

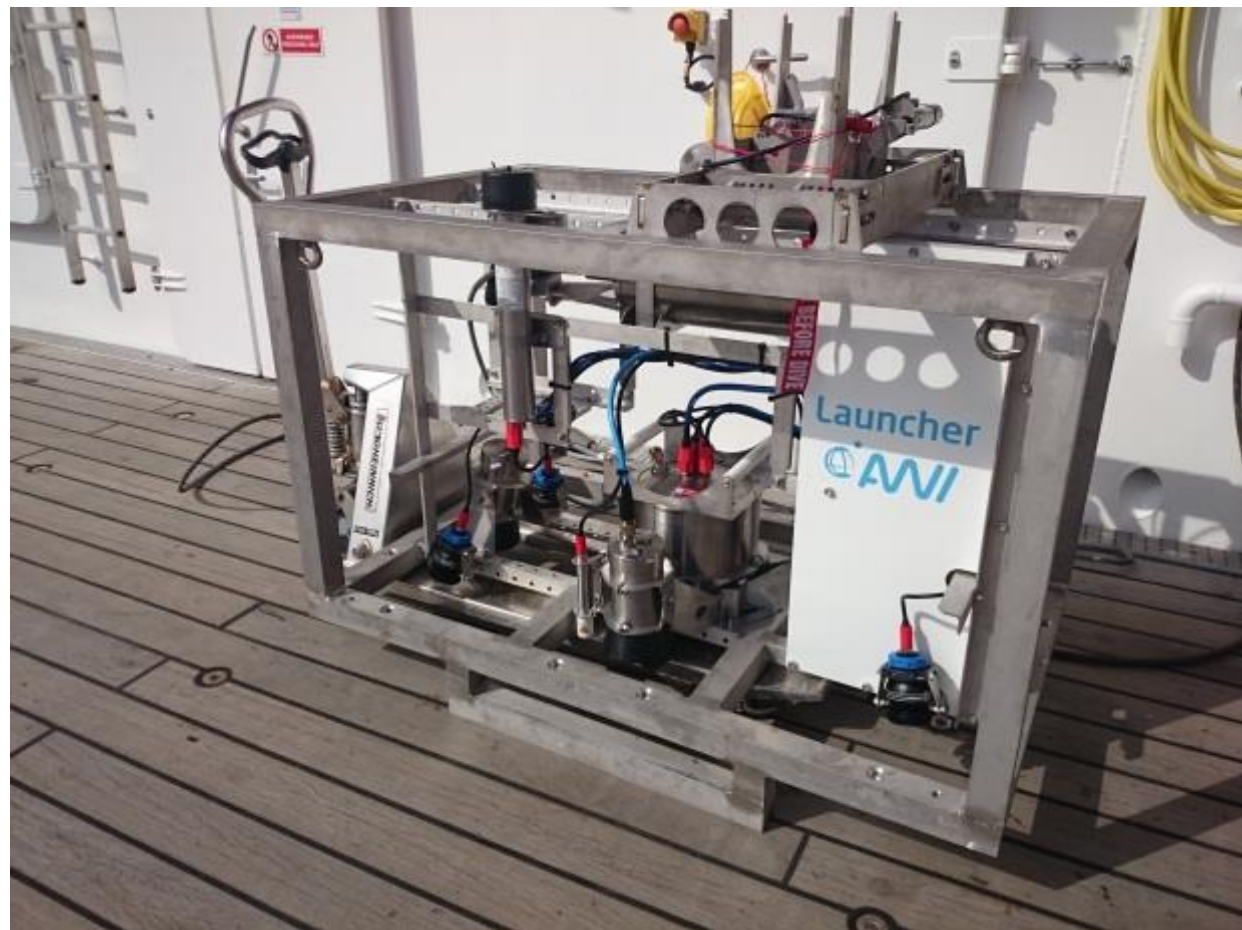
DISCOL AWI OFOS Launcher habitat mapping (AWI OFOS team SO242/2 with aid from SO242/1! Thanks!)

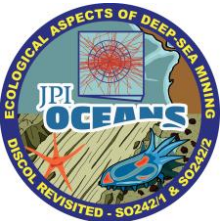


In addition to collecting image data for the biodiversity megafauna analysis (see Pedro presentation for WP2), images collected by the AWI Ocean Floor Observatory System (OFOS) Launcher also allow the mapping and quantification of sub-habitat types across DISCOL.

OFOS is a camera system towed by the ship at a height of approx. 1.5 m.

This quantification will allow the upscaling of the biogeochemical investigations of seafloor / sediment processes to the regional scale.





DISCOL habitat mapping comparison data



OFOS not the only mapping option....Repeated cruises employing various seafloor imaging and mapping techniques have surveyed the DISCOL region over the last 26 years.

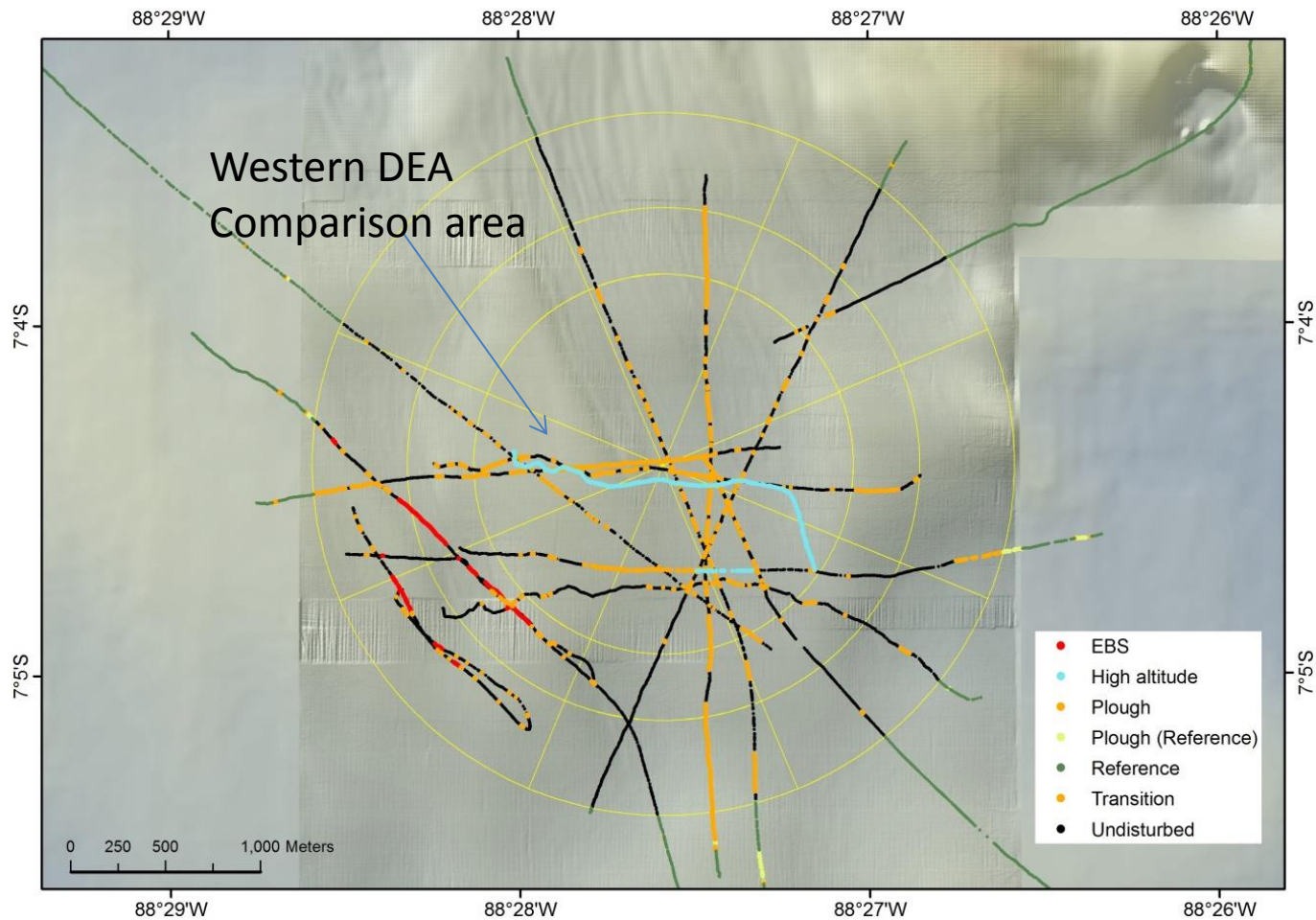
- Various Ocean Floor Observation Systems (OFOS), with different deployment heights and camera arrangements
- Ship mounted sidescan and backscatter imaging systems
- Autonomous Underwater Vehicle (AUV) mounted acoustic systems
- AUV mounted imaging systems – flying at various heights in the water column
- Remote Operated Vehicle (ROV) camera systems
- Crawlers and lander systems

Are results (habitat mapping, species distribution) comparable?

---This is an important concern for time series analysis.

For an area of the western DEA, sampled by the in-situ teams on SO242 1/2, the following are available / being put together:

- Pre 2015 OFOS dives
- 1.5 and 3-4 m OFOS SO242/1 and SO242/2 2015 dives
- Multibeam and backscatter data
- AUV imaging data
- Limited ROV footage



This area of the DEA is probably the most applicable for best technical comparisons in habitat mapping / fauna logging approaches to be made.

DISCOL DEA -
Regional overview

OFOS is a local scale
observation system... where
to deploy it?

