

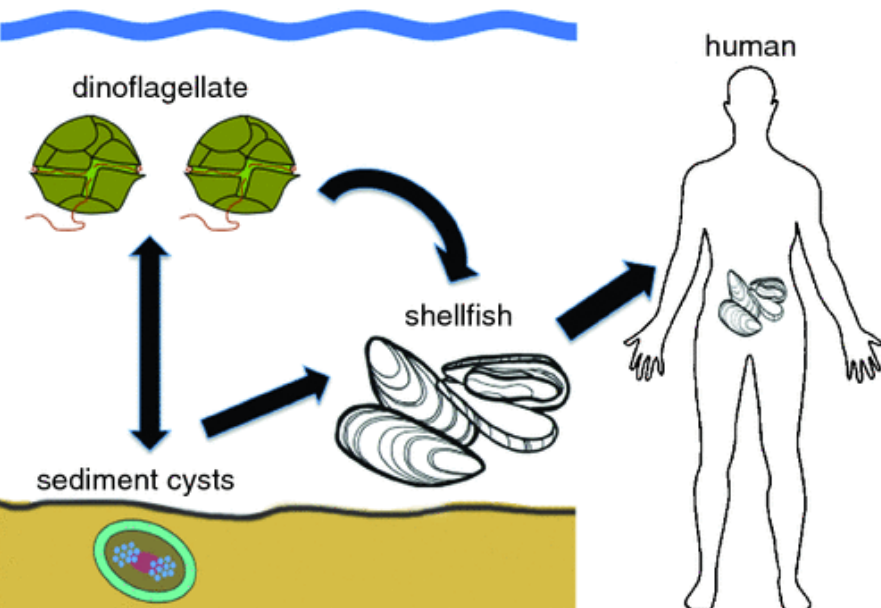
# Innovative technologies for early detection of Harmful Algal Bloom threats

## Contract C01X1515

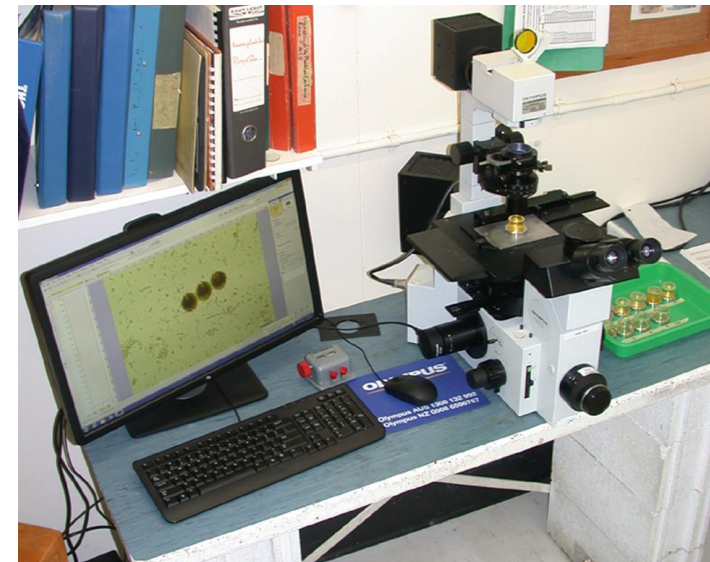
Jonathan Banks, Lincoln Mackenzie, Kirsty Smith Ben Knight, Raphael Kudela

