



# India's National Surveillance Programme for Aquatic Animal Diseases

**P.K. Pradhan and Neeraj Sood**

ICAR-National Bureau of Fish Genetic Resources, Lucknow



# Objectives

- **To detect new and exotic infectious diseases**
- **To collect information on the distribution and occurrence of diseases**
- **To improve reporting obligations of the country to OIE and NACA.**

# A strong network of Aquatic Animal Health Laboratories

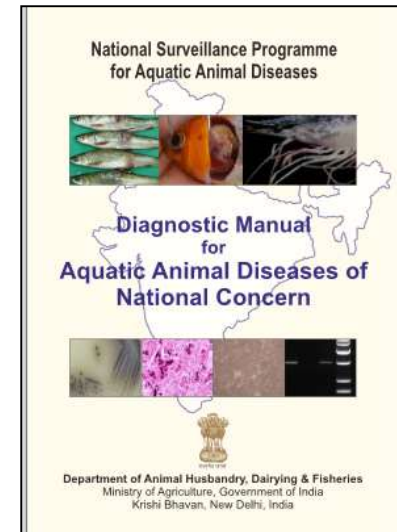


20 states and 2 Union Territories

Collaborating centres: 31

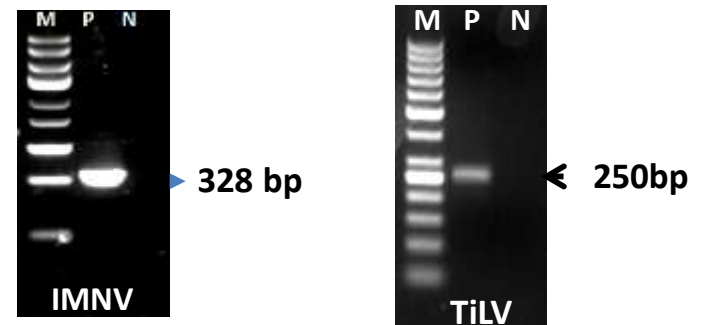
# Manual with Standard Diagnostic Procedures

- Diagnostic protocols for important diseases



## Diagnostic capability for OIE-listed and emerging pathogens

- Positive controls of fish diseases from OIE referral laboratories



# Strengthening passive disease surveillance: Awareness



# Strengthening passive disease surveillance: Awareness Literature

**SENSITIZATION WORKSHOP ON "AQUATIC ANIMAL DISEASES IN ASSAM"**  
Under the National Surveillance Programme for Aquatic Animal Diseases  
**October 17, 2015**

**Background document**

**ICAR-CENTRAL INLAND FISHERIES RESEARCH INSTITUTE REGIONAL CENTRE**  
Gowalhati - 781006, Assam



**बढ़ती मछलियों में बीमारी**

आज हमें मछलियों में होने वाली बीमारियों की निगरानी बढ़ाकर करना पड़ेगा

**शीघ्र खेत की मजदूरियों की प्रमुख बीमारियाँ तथा उनसे ज्ञान**

राष्ट्रीय नवोदय संस्थान, गुवाहाटी

**एनएसपी कार्यक्रम के तहत**

एनएसपी कार्यक्रम के तहत राष्ट्रीय नवोदय संस्थान, गुवाहाटी में मछली बीमारी निगरानी कार्यक्रम का शुभारंभ हुआ।

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**मछली बीमारी निगरानी**

मछली बीमारी निगरानी कार्यक्रम के तहत राष्ट्रीय नवोदय संस्थान, गुवाहाटी में मछली बीमारी निगरानी कार्यक्रम का शुभारंभ हुआ।

**10 µm**

**8**

**10 µm**

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**National Surveillance Programme for Aquatic Animal Diseases**

**अन्तःरासायनिक यूरिडोपीनार्थ**  
**Enterocytozoon hepatopenaei(EHP)**

**एनएसपी कार्यक्रम के तहत**

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**National Surveillance Programme for Aquatic Animal Diseases**

**अन्तःरासायनिक यूरिडोपीनार्थ**  
**अर्ली मोर्टैलिटी सिंड्रोम**  
**Early Mortality Syndrome**

**एनएसपी कार्यक्रम के तहत**

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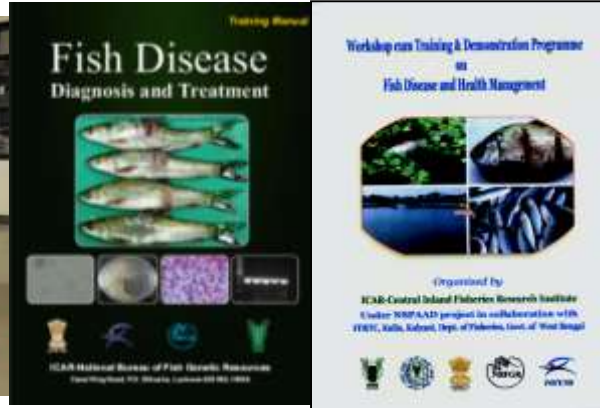
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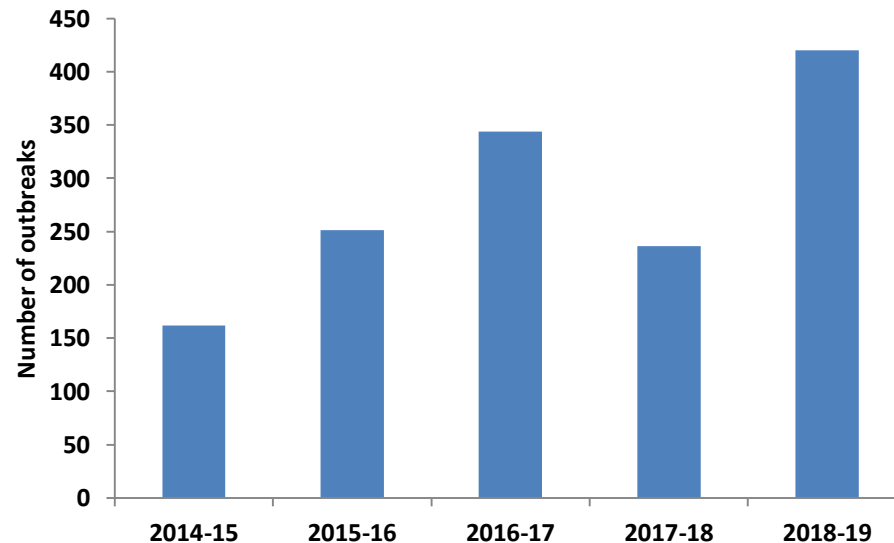
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# Training the Officers of State Fisheries Departments