200 m rocky, volcanic exposure

Experimental
ploughmarks

Variable nodule
densities

7° 0'S

88° 23'W

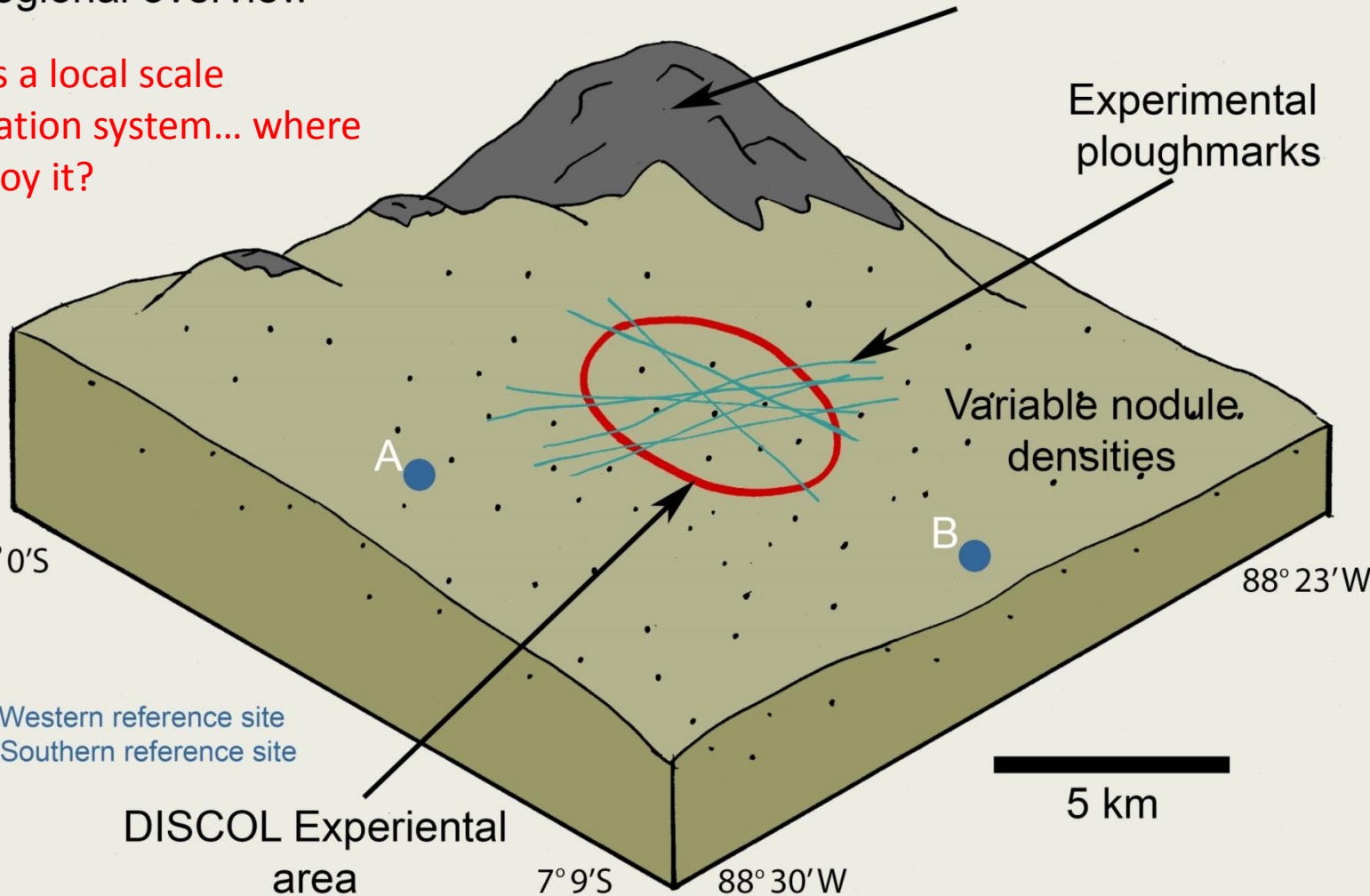
A - Western reference site
B - Southern reference site

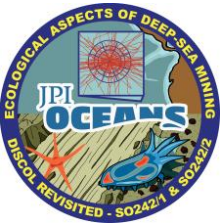
DISCOL Experiential
area

7° 9'S

88° 30'W

5 km



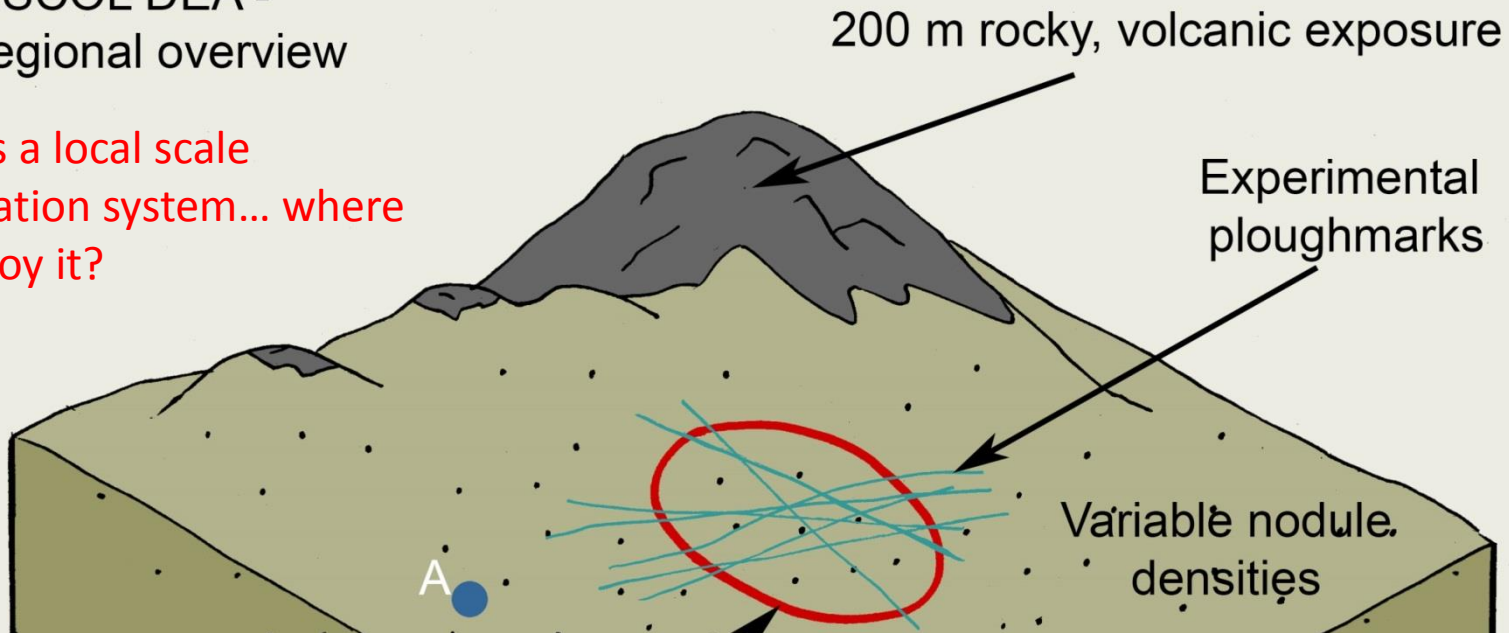


DISCOL AWI OFOS Launcher habitat mapping



DISCOL DEA -
Regional overview

OFOS is a local scale
observation system... where
to deploy it?



SHIPBOURNE ECHOSOUNDER

B - Southern reference site

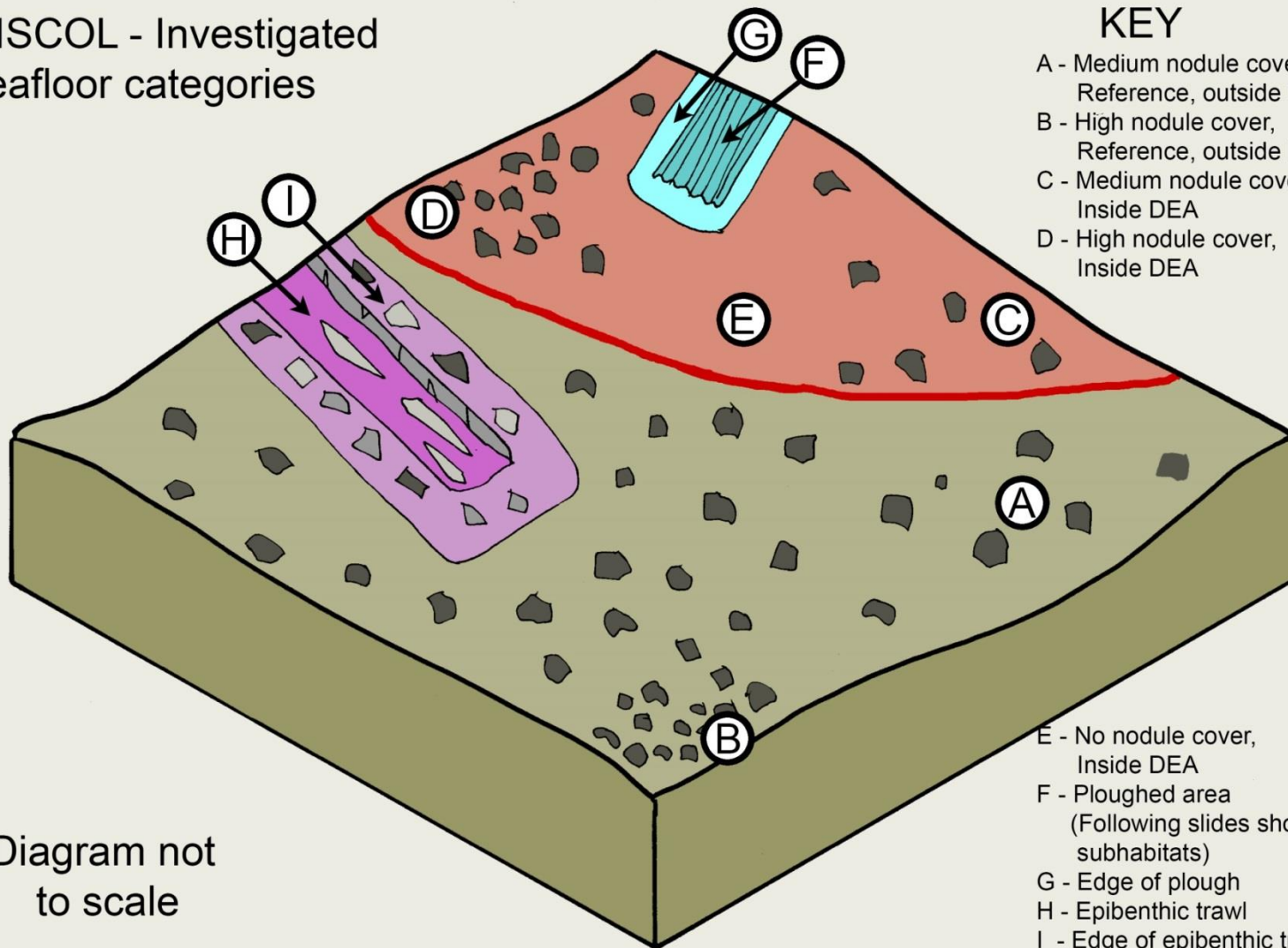
DISCOL Experiental
area

7° 9' S

88° 30' W

5 km

DISCOL - Investigated seafloor categories

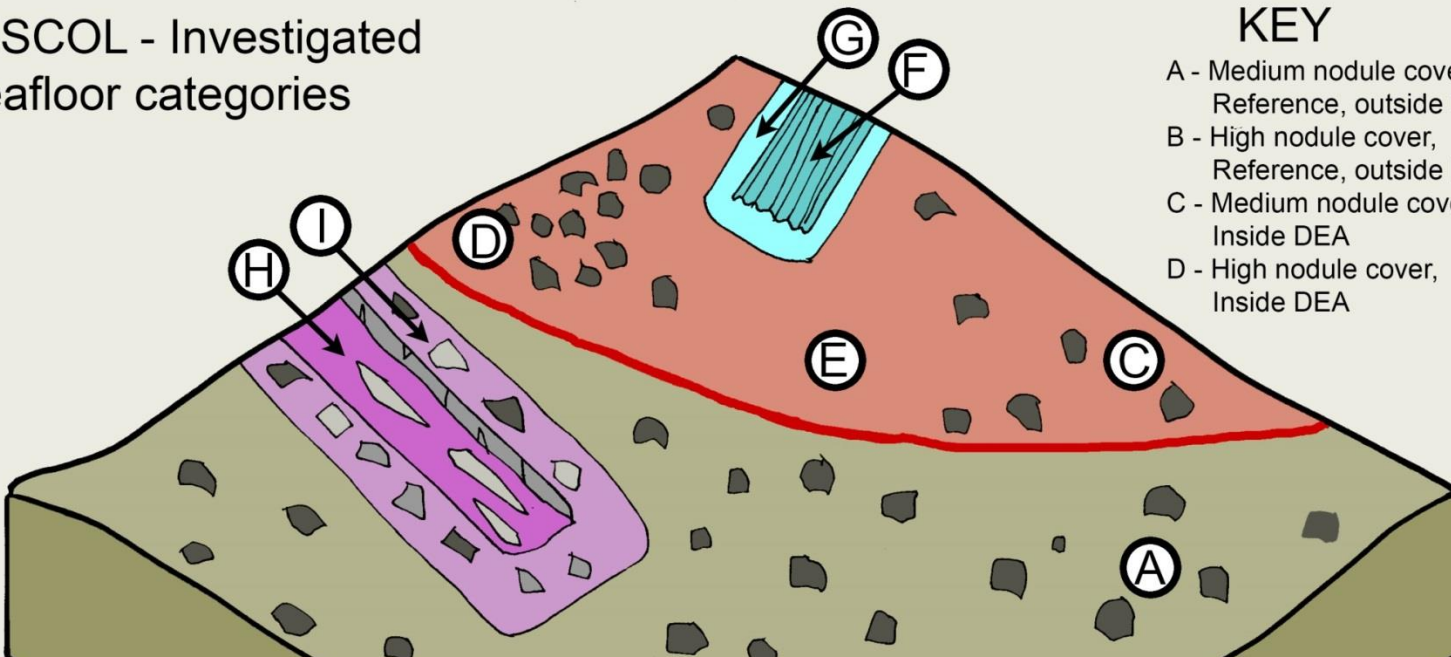


KEY

- A - Medium nodule cover, Reference, outside DEA
- B - High nodule cover, Reference, outside DEA
- C - Medium nodule cover, Inside DEA
- D - High nodule cover, Inside DEA
- E - No nodule cover, Inside DEA
- F - Ploughed area (Following slides show subhabitats)
- G - Edge of plough
- H - Epibenthic trawl
- I - Edge of epibenthic trawl

