

The Origin of Copulation

Scientists believe they have discovered the origin of copulation. They have determined that, about 385 million years ago, a primitive bony fish stopped reproducing by spawning and mated by having sex instead. (Spawning occurs when eggs and sperm are released into the water by female and male creatures and the eggs are fertilised by the sperm.) Strangely though, as fish evolved, they reverted back to spawning. It took another few million years for copulation to make a come-back, reappearing in ancestors of sharks and rays.

Details of the study that discovered the origin of fish copulation were published in the journal "Nature"

(<http://dx.doi.org/10.1038/nature13825>).

For reasons unknown, the species of fish that the international team of researchers says was the first-known animal to stop reproducing by spawning and mate by having sex instead is called *Microbrachius dicki*. The web page found at <http://www.mirror.co.uk/news/weird-news/square-dancing-fish-called-dicki-4465794> doesn't throw much light on the reasons for the name.

That same web page claims that the research findings are thought to be the earliest known example of sexual organs and the ancient armoured fish *Microbrachius dicki* was the first known animal to engage in sexual intercourse.

It goes on to say that "A study of fossils showed that to transfer sperm, males had grooved L-shaped claspers which were held in place by small paired bones on the female".

Microbrachius dicki was a placoderm that occurred in Scottish lakes millions of years before fins evolved into legs. According to Wikipedia, "Placoderms were a class of armoured prehistoric fish, which lived from the mid Silurian to the end of the Devonian period. Their head and thorax were covered by armoured plates; the rest of the body was scaled or naked, depending on the species."

Microbrachius dicki was about 8cm (3") long and lived about 385 million years ago in ancient lakes in what is now Scotland.

Professor John Long from Flinders University was the lead author of the research report. "We have defined the very point in evolution where the origin of internal fertilisation in all animals began. That is a really big step," he said.

Back in 2009, Prof. Long was a palaeontologist at Museum Victoria

(<http://news.bbc.co.uk/2/hi/science/nature/7909984.stm>)

Prof. Long said that the discovery was made as he was looking through a box of ancient fish fossils. He noticed that one of the *Microbrachius dicki* specimens had an odd L-shaped appendage. Further investigation revealed that this was the male fish's genitals.

The male had large bony claspers. These were the grooves that they used to transfer sperm into the female. The female had a small bony structure at their rear that locked the male organ into place. Their anatomy meant that they probably had to mate side by side. The fish were able to stay in position with the help of their small arm-like fins. The little arms linked the male and female together. The male would get his large L-shaped sexual organ into position to dock with the female's genital plates. These plates were very rough and they acted like Velcro, locking the male organ into position for the transfer of sperm.

The initial act of reproducing internally did not continue for very long. It seems that as fish evolved, they reverted back to spawning.



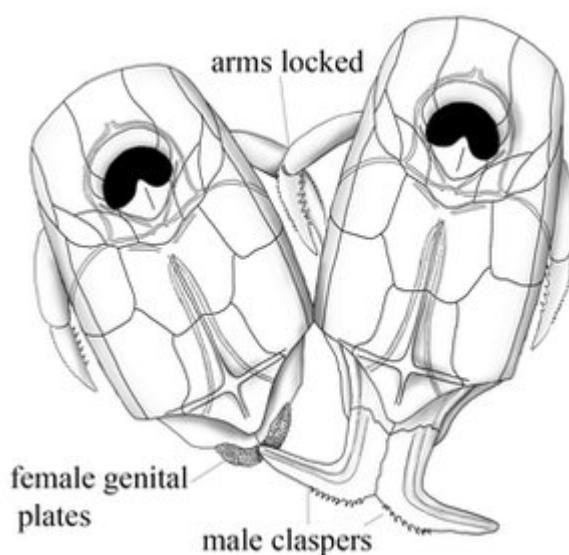
An artist's impression of *Microbrachius dicki* copulating side-by-side (Source:

<http://www.bbc.com/news/science-environment-29661446>



A *Microbrachius dicki* fossil

(Source: <http://www.bbc.com/news/science-environment-29661446>)



Another impression of *Microbrachius dicki* copulating side-by-side

(Source: <http://www.bbc.com/news/science-environment-29661446>)

Related web pages

Fish fossil clue to origin of sex <http://news.bbc.co.uk/2/hi/science/nature/7909984.stm>

Ancient fossil penis discovered <http://news.bbc.co.uk/2/hi/science/nature/3291025.stm>

MLSSA Library Update

New additions to our Society's library have now been added to the list on our website (<http://mlssa.org.au/library/>). Here is a separate list of the recent additions : -

