The Ocean Foundation's International Ocean Acidification Initiative:

Building capacity to monitor, understand, and respond to ocean acidification

Application to the Boldline P3 Cohort Competition:
The Ocean Foundation
1320 19th St NW, 5th Floor
Washington, DC 20036

For profit or non-profit:
Non-profit

Industry affiliation:
Environment

Biographies:
Alexis Valauri-Orton: https://ww.linkedin.com/in/alexis-valauri-orton-7636477a/
Mark Spalding: https://www.linkedin.com/in/mark-j-spalding-0aaa903/

Partnership with the U.S. Government:
The Ocean Foundation has partnered with The U.S. Government through two Public-Private Partnerships focused on building capacity to monitor changes in the ocean's carbonate chemistry, including ocean acidification. These programs are the ApHRICA progam and the OAMM program. Both programs are currently underway and have delivered significant impact, with more than 40 scientists from 19 different countries trained to date.

Stage of partnership:
Our existing program is poised for scale. We have now tested our model in multiple regions with positive results.

Problem Statement:
Our ocean is 30% more acidic than it was 200 years ago, and it is acidifying faster than at any time in our blue planet's history. This rapid change in ocean chemistry is an overwhelming and existential threat to the ocean and all who depend on it. As the ocean becomes more acidic, coral and shellfish struggle to grow their shells and skeletons, and fish find their chemosensory systems disturbed to the point that they can't find their way home. It is estimated that ocean acidification will cost the world economy more than $1 trillion annually by 2100.

The first step to building capacity for markets and communities dependent on the ocean is to *monitor how, where, and how quickly change is occurring*. Two years ago, the cost of starting up an ocean acidification monitoring system was over $250,000, and entire regions of the ocean, including key fishing and coral areas, had no monitoring systems in place.

Without a monitoring system, communities are essentially operating in the dark, with no way to anticipate and adapt to changes.

With our partners, our program has reduced the cost of each startup lab to less than $20,000 and has built a replicable training model that is ready for scale. But, The Ocean Foundation cannot achieve scale alone. A network of partners will be critical to equipping the globe with ocean acidification monitoring capacity and training the people who run those systems.

Idea:
Our core concept is that without ocean acidification monitoring systems, the pending risk to entire communities, ecosystems and markets will be unknown and impossible to anticipate or minimize. We seek to build long-term adaptive capacity for the communities, organisms, and markets that depend on the ocean. And we believe the first step to achieving that is to increase capacity of scientists around the world to monitor ocean acidification, and to equip them with everything they need to conduct high quality measurements.

Our idea is poised for scale. Through our public-private partnerships with the U.S. Department of State, since 2015 we have:

- Trained over 40 scientists from 19 countries in ocean acidification monitoring;
- Created a brand new "kit" of lab and field equipment capable of making high quality measurements that is 1/10th of the cost of previous measurement systems. The kit (aka "GOA-ON in a box") is largely comprised of new, American-made, technologies that have their origin in the Ocean X Prize
- Equipped four countries with these kits (with six more countries due to receive them by the end of the year)

Through partnerships, we can train scientists all over the world and create a robust network of monitoring systems. Also through partnership, we can partner with resource management and financial institutions to ensure these monitoring systems are sited in economically critical regions and to characterize the market at risk, thereby laying the groundwork to understand and predict potential impacts on markets.

Resource Requirements:
A core component of our program is the procurement and delivery of a "kit" of equipment. The items in this kit, which include the iSAMI pH sensor made by Montana's Sunburst Sensors, are technical lab materials produced primarily in the United States. To achieve our vision of greatly expanding monitoring capacity, we require strong partnerships with American businesses that manufacture this equipment as well as adequate funds to purchase the equipment, pack it appropriately with the instructional materials, and ship it.

Additionally, we rely on our science partners to test and improve these kits, as well as to serve as trainers at our workshops. We seek to set up a permanent kit testing facility that will also serve as the hub of our kit procurement and shipping. At present our intention is to set this up at the University of Hawaii under the management of Dr. Christopher Sabine. To achieve this, we will need stakeholder buy-in from the University, as well as funds to support this facility.

And, importantly, to conduct monitoring that is relevant to communities and economies, we need engagement and buy-in from stakeholders in our target regions. This includes universities and academic institutions where we will conduct trainings, but also local government partners, businesses, and NGOs. Through this engagement we can establish long-term, durable, capacity. Critical to the success of this will be the provision of stipends to researchers or financial support to the institutions who will lead monitoring work in their regions.

Best Potential Partners:

Governance and coordination partners:
In order to coordinate our capacity building activities at a global level, we will need to coordinate with the other organizations acting in this space. We are already close partners with many of these organizations, but continued and strengthened partnerships would help streamline global ocean acidification capacity building. These organizations include:

- The International Atomic Energy Association's Ocean Acidification International Coordination Centre
- The International Ocean Commission
- The Global Ocean Acidification Observing Network

Science and data management partners:
We will partner with universities and academics to ensure the equipment and science we are using is of the highest quality. Additionally, we seek to expand our partnerships beyond monitoring specialists to new partners, such as Microsoft Azure or Tableu, who specialize in data management and data visualization.

Equipment and technology partners:
To deliver on the core of our work – delivering American-made sets of equipment for use in high quality ocean monitoring – we require partnerships with science retailers and distributers. We currently work with Fisher Scientific, but we could expand this relationship or form a partnership with VWR International.

Economic and social resilience partners:
To truly build adaptive capacity and to minimize risk associated with ocean acidification, we will partner with finance and primary resource organizations who can help us understand the implications of monitoring data as well as finance adaptation strategies (such as buffered hatcheries for shellfish, or acidification-resistant coral farms). Such organizations could include the World Bank or the FAO.

Ideal End State:
Our end goal is for every coastal country (200) in the world to have capacity to monitor, understand, and manage ocean acidification in their waters, thereby significantly reducing the risk that ocean acidification poses to communities and economies. To date 356 scientists from 66 countries are participating in GOA-ON, thus going to scale is what is needed. To work towards this end, over the next five years we intend to train an additional 100 scientists on ocean acidification monitoring techniques, with a focus on Africa, the

South Pacific, Latin America, Southeast Asia, and the Arctic. We intend to deliver an additional 20 monitoring kits and further innovate and reduce the cost of these kits through the development of new monitoring tools. We will establish multiple centers of excellence for monitoring around the world, and we will create a long-term fund for international research collaboration to further enable international capacity building.