



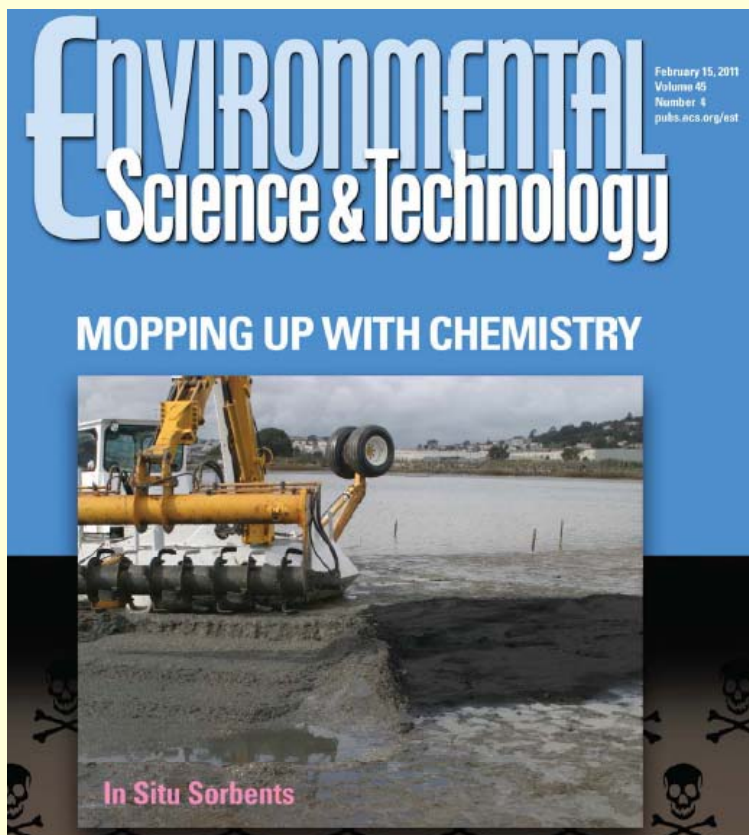
*Monitoring the efficacy and
environmental effects of an in-situ
remedy for contaminated sediment
August 2012
NEMC*

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RECENT FEATURE ARTICLE IN ES&T:

In-situ Sorbent Amendments: A New Direction in Contaminated Sediment Management

Environ. Sci. Technol. 2011, 45, 1163–1168



ENVIRONMENTAL
Science & Technology

FEATURE

pubs.acs.org/est

In-situ Sorbent Amendments: A New Direction in Contaminated Sediment Management[†]

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Richard G. Luthy

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SediMite® as a means of delivering in-situ treatment amendments



