

Exploring the hidden face of our dark deep ocean planet

UNIVERSITY OF Southampton

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NASA

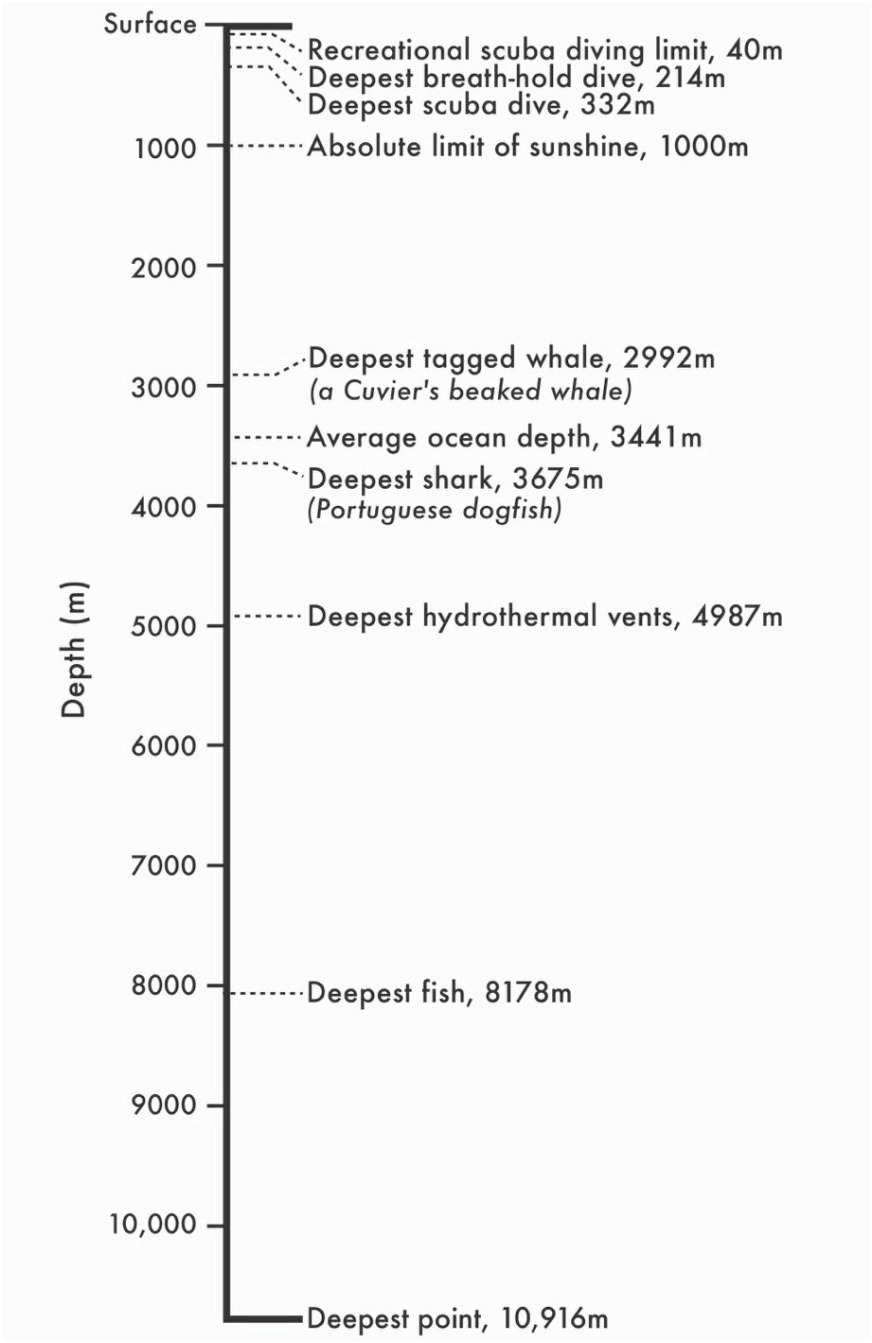


Illustration by Rosie Collins from
Ask An Ocean Explorer by Jon Copley
(Hodder & Stoughton, 2019)

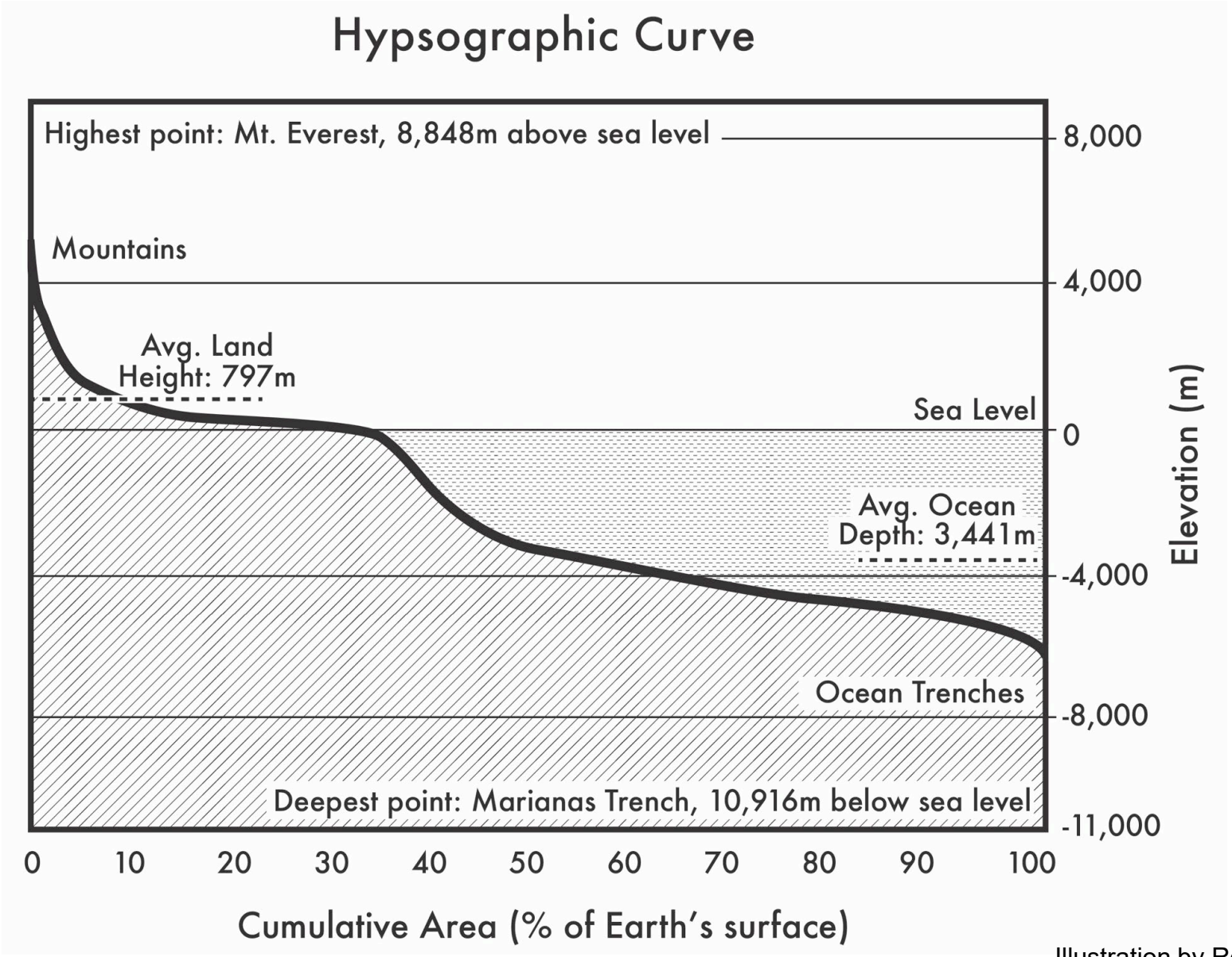
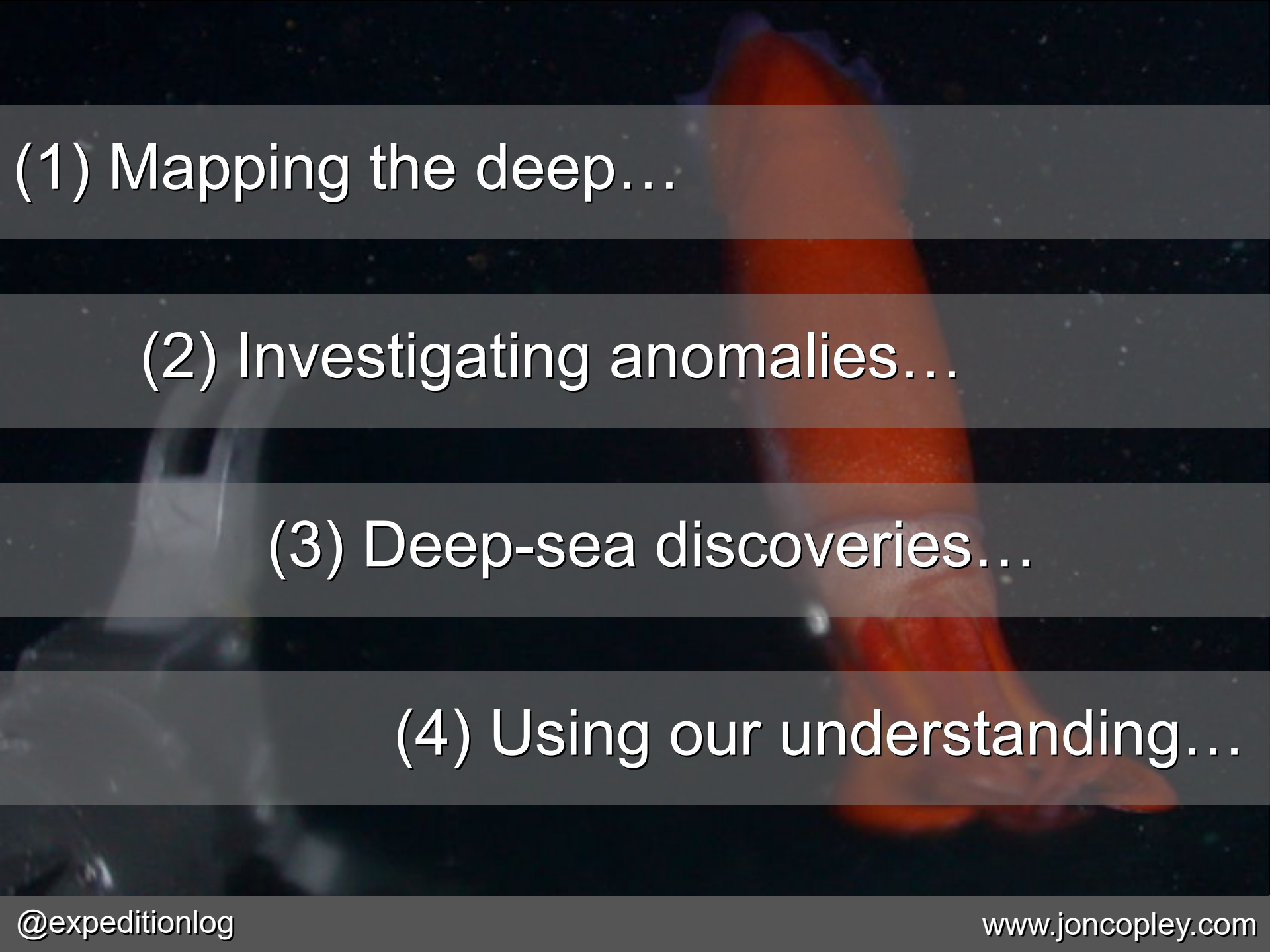
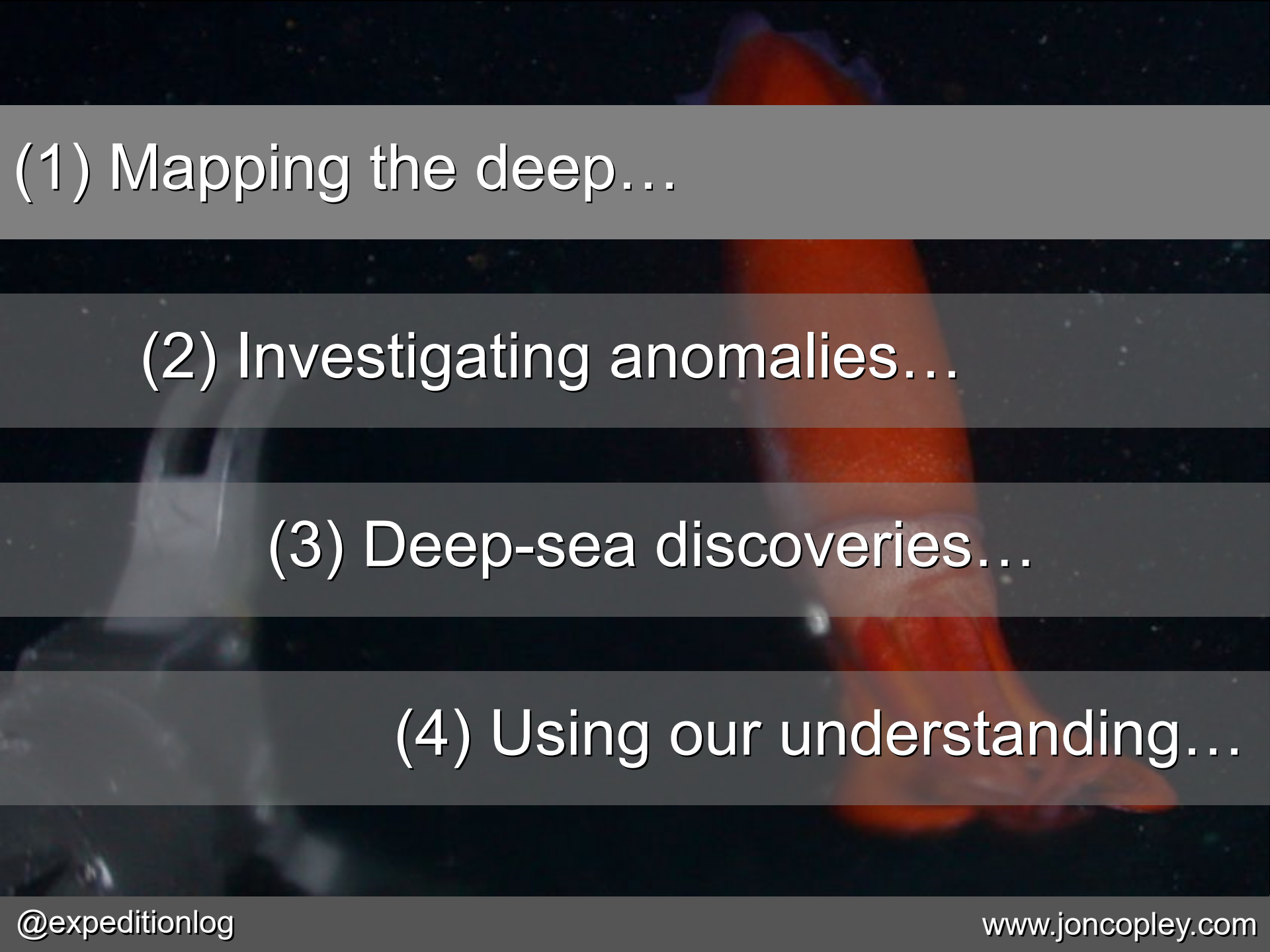


