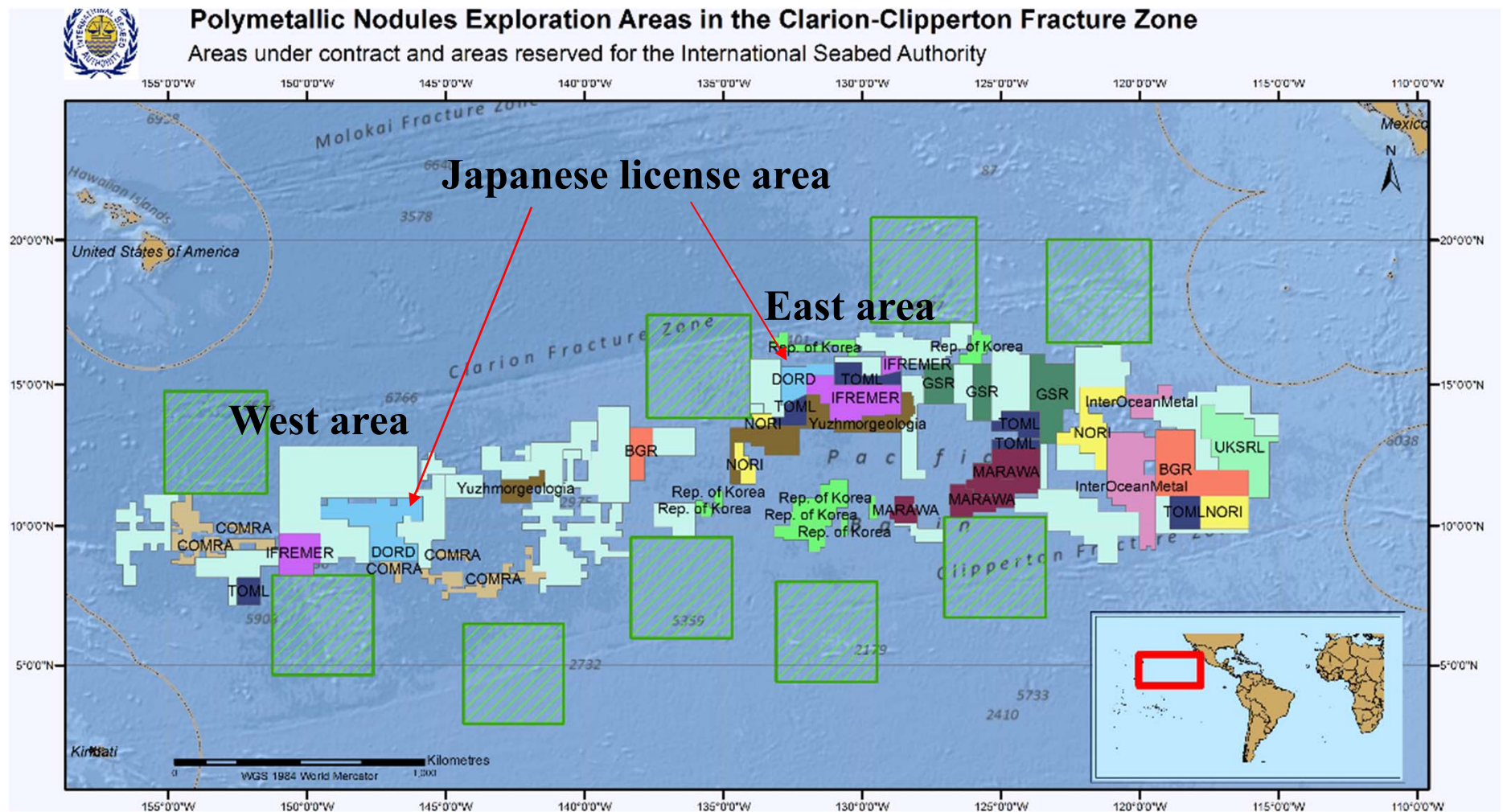


# Status of Japanese activities on biological survey of macrofauna in CCFZ

Deep Ocean Resources Development Co., LTD.

