



FishVet Group

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## Amoebic Gill Disease: Update

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Chris Matthews MRCVS



5/6/99

Faroe Islands vs Scotland

1-1

7/9/02

Faroe Islands vs Scotland

2-2



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## FISH VET GROUP

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- World's largest group of aquaculture veterinarians  
Verdens største gruppe av akvakultur veterinærer
- Scotland, Norway, Thailand, USA & Ireland  
Skottland, Norge, Thailand, USA og Irland
- Providing diagnostic, veterinary & technical services  
to aquaculture  
Gi diagnostiske, veterinær og tekniske tjenester til  
akvakultur





## FISH VET GROUP NORGE

- Digital Histopathology & Molecular Diagnostics  
Digital Histopatologi & Molekylær Diagnostikk
- Specialist-led pathology service connected to larger network for comparative work between countries  
Spesialist -ledet patologi service knyttet til større nettverk for sammenlignende arbeid mellom land
- Partnering with regional veterinary services to offer consultancy in fish health, epidemiology & risk analysis and flesh quality  
Partnerskap med regionale veterinærtjenester å tilby rådgivning i fiskehelse , epidemiologi og risikoanalyse og kjøttkvalitet



Fish Vet Group Norge AS

Hoffsveien 21-23, 0275 Oslo,  
Norway

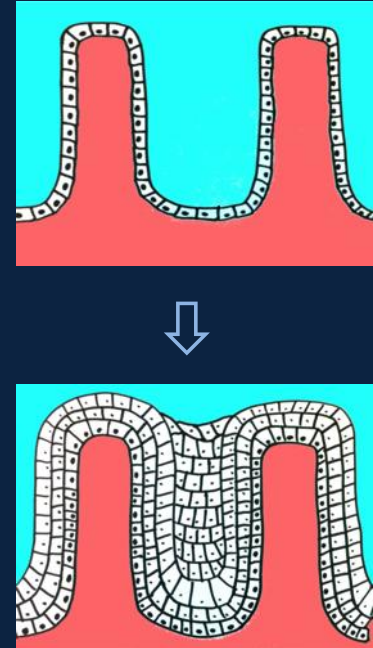
+ 47 21 62 49 80

[www.fishvetgroup.no](http://www.fishvetgroup.no)

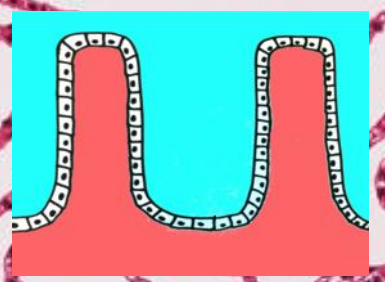
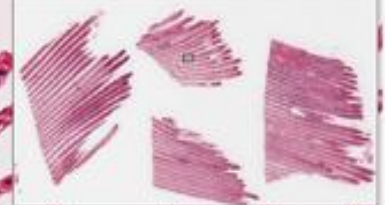
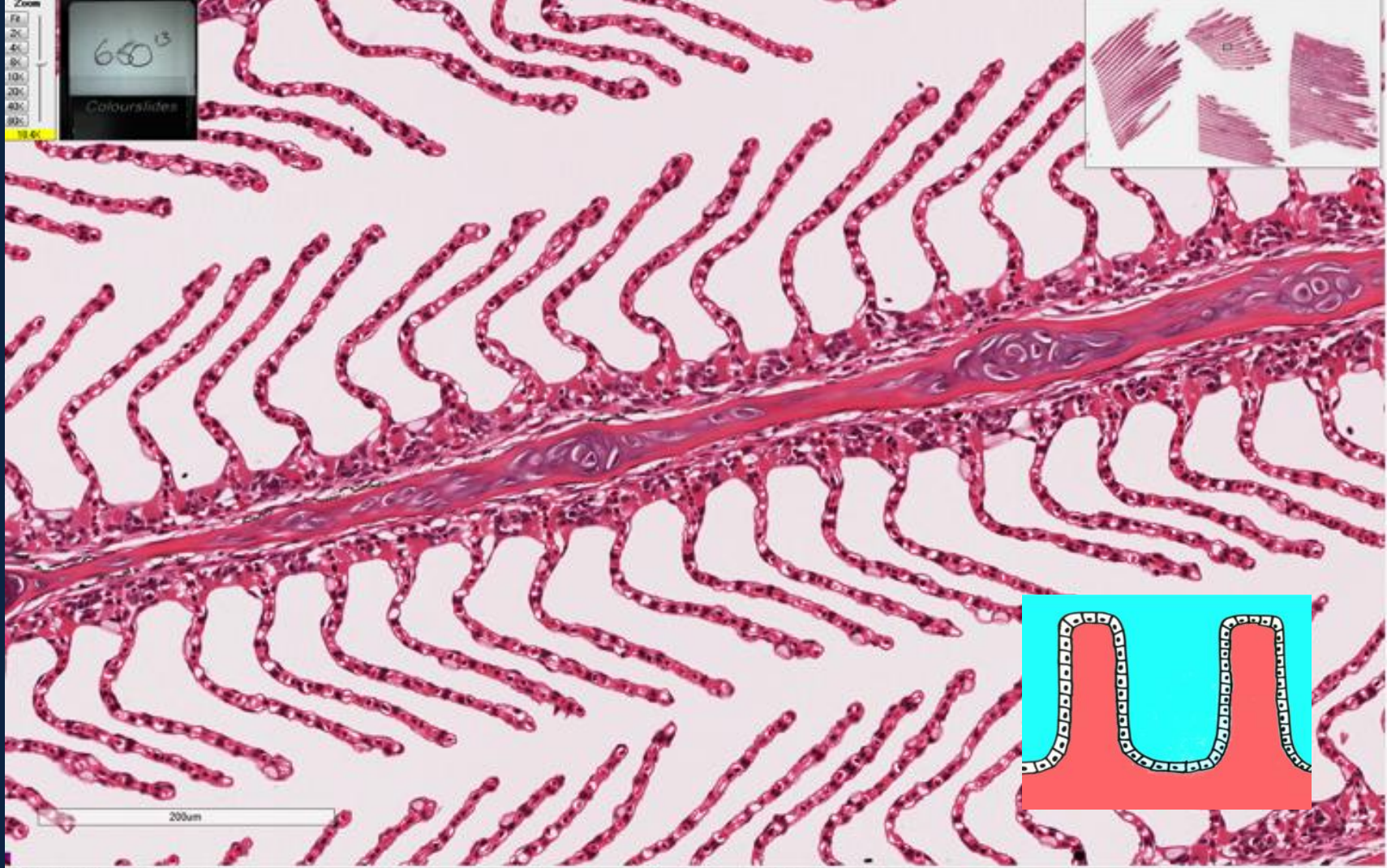