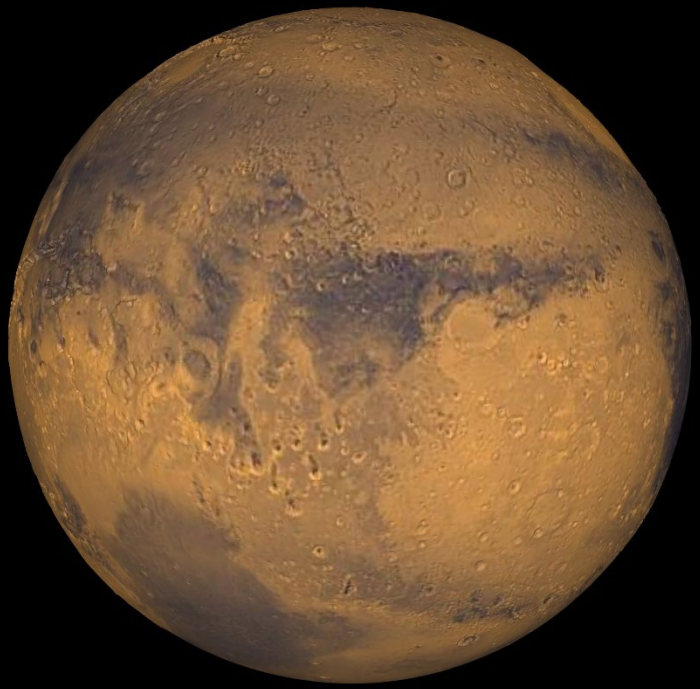
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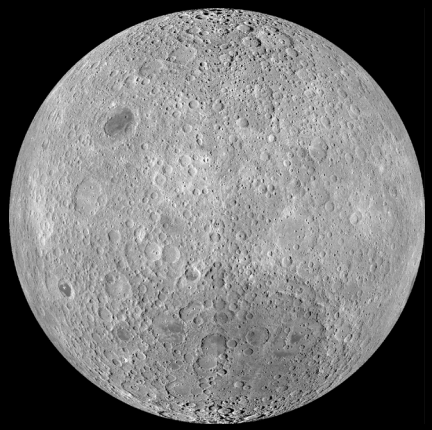

(1) Mapping the deep…
(2) Investigating anomalies…
(3) Deep-sea discoveries…
(4) Using our understanding…

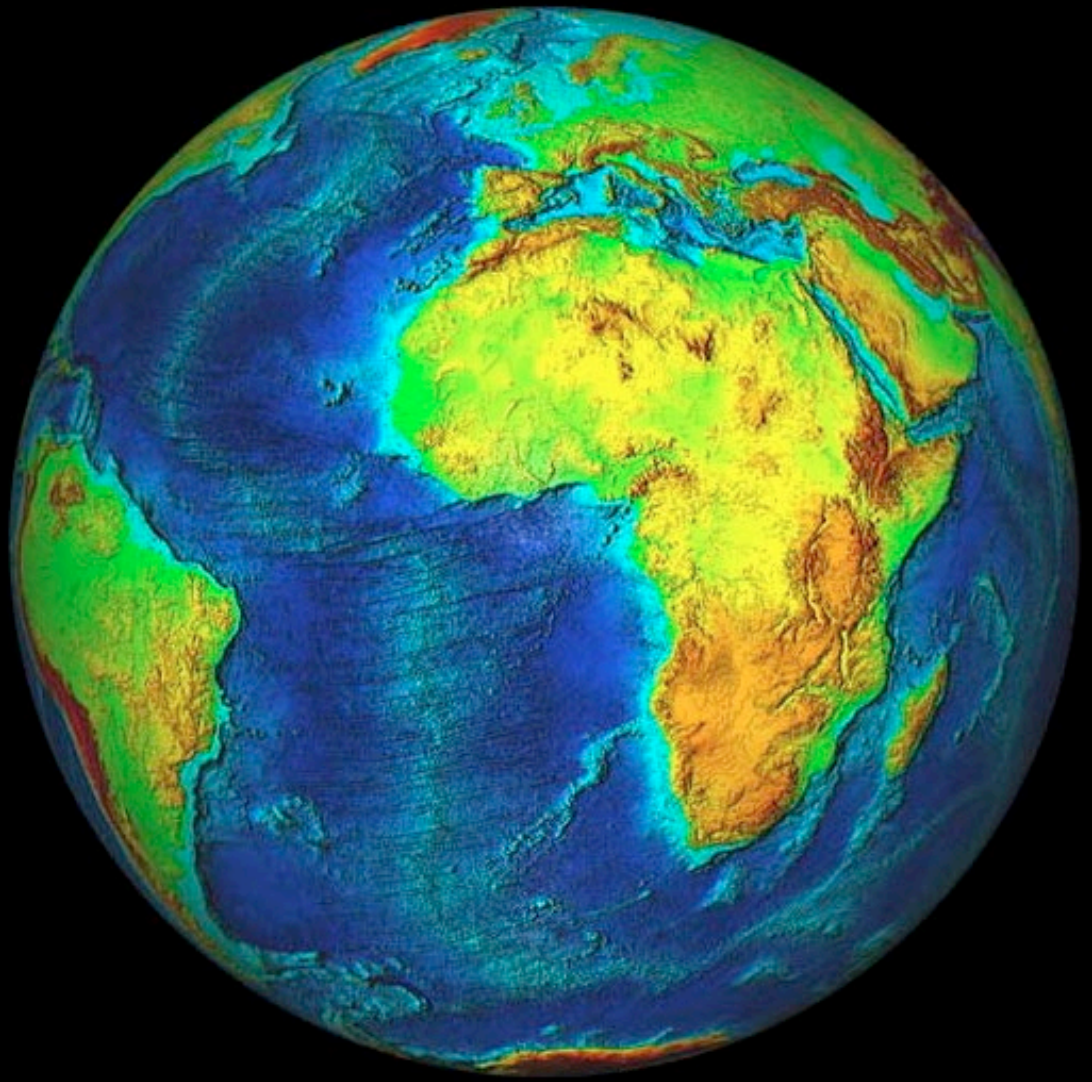

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NASA

NOAA







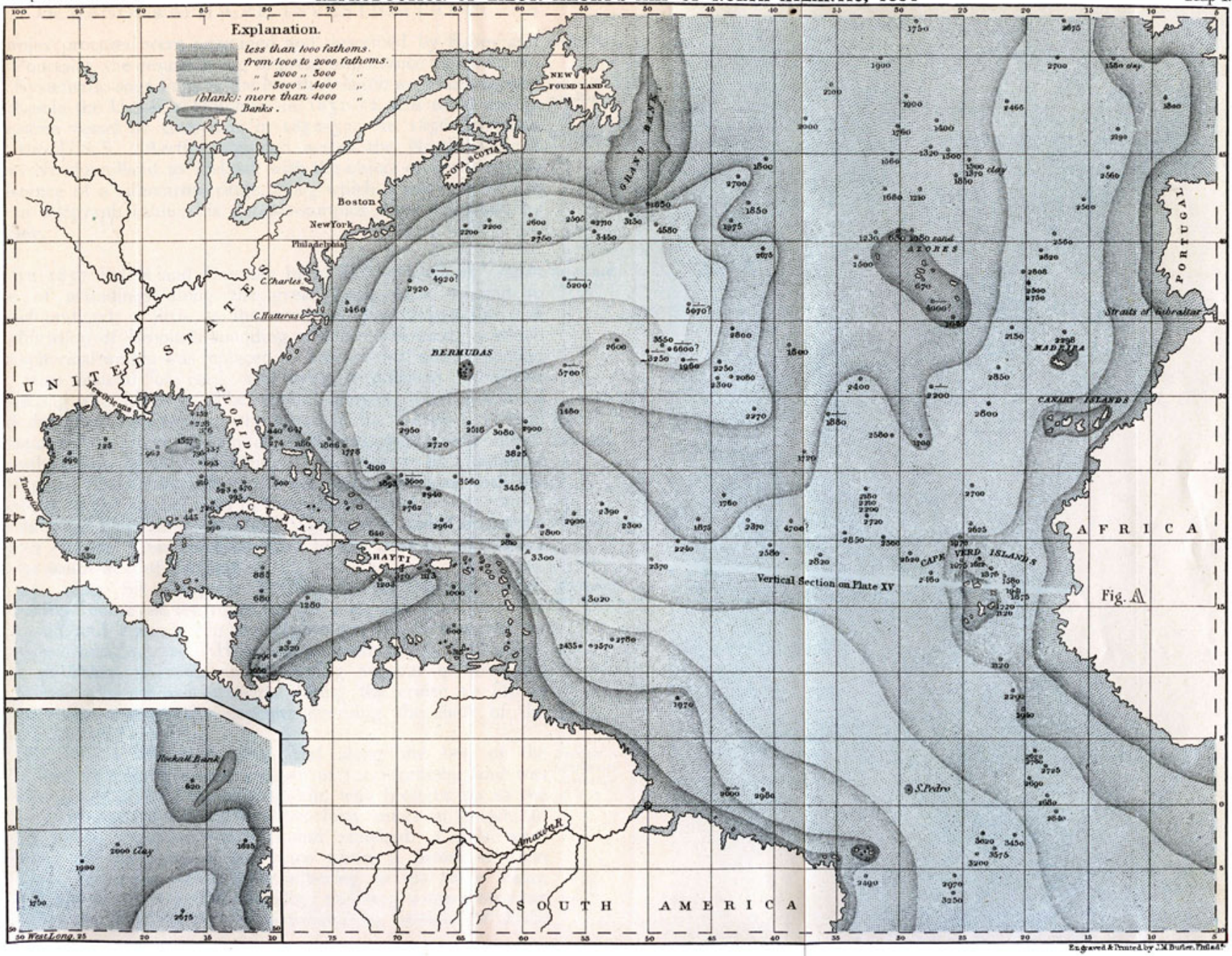
Ferdinand Magellan (1521)



Matthew Fontaine Maury (xxxx-yyyy)