Tens of grams/day production in the laboratory



2-5 Million lb/year at a production facility



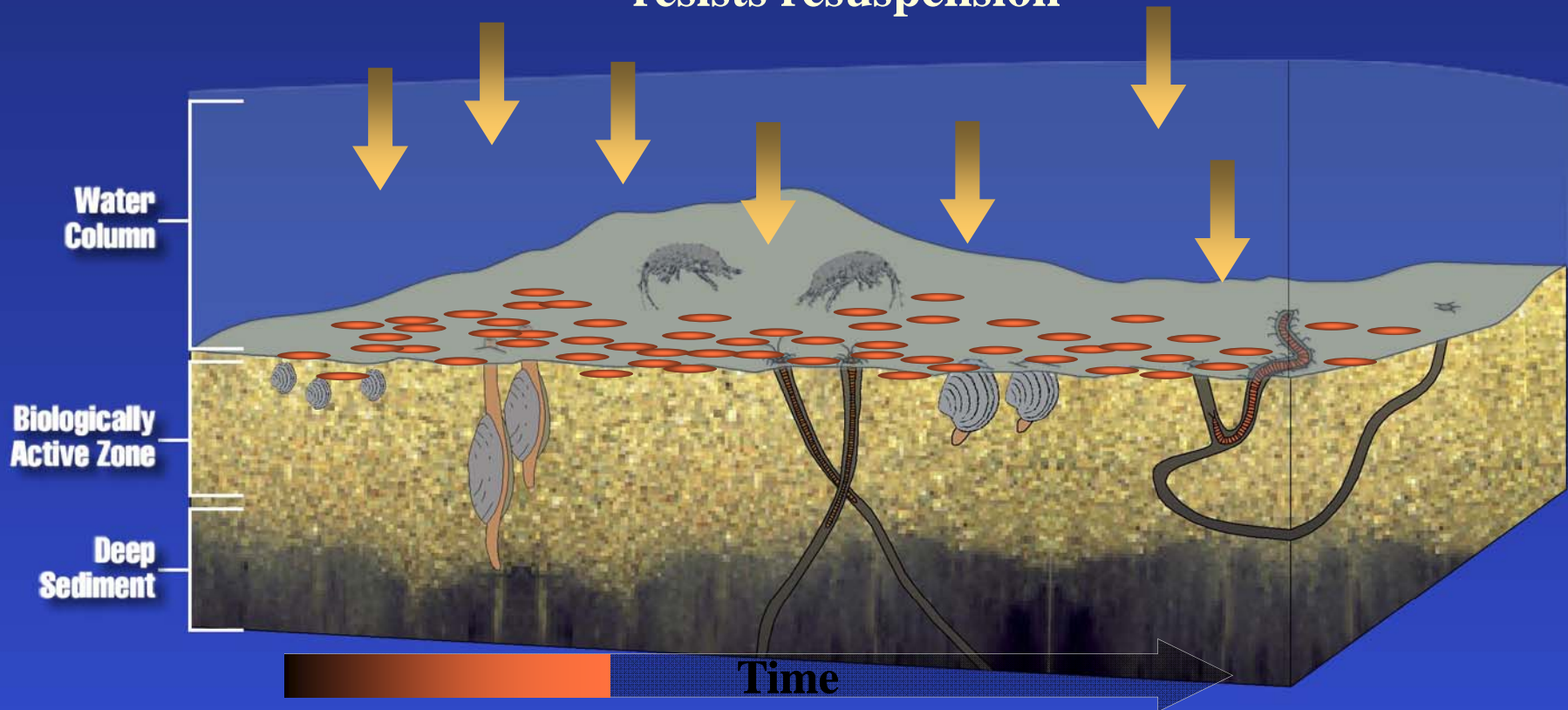
30 lb buckets



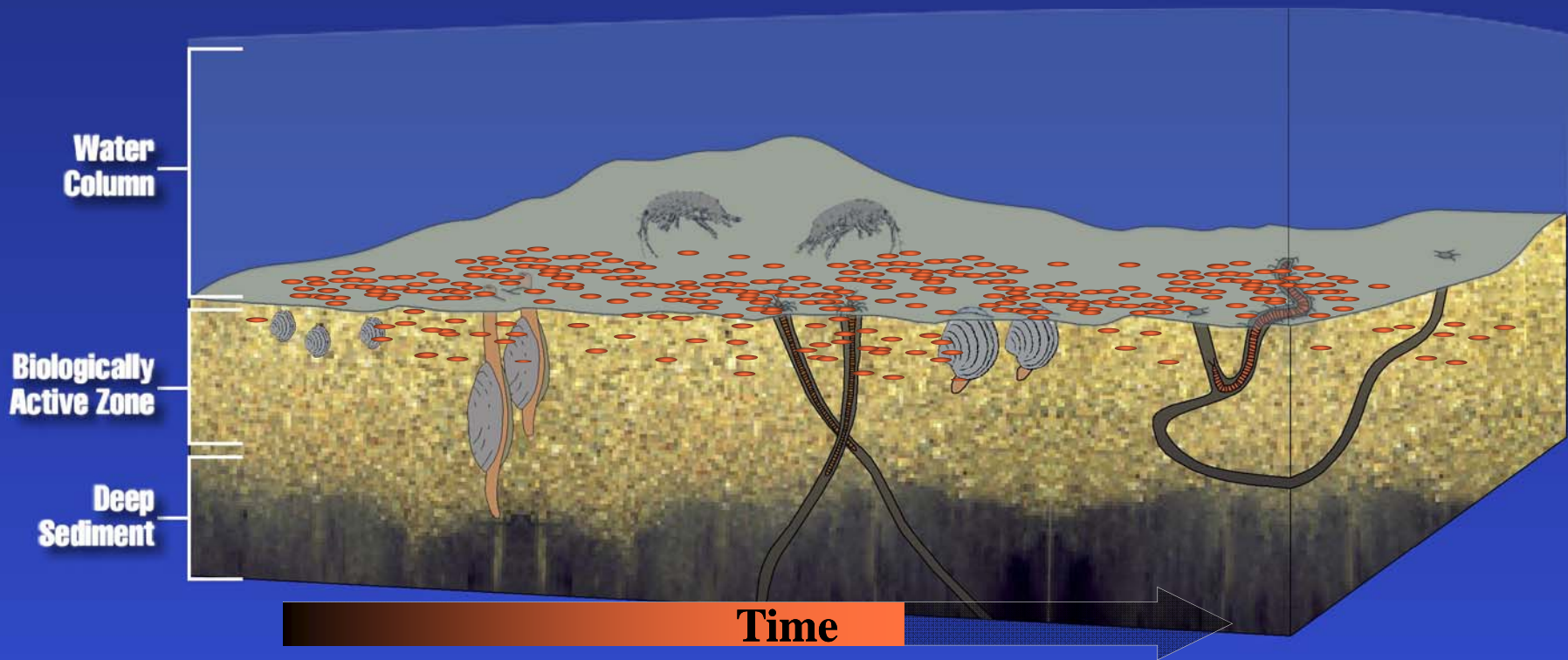
1800 lb bulk bags

SediMite® is designed to provide a low-impact delivery system for AC and other amendments

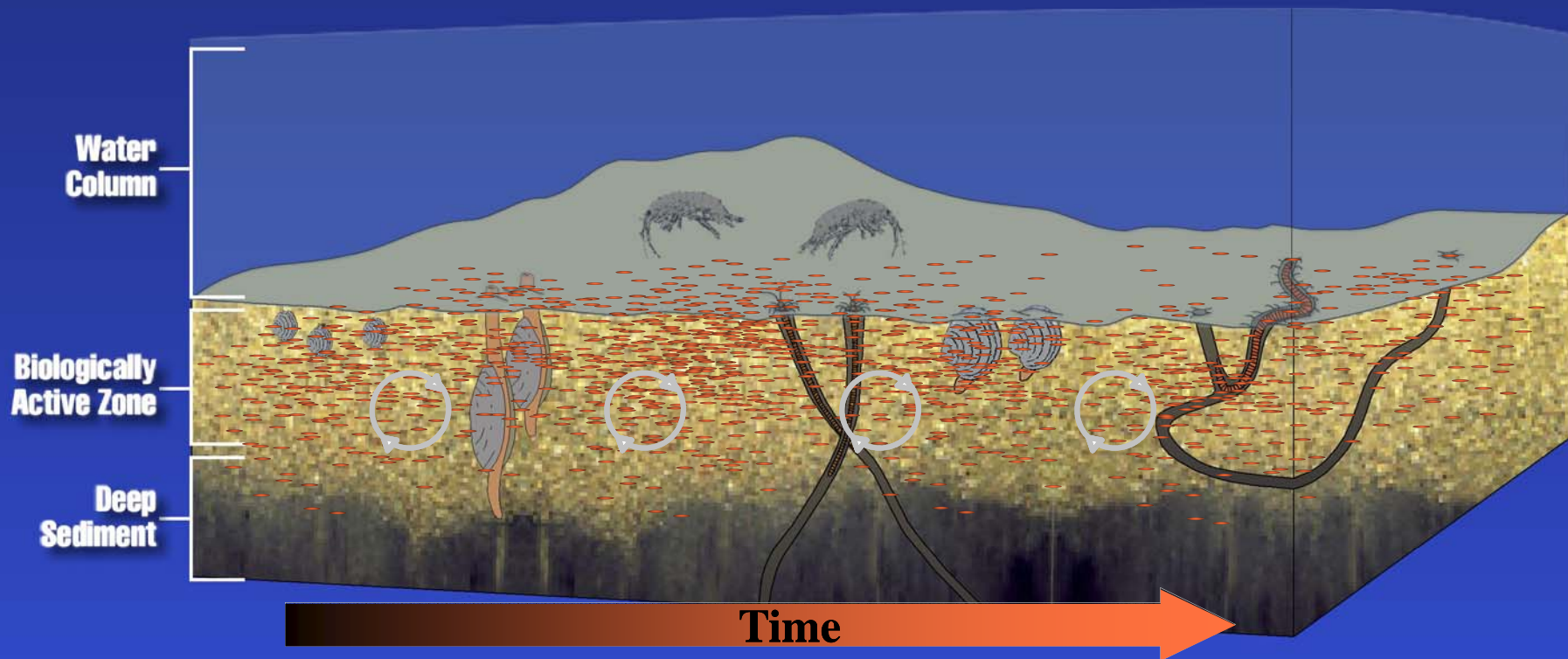
Agglomerate containing treatment agent delivered from water surface or above the sediment—
sinks to sediment surface and
resists resuspension



