

How do ecosystems change over time?
What are the causes of these changes?

2.6.5 Describe the **concept and processes of succession
in a named habitat**

Key words

- Primary succession
- Secondary succession
- Zonation
- Habitat
- species
- Seral (sere) stages
- Pioneer community
- Community
- Population
- 'r' species
- 'K' species
- Climax community

Community

(glossary definition):

- *A group of populations living and interacting with each other in a common habitat*
 - *What is a population?... (Hint: a group of _____ ... same species, ...same area, ...same time*
 - *What is a habitat?... (the environment in which a species lives)*

Misconception! succession and zonation are the same

- Succession: the orderly process of change over time in a community. Changes in the community of organisms frequently cause changes in the physical environment that allow another community to become established and replace the former through competition. Often, but not inevitably, the later communities in such a sequence or sere are more complex than those that appear earlier

SO...

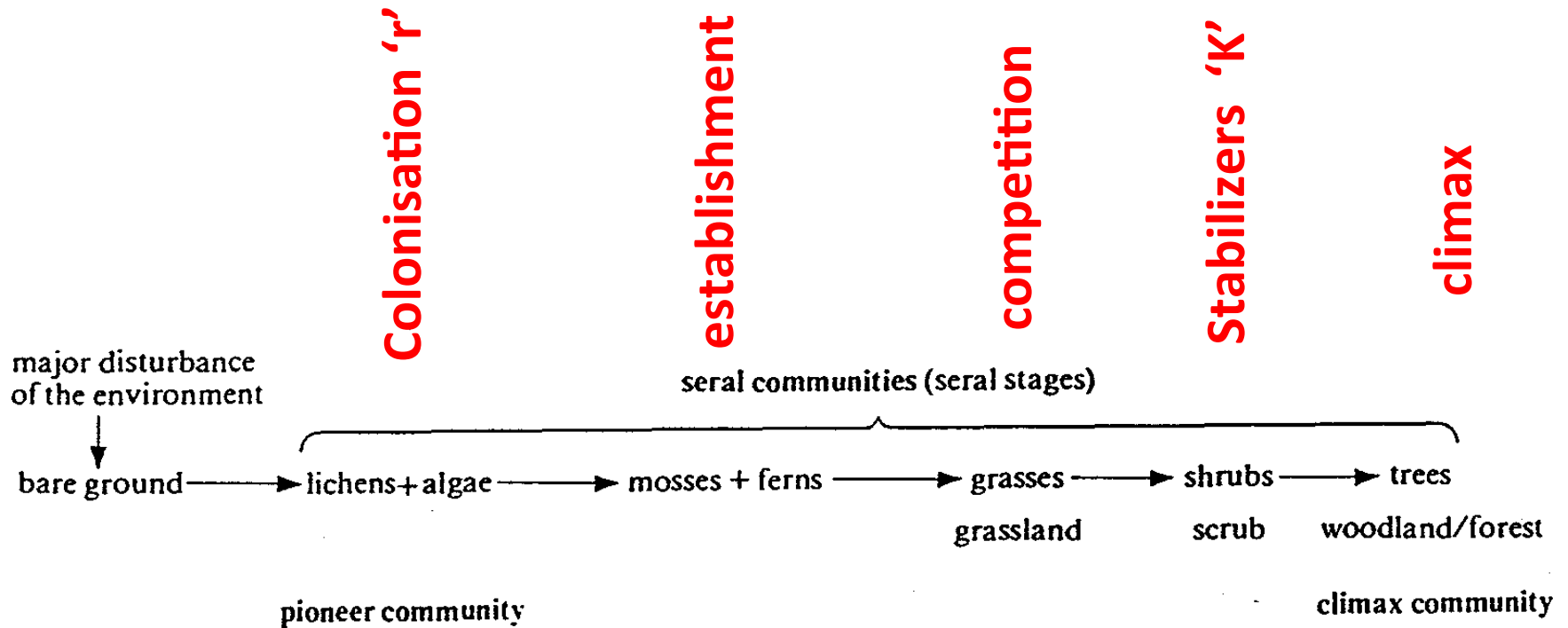
Succession is the *changes* in species composition of an area over *time* (temporal); communities of plants and animals *change* the environment in which they are living.

WHEREAS...

