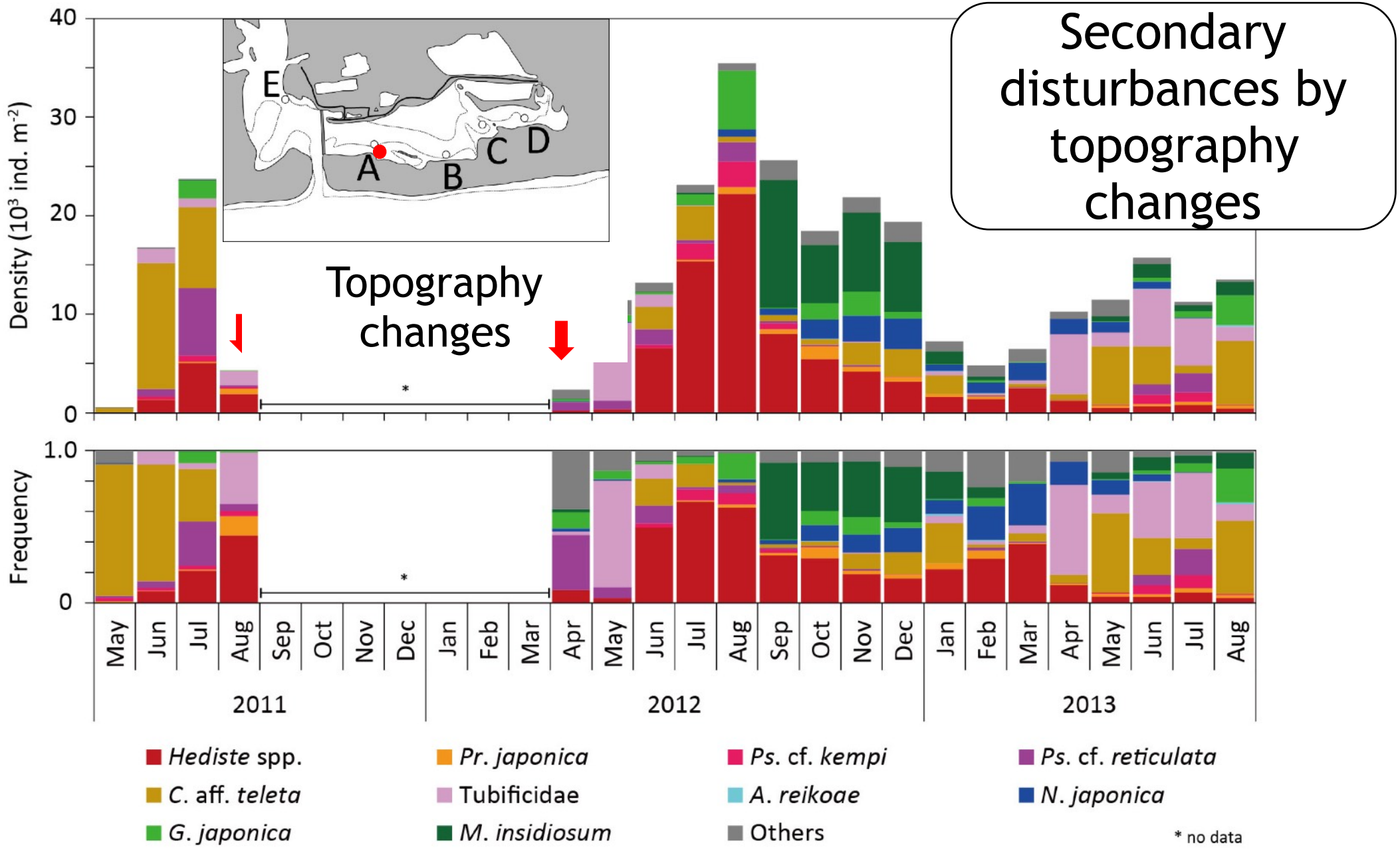

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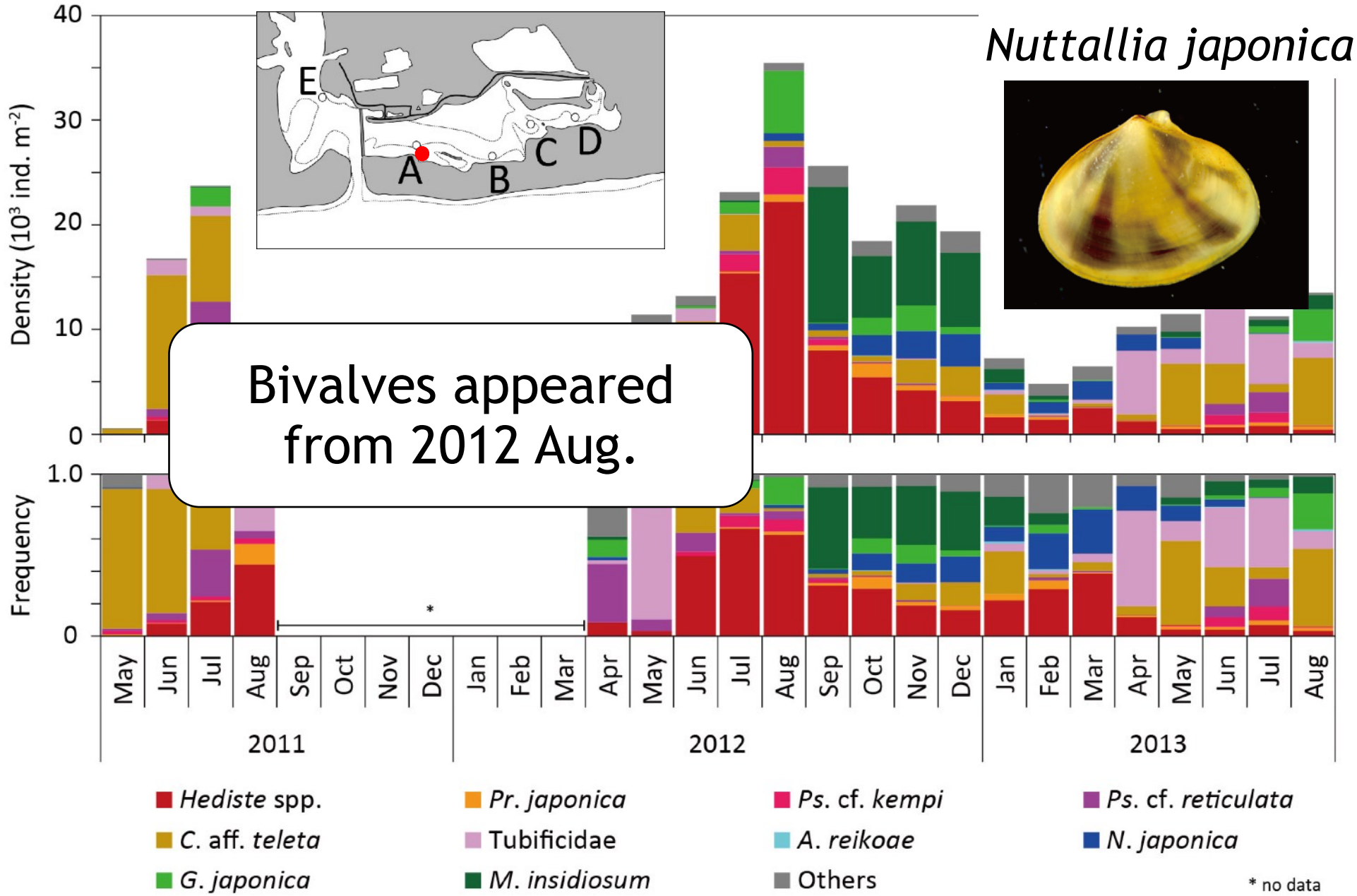

