

# Novel myocardial pathology in farmed salmonids in Norway

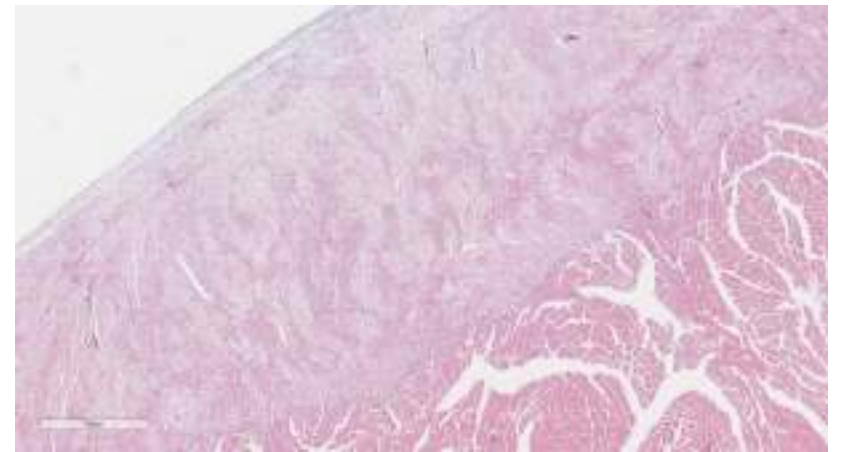
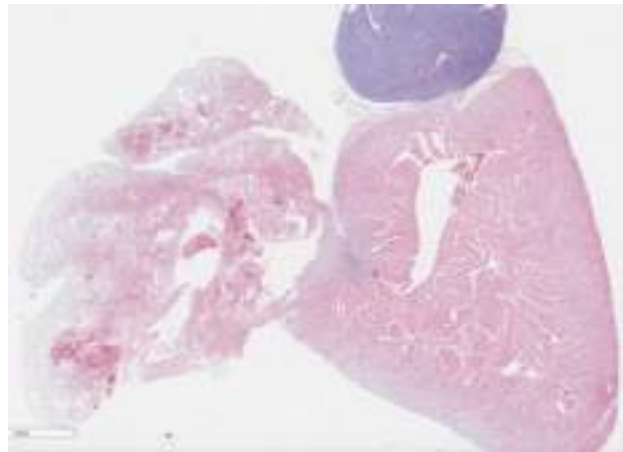
Trination meeting November 2022

Helene Wisløff - Pharmaq Analytiq AS



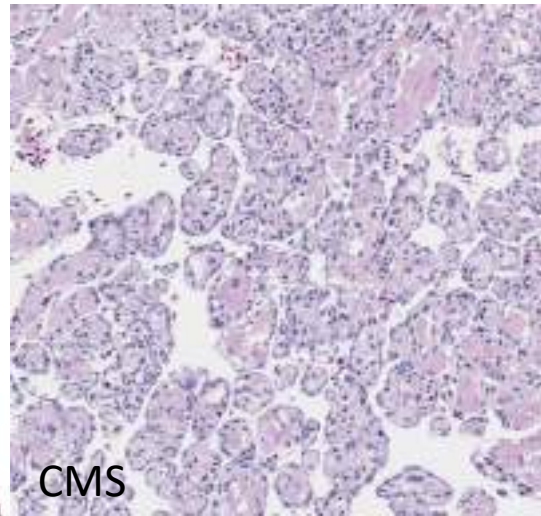
## Layout

- Cardiac pathology in farmed salmonids
- Presentation of novel finding in our diagnostic material
- Short discussion of possible causes
- Future perspectives

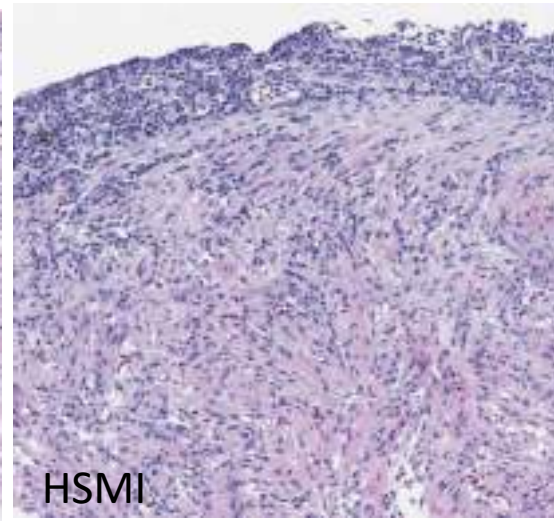


# Cardiac pathology in farmed salmonids

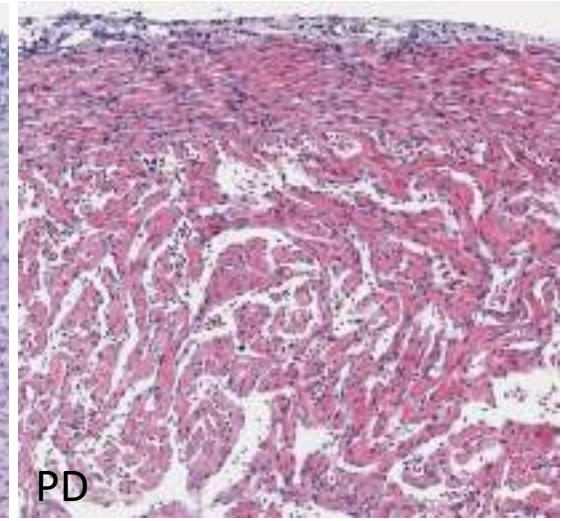
- Viral diseases (HSMI, CMS, PD)
- Other infectious diseases
- Cardiac abnormalities (abnormal morphology, abnormal location, aplasia/hypoplasia of septum transversum etc.)