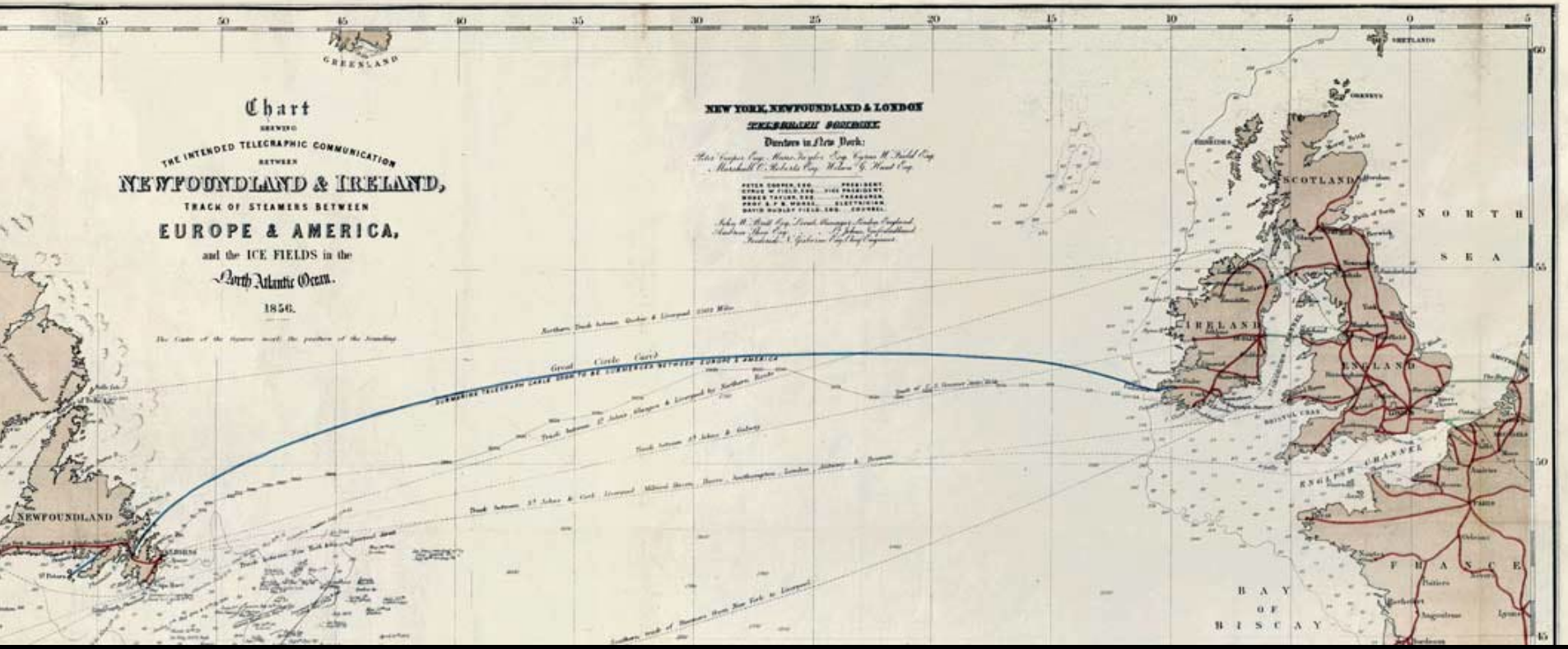
REPRODUCTION OF LIEUT. MAURY'S MAP OF NORTH ATLANTIC, 1854



Engraved & Printed by J.M. Butler, Philad.a

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First trans-Atlantic telegraph cable: 1858



"The Atlantic is dried up, and we become
in reality as well as in wish one country"

The Times, 6 August 1858, p 8

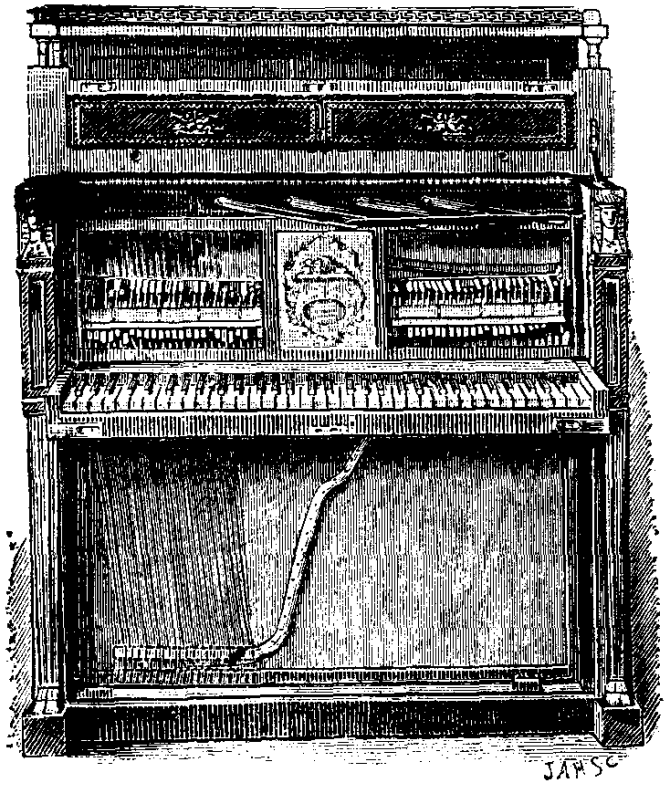
HMS Challenger (1872-1876)

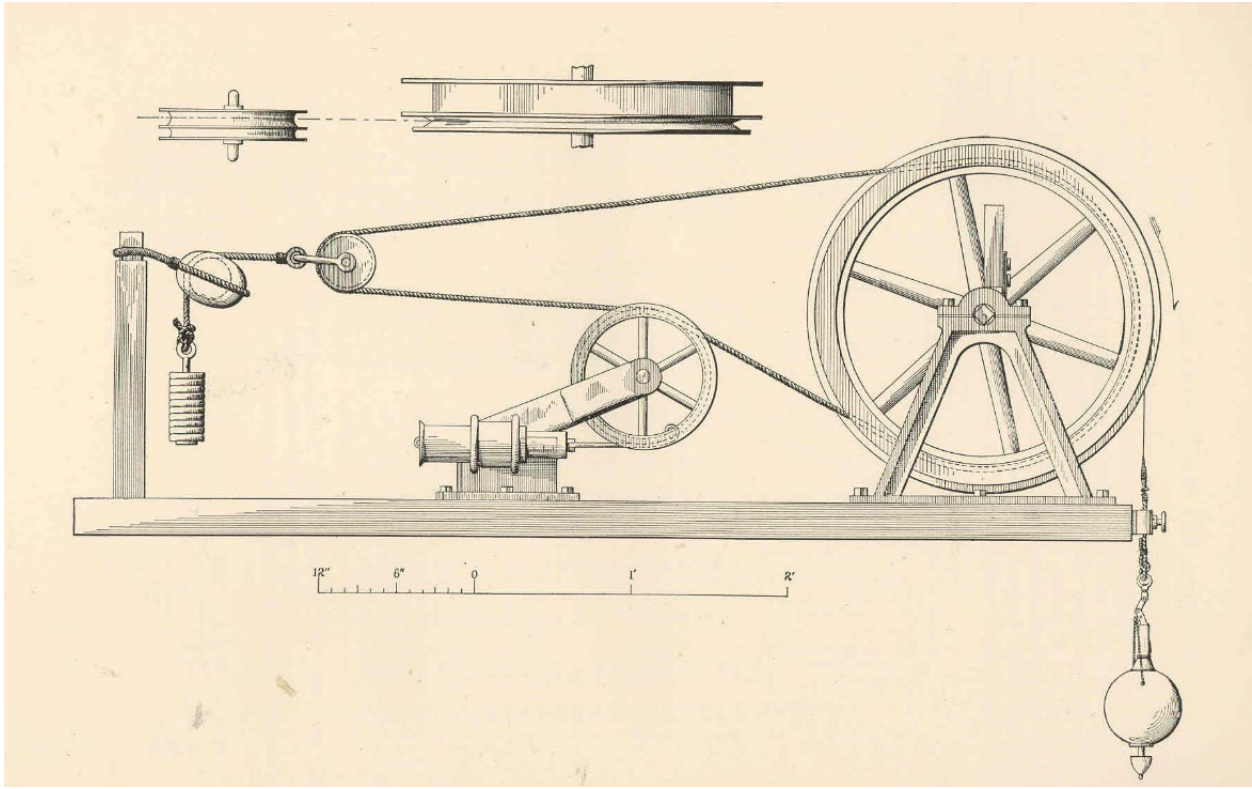


USS Tuscarora (1873-1874)

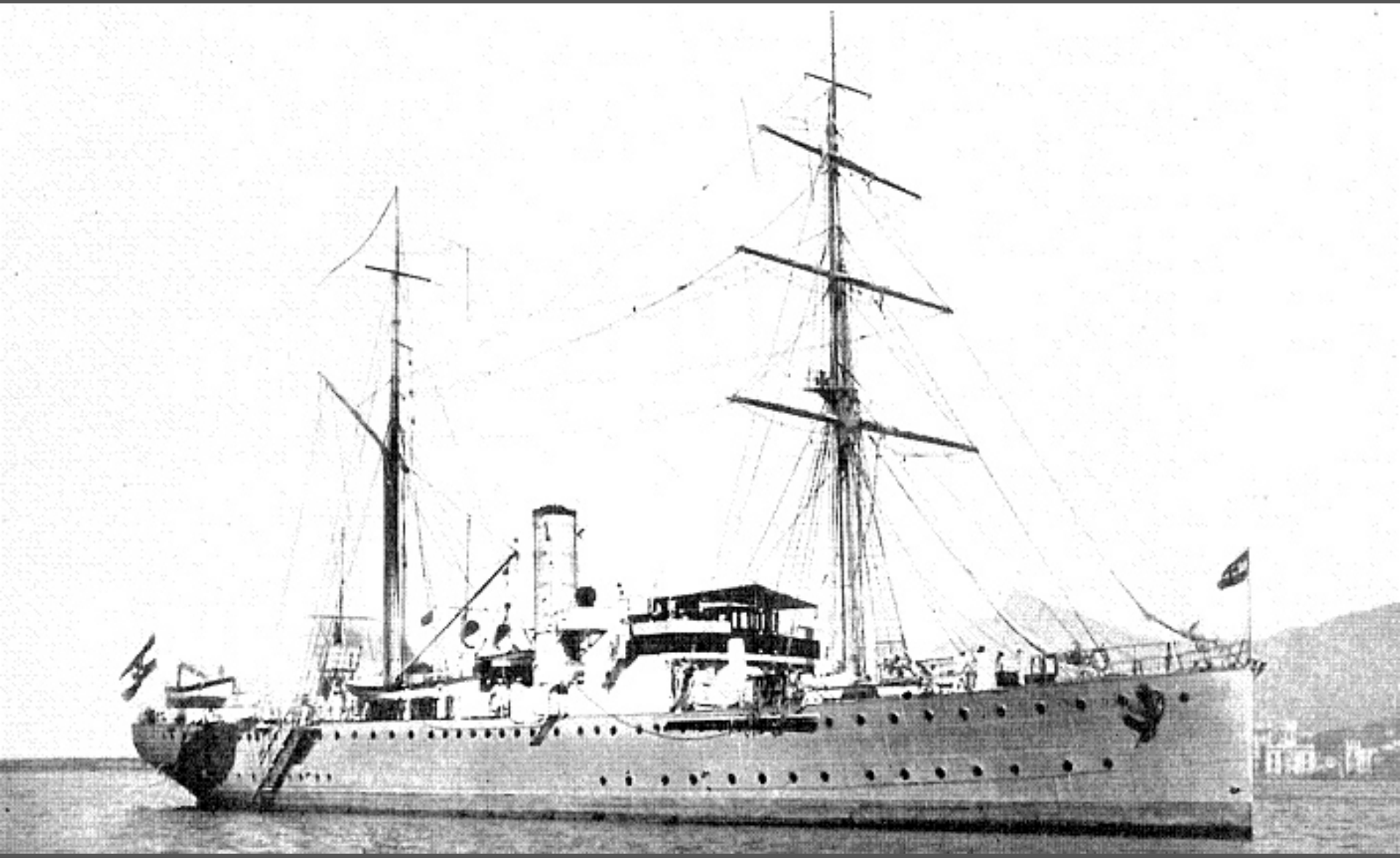


A musical interlude…





Meteor expedition (1927)