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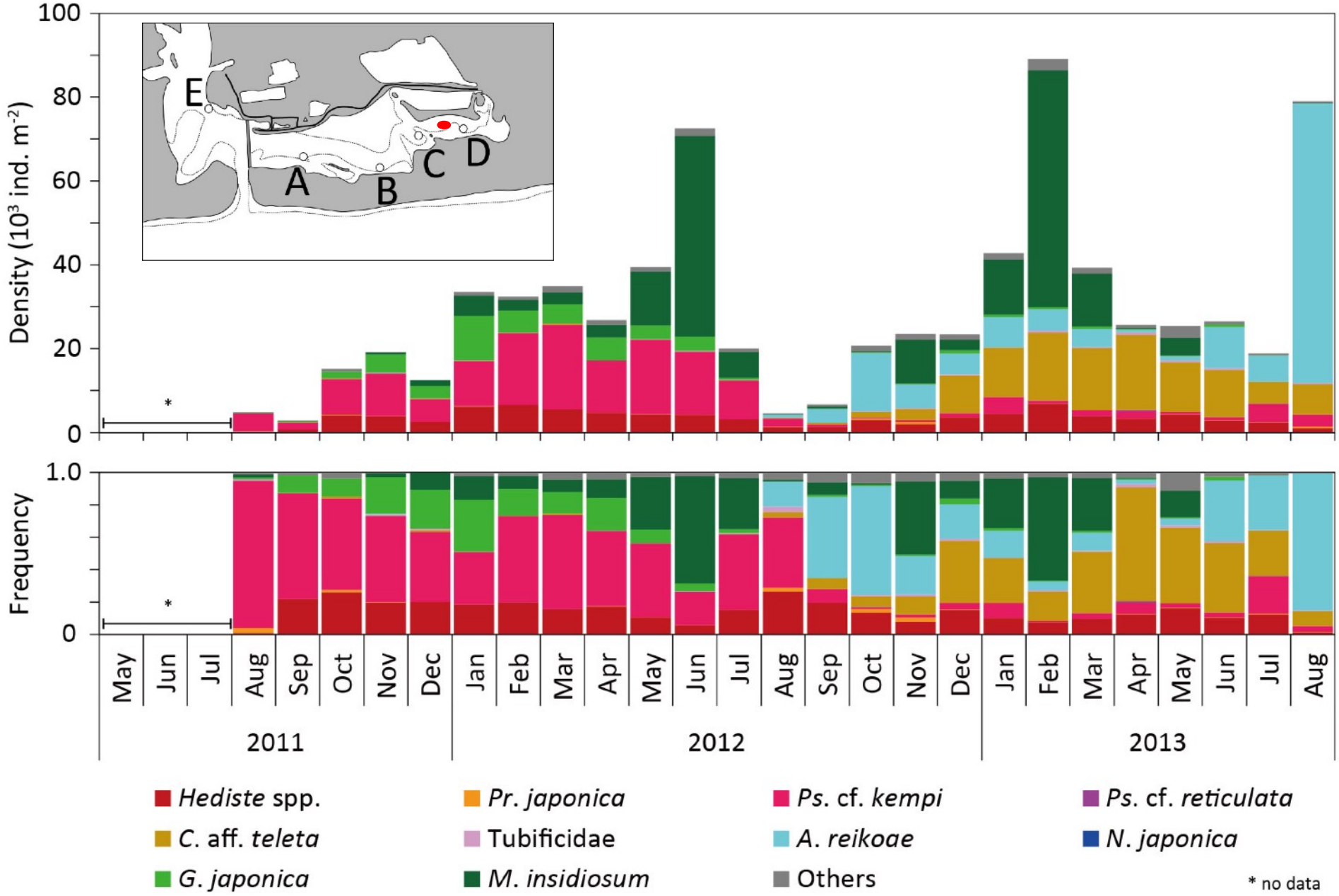
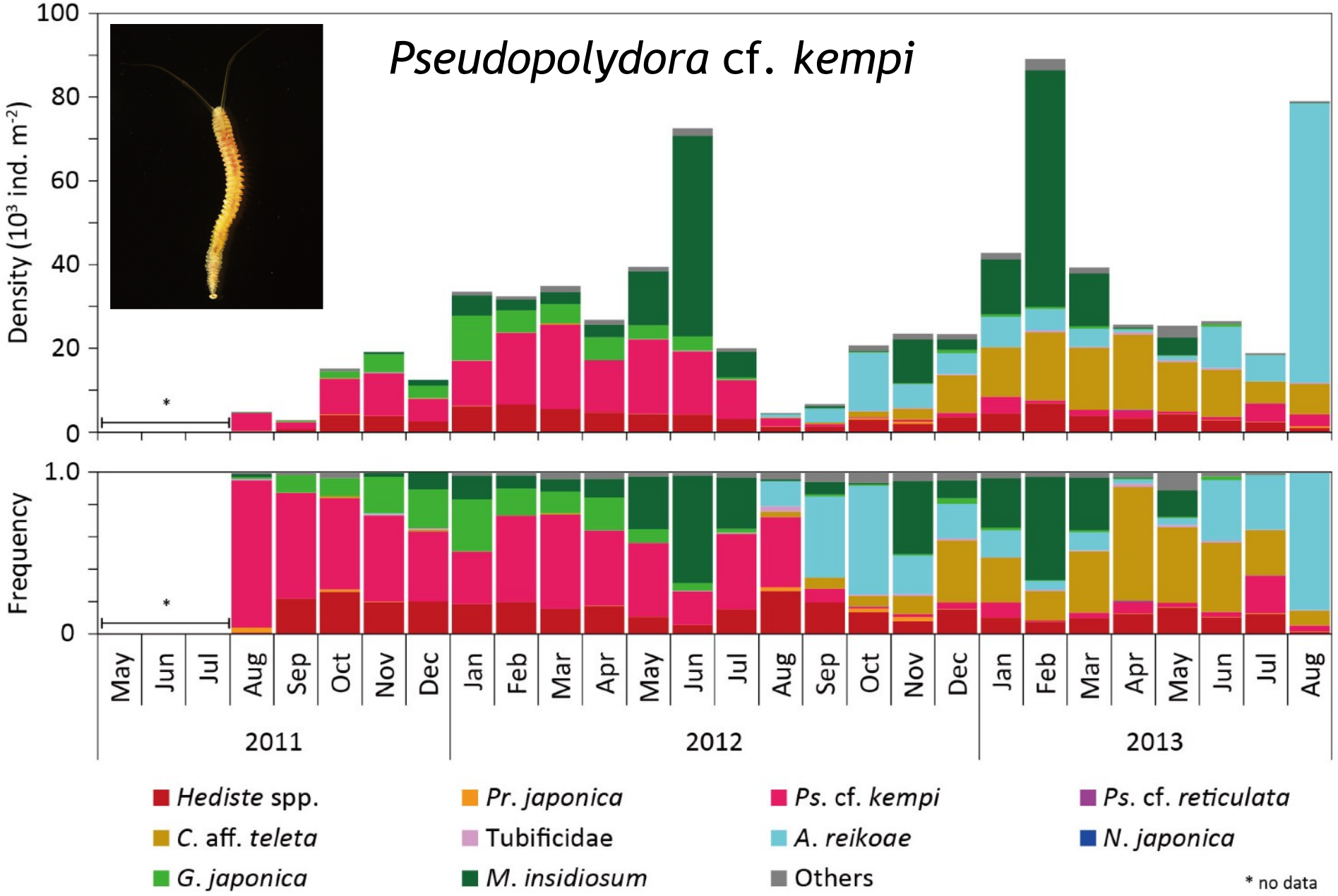


