Diagnostic capacities (IZSVe Reference Laboratory)



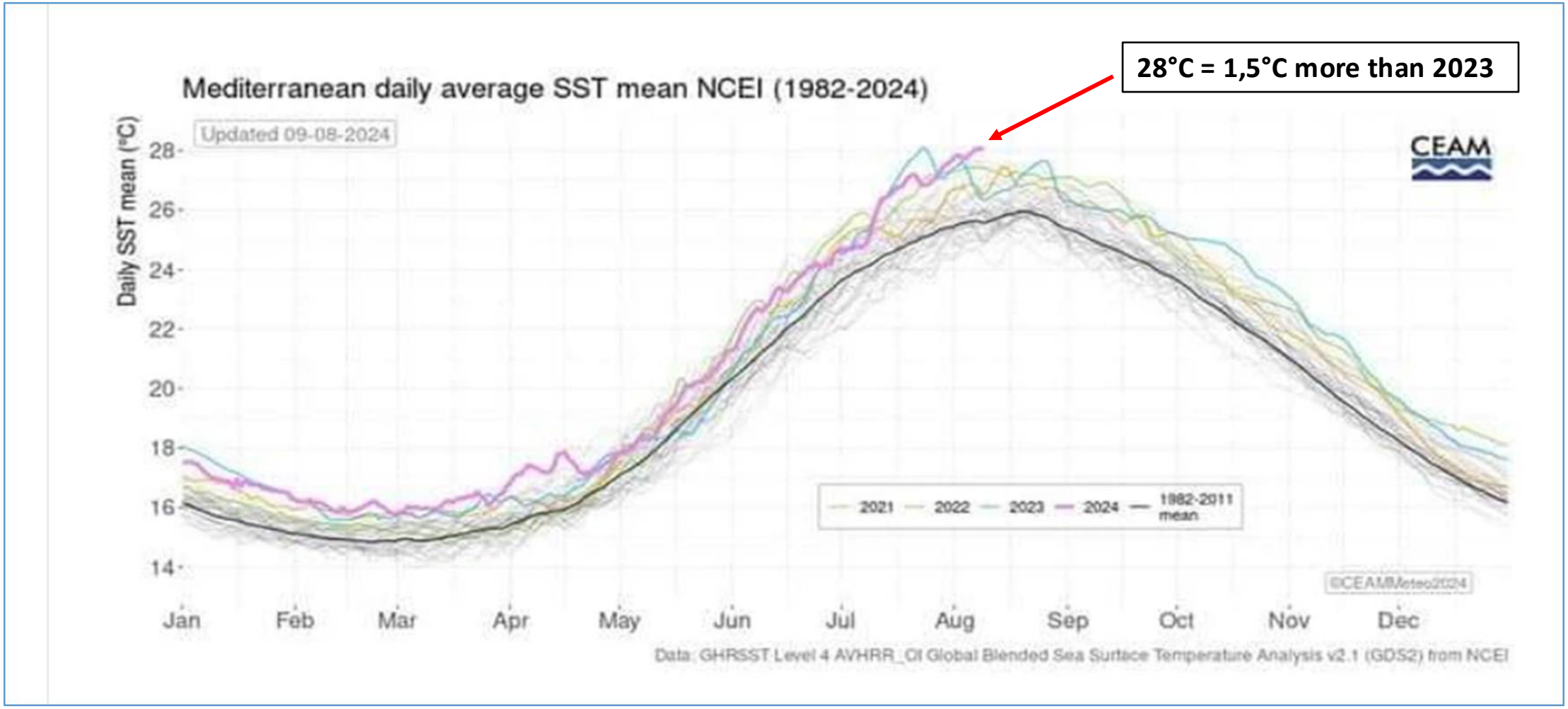
Amedeo Manfrin

WOAH Reference Laboratory for Viral Encephalopathy and Retinopathy

Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro, Italy

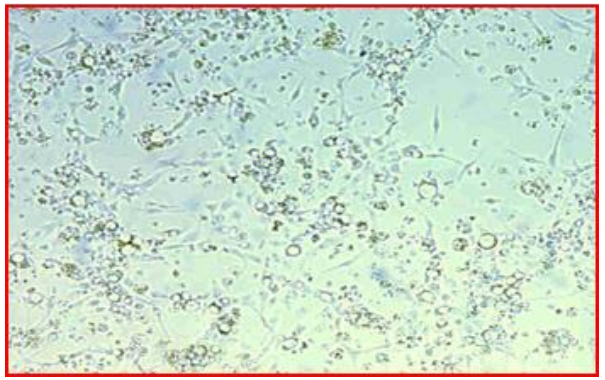
AQMENET National Focal Points training - Jeddah October 28th 2025

Climate change is a big issue in the world: see average water temperature in Mediterranean sea



The most important disease: VER-VNN

- Viral Encephalopathy and Retinopathy (VER) syn. Viral Nervous Necrosis (VNN) is a severe neuropathological disease caused by RNA viruses of genus *Betanodavirus* (Fam. *Nodaviridae*).
- It was detected from the first time in late ’80 but rapidly spread worldwide
- Due to its broad host range, extended geographic diffusion and economic impact VNN is included among the most significant viral pathogens of finfish



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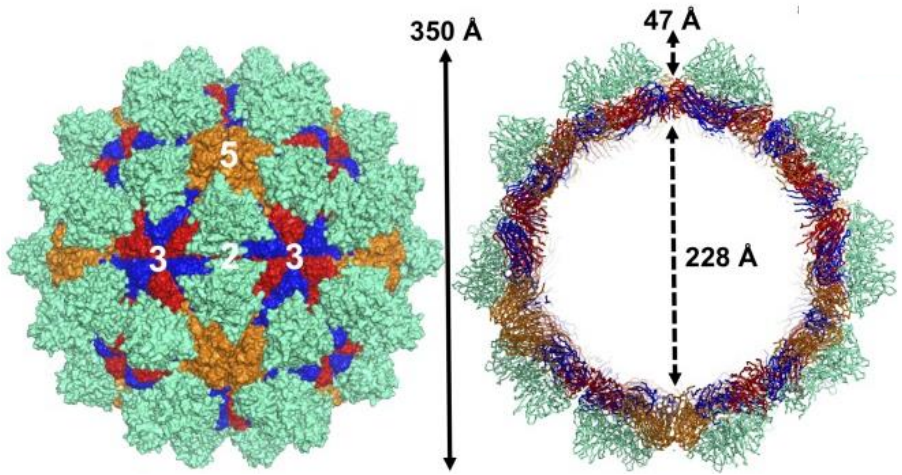
Aetiological agent

CRYSTAL STRUCTURE OF GNNV-LP

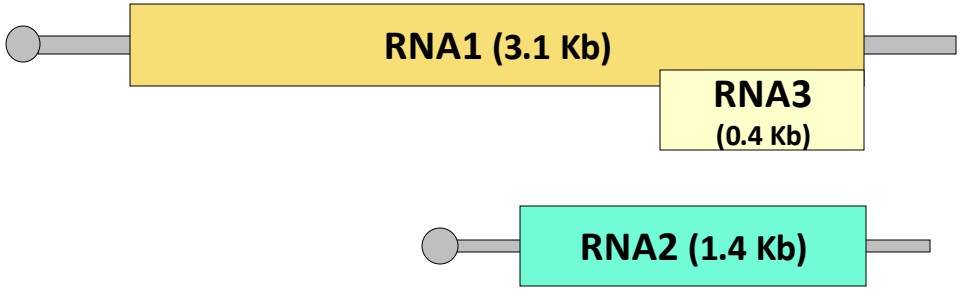
Surface organization Central cavity



Chen *et al.*, 2015

GENOMIC ORGANIZATION

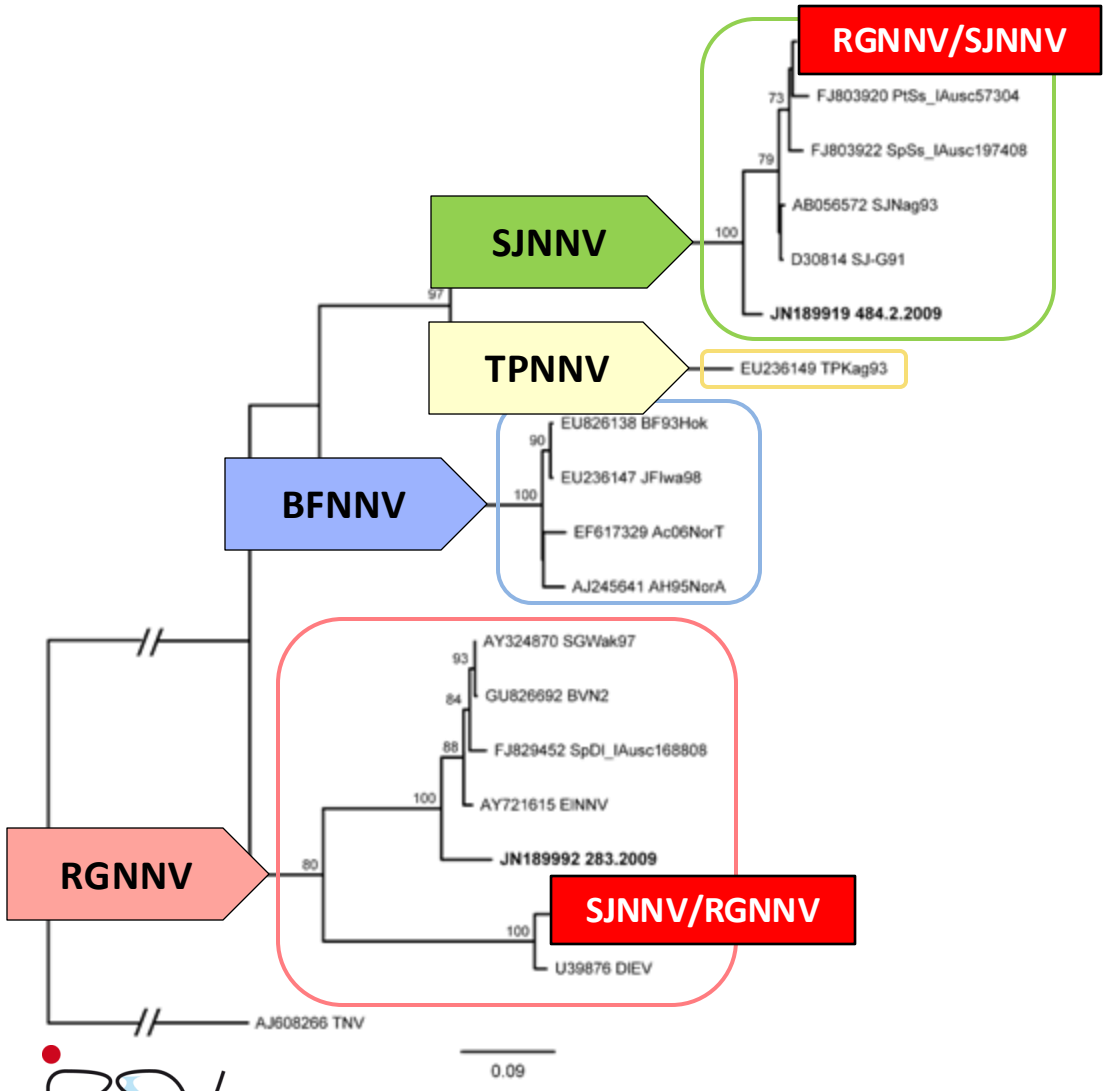
Segmented +ssRNA
CAP at the 5'-end



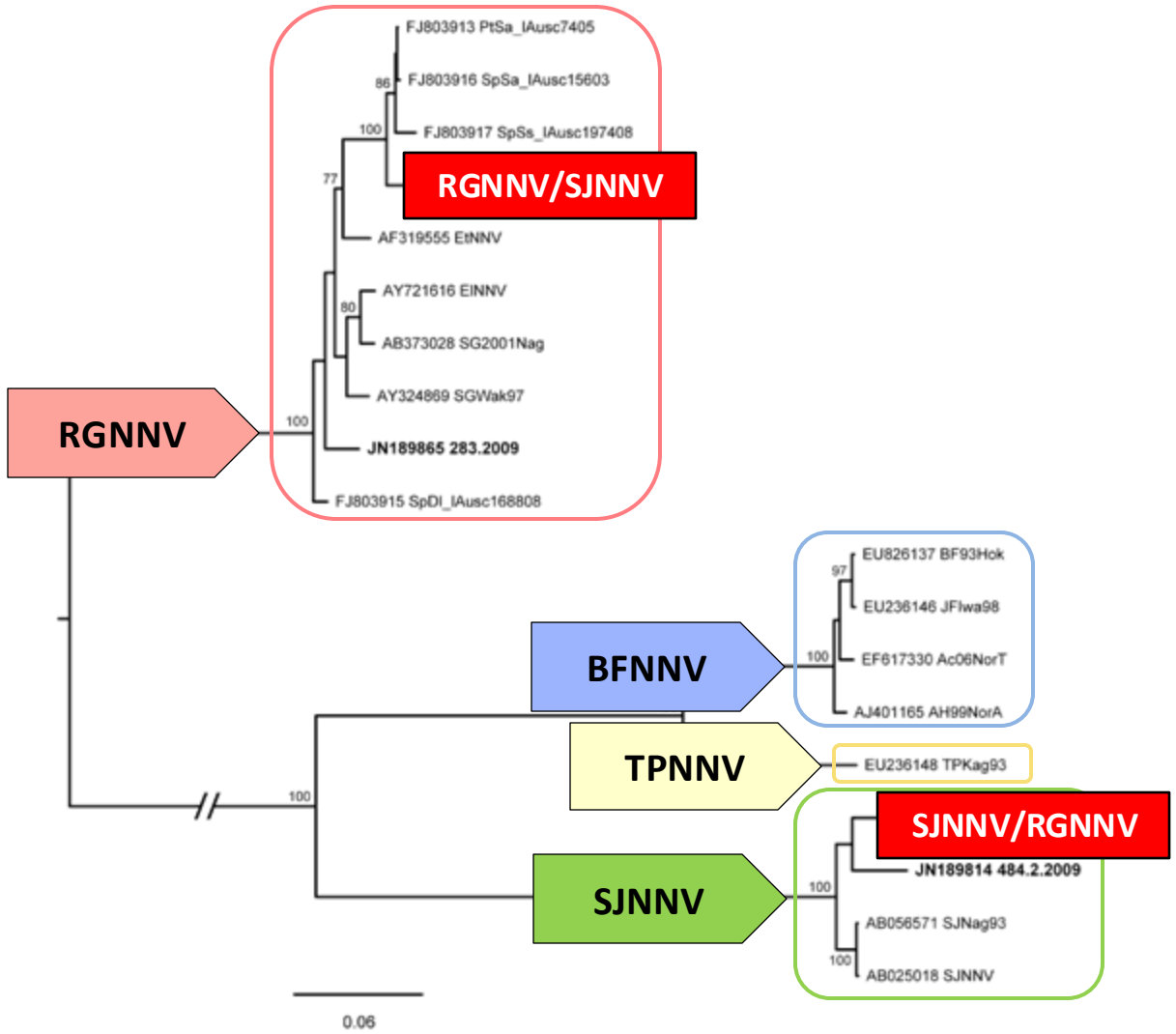
- ✓ RNA1: viral polymerase
- ✓ RNA3: B2 protein, siRNA inhibitor
- ✓ RNA2: structural capsid protein

