MICROBE-LIFT®

Environmentally Friendly

aquaculture products

Just as in the Hippocratic Oath which states, "First, do no harm," Ecological Laboratories' Mission Statement is to solve environmental problems in a way that is compatible with natural processes and does not damage the environment in other ways.

Ecological Laboratories' Microbe-Lift® line of products represents the most environmentally compatible approach to handling common aquaculture problems. The reason for this is simple. All waste, particularly organic waste, must be recycled in nature in some way to continually replenish the critical building blocks of life. In nature, most waste matter is recycled by bacteria and fungi.

Ecological Laboratories' Microbe-Lift line consists of bacterial products, some of which may also contain enzymes and/or vital nutrients to accelerate this natural process. The products contain nothing that is harmful to man, wildlife, aquatic life or the environment.

Ecological Laboratories INC.

Providing Environmental Solutions Since 1976

www.MicrobeLift.com

MICROBE-LIFT® Cycles Aquaculture Ponds Fast

Understanding the Nitrogen Cycle in Aquaculture

Livestock Waste plus Uneaten Food Protein & Dead Plant Matter
are broken down by the aquaculture biology and ammonia is released

3 products to speed the removal of **organic waste, ammonia, nitrite and nitrate** for a **clear, clean, nontoxic aquaculture pond!**

step #1: add ML/AQUA C
Speeds the removal of all organic waste matter by adding a select group of microbes that increase the rate of organic breakdown.

step #2: add ML/AQUA-N1
Provides the necessary nitrifying bacteria (Nitrosomonas and Nitrobacter) required for the biological nitrification process, and assures the continued removal of toxic ammonia!

(when needed) step #3: add MICROBE-LIFT/KH Booster
Supplies the necessary carbonate alkalinity required by nitrifying microorganisms. If carbonate alkalinity is NOT present, the pond pH will be unstable and ammonia removal may cease. ML/KH Booster also provides the necessary carbon source for nitrifying bacteria.

step #4: use ML/KH TEST KIT
to test for KH (carbonate alkalinity)

Measures the presence of necessary carbonate alkalinity. Add ML/KH Booster to maintain proper KH for nitrification.

Nitrosomonas sp.
(contained in ML/N1)
converts ammonia to
Nitrite (NO_2)

Nitrobacter sp.

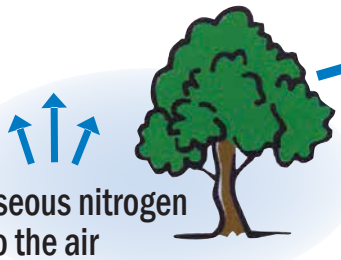
ML/AQUA-N1
(already added in step #2) provides the necessary Nitrobacter bacteria required for the oxidation of Nitrite to Nitrate.

Nitrate (NO_3)
is a food source for plants & algae

Denitrification
The reduction of nitrate in filtered pond anoxic zones

ML/AQUA C *(already added in step #1) contains denitrifiers that function without oxygen. These select microbes can remove nitrates by converting nitrate to nitrogen gas that bubbles harmlessly into the atmosphere.*

Gaseous nitrogen into the air
Nitrogen Gas (N_2)



MICROBE-LIFT® Cycles Aquaculture Ponds Fast

Understanding the Nitrogen Cycle in Aquaculture

MICROBE-LIFT®/AQUA C, MICROBE-LIFT/AQUA-N1® and ML/KH Booster®

is the only natural aquaculture treatment program to cycle and balance your pond fast using a safe, microbial, non-chemical biological process which naturally: controls and eliminates waste organic matter, enhances water quality and reduces and controls toxic ammonia, nitrite and nitrate. Just follow these simple steps:

Step #1: Add **MICROBE-LIFT®/AQUA C** to your aquaculture pond to break down and degrade all waste organic matter, assuring improved environment for aquatic life and plants. **MICROBE-LIFT®/AQUA C** seeds pond water and establishes necessary bio-films on surfaces removing unwanted waste matter and clarifying water fast! **MICROBE-LIFT®/AQUA C** will also reduce and eliminate any odor.

As the organic waste matter - i.e., dead plant life, excessive food and livestock waste - is broken down by pond biology, the waste matter is converted to ammonia in a process called *ammonification*. As the ammonia levels build in your pond, it can become toxic to livestock and aquatic life and must be biologically removed *quickly. Nitrification* - the natural, biological ammonia removal process - is done by a group of microbes called *nitrifying bacteria*. Nitrifying bacteria are very slow to grow (requiring as much as 18 hours for a single cell division compared to every 45-60 minutes for waste degraders) and often require weeks to naturally develop the necessary population to convert all the ammonia produced in your pond.