Fig. Temporal change of macrozoobenthic community at Stn D.



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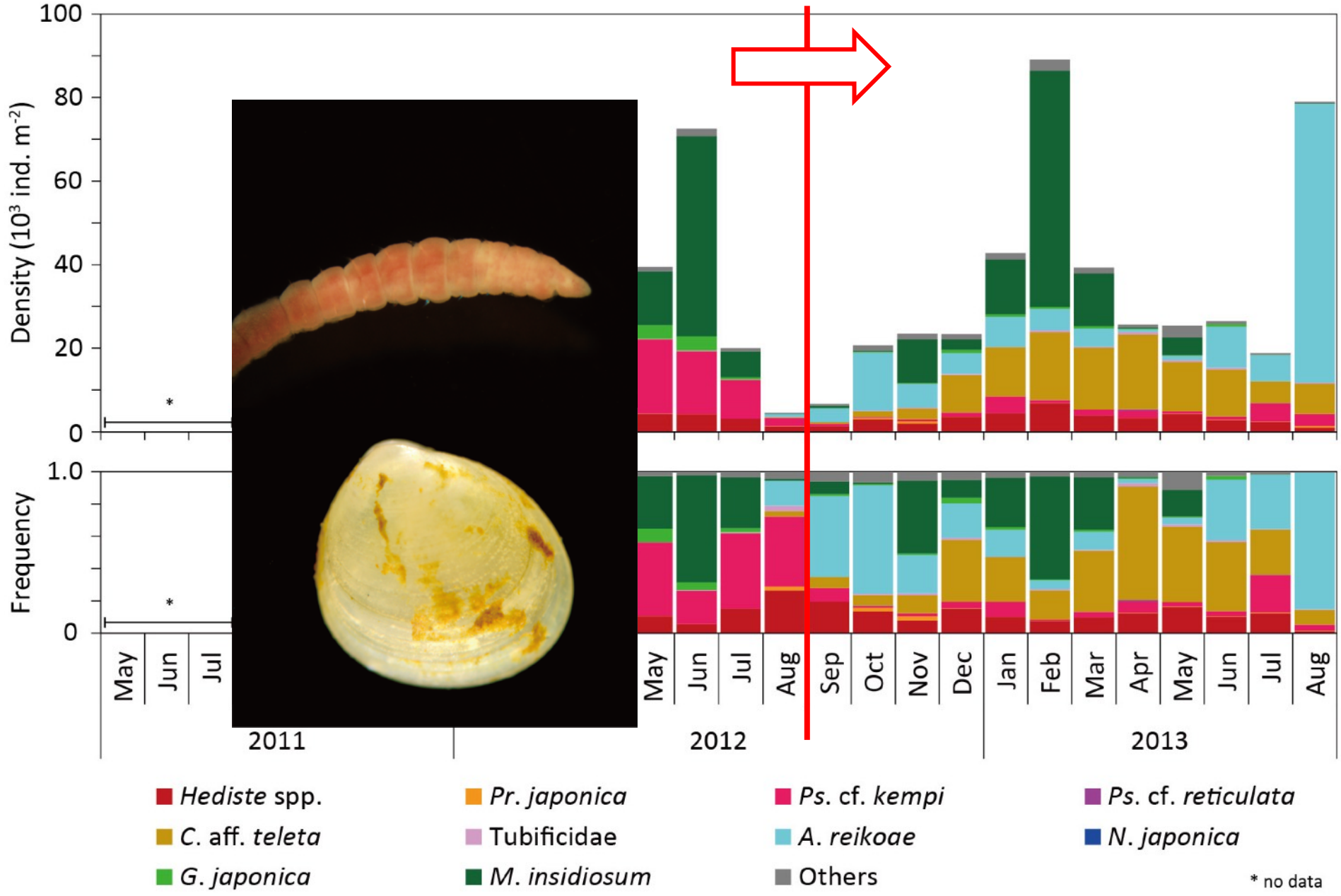

