Development of a gill score guide for the salmon industry

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CSIRO AGRICULTURE FLAGSHIP / INTEGRATED SUSTAINABLE AQUACULTURE PRODUCTION PROGRAM
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Gill Health Initiative 3 - Galway
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The project

- Develop an AGD gill score guide to support training of health opertatives
- Optimise farm management
- Sponsored by Tassal Operations Pty Ltd and Marine Harvest
- Detailed guide for in-house use
  - Aim to develop a poster format for wider salmon industry

Why use gillscore?

- AGD is the host reaction to the presence of the parasite
- Non-destructive scale to describe AGD gross gill pathology of individual fish
- Immediate/real-time
- Measurement of disease status of each population
- To schedule treatment events
- Can be used sequentially on tagged animals
- Consistent trait for breeding selection
- To compare different fish stocks, production areas or treatment strategies

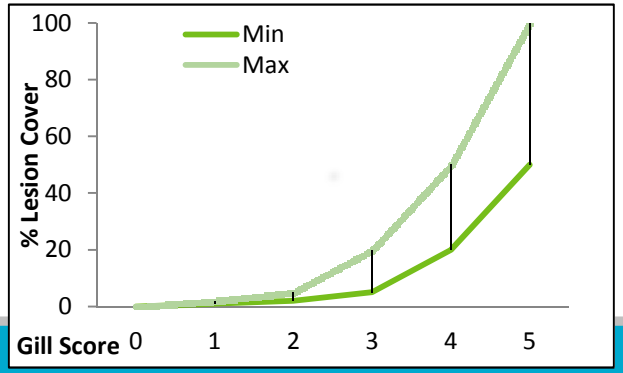
Limitation of gillscore

- Presumptive/subjective
- Does not confirm presence of *(Neo)Paramoeba perurans* associated with gill lesions
- Interpretation of conflicting pathologies
- Scarring/shadowing post bath (more prevalent after H2O2 bathing)
- Experimental challenge may present differently

- Requires standardisation
- Confirmation by PCR and/or histology
- Wet mount smears can be used to visualise amoebae

