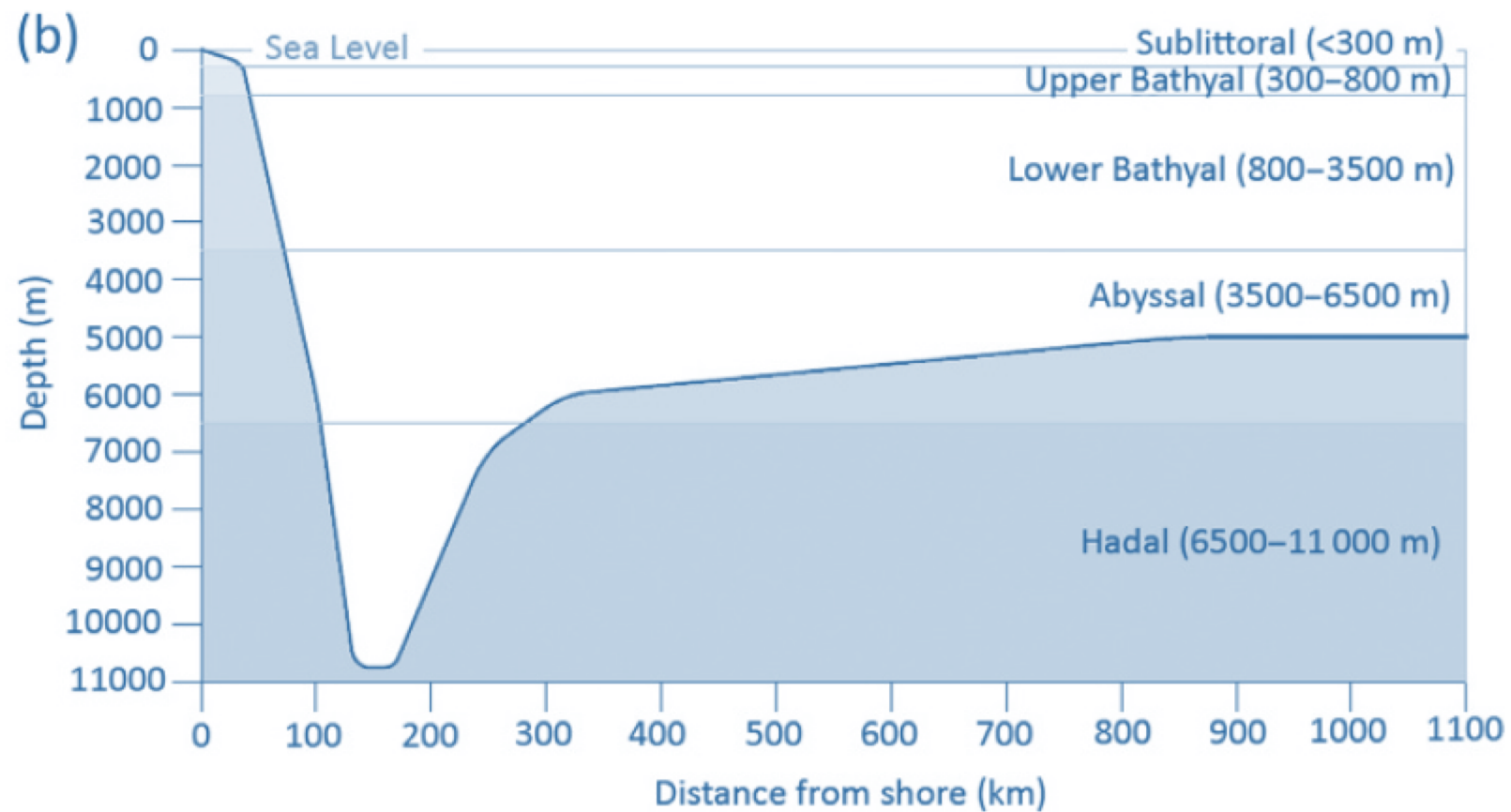
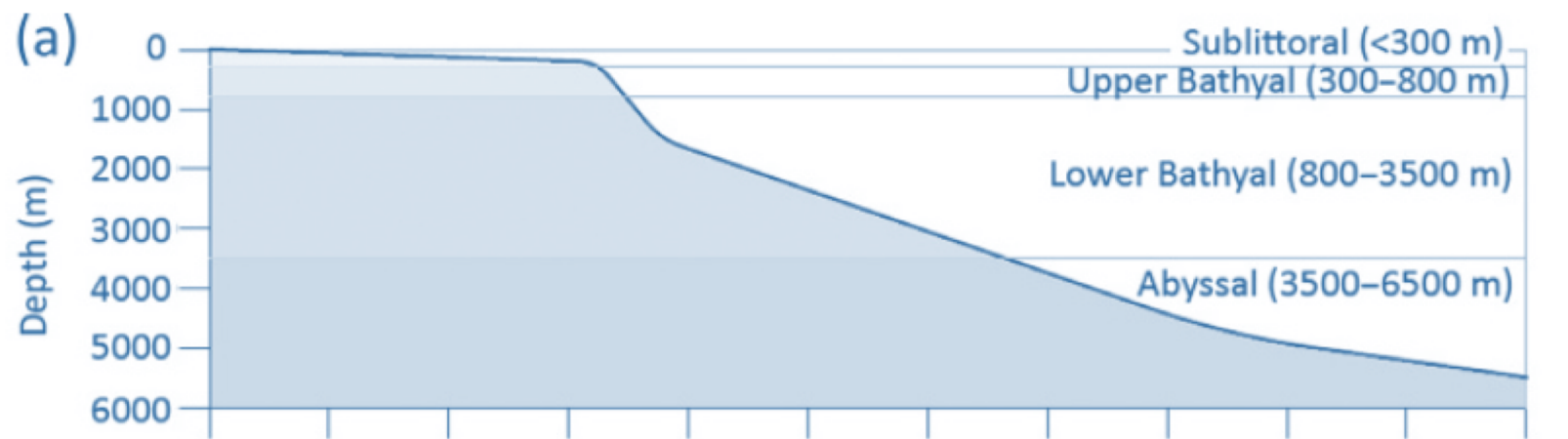


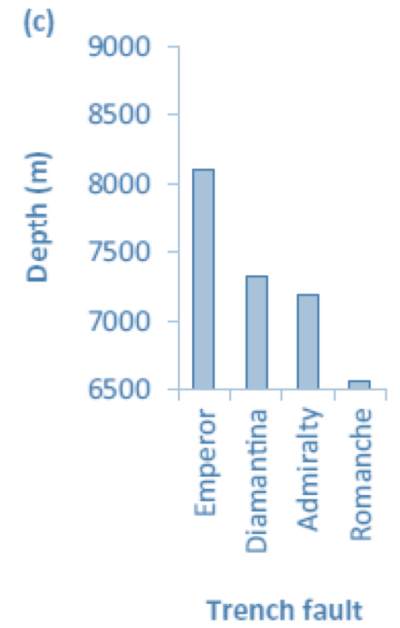
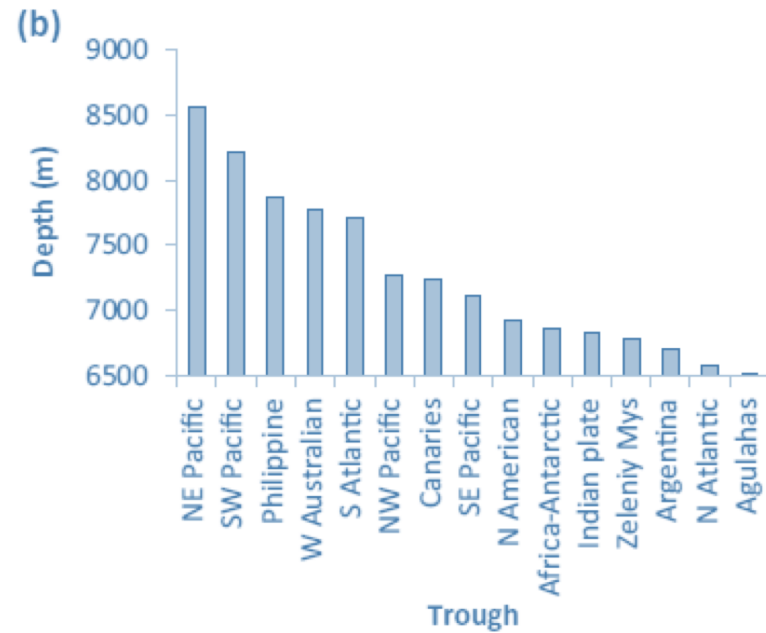
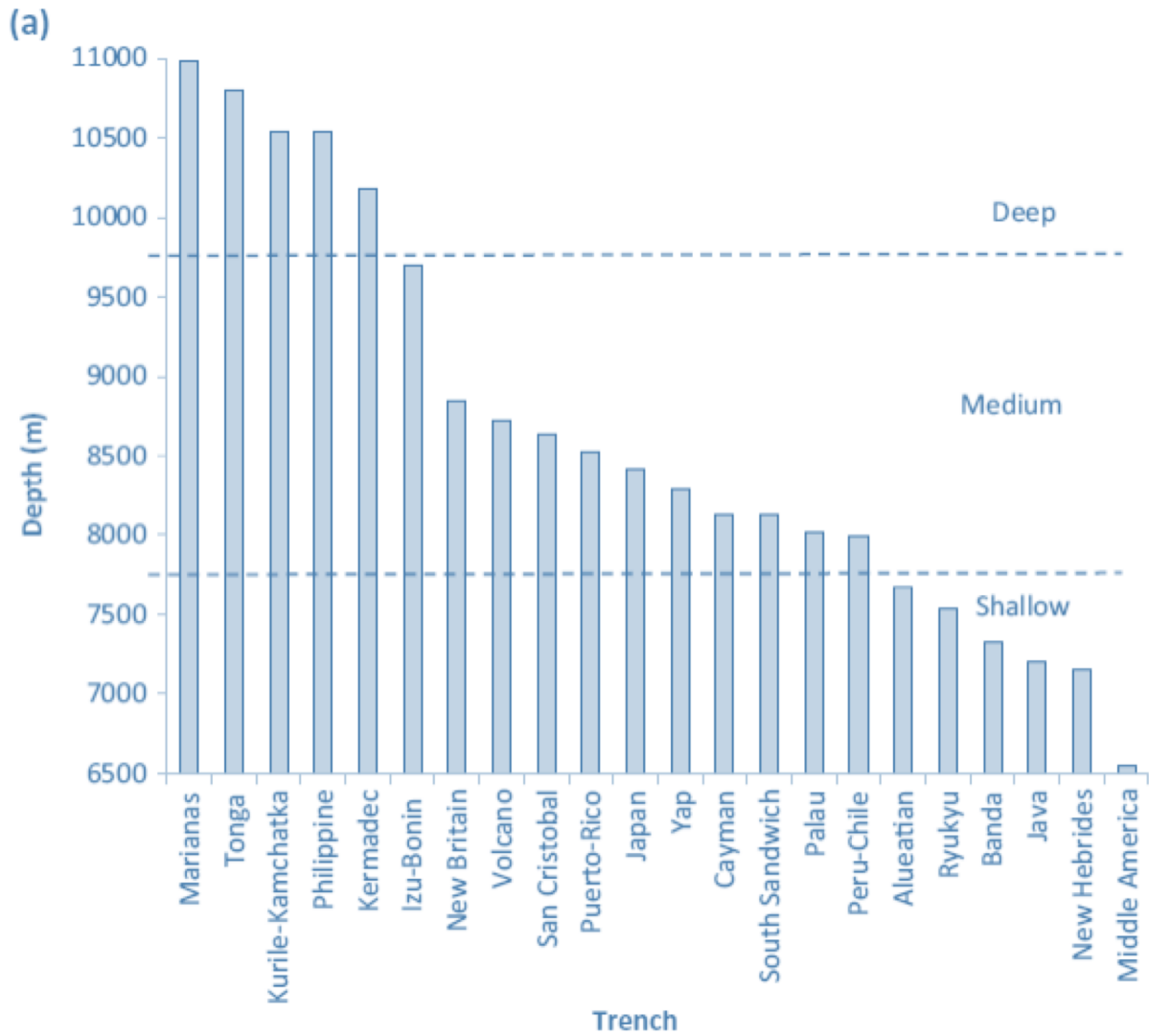
HADAL

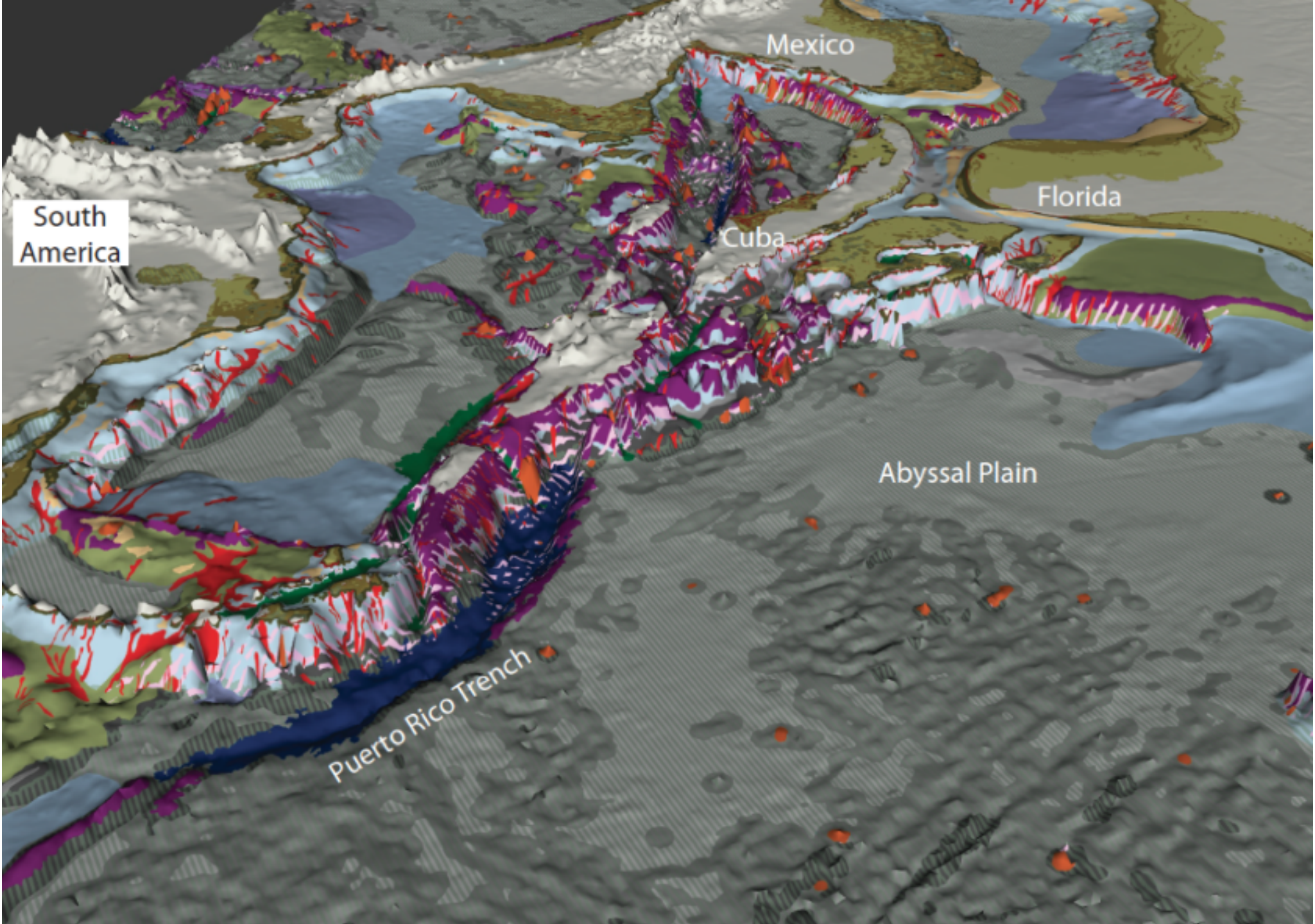
Deep-Sea Research, 1954, Vol. 2, pp. 48 to 58. Pergamon Press Ltd., London.

