

WOAH Reference Centre for Viral Encephalopathy and Retinopathy (VER) Duties and Activities

Anna Toffan and 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

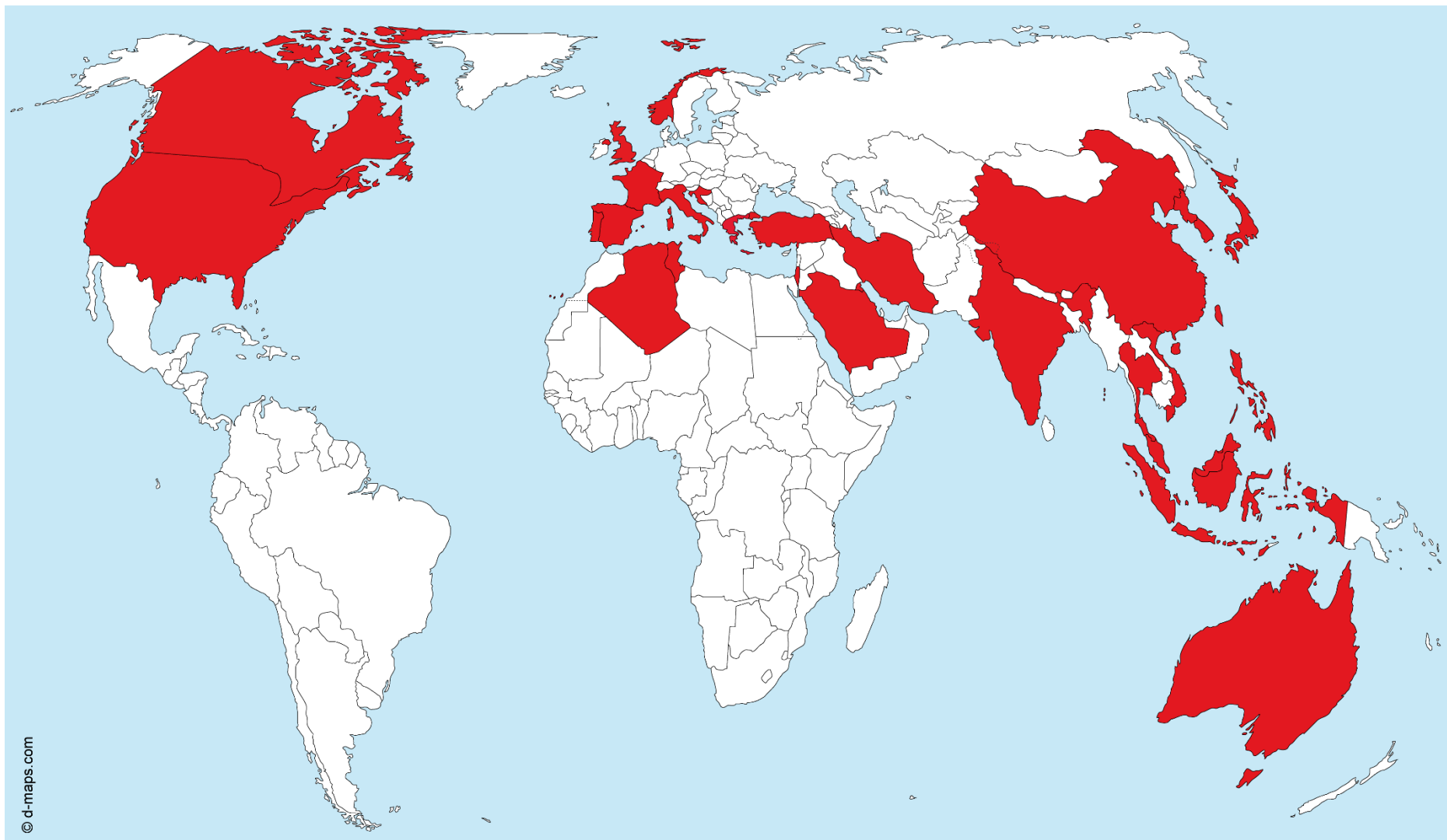


● Introduction to the disease

- 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**

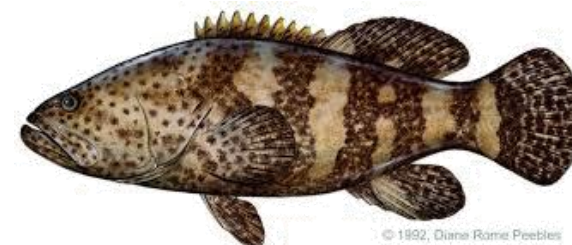
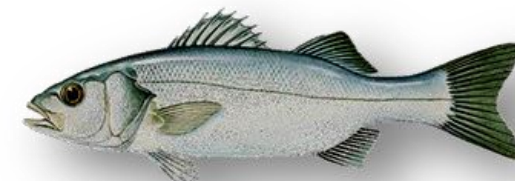


Disease distribution



● 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/2

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- There was a dedicated chapter in the Manual of Diagnostic Tests for Aquatic Animals, but it has been withdrawn in June 2022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



