



Polycyclic aromatic hydrocarbon, trace element, and nutrient distributions as affected by the Deepwater Horizon Oil Spill

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Thanks to NSF & BP for support

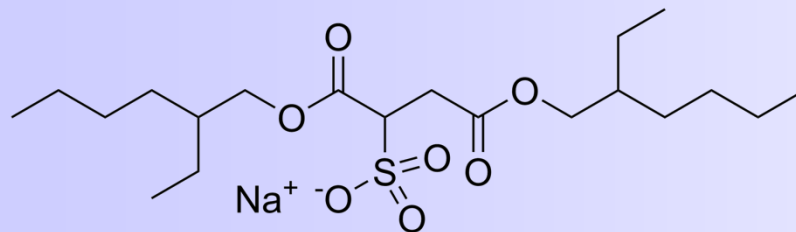
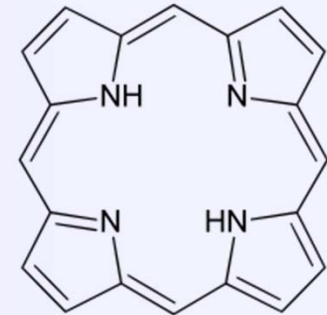
Sampling

- Deepwater Horizon explosion: April 20
- R/V Pelican.....early May
- R/V Walton Smith.....late May
- Leak stopped: July 15
- R/V Cape Hatteras.....mid Oct 2010
- R/V Cape Hatteras.....right now!

- Plus sediment sampling in MS Sound & Bight and coastal marshes through 2010

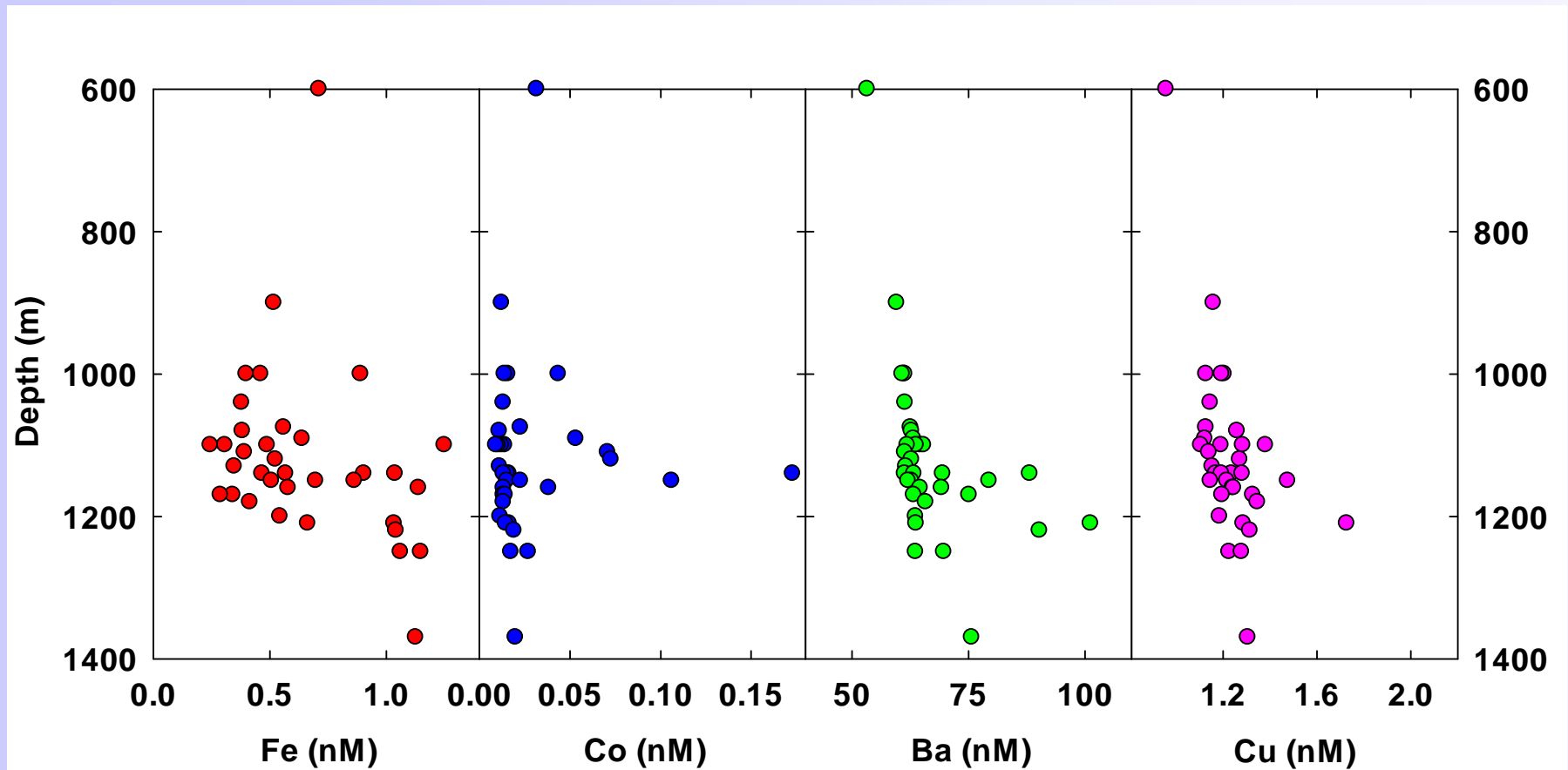
Why Trace Elements in Oil?

