TECHNICAL NOTE

Samphires in the Yarra Yarra Region

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Samphires are distinctive succulent plants, with jointed, apparently leafless stems that look like strings of beads. They range from creeping herbs, only 10 cm tall, to woody shrubs more than a metre tall. Most Australian samphire species (and all those found in the northern wheatbelt) are perennials, i.e. individual plants continue growing for several years. Samphires are among the most salt-tolerant land plants in the world. They are often found fringing saltlakes and saline drainage lines, or occupying valley-floor flats that have been abandoned as cropping land. Under conditions of extreme salinity, they can totally dominate the community where no other plants are able to survive.

In this account, the term 'samphire' is used in two ways. It refers to the individual species, as well as the vegetation type. The vegetation of a particular site can be described as a samphire, in the same way as a woodland or grassland; and it is also correct to say that the plant community is made up of particular samphire species.

The name 'samphire' comes from an earlier English word 'sampere', which is a corruption of the French 'herbe de St Pierre', an edible plant growing in tidal marshes along the Atlantic coast. Similar coastal plants are much sought after as a delicacy throughout the Mediterranean and on both sides of the Atlantic.

At first glance, a samphire flat might seem to support only a single samphire species. Closer examination, however, will show that this is rarely the true situation. There are 36 species of samphire in Australia and at least 19 in the northern wheatbelt. In addition, there are at least another dozen recognised subspecies, and numerous local variants that haven't yet been given a formal name. A further complication is that many taxa (species, subspecies, local variants and 'informals') form natural hybrids with some (but not all) characteristics of both parents. The result is that even a tiny saltlake or saline claypan might contain more than a dozen clearly different samphire varieties, some of which you might never come across again. To put it mildly, samphire taxonomy is difficult and problematic.

Although there are differences of opinion, most authors today consider the samphires to be a natural group within the large and globally widespread family Chenopodiaceae. Other common chenopods are saltbush, bluebush, bindii and tumbleweed. Until very recently, the Australian samphires have been assigned to several genera in the tribe Salicornieae (a division of the Chenopodiaceae family). However, a recent study has concluded that all the Western Australian species, previously included in the genera *Halosarcia, Sclerostegia* and others, now belong in the genus *Tecticornia*. A single species from the genus *Sarcocornia* (which has related species as far away as Africa and Spain) is known from Mongers Lake. Table 1 lists the current and former names of all the samphire species reported from the Yarra Yarra region. (This doesn't mean that others don't exist here – only that they haven't yet been both found and reliably reported.)

The classification of samphires is based largely on the flowers and seeds. These are very small – barely 1 – 2 mm across in most species. Some features can be made out with the naked eye or a hand lens in bright sunlight, but a microscope and dissecting tools are needed for detailed work. Unlike many flowering plants, the general appearance of the plant (size, colour, growth form) is little help; it may even be misleading, having more to do with the time of year, or the age, growth stage, exposure, access to water and nutrition of individual plants. Rather, look carefully at the stems.

Basically, there are two kinds of stem – ordinary vegetative stems and flowering/fruiting spikes (Figs 1 and 2). Vegetative stems perform the same function as the branches in a tree or the crowded stems in a woody shrub (like broombush) - that is, they present the photosynthesising parts (in most plants, leaves; in the case of samphires, the surfaces of the stems themselves) to the sunlight. They consist of stacked, bead-like structures called 'articles'. In reproductive stems (the flowering/fruiting spikes), the articles are generally smaller. They are arranged in tighter stacks, in ways that often help to identify the species. The main feature of reproductive stems is that they carry the flowers and, later, the seeds.

Table 1. Samphires known to be present in the Yarra Yarra region.

