AN #: 17_005_14_001
Market: Aquaculture
Subcategory: Nutrient Monitoring
Product: HI83303

Water Quality Monitoring in Freshwater Fish Farming

Description

Fish are among the most valuable foods for many cultures in the world. More recently, more and more people are including fish in their diet as a source of lean protein. As the appetite for fish grows, so does the strain placed on natural waters. Many of the fisheries, specific locations for harvesting fish, are being depleted faster than the populations can recover. This problem is referred to as overfishing. Overfishing is rampant in fisheries that catch popular species of fish that are used in sushi and other delicacies, such as tuna and salmon. Due to the pricing increases as well as concerns about sustainability, more and more consumers and chefs are turning to aquaculture for farm-raised fish. Fish raised through aquaculture provide a steady supply of sustainable fish without straining natural fisheries.

Aquaculture is essentially underwater farming. Many species of shellfish, finfish, and even aquatic plants can be cultivated through aquaculture. Tilapia and catfish are popular species of fish to raise due to the ease of raising these species. The vegetable-based diet of these fish makes farming less expensive than other species such as salmon, which subsist on other fish. Tilapia and catfish also have a mild flavor, making these fish versatile and appealing to most people.

Water quality is at the core of successful fish farming. Fish grown in aquaculture live, breathe, and eat in the water so eventually they will excrete waste in that water. One of the major waste products from fish is ammonia (NH_3). Ammonia is highly toxic to fish, with as little as 0.02 mg/L showing toxic effects, depending on the species. Fortunately, when ammonia enters water, some of it is ionized to ammonium (NH_4^+) while the rest remains as ammonium. How much ammonia becomes ionized depends on the pH; as the pH decreases, the amount of ammonium increases. Ammonium is less toxic to fish, so it is important for aquaculturists to measure both the pH and ammonia levels to determine how much is ionized to the less harmful ammonium and how much remains as ammonia. Aquaculturists generally keep total ammonia (ammonium and ammonia) levels below 3ppm in the tank water. The low levels are maintained by using microorganisms that metabolize ammonia to nitrates. Some farms even use the ammonia-nitrogen to grow plants at the same time, in a process called aquaponics.

Both ammonium and ammonia can be measured with a method known as the Nessler method. In the Nessler method, the reagents react with ammonia and ammonium to create a yellow-brown compound. The intensity of the color that is produced directly correlates with the concentration of ammonium and ammonia. A photometer can be used to measure the intensity of the color intensity while avoiding the subjectivity of human eyes.

Application

A tilapia farmer contacted Hanna in search of a method to measure total ammonia. They had been using test strips to monitor their pH but found that they were unreliable and difficult to read. It was important that the instrument performed reliably and accurately, since they were expanding their farming operation by adding several more fish enclosures. The technical sales representative suggested the **HI83303** Aquaculture Photometer. With the HI83303, they could measure not only ammonia, but also a wide variety of crucial parameters like nitrate, phosphate, and alkalinity. The customer valued that the photometer can double as a professional pH electrode, which allowed them to perform quality checks in the lab to supplement their in-line process monitoring system. In addition, determining the pH and temperature with the electrode made it easy to obtain the pH necessary for determining the fractions of NH_3 and NH_4^+. The built-in reaction timer and absorbance CAL Check™ cuvettes ensured that results were always consistent and that all of the components were operating correctly. Overall, the customer enjoyed the versatile and easy-to-use nature of this powerhouse of an instrument.