## GILL DISEASE IN SCOTLAND

- Prior to AGD epizootic in autumn 2011, Scotland experienced regular and multi-factorial gill problems  
Før AGD epizootikken høsten 2011, Skottland opplevde vanlige og multi – faktorielle gjelleproblemer
- Many of these gill diseases cause proliferative or hyperplastic responses in the gill epithelium, impairing gas exchange ('proliferative gill disease')  
Mange av disse gjelle sykdommer forårsake proliferativ eller hyperplastiske responser i gjelle epitel, svekke gassutveksling ('proliferativ gjellesykdom')

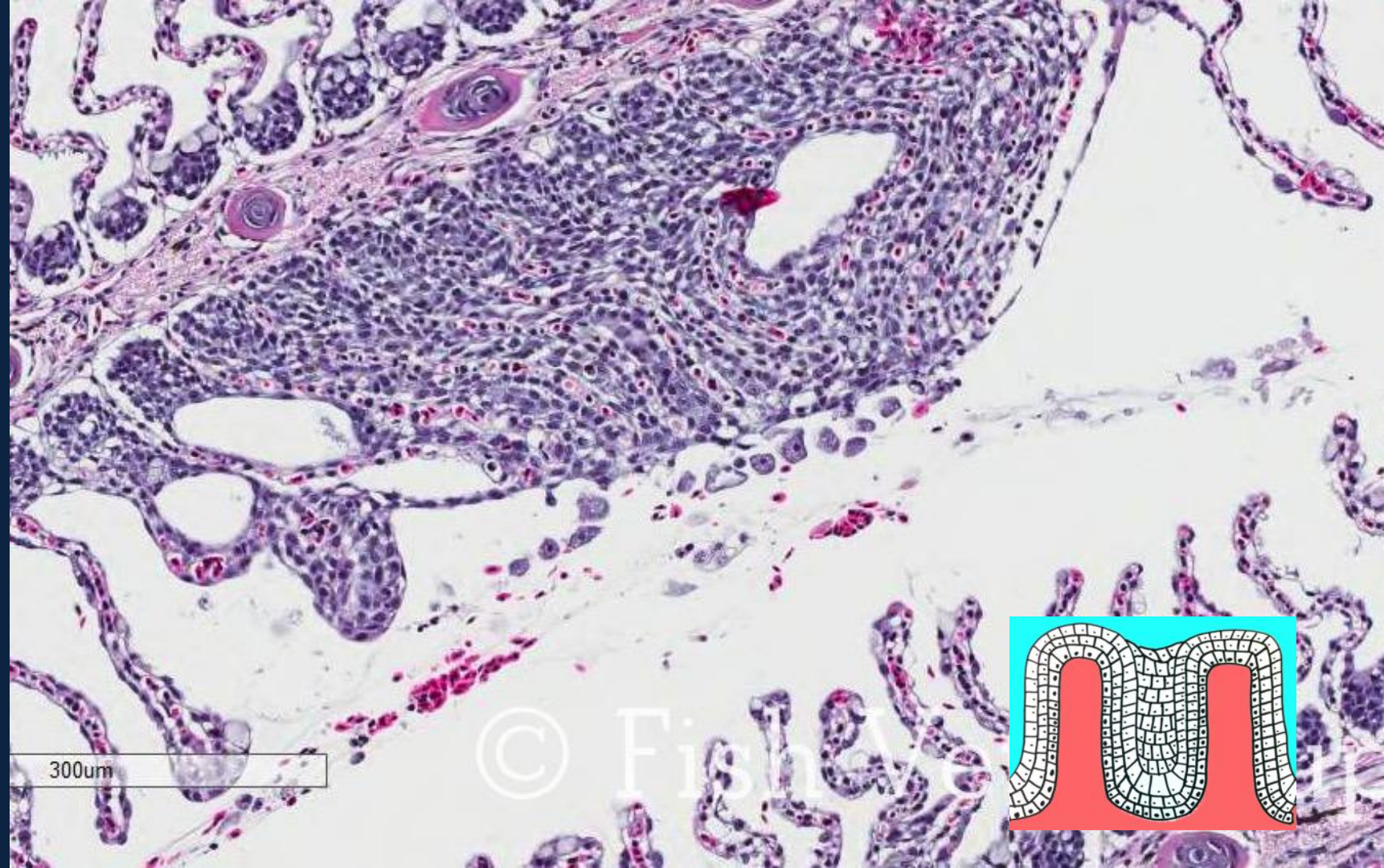


Zoom  
Fr.  
2x  
4x  
8x  
16x  
20x  
40x  
80x  
11.6x  
650<sup>3</sup>  
ColourSlides