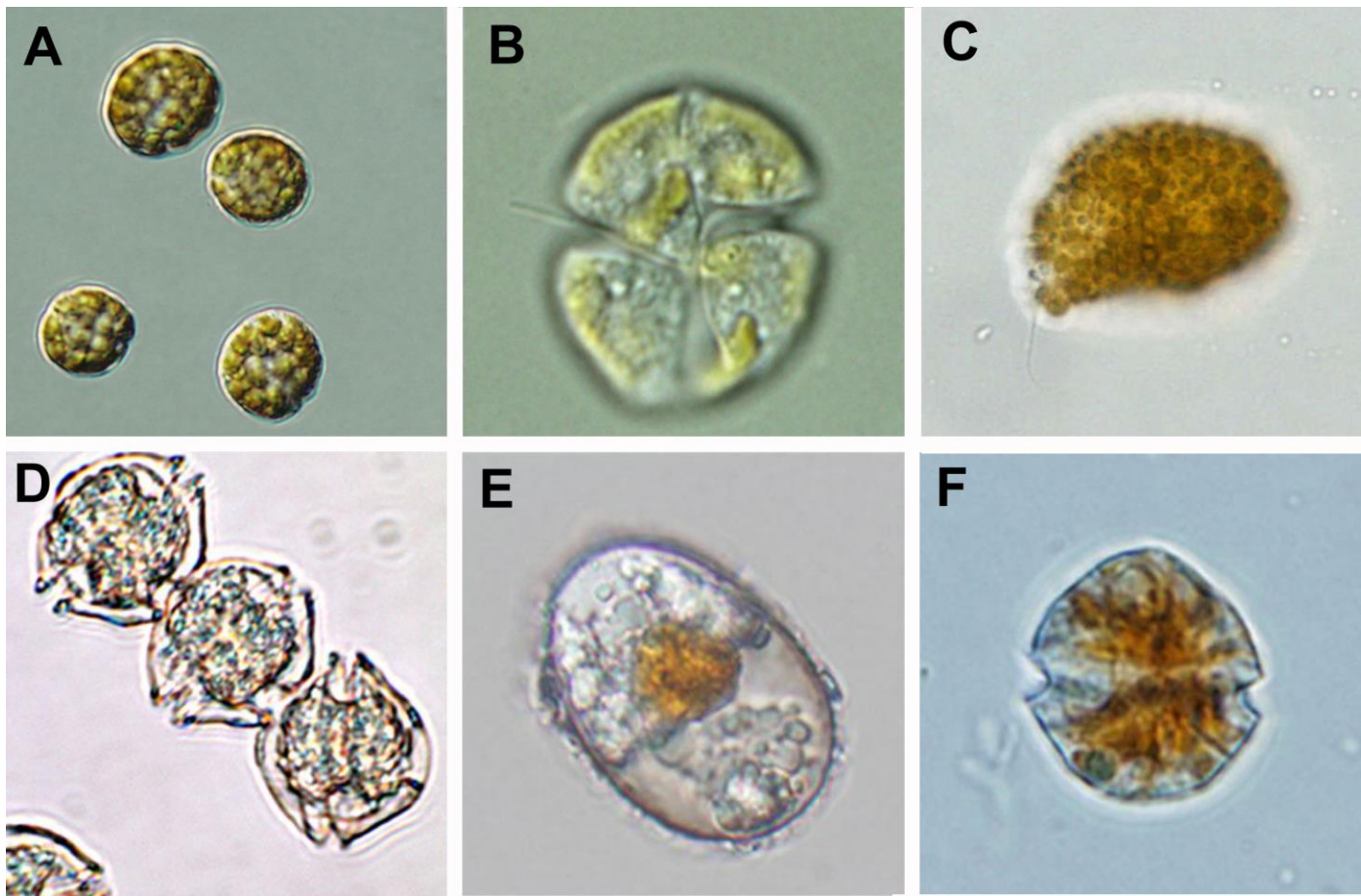
# TOXIC ALGAE

- Algal-toxin contamination is an important quality issue for aquaculture
- Shellfish containing paralytic shellfish poisoning (PSP) toxins (STXs) are common in NZ
- Permissible concentrations of STXs (<0.8 mg/kg) in seafood is strictly regulated
- Early warning of toxic blooms done by cell counts of algae



- Phytoplankton monitoring by microscopy is an effective early warning method but:
  - is relatively expensive
  - needs trained personnel in centralised labs
- Field qPCR: potentially quicker, cheaper monitoring





Five species of harmful micro-algae in New Zealand chosen for field based qPCR assays

A. *Heterosigma akashiwo*; B. *Karenia brevisulcata*; C. *Pseudochattonella verruculosa*;  
D - E. *Alexandrium pacificum* and its resting cysts; F. *Alexandrium minutum*.