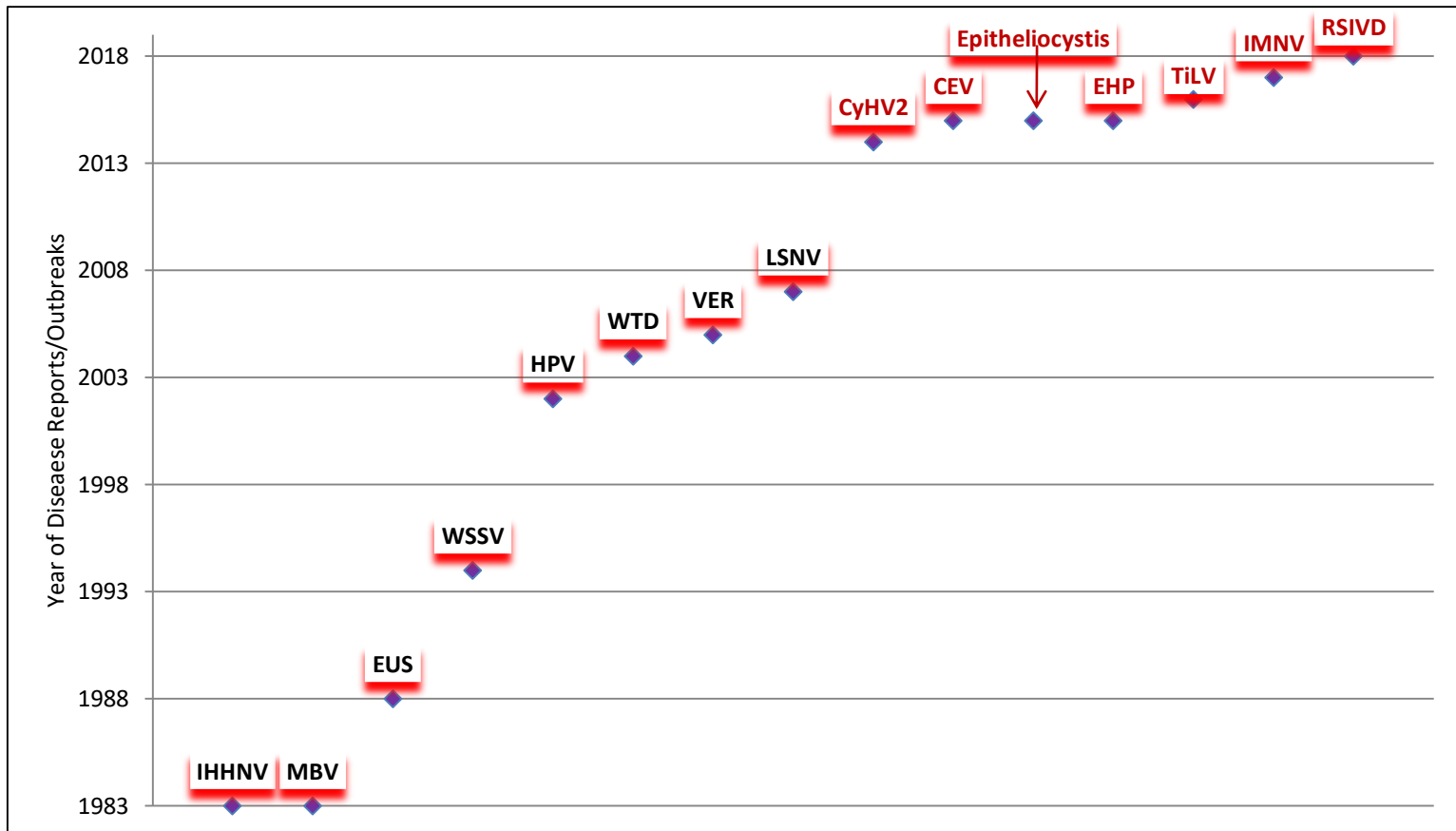


# Passive Surveillance

- Awareness programmes: 521 (23354 farmers)
- Training Programmes: 56 (1413 fisheries officers/Research scholars)
- Disease outbreaks investigated: 1413