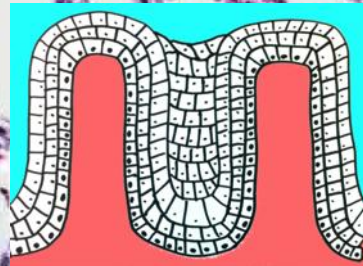
200um





300um

© FishBase





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# GILL DISEASE IN SCOTLAND

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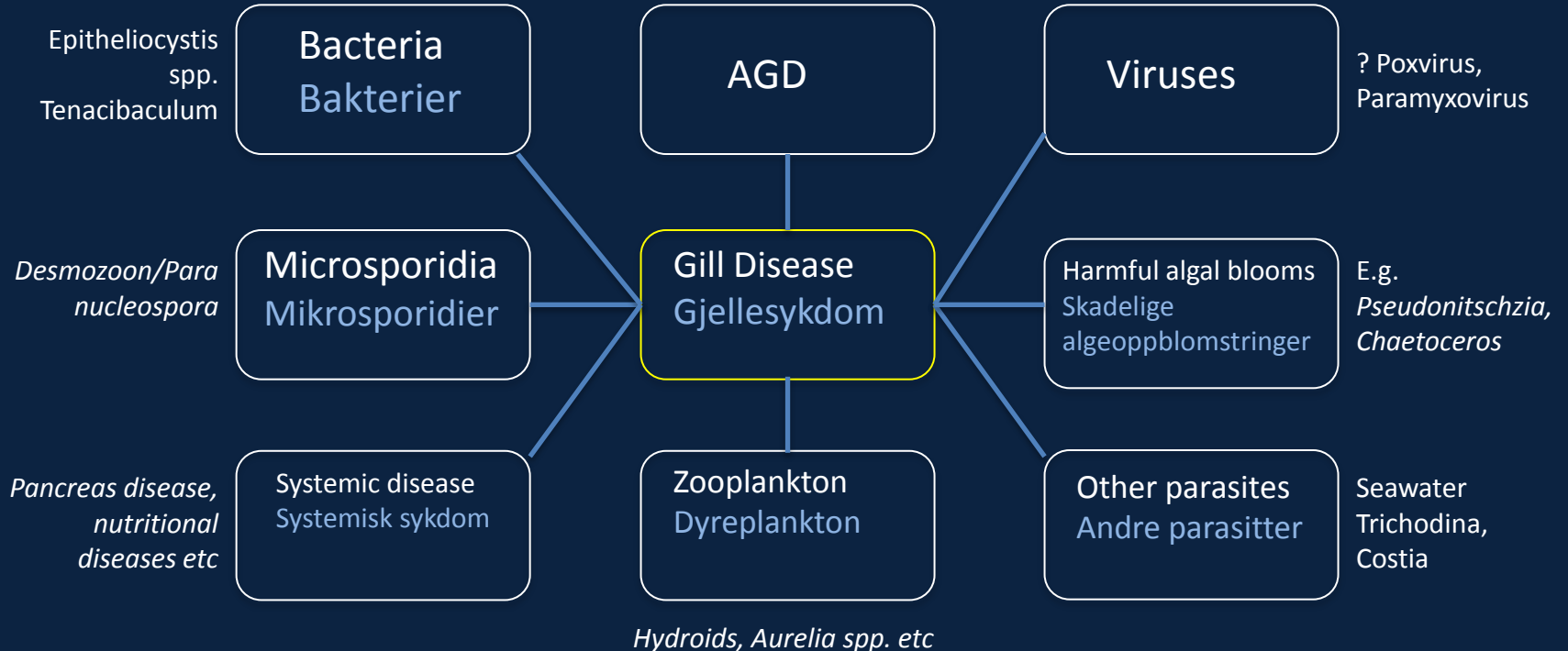
AGD

Gill Disease  
Gjellesykdom



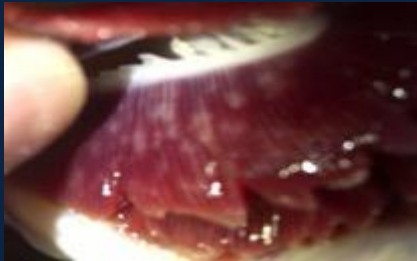


# GILL DISEASE IN SCOTLAND





# GILL DISEASE IN SCOTLAND



Trichodina<sup>2</sup>



Zooplankto



Epitheliocystis<sup>1</sup>



Petechial  
haemorrhage



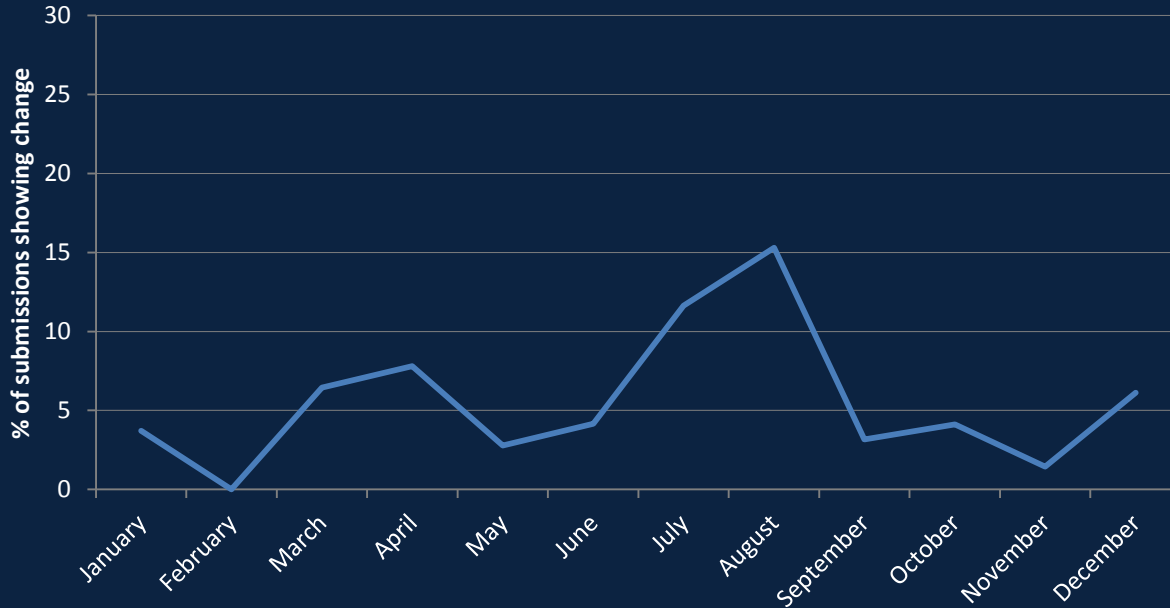
Harmful Algal  
Bloom

<sup>1</sup> Photograph © Hamish Rodger

<sup>2</sup> Photograph © Ray Waddell, Marine Harvest Scotland



## WATER-BORNE IRRITANTS



### Water-borne irritants

e.g. siliceous diatoms, harmful gelatinous zooplankton observed on histopathology.