CMS



HSMI



PD

# Cardiac abnormalities

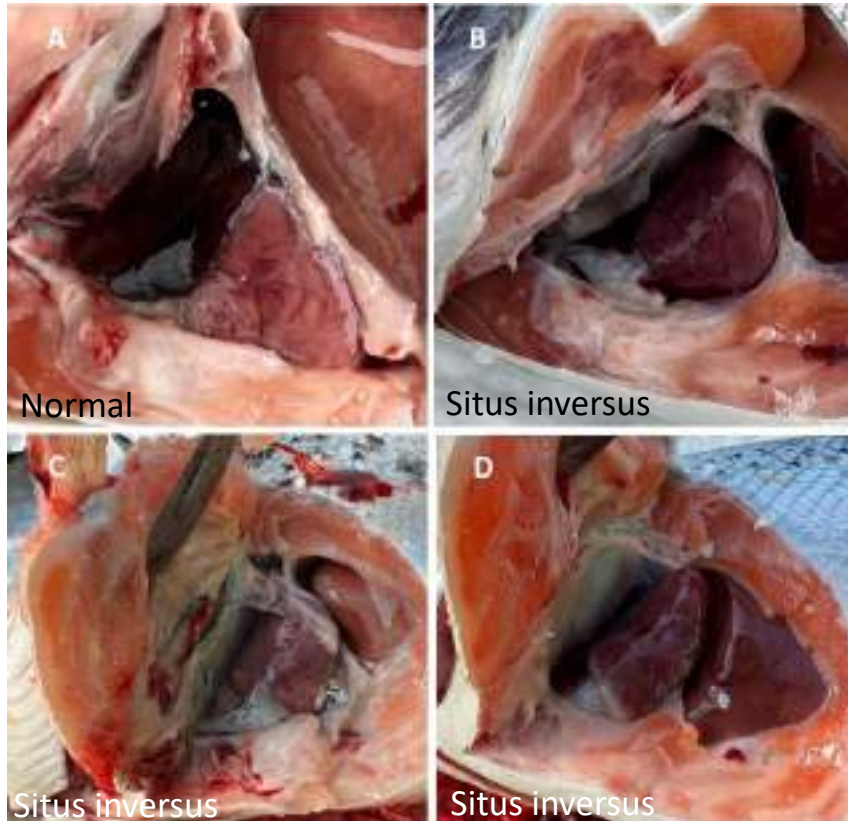


Photo: Jakob Mo, Sinkaberg-Hansen



Photo: Mette Hofossæter, Pharmaq Analytiq

# Novel myocardial pathology

- Lesions in compact myocardium
- Atlantic salmon and rainbow trout, typically 1-3 kg
- Stressful situations (treatment against sea lice, transport, temperature changes)
- Gross lesions: hemopericardium, distended hearts, cardiac anomalies, pale myocardium, ascites, congestion