Diagram not to scale

DISCOL - Investigated seafloor categories



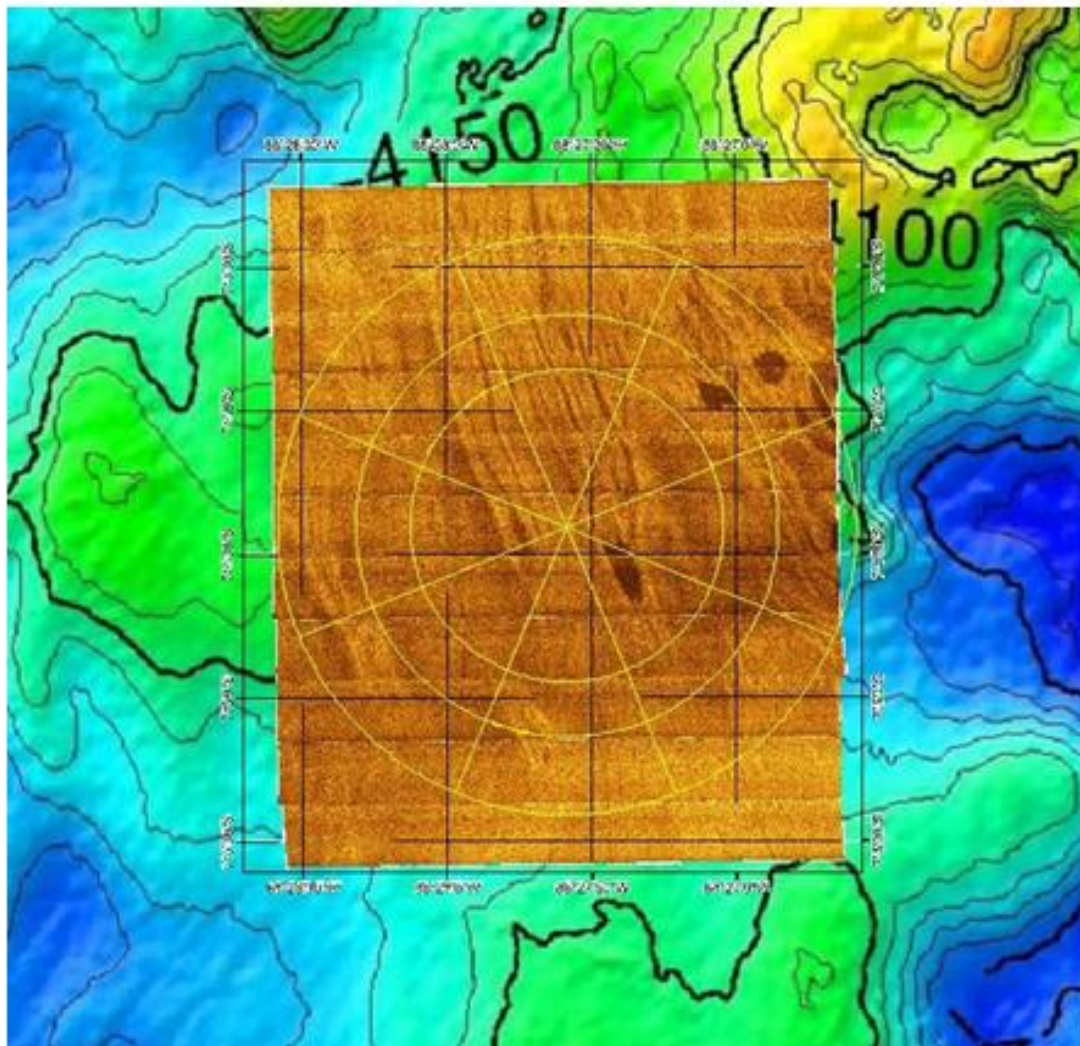
KEY

- A - Medium nodule cover, Reference, outside DEA
- B - High nodule cover, Reference, outside DEA
- C - Medium nodule cover, Inside DEA
- D - High nodule cover, Inside DEA

SHIPBOURNE ECHOSOUNDER SIDESCAN AUV SONAR

Diagram not to scale

- (Following slides show subhabitats)
- G - Edge of plough
 - H - Epibenthic trawl
 - I - Edge of epibenthic trawl



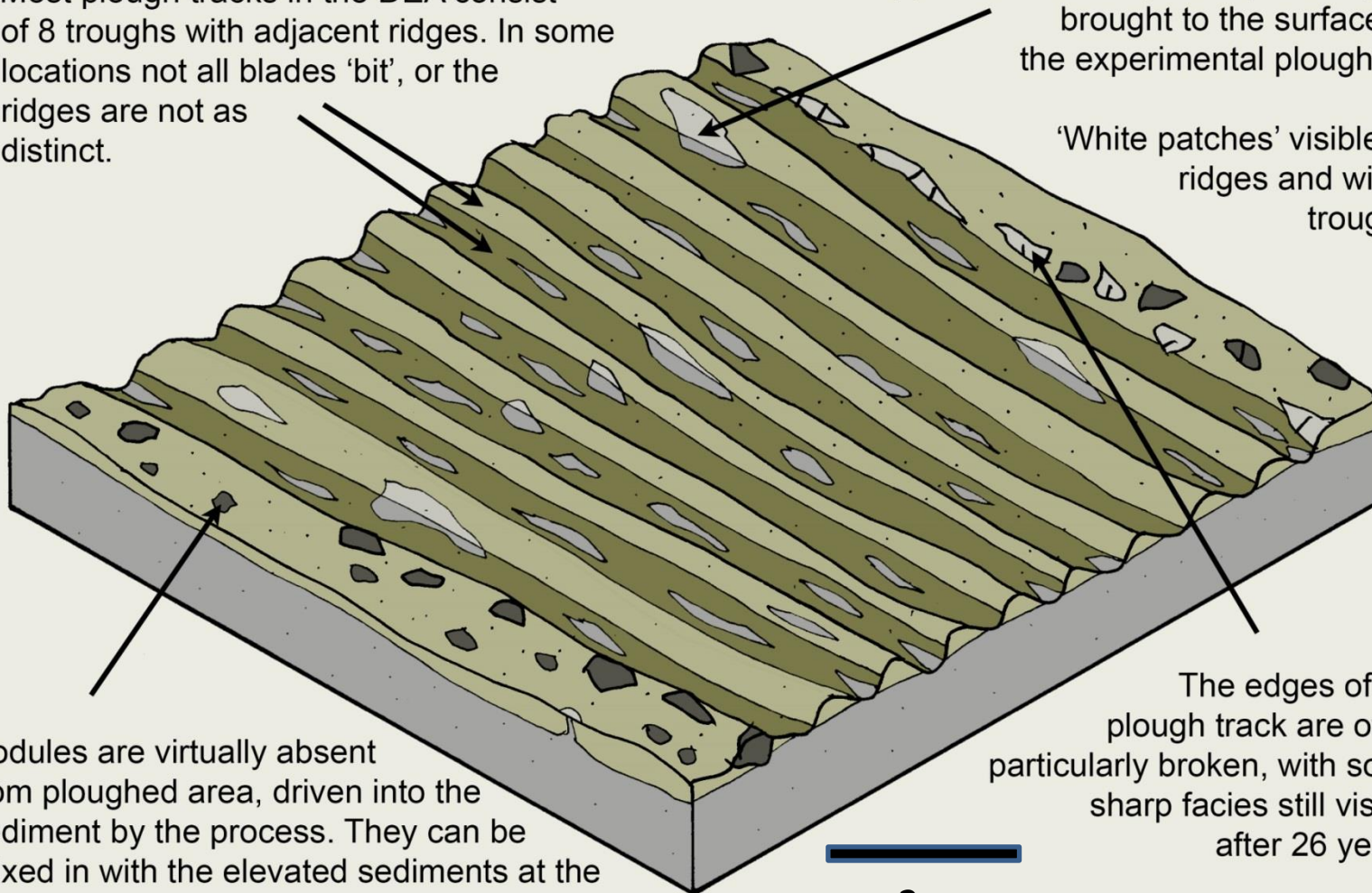
GEOMAR Shipbourne echosounder and backscatter maps

DISCOL DEA - typical plough

Most plough tracks in the DEA consist of 8 troughs with adjacent ridges. In some locations not all blades 'bit', or the ridges are not as distinct.

'White patches' - material from below the upper sediment layers exposed by, or brought to the surface by the experimental ploughing.

'White patches' visible on ridges and within troughs.



Nodules are virtually absent from ploughed area, driven into the sediment by the process. They can be mixed in with the elevated sediments at the edge of the ploughtrack.

The edges of the plough track are often particularly broken, with some sharp facies still visible after 26 years.

