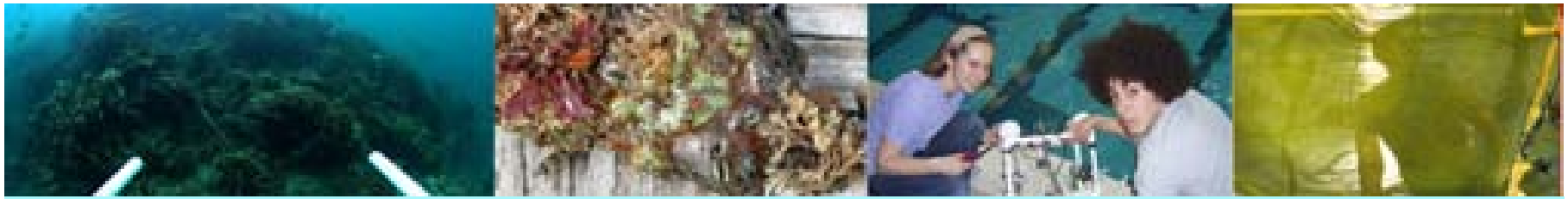


Classroom to Community

MIT Sea Grant Education Programs

Presented by

Sarah Hammond

Marine Educator

Vision

That the citizens in Massachusetts and the region will learn through innovative hands-on opportunities to become ocean-literate citizens who will work locally to protect their coasts and marine resources.

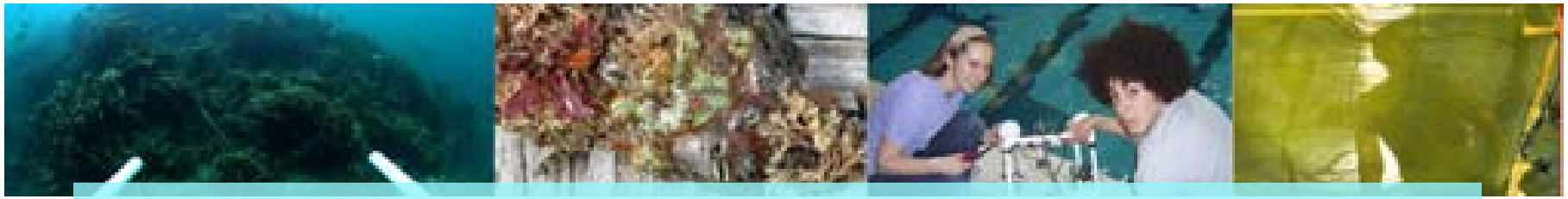
Program Goals

- Make science-based decisions about the state's coastal and marine resources
- Integrate cutting-edge ocean technology and research into learning opportunities
- Demonstrate how technology advances ocean studies

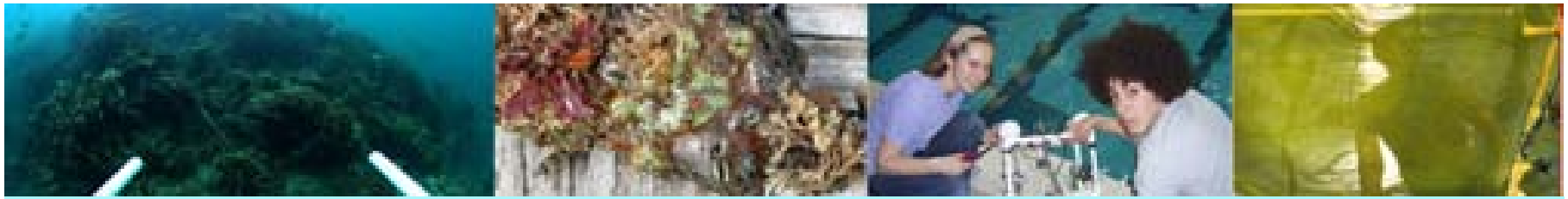
Program Objectives

- Use ocean technology and ocean science to advance science education
- Collaborate with the Sea Grant network and organizations throughout the Commonwealth and greater New England
- Participate in activities that maximize our exposure and impact on students, teachers and the public.