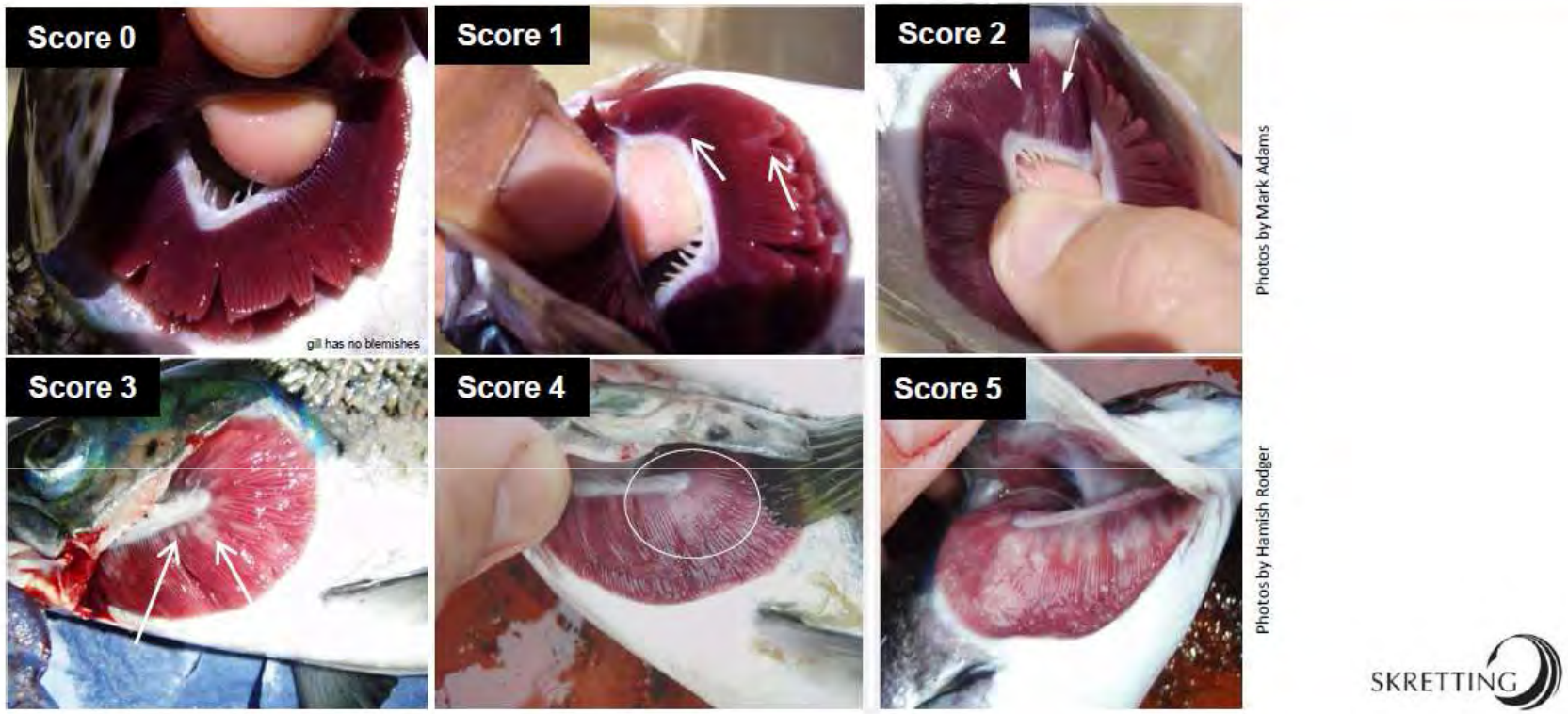
Dealing with AGD – gross gill score

Infection Level	Gill Score	Gross Description (all 8 arches)
Clear	0	No sign of infection and healthy red colour
Very Light	1	1 white spot, light scarring or undefined necrotic streaking
Light	2	2-3 spots/small mucus patch
Moderate	3	Established thickened mucus patch or spot groupings up to 20% of gill area
Advanced	4	Established lesions covering up to 50% of gill area
Heavy	5	Extensive lesions covering most of the gill surface



Taylor, R.S., Muller, W.J., Cook, M.T., Kube, P.D., Elliott, N.G., 2009. Aquaculture 290, 1-8.

