Investigating patterns of growth, grazing and viral lysis of the phytoplankton along a salinity gradient influenced by oil from the Deepwater Horizon spill

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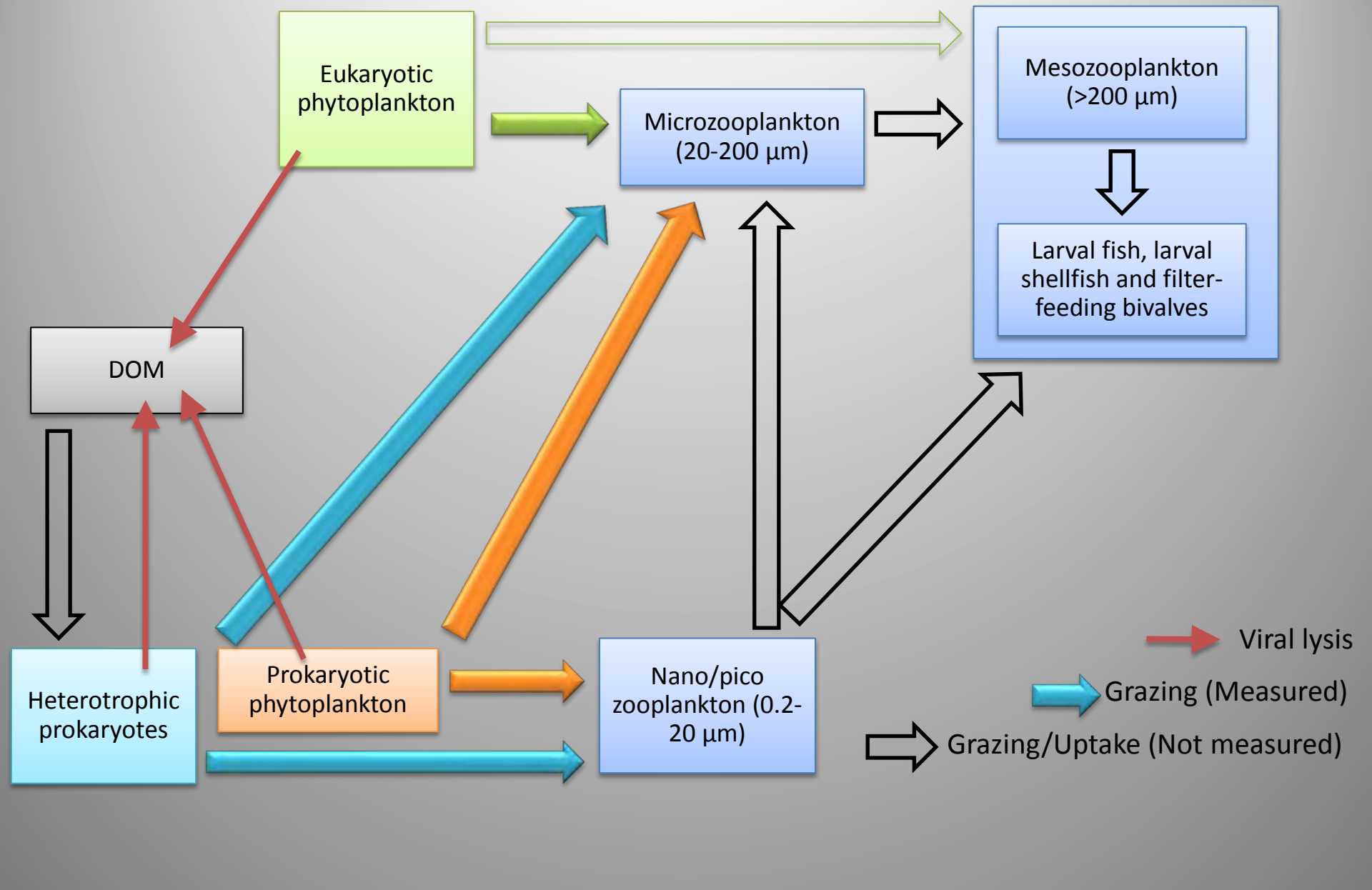
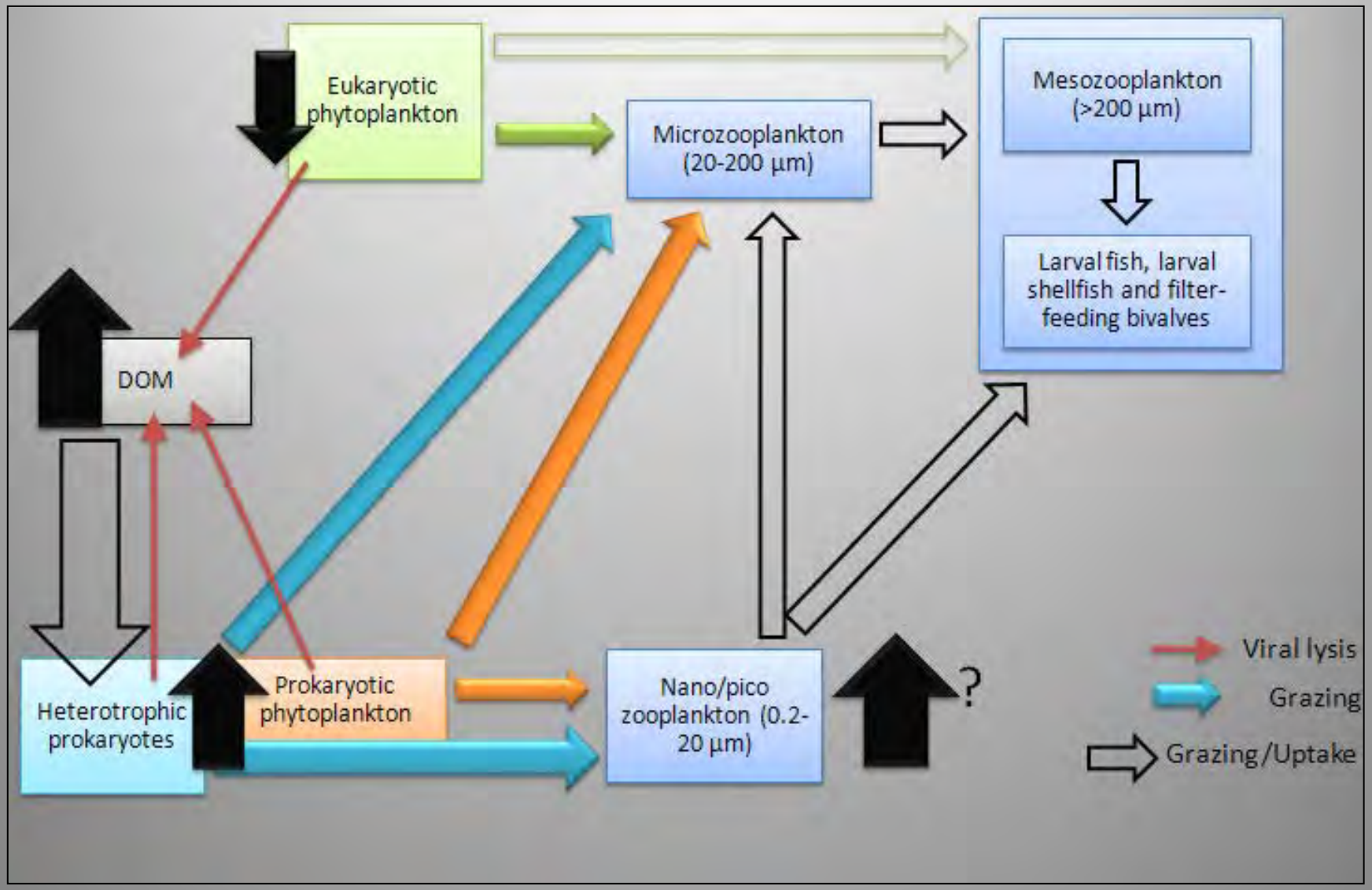
The microbial food web feeds the higher trophic levels



