

R&D INNOVATIONS ON FISH HEALTH MANAGEMENT AND DISEASE CONTROL

Fisheries Research Institute
Department of Fisheries Malaysia



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FOREWORD

Research and Development as well as Innovation (R&D&I) are key activities at the Fisheries Research Institute (FRI), Department of Fisheries Malaysia. As a major fisheries R&D institution in Malaysia, FRI appreciates the importance of innovation, hence our motto “Leading Fisheries Innovation”. Here at FRI, our innovation ranges from product development, methods of management, efficient ways of doing works and etc.

Fish health is one of the main research themes at FRI. A specific division which is the National Fish Health Research Division or NaFisH was established in FRI to execute R&D in fish health. NaFisH is actively involved in R&D&I in fish health management and disease mitigation including working closely with the local universities, government agencies and private companies.

This booklet is published especially for the 11th Symposium on Diseases in Asian Aquaculture (DAA11). The contents portray the innovation and technology that have been developed with regard to fish/shrimp disease management and control in Malaysia and few others related to it. Several of the innovations are ready to be commercialized and some are still at the field trial stage.

It is hoped that the information shared in this booklet would enable investors, private companies and farmers to know what technology is available and help FRI to commercialize it or test it in their premises to evaluate the effectiveness.

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StrepToKit

PROBLEM



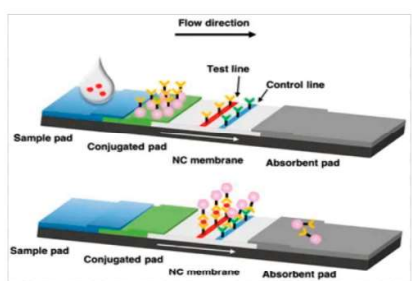
- *Streptococcus agalactiae*, a significant threat which cause Streptococcosis
- Impact: mass mortalities (up to 100%)
- Susceptible size: 300g - 400g
- Clinical signs: erratic swimming, haemorrhagic fin and tail, lethargy and exophthalmia
- No rapid detection of Streptococcosis discovered in Malaysia

SOLUTION



- Rapid detection kit
- An immunodiagnostic kit for detection of *Streptococcus agalactiae* pathogen in tilapia body mucus
- Infected fish can be quarantined immediately to prevent disease spreading

ADVANTAGES



- One step assay
- Fast and low cost, low sample volume
- Simple test procedure, "farmer friendly"
- Qualitative (positive/negative) result
- Applications at point of need
- Long shelf life

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Break & Protect 2 (BP2)

(PI 2017703059)

Marine Leech Remover

PROBLEM

- Fish mortality caused by marine parasite infestation has been reported in the Philippines, Brunei, Indonesia, Singapore, and Malaysia.
- Heavy infestation of this parasite could cause serious injury and secondary infection.
- Current mitigation methods are freshwater or formalin bath and manual removal by hand, towel, or toothbrush, all of which require several workers and are stressful to the fish, as well as tedious and time-consuming.

SOLUTION

- Break and Protect 2: A device for trapping or removing marine leech parasites from fish by disrupting their life cycle.
- It is novel in a way that it could trap the leech from infesting the host (fish) by using information about the leech's life cycle and the natural behaviour of the fish.

ADVANTAGES

- Reduce leech prevalence from 70-100% to 20-28%.
- Able to remove the leech and cocoon from the cages.
- No chemicals are used.
- User-friendly.
- Minimizes secondary infection.



Break & Protect 2
(BP2)



RECOGNITION



Winner £3,000

Commonwealth Secretary-General's Innovation for Sustainable Development Awards 2021



2021
INNOVATION
AWARDS



Gold Medal and 2nd Runner - up

Category Agriculture, Environment and Renewable Energy, iCompEx' 2018



Silver Medal

4th International
Innovation, Design and Articulation i-DeA 2018



3rd Runner - up
(Category Technical
- Individual)

The Department of
Fisheries Innovation
Competition 2018

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Bloated Stomach Fish Treatment Kit

PROBLEM

- Swim bladder disorders commonly occur in groupers (*Epinephelus* spp.).
- Mortality increases up to 100% within 3 days after the onset of positive buoyancy.
- Fish that have been infected may appear bloated and will eventually die from starvation, overexposure to sunlight, or a secondary infection.
- High mortality has been reported in Taiwan, Thailand, Singapore, and Malaysia.
- The existing mitigation methods (air removal using a syringe, a life jacket or wheelchair, or antibiotics) are not practical because they need to be performed repeatedly, involve a long recovery period, and may lead to antimicrobial resistance.

