

Table S2. Knowledge of Effects of Petroleum in the Marine Environment Circa 1983 Paraphrasing and Quoting Selected Excerpts from NRC (1985) Oil in the Sea report (See References in paper).

Major Findings. From both experimental research and field studies of oil spills.

- “Research since 1975 has resulted in considerable advances in the understanding of toxicities of various petroleum components, of effects their life-cycle stages, and on the relative vulnerability of various marine ecosystems.”
- “Much has been learned about the impact of petroleum on intertidal; and coastal ecosystems”.
- Much has been learned about “effects of petroleum on metabolic and physiological processes, especially in fish and in invertebrates.”
- “Little is known about the impact of petroleum on pelagic organisms and populations”.
- “Gaps in our understanding of oil impact on macro-algae, on larval fish, and on polar and tropical organisms.”
- There is a major difficulty at this time in transferring results from laboratory experiments to actual field conditions.
- “No clear indication of so far that commercially important fish stocks have been severely disrupted by either chronic or catastrophic oiling in their environment.”
- “Where oil has had an effect, subsequent monitoring has shown biological recovery taking place.” [over varying periods of time and extent of recovery depending on the ecosystem and type of petroleum]*.
- “Petroleum can have a seriously adverse affect on local environments, persisting, in some cases unaltered, for decades.” [Should be mostly unaltered]*
- “Greatest impact due to oiling clearly occurs in coastal areas, especially those with shallow water, and in areas where local current systems tend to contain or entrain the contaminant.”

Research Need. Broad research activity on “dynamic processes affecting the living organism at its various levels—enzymatic, metabolic, ultrastructural, and molecular a range from the ecosystem level down to the chromosomal.”

Research for Advancing Understanding of Effects of Petroleum in the Marine Environment. Needed Focal Categories.

“Mutagenicity/Tumorigenicity, Alteration of Behavior, Mechanisms of Toxicity, Polar and Tropical Environments, Synergistic Toxicity, Ecosystems Effects.

Major Recommendations.

- “Study the effect of low concentration of petroleum hydrocarbons on the behavior of marine organisms, particularly larval and juvenile forms.”
 - “Conduct studies to examine the apparent coincidence between elevated concentrations of mutagenic/carcinogenic hydrocarbons (PAHs) and pollution-related diseases in certain fish from waters receiving a mix of contaminants.”
 - “Conduct research into impacts of petroleum on polar and tropical environments.
 - “Research into the effects of petroleum on fish stocks, including larval and juvenile stocks, ne extended so as to enable sensible assessment of the impact on these resources.”
“The major uncertainty preventing such assessments, as with mist ecosystems effects, is a limited understanding of natural fluctuations in populations and ecosystems.
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*[] Comments by present authors to further explain the quotation.