

Rare seaweed rediscovered

by John Huisman

Biologists from the Department of Environment and Conservation recently rediscovered one of the world's rarest seaweeds, ironically washed up at one of the State's most popular tourist destinations, Monkey Mia in Shark Bay. The event instigated an in-depth investigation involving taxonomists from around the world using modern forensic techniques. The results led to the recognition of the species as a new genus and finally completed a saga begun more than a century ago.



The beginning of this story about a rare red seaweed dates back 100 years, when the world and its biodiversity were markedly less well known than they are today. At the time, many countries embarked on scientific expeditions to far-flung territories, often those they governed from afar. One such voyage was the Dutch *Siboga* expedition to the Indonesian Archipelago, then known as the Dutch East Indies.

The trip spanned the years 1899 and 1900 and is rightly regarded as one of the great biological voyages of discovery. Led by the professor of Zoology at the University of Amsterdam Max Weber, the six scientific expeditioners also included his wife Anna Weber-van Bosse, who specialised in marine algae. The participation of women in such extended scientific voyages was virtually unheard of at the time, which makes Weber-van Bosse's achievements all the more remarkable.

Early seaweed discoveries

During the expedition, a large number of seaweeds was collected and these eventually formed the basis of eight monographs, recording some 555 species, of which many were new to science. In combination, these publications represent perhaps the greatest phycological (study of algae) contribution of the early 20th century. Anna Weber-van Bosse was



subsequently awarded a doctorate from the University of Utrecht, the first Dutch woman to be so honoured.

Based partly on her *Siboga* collections, Weber-van Bosse described three new species of very unusual red seaweeds, which she named *Thamnoclonium treubii*, *T. tissotii* and *T. procumbens*, placing them in a genus previously known only from the colder waters of southern Australia. These species were unique in that they lived in a symbiotic relationship with a sponge, the seaweed itself not visible, hidden beneath the sponge coating. Coincidentally, some specimens of *T. tissotii* were collected from Dunk Island in Queensland in 1910 and sent to the Kew Herbarium in England, where, due to the plentiful and large size of the specimens, Kew botanist AD Cotton felt that the species "would appear to be frequent". This has not been borne out by subsequent collections, however, as *T. tissotii* has never again been seen in Queensland.



Naming dilemmas

For the next 90 or so years, Weber-van Bosse's species remained known only from these few collections. Questions were raised as to whether the species were correctly placed in the genus *Thamnoclonium*, but without

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Main Raising the trawl-net on the original research vessel *Siboga*.

Inset Dried seaweed specimen collected from Monkey Mia.

Photo - John Huisman

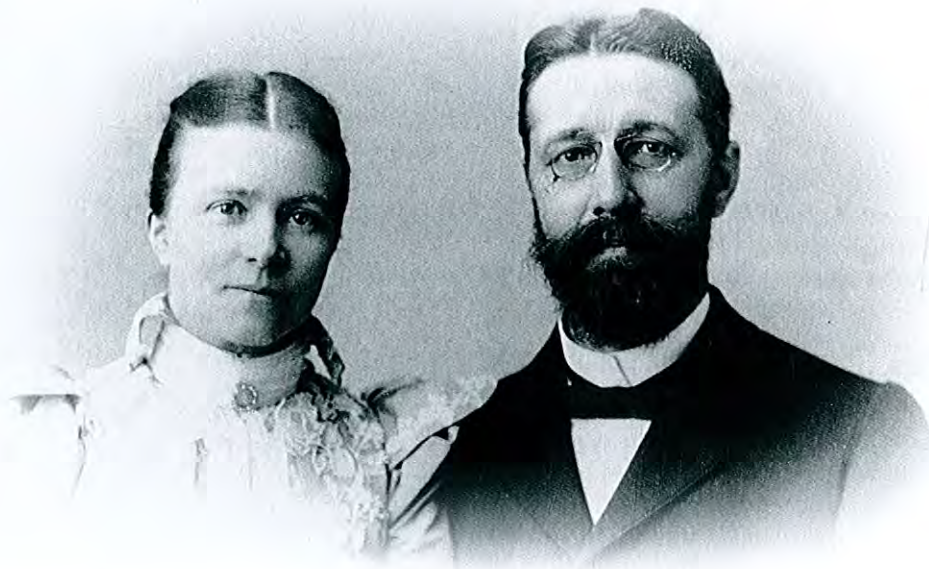
Top Max Weber and Anna Weber-van Bosse with local people on Boleoe Barang Island near Makassar, Indonesia.

