

Seagrass science inspires Malgana artist

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Gathaagudu (two waters), also known as Shark Bay, is the traditional country of the Malgana people. It is also home to expansive seagrass (wirriya jalyanu) meadows. Two large temperate species make up over 4000 km² of seagrass meadows in this World Heritage site.

From far above the crystal-clear blue-green water has dark 'black' stripes created by wire weed (*Amphibolis antarctica*). Under the water the colour palette comes alive

with the vibrant emerald greens of ribbon weed (*Posidonia australis*) and rich deep purples of sun-drenched wire weed.

Let us take you on a high-resolution journey to the surface of seagrass leaves and the individual cells giving life and colour within them.

The bright green chloroplasts are the engine room powering photosynthesis, while the dark pink to purple anthocyanin pigments provide sun protection to wire weed

plants living in extremely high light environments.

Exploring the anatomical structures of seagrasses (and comparative works with eucalypt species) provides inspiration for environmental science student and emerging Malgana artist, Tiahna Oxenham.

In keeping with cultural heritage protocols, art works are created from plant material collected on Malgana country, keeping her connection to country alive.



Aerial photograph of the 'tiger stripes' created by wire weed (*Amphibolis antarctica*) in Shark Bay. Photo: George Steinmetz, 2018



Tiahna Oxenham looks at a high-resolution leaf section image with Dr Wolfgang Lewandrowski. Photo: Elizabeth Sinclair

Fresh seagrass collections were made in Shark Bay waters, with permission from the Malgana Aboriginal Corporation to remove plants from country. The collections included ribbon weed (*Posidonia australis*) and wire weed (*Amphibolis antarctica*).

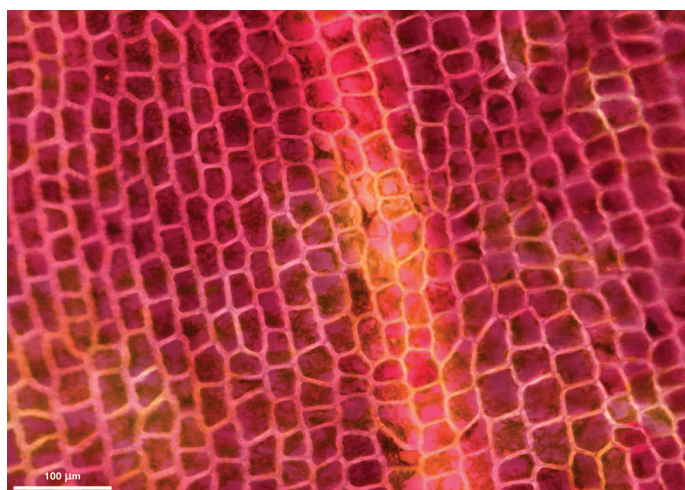
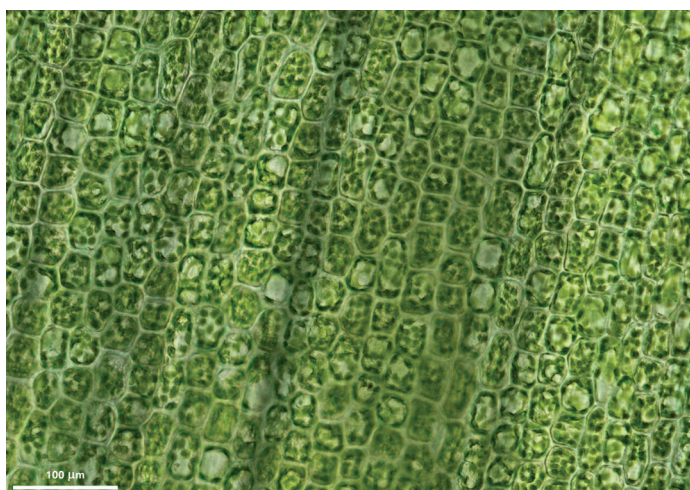
A glimpse onto the surface of seagrass leaves shows the beautiful, repeated shapes of tightly packed

epidermal cells – the cells that protect the leaf from the outside world. Vibrant green chloroplasts are visible in the ribbon weed cells.

