

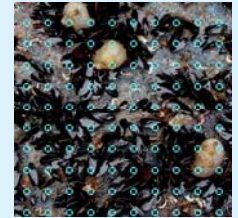
## Aims

- To adapt stereology for biofouling research to analyse digital photographs taken by field workers of non-scientific background in a pan-European project studying biofouling in the aquaculture industry
- To increase precision and robustness of results while not spending more time
- To demonstrate 2 techniques; the Standard Random Dot Technique and the Stereological Approach



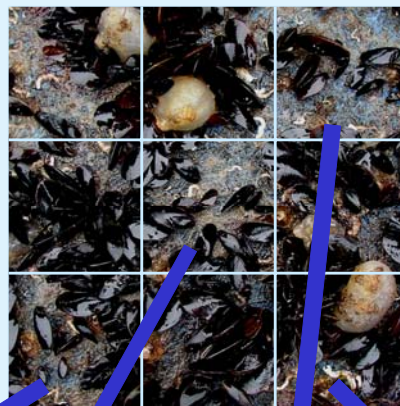
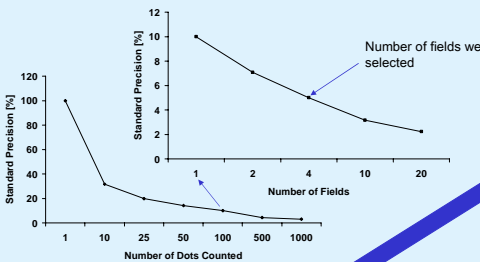
## Standard Random Dot Technique

- Random grid placed onto area of interest. Usually 100 dots (SP = 10%)



## Our Stereological Approach

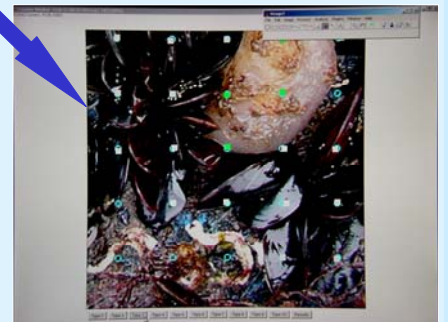
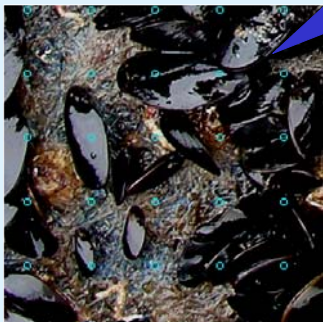
- Standard Precision  $SP = \frac{\sqrt{\text{no. of dots counted}}}{\text{no. of dots counted}}$ , here  $SP = 10\%$ , 100 dots
- Imaging tool: freeware ImageJ (Rasband 1997-2006): no set-up cost, extensive user base, on-line support, platform independence



- Plugin for ImageJ based on random systematic sampling (RSS; Russ and Dehoff 2000):

- Subsample N fields of vision ('Fractionator'), here  $N = 9$
- Choose 1<sup>st</sup> field randomly
- Starting from this field, select other fields uniformly until an *a priori* determined number of fields ( $<N$ ) are found, here every 5<sup>th</sup> field, 4 fields in total are used. Precision increases with number of fields by  $\frac{1}{\sqrt{\text{no. of fields}}}$ , here by a factor of 2
- Place a different random grid (offset point random) on each field of vision. Dots per grid =  $\frac{\text{total no. of dots counted}}{\text{no. of fields}}$ , here 25 dots per field
- Sum up species percentage coverage for every field of vision

- Results for every field of vision summed up = percentage cover for every species in the area of interest



## Conclusions

Advantages Stereological Technique and ImageJ:

- Increased robustness and precision compared to the Standard Random Dot Technique by a factor of 2, but time spent the same
- Variances halved, or less time for same precision as Standard Random Dot Technique

- Easy adaptation of ImageJ to specific user needs
- Implementation of stereology to analyse monthly biofouling data for 10 field sites was successful, easy and speedy

### References

- Rasband, W.S., ImageJ, U. S. National Institutes of Health, Bethesda, Maryland, USA, <http://rsb.info.nih.gov/ij/>, 1997-2006
- Russ J. C., Dehoff R. T. (2000). Practical Stereology. Kluwer Academic/Plenum, New York, 2nd ed., 382 pp, and references therein

### Acknowledgements

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