Classification

RNA2



RNA1



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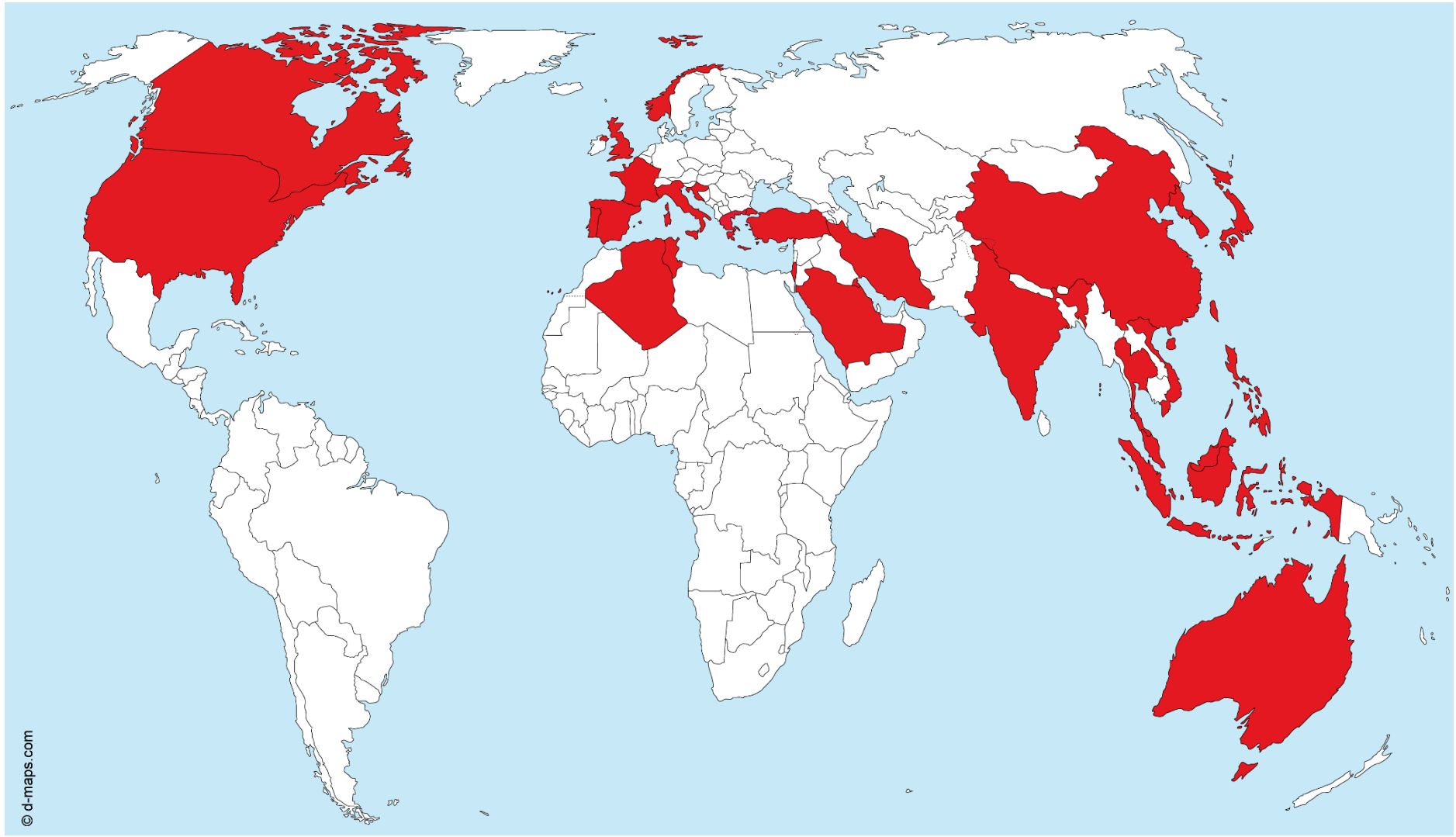
Disease distribution



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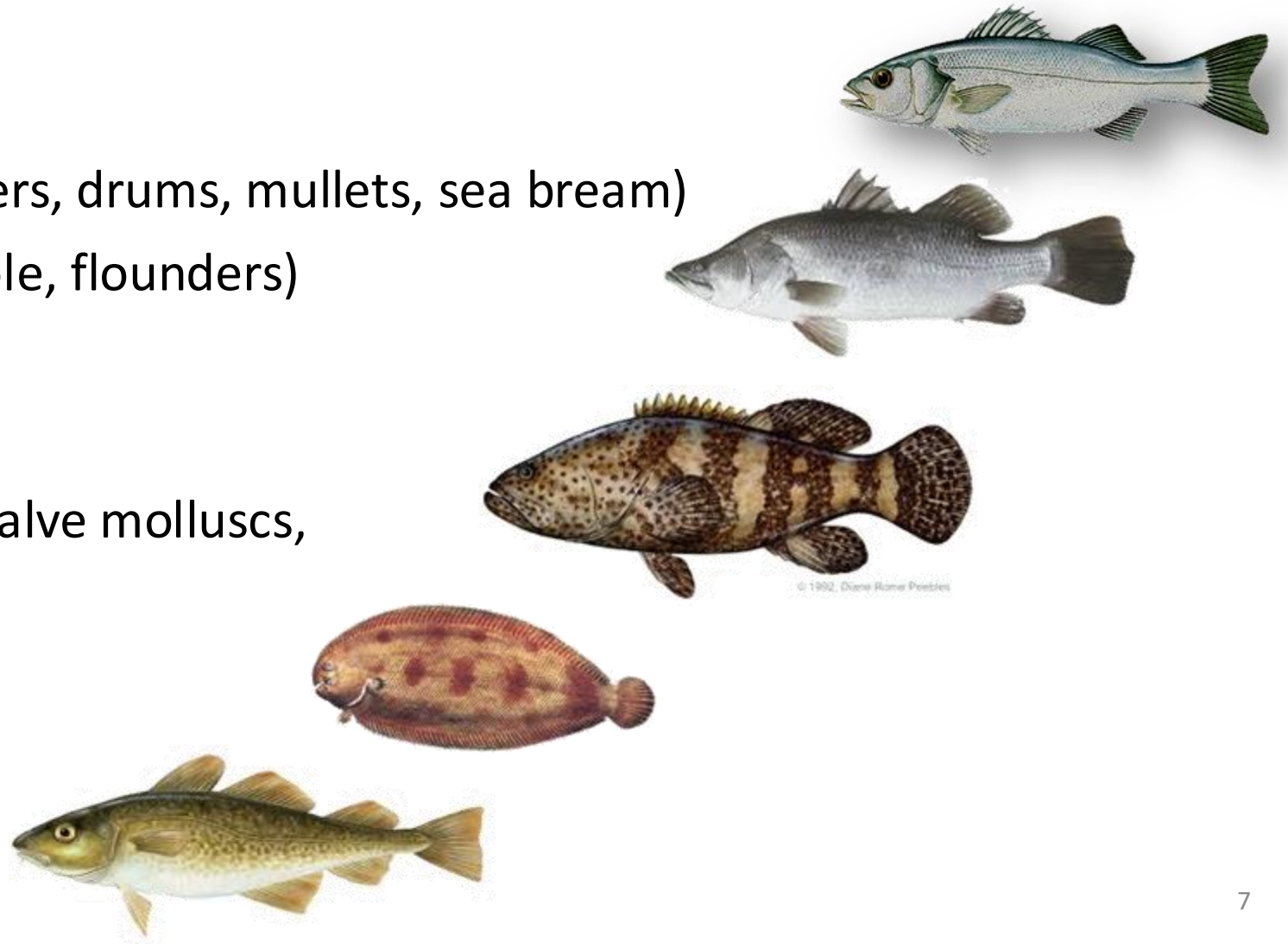
Host Range

- At present the host range comprises 160 species belonging to 80 families and 24 orders

- *Perciformes* (sea bass, groupers, drums, mullets, sea bream)
- *Pleuronectiformes* (turbot, sole, flounders)
- *Gadiformes* (cod)

- Invertebrates, comprising bivalve molluscs, have also been found positive



Criteria for listing aquatic animal diseases/1

AQUATIC ANIMAL HEALTH CODE (CHAPTER 1.2.)

- International spread of the pathogen is likely

AND

- A precise case definition is available and a reliable means of detection and diagnosis exists

AND

- At least one country may demonstrate country or zone freedom from the disease in susceptible aquatic animals

AND

- Natural transmission to humans has been proven, and human infection is associated with severe consequences

OR

- The disease has been shown to affect the health of cultured aquatic animals at the level of a country or a zone resulting in significant consequences e.g. production losses, morbidity or mortality at a zone or country level.

OR

- The disease has been shown to, or scientific evidence indicates that it would affect the health of wild aquatic animals resulting in significant consequences e.g. morbidity or mortality at a population level, reduced productivity or ecological impacts.

Criteria for listing aquatic animal diseases/2

- Viral Encephalopathy and Retinopathy is NOT an WOAH listed disease (Chapter 1.3)
- There was a dedicated chapter in the Manual of Diagnostic Tests for Aquatic Animals, but it has been widrawed in June 2022
- There is still a WOAH Reference Centre in Italy

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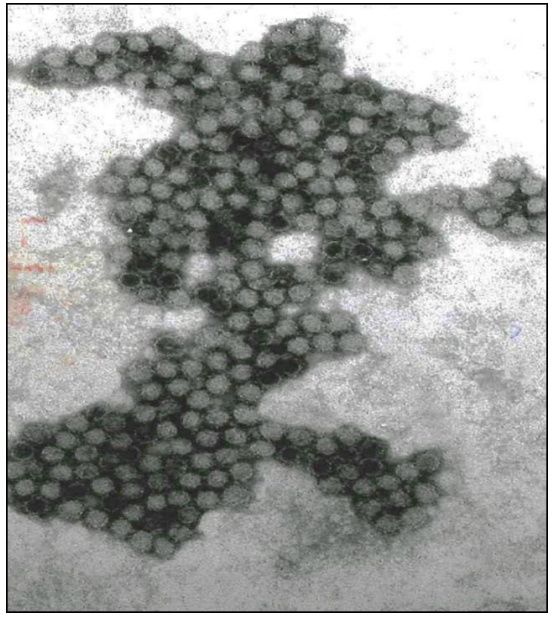
Diagnostic methods available at IZSVe

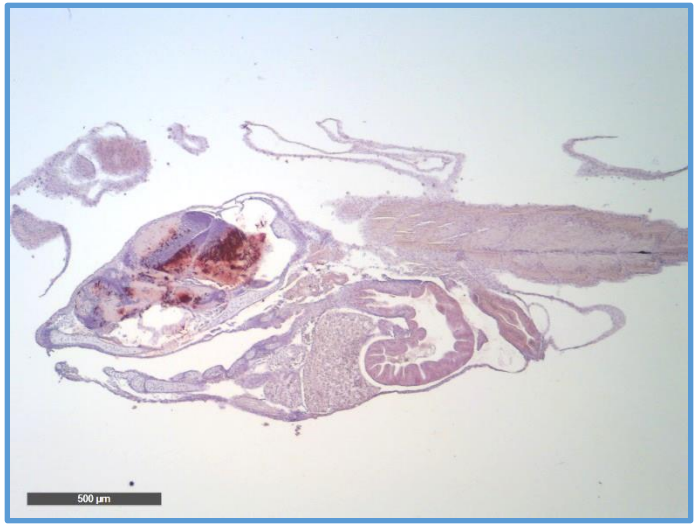
Accredited

- Viral isolation on cell culture (SNN-1 and E-11)

Validated

- Real time RT-PCR for RNA1 and RNA2 detection
- Quantitative RT-PCR
- Sequencing with phylogenetic analysis
- Direct immunofluorescence
- Serum-neutralization
- Histology
- Immunohistochemistry
- ELISA
- TEM