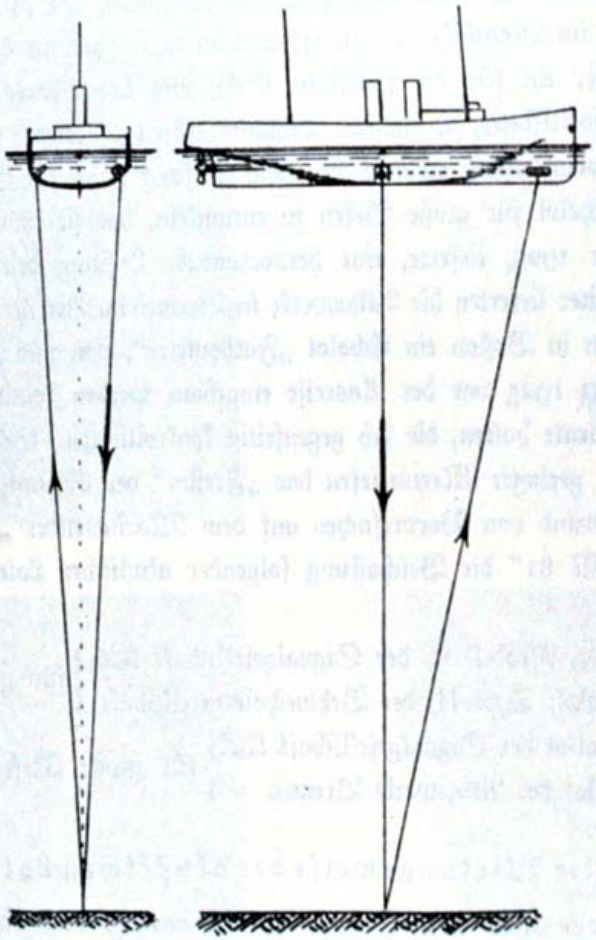
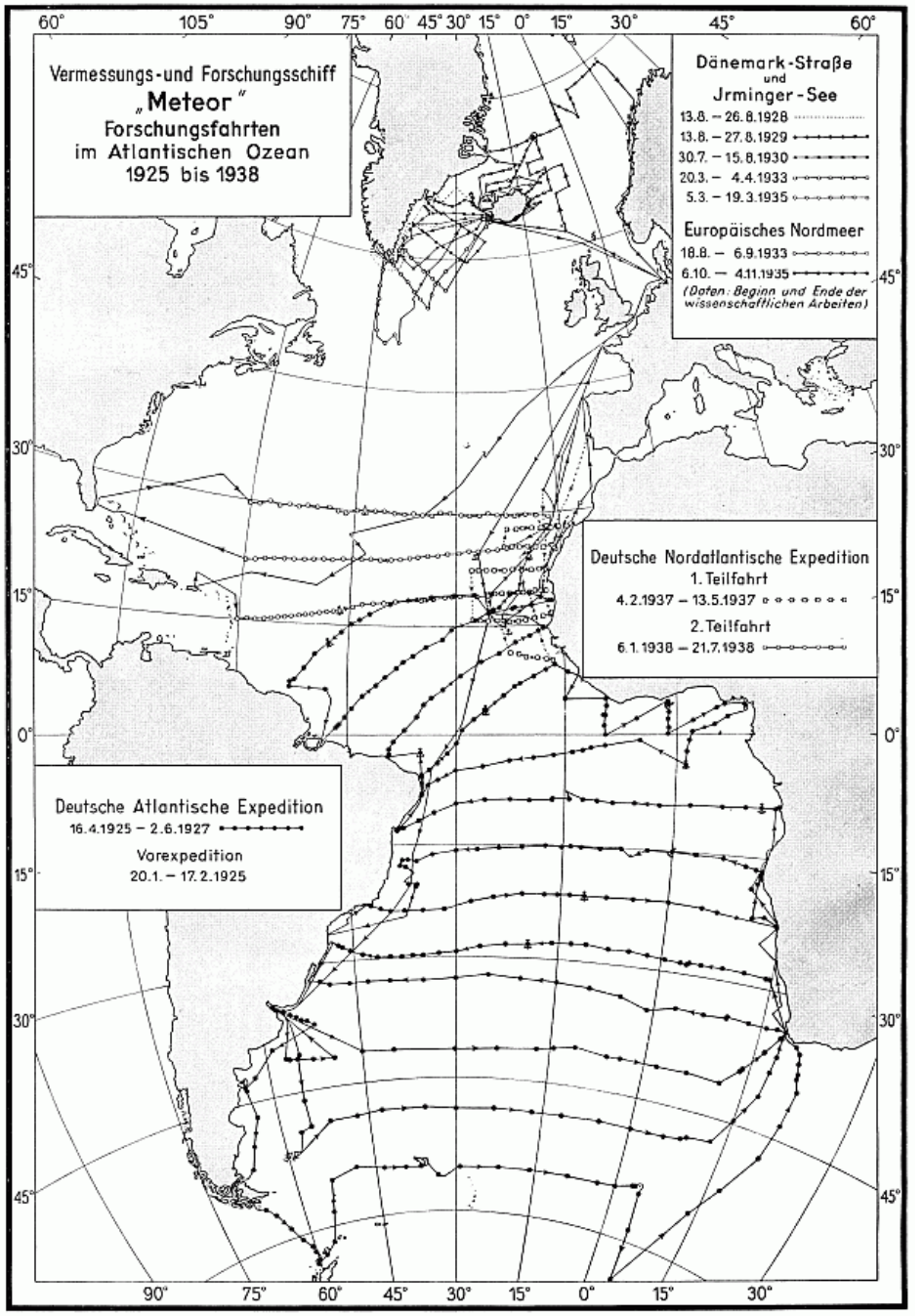


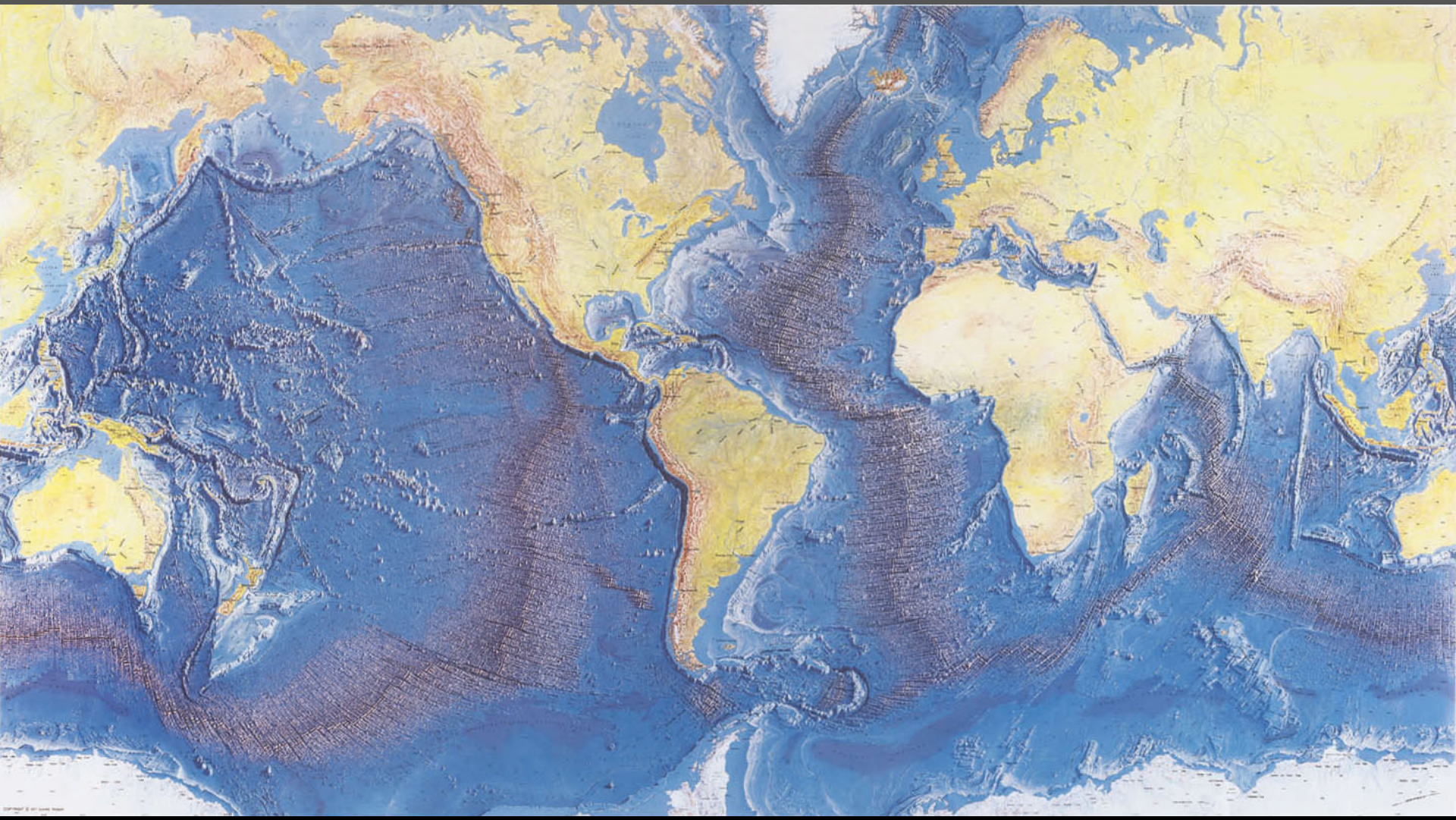
Fig. 10. Prinzip der Echolotung.



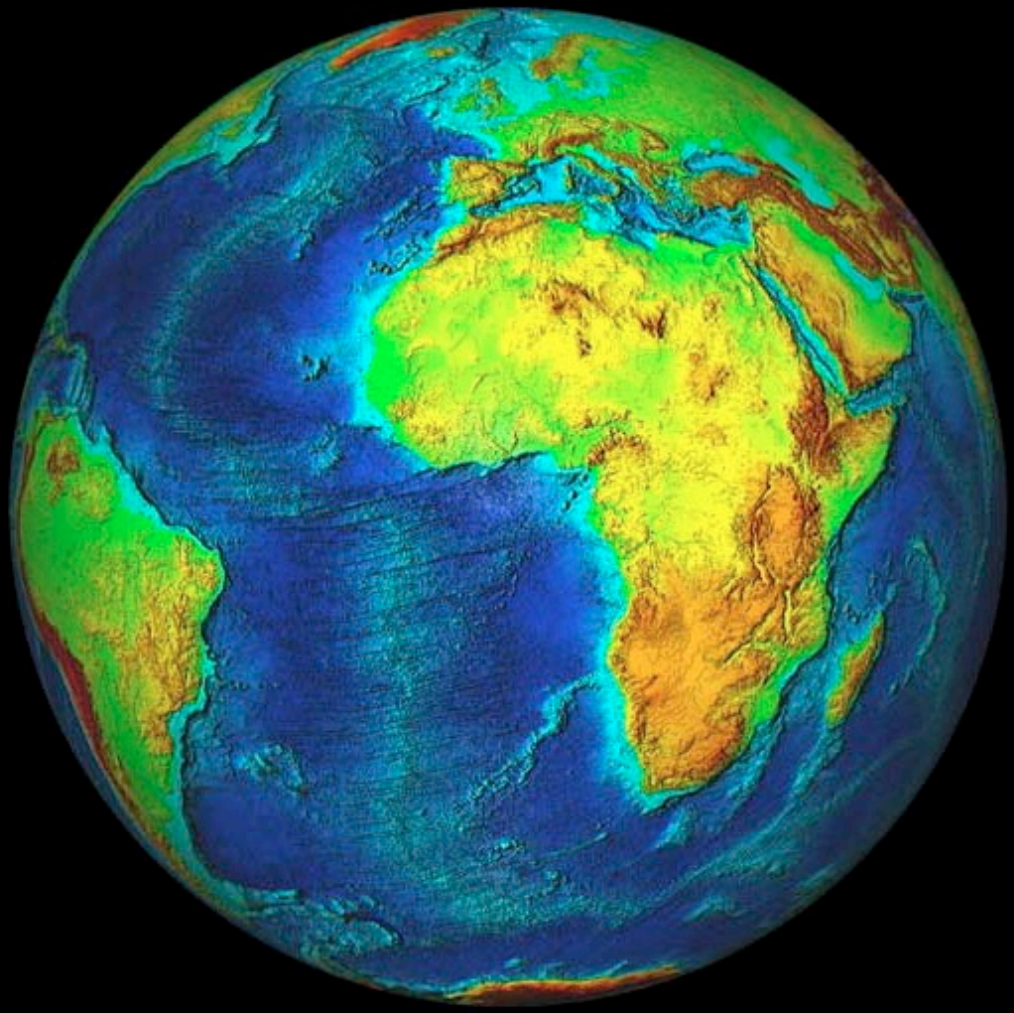
Marie Tharp (xxxx-yyyy)



‘Floor Of The Ocean’ (1977)