- 10's to >100's of ppm of some metals
- Some (especially V and Ni) bound by porphyrins
- Also, Ba from drilling muds
- But Macondo oil low in metals
- Solubilization by components of dispersant?



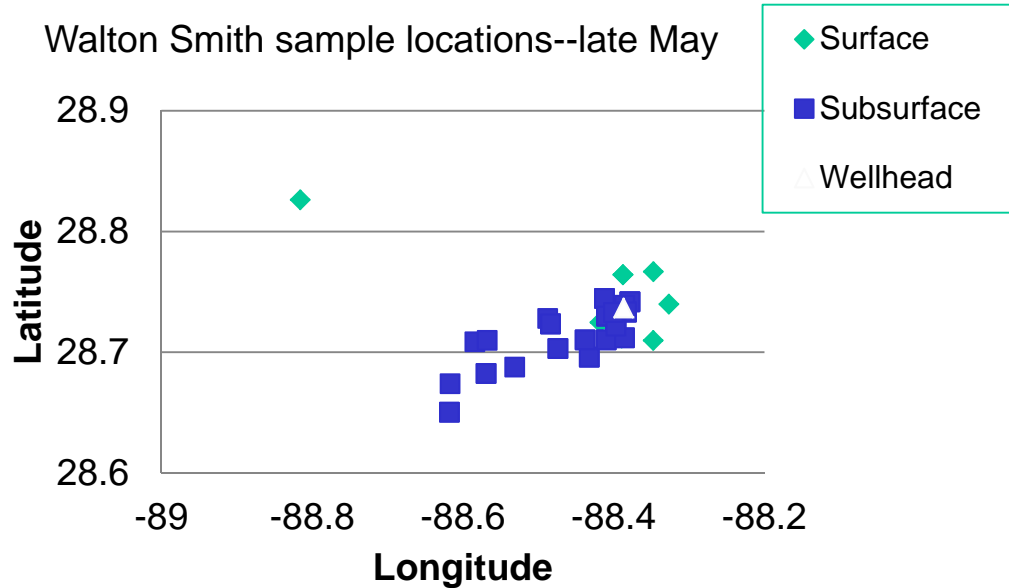
“DOSS” surfactant
sodium dioctyl sulfosuccinate

Late May/Early June (R/V Walton Smith)