Zonation is the *variation* or spread/
distribution species or communities over a
particular *area* (*spatial*)

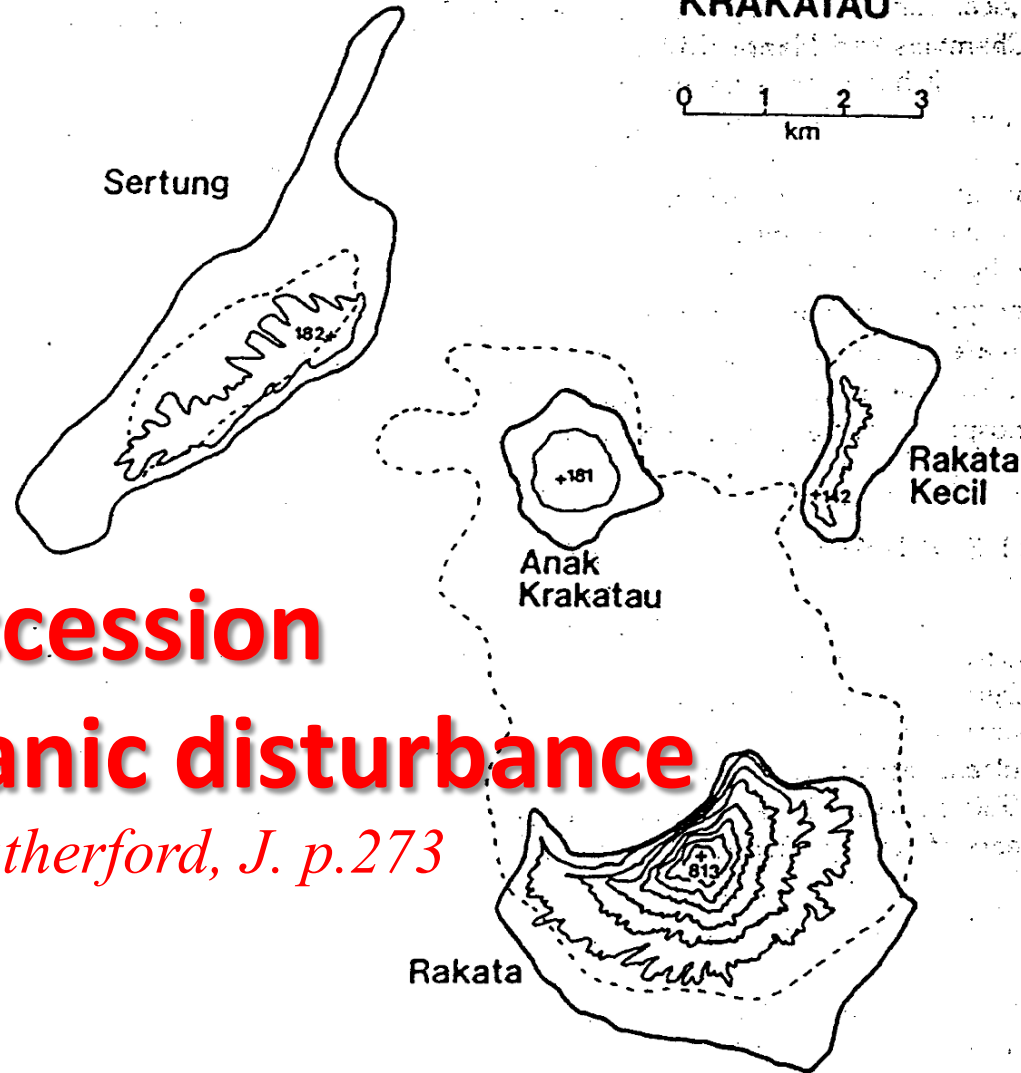
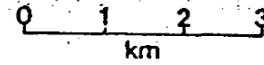
- Succession changes occur in stages called *seres*, starting from a *pioneer community* until it reaches a *climax community* when the species composition stop changing
- Succession can be *primary* or *secondary*
 - *What does that mean? Any ideas?*