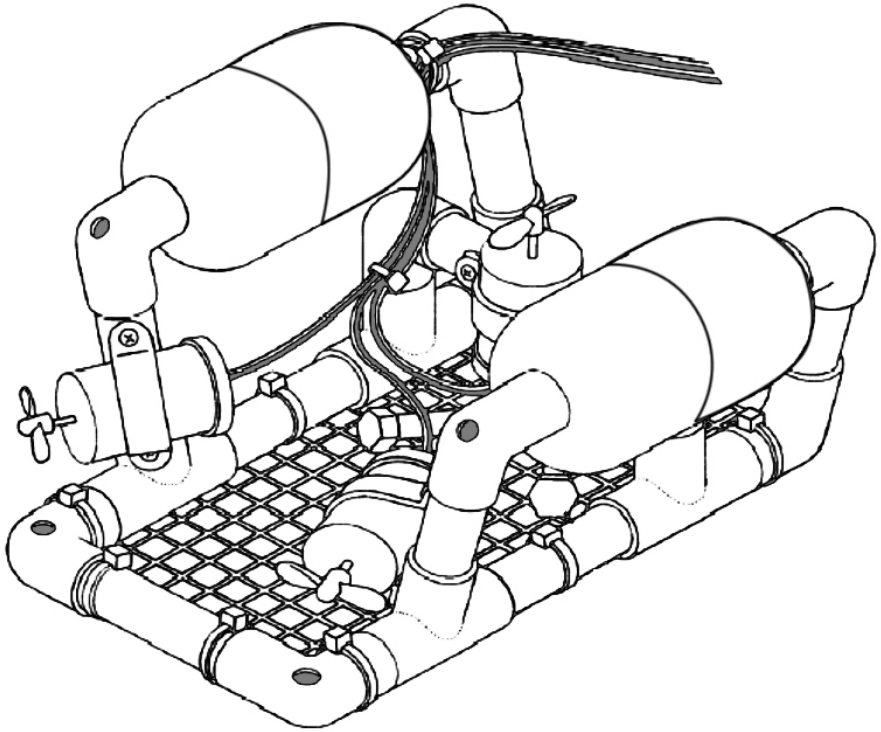
MITSG focuses on training and public outreach that bring current and unique science and technology out of the laboratory and into the hands of students, professionals and the general public.



Recruiting Future Ocean Engineers and Marine Scientists

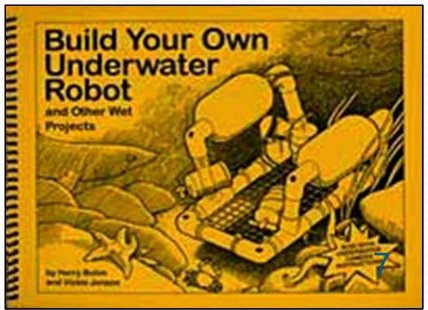


Sea Perch



Background

- “Building Your Own Underwater Vehicles”
- MIT “Discover Ocean Engineering”
- Freshman/Sophomore engineering class
- Started in 2003 by MIT SG with support from ONR
- Used to get K-12 students interested in OE
- “Train the Trainer” 2-day Workshop