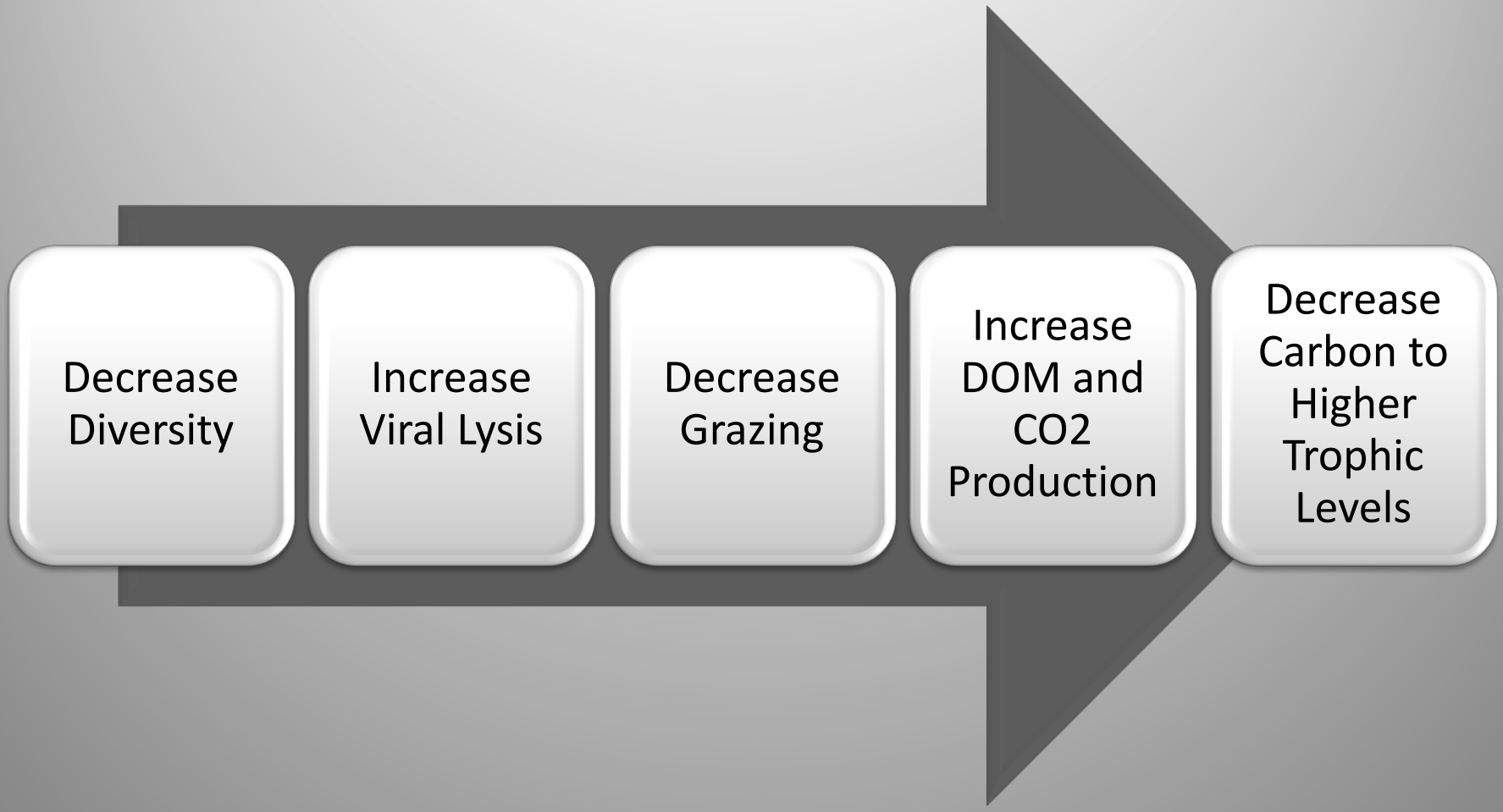
Oil and dispersants can be toxic, but also represent an influx of DOM



