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THE CHALLENGE OF SALT: SALTMARSH OF THE RUBICON ESTUARY
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BRUSHY RIVULET RESERVE ~ SARAH LLOYD

Beaded Glasswort *Sarcocornia quinquefolia*

The challenge of salt: saltmarsh of the Rubicon Estuary

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Introduction

“Too much salt is bad for your health.” We have all heard that said many times.

The same holds true for plants, and there are very few plants that tolerate and grow successfully in a highly saline environment. These plants of saltmarshes—known as halophytes—which occur naturally in the tidal waters of our estuaries such as the Rubicon, and other sheltered coastal waters.

Coastal Saltmarsh is a very specialised vegetation community. It occurs in that usually quite narrow intertidal zone between the mean high tide level and inland to the extent of storm tide flooding. The lower saltmarsh nearest the shoreline is covered regularly by high tides, whereas the higher saltmarsh is flooded less frequently by the spring and flood tides. The mid zone may experience a monthly high tide in sync with the lunar cycles.

Sea water contains just over 3% salt, which plants growing in the lower saltmarsh need to deal with. The less frequently inundated higher parts of the saltmarsh may have soil salt levels up to 27% due to the residual salt left after evaporation. This can be a metabolic challenge for plants, and the species that occur naturally in saltmarsh have evolved various strategies to deal with this, along with that other challenge for plants - waterlogging. The degree of salinity and extent of waterlogging in the various zones and climate niches influence the occurrence of plants and other life.

Saltmarsh vegetation communities

There are two saltmarsh communities that occur naturally in the Rubicon Estuary.

One is the grassy looking reed beds domi-

nated by Sea-rush *Juncus kraussii* (fig. 1). This community is most common in the upper area of the estuary towards The Tongue, and along those higher tidal reaches of the Rubicon River and Franklin Rivulet where there are more freshwater flows. While the Sea-rush is the dominant plant, other species grow in specific niches. These include another grass-like plant, the Chaffy Saw-sedge *Gabnia filum*, and other salt tolerant herbs in the spaces between the “grassy” clumps such as the Shiny Fan-flower or Swampmat *Selliera radicans* and Samphire *Sarcocornia quinqueflora*.

The second type of saltmarsh is termed a saline succulent herbland (Fig. 2). It is usually dominated by the fleshy succulent ground-covering plant known as Samphire or Glasswort *Sarcocornia quinquefolia* with another succulent species Shrubby Glasswort, *Tecticornia arbuscula* also found—and sometimes dominant—in this community (Fig. 3). This succulent community is more prevalent in the lower area of the estuary north from Squeaking Point. There is about 115 ha of saltmarsh mapped in the lower estuary with the largest portion (95 ha) located in North-east Arm, most of which is protected within Narawntapu National Park. There are smaller patches around Port Sorell and Panatana Rivulet, and around the nearby Shell Islands which are also included within the national park.

There is a third saltmarsh community but it is composed of the weedy introduced Ricegrass *Spartina anglica*. This has taken over large areas of tidal flats, and poses a significant threat to the natural saltmarshes and to the estuary’s entire ecology. A federally-funded management and control program undertaken by Cradle Coast NRM in consultation with the Parks and Wildlife Service and the Latrobe Council



Fig 1. Grass-like Saltmarsh dominated by the Sea-rush *Juncus kraussii*. North-east Arm.



Fig 2. Saline Succulent Herbland dominated by Samphire or Glasswort *Sarcocornia quinqueflora*, with clumps of Speargrass *Austrostipa stipoides*, North-East Arm

has been underway for a number of years.

Conservation status

In 2013 Saltmarsh in Australia was listed as a threatened vegetation community under the Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC) (1999).

More than 50% of Tasmanian saltmarsh has

been lost since white settlement by drainage, clearing and landfilling; invasive species such as the Ricegrass; and more recently with climate change effects. Much of what remains is unprotected and fragmented, although the Rubicon is fortunate in having the important saltmarsh area of North-east Arm included within the Narawntapu National Park.

A statewide mapping project of remaining



Fig. 3. Saline Succulent Shrubland dominated by Shrubby Glasswort *Tecticornia arbuscula*. Note the Eastern Grey (Forester) Kangaroo for scale. North-east Arm.

saltmarsh was undertaken by Vishnu Prahalad in 2016, and our current knowledge of its extent is based on his important work.

The limited natural occurrence of saltmarshes around the high tide zone makes them particularly vulnerable to damage and disturbance. Just the act of driving a vehicle through a saltmarsh will cause long lasting damage, and drainage and landfill developments more so.

