AQUA care

Probiotic

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Beyond nutrition

2020

GLOBAL LEADER IN AQUAFEED

2030

WE ARE GOING **BEYOND NUTRITION** SOLUTION PROVIDER

Health

Nutrition **Farming**

Supported by digital developments, while embedding sustainability in our value proposition

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6 CLEAN WATER AND SANITATION

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

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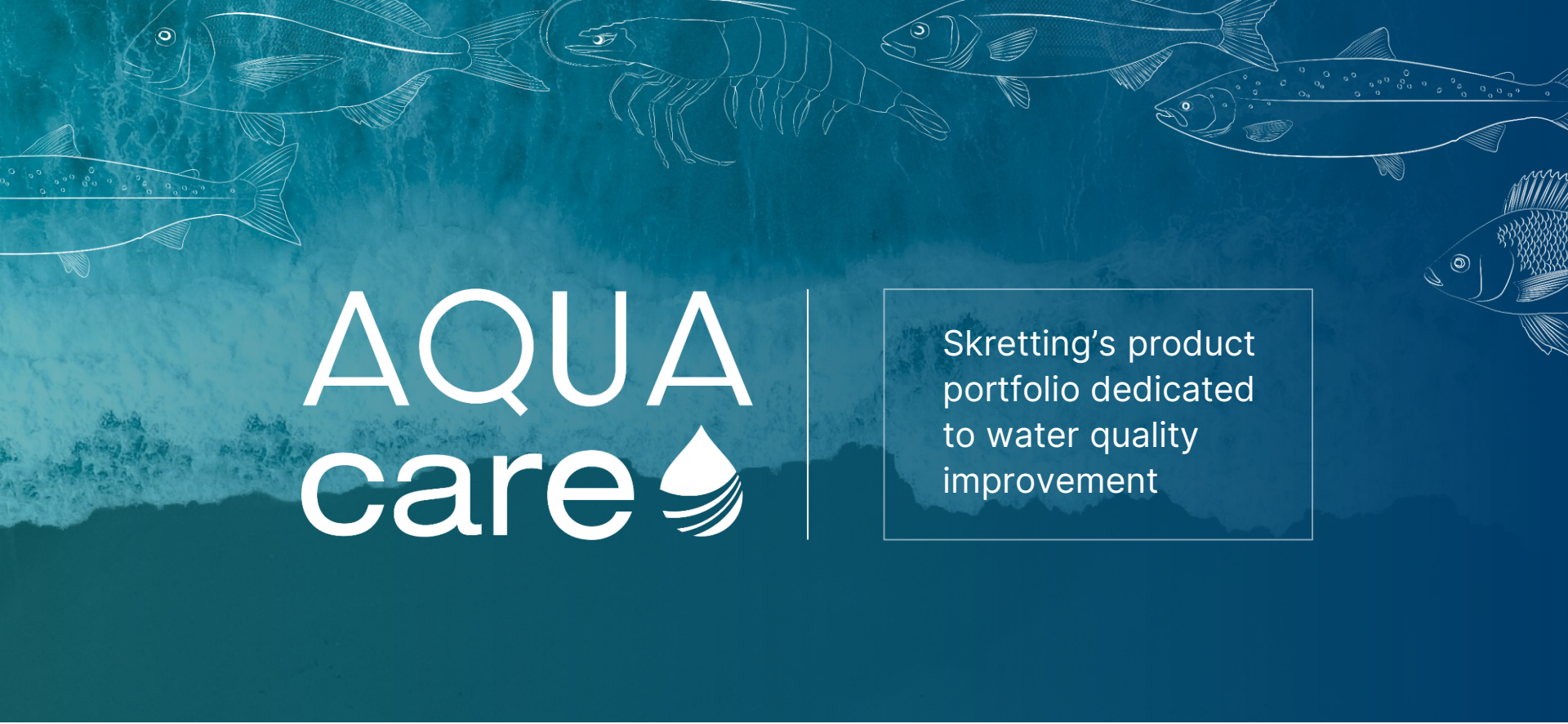

AQUA care

Skretting's product portfolio dedicated to water quality improvement

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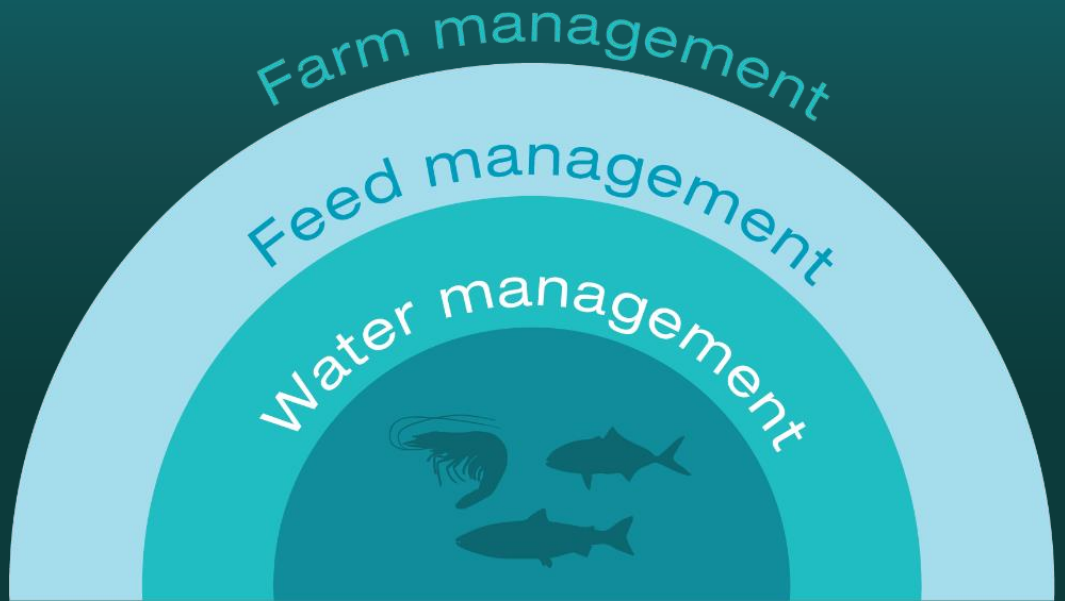
A holistic approach to health and welfare

A healthy environment
is crucial to animal welfare
and maximise farmers
profitability



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The importance of water quality

Water quality is the most important factor affecting fish health and performance in aquaculture production systems

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The complexity of water

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Biosecurity

Definition:

Activities and measures intended to minimise the introduction and spread of infectious diseases/pathogens.

The three major components of biosecurity:

- Animal management
- People management
- Pathogen management

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What are pathogens?

Pathogens are organisms such as bacteria, viruses, fungi or parasites.

Under certain conditions, some organisms may cause disease. This can lead to economical loss.

