Scaevola sericea **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Campanulales	Goodeniaceae

Common name huahekili (English, Hawaii), Hawaiian beach cabbage (English), aupaka (English, Hawaii), naupaka kahakai (English, Hawaii), naupaka kai (English, Hawaii), naupaka kuahiwi (English, Hawaii), Hawaiian half-flower (English), Scaevola (English), Hawaiian seagrape (English), sea lettuce (English), beach naupaka (English), half-flower (English)

Synonym
Scaevola sericea , var. *taccada* (Gaertn.) Thieret & B. Lipscomb
Scaevola sericea , var. *sericea* Vahl
Scaevola taccada , var. *bryanii* St. John
Scaevola taccada , var. *fauriei* (Levl.) St. John
Scaevola taccada , var. *sericea* (Vahl) St. John
Scaevola taccada , (Gaertn.) Roxb.
Scaevola frutescens , Krause
Scaevola frutescens , var. *sericea* (Vahl) Merr., 1912
Scaevola lobelia , var. sericea (Vahl) Benth., 1852
Scaevola frutescens , (Mill.) Krause
Scaevola lobelia , L.
Scaevola koenigii , Vahl

Similar species *Scaevola plumieri*

Summary Beach naupaka (*Scaevola sericea*) is a dominant shrub species present in tropical and subtropical coastal environments, including sand dune, mangrove and seagrape habitats and ruderal land. Native to the Pacific and Indian Oceans, it has become an invasive coastal plant in sand dune ecosystems in the Cayman Islands and Florida, USA, where it forms dense monospecific mounds and out-competes and displaces native plants.

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Species Description
Habit and leaves: *Scaevola sericea* is a dense, spreading shrub that forms rounded mounds from 1 to 3.5 meters (3 to 10 feet) tall. The multi-stemmed shrub produces medium green elliptic leaves which are alternate, waxy and fleshy or succulent, but not stiff or thick-skinned. They grow from 4 to 21 cm long and 1.8 to 9 cm wide and have a broader tip or apex than base. Often the edges of the leaves roll under (Lockhart Undated; Randall Marinelli & Brooklyn Botanic Garden 1996; University of Hawai'i 2001; Burke 2003;). Two varieties are cultivated: *S. sericea* var. *sericea* has silky plant hairs on the stem and leaves; *S. sericea* var. *taccada* has smooth leaves, lacking plant hairs (Randall Marinelli & Brooklyn Botanic Garden 1996; University of Hawai'i 2001; Lockhart Undated). Note that leaf morphology varies by locality (Stender & Stender Undated).
Flowers: The flowers are white or cream-colored and clustered. Flowers emerge in groups of three, with all flowers stalked. They are sometimes blushed with pink, purple or violet and have a pleasant fragrance. They have an irregular shape with five petals (about 2 cm long) - all on one side of the flower like a semi-circle making them appear to have been torn in half and resulting in the vernacular name \"half-flower\". The flowers grow in small clusters from between the leaves at the ends of the stems (Randall Marinelli & Brooklyn Botanic Garden 1996; University of Hawai'i 2001; Lockhart Undated).
Fruit: The round to elliptical drupes measure about 1 to 1.7 cm wide and are coloured white to yellowish-white. Fruits are fleshy berries containing beige corky ridged seeds. The inside of the fruit is corky and the fruits are buoyant (Randall Marinelli & Brooklyn Botanic Garden 1996; University of Hawai'i 2001; Lockhart Undated).
Look for first (Lockhart Undated):
• Rounded shrub;
• White \"half-flower\";
• White clusters of fruit; and
• Large, mostly erect leaves, with wavy margins and small indentations at the apex.
For futher details and a picture guide please see: Lockhart Undated. Please note that the synonym *S. taccada* is used by Lockhart (Undated).

Notes
There are two varieties of *Scaevola sericea* according to ITIS (Integrated Taxonomic Information System): *S. sericea* var. *sericea* Vahl and *S. sericea* var. *taccada* (Gaertn.) Thieret & B. Lipscomb. Synonyms of *S. sericea* are: *S. taccada* var. *bryanii* St. John, *S. taccada* var. *fauriei* (Levl.) St. John and *S. taccada* var. *sericea* (Vahl) St. John. In this species profile the GISD has noted for clarity which references have used the synonym *S. taccada* instead of *S. sericea*.
Part of the family Goodeniaceae, *Scaevola* is a genus of more than 130 tropical species, mostly centered in Australia and Polynesia, but with one widespread, pantropical, coastal species *S. sericea* (DaCosta-Cottam *et al*. 2009; Hammer 1998). Mountain naupaka or naupaka kuahiwi (*Scaevola* spp.) is indigenous to Hawai'i (Scott 1991) and, interestingly, nine out of ten *Scaevola* species occurring in Hawai'i are endemic to the Hawai'ian Islands (Offshore Islet Restoration Committee Undated). Many legends have been told to explain the formation of the naupaka's unique half flowers. In one version a woman tears the flower in half after a quarrel with her lover. The Gods, angered, turn all naupaka flowers into half flowers and the two lovers remained separated while the man is destined to search in vain for another whole flower (Hammer 1998).