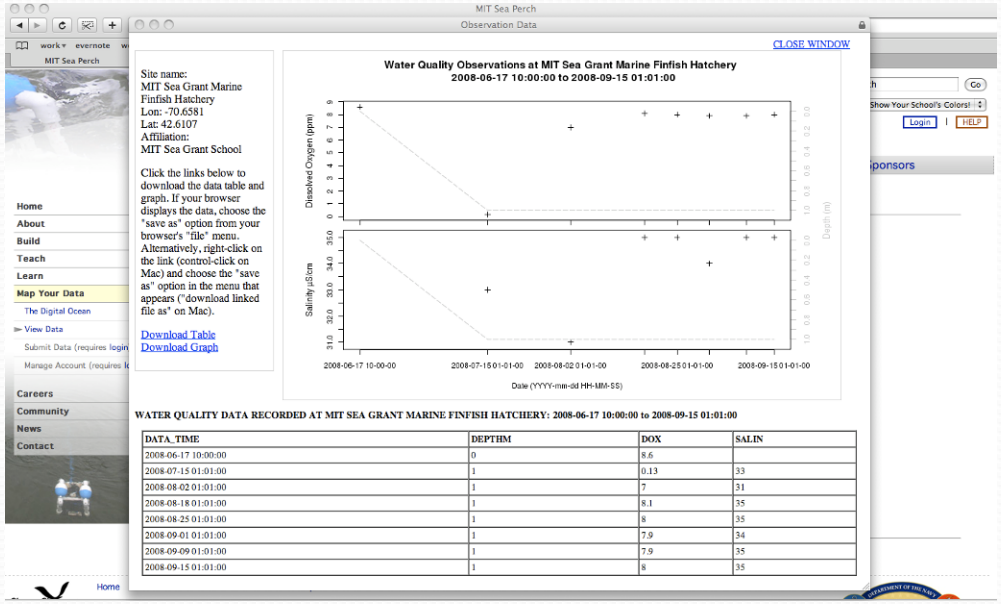
Trainings and Events

- 2-day Teacher Training
- Trained 455 teachers in:
  - 22 U.S. States
  - Cyprus
  - France
  - Puerto Rico
  - USVI
  - Monaco
  - Italy
  - Greece
  - Thailand
  - Spain
- Worked to transfer model to other facilitators
  - HBOI
  - HIMB/Hawaii Sea Grant
  - PNS
  - SNAME
  - GMHC
- Showcased at large-scale, focused outreach events
  - Maker Faire
  - Boy Scouts 100th Jamboree
  - NSTA

Youth Center, Building H-10
Before & After School Care
Boys & Girls Club Programs
Youth Summer Camp

Digital Ocean

- Develop affordable, expandable sensors
- Provide supporting water quality curriculum
- Online Digital Ocean Database
- Interface for classroom activities

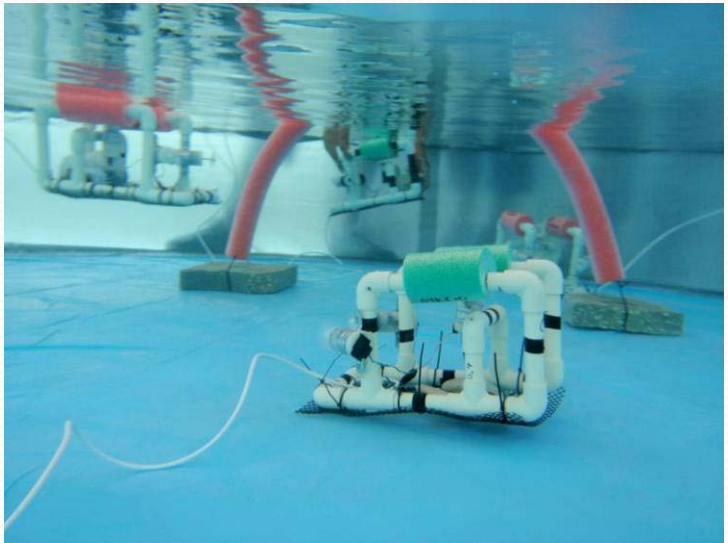


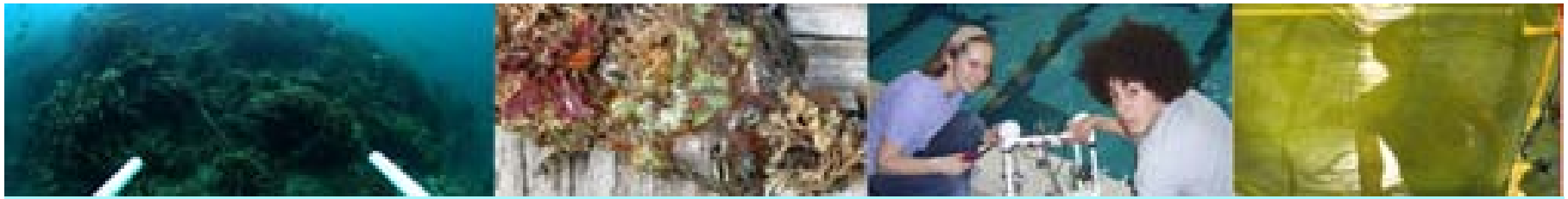
Program Progression

- Start locally with small group of teachers
- Expand regionally/nationally
- Expand internationally
- Provide year round experiences for interested students
- Hands-on intensive programs
- Create a scaffolding of programming aimed at nurturing students into the field of marine science and ocean engineering

Listening to our Constituents

- Real research questions
- Teachers face many obstacles
  - Obtaining funding
  - Fitting new material into set curriculums
  - Freedom from school administrations to try new projects





Sea Perch Institute

Goal

Establish a “Sea Perch Content Institute” to work with a select number of schools in an in-depth manner, throughout the school year, for multiple years.

