

*Carpobrotus edulis* [简体中文](#) [正體中文](#)

**System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Caryophyllales	Aizoaceae

**Common name** umgongozi (Zulu, South Africa), balsamo (Catalan, Spain), patata frita (Catalan, Spain), sea fig (English, USA), higo del Cabo (Spanish), suurvy (Afrikaans, South Africa), rankvy (Afrikaans, South Africa), sour fig (English, South Africa), iceplant (English, New Zealand), perdevy (Afrikaans, South Africa), hottentot fig (English, USA), freeway iceplant (English, USA), ghoenavy (Afrikaans, South Africa), Hottentosvy (Afrikaans, South Africa), Kaapsevy (Afrikaans, South Africa), highway ice plant (English, USA), ikhambi-lamabulawo (Zulu, South Africa), vyerank (Afrikaans, South Africa), figue marine (French), Hottentottenfeige (German), pigface (English, Australia), ghaukum (Afrikaans, South Africa), higo marino (Spanish), Cape fig (English, South Africa)

**Synonym** *Mesembryanthemum edule* , L.  
*Mesembryanthemum edulis*

**Similar species** *Carpobrotus chilensis*, *Carpobrotus acinaciformis*, *Carpobrotus affine acinaciformis*

**Summary** *Carpobrotus edulis* is a mat-forming succulent native to South Africa which is invasive primarily in coastal habitats in many parts of the world. It was often introduced as an ornamental plant or used for planting along roadsides, from which it has spread to become invasive. Its main impacts are smothering, reduced regeneration of native flora and changes to soil pH and nutrient regimes.



[view this species on IUCN Red List](#)

## Species Description

*Carpobrotus edulis* is a perennial, mat-forming herb. It is a "robust, flat-growing, trailing perennial, rooting at nodes and forming dense mats. The succulent horizontal stems curve upwards at the growing point. The leaves are succulent, crowded along the stem, 60–130 x 10–12mm, sharply 3-angled and triangular in cross-section with tiny serrations along the outermost angle, yellowish to grass green, and reddish when older. Flowers are solitary, 100–150mm in diameter, yellow, fading to pale pink, produced mainly during late winter-spring (August–October, in native range). This species is easily distinguished from congeners as it is the only one with yellow flowers. In addition, it has more extensive, although very small, serrations along the outer leaf angle. Fruit is fleshy, indehiscent and edible, 35mm in diameter, shaped like a spinning top, on a winged stalk, becoming yellow and fragrant when ripe. The outer wall of the fruit becomes yellowish, wrinkled and leathery with age. The seeds are embedded in the sticky, sweet, jelly-like mucilage. The fruits can be eaten fresh and they have a strong, astringent, salty, sour taste" (Malan and Notten, 2006). If they are not eaten they become very hard and dark reddish brown and decay slowly in place on the stems. IMEP (2001) describe the defining characteristics of *C. edulis* as: "long tapering leaves with equilateral or obtuse isosceles cross-sections, leaf margins and keel are more or less parallel up to the terminal point area, the centre of mats often die back, and sepals are pointy". *C. edulis* has a very dense fibrous root system concentrated in the upper 50cm of the soil, with new roots forming at each node as the plant spreads outward (D'Antonio and Mahall, 1991).

## Notes

In its native range, the flowers of *C. edulis* are pollinated by solitary bees, honey bees, carpenter bees and many beetle species. Fruits are eaten by baboons, rodents, porcupines, antelopes and people, who also disperse the seeds (Malan and Notten, 2006).

## Lifecycle Stages

*Carpobrotus edulis* produces a fleshy indehiscent fruit in early spring in California, USA, which remains on the plant until autumn when it is eaten by a variety of native mammals. Uneaten fruits remain on the plants for several years. Ungerminated seeds remain viable in the soil for at least two years (D'Antonio, 1990b). It flowers in April in the Balearic Islands (Universitat de las Illes Balears, undated), and between August and October in South Africa (Malen and Notten, 2006).

## Uses

*Carpobrotus edulis* is used for erosion control, as an ornamental or ground cover, for fruit and as a medicinal plant in folklore (GRIN, 2006).

## Habitat Description

In South Africa, *Carpobrotus edulis* is often seen as a pioneer in disturbed sites. It needs well-drained soil, a sunny position and room to spread. It is an excellent evergreen drought-, and wind-resistant groundcover that can be planted on flat, sandy ground, on loose sand dunes, gravelly gardens, lime-rich and brackish soils as well as in containers, rockeries, embankments and will cascade over terrace walls. *C. edulis* is not frost-hardy (Malan and Notten, 2006). In California, *C. edulis* depends upon disturbance to open up vegetative cover, but once it becomes established it is competitively superior to native grasses and will overtop them (D'Antonio, 1993). It can invade coastal dune, bluff, scrub, chaparral and coastal grassland habitat. In Australia it has been observed in coastal heathlands. Schmalzer and Hinkle (1987) observe that soil nitrogen levels limit *C. edulis* growth along highways in California.

## Reproduction

*Carpobrotus edulis* is slightly agamospermic, completely self-fertile, slightly preferentially self-compatible, and experiences no inbreeding depression (Vila *et al.* 1998; Suehs *et al.* 2004b).

"Active growth of *C. edulis* occurs primarily along the main axes, although lateral branches may also grow, particularly following death of the apical meristem of the main axis. An individual branch can elongate more than 1m in a year. Branches tend to grow over each other, resulting in the accumulation of up to 40cm of live and dead plant material. Stems exhibit vine like growth and can crawl over shrubs, fences and other obstacles. Rooting occurs at nodes in contact with the soil surface" (D'Antonio, 1990a). The plant is readily cloned by rooting stem fragments that contain at least one node.