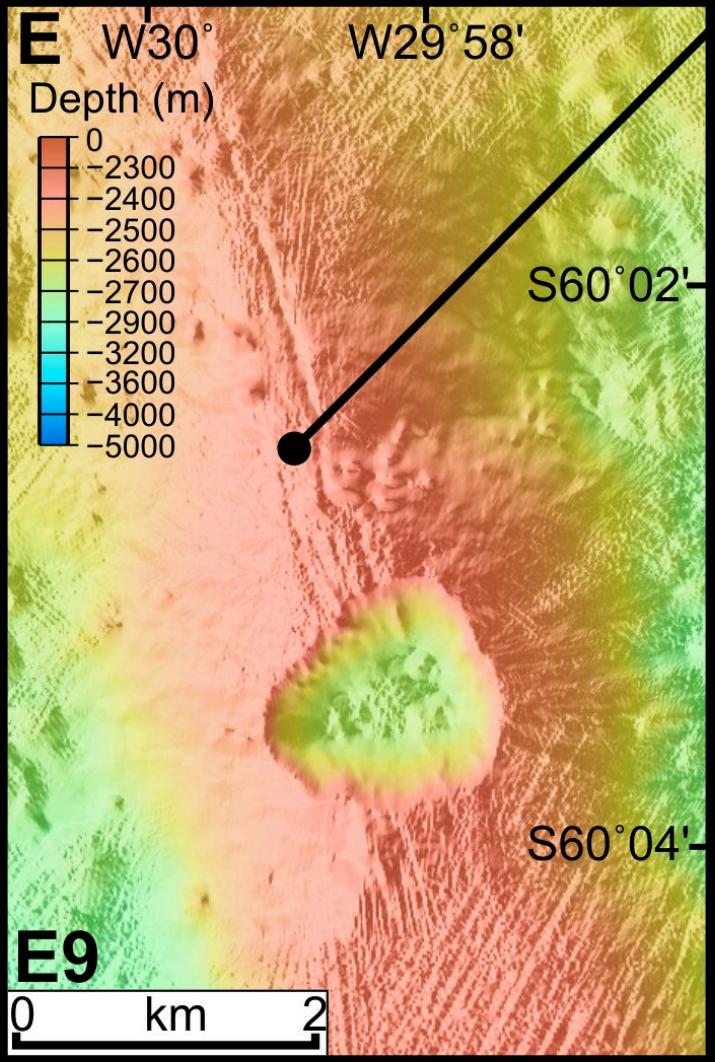


100% of ocean floor mapped…



…at 5 km resolution

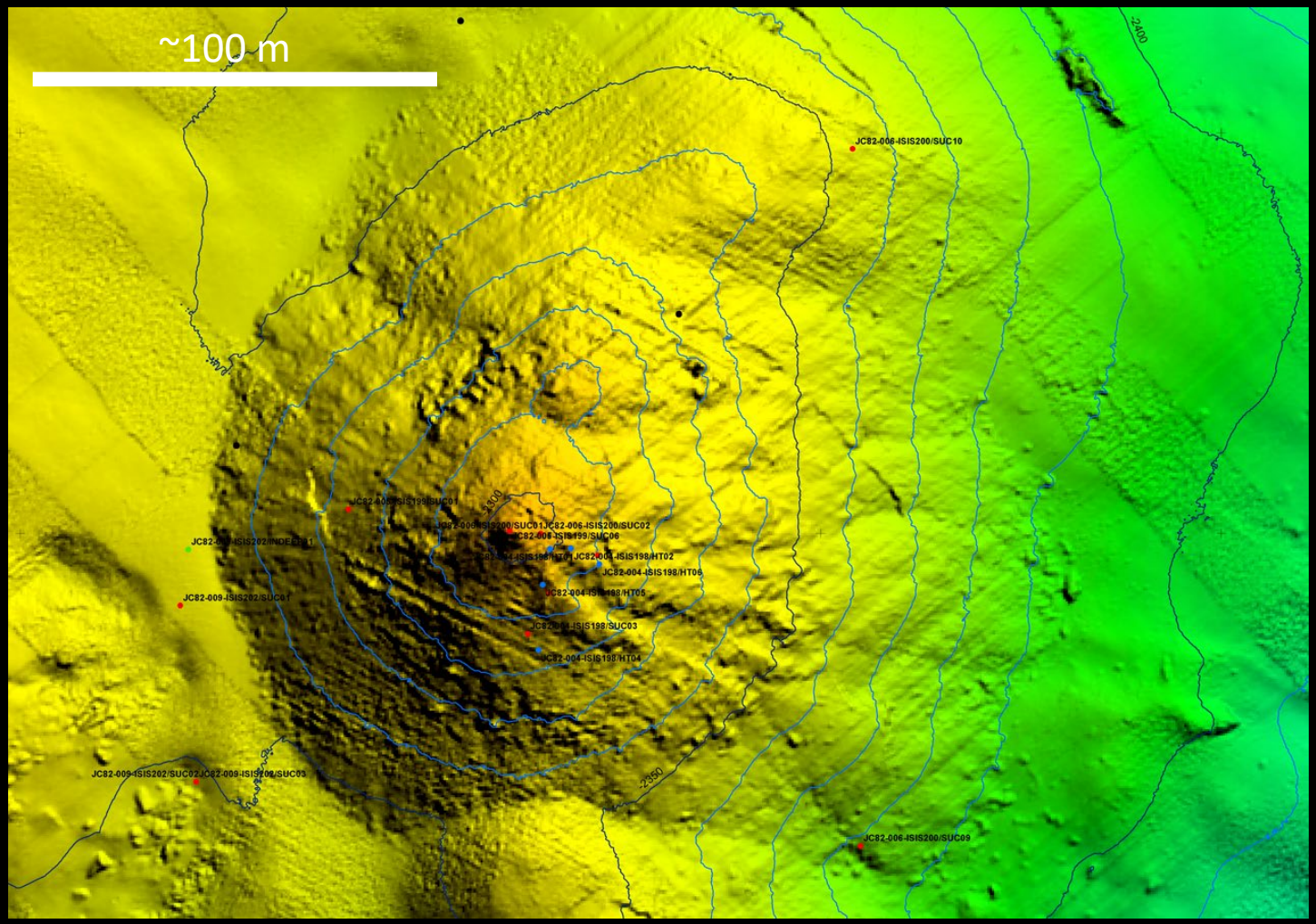
~15% of ocean floor mapped…



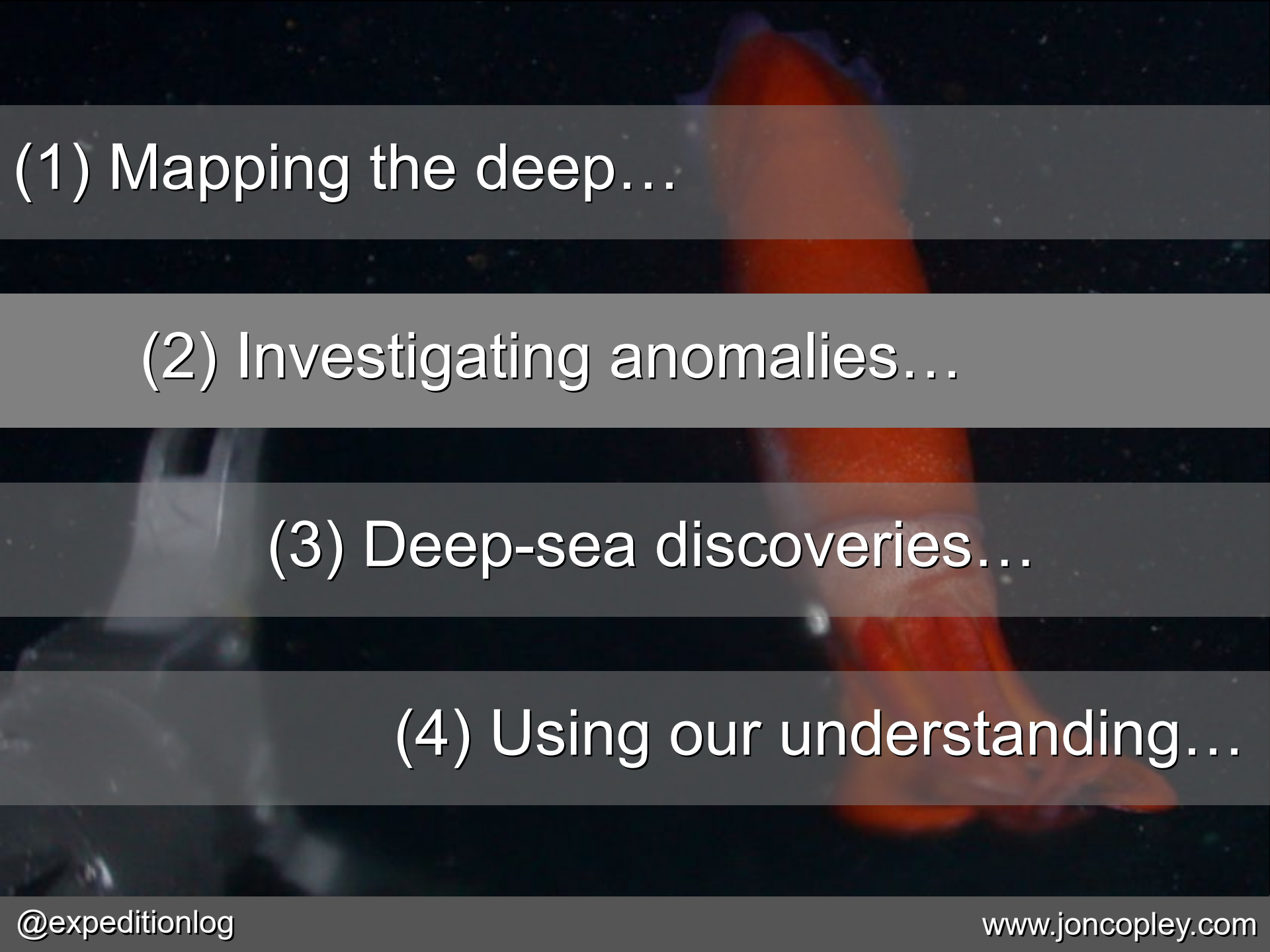
Rogers AD, Tyler PA,
Connelly DP, Copley JT *et al.* (2012)
PLoS Biology **10**: e1001234

…at ~100 m resolution

~0.05% of ocean floor mapped…



…at 1-2 m resolution


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William Beebe & Otis Barton (1930-1934)