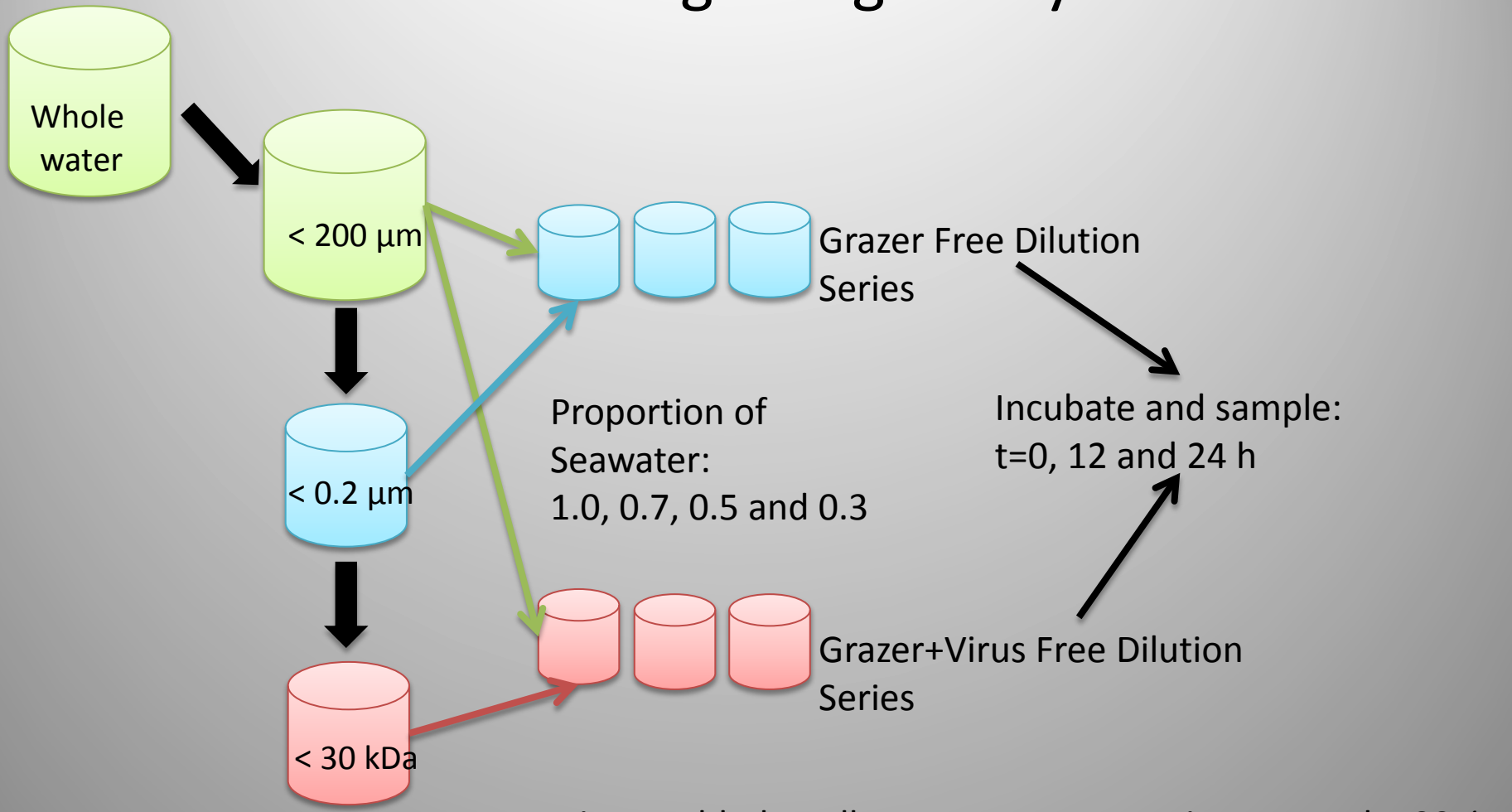
Oil and dispersant can be toxic or a food resource: Shift diversity

- Toxic
  - eukaryotic phytoplankton and cyanobacteria
  - eukaryotic protists and zooplankton
  - some heterotrophic prokaryotes (especially Thaumarchaeota)
- Food resource
  - some heterotrophic prokaryotes
  - some heterotrophic eukaryotes (protists)

A decrease in microbial diversity could cause a shift in trophic transfer

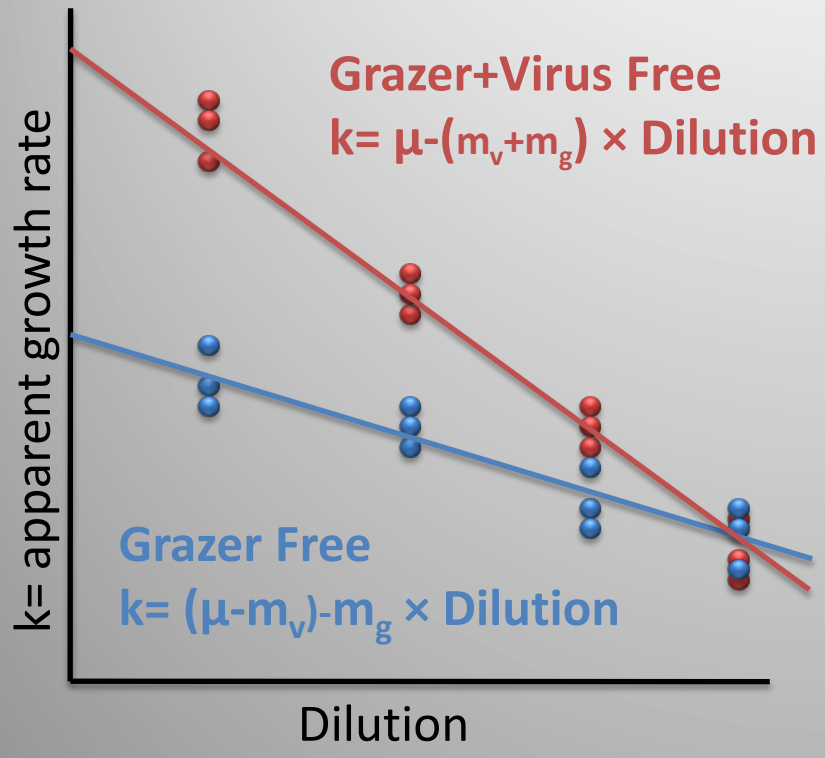


A modified dilution experiment allows simultaneous estimates of grazing and lysis



Nutrients added to all treatments, no nutrient control, 100%.

Calculating growth, grazing and viral lysis



μ=instantaneous growth rate
m_v=mortality due to viruses
m_g=mortality due to grazers

- Linear regression for rates
- Test for significant differences between slopes
- Test for significant effects of nutrients

- Flow Cytometry
  - Total Prokaryotes (Cells $^{-}$L)
  - Cyanobacteria (Cells $^{-}$L)
- **Phytoplankton- Chl *a* (μg $^{-}$L)**