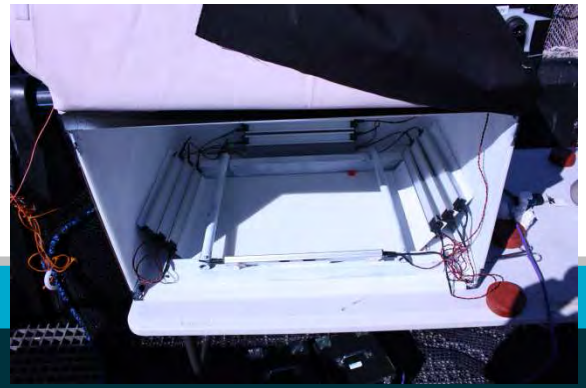
Gill Score Card For On Site Examination



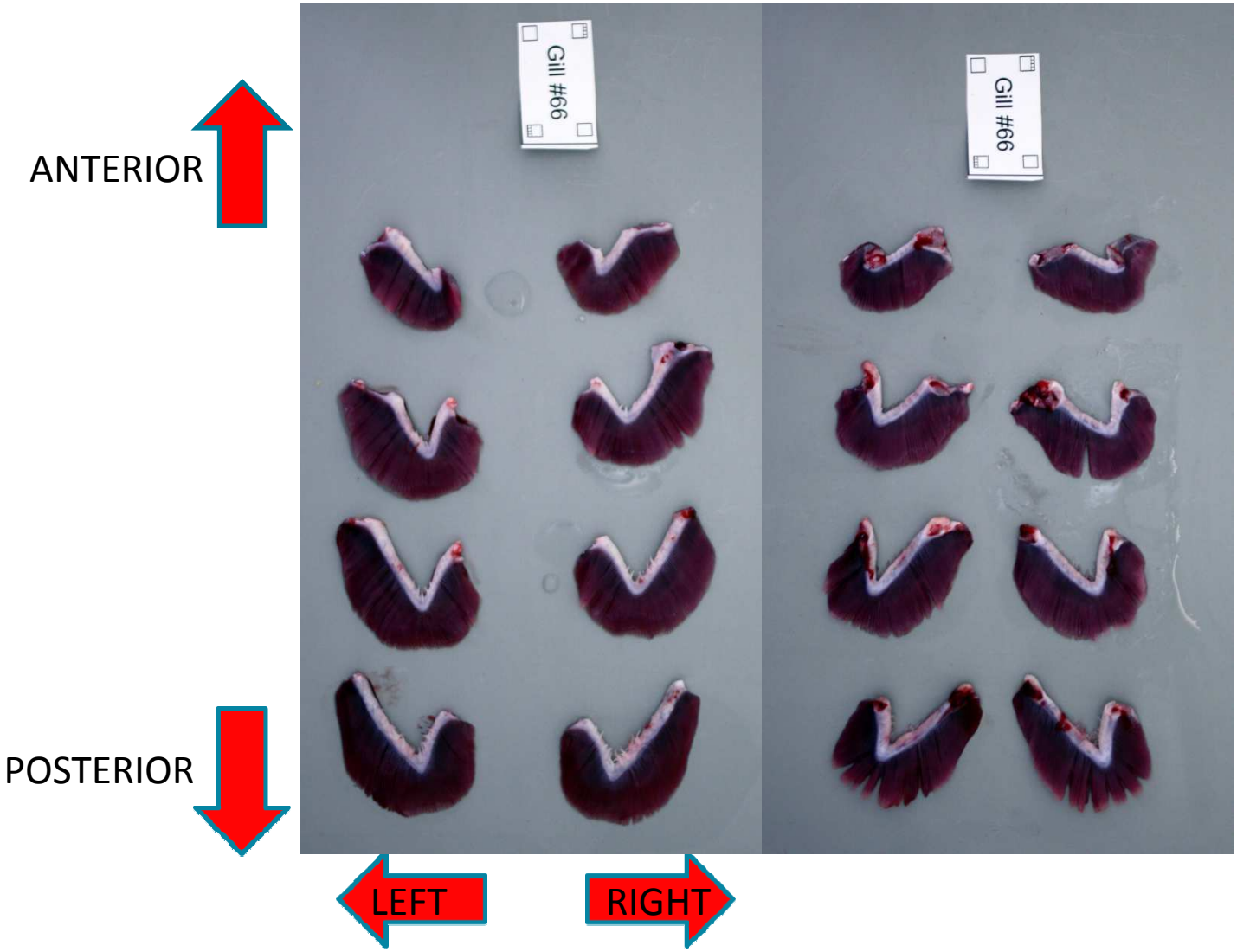
- Score cards previously developed for industry have only shown a single arch.
- Images do not match descriptions

Taking gill images

- 2 sets of photographs taken in field conditions
  - Gills in situ
    - 10 images of arches being checked
    - Ambient lighting – focus, depth of field, glitter
    - More ‘realistic’ but difficult to show complete gill surface
  - Dissected gills
    - 2 images to show all 16 surfaces
    - Blood clots need to be controlled – bleed fish and rinse arches. Blow to head may cause haemorrhage
    - Take immediately post killing
    - 12v controlled light box – total 2700 lux, lighting angle to minimise reflection
    - Good quality camera and lens, depth of field and shutter speed (on barge/boat)



