Response of Archaeal Communities to the Deepwater Horizon Oil Spill

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Deepwater Horizon Oil Spill

- April 22, 2010

- 780,000 m^3 Sweet Louisiana Crude and 205,000 mT of CH_4 released over 85 days (Adcroft et al. 2010)

- Oil reached coastal Alabama in June 2010

Oil contamination is highly toxic to beach sediment Archaea in microcosm study

- Oil addition negatively impacts the ability to amplify Archaea
  - Only detected in 1 of 12 samples after t=0

- Reduction in archaeal community occurred in oil treatments

- Possible measure of impact and recovery

	# of Archaea-positive PCRs		
Treatment	**T=0**	**6 days**	**26 days**
Fertilizer	3/3	3/3	3/3
Oil, No nutrients	3/3	0/3	1/3
Oil + Nutrients	3/3	0/3	0/3

Röling et al. (2004) Appl Environ Microbiol

Purpose: To understand the impact oil contamination has on archaeal communities

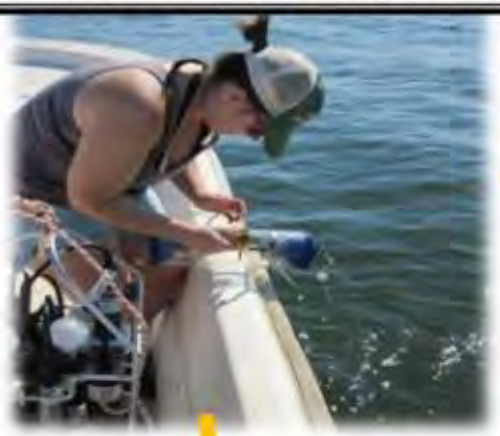
- How does the archaeal community respond to oil contamination?

- Can Archaea be used as a measure of impact and recovery in an ecosystem?
  - Monitor numbers and diversity