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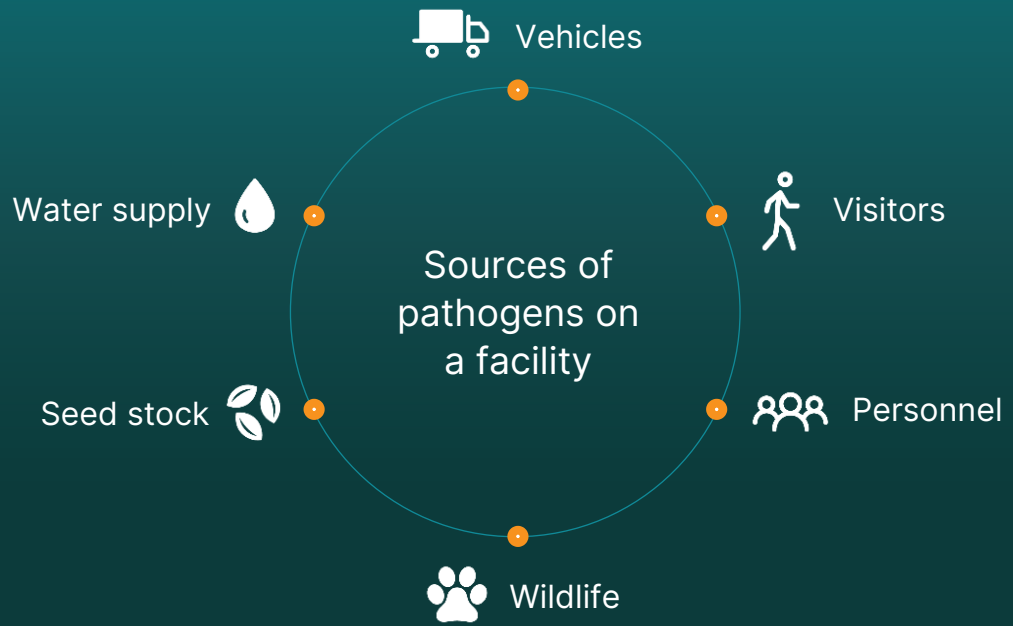
What brings pathogens to a facility?



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Water quality control

Water is the primary vehicle
that introduces and spreads infectious
diseases and pathogens

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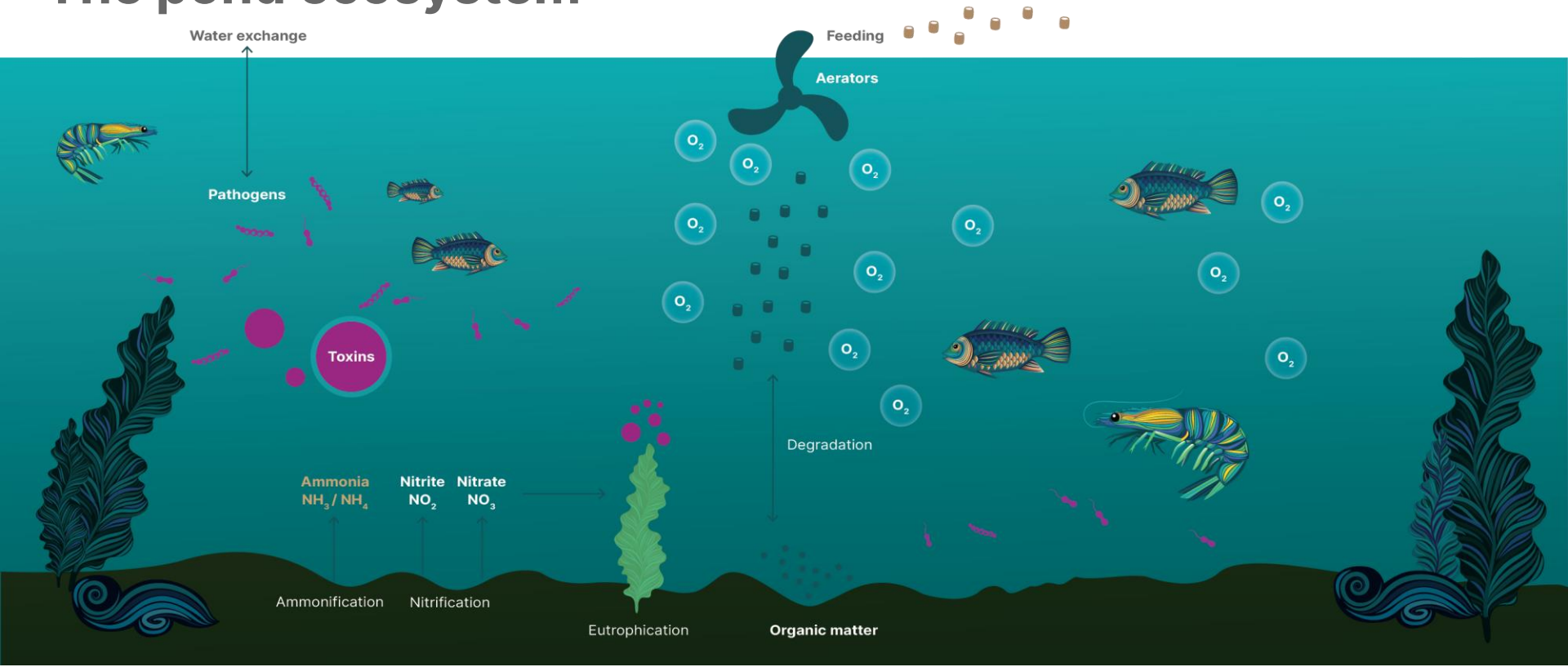
The pond ecosystem



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AQUA care

Probiotic

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AQUA care

- A bioremediation product
- Supports growth and feed conversion ratio

- Designed to improve water quality

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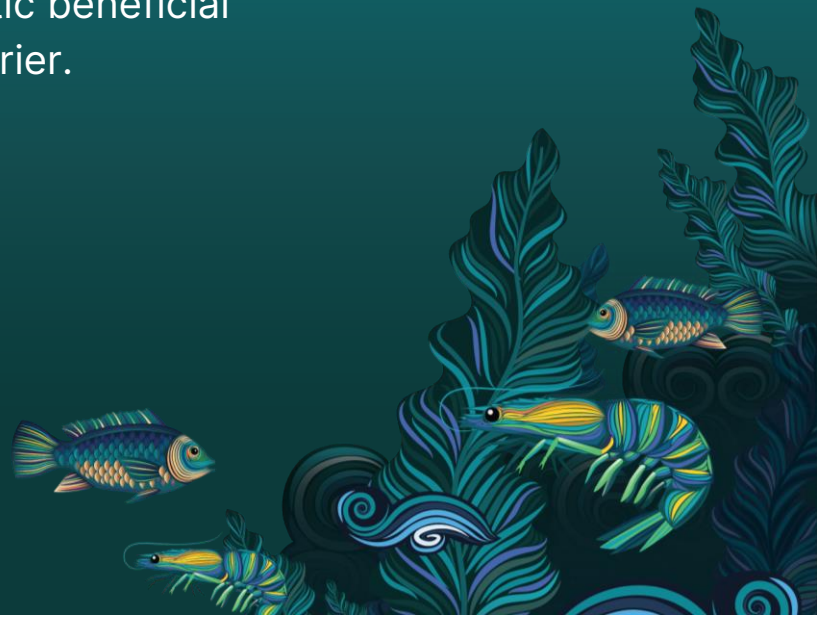
What is AquaCare Probiotic?