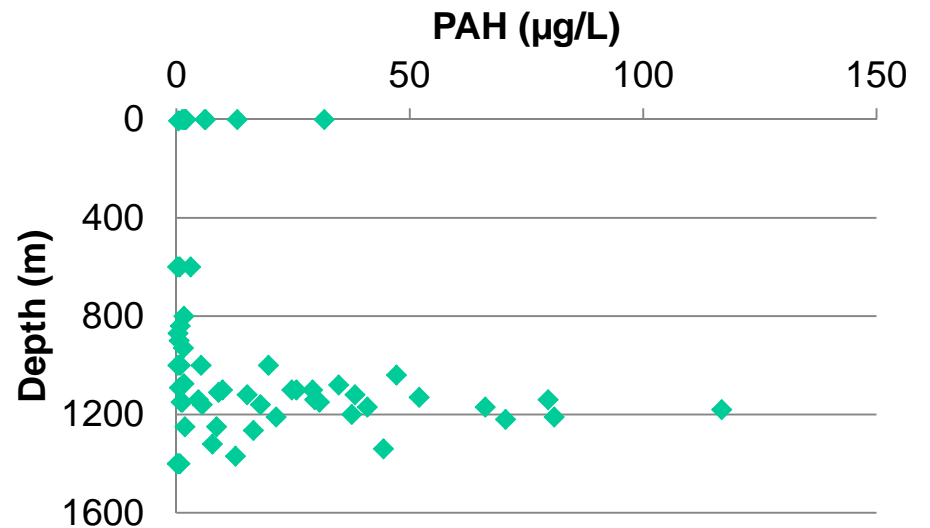


What are PAH's? (and who cares?)

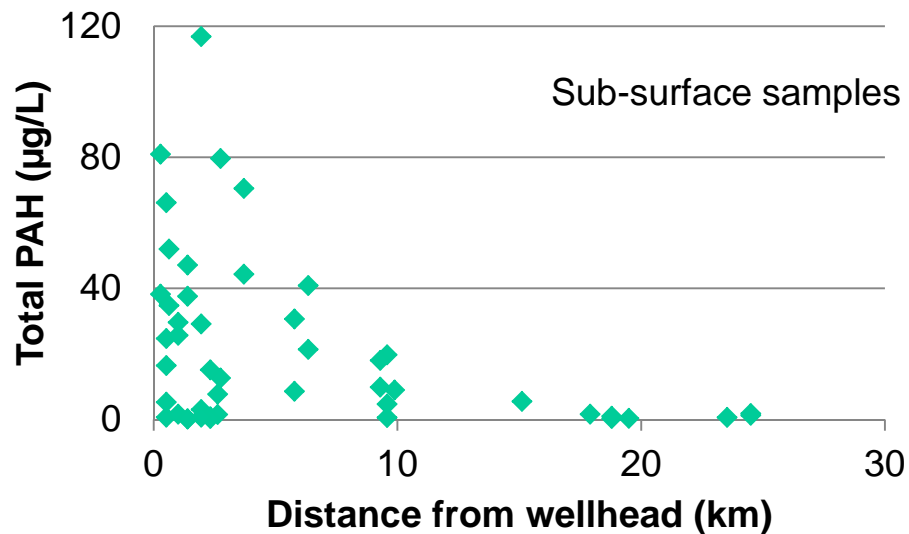
- Polycyclic aromatic hydrocarbons
- Naturally present in fossil fuels; also produced during combustion
- Some are carcinogenic
- Widely dispersed through environment
- Can fingerprint source
- Macondo well source ~1% PAH

