Case No: 2022-0486 Date of visit: 11/10/2022

Time spent on site: 3 hours Main Inspector: [redacted]

Site No: FS1019 Site Name: Strondoir Bay
Business No: FB0169 Business Name: Bakkafrost Scotland

Case Types: 1 REP 2 DIA 3 4 5 6

Water Temp (°C): 12.6 Thermometer No: T155 FHI 045 completed

Observations: Region: ST Water type: S CoGP MA: M-42

Dead/weak/abnormally behaving fish present?	Y	If yes, see additional information/clinical score sheet.
Clinical signs of disease observed?	Y	If yes, see additional information/clinical score sheet.
Gross pathology observed?	Y	If yes, see additional information/clinical score sheet.
Diagnostic samples taken?	Y	

UNI/REG only - if unable to carry out intended visit detail reason below:

Additional Case Information:

Cleaner fish stocks attributed as black loss. Poor performace of cleaner fish - both wrasse and lumpfish on site. Constant low level mortality since inputs with occasional instant losses after input. AGD identified within stocks but uncertain of cause of mortality. Site considers that no stocks remain on site, although several wrasse observed in some of the cages.

Several moribund fish observed although not in vast numbers. Occasional fish observed with sea lice damage to the head. Diagnostic samples taken from 4 fish.

Additional treatments in cycle - 4 x FW treatments, 1 FW and Salmosan, 4 x slice treatments, 2 rounds of hydrolysing

Case No:	2022-0486	Site No:	FS1019
Date of Visit:	11/10/2022	Inspector(s):	[redacted]

Registration/Authorisation Details

1. Business/site details summary checked by site representative?	Y
2. Changes made to details?	Y

Site Details (include cleaner fish for all sections)

Total No facilities	10	Facilities stocked	10	No facilities inspected	5		
Species	Atlantic slamon						
Age group	2021 S0						
No Fish	359,815						
Mean Fish Wt	2.2						
Next Fallow Date (Site)	Summer 2023		Next Input Date (Site)	Autumn 2023			
Recent (last 4 wks) disease problems?		Y	Any escapes (since last visit)?	N			
If yes, detail:	AGD & Anaemia, PD at beginning of the year / end last year - continued negative impact and feeding						

Movement Records

1. Movement records available for inspection?	Y
2. Date of last inspection:	12/05/2021
3. Are records complete and correctly entered?	Y
4. Are movement records available for dead fish and waste?	Y
5. Are records complete and correctly entered?	Y
6. Are health certificates for introductions (outwith GB) available?	N/A

Transport Records

1. Are any movements carried out by (or on behalf) of the business (not using a STB)?	Y
If yes, is there a system in place for maintenance of transportation records?	Y

Mortality Records

1. Mortality records available for inspection?	Y
2. How are mortalities disposed of?	Whole fish - Dundas Chemicals
If other detail:	
3. Mortality records complete and correctly entered?	Y
4. Recent mortality (last 4 wks):	Lost 70,998 fish - 17.37% for past 4 weeks - (wk 37 - 2.88%, 12,407; wk 38 -
5. Evidence of recent increased/atypical mortalities?	Y

If yes, facility nos/no mortality per facility/no stock per facility/reason:

Losses ranging 23-50% per cage since beginning August 2022. Attributed to gill issues. Cage 8 - 50%/19K; cage 4 37%/17k; Cage 3 -38%/17k; cage 2 - 41%/16k. Total loss for period 153k.