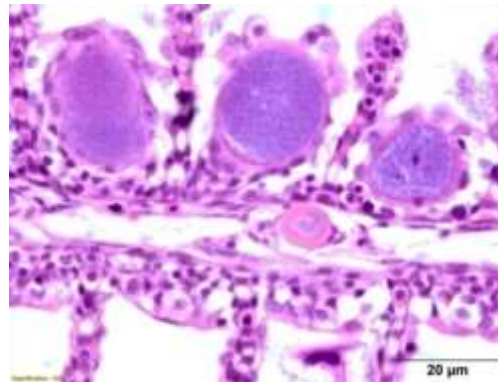


**Year of first reporting of new diseases**

# New Pathogens Detected



***Enterocytozoon hepatopenaei***



***Ca. Actinochlamydia pangasiae*  
sp. nov**



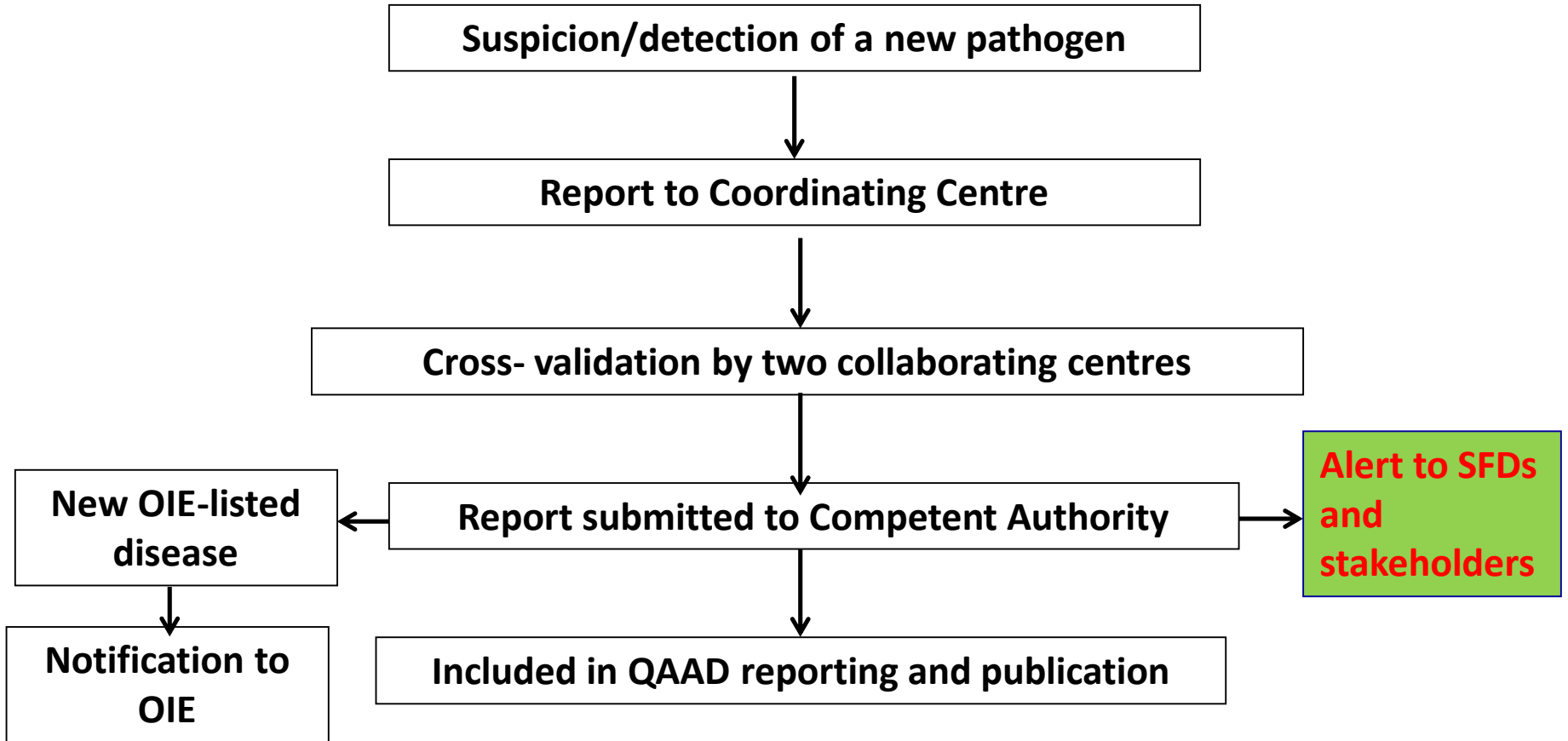
**Infectious myonecrosis virus**



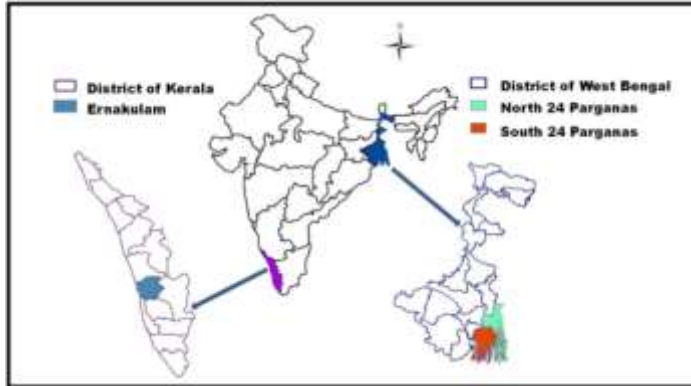
**Red sea bream iridovirus**

**All the first reports have been published in peer reviewed international journals**

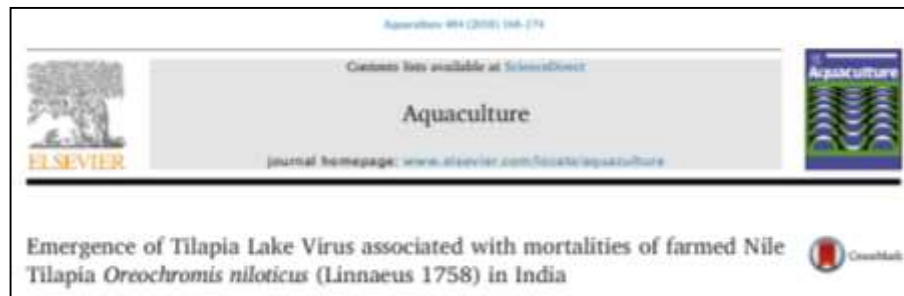
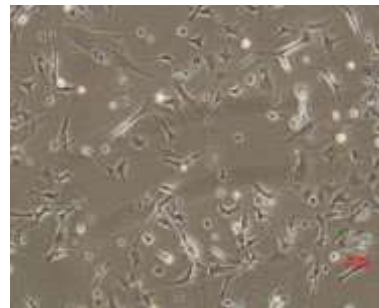
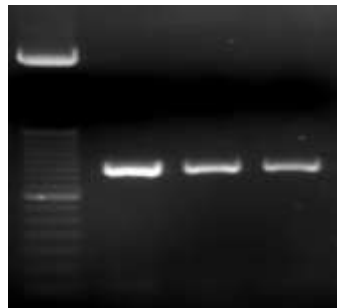
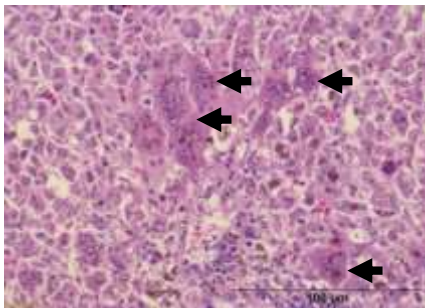
# Reporting Mechanism for a new disease





# Infection with Tilapia lake virus (TiLV)



- Sent an alert to State Fisheries Departments along with action points



# TiLV alert under NSPAAD and prompt action by Govt. of India

 **भा.कृ.अनु.प.—राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो**  
**ICAR-National Bureau of Fish Genetic Resources** 

डॉ. कुलदीप कुमार लाल, निदेशक  
Dr. Kuldeep K. Lal, Director

No. G/NSPAAD/2017-15/3  
Dated: 30.05.2017

Sub: Precautionary measures for preventing introduction/spread of Tilapia lake virus in the country- regarding

THE HINDU

## ICAR alerts MPEDA on Lake Virus in Tilapia fish

It's a popular variety in U.S.

HAJULAPUDI SRINIVAS  
VILAYAWADA

Here is an alert to aqua farmers on the spread of dreaded Lake Virus, in Tilapia fish in India. The Indian Council of Agricultural Research (ICAR) has sounded a caution to farmers on



URGENT  
By Speed Post

F. No. J-1460527/2017-Fy  
Government of India  
Ministry of Agriculture and Farmers' Welfare  
Department of Animal Husbandry, Dairying & Fisheries

Krishni Bhawan, New Delhi-110002  
Dated the 15<sup>th</sup> June, 2017

To  
Commissioner/Director of Fisheries  
Government of \_\_\_\_\_