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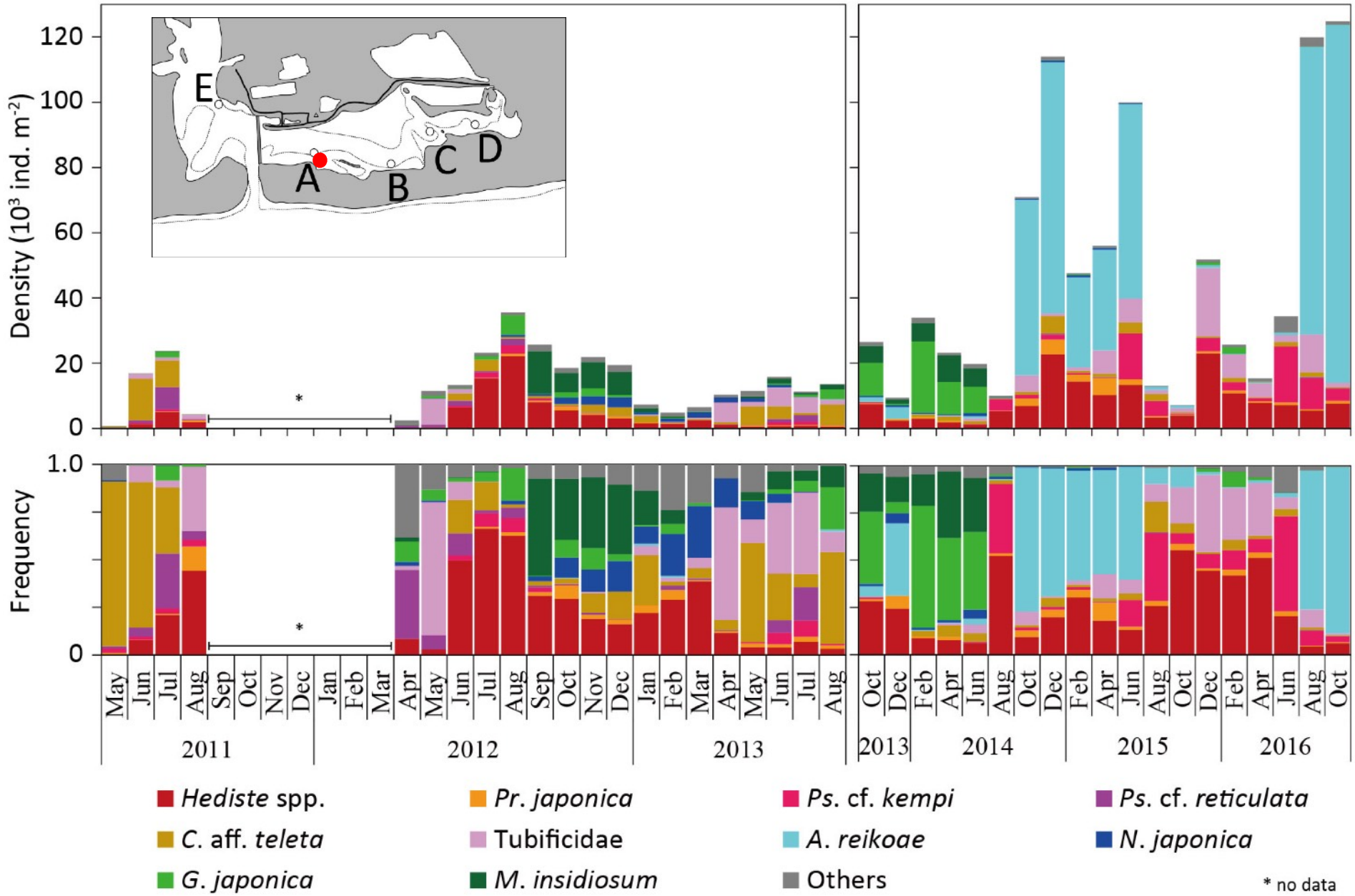
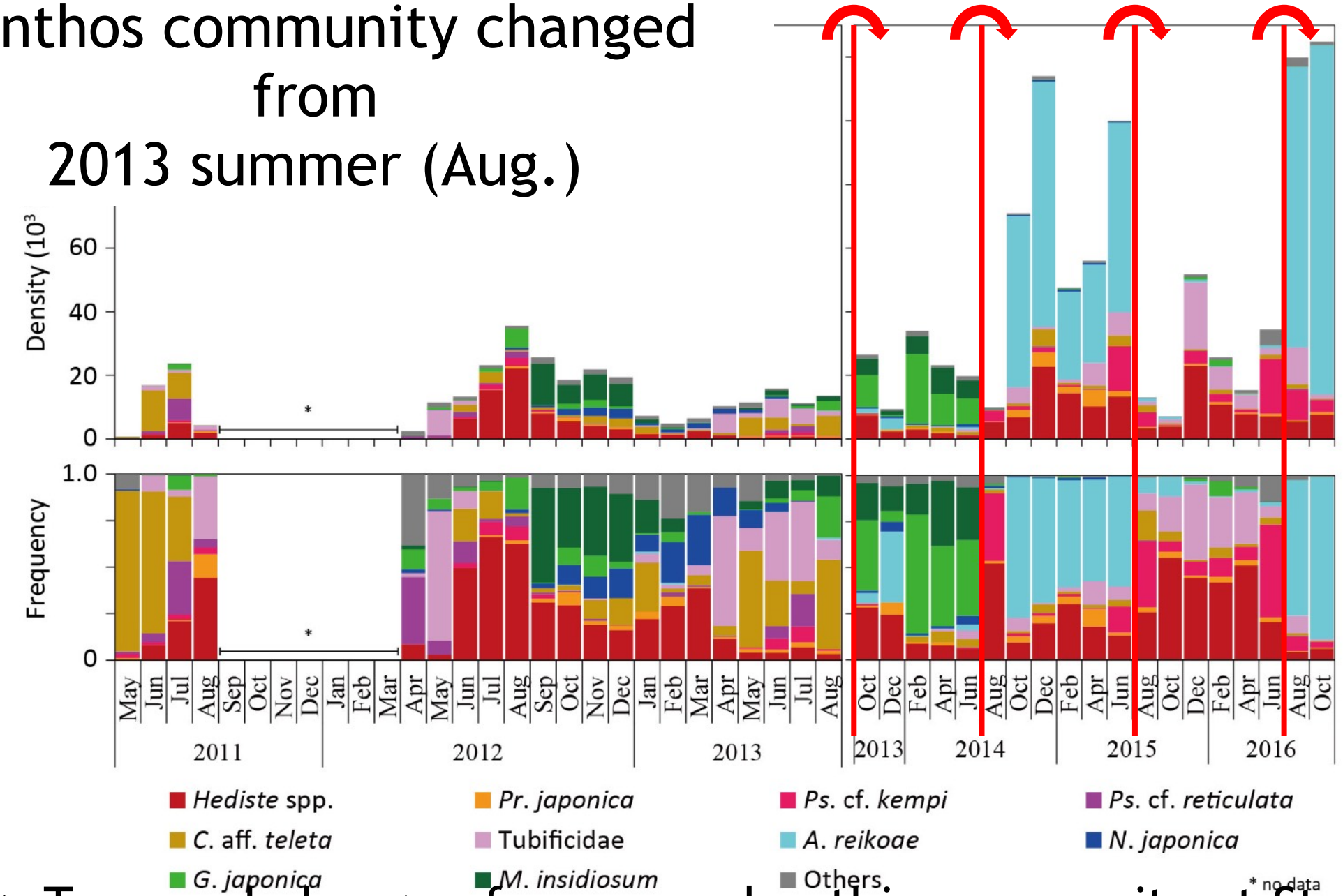