On the sounding of trenches

ROBERT L. FISHER







South America

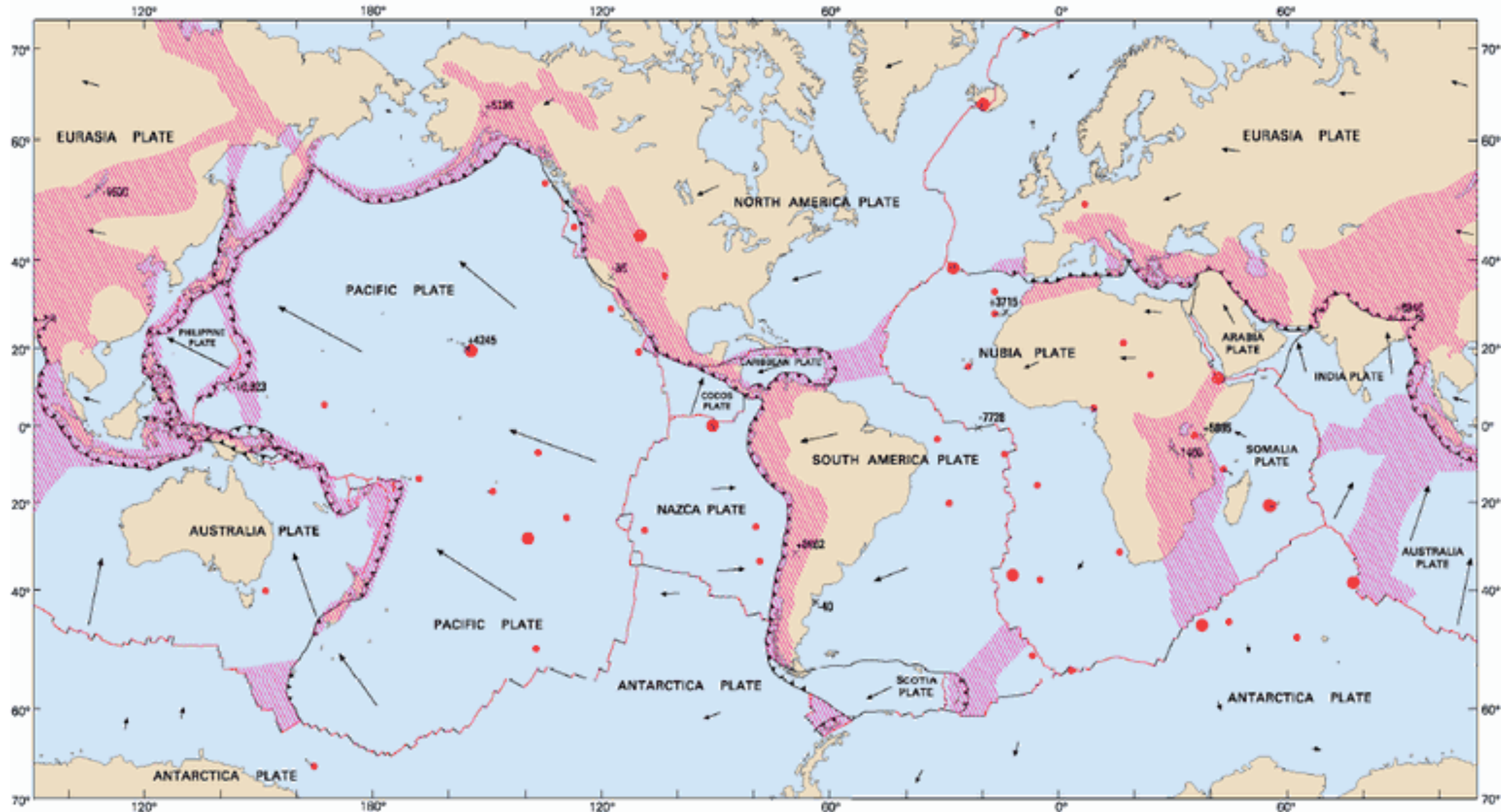
Mexico

Florida

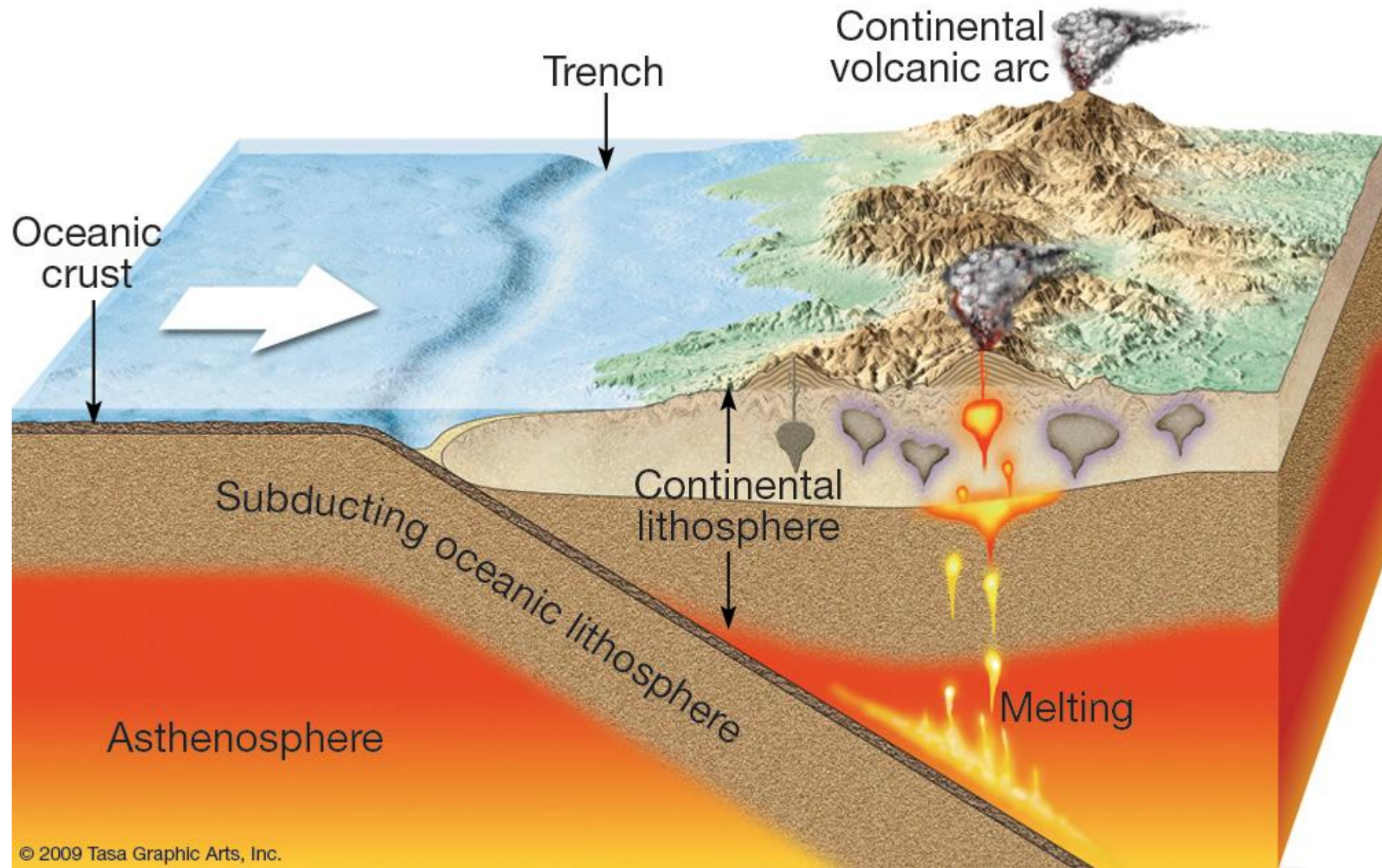
Cuba

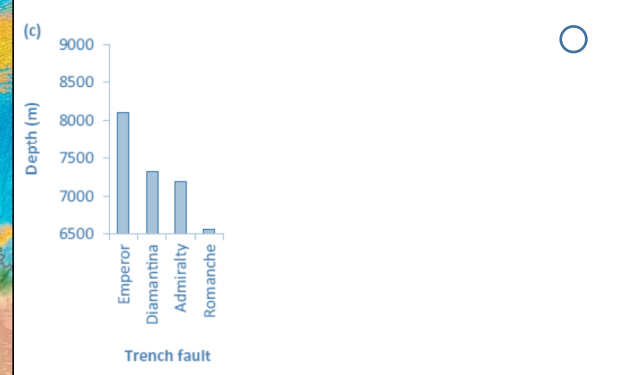
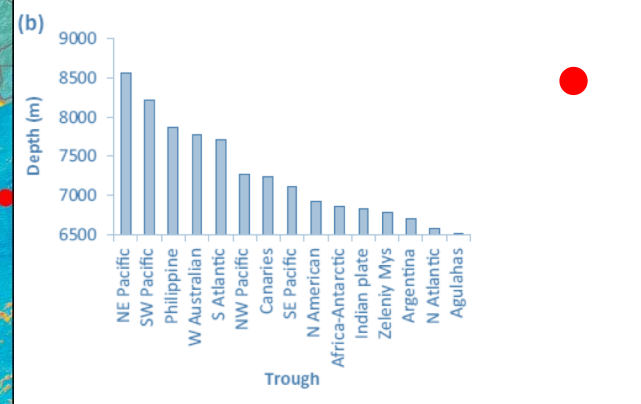
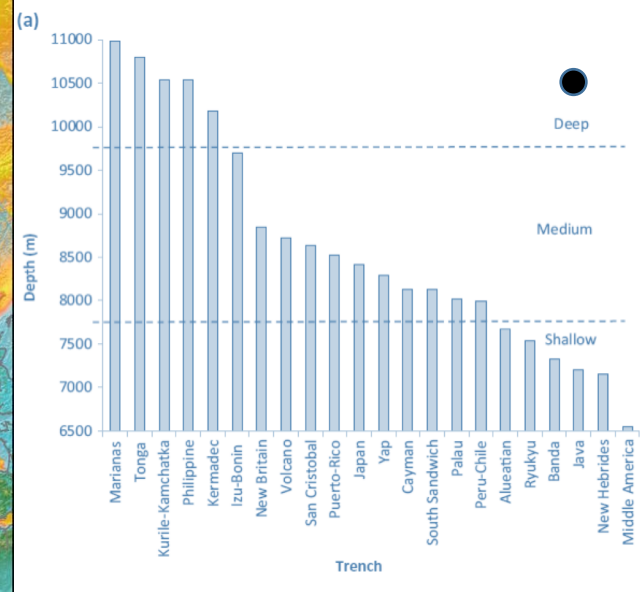
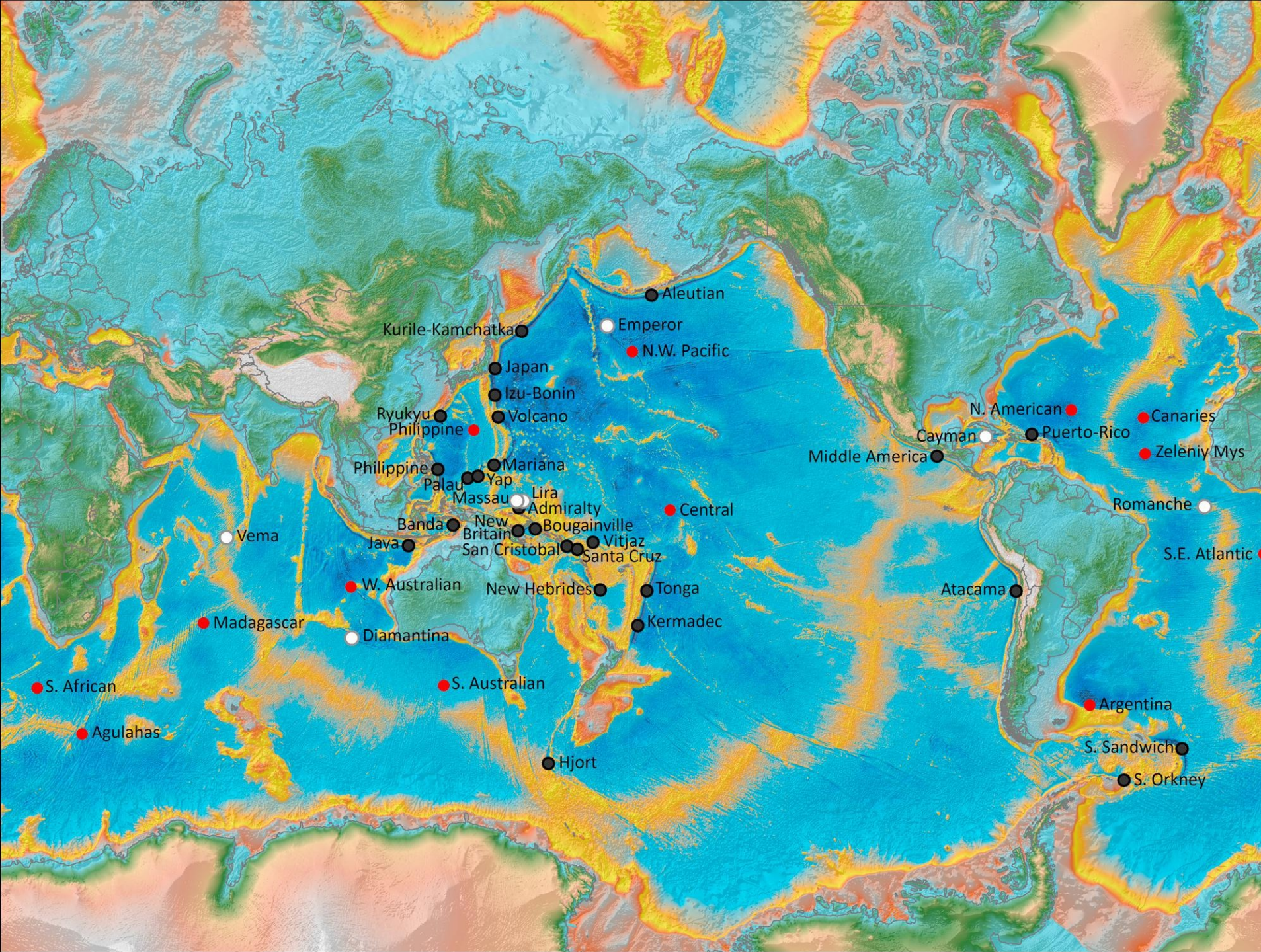
Abyssal Plain

Puerto Rico Trench



— Divergent plate boundary
 Convergent plate boundary
 — Transform plate boundary
 Diffuse boundary
● Selected hotspots
 ← Plate motion
 ×⁺⁴²⁴⁵ Elevation





CHALLENGER

1870's



VITJAZ

1940's and 1950's

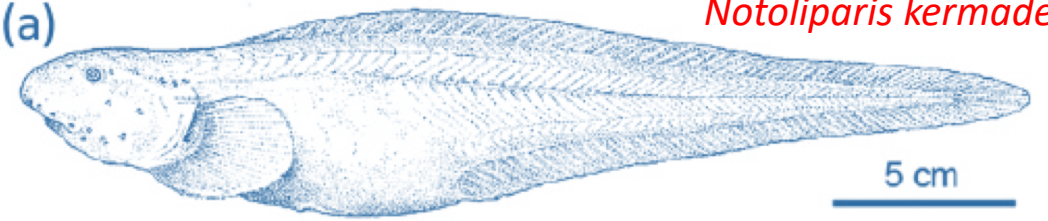


GALATHEA

1950's

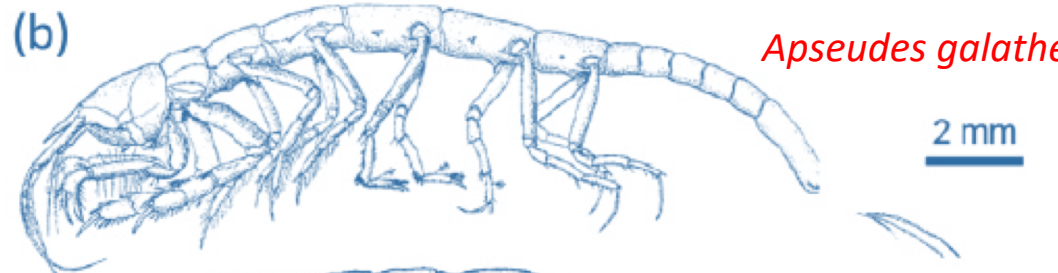


(a)



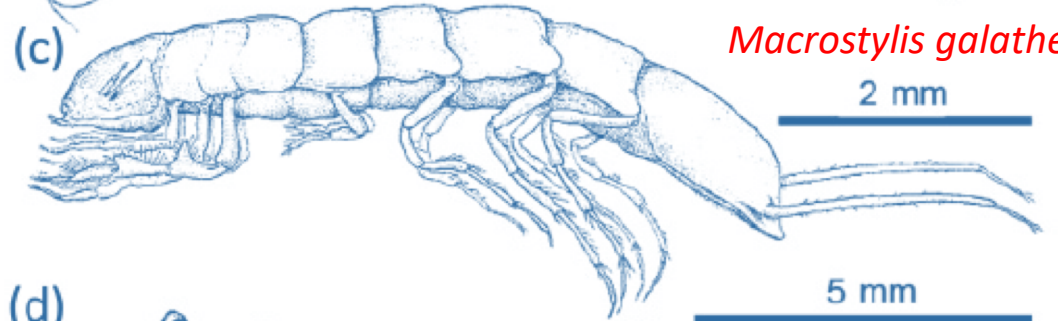
Notoliparis kermadecensis

(b)



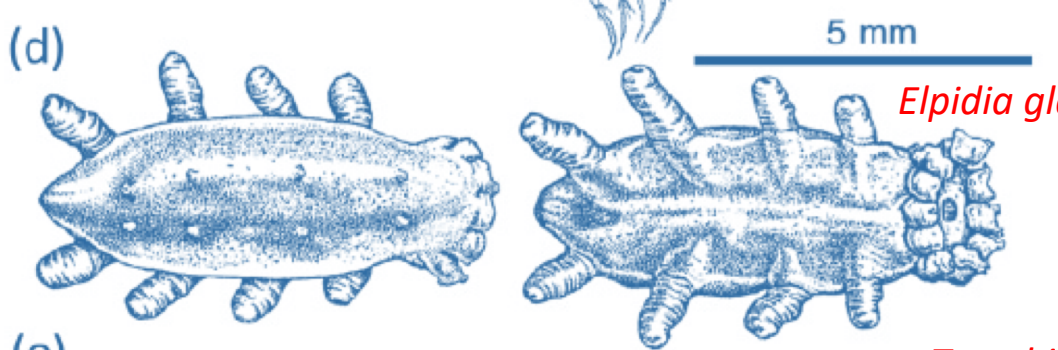
Aapseudes galathea

(c)



Macrostylis galathea

(d)

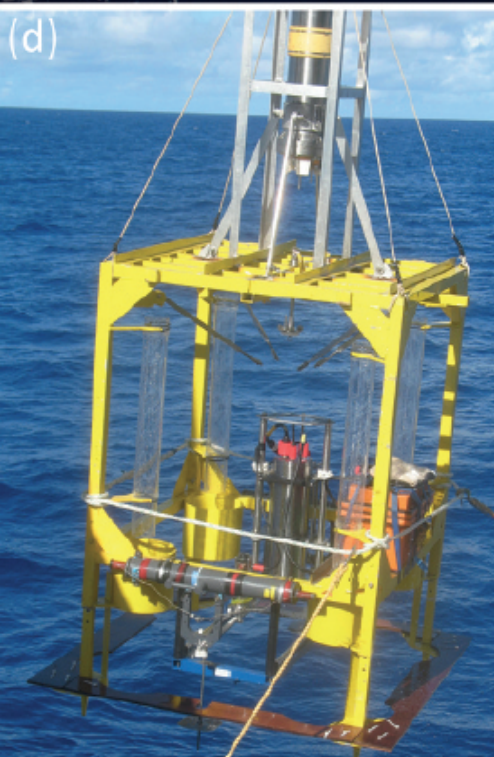
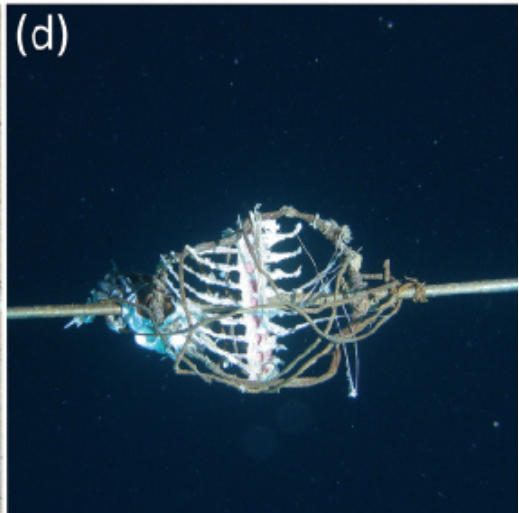
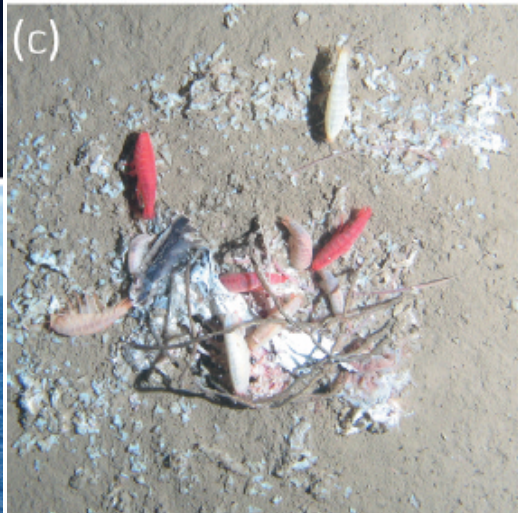
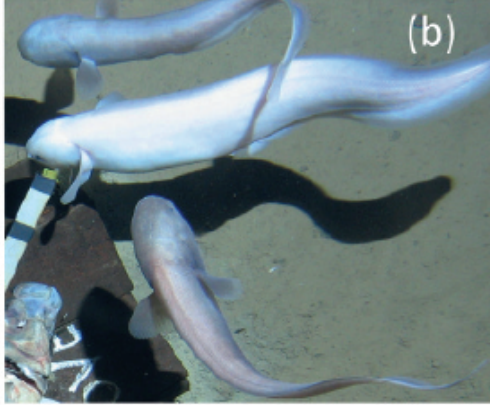
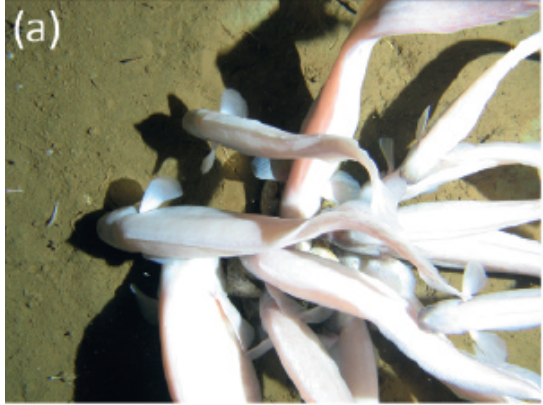
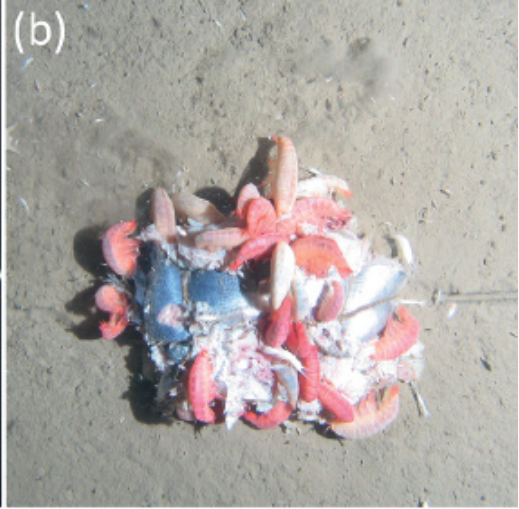
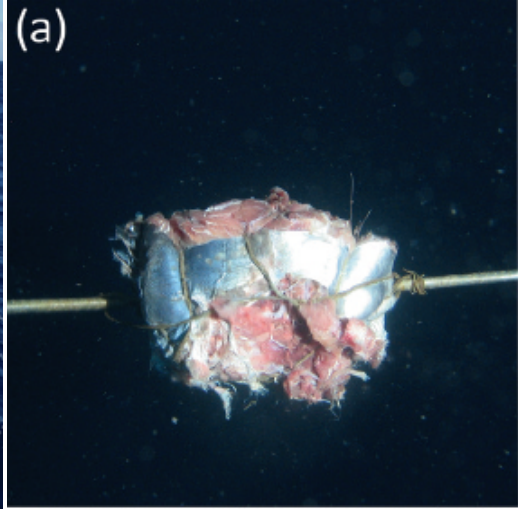
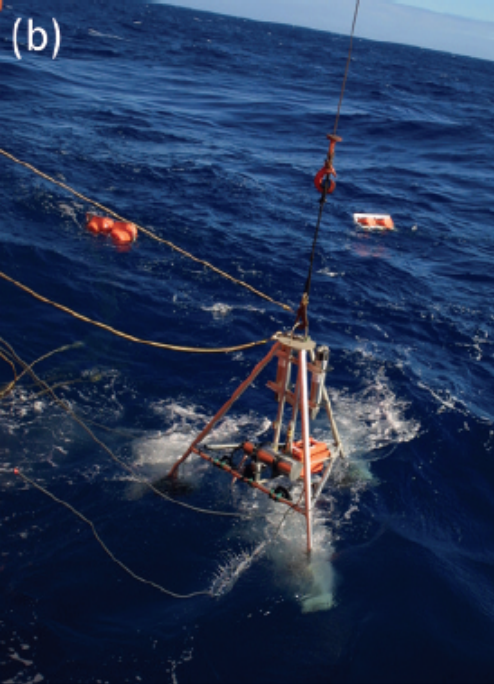


