

PUBLIC INFORMATION SESSION

4th October, 2017
Wanaka



LANDCARE RESEARCH
MANAAKI WHENUA

**Upper Clutha
Water Group**

LAKE SNOW UPDATE

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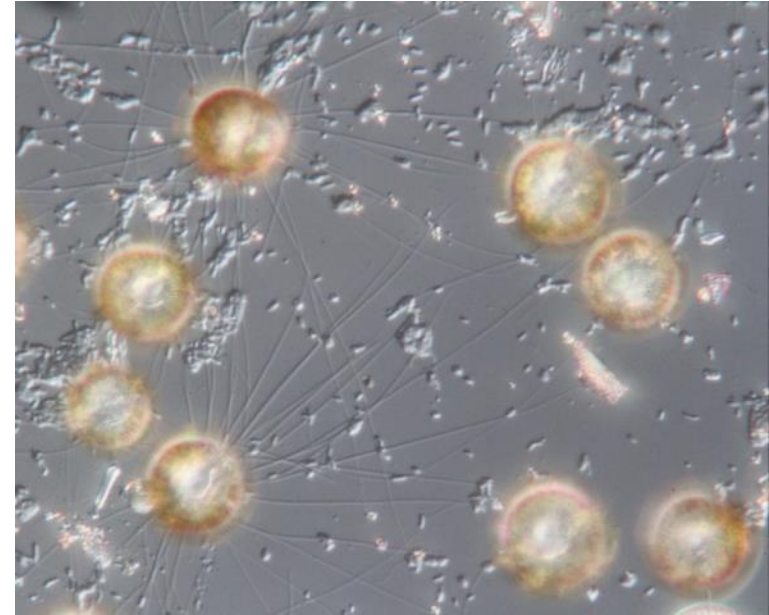
INTRODUCTION

- About lake snow
- Our research
- What next



About lake snow

- *Lindavia intermedia*
- Largish ~ 0.02 mm
- Secretes 'glue' like slime
- Forms a large sticky mass which floats in the water



