

PETROLEUM CONTAMINANTS IN COOK INLET SEDIMENTS AND SELECT BELUGA PREY

DANA L. WETZEL

JOHN E. REYNOLDS, III.



What are PAHs?

- **Polycyclic aromatic hydrocarbons-most toxic**
- **Exist naturally as in seeps, but are associated with oil and gas activities**
- **Sixteen PAHs are considered “priority pollutants” by WHO and EPA**
- **Can be “fingerprinted” to determine the type of source**
- **Metabolites may be more toxic than original compounds**

Polycyclic Aromatic Hydrocarbons



Benzene



Naphthalene



**1-Methyl
Naphthalene**



**2,5-Dimethyl
Naphthalene**



Indane



Fluorene



Phenanthrene



**2-Methyl
Phenanthrene**



Fluoranthene



Pyrene



3,4-Benzopyrene

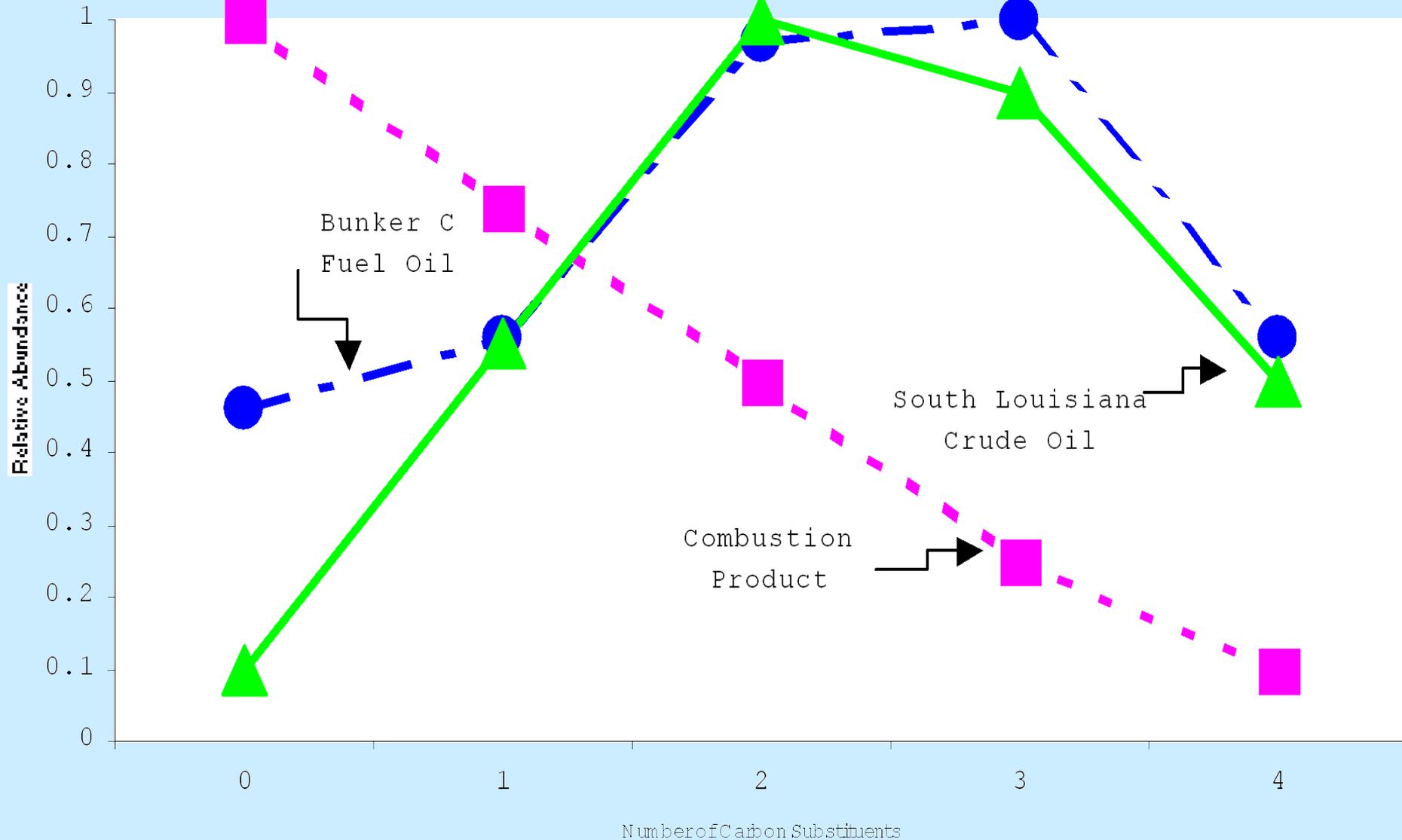


Benzanthracene

PAHs Analyzed by GCMS

2-ring:	C ₀ -C ₄	Naphthalenes
3-ring:	C ₀ -C ₄	Phenanthrenes Anthracenes Dibenzothiophenes Fluorenes
4-ring:	C ₀ -C ₄	Fluoranthenes Pyrenes Chrysenes Benz(a)anthracenes
5-ring:	C ₀	Benzo(a)pyrene Benzo(e)pyrene Benzo(k)fluoranthene Dibenzanthracene