Wild salmon



Farmed salmon

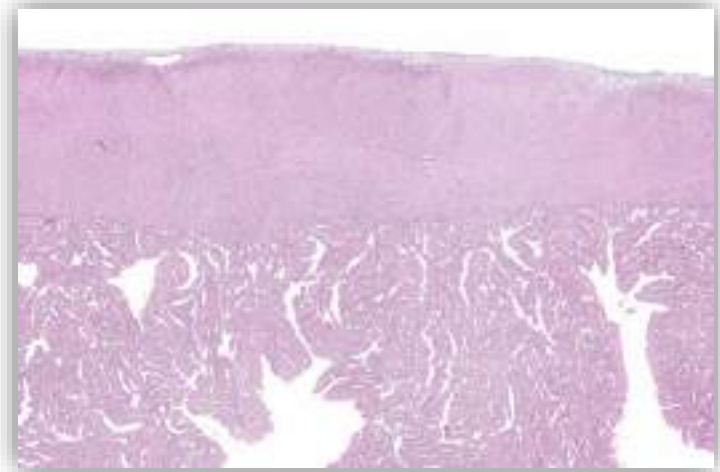


Photo: Jakob Mo, Sinkaberg-Hansen

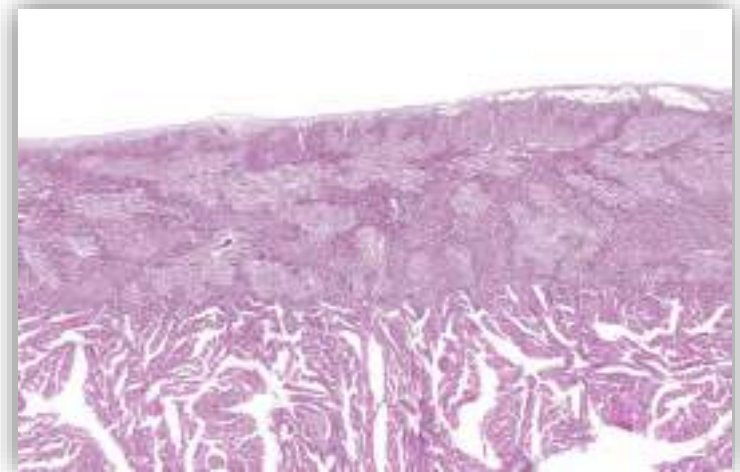
# Histopathological lesions

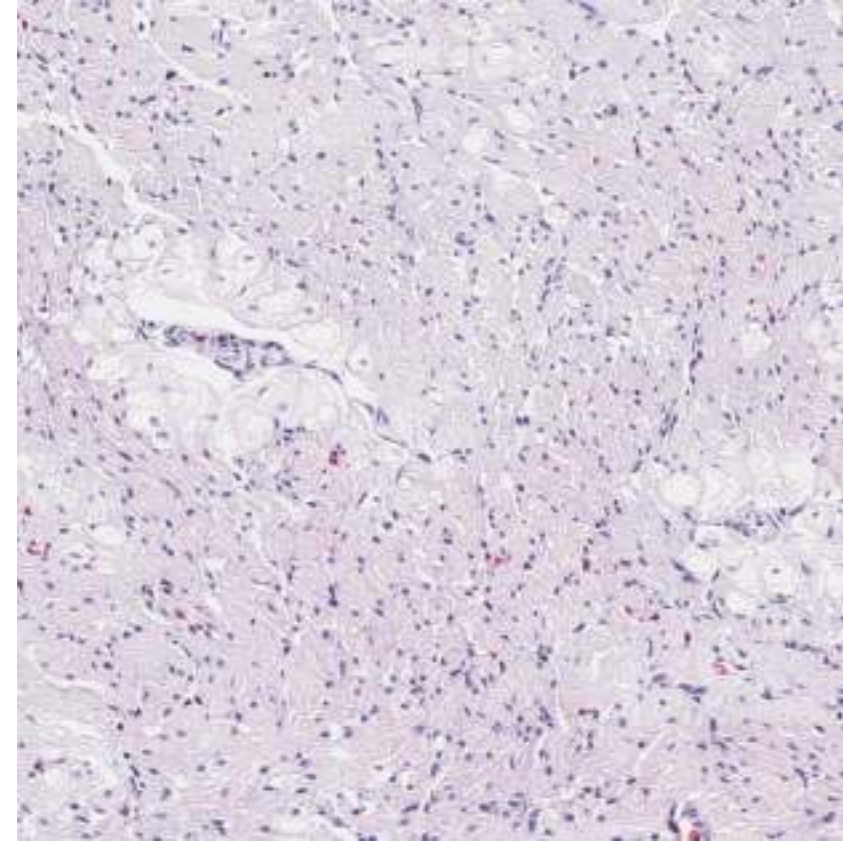
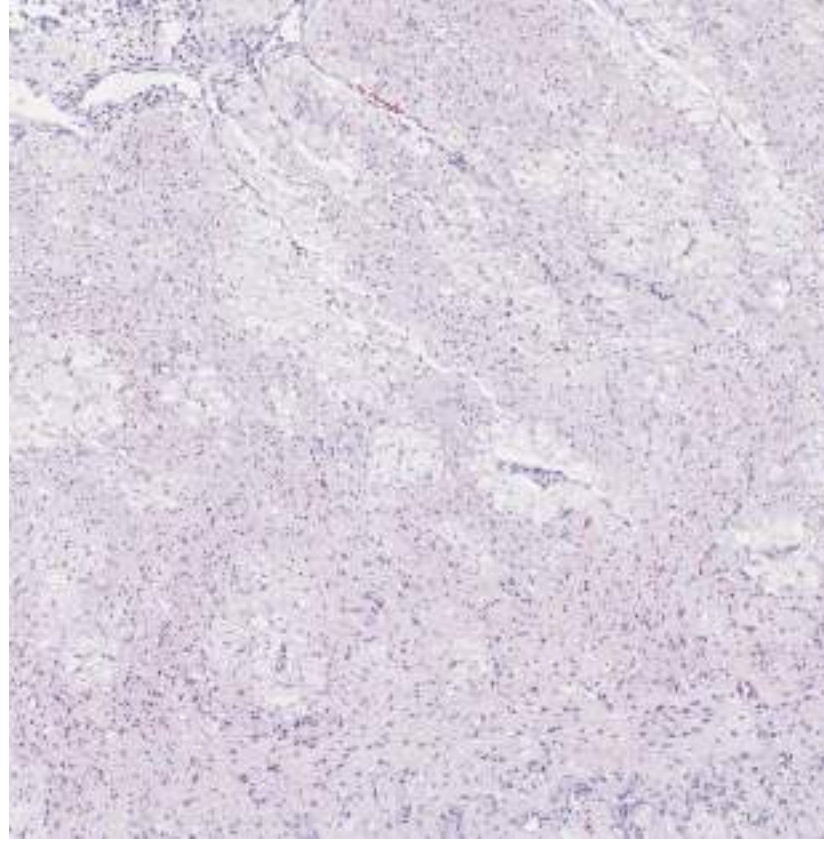
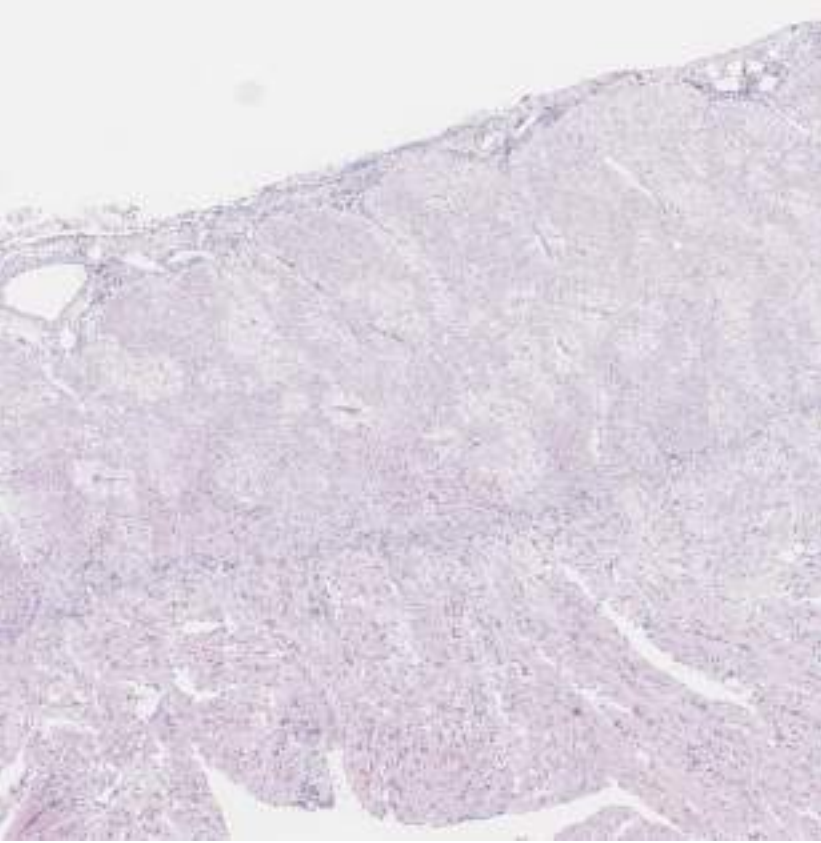
- Multifocal areas in the compact myocardium with paler cardiomyocytes with granular or vacuolated cytoplasm
- The lesions are centered around branches of the coronary arteries.
- No significant inflammatory response
- Reference material, wild salmon 1,5 - 6 kg

