TMA, **BlueTech** & International Collaboration

Presentation to PRAGMA 37

Michael B. Jones – President
www.themaritimealliance.org

12 Sept 2019

Global Blue Economy: Enormous and growing

OECD* 2016 study:
The Ocean Economy in 2030

2010 – US $1.5 trillion (conservatively)
2030 – US $3.0 trillion (conservatively)

"The ocean economy is essential to the future welfare and prosperity of humankind…only recently begun to garner attention and move up the international policy agenda."

Comparison:
  2010 global water industry = $500 B
  2015 space industry = $355 B

*NOTE: The OECD is a Paris-based organization with 36 democratic country members founded in 1960 to stimulate economic progress and world trade.

UNDERWATER COMMUNICATIONS

UNMANNED UNDERWATER VEHICLES

MARINE AND SURVEY VESSELS

HYDROGRAPHY

METROLOGY

MARINE RENEWABLES

OCEAN RESEARCH

OIL & GAS

MARINE SECURITY

AQUACULTURE

TMA BlueTech

Promoting BlueTech & Blue Jobs®

EU Blue Economy:

June 2018 – 1st ever EU Blue Economy report:
The EU's **blue economy** – all economic activities related to oceans, seas and coastal areas – is growing steadily, according to the EU's 1st annual report on the blue economy. With turnover of € 566 billion (US $659 billion), the sector generates € 174 billion of value added and creates jobs for nearly 3.5 million people.

*NOTE: Bernhard FRIESS – Director, Maritime Policy and Blue Economy, DG MARE (European Commission) spoke at **BlueTech Week 2018***

What is a cluster & what do they do?

- A "Business Cluster" is a regional concentration of related industries that helps increase its competitiveness globally.

- "Organized Clusters" occur when regional recognition, funding, & leadership intersect. Effective leadership is critical.

- We believe **BlueTech** clusters are critical to protect the ocean by focusing on the Triple Bottom Line ("People, planet & profit") by balancing economic, environmental & social equity factors.

- **BlueTech** cluster tech & service companies help us understand problems and are critical to develop & deploy solutions

TMA BlueTech

Promoting BlueTech & Blue Jobs®

Non-profit industry association & **cluster organizer**	Largest U.S. **BlueTech** cluster 100+ members
Triple Helix: academia, industry, & policy makers	Create a regional **Blue Voice**

Founded 2007. In 13th year

Our Tagline:
"**Promoting BlueTech and Blue Jobs**"®

Our Mission:

"Promote sustainable science-based ocean & water industries"

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For **TMA**, **BlueTech** is "All Things Wet":

- **BlueTech** is broad – from aquaculture to weather & climate change
- **BlueTech** permits ocean observation in places/ways not formerly possible
  - ➢ **BlueTech** critical to understand problems created over centuries
  - ➢ Ocean observation critical: Need to "change the math" to permit more!
  - ➢ Blue Economy / Space Economy interface permits real-time comms
- Data allows us to understand impacts and change behavior
- Ocean Observation & **BlueTech** are essential for humans to address:
  - ➢ The Big 5: food, water, medicine, energy & real estate
  - ➢ Problems like abandoned netting, plastics, sunken vessels, etc.
- International collaboration is critical – problems & markets too big to act alone

16 Sectors of the Blue Economy for TMA

- Aquaculture and Fishing
- Boats & Shipbuilding
- Defense & Security
- Marine Recreation
- Ocean Instrumentation
- Ports & Maritime Transportation
- Robotics & Submarines
- Very Large Floating Platforms