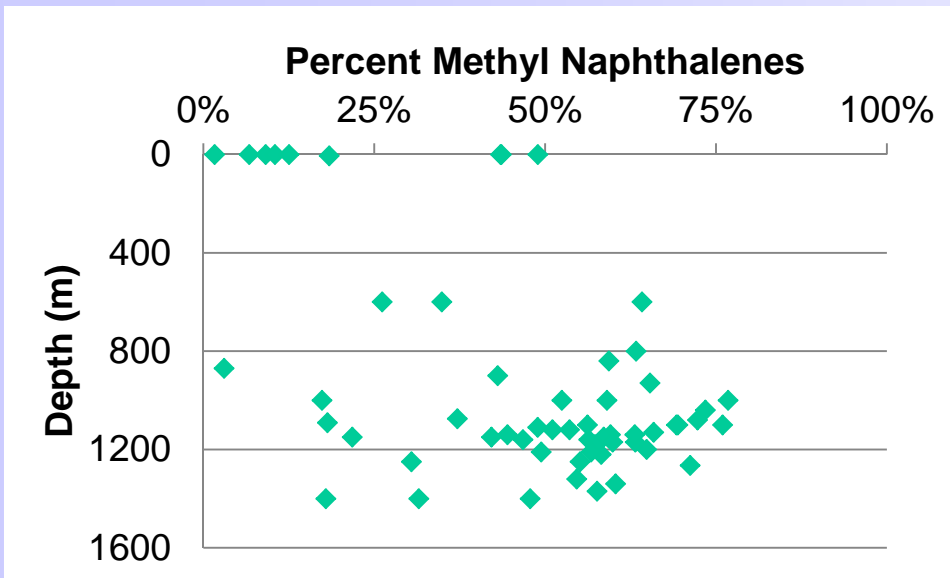


Late May PAH Data (R/V Walton Smith)



Physiological effects on embryonic & larval marine fish reported for PAH <math>< 5 \mu\text{g/L}</math>