School Recruitment Process

- Strict application
- Multi-year commitment
- 5 Content workshops
- Monthly in-school MIT staff visits
- Weekly reporting from schools
- Culmination event at MIT with all schools, SG and guests

Collaborative, not Competitive

- Gives schools opportunity to work together
- Simulates 'real-world' working scenarios
- Proposals, budgets, deadlines
- As a group, the students can look at much more complex problems

Impacts

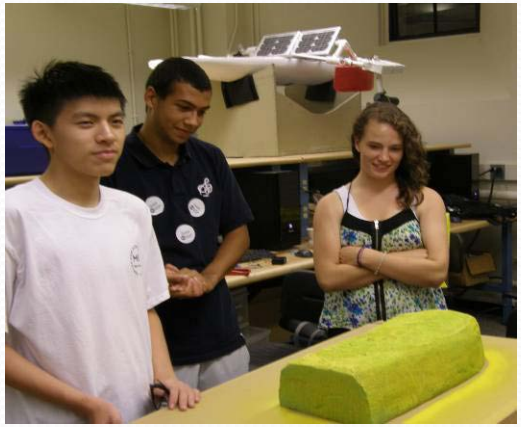
- 4 schools (3 MA, 1 RI)
- 250 students
- 35 vendors in Career Fair
- Press Release
- Multiple newspaper and online media coverage
- Transferring model

OEX

THE
OCEAN ENGINEERING
EXPERIENCE

The OEX Goal

To develop a summer experience in which to immerse students in the fields of marine science and engineering before they apply for college.



OEX Overview

- Students entering 11th and 12th grade
- Hands-on opportunity to experience ocean engineering
- Program:
  - Mini lessons taught by undergraduates and graduates students
  - Lectures by MIT professors and industry professionals
  - Hands-on experience in designing, building and testing

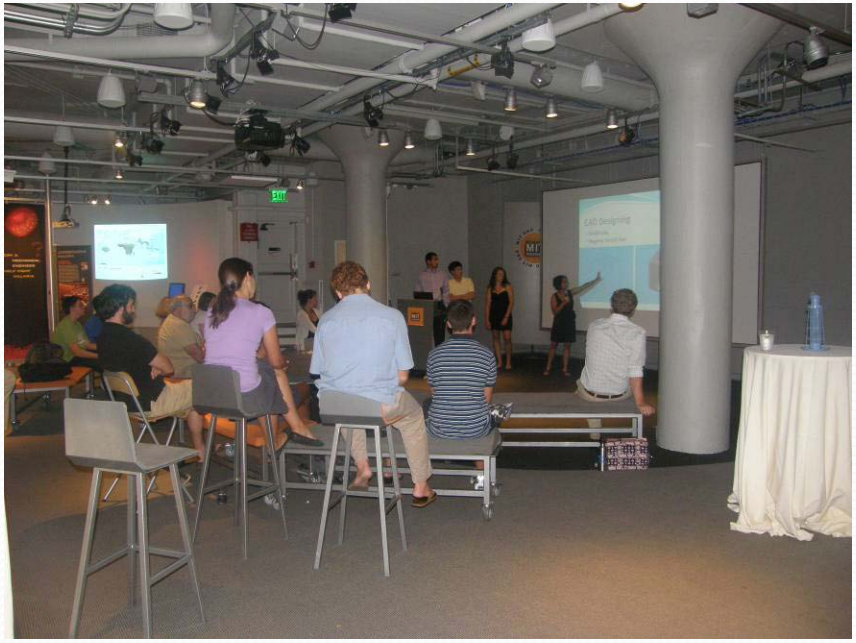
2010 Mission

Build and deploy a floating wind turbine and R/C watercraft with docking capability to simulate an offshore data collection system which includes a power and data station where marine robots can recharge and relay data.

