

Students of seaweeds learn that there are essentially three major groups—the green, brown and red, usually separated clearly by their colour.

But rarely encountered is a fourth group, the ‘yellow-green algae’ more formally known as the Class Xanthophyceae. This small but diverse group includes more than 100 genera and about 600 species, but most are freshwater or terrestrial, with very few marine species. Several morphological types can occur, including simple filamentous forms and single cells that can sometimes aggregate into colonies. From an evolutionary perspective, they are most closely related to the brown algae, but they lack the brown pigment fucoxanthin and therefore appear green or yellow-green due to the presence of chlorophyll a. How then do you then tell them apart from the green seaweeds? It can be difficult, but the green algae produce starch as their carbohydrate reserve, whereas the yellow-green algae do not. Using an appropriate stain can highlight the presence of starch, and this can be used to distinguish the green from the yellow-green algae.

One of the more distinctive yellow-green algae is the genus *Vaucheria*, which forms velvety mats in a variety of habitats, including wet soils, freshwater streams, and brackish waters. A few species also occur in fully marine environments, but these are relatively rare and historically there have been no records of marine *Vaucheria* in Western Australia. A few years ago, during my regular visits to Cape Peron, I noticed an unusual, vivid green mat growing on the sand in gaps between the rocky reef. I collected a small portion and under the microscope it was recognisable as a species of *Vaucheria*, representing the first marine record of the genus for Western Australia. Establishing a species identity was not so straightforward, as doing so relies on observing the sexual reproductive structures and these were absent from the plants. However, *Vaucheria* can be compliant. Placing it in what is known as ‘crude culture’, essentially in a container with plain seawater and leaving it for a



Vaucheria, a yellow-green seaweed

week or so, seemingly stresses the plant and it responds by producing male and female gametes. Based on the reproductive structures, the Cape Peron plants appeared to be closely related to what is regarded as a widespread species, *Vaucheria longicaulis*, but there were subtle differences that warranted further attention. Could this be a new species?

At this stage an article appeared that reported *Vaucheria longicaulis* from the shores of the Wadden Sea, in the cold North Sea just south of the Danish-German border. The Wadden Sea population was described as invasive by the authors, introduced by ships or with the shellfish industry. DNA sequence analyses of our Cape Peron specimens, undertaken by Heroen Verbruggen at the University of Melbourne, indicated that it was the same species as the Wadden Sea *Vaucheria*. Could this mean that the Cape Peron population is a potentially invasive introduction? The species has been observed during recent visits to Cape Peron and appears to be more common,

Above The newly discovered *Vaucheria* forming a turf mixed with other seaweeds.
Photo – Dr John Huisman

but whether this is a consequence of more attentive searching is not known. And as always, there are potential complications. While the analyses have demonstrated that the Cape Peron and Wadden Sea plants are the same species, are they in fact *Vaucheria longicaulis*, a species that was first described from Elkhorn Slough, on the coast of California? DNA sequences from authentic specimens from that locality are not available, but Kerstin Wasson, the Research Coordinator at Elkhorn Slough, kindly offered to collect specimens. The results of DNA analysis of these specimens will confirm whether the Cape Peron species is indeed *V. longicaulis*, or an undescribed species that is also found in the North Sea. Whatever the outcome, I will certainly be keeping a close watch on the species whenever I visit the Cape.