Samples collected from within Mobile Bay to the Alabama Shelf

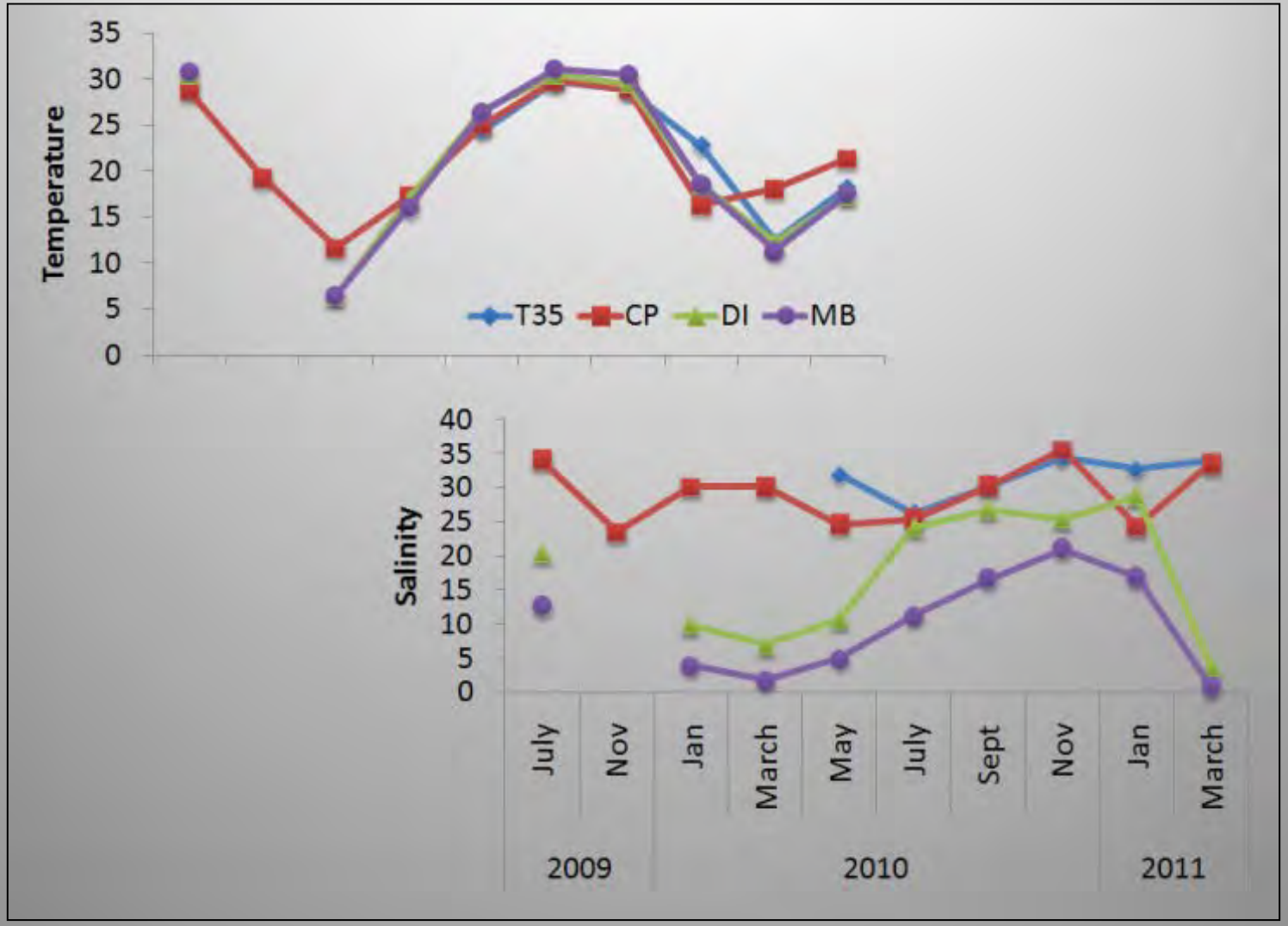
Image from Google Earth

The sampling period began in July 2009, with highest oil exposure in June 2010

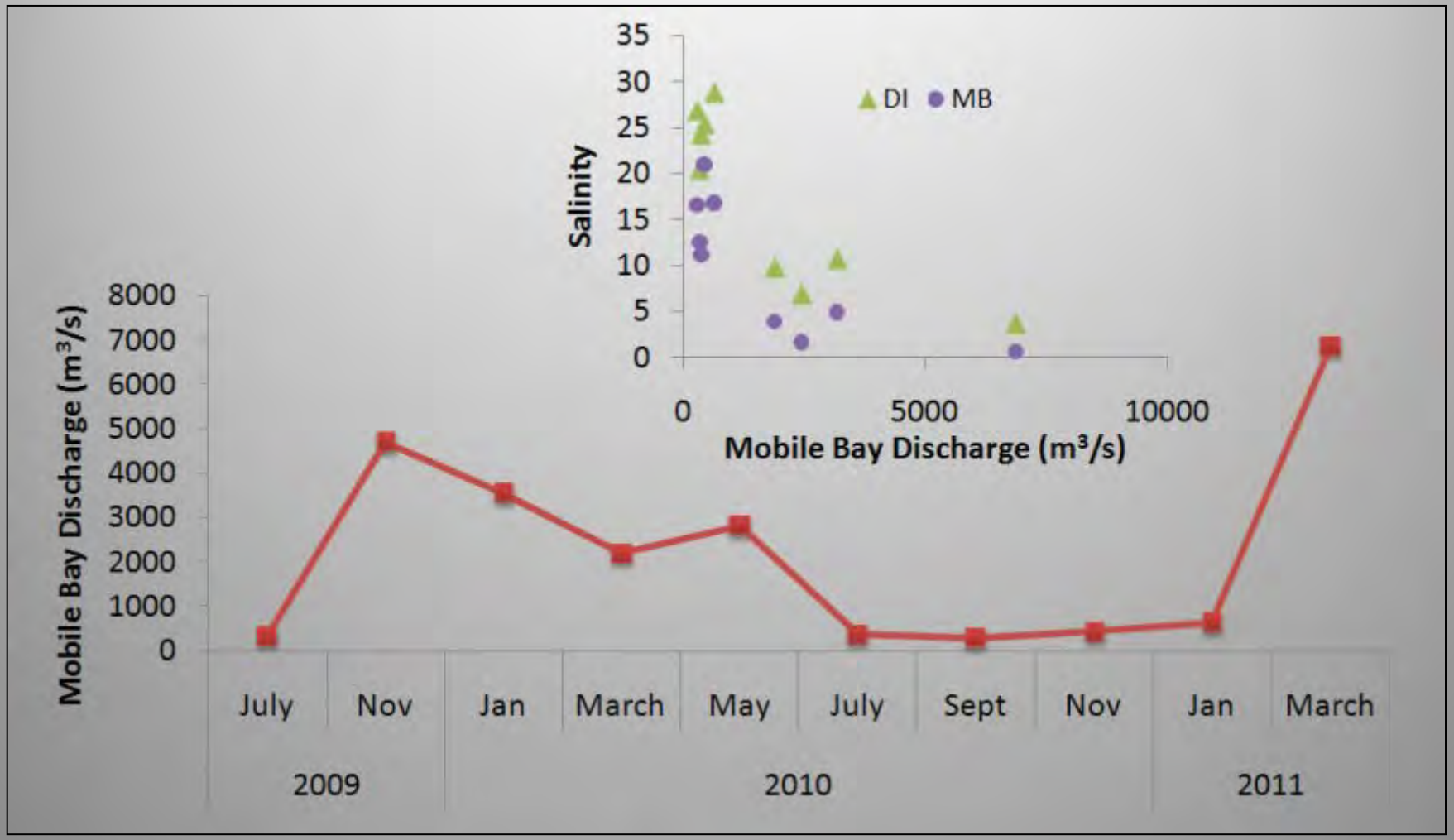
	T35	CP (T20)	DI	MB
2009		July, Nov	July	
2010	May, July, Sept, Nov	Jan, Mar, May, July, Sept, Nov		
2011	Jan, Mar			

Sampling missed the highest exposure to oil.