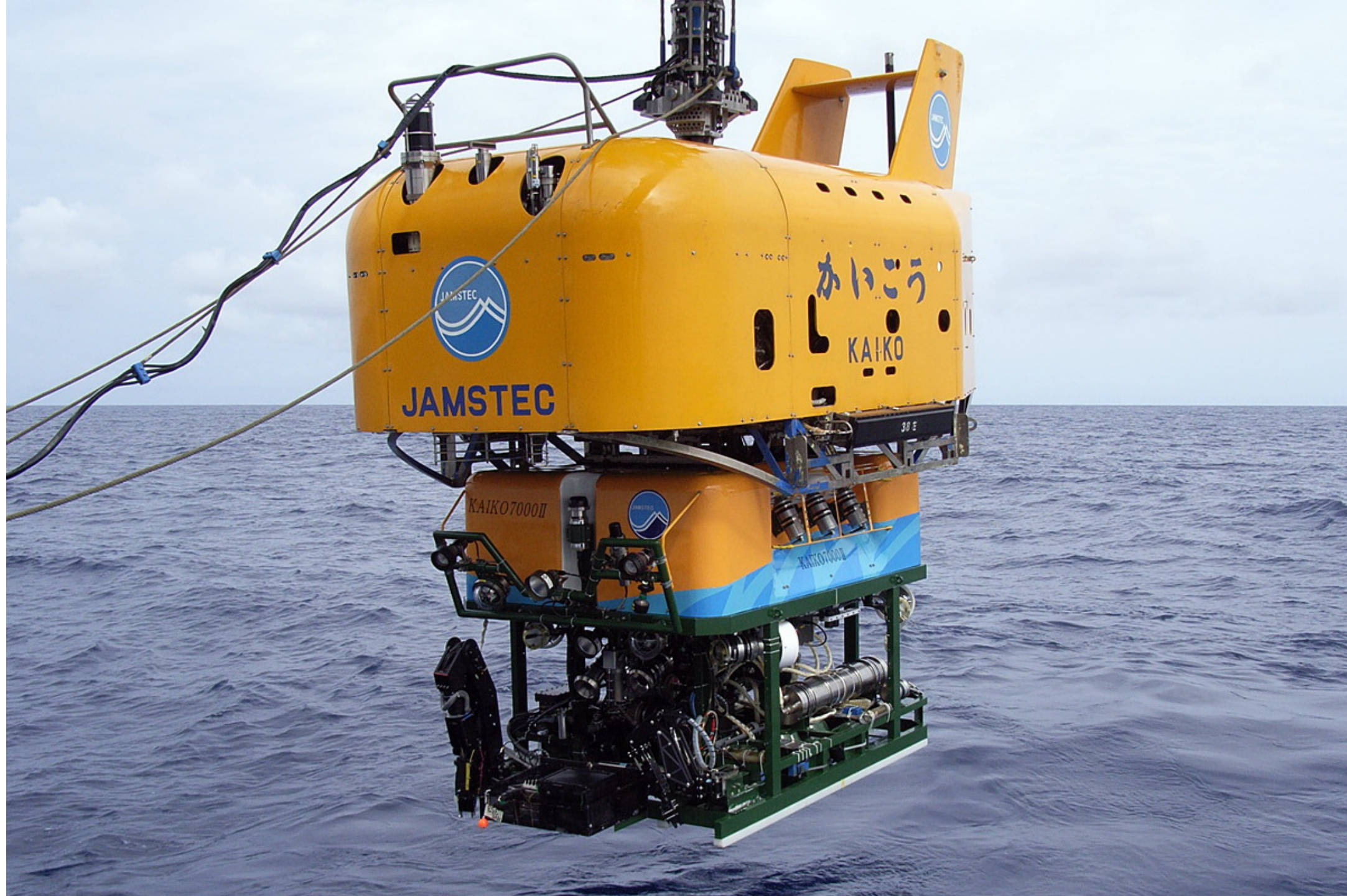
Elpidia glacialis

(e)

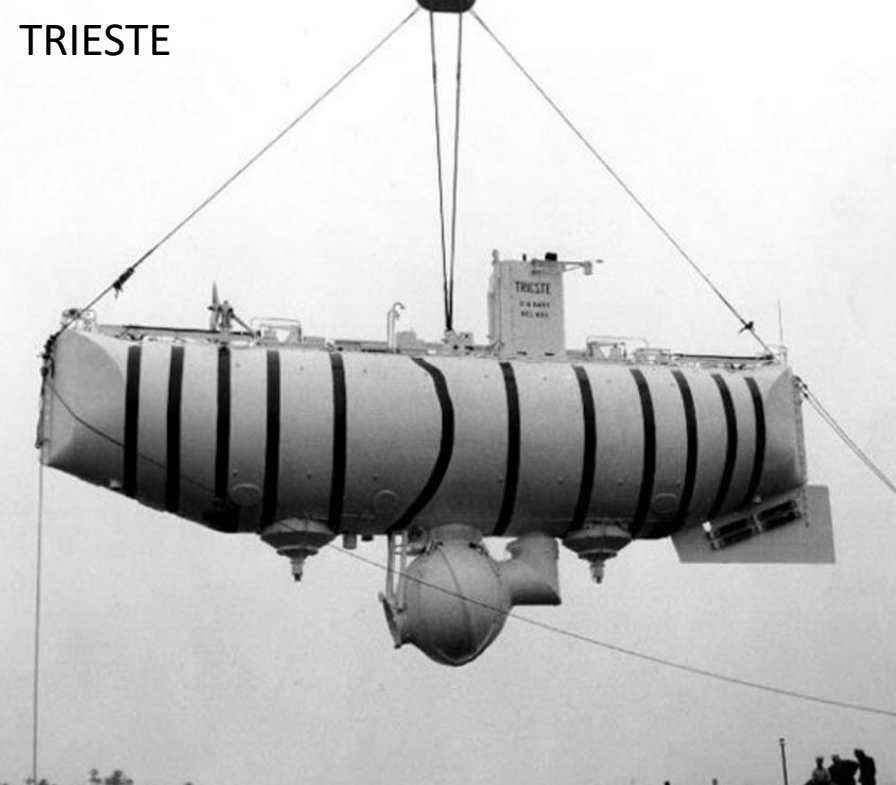


Trenchia wolffi

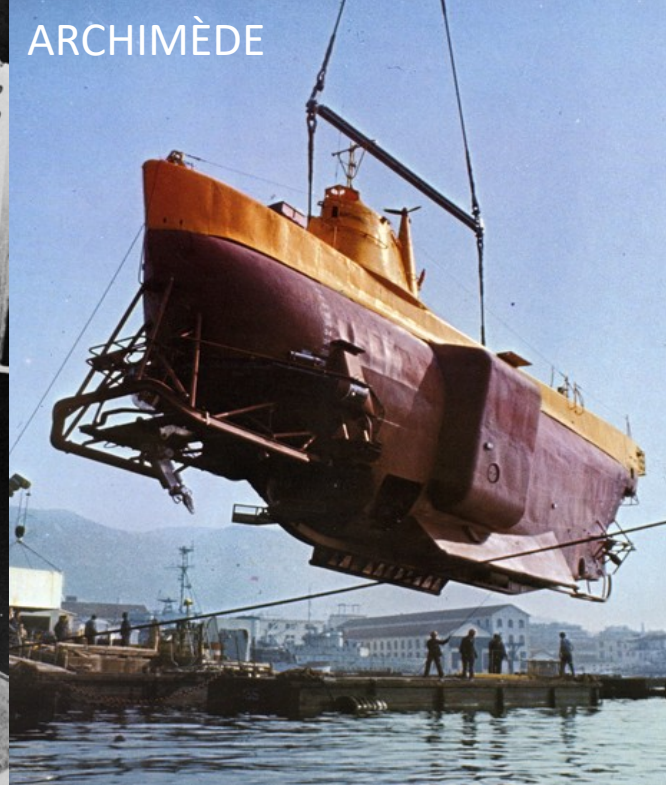




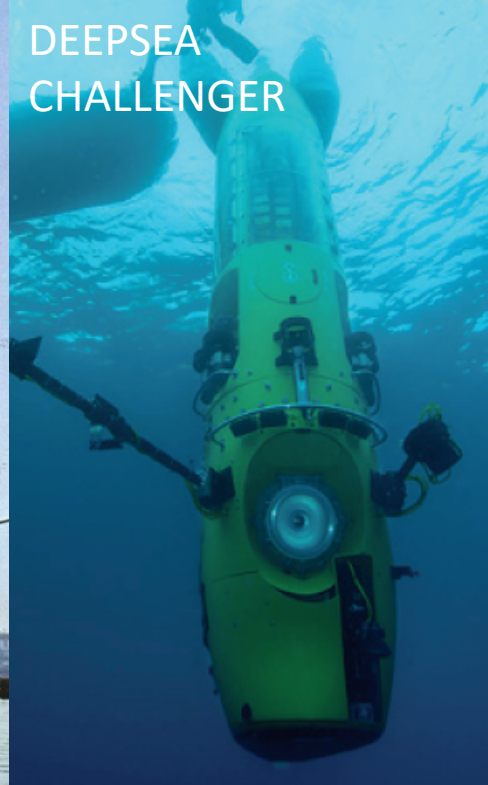
TRIESTE



ARCHIMÈDE



DEEPSEA CHALLENGER

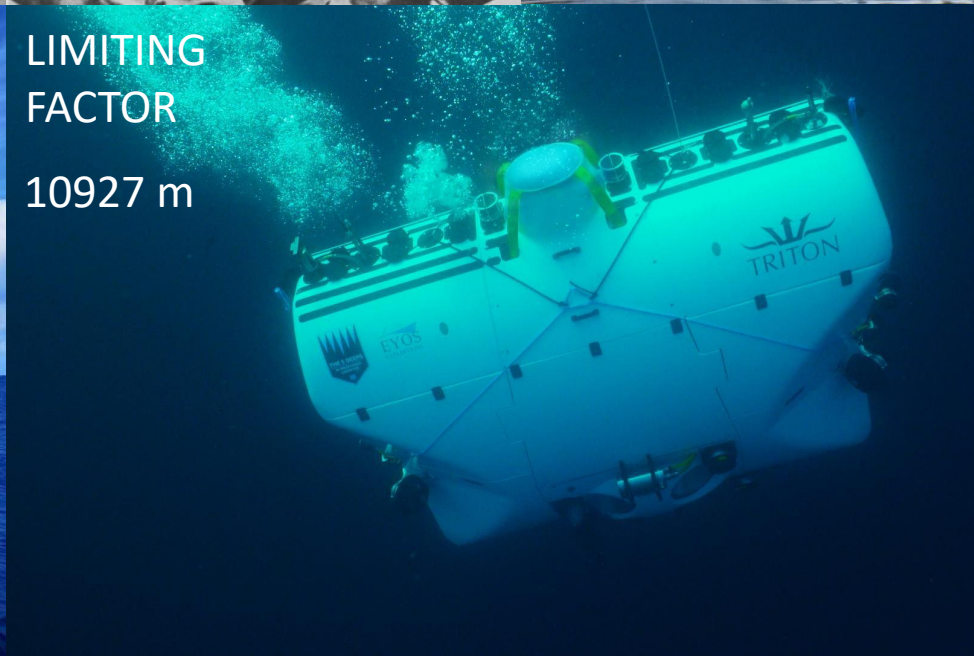


Jacques Piccard

Don Walsh



Fendouzhe – 10.909 m



LIMITING FACTOR
10927 m



Victor Vescovo
Five Deeps Expedition

THE FIVE DEEPS EXPEDITION

The world's first manned expedition to the deepest point in each of the five oceans

ATLANTIC OCEAN

✔ Completed Dec '18

SOUTHERN OCEAN

✔ Completed Feb '19

INDIAN OCEAN

✔ Completed Apr '19

PACIFIC OCEAN

✔ Completed May '19

ARCTIC OCEAN

Scheduled: Sep '19

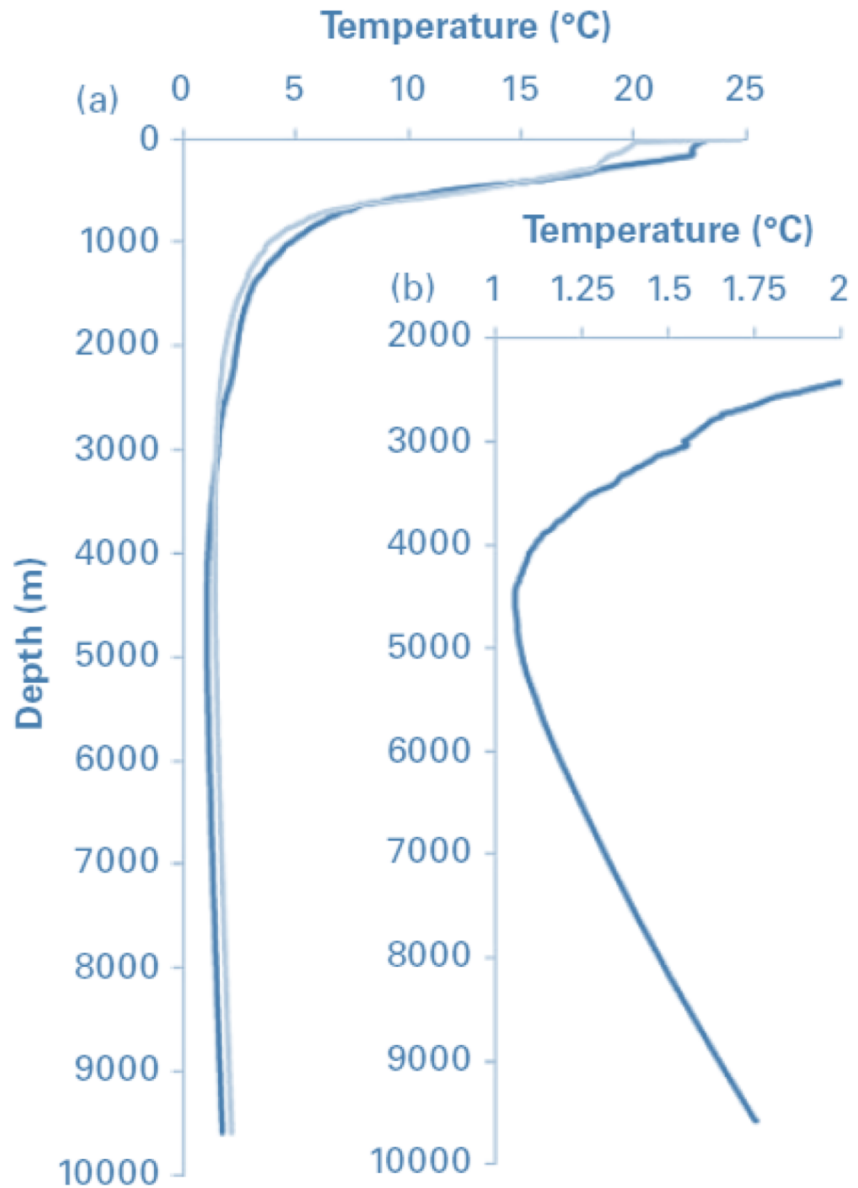


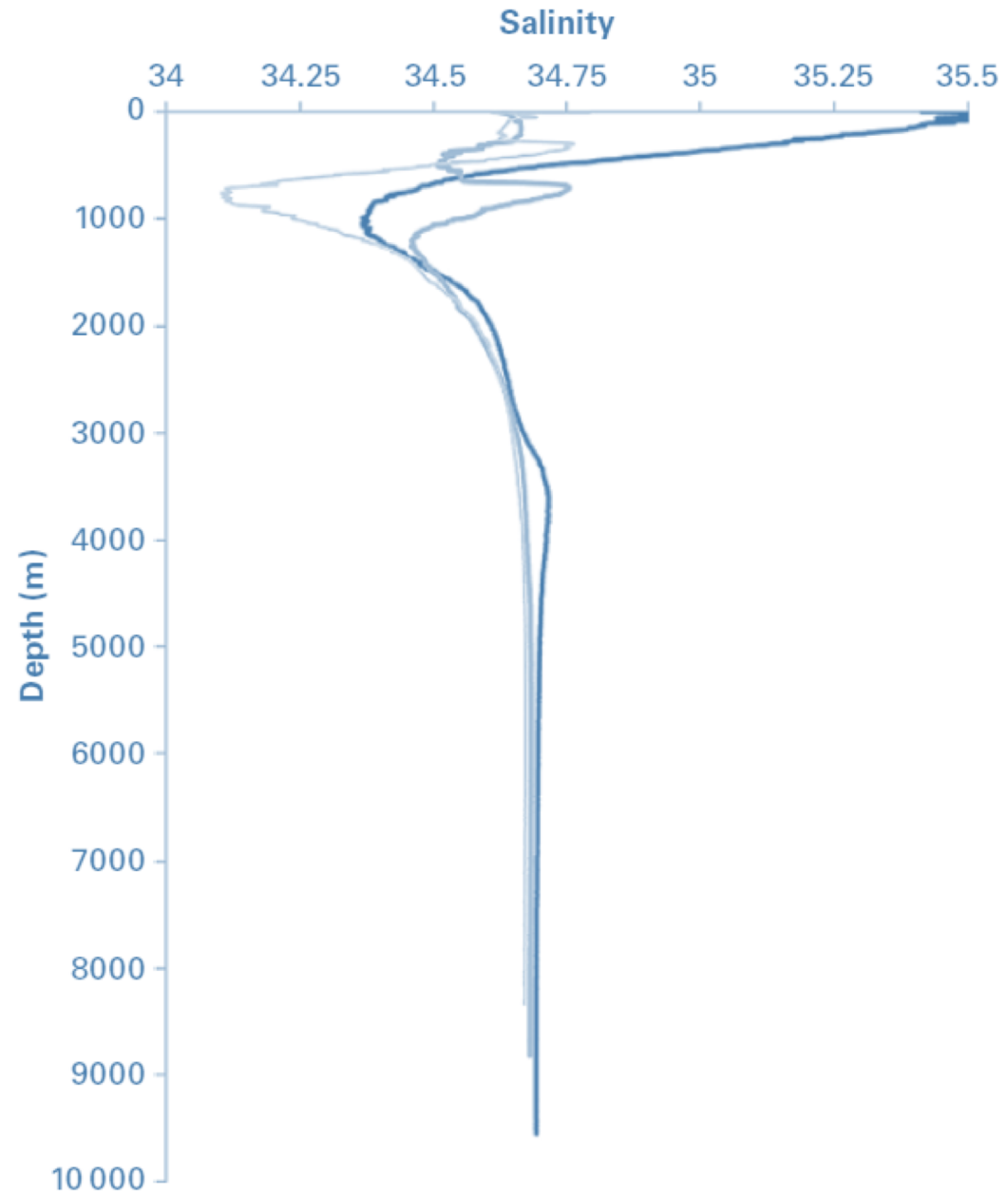
“ONE OF THE MOST AMBITIOUS EXPLORATION EXPEDITIONS OF THE CENTURY”

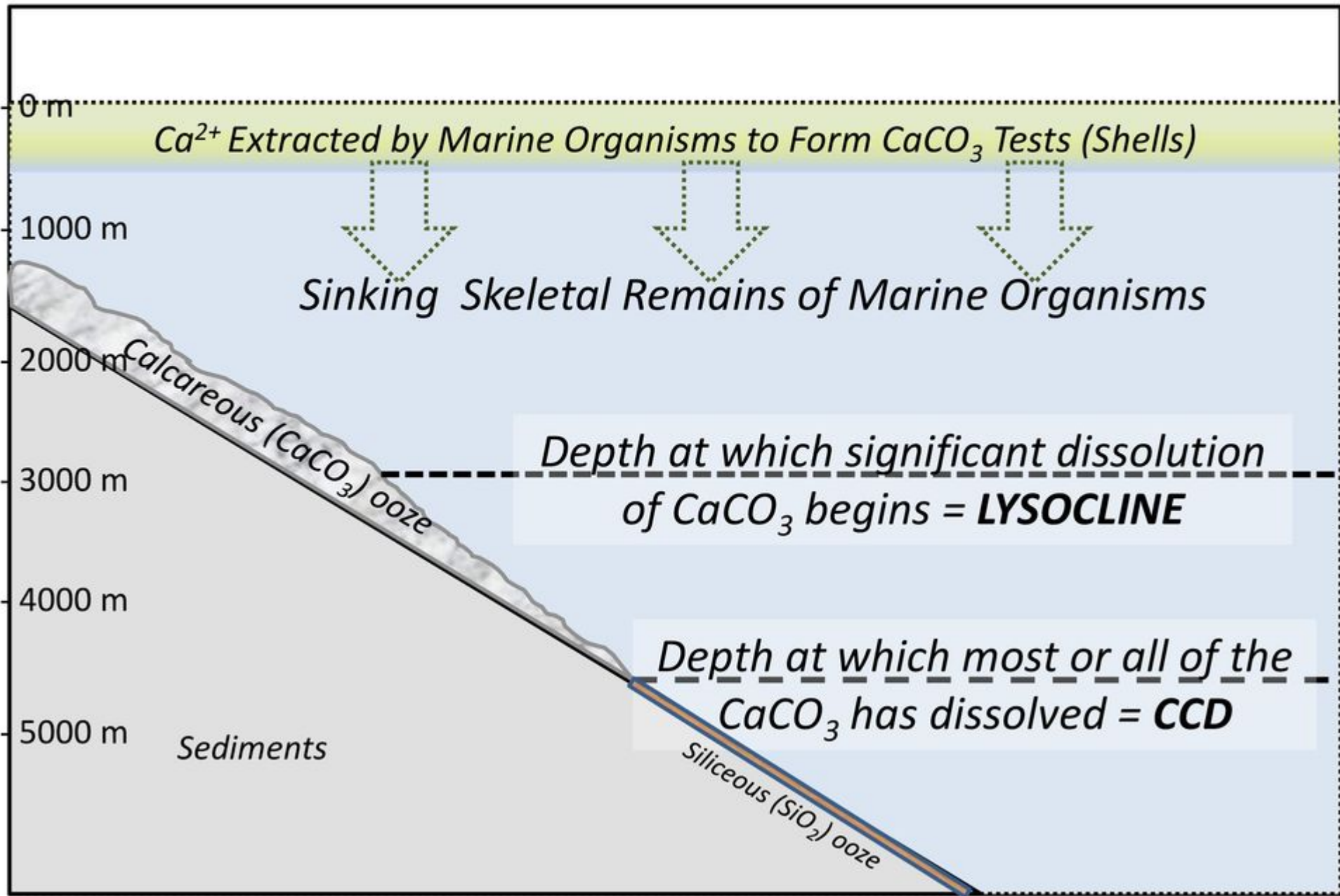
Dr. Don Walsh (Capt USN retd).