Subject: Precautionary measures for preventing introduction/spread of Tilapia lake virus in the country-regarding

Sr,

I am directed to refer to the above mentioned subject and to state that an alert has been received about Tilapia Lake Virus (TiLV), which is considered to be an emerging disease and is responsible for heavy mortalities in tilapia population. Recently incidence of TiLV for tilapia mortalities in West Bengal has been reported, which is under confirmation.

OIE disease card, NACA Advisory on TiLV infection along with a brief write up on the disease are enclosed herewith for information of all concerned.

Department of Fisheries in all the States/UTs are advised to take following measures for prevention and control of incidence and spread of TiLV.

- In case of suspected cases of TiLV infection, a report to be reported immediately to the nearest collaborating centre of National Surveillance Programme for Aquatic Animal Diseases (NSPAAD) under intimation to this Department and National Bureau of Fish Genetic Resources (NBFG), Lucknow.

DEPARTMENT OF FISHERIES, ODISHA, CUTTACK.

2414061-EAX-0671-24105,ccs@director.odfish@gmail.com

Letter No. 9168 /RD-XVII-Resh-14/16

Dated, Cuttack 15<sup>th</sup> June, 2017

District level Officers/DFO, Kausalyagang Fish Farm/Nodal Officer, WorldFish, Project Manager, WorldFish Project.

Sub: Alert on-Tilapia lake virus (TiLV)-regarding.

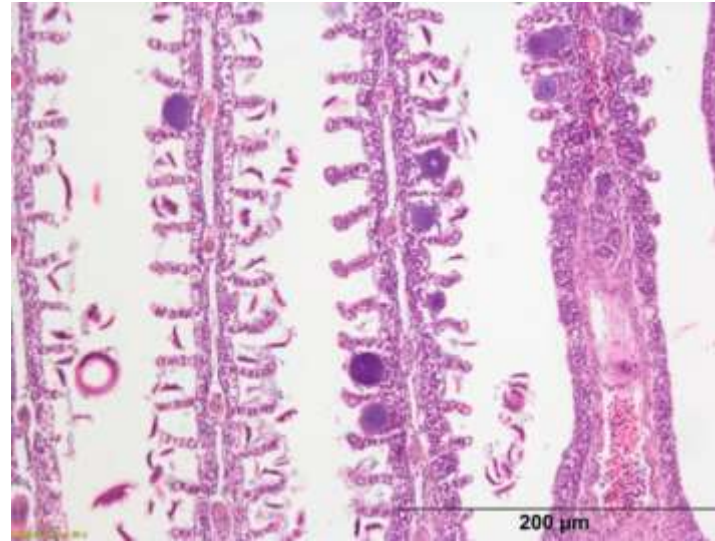
Sir,

With reference to the subject cited above, I am directed to inform you that as present Tilapia lake virus (TiLV) is an emerging disease which causes heavy mortalities in Tilapia populations in culture pond. On the above issue TiLV infection, Disease card of OIE, Disease advisory from NACA and a list of collaborating centres of National Surveillance programme for Aquatic Animal Disease (NSPAAD) with contact details is furnished herewith for your guidance.