SediMite® granules break down over time



and are mixed by bioturbation, thus targeting the biologically active zone



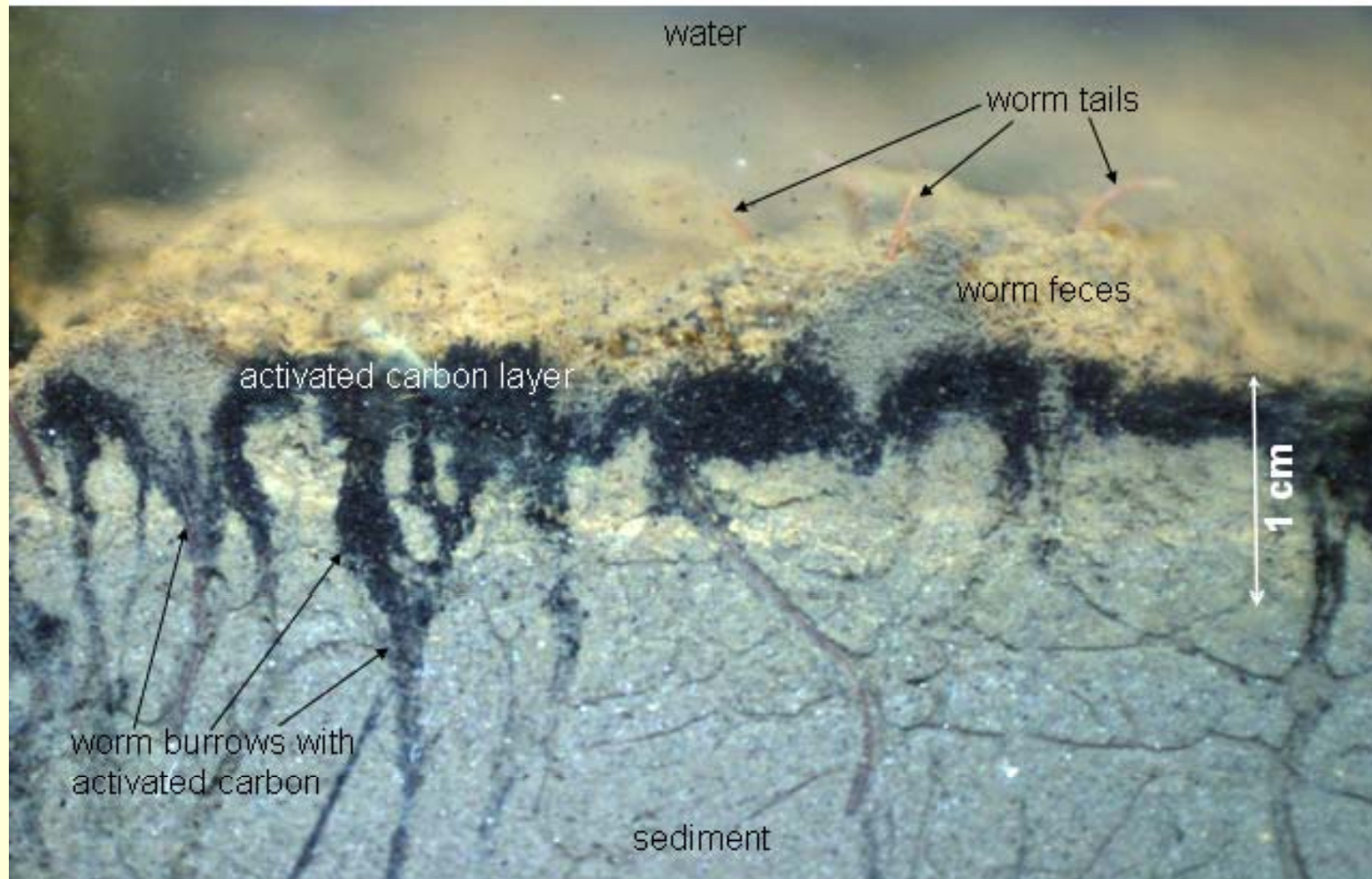


The Workers

(burrowing depth increases left to right)



SEDIMENT AMENDMENT WITH CARBON



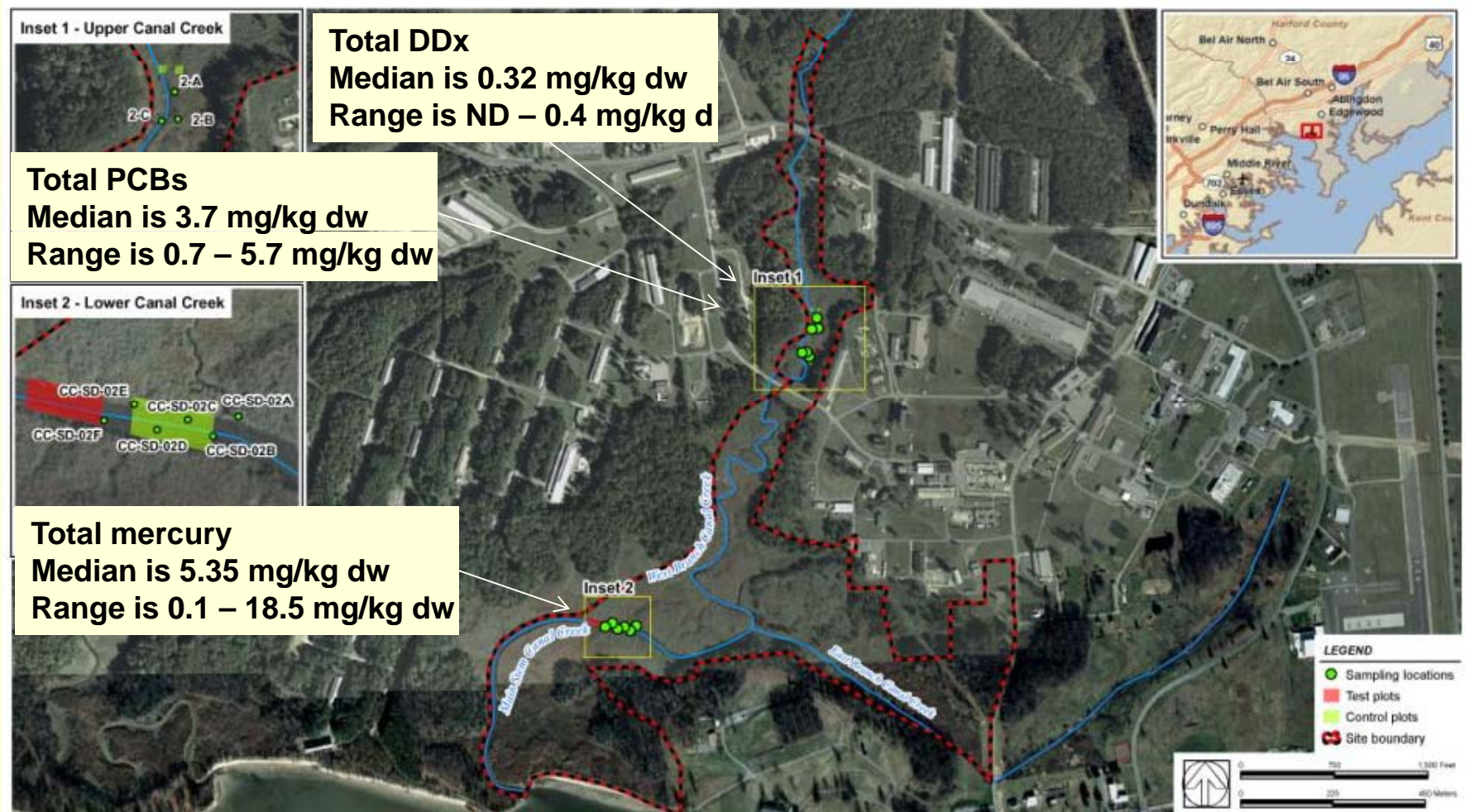
- Side view of aquarium 2 days after placing a layer of AC on sediment
- Carbon is slowly worked into the sediment through worm movement
- PCB accumulation in worms reduced by ~ 80%

Sun & Ghosh, ES&T 2007



Site Description: Canal Creek

Edgewood Area of Aberdeen Proving Ground (APG)





