

VECTORS OR RESERVOIRS OF PATHOGENS OF AHL-LISTED AQUATIC DISEASES

**Standing Committee on Plants, Animals, Food and
Feed (PAFF) - Section: "Animal health and animal
welfare**

19-20 October 2023

Sofie Dhollander

WORKING GROUP ON AQUATIC DISEASES

- Isabelle Arzul
- Shetty Dharmaveer
- Niels Jørgen Olesen
- Morten Schiøtt
- Hilde Sindre
- David Stone
- Niccoló Vendramin



TERMS OF REFERENCE

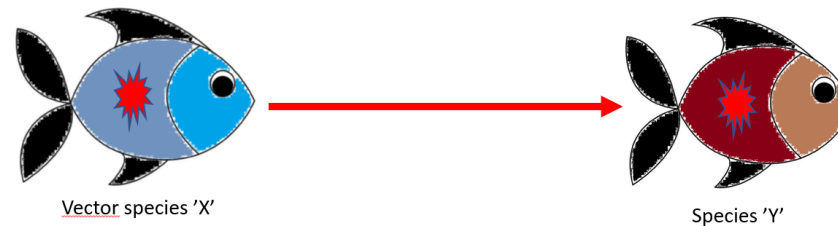
1. For each of the aquatic diseases listed in Annex II to the AHL, assess which species or groups of species of aquatic animals pose a considerable risk for their spread, based on the fact that:
 - they are **vector species or reservoirs** for that disease, or
 - scientific evidence indicates that such role is likely.
2. Assess the **suitability of the conditions under which they should be regarded as vectors or reservoirs for the purposes of movements**.
 - These conditions are set out in Annex I to Commission Delegated Regulation (EU) 2020/990 and in Annex XXX to Commission Delegated Regulation (EU) 2020/692
 - Alternative conditions should be proposed, if the conditions, which are set out in those Regulations, are assessed to be unsuitable.



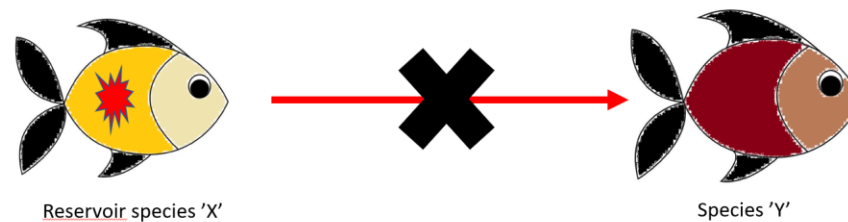
TOR1: LITERATURE REVIEW: REVIEW QUESTIONS

Review questions:

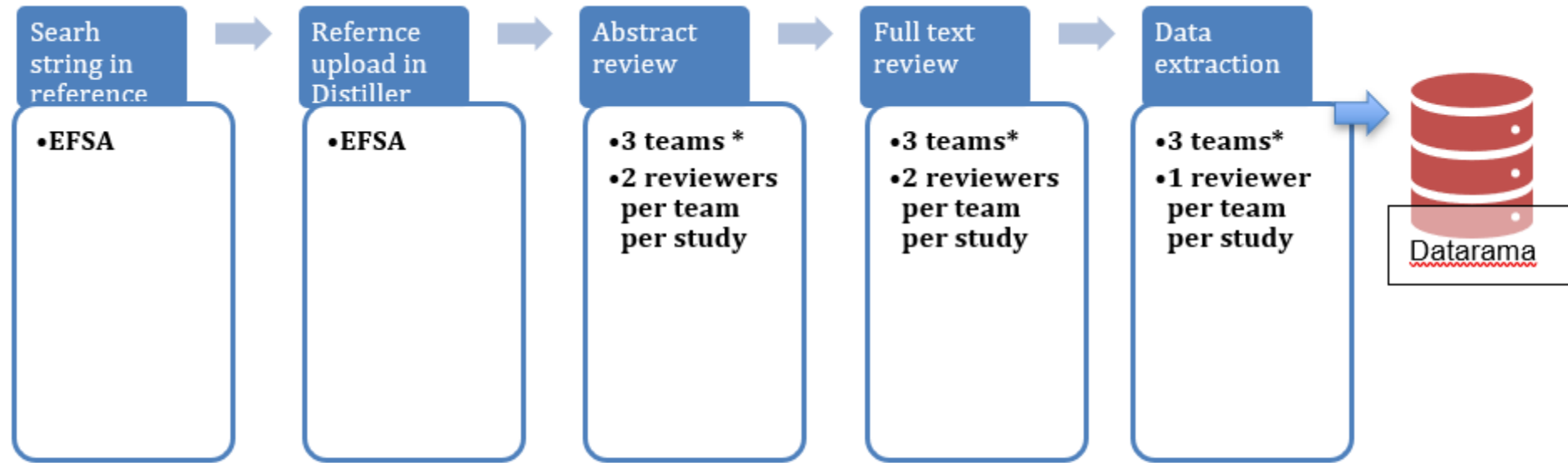
1. For **vector species**: What is the evidence generated by **experimental infection studies**, demonstrating transmission of 'Pathogen A' from '**vector species X**' on or in which Pathogen A was detected, to a species 'Y'?