Year round incidence, consistent peak in mid-summer.

### Vannbårne irritanter

f.eks siliceous kiselalger , skadelig gelatinøs dyreplankton observert på histopatologi .

Forekomst hele året med konsekvent topp i midten av sommeren.



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## WATER-BORNE IRRITANTS

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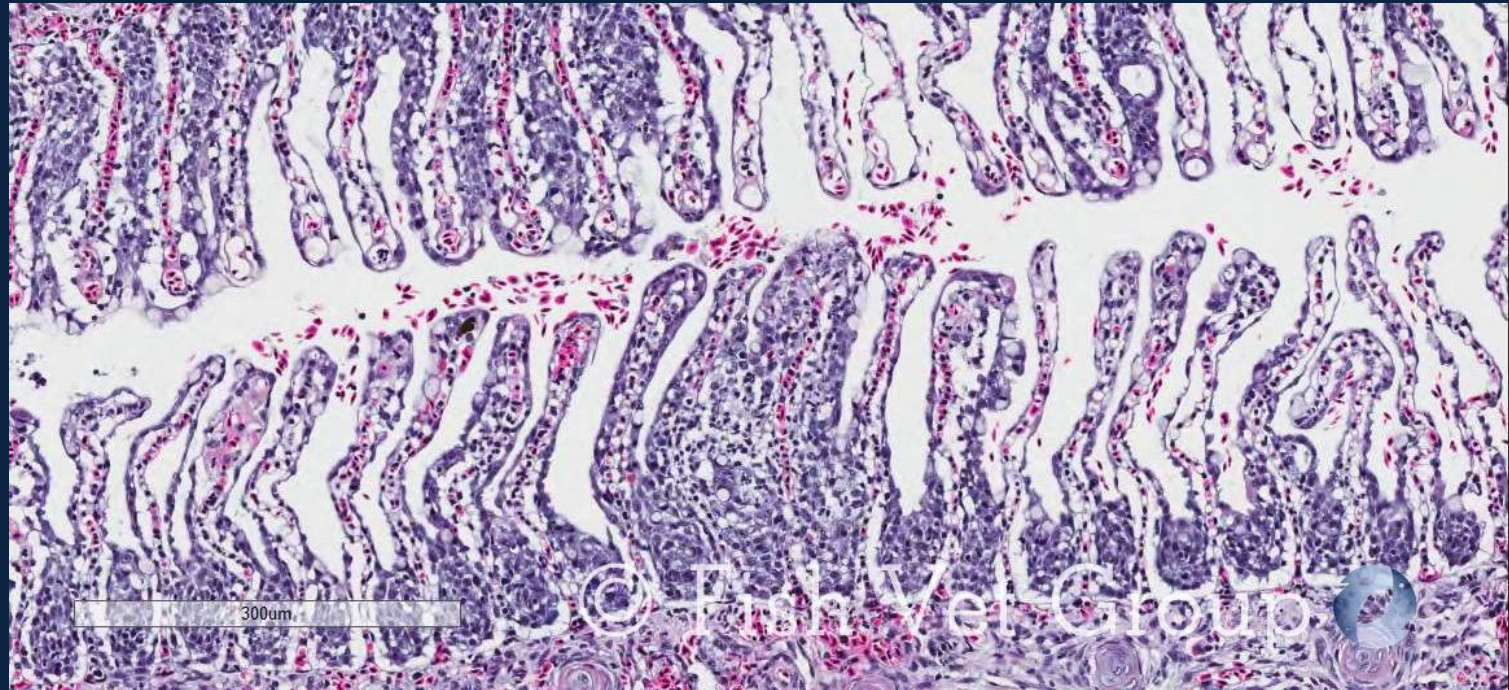
Harmful Zooplankton  
(Jellyfish)



Harmful Algal Bloom

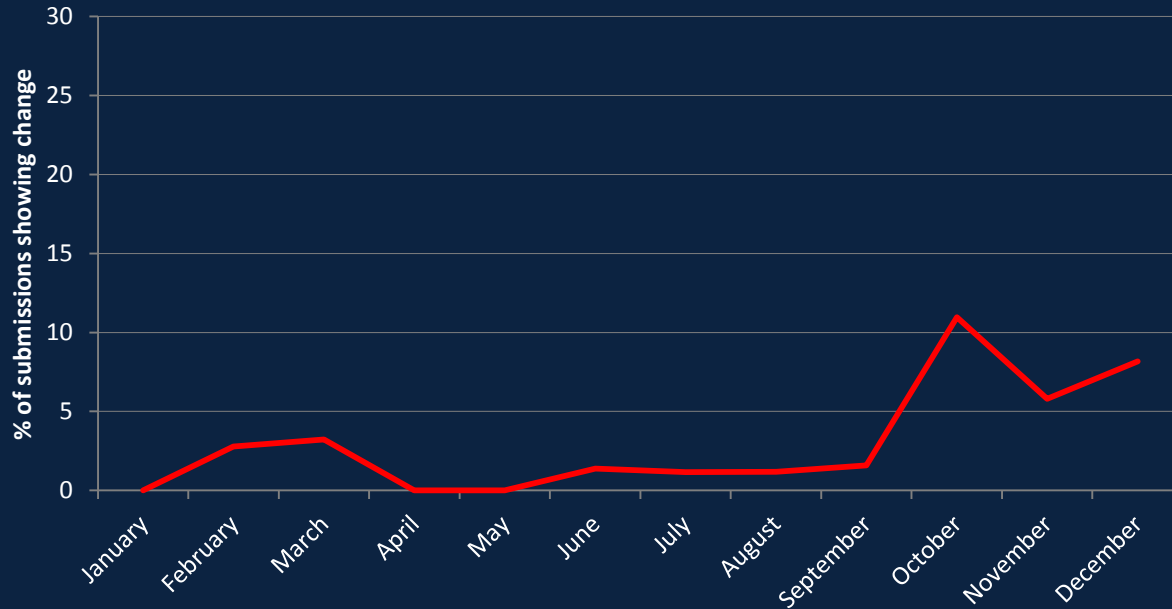


# WATER-BORNE IRRITANTS





# EPITHELIOCYSTIS



## Epitheliocystis

Low incidence most of year, clear peak in late autumn

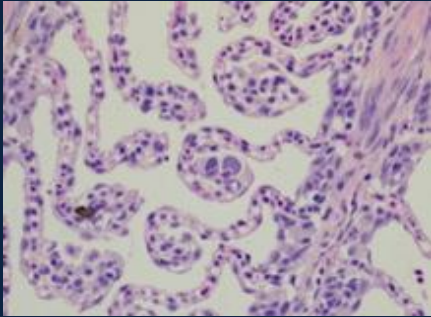
Lav forekomst mesteparten av året, klar topp på senhøsten