- AquaCare Probiotic is a combination of synergetic beneficial bacteria and micronutrients on a carbon rich carrier.

- These bacteria are specifically selected to provide an effective and versatile solution for water bioremediation in varied aquaculture environments.



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Bacillus strains in AquaCare Probiotic

Bacillus amyloliquefaciens
Bacillus licheniformis
Bacillus pumilus
Bacillus subtilis

These four species are aerobic bacteria selected to be efficient in micro-aerobic condition.

They are supported by an optimised carrier blend, allowing for sufficient storage and driving activation once applied to the water.

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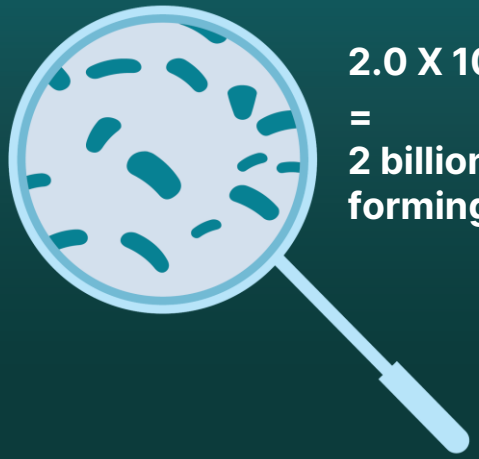
Bacteria concentration in AquaCare Probiotic



2.0 X 10^9 cfu/gram
=
2 billions colony forming units per gram

- Different pond environments have unique nutrient availability
- Exponential growth as soon as the bacteria are released in the pond
- Doubling population every 20 minutes

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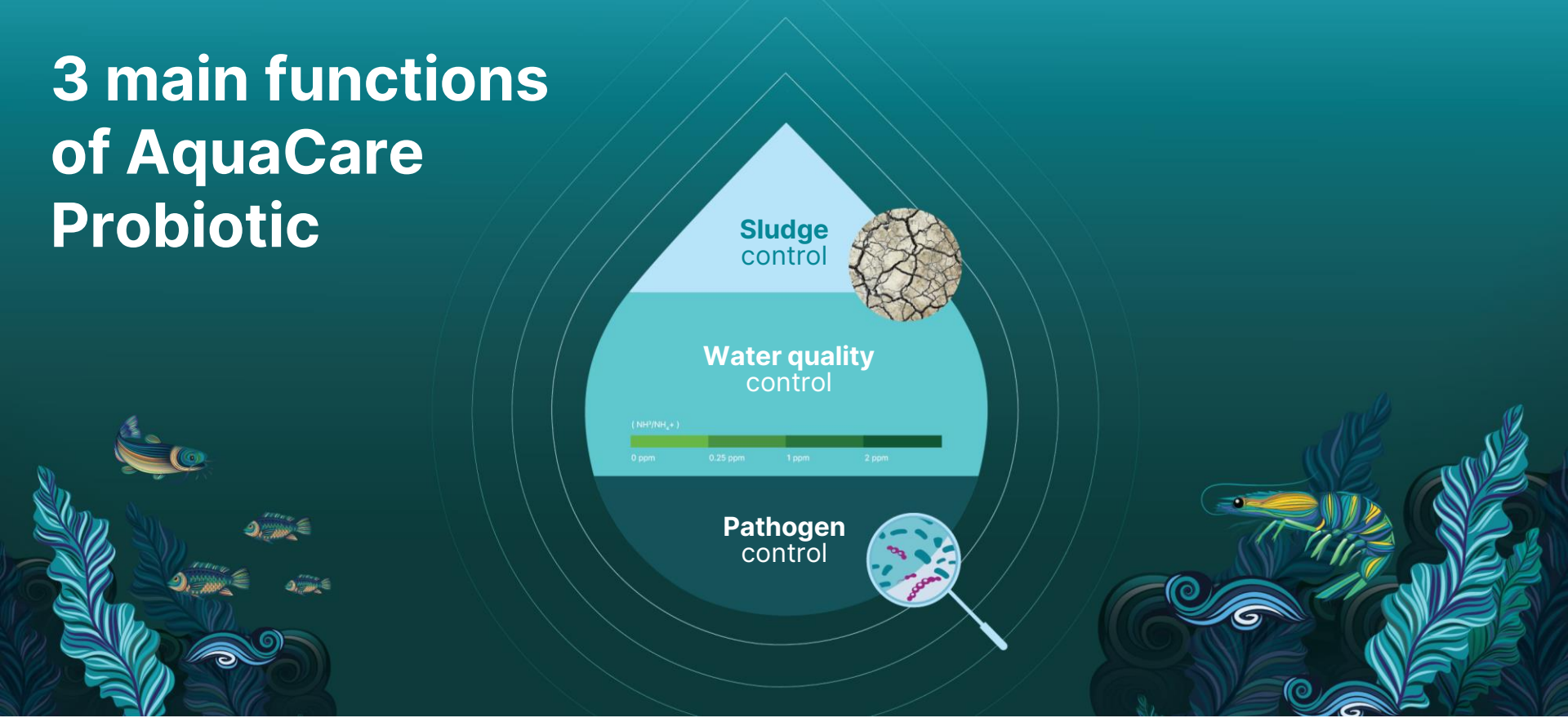
3 main functions of AquaCare Probiotic