BOOKS

"Australia's Spectacular Cowries - review and field study of two endemic genera: Zoila and Umbilia" by Barry Wilson & Peter Clarkson – mlssa No.1069

"Shores and Shallows of Coffin Bay" – mlssa No.1071

"Port River Expressway Bridges – A marine users' guide" – mlssa No.1070

"First Aid & Emergency Care" by John Lippmann & David Natoli – mlssa No.1072

"Occupational First Aid" by St John – mlssa No.1073

"One Place Many Stories: Antarctica" – mlssa No.1074

"Ecology of Australian Temperate Reef – The unique south" edited by Scoresby Shepherd & Graham Edgar – mlssa No.1075

"Stung!" by Lisa-Anne Gershwin – mlssa No.1076

"The Frail Ocean" by Wesley Marx – mlssa No.1077

"Curiosities of South Australia 3" by Russell Smith – mlssa No.1078

"Mangrove Ecosystems in Australia – Structure, function and Management" edited by BF Clough – mlssa No.1079

"Toxic Fish & Sewer Surfing" by Sharon Beder – mlssa No.1080

"Requiem for the Reef – The crown of thorns starfish" by Peter James – mlssa No.1081

"Marine & Estuarine Reserves in Australia – Towards a national policy" by Dr KD Suter – mlssa No.1082

"Wetlands Wildlife – The nature of wetlands in

southern Australia” Gould League – mlssa No.1083

“The Sea Around Us” by Rachel Carson – mlssa No.1084

FILES

“Adelaide’s Living Beaches – A strategy for 2005-2025” – mlssa No.2288

“DEH Corporate Plan 2006/7” – mlssa No.2289

“DEH Corporate Plan 2007/10” – mlssa No.2290

“DEH Environment Highlights 2006” – mlssa No.2291

“Sustainable Consumption (National Youth Affairs)” – mlssa No.2292

“Educating for a Sustainable Future” – mlssa No.2293

“Tackling Climate Change – SA’s Greenhouse Strtaegy” – mlssa No.2294

“Climate Change & Greenhouse Emissions Reduction Bill 2006” – mlssa No.2295

“The Future for Lake Albert” – mlssa No.2297

“Volunteer Partnership in Action” – mlssa No.2298

“A Key to Marine Animals” – mlssa No.2299

“Distribution & Ontogenetic Shifts in Habitat & Abundance of the Temperate Western Blue Groper” – mlssa No.2300

“The Proposed BHPB Desalination Plant at Point Lowly” – mlssa No.2301

“Draft Water Allocation Plan for the Western Mount Lofty Ranges” papers & CD – mlssa No.2302

“Sea Creatures & Sea Shores” (sample only) – mlssa No.2303

“Austasia Aquaculture” magazine 2011 – mlssa No.2304

“Flinders Journal” 2011 – mlssa No.2305

“Boat Owners Guide – Caring for our coastal waters” – mlssa No.2306

“SA Recreational Boating Safety Handbook” – mlssa No.2307

“Water Quality of Adelaide’s Metropolitan Coastal Waters – A Community Summary” – mlssa No.2308

“The SA State Natural Resources Management Plan – What it means for conservation” – mlssa No.2309

“Water in a Changing Climate – A vision for SA in 2050” – mlssa No.2310

“Echo” magazine” (WDCS) incl. “WDCS

magazine” – mlssa No.2311

“Adelaide Coastal Waters information sheet No.1 – Importance of seagrass” – mlssa No.2313

“Moreton Bay Marine Park Draft Zoning Plan” – mlssa No.2314

O’Sullivan Beach Reef – mlssa No.2315

Ewens Ponds – mlssa No.2316

Port Stanvac Desalination Plant – mlssa No.2317

“Draft Northern & Yorke NRM Plan” – mlssa No.2318

Birds, incl. “Wetland Birds of South Australia” booklet (mlssa No.1066) – mlssa No.2319

KI Dolphin Watch – mlssa No.2320

SA FISHERIES PAPERS & MAGAZINES

“Management Options for Murray Cod in SA” – mlssa No.4073

“2007/08 SA Recreational Fishing Survey” – mlssa No.4074

“Management Strategy Evaluation fo SA Snapper” – mlssa No.4075

“Recreational Fishing in Australia – 2011 & beyond: A national industry development strategy” – mlssa No.4076

VIDEOS, CDs, DVDs & Floppy Disks

“Singapore Marine Offshore Oil & Gas” CD – mlssa No.8049

“Fishing Safety” DVD – mlssa No.8050

“Ghosts of the Abyss” DVD – mlssa No.8051

MPAs

“Summary of Submissions Report (March 2008) Encounter Marine Park Draft Zoning Plan” – mlssa No.9015

“Marine Planning Framework for South Australia Overview” – mlssa No.9016

“SA’s Marine Parks Network for Public Comment” – mlssa No.9017

“Draft Marine Parks Bill 2006 Submission Form – mlssa No.9018

Marine Parks miscellaneous – mlssa No.9019

SDFS Documents

“Summary of Formal SARFAC Policies” – sdf18

(“The Sea Around Us” by Rachel Carson was donated to us by a “Karen” (karentreasures).)