Step #2: Use **MICROBE-LIFT/AQUA-N1®** to quickly establish the necessary nitrifying cultures and the ammonia removal process in your aquaculture pond. Just add **MICROBE-LIFT/AQUA-N1®** and these cultures will grow and convert the toxic ammonia to nitrite, then to nitrate. **MICROBE-LIFT/AQUA-N1®** contains *Nitrosomonas*, which convert ammonia to nitrite, and *Nitrobacter*, which convert nitrite to nitrate.

In addition, you should know the term *Carbonate Alkalinity* because the biological nitrification process that removes toxic ammonia from the water in order for it to cycle properly requires a source of inorganic carbon. It takes 7.1 pounds of carbonate alkalinity for every pound of ammonia removed from your pond water. If carbonate alkalinity is *not* available in pond water, it's just like your car running out of gas! The nitrification process will stop, or may not even get started. To ensure toxic ammonia is removed by the necessary nitrifying bacteria, you must test your pond water for adequate carbonate alkalinity until there is a minimum of 50 ppm. Then add **MICROBE-LIFT/AQUA-N1®** to ensure rapid and complete ammonia removal by the nitrifying microbes.

Step #3: Use **MICROBE-LIFT®/KH Test Kit** to test the levels in your aquaculture pond.

Step #4: Use **MICROBE-LIFT®/KH Booster** to supply the necessary carbonate alkalinity required by nitrifying microorganisms. If carbonate alkalinity is NOT present, the pond pH will be unstable and ammonia removal may cease.

MICROBE-LIFT®/AQUA C and Denitrification

MICROBE-LIFT®/AQUA C provides a real value to your aquaculture environment. In addition to being one of the BEST products you can use to speed the removal of unwanted, slow-to-degrade organic matter from your pond environment, the novel cultures in **MICROBE-LIFT®/AQUA C** assist in the removal of nitrate from water via a process called *Denitrification*.

While some nitrate is removed by plants and partial water changes, the most effective way to control nitrate removal is by biological denitrification. In this process, nitrate removal takes place in the anaerobic areas, such as those found in pond filter bio-films. **MICROBE-LIFT®/AQUA C** cultures are also *denitrifying microbes* that provide an important nitrate removal pathway assisting in the removal of nitrate via denitrification. **MICROBE-LIFT®/AQUA C** includes high-rate denitrifiers that convert nitrate to nitrogen gas under an anaerobic condition that exists in filters and pond surface bio-films, reducing the nitrate level in your pond. It is noteworthy that algae can use nitrate as a nutrient.

MICROBE-LIFT®/AQUA C & MICROBE-LIFT /AQUA-N1® are the answer to a *Natural, Clean, Clear NON-TOXIC* Aquatic Environment! You can rely on these two novel, biological products to enhance water quality by removing slow-to-degrade waste matter, and removing and controlling ammonia, nitrite and nitrate via their natural, non-chemical biological process.

Performance Results of Microbe-Lift®Aqua C for the Shrimp Aquaculture in India

High density commercial aquaculture farming of Tiger Prawn, Pacific White Prawn (Vannamei), Tilapia or Basa fish is gaining popularity worldwide as demand for seafood increases daily.

Shrimp and/or fish fecal matter, as well as leftover feed pollutes the water in aquaculture ponds and contributes to high nitrate and organic waste. The polluted water results in hypereutrophication, with large quantities of decaying dead algae and organic fish waste and/or shrimp excretion creating a thick layer of organic waste known as bottom sludge. The pond's ecological balance is significantly disturbed when the sludge builds up, thus reducing water volume. This is very critical for shrimp culture, as bottom sludge shortens the effective grow-out period and results in small shrimp size at harvest. The formation of sludge can also cause diseases, resulting in the possibility of losing the entire shrimp harvest. Many shrimp ponds are experiencing extremely high mortality rates after four months as a result of bottom sludge accumulation. As an example, Tiger Prawns only reach a size of 12-15 grams when harvested at four months, but can increase to 30-35 grams when harvested at six months. The larger prawns command a premium price that can be as much as twice the market price.

Dr. Menoj Sharma and Mr. NK Menon at farm site

M/s EnviroAquaria International, India's exclusive distributor of Ecological Laboratories, Inc., USA, in collaboration with Dr. Manoj Sharma of Mayank Aquaculture Private Limited conducted a pilot trial in their aquaculture farm in Surat, Gujarat state, India during the period of April-August 2013 using Microbe-Lift/Aqua C. Used worldwide and time tested as a product for aquaculture, ML/Aqua C is a consortium of microbes for pond treatment manufactured by Ecological Laboratories, Inc. USA.

ABOUT MICROBE-LIFT®/AQUA C

Microbe-Lift®/Aqua C contains a full consortium of bacteria including aerobic, facultative, anaerobic, chemotrophic and photosynthetic species. The microorganisms in ML/Aqua C are non-toxic and non-pathogenic, safe and harmless to humans, animals, plants and all types of aquaculture.