Typical Seres of Primary Succession



**2.6.5 Describe the concept and
processes of succession
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KRAKATAU

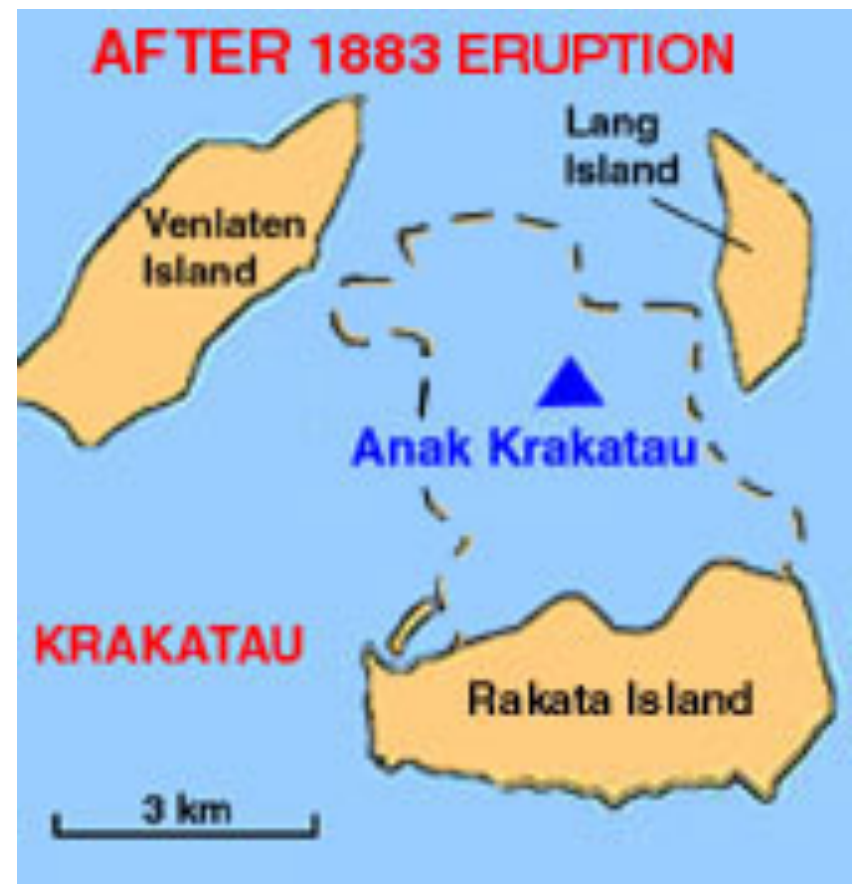


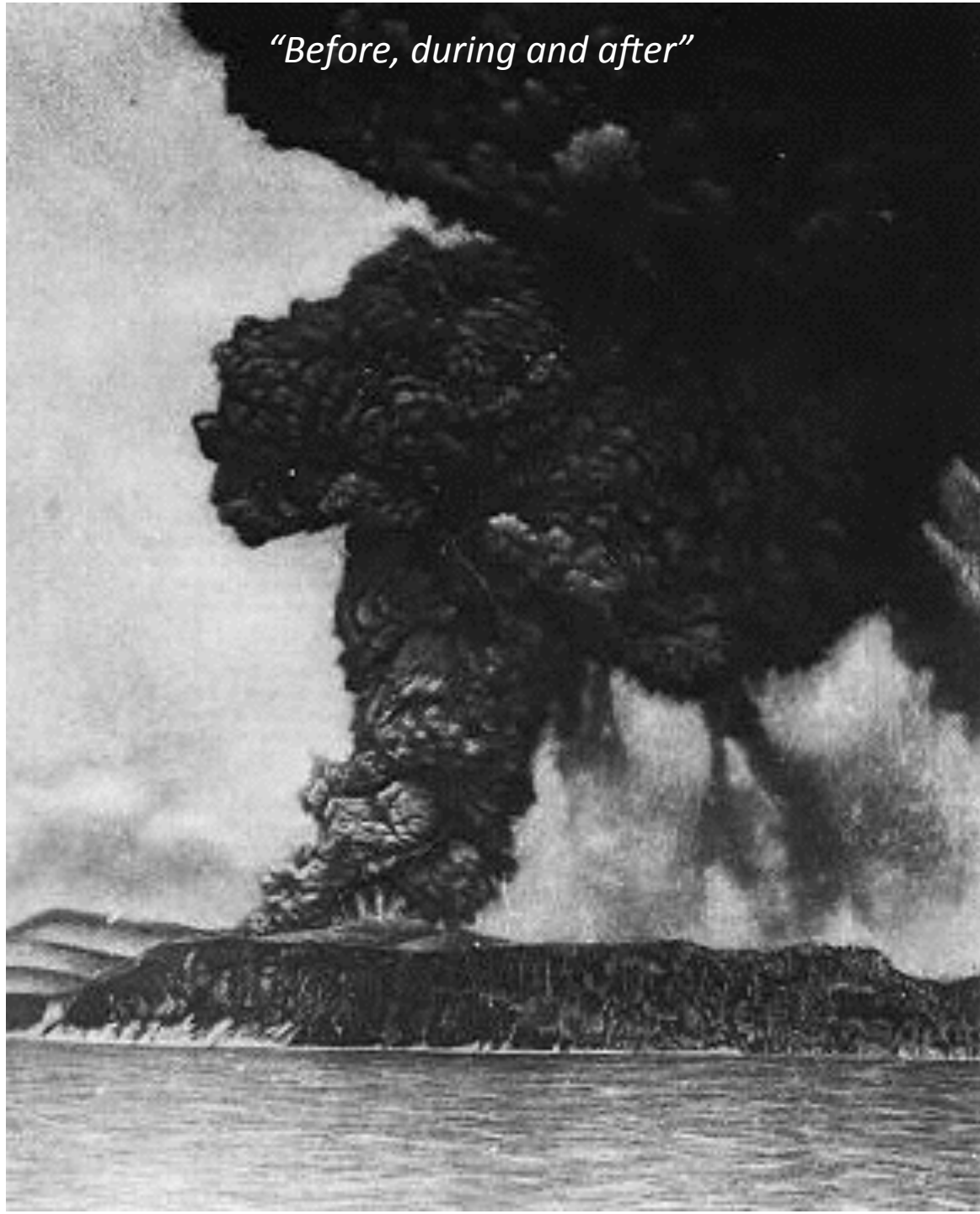
Succession after a volcanic disturbance

refer to Rutherford, J. p.273