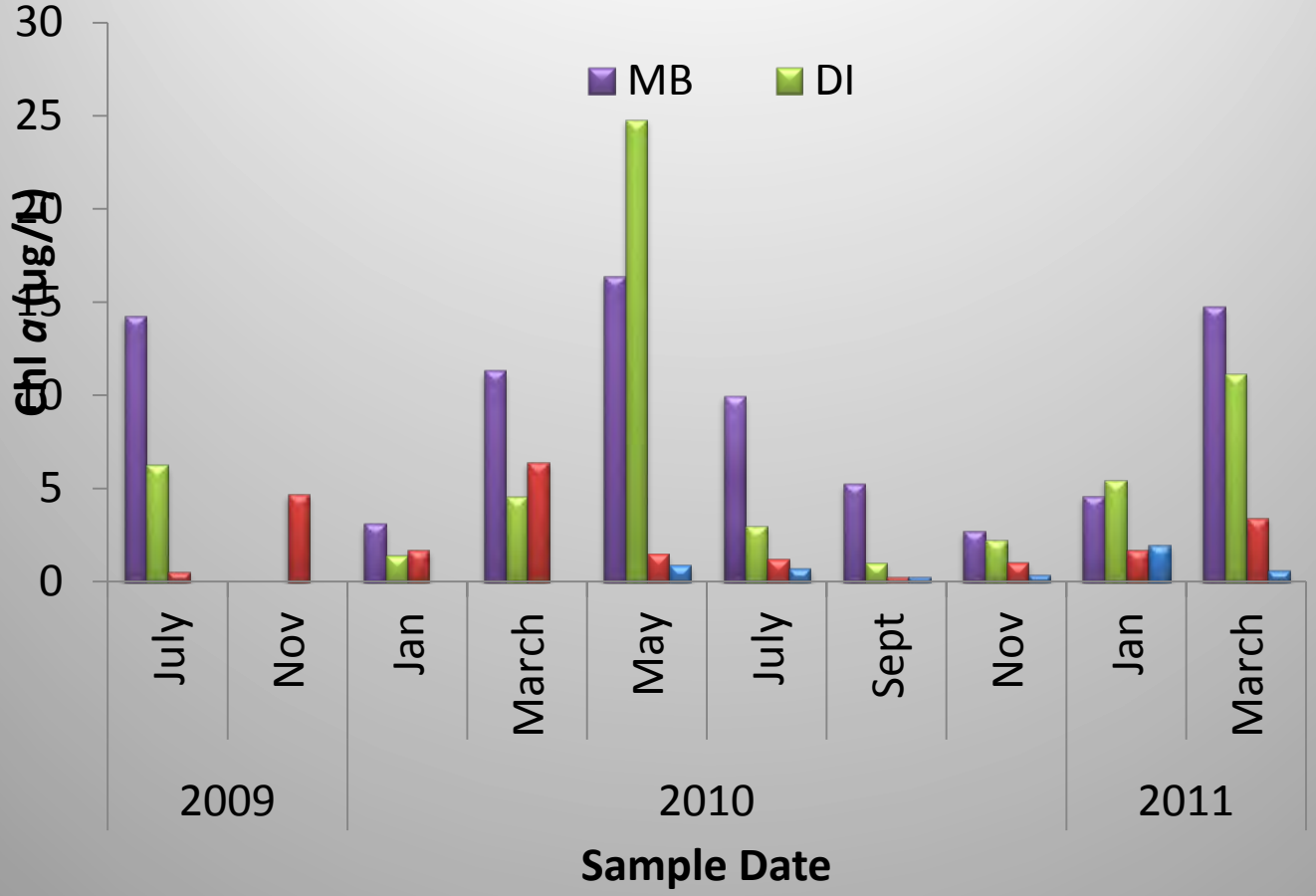
Temperature was similar at all sites, while MB and DI usually had lower salinity



Salinity reflected the discharge from Mobile Bay (average of 7d before sampling)



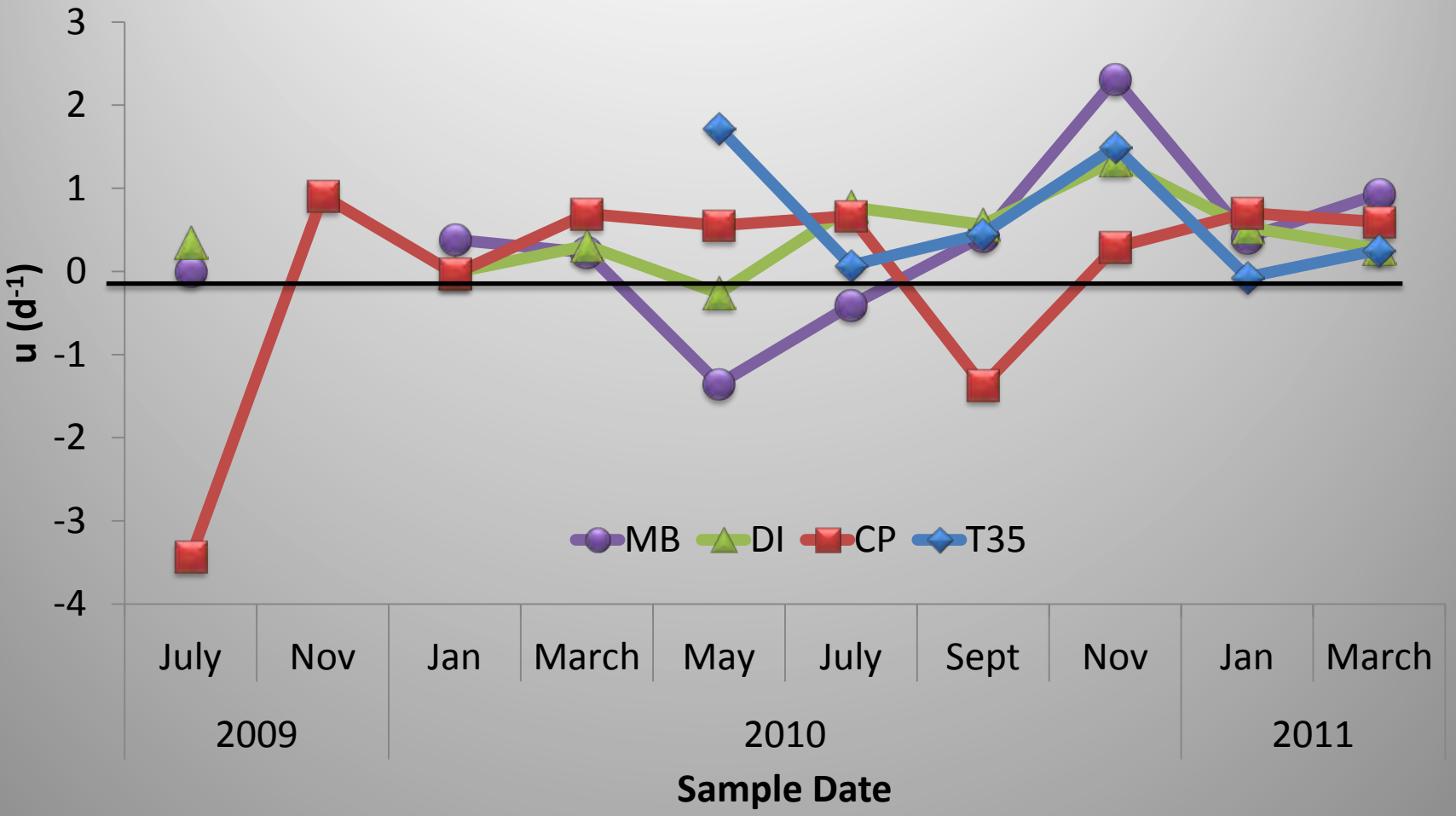
Chl *a* was highest inshore, but more variable than offshore