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Production and provision of reagents

- SNN-1, E-11, GF-1 cell cultures
- Inactivated RT-PCR positive controls for different VER genotypes
- Standard positive and negative serum for ELISA (European sea bass only)
- Hyperimmune positive sera from rabbit for SN, ELISA, IHC
- Reference viral strain of all known genotypes
- > 300 field viruses

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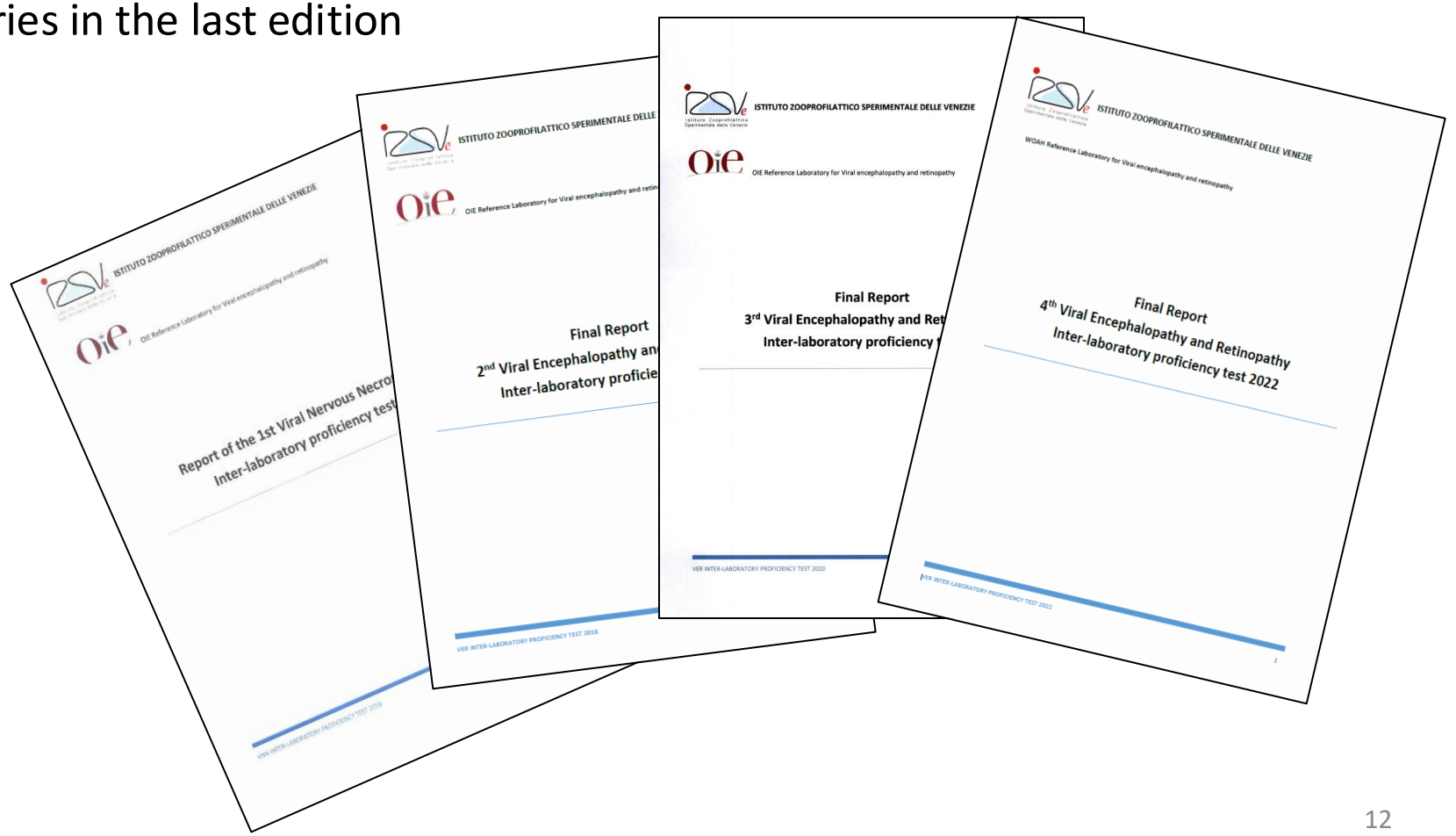
International Proficiecy Test

- Organized every other year since 2016
- Targeted to molecolar methods only (RT-PCR; rRT-PCR; genotyping)
- 25 participants from 17 countries in the last edition
- Next edition planned for 2024



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Scientific publications

Fish and Shellfish Immunology xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Fish and Shellfish Immunology

journal homepage: www.elsevier.com/locate/fsi

Full length article

Lack of *in vivo* cross-protection of two different betanodavirus species RGNNV and SJNNV in European sea bass *Dicentrachus labrax*

Francesco Pascoli[a,*], Andrea Guazzo[a], Alessandra Buratin[a], Marica Toson[b], Francesco Buonocore[c], Giuseppe Scapigliati[c], Anna Toffan[a]

[a] Istituto Zooprofilattico Sperimentale delle Venezie, National Reference Laboratory (NRL) for Diseases of Fish, Mollusk and Crustacean, Legnaro, PD, Italy
[b] Istituto Zooprofilattico Sperimentale delle Venezie, Aquatic Animal Epidemiology Laboratory, Legnaro, PD, Italy
[c] Department for Innovation in Biological, Agro-food and Forest Systems, University of Tuscia, Viterbo, Italy

ARTICLE IN PRESS

Fish and Shellfish Immunology xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Fish and Shellfish Immunology

journal homepage: www.elsevier.com/locate/fsi

Full length article

Vaccination and immune responses of European sea bass (*Dicentrarchus labrax* L.) against betanodavirus

Francesco Buonocore*, Noelia Nuñez-Ortiz[2], Simona Picchietti, Elisa Randelli, Valentina Stocchi, Laura Guerra, Anna Toffan[1], Francesco Pascoli[1], Anna Maria Fausto, Massimo Mazzini, Giuseppe Scapigliati

Department for Innovation in Biological, Agrofood and Forest Systems, University of Tuscia, Viterbo, Italy

Nuñez-Ortiz *et al. Vet Res (2016) 47:89*
DOI 10.1186/s13567-016-0376-3

VETERINARY RESEARCH

RESEARCH ARTICLE Open Access

A formalin-inactivated immunogen against viral encephalopathy and retinopathy (VER) disease in European sea bass (*Dicentrarchus labrax*): immunological and protection effects

Noelia Nuñez-Ortiz[1], Fra
Marica Toson[3], Giuseppe

SCIENTIFIC REPORTS

OPEN

Received: 12 January 2017
Accepted: 21 March 2017
Published: 02 May 2017

Viral nervous necrosis in gilthead sea bream (*Sparus aurata*) caused by reassortant betanodavirus RGNNV/SJNNV: an emerging threat for Mediterranean aquaculture

Anna Toffan[1], Francesco Pascoli[1], Tobia Pretto[2,3], Valentina Panzarin[1], Miriam Abbadi[1], Alessandra Buratin[1], Rosita Quartesan[1], Daniel Gijón[4] & Francesc Padrós[5]

PLOS ONE

RESEARCH ARTICLE

Molecular Basis for Antigenic Diversity of Genus *Betanodavirus*

Valentina Panzarin[1,2]*, Anna Toffan[1], Miriam Abbadi[1], Alessandra Buratin[1], Marzia Mancin[1], Stine Braaen[3], Christel Moræus Olsen[3], Luca Bargelloni[2], Espen Rimstad[3], Giovanni Cattoli[1]

1 OIE Reference Laboratory for Viral Encephalopathy and Retinopathy, Department of Comparative Biomedical Sciences, Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro (PD), Italy, 2 Department of Comparative Biomedicine and Food Science, University of Padua, Legnaro (PD), Italy, 3 Department of Food Safety and Infection Biology, Norwegian University of Life Sciences, Oslo, Norway

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Istituto Zooprofilattico Sperimentale delle Venezie

Scientific publications

Contents lists available at ScienceDirect

Journal of Virological Methods

journal homepage: www.elsevier.com/locate/jviromet

First generic one step real-time Taqman RT-PCR targeting the RNA1 of betanodaviruses

M. Baud [a], J. Cabon [a], A. Salomoni [b], A. Toffan [b], V. Panzarin [b], L. Bigarré [a,*]

Received: 26 J
DOI: 10.1111/j

Panzarin et al. Veterinary Research 2014, 45:56
http://www.veterinaryresearch.org/content/45/1/56

VETERINARY RESEARCH

RESEARCH Open Access

In vitro study of the replication capacity of the RGNNV and the SJNNV betanodavirus genotypes and their natural reassortants in response to temperature

Valentina Panzarin*, Elisabetta Capp
and Giovanni Cattoli

frontiers | Frontiers in Veterinary Science

ORIGINAL RESEARCH
published: 03 August 2022
doi: 10.3389/fvets.2022.932327

Role of Rotifers in Betanodavirus Transmission to European Sea Bass Larvae

*Lucia Vázquez-Salgado [1], Francesco Pascoli [2], Andrea Marsella [2], Lorena Biasini [2], Alessandra Buratin [2], Tobia Pretto [2], Miriam Abbadi [2], Erica Melchiotti [3], Isabel Bandin [1] and Anna Toffan [2]**

[1] Departamento de Microbiología y Parasitología, Instituto de Acuicultura, Universidade de Santiago de Compostela, Santiago de Compostela, Spain, [2] Istituto Zooprofilattico Sperimentale delle Venezie, OIE Reference Laboratory for Viral Encephalo-Retinopathy, National Reference Laboratory for Fish Diseases Legnaro, Padova, Italy, [3] Department of Histopathology, Istituto Zooprofilattico Sperimentale delle Venezie Legnaro, Padova, Italy*

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pathogens

MDPI

Article

Pathogenicity of Different Betanodavirus RGNNV/SJNNV Reassortant Strains in European Sea Bass

Lorena Biasini, Paola Berto, Miriam Abbadi, Alessandra Buratin, Marica Toson, Andrea Marsella, Anna Toffan and Francesco Pascoli *

Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro, 35020 Padova, Italy; lbiasini@izsvenezie.it (L.B.); pberto@izsvenezie.it (P.B.); mabbadi@izsvenezie.it (M.A.); aburatin@izsvenezie.it (A.B.); mtoson@izsvenezie.it (M.T.); amarsella@izsvenezie.it (A.M.); atoffan@izsvenezie.it (A.T.)
* Correspondence: fpascoli@izsvenezie.it

ORIGINAL ARTICLE

WILEY Journal of Fish Diseases

Detection and molecular characterization of betanodaviruses retrieved from bivalve molluscs

E Volpe[1] | M Grodzki[1] | V Panzarin[2] | A Guercio[3] | G Purpari[3] | P Serratore[1] | S Ciulli[1]

Open Access Article

Long-Term Protection and Serologic Response of European Sea Bass Vaccinated with a Betanodavirus Virus-Like Particle Produced in *Pichia pastoris*

by Sofie Barsøe [1], Anna Toffan [2], Francesco Pascoli [2], Ansgar Stratmann [3], Tobia Pretto [2], Andrea Marsella [2], Mériem Er-Rafik [4], Niccolò Vendramin [1], Niels J. Olesen [1], Dagoberto Sepúlveda [1] and Niels Lorenzen [1,*]

1 National Institute of Aquatic Resources (DTU AQUA), Technical University of Denmark, 2800 Lyngby, Denmark
2 Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe), 35020 Legnaro, Padua, Italy
3 W42 Biotechnology GmbH, 44227 Dortmund, Germany
4 National Center for Nano Fabrication and Characterization (DTU Nanolab), Technical University of Denmark, 2800 Lyngby, Denmark
* Author to whom correspondence should be addressed.

Vaccines **2021**, *9*(5), 447; **https://doi.org/10.3390/vaccines9050447**

Received: 30 March 2021 / Revised: 22 April 2021 / Accepted: 23 April 2021 / Published: 2 May 2021

Training

- WOAH Twinning program with Tunisia 2017-2018

- International collaboration project AQUAE STRENGHT: Strengthening capacity on aquatic animal health and epidemiological surveillance

- Remote collaboration with several countries (Malaysia, Spain, France, Croatia, Greece, etc.)