2. For **reservoir species**: What is the evidence generated by **experimental infection studies or field studies**, demonstrating the detection of Pathogen A on or in species X, **without further evidence of transmission** of pathogen A to a species 'Y'?



EXTENSIVE LITERATURE REVIEW PROCESS



*1 team for Fish, 1 team for Crustaceans and 1 team for Molluscs



TITLE AND ABSTRACT SCREENING-EXPERIMENTAL INFECTIONS

Fish	Molluscs	Crustaceans
Infection with HPR-deleted infectious salmon anaemia virus	Infection with <i>Mikrocytos mackini</i>	Infection with white spot syndrome virus
Koi herpes virus disease	Infection with <i>Bonamia exitiosa</i>	Infection with Taura syndrome virus
Epizootic haematopoietic necrosis	Infection with <i>Marteilia refringens</i>	Infection with yellow head virus
Infectious haematopoietic necrosis	Infection with <i>Perkinsus marinus</i>	
Viral haemorrhagic septicaemia	Infection with <i>Bonamia ostreae</i>	

Team Fish	Team Molluscs	Team Crustaceans
RUSINA Alessia	Engelsma, Marc (procurement)	KOHNLE Lisa
AIRES Mariana	Ana Roque (procurement)	LINDGREN KERO Linnea (Interim)
Christos Palaiokostas (ISA)	Dolores Furones (procurement)	Meroc Estelle (ISA)
Dhollander Sofie	Debora Cheslett (procurement)	RUSINA Alessia
Karagianni Anna Eleonora		Selam Alemu
Ilaria Carmosino (ISA)		Elea Baily
Marzia gnocchi		



TITLE AND ABSTRACT : EXAMPLE ELIGIBILITY SCREENING

Is the abstract written in an **EU language**?

Is this a **primary research** study?