6. Any other peaks in mortality during period checked?	Y
If yes, detail:	Some mortality following input Oct 2021 (transfer). Following this grumbling mortality through to April 2022 (PD). From july onwards 2022, increasing mortality associated with gill issues.
7. Have increased (unexplained) mortalities been reported to vet or FHI?	Y
If yes, detail action:	Sampling activity - see under results of surveillance
8. Have 'mortality events' been reported to FHI? If no, enter details on mortality events sheet.	Y

Treatments and Medicines Records

1. Recent treatments (see comment)?	Y
If yes, detail:	T.M.S.
If other, detail:	FW treatment finished last week
2. Medicines records available for inspection?	Y
3. Are records complete and correctly entered?	Y
4. Are fish in a withdrawal period?	Y
5. If yes, what treatment(s)?	T.M.S.
If other, detail:	
6. Are medicines stored appropriately?	Y

Biosecurity Records

1. Biosecurity records available for inspection?	Y
2. Has the manner and frequency of mortality removal, recording and safe disposal been considered?	Y
3. Has the manner and period in which the APB will notify Scottish Ministers or veterinary professional of any *increased* (*unexplained)* mortality at the site been included?	Y
4. Has the action that will be taken in the event that the presence or suspicion of the presence of a listed disease is detected been included and *how* and *when* that will be notified to Scottish Ministers?	Y
5. Has the health status of aquaculture animals being stocked on the farm site been covered (equal or higher health status, certification if required)?	Y
6. Have the husbandry and biosecurity measures implemented between each epidemiological unit to minimise transmission of disease been covered (movement of staff, visitors, equipment, live or dead fish etc.)?	Y
7. Is documentation available regarding the measures in place to maintain the physical containment of aquaculture animals held on site?	Y
8. Have the biosecurity procedures been adequately implemented on site?	Y
If no, detail:	

Results of Surveillance

1. Has any animal health surveillance been carried out by, or on behalf of, the business?	Y
2. If yes, are results available for inspection?	Y
3. Any significant results?	Y
If yes, detail (if not detailed under recent disease problems).	PD, anaemia and AGD
Records checked between:	12/05/21 to 11/10/2022

Case no:	2022-0486	Site No:	FS1019	Date of visit/ Sampling:	11/10/2022	12/1							
Priority samples:	VI		BA		PA		MG		HI				
Time sampling starts/ends:	15:45:00	17:00:00	Inspector:		VMD No.	0							
Environmental conditions:	1	Indoors	2		3		4		5				
Summary samples	HIST	Y	BA	Y	MG	Y	VI		PA		Total Samples		

Add Fish/Pools - click

	Pool/Fish No	F1	F2	F3	F4								
	Fish nos	1	2	3	4								
	Pool Group												
Stock Details	Species	SAL	SAL	SAL	SAL								
	Average weight	2.2000	2.2000	2.2000	2.2000								
	Sex	N/A	N/A	N/A	N/A								
	Water Type	SW	SW	SW	SW								
	Stock Origin	Landcatch	Landcatch	Landcatch	Landcatch								
	Facility No	3	3	4	4								

12/2022 Additional Sample Information:

SW 4 fish standard diagnostic sample

4 Total Tests assigned 3

Case no:	2022-0486	Site No:	FS1019	Method of killing:	Anaesthetic
Date of visit:	11/10/2022	Inspector(s):	[redacted]	Sheet Relevant:	Y

S for strong presence: **M** for medium presence: **W** for weak presence

Fish Number		1	2	3	4						
Time sampled after death (if > 45 minutes)											
External Signs											
Behaviour	Moribund			W	W						
	Lethargic	S	S	S	S						
	Hanging vertical										
	Spiralling										
	Flashing										
	Loss of equilibrium										
Body	Dark										
	Distended abdomen										
	Anorexic										
	Scale Oedema										
Opercula	Shortened										
	Flared										
Haemorrhaging	Throat										
	Ventrum		W								
	Base of fins										
	Elsewhere										
Eyes	Exophthalmic										
	Enophthalmic (sunken)										
	Cataract										
	Haemorrhagic										
Gills	Pale	W	S	S	M						
	Zoned	M	S	M	W						
	Necrotic	S	W		W						
Lesions	Flank										
	Elsewhere										
Vent	Inflamed										
	Trailing faeces										
Lice Load	Estimate numbers										
Internal Signs											
Ascites	Clear		S								
	Bloody	W									
Oedema	In tissues										
Heart	Pale/anaemic		W		W						
	Granulomas										
	Deformed										
Liver	Petechial haem	W									
	Gross haem										
	Tissue breakdown										
	Enlarged										
	Colour number(s)	3	3	3	3						
	Granulomas										
	Lesions										
Pyloric caeca	Petechial haem										
	Tubules mauve										
	Lack of fat										
Spleen	Enlarged										
	Granulomas										
Gut	No food present	S	S	S	S						
	Yellow pseudo-faeces				S						
	External haem										
	Internal haem										
Body wall	Haemorrhaging	S									
Swim bladder	Haemorrhaging										
	Fluid filled										
Kidney	Swollen										
	Grey										
	Granular										
	Liquefied										
General	Parasites present										
	Anaemia										