New Name	Former Name
Tecticornia bulbosa	*Halosarcia bulbosa*
T. doleiformis	*H. doleiformis*
T. fimbriata	*H. fimbriata*
T. halocnemoides	*H.halocnemoides*
T. indica	*H. indica*
T. lepidosperma	*H. lepidosperma*
T. leptoclada	*H. leptoclada*
T. lylei	*H. lylei*
T. peltata	*H. peltata*
T. pergranulata	*H. pergranulata*
T. pruinosa	*H. pruinosa*
T. pterygosperma	*H. pterygosperma*
	H. sp. Lake Moore (M.N. Lyons 2603)
T. syncarpa	*H. syncarpa*
T. undulata	*H. undulata*
T. disarticulata	*Sclerostegia disarticulata*
T. moniliformis	*S. moniliformis*
T. tenuis	*S. tenuis*
Sarcocornia quinqueflora	*Sarcocornia quinqueflora*

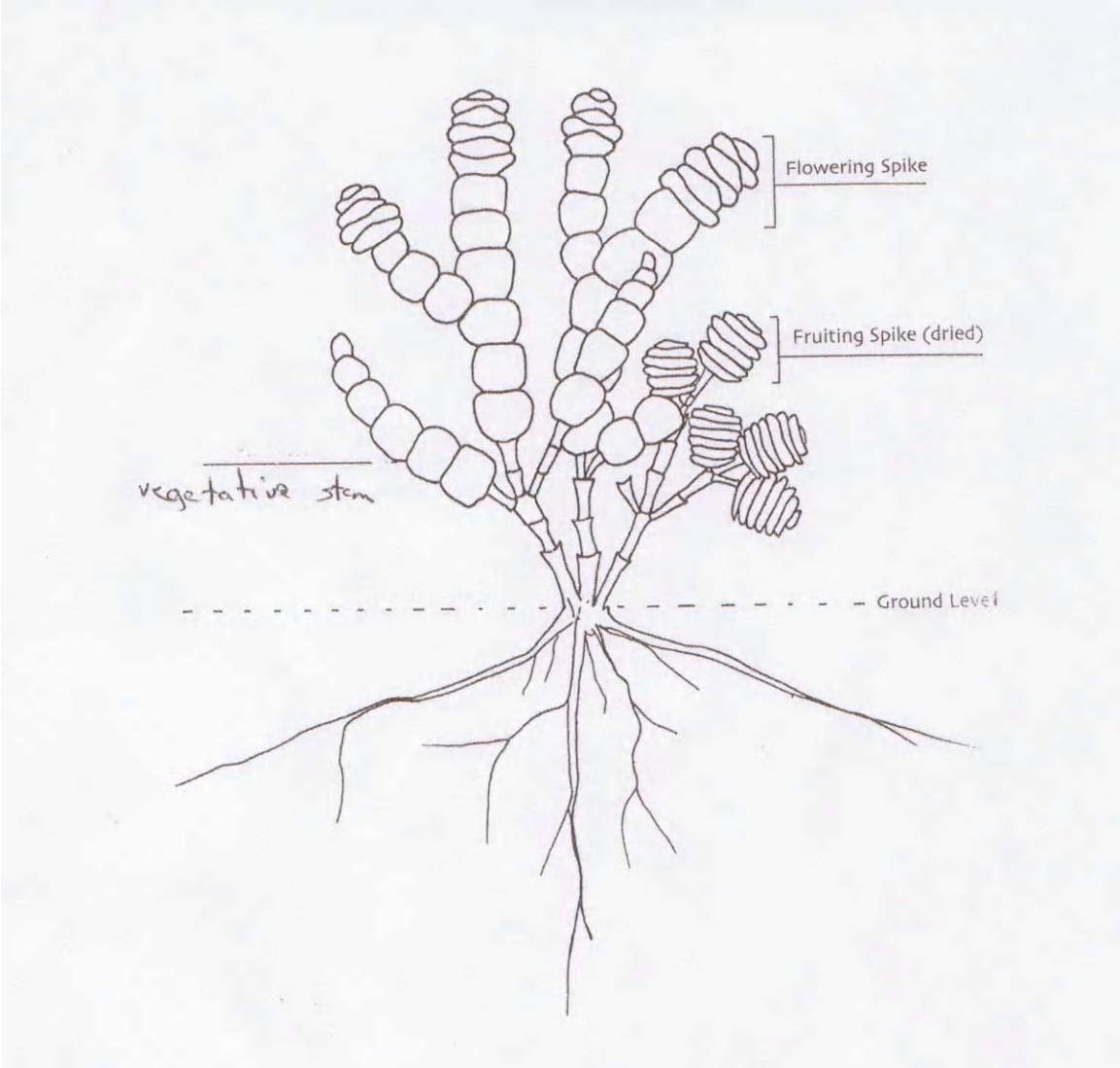

Fig. 1. Samphire plant, showing vegetative stems and flowering/fruiting spikes (magnified about 2.5 times). After Datson (2002).

Fig. 2. *Tecticornia lepidosperma* near Burakin, with both flowering and vegetative stems (approx. natural size).