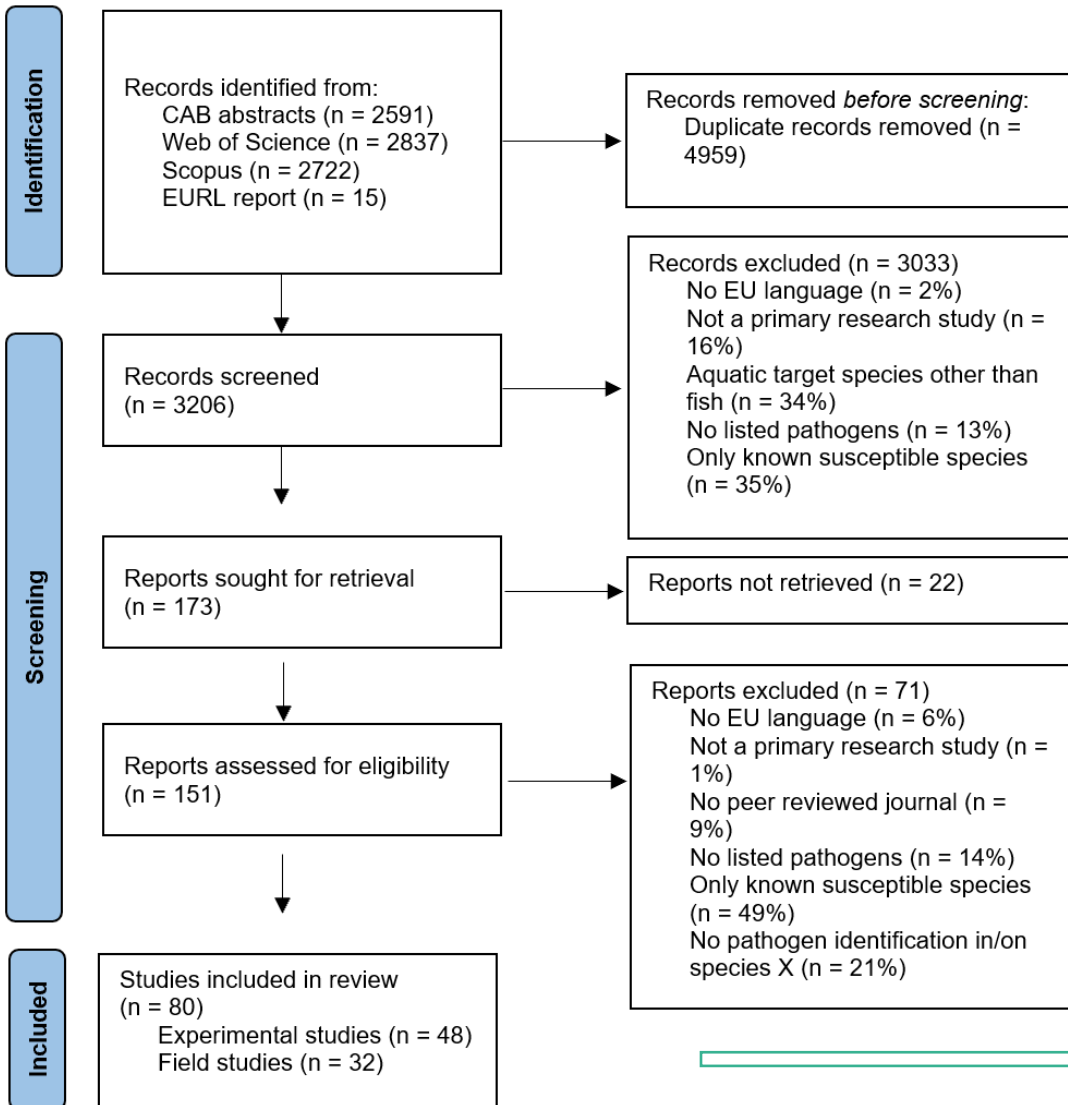
Species X belonging to either **fish, crustaceans or molluscs**?

Does the paper report a study that included one or more **pathogens listed** in Table 1 of the Review Protocol?

Does this study investigate at least one Species X, which is **NOT a known susceptible species**?