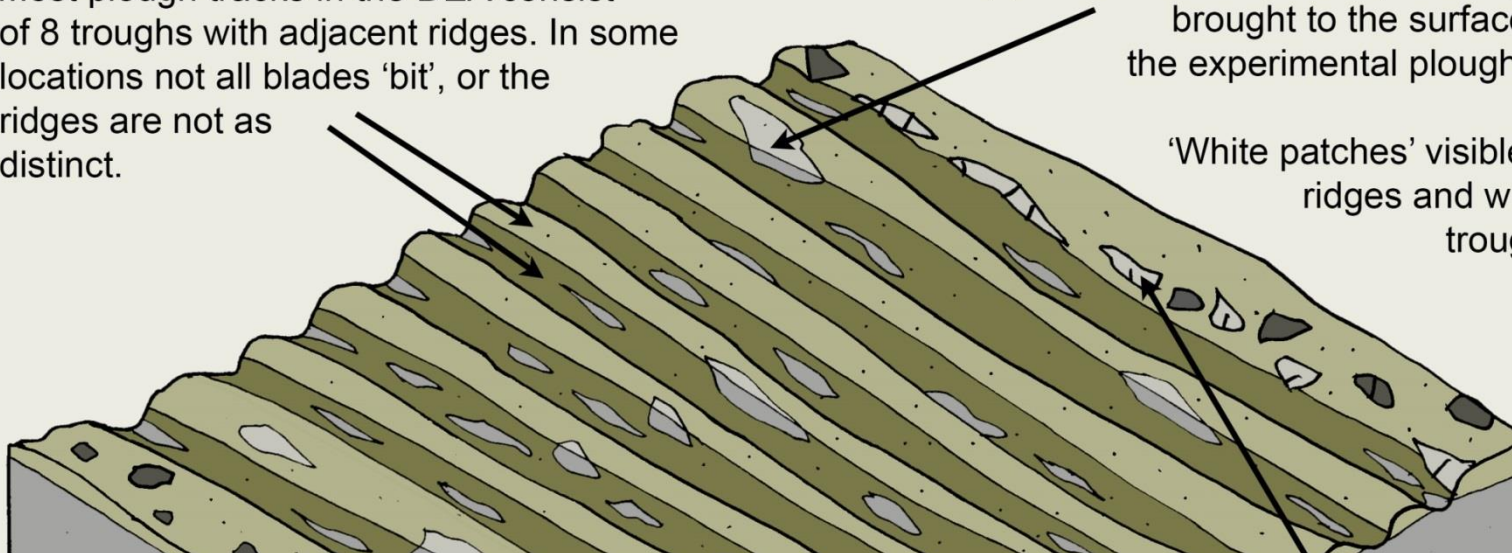
2 m

DISCOL DEA - typical plough

Most plough tracks in the DEA consist of 8 troughs with adjacent ridges. In some locations not all blades 'bit', or the ridges are not as distinct.

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'White patches' visible on ridges and within troughs.



SIDESCAN AUV SONAR

AUV IMAGES (various heights)

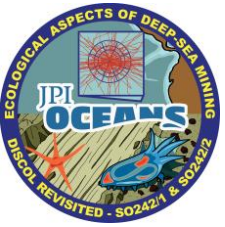
OCEAN FLOOR OBSERVATION SYSTEM (high operation 4 m)

Nodules are virtually absent from ploughed area, driven into the sediment by the process. They can be mixed in with the elevated sediments at the edge of the ploughtrack.

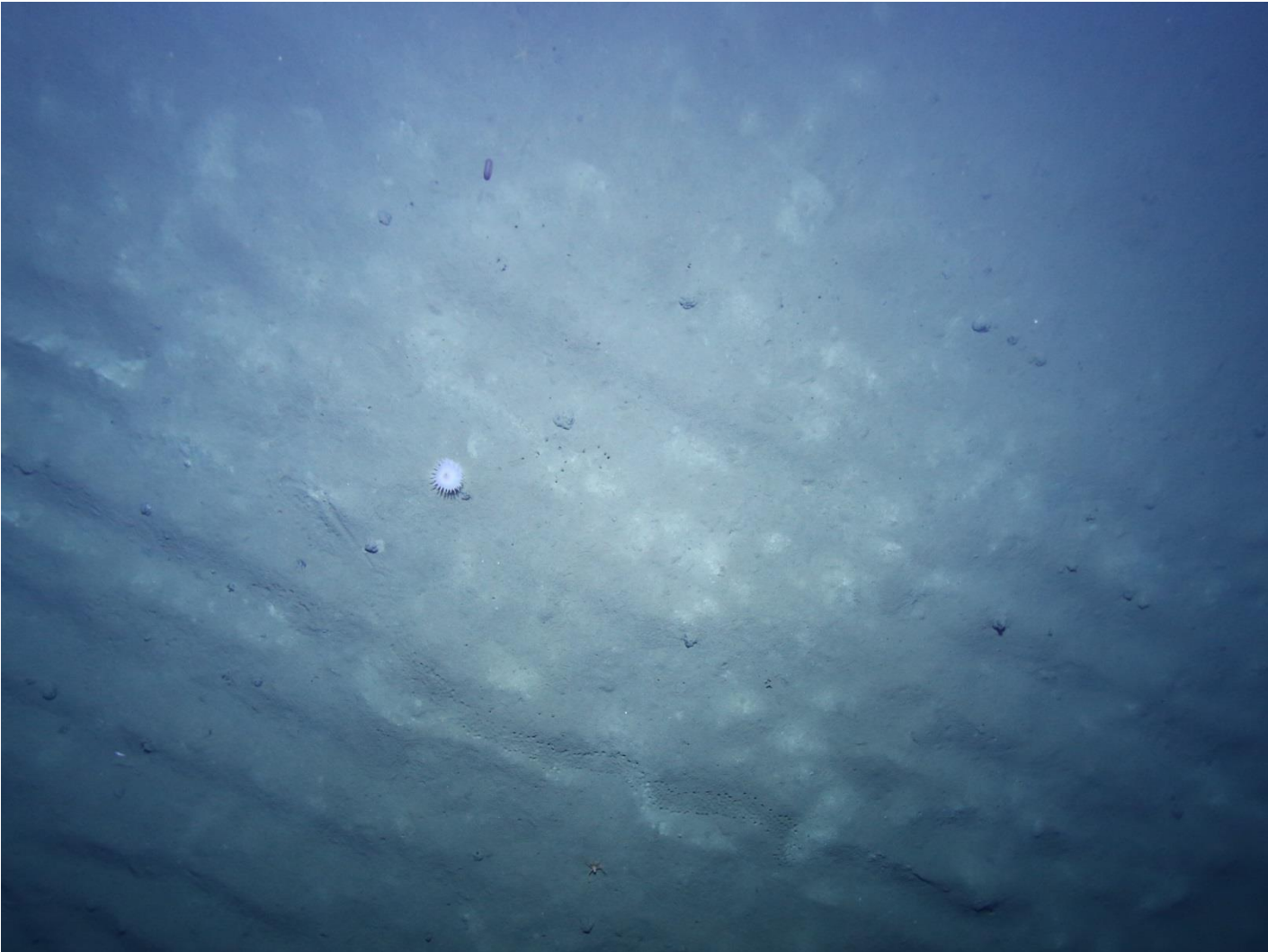


particularly broken, with some sharp facies still visible after 26 years.

2 m



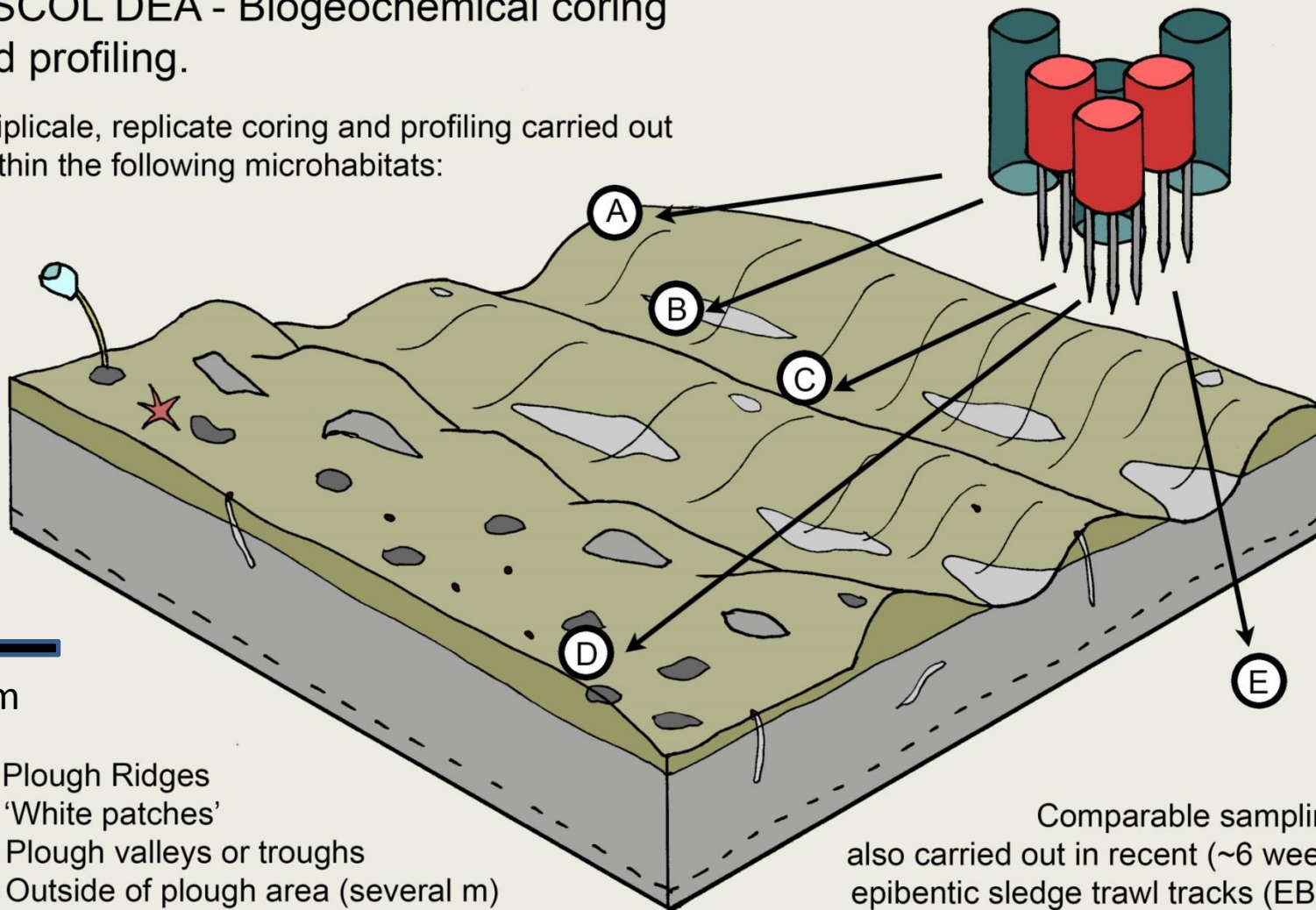
DISCOL AWI OFOS Launcher habitat mapping



GEOMAR AUV image

DISCOL DEA - Biogeochemical coring and profiling.