Sample sites in the Northern Gulf of Mexico

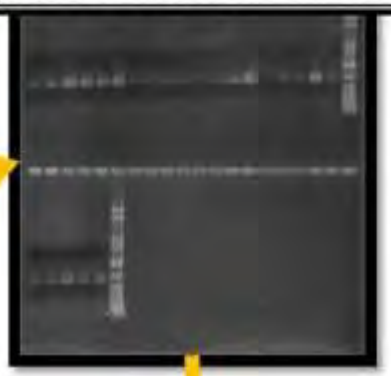
Methods

Surface and bottom Samples

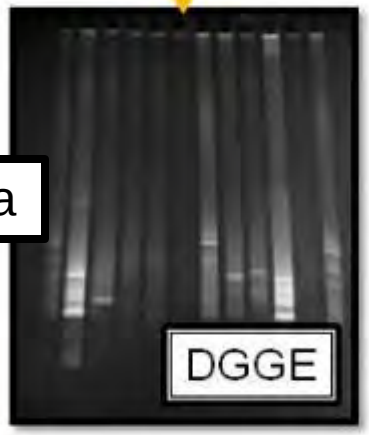


DNA Extraction

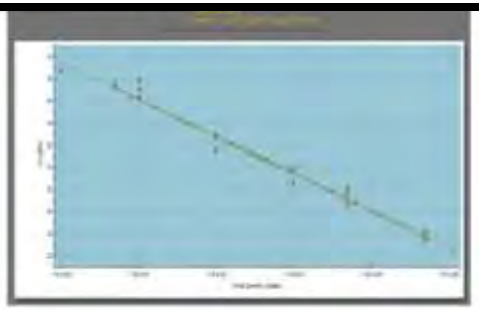