- Twinning project with Jeddah KSA laboratory (agreement signed and ready to start)

- Twinning project with Central Animal Laboratory in Oman....coming soon

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The importance of bacterial diseases

“bacterial pathogens cause major losses to aquaculture, comprising around 34% of total diseases”

Soibam Khogen Singh, Maibam Malemngamba Meitei, Tanmoy Gon Choudhary, Ngasotter Soibam, Pradyut Biswas, Gusheinzed Waikhom,(2022) Chapter 15 - **Bacterial diseases in cultured fishes: an update of advances in control measures,** Bacterial Fish Diseases,Academic Press,

Sometimes more than 40 %.....billions of dollars $ are lost

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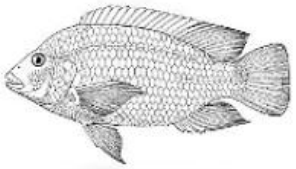
Main bacterial diseases in the world

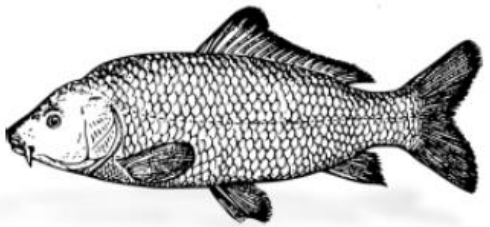
OIE GLOBAL CONFERENCE
ON AQUATIC ANIMAL HEALTH
COLLABORATION, SUSTAINABILITY: OUR FUTURE
SANTIAGO, CHILE, 2-4 APRIL 2019

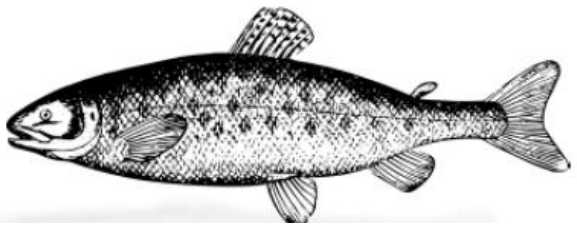
WORLD ORGANISATION FOR ANIMAL HEALTH
Protecting animals, preserving our future

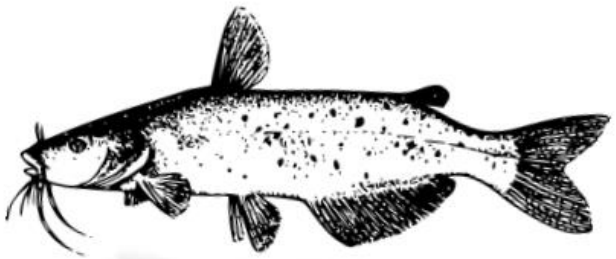
Ad hoc Group Recommendation: Priority fish pathogens

- *Aeromonas hydrophila* and other species (Freshwater cyprinids) (H)
- *Pseudomonas* spp. (Freshwater cyprinids) (H)
- *Vibrio* spp., (Marine fish) (H)
- *Photobacterium* spp. (Marine fish) (H)
- *Streptococcus* spp. (Marine fish) (H)
- *Edwardsiella ictaluri, E. tarda* (Catfish) *(H)*
- *A. hydrophila* and other species (Catfish) (H)
- *Streptococcus inae*, and *S. agalactiae* (Freshwater cichlids) *(M)*









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Typing of bacterial pathogens is availble in IZSVe

BIOCHEMICAL

singular test
micromethods (Biologin, API System, Vitek)

SEROLOGICAL

Slide agglutination test
ELISA
Immuno fluorescence - IF/Immuno Histochemistry - IHC

PROTEIC PROFILE

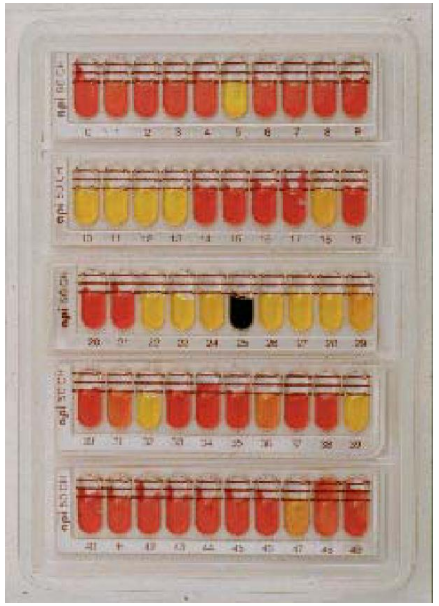
MALDITOF - Matrix assisted laser desorption/ionization time of flight

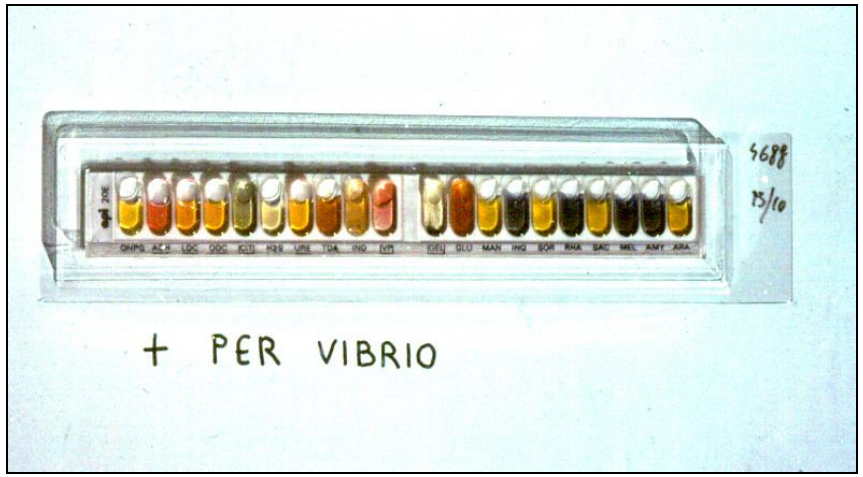
MOLECULAR BIOLOGY

PCR, Real Time PCR, RPLF, MLST, ecc.

Miniaturized methods: strip/kits with different tests

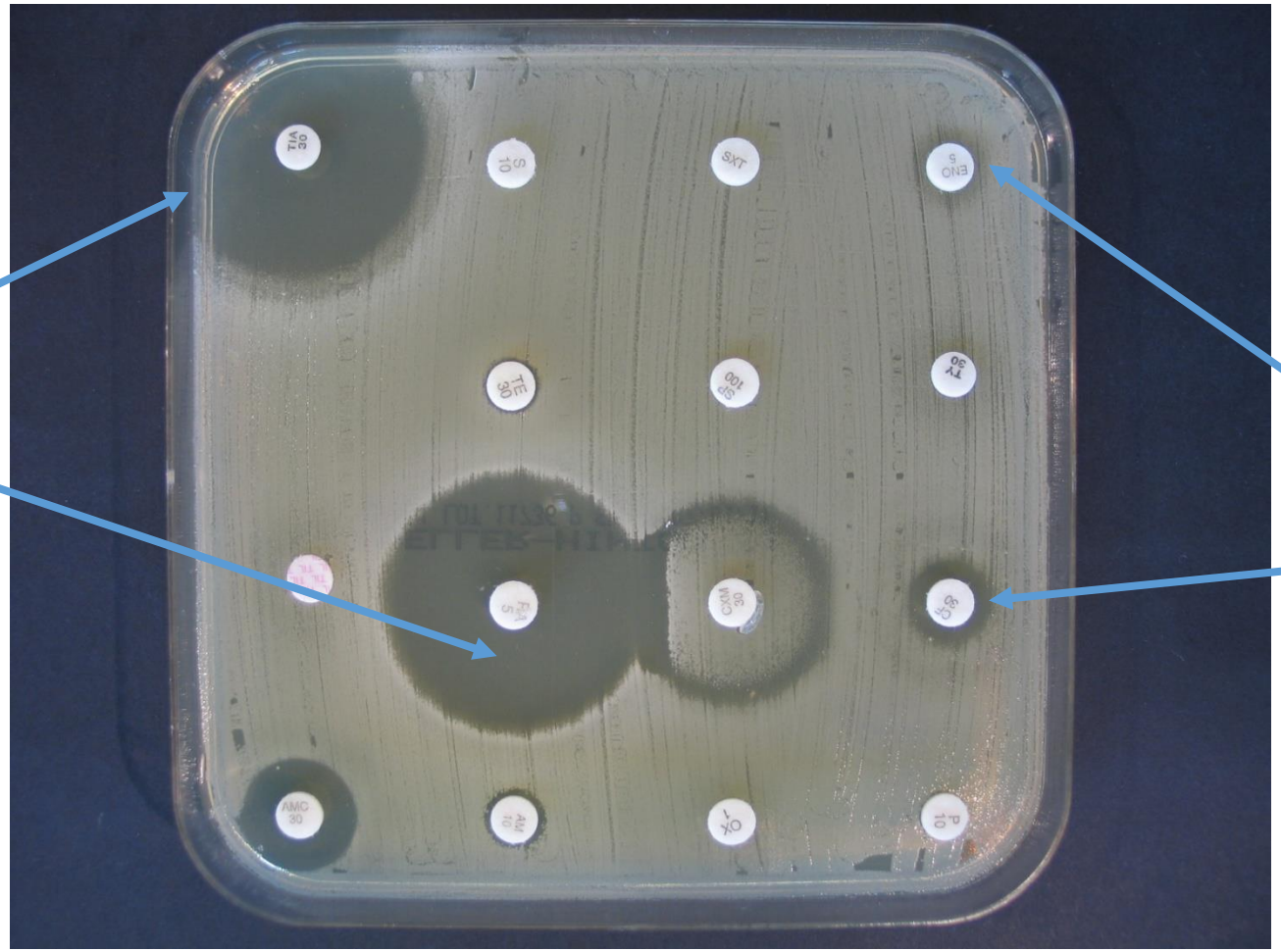
Commercial kits including different tests (aminoacids, carbohydrate, protein, etc)**.** After 24-48 hrs of incubation checking the different colour of each single well you can obtain a **key code** corresponding to a single strain species. If the result is over 98 % the identification is very good, if lower you need to perform additional tests. **Be aware that not all the fish pathogens can be identified correctly…you usually need more additional tests.**





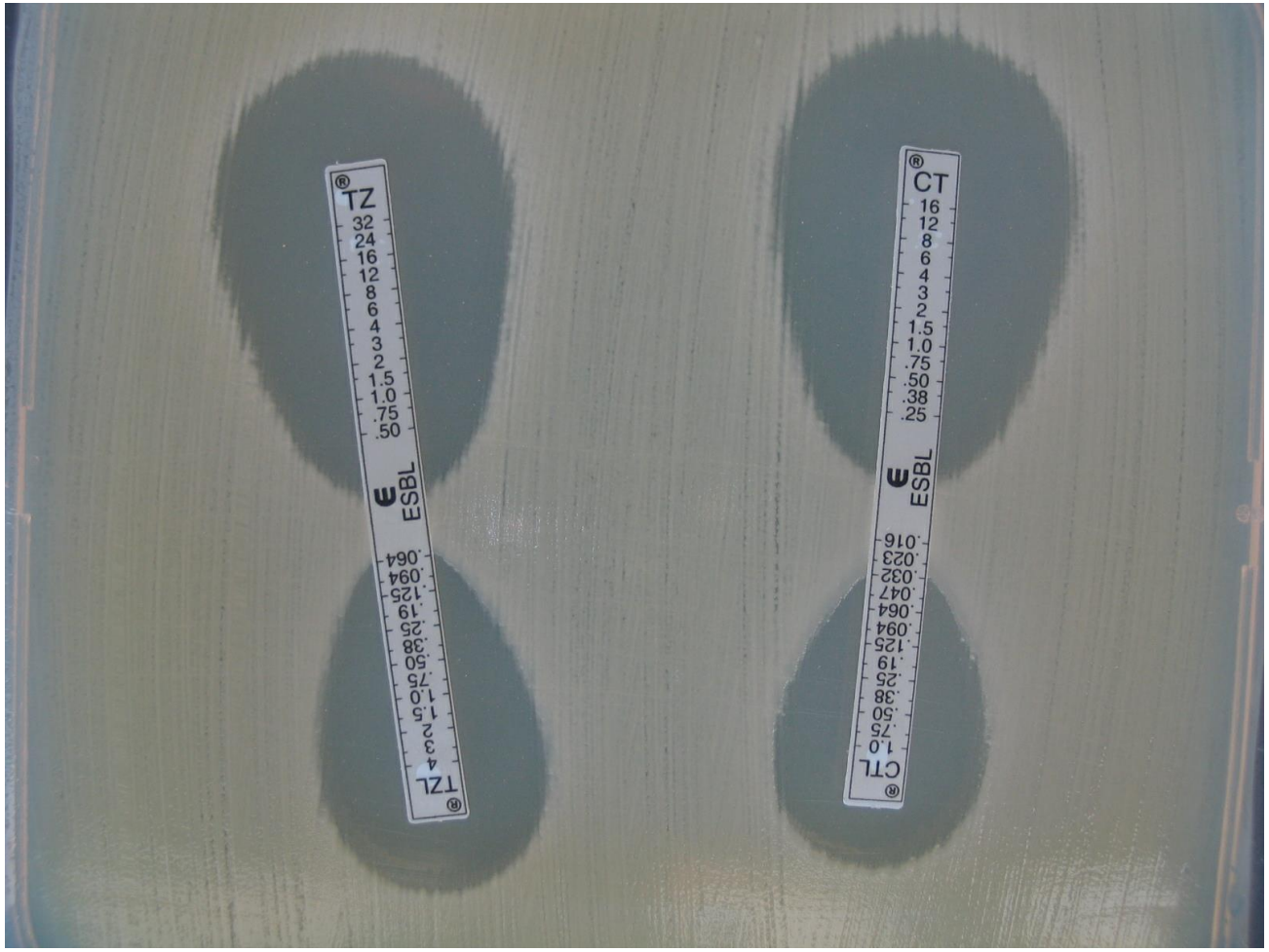
Antimicrobial susceptibility test – agar diffusion (Kirby Bauer)

Susceptible



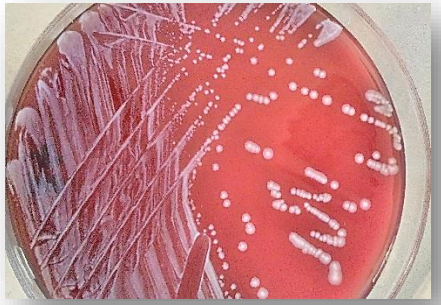
Resistant

E-test (different concentration)



Minimal Inhibitory Concentration (M.I.C.)