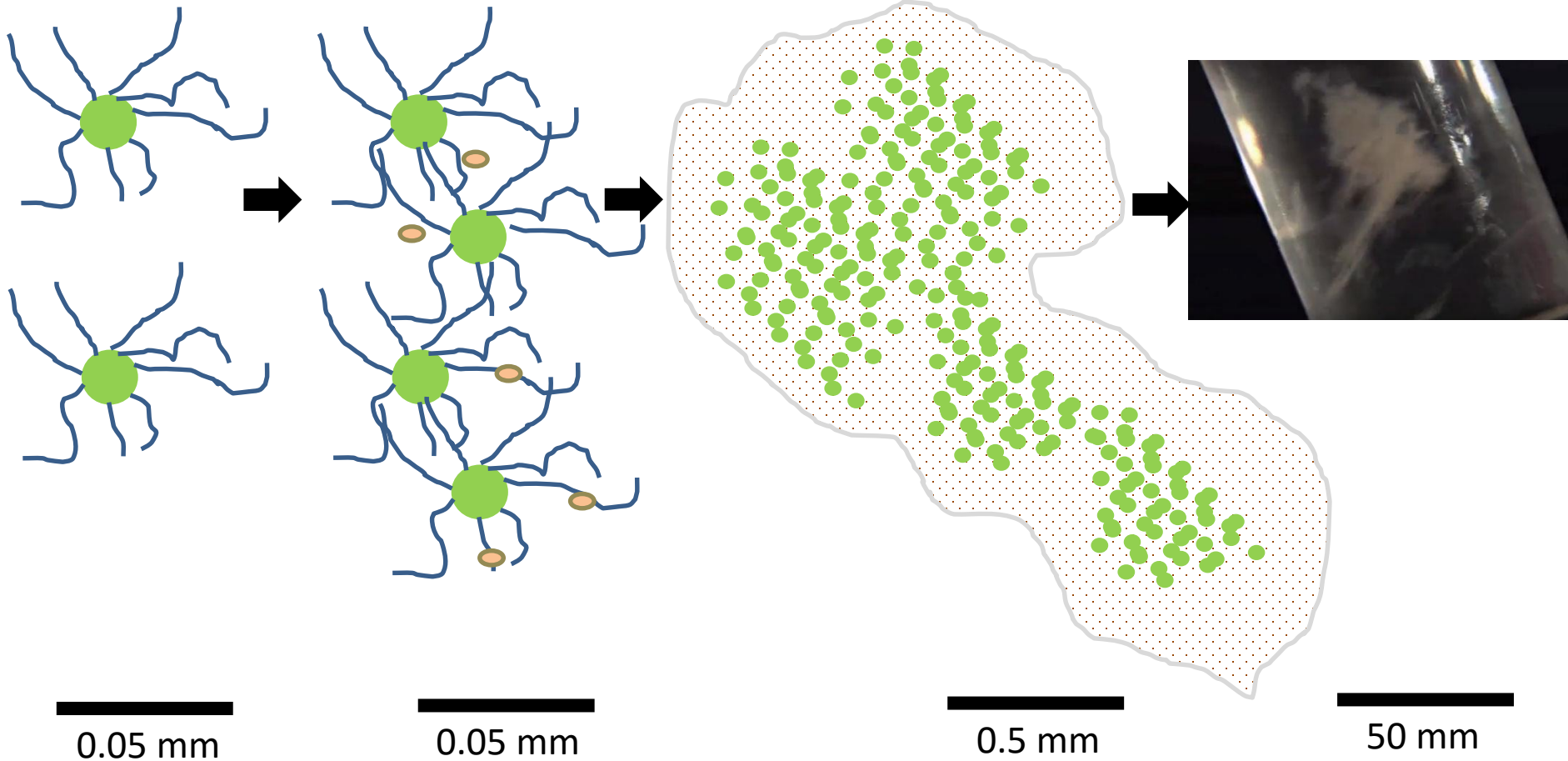
Images Dr Phil Novis

Lake snow or lake snot?

- Marine snow
- Lake snow
- Lake snot

Is generally called lake snow

How lake snow forms



People issues

- Water supply
- Clogging filters
- Sticking to swimmers
- Fouling of fishing gear



Ecological impacts



Where is lake snow present?

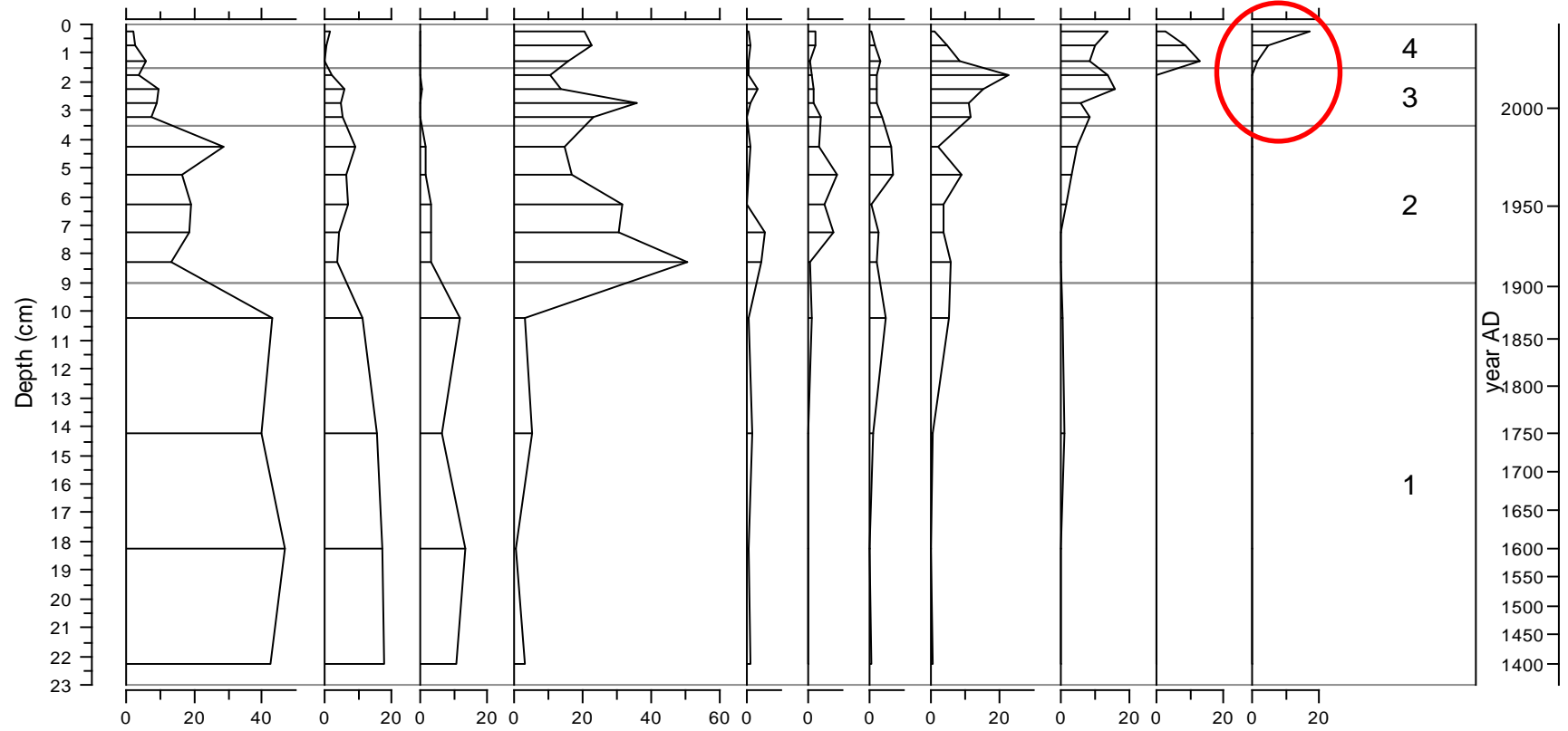
- Lake Wanaka / Hawea
- Lake Wakatipu / Moke
- Lake Benmore (Canterbury)
- Pukaki lakes (Canterbury)
- Lake Coleridge (Canterbury)
- Lake Waikaremoana (N.Island)