Triplicate, replicate coring and profiling carried out within the following microhabitats:



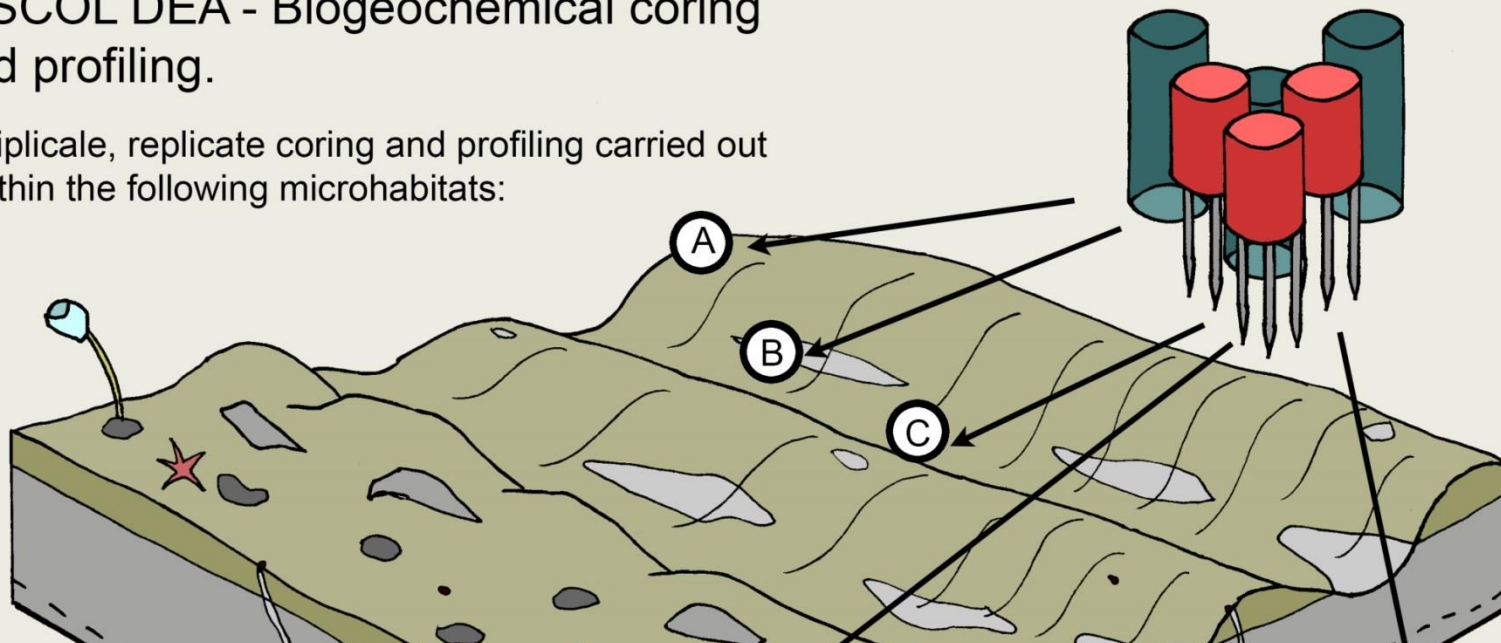
0.5 m

- A - Plough Ridges
- B - 'White patches'
- C - Plough valleys or troughs
- D - Outside of plough area (several m)
- E - Outside of DEA (reference areas)

Comparable sampling also carried out in recent (~6 week) epibentic sledge trawl tracks (EBS) made by SO242/1.

DISCOL DEA - Biogeochemical coring and profiling.

Triplicate, replicate coring and profiling carried out within the following microhabitats:



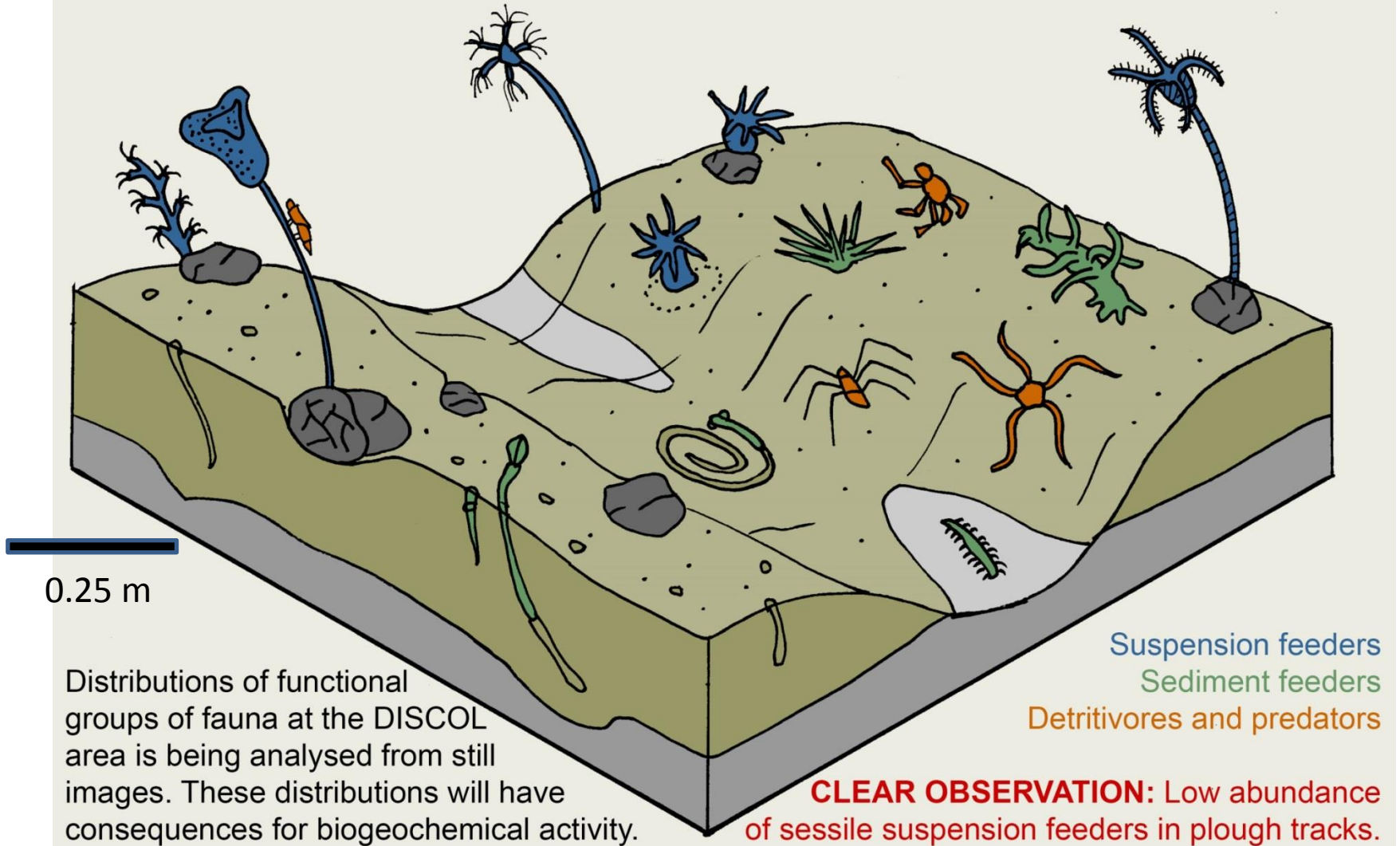
AUV IMAGES (low flying)

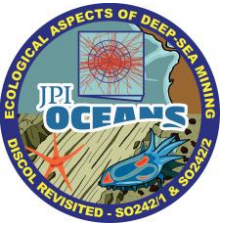
OCEAN FLOOR OBSERVATION SYSTEM (OFOS) – 1.5 m height
 REMOTE OPERATED VEHICLE (ROV)

- B - 'White patches'
- C - Plough valleys or troughs
- D - Outside of plough area (several m)
- E - Outside of DEA (reference areas)

Comparable sampling also carried out in recent (~6 week) epibentic sledge trawl tracks (EBS) made by SO242/1.

DISCOL DEA - megafauna processing

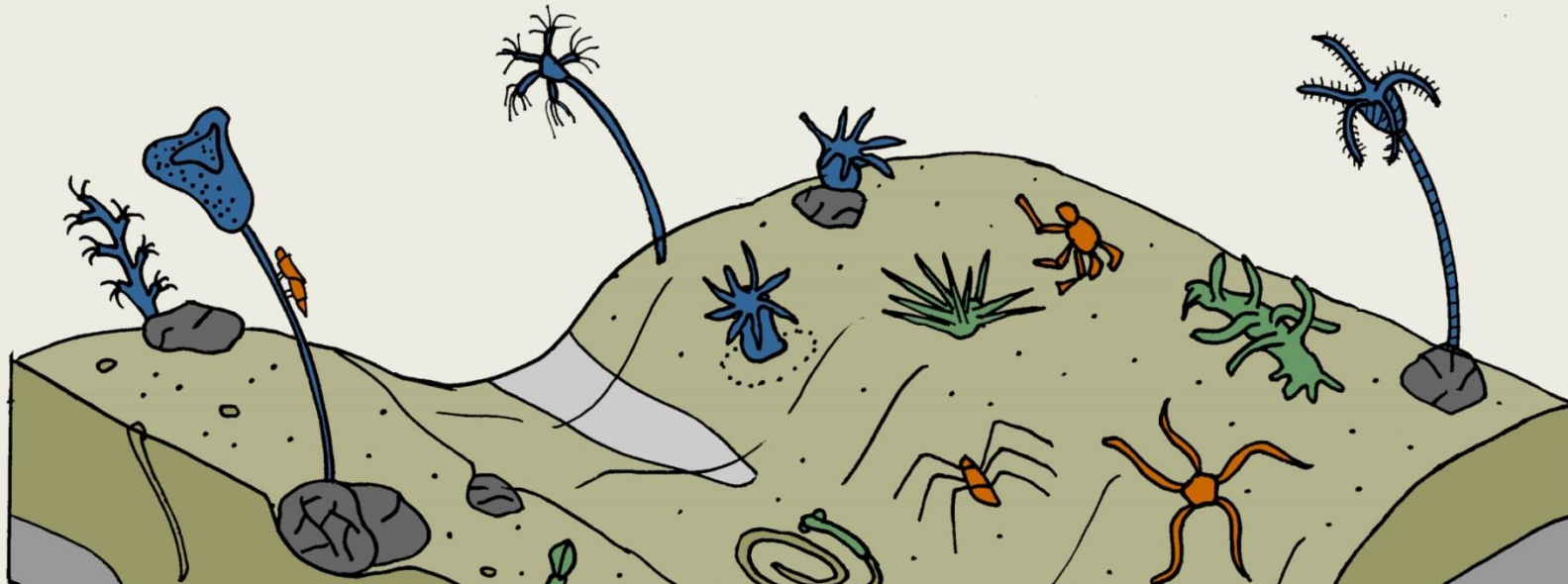




DISCOL AWI OFOS Launcher habitat mapping



DISCOL DEA - megafauna processing

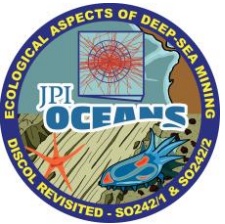


OCEAN FLOOR OBSERVATION SYSTEM (OFOS) – 1.5 m height REMOTE OPERATED VEHICLE (ROV) LANDERS AND CRAWLERS

Distributions of functional groups of fauna at the DISCOL area is being analysed from still images. These distributions will have consequences for biogeochemical activity.

Sediment feeders
 Detritivores and predators

CLEAR OBSERVATION: Low abundance of sessile suspension feeders in plough tracks.