Fig. Temporal change of macrozoobenthic community at Stn A.

Benthos community changed from 2013 summer (Aug.)



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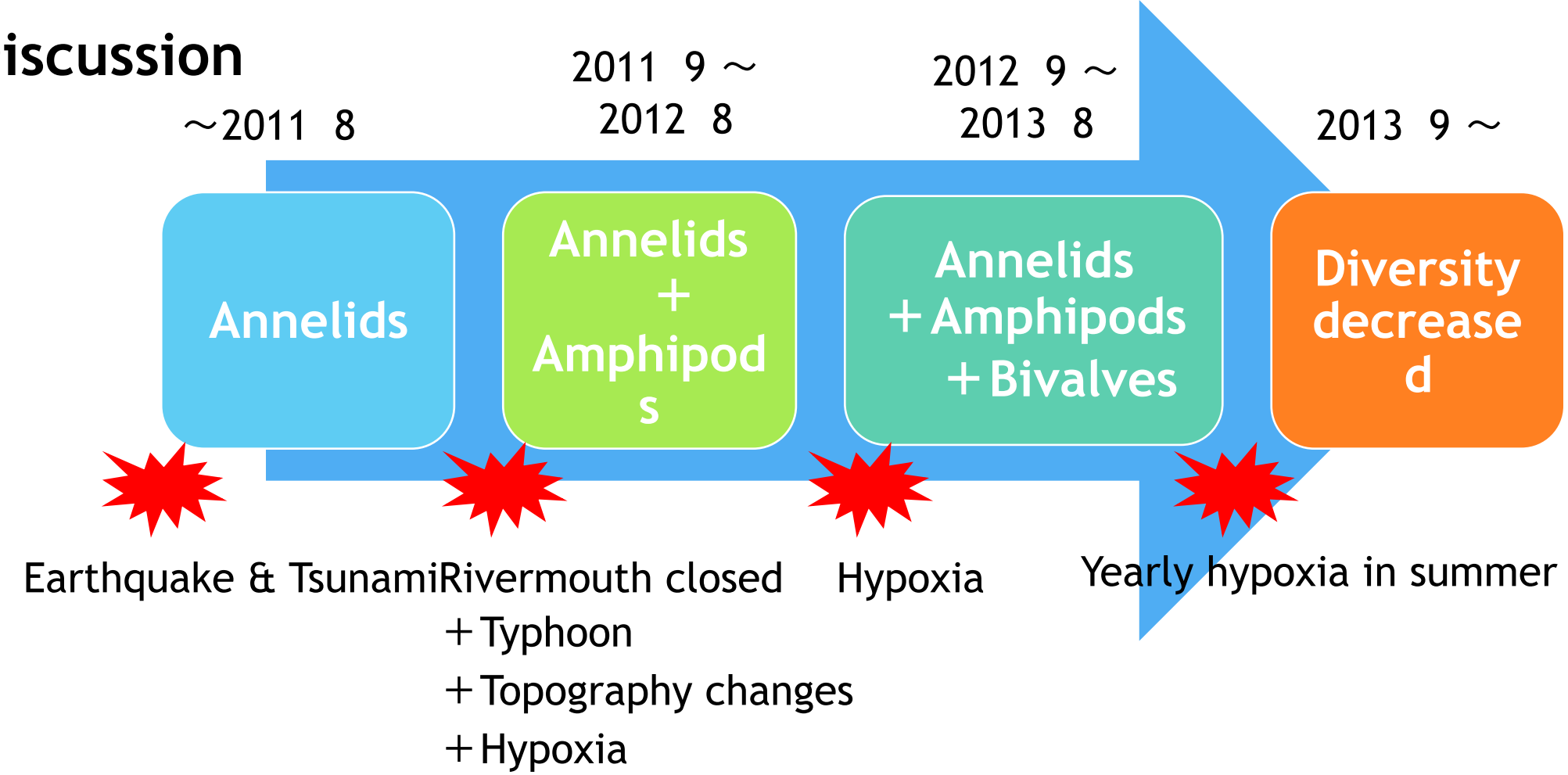
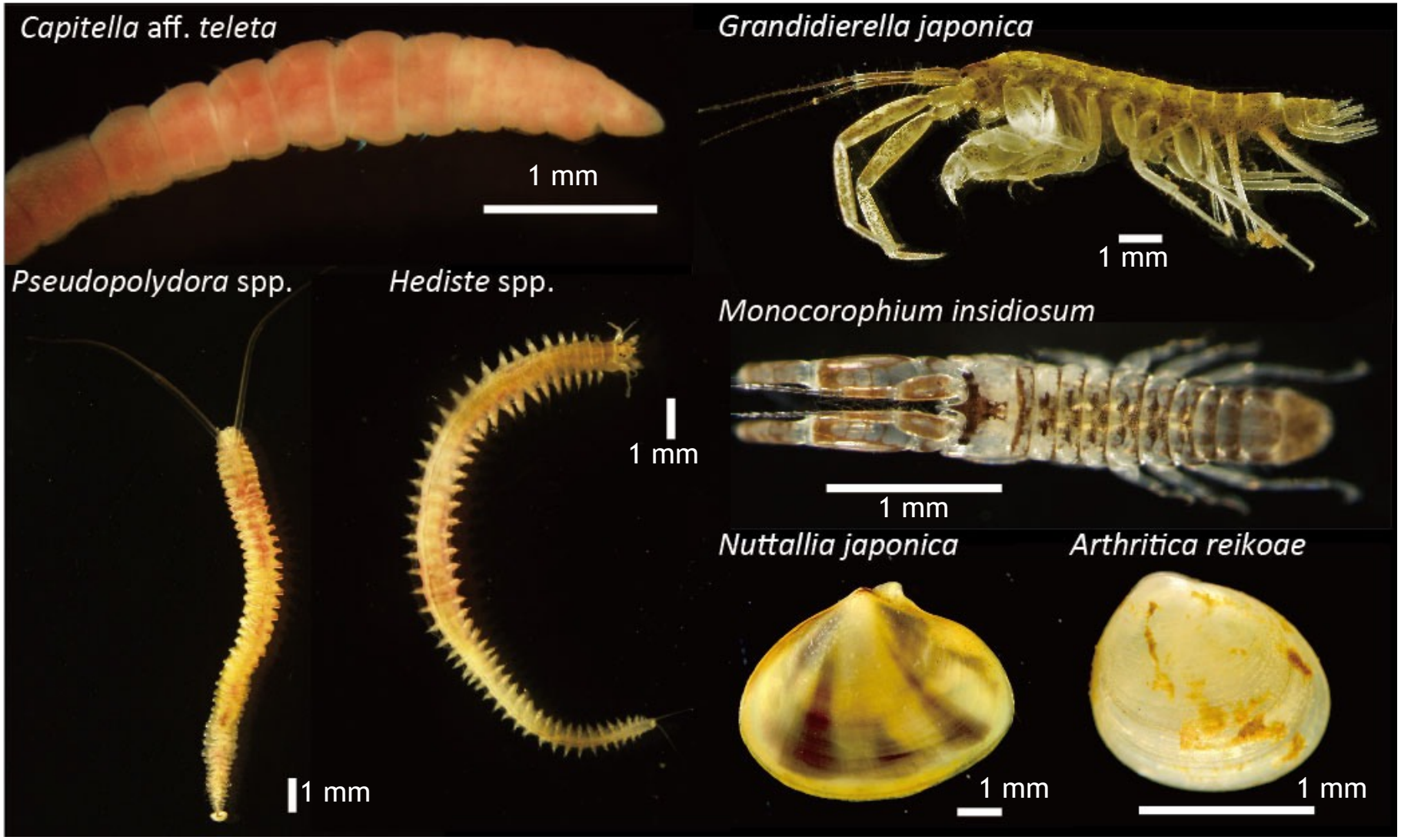
Discussion