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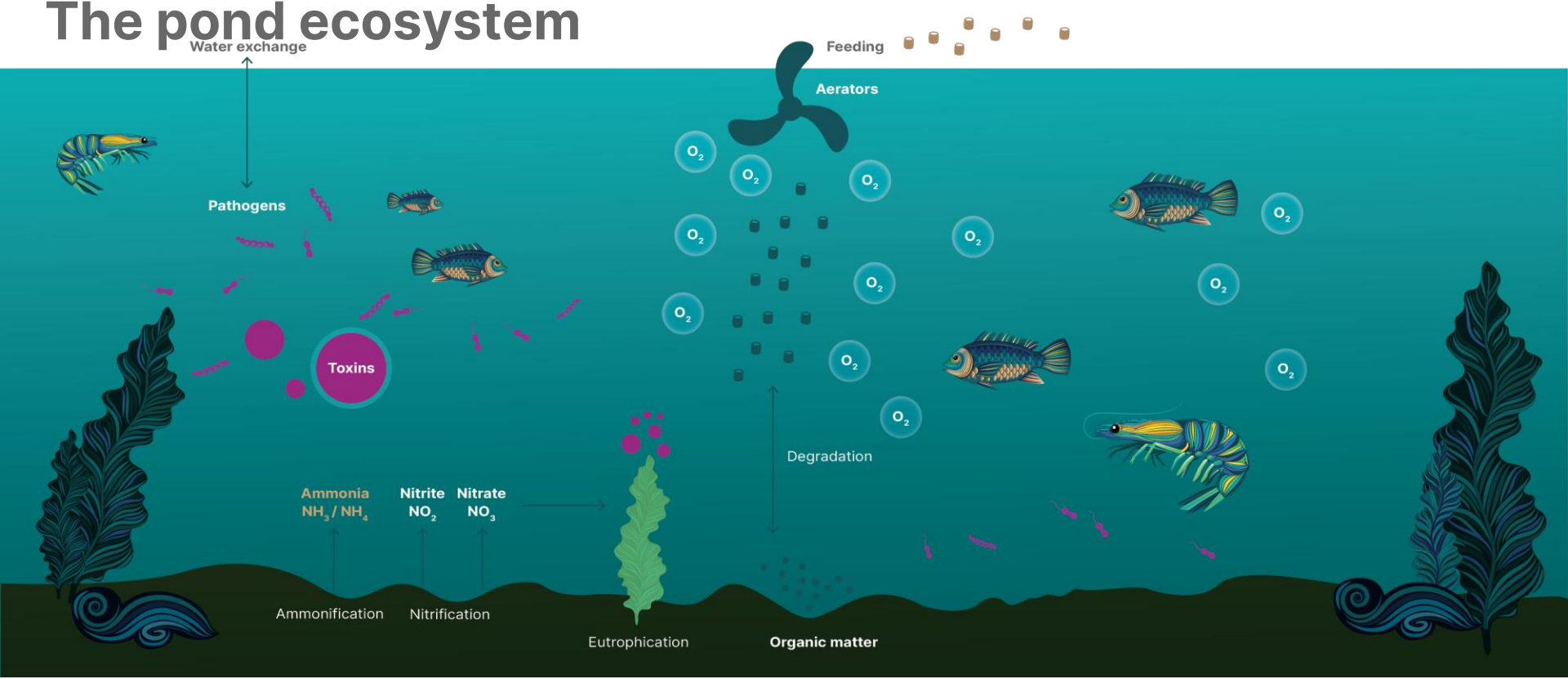
The pond ecosystem



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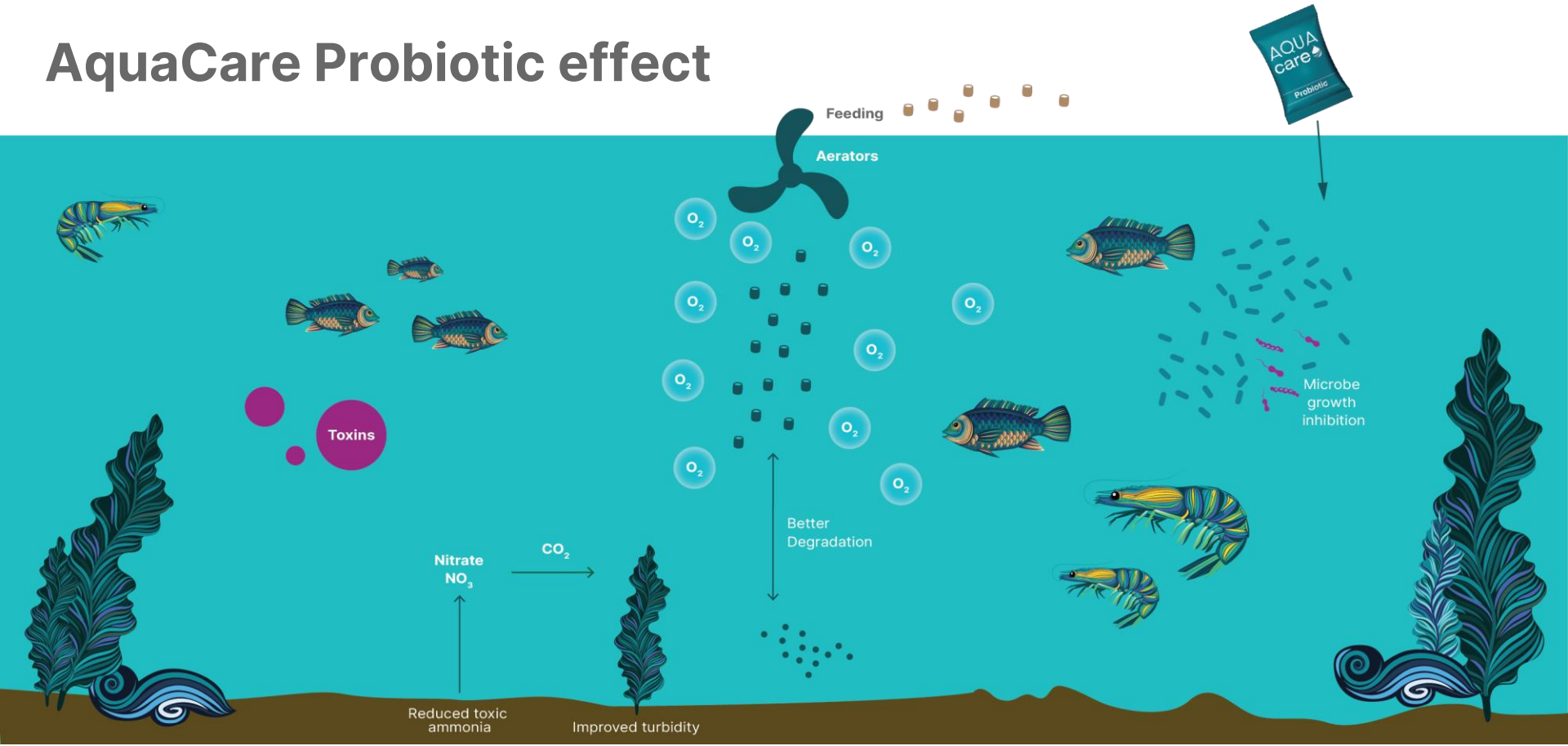
AquaCare Probiotic effect



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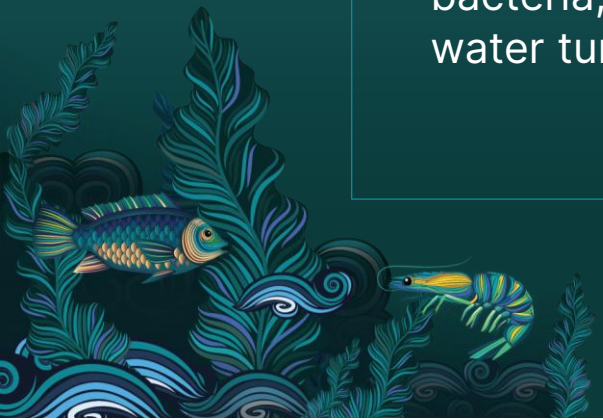
Sludge reduction and organic material decomposition

The removal of large organic compounds by bacteria, among which the *Bacillus* family, reduces water turbidity, and break down the organic waste.