Site Description: Bailey's Creek Fort Eustis on the James River

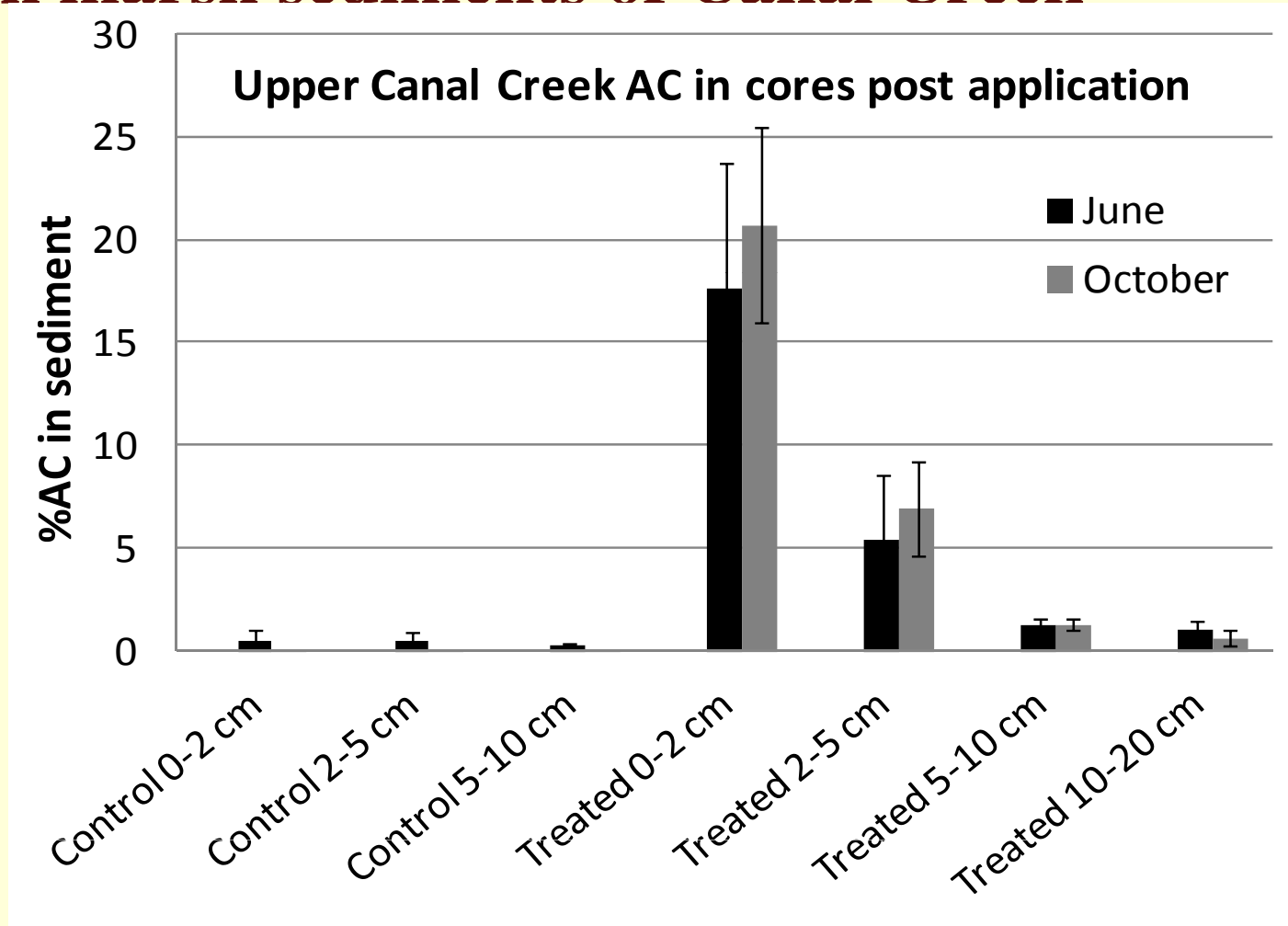




APPLICATION OF AC

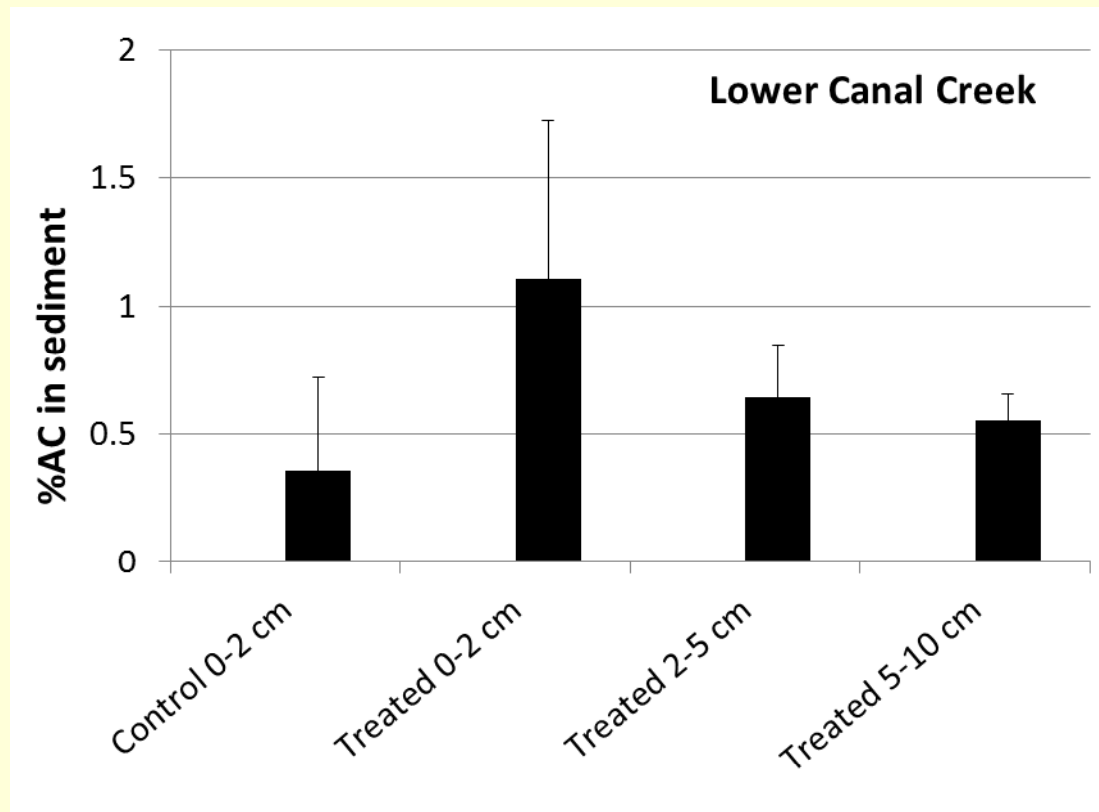


AC in marsh sediments of Canal Creek



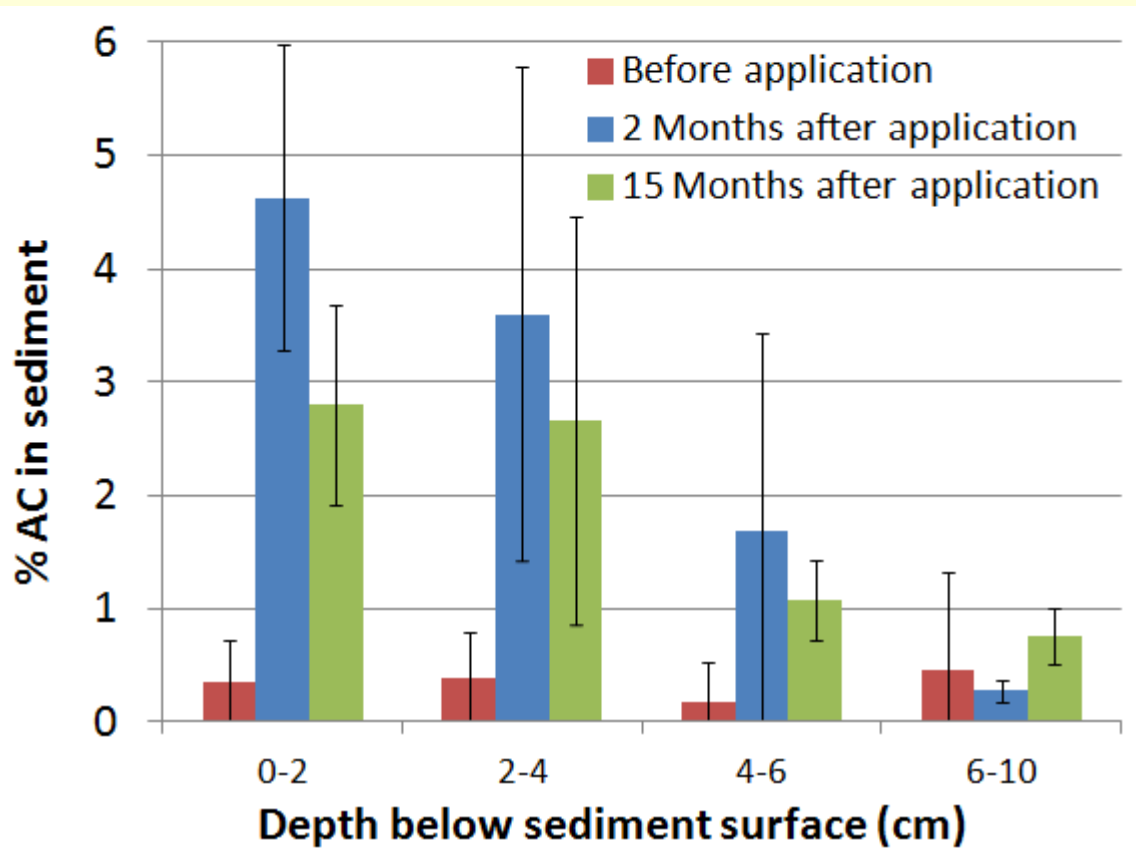


AC distribution in Lower Canal Creek sediments in June 2011





AC in treated sediment for Bailey's Creek after 2 and 15 months



- After two months: account for 70% AC based on cores; 88% based on ponar grabs
- After 15 months: account for 50% of AC based on cores