Wild salmon, normal histology



Farmed salmon, myocardial degeneration





## Example 1 Salmon dead after thermal de- lousing

- Multifocal pale areas in compact myocardium
- Typically centered around branches of coronary vessels
- Swollen cardiomyocytes

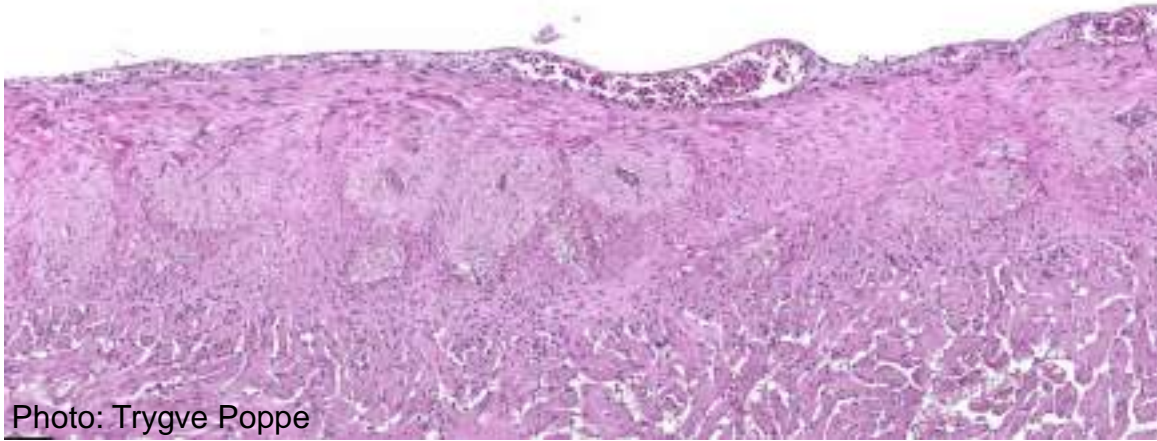


Photo: Trygve Poppe