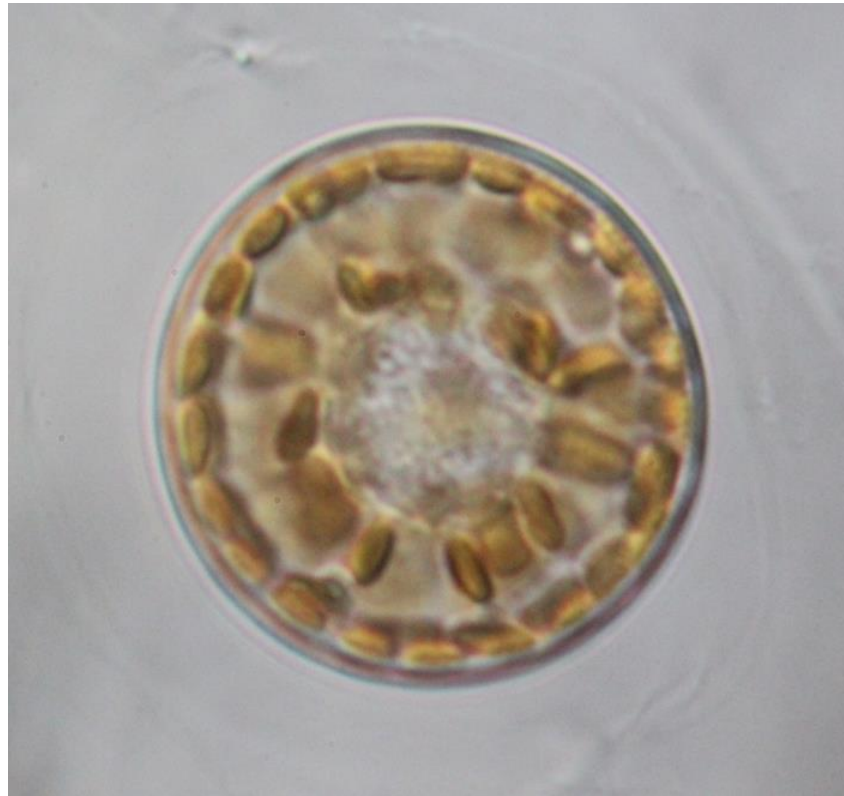
Lake Wanaka sediment core

Schallenberg & Saulnier-Talbot (in prep)

Discostella stelligera small (cf *pseudostelligera*)
Discostella stelligera large
Cyclotella meneghiniana
Achnanthydium minutissimum complex
Fragilaria sp cf *crotonensis*
Nitzschia perminuta complex
Nitzschia amphibia
Aulacoseira granulata
Brachysira neoexilis/microcephala
Nitzschia sp 2
Lindavia intermedia