The Krakatau Islands showing contours every 100 m and (dotted line) the coastlines in 1883. (After Richards [112]).

In 1883 a major eruption occurred in the island volcano of Krakatoa (*Krakatau*)

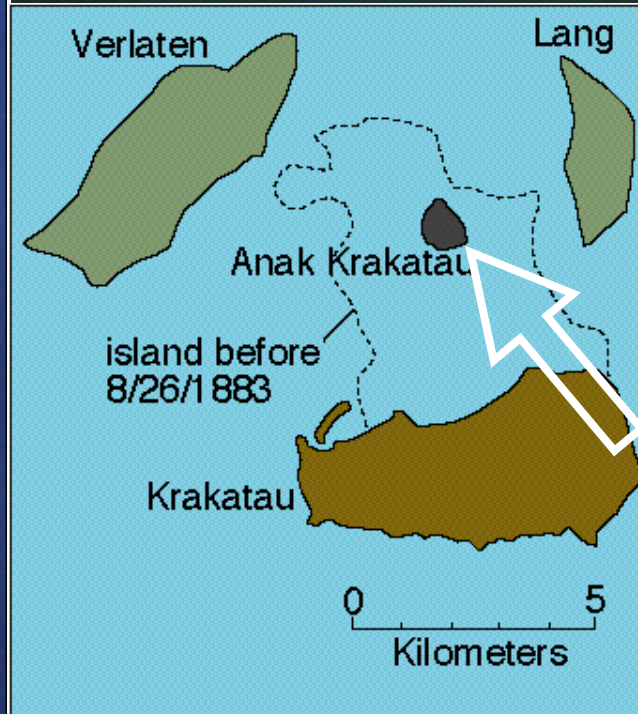
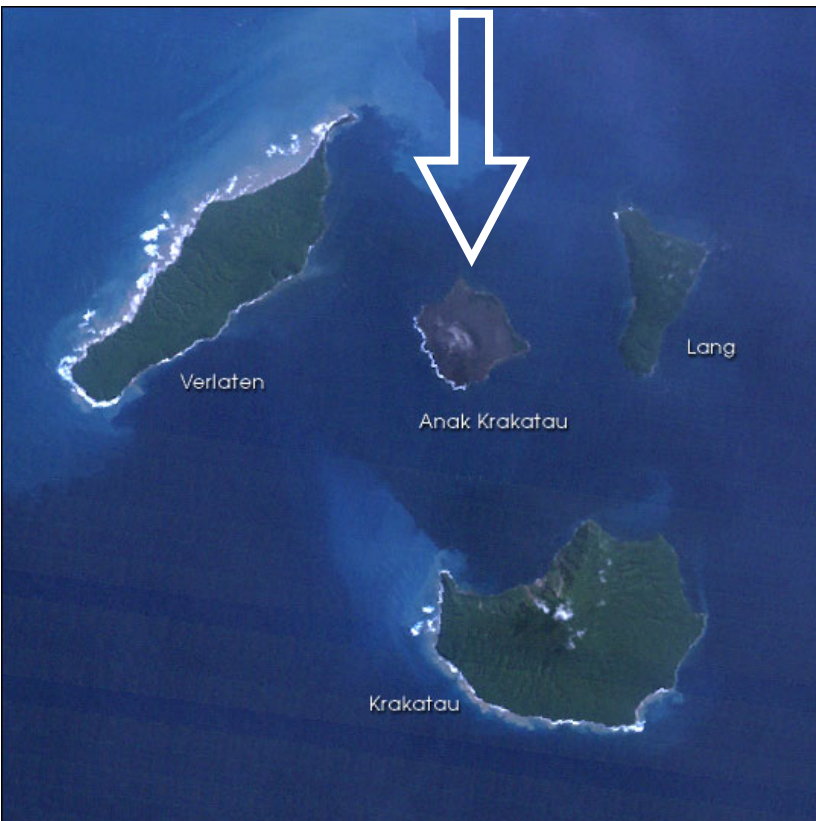