Case no: 2022-0486

Date of visit: 11/10/2022

S for strong presence: **M** for medium presence: **W** for w

Fish Number											
Time sampled after death (if > 45 minutes)											
External Signs											
Behaviour	**Moribund**										
	Lethargic										
	Hanging vertical										
	Spiralling										
	Flashing										
	Loss of equilibrium										
Body	**Dark**										
	Distended abdomen										
	Anorexic										
	Scale Oedema										
Opercula	**Shortened**										
	Flared										
Haemorrhaging	**Throat**										
	Ventrum										
	Base of fins										
	Elsewhere										
Eyes	**Exophthalmic**										
	Enophthalmic (sunken)										
	Cataract										
	Haemorrhagic										
Gills	**Pale**										
	Zoned										
	Necrotic										
Lesions	**Flank**										
	Elsewhere										
Vent	**Inflamed**										
	Trailing faeces										
Lice Load	**Estimate numbers**										
Internal Signs											
Ascites	**Clear**										
	Bloody										
Oedema	**In tissues**										
Heart	**Pale/anaemic**										
	Granulomas										
	Deformed										
Liver	**Petechial haem**										
	Gross haem										
	Tissue breakdown										
	Enlarged										
	Colour number(s)										
	Granulomas										
	Lesions										
Pyloric caeca	**Petechial haem**										
	Tubules mauve										
	Lack of fat										
Spleen	**Enlarged**										
	Granulomas										
Gut	**No food present**										
	Yellow pseudo-faeces										
	External haem										
	Internal haem										
Body wall	**Haemorrhaging**										
Swim bladder	**Haemorrhaging**										
	Fluid filled										
Kidney	**Swollen**										
	Grey										
	Granular										
	Liquefied										
General	**Parasites present**										
	Anaemia										

Additional comments:

F1 & F2 - blood clot over the liver. Strong haemorrhaging over gills of F4, weak haemorrhaging over the gills of F2 & F3. Adhesions observed in all fish. F1 showed an area of extensive haemorrage and bruising on the internal wall of the body cavity - sample taken for histology.

Site No: FS1019

Case No: 2022-0486

Nature of non-compliance:

Action taken (FHI):

Non-compliance relevant to (delete): VirologyMolGen/Bacteriology/Histology/Parasitology

Case No: 2022-0486 Date of visit: 11/10/2022

Site No: FS1019 Inspector: [redacted]

Results Summary	Freq.	Date of Notification						
		Database	Insp	Phone	Insp	Writing	Insp	2nd Insp
ASAL	2/4	03/11/2022				08/12/2022		
YRUK	1/4	03/11/2022				08/12/2022		
AERH	2/4	03/11/2022				08/12/2022		
GPAT	4/4	03/11/2022				08/12/2022		
EPIT	1/4	03/11/2022				08/12/2022		
CGDH	4/4	03/11/2022				08/12/2022		
AGDQ	1/4	03/11/2022				08/12/2022		
IHNP	0/4	03/11/2022				08/12/2022		
IPNM	0/4	03/11/2022				08/12/2022		
ISAQ	0/4	03/11/2022				08/12/2022		
PMVP	0/4	03/11/2022				08/12/2022		
SALP	0/4	03/11/2022				08/12/2022		
PNST	4/4	03/11/2022				08/12/2022		
SPVP	4/4	03/11/2022				08/12/2022		