You are therefore requested if in any case mortalities in Tilapia populations exhibit clinical signs similar to TiLV, you immediately intimate to the nearest collaborating centre of NSPAAD with a copy to coordinating centre ICAR-National Bureau of Fish Genetic Resources (NBFG).

Yours faithfully

# Scientific advice to farmers- a case study



Tank II = 26/5/15 6100

Date	Feed	Wt	Balance
26/5/15 To 28/5/15	140 kg	7	6093
28/5/15 To 30/5/15	104 "	175	5898
30/5/15 To 31/7/15	369 "	1261	4637
31/7/15 To 7/10/15	146 "	0	4637
7/10/15 To 20/10/15	267 "	1	4636
20/10/15 To 22/10/15	406 "	0	4636
22/10/15 To 23/10/15	533 " (1905 kg)	0	4638
23/10/15 To 31/10/15	708 " (8733)	22	4606
31/10/15 To 2/11/15	347 " (3189)	3	4603
Total feed = 3482 kg			
Wt out = 6024			
Total wt = 1916 kg (55%) = 3011 days			
Total cost = 1477 @ 24%			
Survival/surplus = 433 (Survival) (40 from 100)			

(4) 6100 26/5/15

Date	Feed	Wt	Balance
26/5/15 To 28/5/15	140 kg	19	6081
28/5/15 To 30/5/15	104 "	171	5910
30/5/15 To 31/7/15	370 "	1052	4858
31/7/15 To 7/10/15	146 "	1	4857
7/10/15 To 20/10/15	267 "	3	4854
20/10/15 To 22/10/15	406 "	0	4854
22/10/15 To 23/10/15	531 " (1974)	0	4851
23/10/15 To 31/10/15	768 " (8742)	2	4849
31/10/15 To 2/11/15	447 " (3189)	3	4846
Total feed = 3189 kg			
Wt out = 4976			
Total cost = 1124 @ 24% (Survival/surplus) = 1306 kg			
Survival wt = 438 gm FCR = 1.498 (Wt out = 1.8)			
22/12/15 6500 kg (180 gm) = 6800			

Records of farmer from Barabanki, Uttar Pradesh culturing Pangas

# **Active surveillance- a case study**

# CHECKLIST 1: Scenario setting

National status of the disease in question: **White spot syndrome virus (WSSV)- present**

WSSV surveillance: **Yes**

Do you know the status of WSSV in your trading partners or neighbouring

Countries: **Yes**

Do you share watershed with another country: **Yes**

Data sources: **Existing surveillance/ Scientific Reports/QAAD reports**

What is country scenario: **Scenario 1: Infected status**

But status of disease in this northern provinces is unknown



Distribution map of WSSV in India



## CHECKLIST 2: Defining surveillance objective

**Objective: To investigate the presence or absence of WSSV in farmed shrimp populations in inland saline waters of Haryana**

- 400ha used for inland saline shrimp culture
- Culture of *Litopenaeus vannamei*
- Potential for high health status
- Isolated water source – borewell
- Strict biosecurity feasible



## CHECKLIST 3: Defining population

Populations of interest:

Targeted populations: Grow-out farms of *Litopenaeus vannamei*: 139

Studied populations: Sampled farms: 51



**CHECKLIST 4: Clustering of disease!!**



## CHECKLIST 5: Case Definition

**Clinical:** A disease of shrimps characterized by appearance of discrete white spots on exoskeleton and associated with high mortalities

**Laboratorial:** A shrimp which yields positive PCR result for WSSV and sequenced products showing homology with WSSV sequences .

**Epidemiological:** A pond where one or more shrimp have one or more visible, discrete white spots on the exoskeleton; pond subjected to emergency harvest because, in the opinion of the manager, there is a risk of mass mortality from white spot syndrome (FAO 2004).

## **CHECKLIST 6: Diagnostic testing Description of tests**

- **Gross Observations (Level I)**
- **Histopathology (Level II)**
- **Nested PCR of Tissues (Level III)**
- **Sequencing of PCR products (Level III)**

# CHECKLIST 7: Study design and sampling

SHRIMP PREVALENCE %	FARM PREVALENCE %	NUMBER OF FARMS TO SAMPLE	NUMBER OF SHRIMP TO SAMPLE	HERD SENSITIVITY (PROBABILITY OF DETECTION IF TRULY POSITIVE)
10	2	114	15	0.78
15	2	95	14	0.95
20	2	95	14	0.95
30	2	95	9	0.95
10	3	82	15	0.79
20	3	68	14	0.95
30	3	68	9	0.95
10	5	62	15	0.78
15	5	51	19	0.95
20	5	51	14	0.95
30	5	51	9	0.95

- Considering the resources available – it is possible to sample a maximum of 50 farms and to collect 10-15 samples from each farm.
- Detecting infection in farms at a prevalence of less than 5% is not possible with the resources available.
- Taking 15 shrimp per pond is enough to detect disease in the pond with 95% probability, if the prevalence within the pond i.e. of infection in the shrimp, is more than 10% . <http://epitools.ausvet.com.au/content.php?page=2StageFreedomSS1>

# CHECKLIST 8: Data collection and management

Farm No:

फार्म संख्या:

**झींगा स्वास्थ्य सर्वेक्षण**  
SHRIMP HEALTH SURVEY

**गोपनीय**  
Confidential

Date:  (dd/mm/yy)  
दिनांक

Time:

1. क्या आप यही व्यक्ति हैं जो इस फार्म की प्रत्येक दिन की अवधि में देखभाल करते हैं जिसमें हमारी रुचि है?  
(Are you the person who looked after this farm every day during the time period we are interested in?) YES/हाँ   
NO/नहीं   
DON'T KNOW   
नहीं जानते हैं