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# EPITHELIOCYSTIS

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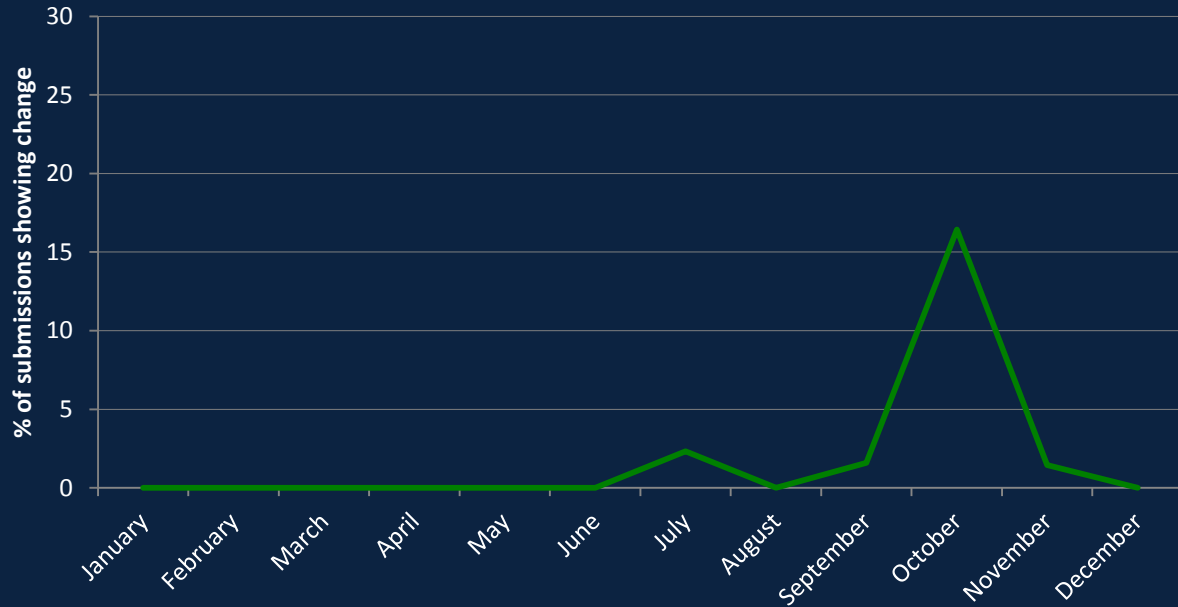


Epitheliocystis





# DESMOZON LEPEOPHTHERII



**(Synonym) *Paranucleospora theridion***

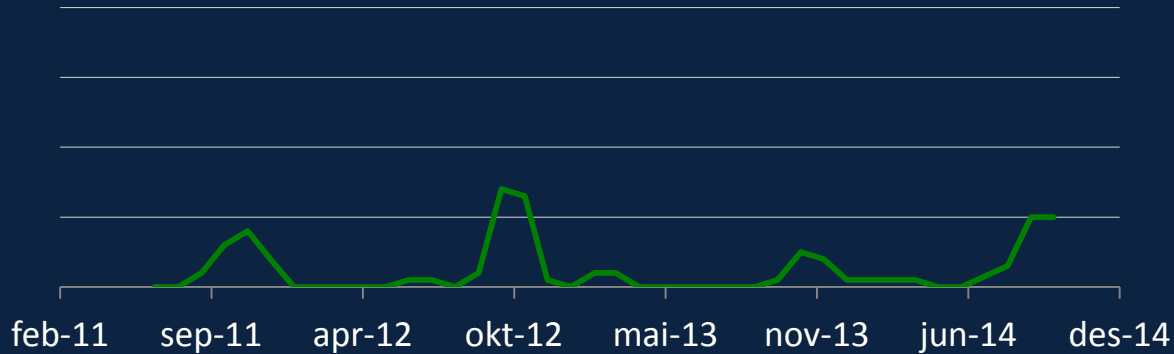
Spores almost entirely only detected on histopathology for short window of time in late autumn

Sporer nesten utelukkende bare oppdaget på histopatologi i et kort tidsvindu på senhøsten