Report Summary			
Case Type	Date	Insp	2nd Insp
DIA	08/12/2022		

FISH HEALTH INSPECTORATE VISIT REPORT

SUMMARY FOR INFORMATION OF SITE OPERATOR

BUSINESS NO	FB0169	**DATE OF VISIT**	11/10/2022
SITE NO	FS1019	**SITE NAME**	Strondoir Bay
CASE NO	20220486	**INSPECTOR**	[redacted]

Section 1: Summary

Following a report of increased mortality, an inspection of the site was conducted and diagnostic sampling undertaken. Increased mortality of over 17% had been experienced for the four weeks preceding the visit and had been attributed to amoebic gill disease and anaemia. Diagnostic samples were taken from 4 fish.

From the case description and information provided by the site and in conjunction with the clinical signs and gross pathology observed, the pathogens identified and histopathological observations from the fish sampled, it is most likely that complex gill disease is the significant factor responsible for the condition of the fish and the mortality being experienced on site.

Histopathology examination revealed features consistent with *Aeromonas salmonicida* (furunculosis) and complex gill issues, along with mild, multifocal hepatic and splenic necrosis.

The bacterial species *Yersinia ruckeri* and *Aeromonas salmonicida* subsp. *salmonicida* were isolated from the samples taken. Both are primary fish pathogens and the level and purity would suggest they are contributary factors in the morbidity of this case. Molecular genetic testing revealed positive results for *Neoparamoeba perurans* (the causative agent of amoebic gill disease), salmon gill poxvirus and *Paranucleospora theridion*.

Please contact myself or the duty inspector should you require any further information, have any queries regarding this report or if any problems develop.

Section 2: Case Detail

Observations

An inspection was conducted in response to increased mortality experienced on the site. During the inspection several moribund fish were observed across the cages inspected. The occasional fish showed damage to the head suspected to be a result of sea lice infestation. Four fish were removed from the site for closer examination and diagnostic sampling. All four fish appeared to be lethargic in behaviour and fish 3 and 4 were moribund. External haemorrhaging across the ventrum was observed on fish 2. All fish had pale and zoned gills which appeared necrotic in fish 1, 2 and 4 and haemorrhagic in fish 2, 3 and 4. Internally, clear ascites (fish 2) and bloody ascites (fish 1) was observed within the body cavity. The heart appeared anaemic in fish 2 and 4. Petechial haemorrhaging was observed across the liver of fish 1, which also showed extensive haemorrhage

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and bruising on the internal wall of the body cavity. None of the fish had food present within the gut and yellow faecal casts were observed within fish 4.

Samples

Samples were collected from four fish according to the table below:

Fish number	Facility number	Species	Stage	Origin
1	3	Atlantic salmon	2.2 kg / 2021 S0	Landcatch
2	3	Atlantic salmon	2.2 kg / 2021 S0	Landcatch
3	4	Atlantic salmon	2.2 kg / 2021 S0	Landcatch
4	4	Atlantic salmon	2.2 kg / 2021 S0	Landcatch

Results

Bacteriology: Kidney and gill material from all four fish was inoculated onto appropriate media for the isolation of bacteria.

The following bacteria were isolated from fish F1-F4:

- *Yersinia ruckeri:* F3 (Kidney);
- *Aeromonas salmonicida* subsp. *salmonicida*: F1 & F2 (Kidney)

From the tests conducted, we do not have evidence of either isolates being resistance to amoxycillin, oxytetracycline, sulphamethoxazole/trimethoprim or florfenicol.

Virology: Tissue samples were tested for segments of nucleic acid indicative of the presence of the pathogens specified below using real-time PCR (qPCR).