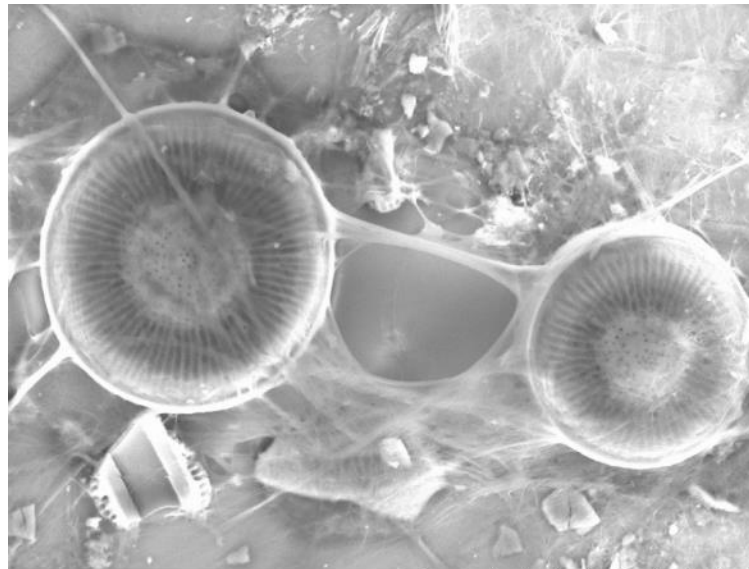


OUR RESEARCH



Purpose

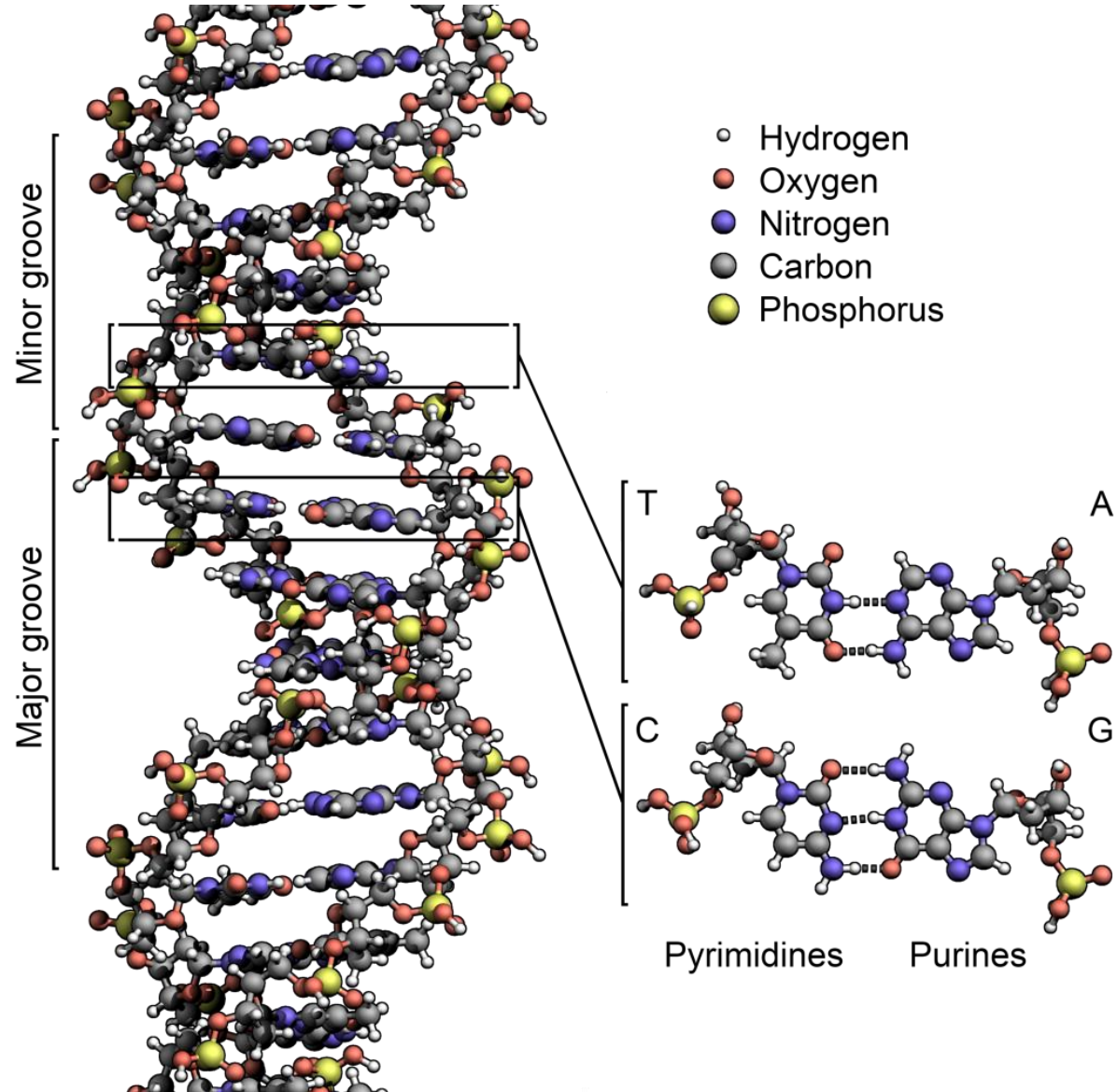
“To test whether lake snow (*Lindavia Intermedia*) is a recent invader to NZ lakes”



