

LENScience Senior Biology Seminar Series
Ancient Secrets in the Seaweed
Post-Seminar Challenge Questions

Challenge 1

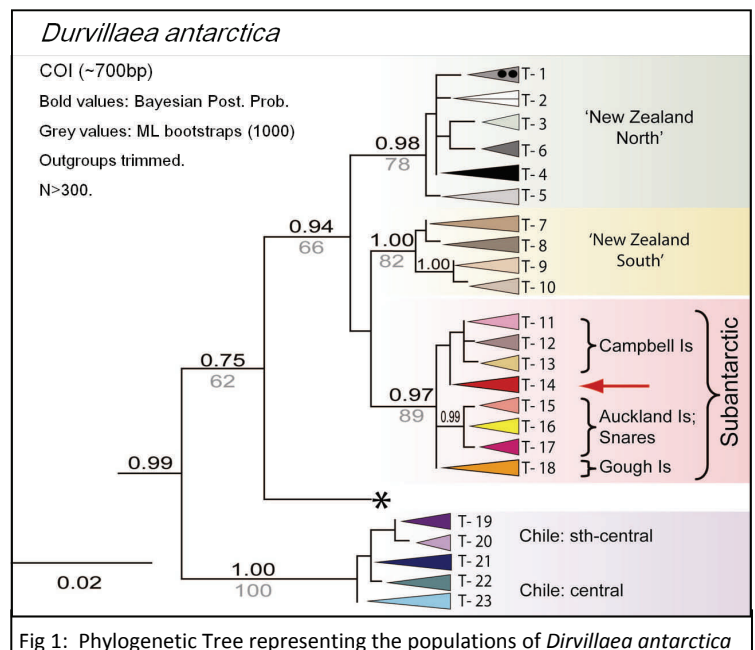
1. The genus *Durvillaea* (commonly known as Southern Bull-Kelp) contains a number of species, of which *Durvillaea antarctica* is one.

(a) Define genus and species.

Biologists have different ways of defining species. Three of the most common are the biological, morphological and phylogenetic species concepts.

(b) Explain the differences between each, including a description of its limitations.

2. Figure 1 shows a phylogenetic tree illustrating genetic variation within the single species *Durvillaea antarctica*. Explain what the diagram tells you about the variation shown within the species. Do you think this bull-kelp should be treated as one, or several, species? (Do you feel you have enough information to make this decision, and if not, what other information might you require?)



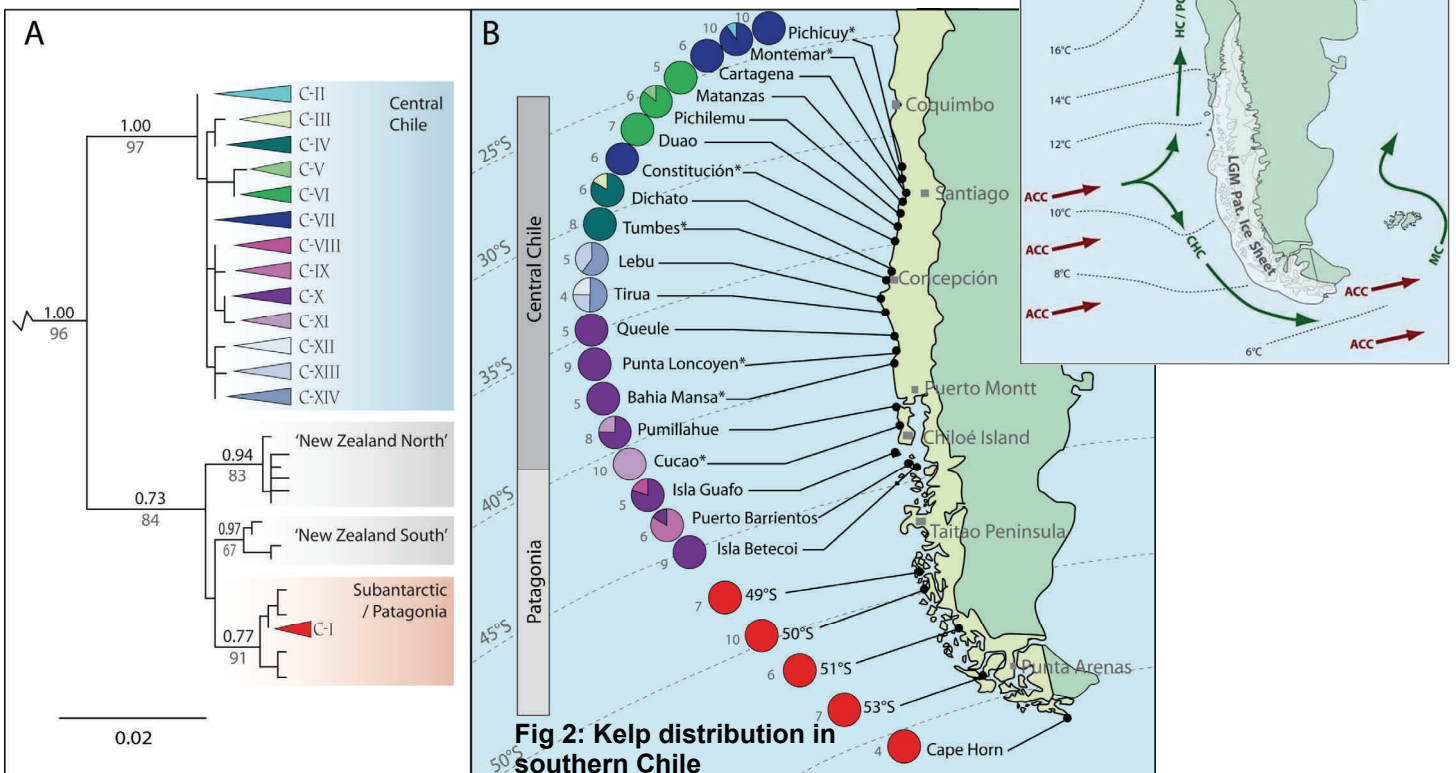
Challenge 2

3. Ceridwen and the team analysed the samples from the populations using molecular biotechnologies. The evidence allowed them to **infer** what had happened to the populations in the last glacial period. What does the term **infer** mean and why is it used in this context?
4. Mitochondrial DNA is used in the analysis of the samples because it is abundant and easily accessible. However there are other advantages of using mitochondrial DNA over using nuclear DNA. Discuss possible reasons for these advantages.

Challenge 3

- Discuss the potential mechanisms and role of climate change in causing genetic variation within *Durvillaea antarctica*. Use the data from Fig 8 and Fig 9 (on page 5 of the seminar paper), to explain why the evidence suggests that the subantarctic populations of *Durvillaea antarctica* have colonised this area recently (in terms of geological time). Explain what would have to occur in order for new species to evolve from the variants currently seen within the population?
- Figure 2 below shows genetic data from Ceridwen's study relating to populations of *Durvillaea antarctica* along the coast of Chile. Figure 3 shows the currents in this area, and the position of the glacial ice sheet in southern Chile at the peak of the last Ice Age. Using the information in these figures:

- Can you suggest a hypothesis to explain the genetic patterns observed in the kelp?
- What evidence did you use to form this hypothesis?
- What further questions do you need to answer to support your ideas?



POST YOUR IDEAS, QUESTIONS AND SUGGESTED ANSWERS AT
http://lens.auckland.ac.nz/index.php/Seminar_4_2010_Discussion_Page