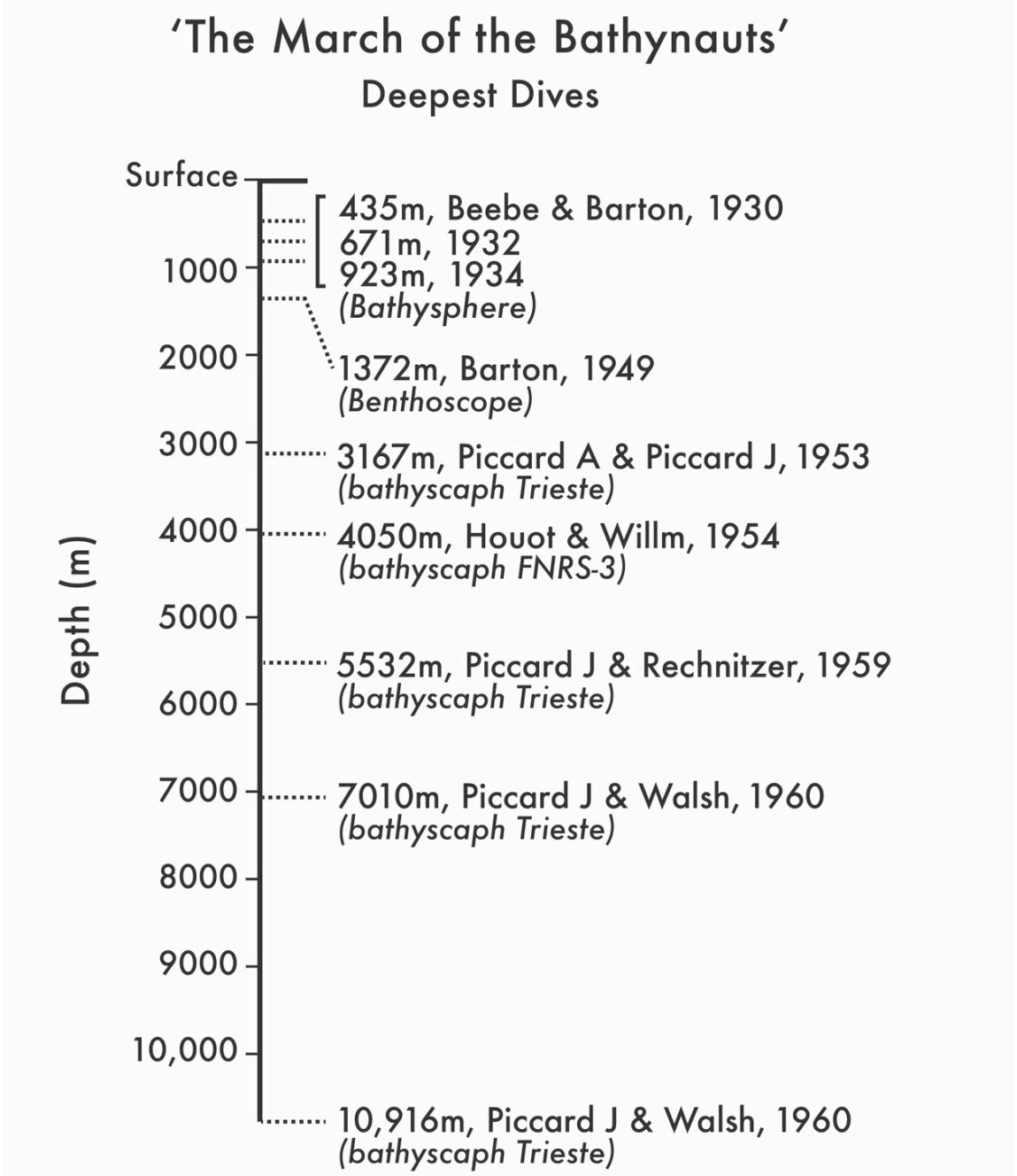


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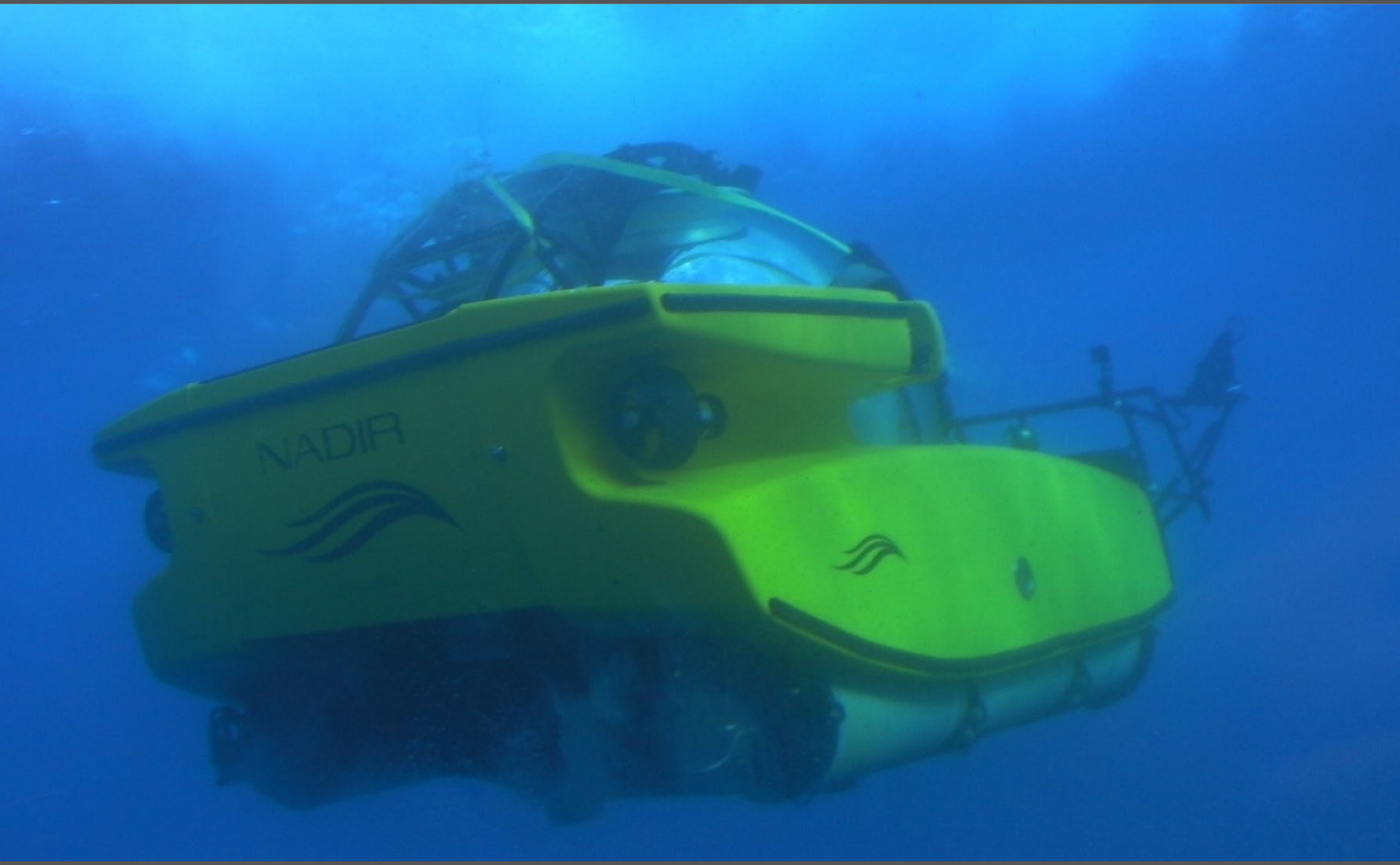
Don Walsh & Jacques Piccard (1960)



Modern Human-Occupied Vehicles (HOVs)



Modern Human-Occupied Vehicles (HOVs)

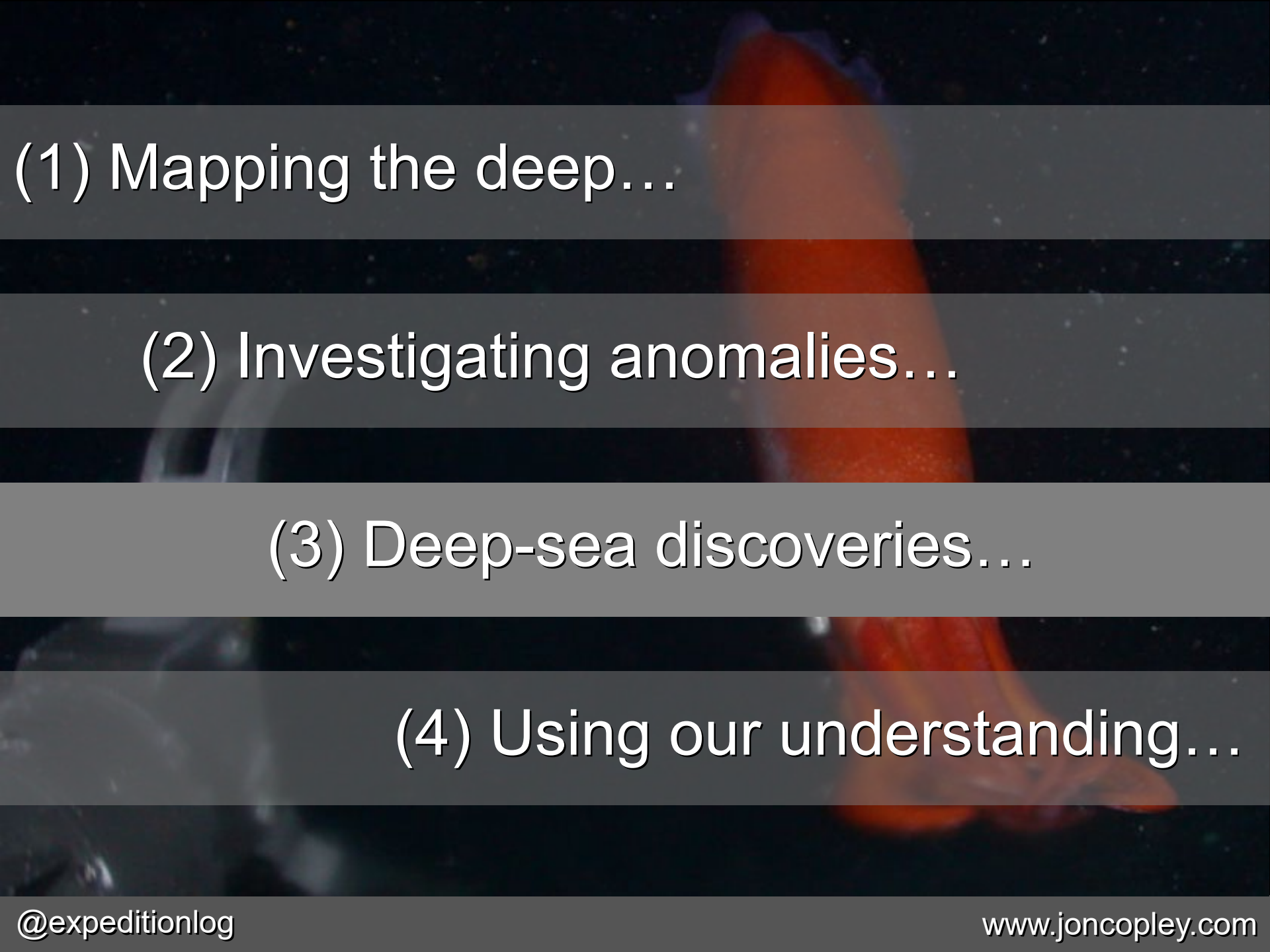


Remotely Operated Vehicles (ROVs)

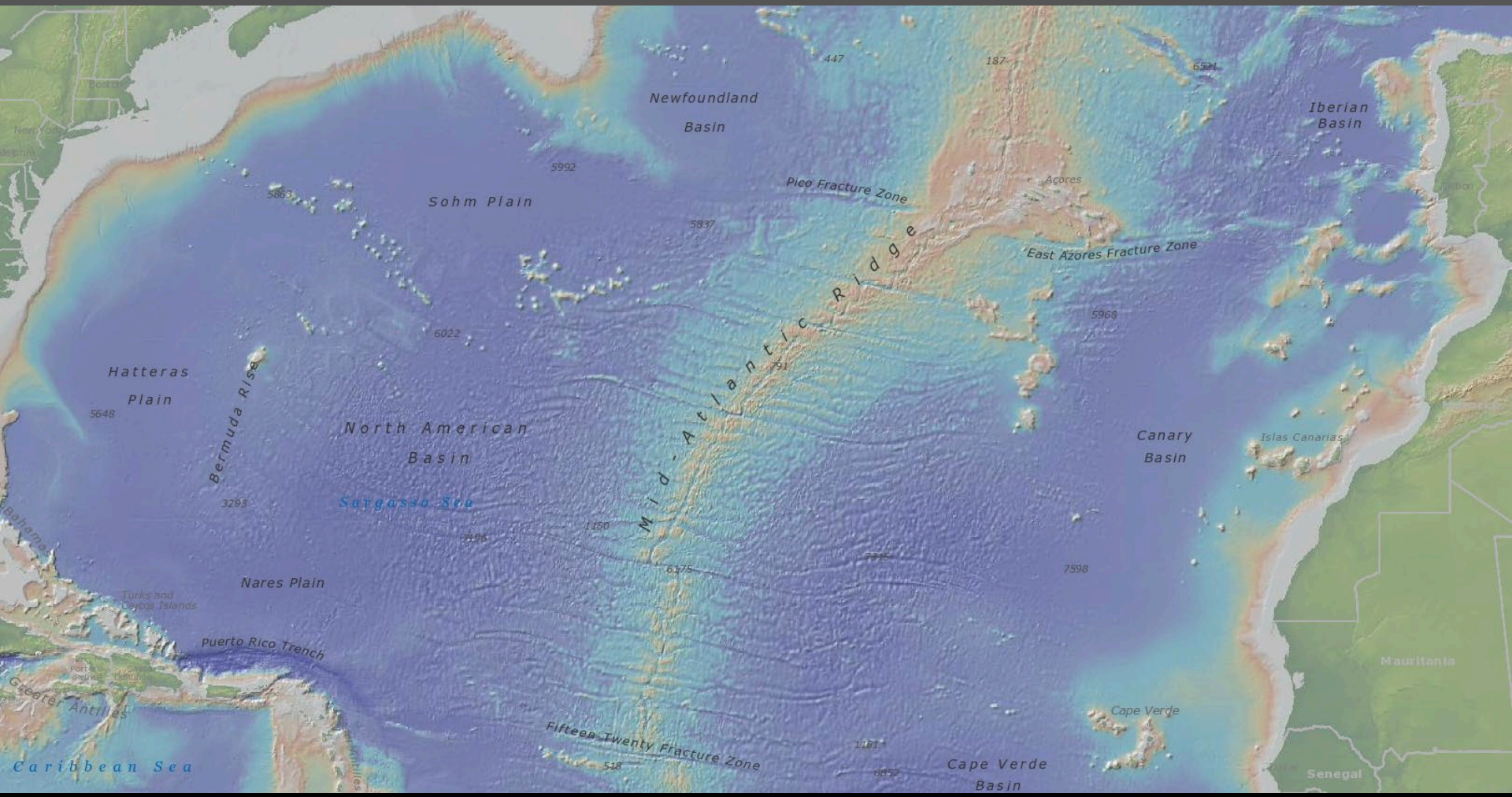


Remotely Operated Vehicles (ROVs)