ML/Aqua C is made up of various types of bacterial species that have been cultivated for compatibility, reproduction and synergistic growth delivered in an active vegetative state. These are natural bacteria and have not been genetically modified. When ML/Aqua C is added to a polluted area, the bacteria immediately revive and begin to feed on organic waste. In aquaculture bioremediation, ML/Aqua C acts as a probiotic to help the shrimp or fish digest the food more efficiently and extract more nutrients from the feed. These photosynthetic bacteria, along with other heterotrophic organisms in ML/Aqua C provide the following results:

1. Purification of the water and recycling the waste as a food source
2. Increased profits due to larger yields and lower feed costs, significantly enhancing the cost-effectiveness of aquaculture
3. Maintenance of the required bloom of water for an enhanced environment for fish to grow
4. Reduces nutrients that promote algae blooms
5. Elimination of sludge formation

OBJECTIVES

Microbe-Lift®/Aqua C is a consortium of microbes unlike the locally available probiotics that contain only a few beneficial bacteria. The local product is less expensive than ML/Aqua C, which many or the farmers felt was too costly to use. The shrimp farms in Surat were using locally cultured probiotics (bacteria) for treatment of their aquaculture ponds with satisfactory results for water quality and shrimp yield as reported by Dr. Manoj Sharma. However, these probiotics/bacteria are not capable of reducing or eliminating sludge formation, a major issue faced by the farmers after harvesting.

The main objective of the trial was to establish the commercial benefits of using ML/Aqua C, which not only provides higher yields but also results in larger size shrimp, which are in greater demand for export. **When using ML/Aqua C, sludge formation is eliminated or greatly reduced, thus making it unnecessary to remove the sludge after harvest to ready the pond for the next season.** This not only reduces the additional and unwanted expenditure of removing the sludge but saves time as well.

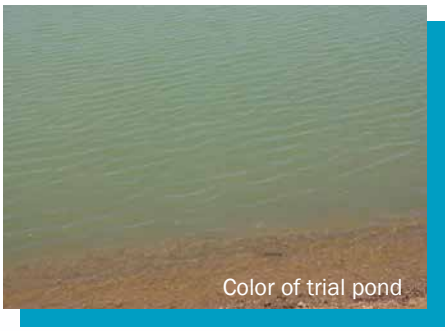
Sludge after harvest in all control ponds

All products are 100% natural, non-toxic, non-pathogenic, and biodegradable.

The consortium of bacteria in ML/Aqua C also reduces the possibilities of disease and high mortality rates, permitting for higher stocking of the shrimp. By using ML/Aqua C, the farmers gain so much in production that the cost of the product is negligible by comparison.

Key objective of the trial was to evaluate the effectiveness of ML/Aqua C in the following areas:

- Maintaining the ecological balance of the pond by reducing organic waste and eliminating bottom sludge
- Reducing pathogenic bacteria and diseases through probiotic effect
- Increasing growth rate and reducing mortality
- Achieving larger prawn at harvest, commanding a much higher market price
- Permitting higher density and lowering the mortality rate to achieve a higher yield
- Improving the feed conversion ratio (FCR) to save on feed cost
- Reducing the rate of water changes to provide a cleaner environment



Color of trial pond

TRIAL PROCEDURE

Two Tiger Prawn ponds and four Vannami shrimp ponds were treated with Microbe-Lift®/Aqua C from April-July 2013, based on the manufacturer's dosing recommendations. Two of the Vannami ponds were stocked more heavily than the farms' standard practice of 100,000 per pond for a hectare with a water depth of 1.5 meters. The remaining non-treated pond served as control during the trial. Comparisons were made with the performance as per past farming/harvest records using the locally made bacteria for pond treatment.

Manufacturer's dosing recommendations for a one hectare pond is as follows:

Week Number	Dosing	Remarks
2-3	1 gallon	Avoid dosing in week 1
4-10	0.75 gal/week	May do 0.5 gallon each week
12-20	1.5 gal/2 weeks	May do 1 gallon every 2 weeks

The standard parameters such as NH_3, pH, DO, salinity, water color and soil quality were regularly checked and measured using the regular farm standards.

TRIAL RESULTS

The shrimp harvest began Week 1 of August 2013. At this time the water quality of both the Vannami and Tiger ponds were found to be good. The sludge formation was negligible. The noteworthy results according to Dr. Sharma were:

1. Good yield
2. No increase in mortality despite a higher stocking density
3. No sludge
4. Absolutely no smell from the pond after draining during harvest
5. Most importantly, the size of both shrimp species were quite large (32 grams and above per shrimp)
6. Taste of shrimp was very good
7. The color of the Vannami shrimp were golden brown, unlike the white color from prior harvests.