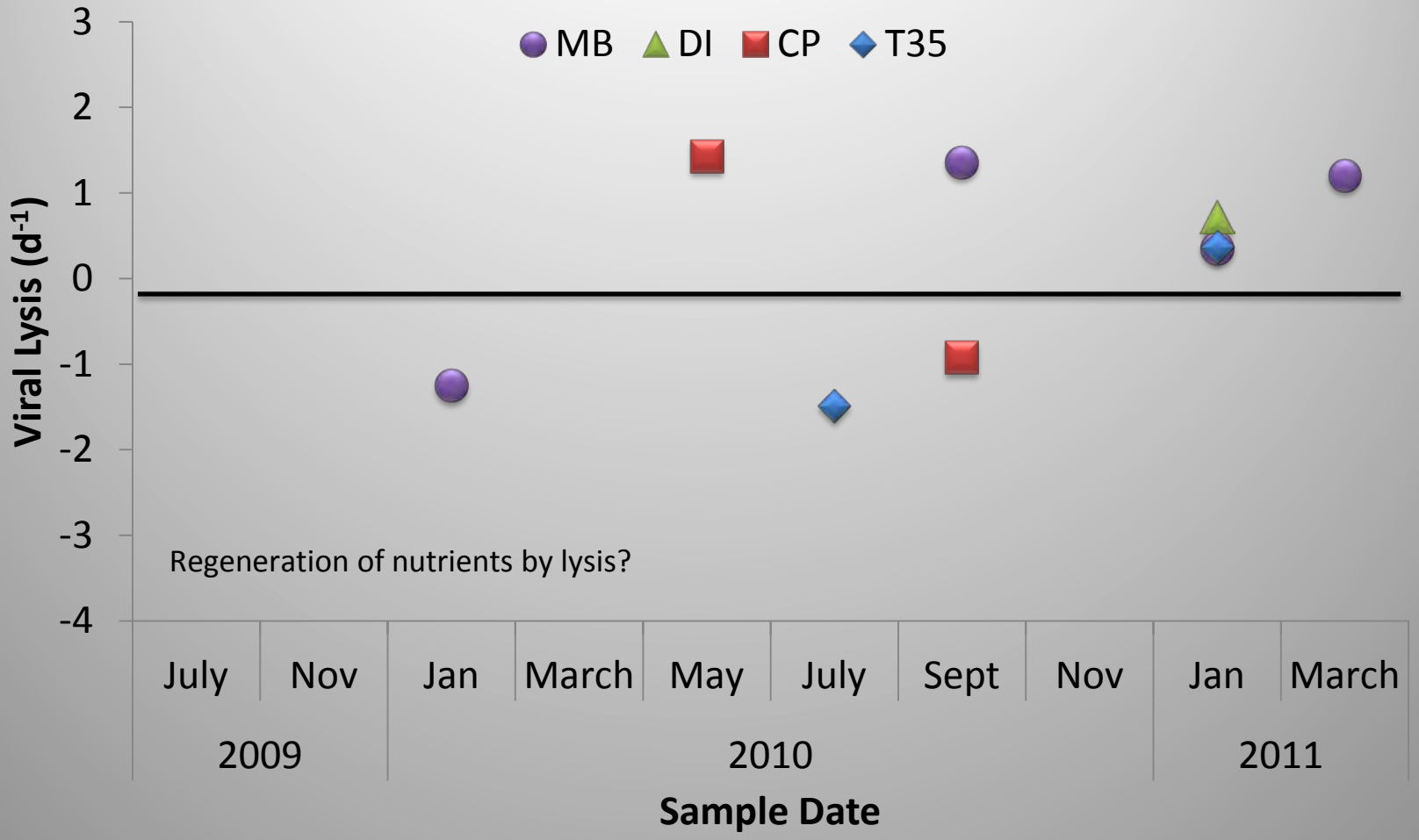
Nutrients appear to be limiting in 12/34 samples: Mostly DI and CP (T20)

	T35	CP (T20)	DI	MB
2009		**July** Nov	**July**	July
2010	May July Sept Nov	Jan Mar **May** **July** **Sept** Nov	Jan Mar May **July** **Sept** **Nov**	Jan Mar May July **Sept** **Nov**
2011	**Jan** Mar	Jan Mar	**Jan** Mar	Jan Mar

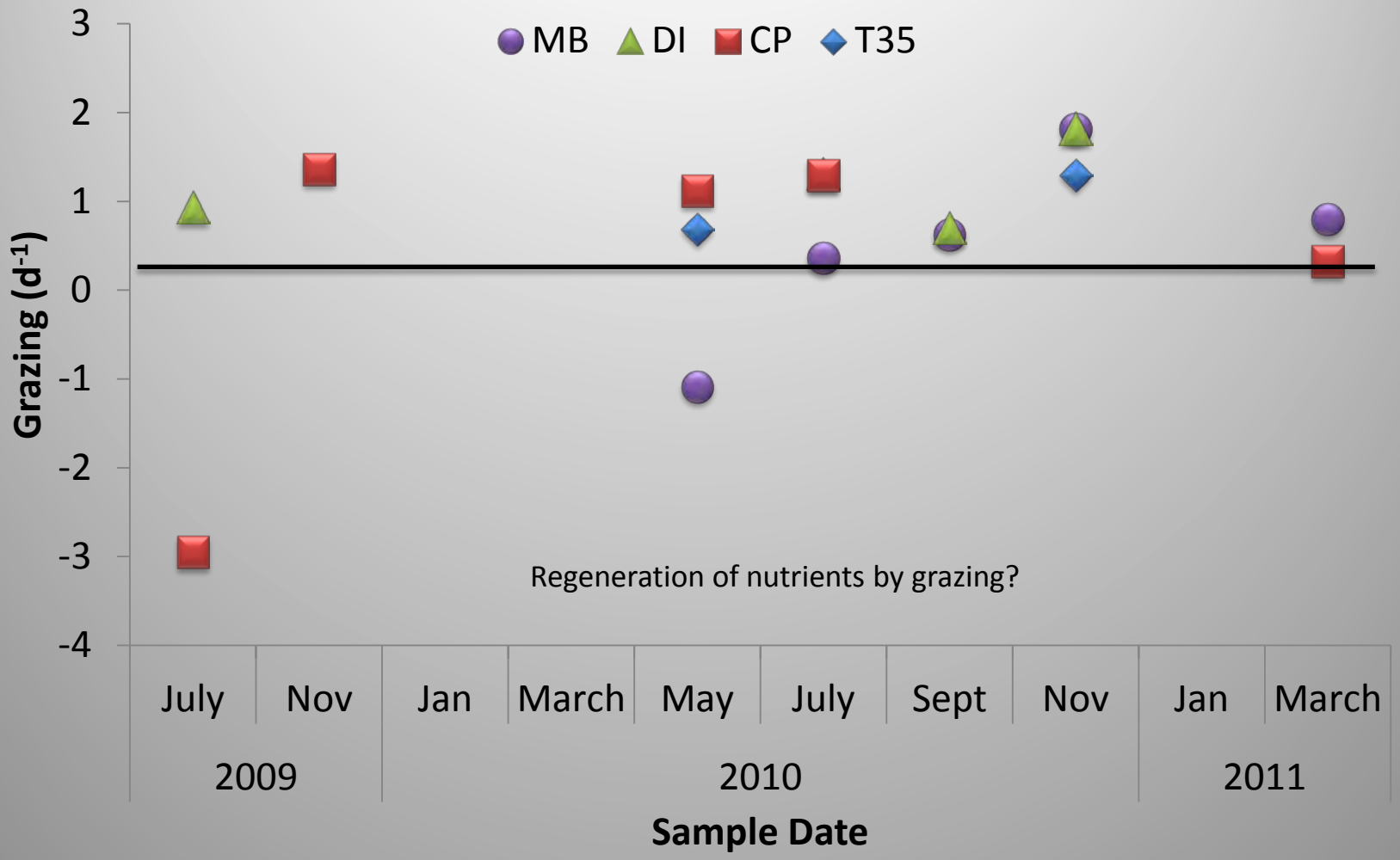
Growth rates were usually positive with lowest rates at CP (T20)



