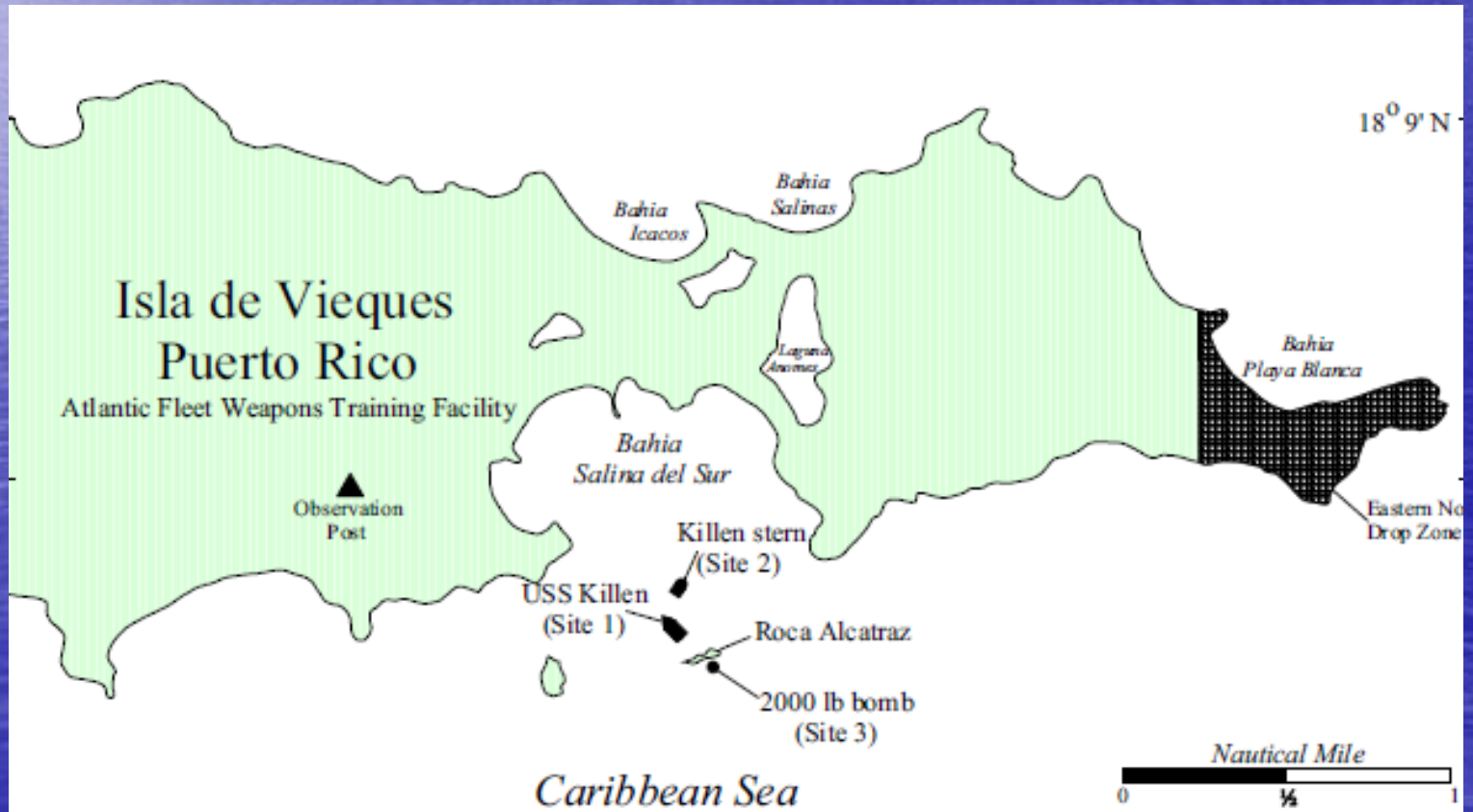


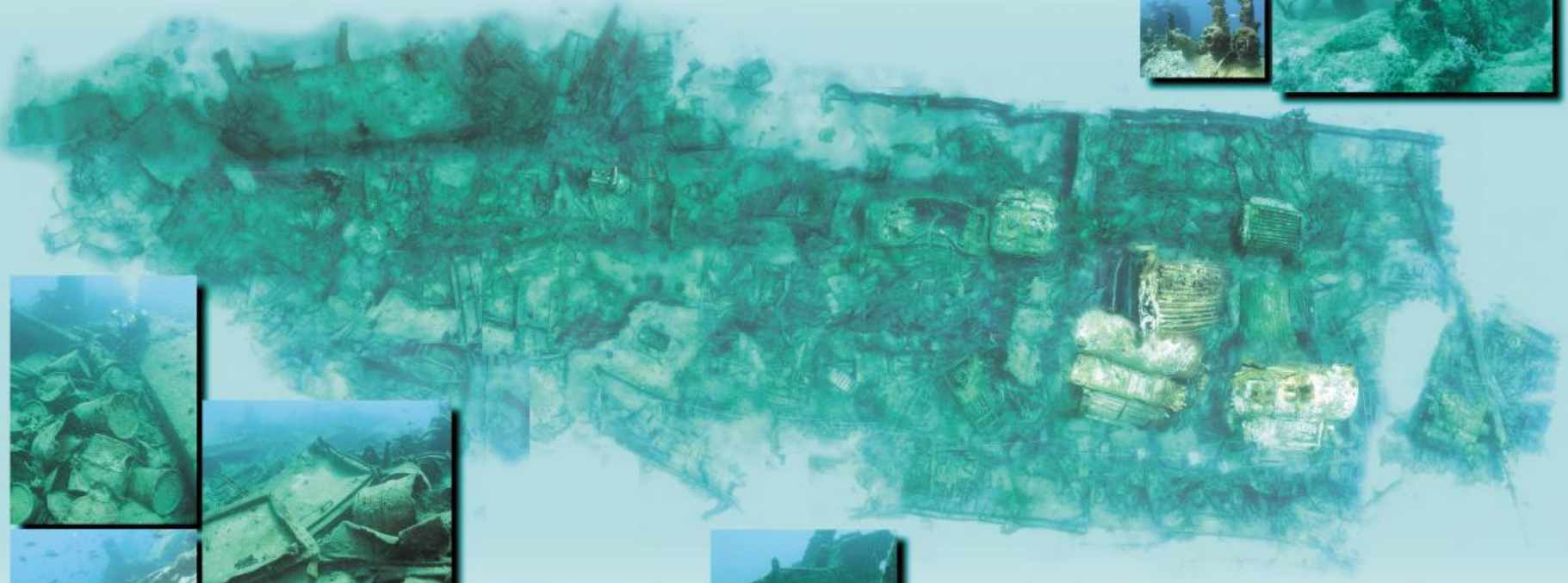
Ecotoxicology in a Coral Reef Ecosystem
from Substances Leaching from
Ammunition at Isla de Vieques,
Puerto Rico, and Modern Advancements
in Trace Level Detection Instrumentation