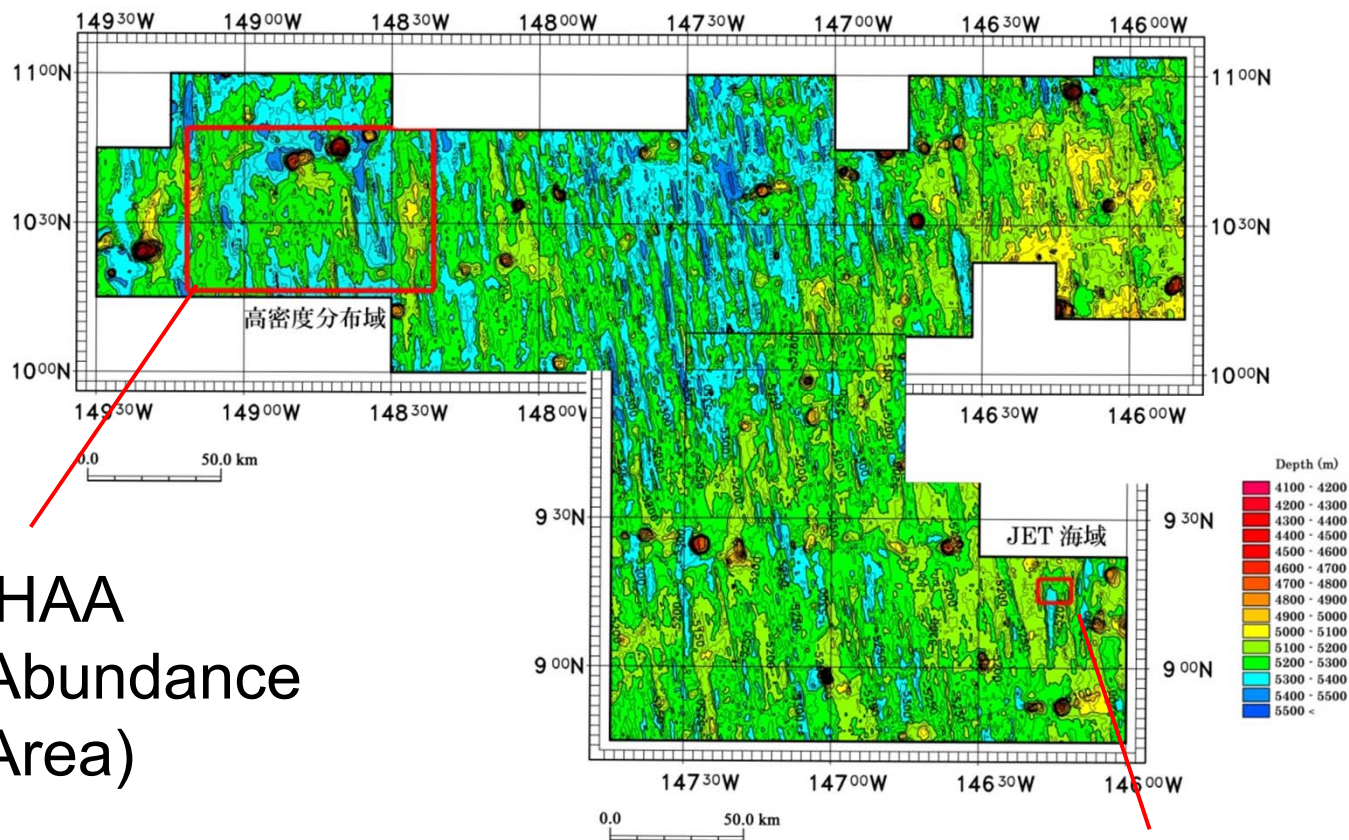


# Location of Japanese license area



# Study area

## West area



HAA  
(High Abundance  
Area)

JET area  
(Japan Deepsea Impact Experiment)

# History of the studies in West area

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1989~ Preliminary technical examination

1991~1996 Field study (JET area)

\* 1994 Impact experiment

(1997~2005 Field study (off Minamitorishima island in the Japanese EEZ))