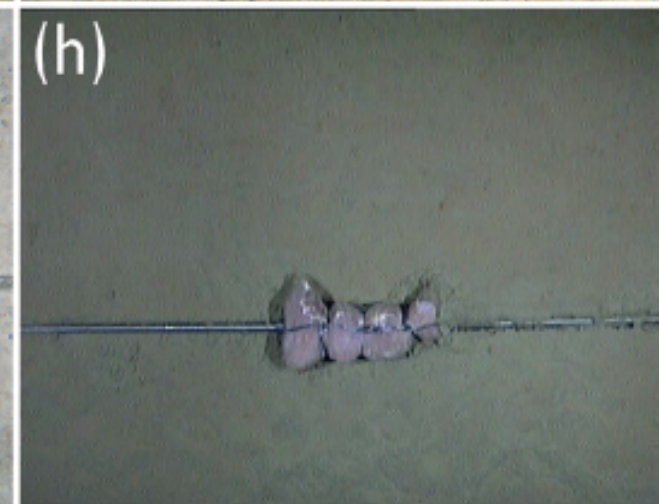
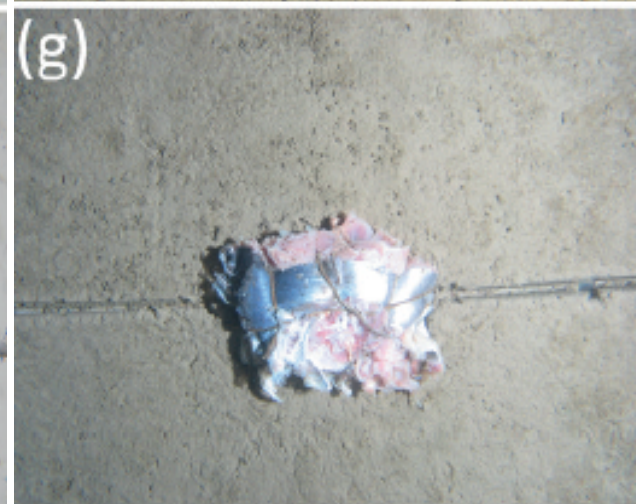
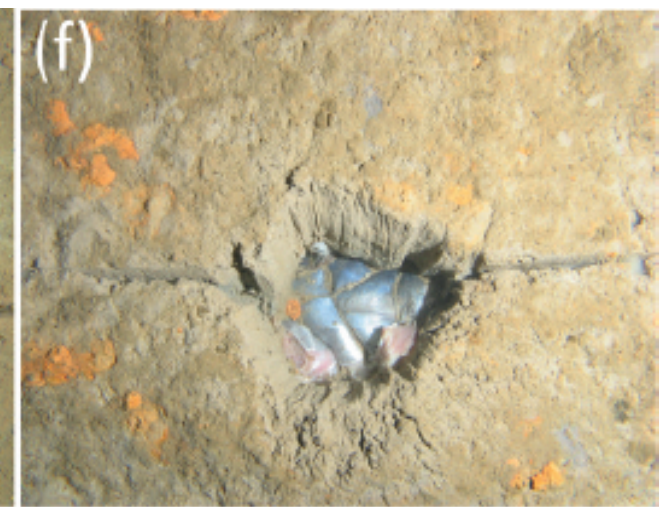
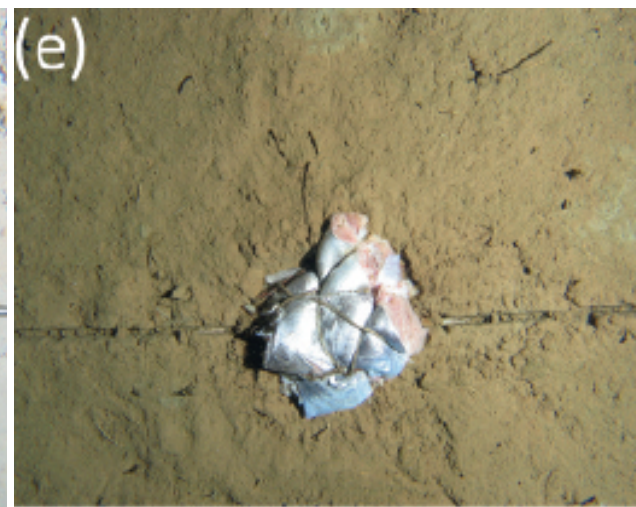
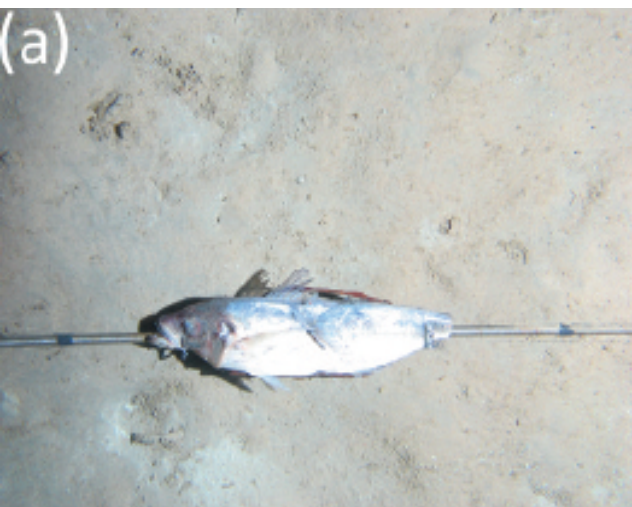
Pilot of Trieste. Profesor of Oceanography. Hon. Pres Explorers Club.

CARACTERÍSTICAS AMBIENTAIS

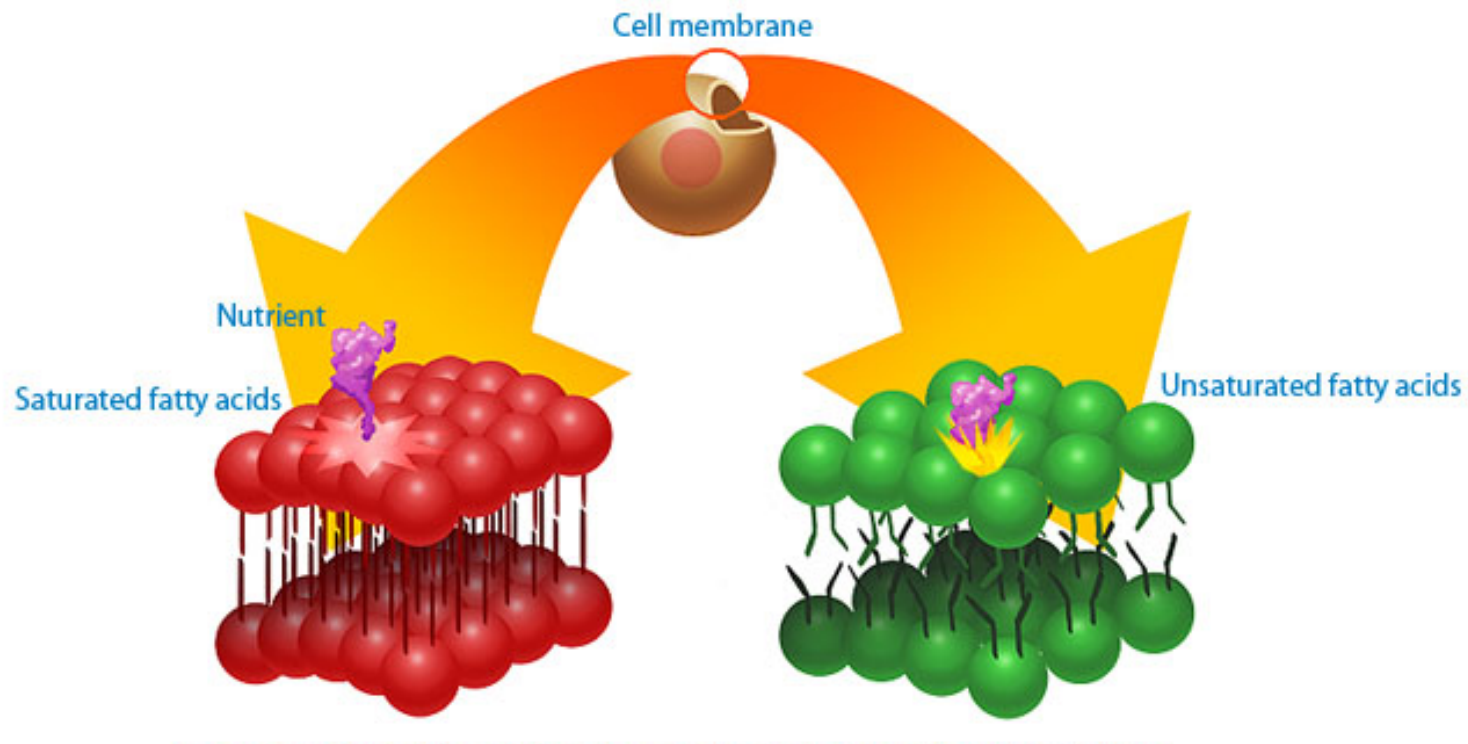








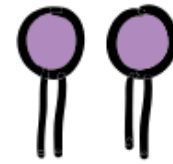
ADAPTAÇÕES À PRESSÃO



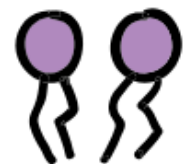
fluidiez



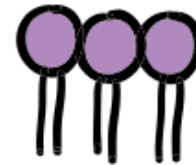
saturated
fatty acids



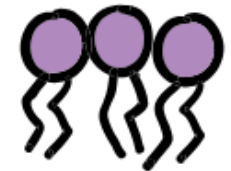
unsaturated
fatty acids



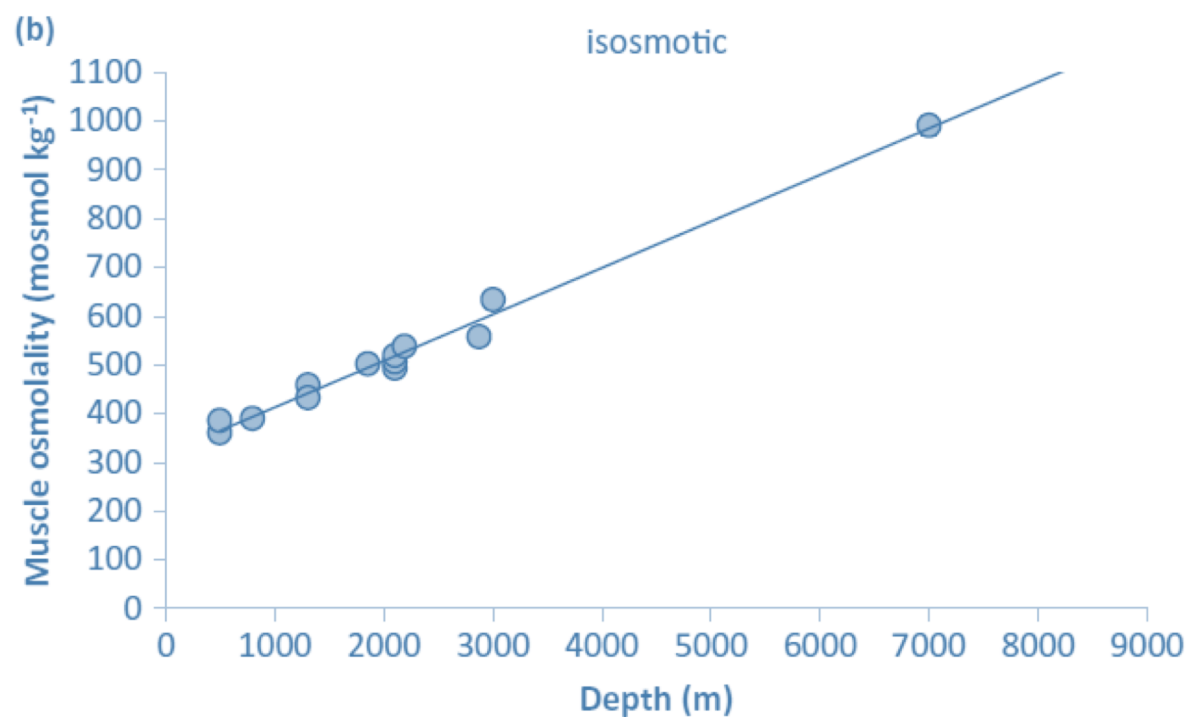
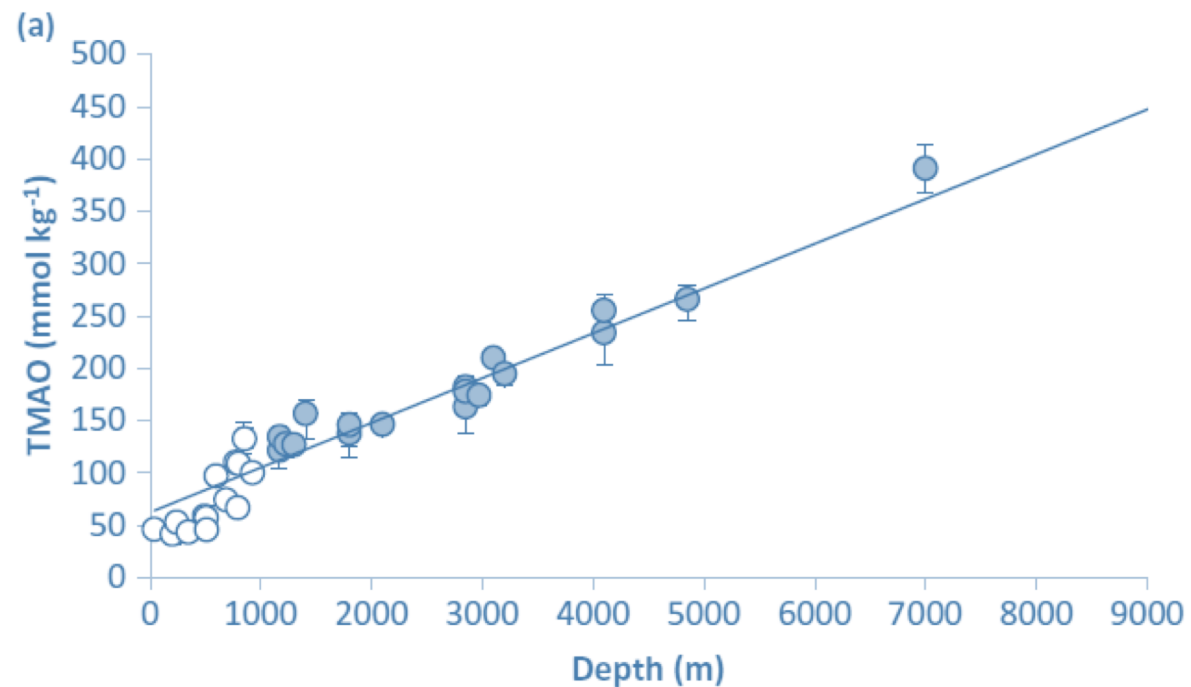
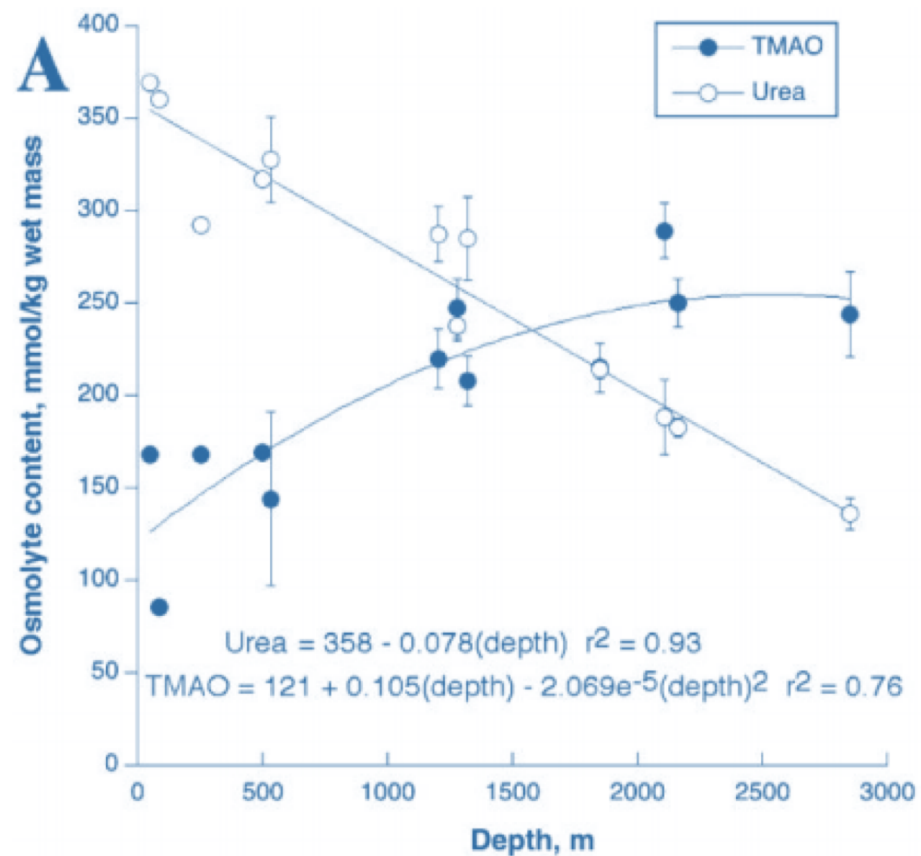
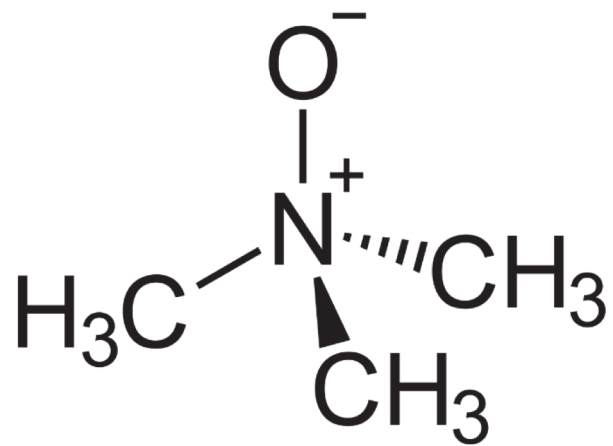
Try to stack these...



NEAT!



NOT AS NEAT!

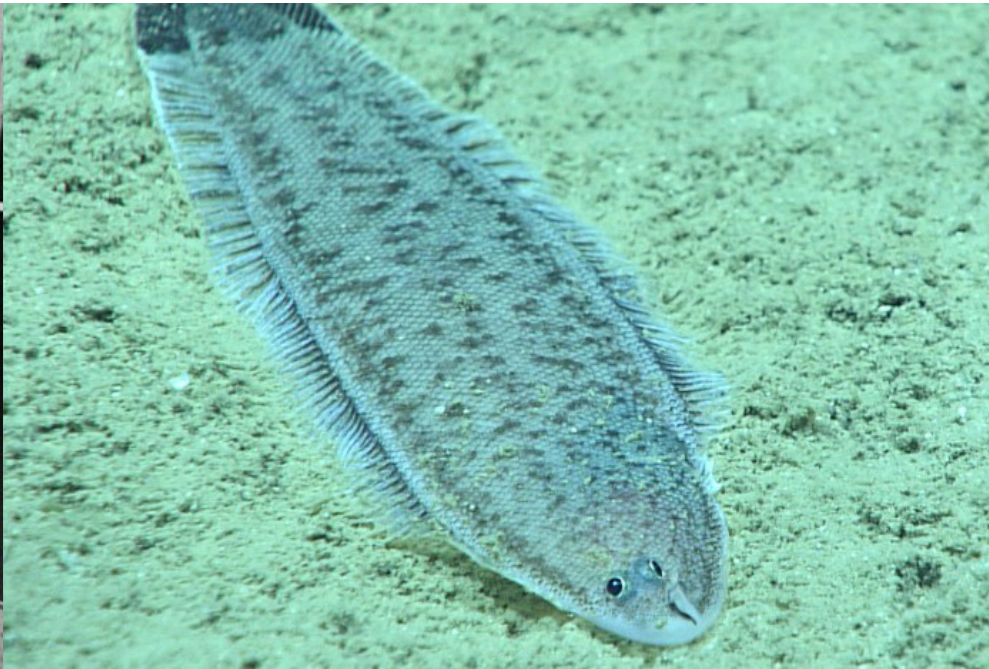


‘Lying on the bottom just beneath us was some type of flatfish, resembling a sole, about 1 foot long and 6 inches across. Even as I saw him, his two round eyes on top of his head spied’