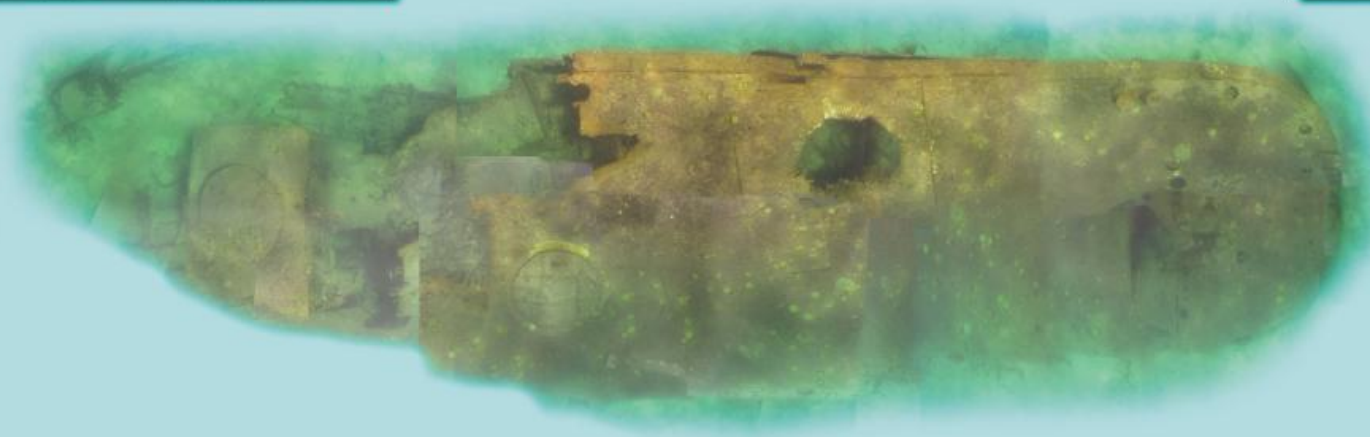
Jim Barton

Underwater Ordnance Recovery

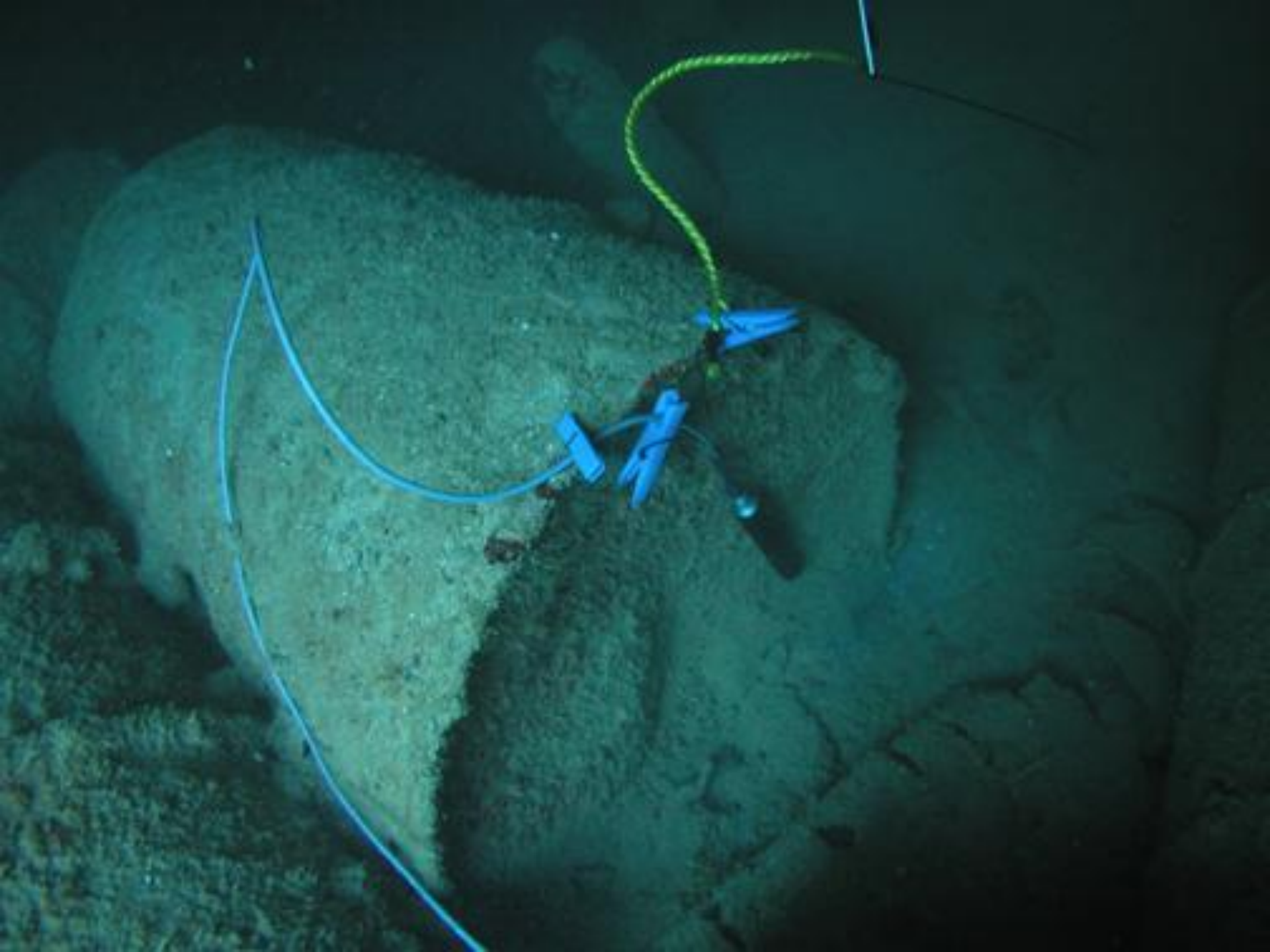