***Eruptions continued,
and a new island,
Anak Krakatau,
appeared in the centre
of the old caldera***

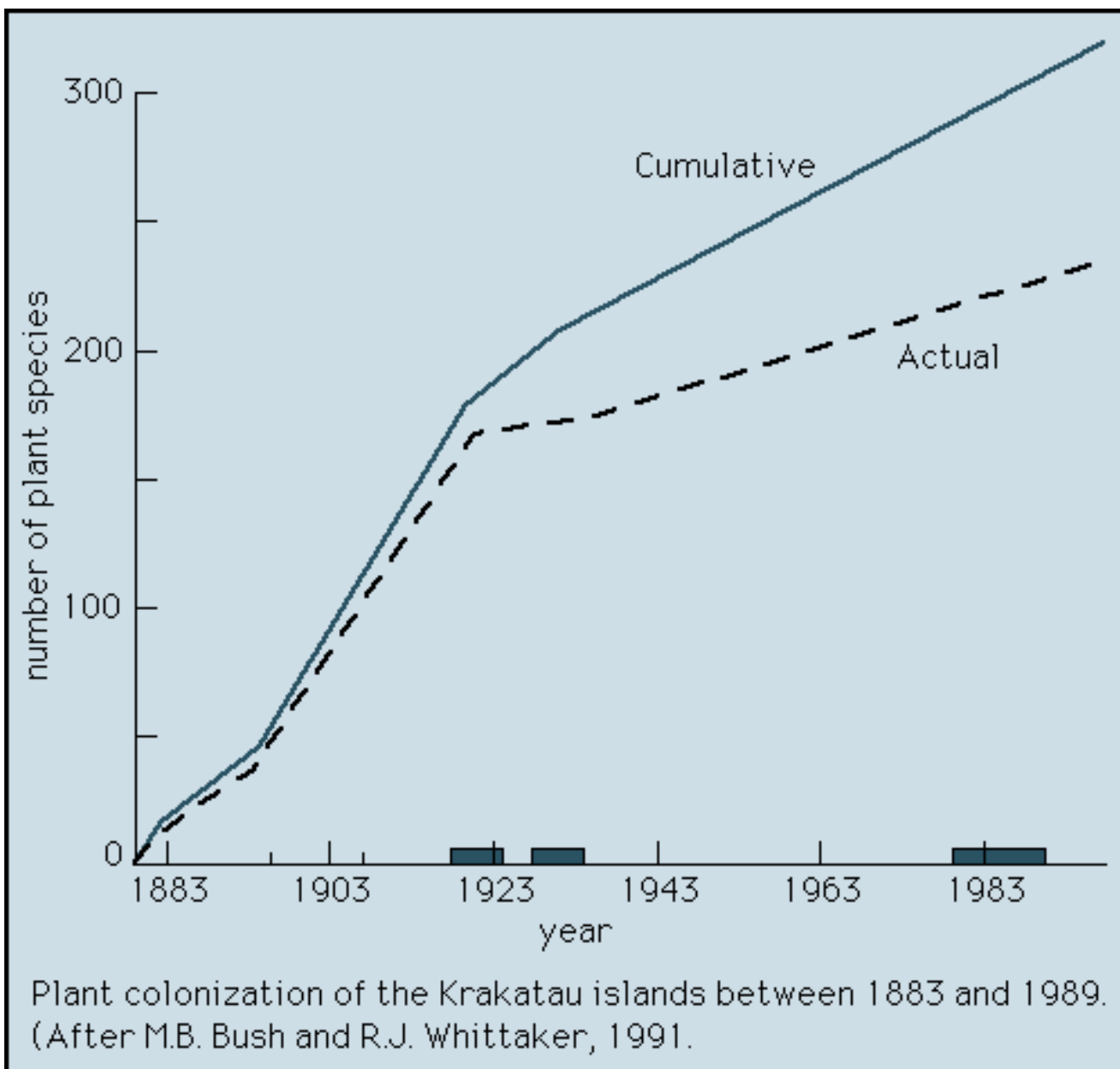


From Simkin and Fiske, 1983

*Life soon began to appear on the new,
sterile land... but how?*



Colonisation on Krakatoa, 1883- 1983



August 1883 Eruption