DISCOL AWI OFOS Launcher habitat mapping



Feeding clade examples:

Holothurians – Sediment feeders

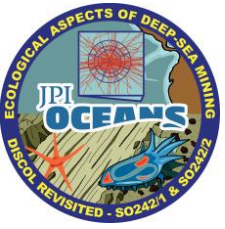


Hemichordates – Sediment feeders



Sponges – Suspension feeders



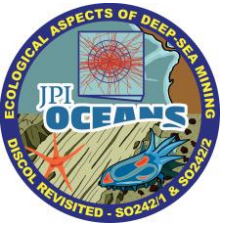


DISCOL AWI OFOS Launcher habitat mapping



Crinoids – Suspension feeders



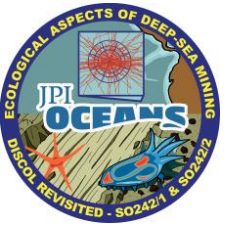


DISCOL AWI OFOS Launcher habitat mapping



Anenomes – Suspension feeders / Predators



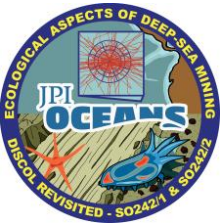


DISCOL AWI OFOS Launcher habitat mapping



Seastars and ophiuroids – Detritivores and Predators





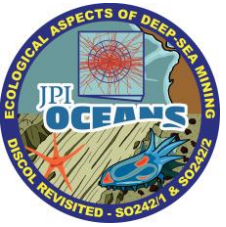
DISCOL AWI OFOS Launcher habitat mapping



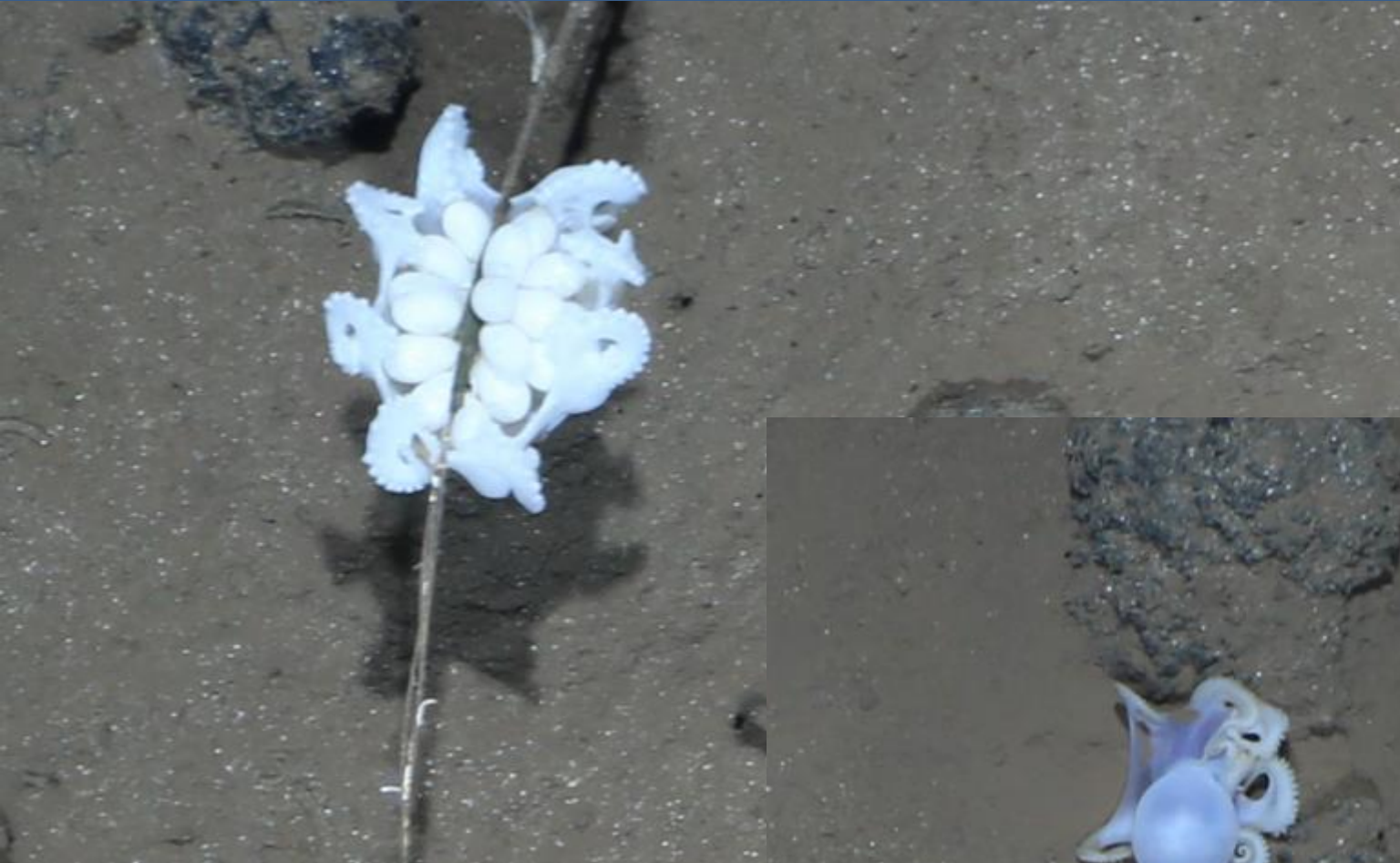
Habitat engineer / habitat niche providers very important at DISCOL.

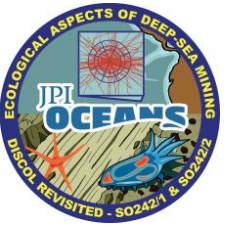
..Abundances of such animals differs with microhabitat (based on preliminary results)

Some of these relationships require CLOSE UP IMAGING TO IDENTIFY!



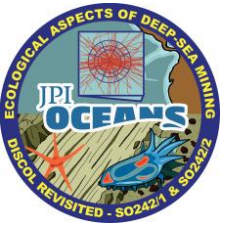
DISCOL AWI OFOS Launcher habitat mapping





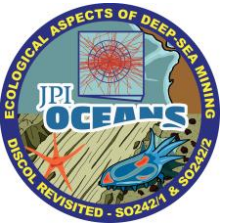
DISCOL AWI OFOS Launcher habitat mapping





DISCOL AWI OFOS Launcher habitat mapping



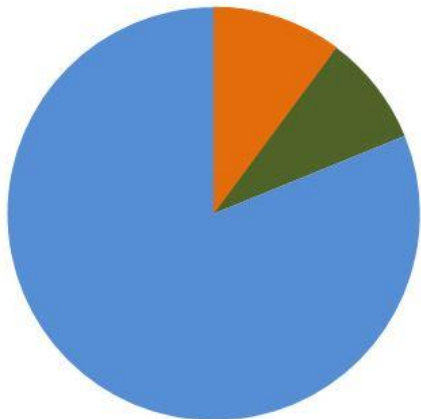


DISCOL AWI OFOS Launcher habitat mapping

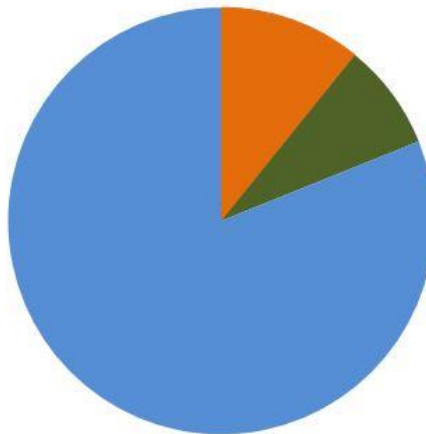


Early feeding clade results, based on ~10% of data, and broad habitat type:

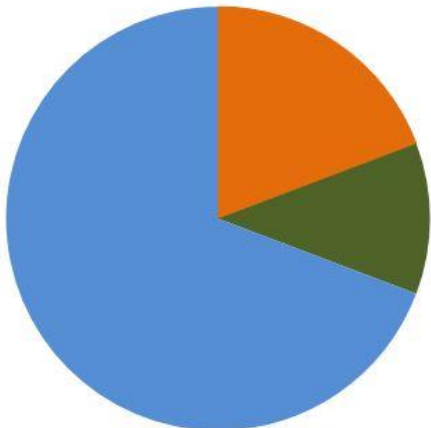
Reference



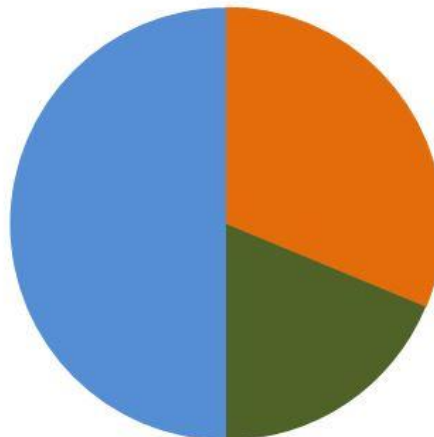
Unploughed DEA



Transition



Ploughed



**Detritivores and
predators**

Sediment feeders

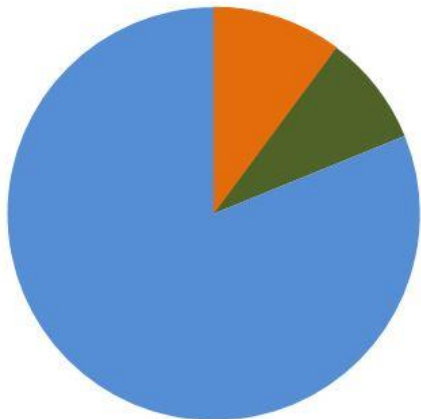
Suspension feeders

(Data shown as percentages of individuals of observed populations. For actual densities, some data will be presented with WP2)

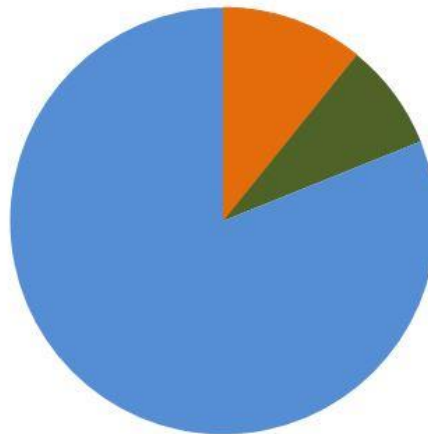
Biomass and feeding rates , in contrast to individual abundances, not yet assessed.

Early feeding clade results, based on ~10% of data, and broad habitat type:

Reference



Unploughed DEA



Detritivores and predators

Sediment feeders

Suspension feeders

Transition

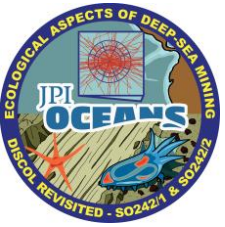


Ploughed



What about the finer scale heterogeneity?

