SALTMARSH PLANTS OF NEW SOUTH WALES

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A better basis for extrapolations would be from Mediterranean communities but usable data are not available. It seems likely that productivity of colonized salt marshes is much lower than that of American Spartina maritima. The only estimates of productivity for Australian saltmarsh are given by Collinson and McDermott (1969) for Juncus kraussii marsh in the Blackwood estuary. Their estimates for two above ground production range from 0.5-3.1 kg dry wt/m² but the higher figures being in the mid to upper range of estimates for saltmarshes and freshwater macrophytes but well below the maximum recorded from American marshes.

Given the relatively small extent of coastal saltmarsh and the nature of the vegetation it seems likely that their potential contribution to local diet or food chain will be small but will be an aid for aquatic data from Australian marshes rather than reliance on overseas estimates. While quantitative exchanges between saltmarshes and estuaries may be small, quality may be important. Exchanges of nutrients (e.g. nitrogen and phosphorus) could be essential for the function of estuarine ecosystems but again research is urgently needed. It is difficult in this stage to quantify generalisations about exchanges between saltmarshes and estuaries in ignorance of the fact that some of their potential impact might be to lead to control of carbon in any proposed development. In other respects, we can only observe the importance of saltmarsh. They are an important habitat for both, particularly waders, and are one of the few remaining species-rich coastal ecosystems (displets Hamilton) (1919) description of a marsh as a "monotonous stretch of dull green, smothered in reeds". The saltmarsh brook is a mosaic adapted to its environment. We are only beginning to understand the details of the processes by which these adaptations are achieved. Greater knowledge of the species, of interest into their own right, may be of wider applicability. For example, it has been suggested that saltmarshes could be used to rehabilitate wild plant species may lead to the development of new crop species and varieties for saltmarsh and agricultural lands. This species may be worthy optimism but saltmarshes will provide natural laboratories for such research. The relative species of saltmarsh plants that is in the future requires a programme designed to make them ideal for teaching purposes. Saltmarshes provide good demonstration of natural selection and offer opportunities for the study of succession.

Before we can fully appreciate the value of saltmarsh, much research is required. However, some new facts on the likely to occur, many invertebrates will have changed. In addition to the obvious recession, some forces acting on marshes may be less apparent. Pollution, both chemical and noise, many marshes, little is known of its effects. Regulation of the flow of rivers into estuaries will not remain the same. Conditions experienced by the marshes. It is important to predict what this will have but it emphasizes the difficulty of accounting for the effects man has on ecosystems. For example, if marshes are not in a completely natural state, true control sites probably do not exist and our base line for comparison is continually changing.

The flora of saltmarshes is, when compared with that of other habitats, much more restricted than that of their freshwater counterparts. In addition to those species in this group covered in the Key other Angiosperm spp. and Cyperaceae spp. are likely to occur. Species from the drier land and beaches might also be found and a number of alien species (including several ornamental) also occur.

Areas flushed by freshwater supporting low growing vegetation: These communities are commonly found in small, gullies or stream beds. They are often found near to streams and are frequently found in large numbers. These communities are very sensitive to changes in the hydrology of the area and are therefore often found in small, shallow, seasonal streams. The species of these communities are often fast growing and are able to quickly colonize new areas. This is especially true for the Specialist herb remedies included the creeping white wallflower and the purple plant - Mimiopsis repens. It is very difficult to distinguish many species from this habitat in the wild as a result of the larger species being abundant and a result of the larger species being abundant.

Tall shrubs: In the more saline margins, the two major communities of these are Juncus effusus and Juncus jamesii, around sandhills a number of members of the Cyperaceae are present. A number of other Juncaceae spp. also occur but these are difficult to identify and are not currently available. A rich understory of small shrubs and a variety of herbing crops may be a piece that has been left little investigated. At least around Sydney members of the family Restionaceae do not seem to occur very commonly in the more saline shrubs. They may be distinguished when vegetation from the superficially similar species of the Cyperaceae by looking at the leaf sheath. In the shrubs when the leaves are reduced to scales the leaf sheath forms the whole of the stem and is tubular, in the Restionaceae these leaves are reduced to the leaf sheath is split on one side. The majority of species on saltmarshes are also found in other habitats - sand dune, salt flats, swamps. Many species from inland heathland may, where populations are still preserved, on the coastal heathland. The majority of Spartina spp. are native to South Australia and are found in coastal heathland. The species of the upper margin of the saltmarsh are less well covered in the Key although all widespread species in these communities should be included.