From 2013 Sep., each summer hypoxia induced community changes and reduced species diversity → Continued unstable

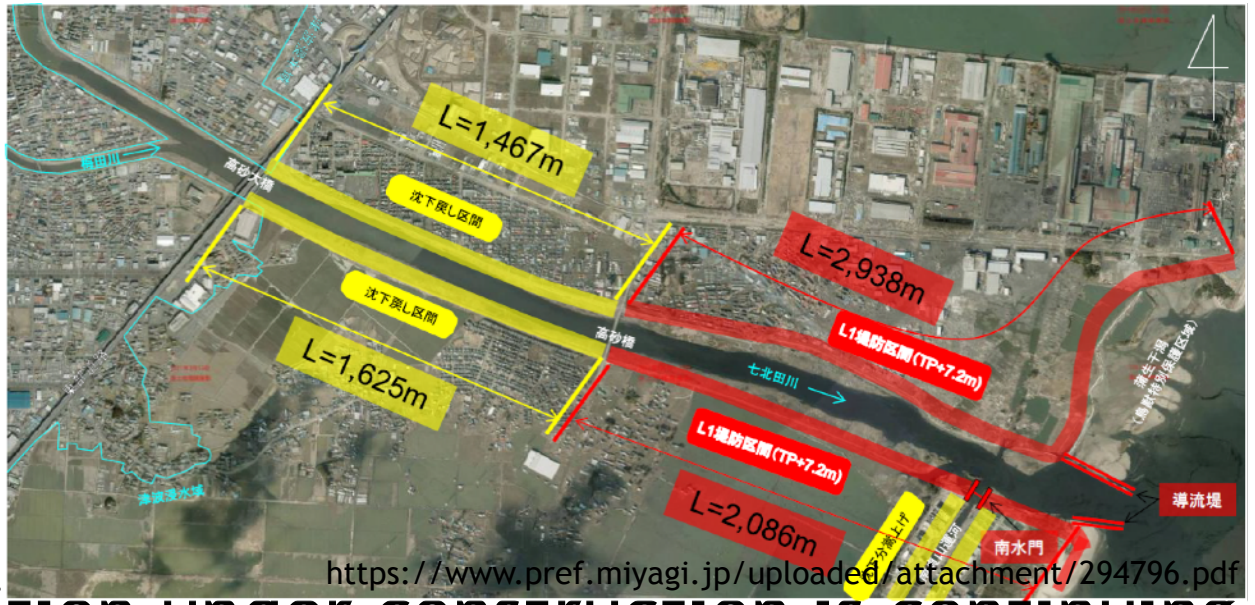
Discussion



No changes in dominant species after the disturbance
(Compared with Kikuchi & Hata 1999)