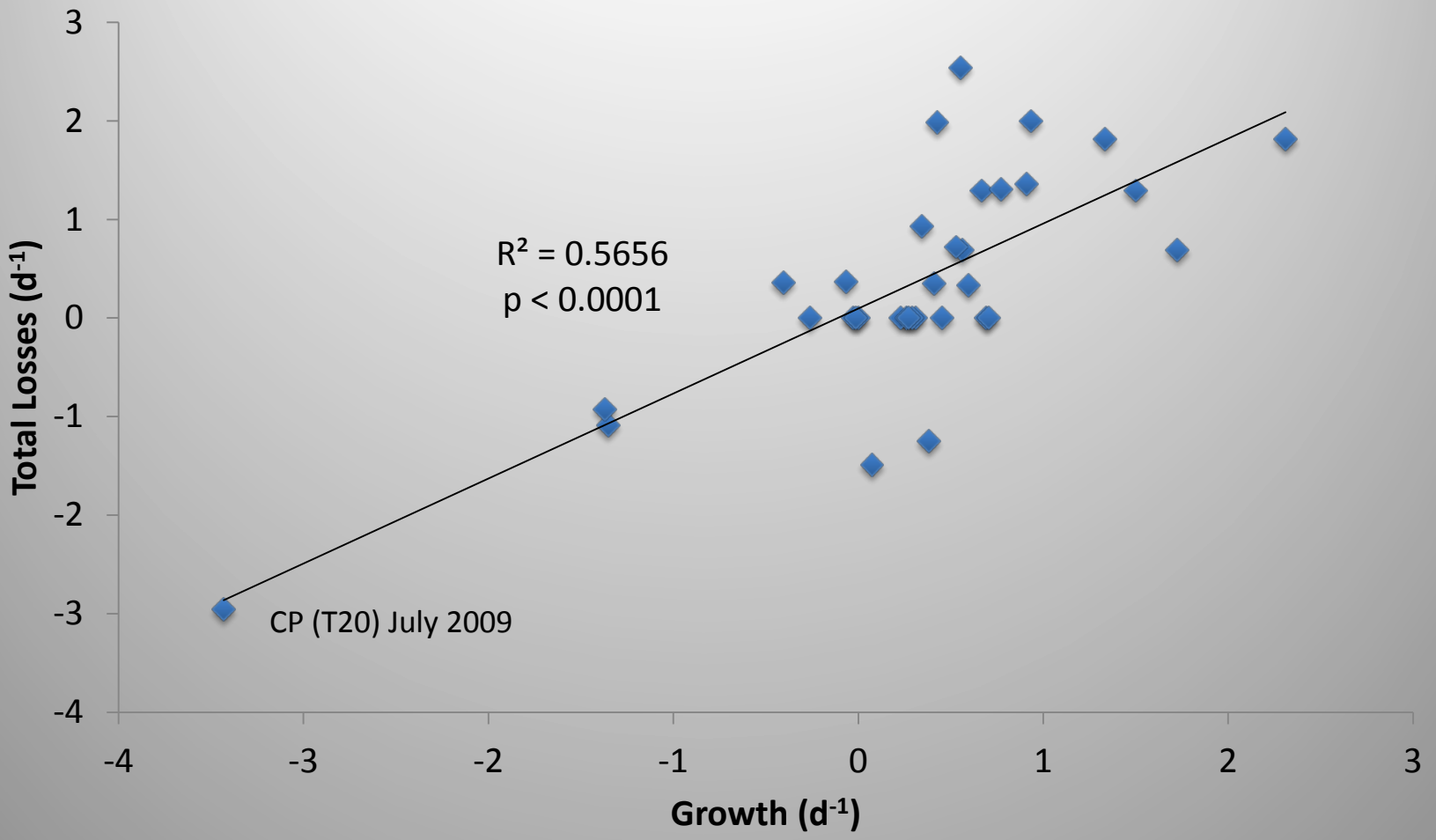
Viral lysis was detected at all sites at least once (9/34), mostly at MB