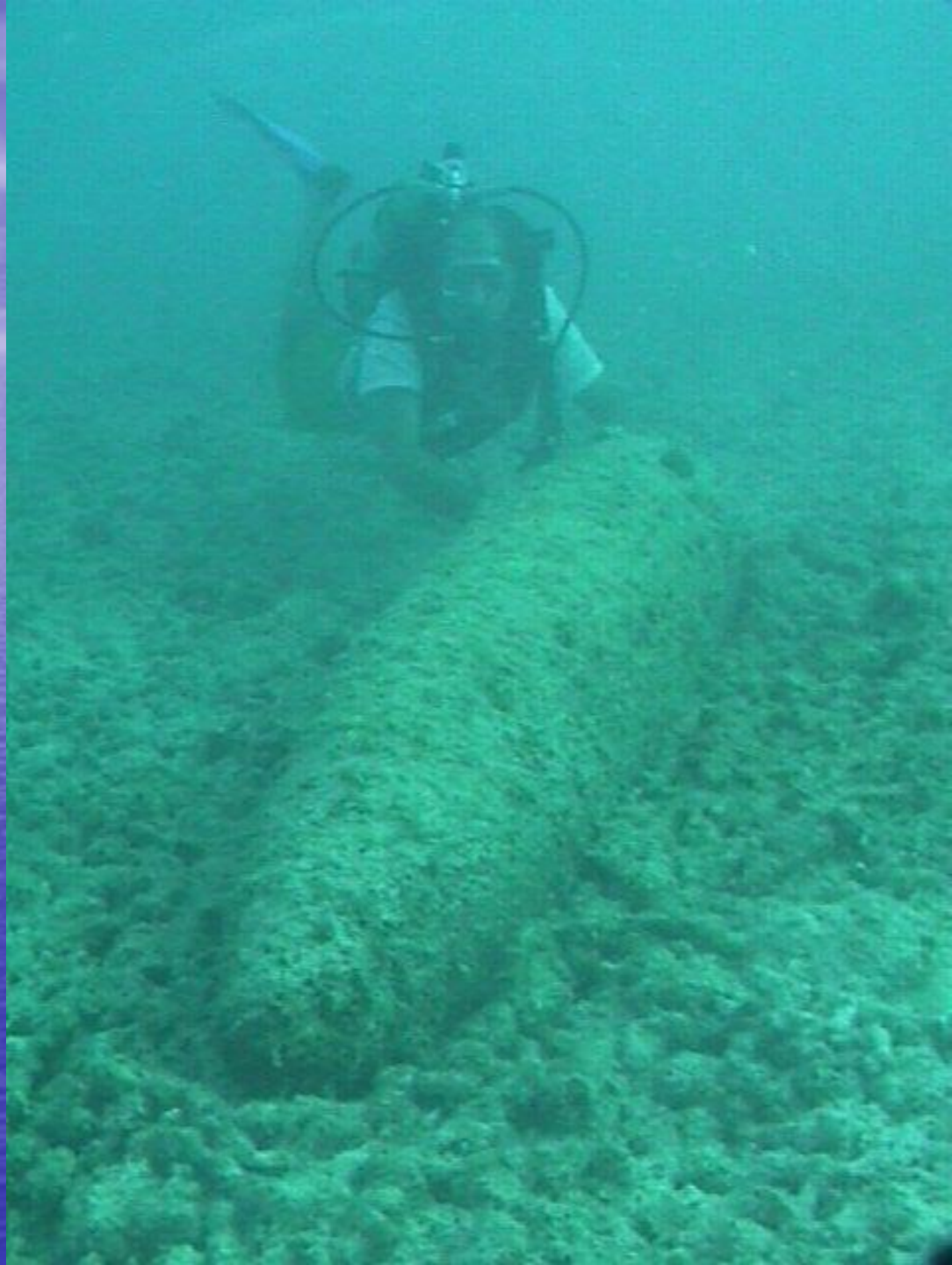
















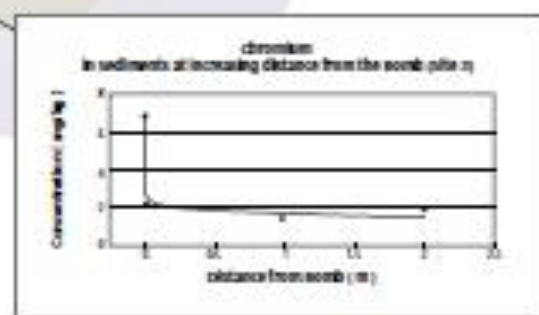