Landcare 2016-10-31 N D4.3 x2.5k 30 µm

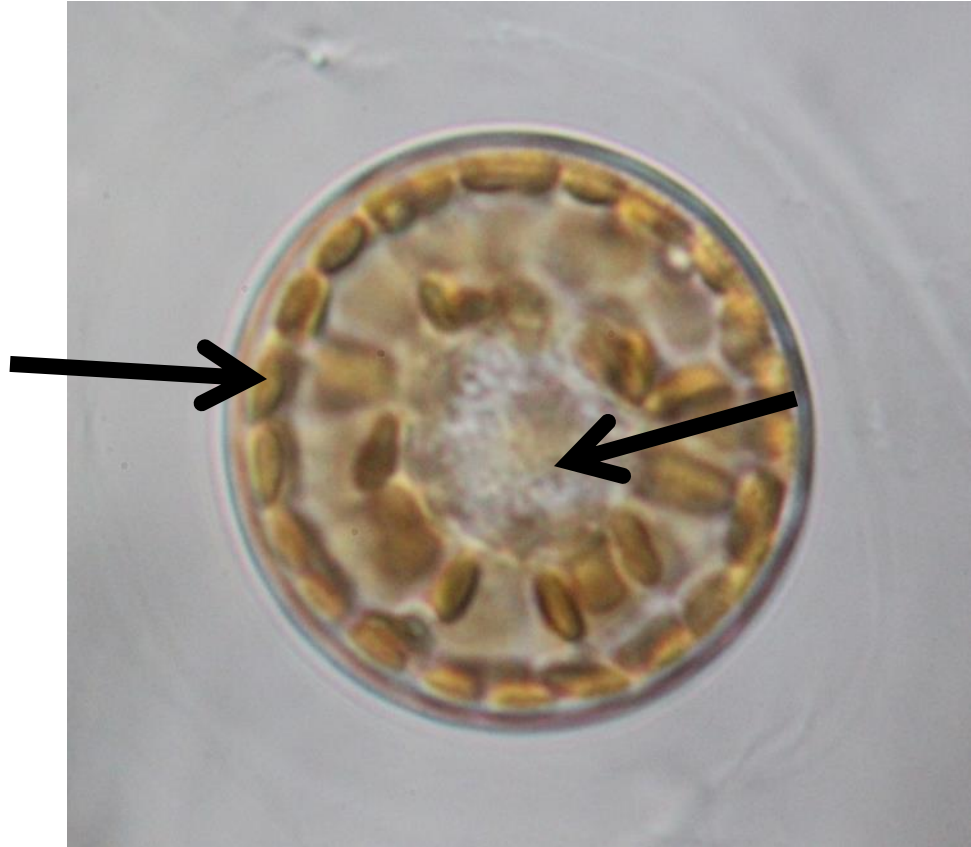
DNA

- A chemical



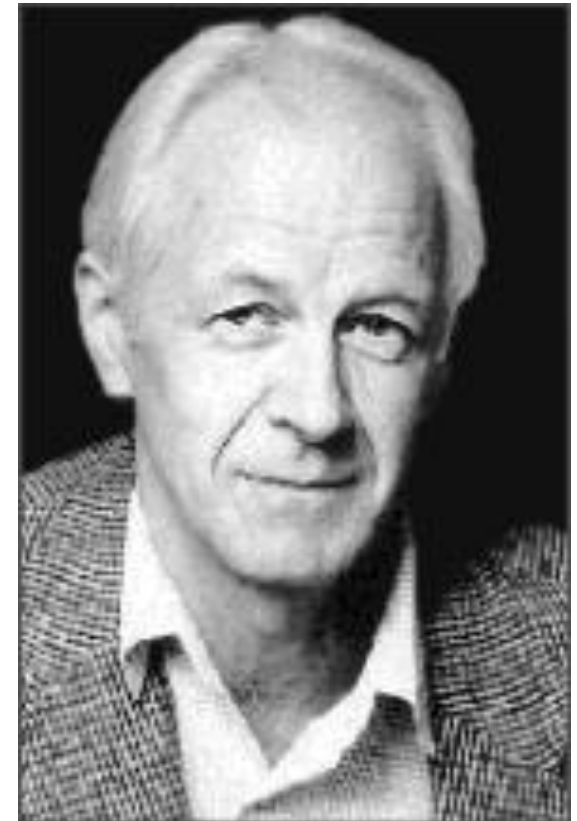
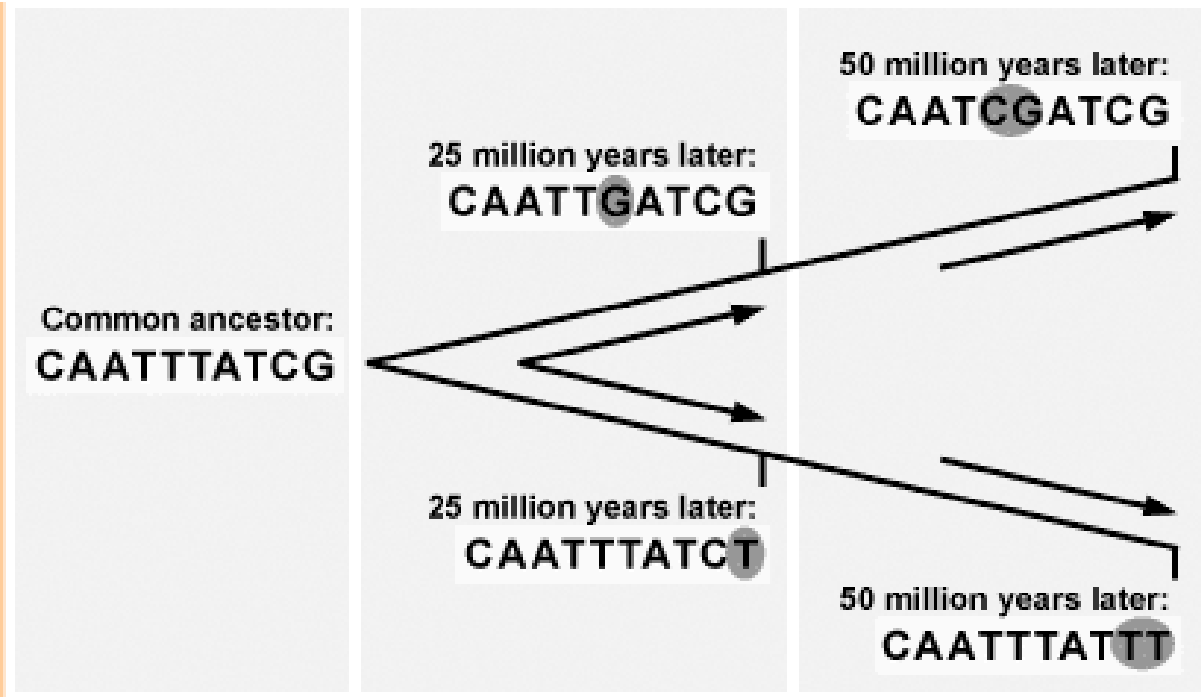
DNA