**Diagnostic**  
TECHNOLOGY



**phytoxigene™**

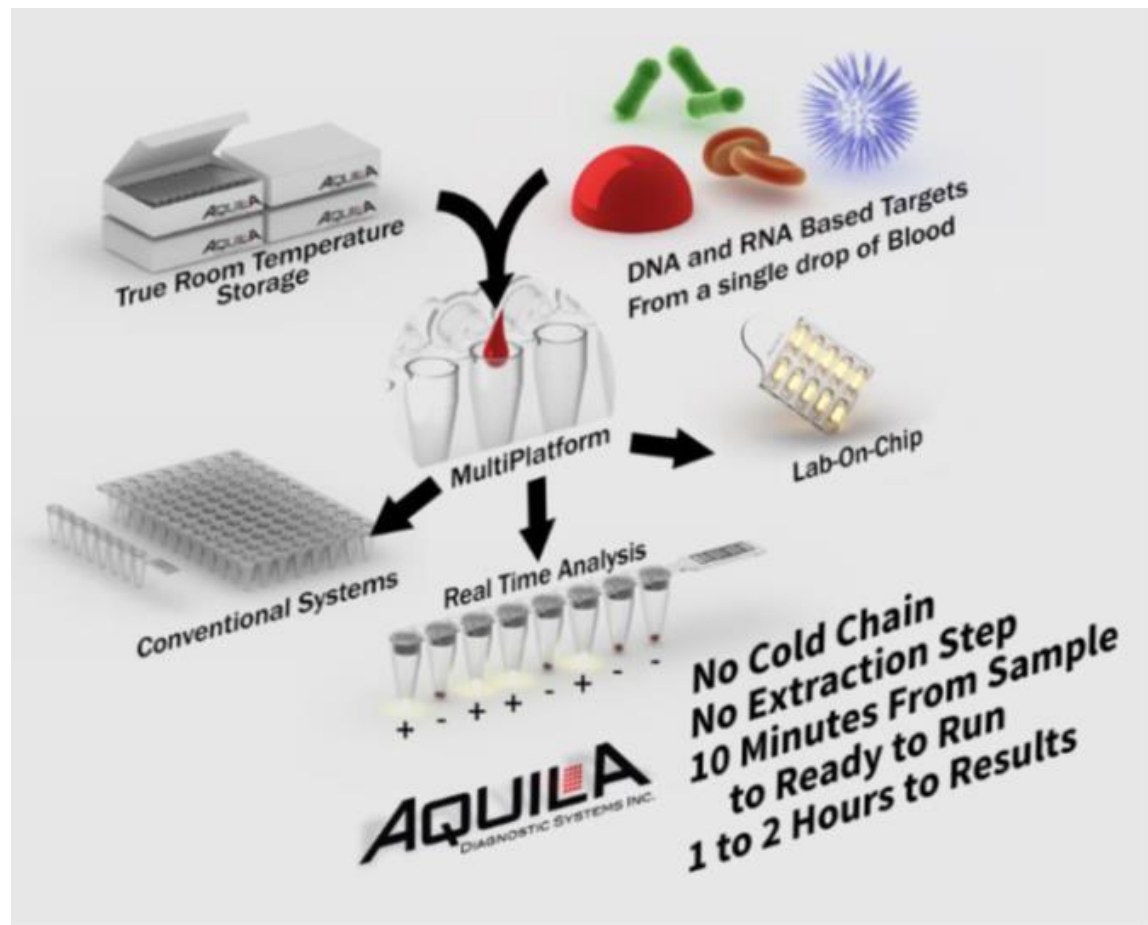
## DinoDTec

- Rapid field qPCR assay
- Lyophilised reagents
- Targets a gene in the STX synthesis pathway – “no gene no toxin”