Archaeal 16S PCR



DGGE

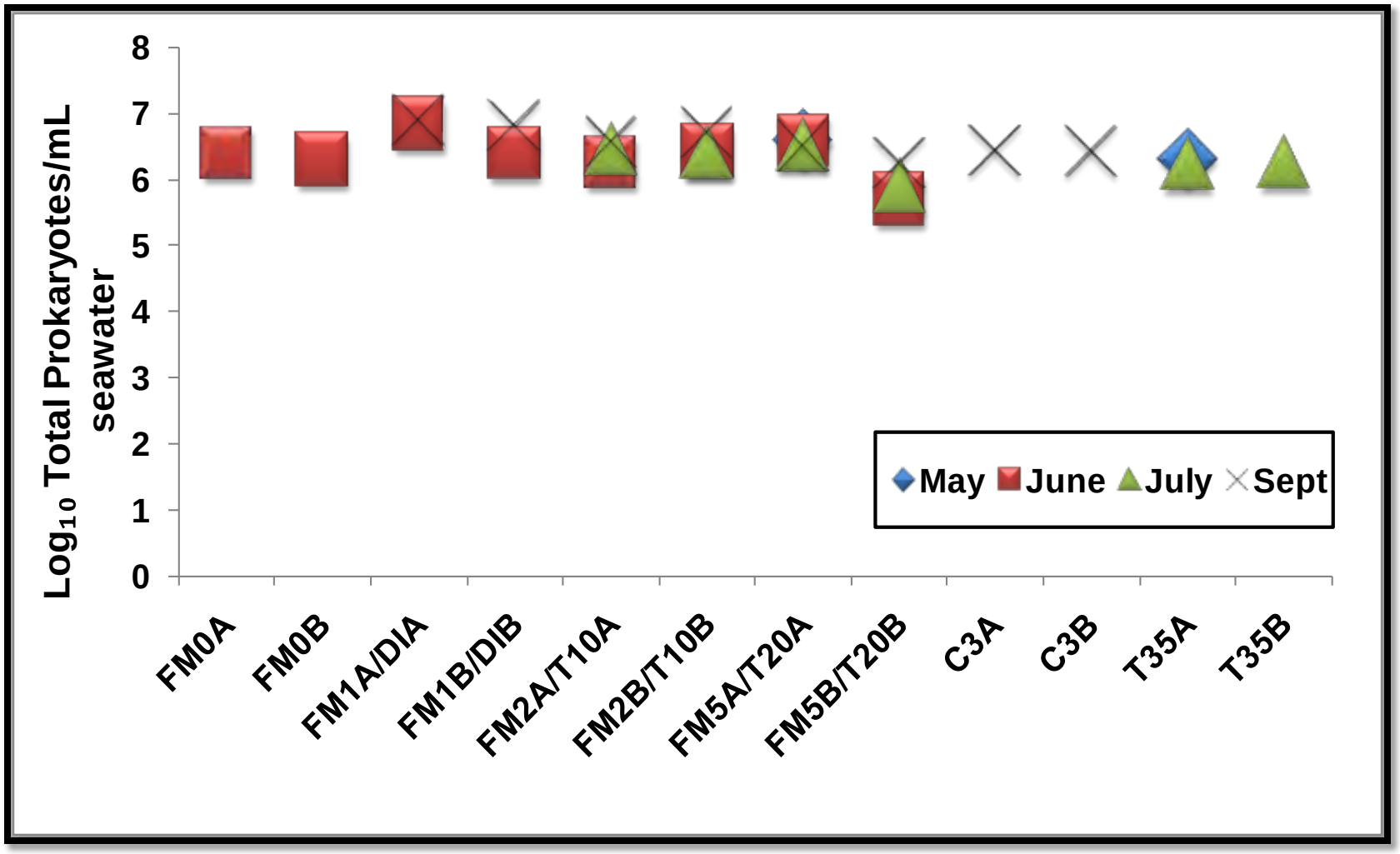


qPCR Thaumarchaeota/Crenarchaeota

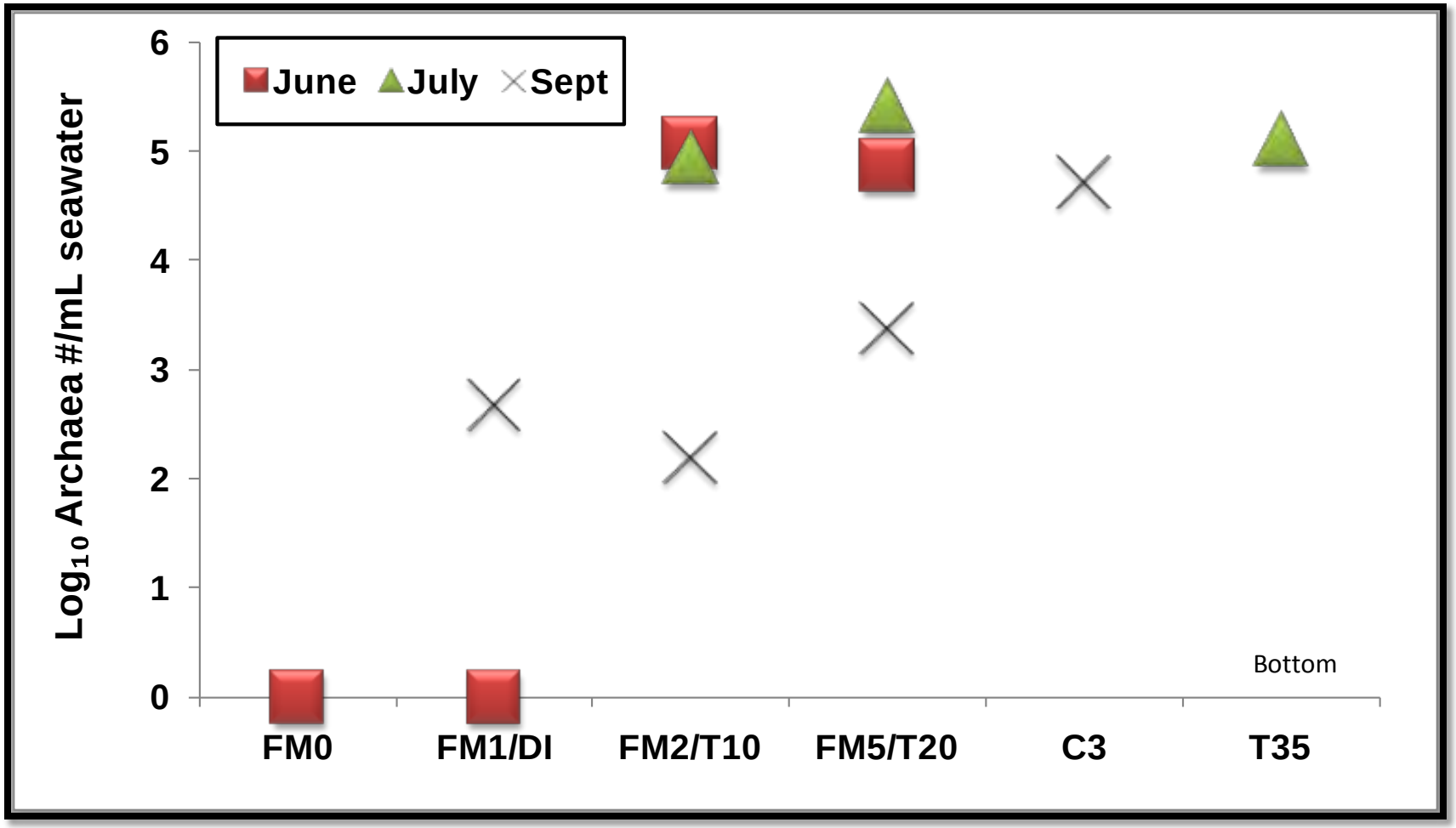


Total Prokaryotes

