Potential effects of mining on the bathypelagic
# Deep-sea Organisms

## Part I

1. Historical aspects
2. The physical environment of the deep sea
3. Methods of study of the organisms of the deep-sea floor

## Part II

**Organisms of the deep-sea benthic boundary**

4. The megafauna
5. Smaller animals

## Part III

**Patterns in space**

6. Small-scale spatial patterns
7. Abundance and size structure of the deep-sea benthos
8. The diversity gradient
9. Depth-related patterns in community composition
10. Zoogeography, speciation and the origin of the deep-sea fauna

## Part IV

**Processes: patterns in time**

11. Food resources, energetics and feeding strategies
12. Metabolic processes: microbial ecology, and organism and community respiration at the deep-sea bed
13. Reproduction, recruitment and growth of deep-sea organisms
14. Animal–sediment relations in the deep sea
INHABITABLE VOLUMES on EARTH

- terrestrial (100m) 1%
- shallow ocean (200m) 5%
- deep ocean (3800m) 93%
- ocean bottom (50m) 1%

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TYPES OF SEDIMENT PLUMES

Plume **drifting** through the water

(Dissolved organic matter vs Particulate)

Plume **settling** through the water

Plume landing on **sea floor**
SETTLING PLUME
Same amount of material reaches the sea floor but...
- lower concentration over large area
- passes through dramatically different volume

Area $\propto h^2$
Volume $\propto h^3$
Concentration $\propto \frac{1}{h^2}$
3000m height: 1.3 billion m³
100m height: 1500 m³
880,000 times less
DRIFTING PLUME

A fleet of tanker trucks 15 miles long — every day…

- Probably the biggest knowledge gaps:
  - modeling the portion of sediments that don’t sink
  - understanding deep currents in the lease regions
Based on 350,000 records, 76% of macroscopic animals, from the surface to 4000 m were capable of bioluminescence.
SEDIMENT-LADEN TRANSMISSION

CLEAR LAKES and DEEP OCEAN

AVAILABLE LIGHT

SEDIMENT-LADEN

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Warrant and Locket 2008
Many Functions of Bioluminescence

DEFENSE

OFFENSE

COMMUNICATION

Below 1500m

Erenna siphonophore (a kind of jelly)

Haddock, et al. (2005)
Pugh & Haddock (2016)
Choy, Haddock, Robison (2017)
j.mp/deepfoodweb
Choy, Haddock, Robison (2017)
Probably non-bioluminescent

Depth (m)

0

500

1000

1500

2000

2500

3000

3500

0.00

0.25

0.50

0.75

1.00

Proportion

0.00

0.25

0.50

0.75

1.00

Proportion

PARTICLE-FEEDING GROUPS

Taxon

Appendicularia

Thaliacea

Fishes

Crustacea

Chaetognatha

Cephalopoda

Pteropoda

Polychaeta

Scyphozoa

Hydromedusae

Siphonophora

Thaliacea

Martini & Haddock 2017
Potential effects of deep-sea mining on water-column communities

BEFORE AFTER

Mortality
Noise
Respiration
Visual Comms
Feeding
Buoyancy
Toxicity
Contamination
Fisheries
C Transport

Benthic plume
Sinking plume
Advected plume

THANKS
Jeff Drazen
Anela Choy
Diva Amon
Jacqui Evans