Jacques Piccard

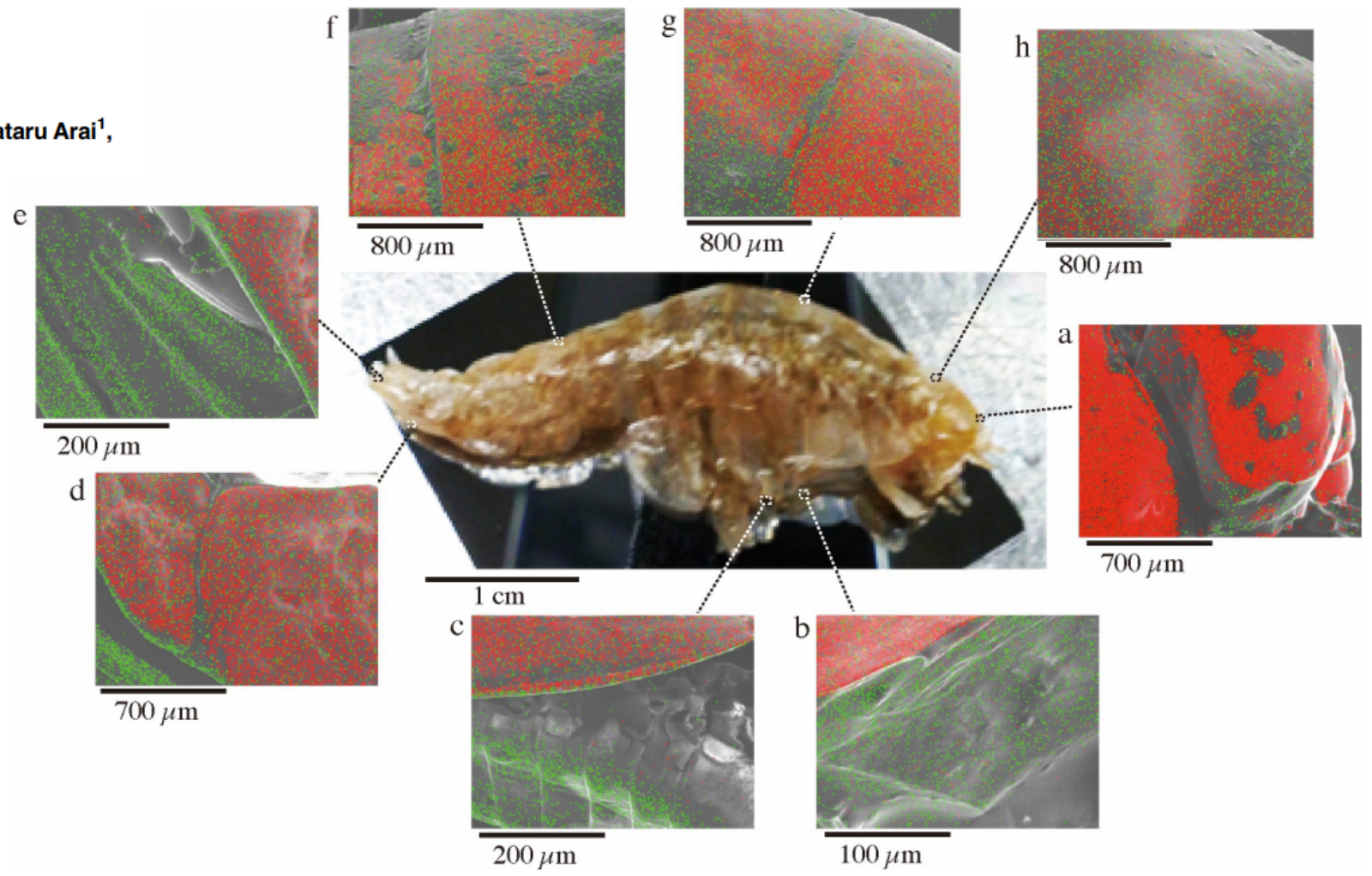
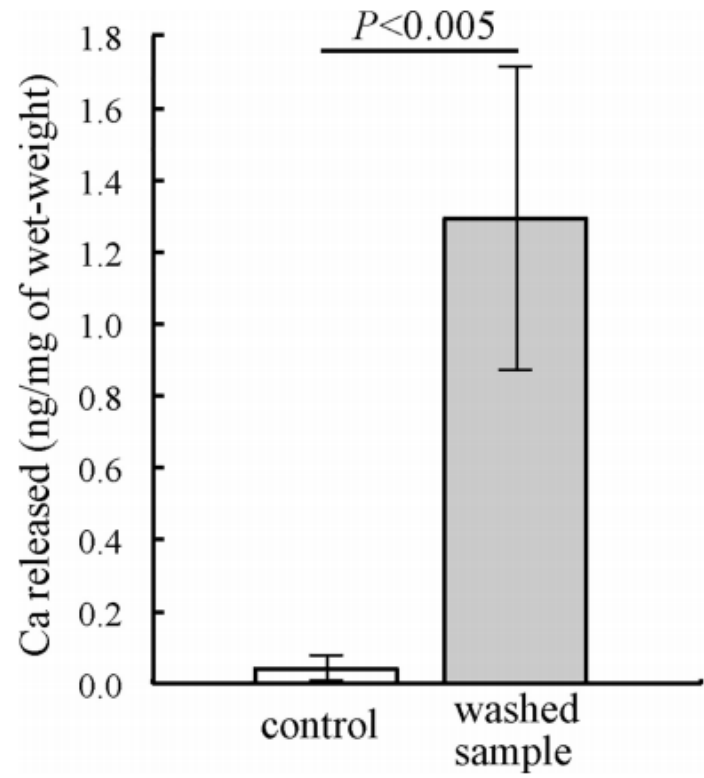
‘In the half century since our dive, there has been some speculation that we did not see a flatfish. And this is entirely possible. Neither Jacques nor I were trained biologists and the critter could have been something else’

Don Walsh

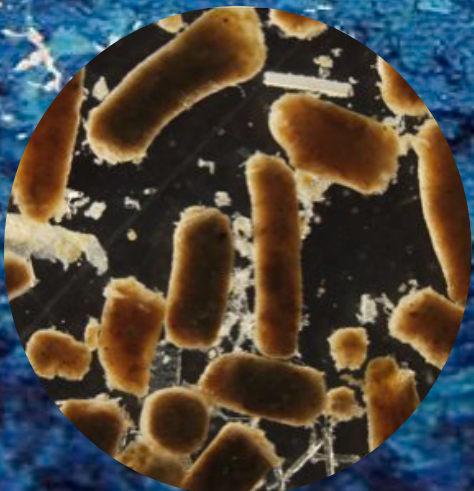
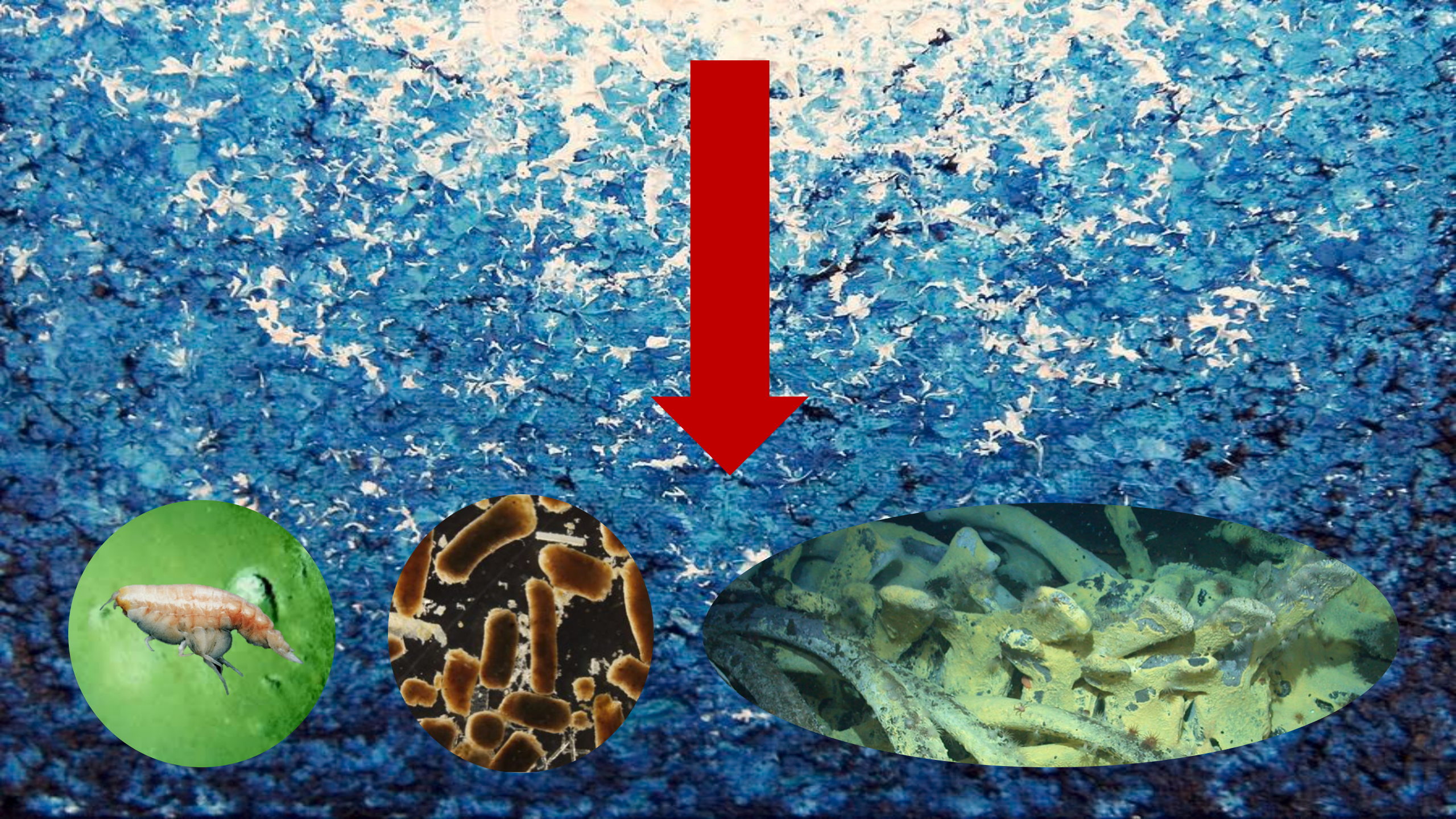


An aluminum shield enables the amphipod *Hirondellea gigas* to inhabit deep-sea environments

Hideki Kobayashi^{1*}, Hirokazu Shimoshige², Yoshikata Nakajima², Wataru Arai¹, Hideto Takami¹



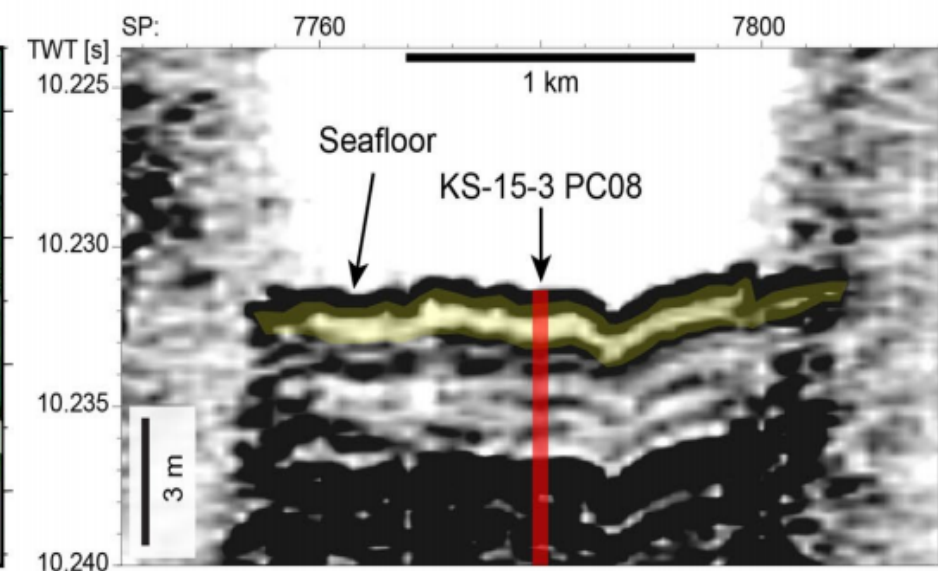
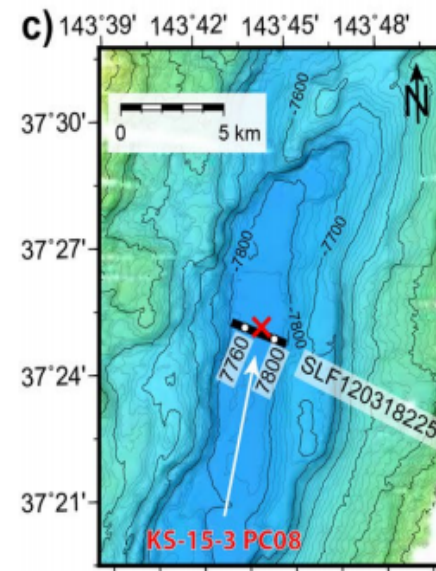
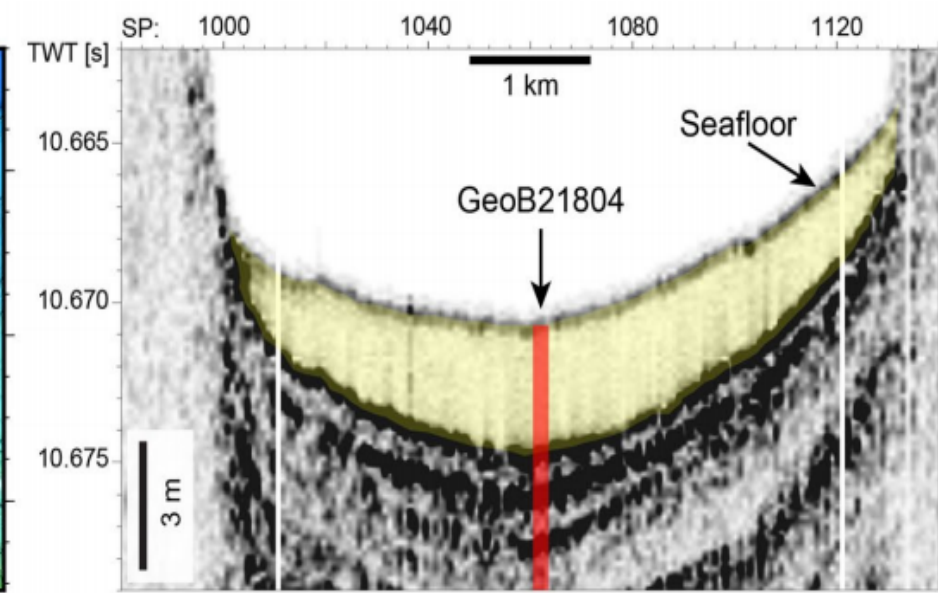
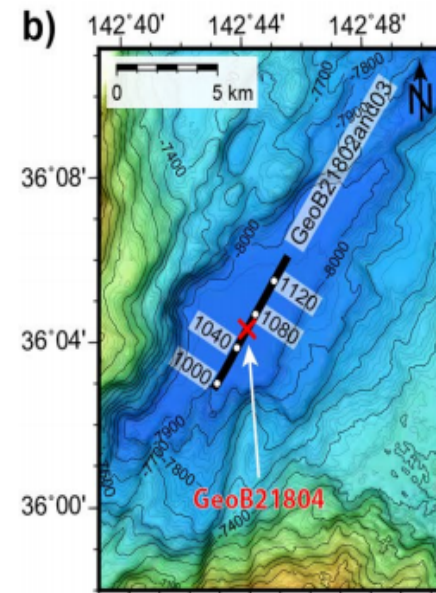
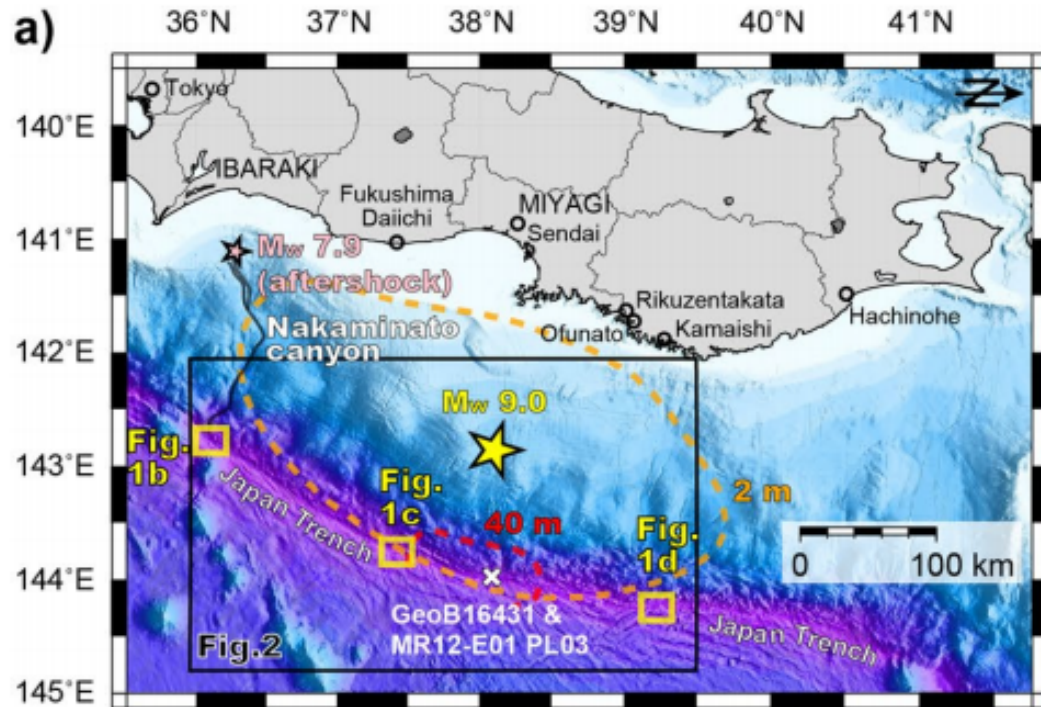
SUPRIMENTO ALIMENTAR



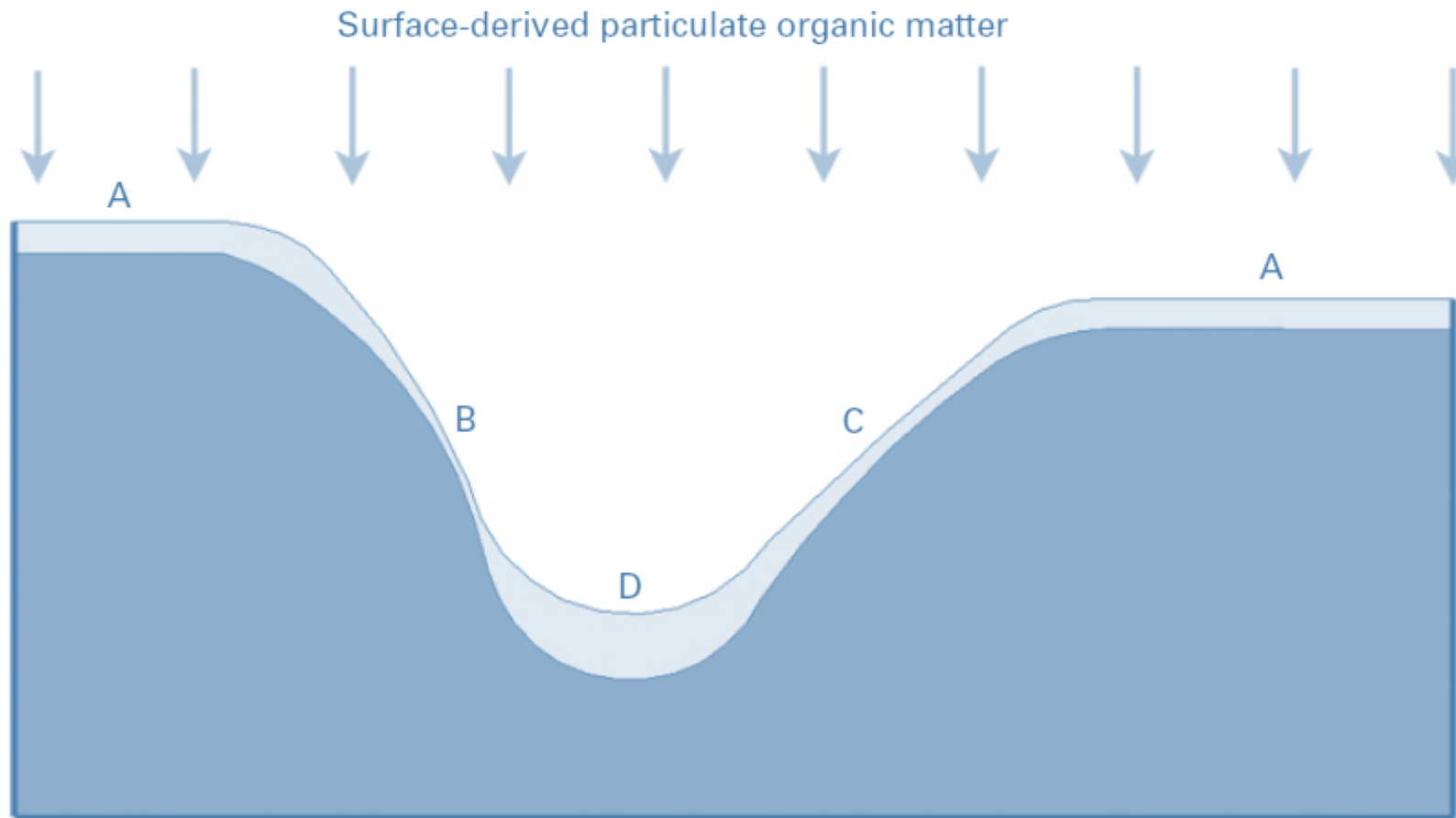
OPEN Megathrust earthquake drives drastic organic carbon supply to the hadal trench

Received: 14 June 2018
 Accepted: 8 January 2019
 Published online: 07 February 2019

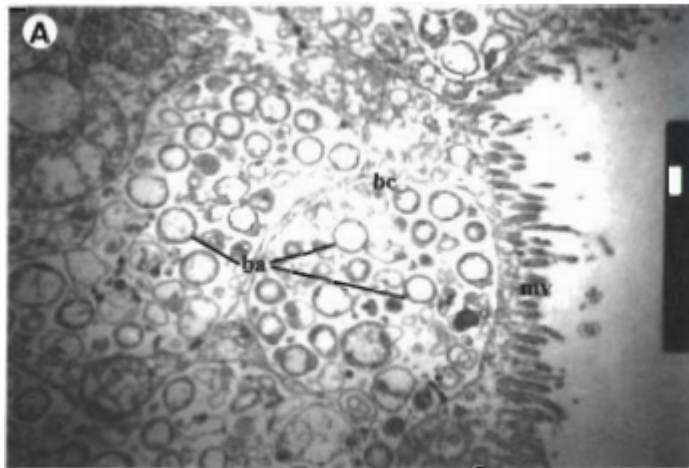
A. Kioka¹, T. Schwestermann¹, J. Moernaut¹, K. Ikehara², T. Kanamatsu³, C. M. McHugh⁴,
 C. dos Santos Ferreira⁵, G. Wiemer^{6,7}, N. Haghipour^{6,7}, A. J. Kopf⁸, T. I. Eglinton⁶ &
 M. Strasser^{1,5}