- 3-4 colonies in 5 mL physiological solution (final concentration = 0,5 McFarland scale)
- 100 µL in special broth (CAMHB)
- 100 µL of suspension in each well (commercial 96 microplates are available)
- Overnight incubation at 22°C

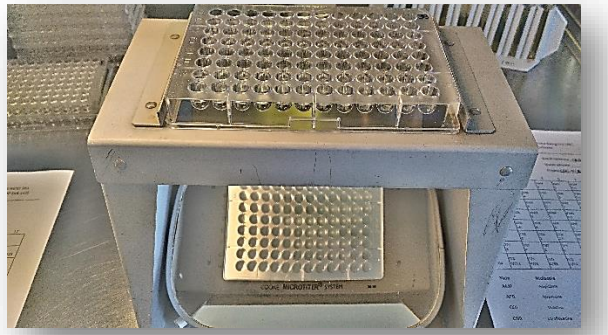


Blood agar pure culture

3-4 colonies of isolated colonies

0,5 McFarland

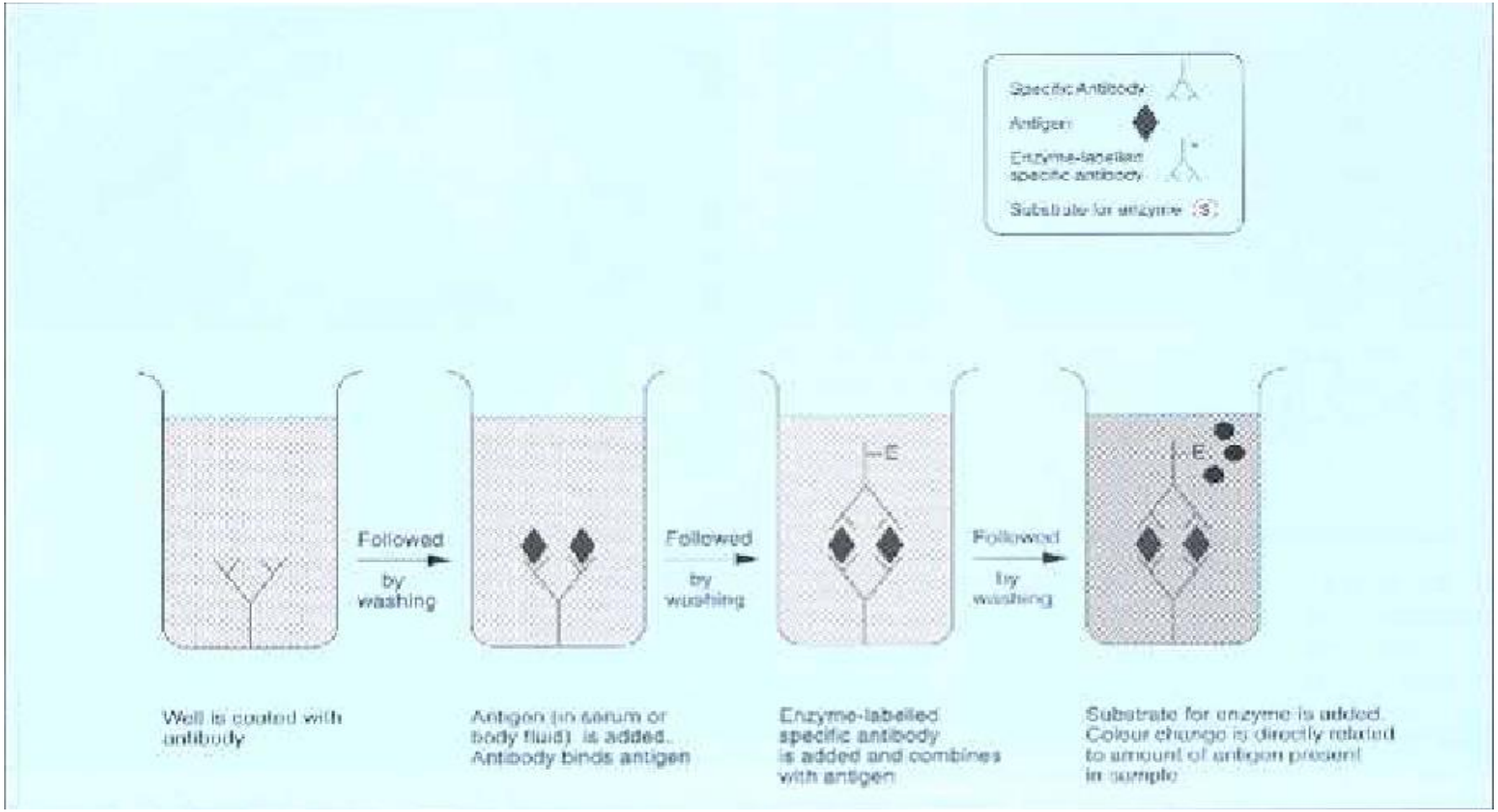
Inoculum in 96 wells microplates



Check the wells after overnight incubation

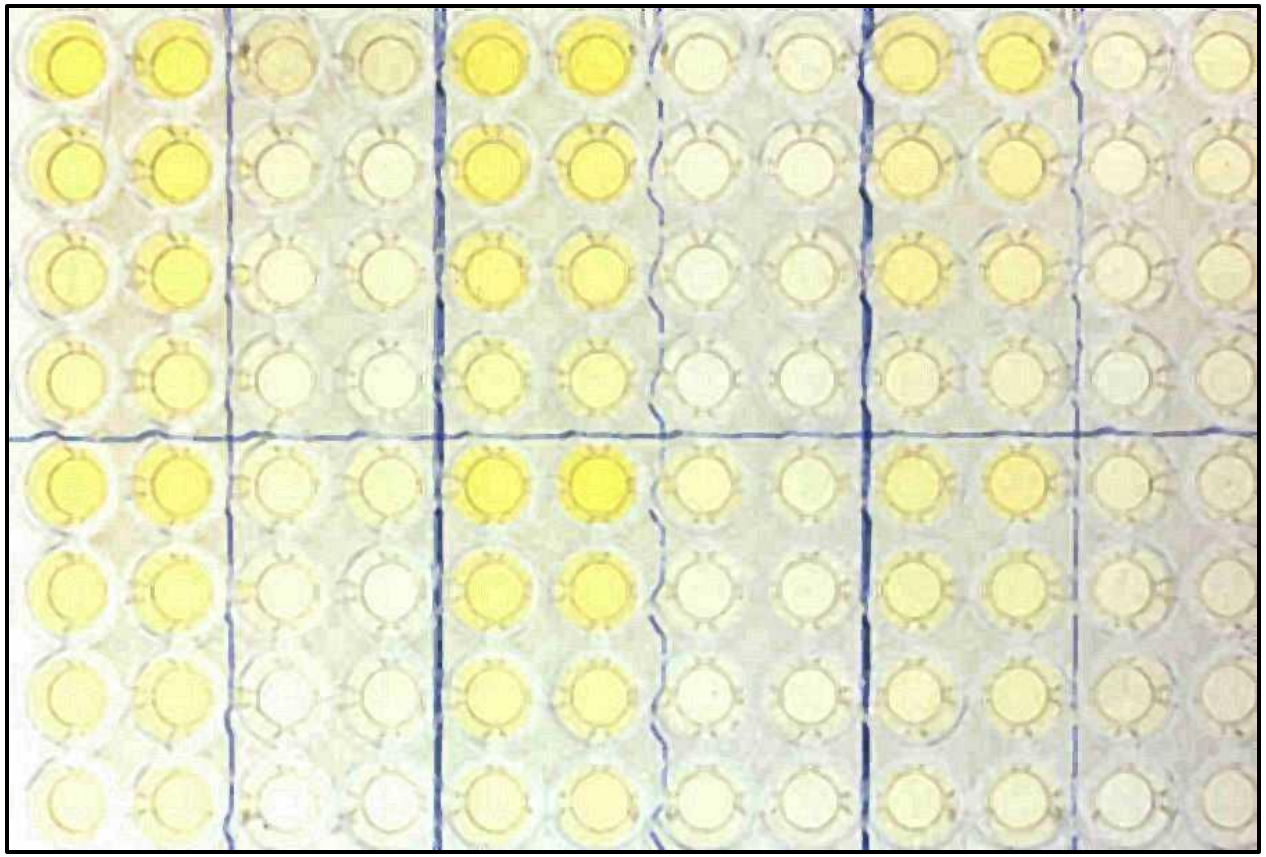
E.L.I.S.A.

(Enzyme Linked Immuno Sorbent Assay) to detect pathogens or antibodies

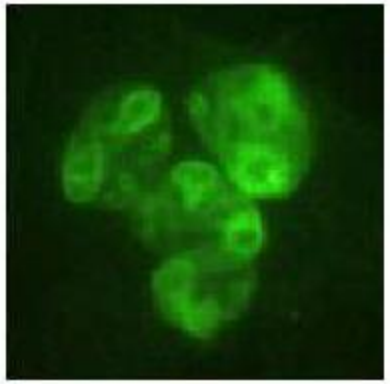


ELISA TEST RESULTS

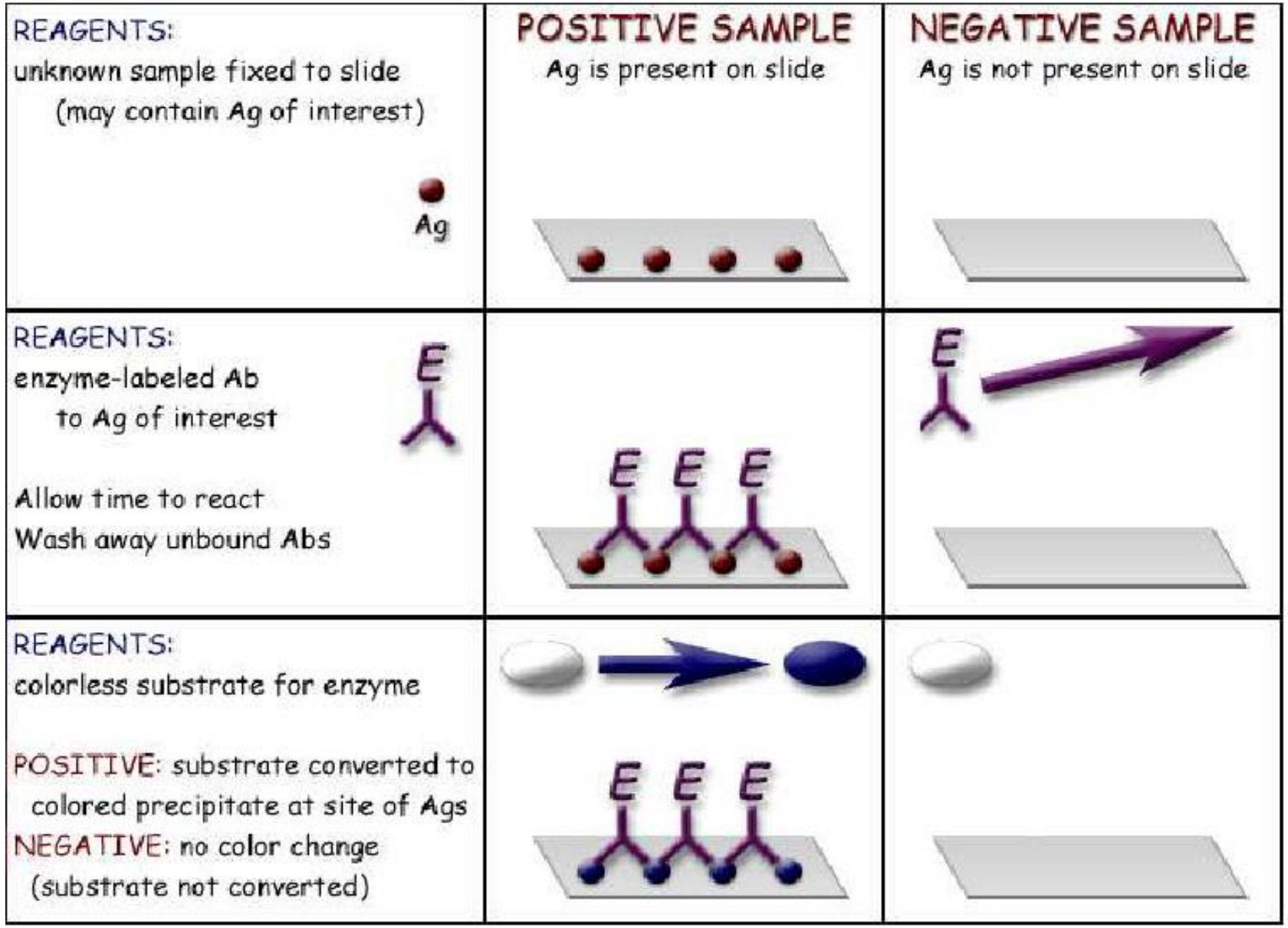
+ - + - + -



Immunofluorescence

REAGENTS:	POSITIVE SAMPLE	NEGATIVE SAMPLE
unknown sample fixed to slide (may contain Ag of interest) 	Ag is present on slide 	Ag is not present on slide 
REAGENTS: fluorescein-labeled Ab to Ag of interest  Allow time to react Wash away unbound Abs		
PROCEDURE: observe under a fluorescence microscope  POSITIVE: green fluorescence NEGATIVE: no fluorescence		

Immuno histochemistry – IHC (with histological sections)



Protein fingerprint: Matrix assisted laser desorption/ionization time of flight (MALDITOF)