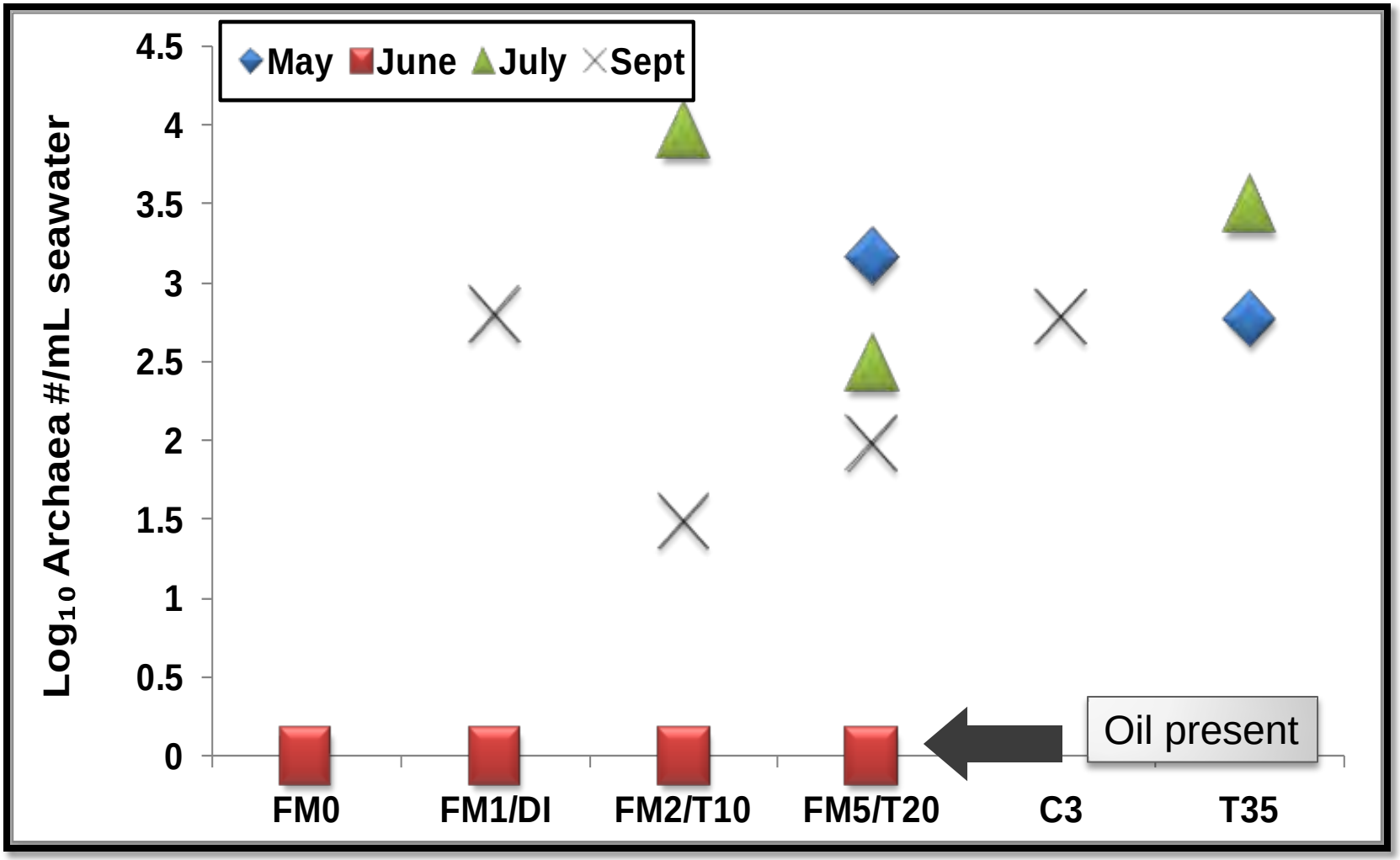
Total prokaryotes/mL remain constant



Archaeal #'s highest in bottom water samples



Archaea disappear in surface waters during presence of oil

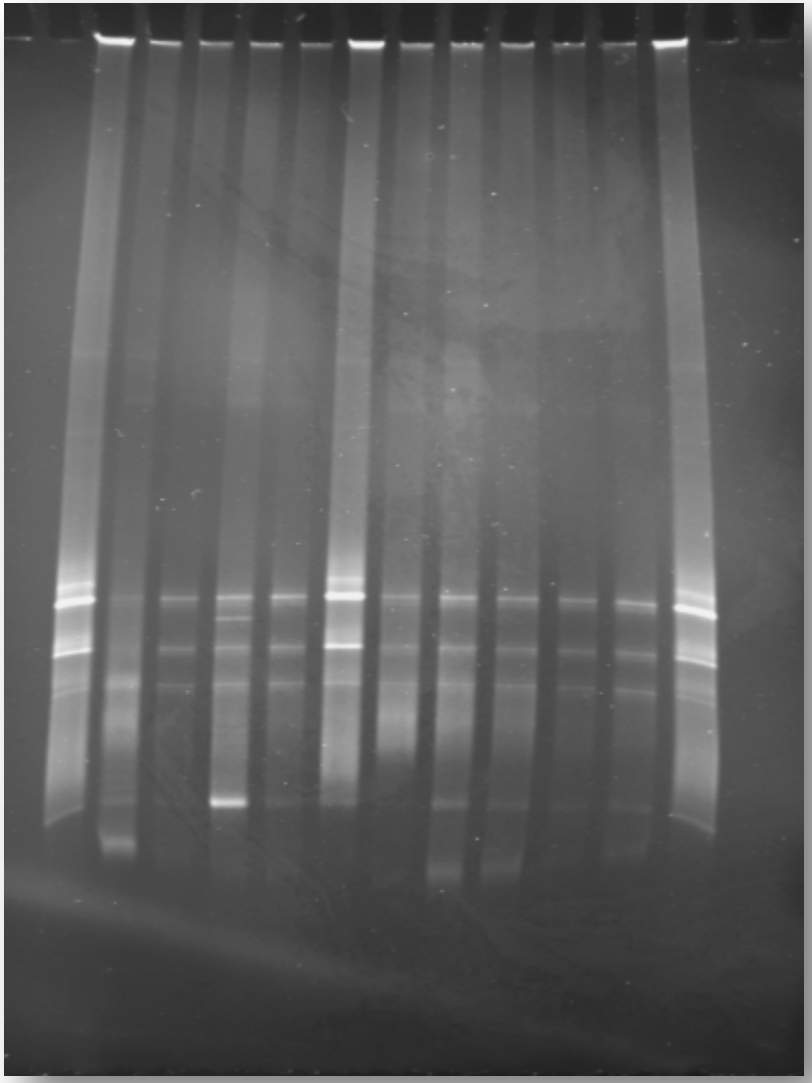


