

# BRYOPHYTE LIFE CYCLE

## UNDERSTANDING THE ALTERNATION OF GENERATIONS

The way that almost all land plants reproduce is by means of two distinct, alternating life forms, a sexual phase that produces and releases gametes or sex cells and allows fertilisation, and a dispersal phase – both of which are adaptations to an essentially waterless environment. The sexual phase is known as the GAMETOPHYTE or haploid (n) generation and the dispersal phase is the SPOROPHYTE or diploid (2n) generation.

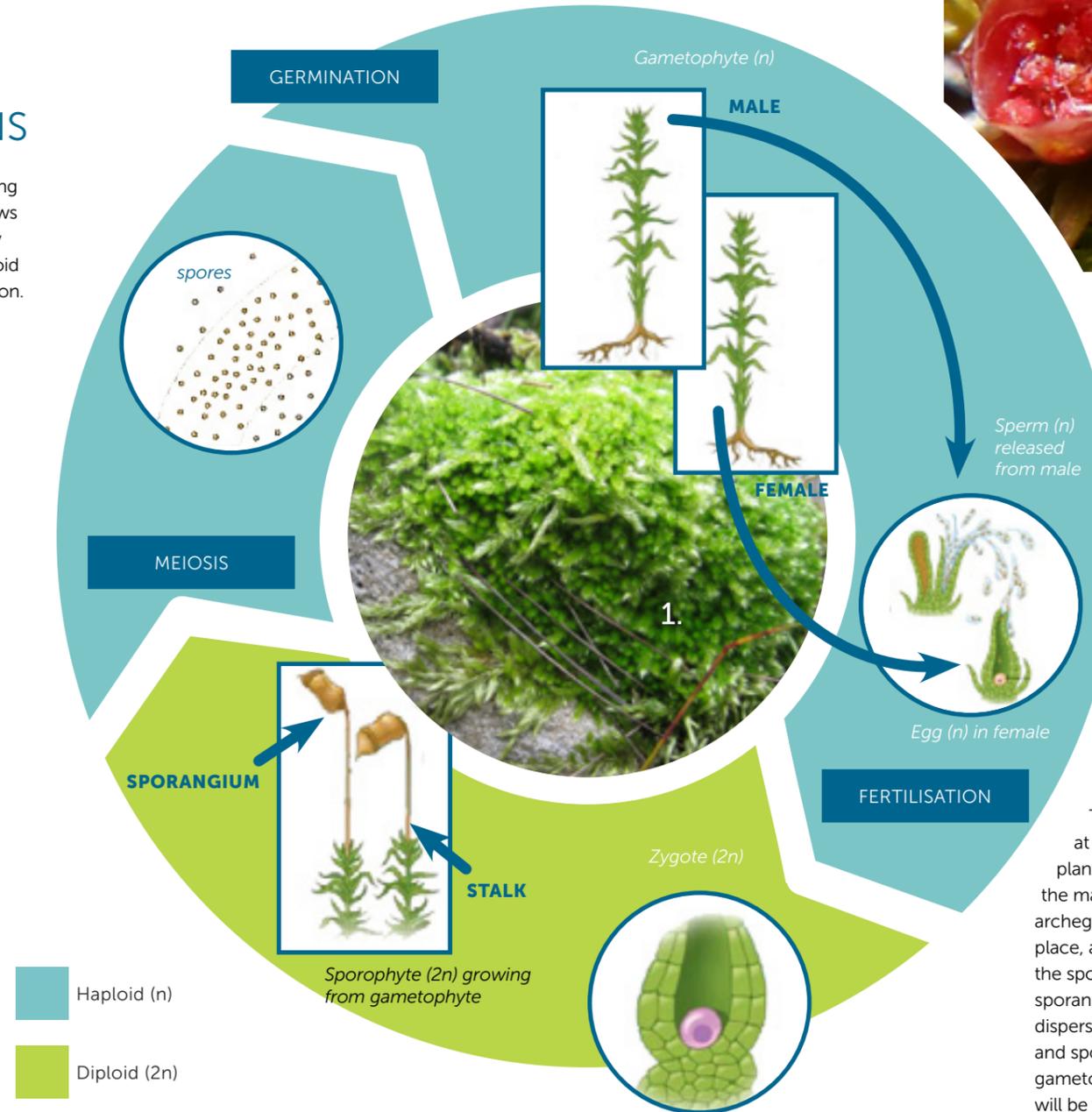
Mature gametophyte plants produce haploid sex cells (egg and sperm) in sex organs (the male antheridia and female archegonia). These sex cells (also called gametes) fuse during fertilisation to form a diploid (2n) zygote which grows, by means of mitosis (that results in two daughter cells each having the same number and kind of chromosomes as the parent cell), into a new sporophyte plant. The diploid sporophyte produces haploid (n) spores (i.e. each spore has a single set of chromosomes) by means of the process of cell division called meiosis. Meiosis results in four daughter cells each with half the number of chromosomes of the parent cell. The spores are dispersed and eventually germinate and grow into haploid gametophyte plants – and so the cycle continues.