2010 Establishment of five-years study program

2011 Field study (JET area)

2012 Field study (JET area & HAA)

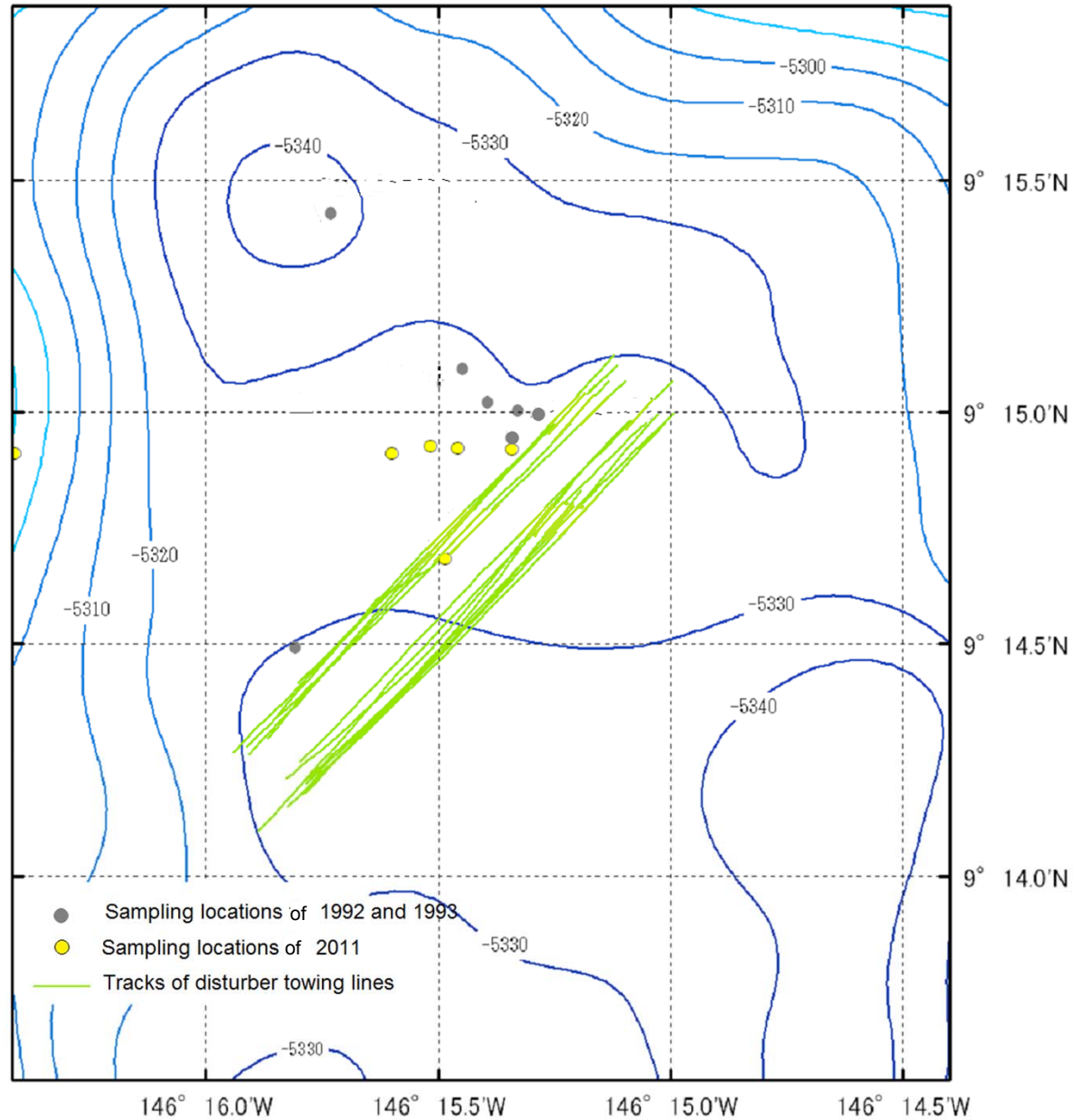
2013 Field study (HAA)



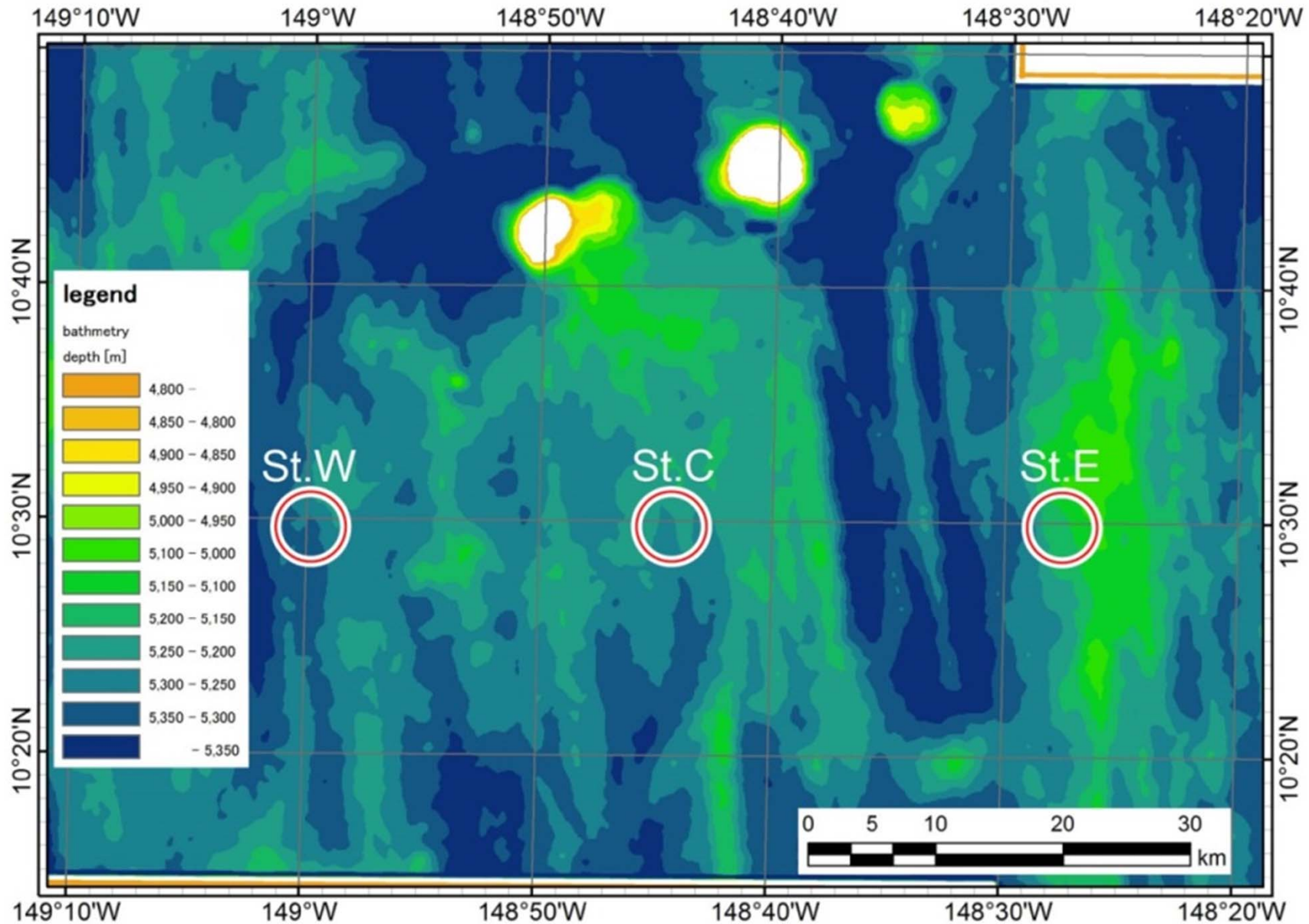
# Sampling locations in JET area



Deep Sea Sediment Resuspension System(DSSRS)



# Sampling locations in HAA



# Status of the baseline study in CCFZ



Category	Research items	Status
Water column (censor)	Temperature	●
	Salinity	●
	Density( $\sigma_t$ )	●
	Dissolved oxygen	●
	Turbidity	●
Water column	pH	●
	Alkalinity	●
	Dissolved oxygen	●
	PO <sub>4</sub> -P	●
	SiO <sub>2</sub> -Si	●
	NH <sub>4</sub> -N	●
	NO <sub>2</sub> -N	●
	NO <sub>3</sub> -N	●

Category	Research items	Status
Water column	TOC	●
	POC	●
	PON	●
	Metals	●
	Chl-a	●
	Pheophytin	●
	Zooplankton	●
	Phytoplankton	●
ADCP	Pico-/nano-plankton	●
	Bacteria	●
ADCP	Water current	●
Sediment trap	Mass flux	●

■ : ISA recommendation

● : done    × : none / a few

# Status of the baseline study in CCFZ



Category	Research items	Status
Camera system	Megafauna	●
Sediment	Particle composition	●
	Density	●
	Water content	●
	IL	●
	TOC	●
	T-N	●
	CaCO <sub>3</sub>	●
	Total silicate	●
	Opal	●
	Pb-210	●
	Metals	●

Category	Research items	Status	
Sediment	Macrofauna	●	
	Meiofauna	●	
	Microfauna	●	
Biology	Genetic information	×	
	Stable isotope	×	
Pore water	PO <sub>4</sub> -P	●	
	SiO <sub>2</sub> -Si	●	
	NH <sub>4</sub> -N	●	
	NO <sub>3</sub> -N	●	
	NO <sub>2</sub> -N	●	
	Alkalinity	×	
	Metals	●	
	ORP	×	
	Sampling	Megafauna	×
		Near-bottom fauna	×