- A chemical



DNA

- A chemical
- Stores genetic information
- Changes over time



DNA

- A chemical
- Stores genetic information
- Changes over time



DNA

- A chemical
- Stores genetic information
- Changes over time



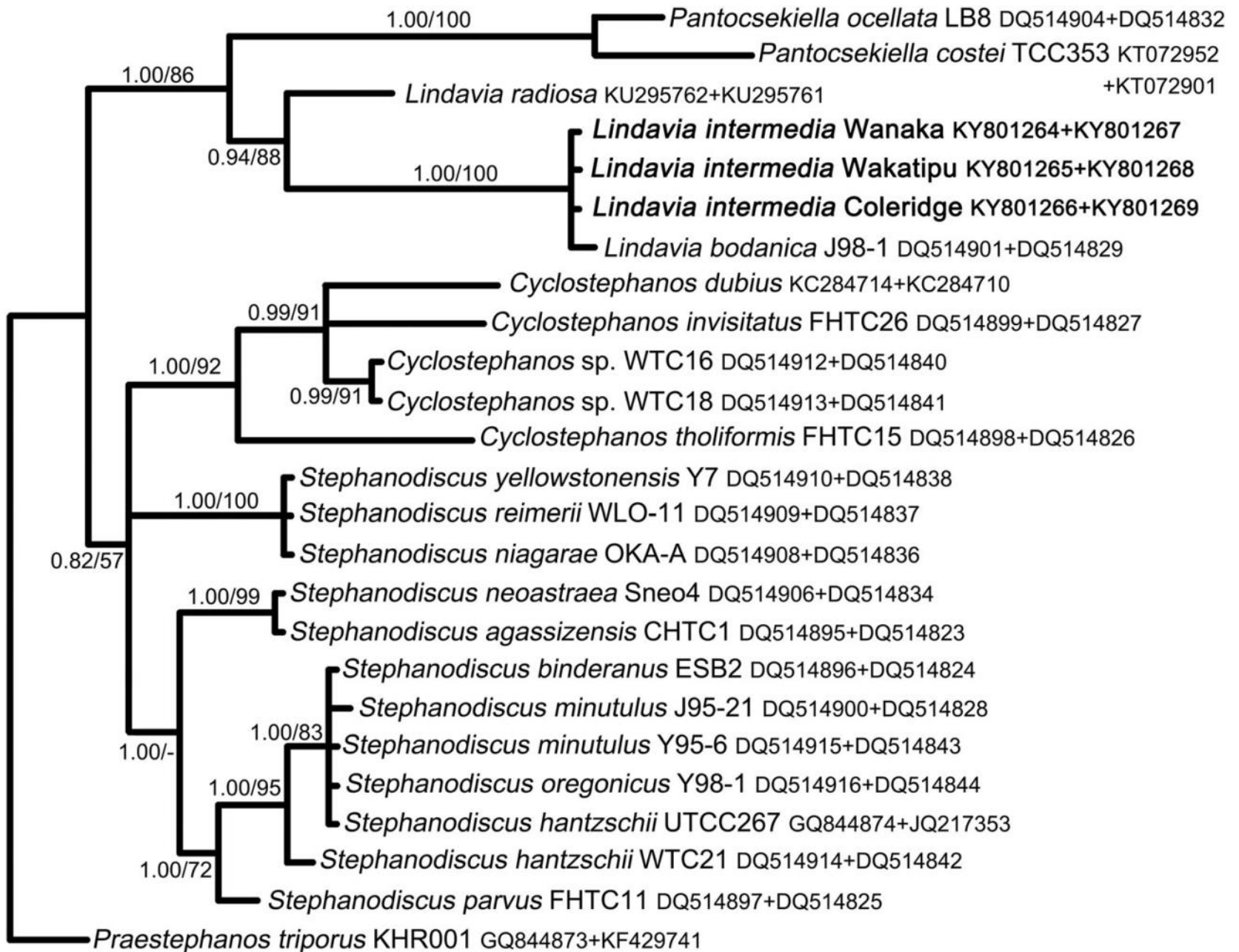
A. hookerianum

A. richardii



DNA

- A chemical
- Stores genetic information
- Changes over time
- Records ancestry



Lake snow

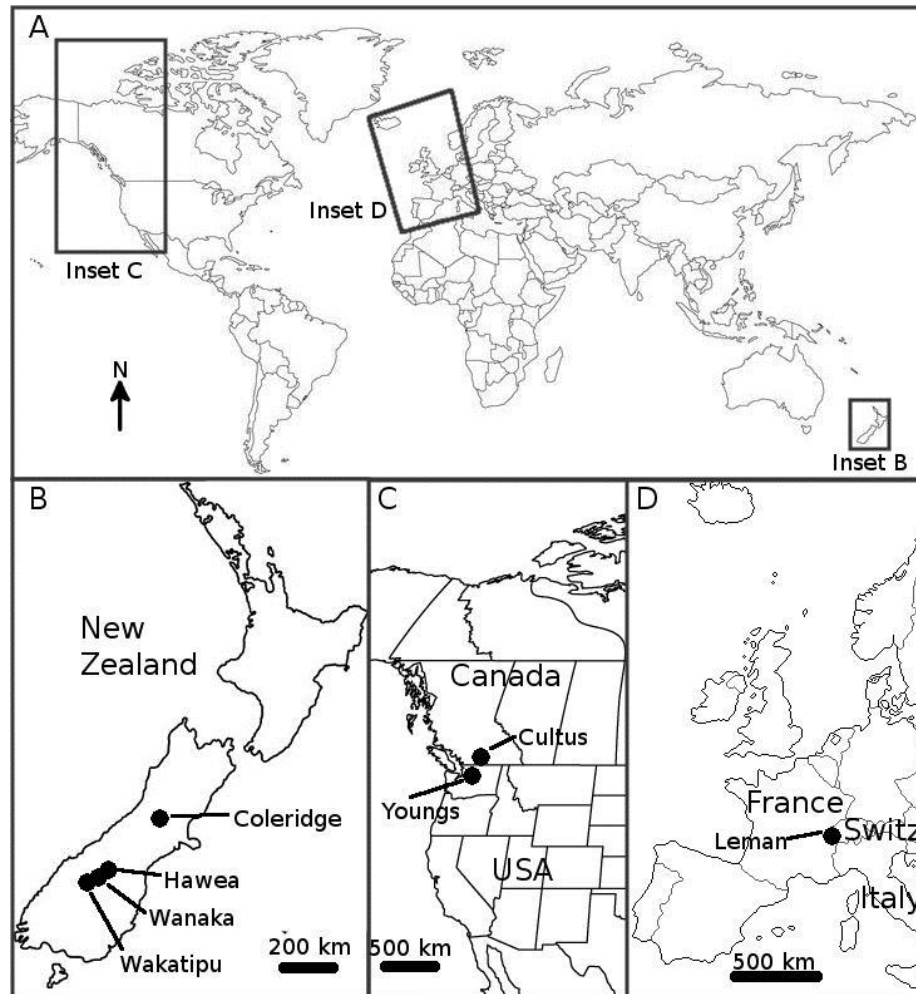
“phylogeography”