Trench Resource Accumulation Depth

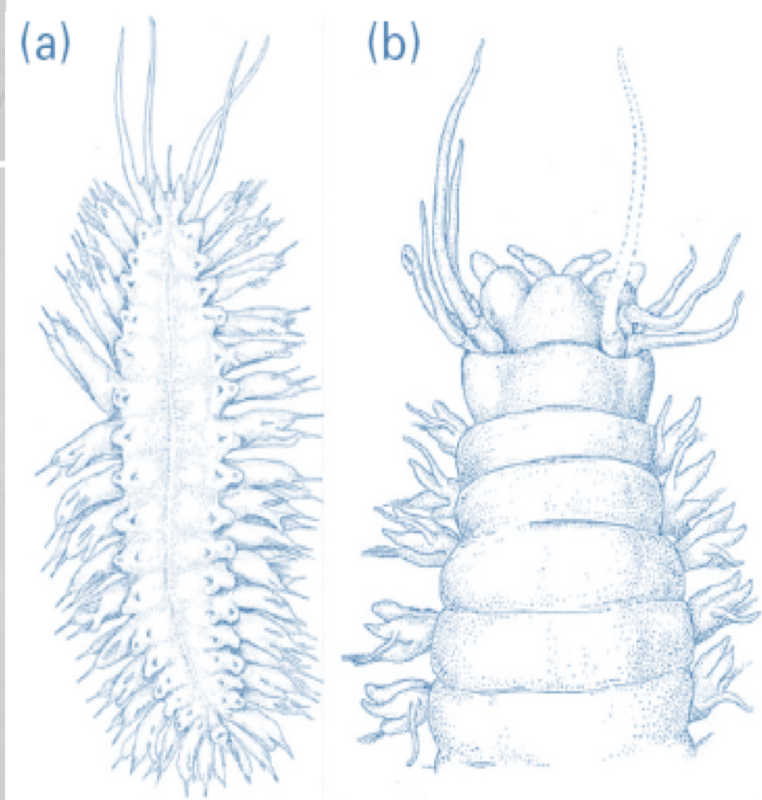
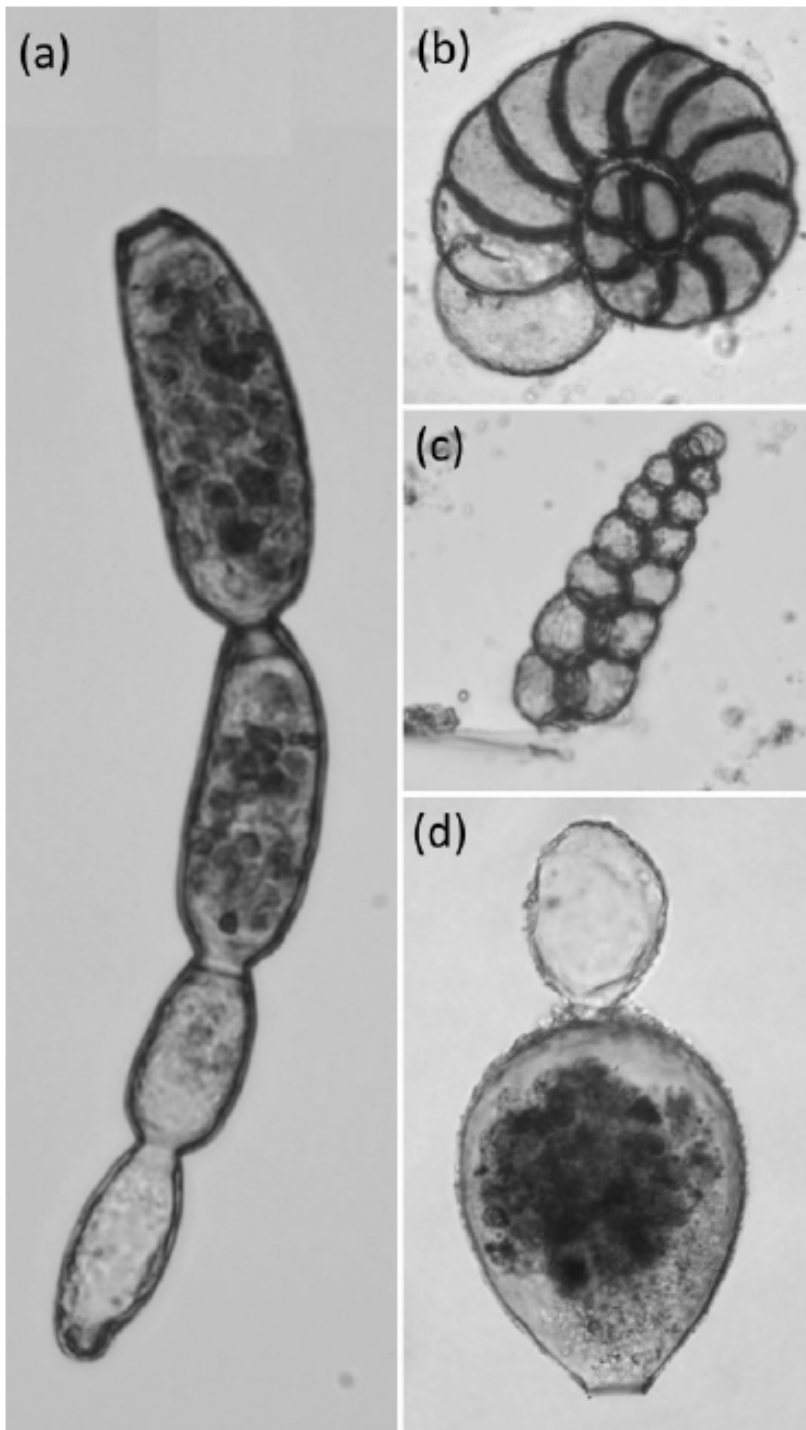


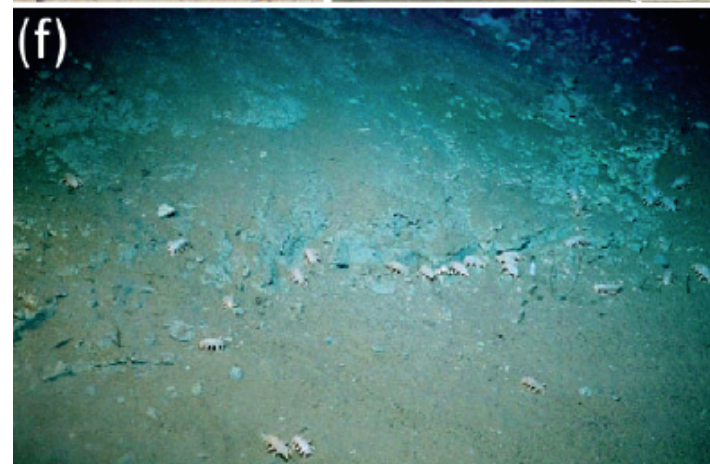
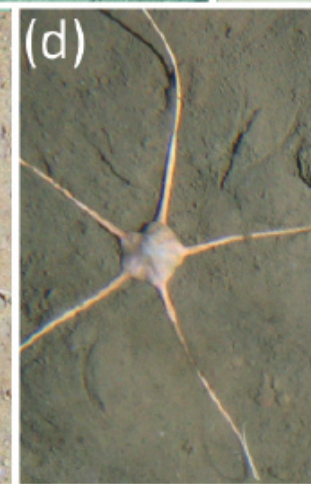
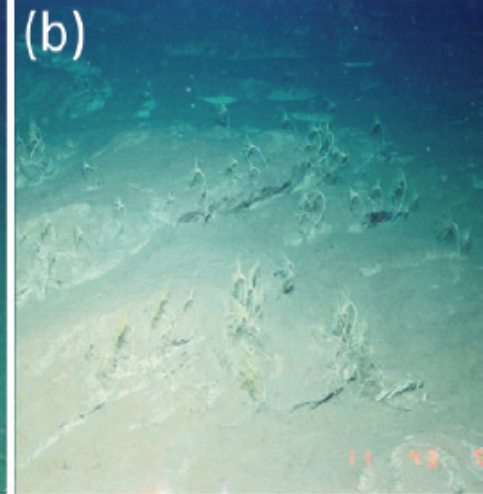
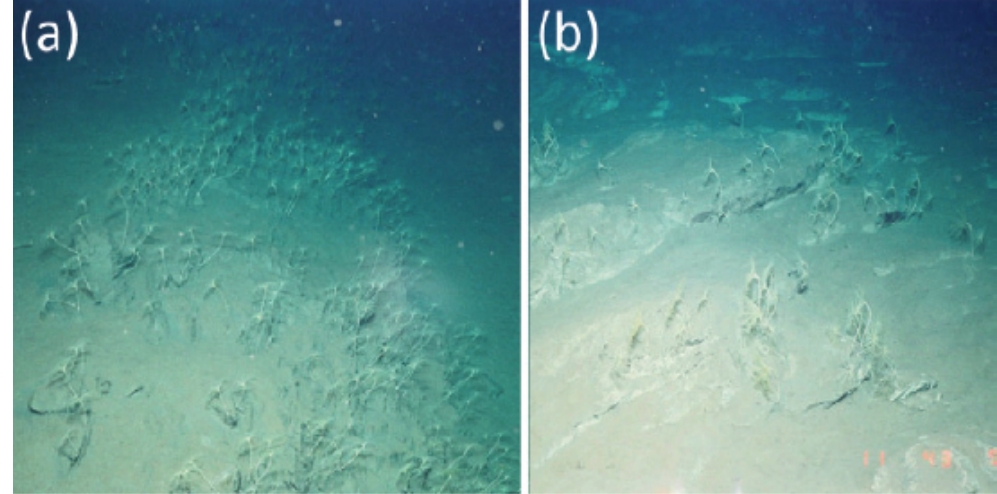
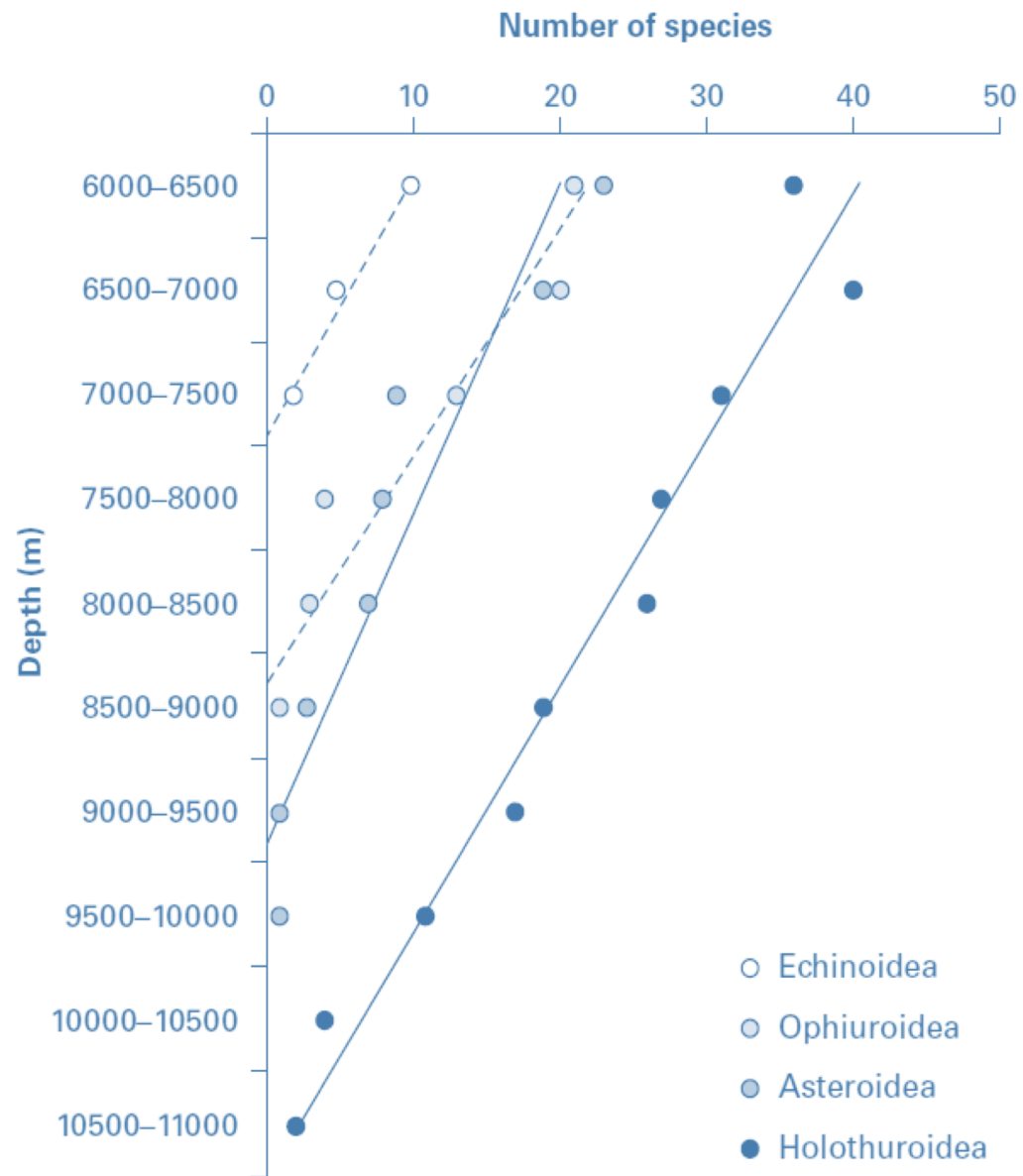


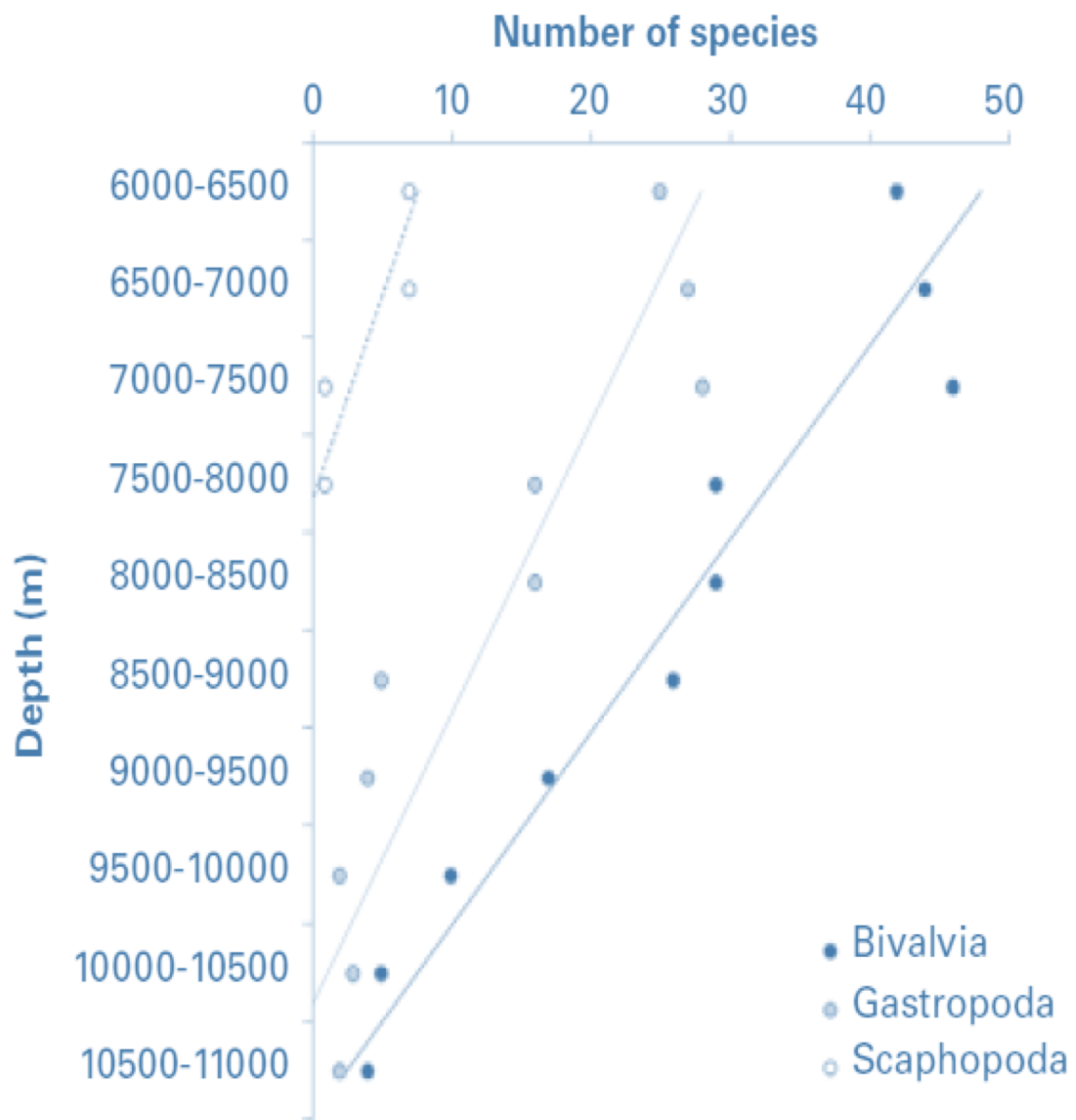


ORGANISMOS

Isolate	Trench	Depth (m)	T _{opt} (°C)	P _{opt} (MPa)	Reference
Colwelliaceae					
<i>Colwellia peizophila</i> Y223G ^T	Japan	6 278	10	60	Nogi <i>et al.</i> , 2004
<i>Colwellia hadaliensis</i> BNL-1 ^T	Puerto-Rico	7 410	10	90	Deming <i>et al.</i> , 1988
<i>Colwellia</i> sp. strain MT41	Mariana	10 476	8	103	Yayanos <i>et al.</i> , 1981
Psychromonadaceae					
<i>Psychromonas kaikoeae</i> JT7304 ^T	Japan	7 434	10	50	Nogi <i>et al.</i> , 2002
<i>Psychromonas hadalis</i> K41G	Japan	7 542	6	60	Nogi <i>et al.</i> , 2007
Moritellaceae					
<i>Moritella japonica</i> DSK1	Japan	6 356	15	50	Kato <i>et al.</i> , 1995a
<i>Moritella yayanosii</i> DB21MT-5	Mariana	10 898	10	80	Nogi and Kato, 1999
Shewanellaceae					
<i>Shewanella benthica</i> DB6705	Japan	6 356	15	60	Kato <i>et al.</i> , 1995a
<i>Shewanella benthica</i> DB6906	Japan	6 269	15	60	Kato <i>et al.</i> , 1995a
<i>Shewanella benthica</i> DB172R	Izu-Bonin	6 499	10	60	Kato <i>et al.</i> , 1996
<i>Shewanella benthica</i> DB172F	Izu-Bonin	6 499	10	70	Kato <i>et al.</i> , 1996
<i>Shewanella benthica</i> DB21MT-2	Mariana	10 898	10	70	Kato <i>et al.</i> , 1998
<i>Shewanella</i> sp. strain KT99	Kermadec	9 856	~2	~98	Lauro <i>et al.</i> , 2007
Non-Gammaproteobacteria					
<i>Dermacoccus abyssi</i> MT1.1 ^T	Mariana	10 898	28	40	Pathom-aree <i>et al.</i> , 2006
<i>Rhodobacterales</i> bacterium PRT1	Puerto-Rico	8 350	10	80	Eloe <i>et al.</i> , 2011