Discussion

- Hypoxia in each summer has been inducing benthos community to unstable condition



https://www.pref.miyagi.jp/uploaded/attachment/294796.pdf

- Condition under construction is continuing
- Secondary earthquake following tsunami occurred in November 2016

- Monitoring is strongly requested

http://www.asahi.com/articles/photo/AS20161122001274.html

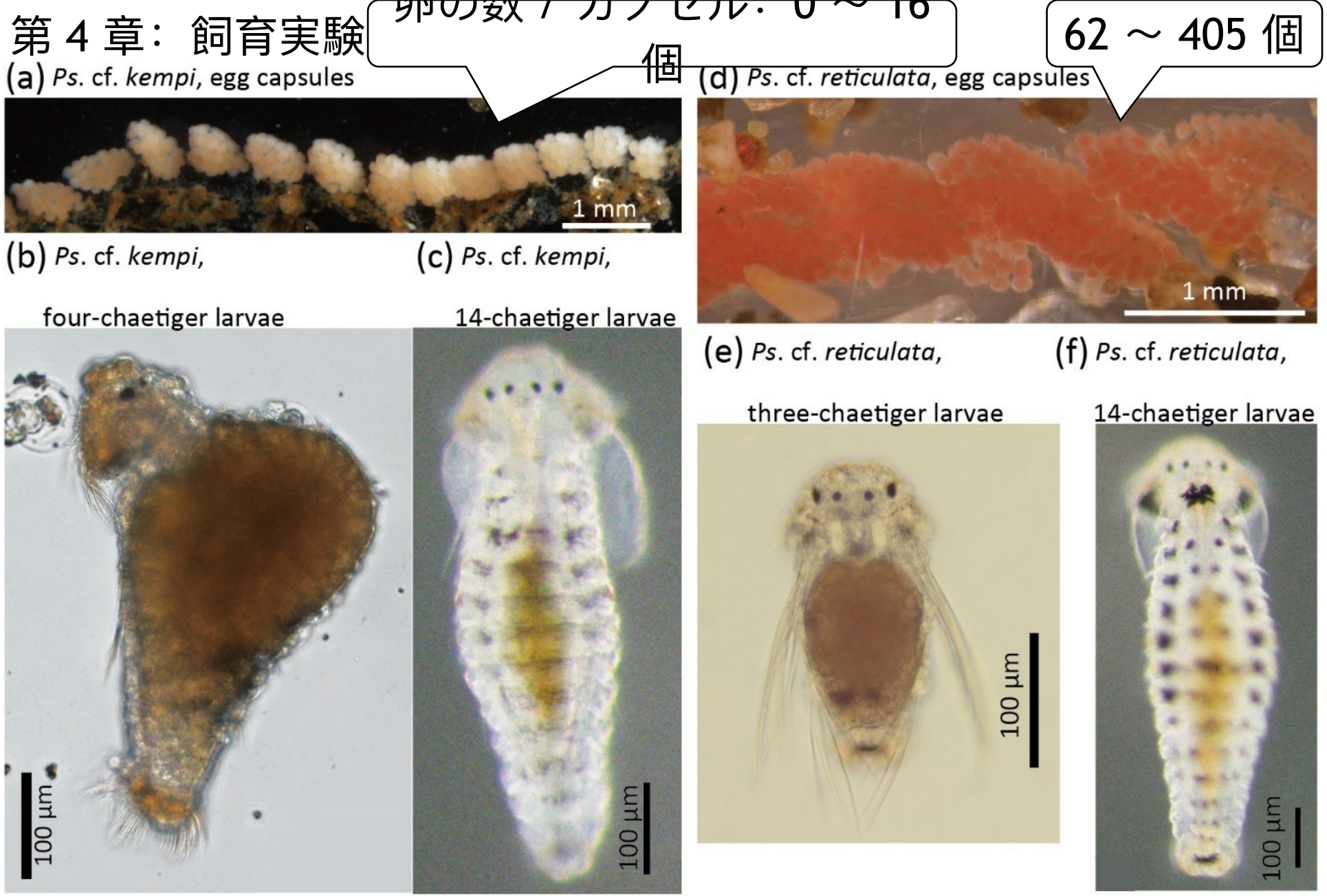
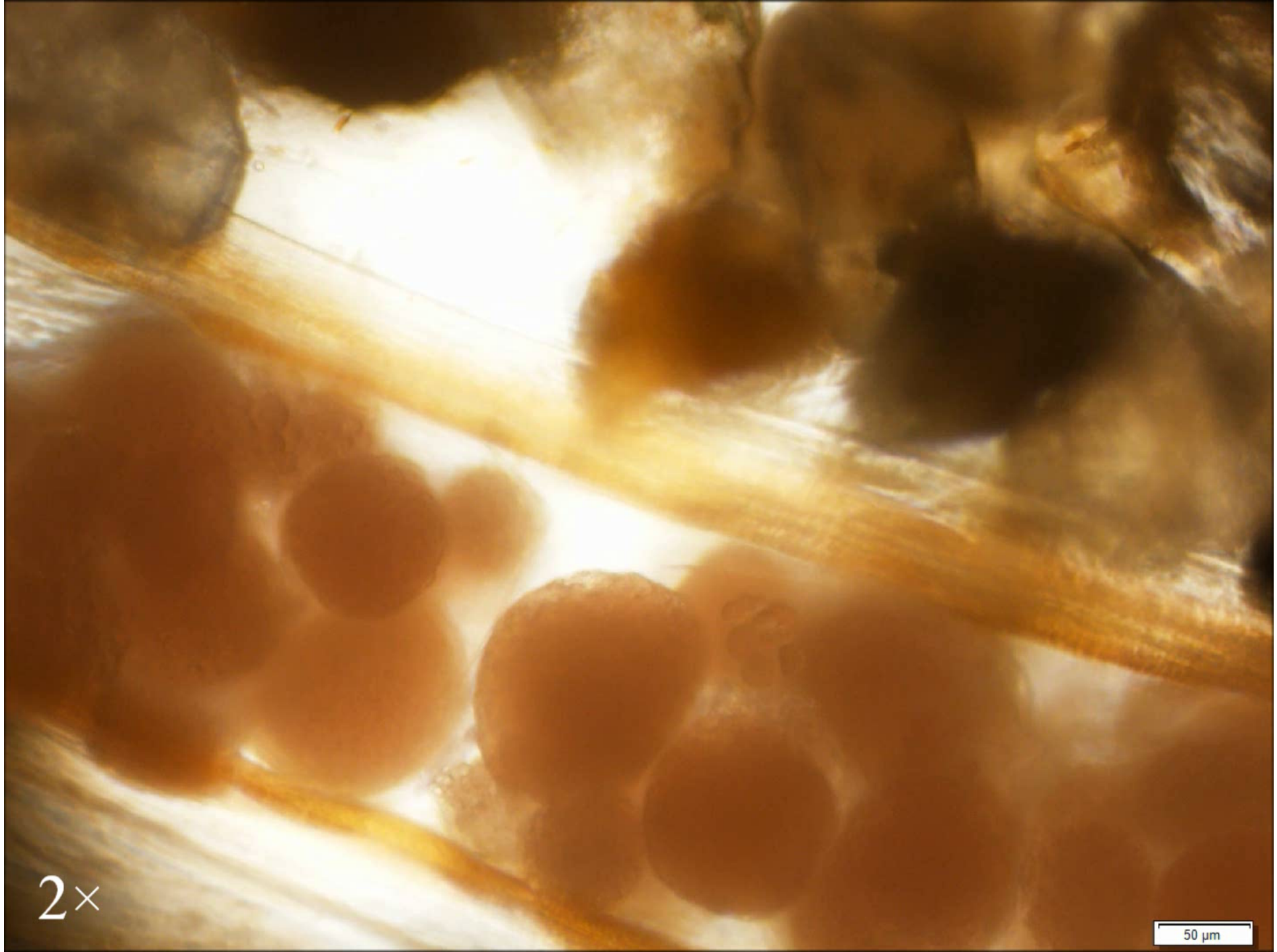
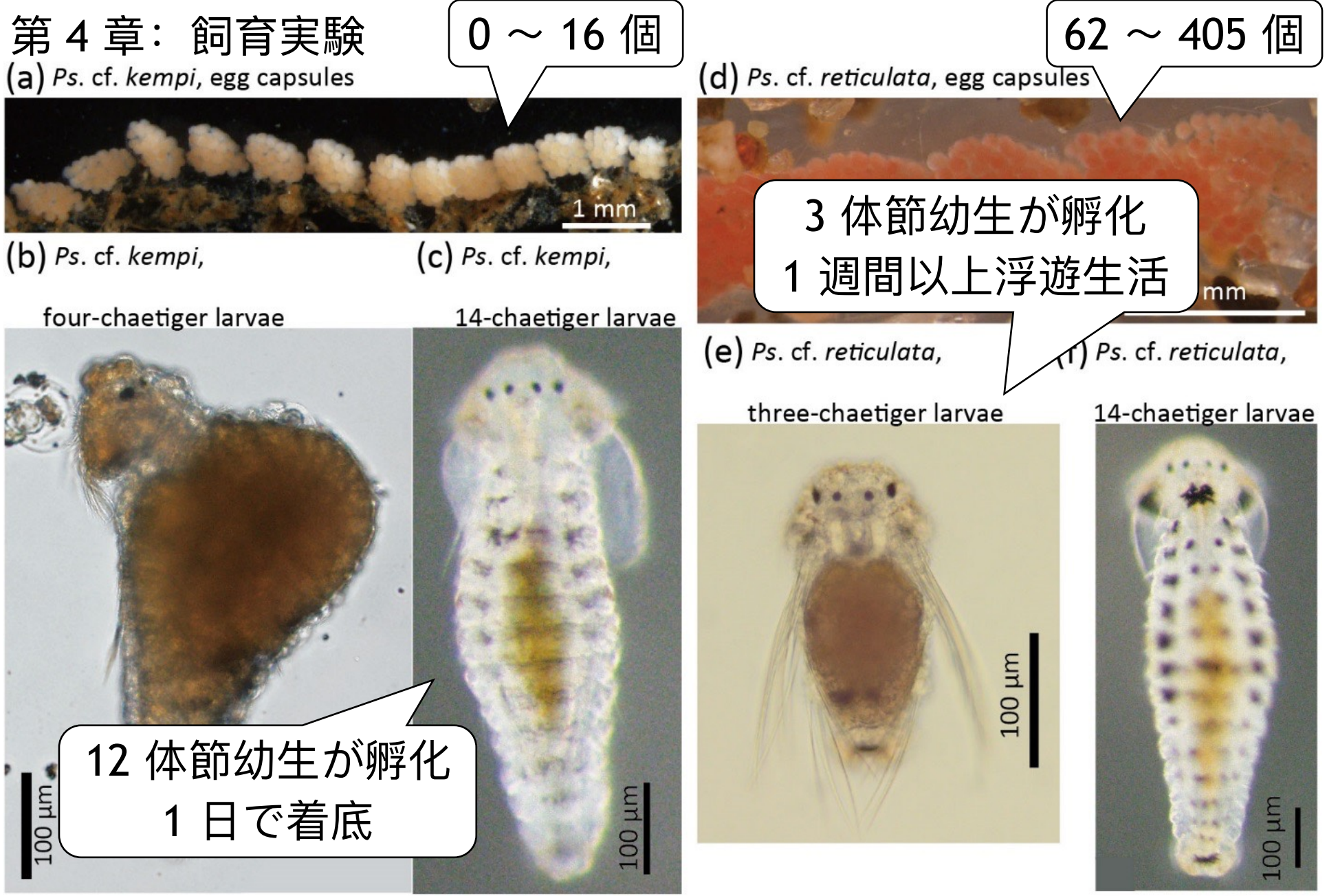


Fig. 13. Larval development of *P.* cf. *kempi* (a-c) and *P.* cf. *reticulata* (d-f) (Kondoh et al. 2017).


2×
50 µm



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