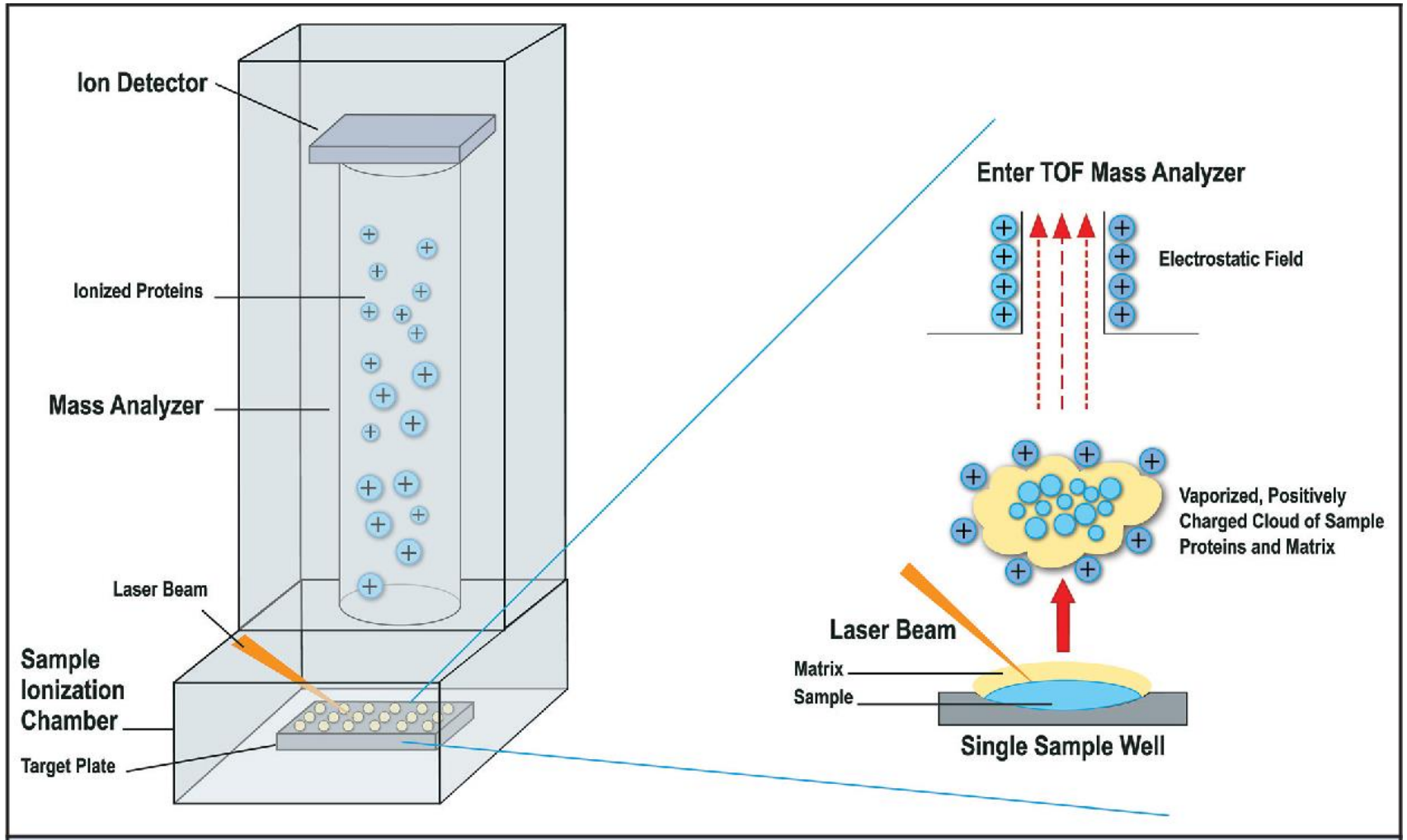
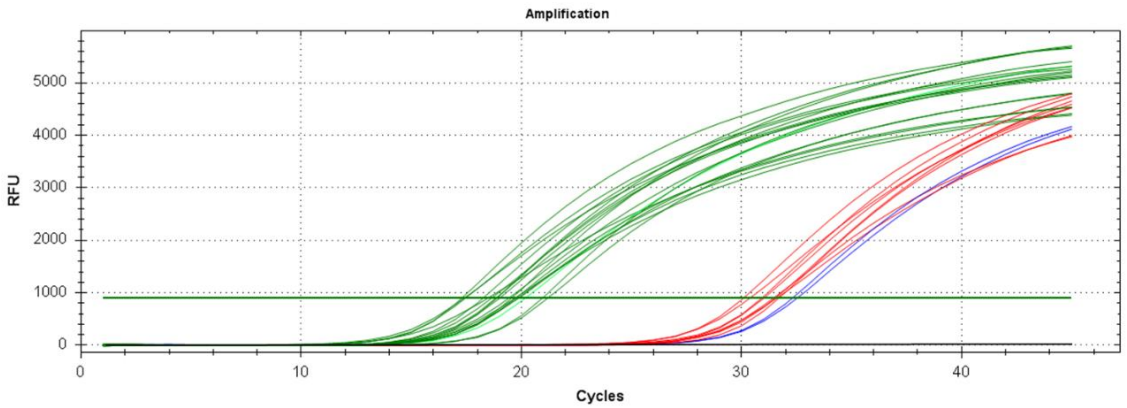


Fig. 2. MALDI-TOF mass spectrometer. The target plate is placed into the chamber of the mass spectrometer.

Molecular biology (genotyping).....still in progress

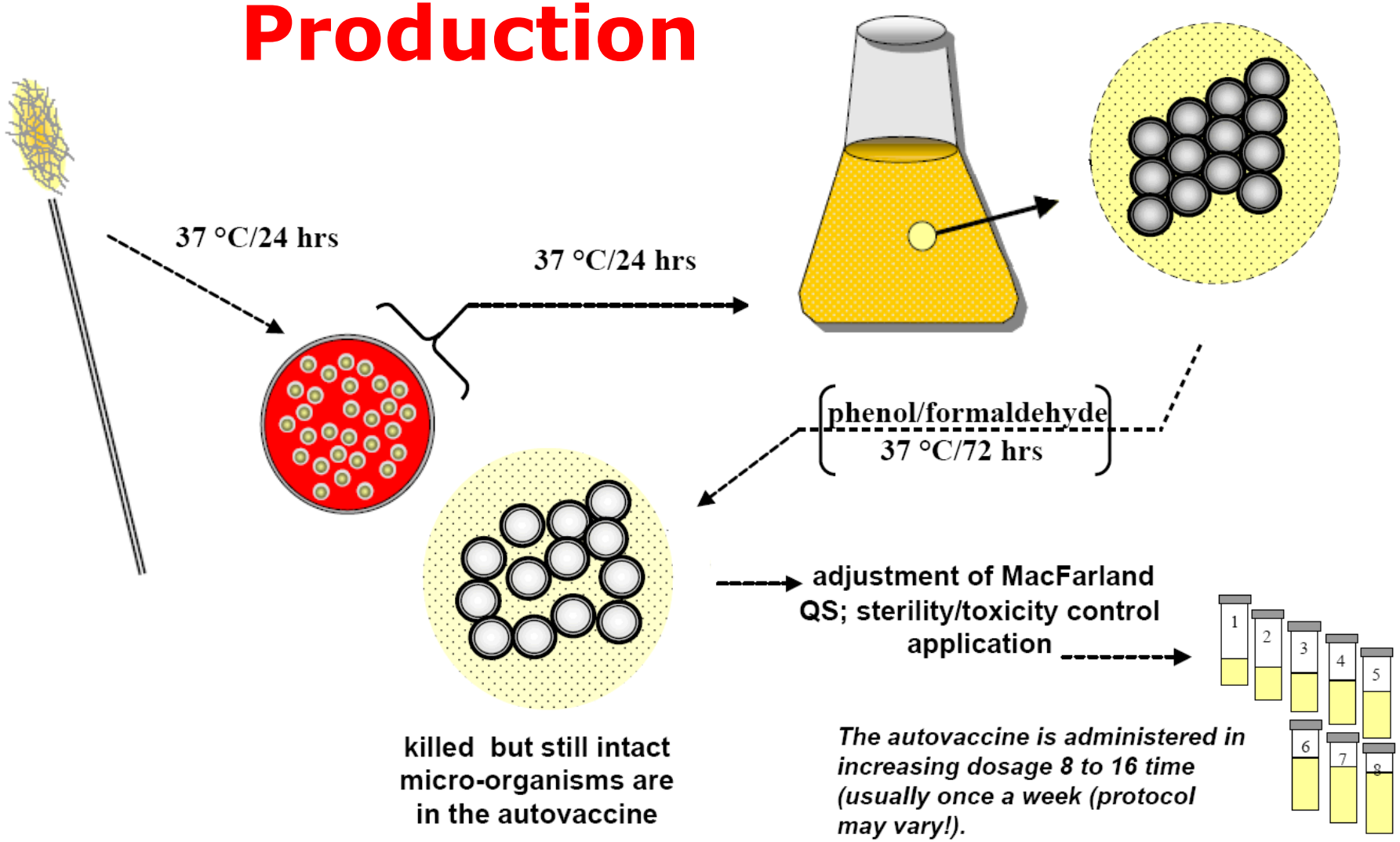
- PCR classical (e.g rRNA 16 S)
- Nested PCR
- Real time PCR
- Random Amplification Polymorphic DNA (RAPD)
- Pulsed Field Gel Electrophoresis (PFGE)
- Multi Locus Sequencing Typing (MLST)
- Whole Genome Sequencing (WGS)
- Next Generation Sequencing (NGS)



Autogenous vaccines are also produced by IZSVe

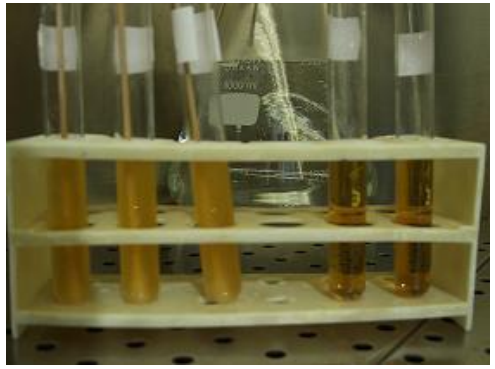
- The autogenous vaccine is a veterinary immunological drug prepared with pathogens and / or antigens isolated from subjects affected by infectious form dominant in a particular farm and used for the treatment of the same farm animals or the animals of the same country if the DVM believe it appropriate for evident epidemiological reasons (**DIRECTIVE 2001/82/EC** . Article 3. 2: Inactivated immunological veterinary medicinal products …)

Production


37 °C/24 hrs
37 °C/24 hrs
phenol/formaldehyde
37 °C/72 hrs
killed but still intact micro-organisms are in the autovaccine
adjustment of MacFarland QS; sterility/toxicity control application
1
2
3
4
5
6
7
8
The autovaccine is administered in increasing dosage 8 to 16 time (usually once a week (protocol may vary!).

Controls on the final product

- Inactivation (growth media)
- Sterility (growth media)
- Toxicity (mouse, guinea pigs, fish)



Why we use inactivated autogenous vaccines?

- absence of residual pathogenicity
- absence of recombination and reversion
- major stability in the conservation and during the use
- withdrawl period close to 0 days

Main disadvantages of inactivated autogenous vaccines

- usually require adjuvant to obtain the maximum immune response (mineral oil with side effects)
- primarily stimulate humoral immunity
- require frequent dosing (booster effect)

Aquacolture epidemiology unit….born in 2014

Data collection and management of :

- fish, shellfish and crustacean **facilities (**management of regional and national farm database) including **geographycal information**
- data erasing from **IZSVE laboratory information system** concerning fish monitoring plans and data related to microbiological
- parameters, biotoxins, toxic phytoplancton and heavy metals in **bivalves harvesting areas**

Data validation and analysis

- Descriptive analysis: ongoing monitoring activities
- Epidemiological situation and study of risk factors associated to relevant diseases

Disease outbreak management

-

Data management

- **Data arising from laboratories** made available for their interpretation, merging with epidemiological information in order to report the evolution of the situation at local level
- Integrate all the data available troughs an efficient Management Information System, in order to use them for planning actions
- Coordination of activities between LCVA, Laboratory and Epidemiology Unit