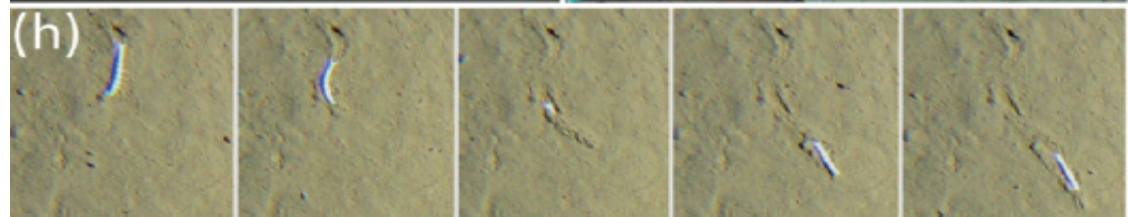
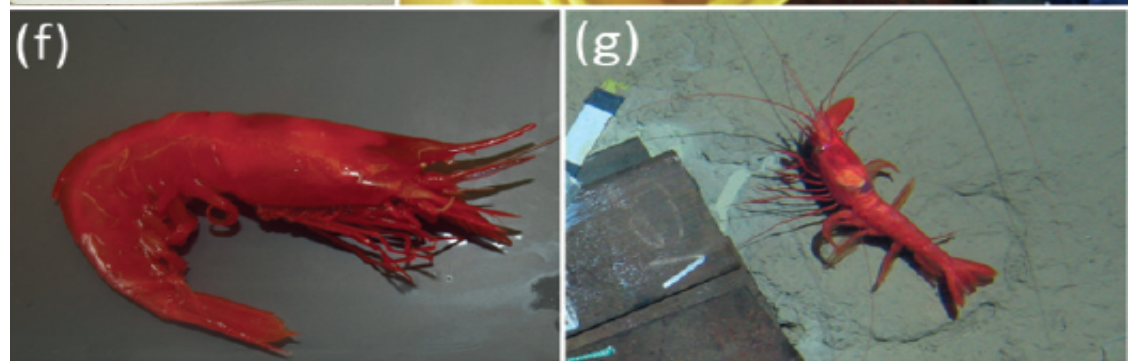
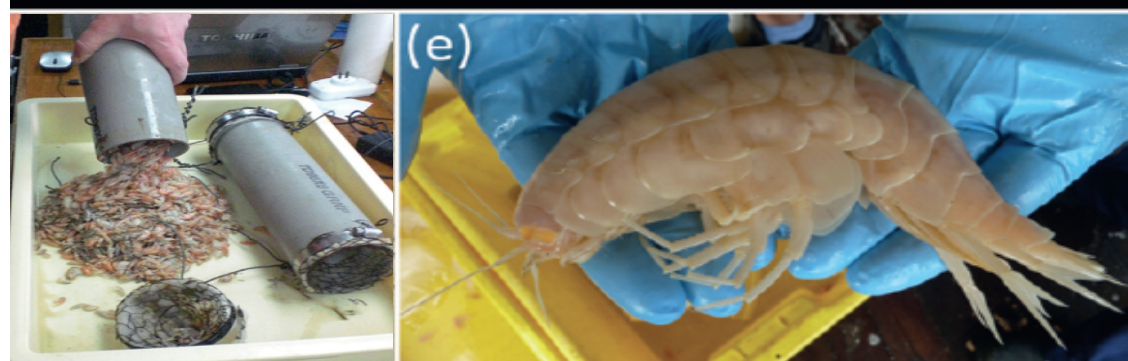
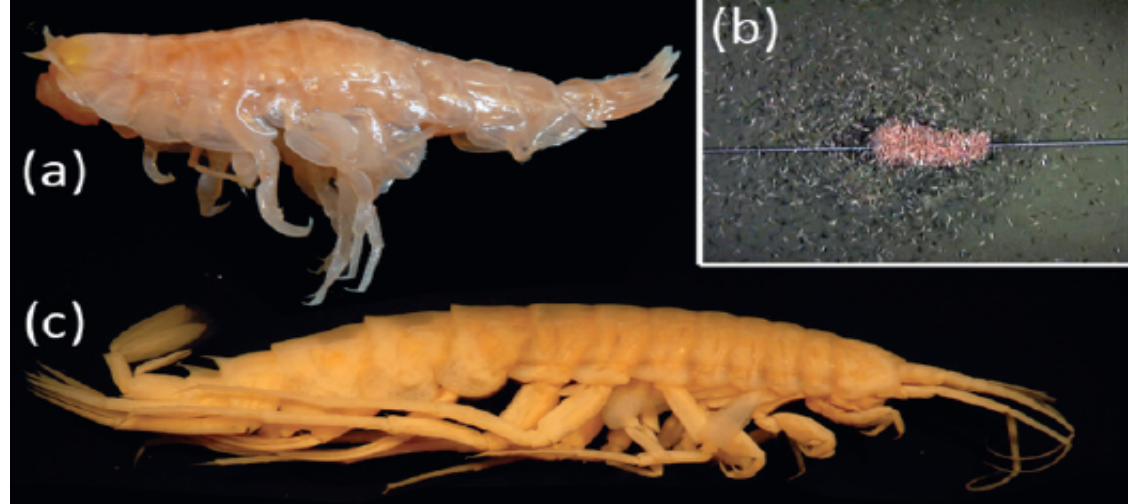
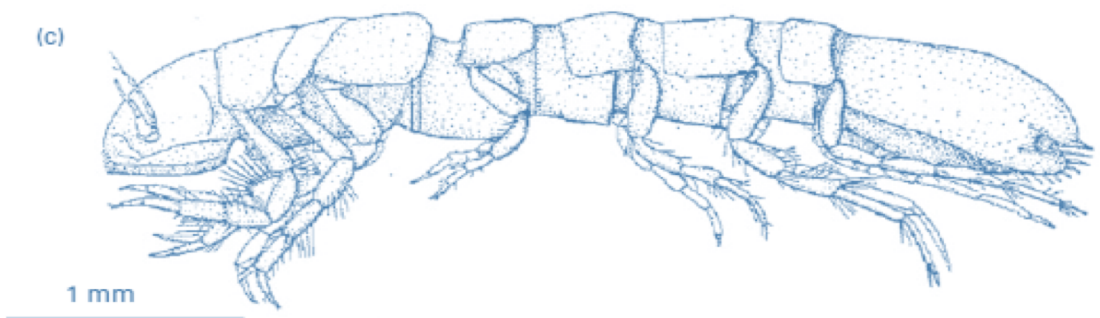
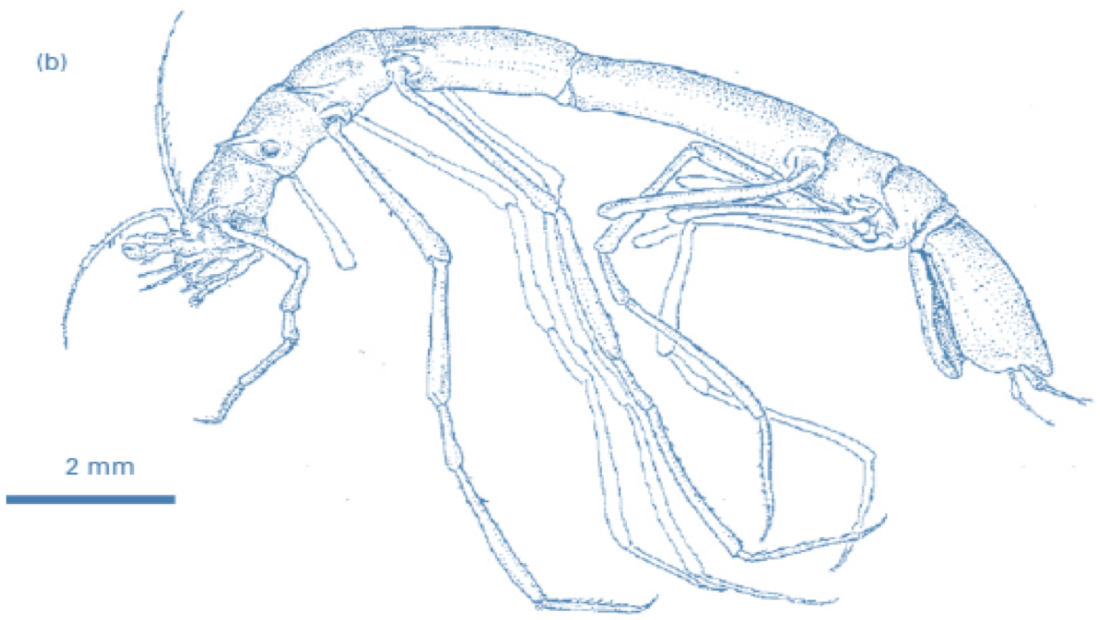
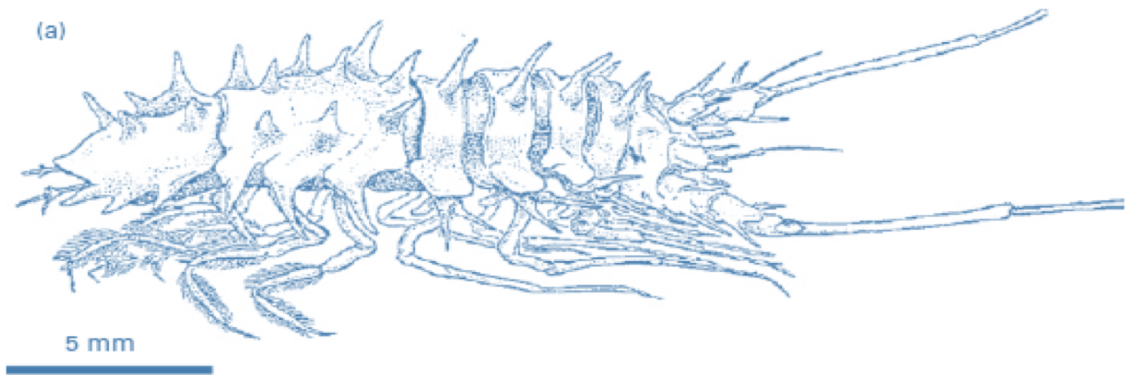


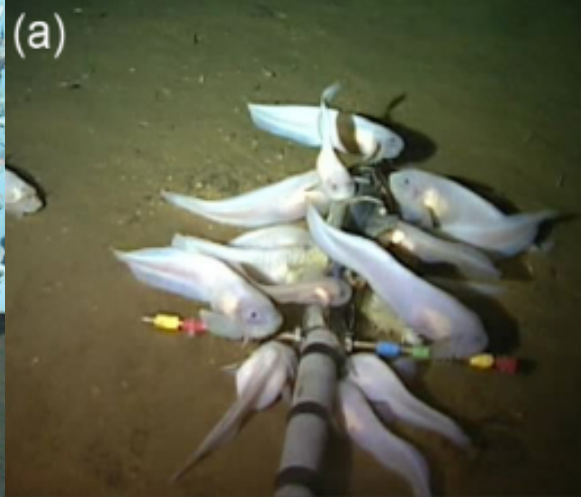
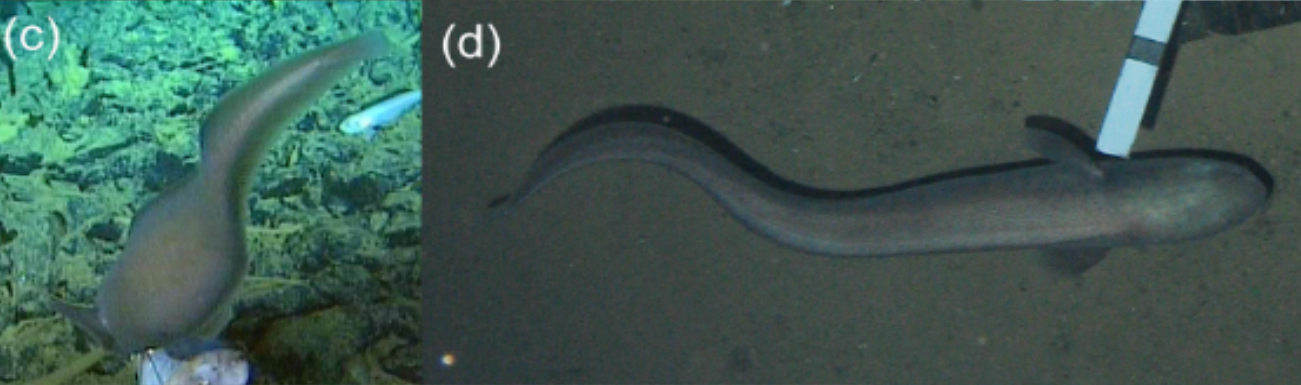
(e)

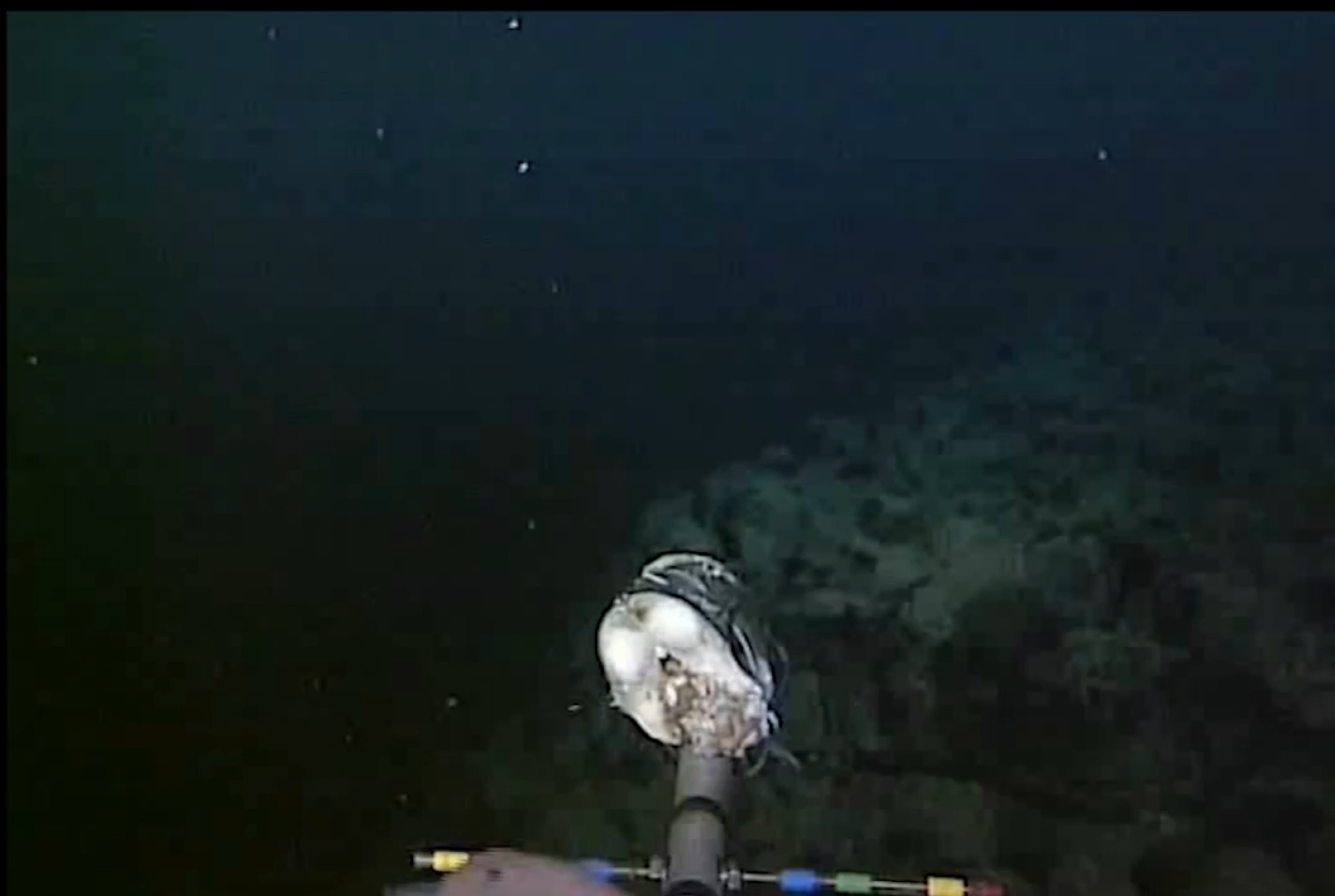


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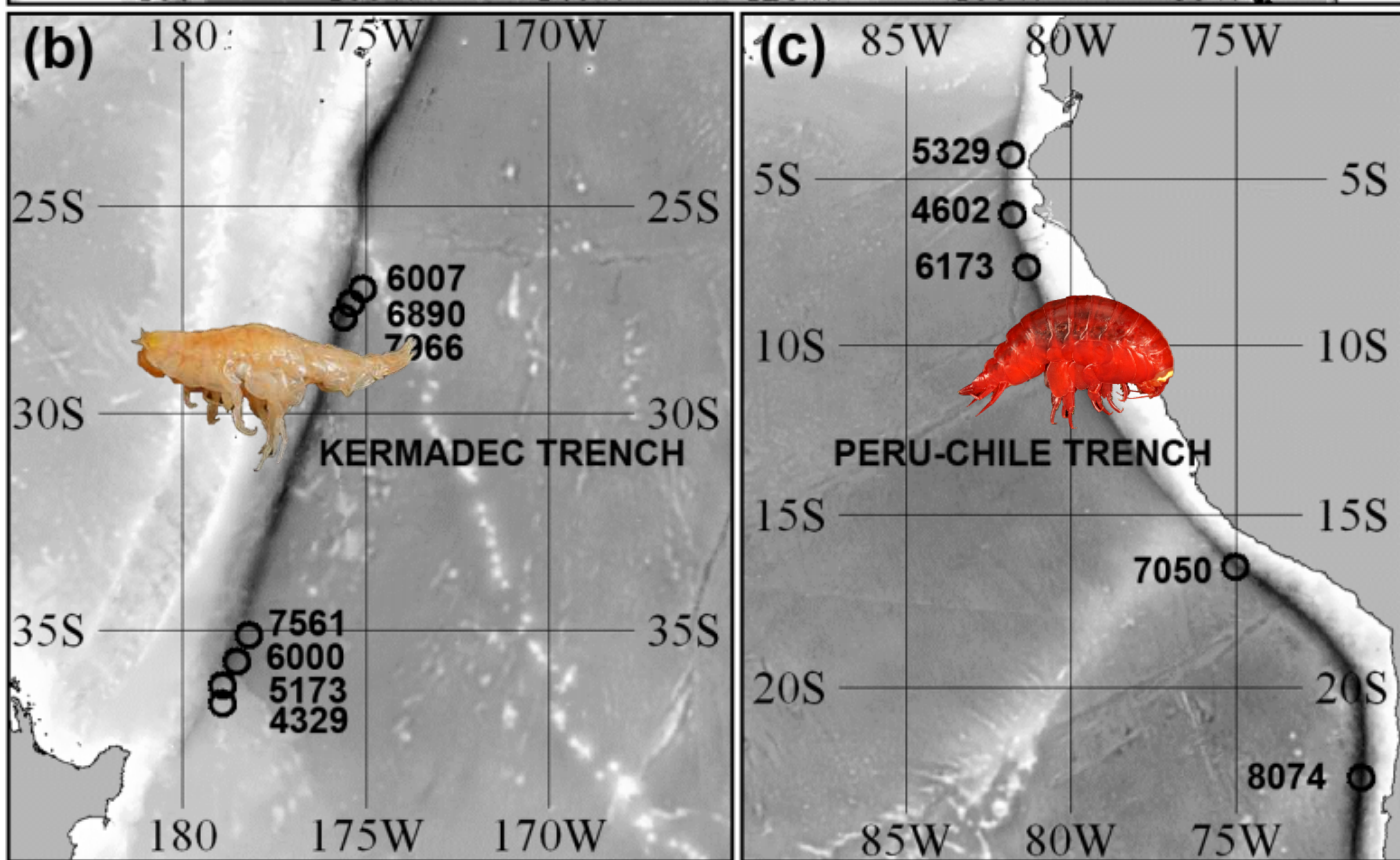
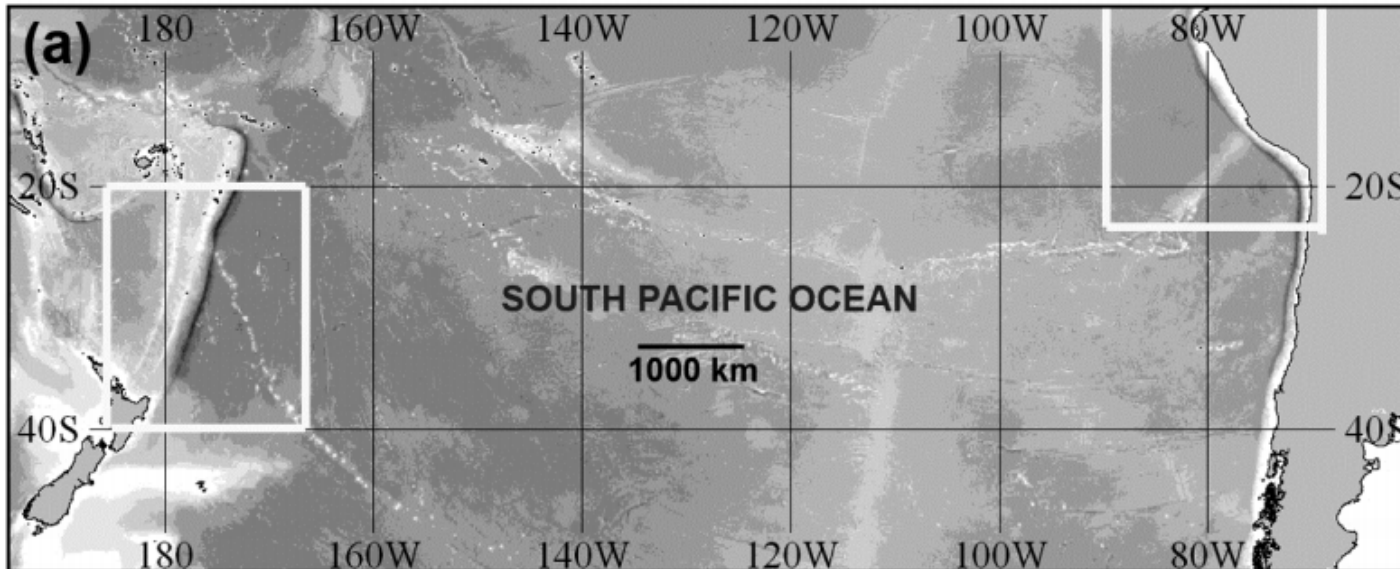








ENDEMIISMO



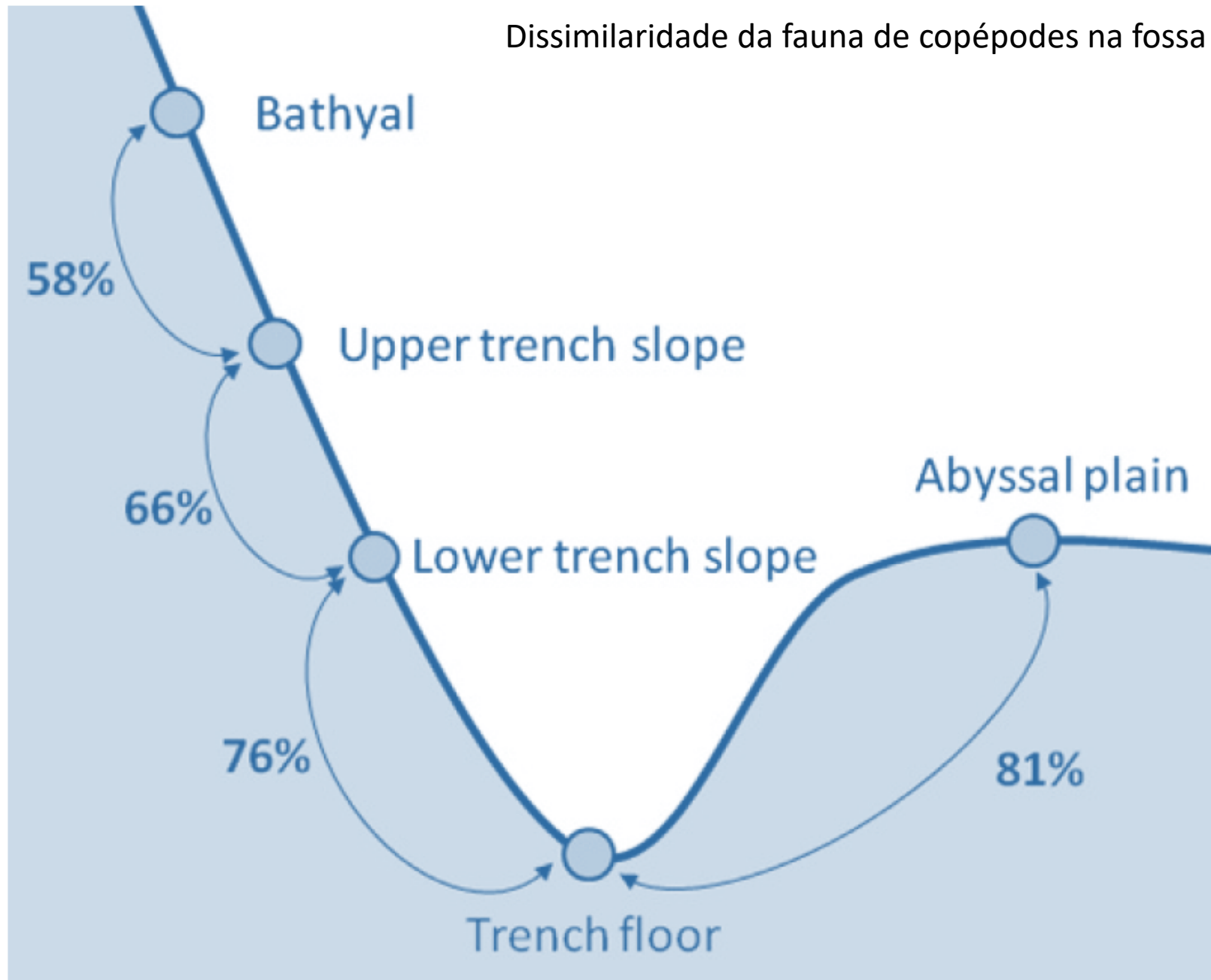
Deep-sea amphipod community structure across abyssal to hadal depths in the Peru-Chile and Kermadec trenches

