

## What constitutes the wrack found on South Australian sandy beaches?

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The composition of wrack deposits is known to influence the rate of processes that wrack undergoes whilst on the beach (e.g. decomposition, incorporation into trophic webs, role as a habitat). Globally, previous research has shown that the composition of wrack deposits varies considerably among locations, comprising differing proportions of macroalgae, seagrass and other material such as epiphytes, sponges, carrion, terrestrial and dune vegetation and anthropogenic debris. There is currently little information on the type of wrack on South Australian (SA) sandy beaches, although wrack deposits are a feature of many SA sandy beaches. To date, only one study investigating SA wrack deposits has been carried out. This research thus aimed then to quantitatively assess the composition of wrack deposits on sandy beaches within three bio-geographical regions of SA; the Metropolitan coast within Gulf St Vincent, the Fleurieu Peninsula, and the South East region (Fig. 1).

A total of 17 beaches (Figure 1) were sampled at bimonthly intervals over the 14 months from June 2005 to August 2006, making this study one of the most comprehensive to date. Wrack composition was quantified by collecting wrack from the drift line of each beach, which was then sorted, identified and weighed to obtain the biomass, taxonomic composition and species richness of algae, seagrass and other material. Multivariate analyses (MDS ordination and PERMANOVA tests) were used to assess whether the wrack deposits differed spatially, among the three regions or the beaches within each region, or temporally among the visits.

Individual wrack samples contained between two and 75 species. The wrack deposits sampled in this study contained a total of 242 species (including 'other' material), reflecting the high diversity of seagrass and algal species within SA. Red algae were the most diverse group, comprising 126 of the 242 species, although they contributed only a small proportion of the biomass, in part due to their typically small size. Brown algae contributed a similar proportion of the biomass in each of the regions. Whilst kelps only comprised four

species, their large size meant that in the South East region, where these species are present, they made up a large proportion of the biomass. In the South East region, seagrass contributed the least biomass of any taxonomic group and, the proportion of seagrass was less than in any other region.

The species composition and relative masses of those species varied both spatially and temporally. Beaches that were geographically close to each other had similar wrack and beaches with high wrack cover tended to have wrack deposits with more variable composition. Wracks in the Metropolitan Adelaide and Fleurieu regions were characterized by seagrasses and brown algae. Wrack deposits in the South East region were more diverse, with higher total numbers of species and higher algal diversity, driven by the great diversity of kelps, green algae and red algae in that region. Beaches in the South East region could be further separated into two groups, separated by the geographical boundary of Cape Jaffa (36°56'S, 139°40'E). The two beaches north of Cape Jaffa had similar wrack to the Metropolitan region (Fig. 2) and had wrack with a high proportion of seagrass. The four beaches south of Cape Jaffa were distinct from the others and were dominated by algae, with a mix of red, green and brown algae, including kelps (e.g. *Macrocystis pyrifera*, formerly *angustifolia*) (Fig. 2).

Wrack composition varied temporally and spatially (among beaches and the three bio-geographic regions). The suite of macroalgal and seagrass species found on these beaches is unique and the diversity exceeds values previously reported in the literature. This reflects the high diversity of seagrasses & algae in SA waters and the scope (high number of beaches and sampling occasions, and the large geographical range) of this study. Sandy-beach wrack deposits contain macrophytes growing nearby and from distant sources and provide a link between sandy beaches and offshore macroalgal and seagrass habitats. SA wrack deposits contribute a complex, diverse, and also spatially and temporally variable resource to the beach and nearshore ecosystem.

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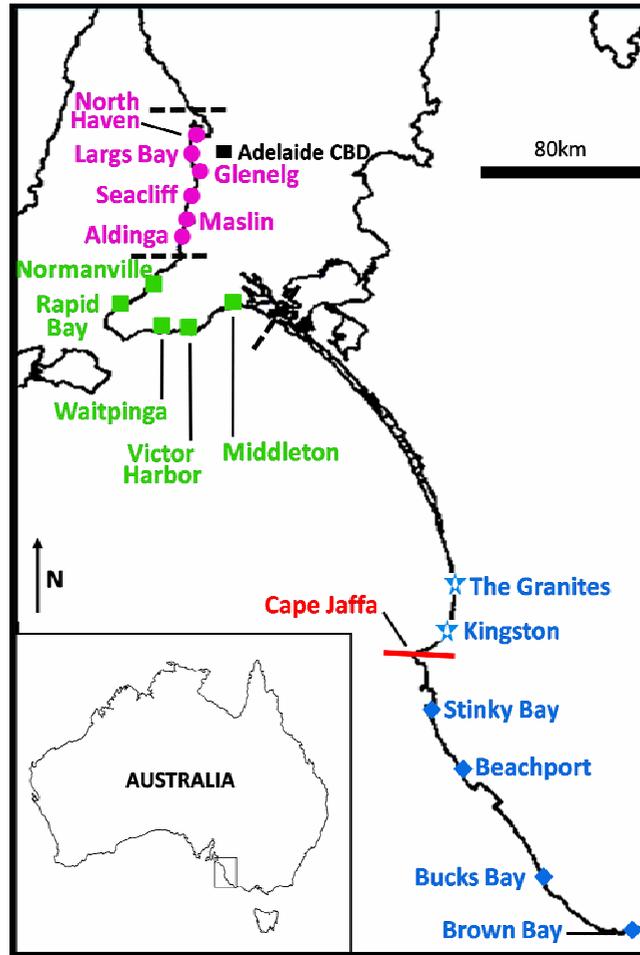


Figure 1: Map of the beaches surveyed, indicated by symbols. Inset is a map of Australia showing the study area. The dashed lines indicate the boundaries of the 3 bio-geographical regions (Metropolitan coast, Fleurieu Peninsula & South East).

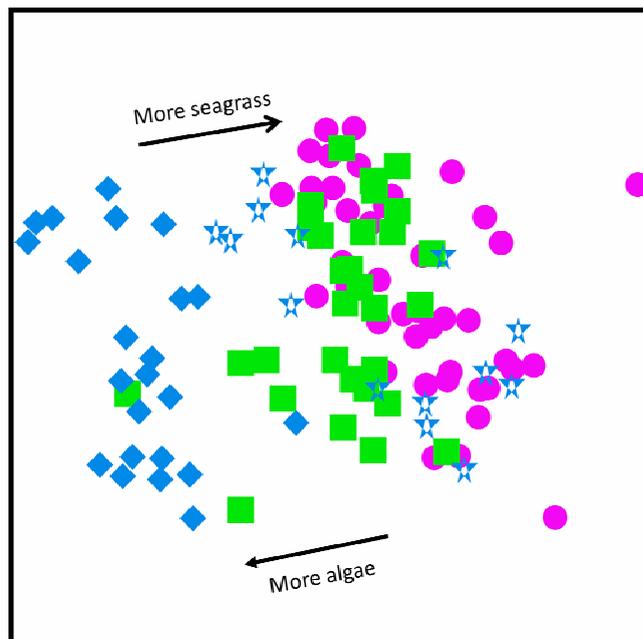


Figure 2: Two-D MDS plot of wrack composition for each beach & visit. Symbols are plotted by shape & colour for the three regions: ● = Metropolitan, ■ = Fleurieu & ★/◆ = South East. For the South East, ★ = north & ◆ = south of Cape Jaffa, respectively. n = 107, 2-D stress = 0.20. Points that are close together have similar species &/or relative masses of those species.