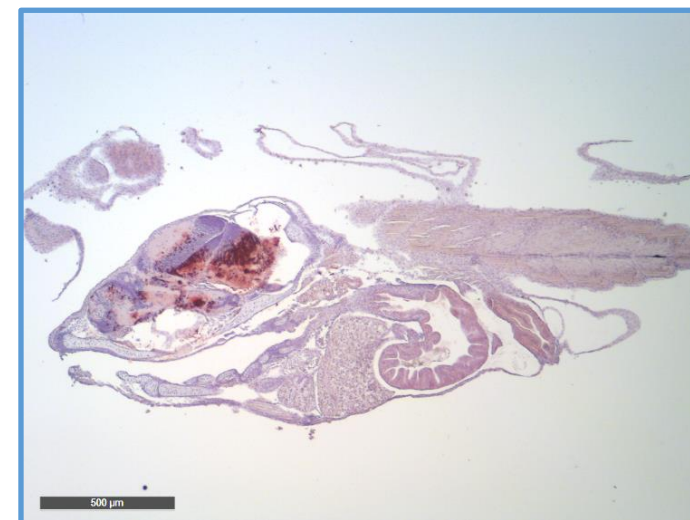
● Diagnostic methods available at IZSVe

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



● 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





International Proficiency Test

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



● National and International projects

- RC 02/14: The antibody response against betanodavirus in sea bass (*Dicentrarchus labrax*): development of advanced serological assays
- RC 09/15: Emerging Viral Encephalopathy and Retinopathy in sea bream (*Sparus aurata*) in the Mediterranean sea: pathogenesis, immunological response and diagnosis
- RC 13/22: Vertical transmission and immunoresponse of Betanodavirus in sea bream (*Sparus aurata*)



- European Project Targetfish (ended in 2017)
Targeted disease prophylaxis in European fish farming



- European Project Medaid (2017-2020)
Mediterranean Aquaculture Integrated Development

- European Project VetBioNet (2017-2021)
Veterinary Biocontained facility Network for excellence in animal infectiology research and experimentation



- European Project PathoGelTrap (2020-2023)





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 *Dicentrarchus 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-Ortiz², Simona Picchietti, Elisa Randelli, Valentina Stocchi,
Laura Guerra, Anna Toffan¹, Francesco Pascoli¹, Anna Maria Fausto, Massimo Mazzini,
Giuseppe Scapigliati

^{*} Department for Innovation in Biological, Agrofood and Forest Systems, University of Tuscia, Viterbo, Italy

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-Ortiz¹, Fr
Marica Toson³, Giusepp

SCIENTIFIC REPORTS

OPEN

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

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

Anna Toffan¹, Francesco Pascoli¹, Tobia Pretto^{2,3}, Valentina Panzarin¹, Miriam Abbadi¹,
Alessandra Buratin¹, Rosita Quaratesan¹, Daniel Gijón^{*} & Francesc Padrós⁵

RESEARCH ARTICLE

Molecular Basis for Antigenic Diversity of Genus *Betanodavirus*

Valentina Panzarin^{1,2,*}, Anna Toffan¹, Miriam Abbadi¹, Alessandra Buratin¹,
Marzia Mancin¹, Stine Braaen³, Christel Moræus Olsen³, Luca Bargelloni²,
Espen Rimstad², Giovanni Cattoli¹

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

* vpanzarin@izsvenezie.it



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,*}

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



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 Capg 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

Lucía Vázquez-Salgado¹, Francesco Pascoli², Andrea Marsella², Lorena Biasini², Alessandra Buratin², Tobia Pretto², Miriam Abbadi², Erica Melchioni², Isabel Bandin¹ 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, CIE Reference Laboratory for Viral Encephalo-Retinitis, National Reference Laboratory for Fish Diseases Legnaro, Padova, Italy; ³ Department of Histopathology, Istituto Zooprofilattico Sperimentale delle Venezie Legnaro, Padova, Italy



Article

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

Lorena Biasini¹, Paola Berto², Miriam Abbadi³, Alessandra Buratin, Marica Toson, Andrea Marsella², Anna Toffan² and Francesco Pascoli^{2,*}

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



Received: 26 June 2021
DOI: 10.1111/

ORIGINAL ARTICLE

WILEY | Journal of Fish Diseases

Detection and molecular characterization of betanodaviruses retrieved from bivalve molluscs

E Volpe¹ | M Grodzki¹ | V Panzarin² | A Guercio³ | G Purpari³ | P Serratore¹ | S Ciulli¹

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 Barsøe¹, Anna Toffan², Francesco Pascoli², Ansgar Stratmann³, Tobia Pretto², Andrea Marsella², Mérim Er-Rafik⁴, Niccolò Vendramin¹, Niels J. Olesen¹, Dagoberto Sepúlveda¹ 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
- Twinning project with Kingdom of Saudi Arabia (Jeddah Fish Health laboratory)agreement signed and starting as soon as possible.
- Twinning project with Oman Central Laboratory for animal Health (in progress after a preliminary assessment by IZSve experts in April 2025).
- International collaboration project AQUAE STRENGTH: Strengthening capacity on aquatic animal health and epidemiological surveillance 2023-26 (Morocco, Tunisia, Cambodia)
- Remote collaboration with several countries (Malaysia, Spain, France, Croatia, Greece, etc.)



● Activities on behalf of the WOAAH

- Annual report of activities available at <http://www.WOAAH.int/our-scientific-expertise/reference-laboratories/annual-reports/>
- Participation to WOAAH general session in Paris
- Participation to several scientific events to spread WOAAH role and activities





14