Haung, 2003



Haung, H.J. 2003. Important tools to the success of shrimp aquaculture - aeration and the applications of tea seed cake and probiotics. Aqua International February 2003:13-16.

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Sludge control

The sludge is reduced over the course of the cycle

AquaCare Probiotic

- Contains bacteria that consume organic material such as faeces and uneaten feed, that would otherwise end up as sludge.
- Leads to less pollution and faster preparation of ponds for the following cycle.
- Supports the absorption of nutrients by the animal

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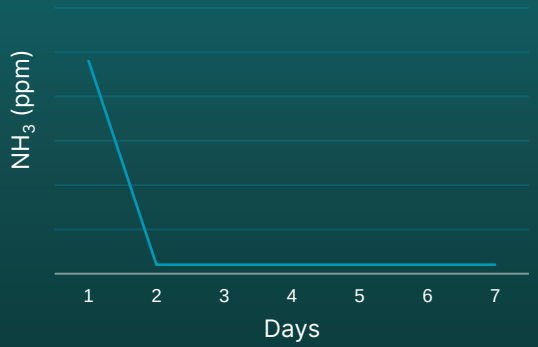
Water quality control

- Ammonia can be toxic to fish and shrimp if allowed to accumulate during production.
- When ammonia levels are high, fish and shrimp cannot efficiently convert feed.
- AquaCare Probiotic provides water conditioning microbes that improve water quality by actively utilising ammonia compounds including nitrite and nitrate.



Field trial investigating the effect of AquaCare Probiotic on NH_3. The result demonstrate a decrease in NH_3 level 24 hours after AquaCare Probiotic was applied.

NO_2- and NH_3 are reduced

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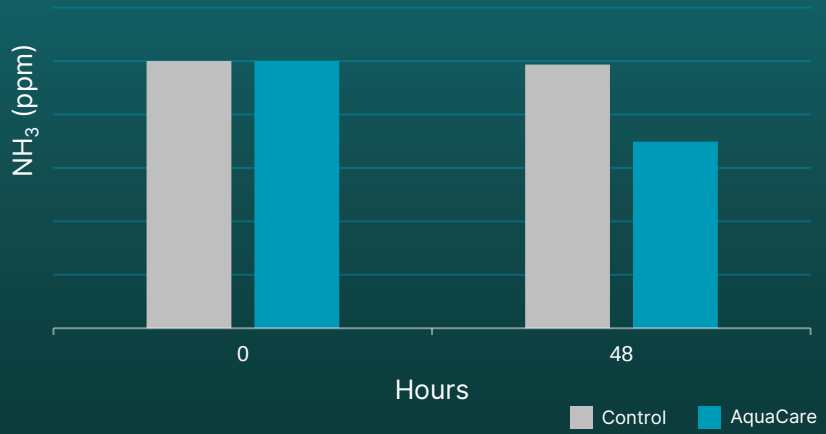
Water quality control

- Two independent trials showed the effect AquaCare Probiotic has on ammonia.
- The need for water exchanges is drastically reduced.



In Vitro assessment of the effect of AquaCare Probiotic on NH_3 level at 10^3 CFU/g concentration, pH 8.0, 15ppt salinity and 30˚C temperature after 48 hrs.

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Pathogen control

- **Principle:**
  Use of “**competitive exclusion**” for improving a specific biocoenosis.

- **Competitive exclusion**

  Gause's Law: Two species that compete for the exact same resources cannot stably coexist.

Same Resource

One of the two competitors will always have an advantage over the other that leads to one species dominating the other.

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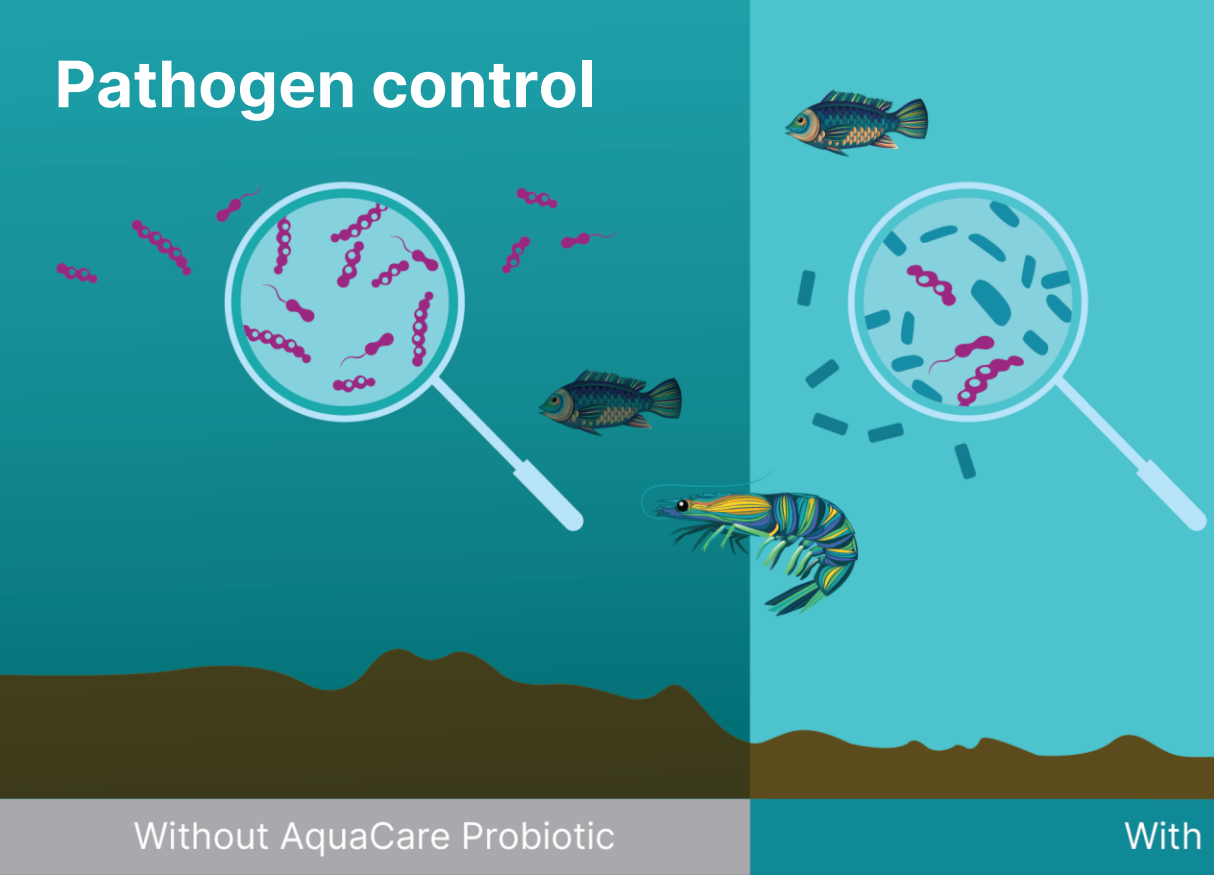
Pathogen control



AquaCare Probiotic provides a mixture of beneficial bacterial species selected for their ability to outcompete Vibrio spp., and other potential pathogenic microbes within a pond system.