Obtain material from different areas

- Washington
- British Columbia
- ~~■ Alaska~~
- ~~■ Wyoming~~
- ~~■ New England~~
- Switzerland
- ~~■ Germany~~

Lake snow

“phylogeography”



Lake snow

“phylogeography”

Obtain material from different areas

Find rapidly changing regions of DNA

- 100 candidates
- 20 gave bands on gels
- 12 produced variation
- 6 were repeatable

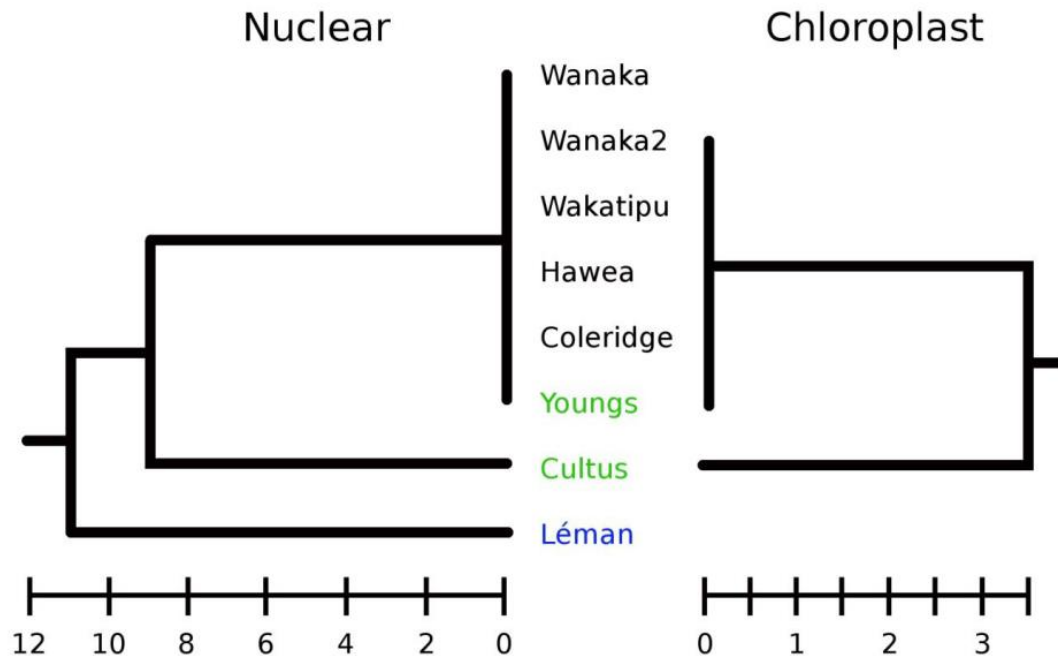
Lake snow

“phylogeography”