- Total prokaryotes remain constant

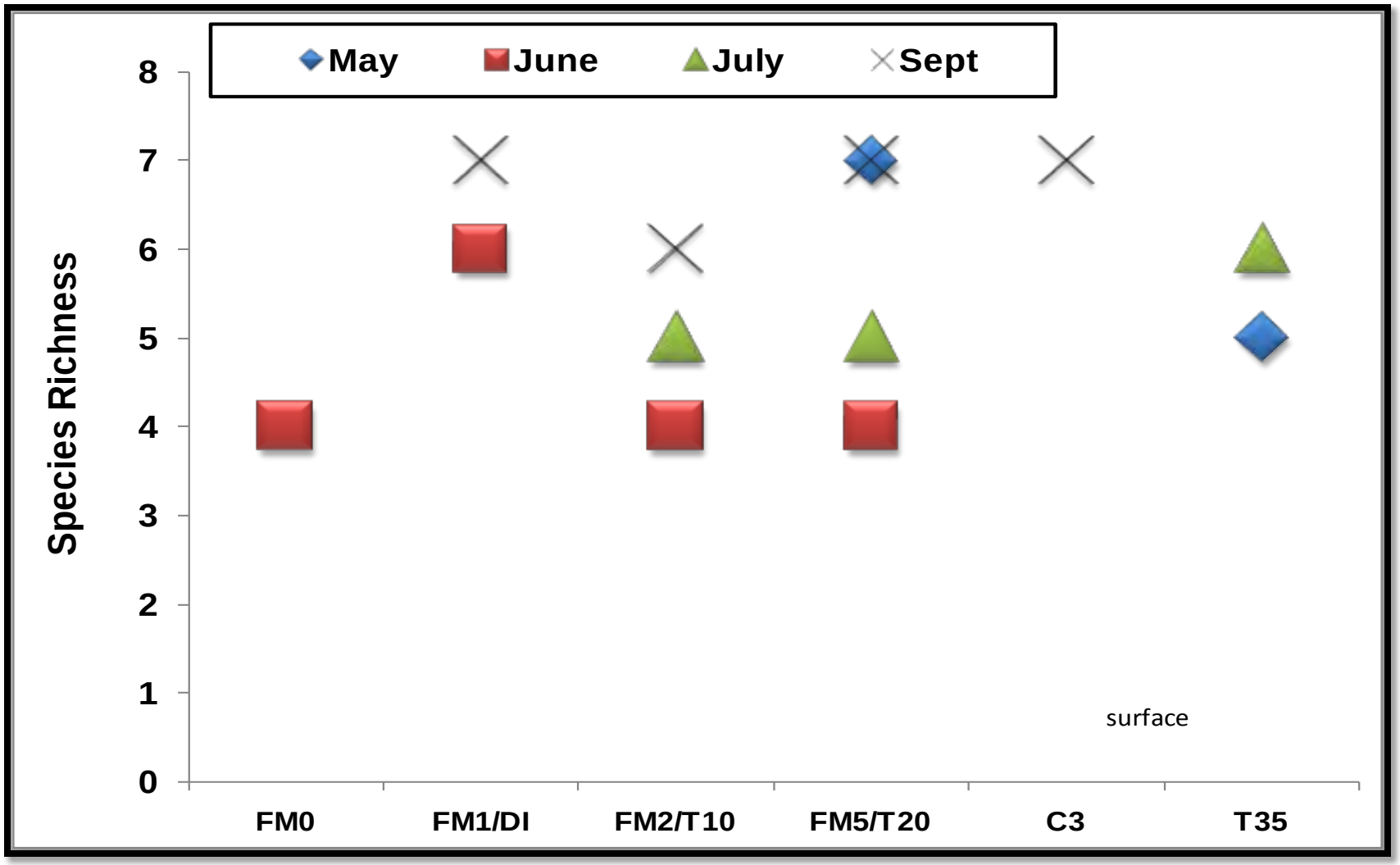
DGGE Analysis: Species Richness

- Example DGGE showing the diversity of Archaea samples from northern Gulf of Mexico