# DESMOZOOM LEPEOPHTHERII



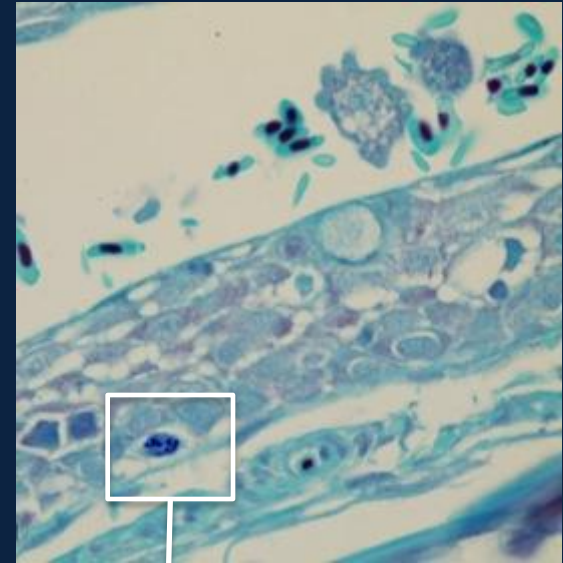
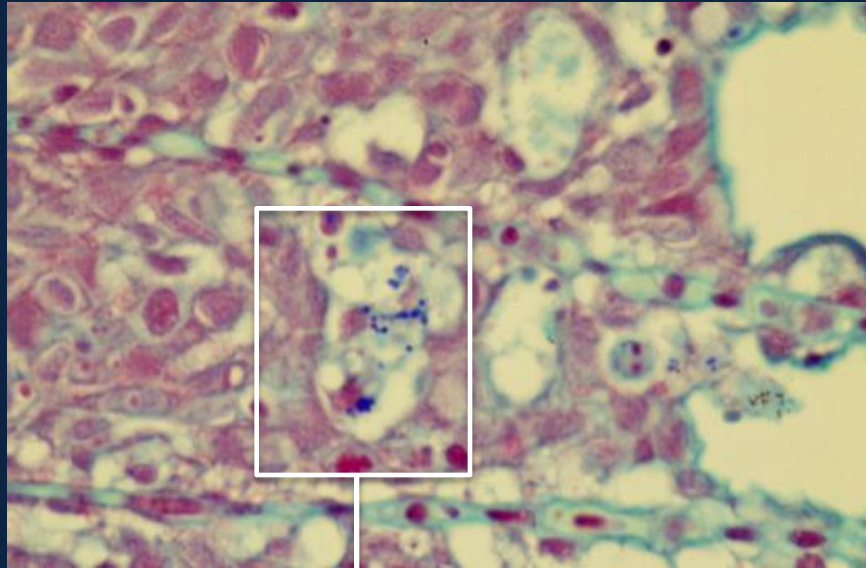
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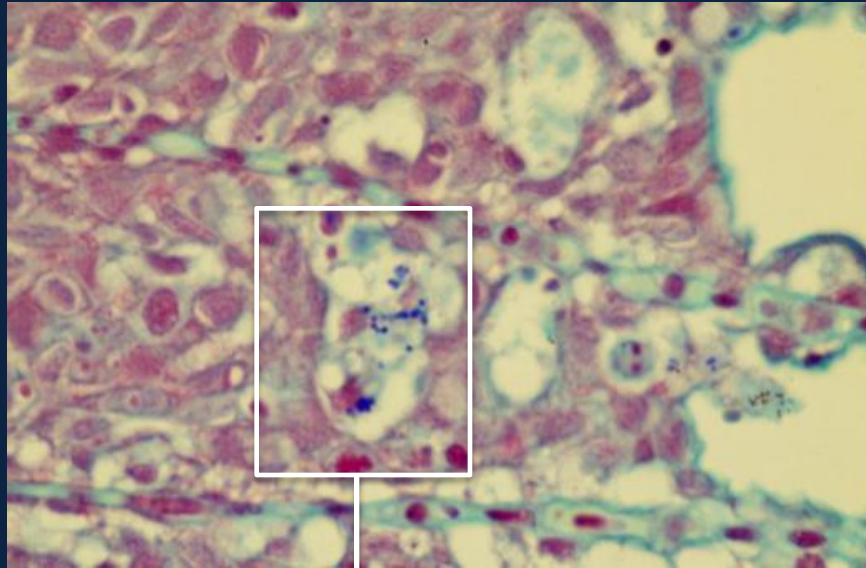
# DESMOZON LEPEOPHTHERII