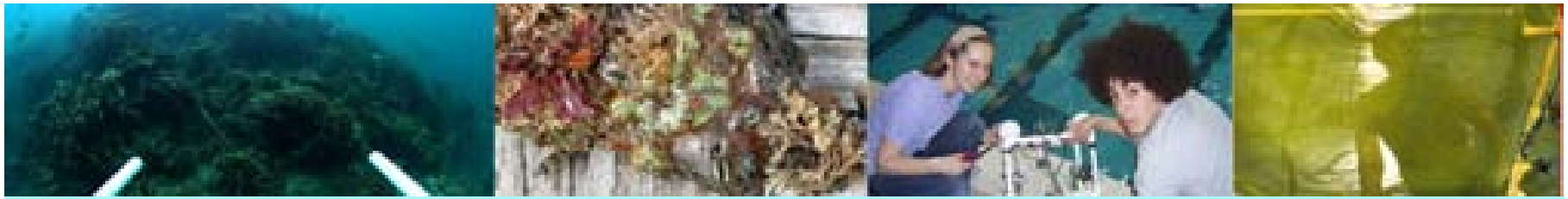
Impacts

- 8 students (MA, MD, GA and WA)
- Mentors: 1 MIT undergrad and 2 MIT grad students
- Lectures and Lab Tours:
  - 3 grad students
  - 1 MIT professor
  - MIT Staff
  - 1 industry professional

OEX Outreach



- Public Demonstration of project
  - MIT community + on site to view (approx 50 people)
  - Final Presentation Night at the MIT Museum
  - Breakfast Showcase for parents/families of students



Reef Explorer II Class Submersible

MIT Sea Grant's Autonomous Underwater Vehicles Laboratory

The Beginning

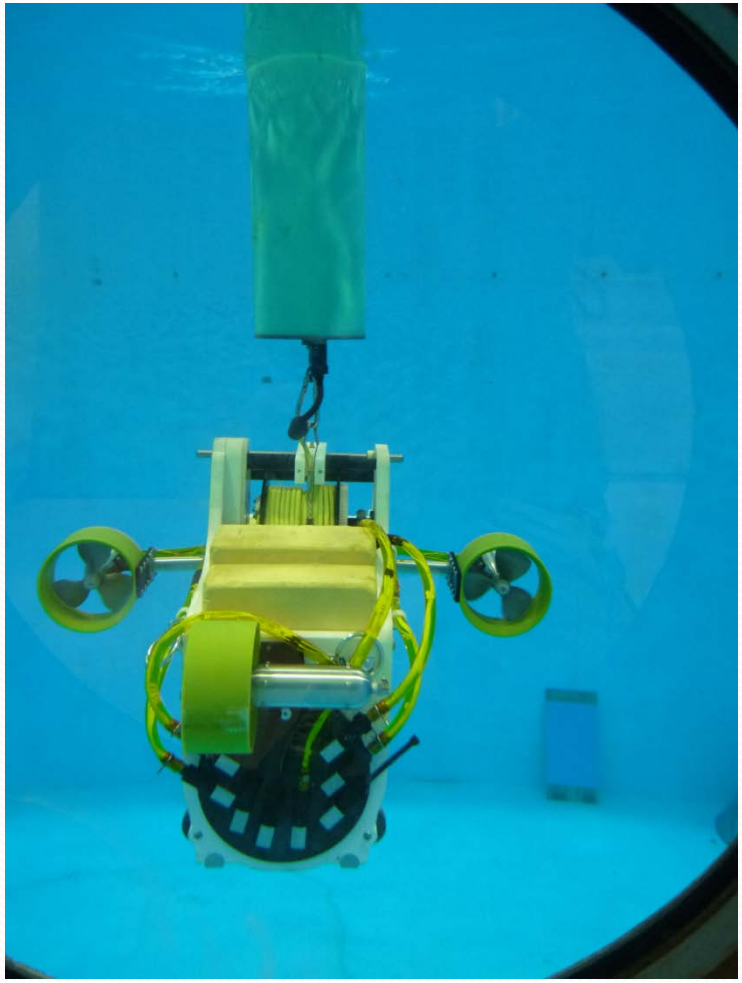
- Through a collaboration between Sea Grant and Hawaii Institute of Marine Biology at a Sea Perch Teacher Training