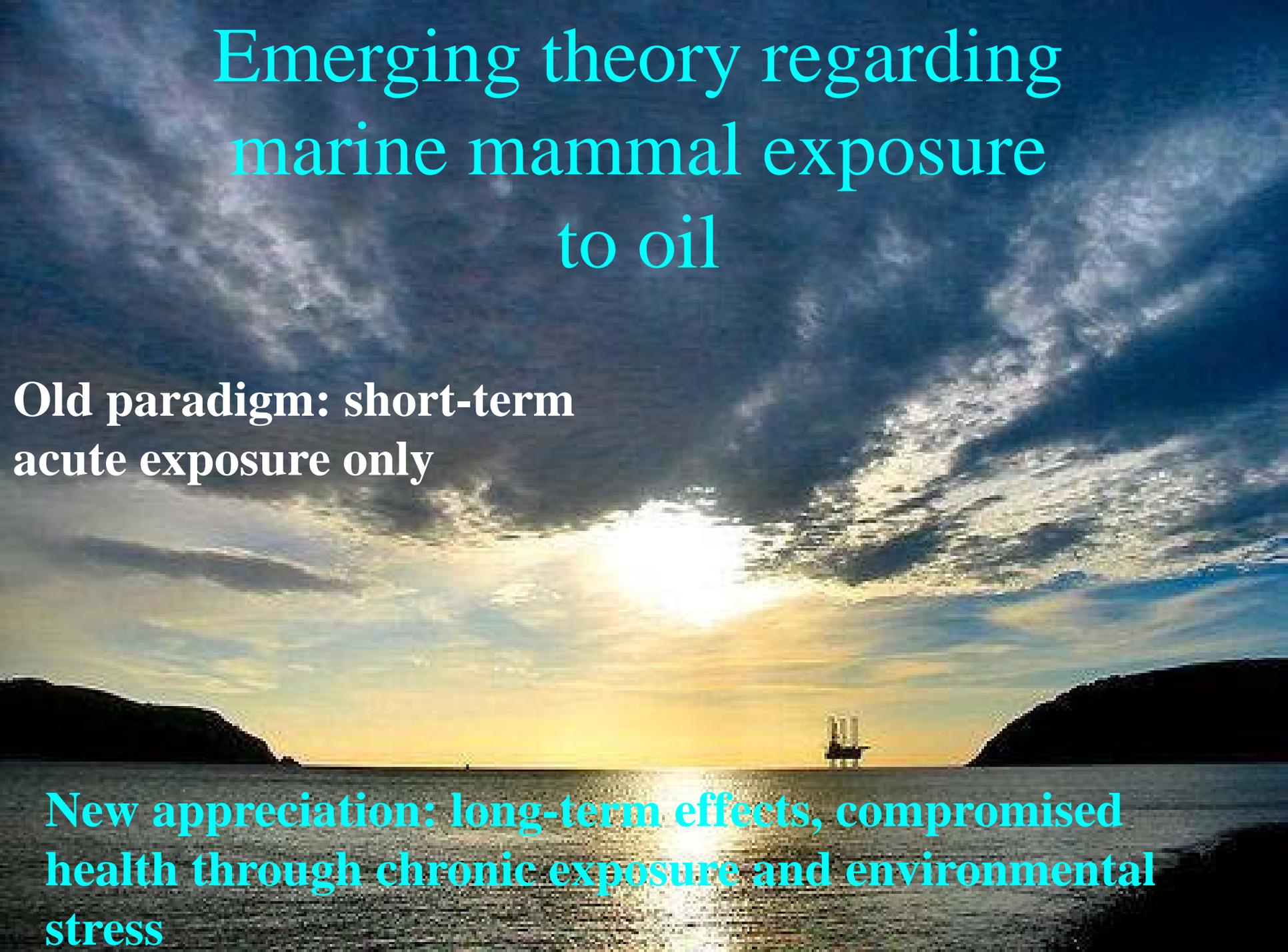
Alkyl Homolog Distributions for Petroleum and Combustion Products



Emerging theory regarding marine mammal exposure to oil

**Old paradigm: short-term
acute exposure only**

**New appreciation: long-term effects, compromised
health through chronic exposure and environmental
stress**



BIOLOGICAL EFFECTS OF PETROLEUM HYDROCARBONS

- Inhibition of microbial degradative processes
- Depressed photosynthetic rate in algae
- Chromosome aberration
- Abnormal cell growth (tumors)
- Abnormal development
- Interference with chemotactic response

EFFECTS OF PETROLEUM HYDROCARBONS

- Alteration of sex ratio
- Reproductive failure
- Behavior modification
- Inhibited molting
- Reduced resistance to environmental stress

Fish Sampling

King Salmon

Sockeye Salmon

Hooligan



**Sediments collected by grab
sampler Top 2.5 cm**



Summary, PAHs in sediments

- All values generally low
- Eagle River has highest levels
- Naphthalenes, anthracenes and phenanthrenes most ubiquitous/abundant of the PAHs
- The data suggest input from both combustion and fresh oil
- Highly carcinogenic benzo-a-pyrene at measurable levels in all samples

Summary, PAHs in fish

- Same general pattern as for sediments in terms of types of PAHs, but slightly more pyrene & fluorene constituents
- Highest values in whole fish were from hooligan in the Little Su for naphthalenes
- King salmon in Ship Creek have notable levels of PAHs in their meat; the same holds true for sockeye roe

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