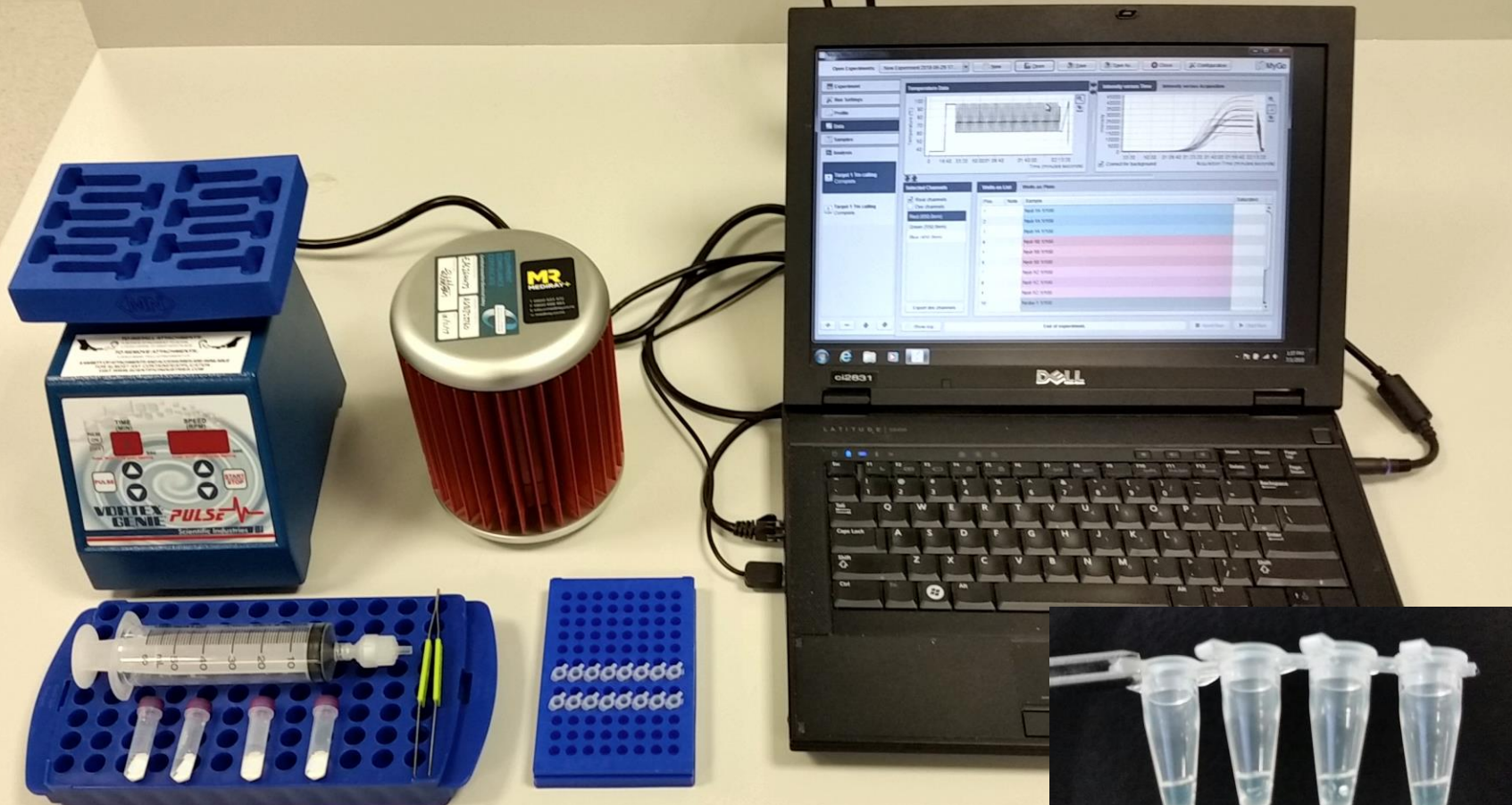


# HYDROGEL

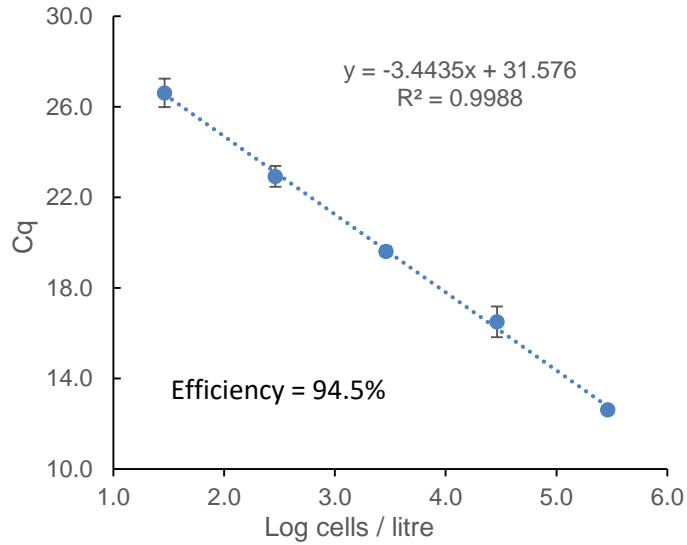
- Solid phase field qPCR assay for *Alexandrium* cells
- Targets LSU rRNA nuclear gene (28S)



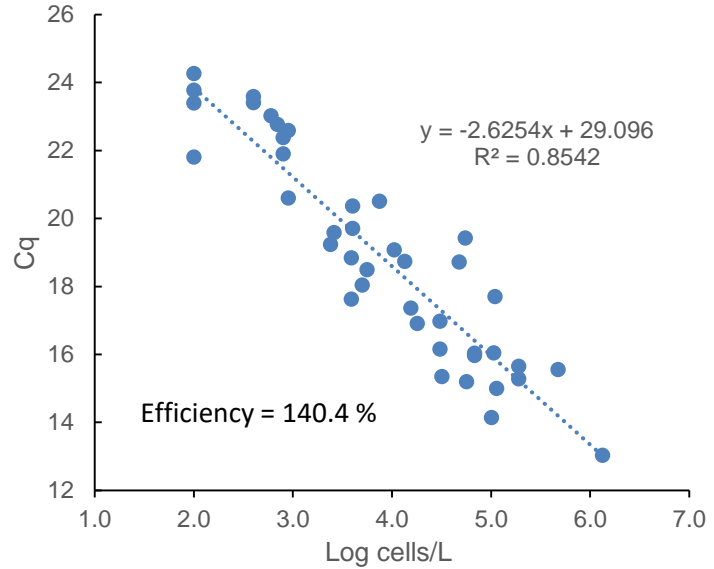
- Simple setup
  - Vortexer and tubes containing beads
  - Mygo mini thermocycler
  - PCRs