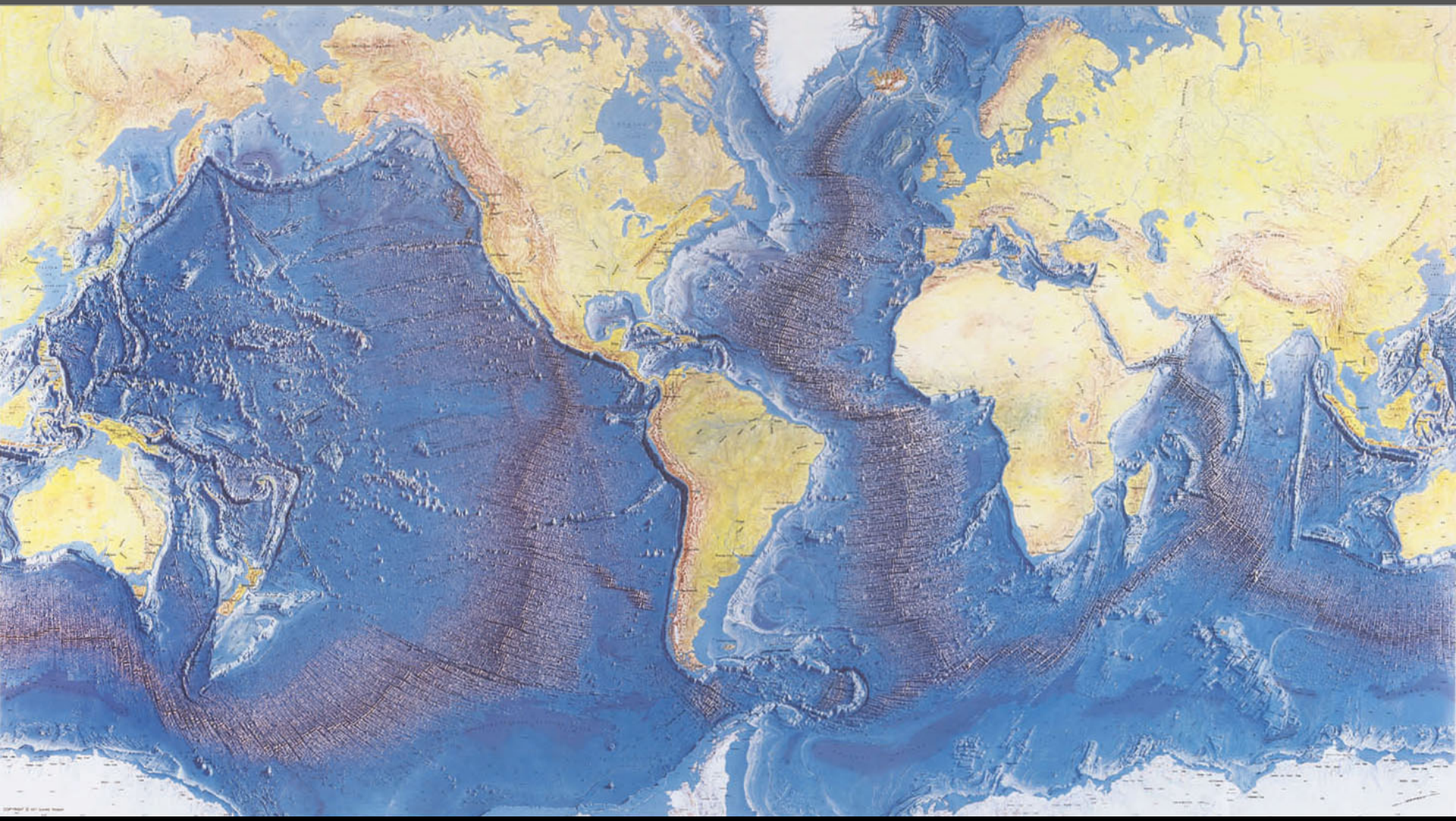



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Mid-Atlantic Ridge



Global mid-ocean ridge



Project FAMOUS (1973-1974)





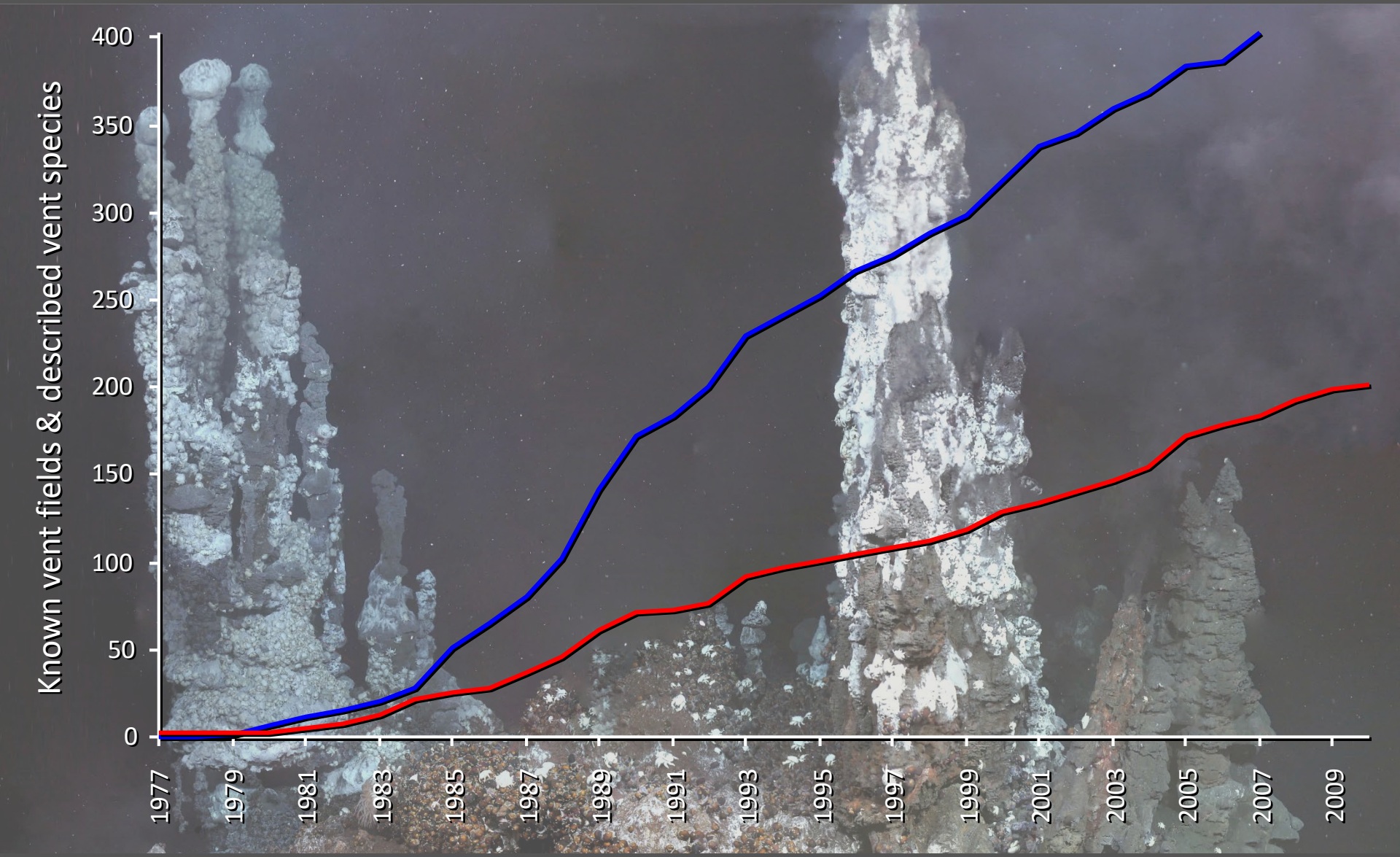
"the ocean floor is disturbingly different
from what we had imagined"