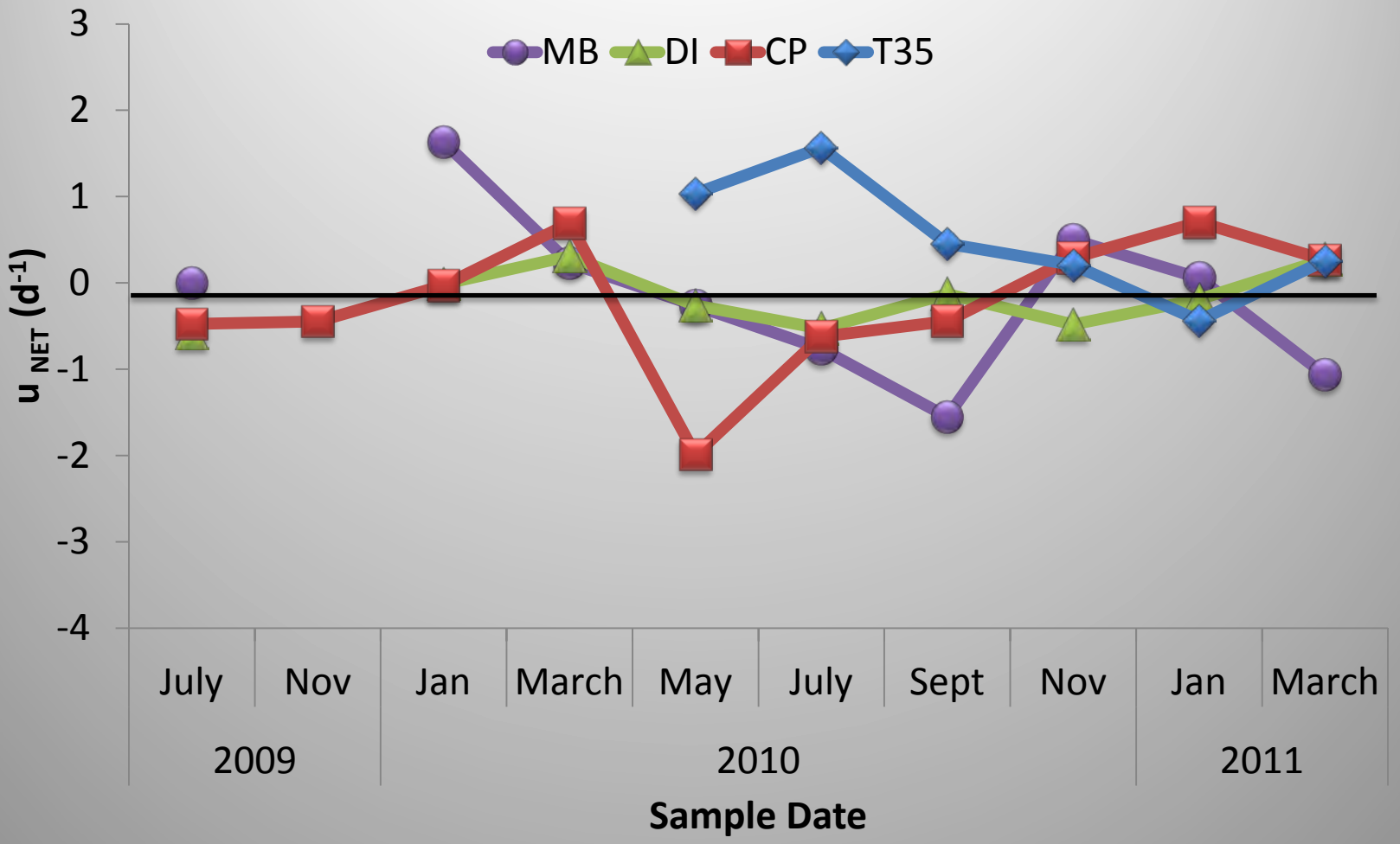
Grazing was detected more often (16/34) and at all sites



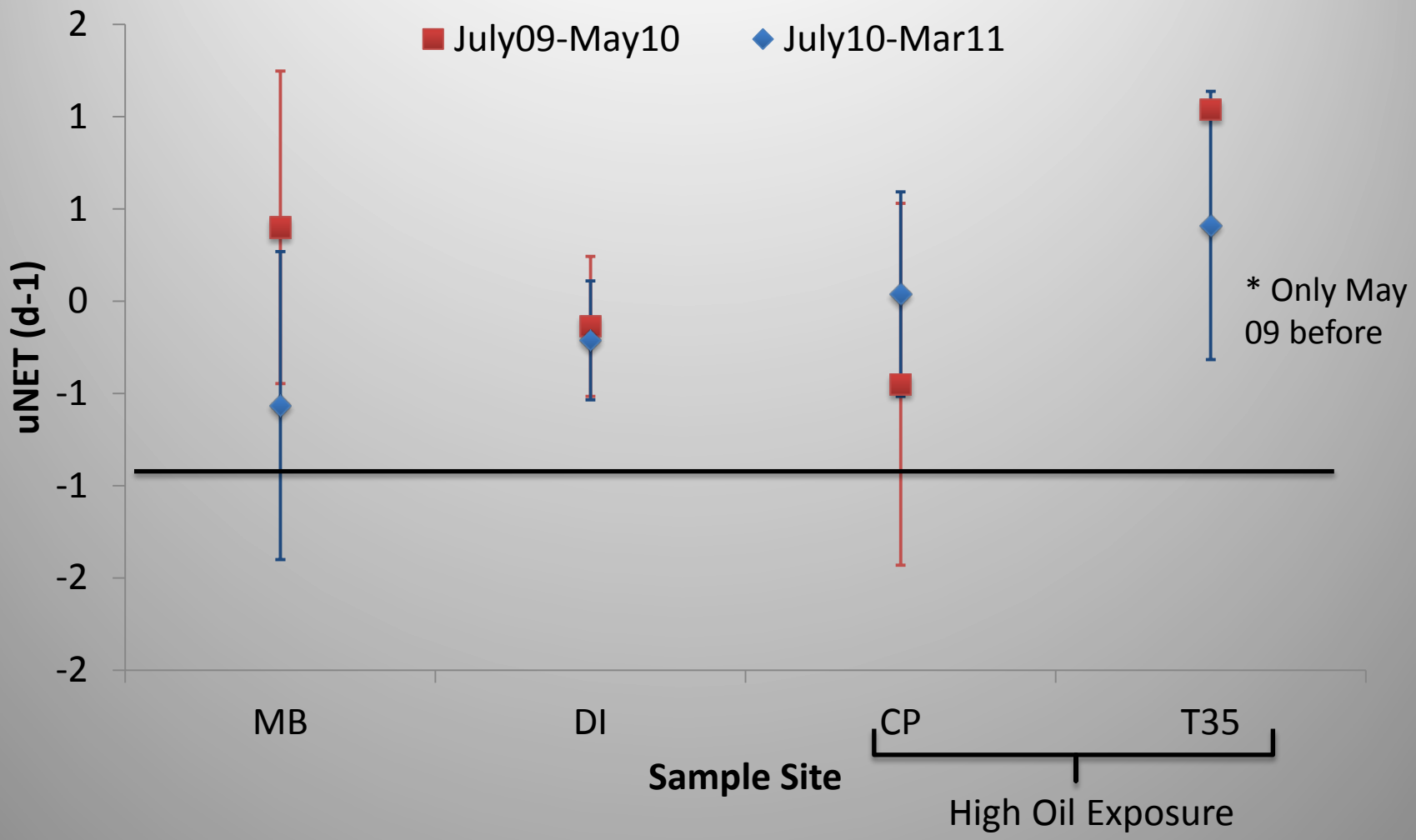
Total losses were positively related to growth



μ_{NET} was variable, but close to zero for most samples



Comparison of μ_{NET} from before oil exposure with after does not suggest a large impact for phytoplankton



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