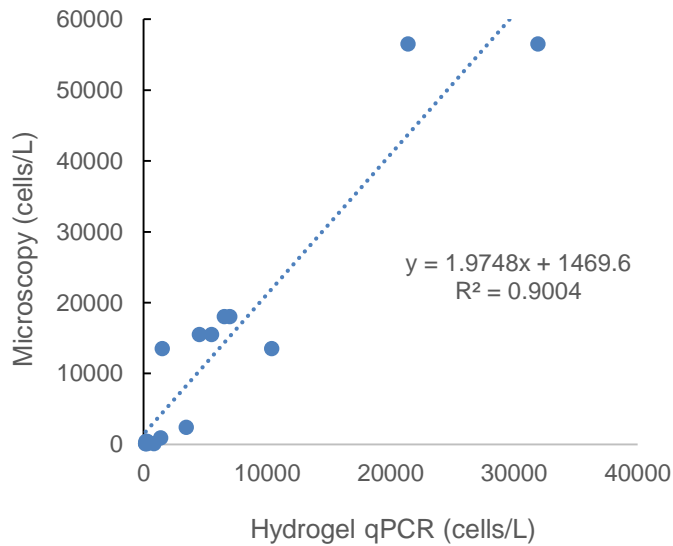
*A. pacificum* cultured cell standard



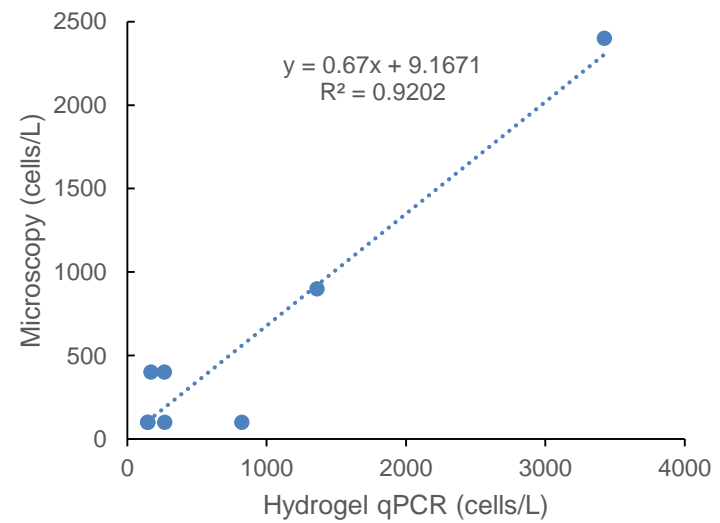