MONITORING EFFICACY

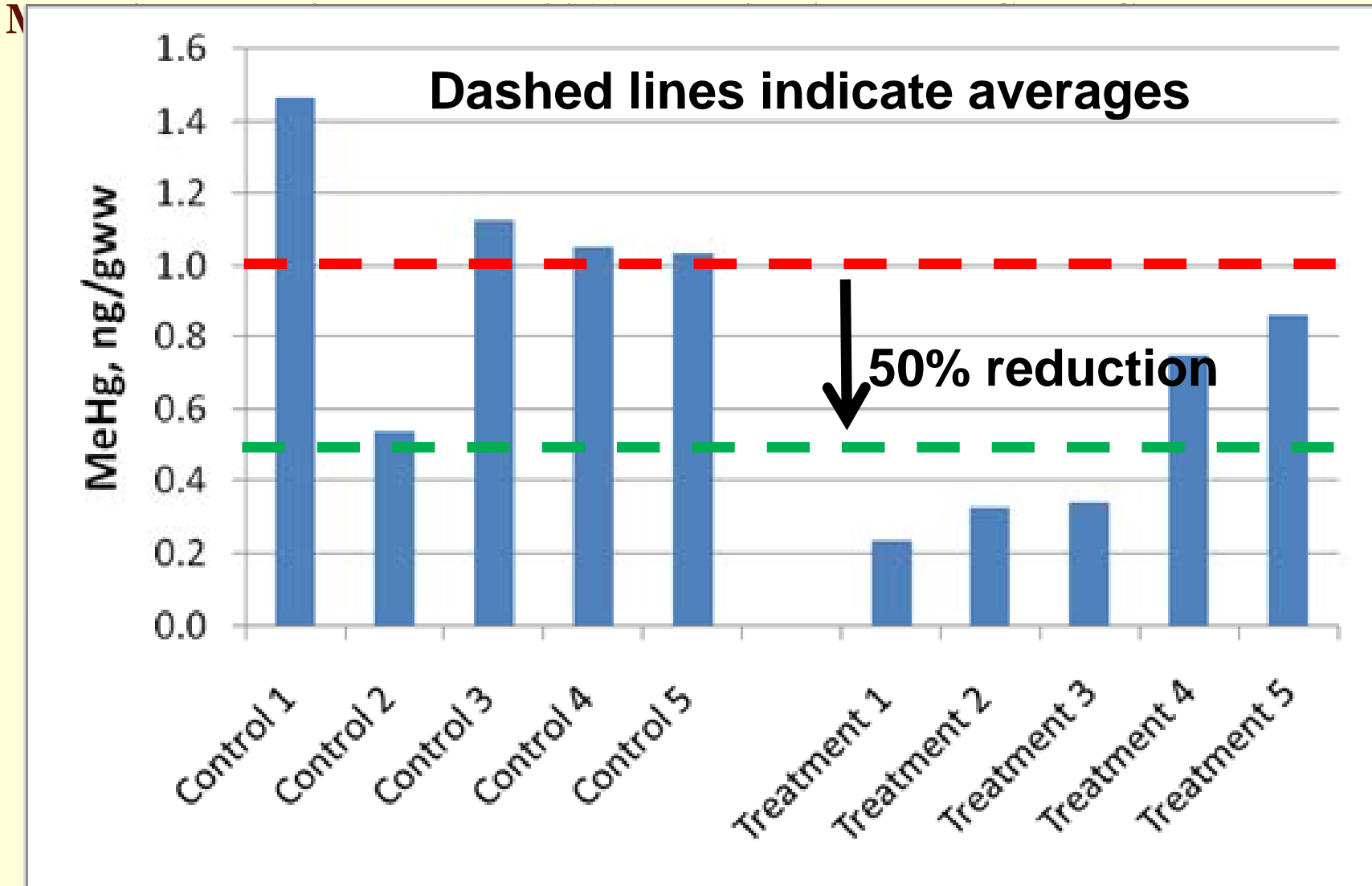
Laboratory exposures of field collected sediment