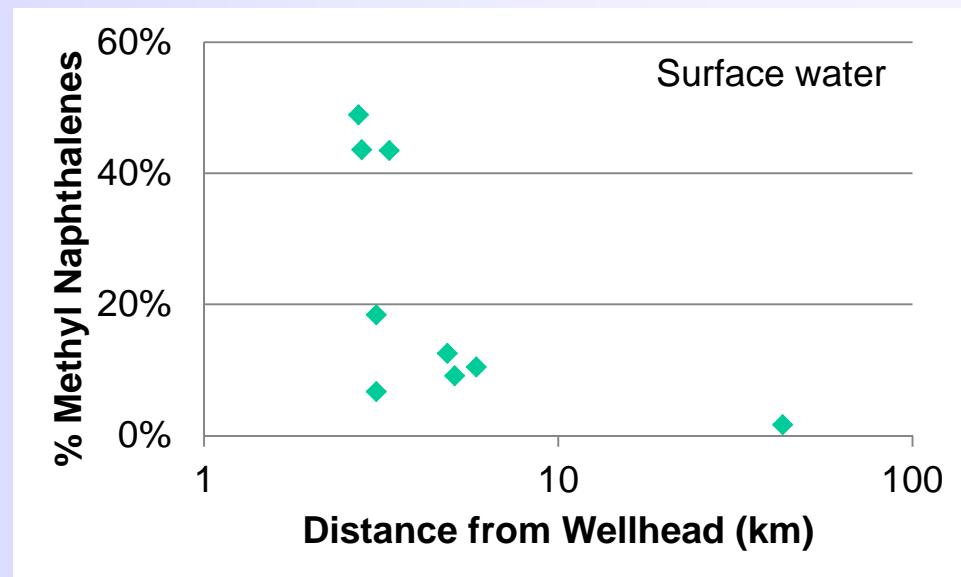




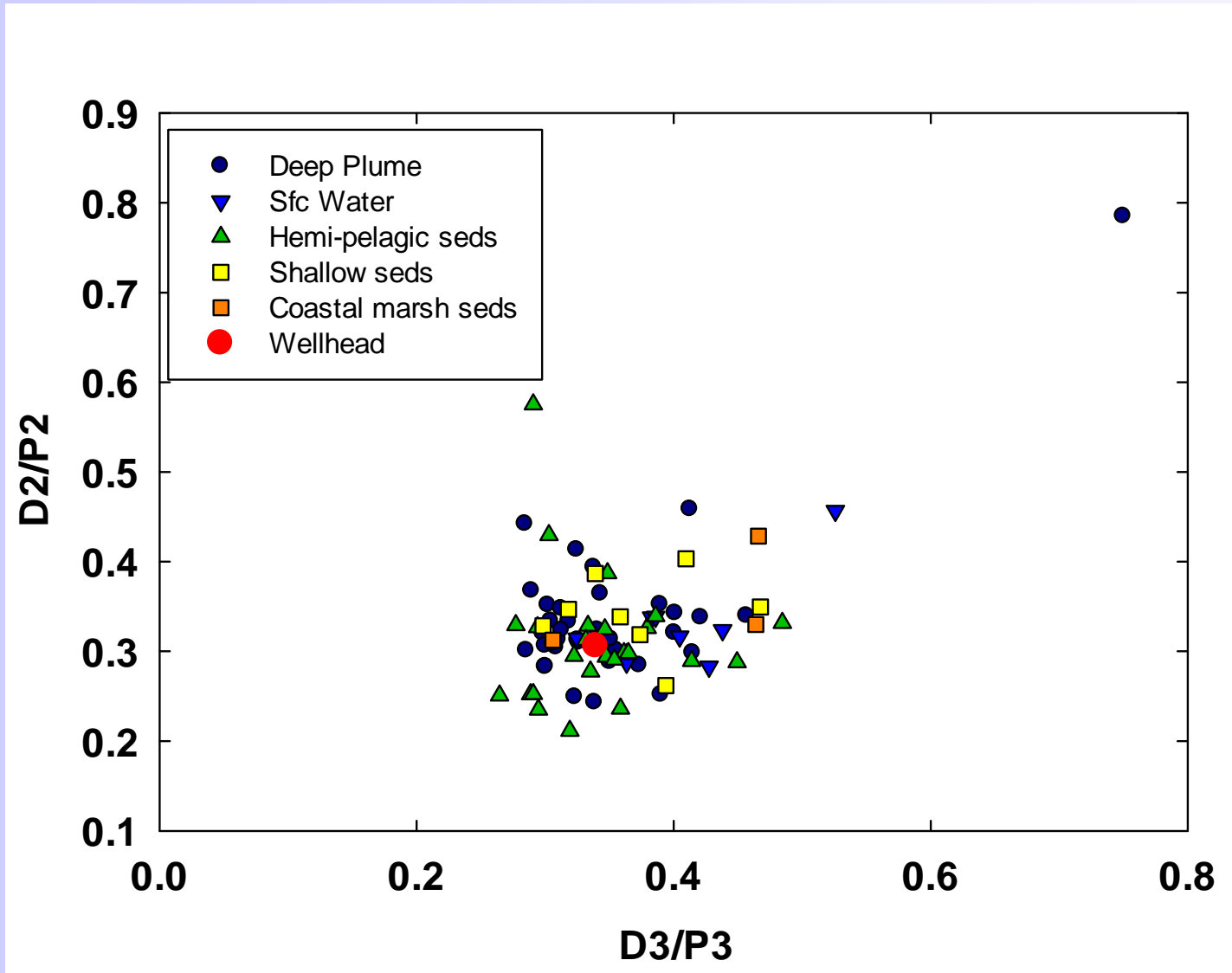
Late May PAH Data (R/V Walton Smith)

Similar observations on R/V Pelican cruise (Diercks et al., 2010)