Plants of Saltmarsh

Vishnu Prahalad discusses 40 different herbs, a few shrubs and an additional 25 grass-like plants in his booklet, *A Guide to the Plants of Tasmanian Saltmarsh Wetland*, (see references).

The Beaded Glasswort or Samphire *S. quinqueflora* (see front cover) once belonged to the Saltbush family Chenopodiaceae until it was considered to be more related to plants in the Amaranthaceae family. It is a ground-covering

herb that occurs as the dominant plant of the succulent saltmarsh, where it forms extensive patchwork carpets of greens and reds, interspersed with occasional clumps of spear grass and the odd Shrubby Glasswort. (Fig. 2). Instead of obvious leaves, it has green stems in a series of swollen succulent cylindrical segments, which function as leaves. The swollen stems store excess salt which is disposed of when the stems wither and die off over winter at the end of each growing season. This method of addressing salt in a halophyte is called “a salt accumulating plant”. The flowers are much reduced, and its lack of showy petals indicates it is wind pollinated.

The Shrubby Glasswort, now called *Tecticornia arbuscula* (Fig. 4), is also a member of the Amaranthaceae family and while it has similar looking “foliage” to the previous species, it is a woody shrub, which can grow to 2 metres high and wide. It occurs either as scattered bushes or a dense interwoven shrubland



Fig. 4 Shrubby Glasswort foliage detail.



Fig. 5 Yellow Sea-lavender *Limonium australe*

such as in North-east Arm (Fig. 3). Like the previous species, Shrubby Glasswort has fleshy swollen segmented stems instead of obvious leaves, which act as salt storage vessels as well as for photosynthesis and growth.

It has been demonstrated that the largest of these plants can be of considerable age. A report by Con Rhee in *The Natural News* (July 2005) detailed his measurements of a large dead plant near Port Sorell. He cut and prepared woody basal stem cross sections and determined that each millimetre within the 40 mm stem radius contained four growth rings. That means that it took the plant four seasons to increase the girth (radius) of its main stem by one millimetre. The plant had lived for 160 years, a considerable lifespan for any shrub. He applied the same methodology to the largest living plant he could find. It had a basal stem radius of 100 mm, which suggests the plant is likely to be more than 400 years old. A most venerable age for a shrub, worthy of our respect and admiration, particularly as it is growing in such a challenging environment.

Yellow Sea-lavender *Limonium australe* (Fig 5) is a close relative of the familiar garden Statice which is commonly grown in cottage gardens. Its status is 'rare' (Threatened Species

Protection Act 1995) in Tasmania and there are limited and localised occurrences in the Rubicon Estuary. It occurs near Squeaking Point growing almost on the soggy tide line. It forms a rosette of long undulating dark green to yellowish leaves and is anchored with a stout tap root. In summer numerous branching flower spikes appear with masses of papery flowers having yellow petals and whitish sepals giving it a bi-coloured appearance. It deals with the excess salt by pumping it out through its roots.

Round-leaf Pigface *Disphyma crassifolium* (Fig. 6) is a native species despite its similarity with the exotic cultivated species and varieties of *Mesembryanthemum*. Typical of the pigfaces, it has succulent round leaves, and brilliantly coloured open formed flowers, and is another "salt accumulating plant". It is more likely to be seen in the slightly elevated areas or on the occasional rocky outcrop. Like Samphire it is a low growing matting plant, rooting at the leaf nodes, and it blends into the ground-covering mosaic of the saltmarsh community when it is not in flower.

Shiny Swamp Mat or Shiny Fan-flower, *Selliera redicans* (Fig. 7) grows in swampy herblands as well as in the saltmarsh. It forms



Fig. 6 Round-leaf Pigface *Disphyma crassifolium*



Fig. 7 Shiny Swamp Mat or Shiny Fan-flower *Selliera radicans* Narawntapu National Park

a tight prostrate mat of shiny bright green fleshy leaves and in season the distinctive fan-shaped cream flowers. It is an important nectar plant for insects such as the Chequered Blue Butterfly *Theclinesstes serpentata* and the larger Australian Admiral *Vanessa kershawi*, which are active in and around saltmarshes, particularly during summer.

Prickfoot or Prick-knee *Eryngium vesiculosum* (Fig. 8) is most visible in quite large patches in the more brackish herblands around the lagoon within Narawntapu NP. It also grows in suitable nooks and crannies around the true saltmarsh. It has blueish-green spiky leaves with showy blue flowers in a range of hues over summer. It is a photogenic plant, hence the alternative common name of “Prick-knee”. The seed heads are also rather spiky.