2.



3.



## COPING OUT OF WATER

Bryophytes, which include moss, are primitive plants that give us some idea of how the first plants that ventured onto land coped with their new waterless environment. They share many features with other plants, but differ in some ways – such as the lack of an effective vascular system (specialised tissue for transporting water and nutrients – xylem and phloem) which distinguishes them from ferns, conifers and flowering plants. They usually form low-growing, dense cushions on rocks, the bark of trees, and other surfaces including buildings. The plants absorb and lose water depending on their surroundings and they need a film of water in which to reproduce as the sperm need to swim from the male reproductive organs to the eggs in the female organs.

## BRYOPHYTE REPRODUCTION

The diagram shows the life cycle of a typical moss. What you see growing on rocks at Kirstenbosch or on damp walls on your house, is the gametophyte form of the moss plant. Sexual cells or gametes are formed by male and female gametophyte plants – and the male gamete or sperm needs water in which to swim towards the female eggs in the archegonia of the female plants (see photo above). Once this occurs, and fusion takes place, a diploid zygote forms with two sets of chromosomes. The zygote develops into the sporophyte which is a stalk growing out from the gametophyte plant that supports a sporangium or capsule in which spores are produced (see photo to the left). The spores are dispersed and grow into the new gametophyte generation. So, although the gametophyte and sporophyte are two different plants, in mosses the sporophyte is always attached to the gametophyte. This is different to the life cycle of ferns, conifers and flowering plants which will be covered in subsequent factsheets.

**READ MORE**  
This factsheet follows on from the *Veld & Flora* Factsheets on Classification in the September 2012 and March 2015 issues of *Veld & Flora* 98(3). Available online: <http://labpages.blogspot>.

**Alternation of generations:**  
[www.youtube.com/watch?v=ypFzdHINLTW](http://www.youtube.com/watch?v=ypFzdHINLTW)  
**Life cycle of liverworts and moss:**  
[www.youtube.com/watch?v=vZuB2TAMKgE](http://www.youtube.com/watch?v=vZuB2TAMKgE) and [www.youtube.com/watch?v=o1z0Vfo62Lg](http://www.youtube.com/watch?v=o1z0Vfo62Lg).

[www.ispotnature.org](http://www.ispotnature.org) and search for "bryophytes" or "mosses".  
Cocks, Martin 1996. Surviving at the edge of life: The tiny plants that eke out an existence on the frozen continent. *Veld & Flora* 82(2), p. 46–48.

**LINKS TO THE CURRICULUM**  
**GRADE 11 Life Sciences, Strand 1:** Diversity, Change and Continuity. Topic: Biodiversity of Plants. Content: Grouping of bryophytes, pteridophytes, gymnosperms and angiosperms.  
**GRADE 12 Life Sciences Strand 1:** Life at molecular, cellular and tissue level. Topic: Meiosis: the process of reduction division purposes of reduction division (gametogenesis and exceptions: mosses, ferns), Importance of meiosis: diploid to haploid: production of gametes.

**PHOTOGRAPHS/IMAGES**  
Images for the life cycle diagram from Online Textbook, Prentice Hall, [www.mtchs.org/BIO/text/chapter19/concept19.2.html](http://www.mtchs.org/BIO/text/chapter19/concept19.2.html).  
1. The gametophyte form of the moss plant, seen growing on the rocks at Kirstenbosch (shown here) or on damp walls on your house. Photo: C. Voget  
2. In bryophytes the sporophyte plant is a stalk growing from the gametophyte plant. The stalk supports a sporangium that produces spores which give rise to new gametophyte plants. Photo: Sally

Adam, iSpot.  
3. In the tufted moss *Polytrichum* the male sex organs (antheridia) occur within a whorl of leaves and discharge sperm into the water-filled, reddish splash caps. From there raindrops splash the sperm cells onto nearby female plants. Photo: Chris Vynbos, iSpot.

*An African perspective* by Jo van As, Johann du Preez, Leslie Brown and Nico Smit, published by Struik Nature and from Josh Hall of Educations, [www.youtube.com/watch?v=o1z0Vfo62Lg](http://www.youtube.com/watch?v=o1z0Vfo62Lg).

Download these and other resources from the *Veld & Flora* LAB Pages: <http://labpages.blogspot.co.za>.

TEXT adapted by Caroline Voget from the book *The Story of Life and the Environment*: