FARMING the OCEAN

CURRENT MEASUREMENT FOR AQUACULTURE

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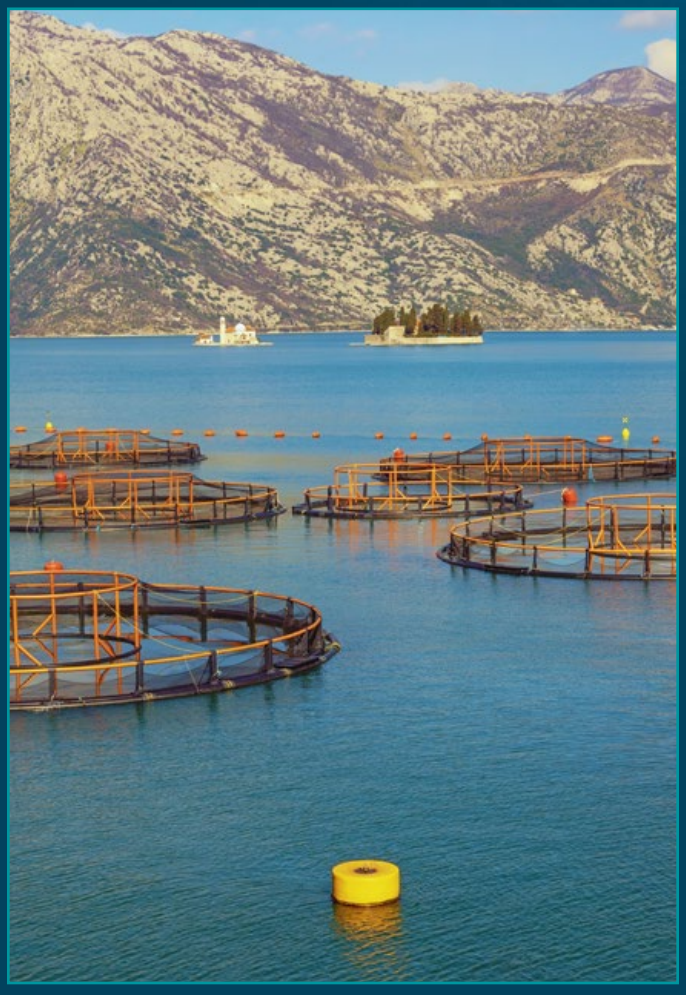

The world is hungry for seafood. And our appetite has only increased over recent years, with seafood consumption more than doubling since 1990.[1]

Feeding a population of nearly 8 billion people has become a challenge—and doing so in a sustainable way is even more so.

According to the Food and Agriculture Organization of the United Nations, only 65.8% of global fish stocks are within biologically sustainable levels. Overfishing is the likely culprit, and marine aquaculture is the likely solution.

There are many hurdles to growing fish commercially in the ocean; hurdles such as maintaining a healthy environment for the fish and meeting country-specific regulations. Water quality and current measurement are key to overcoming these obstacles.

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[1] **The State of World Fisheries and Aquaculture 2020**, Food and Agriculture Organization of the United Nations

MAINTAINING A HEALTHY AQUATIC ENVIRONMENT

Aquaculture farms need to monitor their aquatic environments to secure fish welfare.

This includes both inside and outside the large sea cages—robust and resistant farm structures that can withstand the forces produced by strong water currents. At a minimum, aquaculture experts recommend monitoring the water's oxygen level, temperature, current speed, and direction.

But why is it so important to keep tabs on these parameters?

Oxygen is essential in all energy-demanding processes for fish. Sufficient oxygen is necessary for the fish to transform feed into energy. Each fish species has its preferred oxygen levels—and dissolved oxygen concentrations below their welfare and tolerance limits result in lower yields.

To put it simply, when oxygen levels are low, the fish aren't as hungry—and when they do eat, their bodies aren't as efficient at processing nutrients to grow.

Water temperature is equally as crucial to aquaculture. Like dissolved oxygen, each fish species has an optimal temperature range it thrives in. If marine temperatures were to increase or decrease substantially from that range, it would directly impact the ability of the fish to reproduce and grow.

Understanding current conditions is also essential to ensure a supply of fresh oxygen-rich seawater consistently refreshes sea cages. It also ensures that waste and byproducts (think ammonia, etc.) are circulated out of the system.

Water quality and current measurements help aquaculture managers avoid environmental pitfalls and maintain an optimal setting to produce as much food as possible for a hungry world.