The number of species potentially capable of occurring in the upper margin but large is the actual flora of the habitat is poorly documented. A number of different marginal communities are recognised:

Open saltmarsh on the coastal strip. The majority of species are introduced. Plantago major and Plantago maritima are most frequent but also found are Salicornia spp. and Juncus effusus leaves and herbs may occur. Drift line of rotting organic material often washed up seaweeds and algae. The vegetation in this habitat tends to consist of small discontinuous patches dominated by single species with great variation in species composition between sites. The most frequent species are annual, or shortlived and generally of the family Chenopodiaceae. In addition to those species in this group covered in the Key other Angiosperm spp. and Cyperaceae spp. are likely to occur. Species from the drier land and beaches might also be found and a number of alien species (including several ornamental) also occur.

ARTIFICIAL KEY TO SPECIES OF COASTAL MARSHES IN NEW SOUTH WALES

Plants with definite woody stems at least at bases (generally of shrubby appearance) 1

Plants herbaceous but not grasslike 2

In number of species 2

Plants grassland (grassy - grasses, rushes, sedges) 3

1 Plants with woody stems

1a Stems prostrate, with creni apparent dlussd suckers forming branches. Spartina alterniflora 1

1b Stems not woody, not prostrate, erect, or suckering 2

2 Leaves small, 'health-like', dark green or green grey with curved margins, lower leaves opposite, upper leaves often whitish. Flowers pale pink or white. 

2a Callitrichia (syn. Littorella) 2

2b Leaves linear, alternate flexible 3

3 Leaves with flattened laminae 3a

3b Leaves with flattened laminae 3b

4 Leaves with sharp point at tip. Plants normally up to 1m high, and up to 5cm on young plants, hardier and more resistant to frost. Salicornia herbacea 4

5 Plants shrubby, up to 1m high 5a

6 Fleshy shrub-like plant up to 1m tall, glabrous, stem covered with short hairs and only woody towards base. Leaves 4-15cm long, new growth often a rather bright yellow green, older growth becoming reddish or purple. 5b

7 Shrubs to 1m, and leaves, and stem, succulent (already covered with hair). Leaves 0.5-1.5cm long. Flowers solitary, axillary, petals enlarging and becoming fleshy after flowering - red or yellow in colour, making good in drier years. Eucharis composita

References

7. Small procumbent plant, woolly at base, leaves 0.5-1.5cm long, rather crowded, dark green. Flowers, solitary, axillary with a white tubular corolla with reflexed lobes.

8. Solea hirta

9. Leaves alternate (arrowhead shaped) to ovate 2-4cm long, green, glabrous. Striaght branches to 50cm high (rarely taller), slightly woolly at base.

10. Leaves lanceolate to oblanceolate.

11. Leaves oblong-lanceolate, rounded tip, 2-4cm long. Tall, sometimes straggling shrub (up to 1.5m). Whole plant greyish and covered (scarly) with scales.

12. Leaves leathery to lanceolate, 3-10cm long, entire, toothed, lower leaves sometimes glaucous. Leaves green or greyish. Up to 1m tall but often straggling, woolly near base.

13. Teucrium chamaedrys

14. Leaves opposite, ovate, oblong to elliptic with a few distinct subulate teeth. Lower leaves usually 15-30cm tall but may be more (2-3cm). Flowers in cyme inflorescences (solitary in very small plants).

15. Vicia faba

16. Tall herb (up to 2m), leaves sessile to 12cm long — 1cm wide, toothed or entire, flowerless, thin, "flabby", wide, yellow, white or blue, in loose, knobby panicles.

17. Aegilops alexandri

18. Stem creeping, rooting at nodes, leaves scale-like (spoon shaped) to ovate, 2-4cm long. Flowery, up to 1cm tall, solitary, axillary, white, 1-2cm long. Not as above.

19. Leaves lanceolate to arrowhead shaped, opposite, or alternate, 2-4cm long, green, glabrous. Striaght branches to 50cm high (rarely taller) slightly woolly at base.

20. Leaves opposite, 2-3cm long (lower leaves sometimes basitich), entire or toothed. Leaves green or greyish. Up to 1m tall but sometimes straggly and deformed.

21. Graminoid plants

22. Phlox wrightii, stems to 50cm or taller.

23. Phlox amoena

24. Stems triangular, bearing long fl. (but lacking leaves. Stout plant (to 1m), stems arising from rhizome, often loosely tufted. Stipa maritima/chloris/stripa Strips not above.

25. Flowery stems to 1-1.5m (generally around 3m), inflorescence a cymose panicle. 5-8cm long, leaves restricted to basal parts of stems about 10cm long, dark green. Stems slender, rigid, up to 70cm. Inflorescence 10-40cm long of fl. episcopic which are on stems leaves reduced to pithy, slightly shading scapes. Stems dense, dark.