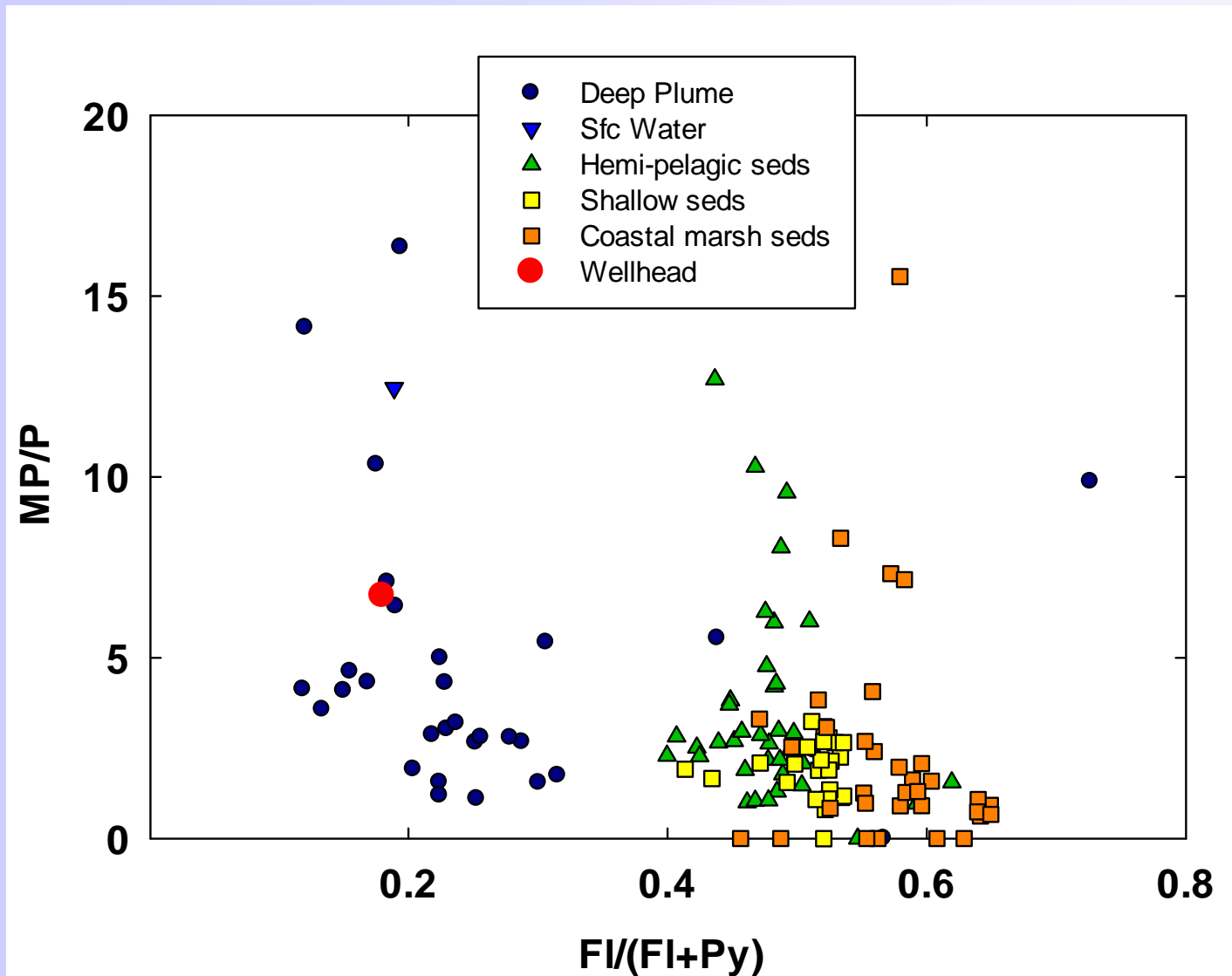
Macondo well source: ~50% of PAH's were methyl naphthalenes