Lifecycle Stages
Plants can produce fruits within their first or second year (Lockhart Undated) and produce flowers and fruits year-round (but mostly from late spring to early fall in Florida, USA) (FLEPPC 2009). Fruits float in sea water and the viability of mature seeds is not substantially affected by exposure to sea water for long periods of time; seeds treated with saline solutions germinate rapidly after exposure to fresh water (Lesko & Walker 1996, in Goldstein *et al*. 1996). One study showed that the seeds germinated best after 250 days in salt water (Bornhorst 1996, in University of Hawai'i 2001). *S. sericea* grows easily from cuttings or seed (University of Hawai'i 2001).

Uses
Naupaka is used in landscaping and erosion control (USDA-ARS Undated b). For example *S. sericea* has been used for that purpose on reclaimed Temaiku milkfish ponds on Tarawa, Kiribati.
Scaevola spp. are used in traditional Polynesian craft, for example, to construct reef-fishing nets (Aalbersberg Nunn & Ravuvu 1993)
S. sericea has a history of use in Polynesian traditional medicine and extracts have shown selective anti-viral activity against Herpes Simplex Virus-1 and 2 and Vesicular Stomatitis Virus in vitro (Locher *et al*. 1995).

Habitat Description
Beach naupaka is present in coastal habitats and environments including the following natural habitats: sand dune, marine/estuarine, xeric hammock, tidal marsh, saline shores, seagrape, maritime forest, mangrove, coastal strand, coastal berm, coastal rock barrens and coastal uplands (SE-EPPC Undated; Nelson 1996, in FLEPPC 2009). Single specimens have also been reported from pine flatwoods and prairies (SE-EPPC Undated). It is also present in regularly disturbed and developed land, ruderal land, roadsides and dump sites (SE-EPPC Undated). Beach naupaka spreads along wrack lines of the coast, canal banks, mangroves and inland shorelines (Lockhart Undated).
S. sericea is reportedly sensitive to frost (Lockhart Undated), fire and heavy shade (Smith and Tunison 1992, Herbst and Wagner 1992, in FLEPPC 2009). However, beach naupaka is well suited and adapted to live in salt-sprayed coastal environments. Plants from coastal strands are often subject to heavy loads of salt spray and shifting sandy substrate with low water-holding capacity and variable salinity. Coastal substrate salinity may range from 0.1% to 3% (Barbour *et al*. 1985, in Goldstein *et al*. 1996). In a study by Goldstein and colleagues (1996) it was found that *S. sericea* was strongly affected by substrate salinity but only weakly affected by salt spray. Parameters measured were new stem and leaf biomass, leaf sap osmolarity and photosynthetic rates. The authors believe that these physiological responses may partially explain the wide geographical distribution of *S. sericea* in coastal habitats throughout the tropical and subtropical Pacific and Indian Oceans.

General Impacts
According to the Global Compendium of Weeds beach naupaka is an agricultural and environmental weed. The Florida Exotic Pest Plant Council lists beach naupaka as a Category I species, defined as a plant that is invading and disrupting native plant communities; it has been included in a survey of invasive or potentially invasive cultivated plants in Hawai'i (GCW 2007b).
Competition: Beach naupaka colonises sand dunes and competes with native coastal vegetation. It can quickly form extensive colonies, providing a seed source for more rapid dispersal to other shorelines. In southern Florida it competes directly with the related native inkberry (*Scaevola plumieri*), a state threatened species, which has stiff, dark green glossy leaves and black fruit (Randall Marinelli & Brooklyn Botanic Garden 1996).
Threat to endangered species: In the Caymans beach naupaka is chronically invasive and appears capable of out-competing most flora naturally associated with sandy beach and cobble habitat (DaCosta-Cottam *et al*. 2009) including lavender, pop-nut, broadleaf and almond trees (Blumenthal 2004). Beach naupaka (*S. sericea*) negatively impacts various critically endangered and vulnerable species, including cocoplum (*Chrysobalanus icaco*), bay balsam (*S. plumieri*), tea banker or mint (subspecies: *Pectis caymanensis* var. *robusta* and *P. caymanensis* var. *caymanensis*) and broadleaf (*Cordia sebestena* var. *caymanensis*).
Physical Disturbance: The shallow root systems of *S. sericea*, combined with its ability to out-compete native species, encourages dune de-stabilisation (Hammerton 2001, Sealey *et al*. 2004, Nero & Sealey 2006); however, in some parts of the Pacific the species is used for erosion control.
Modification of Nutrient Regime: *S. sericea* can reportedly result in an increased delivery of sediments and nutrients to the marine environment due to dune destabilisation (Nero & Sealey 2006).
Other: Sea turtles may be prevented from accessing their nesting sites in the Caymans, however, no data has been collected to confirm this (Blumenthal 2004).