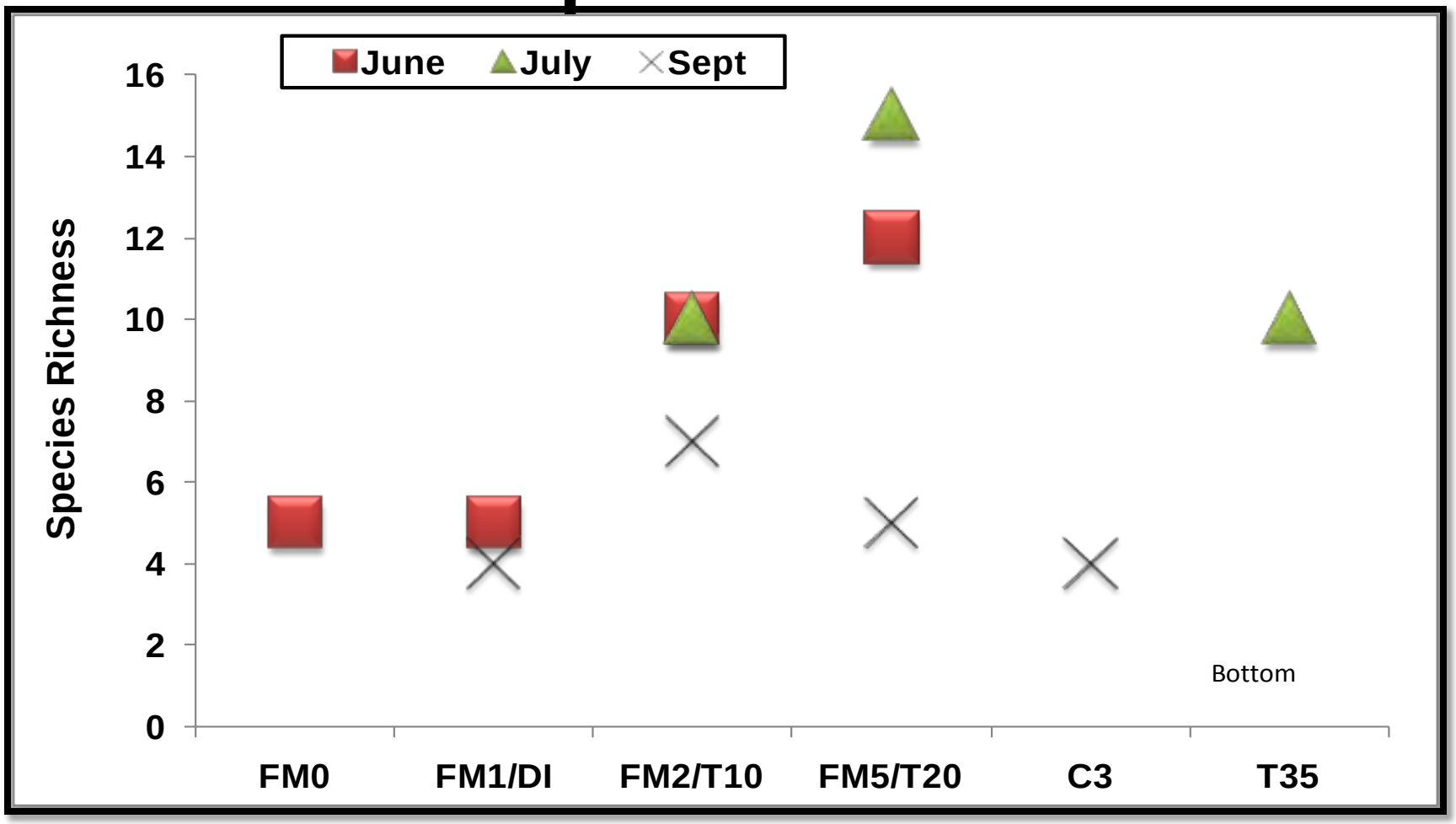
- Species richness # ranges from 4 to 15 in July T20B sample