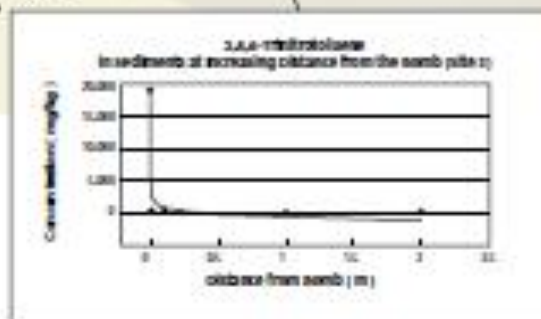
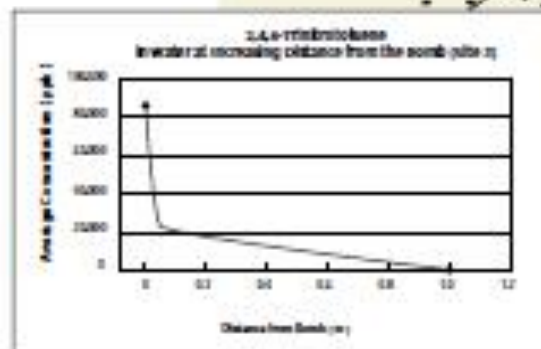
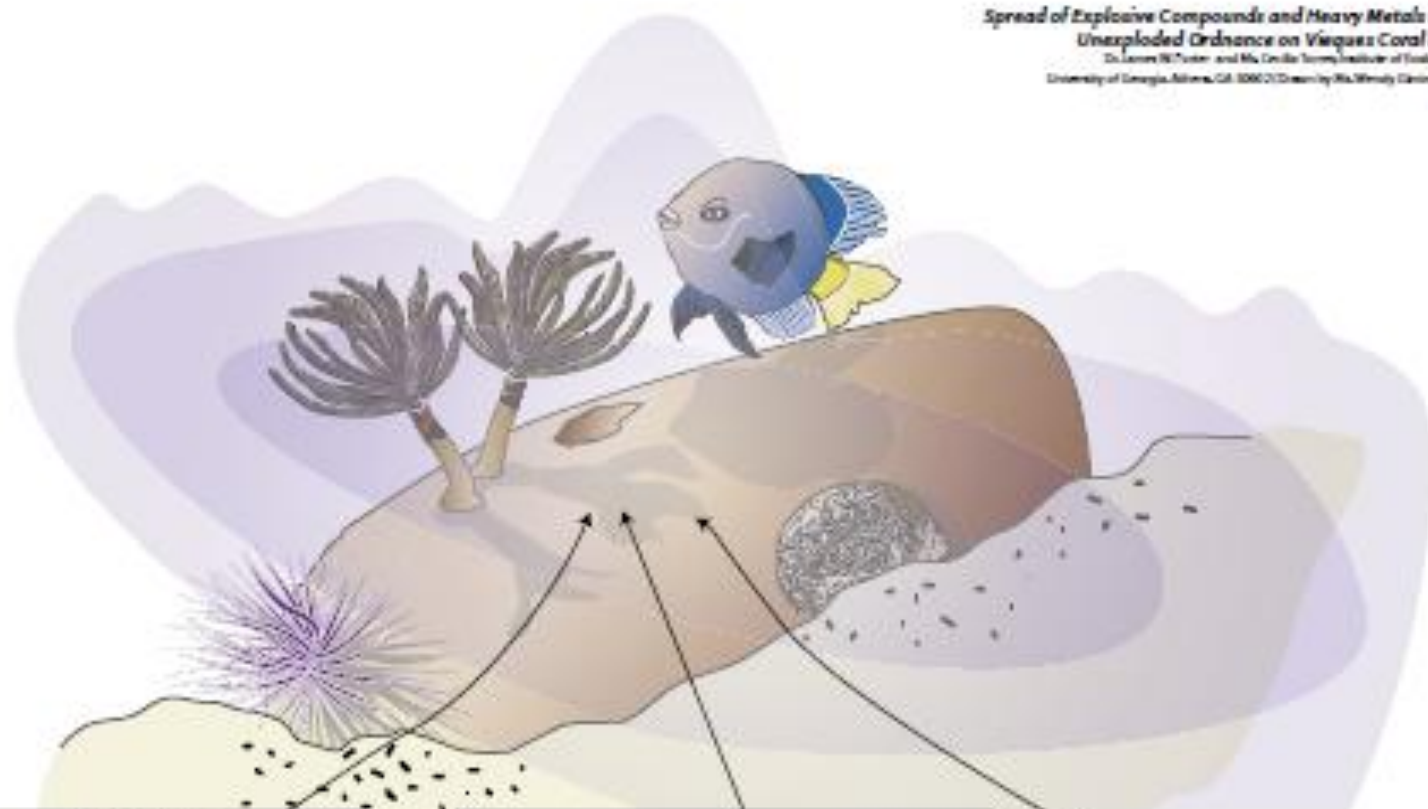