Orientation of gill Images



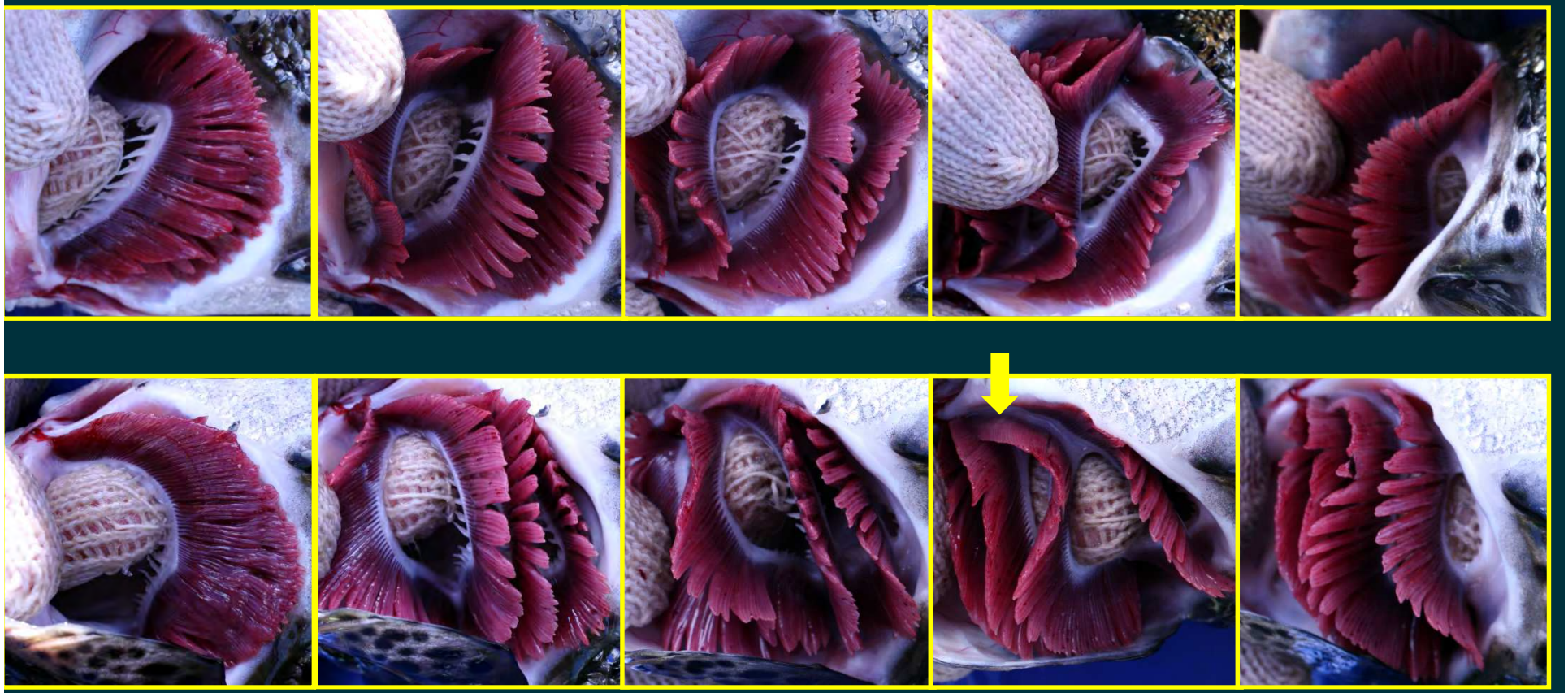
Gill Score 0 external view

Gill Score 0 Example

Gill Score 1 external view

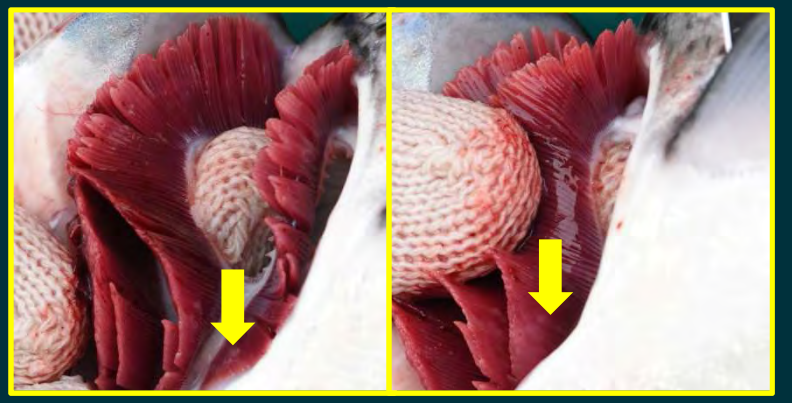
Gill Score 1 Example

Gill Score 2 external view



Gill Score 2 Example

Gill Score 3 external view



Gill Score 3 Example

Gill Score 4 external view

Gill Score 4 Example

Gill Score 5 external view

Gill Score 5 Example

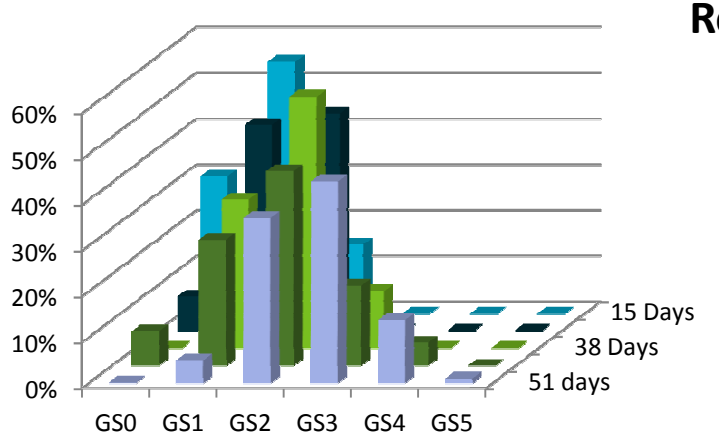
Conflicting pathology

Sampling