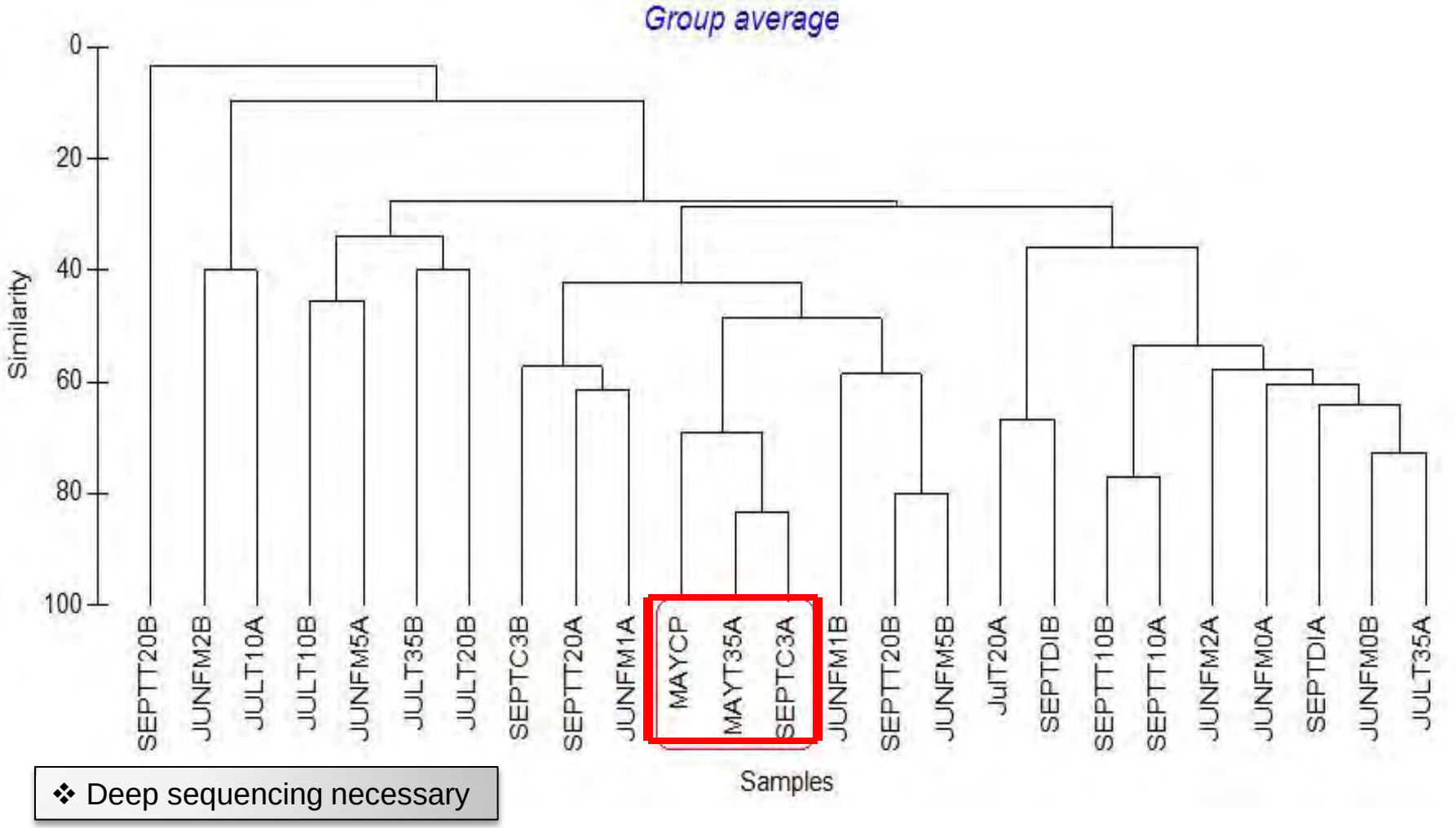
Species richness varies over time and between sites in surface



Species richness highest in bottom samples: Increases in June when oil present



Archaea community appears to recover by September



- Deep sequencing necessary

Conclusions

- Significant impact to archaeal community in presence of surface oil
- System appears to recover after contamination
  - Deep sequencing next step
- Archaea possible measure of impact and recovery in contaminated environments

Acknowledgements

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