MEETING TOUGH REGULATIONS

Another challenge to marine aquaculture is the strict regulations that must be met to establish a new offshore site. As you can imagine, these regulations vary from country to country. Still, most regions require current surveys before approving a new facility's design.

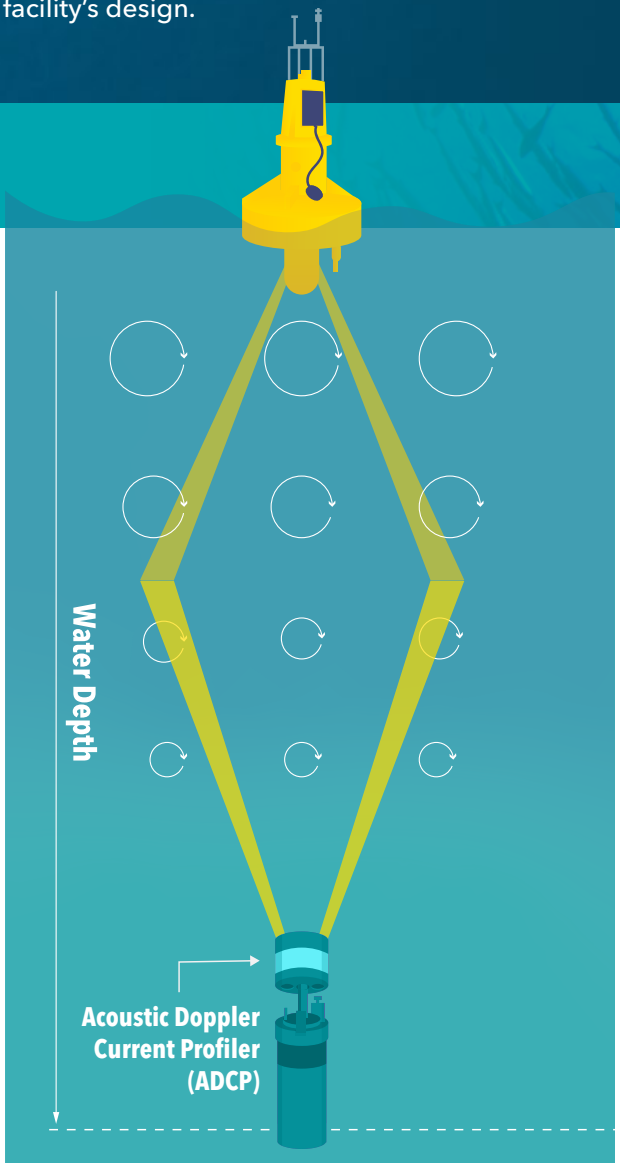
These current surveys map water (exchange) flow, spread, current, and bottom currents–and are ultimately used to map how organic materials move within a marine environment. These measurements form the basis for the environmental bearing capacity–the maximum amount of fish grown in a facility without negatively affecting the surrounding aquatic environment.

Current surveys are required for regulatory approval, but the data collected can also help optimize a facility's design.

The longer you measure water currents in some countries, the less safety factor engineers must apply to cage designs. In essence, the more data you collect–and the better you understand year-round water conditions–the more you can relax your sea cage safety margins.

For an ocean farm, it's critical to find an ideal location where you know the environmental conditions in detail to maximize profitability.

Lastly, even after a site is approved and operational, water quality and current measurements have proven helpful to monitor for pollution events that could harm fish. Real-time data helps farm managers protect their crops from contaminants such as oil spills or harmful algal blooms. Overall, long-term current data can translate into significant savings for farm owners *(and happier fish!)*



MEASURING OCEAN CURRENTS

So, how do aquaculture experts monitor for water currents exactly? There are two methods: an **Acoustic Doppler Current Profiler (ADCP)** or a single point **Doppler Current Meter (DCS)**.

These *in-situ* devices send out an acoustic signal that bounces off particles in the water column. The signal then reflects back to the instrument, which calculates the speed and direction the water is moving.

ADCPs can be deployed safely on the seafloor or mounted on a moored buoy–which is the most common setup. An alternative is to use three DCSs at different depths on a mooring.

Both solutions must provide stable data with very little background noise to measure currents reliably and ensure the data will meet regulatory requirements.

There are several ADCPs and single point DCSs available today, but the Aanderaa RCM Blue has quickly become the top option for the most accurate current measurements.

OVERCOMING OBSTACLES

While offshore aquaculture certainly has its hurdles to overcome, it is one of many solutions necessary to feed our growing population.

With the help of powerful instrumentation and accurate current and water quality data, it will become a sustainable source of food for the world.

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- Easy configuration
- LED with color code reports status
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