Conservation Council of SA's recent Annual General Meeting

The Conservation Council of SA held its AGM on 30th October 2014. Sarah Sutter, CEO of NaturePlay SA, gave a at the start of the evening. There was no need to hold an election at the AGM, as only single nominations had been received for each of the five office bearer positions and the five ordinary members of the Executive Committee. The committee is therefore made up as follows: President - Nadia McLaren, Vice Presidents - Eric Nicholson and Philippa Rowland, Treasurer - Sean Habgood, Secretary - Gabrielle Appleby, Ordinary Members - Jake Bugden, Faith Coleman, Mary-Anne Healy, Holly Niner & Graham Davies. The chairs for the Environmental Standing Committees are Matthew Curnow for Energy, Nicholas Newland for Biodiversity and Wil van Deur for Waste.

‘Melaleucas in my Normanville WIRRA’ (by David Muirhead)

I have recently taken some mobile phone images of several ‘local native’ species of *Melaleuca* growing at our Normanville shack.

The shack's bush garden represents nearly five decades of one family's effort and one individual's ceaseless persuasion.

Anybody who is able to correctly guess the individual's name can collect their prizes (see Author of article for a good clue). Each prize is: A SELF-SET seedling (at least one per person, more if attendance is low) of a local native shrub from this Normanville WIRRA, in small tubes, when they attend a MLSSA-related function, field day or general meeting (for which the venue, date and time is yet to be announced but there should be adequate notice).

I believe that the shack's bush garden most

closely reflects my long-term attempt to demonstrate the core values, and principles of establishment and maintenance, of a home garden WIRRA, as described in a booklet that I like to call ‘my WIRRA bible for beginners’.

That booklet, in only 68 pages, sells the many benefits of starting your very own WIRRA so passionately, and incorporates such a wealth of knowledge, derived almost entirely from the author's local experience in his own home garden in Adelaide, that it stands tall as the single biggest driver for my own interest in WIRRAS.

This is the case, even though its publication post-dated, almost uncannily, my earlier gardening mind-set, which had already evolved conceptually to effectively match that booklet's ultimate definition of the ideal garden.

The thing is, the booklet VALIDATED everything I'd yearned to see in print but had not really thought I ever would!

Until then, I'd been learning much from, and emulating, various like-minded native plant enthusiasts, in particular through my enduring Trees For Life membership, but also via many other individuals e.g. endemic plant nursery owner/managers.

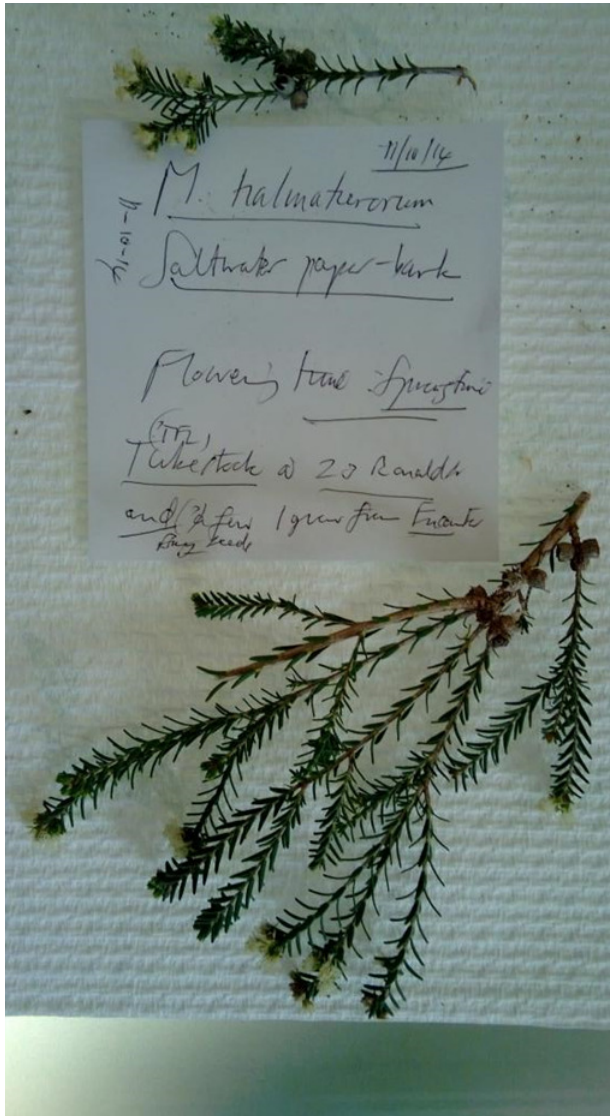
The inspirational booklet's mere title (‘WIRRA - The Bush That Was Adelaide’ by Wal Bushman, published by NATURE CONSERVATION SOCIETY OF S.A. INC., Adelaide, 1986: National Library of Australia ISBN 0 949751 10 3) was for me alluring, suggesting one could, even should, strive towards a unique, special type of backyard garden that might be worlds apart from all other gardens, most of which are increasingly very conventional and boringly repetitive, right around the world.