 June 1886 6 Spp Cyanobacteria
 1897 Tall grass savanna
 1919 Scattered Trees
 1931 Macaranga-Ficus Woodland
 1980 Second Growth Rainforest

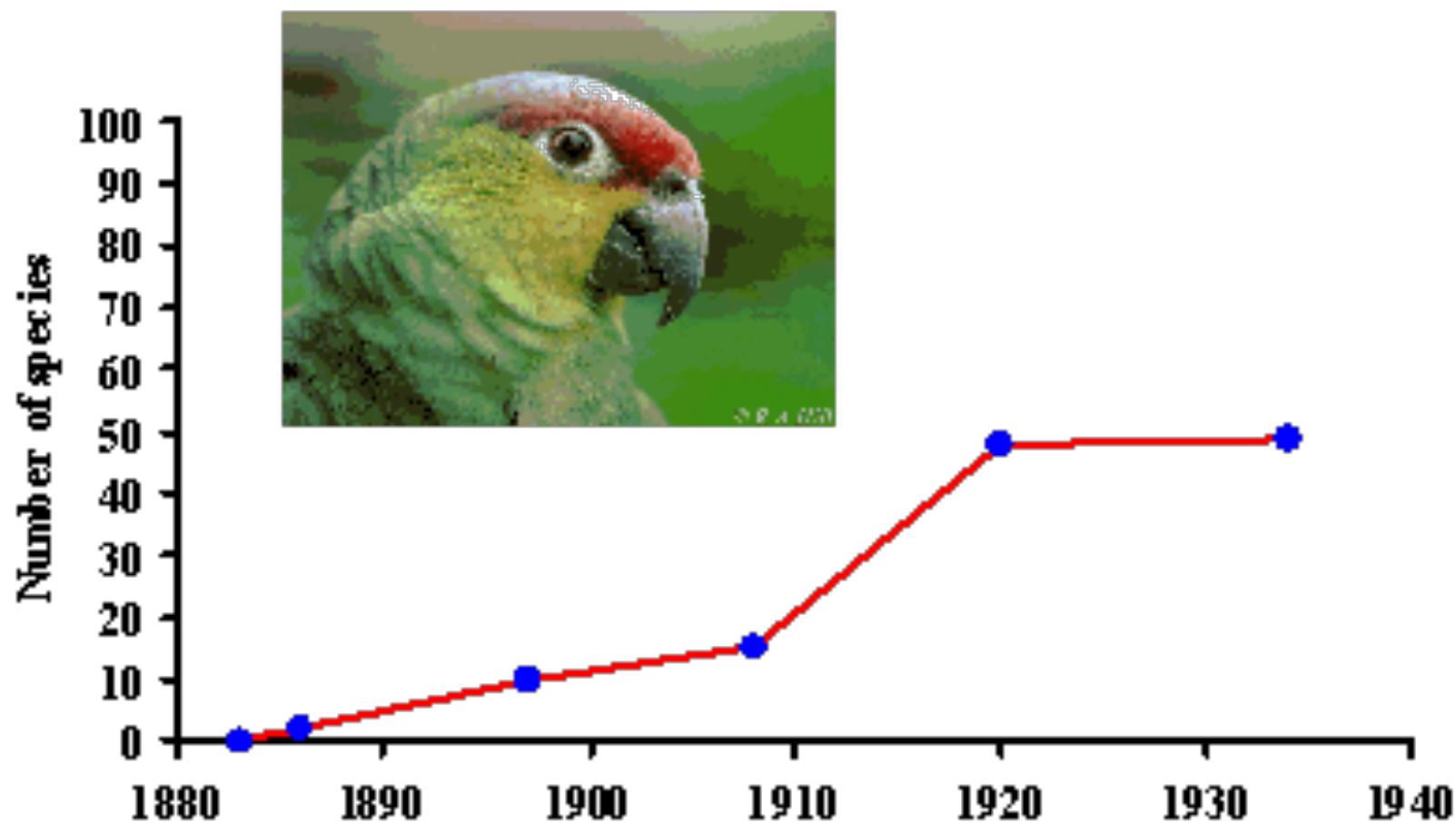
Plant colonization of the Krakatau islands between 1883 and 1989. (After M.B. Bush and R.J. Whittaker, 1991.)