Hammond A (1975) *Science* **187**: 823

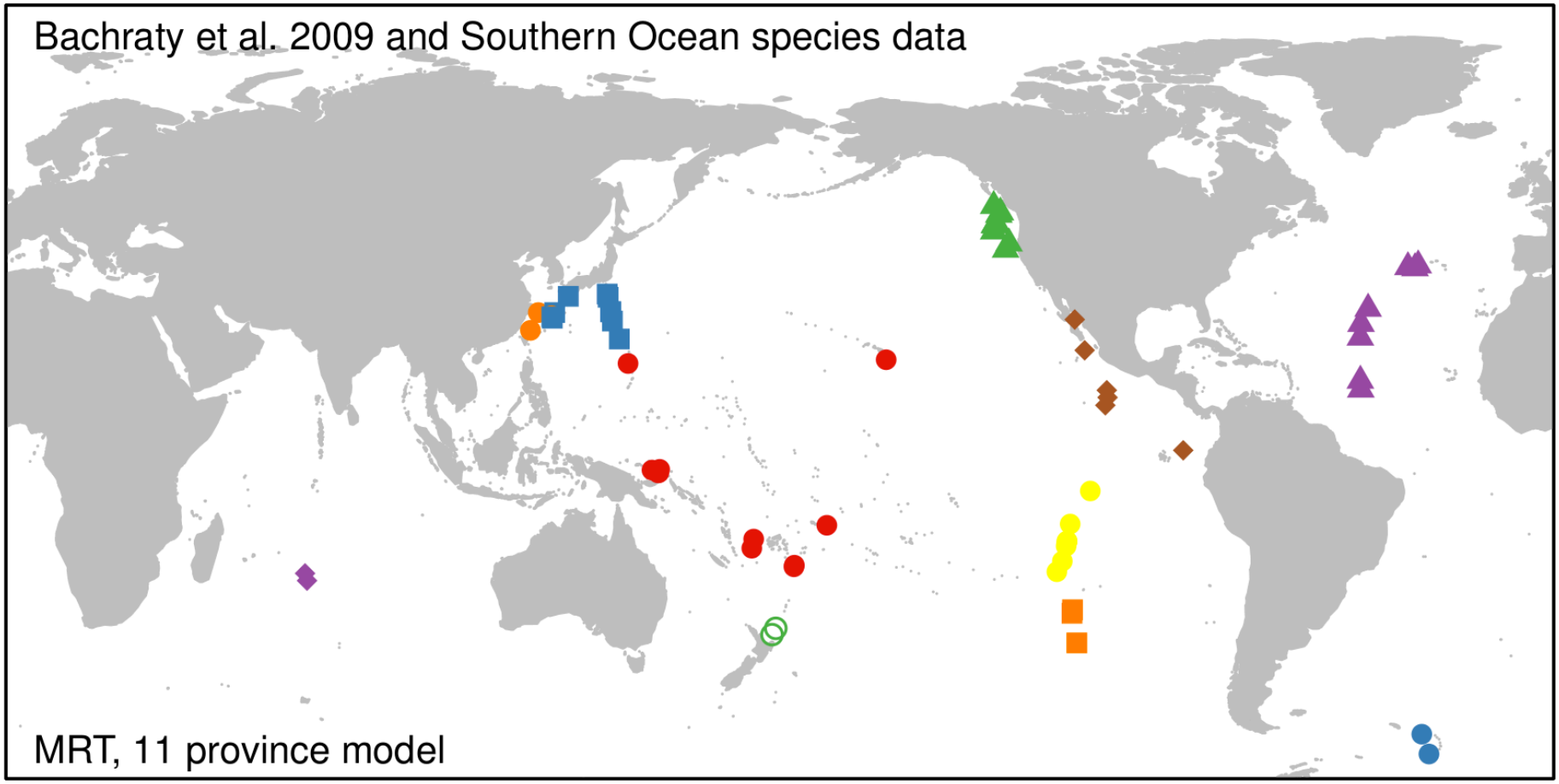
Hydrothermal vents



Hydrothermal vent discoveries



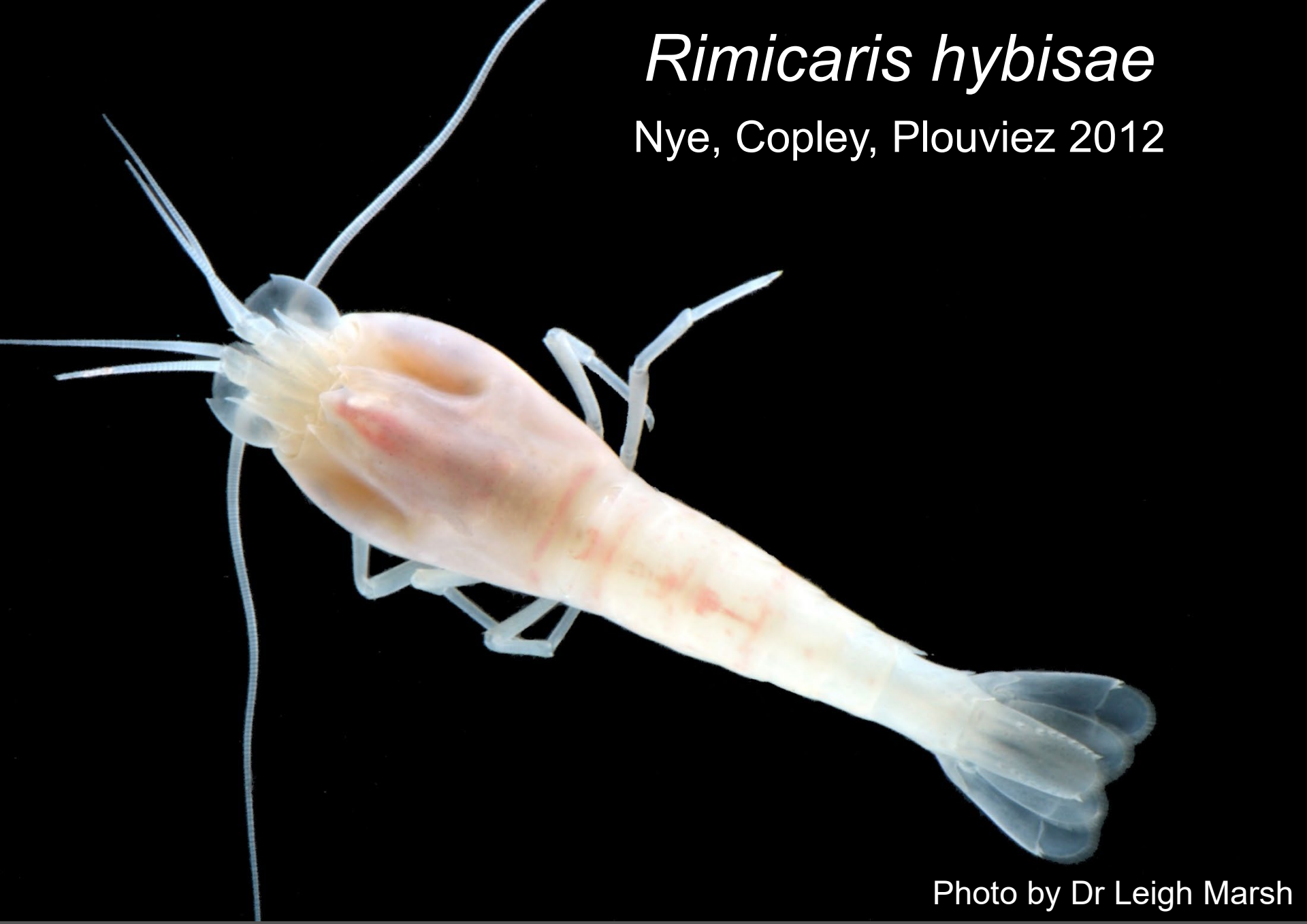
Hydrothermal vent discoveries



Rogers AD, Tyler PA, Connelly DP, Copley JT *et al.* (2012) *PLoS Biology* **10**: e1001234

“Beebe Vent Field”

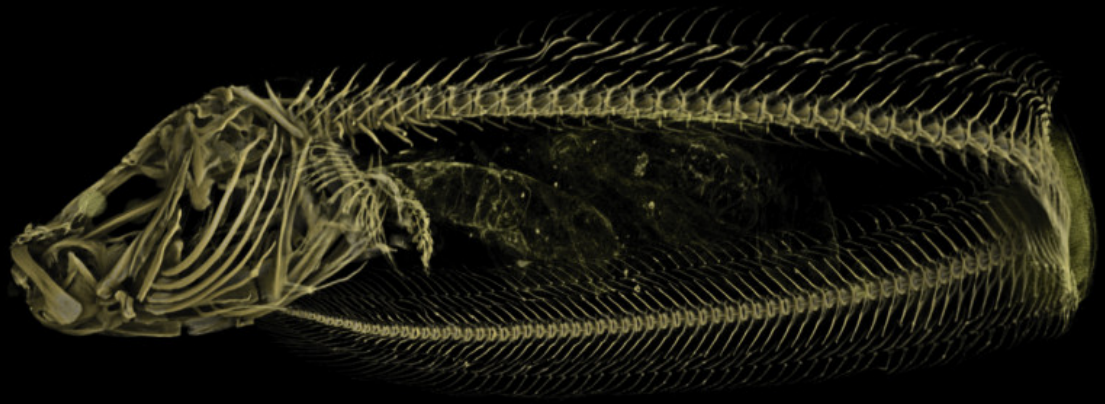
(5 km deep, Cayman Trough)

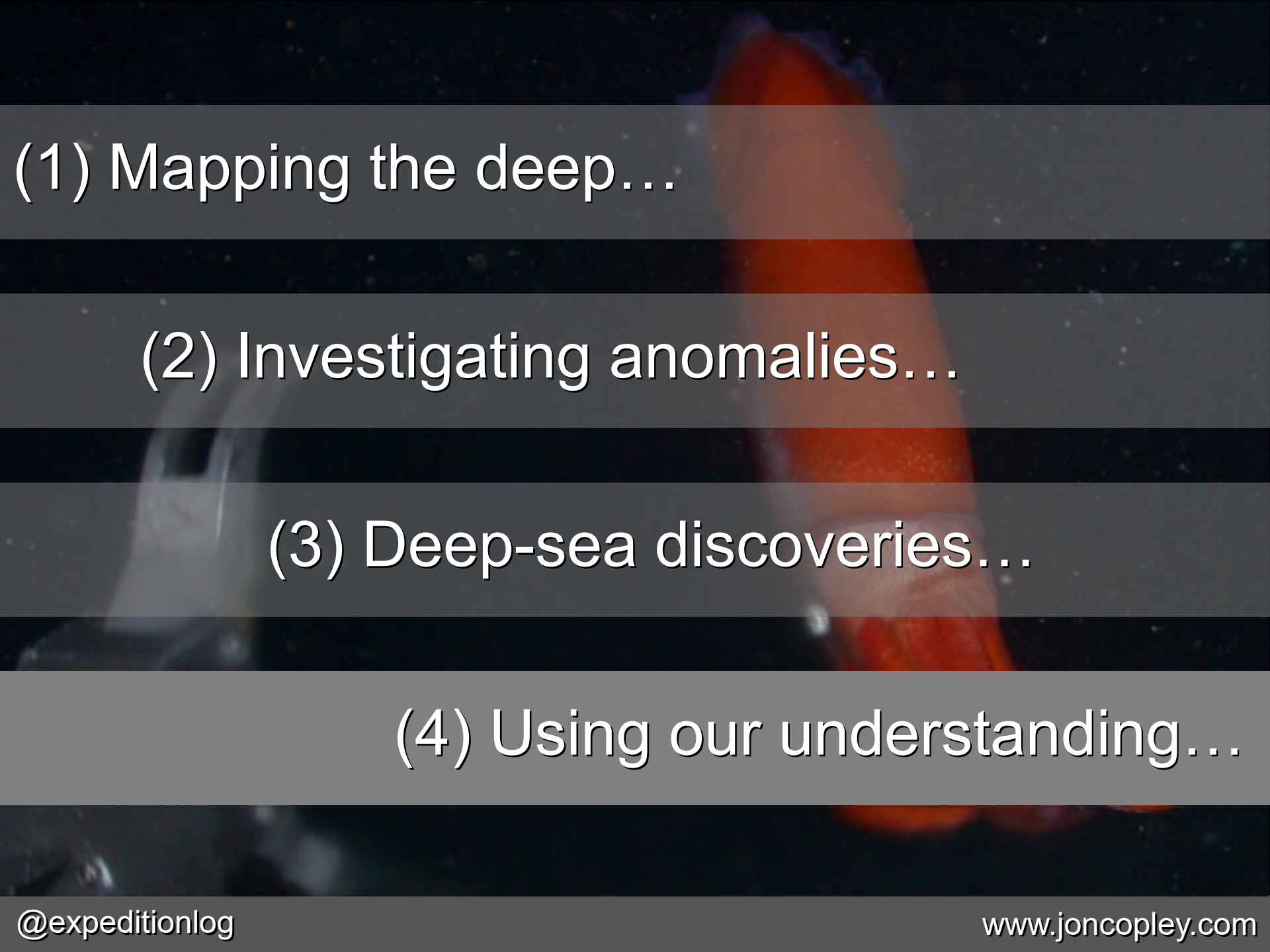

Rimicaris hybisae
Nye, Copley, Plouviez 2012
Photo by Dr Leigh Marsh

Pachycara caribbaeum

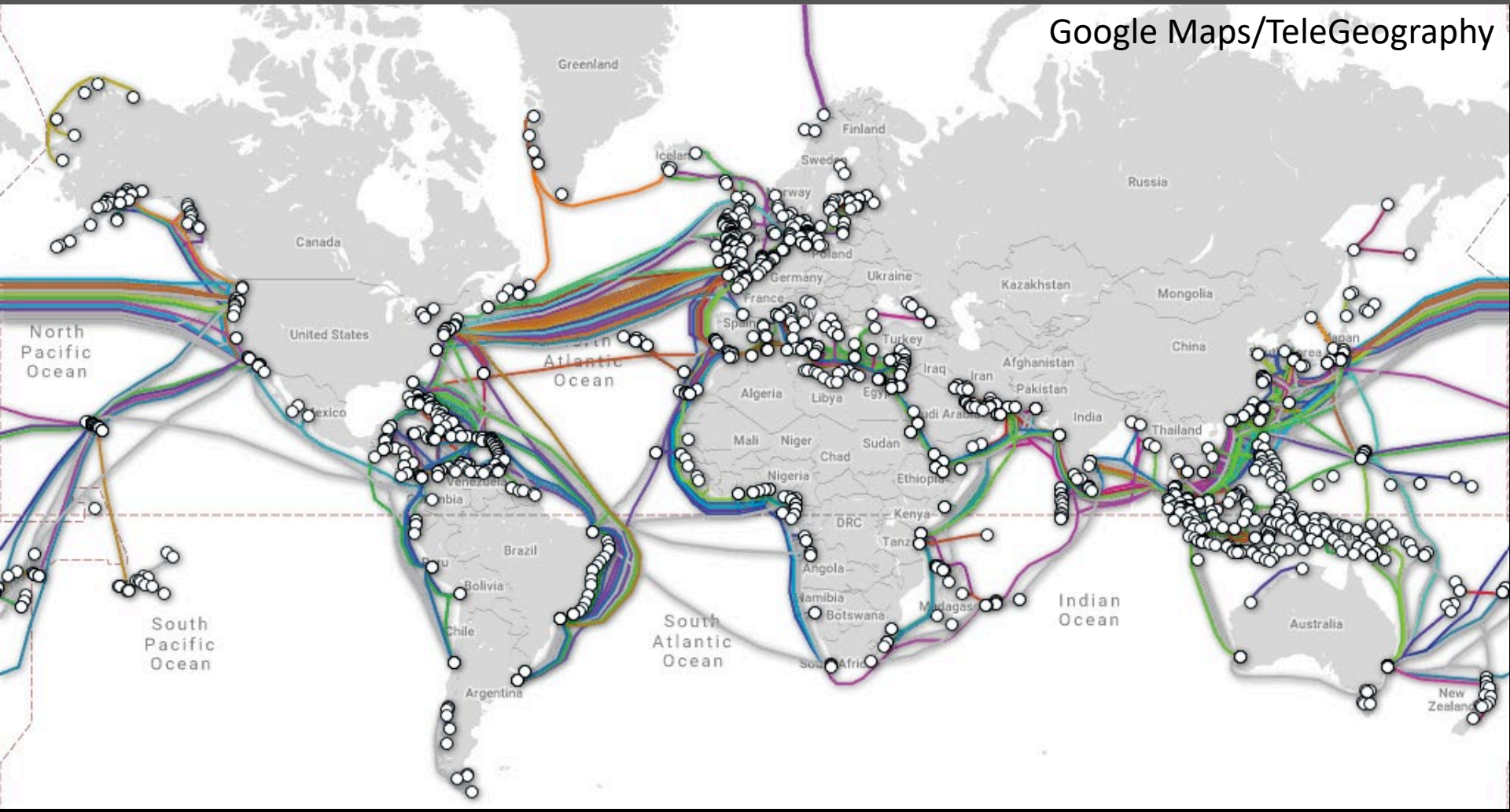
Anderson, Somerville, Copley 2016






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Modern deep-sea cables







Deep-sea trawling



Future deep-sea mining?



Copper & Gold at hydrothermal vents

Tiny island-like habitats, only ~250 known

Total habitat area known worldwide: ~50 km^2

Hundreds of species, not found in other habitats



Cobalt & Rare Earth Elements on seamounts

~9,000 large seamounts worldwide, each ~700 km^2

1000s of species, e.g. slow-growing deep-sea corals



Rare Earth Elements in nodules on abyssal plains

Eastern Pacific nodule area: ~6 million km^2

1000s of species, but in sparse populations

The Telegraph

News › Science

Prostate cancer drug based on sea-bed bacteria brings complete remission for half of patients

THE LANCET
Oncology

ARTICLES | VOLUME 18, ISSUE 2, P181-191, FEBRUARY 01, 2017

Padeliporfin vascular-targeted photodynamic therapy versus active surveillance in men with low-risk prostate cancer (CLIN1001 PCM301): an open-label, phase 3, randomised controlled trial

Prof Abdel-Rahmène Azzouzi, MD • Prof Sébastien Vincendeau, MD • Prof Eric Barret, MD • Prof Antony Cicco, MD • François Kleinclauss, MD • Henk G van der Poel, MD • et al Show all authors



Chrysomallon squamiferum (‘scaly-foot snail’)

Chen, Linse, Copley, Rogers 2015



Photo by David Shale