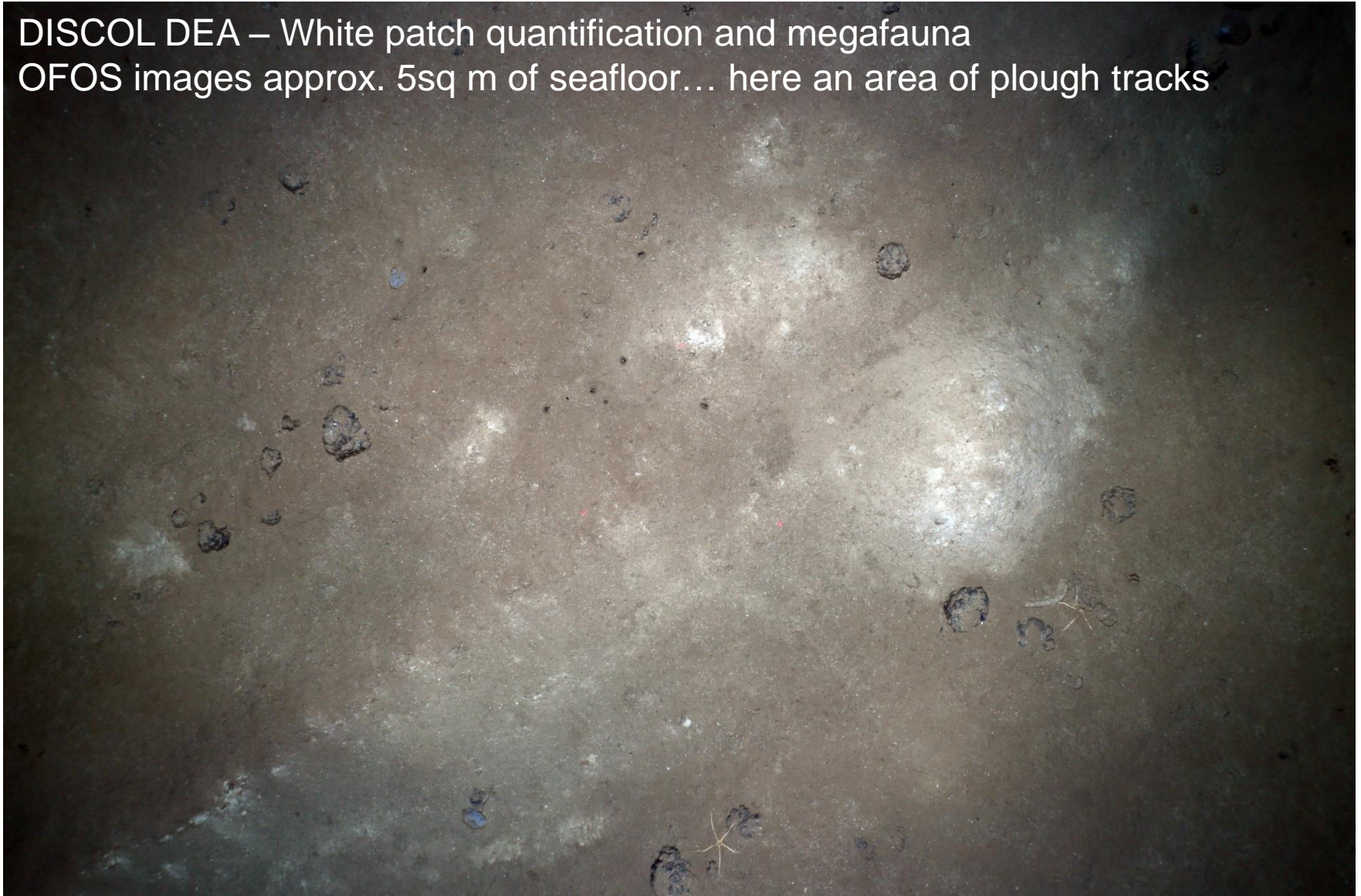
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DISCOL AWI OFOS Launcher habitat mapping

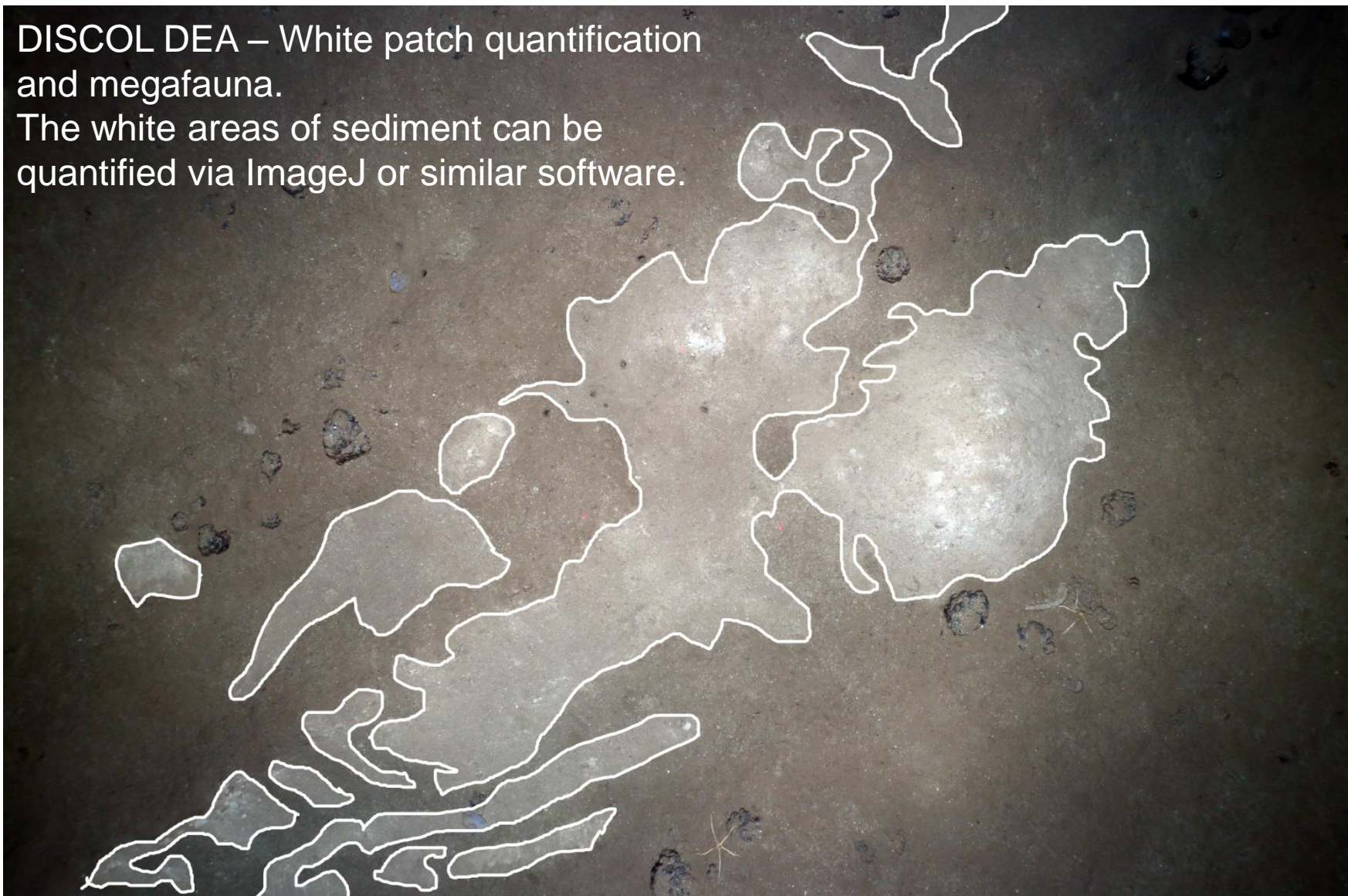


DISCOL DEA – White patch quantification and megafauna
OFOS images approx. 5sq m of seafloor... here an area of plough tracks



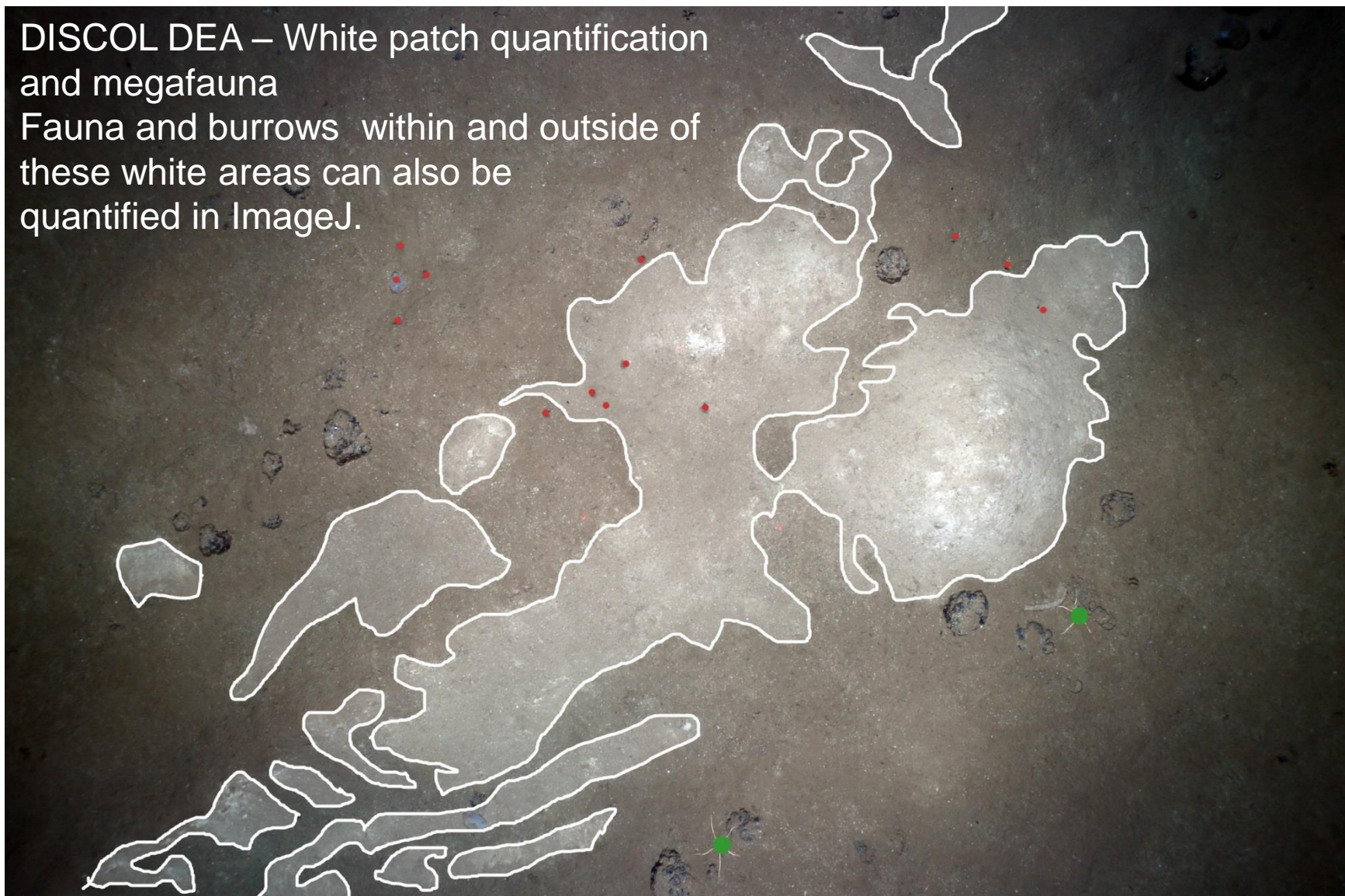
DISCOL DEA – White patch quantification and megafauna.

The white areas of sediment can be quantified via ImageJ or similar software.