Samphire flowers, as already pointed out, are very small and are generally difficult to see. For several weeks in Spring, however, the flowers are quite conspicuous. And because there tend to be many samphire taxa at a particular site and each taxon blooms at a slightly different time and for a slightly different duration, this flowering event can be drawn out over several months. There are no showy petals or bracts. The most obvious structure is the stamen (the male reproductive part), which seems to protrude directly from the stem (Fig. 3). Some flowers also have a female part – the style (Fig. 4).

Fig. 3. Stamens protruding from *Tecticornia indica* subsp. *bidens* flowers (magnified about 3 times).

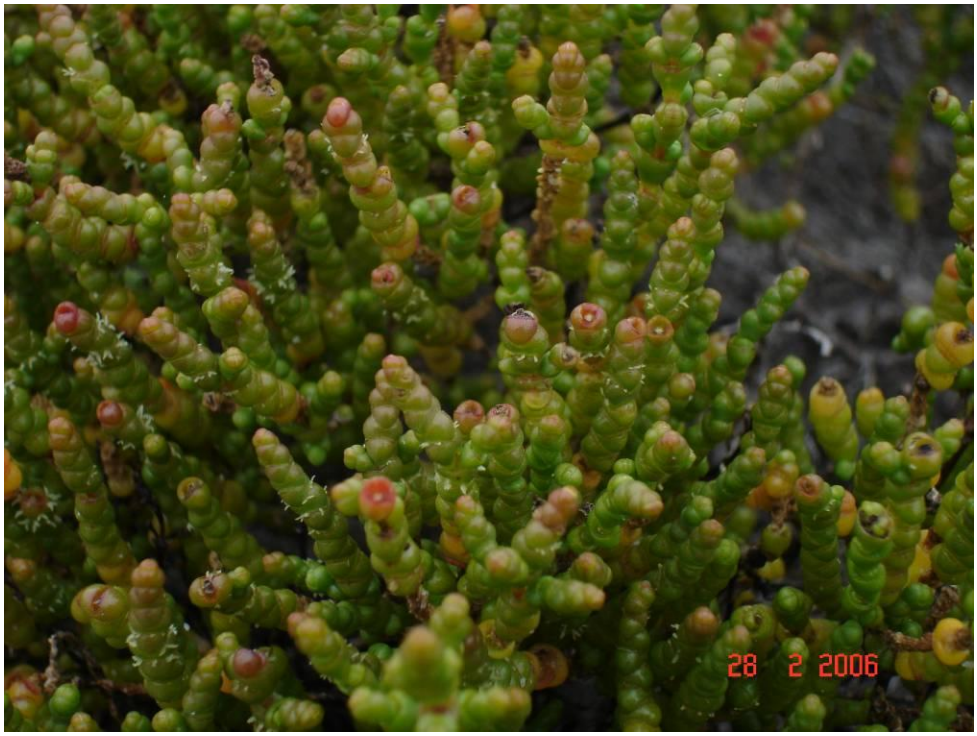

Fig. 4. Styles protruding from *Tecticornia halocnemoides* flowers (magnified about 2 times).