Combined assays 7 - 28 Jun-18



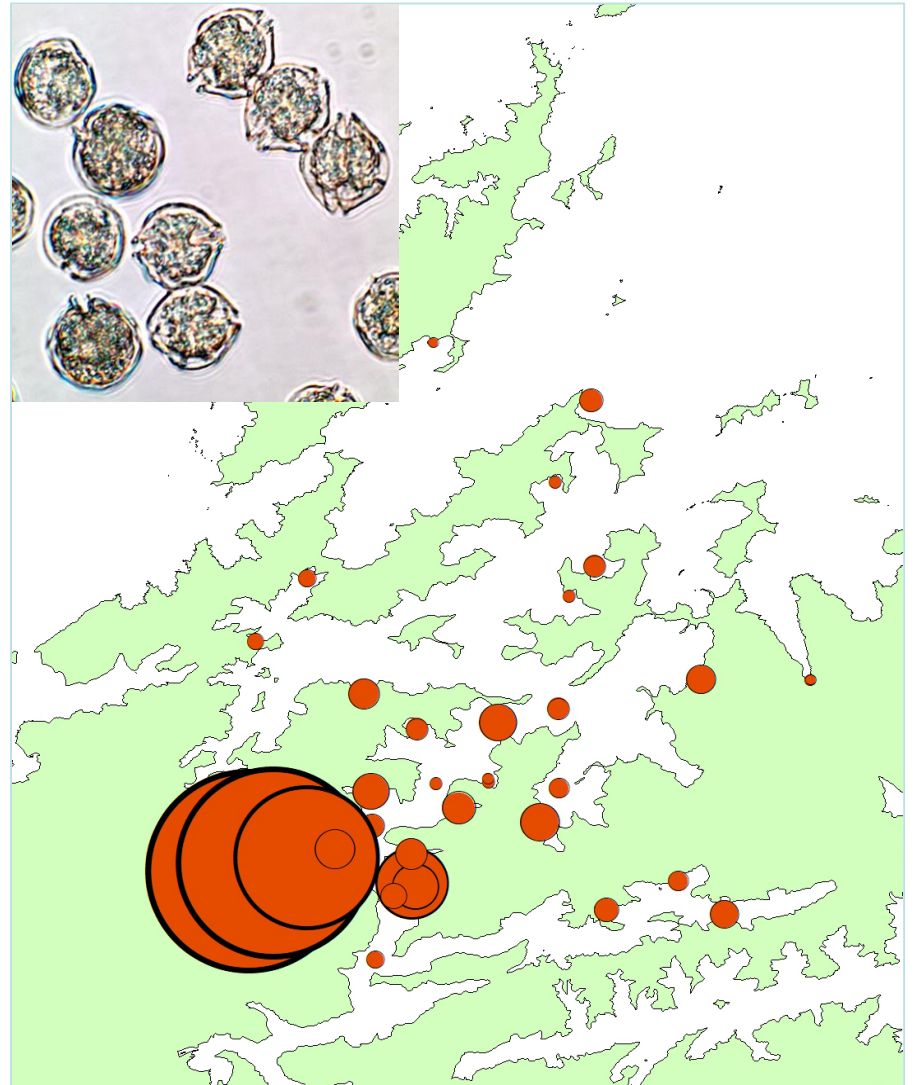
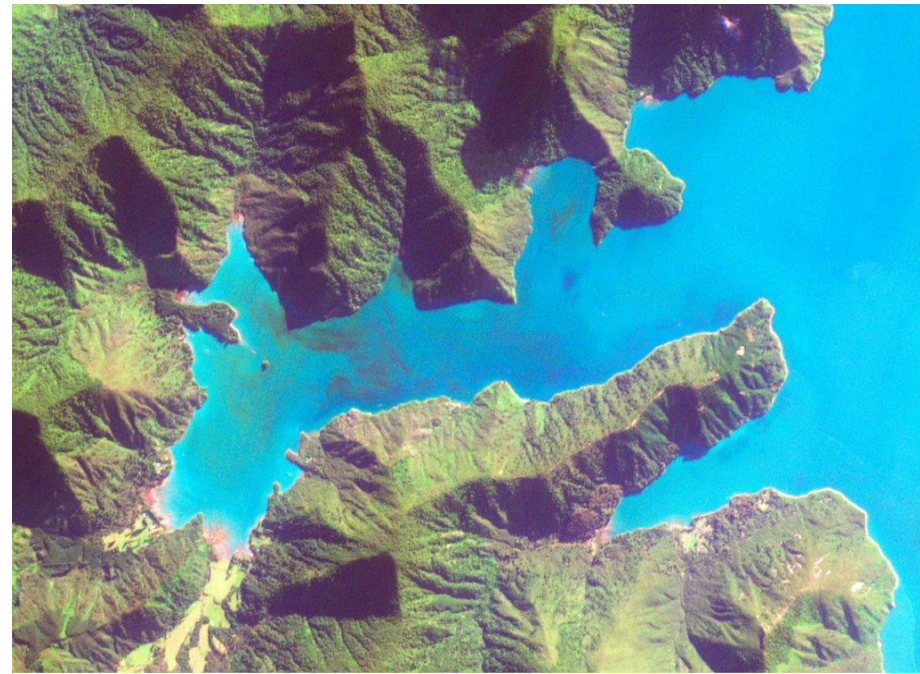
Nydia-Pelorus (28/6/18)