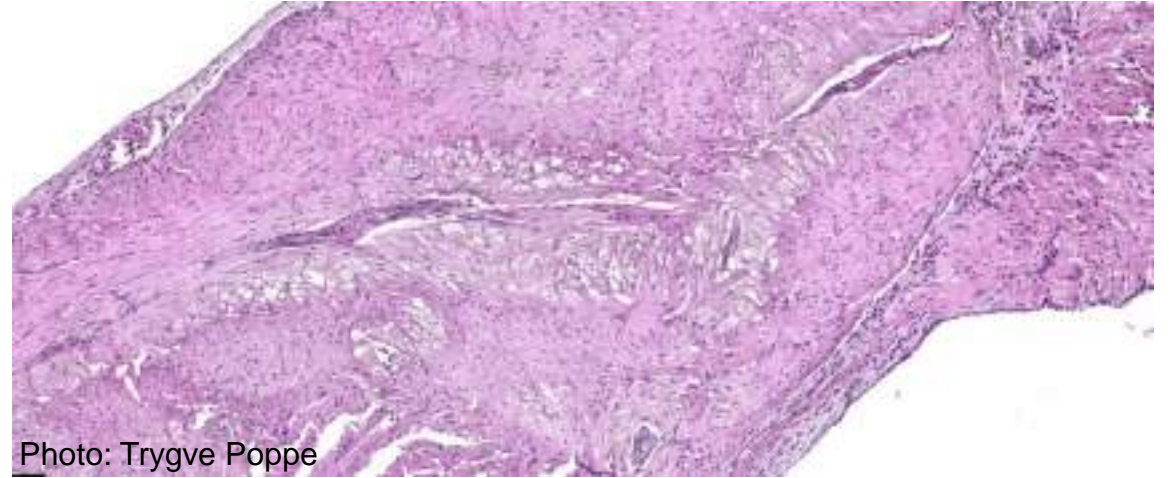


Photo: Trygve Poppe

## Example 2

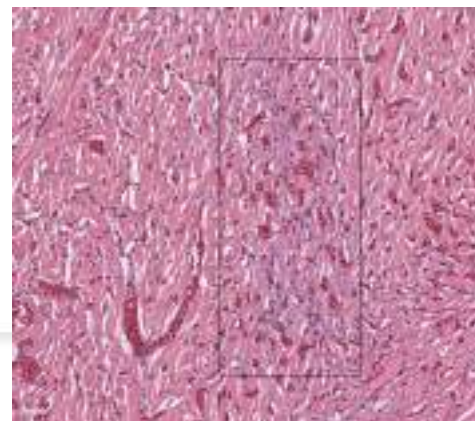
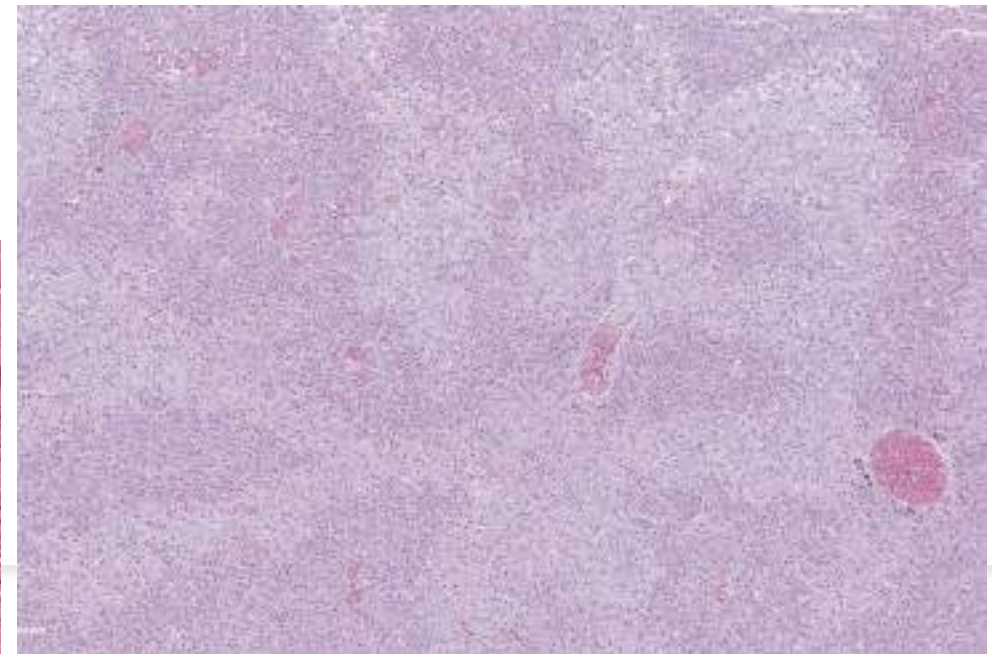
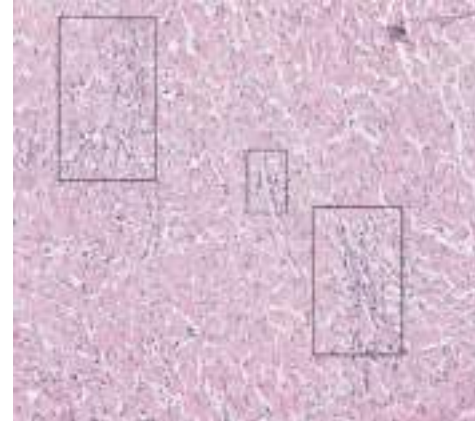
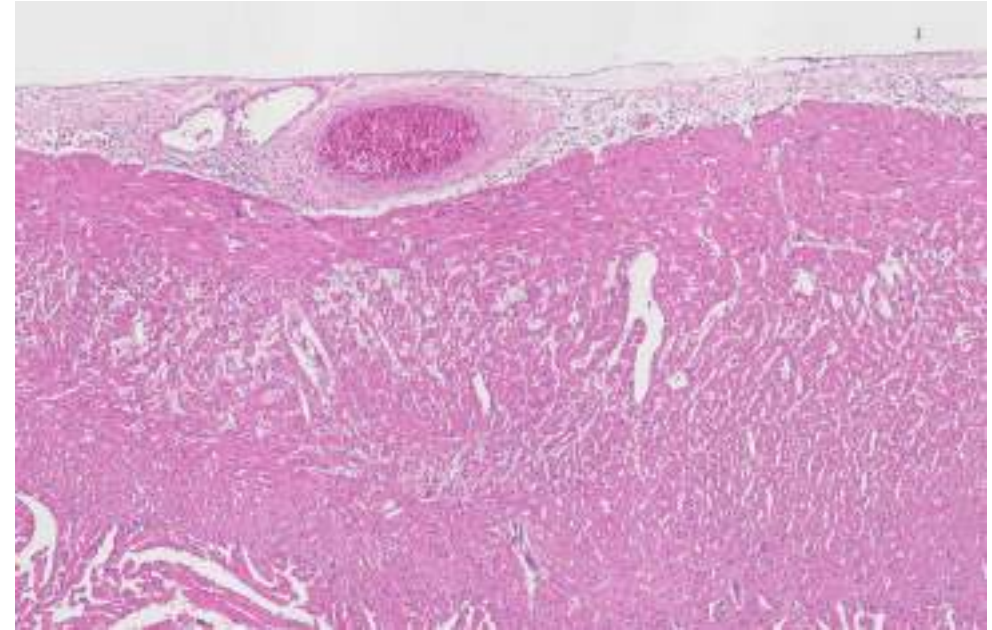
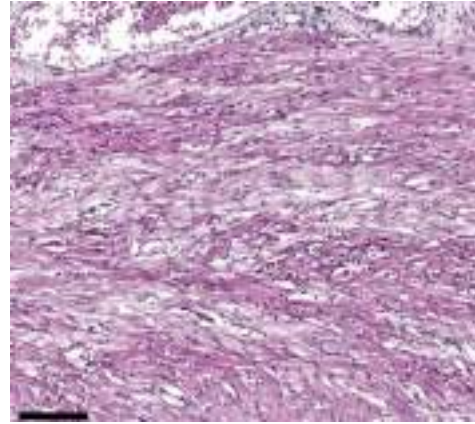
Rainbow trout – dead  
after transfer to sea at  
cold temperatures

