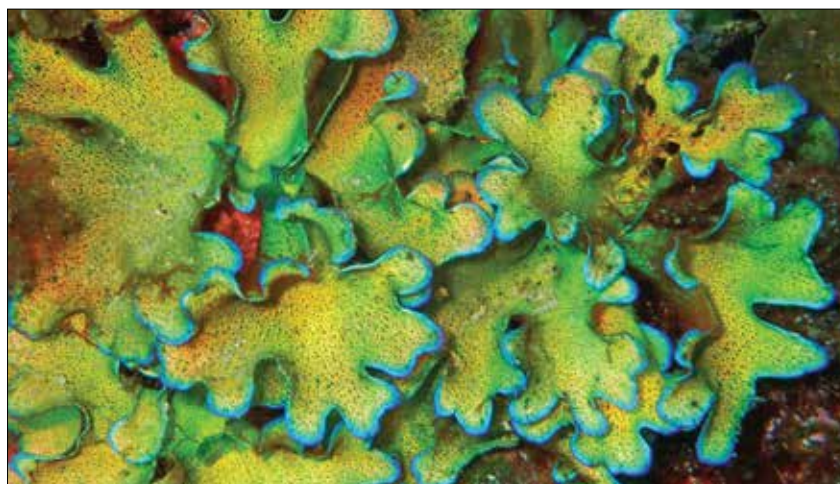


Taxonomy is an evolving science, often in parallel with technological advances that enable a more detailed appreciation of a species' ancestry and relationships, and therefore its 'proper' place in any taxonomic scheme. Historically, taxonomic schemes were based on what was observable, initially by eye, then magnified using microscopes, at each step the additional techniques allowing the assessment of more features, and ideally this accumulated knowledge leading to a taxonomic consensus. This process can be convoluted, and the seaweeds provide an excellent example. When Linnaeus first proposed his binomial scheme for naming species in 1735 (the 'Genus species' system), he grouped together organisms with shared physical traits. He included only four genera of algae: *Fucus* included all the large species, *Ulva* the smaller membranous species, *Conferva* the filamentous species, and *Chara*, the reasonably well-known freshwater genus. Of these only the first three are indeed seaweeds as we now know them, however none are presently defined according to the Linnaean concept.

Since Linnaeus, the basis for seaweed taxonomy has changed considerably. Colour, essentially a biochemical character, was elevated in importance and it remains the primary character on which seaweeds are segregated. Many more genera of seaweeds have been described and they now number in the thousands, with more being added on a regular basis. In recent years, the recognition of new genera and species has been greatly accelerated by the adoption of DNA sequencing techniques, which allow us to view the 'blueprints' by which organisms are constructed and compare them for slight or major changes. Species are now being defined by their DNA 'barcodes' in addition to the more traditional morphology, and indeed many genetically recognisable organisms are often morphologically indistinguishable.

Which brings us to the subject of this article. The spectacular, iridescent red alga genus *Asteromenia* was described in 1996, based on a study of specimens collected from the Houtman Abrolhos Islands in Western



## Asteromenia

Australia that were thought to be the same as a Venezuelan species known as *Halichrysis peltata*. The recognition of a pantropical species was not unusual, so the name *Asteromenia peltata* was proposed. That this was not the case was first demonstrated in 2006, in a study incorporating DNA sequences by Canadian phycologist Gary Saunders and colleagues. It was shown that, although belonging to the same genus, *A. peltata* from Venezuela was a different species from the Abrolhos taxon, which was given the new name *Asteromenia exanimans*. One problem solved, but inadvertently another was introduced.

As there was no fresh material of the Abrolhos entity, the DNA sequence for *A. exanimans* was derived from a specimen from the mainland coast at Green Head in WA, which in all aspects conformed to the species as known from the Abrolhos. However, the 'type' specimen, the one to which the name *A. exanimans* is permanently attached, was an older collection from Suomi Island in the Abrolhos. At the time it was thought that only one species of *Asteromenia* occurred on the WA coast. However in 2018 two species from the north-west were added to the genus. These later discoveries sowed the seeds of doubt. Was the Green Head specimen (the source of the DNA) the same species as the Suomi

**Above** A new species of *Asteromenia* as yet unnamed.

Photo – Ann Gunness

Island type specimen? This could only be solved by sequencing fresh material from the Abrolhos, but with no trips to the islands planned, this was not feasible.

Enter citizen science. Avid diver Ann Gunness from Geraldton regularly visits the Abrolhos and has developed an interest in photographing seaweeds, which she often forwards to the WA Herbarium to have their identities confirmed. One of Ann's images was of *Asteromenia*, and she kindly agreed to collect specimens for DNA analysis. These were passed to Gary Saunders, their DNA sequenced, and the results confirmed our suspicions, that the Abrolhos *A. exanimans* is not the same and the Green Head entity is a new species that requires a new name. The naming is yet to happen formally, but it will acknowledge both Ann's contribution and that of Julia Phillips, the former CSIRO phycologist who collected the Green Head specimens. With eight of these species found in Australian seas, this region appears to be the centre of diversity for this stunning genus, which cannot help but invite attention from professional and citizen scientists alike.