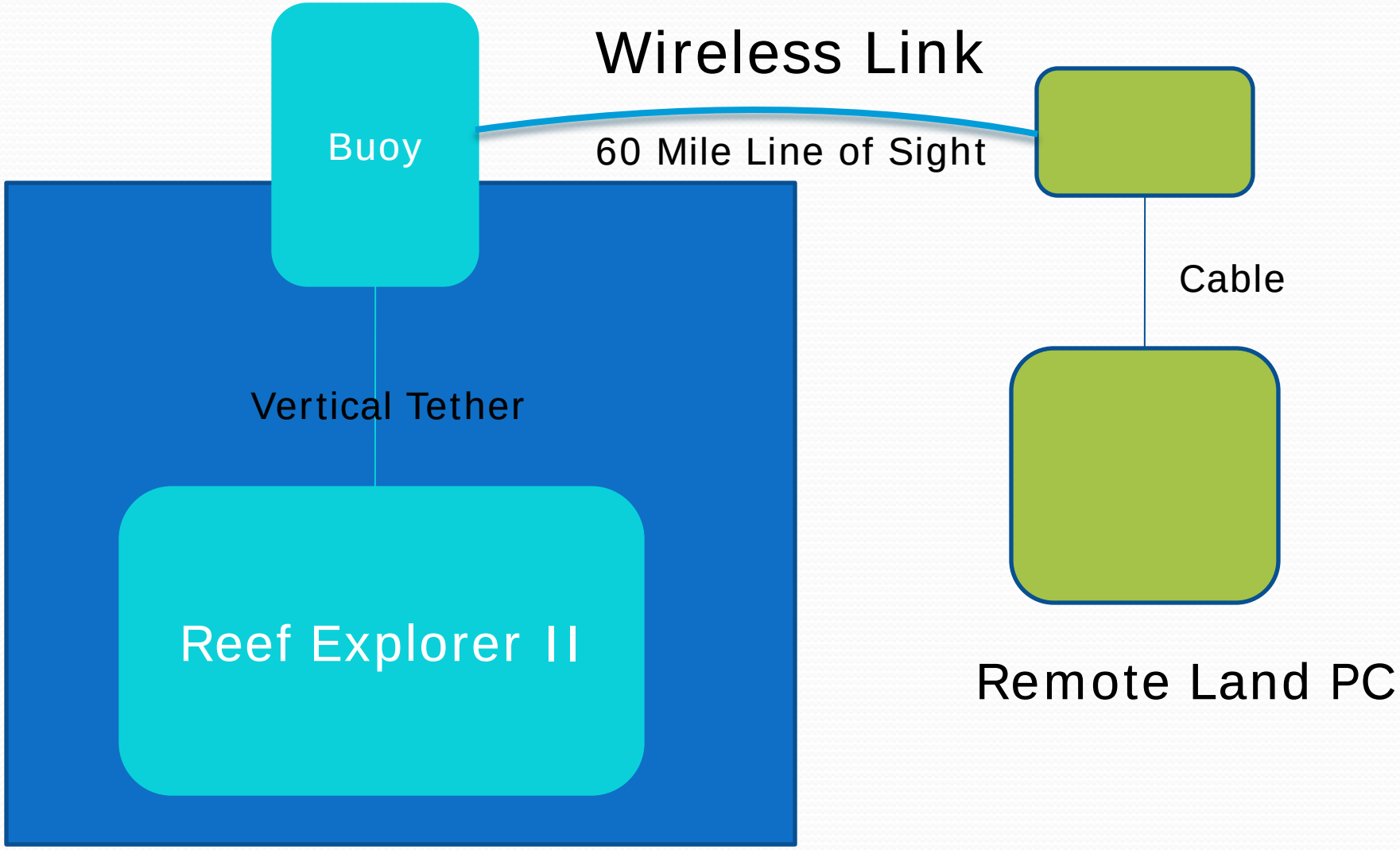
- Recognition of the vast abilities of Autonomous Underwater Vehicles (AUVs)
- Can an AUV be designed to help convey the results of scientific marine investigation to students around the world?