2. आपके पास कितने तालाब हैं?  
(How many ponds do you have? (please circle) 1 2 3 4 5 6 7 8 9 10 11 12) नहीं जानते हैं   
Don't know

3. इस फार्म का कुल तालाब क्षेत्र कितना है?  
(What is the total pond area on this farm?)  एकड़ /  हेक्टेर  नहीं जानते हैं   
Don't know

4. क्या भूमि पर किसान द्वारा कृषि की जाती है अथवा पट्टा पर है अथवा किराये पर है अथवा अन्य?  
(Is the land farmed by the owner or leased or rented?)  मालिक  LEASE  RENTED  अन्य  OTHER (please specify)   
नहीं जानते हैं

**CURRENT CROP**

5. क्या आपके किसी तालाब में किसी भी झींगा की मृत्यु हुई?  
(DURING THIS CROP did you see any dead shrimp in any of your ponds?) YES/हाँ   
NO/नहीं   
DON'T KNOW   
नहीं जानते हैं

6. कितने तालाब प्रभावित हुए?  
(How many ponds were affected?)  1 2 3 4 5 6 7 8 9 10 11 12   
(Please circle/please write #)

7. इनमें से कौन सी कथनों में इन मौतों की संख्या और पैटर्न (प्रतिमान) का सबसे अच्छा वर्णन करता है?  
(Which of these statements best describes the number and timing (pattern) of these deaths?)

A. अब तक की सम्पूर्ण अवधि के दौरान हर सप्ताह कुछ मृत झींगे दिखाई दिए  
(A few dead shrimps seen EVERY WEEK during the whole period)



# Sampling of shrimp farms in Haryana





# CHECKLIST 9: Data analysis

RISK FACTOR FOR MORTALITY											
FARM_NO	NO_PDS	DEAD_SHR	PDS_AFF	YOUR_OPI	PD_DRAIN	PD_DRY	DO_PD_BOT	PD_BOT_TRI	PD_FERT	SEED_SPF_Y	FD_COM_W
1	8	No	0		Yes	Yes		Yes		No	Avanti feeds
2	8	No	0		Yes	Yes	Yes			Yes	Avanti feeds
3	4	Yes	1	pH change	Yes	Yes	Yes	Yes	Yes	Yes	Cargill feeds
4	12	Yes	1	Moulting prob	Yes	Yes	Yes	Yes	Yes	Yes	Growell, Car
5	2	No	0		Yes	Yes	Yes	Yes	Yes	No	Cargill feeds
6	2	No	0		Yes	Yes	Yes	Yes		No	Cargill feeds
7	5	No	0		Yes	Yes	No	Yes		No	OM Parvan f
8	5	Yes	2	Lack of oxygen	Yes	Yes	Yes	Yes	Yes	No	Growell feer
9	5	Yes, Continuou	4	Disease	Yes	Yes	Yes		Yes	No	Cargill feeds
10	18	No	0		Yes	Yes	Yes			Yes	CP Aqua
11	8	Yes	2		Yes	Yes	Yes	Yes		Yes	Om Prawn fe
12	3	No, slow grow	0		Yes	Yes	Yes	Yes		Yes	Avanti in Sta
13	5	No, slow grow	2		Yes	Yes	Yes	Yes		999	Om Prawn fe
14	21	No	0		Yes	Yes	Yes	Yes		Don't know	Om Prawn fe
15	7	Yes	2	Ammonia	Yes	Yes		Yes		Yes	ABIS feeds
16	5	Yes	1	Loose shell syr	Yes	Yes	Yes	Yes		Yes	Om Prawn fe
17	9	Yes	4	Mineral defici	Yes	Yes	Yes	Yes		Yes	Avanti feeds
18	2	Yes (First crop)	1	Disease	Yes	Yes	Yes	Yes		No	Avanti feeds
19	5	Yes	3	Moulting prob	Yes	Yes	Yes	Yes	Yes	Don't know	Avanti feeds
20	3	No	0		Yes	Yes	Yes	Yes		Yes	Om Prawm f
21	17	No	0		Yes	Yes	Yes	Yes		Yes	Cargill feeds
22	6	Yes	3	White feces sy	Yes	Yes	Yes	Yes		No	Om prawn fe
23	23	No	0		Yes	Yes	Yes	Yes		Yes	Daksh, RNK (
24	2	No	0		Yes	Yes	Yes	Yes	Yes	Yes	RNK, Andhra
25	3	No	0		NA	NA	NA		Yes	Yes	Avanti feeds