In samphires of the genus *Tecticornia* (i.e. almost all those likely to be encountered in the northern wheatbelt), the flowers are arranged in groups of three ('triads'). At each article-junction along the flowering stem, there are two triads, opposite each other (i.e. six flowers in all). These pairs of triads are staggered along the stem at right-angles to each other (Fig. 5).

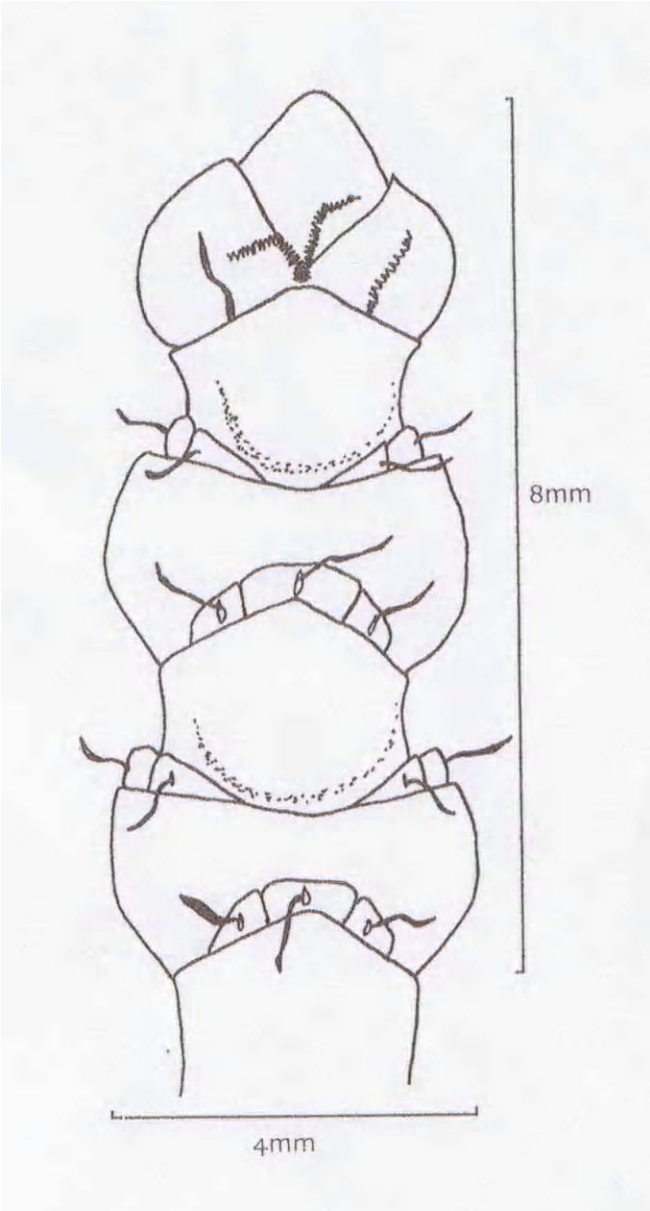

Fig. 5. Close-up of *Tecticornia pergranulata* flowering stem, showing arrangement of flowers in groups of three (triads) and staggered arrangement of triads. Note protruding styles (× approx. 13). After Datson (2002).

The single most useful feature in identifying samphire species is the seed – particularly its colour, shape and ornamentation. One very common species, *Tecticornia pergranulata* has abundant, comma-shaped seeds, varying from dark reddish brown to black, with an unmistakable spiral ornamentation. They look like tiny coils of rope (Fig. 6). These seeds are held only loosely within the pith and can be released simply by pulping the fruiting stems in the palm of the hand. Other species have seeds with characteristic patterns of dimples, bumps, spines, wavy lines or smooth surfaces. Colours include white, yellow, red, brown, and black. They can be opaque, translucent or almost transparent (Fig. 7). In some species, the seeds are readily released; in others, the seeds are enclosed in pithy fruitlets and are difficult to extract.