Nydia-Pelorus (28/6/18)







*Alexandrium pacificum* distribution in Pelorus Sound, May-June 2018 led to harvest closure

# PELORUS SOUND FIELD TRIAL

- DNA extractions and qPCR assays easily performed at sea
- Field qPCR results for up to 16 samples available within 90 minutes
- Field qPCR is competitive with conventional microscopic analysis

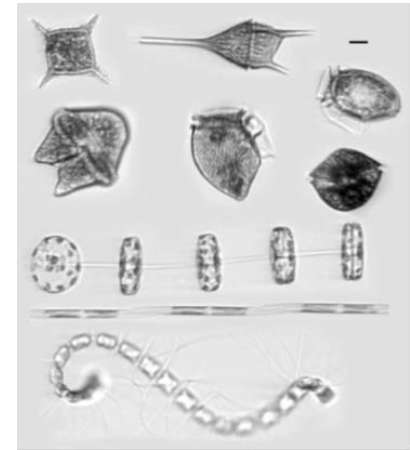


## FUTURE WORK 1

- Hydrogel and STX-gene field qPCR assays promising but require optimisation to improve sensitivity and precision
- Improved sample preparation and DNA extraction methods still required

## FUTURE WORK 2

- Deployment of Imaging Flow Cytobot (McLane Research Laboratories Inc.) 2018/19 summer to count toxic algae
- After training, images automatically processed to provide:
  - identification
  - abundance
  - biovolume
- Data can be viewed remotely



# SUMMARY

- Field qPCR achieved
- Concentrations calculated with qPCR correlate with microscopy
- Testing of imaging flow cytobot planned for summer 2018/19