Chaffy Sawsedge *Gahnia filum* (Fig. 9) is a close relative of Cutting-grass (*Gahnia grandis*), but it is a salt tolerant shoreline plant which is more likely to be seen in the upper tidal reaches of the Rubicon Estuary. As can be seen in the photo, it often grows adjacent to that other salt tolerant vegetation community, Swamp Paperbark *Melaleuca ericifolia* which is also widespread within the estuary and is usually located on the brackish inland side of

the saltmarsh communities. This Sawsedge is a known host plant for the caterpillar of the Chrysotricha Skipper *Hesperilla chrysotricha*.

The ecological values of saltmarshes

The fringe of saltmarsh which follows the shoreline of the Rubicon Estuary supports a diversity of wildlife and is an important part of the natural filtration system that maintains the health and vitality of the estuarine environment. Numerous species of fish use estuarine nurseries for breeding and crabs are very effective at helping to aerate waterlogged soils with their extensive burrows and their recycling of the saltmarsh detritus. In turn the crabs help support many wading and shore-birds, including resident species such as the Pied Oystercatcher *Haematopus longirostris* and White-faced Heron *Egretta novaehollandiae*, and international migrants such as tiny Red-necked Stint *Calidris ruficollis* and larger Bar-tailed Godwit *Limosa limosa*.

The saltmarsh shoreline within North-east Arm is an important high tide roost for many of these birds, and resident species such as the Pied Oystercatcher and the Red-capped Plover *Charadrius ruficapillus* nest in and around



Fig. 9 Chaffy Sawsedge *Gahnia filum* Finger Point, Rubicon Estuary

these saltmarshes.

Succulent saltmarsh samphires and other plants produce fruit making it an important summer feeding ground for Blue-winged Parrot *Neophema chrysotoma*, now listed as a threatened species (EPBC 1999) due to loss of habitat, particularly nesting hollows.

Narawntapu National Park also provides important habitat and is a local stronghold for the White-fronted Chat *Epthianura albifrons*, which is often observed foraging in small groups or flocks across the succulent saltmarsh. It also most likely nests within the Shrubby Glasswort vegetation.

The environmental conditions, particularly the limitations posed by saline soils, which restricts the saltmarsh to the narrow estuarine high tide line zone, also gives plants that can grow in this salty environment the competitive edge over plants in the adjacent vegetation. Such soils are naturally toxic to most plants.

The saltmarshes around the Rubicon Estuary contribute to the ecological health of the estuary and help to protect the shoreline from



Fig. 8 Prickfoot or Prick-knee *Eryngium vesiculosum* Narawntapu National Park

erosion during floods and spring tides. The saltmarshes provide critical habitat for many species of fauna including a number of threatened and declining species.

We all should respect, protect and care for the saltmarsh, the future health of the Rubicon Estuary Key Biodiversity Area (KBA) depends on it.

The Challenge of Salt - References and further reading

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Brushy Rivulet Reserve

Sarah Lloyd

For me the ill-considered government proposal to build a prison on Brushy Rivulet Reserve was more than a ‘nimby’ issue. I started visiting the reserve in 2006 and equipped with camera and new telephoto lens, regularly called in because of the number and variety of bird species there. In 2007, I had the rare thrill of seeing a Tasmanian Masked Owl in the daytime, Satin flycatchers and Dusky Woodswallows building nests, and a Grey Goshawk. It was rare *not* to see a Wedge-Tailed Eagle, probably because—as we later discovered—it has a nest on the Rivulet. This nest turned out to be important because there is a 500 metre radius exclusion zone surrounding the nest of this listed threatened species. This seriously curtailed the government’s plans for the site.

I didn’t know much about the ecology of the reserve during those photographic expeditions. It wasn’t until I started reading about the reasons for its purchase, and documenting the flora, fauna and funga while objecting to the proposal, that I learned more about the area.