■ : ISA recommendation

● : done    × : none / a few



# Summery of the data in CCFZ



Sampling gear	Survey items	1991-1996	2011-2013
CTD	Temp., Sal., DO etc.	11 sta.	7 sta.
Multi-bottle sampler	DO	-	>90
	Nutrients	>200	>90
	Organic carbon and nitrogen	>200	>90
	Phyto-plankton	>200	-
	Zoo-plankton	9	-
ADCP	Water current	10 sta.	3 sta.
Sediment trap	Mass flux	7 sta.	3 sta.
Camera system	Megafauna	11.4km	30.0km
MC / BC	Sediment(Chemical &Physical)	>700	>100
	Pore water	>300	>5
	Bacteria	>350	>100
	Meiofauna	>350	>100
	<b><u>Macrofauna</u></b>	<b><u>23</u></b>	<b><u>8</u></b>

# Macrofauna samples



Year	Cruises	Area	No.samples
1991	JOGMEC	JET	5
1992	R/V Hakurei-maru No.2	JET	4
1993		JET	7
1996		JET	7
2011		JET	5
2013	Hawaii Univ. R/V Kilo Moana	HAA	3



# Sampling method

Box corer



45cm

15cm

JET area



HAA



- Sampled by the box corer
- Divided into 0-5cm and 5-10cm layers
- Retained by a 300 $\mu$ m sieve (250 $\mu$ m recently)
- Fixed by 10% neutralized formalin

# Issues of macrofauna study in Japan

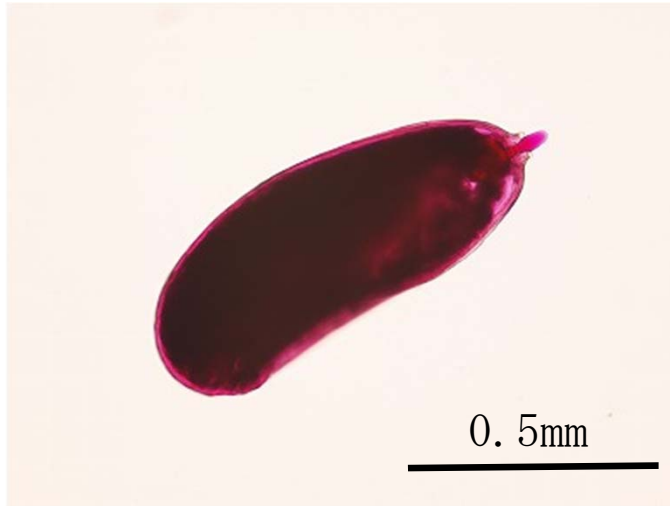
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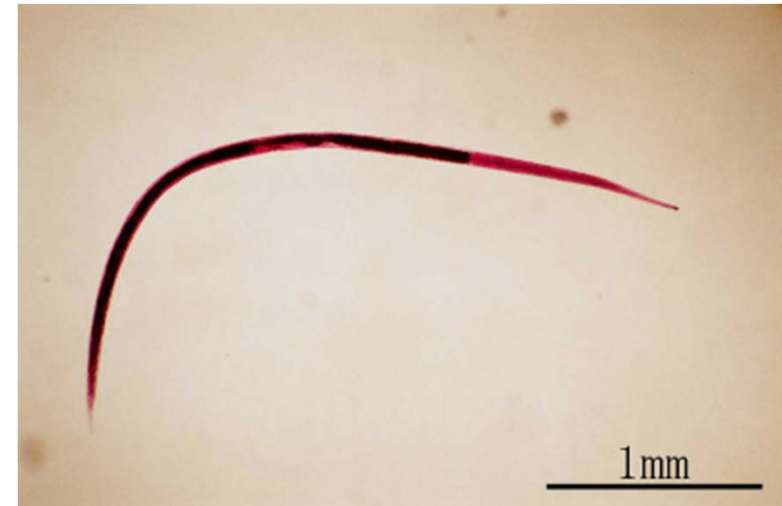
- The emergent organisms has been classified only into high taxonomic groups
- The size of sampling quadrates differed between survey years
- We have mostly used 300 $\mu$ m sieve to obtain macrofauna in the past studies (should be 250 $\mu$ m as recommended by ISA)
- Sample sizes are not enough for statistical analysis especially in HAA