Dr. Sharma was extremely happy with the trial results. Originally he believed Microbe-Lift®/Aqua C to be just another probiotic but concluded from the trial results that this was not true. By using ML/Aqua C, the farmers gained so much in production that the product more than paid for itself.

Mr. Menon of EnviroAquaria during harvest

Vannamei shrimp at harvest

ALL LIQUID PRODUCTS ARE AVAILABLE IN 1 ,5 , 30, 55 , 275 GALLON SIZES

Microbe-Lift®/AQUA-C

SPECIFICALLY FORMULATED FOR THE AQUACULTURE INDUSTRY

Creates a healthy environment for your tank, pond, raceway or pool, promoting faster fish growth

MICROBE-LIFT/AQUA-C breaks down dead algae and organic sludge and significantly reduces noxious odors caused by algae, fish waste and urine.

Specific Benefits:

- *Reduces ammonia, nitrogen and nitrate levels.*
- *Reduces frequency of dredging*
- *Reduces biological oxygen demand (B.O.D.) and related organics which can cause off flavors in fish*
- *Reduces buildup of bird droppings, fish feed and dead leaves.*
- *Seeds and maintains biological filters*
- *Effective over a wide range of pH conditions*
- *Sustains biological activity in water temperatures down to 40° F (4° C)*

Healthy shrimp from the trial pond during the growing stage

Due to the many varieties of aquaculture systems, we recommend that you call your Microbe-Lift distributor for detailed dosage rates and application instructions.

Microbe-Lift®/Aqua-N1

ESTABLISHES & MAINTAINS NITRIFICATION IN FISH & SHRIMP PONDS
Eliminates the toxic effect of ammonia

MICROBE-LIFT/Aqua-N1's highly-specialized microbial consortium of nitrifying cultures are specially formulated to eliminate ammonia via a natural biological process termed nitrification.

Specific Benefits:

- *Initiates nitrification*
- *Promotes stable nitrification*
- *Provides cold weather nitrification*
- *100% natural, non-toxic and non-pathogenic*
- *Safe for use around plants & animals*

Dry Ammonia Remover

MICROBE-LIFT/Dry Ammonia Remover uses a PATENTED process that removes chlorine, DESTROYS chloramines and completely ELIMINATES the ammonia that is left behind when the chloramine bond is broken.

Specific Benefits:

- *Ship livestock without toxic ammonia problems for 72+ hours*
- *Can be combined with antibiotics and anesthetics*
- *Completely safe for biofilters*
- *Tested with shrimp, shellfish, aquatic Invertebrates*

SIZE	ITEM #	TREATS	APPLICATION RATE
1 LB. (.45 KG)	DAR01	3,760 GAL. (14,233 L)	For each measured or anticipated 1 mg/L total ammonia, 1 oz. of Clor-Am-X will treat 235 gals. of water. It will remove 1 ppm total ammonia, 3.2 ppm chloramines and 2.0 ppm chlorine
5 LBS. (2.26 KG.)	DAR05	18,800 GAL. (71,165 L)	
10 LBS. (4.5 KG.)	DAR10	37,600 GAL. (142,331 L)	
55 LBS. (25 KG.)	DAR55	188,000 GAL. (711,650 L)	

55 lbs. (24.94 Kg.)

10 lbs. (4.53 KG)

5 lbs. (2.26 KG)

Dry Ammonia Remover is safe for use with fish intended for human consumption.

NEW!

KH - Alkalinity Bio-Active Booster

MAINTAINS STABLE NITRIFICATION

The biological removal of ammonia (nitrification) is one of the most important functions in a pond. This essential microbial process requires the presence of carbonate alkalinity in pond water at all times, as the biological ammonia removal process utilizes 7.1 mgs. of carbonate alkalinity for every 1 mg. of ammonia removed by nitrification.

Should pond carbonate levels fall below the necessary level, nitrification will stop and will fail to start again. With the loss of carbonate alkalinity pH levels will vary and pH be difficult to control as carbonate alkalinity stabilizes pond pH.

Specific Benefits:

- *Promotes stable nitrification*
- *100% natural, non-toxic and non-pathogenic*
- *Safe for use around plants & livestock*

SIZE	ITEM #	TREATS:
2 LBS. (0.9 KG.)	CABPSM	SEE LABEL
8 LBS. (3.62 KG.)	CABPMD	
20 LBS. (9.07 KG.)	CABPLG	
50 LBS. (22.67 KG.)	CABPXL	

KH Test Kit

Test KH (Carbonate Alkalinity) - essential for nitrification.

Made in the USA

Ecological Laboratories INC.

Providing Environmental Solutions Since 1976

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POPCAT AQUAC