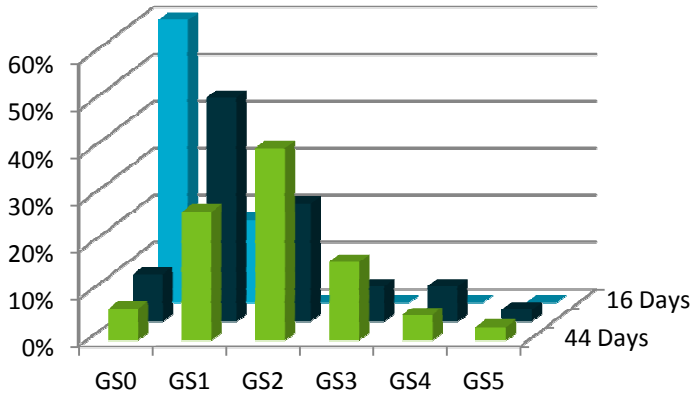
- Sampling from fish cages is never truly random – take large seine sample
- Commercial freshwater bathing threshold normally 30% light+ score (2-5)
  - Expect reduced SFR once GS3-4 appearing
- Critical measure is % gill score 5
  - Depending on Temp, O2, fish type, fouling etc.:
    - 2.5% to 5% GS5 = 0.1% to 0.4% mortality/day
    - 5 to 8% GS5 = 0.5%+ morts/day
- Samples size required for true prevalence = 0.025, precision = 0.05 sensitivity 0.99 and specificity 0.99 is 40 fish