Field activity

Laboratory

WEB-GIS

Epidemiology and diagnostic team

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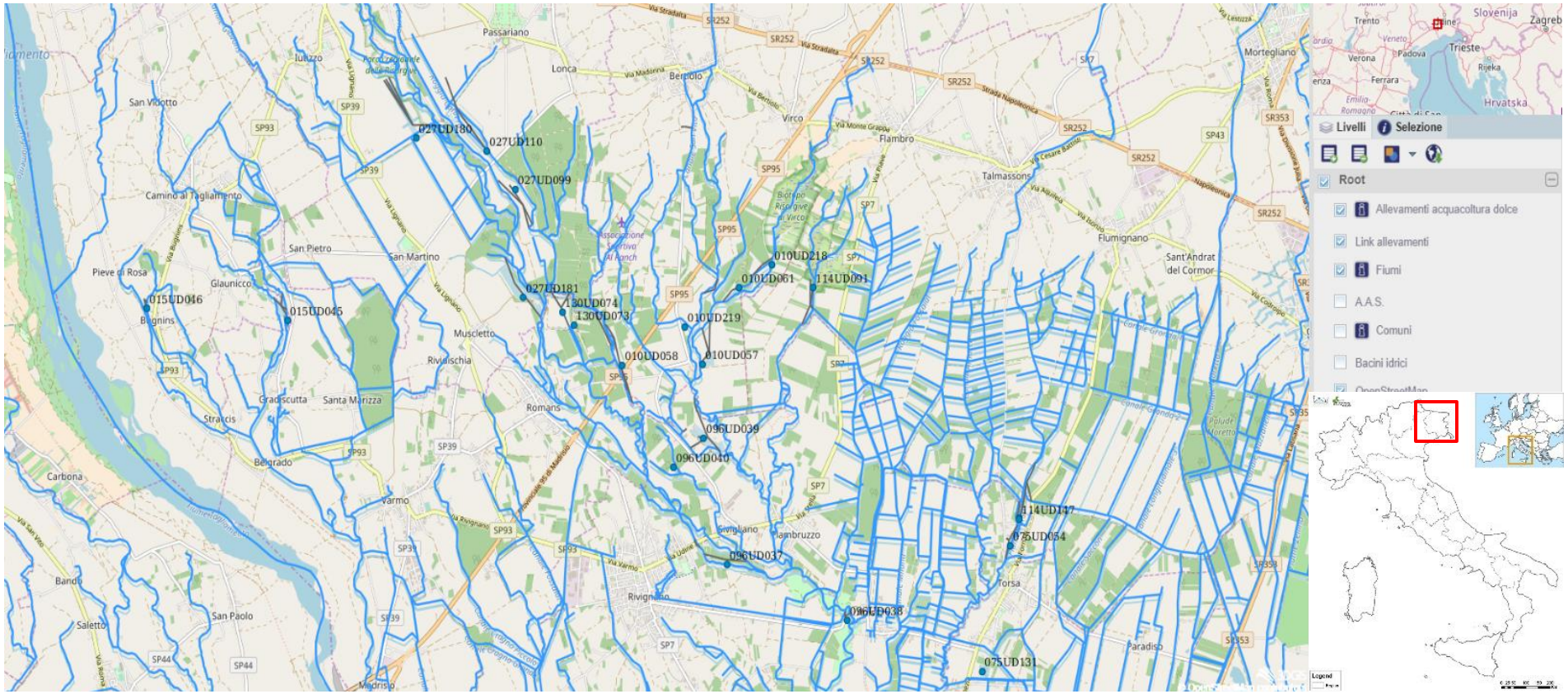
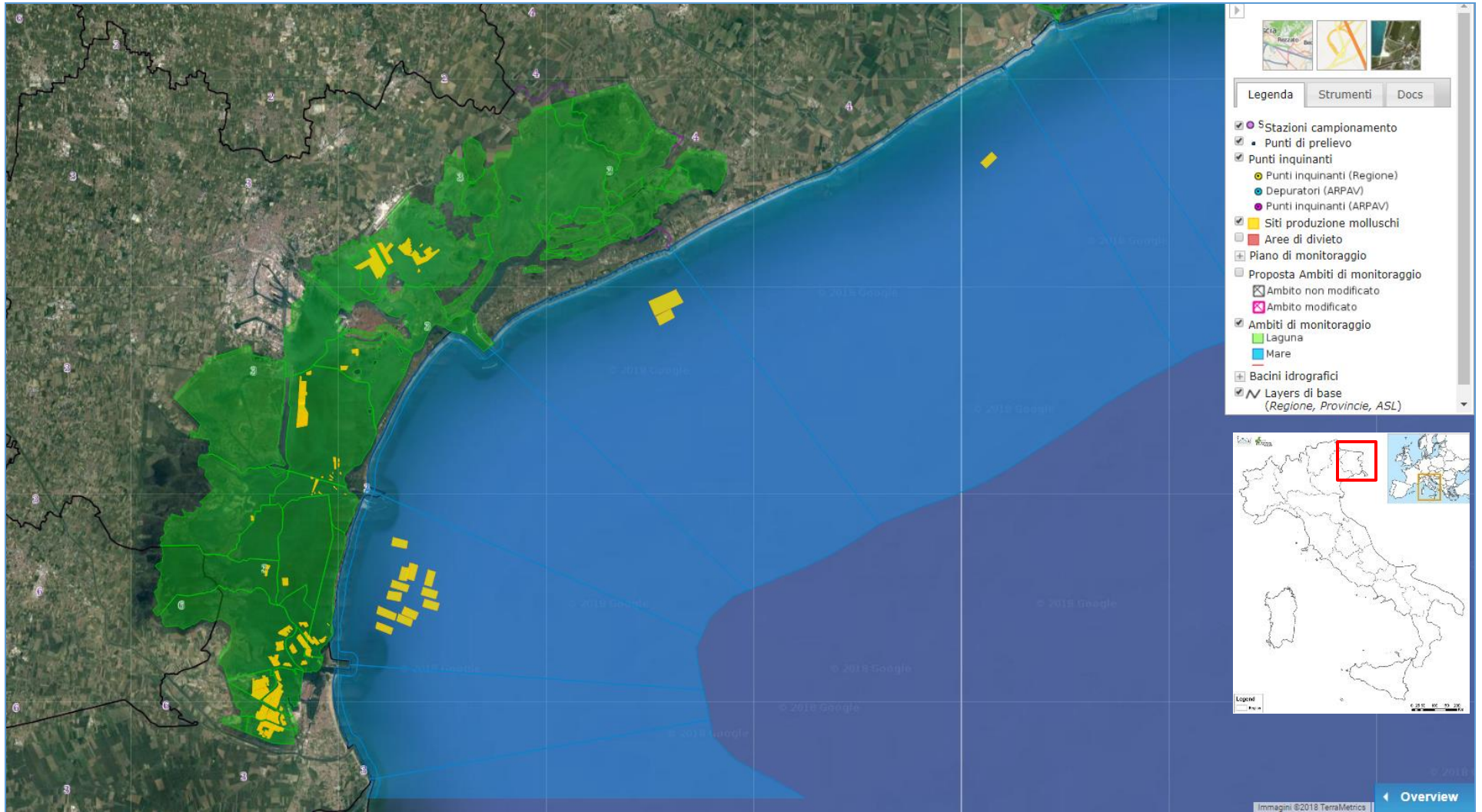
Web-based GIS managemet information system of fish facilities



Web-based GIS managemet information system of shellfish facilities



Last but not least: Seafood control

- **Seafood microbiological** control according to new food hygiene legislation
- **Monitoring** on microbiological parameters, biotoxins and toxic phytoplancton in bivalves harvesting areas
- **Shelf life evaluation** of different fisheries products
- **Fish species identification** (biotec. methods) to avoid sanitary and commercial frauds
- **Chemicals control:** drugs, additives, heavy metals, histamine

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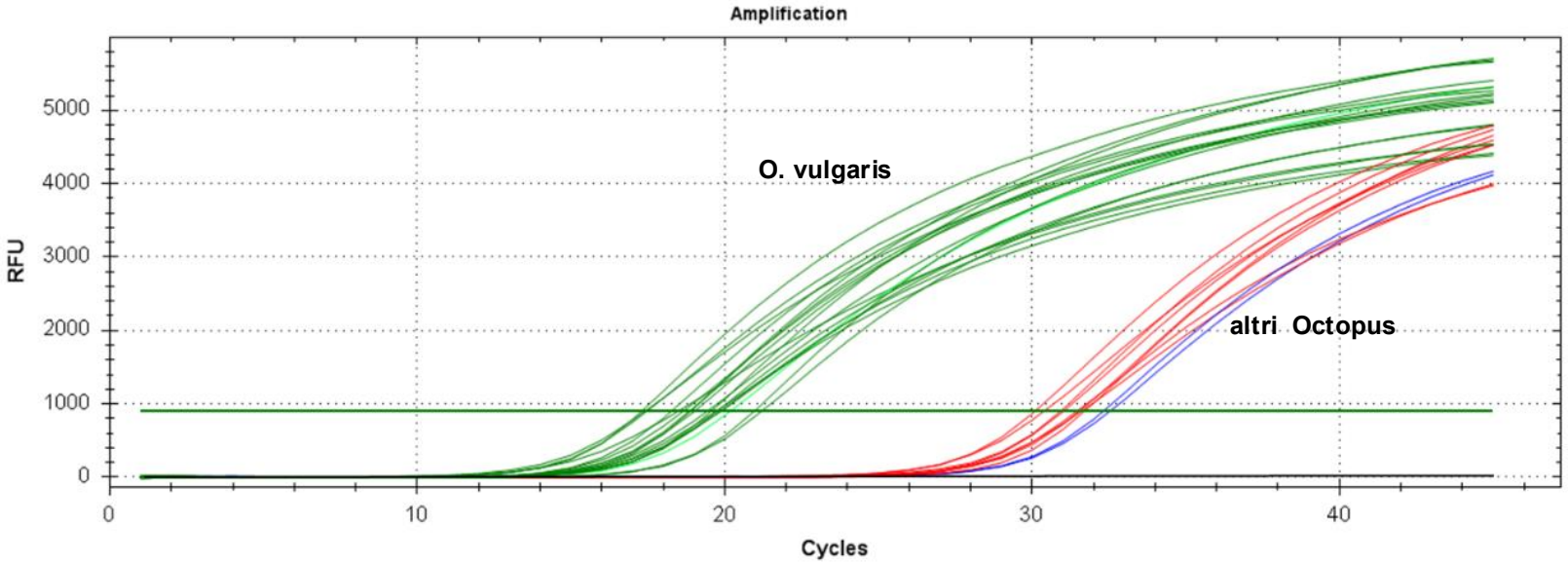

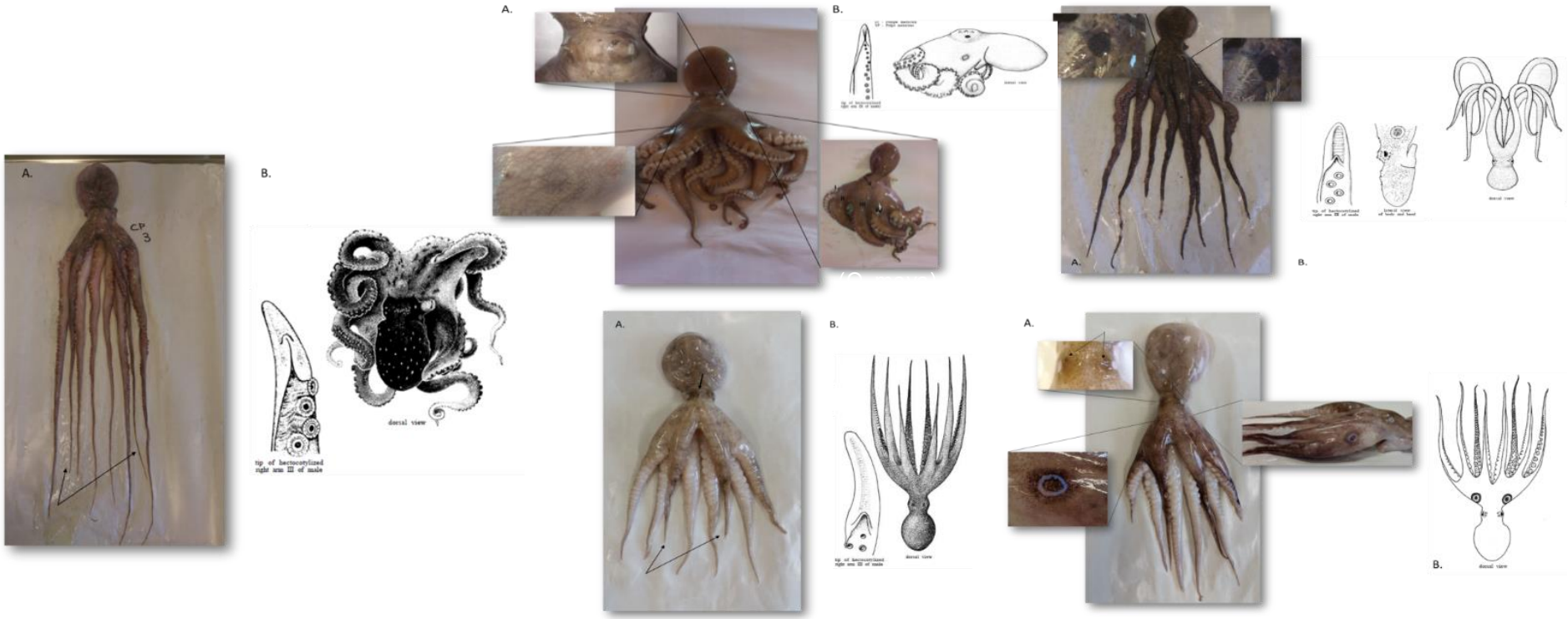

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IZSVe Ittiobase

Classificazione tassonomica | Nomi Comuni | Tracciati IEF | Sequenze | Distribuzione | Caratteristiche commerciali | Sicurezza e Frode

Engraulis encrasicolus
(Linnaeus 1758)

Ordine: Clupeiformes
Famiglia: Engraulidae
Genere: Engraulis
Alfa3: ANE

Sinonimi:
Lunghezza massima: 20 cm

Acciuga, Alice

Specie inserita del Decreto MIPAAF con denominazione obbligatoria.
Il nome di specie: encrasicolus, deriva dal greco en = dentro, chole = bile e kras = testa, a significare il sapore amaro, quando viene consumata cruda.