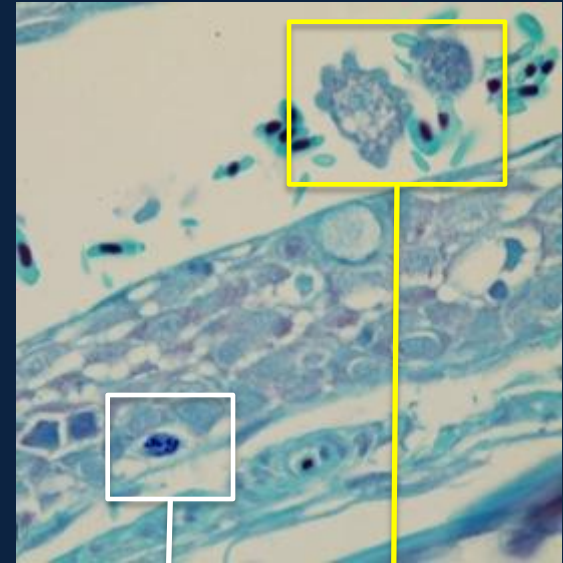
*Desmozoon lepeophtherii*



# DESMOZON LEPEOPHTHERII



*Desmozoon lepeophtherii*

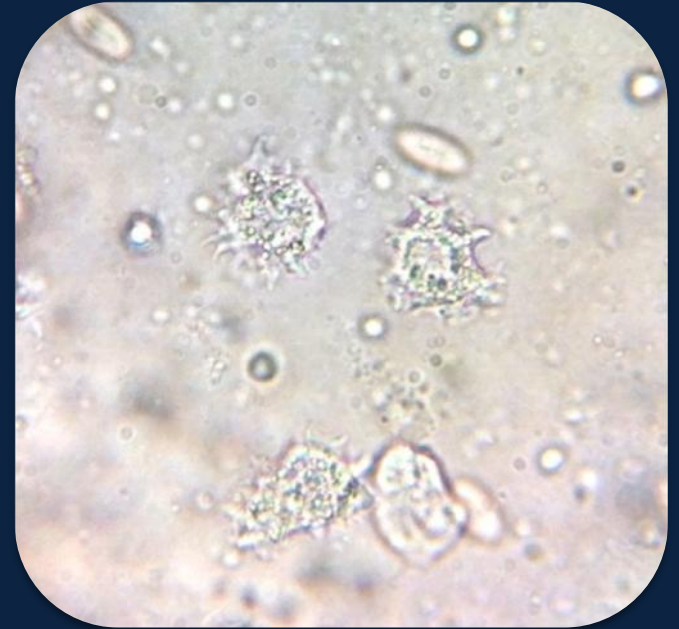


*Amoebae*



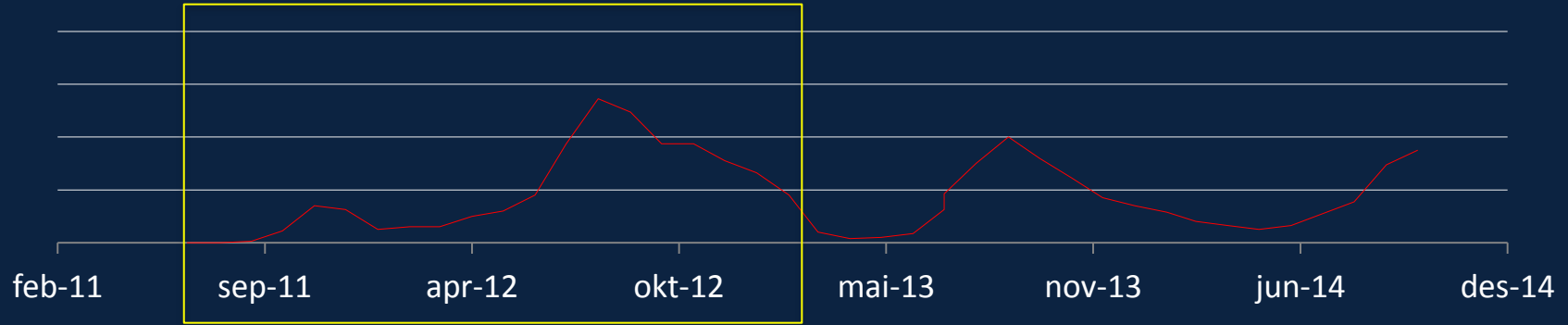
## AMOEBIC GILL DISEASE

- Caused by protozoan *Neoparamoeba perurans*  
Forårsaket av protozoen *Neoparamoeba perurans*
- Wide geographic distribution: capable of causing gill disease in various aquaculture species (Atlantic salmon, wrasse, lumpsucker, turbot)  
Bred geografisk distribusjon: stand til å forårsake gjellesykdom i ulike oppdrettsarter (atlantisk laks, leppefisk, rognkjeks, piggvar)
- Significant industry challenge in Northern Europe, Spain, Chile, Australia (Tasmania)  
Betydelig utfordring for industrien i Nord-Europa, Spania, Chile, Australia (Tasmania)





## AGD IN SCOTLAND

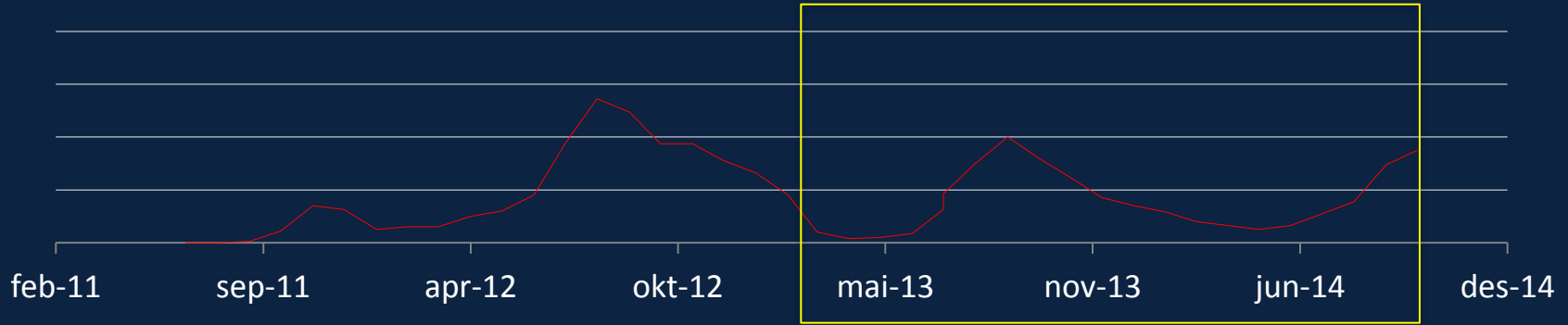


Epizootic in 2011/12: majority cases no mortality, 'severe' cases 10%, worst case 65%  
Epizootic i 2011/12: fleste tilfeller ingen dødelighet, "alvorlige" tilfeller 10%, verste tilfeller 65%



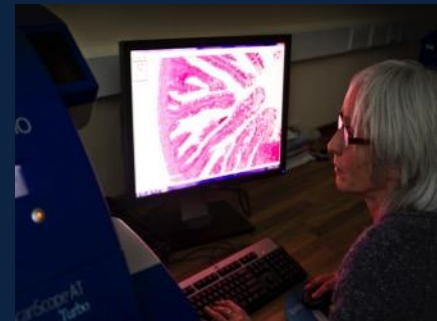


## AGD IN SCOTLAND



2013/14: Similar distribution of pathogen to 2012 (detected on histopathology/PCR), much less clinical impact due to a) better environmental conditions b) early treatment

2013/14: Ligner distribusjon av patogen til 2012 (oppdaget på histopatologi / PCR), mye mindre klinisk effekt på grunn av a) bedre miljøforholdene b) tidlig behandling





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## AGD: RISK FACTORS

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- High (oceanic) salinity/low rainfall  
Høy ( oseanisk ) saltholdighet / lite nedbør
- Warm water temperatures  
Høy sjø temperatur
- Low motion sites  
Lokaliteter med liten vannstrøm
- Poor/slow mortality removal  
Dårlig/treg fjerning av dødfisk
- Higher stocking densities  
Høyere tettheter
- Poor net hygiene  
Dårlig rensing av nøter
- Poor smolt transfer  
Dårlig smoltutsett
- Chronic PD/runts  
Kroniske PD / tapere



## TREATMENT OF AGD

- Tasmania (endemic AGD):

Freshwater bathing (<3ppt salinity) for 2hrs  
Ferskvann bading ( < 3ppt saltholdighet )  
for 2 timer

Up to 13 treatments per 16 month cycle  
Opp til 13 behandlinger per 16 måneders  
syklus

1.25-1.75 AUD/kg HOG cost to  
production cost  
7,54 – 10,56 NOK / kg HOG kostnader til  
produksjonskostnad







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## TREATMENT OF AGD

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- Hydrogen peroxide: does it work?  
Hydrogen peroxide : virker det?