- Biomedicine
- Cables & Connectors
- Desalination/Clean Water
- Ocean Energy & Minerals
- Oceanography & Marine Science
- Professional Services
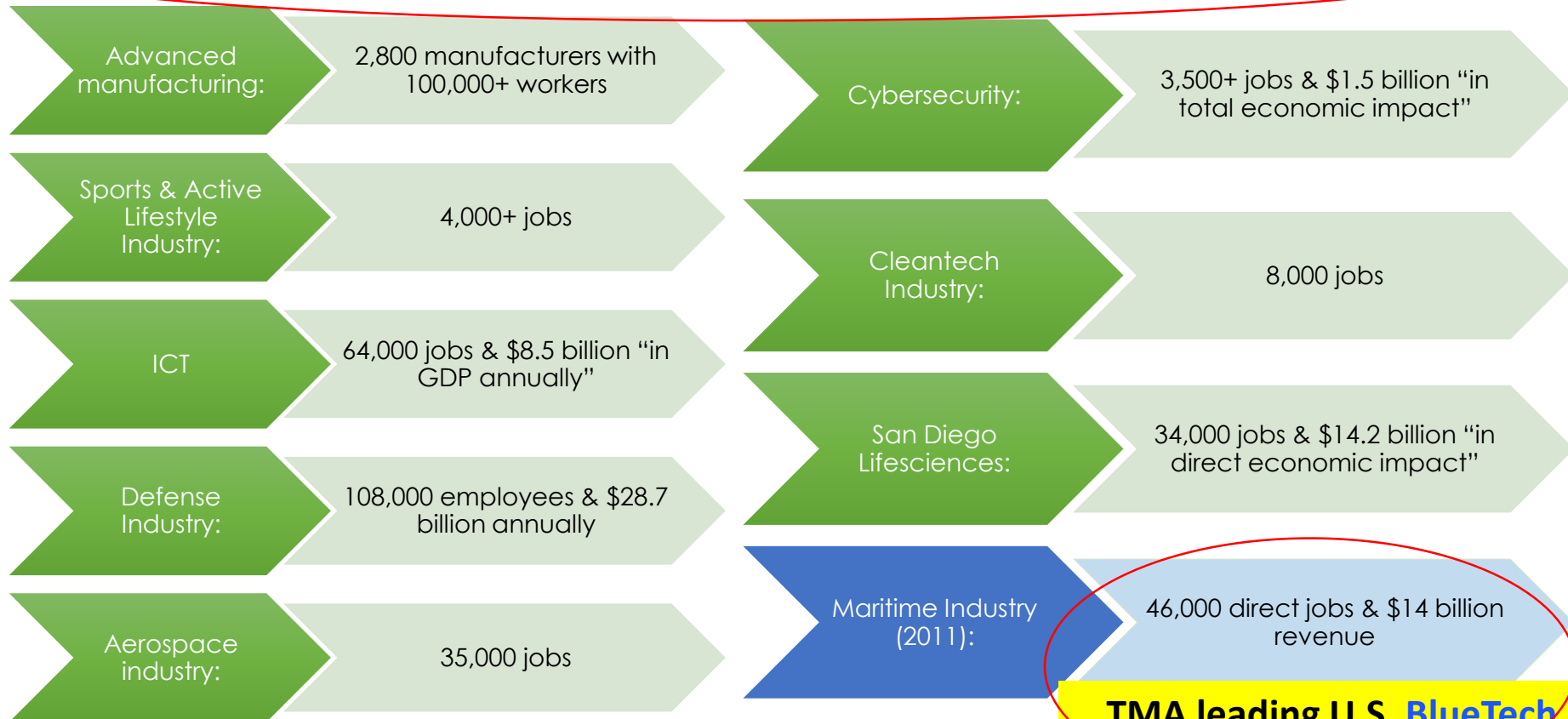- Telecommunications
- Weather & Climate Science

"If its wet, it's Blue"

Comparative industry clusters in San Diego

Cluster	Data		Cluster	Data
Advanced manufacturing:	2,800 manufacturers with 100,000+ workers		Cybersecurity:	3,500+ jobs & $1.5 billion "in total economic impact"
Sports & Active Lifestyle Industry:	4,000+ jobs		Cleantech Industry:	8,000 jobs
ICT	64,000 jobs & $8.5 billion "in GDP annually"		San Diego Lifesciences:	34,000 jobs & $14.2 billion "in direct economic impact"
Defense Industry:	108,000 employees & $28.7 billion annually		Maritime Industry (2011):	46,000 direct jobs & $14 billion revenue
Aerospace industry:	35,000 jobs			

TMA leading U.S. BlueTech cluster & leading intl. cluster

Source: San Diego Regional Economic Development Corporation 2016

Partner Organizations

Canada — INTERNATIONAL TRADE ADMINISTRATION

THE MARITIME ALLIANCE — Promoting BlueTech and Blue Jobs®

Institute of the Americas®

SAN DIEGO REGIONAL EDC

DEPARTMENT OF COMMERCE — UNITED STATES OF AMERICA

SCRIPPS INSTITUTION OF OCEANOGRAPHY

UC San Diego

oceansadvance

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — NOAA — U.S. DEPARTMENT OF COMMERCE