Salmon gill poxvirus (SGPV)

Fish Number	**Endogenous control Cp value**	**Cp Values**			**Reported Result (PCR)**
F1	22.76	25.76	26.15	26.17	POSITIVE
F2	23.61	28.61	28.75	28.55	POSITIVE
F3	23.52	33.03	32.99	33.32	POSITIVE
F4	23.65	37.91	38.13	38.02	POSITIVE

The samples tested negative for infectious haematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), infectious salmon anaemia virus (ISAV), piscine myocarditis virus (PMCV), salmonid alphavirus (SAV) and viral haemorrhagic septicemia virus (VHSV).

Parasitology: Tissue samples were tested for segments of nucleic acid indicative of the presence of the parasites specified below using real-time PCR (qPCR).

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Neoparamoeba perurans (AGD)

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	-	-	-	-	Negative
F2	-	-	-	-	Negative
F3	-	-	-	-	Negative
F4	23.65	33.02	32.80	33.09	POSITIVE

Paranucleospora theridion

Fish Number	Endogenous control Cp value	Cp Values			Reported Result (PCR)
F1	22.76	28.64	28.95	28.92	POSITIVE
F2	23.61	33.20	33.54	32.88	POSITIVE
F3	23.52	32.55	32.47	32.57	POSITIVE
F4	23.65	32.63	32.22	32.13	POSITIVE

Histology: Tissue samples of gill, skin and skeletal muscle, heart, pyloric caeca, pancreas, hind gut, liver, spleen and kidney were taken from fish 1-4. The tissue samples were fixed in 10% neutral buffered formalin prior to examination by light microscopy. The following histopathological changes were observed:

Gill: Lamellar hyperplasia, multifocal, several, mild in all fish and presence of several dense aggregates of Gram-negative bacteria (F1 & F2). Filament tip bluntness and necrosis, increase of eosinophilic granular cells at the filament centre observed in F3. Occasional basophilic epithelial inclusions (likely epitheliocystis) (F4). Lamellar telangiectasia with multifocal thrombosis in all fish.

Skin & Muscle: Lesion: musculature necrosis and mild haemorrhage (F1).

Heart: F1 display several small dense aggregates of Gram-negative bacteria in the two chambers. F2 displayed marked epicarditis and displayed a pustule-like lesion filled with mostly neutrophil-like granulocytes.

Gut and pyloric caeca: Mild cell sloughing (potentially associated with post-mortem artefact) (F3).

Pancreas: Within the normal range.

Liver: Hepatocellular necrosis, mild, multifocal (F1, F3, F4) and mild infiltration (F3), some mild, diffuse hepatocellular vacuolation (macrovisicules) (F1- F3).

Kidney: Some renal tubular dilation, some shrunken glomeruli and interstitial cell (haemopoietic) necrosis (F1).

Spleen: cellular necrosis, mild, multifocal (F3), some cuffing (F4).

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Signed: [redacted] Date: 8 December 2022

Fish Health Inspector

The Fish Health Inspectorate Service Charter detailing standards of service is available on the Marine Scotland website at https://www.gov.scot/publications/fish-health-inspectorate-service-charter/