Brief background

In 1997 70 ha of grassy woodland/eucalypt forest came to the attention of Private Forest Tasmania because the owner wanted to ‘con-

vert the forest to plantation’. Senior botanist with the Forest Practices Authority (FPA), Fred Duncan, negotiated with the landowner to prevent this because of the presence of a threatened vegetation community (inland black peppermint *Eucalyptus amygdalina* forest) and two threatened plant species, blue pincushion *Brunonia australis* and handsome hooksedge *Uncinia elegans*. The site was recommended as a Comprehensive, Representative and Adequate (CAR) reserve under the Regional Forest Agreement, and the CAR Scientific Advisory Committee (CARSAG) considered it of ‘high enough import regionally to consider purchasing ... [and] very important because inland *E. amygdalina* forest has become highly fragmented and this property is at the edge of its geographic range’ – i.e. the western edge of the Midlands vegetation.

What is so special about the Midlands?

Since European settlement, the temperate grasslands and grassy woodlands of the Tasmanian Midlands have been cleared extensively for sheep farming and, more recently, for cropping, poppies, orchards and vegetables. It is now considered to encompass some of the most threatened ecosystems in the world.



Brushy Rivulet Reserve is important for rare and threatened species, and also for common species, e.g. Grey Fantail (left) and Spotted Pardalote (right), whose status remains uncertain in these rapidly changing times.

Brushy Rivulet Reserve has proven to be much more important for conservation than was realized when it was purchased in 1999. I discussed this many times with people involved with its purchase during the prison saga. Fred Duncan (who, like others, was ‘astounded’ when he heard the government’s plan) well remembers the land, even though he probably assessed hundreds of properties while working for the FPA. And it was because he was assessing so many properties, that comprehensive surveys of each parcel of land were not undertaken at the time. Instead, he adopted the precautionary approach: there was enough of value to recommend its purchase: threatened plants and vegetation community, and, although not threatened, bettongs, and the extensive area of trident riverbush *Micrantheum hexandrum*, along Brushy Rivulet. This large bushy plant is more common on the east coast than the western edge of the Tasmanian Midlands, and along with other flowering plants adjoining the waterway provides a significant area of safe nesting, foraging and roosting sites for bird species that are declining elsewhere in Tasmania.

Fred’s insistence that the land be purchased was vindicated by the other rare and threatened species found there subsequent-

ly: a Masked Owl’s nest in the middle of the proposed prison ‘footprint’, Tasmanian Devils captured on remote cameras, a Green and Gold Frog, a Grey Goshawk nest on the rivulet, and another threatened plant species, dwarf fanwort *Aphelia pumilio*.

Dr Phil Bell was the first conservation officer with the Private Forest Reserve Program. After visiting the reserve in 2020, he emphasised the land’s significance and contribution to the CAR reserve system, especially in light of new information about its natural values, and the ongoing land clearing and degradation of forest remnants in the region. He commented that ‘biodiversity values are packed in pretty tightly in this forest remnant’.

Many species I recorded at the reserve nearly 20 years ago persist, albeit in smaller numbers. Happily, the endemic Dusky Robin, now considered ‘vulnerable’ has been seen there during every recent visit—reason enough for the area’s permanent protection.

Brushy Rivulet Reserve, despite its location adjoining the very busy Birralee Road, is a tranquil place full of natural treasures. We hope you will join us for the December outing to experience some of these for yourselves.



Slender ringtail damselfly *Austrolestes analis*



White's skink (*Liopholus whitii*) was on or near the same rock every time I visited the reserve.



An interesting variety of fungal species including boletes (left) and *Phylloporus* (right) occur at the Reserve.



Nacoleia rhoealis



Shouldered Brown *Heteronympha penelope*



Blue Pincushion *Brunonia australis*



Dwarf Boronia *Boronia nana*



Ovipositing braconid wasp



Cuckoo wasp *Chrysis* sp.

Threats to Brushy Rivulet Reserve

In a March 2021 report I wrote ‘Apart from some scattered and sparse areas of gorse *Ulex europeans*, Brushy Rivulet Reserve is relatively free of weeds.’ However, there have been several favourable growing seasons since 2021, and gorse now poses a serious threat to the biodiversity of the area.

Brushy Rivulet Reserve is no longer destined to be the site of a high security prison, but it is still not formally protected.

A parcel of land of this size that contains numerous large hollow-bearing trees—an important and diminishing resource—many rare and threatened species, and common but declining birds, warrants the highest form of protection.



Brushy Rivulet, especially where it flows through the reserve, is notable for being a watercourse with a relatively intact catchment and riparian vegetation. It has an Integrated Conservation Value rating of 'High' (Conservation of Freshwater Ecosystem Values database).



The Tasmanian Masked Owl is an apex predator, a species at the top of the food chain that preys on other animals but has no predators itself. Masked Owls are important for taking introduced pest species such as starlings, rabbits and rats.

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