SOLUTION

- KRIPeK was designed to treat swim bladder disorders in tiger groupers (*Epinephelus fuscoguttatus*).
- The product has 2 main procedures;
 - (i) air removal from the swim bladder using a needle and,
 - (ii) force-feeding of functional diet through a tube.

ADVANTAGES

- Reduction in mortality due to timely treatment.
- Reduction of unsold farmed fish due to bloated swim-bladder disorders.
- Reduction in the usage of antibiotics.
- Rapid recovery of treated fish.



RECOGNITION



Silver Medal

CROWN Event A – Professional Inventors
(Educators, Researchers, Designers and Industries) in i-DeA™ 2020



First Place

(Group: Category – Open)

The Department of Fisheries Innovation Competition 2020

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Shrimp Health On-Site Spotter (SHOS-Spotter)TM

TM2021029905

PROBLEM

- Farmed shrimp are often infected with viral and bacterial diseases such as WSSV, IHHNV, Vibriosis, IMNV, EHP, DIV1, WFD, and AHPND.
- Cause huge losses (USD 1.3 billion) due to AHPND (2011–2013) in Malaysia.
- Existing adopted methods are rapid detection kits, PCR, RT-PCR, manual isolation, and histopathology.
- These methods are tedious, require skilled manpower, are expensive, time-consuming, not practical for farmers and causes delay in decision-making.

SOLUTION

- SHOS-Spotter is an on-site method used to determine the health status of farmed shrimp.
- The SHOS-Spotter works by assigning a score to the number of hepatopancreatic cells in the shrimp intestine, ranging from 0 to 2. Farmers can use the SHOS-Spotter to assess the health condition of their shrimp in 1 to 3 hours, determining whether the shrimp has a sick or healthy intestine. This enables farmers to act quickly before the shrimp die.

ADVANTAGES

- Provides early detection.
- A quick method; on-site time of 1 – 3 hours.
- Easy to implement without the need of technical staff.
- Allows farmers to assess shrimp health and take immediate action.



RECOGNITION



Silver Medal

Public Service Innovation Awards
Malaysia Technology Expo 2022



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StrepToVax

(PI 2015702360)

PROBLEM

- Streptococcosis is a common disease in farmed tilapia. The disease is endemic in Malaysia.
- The condition is caused by the bacterium *Streptococcus agalactiae*.
- Symptoms include pop-eye, inflammation of the skin and brain, and erratic swimming behavior. Serious infections can cause up to 60% of deaths.

SOLUTION

StrepToVax

ADVANTAGES

- Vaccines from local bacterial isolates
- Formulated into fish meal; easier to use
- Cheaper
- Less pressure on the fish
- Provide protection for 4 months, with a survival rate of 75 – 80% (based on field tests).



RECOGNITION



Gold Medal and 3rd Runner - up
Category Learning and Teaching, iCompEx' 2018



Gold Medal

Malaysia Agricultural Invention Show (MAGIS) 2015



First Place (Category : Individual)
The Department of Fisheries Innovation
Competition 2016

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Diagnosis Case Procedure Manual Kit



PROBLEM

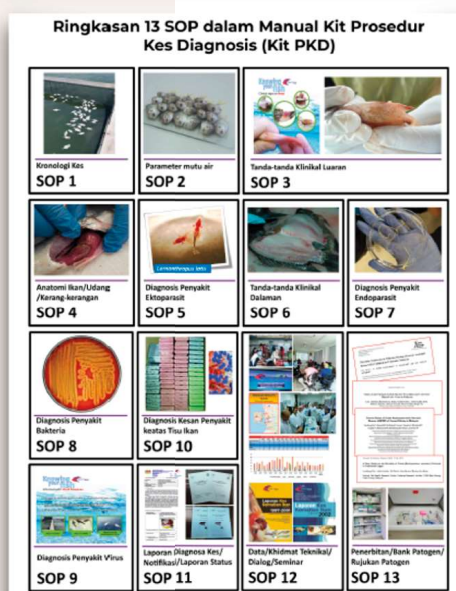
- Lack systematic and scientific cases documentation
- Solely depend on the investigation officer experience