Above The original specimen of *Thamnodonium tissotii* in the Leiden Herbarium (Netherlands).

Photo - Willem Prud'homme van Reine

Left Anna Weber-van Bosse and Max Weber, circa 1890.

Historical photos courtesy of Artis Library, Special Collections University of Amsterdam



new fertile material the issue could not be resolved. It is surprising to most people that seaweeds reproduce sexually, and in the red seaweeds the process is perhaps the most complex of all plants. It involves the nuclei of the fertilised egg cells being duplicated and transferred to numerous other cells in the female plant, from which the next generation develops. The taxonomy of red seaweeds is based primarily on the intricate details of this process, so it is often impossible to classify specimens that are reproductively immature.

Then, in the late 1980s, a population of *T. tissotii* was observed at Herald Bight in Shark Bay, many thousands of kilometres to the south of the original locations. The plants grew in drifting, entangled clusters and specimens were also commonly found washed up at nearby Monkey Mia. Unfortunately, none of the collections were reproductively mature and without these stages no new information could be added. After having not been seen for nearly a century, the rediscovery of this species was certainly welcome, but better specimens were needed.

Taxonomic investigation

Turn the clock forward to 2009 and, despite several expeditions in the interim, the all-important reproductive stages remained elusive. However, by this stage, a new tool had entered the taxonomist's kit: DNA sequencing. By comparing the unique pattern of nucleotide bases in fragments of DNA, taxonomists, much like forensic biologists matching the DNA of



Above One of the specimens collected from Monkey Mia.

Below right A transverse microscopic view of the seaweed's surface, showing the seaweed coated with sponge tissue.

Below left The fertile branches of the seaweed, which penetrate through the sponge tissue.

Photos - John Huisman

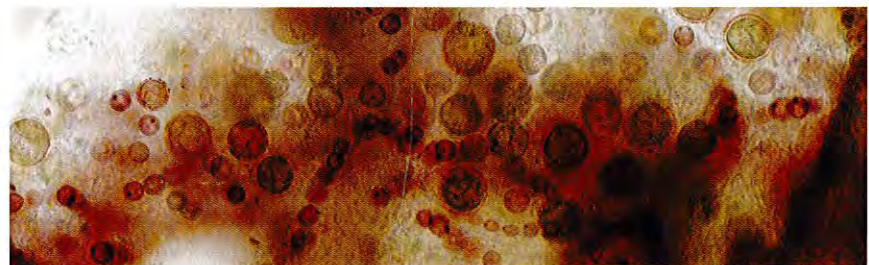
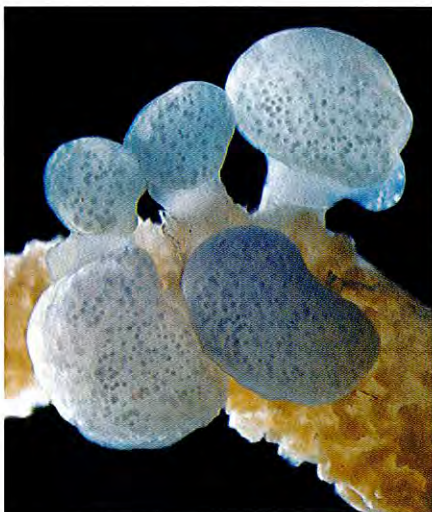
criminals, can establish how closely related each species is and, from that knowledge, propose how these species fit within a larger evolutionary history. Using this technique, the nagging questions about the taxonomic placement of these species of seaweed could potentially be answered. However, this procedure can only be undertaken with relatively fresh specimens. So, once again, the hunt was on.

A fertile search

Fortunately, patience is often rewarded. In 2009, a Department of Environment and Conservation expedition to Shark Bay, primarily

undertaken to study mangroves (see 'Marvellous Mangroves', *LANDSCOPE*, Summer 2009-10) provided an opportunity to search once again for the elusive seaweed. The first days proved fruitless, but, in perhaps the most unusual twist in this tale, a drift specimen was found on the Monkey Mia boat ramp, wedged under the wheel of the trailer as the boat was being pulled from the water! A walk along the beach yielded a further 10 specimens, including the much-needed fertile plants.

Some of the fertile plants were sent to Belgian botanist Olivier De Clerk, an expert in this group of seaweeds. There, their DNA was sequenced, ultimately proving that the species were only remotely related to true *Thamnoclonium* and that a new genus was needed to accommodate them. This genus is yet to be named, but, after more than a century, the book can finally be closed on Weber-van Bosse's enigmatic species.



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