# Observed benthic fauna(>300μm)



Foraminiferida



Nematoda



Gastropoda

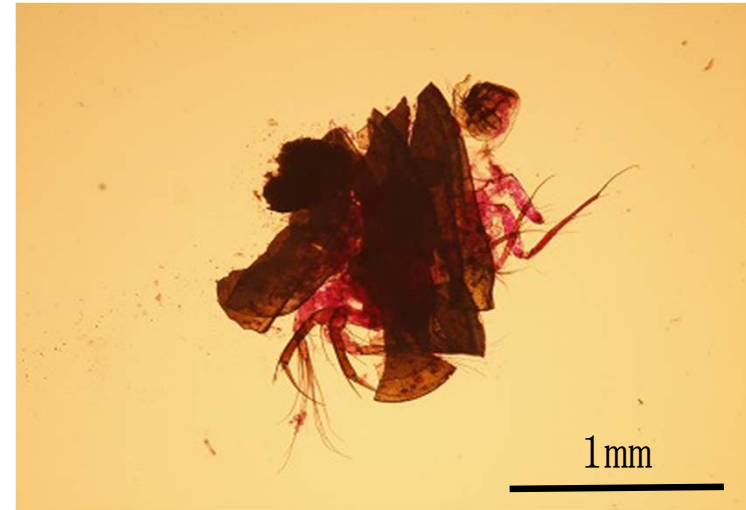


Bivalvia

# Observed benthic fauna (>300µm)



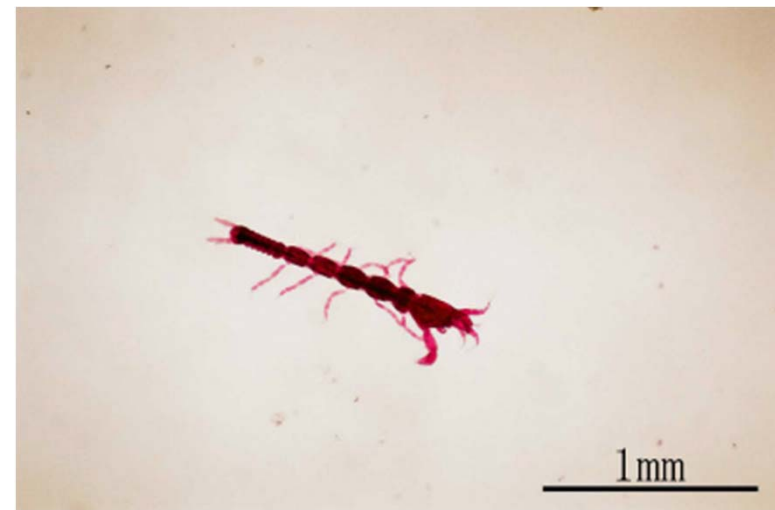
Polychaeta



Ostracoda



Harpacticoida



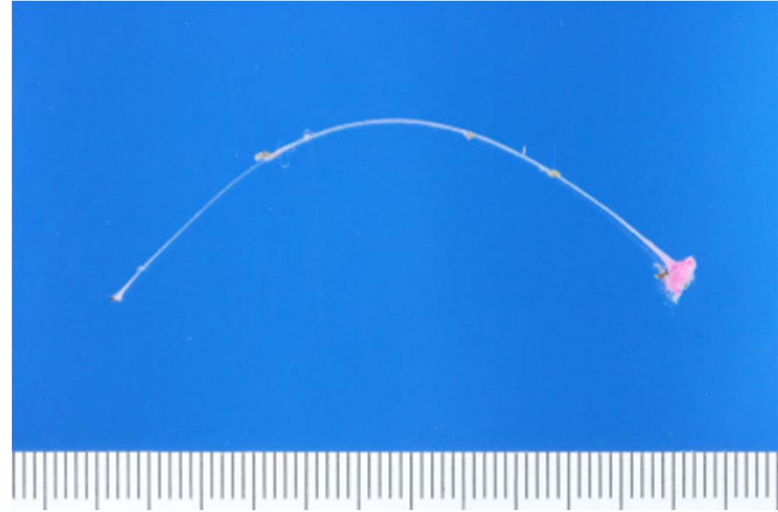
Tanaidacea

# Observed nodule fauna

Nodule fauna was removed from nodule surface using tweezers



Hydrozoa



Gorgonacea



Tanaidacea



Isopoda

# Occurrence of macrofauna



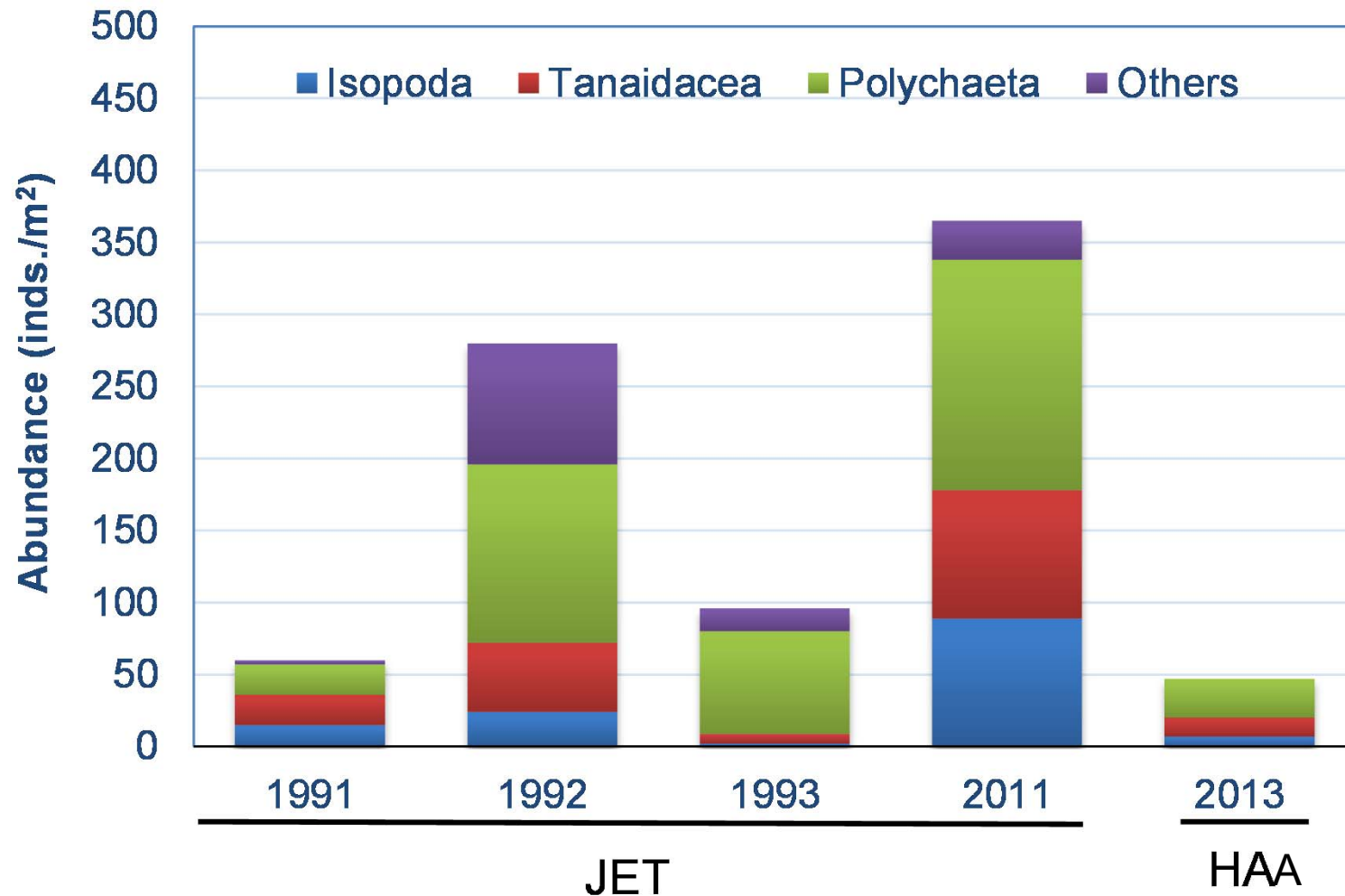
Taxa \ Year	1991	1992	1993	2011	2013
Hydrozoa	+	+	+		
Gastropoda		+	+	+	
Bivalvia	+	+	+	+	
Oligochaeta			+		
Polychaeta	+	+	+	+	+
Echiurida			+		
Brachiopoda			+		
Tanaidacea	+	+	+	+	+
Isopoda	+	+	+	+	+
Urochordata			+		

\*<sup>1</sup> Nematoda, Harpacticoida and Ostracoda were removed from the list in accordance with the definition of macrofauna (Danovaro, 2010)

\*<sup>2</sup> Foraminiferida was excluded from the analyses due to the difficulty in distinguishing its viability