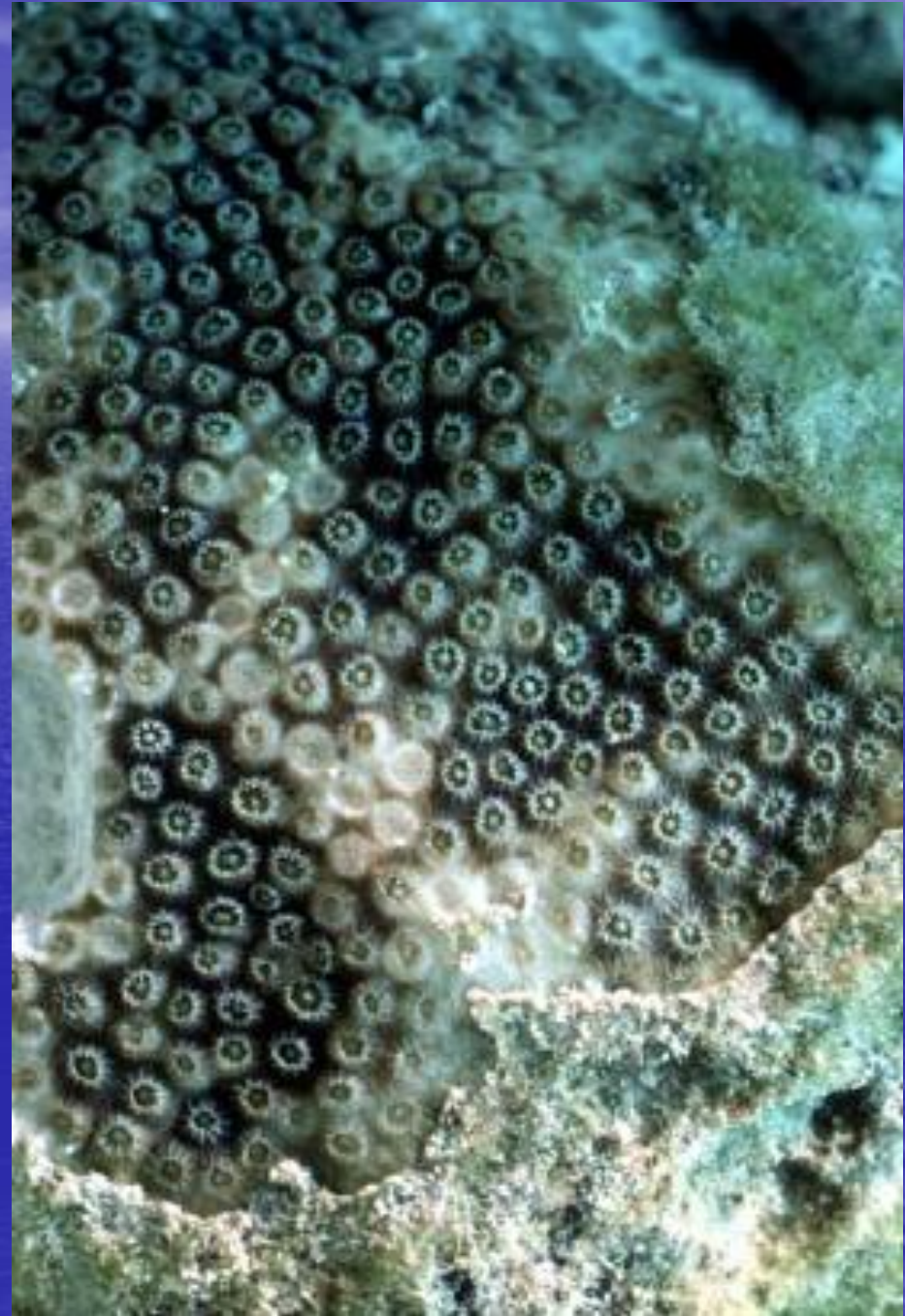
“Radiological, Chemical, and
Environmental Health Assessment of
the Marine Resources of the Isla de
Vieques Bombing Range, Bahia Salina
del Sur, Puerto Rico – March 8, 2004”