IOOS — Integrated Ocean Observing System

The City of SAN DIEGO

National University Polytechnic Institute

THE NOBLEST MOTIVE IS THE PUBLIC GOOD — COUNTY OF SAN DIEGO — MDCCCL

marine southeast

CICESE

MARITIME MUSEUM — Star of India — SAN DIEGO

ENSENADA ECONOMIC DEVELOPMENT COMMISSION EDC

PÔLE MER MÉDITERRANÉE

XPRIZE®

Marine Institute — Foras na Mara

MiraCosta College

SCEDC — South County Economic Development Council

SAN DIEGO WORKFORCE PARTNERSHIP®

CIP-OEA COMISION INTERAMERICANA DE PUERTOS OAS-CIP — INTER-AMERICAN COMMITTEE ON PORTS

WTCSD — WORLD TRADE CENTER® SAN DIEGO

Inter - American Committee on Ports

PLOCAN consorcio — PLATAFORMA OCEÁNICA DE CANARIAS

MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Gobierno de Canarias

Unión Europea — Fondo Europeo de Desarrollo Regional

Areas of particular **TMA** focus:

- Promote <u>recognition</u> of importance of Blue Economy & BlueTech
- **K-12 education focus in addition to academia collaboration**
- Understand & protect supply chain as critical part of eco-system
- Promote the circular economy – use 100% of everything!
- **Promote intl. BlueTech clusters & chapters** (+ capacity building)
- Promote entrepreneurs/SMEs via incubators/accelerators & link
- Attract more investment capital…particularly impact investors
- **To study ocean, drive down price of platforms and sensors**

TMA (*like other "full-featured" clusters*) is about <u>collaboration</u> across Academia, Industry & Policy *(the Triple Helix)* to create regional **Blue Voice** & promote **Blue** opportunity.
==*Must understand and align <u>stakeholder interests</u>*==.

Academia/ Education/ BlueSTEM

BlueTech Cluster

BlueTech Industry

<u>Academia/education interests:</u>
- *Research/make an impact*
- *Funding*
- *Jobs for students*

Policy *(including elected officials, military, NGO, press, etc.)*

<u>Industry interests:</u>
- *Solve a need & create ROI*
- *Qualified employees*

<u>Elected officials interests:</u>
- *Solve problems*
- *Economic prosperity*
- *Get re-elected*

<u>Stakeholder overlap:</u>
- *Needs & solutions*
- *Economic growth*
- ==*Jobs*==

www.TMABlueTech.org

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Education & Workforce Development Overview:

- **BlueSTEM Academy & Career Pathway at San Diego Unified School District**

- **Blue Economy** career pathway job videos and **BlueTech** Jobs website
  - VirtualJobShadow.com/partners/maritime-alliance/

- **Blue Economy** immersion program for HS students (from Blue Collar to **BlueTech**)

- SeaPerch San Diego chapter (national SeaPerch program)

- **BlueSTEM Internship Program** established in 2018

- **Blue Economy Education Collaborative (BEEC)** with 40+ focused on ocean/water

- "Workforce of Tomorrow" track part of annual **BlueTech Week**

- **BlueTech Foundation** at San Diego Foundation will be gathering additional funds and pursing alliances to support **BlueSTEM** programs in the region

BlueSTEM Pathway Developments

Case study: SDUSD partnership to develop **BlueSTEM** Academy & Career Pathway

- Established in 2017 after Summer Site Visits to **TMA** Companies
- Pilot Middle School: Pacific Beach Middle School (grades 7 & 8)
    - Interdisciplinary, year long project: Blue Economy Video
- Pilot High School: Mission Bay High School (grades 9 -12)
    - Focus on 9th Grade Biology / 11th & 12th Grade Marine Biology and Environmental Studies
- BlueSTEM Advisory Group
    - 1st time Middle School & HS teachers coordinate an interdisciplinary & themed effort
- Project-Based Learning Institute
    - 2 week workshop for teachers to gain industry exposure and develop interdisciplinary projects
- Starting 2019, SDUSD will infuse **BlueTech** across 105,000+ K-12 grade students
    - Ocean and water literacy!!
    - Curriculum development
    - Including fieldtrips to Aquarium, Maritime Museum, 11th annual **BlueTech Week** and more