Field exposures of invertebrates in chambers

Field collected native animals

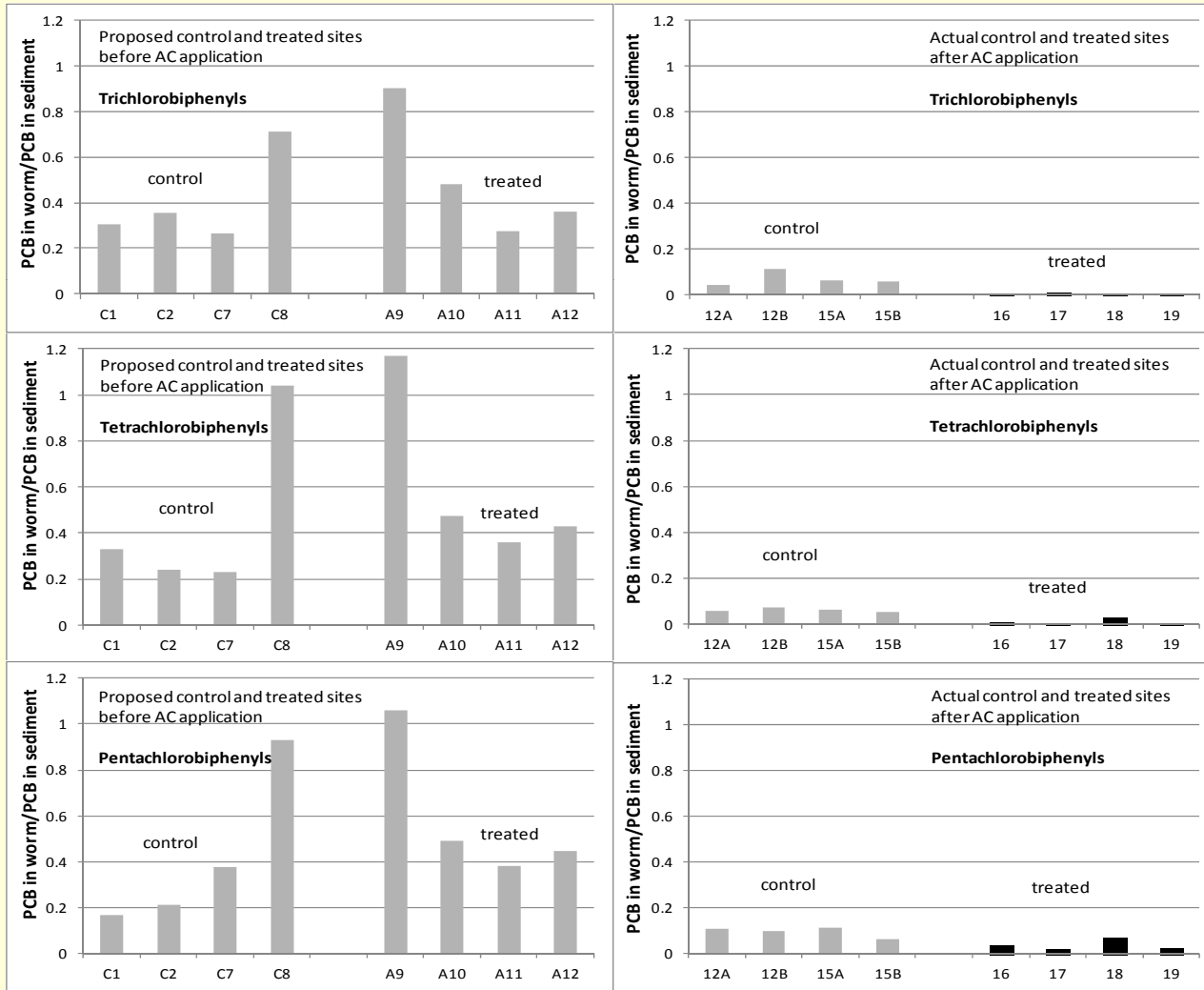
Pore water measurements

Passive samplers



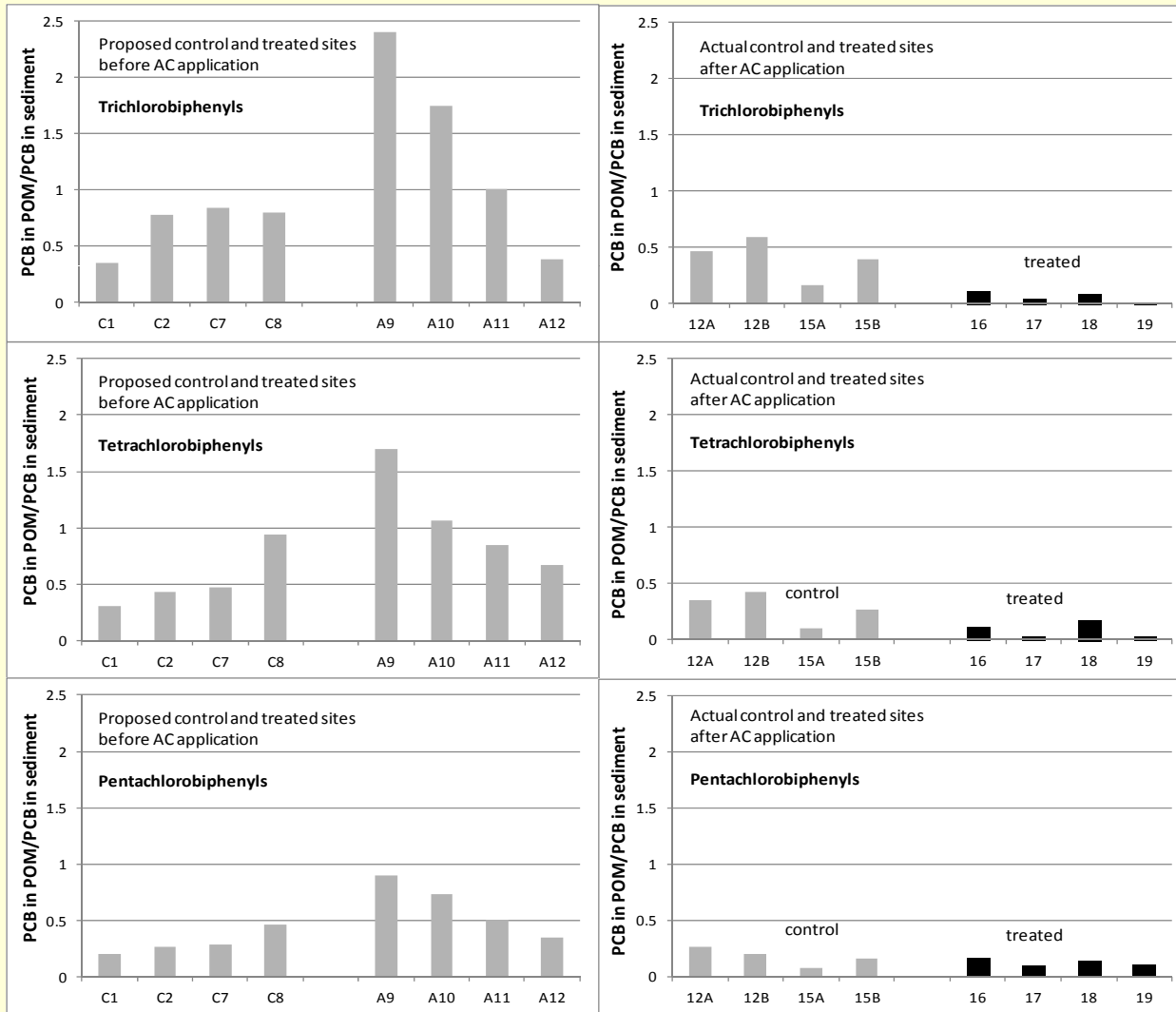


PCBs in worms for Upper Canal Creek





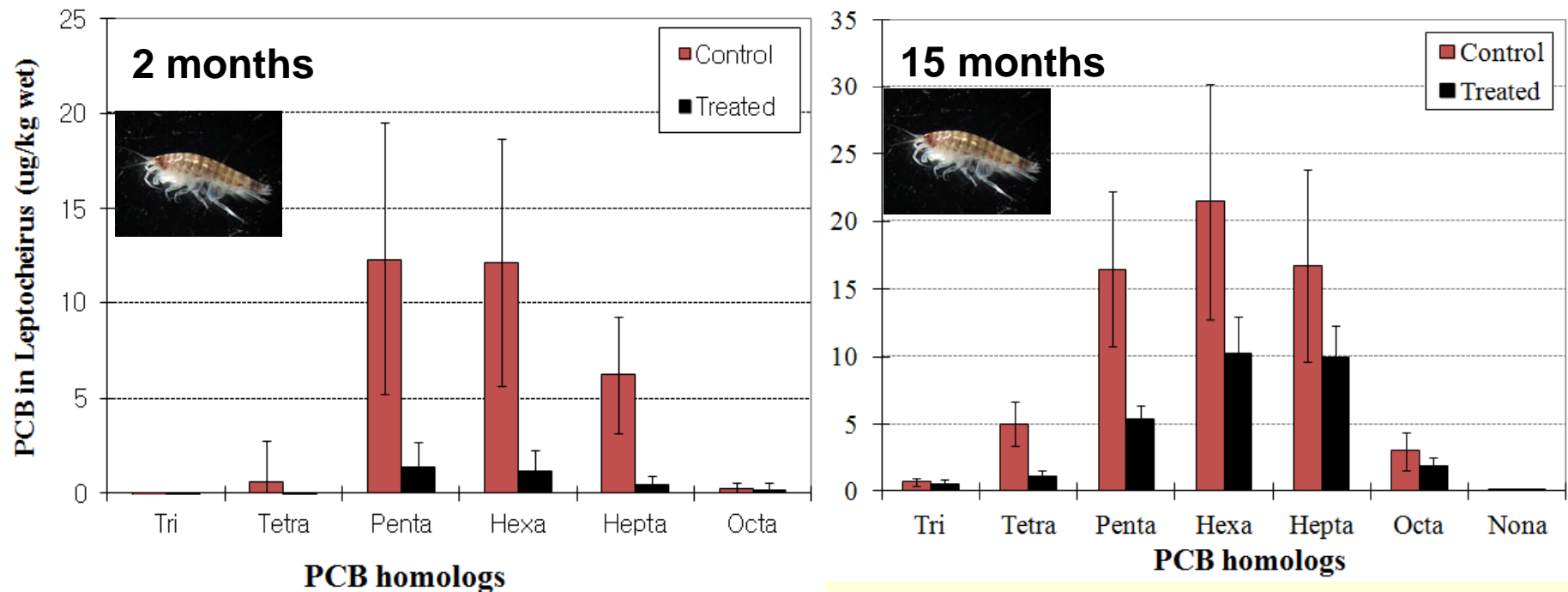
PCBs in passive samplers from Upper Canal Creek





Efficacy of PCB treatment in Baily's Creek sediment at 2 and 15 months

- Reduction after 2 months ~ 90% (measured using 2-week test)
- Reduction after 15 months ~ 50% (measured using 2-week test)
- Mixing and dilution of AC dose in 15 months reduced effectiveness (edge effect)