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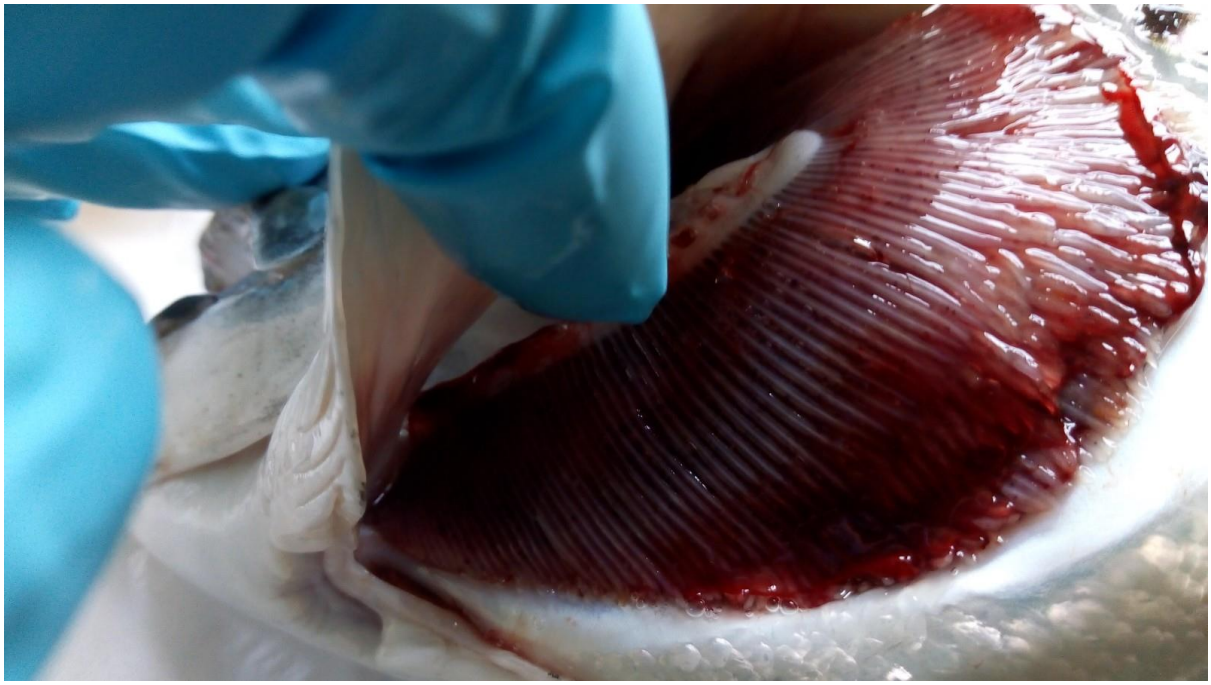
Strondoir Bay – 2022-486