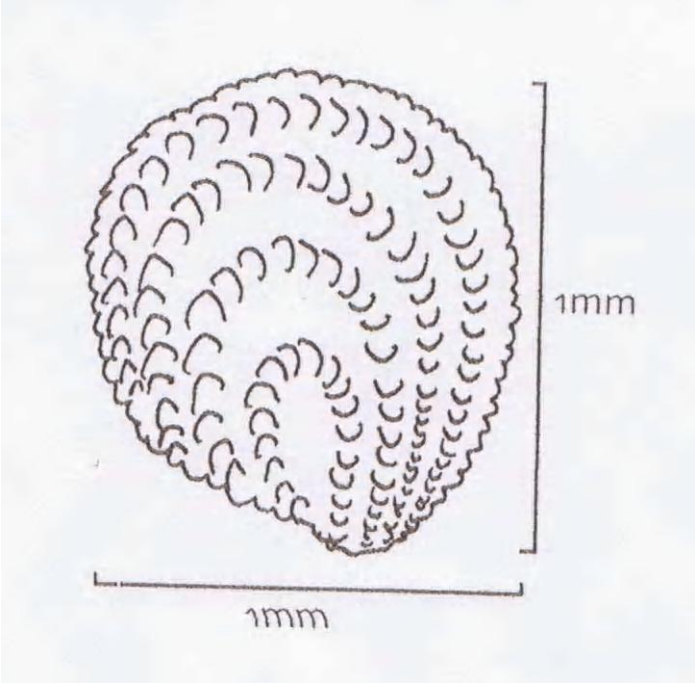

Fig. 6. Close-up of *Tecticornia pergranulata* seed, showing characteristic 'rope-coil' ornamentation (× approx. 60). After Datson (2002).

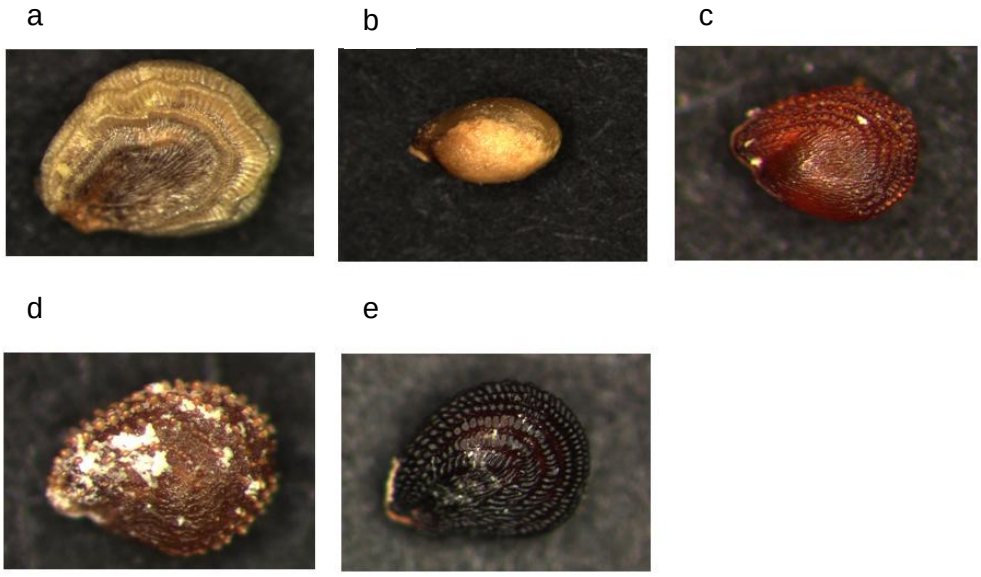

Fig.7. A selection of samphire seeds (magnified about 30 times).

a. Tecticornia lepidosperma

b. T. chartacea

c. T. fimbriata

d. *T. sp.* Lake Moore (M.N. Lyons 2603) – a new, undescribed species

e. T. pergranulata

Photos by K. Shepherd.