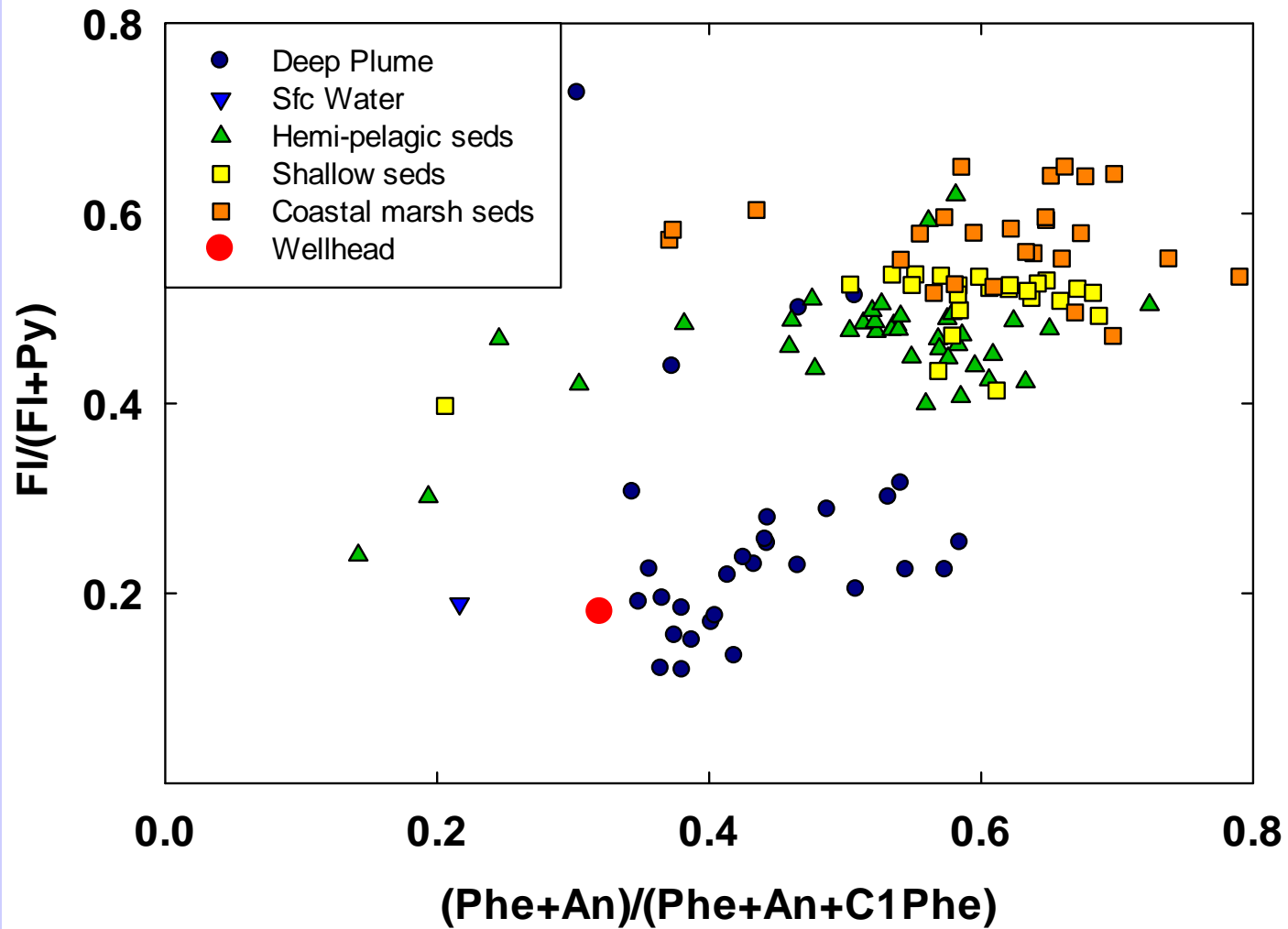
Dibenzothiophene/Phenanthrene Ratios: C3 vs C2 derivatives---ratios should weather similarly