Some AquaCare bacteria create compounds that kill (bacteriocidal) or suppress the growth (bacteriostatic) of pathogenic species.

Water exchange reduction also reduces risk of new bacterial contaminations.

Without AquaCare Probiotic

With AquaCare Probiotic

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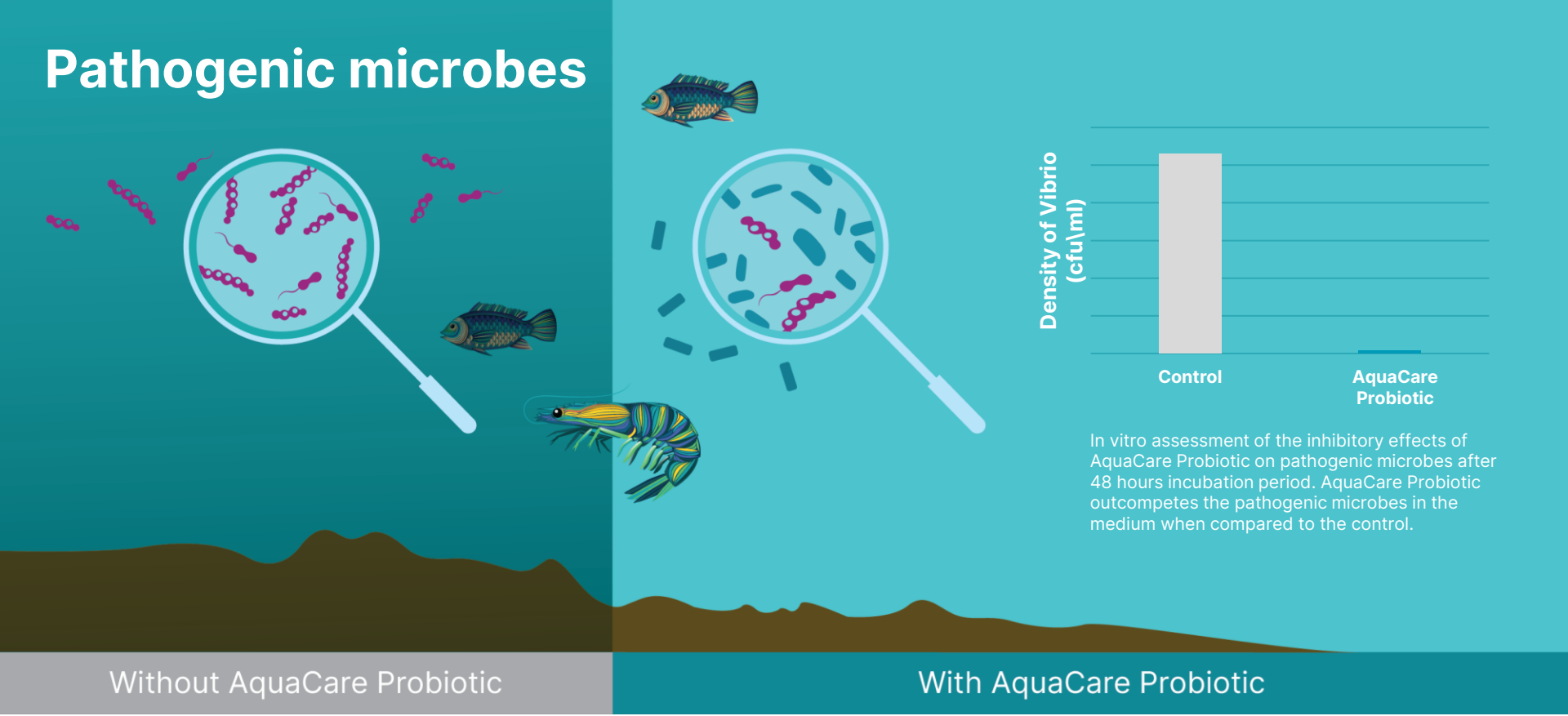
Pathogenic microbes



In vitro assessment of the inhibitory effects of AquaCare Probiotic on pathogenic microbes after 48 hours incubation period. AquaCare Probiotic outcompetes the pathogenic microbes in the medium when compared to the control.

Without AquaCare Probiotic

With AquaCare Probiotic

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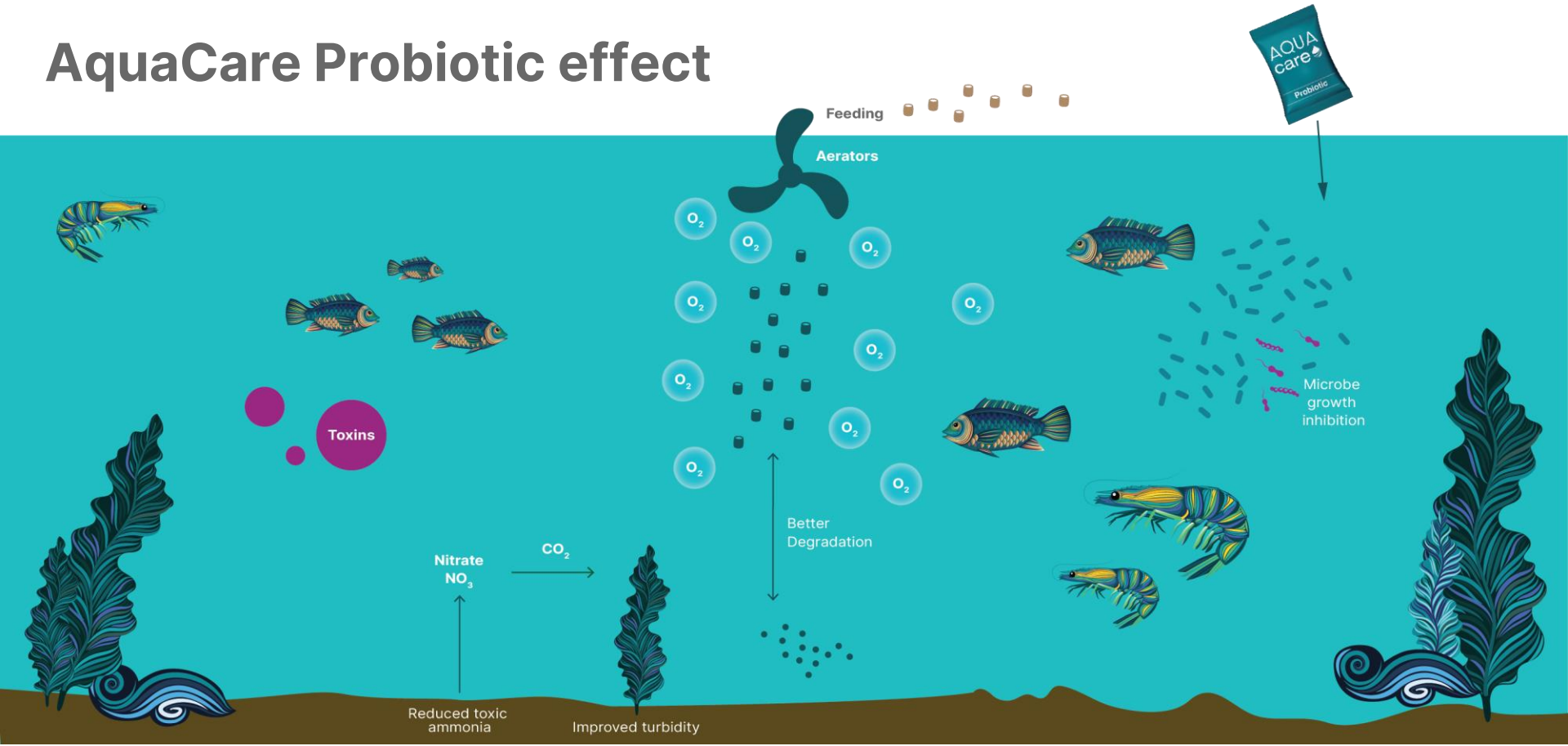
AquaCare Probiotic effect



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Robustness and health of fish and shrimp

Better water + **Pond bottom qualities**

Improvement of animal habitat.

Positive effect on the health by minimising stress.

Bacteria competition and reduced water exchanges

Decrease of pathogenic exposure probability.

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AquaCare Probiotic improves animal husbandry by reducing

Direct

- Ammonia
- Nitrite
- Nitrate
- Pathogen populations
- Bottom sludges

Indirect

- Biological oxygen demand
- Hydrogen sulfide
- Animal stress
- Water exchange
- Use of antibiotics
- Environmental contamination

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Animal husbandry is consequently improved

- Water quality
- Disease resistance
- Animal robustness
- Available oxygen

- Stress tolerance
- Feed conversion
- Protein use efficiency
- Nutrient digestion

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Easy application

Initial dosage:
- 4 x 250g pouches per hectare 3-7 days in advance of stocking

Maintenance dosage:
- 2 x 250 g pouches per hectare every 5-7 days (<60 PLs/m^2)

When water quality is poor, stocking density is higher or pathogens are detected:
- 4 x 250 g pouches per hectare every 5-7

Usage range:

PH range	Temperature	Salinity range
5.8 - 10.5	>10°C	0 - 55 ppt

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Easy application

Application method:
It is recommended to distribute AquaCare Probiotic in the afternoon with aerators turned on.
*DO NOT INCUBATE

Recommended dosage hatchery:

- 1-5 g/m^3 per day

Water reservoir	2 grams
Nauplii (N1-5)	2 grams
Zoea (Z1-3)	4 grams
Mysis & PL	5 grams
Broodstock	4 grams

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Easy application

Dosage calculator for AquaCare in GROW OUT

Fill in fields				
	Unit volume in cubic meter (m3)	Production period in weeks	Number of pouches per bucket	40
Production data	400	24	Price per bucket (€/$)	50

Calculated values			
Total product volume needed (g)	60	Total number of buckets needed	0.006
Total number of pouches needed	0.24	Total price based on number of buckets needed (€/$)	0.3

Breakdown of product needed

Initial product needed		Weekly product needed	
Dosage in grams (g)	Dosage in number of pouches needed	Dosage in grams (g)	Dosage in number of pouches
40	0.16	20	0.08

oduct needed for weekly application for the entire production cycle (+ 1 emergency dosage include

Total amount of product needed in grams throughout the production cycle	Total number of pouches needed throughout the production cycle
540	**2.16**

Recommended AquaCare dosage

Recommended dosages in GROW OUT units	Per hectare (10.000m3)
Initial dosage	4 x 250g pouches
Weekly maintenance dosage	2 x 250g pouches
Acute dosage for emergency application	4 x 250g pouches

Dosage per unit volume	Initial application		Weekly application	
AquaCare **weekly** application volume (g)	Initial dosage (g)	Number of pouches	Maintenance dosage (g)	Number of pouches
Per hectare, 10.000 m2	1000	4	500	2
Per 1000 m2	100	0.4	50	0.2
Per 100 m2	10	0.04	5	0.02
per 10 m2	1	0.004	0.5	0.002
per 1 m2	0.1	0.0004	0.05	0.0002

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AquaCare for hatcheries and small ponds

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AquaCare for hatcheries and small ponds

1 kg containers, 4 pouches of 250g per container

3g tablets, 333 tablet per container

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Easy application

Dosage calculator for AquaCare in HATCHERY

Fill in fields				
	Unit volume in cubic meter (m3)	Production period in weeks	Number tablets per 1 kg container	333
Production data	10	52	Price per 1 kg container (€/$)	50

Calculated values			
Total number of tablets needed	60	Rounded up number of 1 kg containers needed	4
Total number of 1 kg containers needed	3.3	Total price based on number of containersneeded (€/$)	200

Breakdown of product needed	
Initial product needed	Weekly product needed
Number of tablets	Number of tablets
40	20

oduct needed for weekly application for the entire production cycle (+ 1 emergency dosage include
Total amount of tablets needed throughout the production cycle
1100

Recommended AquaCare dosage

Recommended dosages in HATCHERY units	per m3
Initial dosage	4 tablets
Weekly maintenance dosage	2 tablets
Acute dosage for emergency application	4 tablets

	Daily dosing
Water reservoir	0.5

Dosage per unit volume	Initial application	Weekly application
AquaCare weekly application volume per m3	Number of tablets	Number of tablets
RAS hatchery unit	4	2
Flow through system	2	1
Pond system	2	1

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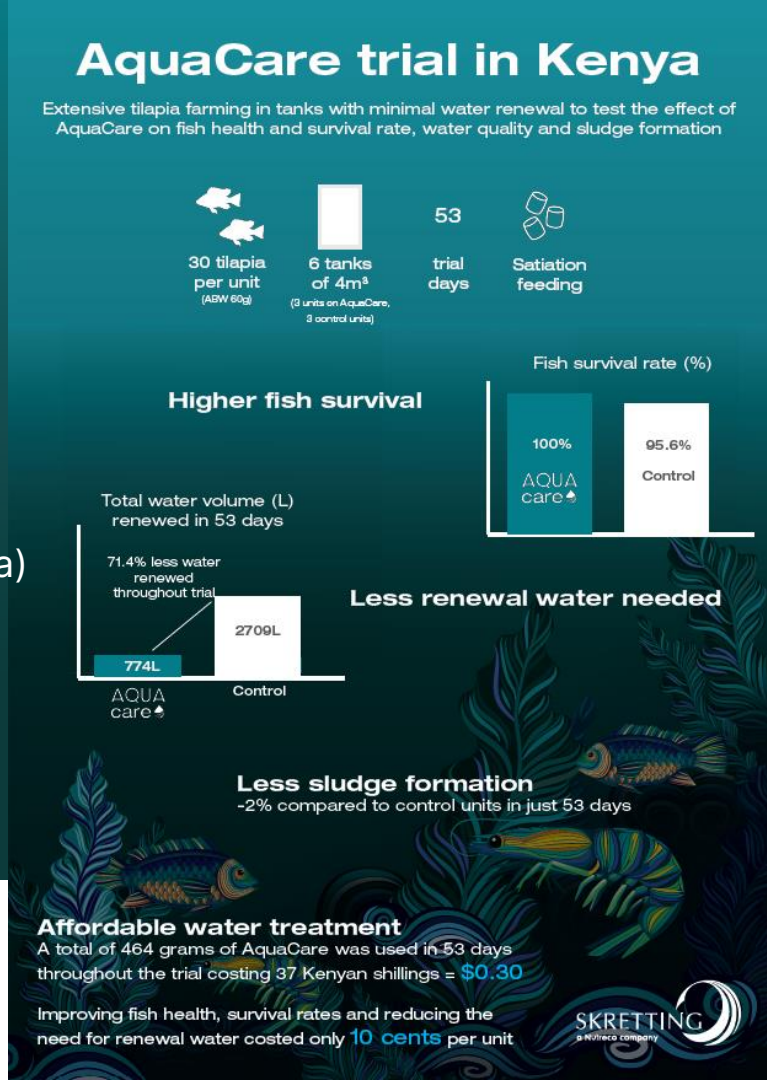
Trial results

A positive effect on

- Water quality
  - more stable ammonia levels (Kenya)
  - Clearer water (Benin, Kenya)
  - Reduced smell (Benin)
  - Less need for water renewals (Benin, Kenya, Nigeria)
- Fish performance
  - Higher survival rates (Kenya, Benin)
  - improved feed intake (Benin)
  - Better growth (Benin)



What we have never seen

- Negative results of adding Aquacare
- Too low oxygen levels for fish
- Increased mortalities

What if fish eat the powder/tablets?

We have seen positive results of the probiotic on the gut and are currently developing products for improvement of fish health

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AQUA care

Probiotic

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When is it best to start using AquaCare Probiotic?

As early as possible in the life cycle.

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How long should I wait before stocking the pond after initial usage of AquaCare Probiotic?

3-7 days.

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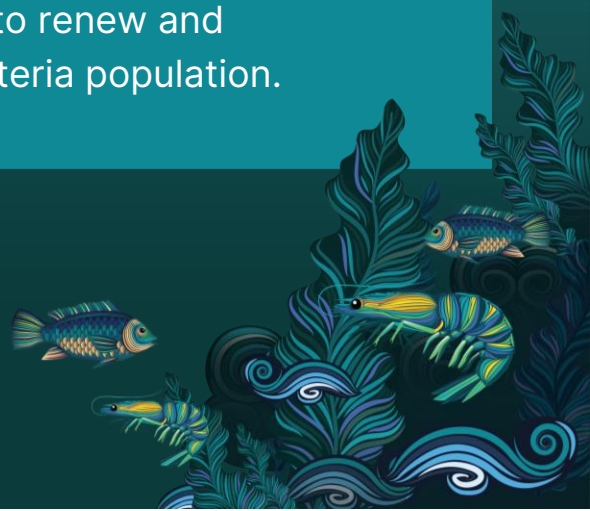
How long does the bacteria last in the pond?

Typical bacteria lifespan is 7 days.

How long does the product work after applied?

Weekly application is recommended to renew and refresh the bacteria population.



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When is the best time to distribute AquaCare Probiotic in the pond?

In the afternoon with aerators on.

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When is the worst time to distribute AquaCare Probiotic in the pond?

When there is low oxygen in the water.

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How to optimise the product usage?

Good bacteria survival depends on:

- Frequent and constant application during the whole duration of the cycle and throughout the years
- Direct application (no fermentation)
- Water quality monitoring to increase dosage during stress periods

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What are the first signs that the product is working?

- The colour of the water will change after a couple of days
- The animal activity will increase after a couple of days
- If you had bad odour of your water, the smell will disappear within 2 to 3 days

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For which species is AquaCare Probiotic most efficient?

All warm water species raised in closed environment.

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Will AquaCare Probiotic boost the performance of functional feed?

Why?

AquaCare Probiotic is the perfect complement to functional feed.

It allows the animal to take the full advantage of high performance feed while reducing nutrient waste

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Does AquaCare Probiotic have an effect on feed consumption?

- As it is distributed in water, AquaCare Probiotic is not intended to have direct effect on fish and shrimp digestion
- However, animals living in a good environment are less subject to stress, may feed more regularly and get more benefits from the feed they ingest
- AquaCare Probiotic can have an indirect positive impact on FCR while reducing feed waste

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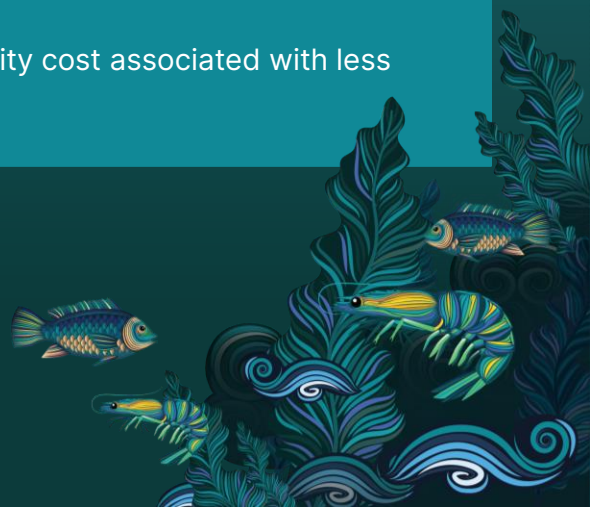
What economical gains are associated with using AquaCare Probiotic?

- Reducing labour engaged for pond preparation and cleaning between cycles
- Increasing yields through better survival and growth rates
- Reducing electricity cost associated with less water pumping



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