Objectives

- To provide a window into the sea for individuals without access
- To provide a remote connection through the internet to bridge the ocean to the land
- To provide a “virtual field trip” for students to a coral reef

Implementation




Wireless Link
Buoy
60 Mile Line of Sight
Cable
Vertical Tether
Reef Explorer II
Remote Land PC

Rex Has been Deployed from these locations

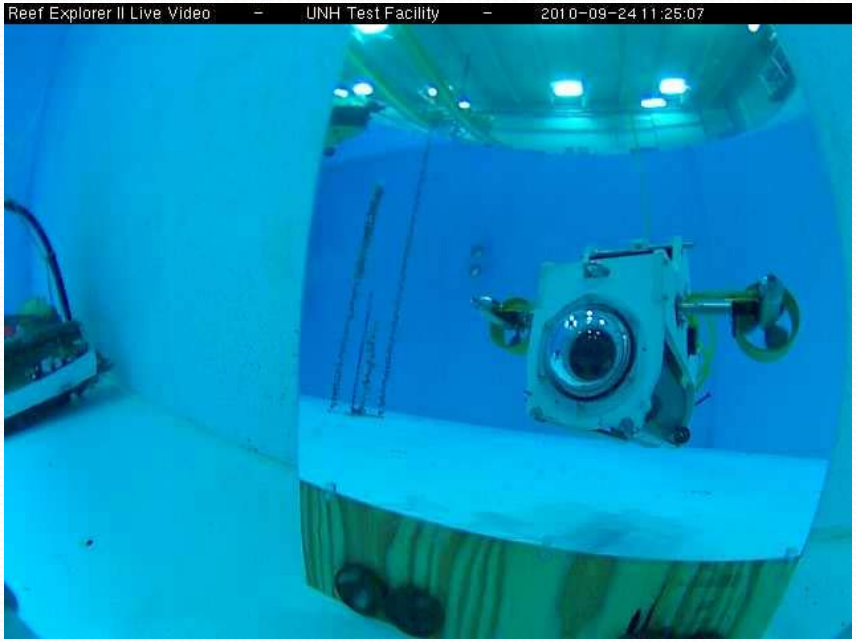
And operated from these

Hawaii Partnership

- Hawaii Institute of Marine Biology
- NOAA Education grant
- Comparison of reef habitats
- Required ability to explore sites remotely
- Students collect data in real time
- Creation of a virtual laboratory

Impact

- Deployed and operated dozens of times globally
- Taught several pilot classes of 30 students using this tool
- Students of SPI have used Rex II
- Brought ocean ecosystems to the classroom

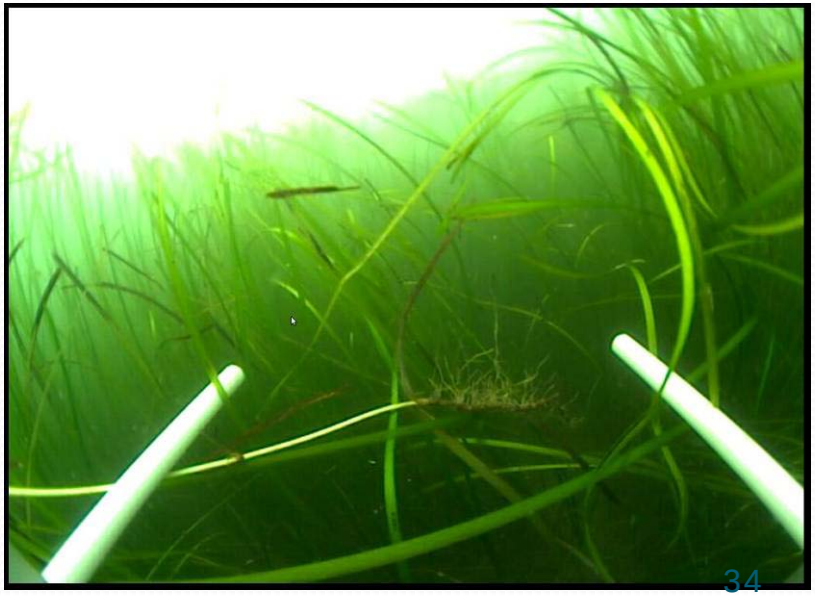


Applications

- Translate research to the classroom, live and from a distance
- Gives a similar experience to diving without the breathing time restrictions
- Remote water quality sensing
- Remote surveying of marine habitats such as coral and eel grass