MONITORING FOR EFFECTS

Examination of communities

Laboratory toxicity tests

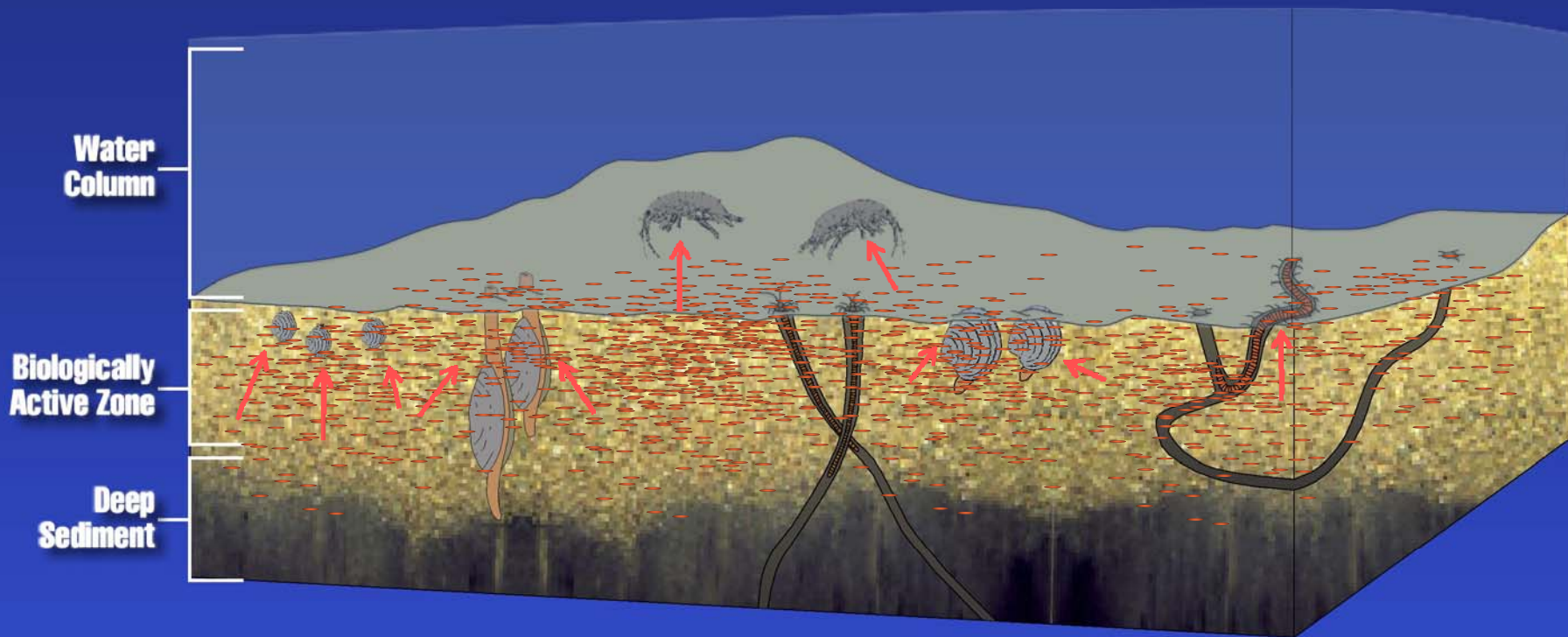
Colonization studies

A conceptual model of how freshwater and marine organisms come into contact with activated carbon



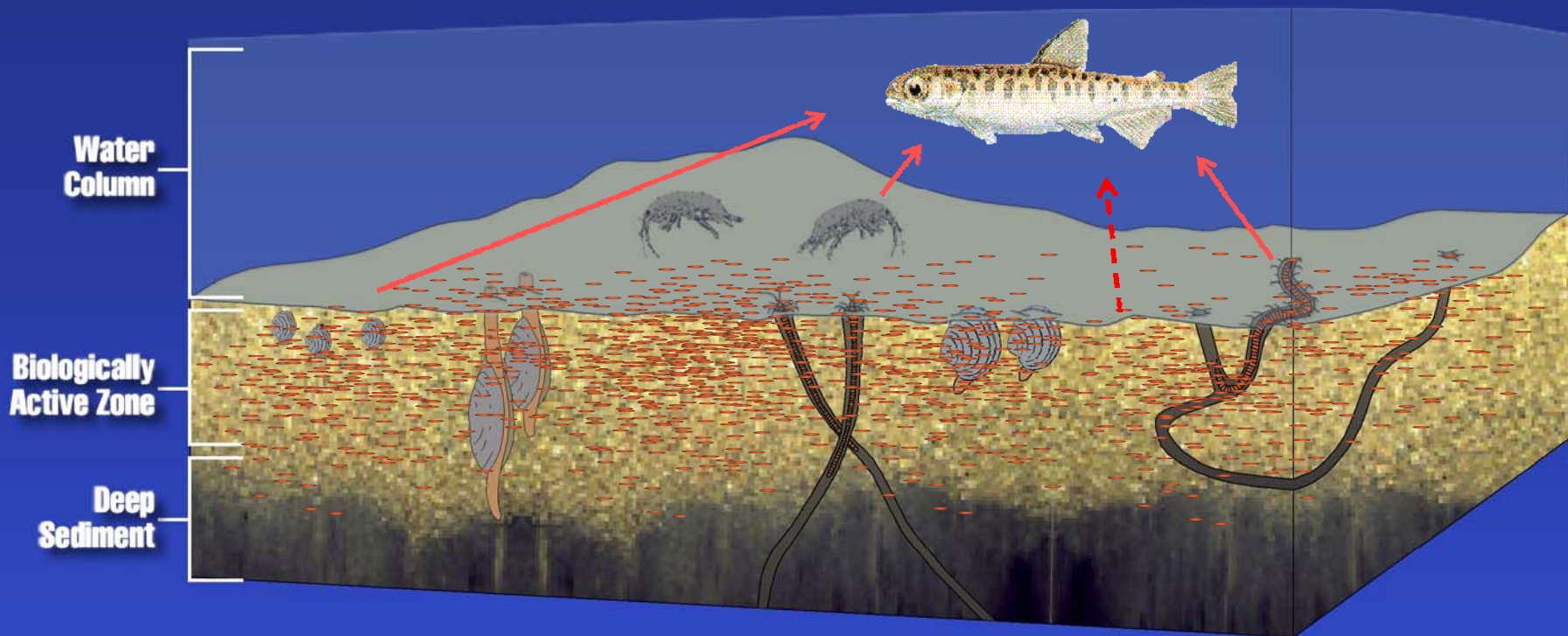
Potential for effects of activated carbon in sediments on benthic invertebrates. Exposure pathways include:

- physical contact
- ingestion of sediment
 - do the PCBs come off in the gut?



Potential for direct and indirect effects of activated carbon in sediments on fish. Possible types of effects to evaluate:

- reduced prey base (benthic invertebrates)
- ingestion of sediment with AC exposure in gut



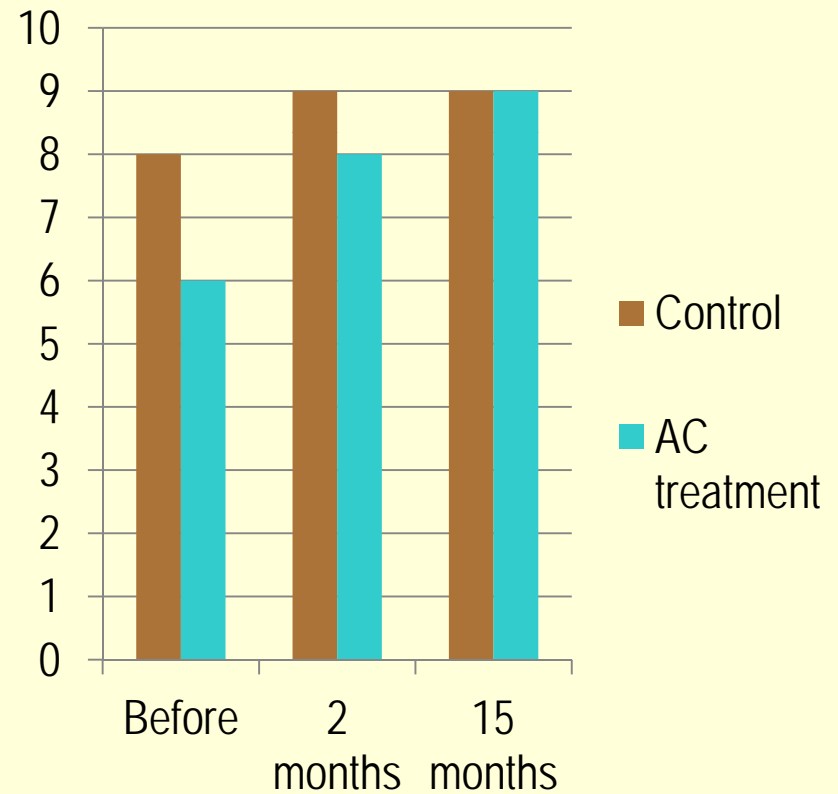


A field study of effects in marine system

Polychaetes (marine worms)