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Education / working with policy makers

City & County of SD:

MAYOR KEVIN L. FAULCONER
CITY OF SAN DIEGO

FOR IMMEDIATE RELEASE
Tuesday, March 17, 2015

CONTACT:
Charles Chamberlayne (619) 453-9911 or Chamberlayne@sandiego.gov

MEDIA ADVISORY

Faulconer, Cox Launch
Blue Tech Vision for San Diego
Mayor, Supervisor & City Council President Propose Blue Tech Incubator

San Diego, CA – As part of a new *blue tech* vision that will create more maritime jobs for the San Diego region, Mayor Kevin L. Faulconer and County Supervisor Greg Cox today proposed a major initiative that was jointly approved by the City of San Diego and County of San Diego to help give San Diego's *blue economy* a boost by creating a blue tech incubator.

Mayor Faulconer said, "Thanks to our fast-growing blue-tech economy, San Diego has yet another opportunity to be a global leader in technology and innovation. Our coastal city is uniquely positioned to be the perfect global breeding ground for water-related technology, innovation and jobs. I'm proud to help lead this effort that is a big step toward creating a blue-tech incubator and center of excellence and putting San Diego front and center for blue tech globally."

State of California:

California State Controller Betty Yee Highlights TMA as a Model of BlueTech Cluster Collaboration

The October 2018 edition of the "California Fiscal Focus" - a monthly report from the State Controller - highlights the Blue Economy in California and focuses on San Diego as "home to the most robust form of the state's blue economy" and TMA efforts in "aligning "BlueSTEM" resources and curriculum for grades K-14, and creating pathways for trade school and college graduates to easily connect with jobs and industry."

Controller Yee calls for "a unified strategy for California's blue economy [that] would enable a socially inclusive, sustainable model to secure healthy ocean and coastal ecosystems for generations."

California State Controller Betty Yee will be a speaker at the 10th annual BlueTech Summit & Tech Expo in San Diego on Wednesday, November 7th.
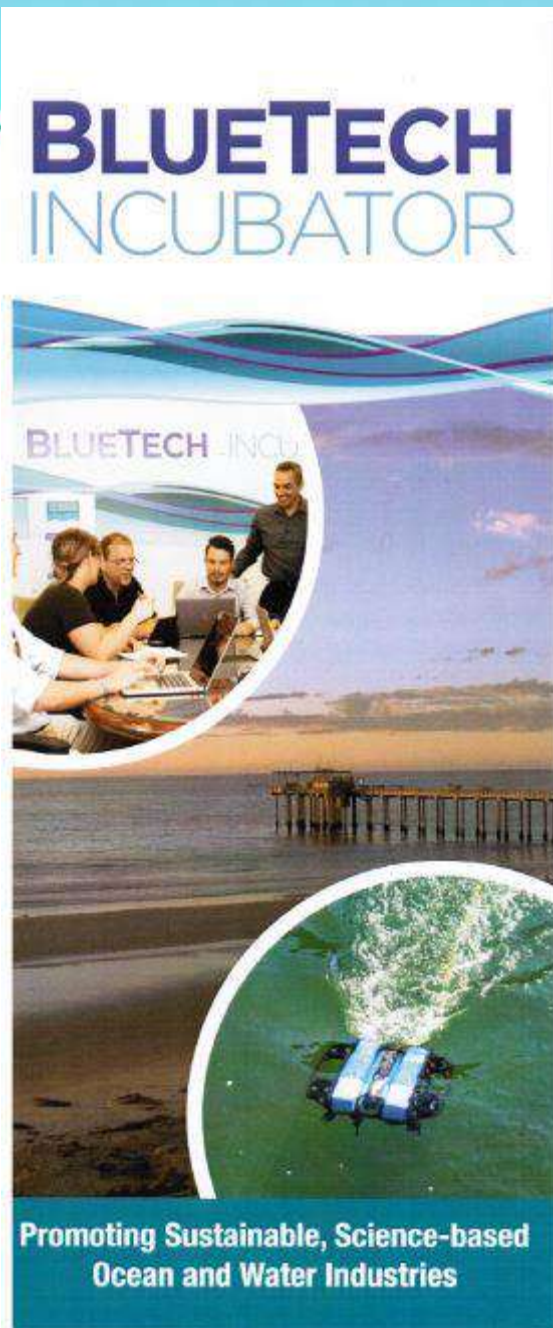
TMA BlueTech Incubator:

Leading the BlueTech Revolution:

"Companies at the **BlueTech Incubator (BTI)** - San Diego's ocean & water tech incubator run by **The Maritime Alliance (TMA)** - are at the cutting edge of innovation in the growing Blue Economy. BTI fosters early stage, innovative, science-based **ocean & water/wastewater tech companies**, helping propel them to greater opportunity and financial viability. Our biggest strength is our global network of BlueTech clusters, companies and contacts."

+ SAGE Mentor Program

BlueTech Cluster Alliance (BTCA)

- **Mission** of **BTCA**: promote sustainable investment & growth of the <mark>knowledge-based ocean and water industries</mark>, to the mutual benefit of all Parties, through active regional, national and international collaboration.

- **Goal**: Work together in areas where members of participating clusters can share information, <mark>collaborate on research and development initiatives</mark>, and jointly pursue business development opportunities.

Charter Members of **BTCA**:

- Blue Growth UK (2 UK clusters)
- Forum Oceano (Portugal)
- Marine Institute (Ireland)
- Oceans Advance (Canada)
- PLOCAN (Spain)
- Pôle Mer Mediterranee (France)
- **TMA BlueTech™** (U.S.)

Regular Members of **BTCA**:

- GCE Ocean Technology (Norway)
- Pôle Mer Bretagne Atlantique (France)

TMA & BTCA cluster capacity building efforts:

- International outreach (developed & developing countries):
  - Brazil, Japan, Korea, South Africa and others
- **TMA** Domestic outreach
  - Alaska, Hawaii, Mississippi, RI, Washington (including Port study)
- California & Cali-Baja outreach
  - Working at State level (State Controller Betty Yee, etc.)
  - **TMA** chapter Baja CA Norte (& joint economic study)
  - Possible **TMA** chapters in Ventura & Santa Barbara counties…and in northern CA

BTW2018

· 7 events in 5 days with 550+ unique attendees from 16 countries
· Tech Expo with 38 table-tops
· 150 speakers
· 140+ companies (105 companies in 2017)
· 14 BlueTech clusters or clusters-in-formation
· 23 companies in the 3rd annual PitchFest

BTW2019 (presenting companies to address SDGs)

· Theme: **UN 2030 Agenda for Sustainable Development, Clusters & the Triple Helix**
· Focus: **SDG 6** (Clean Water & Sanitation), **SDG 7** (Affordable & Clean Energy), **SDG 14** (Life below Water) and **SDG17** (Partnerships for Goals) · Attendees: 650-700+ representing Triple Helix (Academia/Education, Industry & Policy Makers)

11th annual BlueTech Week

November 18-22, 2019 / San Diego, CA
www.bluetechweek.org

"UN 2030 Agenda for Sustainable Development, Clusters & the Triple Helix"

Monday Nov 18
5th annual BlueTech Clusters Meeting + Triple Helix Dialogue segment

Tuesday Nov 19
"UN Decade of Ocean Science: Promoting Academic, Government & Industry Collaboration"
Co-Hosted with Scripps Institution of Oceanography / UCSD

Wednesday Nov 20
11th **BlueTech Summit & Tech Expo**
Morning plenary + afternoon tracks + Blue Economy Workforce of Tomorrow + 11th annual Maritime Gala Dinner

Thursday Nov 21
11th **BlueTech Summit & Tech Expo**
Morning tracks + afternoon plenary + 8th annual Green Connections

Friday Nov 22
4th annual BlueTech Investor Day

Rev. 22 April 2019

- Aquaculture & BioMarine
- Blue Economy & Finance
- BlueTech Clusters Day
- Green Connections 2019
- Investor Day
- Offshore Renewables
- Robotics + Smart Transport
- UN Decade of Science
- Water/Wastewater

BlueTech critical to identify & solve problems (*examples*)

Autonomy Software and Autonomous Vessels

Clean transport, combat IUU, EEZ management, fish counting/management, etc.

Big Data & Location Technology

GIS Mapping, location platforms, spatial data analytics, weather prediction, etc.