Gill score progression

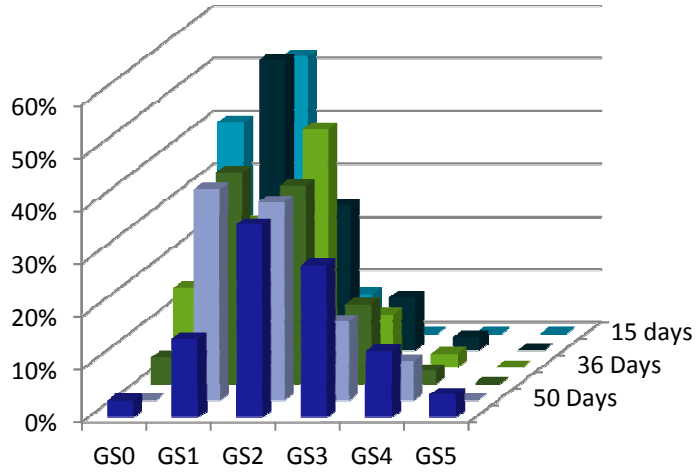
Round 1



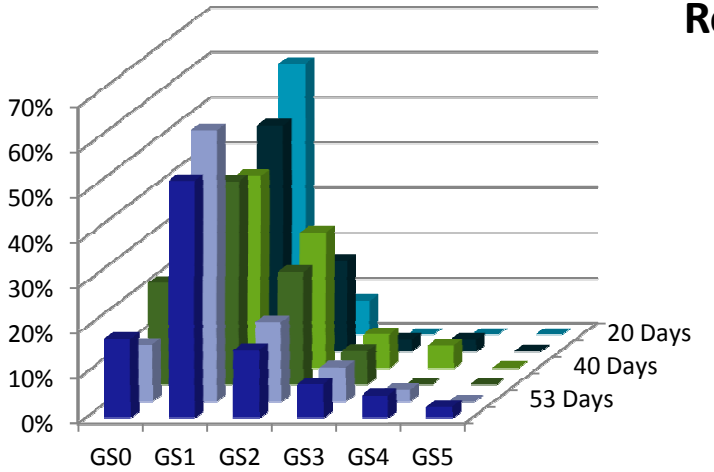
Round 3

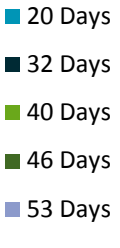


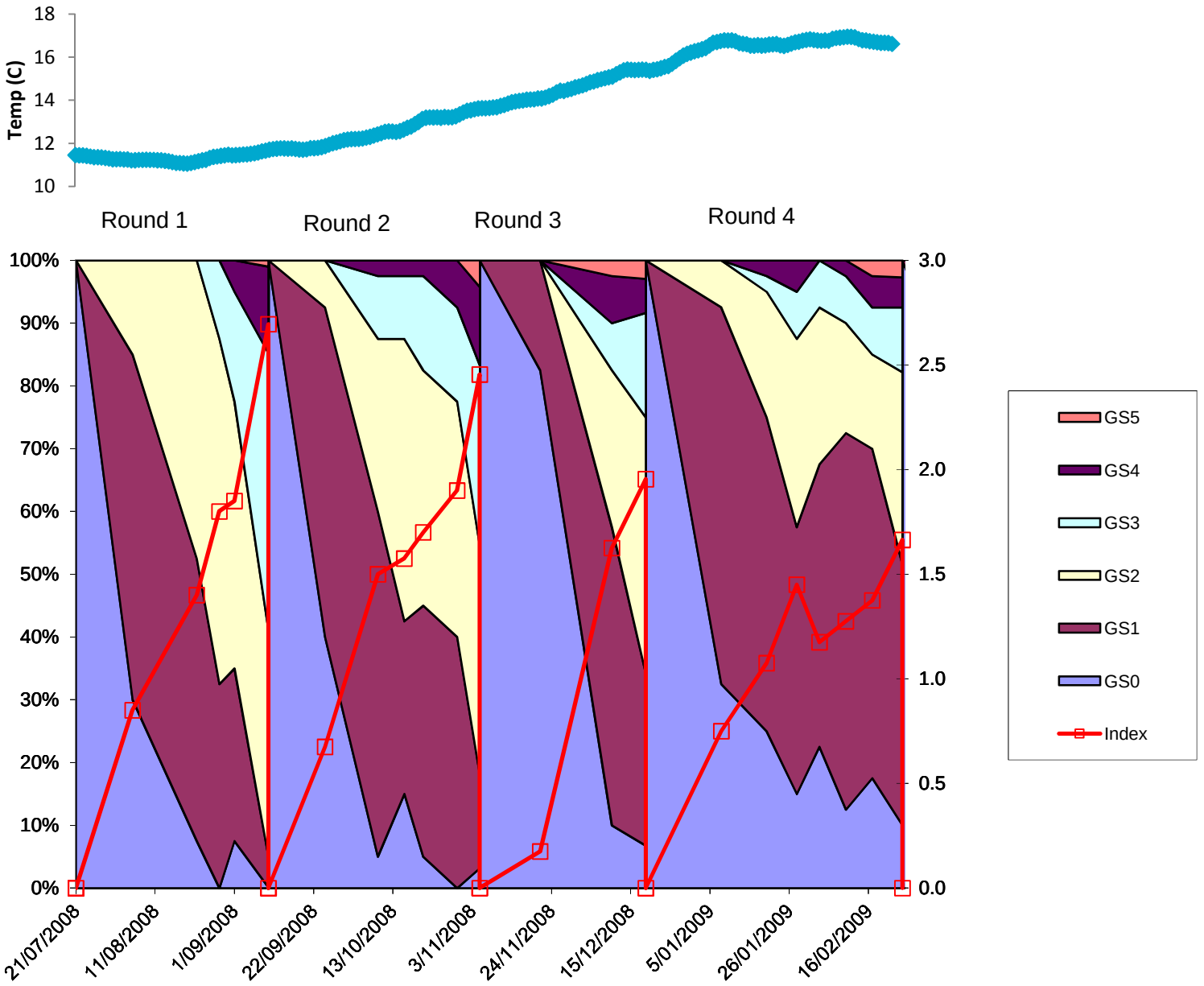
Round 2



Round 4






Temp (C)
18
16
14
12
10
Round 1
Round 2
Round 3
Round 4
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
3.0
2.5
2.0
1.5
1.0
0.5
0.0
21/07/2008
11/08/2008
1/09/2008
22/09/2008
13/10/2008
3/11/2008
24/11/2008
15/12/2008
5/01/2009
26/01/2009
16/02/2009
GS5
GS4
GS3
GS2
GS1
GS0
Index

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