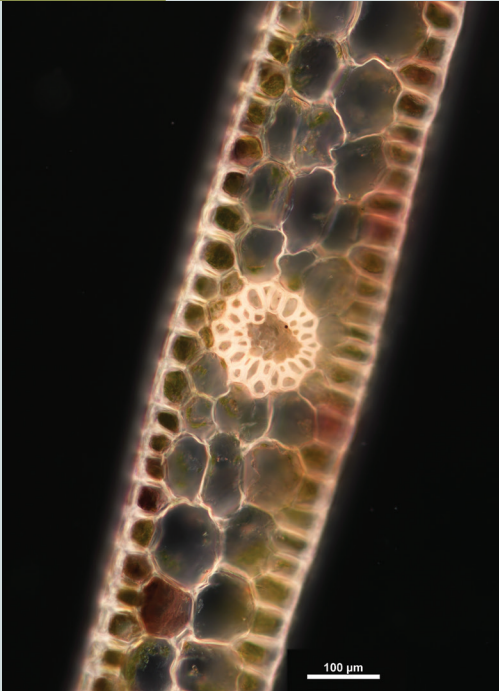
Transverse sections were prepared from living seagrass leaves by carefully sectioning leaves to the thickness of a single cell, almost invisible to the naked eye, using a sharp feather blade. The thin and delicate sections were mounted on glass slides.

All sections were inspected under a high-resolution compound microscope to capture images of the internal cells. No staining was necessary to highlight the different cell types, as the cells distinctly and naturally fluoresce.

Seagrasses do not have stomata – the pores in the leaves that regulate gas transfer and water loss through epidermal cells in terrestrial plants.



Leaf surface images of ribbon weed (left) and wire weed (right) under the microscope.



Transverse section of a wire weed leaf under the microscope. This image provided the template for the first artwork.



Wirriya Jalyanu Festival poster featured Tiahna's ribbon weed (*Posidonia*) fruit inspired artwork, an acrylic pen on acrylic on canvas (30 x 22.5 cm).



The completed artwork. Seagrass cell outlines were drawn in pencil and meticulously filled in with a dot method using acrylic paints on cotton canvas (76cm x 50cm). Photo: Tiahna Oxenham

Instead, gas diffuses directly from the sea water through the outer wall of epidermal cells, where most of the chloroplasts are found. Thin-walled mesophyll cells encircle large, dark air-lacunae. They are full of air for gas exchange and give leaves buoyancy, which assists in the synchronous waving or 'monami' of seagrass leaves in response to water movement.

The epidermal cells of wire weed are often brightly coloured pink to purple, with stripes of orange cells giving away the location of vascular bundles. The tightly arranged bundle sheath cells fluoresce golden and encase the vascular tissues – the transport system for critical substances and nutrients that sustain plant life.

The first of four artworks to be completed in this 'seagrass under the microscope' series was included in a portfolio featuring seagrass-inspired artworks by multiple artists at the Wirriya Jalyanu (seagrass) Festival in Denham, Shark Bay on 8 April 2021.

The festival is a celebration of Malgana language, art and science of Shark Bay's seagrass ecosystems. An earlier work inspired by ribbon weed fruit (*Posidonia australis*) was featured on promotional material for the festival.

Acknowledgement

We thank Sabrina Dowling Giudici from *Aartworks Development Program* www.aartworks.org in the Gascoyne region, a service encouraging positive relationships on country and respecting cultural creativities.

Tiahna's nature-inspired artwork can be found at <https://www.juridadesigns.com>.

The Wirriya Jalyanu Festival was supported through the Australian Government's National Environmental Science Program. ■