SOLUTION

- Pictorial fish sampling steps for diagnostic cases
- Proper and accurate organ sampling

ADVANTAGES

- Proper documentation of reported cases
- Provide farmers with timely and appropriate recommendations for the diagnosed cases



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RECOGNITION



First Place

(Group: Category – Procedure)

The Department of Fisheries Innovation Competition 2019

Garlex® (CRLY00028224)

PROBLEM

- Slow growth and death due to bacterial infections are two of the most common issues faced by Malaysian marine fish farmers.
- Due to the obvious slow growth, the fish will take longer time to reach marketable size.
- This will raise the cost of labor, the amount of food needed, and the risk of death from diseases or natural disasters like floods or droughts.

SOLUTION

Garlex® is a herbal-based solution extracted from garlic, which is known for its antimicrobial properties. It also serves as an appetizer to increase the fish's appetite.

ADVANTAGES

- A simple and inexpensive technique.
- May be used directly by mixing it with fish meal.
- Acts as a growth promoter and bacterial inhibitor in marine fish.
- Inhibits the growth of bacteria in major organs of fish by up to 80% after a month of being given a Garlex-mixed diet.
- Cheaper than antibiotics.

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Leech-Guard



PROBLEM

Leech infestation in marine fish culture is one of the major problems faced by farmers. It is usually associated with slow growth, and the fish will take a longer period to reach marketable size. This will substantially lead to an increased cost of operation and a risk of death due to diseases or natural disasters. Normally, farmers use formalin to treat leech infestations, which could lead to residues, an increase in production costs, and less profit.

SOLUTION

- Leech - Guard : Noni Extract (Morinda)
- To treat fish that are infested with marine leeches
- Still in the R&D stage and undergoing field testing

ADVANTAGES

- Made from natural compounds.
- There are no residues in the fish tissues or the environment.
- Less expensive than antibiotics.
- Safe and user-friendly.

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RECOGNITION



**Second Place
- Runner up (Group)**

The Department of Fisheries
Innovation Competition 2019

SirehMAX®

(MY-172900-A)

PROBLEM

Aquaculture diseases caused by bacterial infection are significant.

To overcome this, farmers have been using antimicrobials, chemicals, and synthetic drugs.

The use of chemicals may result in the emergence of antimicrobial resistance fish pathogens, residual problems in fish tissue, and may affect human health.

The withdrawal period may increase operating costs.

RECOGNITION



Gold Medal

Malaysia Agricultural Invention Show
(MAGIS) 2015

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SOLUTION

SirehMAX® is a herbal product extracted from betel leaf (*Piper betle*) given orally to treat bacterial infections in aquatic animals.

ADVANTAGES

- Broad-spectrum antimicrobial properties.
- Effective against various fish species, ages, and environments (freshwater, brackish, and saltwater).
- Based on natural ingredients, easy to degrade, and not toxic to fish.
- Can be used for treatment and prophylaxis.
- No withdrawal period.
- Easy to use (immersion and oral).



SitroPro® (PI 2017703131)



SitroPro® is a chemical-free alternative to aquaculture chemicals.

SitroPro® was extracted from selected herbs and has been proven to serve as a therapeutic agent against protozoan parasites and ecto-parasites such as marine leeches (*Zeylanicobdella arugamensis*) in farmed fish.

Marine leech infestation is one of the most serious problems in the aquaculture of marine fish, especially grouper and sea bass. Apart from its therapeutic potential, SitroPro® also acts as an immune-stimulant agent in sea bass cultured in marine cages, potentially lowering mortality and increasing growth rates.

In addition, it has the potential to help increase the survival rate of super intensive shrimp culture. SitroPro® may provide an alternative to the use of chemicals like formalin in aquaculture, reducing risk to farmers and improving food safety.



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Super Intensive Shrimp Culture

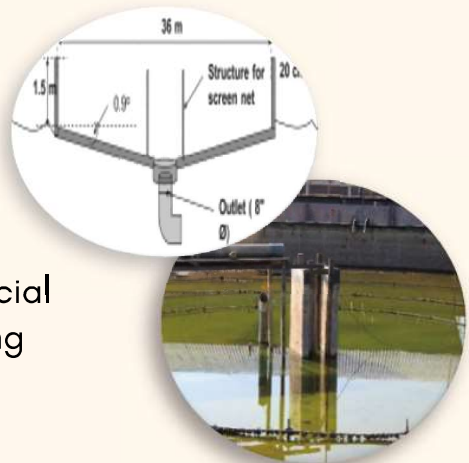


SMALLER ROUND TANKS LAYERED WITH HPDE SUCH AS 1000M³ AND 100M³ TANKS

In order to achieve high shrimp production at a lower cost, a super intensive culture system relies on precise management practices such as high stocking density, central drainage, minimal water exchange, good seed quality, and fully bio-secured system.