NOAA Hollings Scholar

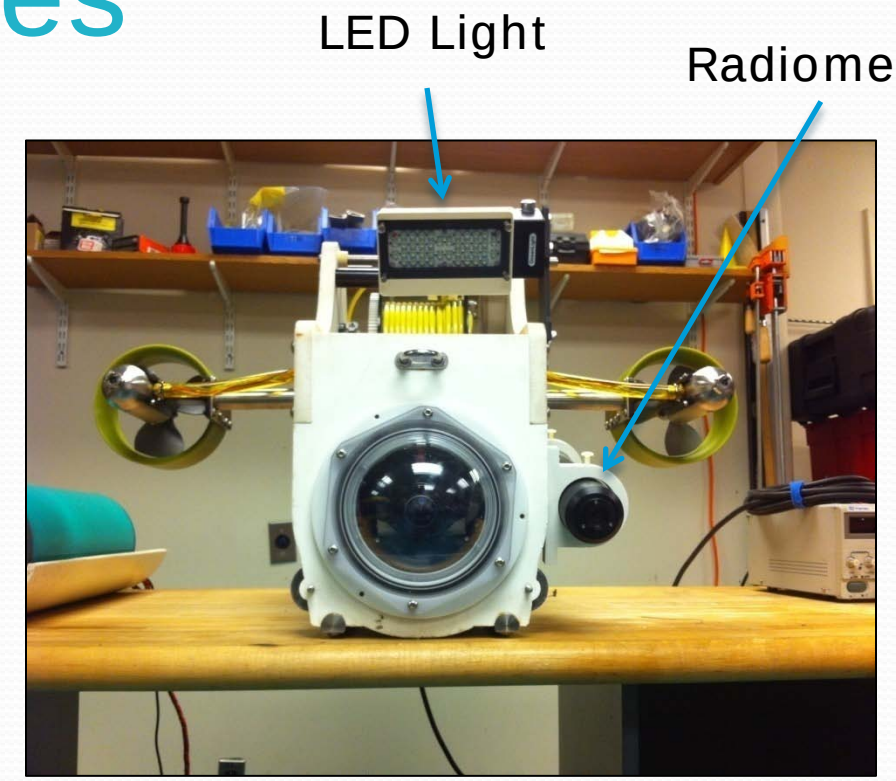
- Eelgrass Stewardship Program spurred interest
- Study aimed to observe eelgrass in multiple sites along the Massachusetts coast, especially the scarring caused by boat mooring chains in natural eelgrass beds.

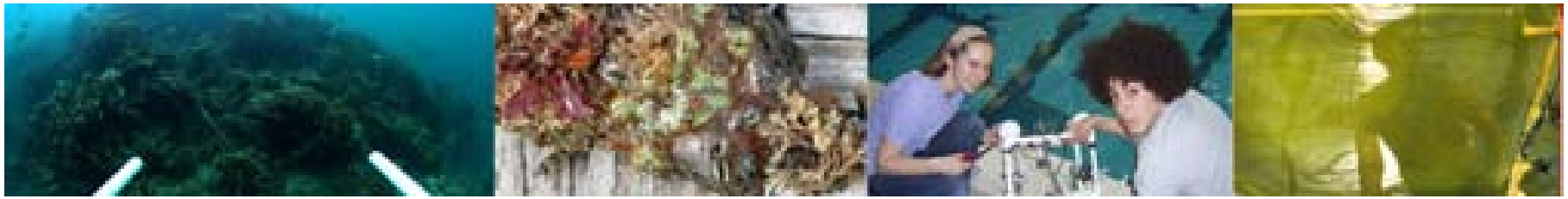


Invasive Species

- Equipped with:
  - Radiometer
  - LED Lights
  - Range finding sonar

- Measure radiation intensity of different marine species for identification





Future Projects

Projects in Development

- Securing funds to revive GEMS
  - Focus on technology to solve marine issues
- Transfer SPI and OEX to Hawaii and PNS
  - Spread through SGEN
  - National SG training
  - Identify other hubs to facilitate SPI-like projects

Scientific Challenge

- Goal: To mobilize the SGEN network
- Design a multifaceted research question that programs can integrate into research/outreach
- MITSG will design SPI, OEX and internship programs around central question
- NESG educators to assist in recruiting and coordination
- Contributes to the Digital Ocean database