This booklet's truly unique theme stood, then and sadly even now, almost alone among the plethora of books on gardening in Australia.

It helped me to hone my enduring passion for planting only locally occurring native plants (with very few exceptions e.g. we have a lemon tree at Normanville but, at the time of planting that, Australia's remarkably adaptable Desert Lime, an arid regions endemic citrus shrub, *Eremocitrus glauca*, was either unavailable even

via specialist nurseries, or I'd not heard of its becoming available) in every garden our family have owned since I was a young lad.

Back to *Melaleucas*, let's do it image by image.



This is *Melaleuca halmaturorum*, the saltwater paper-bark a.k.a. swamp paperbark.

This specimen is from a flowering tree in springtime (11-10-2014, as per the barely legible scrawl in the photo!).

It is from one of 5 surviving Trees For Life tube stock of this species that I planted in a very small seasonally damp area well out from the back of the shack where puddles would linger longest after a decent rain.

I planted those about 3 decades ago, at which

time TFL was too small a community volunteer group to offer region-specific local provenance seeds to volunteer growers such as myself.

Likewise, the seedlings 'grown to order' by TFL volunteer growers for participating rural members in the major primary production geographic regions of SA, (most were farmers planting windbreaks and wildlife corridors, revegetating remnant scrub, or restoring historically over-cleared hence eroded or increasingly saline sites) initially came from a mix of seed from several different regions for each species on offer, to ensure at least some genetic diversity, but the rural recipients would often not know if their boxes of seedlings included provenances specific to their region.

So exact provenance for my few *Melaleuca halmaturorum* at our shack is uncertain.

My guess would be: seed collected by TFL members at Encounter Bay, where this paperbark tree forms attractive, dense thickets in the Inman and Hindmarsh River estuaries, or perhaps seed collected in the Patawalonga's remnant wetlands on the western side of Tapleys Hill Rd opposite Adelaide Airport.

Least possibly, the one or two smallest specimens (thus POTENTIALLY younger, but their smaller size probably simply reflects competition for moisture in that confined space) of these 5 'long-term survivors' may be from seed I personally collected and germinated from Encounter Bay (I know I grew a few seedlings from that source, but am not able to recall if any survived planting out, and I suspect they died from lack of regular watering in their first year or so).

Basically, there are only four dry country, medium to large shrubs and small to medium trees in the *Melaleuca* family in SA that are in contention for Brian Brock's coastal species. I have photos of three of these four *Melaleuca* species, all planted by me many years ago on our shack block: -



***Melaleuca lanceolata* at shack with new growth mid-Spring, but nil flowers**
(Flowers in mid-late summer at shack)



***Melaleuca brevifolia* flowers**
(Mid-Spring at shack)

Specimens of each of the 3 species are thriving, with canopies approaching each species' predicted full height. Though we have three of these species at our shack, we lack the fourth, *Melaleuca acuminata*. This does occur on the Fleurieu Peninsula and, in many aspects, closely resembles *Melaleuca lanceolata*.

At maturity, *Melaleuca acuminata* looks very like a half-size, shrubbier or less tree-like *Melaleuca lanceolata*, but it is easily distinguished by its flowering in spring vs. *Melaleuca lanceolata* which flowers from



***Melaleuca decussata* (TFL tubestock) flowering at shack mid-Spring**

February to April, with rare exceptions.

For more detailed descriptions of, keys for identification and delineation of the four indigenous SA Melaleucas discussed above, please refer to appropriate reference books (I use Black's revised edition of 'Flora of South Australia', volumes 1-4), or use the internet (The 'Virtual Herbarium' ALA-linked site, for example).