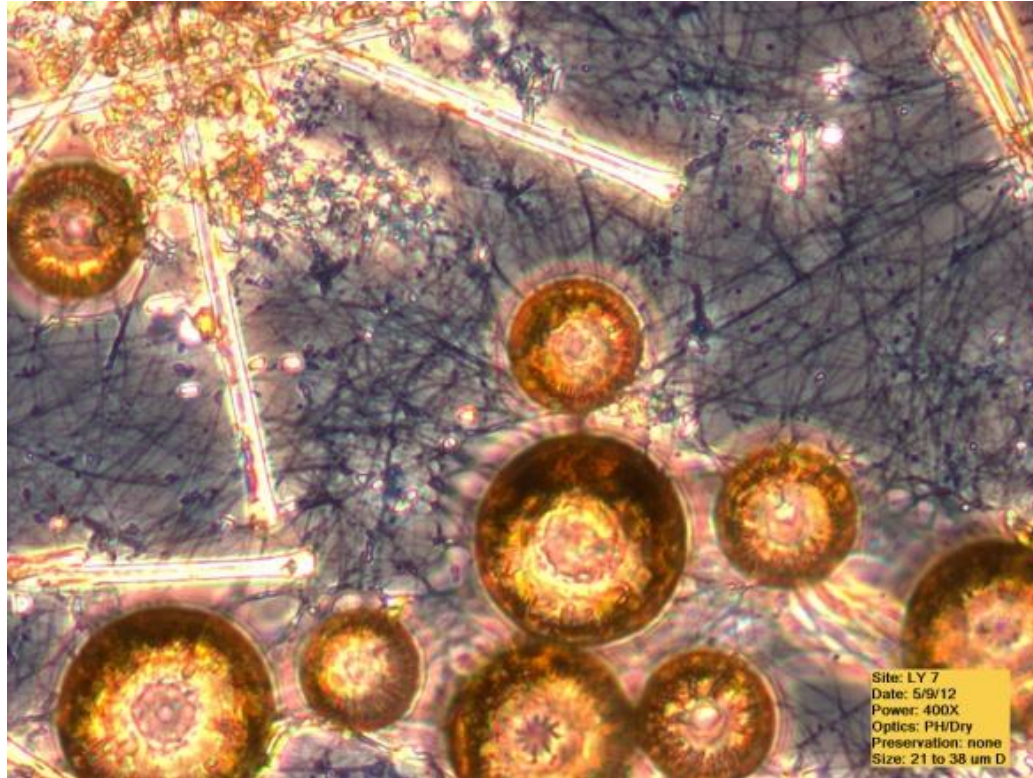
Obtain material from different areas

Find rapidly changing regions of DNA

Collect data from each region



Lake snow “phylogeography”



NZ and Washington lake snow is the same

Lake snow “phylogeography”

Pattern of diversity most consistent with a
“there to here” explanation

■ WHAT DOES ALL THIS MEAN?

- Lake snow should be regarded as invasive
- Quite likely from North America
- Drivers: more complex than straight environmental change
- Another biosecurity lesson

IT DOESN'T TELL US

- Anything about mechanisms
- Exactly when it arrived
- How to fix it

In short: we need to know more about it

WHAT NEXT?

- Lake monitoring
- ORC-funded work
- University funded research
- MBIE projects

Lake monitoring

From Sept. 2016, monthly boat-based monitoring of:

- Hawea / Wanaka
- Wakatipu / Hayes
- Three years committed
- LTP?



New ORC-funded work

Confirming the time of arrival of lake snow in Otago

- Coring and dating the sediments of lake snow infected lakes in the region
- Checking all NZ diatom lists and historical collections for reference to lake snow

New ORC-funded work

- Studying literature on causes of algae shifts to *Lindavia*-like diatoms in big deep lakes from around the world
- Studying world-wide literature on causes of polysaccharide production by the algae
- 1-year programme

University of Otago Research

Lake snow and fish populations

- Travis Ingram, MS, and Birgit Köhler (Uppsala University)
- Measurement of the sinking rate of lake snow to the lake bed and its impact on common bullies
- 1-year programme



Lakes380 MBIE research

Led by Marcus Vandergoes (GNS) and Susie Wood (Cawthron Institute)

- Determining the environmental history of 380 NZ lakes through sediment coring
- Southern Great Lakes diatom analysis
- 5-year programme



MBIE: Lake snow toolbox



Guardians of Lake Wanaka



About the fund

- Endeavour Smart Ideas fund
- Up to \$1 million dollars over three years
- Successful proposal:
*“Lake snow detection and quantification:
novel methods for an emerging
environmental problem”*

Project overview

- Develop new tools to quantify and detect
- Test those tools in Lake Wanaka



Wrap up...

- No quick fixes
- So much more to learn

HOW YOU CAN HELP

- Help stop the spread

Check, Clean, Dry – always

- Tell us when you encounter lake snow...

It helps build a picture of where it has the biggest impact on people enjoying the lakes

HOW YOU CAN HELP



 Get Emergency READY

 Contact us

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Submit it



Citizen Science - lake snow encounter form

Have you had an encounter with lake snow? Report it here as part of Otago's citizen science. It helps ORC, and our research partners understand where in our beautiful lakes that lake snow is causing a nuisance to you. [Read more »](#)



Environmental Enhancement Fund

The fund provides support for the cost of activities which either retain the existing characteristics of valued natural resources or improves environments degraded because of problems in the past. [Read more »](#)



Current notified applications

You can view resource consent applications that are currently open for submission, awaiting hearing, being heard or pending a decision. Submissions on currently notified applications can be submitted online. [Read more »](#)

Questions?



www.orc.govt.nz



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**Thank you for
coming along tonight**



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**Upper Clutha
Water Group**