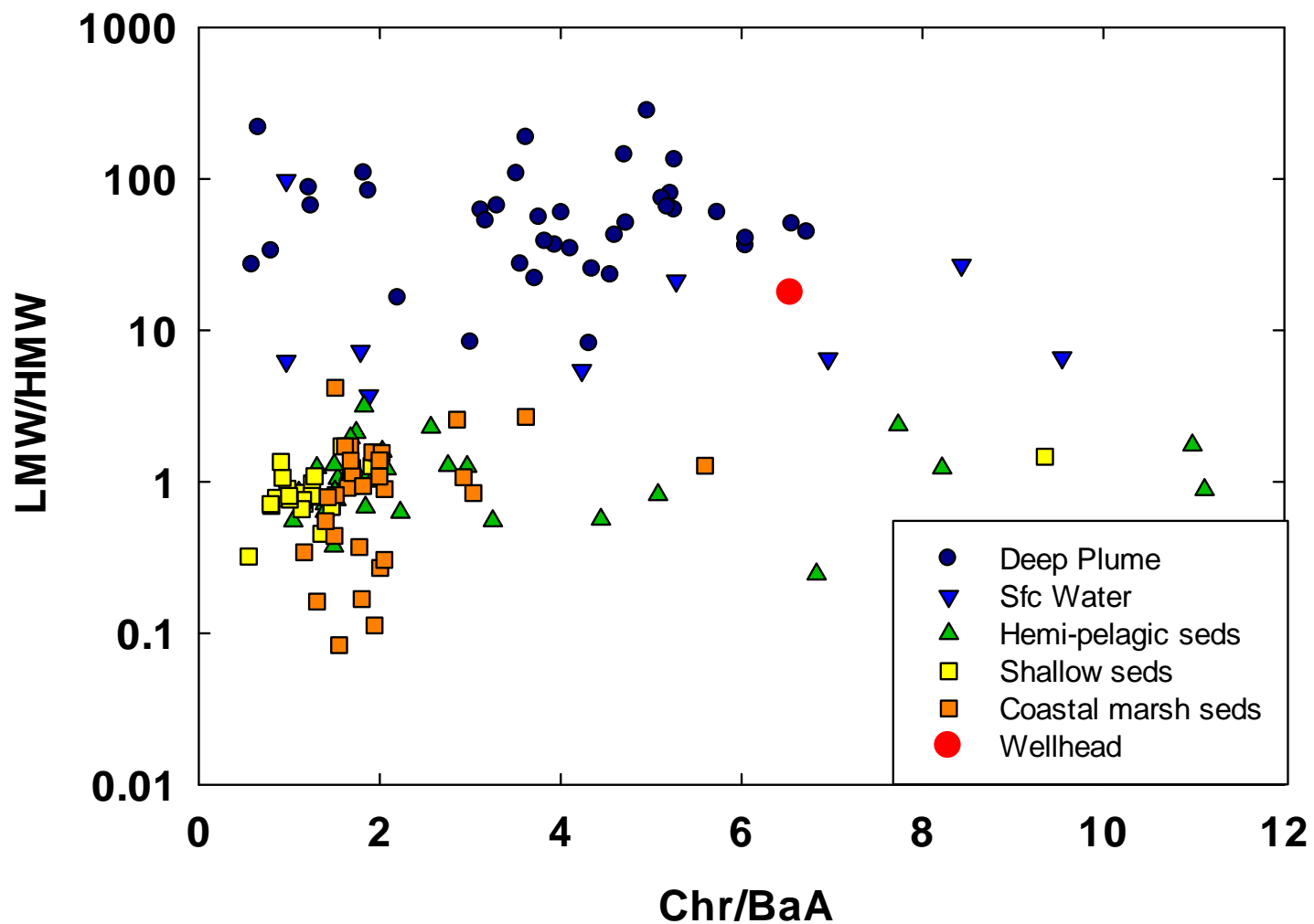
MP/P = methylphenanthrenes/phenanthrene
FI/(FI + Py) = Fluoranthene/(Fluoranthene + Pyrene)
More “pyrogenic” towards lower right



More “pyrogenic” towards upper right



Low to high MW PAH ratio vs
Chrysene/Benzo(a)anthracene ratio
Low values of each ratio imply “pyrogenic”



Methane Update

- Latest news from R/V Cape Hatteras...methane low nM and no significant blips on the Chelsea Aquatracka. But they're still ~20 km from wellhead.
- (Thanks to Hannah Roberts and DongJoo Joung for updates from the ship)

Conclusions

- Small trace element anomalies probably due to oil (Co) and drilling muds (Ba, Cu?)
- Fe limiting (?) but benthic source (?)
- Fractionation of PAH's observed from wellhead through the environment
- Use pyrogenic indicators cautiously



Life at sea
was good
(as long as
there was no
crude smell)