By far the most commonly occurring species in the Yarra Yarra region are *Tecticornia halocnemoides*, *T. indica* and *T. pergranulata*. These three species (along with their subspecies and local variants) probably account for more than half the area occupied by samphire in the region.

There is very little known (or at least written) about the ecology of samphires. A common observation in the Yarrra Yarra (and presumably in other regions too) is that samphires organise themselves into roughly concentric zones around a wetland, where certain taxa are consistently associated with each other and with certain environmental

conditions. At Mongers 55, for example, there is an almost mono-specific ring of *Tecticornia halocnemoides* around the 15 ha dispersal lake. Moving away from the shore, there are distinct zones dominated by *T. pergranulata* (north side) or at least two varieties of *T. doleiformis* (south side), with local concentrations of several other species. The outer 10-20 m is overwhelmingly dominated by the distinctive large and untidy woody shrub, *T. indica* subspecies *bidens*.

The conditions most likely to influence distribution at this micro level are drainage and salinity, as some species are demonstrably more tolerant than others of salinity and waterlogging. Soil pH might also be important, at least for some species, but I am not aware of any studies that have specifically addressed this possibility.

It seems likely that there is also a strong historical influence on which samphires live where. Highly diverse communities -- those with multiple taxa -- are found only at 'old' sites, i.e. those, such as saltlakes and claypans, which may be several centuries or millennia old. The most diverse communities, as well as those with the strongest zoning, are observed fringing the major saltlakes, such as Mongers Lake. Recently colonised samphire flats, by contrast, many of which date back only as far as the 1999 flood, typically consist of a few or even a single species.

You might feel that this is all very interesting, but so what? Samphires dominate large parts of the saline wetlands in the Yarra Yarra region. In fact, there are large areas, such as saltlake margins, where samphires are the only plants to grow. If there is any 'downstream' environmental impact of agricultural activities, like groundwater-disposal into saltlakes, then it will only be evident in the samphire communities. In other words, to judge whether any environmental degradation or improvement is happening, it will be necessary to recognise changes in the samphire community. And to recognise changes, it will be first necessary to describe the *before* and *after* states.

Perhaps it will eventually be possible to identify environmental impacts in saline wetlands by monitoring a few simple indicators, like the presence or absence of a certain species. For now though, we will need to describe many aspects of wetland ecology. To do that, we will need to develop fundamental skills in describing samphires.

Further Reading

The undisputed 'bible' on WA samphires is Paul Wilson's scholarly monograph, published in the WA Herbarium's journal, Nuytsia. The full reference is

Wilson, P.G. (1980) A revision of the Australian species of Salicornieae (Chenopodiaceae). *Nuytsia* **3** (1), 3-154.

Bindy Datson's book 'Samphires of Western Australia' is a more readable account and certainly a more recent one. Although its emphasis on the Goldfields region and its light treatment can be unsettling at times, this is probably the most useful guide available for interested novices. The full reference is

Datson, B. (2002). 'Samphires in Western Australia: a Field Guide to the Chenopodiaceae Tribe Salicornieae'. Department of Conservation and Land Management, Perth. 125 p.

Another useful resource is the Department of Environment and Conservation's Florabase website, which lists all current Western Australian plant species and includes photos, distribution maps and some descriptive information. The website address is http://florabase.calm.wa.gov.au.

Kelly Shepherd, now at the WA Herbarium, has worked extensively on Western Australian samphires, and has written or co-written several papers on the group. These tend to be specialised works and are probably unsuitable for the general reader. The same can be said for a number of other papers, reports and theses produced by researchers at The University of Western Australia in recent years. Copies of or references to these can be obtained from Ian Fordyce at the Kalannie office of the Yarra Yarra Catchment Management Group.