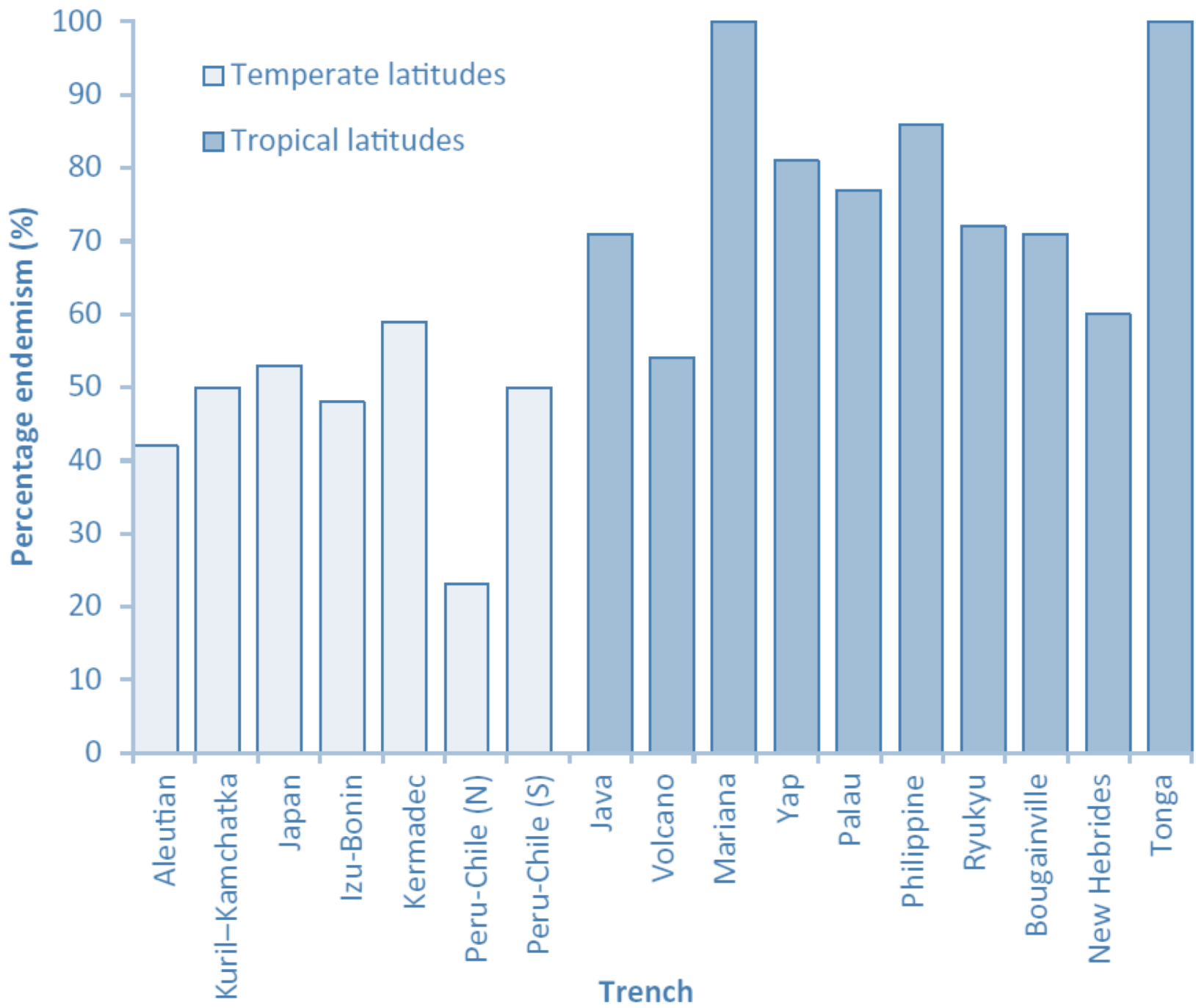
Toyonobu Fujii^{1,*}, Niamh M. Kilgallen^{2,3}, Ashley A. Rowden², Alan J. Jamieson¹

Variables	Correlation (ρ)	p-value
PRE, LON	0.64	< 0.001
PRE, SED, LON	0.55	< 0.001
PRE, LON, PRO	0.55	< 0.01
PRE, SED, LON, PRO	0.54	< 0.01
(PRE)	0.41	< 0.01
(TEM)	0.36	< 0.05
(LON)	0.36	< 0.05
(PRO)	0.34	< 0.05
(LAT)	0.12	ns
(SED)	0.12	ns

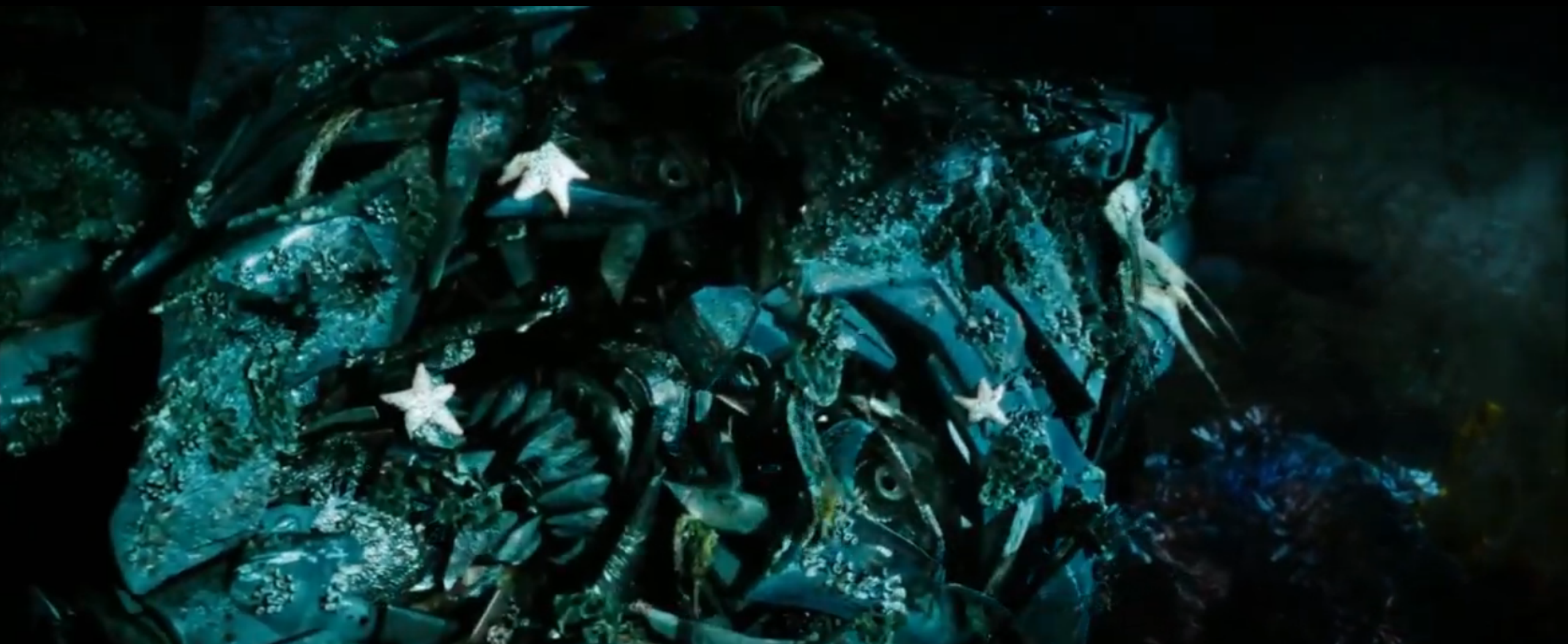
Trench	% endemism	Trench	% endemism
Aleutian	42	Tonga	100
Kuril–Kamchatka	50	Kermadec	59
Japan	53	Peru–Chile	23–50*
Izu-Bonin	48	Banda	43
Volcano	54	Hjort	20
Mariana	100	Java	71
Yap	81	South Sandwich	37
Palau	77	Romanche	60
Philippine	86	Puerto-Rico	50
Ryukyu	72	Cayman	47
Bougainville	71	Pacific Troughs	28
New Hebrides	60	Atlantic Troughs	20
Total			56.4

Dissimilaridade da fauna de copépodes na fossa de Kuril-Kamchatka





CONSERVAÇÃO



Bioaccumulation of persistent organic pollutants in the deepest ocean fauna

Alan J. Jamieson^{1*}, Tamas Malkocs², Stuart B. Piertney², Toyonobu Fujii¹ and Zulin Zhang³

Marine Policy 96 (2018) 204–212

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journal homepage: www.elsevier.com/locate/marpol



Human footprint in the abyss: 30 year records of deep-sea plastic debris

Sanae Chiba^{a,b,*}, Hideaki Saito^c, Ruth Fletcher^b, Takayuki Yogi^d, Makino Kayo^d, Shin Miyagi^d, Moritaka Ogido^d, Katsunori Fujikura^e

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Toxic anthropogenic pollutants reach the deepest ocean on Earth

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Research



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Microplastics and synthetic particles ingested by deep-sea amphipods in six of the deepest marine ecosystems on Earth

A. J. Jamieson¹, L. S. R. Brooks¹, W. D. K. Reid¹, S. B. Piertney², B. E. Narayanaswamy³ and T. D. Linley¹

Effects of Pharmaceutical Wastes on Microbial Populations in Surface Waters at the Puerto Rico Dump Site in the Atlantic Ocean

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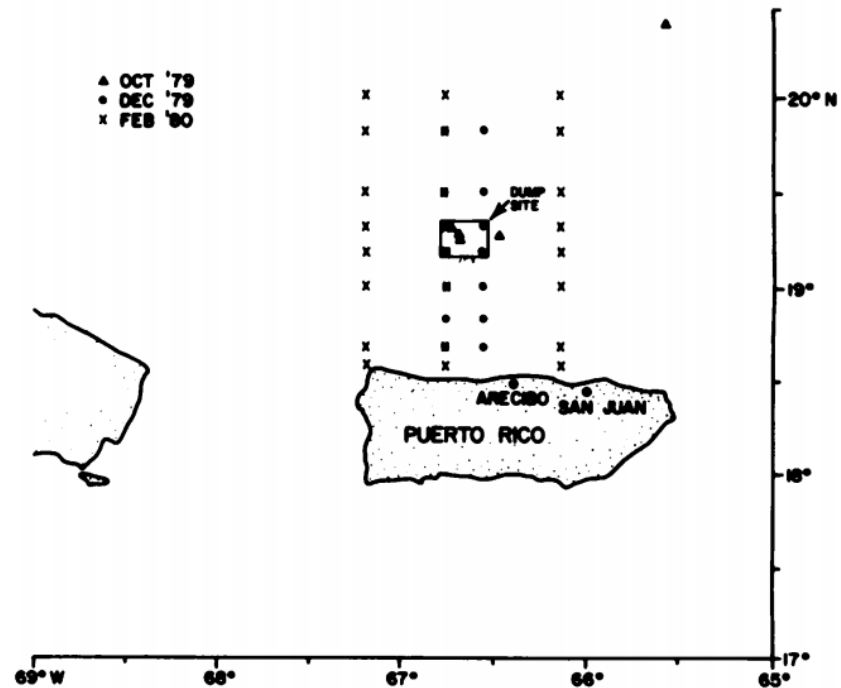
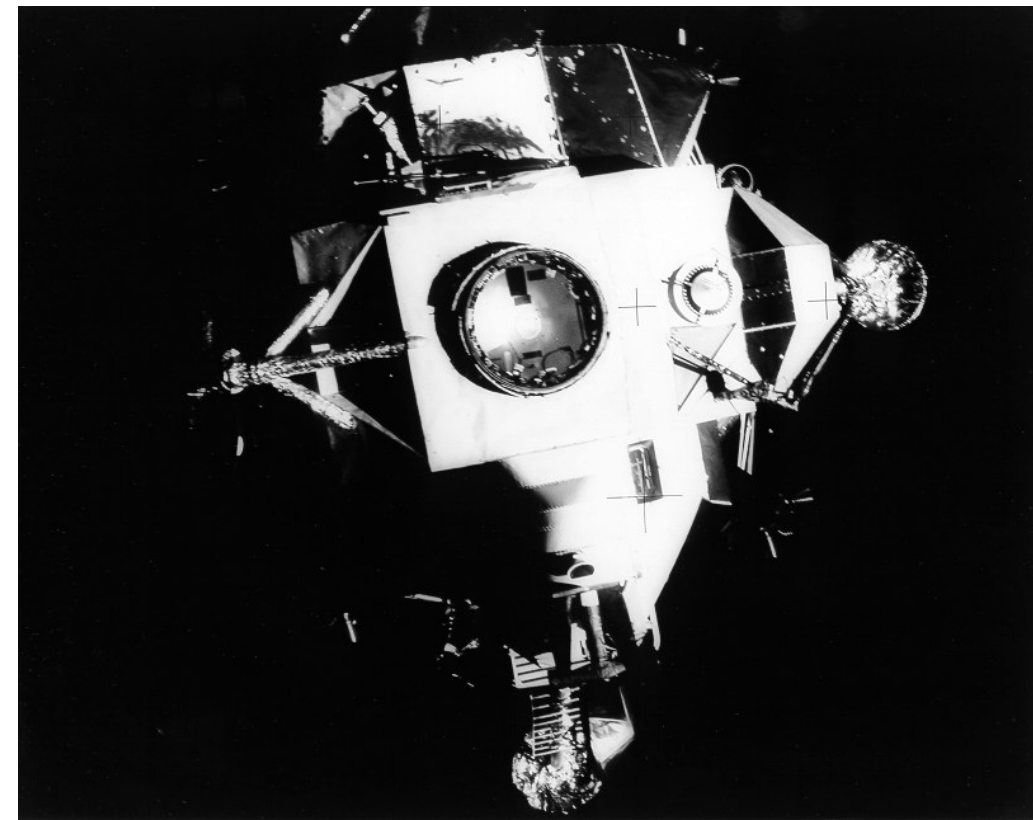


FIG. 1. *Pharmaceutical waste dump site, located 64 km north of Puerto Rico, and stations sampled in October 1979 (▲), December 1979 (●), and February 1980 (×).*



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Hadal disturbance in the Japan Trench induced by the 2011 Tohoku–Oki Earthquake

Kazumasa Oguri^{1,2}, Kiichiro Kawamura^{3*}, Arito Sakaguchi^{4*}, Takashi Toyofuku¹, Takafumi Kasaya⁵, Masafumi Murayama⁶, Katsunori Fujikura¹, Ronnie N. Glud^{7,8,9} & Hiroshi Kitazato¹



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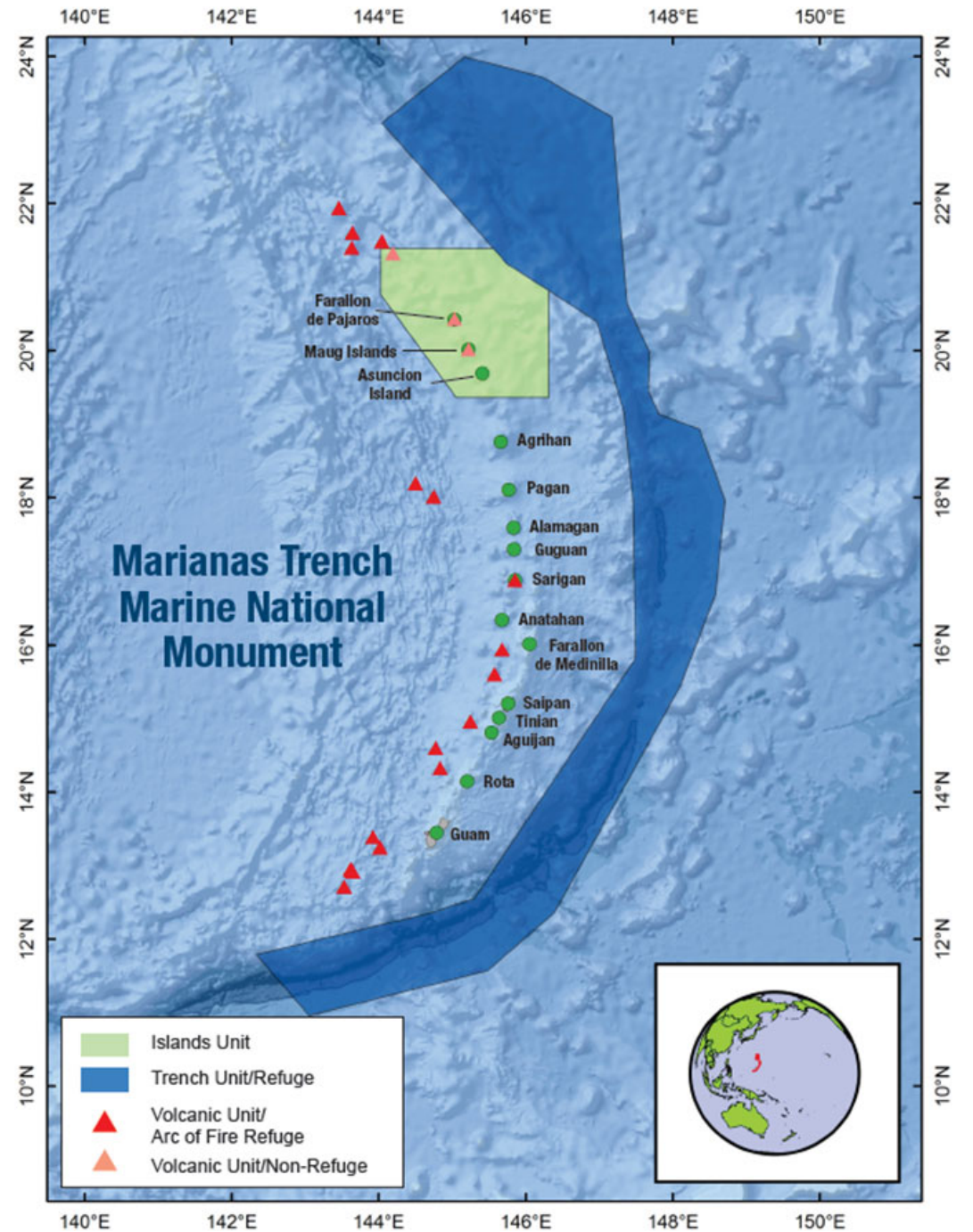
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Review

Piezophilic adaptation: a genomic point of view

Francesca Simonato^{a,*}, Stefano Campanaro^{a,1}, Federico M. Lauro^b,
Alessandro Vezzi^a, Michela D'Angelo^a, Nicola Vitulo^a,
Giorgio Valle^a, Douglas H. Bartlett^b

EXTRAS ONLINE



RESUMINDO

- 6000/6500-11000 m de profundidade
- 3 tipos de fossa
- fossas 'propriamente ditas' são as mais numerosas

- explicadas pela tectônica de placas
- encontradas em zonas de subducção e falhamento
- associadas a desastres naturais

- início com HMS Challenger (século 19)
- salto em conhecimento - expedições soviética e dinamarquesa (anos 50)
- exploração tripulada (anos 60-hoje)
- visitação comercial no futuro?

- temperatura entre 1 e 4 °C
- aquecimento adiabático - T equivalente à zona batial
- salinidade é um dos parâmetros mais constantes (35)
- sedimento rochoso a extremamente fino (lama silicada - CCD)

- lipídeos insaturados mantêm a fluidez da membrana
- piezólitos garantem equilíbrio hídrico e sustentação celular
- íons de alumínio fortificam a carapaça em *Hirondellea gigas*

- MO é principal fonte de energia para o mar profundo
- <1% chega na zona abissal
- aspectos qualitativos da MO - pigmentos, proteínas e ácidos graxos
- acúmulo de recursos ao longo do eixo – TRAD
- evidência de quimioautotrofia

- conhecimento biológico limitado pela tecnologia
- foraminíferos, poliquetos e crustáceos são os grupos mais diversos
- distribuição vertical é limitada pela pressão – peixes
- inexistência de emanções frias e hidrotermais?

- alto endemismo entre fossas
- alto endemismo entre fossas e faixa abissal
- mais fundo - menos espécies

- depósito proposital de rejeitos farmacêuticos
- depósito involuntário de material radioativo
- potencial biotecnológico dos extremófilos
- necessidade urgente de criação de áreas de proteção

The end