Question:

Would you expect 'r' or 'K' - strategists to be more common amongst the early pioneer colonizers?

Why?

Recolonisation by land birds



*Eruptions (disturbances) have continued,
and localized small-scale
re-colonisation continues to happen*



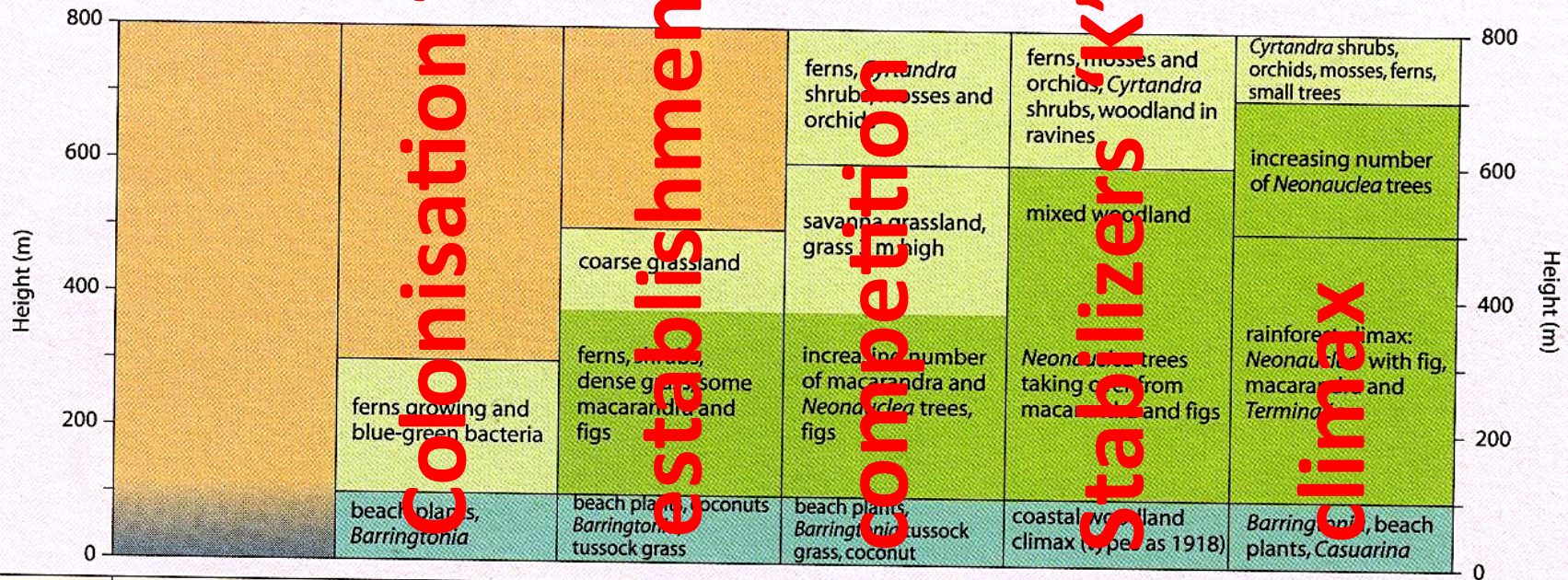
- Krakatau is an example of a lithosere - the colonization of bare rocky ground leads to a woodland
- (as opposed to a hydrosere –where vegetation fills a lake/pond and develops into a forest ...)

Krakatau, Indonesia

Climate

Temperatures are high and constant. Most months average 28°C, giving a very low annual range. Rain is heavy, falling in convectional storms most afternoons throughout the year.

Note: The rainforest climax vegetation here does not contain as many species as the rainforests on surrounding islands.