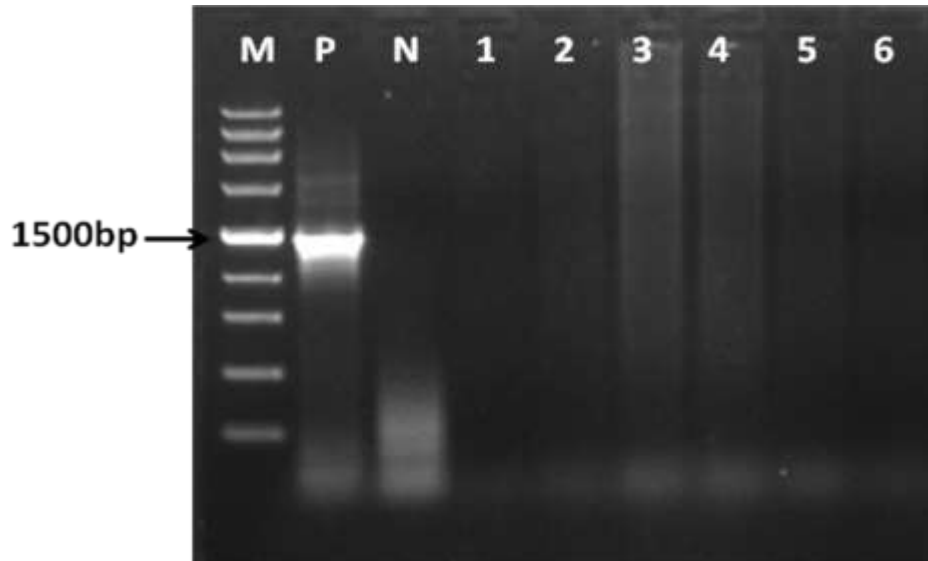
# Pond preparation

- Draining and drying – ALL
- Mechanical treatment of bottom
  - Earthen
    - Ploughing 86.7%
    - Silt removal 6.7%
    - Both 3.3%
  - Lined - Mud pump, washed or cleaned with cloth
- Chemical treatment of bottom
  - Bleaching powder 78.6%
  - Lime 40.5%
  - Probiotics 60.0%

# Stocking

- Stocking density(*estimated - number/pond area*)
  - Median 150,000/acre
  - Range 100,000 - 400,000
- PL Size
  - Median 8
  - Range 6.5-12
- Health status of seed
  - SPF 51.2%
  - Not SPF 20.9%
  - Unknown 27.9%
- Origin of seed – 4 states
  - Andhra 85.7%
  - Pondicherry 9.5%
  - West Bengal & Odisha 2.4%

# Screening for WSSV



All the shrimp samples were negative for WSSV in nested PCR

**Inference: It could be inferred that WSSV infection was absent in shrimp farms in inland saline areas of Haryana, assuming farm prevalence of 5% and shrimp prevalence of 20% with confidence level of 95%.**

# Dispelling Rumours: Acute Hepatopancreatic Necrosis Disease

- Rumours about EMS in shrimp farms from India during 2013.
- Emergency response team constituted
- Sampling was undertaken in suspected areas- Andhra Pradesh, Tamil Nadu.
- **None of the samples positive for AHPND.**
- Subsequently, over last 4 years, more than 12000 shrimp samples screened

# FAO 'Re-echo Seminar and Round-Table Discussion on AHPND National Action Planning' (Sept. 2015)

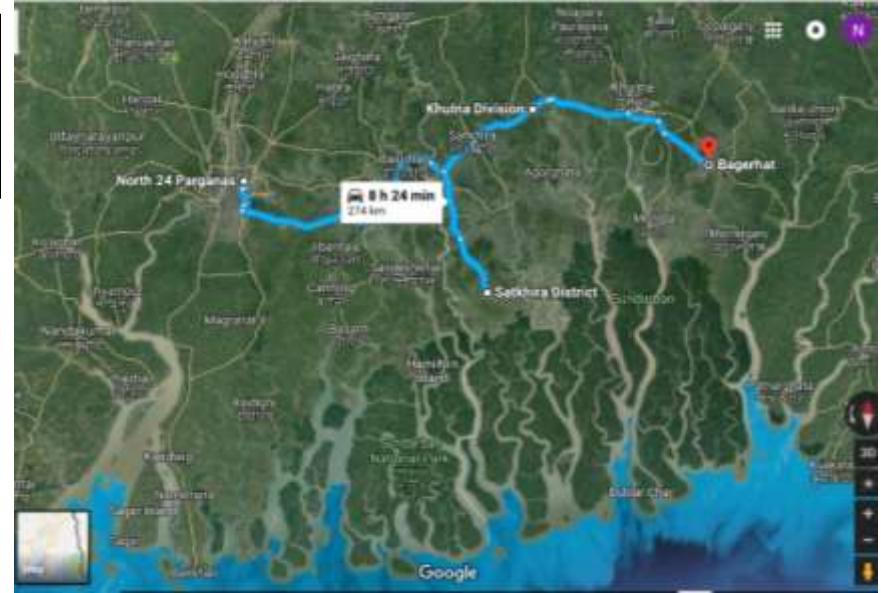


# Threat of AHPND in 2017!

*J. Bangladesh Acad. Sci., Vol. 41, No. 2, 127-135, 2017*

**MOLECULAR IDENTIFICATION OF AHPND POSITIVE *VIBRIO* PARAHAEMOLYTICUS CAUSING AN OUTBREAK IN SOUTH-WEST SHRIMP FARMING REGIONS OF BANGLADESH**

- Intimation to Competent Authority, for issuing alerts



**Mass awareness program in North 24 Parganas, West Bengal**



# National Database on Aquatic Animal Diseases



- Home
- Collaborating Centers
- Research Group
- States Covered
- Gallery
- Events
- Download
- Login

## Download

- NSPAAD Application User Manual
- Format for Baseline Information of the Farm
- Format for Biological Sample Collection- Finfish
- Format for Biological Sample Collection- Crustaceans
- Format for Biological Sample Collection- Molluscs
- Format for Collection of Information from Disease Outbreak- Finfish
- Format for Collection of Information from Disease Outbreak- Crustaceans
- Format for Collection of Information from Disease Outbreak- Molluscs



## BASE LINE DATA OF THE FARM

Date : *	
State : *	
District : *	
Block : *	
Village : *	
<b>Contact details :</b>	
Name of the farm :	
The farm has been operational since (year) :	
Owner of the farm :	
Contact person name : *	
Village :	
Block :	
Pin code :	
Phone No :	
<b>GPS Coordinates :</b>	
Latitude :	
Longitude :	
<b>Details of the farm :</b>	
Ownership of the farm :	<input type="checkbox"/> Owned <input type="checkbox"/> Community <input type="checkbox"/> Leased <input type="checkbox"/> State farm <input type="checkbox"/> None
If leased :	From:                      To:
Type of farm : *	<input type="checkbox"/> Brackishwater <input type="checkbox"/> Cold water <input type="checkbox"/> Freshwater <input type="checkbox"/> Mariculture