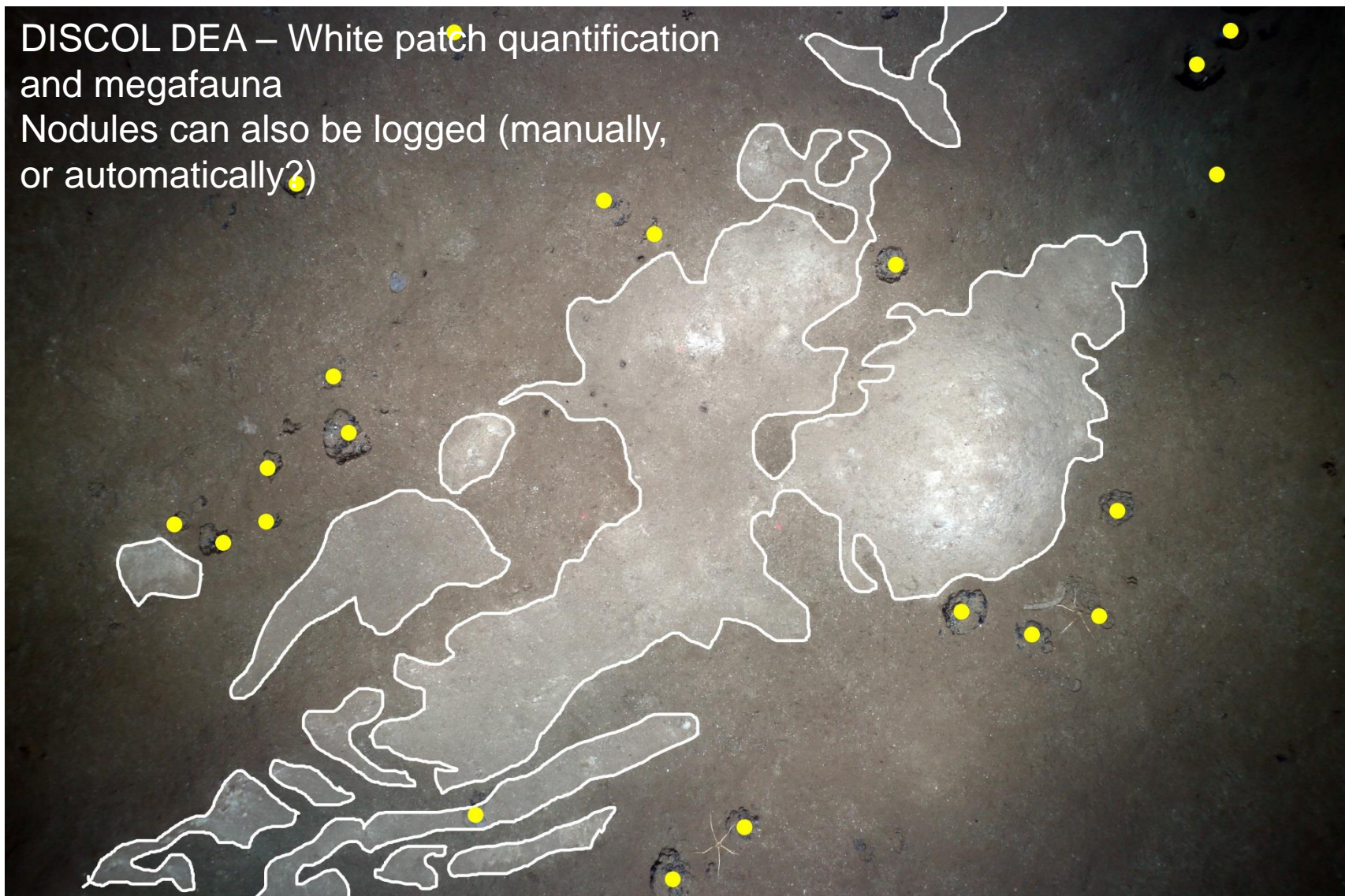


DISCOL DEA – White patch quantification
and megafauna

Fauna and burrows within and outside of
these white areas can also be
quantified in ImageJ.



DISCOL DEA – White patch quantification
and megafauna
Nodules can also be logged (manually,
or automatically?)



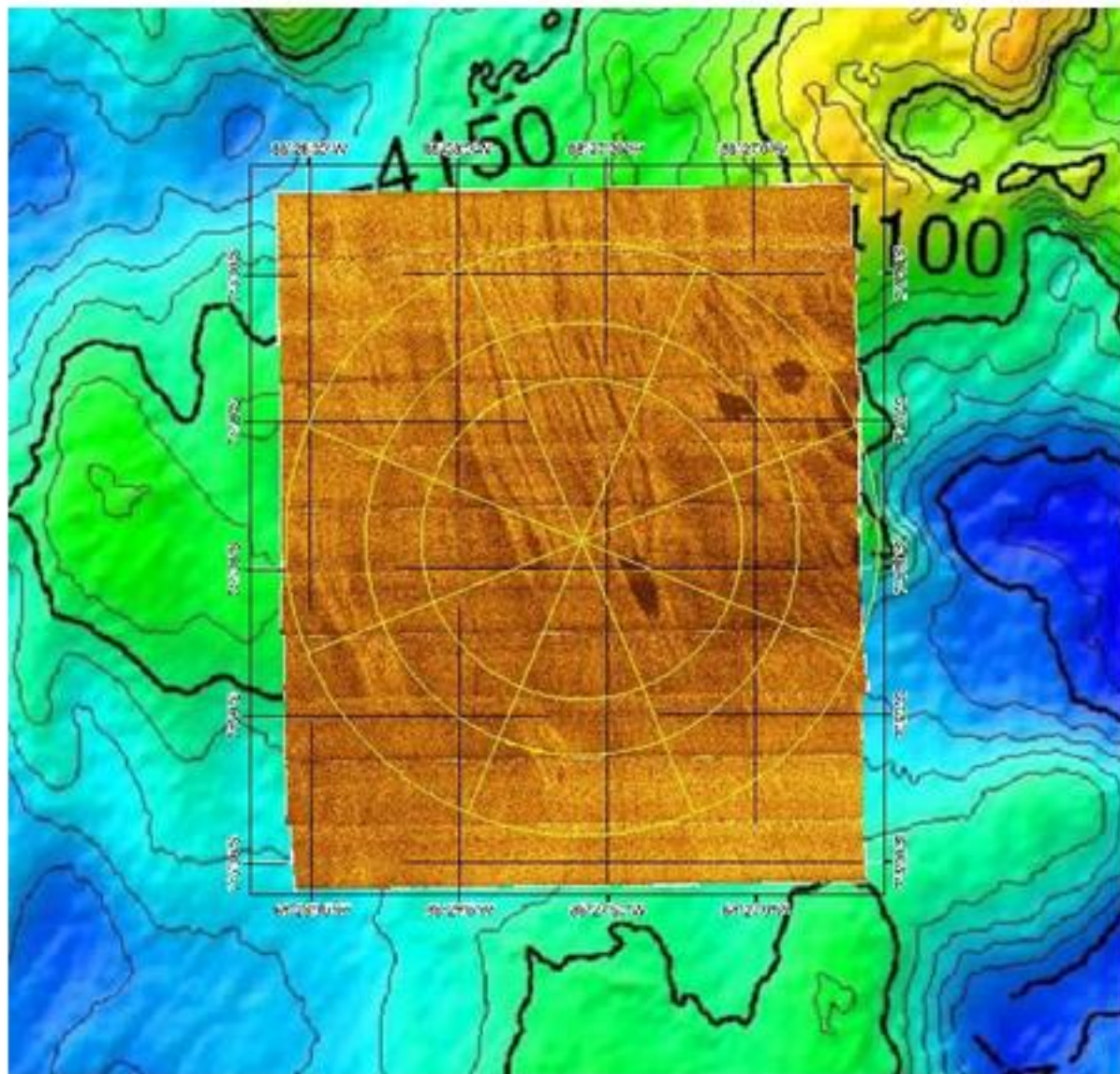


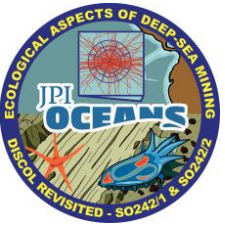
SUMMARY

By investigating and mapping regions of the DISCOL area with different equipment, extrapolation of local observations to larger scales is envisioned.

...There is as high heterogeneity in the DISCOL area across a range of scales, so care is needed in this extrapolation, however.

..For studies of processes occurring at and within the sediment, a detailed analysis of biodiversity is not essential.



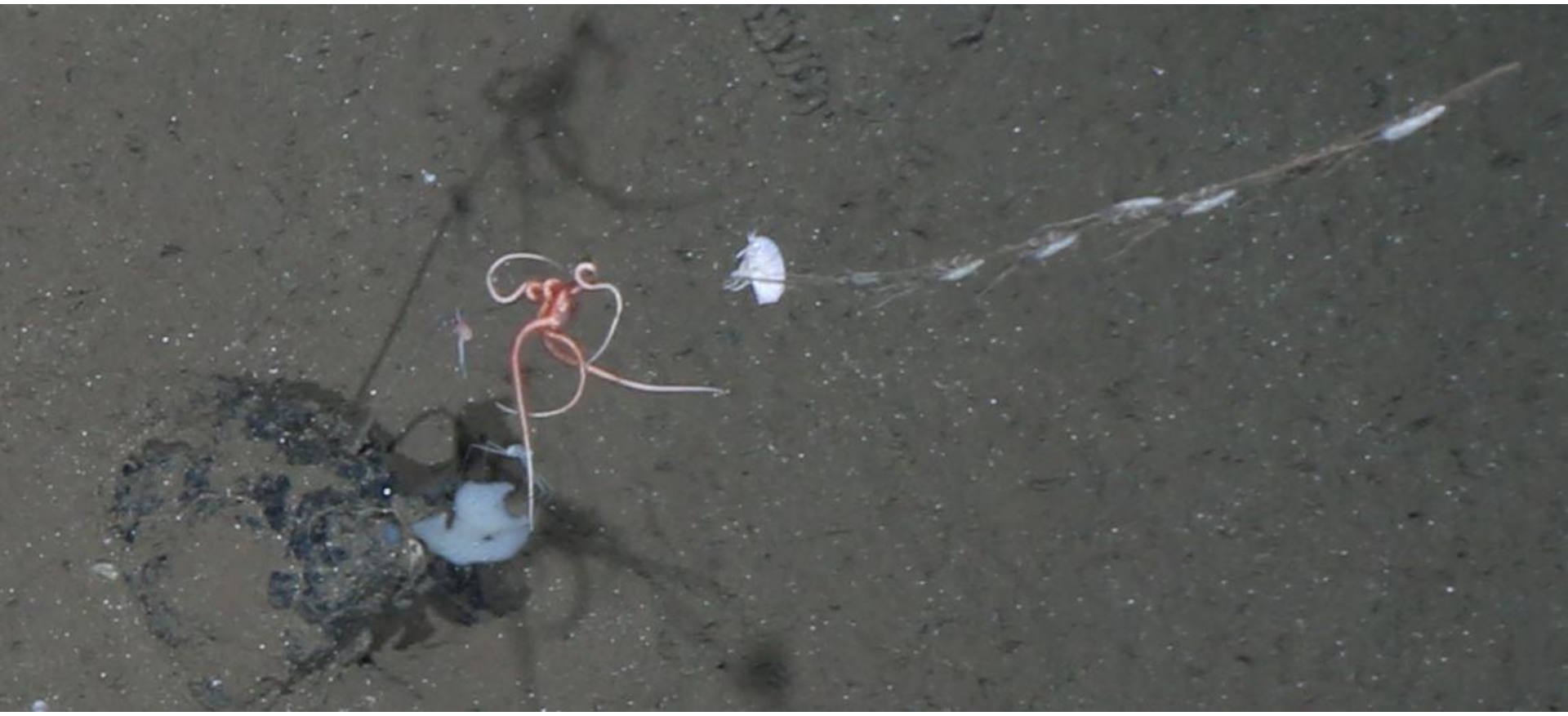


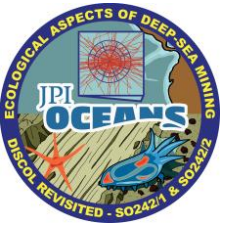
DISCOL AWI OFOS Launcher habitat mapping



SUMMARY

..High quality close-up camera systems can also be used to investigate more focused interactions...





DISCOL AWI OFOS Launcher habitat mapping



SUMMARY

..elucidating relationships with may well be missed due to processing artifacts in production of high resolution mosaics.

