Sea spurge, *Euphorbia paralias*, ecological assessment and testing of potential biological control agents

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Summary Sea spurge (*Euphorbia paralias* L.; Euphorbiaceae) is a major herbaceous weed of the foredune, and increasingly the hinterland, of the southern Australian coastline. Sea spurge threatens a range of endangered species and aboriginal heritage sites and impedes public recreational use of coasts. The weed is an approved target for biological control in Australia, as this approach is likely to be the most viable option for long-term control.

In 2011–2012 we gathered baseline data on the plant's growth, phenology and reproductive output at three sites in Western Australia and at three sites in Victoria. These study sites were set up for longer term monitoring, either of the invasion process or the impact of any future biological control agents. We found that high seed production was accompanied by low seedling survival. Generally seedling survival was highest in areas of stable sand dune closest to the sea.

Single measures of vegetative biodiversity associated with sea spurge infestations were also made at five sites in Western Australia and at three sites in Victoria to assess the possible impact of the weed on native vegetation. The seven of the eight sites had predominately bare sand even when sea spurge was the dominant plant present, whereas the remaining site was predominately marram grass.

During the same period, experiments were conducted at the CSIRO European Laboratory, France, to assess the potential of two plant pathogens as biological control agents for sea spurge. The leaf spot *Passalora euphorbiae* (Karak.) Arx (Mycosphaerellaceae) and the rust *Melampsora euphorbiae* (Ficinus & Schub.) Castagne (Melampsoraceae) were discovered during surveys of sea spurge in France and Spain. Both were observed to be damaging to sea spurge in the field and are reported to be restricted to a few species in the genus *Euphorbia*. Initially the biology, cultivation and long-term storage of the pathogens were investigated. A potential host test list was established that reflected the recent advances in understanding of Euphorbiaceae phylogeny, especially the number and structure of clades in the genus *Euphorbia*. Test plants were obtained, including native species from Australia, and grown in the glasshouses in France. At the time of writing 16 and 13 species had been tested or were undergoing tests for the rust and leaf spot respectively. Both pathogens appeared to be highly host specific. However, further tests are needed to complete this aspect of the risk assessment. Further work is also needed on the molecular identity of the pathogens.

The future of this project depends on obtaining additional funding to complete the risk assessment of the biological control agents, the importation into quarantine in Australia, application for release and the eventual release on sea spurge in Australia. The ecological studies form a strong basis for benchmarking the success or failure of the project.

Keywords Biocontrol, environmental weed, coastal ecosystems.

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