- Multifocal pale areas in compact myocardium
- Typically centered around branches of coronary vessels
- Swollen cardiomyocytes



# Histopathological lesions

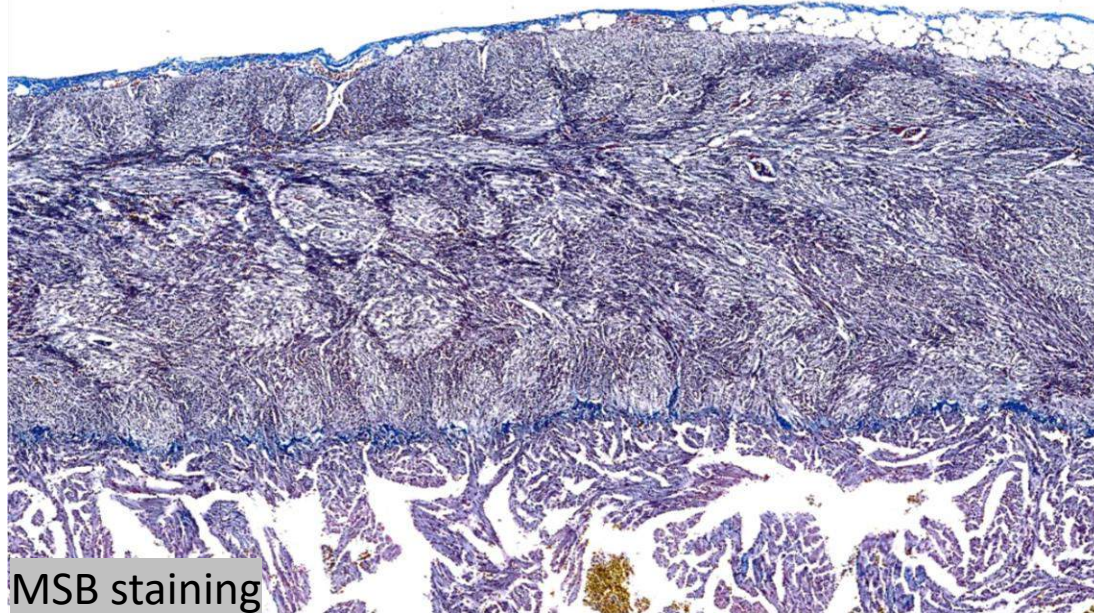
- Wavy fibers
- Separation of cardiomyocytes
- Multifocal fibrosis
- Liver necrosis
- Congestion