Management Info
Manual: Beach naupaka is difficult to control. The fleshy branches are easy to hand-pull, but the broken underground stems readily re-sprout if not completely removed (Lockhart Undated). Young specimens may be hand-pulled and should be removed from the site because the plant roots easily from cuttings. Older plants may be mechanically removed by digging or hand-pulling and taken away (along with the seeds) from the site (Randall Marinelli & Brooklyn Botanic Garden 1996).
Chemical: Herbicides have been effective in dry dune habitat, but removal and treatment of beach naupaka in tidal mangrove areas requires more careful treatment. Monitoring and re-treatment are necessary for at least two to three years after removal, to weed out new seedlings and stem sprouts (Lockhart Undated). If mechanical removal is not possible, the plants should be cut down to the ground and treated with 50% triclopyr herbicide (amine formula) and 50% water (Randall Marinelli & Brooklyn Botanic Garden 1996). Eradication recommendation in Florida, USA, is basal application with 10% Garlon 4 or stump application with 50% Garlon 3A.
Integrated Pest Management: The Darwin Initiative project, 'An Assessment of the Coastal Biodiversity of Anegada' is monitoring the spread of *S. sericea* on Anegada and asking the local community to help by reporting new localities of the plant to the National Parks Trust. To assist in field identification, they have produced a poster and a monitoring form to help distinguish the native species of *Scaevola* from the exotic (Kew Gardens Undated a).
In the wake of Hurricane Ivan, a collaborative three year Darwin project was funded to produce a *Biodiversity Action Plan* for the Cayman Islands. Integral to this aim were: biodiversity mapping, research into key endemic taxa and invasive species, institutional capacity building and environmental awareness activities for the general public and key stakeholders. Major botanical outputs included invasive plant species collection, including that of *S. sericea*, identification, mapping and *Biodiversity Action Plan* recommendations to mitigate the impact of invasive species (Kew Gardens Undated b). To view coastal biodiversity maps for all islands please see: Darwin Initiative. Undated a. *Habitat maps: Coastal*
In Florida alternative species to invasive species are recommended for landscaping and gardening, for example, the native inkberry (*Scaevola plumieri*). This species is native to Florida, Louisiana, Texas and Puerto Rico and is appropriate for dune and beach plantings, erosion control, as a foundation shrub and for screening (Burrell *et al*. 2006). According to one author "*Inkberry responds well to pruning and can form many interesting shapes as a single shrub or continuous ground cover...The dense clusters formed by this plant make excellent cover for many birds and small animals*." (from *Seashore Plants of South Florida and the Caribbean* by David W. Nellis).

Pathway
Invasive flora in the Caymans establishes mainly as a result of land clearance in association with development, and also through landscaping with exotics species, particularly *Scaevola sericea* (DaCosta-Cottam *et al*. 2009). It was introduced as a salt-tolerant ornamental on many West Indian islands (Proctor 2009, in DaCosta-Cottam *et al*. 2009).Principally through the nursery trade, beach naupaka has become pantropical in distribution, readily spreading from landscape plants into coastal habitats outside its historic natural range (Hammer 1998). For example, it is a common nursery landscape species in Florida (Wirth Davis & Wilson 2004).

Principal source:

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[1] GUAM
[1] INDONESIA
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[1] PITCAIRN
[1] SAINT LUCIA
[1] SRI LANKA
[1] TANZANIA, UNITED REPUBLIC OF
[69] UNITED STATES
[1] WEST INDIES
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[1] SOUTH AFRICA
[1] TAIWAN
[1] THAILAND
[1] VIRGIN ISLANDS, BRITISH

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Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.

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