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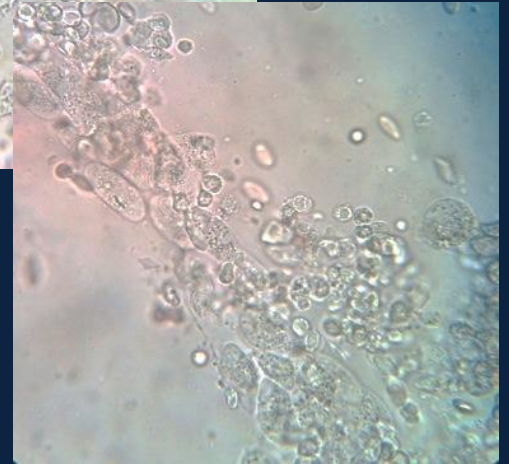
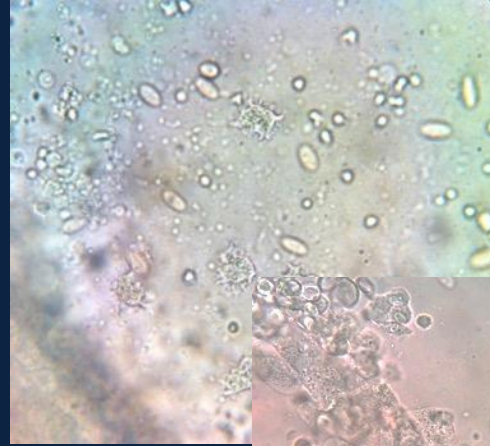
## TREATMENT OF AGD

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- Hydrogen peroxide: does it work?  
Hydrogen peroxide : virker det?

Yes: good evidence that amoebae killed by 1000 ppm  $H_2O_2$ , both from field and published experimental work (UTas)

Ja: god dokumentasjon på at amøber blir drept av 1000 ppm  $H_2O_2$  , både fra felt og publisert eksperimentelt arbeid ( UTas )





## TREATMENT OF AGD

- But....  
Men...

Treatments occasionally *cause* mortality  
Behandlinger kan av og til føre til dødelighet

Farms known to report rising (worsening)  
scores following treatment  
Oppdrettsanlegg kjent for å rapportere  
stigende ( forverring ) gjellescore etter  
behandling

Some AGD cases improve spontaneously  
Noen AGD tilfeller forbedres spontant





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## WHAT SHOULD THE FARMER DO?

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- Regular gill health monitoring (particularly in risk periods- high water temperature, high salinity)  
Regelmessig gjelle helseovervåking ( spesielt i risiko perioder- høy vanntemperatur, høyt saltinnhold )
- Sites/health staff should receive training on gill examination, gill scores performed once weekly (in Scotland, generally 10 fish from 5 cages weekly)  
Ansatte på anlegget og helsepersonell bør få opplæring på gjelle undersøkelse , gjelle score utføres en gang i uken ( i Skottland , vanligvis 10 fisk fra fem bur ukentlig)
- Monthly histopathology & PCR recommended (5-10 fish) using standardised sampling  
Månedlig histopatologi & PCR anbefales ( 5-10 fisk ) med standardisert prøvetaking



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## WHAT SHOULD THE FARMER DO?

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## WHAT SHOULD THE FARMER DO?

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With the scissors we make two cuts. Trying not to lose the sample...



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## WHAT SHOULD THE FARMER DO?

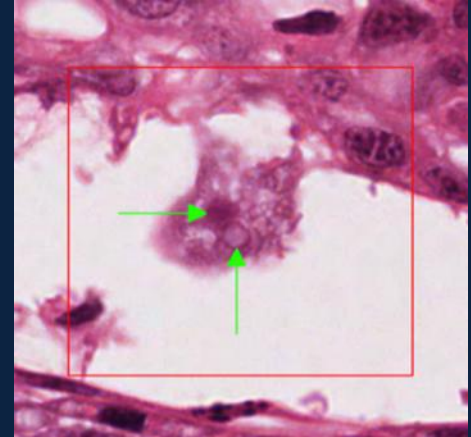
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- Information (gill scores, PCR results, presence/absence of other diseases, hydrographic/ environmental data) can be used to perform risk analysis about treatment strategies, and predict likely outcomes  
Informasjon ( gjelle score, PCR resultater, tilstedeværelse / fravær av andre sykdommer, hydrografiske / miljødata ) kan brukes til å utføre risikoanalyse om behandlingsstrategier , og forutsi sannsynlig utfall
- Example: in Scotland 2013-14, analysis of gill score data from >20 farms showed that farms treating at an early stage (site average gill score <1 compared to >1) required on average 30% less treatments over cycle.  
Eksempel : i Skottland 2013-14 , analyse av gjellescore data fra > 20 anlegg viste at anlegg som behandlet ved et tidlig stadium (site gjennomsnittlige gjelle poengsum < 1 sammenlignet med > 1) som kreves i gjennomsnitt 30% færre behandlinger over syklusen .



## AGD: RECENT RESEARCH

- Most published research in past year has been from Tasmania and concentrated on understanding host response to amoebae (immune response, changes in proteome)  
Mest publisert forskning i det siste året har vært fra Tasmania og konsentrerte seg om å forstå vert respons på amøber  
( immunrespons , endringer i proteom- )
- No prospect of vaccine soon, though growing understanding of response and mechanism via which amoebae attach  
Ingen utsikter til vaksine snart , selv om økende forståelse av respons og mekanisme hvordan amøber fester seg







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## AGD: FUTURE

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- Unclear if AGD will be an endemic, perennial challenge in northern Europe  
Uklart om AGD vil være en endemisk , flerårig utfordring i Nord-Europa
- Treatment options limited in next 3-5 years  
Behandlingstilbud begrenset i neste 3-5 år
- Vaccination a possibility in future  
Vaksinering en mulighet i fremtiden
- Functional feeds  
Funksjonelle fôr





## AGD: FUTURE

- Breeding programs may identify QTLs  
Avlsprogrammer kan identifisere QTLer
- Informatics: Better characterisation of complex gill diseases (where AGD is present) and risk factors for disease & treatment loss will allow development of evidence-based decision tools  
Informatikk : Bedre karakterisering av komplekse gjelle sykdommer ( der AGD er til stede ) og risikofaktorer for sykdom og behandling tap vil tillate utvikling av kunnskapsbaserte beslutningsverktøy





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THANK YOU

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