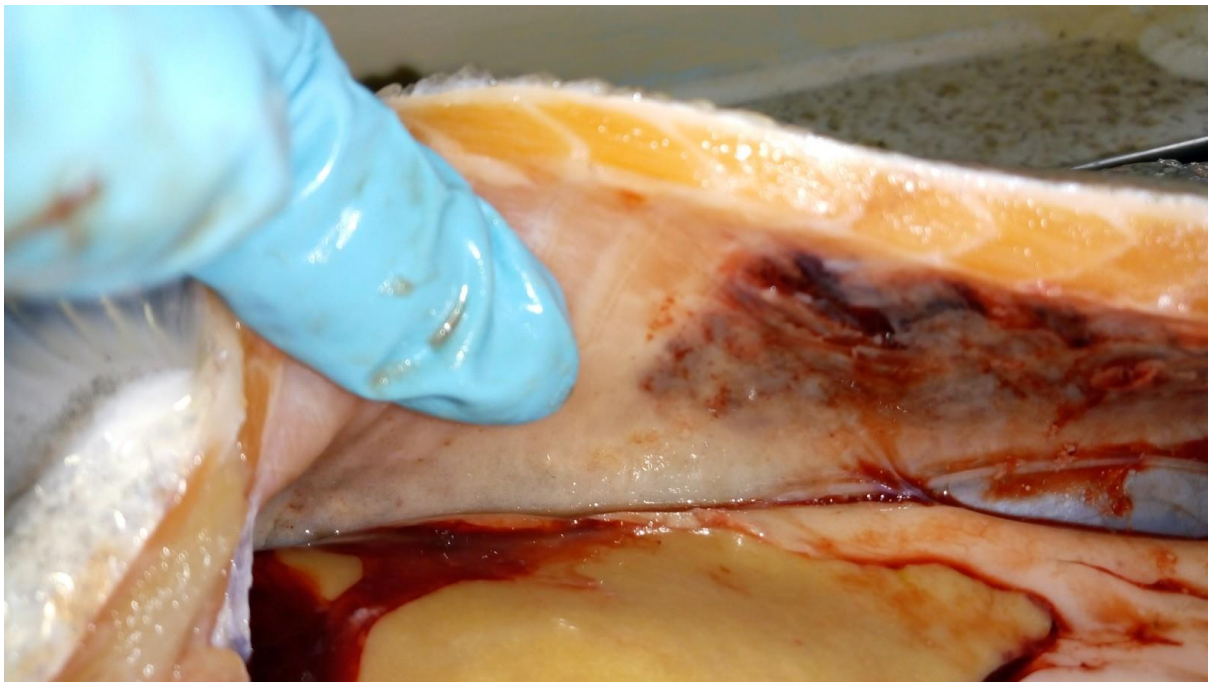
Fish 1 – Pale, zoned, necrotic gills

Fish 2 – Pale, zoned, clumped necrotic gills with slight haemorrhaging

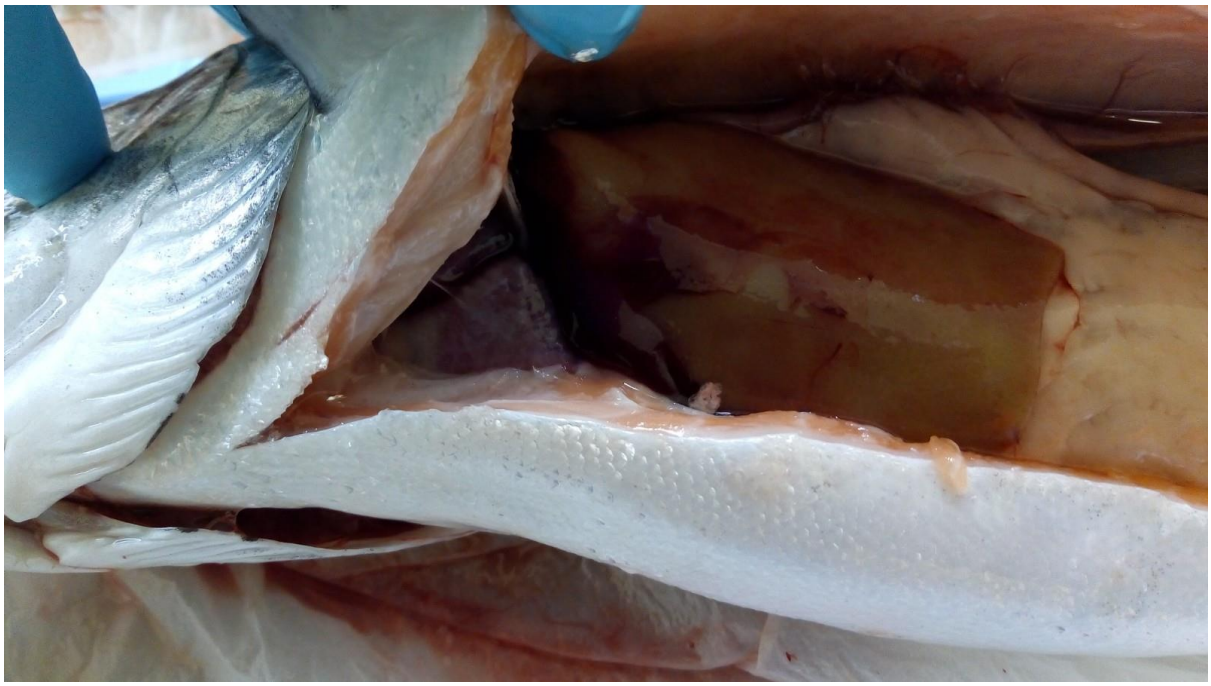
Fish 3 – Pale zoned gills with slight haemorrhaging



Fish 4 – Pale, zoned necrotic gills with haemorrhaging



Fish 1 – Blood clot over the liver. Extensive haemorrhaging and bruising on the internal wall of the body cavity



Fish 2 – Blood clot over the liver