Number of species



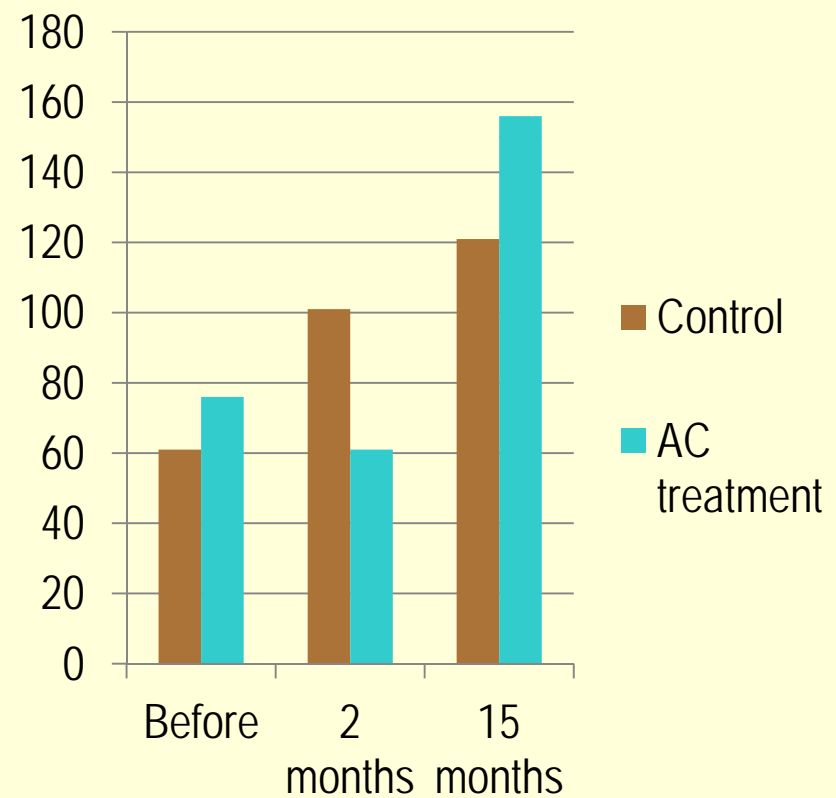


A field study of effects in marine system

Polychaetes (marine worms)



Abundance



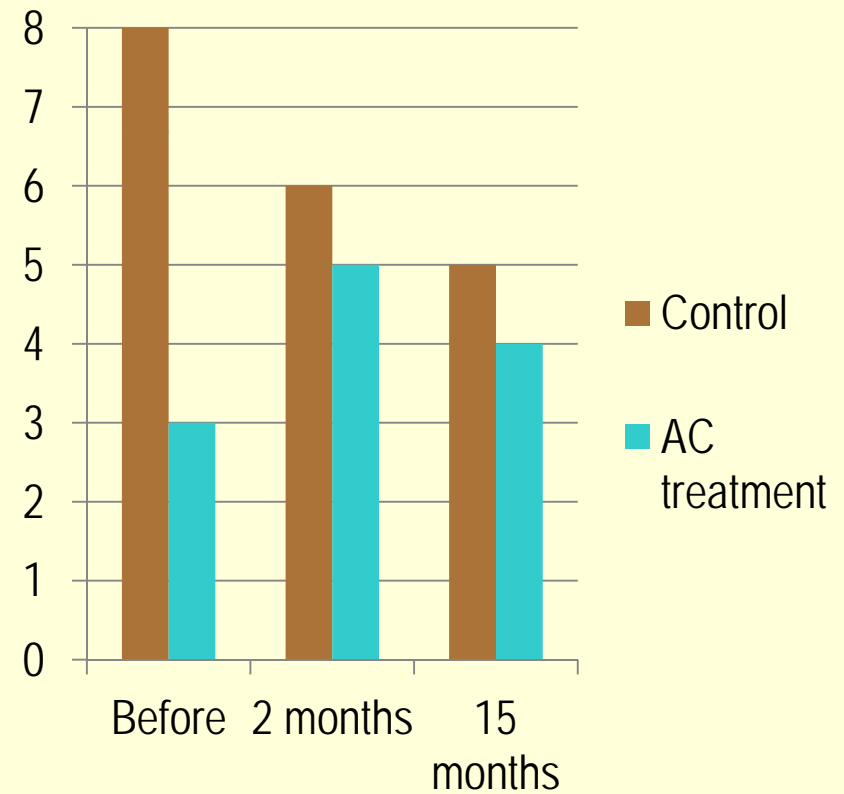


A field study of effects in marine system

Arthropods



Number of taxa/species



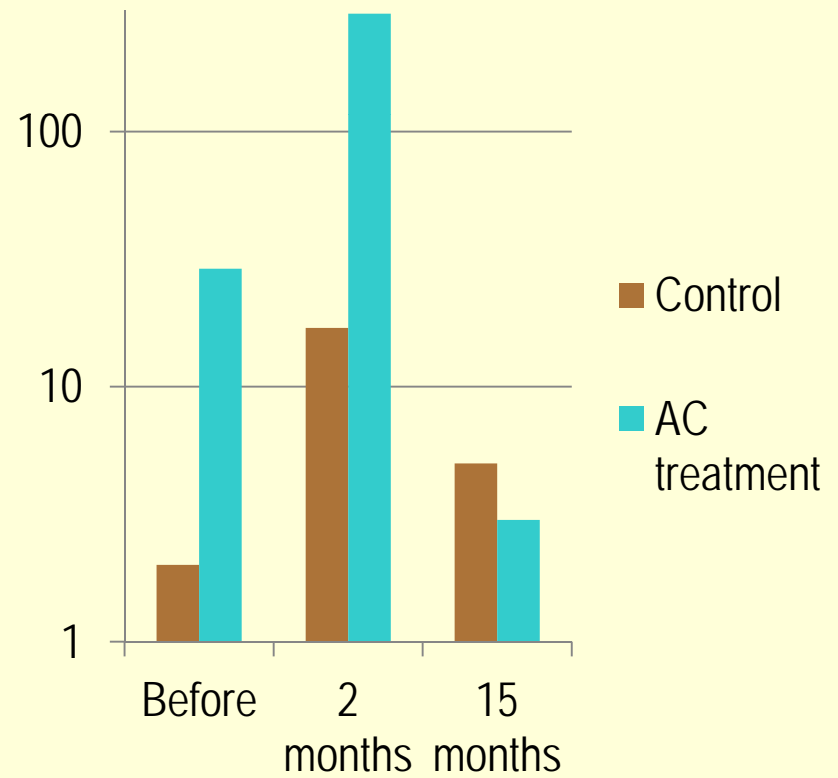


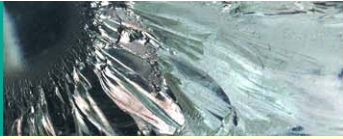
A field study of effects in marine system

Arthropods



Abundance





Questions?