REVIEW PROCESS – COLLECTION OF EVIDENCE



	A	B	C	D	E	F	G	H	I	J	K	L
1	Refid	Bibliograp	pl	age	SpeciesX	agecatX	e	ryX	waterX	matrixX	labTestX	Inf
2	83	Al-Hussinee,	1	VHS	Pomoxis annularis (white crappie)	provided	1	CA	and eastern	ey,liver,sp	PCR	Yes
3	83	Al-Hussinee,	1	VHS	Pomoxis annularis (white crappie)	provided	1	CA	and eastern	ey,liver,sp	CellCult	Yes
4	83	Al-Hussinee,	1	VHS	Pomoxis annularis (white crappie)	provided	1	CA	and eastern	ey,liver,sp	ImmHis	Yes
5	83	Al-Hussinee,	2	VHS	Lota lota (Burbot)	provided	1	US	and the St.	ey,liver,sp	CellCult	Yes
6	83	Al-Hussinee,	2	VHS	Lota lota (Burbot)	provided	1	US	and the St.	ey,liver,sp	PCR	Yes
8	340	Breyta,	1	IHN	O. gorbuscha (Pink salmon)	provided	9999	U.S.A.	and Snake River	specified	PCR	Yes
9	782	Fabian, M.,Bè	1	KHV	Rutilus rutilus	Not provid	46	DE	Production pond	brain,intes	PCR	Yes
10	782	Fabian, M.,Bè	2	KHV	Gobio gobio	Not provid	10	DE	Production pond	brain,intes	PCR	Yes
11	782	ponds?.	3	KHV	Scardinius erythrophthalmus	Not provid	58	DE	Production pond	brain,intes	PCR	Yes
12	782	Fabian, M.,Bè	4	KHV	Perca fluviatilis (European perch)	Not provid	83	DE	Production pond	brain,intes	PCR	Yes
13	782	Fabian, M.,Bè	5	KHV	Abramis brama (Common bream)	Not provid	2	DE	Production pond	brain,intes	PCR	Yes
14	782	Fabian, M.,Bè	6	KHV	Leuciscus leuciscus (Common dace)	Not provid	10	DE	Production pond	brain,intes	PCR	Yes
15	782	Fabian, M.,Bè	7	KHV	Tinca tinca (Tench)	Not provid	91	DE	Production pond	brain,intes	PCR	Yes
16	782	Fabian, M.,Bè	8	KHV	Ameiurus nebulosus (Brown bullhead)	Not provid	39	DE	Production pond	brain,intes	PCR	Yes
17	782	Fabian, M.,Bè	9	KHV	Gasterosteus aculeatus (Three-spine stic	Not provid	34	DE	Production pond	brain,intes	PCR	Yes
18	782	Fabian, M.,Bè	10	KHV	Esox lucius (Northern Pike)	Not provid	15	DE	Production pond	brain,intes	PCR	Yes
19	1230	Jin,	1	KHV	goby)	provided	35	PL	Szczecin Lagoon	(animal	PCR	Yes
20	1230	Jin,	2	KHV	goby)	provided	11	DE	n (Greifswalder	(animal	PCR	Yes
21	1230	Jin,	2	KHV	goby)	provided	11	DE	n (Greifswalder	(animal	Seq	Yes
22	1230	Jin,	1	KHV	goby)	provided	35	PL	Szczecin Lagoon	(animal	Seq	Yes
24	1610	Lopez-	1	VHS	Reinhardtius hippoglossoides (Greenlan	provided	14	CA	(North Atlantic	specified	PCR	Yes



ASSESSMENT OF EVIDENCE

STEP 1: INDIVIDUAL ASSESSMENT

- *How certain are you that species X is a RESERVOIR species based on the evidence generated through the ELR?*
 - *Yes : > 90% certainty*
 - *No: < 10 % certainty*
- *How certain are you that species X is a VECTOR species based on the evidence generated through the ELR?*
 - *Yes : > 90% certainty*
 - *No: < 10 % certainty*

Any positive test result that is not one of the above situations was considered **inconclusive**.

The inconclusive results were elaborated in group discussion> **STEP 2**



STEP 2: GROUP DISCUSSION

- Smaller expert working groups for fish, crustaceans, or mollusc diseases
- individual judgements were discussed to reach a consensus judgement
- Experts were asked to choose from the following ranges of certainty for the inconclusive cases:

Likely	66-90%
As likely as not	33-66%
Unlikely	10-33%

- Reasoning for each choice are given.
- **66-90% was set as the cut-off level to consider the target species vector or reservoir**



CONCLUSIONS FISH– EXAMPLE: KHV

- Koi herpes virus disease
- **Vector**
- The following species are considered vector species for KHV with >90% certainty: *Carassius auratus* (Goldfish), *Carassius auratus gibelio* (Prussian carp), *Ctenopharyngodon idella* (Grass carp), *Gymnocephalus cernua* (Eurasian ruffe), *Hypophthalmichthys molitrix* (Silver carp), *Rutilus rutilus* (Common roach) and *Tinca tinca* (Tench).
- **Reservoir**
- The following species are considered reservoir species for KHV with >90% certainty: *Acipenser gueldenstaedtii* (Russian sturgeon), *Acipenser oxyrinchus* (Atlantic sturgeon), *Acipenser ruthenus* x *Huso huso* (Hybrid sterlet x beluga), *Barbatula barbatula* (Stone loach), *Gasterosteus aculeatus* (Three-spine stickleback), *Perca fluviatilis* (European perch) and *Scardinius erythrophthalmus* (Pearl roach).