Nomi Comuni

Engraulis encrasicolus

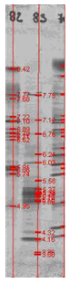
- Acciuga, Alice
- European Anchovy
- Anchois, Anchois Commun
- Anchovis, Sardelle
- Anchoa, Bocarte, Boqueron
- Ansjos, Europæisk Ansjos
- Ansjovis
- Ansjos
- Biqueirão

Classificazione tassonomica | Nomi Comuni | Tracciati IEF | Sequenze | Distribuzione | Caratteristiche commerciali | Sicurezza e Frode

Engraulis encrasicolus

Valore dei pI delle bande significative di *Engraulis encrasicolus* a diverso intervallo di pH:

8.15<pH<9.50: **8.43**
6.55<pH<8.14: **6.70, 6.78, 6.89, 7.11, 7.21**
5.20<pH<6.54: **5.74, 5.85, 5.91**
3.50<pH<5.19: **4.93**



Esempio di tracciato con pI elaborati dal software

Tracciato Ief

Classificazione tassonomica | Nomi Comuni | Tracciati IEF | Sequenze | Distribuzione | Caratteristiche commerciali | Sicurezza e Frode

Engraulis encrasicolus

Sequenza 1 di 12
Successivo

Origine:
Primer Forward: COIFISHF1 (5' TCAACYAATCAYAAAGATATYGGCAC 3')
Primer Reverse: COIFISHR1 (5' ACTTCYGGGTGRCCRAARAATCA 3')

Sequenza:
>253
----------TGAGCAGGAATGGTAGGGACAGCACTTAGCCTCCTTATTCGAGCAGAACTAAGCCAACC
AGGAGCACTTCTGGGGGACGATCAAATTTATAACGTAATCGTTACTGCTCACGCATTCGTAATAATCTTTTTCATGGTAA
TGCCCATTCTAATCGGTGGGTTCGGGAATTGACTAGTTCCTCTAATACTAGGGGCTCCAGACATGGCATTCCCCCGAATG
AACAATATGAGCTTTTGACTCCTTCCCCCTTCTTTCCTTCTCCTCTTAGCATCATCTGGTGTTGAAGCAGGGGCCGGGAC
AGGATGAACAGTCTACCCCCCTCTAGCAGGAAACCTCGCCCACGCCGGAGCATCAGTGGATTTAACAATCTTCTCTCTCC
ACTTGGCAGGGATTTCATCGATCCTAGGTGCCATTAATTTCATTACTACCATCATTAATATGAAACCACCTGCTATTTCA
CAATACCAGACACCTCTATTTGTCTGAGCTGTATTAATCACGGCAGTACTTTTACTTCTTTCACTACCCGTTCTAGCTGC
TGGGATTACTATGCTTCTTACAGACCGAAACCTAAATACTACTTTCTTCGACCCAGCAGGGGGAGGAGACCCAATTCTTT
ATCAACACCTA

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Thank You
Dank Je
Blagodaram
Dziekuje
Juspaxar
Ngiyabonga
Dankscheen
спасибо
köszönöm
Kiitos
Vinaka
Maake
Ásante
Shukria
Dhanyavadagalu
Manana
Dankon
Kam Sah Hammida
감사합니다
Mauruuru
Biyan
Matondo
Terima Kasih
Taiku
Tack
Diolch i Chi
Chokrane
Arigato
Grazie
Gracias
Mochchakkeram
Tingki
Paldies
Khap
Kop Khun
Kia Ora
Gratias Tibi
Obrigado
ありがとう
Djiere Dieuf
Eskerrik Asko
Najis Tuke
Go Raibh Maith Agat
ขอขอบคุณคุณ
Salamat
Merci
Di Ou Mèsi
Danke
Welalin
Hvala
Grazas
धन्यवाद
cảm ơn bạn
Ua Tsaug Rau Koj
Bedankt
Dakujem
Děkuji
Nirringrazzjak
Suksama
Nuwun
Matur
Rahmat
Misaotra
谢
谢
Хвала

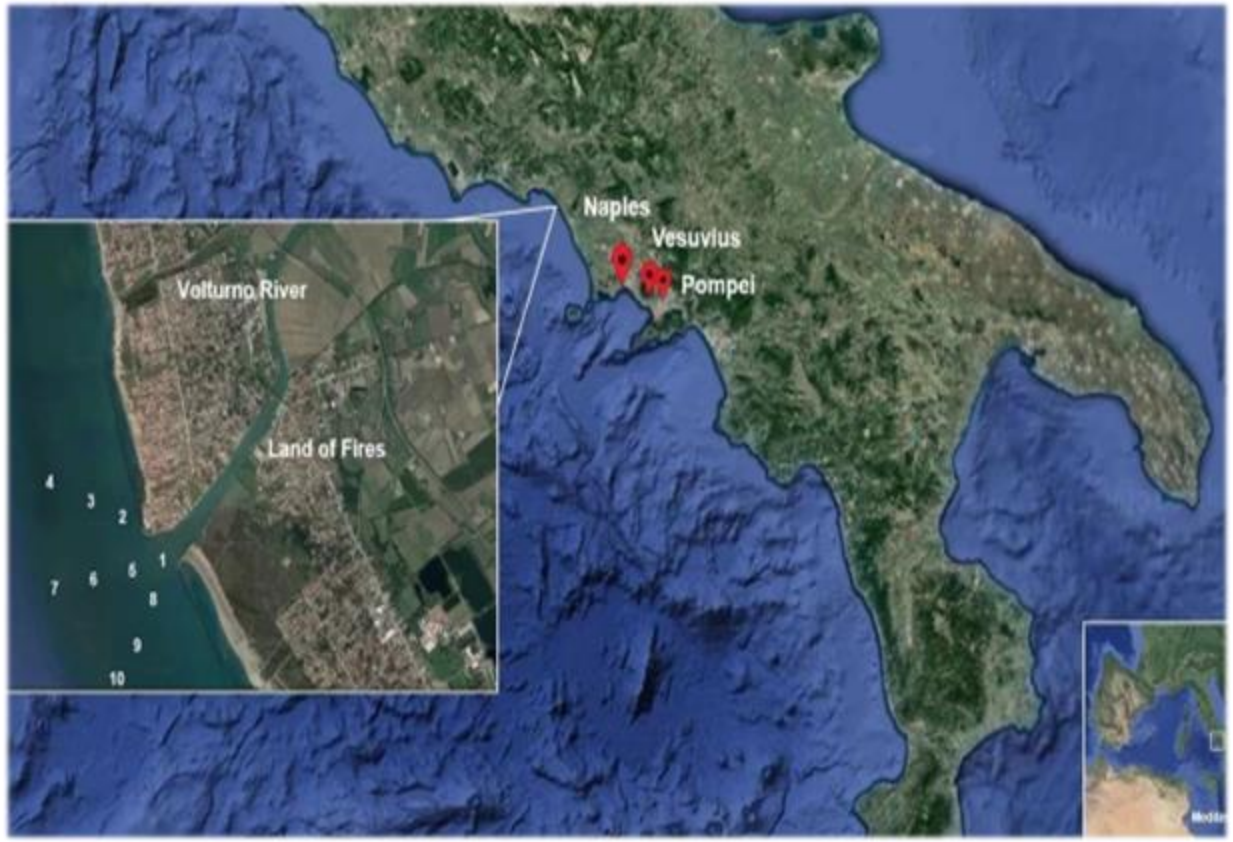
BTSF Zone for aquatic animals

AHL, Article 4, definition 35

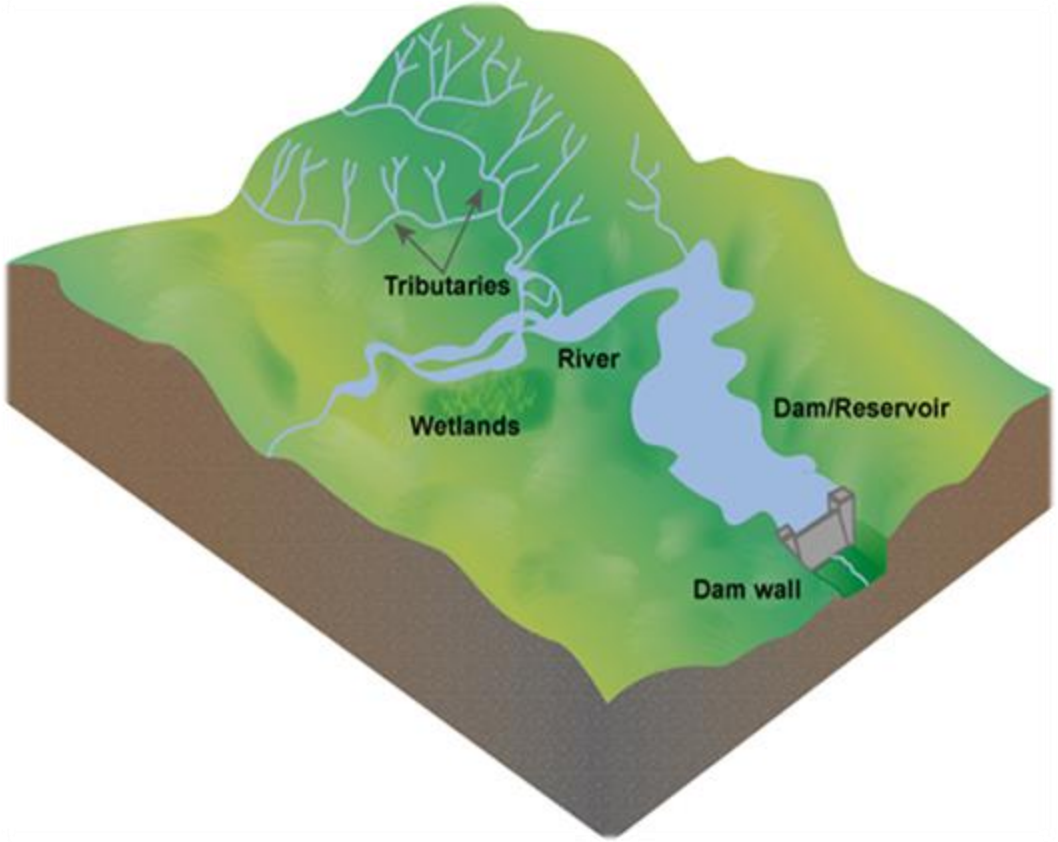
ZONE: A contiguous hydrological system with a distinct health status with respect to a specific disease that forms an area that including:

- (i) one or more water catchment(s) from the source to the estuary or lake;
- (ii) part of a water catchment from the source to a barrier;
- (iii) part of a coastal area with a precise geographical delimitation;
- (iv) an estuary with a precise geographical delimitation;

BTSF Some examples of zones

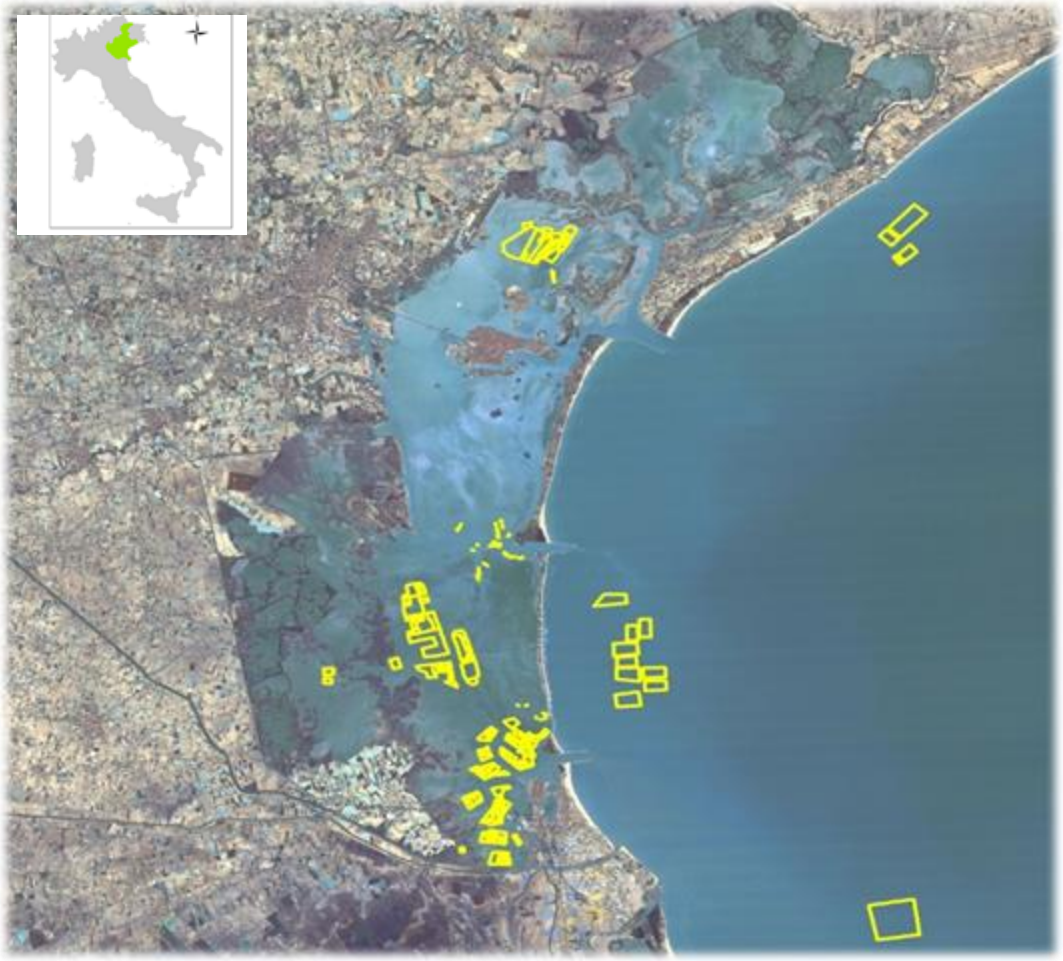


Water catchment from the source to the estuary



Part of a water catchment from the source to a barrier;

BTSF Examples of zones



Part of a costal area

Estuary

Compartment for aquaculture animals

A Compartment for aquatic animals is:

An aquatic animal sub-population

- Contained in one or more aquaculture establishments
- Common biosecurity management system
- Distinct health status for specific disease(s)
- Subject to appropriate disease control and biosecurity measures

Independent of the health status of surrounding waters

- Water must originate directly from a well/borehole/spring or has been treated through a water treatment plant
- If water originates from outside the establishment, the water shall be supplied directly and be channeled to the establishment
- Natural or artificial barriers that prevent aquatic animals from entering from the surrounding natural waters must be present
- The compartment must be protected against flooding and infiltration of water from surrounding natural waters (Article 79)