26. Leucanthemum vulgare

27. Leaves (floral few borne as a loose tuft on a creeping rhizome). Inflorescence a spike with indistinct flowers somewhat from a globular group of three follicles. Often minute (less than 3cm) rarely to 3cm.

Not as above.

8. Phlox subulata

9. Phlox baccata

10. Phlox patens

11. Phlox longifolia

12. Phlox drummondii

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Notes on species:
Aegilops drummondii R. Br. (Gramineae).
Annual grass, widespread but nearly abundant in the upper marsh in both areas subject to freshwater influence and sandy sandy sites. Also found in brackish seagrass on the lower dunes. Two species with similar large, open, wind-dispersed panicles are found less frequently in the upper marsh — A. arenaria R. Br. and A. communis R. Br.

Aegilops drummondii Labl. ex Vest. (Umbelliferae).
A small member of the current family widespread in the upper marsh often amongst Arenaria arvensis. Generally in damper sites but occasionally on dry sandy areas. The related Aegilops ecタイプ crawlus (Pers.) F. Muell. with Elymus leaf segments and enter stems occurs less frequently in the upper marsh.

Aegilops narcissus (Caryophyllaceae).
Introduced from America, a widespread species in upper saltmarshes, particularly Eulalia leucocentra stands, generally in permanently wet areas.

Aegilops mutica Moq. (Chenopodiaceae).
Upper saltmarsh. Often associated with the fines line, generally on well drained sandy soil. Introduced, widespread but rarely common on saltmarshes. Annual or biennial tends towards the base.

Aegilops californica (T. Br.) Pall. (Cyperaceaee).
Often grows in dense stands or mixed with J. arundinacea in the upper marsh in permanently moist sites.

Aegilops drummondii (Chenopodiaceae).
Introduced from the northern hemisphere. An annual but sometimes beds itself on the lower edge of the saltmarsh, smaller plants scattered in upper marsh communities.

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Cerastium spp. (Cerastiacae).

Three species of Cerastium occur in dry sandy sites in upper saltmarsh in central NSW. All are annual herbs which when well grown are 25-100 cm tall but in the upper marsh are often stunted and can be difficult to identify to species level. One species C. glaucescens (L.) Fisch. is native, the others are introduced from Europe. The species may be distinguished as follows:

1. Basal rosette of leaves always present, flowers light red, corolla tube clearly longer than calyx.
   - Cerastium glaucescens (L.) Fisch.

   - C. erythraeum Rafn.

2. Basal rosette absent at time of flowering; some of the basal leaves may persist, but not as a complete rosette; flowers light pink, corolla tube slightly longer than calyx. Leaves elliptical.
   - C. spectabile (L.) Fisch. Basal rosette absent, flowers deep pink to red (often with a grey-blue tinge to 5), corolla tube slightly longer than calyx. Leaves obovate-elliptical.
   - C. emmenium (Hoffm. et Link) Fisch.

- The differences in the nature of the inflorescence between species given in flowers may be applied to well-grown specimens but are often unsuitable in stressed saltmarsh specimens with only one or two flowers.

Another introduced species occurring widely in the same habitat is C. pubescens (Swartz) Drake. This has not been recorded in the Sydney region — it is very similar to C. emmenium and stressed specimens of the two species would be very difficult to tell apart. Well-grown examples may be distinguished as follows:

2-4 internodes on stem, branches of stem diverging at a wide angle.
- C. pubescens

3-5 internodes on stem, branches of stem diverging at narrow angle.
- C. emmenium

Convolvulus arvensis L. (Convolvulaceae).

Markedly succulent with characteristic of wet sites, generally influenced by fresh water run-off. Can survive for long periods submerged at the edge of brackish creeks.

Convolvulus reptans Bent. (Convolvulaceae).

Creeping perennials with pinnate leaves. Found in similar habitats to C. arvensis.

Erythrina composita R. Br. (Fabaceae).

A diffuse or compact sometimes tall bush found in drier upper saltmarshes at or above the tidal limit. Scattered.

Frankenia pauciflora D.C. (Frankeniaceae).

An attractive dwarf shrub found in drier saltmarsh communities. A widespread and locally abundant in the other southern sites it does not occur in the Sydney region but may possibly be found on the coast elsewhere in the state.

Hemichroa pensylvanica R. Br. (Amaranthaceae).

Found in the winter parts of saltmarshes, either as a community dominant or with Sarcocornia quinqueflora. Widespread and locally abundant in the other southern sites it is absent from the Sydney region but has been recorded from the south coast of NSW.

Hydrocotyle bonariensis Lam. (Umbelliferae).

Introduced from South America. Widespread and sometimes abundant in upper marsh communities. Large plants are found in moister communities and smaller more succulent specimens in drier salter sites.