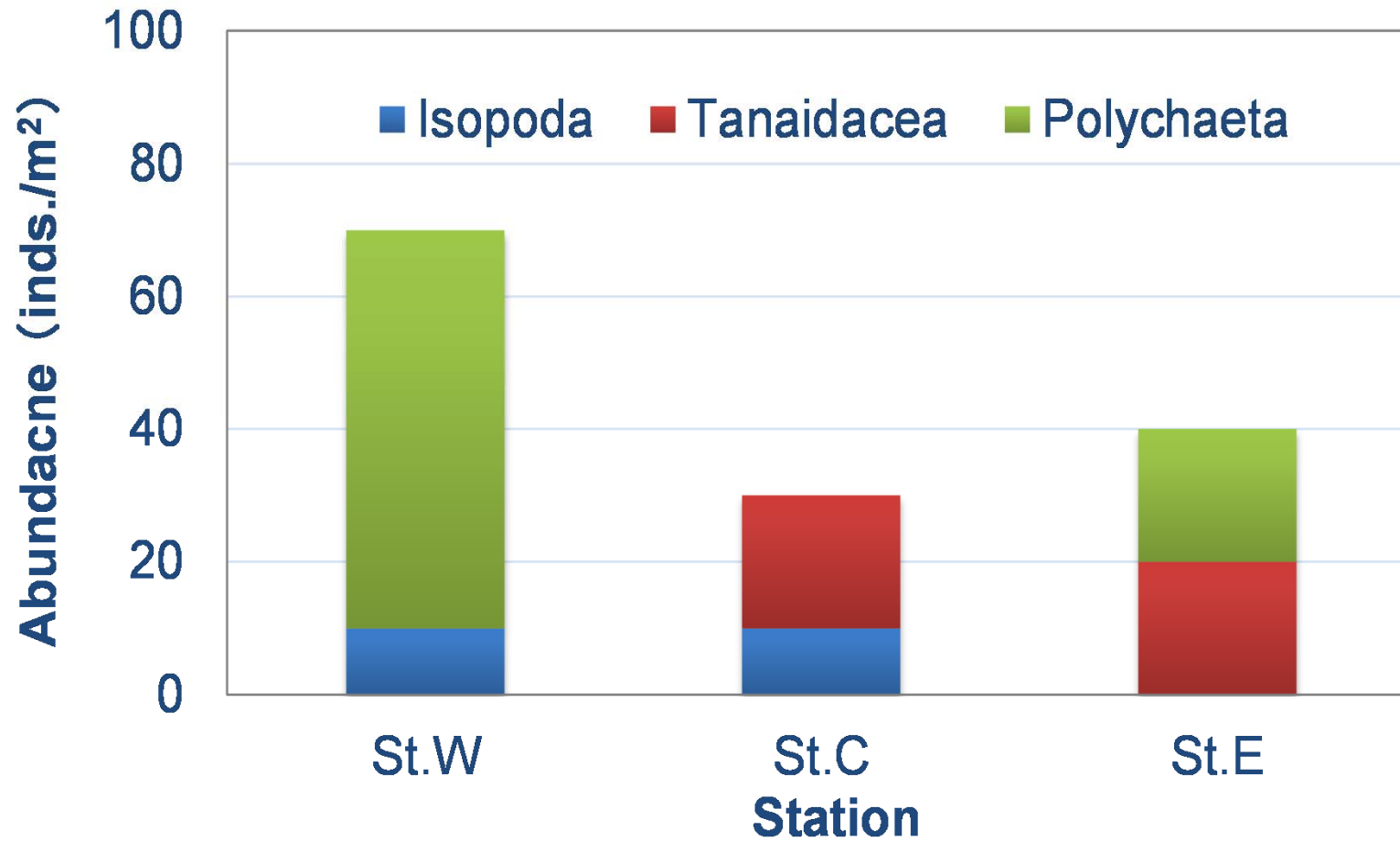


# Macrofauna abundance



\*The sampling area per location is 0.12~0.16m<sup>2</sup> for 1991, 1992 and 1993, and 0.09m<sup>2</sup> for both 2011 and 2013

# Macrofauna abundance in HAA



# Prospective

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Future works of the biological survey need to;

- follow the recommendations for the guidance of contractors (ISBA/19/LTC/8)
- obtain comparable data between JET and HAA and within each area.
- classify the macrofauna into lower taxonomic groups  
(morphological / molecular biological approaches)





감사드리다

*tatami* stones in Okinawa