Cybersecurity in the Maritime Domain

Food Security

Ocean Energy

Ocean Observation (for business & recreation)

Pollution Mitigation

Hydrocarbon cleanup, plastics-to-fuel, reduction of noise pollution, etc.

Port, Maritime & Shipping Efficiency and Security (including predictive analytics)

Water/Wastewater

OceanTech:

Marine Construction Technologies www.marinecontech.com

- Piles are hollow steel tubes driven deep into the seabed or substrate. They are essential for construction of bridges, ferry terminals, docks, port facilities & offshore/nearshore structures. However, noise from impact pile driving is damaging to birds, marine mammals & fish and can be a major annoyance for residents and tourists.

- Benefits
    - MCT piles can reduce noise by more than 20dB, which reduces the effected area by 85-90%. LESS PILE DRIVING NOISE = FASTER PERMITTING, SMALLER ZONES OF HARASSMENT/HARM, AND FEWER PROJECT DELAYS.
    - Elimination of time-consuming bubble curtains means contractors drive more piles each day.
    - Regulators often cap number of strikes to reduce **cumulative impact to sensitive wildlife**. With less pile driving noise, contractors can produce more strikes before reaching that cap leading to faster overall project completion.
    - Smaller zones of harassment and harm mean fewer potential work interruptions.

- Approved by U.S. Department of Transportation and Washington State Dept. of Transportation

OceanTech:

OceanTech:

Planck Aerosystems www.planckaero.com

- Existing drone technology has been built around a static environment and assumes the "home" position is not moving. As soon as that changes (moving forward/backwards; side-to-side, up and down, etc.) much stops working.

- In addition, wind around moving platforms complicates things

- 1st autonomous drone company to focus on operating from moving vehicles including launching drones (primarily quadcopters) from boats:
  - Combines AI, advanced controls, and computer vision to operate;
  - Permits fully autonomous missions;
  - Have developed algorithms to recognize objects (e.g. whales)

- Customers include commercial maritime operators, fishing vessels/fleets, government agencies, oceanographic institutes, and many others.
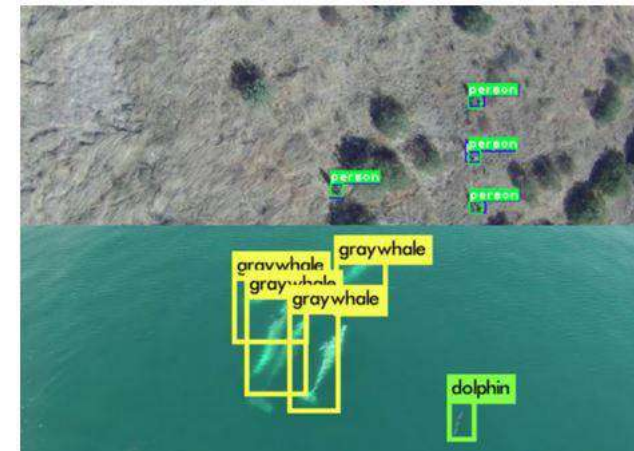
OceanTech:

Shearwater® Drone System

Ready-to-fly drone system designed for truck and vessel-based operations.

Computer Vision

Planck provides computer vision apabilities for real-time situational awareness applications.

ACE™: Autonomous Control Engine

Vision-based navigation solution enables fully autonomous UAS operation, including push-button takeoff and precision landing from confined spaces, moving vehicles, and vessels at sea.

OceanTech:

SubSeaSail, LLC   www.subseasail.com

- "Changing the Math" with semi-submersible sailing drone. Submerged hull improves sailing efficiency by reducing drag

- First patent issued, multiple patents pending.

- Attributes:
    - 100% energy harvesting allowing long-term deployments;
    - Multi-waypoints or station keeping singly or in swarms;
    - Scalable design from sub-1 meter up;
    - Low cost ($40-50k platform) – goal to make it affordable;
    - Extremely low observability and fully submergible

- Many applications including:
    - AUV conveyance/docking/recharging;
    - Cargo delivery;
    - Comms gateway;
    - Sensor platform;
    - Surface/sub-surface intrusion detection (combat IUU, drugs, etc.)