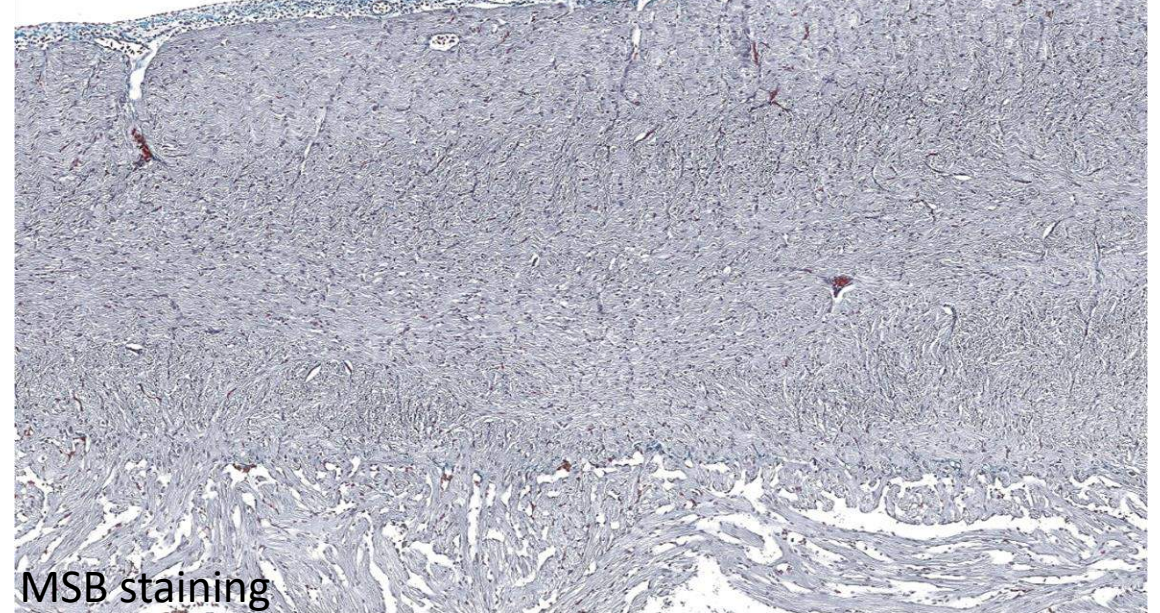
# Histopathological lesions

- Fibrosis between compact and spongy myocardium
- Thickened atrial wall

Farmed salmon, myocardial degeneration

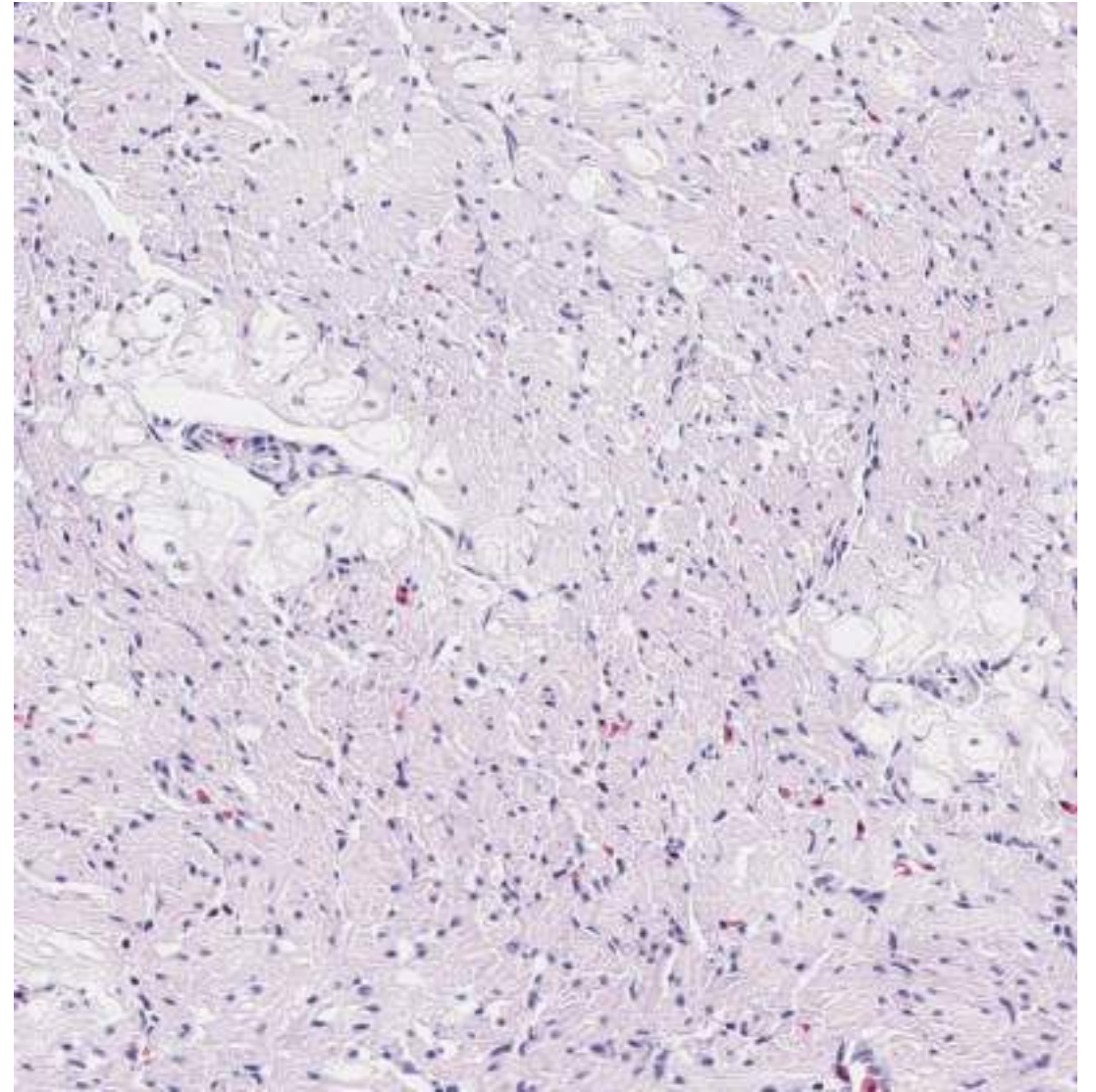


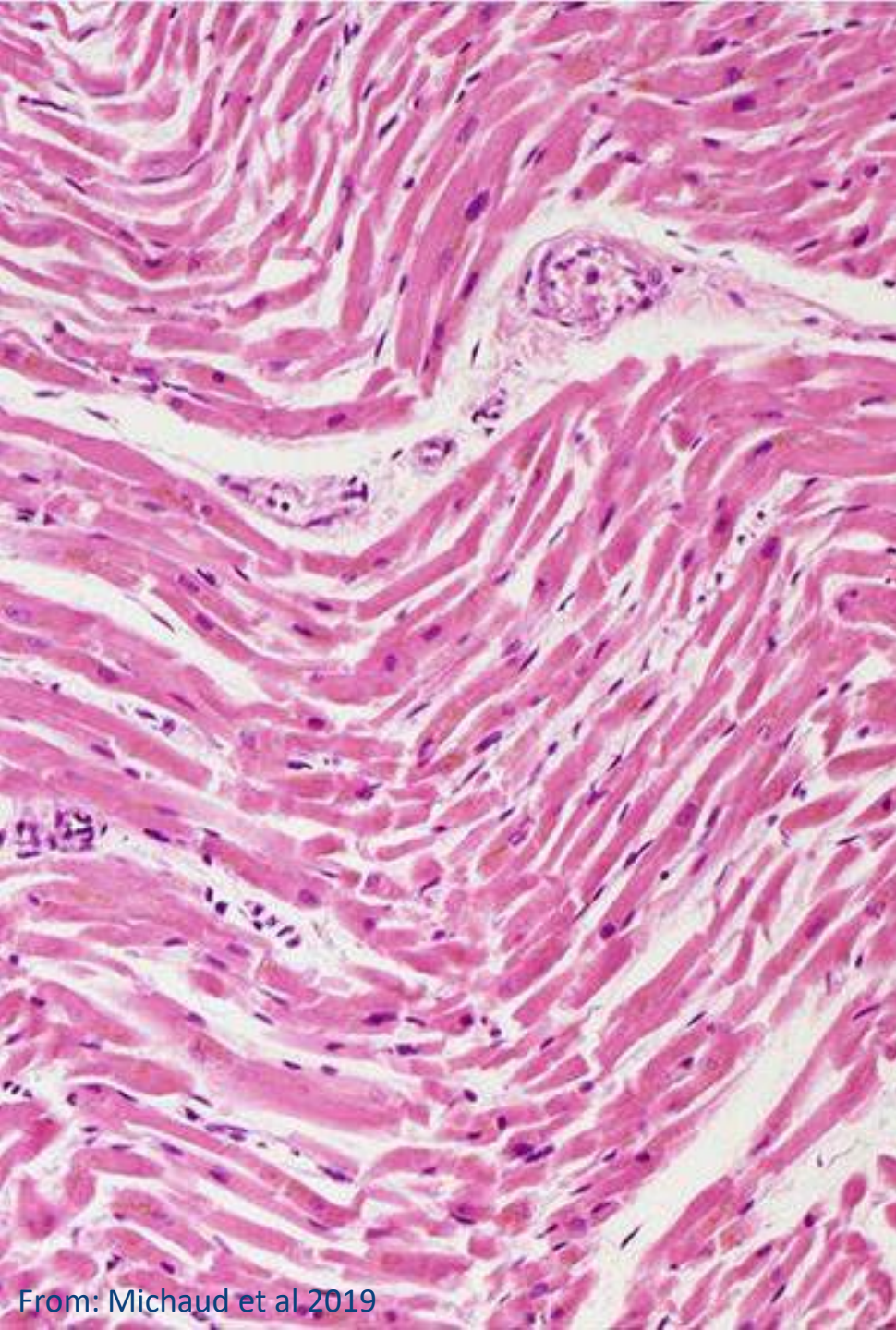
Wild salmon, normal histology



# Discussion

- The lesions are interpreted as degeneration of cardiomyocytes
- Ischemic degeneration
- Impaired vessel function of coronary arteries
- Coronary artery spasm (CAS)
- Acute coronary syndrome (ACS)





# Comparative pathology

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- Coronary artery spasm (CAS) is defined as an intense constriction of the vascular wall, which causes total or subtotal occlusion of the coronary arteries.
- Acute coronary syndrome (ACS): prolonged coronary spasm leading to vessel occlusion and subsequent myocardial ischemia
- Predisposing factors for CAS: temperature shock/changes, physical challenges, endothelial damage, chronic inflammation, hyperventilation



# Future perspectives

- Real prevalence
- Risk factors
- Define/describe lesions (EM etc.)
- Pathogenesis

Poppe, T. T., Reed, A. K., Hofossæter, M., & Wisløff, H. (2021). Novel myocardial pathology in farmed salmonids. *Journal of Fish Diseases*, 44, 1657–1660. <https://doi.org/10.1111/jfd.13486>

Thank you: all my colleagues at Pharmaq Analytiq and Trygve Poppe



**Thank you for your attention!**



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