In closing, I must emphasise I've limited my article to what I consider are the four Melaleuca species of relevance with regard to MLSSA member Brian Brock's questions, comments and endorsements both past and recent, some of which have been relayed to me by our President, Steve Reynolds.

It is important to note that there are about 18 other described Melaleuca species occurring naturally within SA's borders, and several have very attractive mauve or pink/purplish flowers (the commonest of those being *M. decussata*, 'Totem Poles', which has a fairly wide distribution in our State, including Southern Lofty where it is perhaps best seen in dense thickets in Deep Creek Conservation Park, and

on Kangaroo Island).

Perversely, but to add a bit of colour, I've included an image of a flowering tubestock TFL specimen of *M.decussata* also growing at our shack.

However, I've been a bit naughty (untrue to my 'WIRRA' passion!) even planting this one example there, as it prefers damper localities and, though it can be found in a few such sites only a km or two from our shack, I very much doubt it would ever have occurred naturally within our exact shack's boundaries!

David Muirhead (keen MLSSA diver and photographer, temporarily sidelined due minor age-related musculoskeletal complaints, hence the article's focus on my terrestrial botanical passion for local natives).



Mature *M.lanceolata*, Normanville Heights roadside remnant vegetation tree in mature phase (NOT a planted tree). This image demonstrates the marked variation of tree height and form (shape) that occurs within this species, when viewed alongside the image of the wind-flattened, stunted but thriving primary dune swale crest *M.lanceolata* specimen with its several trunks almost parallel to the ground. The two trees grow only about 1.5 KM apart at Normanville. Both withstand strong SW gales,

but the low, flattened second-line coastal specimen on the dune crest must also adapt to the heavy salt and sand grain content of such gales.

More Melaleuca pics: the lanceolatas I planted at shack (some of them) were grown from seed I collected from these same pictured dune thicket shrubs (within 200-300m of shack), some of which are ALSO undoubtedly 100+ years old (despite being less than 3m high, on average, due to their exposed, SW gale blasted location).



Sweet Quandong + *M.lanceolata* on primary dune crest (north of jetty) Normanville



***Melaleuca lanceolata* thicket (15-6-13) with quandongs ('native peach') primary dune crest+seaward swale slope, Normanville North Dunes**

WOOLLY MAT RUSH: Brief notes on a fascinating coastally common endemic Australian iron grass

by David Muirhead

I came across this woolly mat rush at the heritage scrub, inland from our shack, where I recently noted it is fairly common in the small non-cleared bits of that Drooping sheoak/Native pine/Mt Lofty Grass tree (*Xanthorrhoea quadrangulata*) well drained sandy scrub: -



I was somewhat surprised, however, not long after that, to find that it is common in the very restricted secondary dunes area of Minda Home at Brighton.

While it is considered common and widespread in most mainland states, it is either absent from silica coastal dunes such as Normanville, or probably existed on the now fully cleared and 99% exotic grass and weeds covered hind dunes flat land, but not in the actual dunes themselves, as being a robust, tough and perennial plant there should still be a few plants in said dunes, especially in the swales, and I have never seen it there, even in my youth.

It would be hard to forget the distinctive, woolly seed heads of this plant, which are quite different from all the commonly associated dune and subcoastal species, and easily observed from some distance, even in weed infested sites. It is a moderately ornamental and medium height iron grass which seems to have escaped attention from horticultural types in marketing terms so far, which is both a pity and an opportunity that awaits the entrepreneur.

It must be ideal for frontline coastal revegetation and cottage gardens in most parts of South Australia, and you can almost bet that some

native butterflies rely on it.

Here below, is another image of the above common mat rush species, Woolly Mat-rush (*L.leucophyta* subsp. *leucophyta*) in Australia, but it appears to be in decline and quite uncommon in most areas near Adelaide, and possibly further afield e.g. Aldinga Scrub and Deep Creek: -



Minda's Woolly Mat-rushes (not usually in SA's dunes, I thought)

NB: The soursobs may be a significant competing factor in this impressive and quaintly woolly-flowered *Lomandra* species' decline along our coasts, where we need to foster every local dune-adapted plant for biodiversity preservation, stabilising dunes sand, and so we can learn which are the main causes of decline of such a tough, long-lived irongrass, which favours infertile dry well drained sandy neutral to alkaline soils but is, like most *Lomandras*, slow to reproduce and spread into new areas. Of interest also, even the Minda Dunes only have this species on the secondary dune system, I've searched the primary Minda dunes recently at some length and found none.

I hope to germinate seed over coming years, from several provenances including Minda and Normanville (permission is needed for seed collection, esp. at Minda, so I'll try my Trees For Life hat there).