Juncea stenon Hoeh. (Juncaceae).

A tall rush, frequently the community dominant in the upper marsh. May be found both in sites subject to fresh or brackish run-off and dry, well drained areas. Around brackish lagoons may form a community which is permanently flooded for much of the year.

Limonium austrele (R. Br.) Kenton (Plumbaginaceae).

Races in NSW; the western race to Sydney is from Kiama. A number of European species of Limonium are naturalised in Australia and occur in upper saltmarsh communities, for example, S.A. These species may yet appear in NSW.

Mesembrium cylindrica (Willd.) Coss. et Durieu (Gesneriaceae).

Introduced from the Mediterranean region. Occurs in upper saltmarsh communities but much less commonly than the similar Parapholis incisa.

Parapholis incisa (L.) C.E. Hubbart (Gesneriaceae).

Introduced from Europe. Widespread in upper marsh communities. The most widely known examples are found in open dry marsh communities; straighter taller specimens are found in closed vegetation. Also abundant in waste sites close to the sea and on cliff tops.

Pisidium vulgarum Swartz (Gesneriaceae).

Common in brackish areas, may form extensive almost pure stands. In many saline marshes retained in the upper zones where flushing with fresh water occurs, in most uniformly brackish sites may be found throughout the marsh.
*Plantago coronopus* L. (*Plantaginaceae*).
Introduced from the northern hemisphere. Very variable in size, degree of dissected leaves and hairiness. Annual or biennial, favours disturbed sites, often accompanying *Panicum incanum*.

*Panicum miliaceum* L. (*Poaceae*).
Introduced annual from the northern hemisphere. Widespread in upper marsh communities, generally in damp sites. (In drier upper marsh fringes and other introduced grass, *Lagurus ovatus* L., with a dense ovate spike, with prominent awns [rabbit's tail] may occur.)

*Rhagulus hancei* (Lindl.) Muq. (*Chenopodiaceae*).
A straggling shrub, sometimes growing over other shrubs. At and above the tidal limit particularly in sandy or rocky sites.

*Salicornia pallidai* L. (*Chenopodiaceae*).
A cosmopolitan species found in sandy open communities at the upper edge of the marsh.

*Suaeda repens* (Forst. et L.) Pers. (*Plantaginaceae*).
A very variable species, widespread and found in most saltmarsh communities as a minor constituent, occasionally occurs in abundance.

*Sarcocornia quinquaphylla* (Boeke ex A.G. and R.S. Scott) Scott (*Chenopodiaceae*).

*Salsola oppositifolia* or *S. glauca* — previously included in the genus *Salicornia* or *Arthrocnemum*. A herb of creeping underbrush with succulent jointed stems, often tinged reddish. Often the only vascular plant in the lower saltmarsh. It is found through the mid and lower saltmarsh zones, particularly in winter areas.

*Scirpus maritimus* L. & S. floridana A. Gray (*Cyperaceae*).
These two species are difficult to tell apart without examination of the fruit under a hand lens or binocular microscope. Upper saltmarsh, or fringing lagoceas, generally with shallow standing water for a large part of the year.

*Scirpus nodosus* Roth. (*Cyperaceae*).
Upper saltmarsh, generally drier, sandy areas, normally as scattered clumps rather than as dense stands, also found on sand dunes and cliffs.

*Selena radians* Cav. (*Gentianaceae*).
Upper margins of saltmarsh. Very variable in size, widespread but generally present in small quantities, only locally abundant. Also found in wet flats on cliff tops.

*Sporobolus sp.* (*Cyperaceae*).
A small herb found at the upper margin of saltmarshes, generally in open dry sandy communities. The species in the Sydney region according to Beesley et al. (1972) is *S. rubra* (L.) J. et C. Presl. 

*Sambucus repens* (*Sambucaceae*).
In the other southern states *S. media* (L.) C. Frey has been recorded.
**Sporobolus virginicus**

The most important grass on NSW saltmarshes. Very variable, particularly in leaf length and extent of solitary. Leaves range in length from short (1-2 cm) to long (up to 1 m). Found scattered throughout the saltmarsh communities. It may also form extensive stands on some sites.

**Puccinellia striata**

Widespread on the upper marsh, particularly on small patches which may be found on the normal tidal limit. In the Sydney region, it is usually found on the upper marsh.

**Wilczinia basillii**

Found throughout the marsh, particularly in slight depressions with impeded drainage. In the upper marsh, it is often found in saline areas. It may also form extensive stands on the normal tidal limit.

**Zostera marina**

Widespread in dry sandy areas at the upper edge of marshes, where it is found above the normal tidal limit. Spikes fall when ripe, leaving the stems.

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**References:**