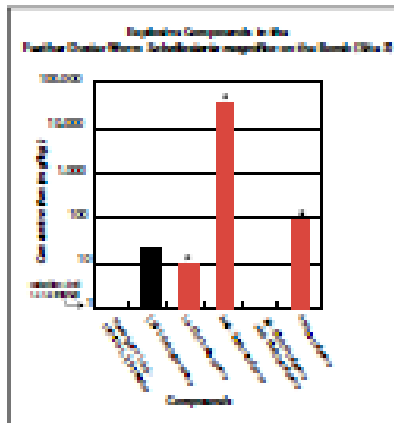


*Spread of Explosive Compounds and Heavy Metals in the Vicinity of
Unexploded Ordnance on Vieques Coral Reefs.*

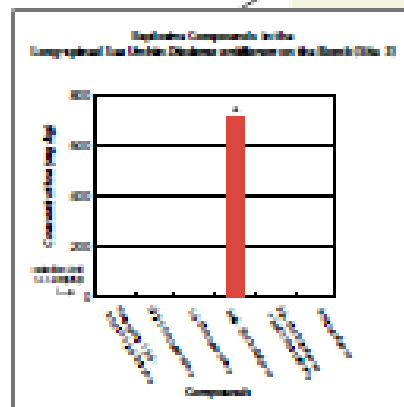
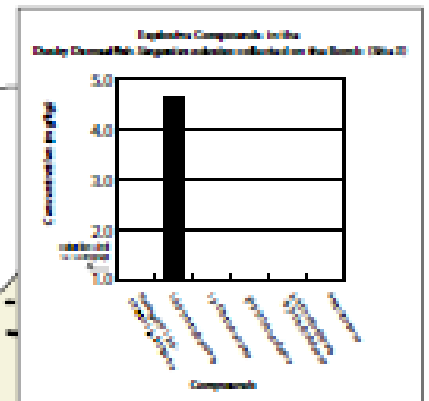
Dr. James W. Turner and Ms. Cecilia Torres, Institute of Ecology
University of Georgia, Athens, GA 30602. Drawn by Ms. Wendy Davidson. Fig. 1.7.



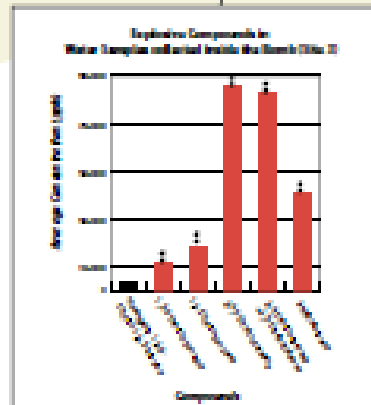




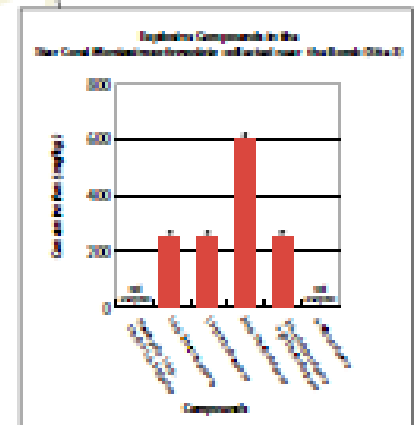
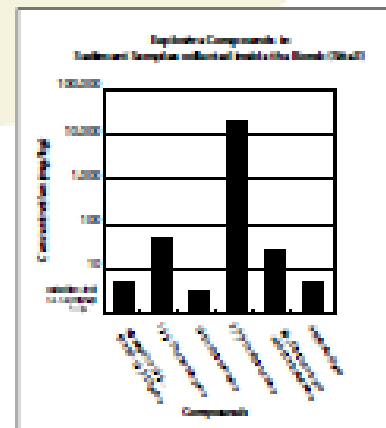
¹ Concentrations exceed EPA's RBC (Risk Based Concentration) for Fish



¹ Exceeds EPA's RBC Safety Standards



² Exceeds EPA's RBC for Tap Water



¹ Exceeds EPA's RBC Safety Standards

Movement of Explosive Compounds Through the Vieques Coral Reef Ecosystem.