### NSPAAD LOGIN PANEL

Welcome To NSPAAD! Please enter your user name and password to sign in

Username

Password

**LOGIN**  Remember me



Pradeep Mandal farm, Balasore, Odisha



# Quarterly Aquatic Animal Disease (QAAD) Reporting

- Significant improvement in QAAD reporting
- Reporting on basis of level III diagnosis
- NSPAAD highlighted internationally in QAAD report by OIE/NACA/FAO ([1494556312\\_quarterly-aquatic-animal-disease-report-october-december-2016.pdf](http://1494556312_quarterly-aquatic-animal-disease-report-october-december-2016.pdf))



Country: **INDIA\*** Period: **January - March 2019**

Item	Disease status <sup>1</sup>			Level of diagnosis	Epidemiological comment numbers
	January	February	March		
<b>DISEASES PREVALENT IN THE REGION</b>					
<b>FINFISH DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Infection with epizootic haematopoietic necrosis virus	0000	0000	0000		
2. Infection with infectious haematopoietic necrosis virus	0000	0000	0000		
3. Infection with spring viraemia of carp virus	0000	0000	0000		
4. Infection with viral haemorrhagic septicaemia virus	0000	0000	0000		
5. Infection with <i>Aphanizomenon foveolatum</i> (AFV-1)	-	-	-		
6. Infection with red sea bream iridovirus (2013)	(2013)	(2013)	(2013)		
7. Infection with koi herpesvirus	0000	0000	0000		
<b>Non OIE-listed diseases</b>					
8. Groupers iridovirus disease	0000	0000	0000		
9. Viral encephalopathy and retinopathy	-	-	-		
10. Enteric septicaemia of flatfish	0000	0000	0000		
11. Carp edema virus disease	-	-	-		
12. Tilapia lake virus (TiLV)	-	-	1/1	III	1
<b>MOLLUSC DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000		
2. Infection with <i>Perkinsus olseni</i>	1/1	1/1	1/1	II, III	2
3. Infection with abalone herpes-like virus	0000	0000	0000		
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
5. Infection with <i>Marjitelloides chungmaensis</i>	0000	0000	0000		
6. Acute viral necrosis (in scallops)	0000	0000	0000		
7. Akoya oyster disease	0000	0000	0000		
<b>CRUSTACEAN DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Taura syndrome	0000	0000	0000		
2. White spot disease	1/1	1/1	1/1	I	1,2
3. Yellowhead disease	***	***	***		
4. Infectious hypodermal and haematopoietic necrosis	***	***	***		
5. Infectious myonecrosis	0000	0000	0000		
6. White tail disease (MrNV)	-	-	-		
7. Necrotising hepatopancreatitis	0000	0000	0000		

Country: **INDIA** Period: **January - March 2013**

Item	Disease status <sup>1</sup>			Level of diagnosis	Epidemiological comment numbers
	January	February	March		
<b>DISEASES PREVALENT IN THE REGION</b>					
<b>FINFISH DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Epizootic haematopoietic necrosis	0000	0000	0000		
2. Infectious haematopoietic necrosis	0000	0000	0000		
3. Spring viraemia of carp	0000	0000	0000		
4. Viral haemorrhagic septicaemia	0000	0000	0000		
5. Epizootic ulcerative syndrome	-	-	-		
6. Red sea bream iridovirus disease	0000	0000	0000		
7. Koi herpesvirus disease	0000	0000	0000		
<b>MOLLUSC DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Infection with <i>Bonamia exitiosa</i>	0000	0000	0000		
2. Infection with <i>Perkinsus olseni</i>	-	-	-		
3. Infection with abalone herpes-like virus	0000	0000	0000		
4. Infection with <i>Xenohaliotis californiensis</i>	0000	0000	0000		
<b>Non OIE-listed diseases</b>					
5. Infection with <i>Marjitelloides chungmaensis</i>	0000	0000	0000		
6. Acute viral necrosis (in scallops)	0000	0000	0000		
7. Akoya oyster disease	0000	0000	0000		
<b>CRUSTACEAN DISEASES</b>					
<b>OIE-listed diseases</b>					
1. Taura syndrome	0000	0000	0000		
2. White spot disease	1/1	1/1	1/1	I	1,2
3. Yellowhead disease	***	***	***		
4. Infectious hypodermal and haematopoietic necrosis	***	***	***		
5. Infectious myonecrosis	0000	0000	0000		
6. White tail disease (MrNV)	-	-	-		
7. Necrotising hepatopancreatitis	0000	0000	0000		

# **Impacts of National Surveillance Programme**

- **A strong network of Aquatic Animal Health Laboratories**
- **Strengthening of passive disease surveillance in the country**
- **Diagnostic capability for OIE/NACA listed/emerging diseases**
- **Detection of several new pathogens**
- **System for alerts and advisories to stakeholders**
- **Transparent disease reporting**
- **Publications in peer reviewed journals**



**Team NSPAAD**

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- **Prof. C.V. Mohan, Former Research and Dev. Manager, NACA**
- **Dr. Eduardo Leano, NACA, Bangkok**
- **State Fisheries Departments**
- **Collaborating Centres of NSPAAD**

A large quantity of fresh, light-colored shrimp are piled in numerous blue and yellow plastic crates. The shrimp are densely packed, filling most of the crates. A small wooden tray is visible in the middle of the pile. The background shows a concrete floor and a grey tarp.

**Thanks for your kind  
attention...**