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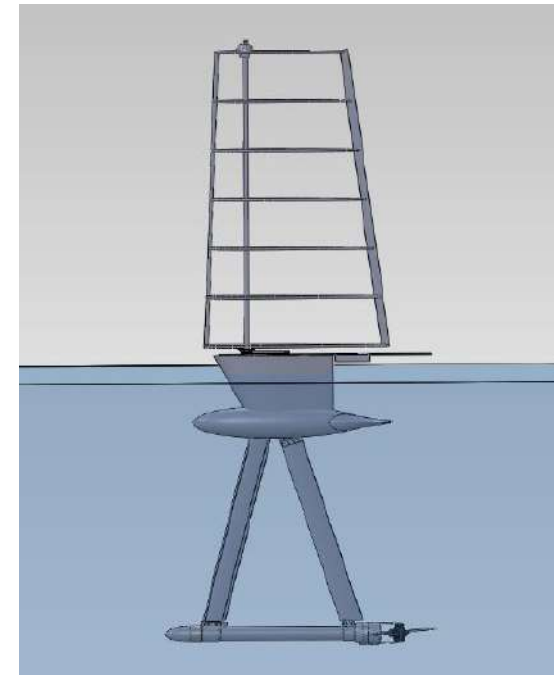
Case Study (cont. – 2):

» *P4 sailing. TRL 6…looking for partners*

Design Features:

Energy harvesting
Long term deployable
Multi-waypoints or station keeping
Scalable design from sub-1 meter up
Low cost
Low observability
Fully submergible
Deployable singly or in swarms

Sample applications:

AUV conveyance/docking/recharging
Comms gateway
Mine delivery or detection
Submarine detection

Cargo delivery
"Lilypad" capability (surface as needed)
Sensor platform
Surface or sub-surface intrusion detection

Extended multi-waypoint mission testing

Case Study (cont. – 3):

:
1) Looking for innovative sensors (and other technology)
2) Early user and operational experience need (academia and/or military)
3) Joint SBIR/grant opportunities
4) Interns and hiring possibilities
5) Technology validation, papers, and presentations

SubSeaSail LLC: Select academia-industry collaboration examples:
Dr. Jules Jaffe – Director, of Institutional Initiatives, SIO
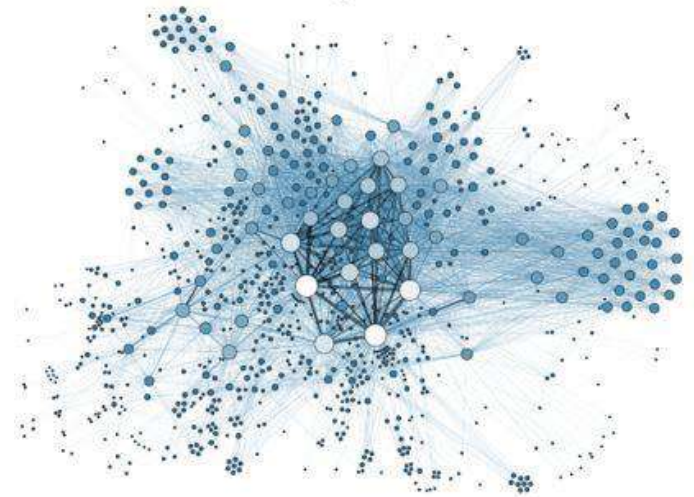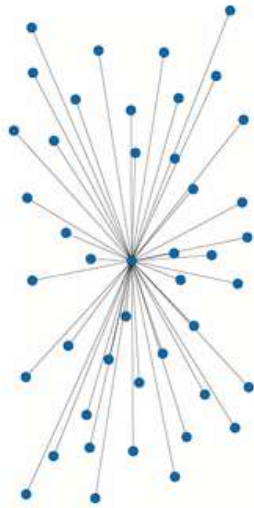*Developing recording hydrophone package in pressure enclosure to be deployed by SubSeaSail on sensor reel to 100M*

Dr. Sean Anderson – Professor & Chair, Environmental Science & Resource, CSU Channel Islands
1. Identifying low profile, low power sensors for MPZ/EEZ monitoring
2. Will provide deployment support with students/professor team

"*If you want to go quickly, go alone.*
If you want to go far, go together."

an African proverb

We need each other. We need to collaborate.
Thank you!

![TMA BlueTech™ — Promoting BlueTech & Blue Jobs®]

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Access channel here

Visit us at
www.themaritimealliance.org