THE OUTLET SYSTEM IS LOCATED IN THE CENTRE OF THE POND

There are several risks, including pathogen introduction and escapees. Typically, commercial Pacific White Shrimp operations with a stocking density of 80 to 120 pieces/m² produce approximately 10 – 20 tonnes/ha.



PADDLE WHEEL AND A SUPERCHARGER BLOWER ARE CONNECTED TO AN HDPE PIPE AND A 4M AEROTUBE

A super intensive culture system produces approximately 40 – 50 tonnes/ha of shrimp which is 4 – 5 times more than the normal commercial practice without compromising water quality or shrimp growth performance.

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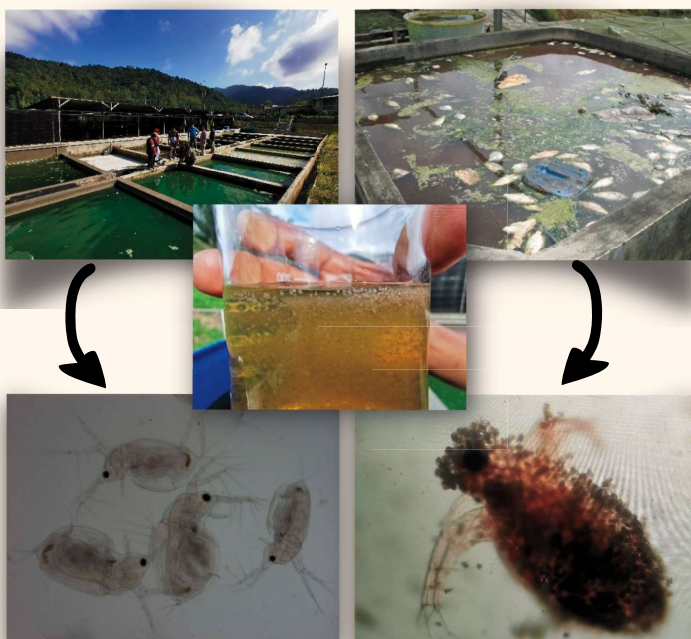
Empathize with Customer

Artemia has long been a staple of aquaculture as a primary live feed. However, due to high demand and limited supply, *Artemia* is expensive. As a result, fish nursery operations have been negatively affected as well.

2

Ideate Solutions

One of the most promising replacements for *Artemia* is *Moina* sp. Wild *Moina* sp. is often found in unsanitary environments, such as sewage ponds or drainage systems, and is known to harbour pathogens.



Hygienic *Moina* sp. Production

3

Define the Problem

Fish fry that are not fed a pathogen-free, nutrient-dense diet may become stunted, disease-prone, and ultimately die. This may have an impact on operations and lead to losses.

4

Innovation Tool

Hygienic *Moina* sp. is produced from intensive and sanitary cultivation procedures.

Advantages :

- Consistent supply
- Cost-effective
- Sustainable
- Hygienic and safe

RECOGNITION



First Place

(Group: Category – Procedure)

The Department of Fisheries Innovation Competition 2020

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PrimeZeal

(MY-182835-A)

PROBLEM

- Fresh unprocessed feed, such as squids, mussels, and worms, is typically fed to prawn broodstock.
- Fresh feed, particularly mussels and worms, is highly susceptible to parasite, bacteria, and virus contamination.
- As a result, hatchery owners avoid using fresh feed. This causes an imbalance of nutrients in the prawn broodstock's feed, affecting their health, survival, and spawning performance.

SOLUTION

PrimeZEat is a moist feed with a formulated composition for better health and increased spawning performance of prawn broodstock.

ADVANTAGES

- Reduces disease transmission among members of the same population
- Increases the survival rate
- Maintains spawning efficiency



RECOGNITION



Gold Medal

iCompEx 2018, Politeknik Sultan Abdul Halim Mu'adzam Shah, Kedah

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LET'S GET IN TOUCH !

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