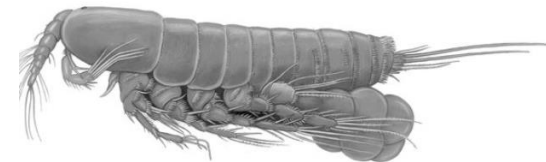


Disclaimer: The assessment was exclusively based on peer reviewed evidence and should be updated when new evidence becomes available. >same for all pathogens assessed



CONCLUSIONS CRUSTACEANS-EXAMPLE: WSSV

- **White Spot Syndrome virus**
- **Vectors**
 - The genus *Nitocra* (a genus of copepods) and the species *Octolasmis neptuni* (Pedunculate barnacle) are considered to be vectors for infection with WSSV with more than 90% certainty.
- **Reservoirs**
 - *Apocyclops royi* (a species of copepods) and *Ergisalus manicatus* (Gill louse) are considered to be reservoirs of white spot syndrome virus, with a certainty between 90-100%.
 - *Artemia* (Brine shrimp), *Schmackeria dubia* (a species of copepods) and *Squilla mantis* (Spottail mantis shrimp) are considered to be reservoirs of white spot syndrome virus, with a certainty between 66-90%.



CONCLUSIONS MOLLUSCS: *BONAMIA EXITIOSA* AND *BONAMIA OSTREAE*

Bonamia exitiosa

- **Vectors**

- No evidence was found to identify any vectors for *Bonamia exitiosa*.

- **Reservoirs**

- *Ostrea stentina* (Dwarf oyster) is considered to be a reservoir species for *Bonamia exitiosa* with more than 90% certainty.



- ***Bonamia ostreae***

- **Vectors**

- No evidence was found to identify any vectors for *Bonamia ostreae*.

- **Reservoirs**

- *Ostrea angasi* (Angasi oyster) is considered to be a reservoir species for *Bonamia ostreae* with 66-90% certainty.



TOR 2: OBJECTIVE AND METHODOLOGY

Objectives

- Review the **conditions** under which fish/crustacean/mollusc species shall be regarded as **vectors or reservoirs** of diseases listed in Annex II to the AHL **for the purposes of movements**

Methodology

- **Narrative literature review** to collect any evidence from scientific literature identifying conditions that may **prevent** transmission by vectors
- **Duration** of the experimental studies and the **water temperature** were compiled during the ELS
- The experts concluded by **consensus** if the collected evidence was sufficient to support the need to alter the conditions Annex I to Commission Delegated Regulation (EU) 2020/990 and in Annex XXX to Commission Delegated Regulation (EU) 2020/692



CONCLUSIONS – EXAMPLE: FISH

Viral haemorrhagic septicaemia, Infectious haematopoietic necrosis or HPR-deleted infectious salmon anaemia virus

- Under transport conditions at temperatures **below 25°C**, it is likely (66-90% certainty) that VHSV, IHNV and HPRΔ ISAV will remain infective.
- Vector or reservoir species can transmit VHSV, IHNV or HPRΔ ISAV when transported at a **temperature below 25°C** into a non-affected area. Exposure in an VHSV, IHNV or HPRΔ ISAV affected area may have occurred if the vector or reservoir originate from:
 - a) an aquaculture establishment where susceptible species or reservoir or other vector species of are kept;
 - b) the wild, where they may have been exposed to susceptible, reservoir or other vector species;
 - c) an aquaculture establishment supplied with water possibly contaminated with VHSV, IHNV or HPRΔ ISAV.

Epizootic haematopoietic necrosis and Koi herpes virus

The conclusion was the same , however they are likely to remain infective under all transport temperatures.



SCIENTIFIC OPINIONS AND SCIENTIFIC REPORTS WERE PUBLISHED

- [Species which may act as vectors or reservoirs of diseases covered by the Animal Health Law: Listed pathogens of crustaceans - - 2023 - EFSA Journal - Wiley Online Library](#)
- [Species which may act as vectors or reservoirs of diseases covered by the Animal Health Law: Listed pathogens of fish - - 2023 - EFSA Journal - Wiley Online Library](#)
- [Species which may act as vectors or reservoirs of diseases covered by the Animal Health Law: Listed pathogens of molluscs - - 2023 - EFSA Journal - Wiley Online Library](#)

- [Extensive literature review on vectors and reservoirs of AHL-listed pathogens of crustaceans - - 2023 - EFSA Supporting Publications - Wiley Online Library](#)
- [Extensive literature review on vectors and reservoirs of AHL-listed pathogens of fish - - 2023 - EFSA Supporting Publications - Wiley Online Library](#)
- [Extensive literature review on vectors and reservoirs of AHL-listed pathogens of molluscs - Engelsma - 2023 - EFSA Supporting Publications - Wiley Online Library](#)



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