Dr. James R. Turner and Ms. Corinne Torres, Institute of Ecology,
University of Georgia, Athens, GA, 30602 (Directed by the Windy General) (Fig. 5.4)

SANDIA REPORT

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Chemical Sensing of Explosive Targets in the Bedford Basin, Halifax Nova Scotia

Philip J. Rodacy, Stephen D. Reber, Pamela K. Walker

Prepared by

Sandia National Laboratories

Albuquerque, New Mexico 87185 and Livermore, California 94550

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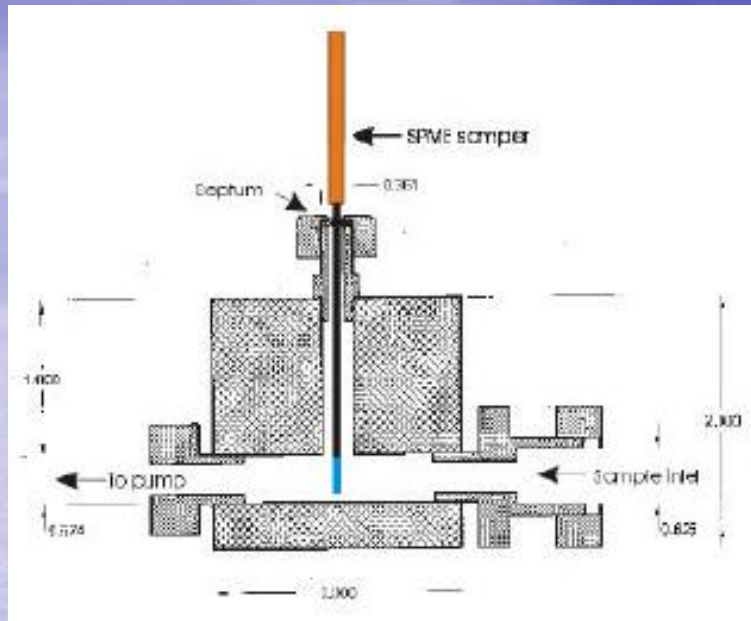
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Sandia National Laboratories

Bedford Basin





Flow through sampling system

Data table continuation

Sample Site: Rent Point

Sample Identifier: G1

Likely ID – 5 inch shell, fuse missing

All results are in parts-per-billion

Water samples, GC Analysis with ECD detection	0.3 meters from shell	1 meter from shell	1 meter from shell	2 meters from shell	2 meters from shell	3 meters from shell	3 meters from shell
Sampling method	Underwater grab, sample 1	Underwater grab	Surface grab	Underwater grab	Surface grab	Underwater grab	Surface grab
2,6 DNT	nd	nd	nd	nd	nd	nd	nd
Dinitrobenzene	nd	nd	nd	nd	nd	4.11	1.02
2,4 DNT	0.02	1.97	0.06	nd	0.73	trace	nd
TNT	nd	0.07	trace	0.07	0.04	nd	nd
TNB	nd	nd	nd	nd	nd	nd	nd
4-AM-DNT	nd	1.27	nd	nd	trace	nd	nd
2-AM-DNT	nd	0.79	nd	nd	trace	nd	nd

Table R. Sample G1 water analysis by GC

Water samples, SPME / IMS analysis	0.3 meters from shell	0.3 meters from shell	1 meter from shell	1 meter from shell	2 meters from shell	3 meters from shell
Sampling Method	Surface SPME	MityVac SPME	Surface SPME	MityVac SPME	Surface SPME	Surface SPME
2,6 DNT	nd	nd				
Dinitrobenzene	nd	nd	trace	nd	nd	detect
2,4 DNT	trace	trace	detect	detect	detect	detect
TNT	trace	nd	detect	detect	nd	nd
TNB	nd	nd	nd	nd	nd	nd
2- or 4-AM-DNT	nd	nd	detect	nd	trace	nd

In Conclusion:

- All conventional munitions should be classified as point source emitters of pollution
- Even small sized WWI Era projectiles found in salt water are capable of contaminating marine habitats
- The use of modern detection technology promises to revolutionize our ability to quantify trace levels of toxicants by providing virtually instantaneous results, and thus greatly reduce costs.