Year	1883	1886	1908	1918	1933	1983	Year
Number of plant species	0	26	115	132	271	?	Number of plant species

Number of animal species

200

618
(in 1921)

795

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Guidelines to plan your response

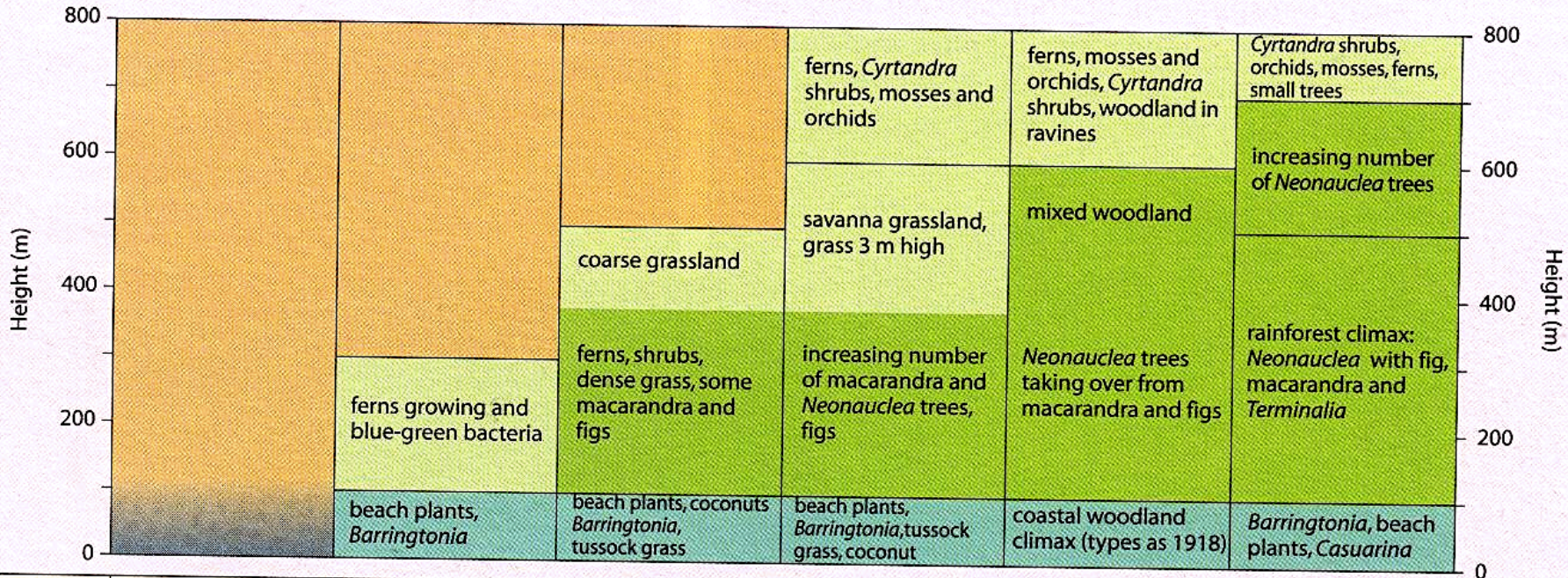
- A brief intro (few sentences)
 - name, location, date of eruption (disturbance) – why Krakatoa is a good case study
 - Embed definitions: succession, primary/secondary, lithosere, etc.
- Discuss changes in the structure over time (at each stage)
 - Height of plants, ground layer, impact of light and other factors, interactions, etc.
 - Use as many species names (not just ‘plants’ to make it case study specific)
 - which species have gone, which have appeared, biomass, productivity, what happened to specie diversity, etc.
 - Be specific to Krakatoa –the reader should be unable to apply your answer to other succession event!

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2.6.6 Explain the changes in energy flow, gross and net productivity, diversity and mineral cycling in different stages of succession.

Changes through the stages of succession...

1. Energy flow becomes (complex/simplified)
2. Gross Productivity (fall then rise/rise then fall)
3. Net Productivity (rise then fall/ fall then rise)
4. Diversity (increases then drops/drops then increases)
5. Mineral cycling (decreases/increases)

TASK: Turn to the person next to you - discuss and choose the correct answer for each pair of statements. *LIST REASONS* for each choice.

2.6.7 Describe factors affecting the nature of climax communities

2.6.7 Factors Affecting Climax Communities

- Natural abiotic factors such as insolation, climate (temp+prec.) and edaphic (soil)
 - have the greatest influence on the vegetation distribution
 - they can ‘arrest’ succession at a seral stage preventing it from reaching a climax community
 - e.g. water logging/floods
- Human or anthropocentric
 - land management practices by humans can also ‘arrest’ succession
 - e.g. urban developments
 - e.g. Woodlands will not develop on a heavy sheep-grazed hillside... *(Rutherford, J., Course Companion p.272)*

How do ecosystems change over time?
What are the causes of these changes?

Krakatoa is the means by which we are
learning about how and why
ecosystems respond to disturbances
and change over time