## General Impacts

*Carpobrotus edulis* can form impenetrable mats up to 20cm wide and over 50cm deep, and will sometimes compete aggressively with native species (D'Antonio and Mahall 1991, D'Antonio, 1993; PIER, 2005). Once it becomes established, it shows a high vegetative reproductive rate, and its growth does not appear to be affected by herbivory or competition (D'Antonio 1993; Campelo *et al.* 1999). *C. edulis* can also decrease species diversity by preventing sand movement, which hinders the natural processes of disturbance and change in dune environments (Kim, undated). *C. edulis* reduces soil pH and influences nutrient dynamics (D'Antonio 1990a, D'Antonio and Mahall, 1991). *C. edulis* has been observed to invade new areas following fire events in California (Zedler and Scheid 1988; D'Antonio *et al.* 1993). *C. edulis* hybridises with its related species (native, naturalised and alien) in many parts of its introduced range (Chinnock, 1972; Vila and D'Antonio, 1998; Albert *et al.* 1997; Suehs *et al.* 2004a; Gallagher *et al.* 1997), which may intensify the invasion process (Suehs *et al.* 2004a) or impact on the integrity of native species.

## Management Info

**Preventative measures:** A [Risk Assessment of \*Carpobrotus edulis\*](#) for Hawaii and other Pacific islands was prepared by Dr. Curtis Daehler (UH Botany) with funding from the Kaulunani Urban Forestry Program and US Forest Service. The alien plant screening system is derived from Pheloung *et al.* (1999) with minor modifications for use in Pacific islands (Daehler *et al.* 2004). The result is a score of 9.5 and a recommendation of: \"Likely to cause significant ecological or economic harm in Hawaii and on other Pacific Islands as determined by a high WRA score, which is based on published sources describing species biology and behaviour in Hawaii and/or other parts of the world.\"

**Physical:** Manual methods appear to be the most effective means of controlling *C. edulis* at this stage. Albert (1996; in PIER, 2005) recommends: \"Hand-pull individual plants and remove any buried stems. Mulch to prevent re-establishment. Large mats can be removed by rolling them up like a carpet\". It is important to remove any *C. edulis* remains during eradication, as any remains left in place become a focus of regeneration, due to the large number of seeds which survive in the fruit for a long time (Fraga *et al.* 2006).

Another thing to keep in mind following removal of *C. edulis* is that secondary plant invaders can take advantage of opened areas, spreading rapidly and impeding restoration efforts in coastal dune habitats. *C. edulis* leaves behind a layer of debris of dead and decaying organic matter that accumulates under the plant. This tends to be left behind after *C. edulis* is removed. Within the debris are often the dormant seeds of invasive grasses, and these sprout after *C. edulis* is removed, benefiting from the accumulation of nutrients in the area that *C. edulis* has facilitated. To avoid this it may be best to selectively remove *C. edulis* to ensure that some is left behind to stabilise the soil and minimise sand movement into the area. Once the area has been restored to a more natural community, the remaining *C. edulis* can be removed and that area restored in turn (Kim, undated).

**Chemical:** PIER (2005) suggest the use of glyphosate herbicides. Schmalzer and Hinkle (1987) reported that there had been no comprehensive survey of herbicide effects on *C. edulis*. It is assumed that broad spectrum herbicides would kill *C. edulis* but they may also impact adjacent vegetation. Chlorflurenol, a morphactin, has been used to reduce growth of *C. edulis* along roadways (Hield and Hemstreet, 1974; in Schmalzer and Hinkle, 1987).

**Biological:** The options for biological control are currently limited, as the pathogens which attack *C. edulis* are not specific to it. *Verticillium* wilt can cause considerable damage (McCain *et al.* 1974), but using it could cause problems as it also attacks commercial crops (Schmalzer and Hinkle, 1987). Suehs *et al.* (2004b) state that a constraint on seed production or germination would be the most efficient way to control *C. edulis* on a long-term basis, if possible, due to its high success in these domains. Two introduced scale insects caused widespread mortality of *Carpobrotus edulis* plantings in California in the 1970s (Donaldson *et al.* 1978). As a result the California highway Department introduced natural enemies to control iceplant scale (Tassan *et al.* 1982). Nonetheless, scale insects have been observed to cause death of clones in California and could be more widely promoted in natural settings.

## Pathway

*Carpobrotus edulis* has been widely used for erosion control and has been planted along roadsides in California (GRIN, 2006).

## Principal source:

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

**Review:** Carla D'Antonio Professor Ecology, Evolution & Marine Biology University of California, Santa Barbara USA

**Publication date:** 2008-11-09

## ALIEN RANGE

[1] ALBANIA  
[2] AUSTRALIA  
[1] CHILE  
[5] FRANCE  
[1] GERMANY  
[1] GREECE  
[1] IRELAND  
[3] MALTA  
[5] NEW ZEALAND  
[4] PORTUGAL  
[13] SPAIN  
[1] UNITED KINGDOM

[1] ARGENTINA  
[1] BERMUDA  
[1] CROATIA  
[1] FRENCH POLYNESIA  
[1] GIBRALTAR  
[1] GUERNSEY  
[2] ITALY  
[1] MEXICO  
[1] PITCAIRN  
[1] SAINT HELENA  
[1] TUNISIA  
[8] UNITED STATES

**Red List assessed species 8: CR = 6; EN = 1; VU = 1;**

[Apium bermejoi](#) **CR**

[Armeria pseudarmeria](#) **EN**

[Cheirolophus crassifolius](#) **CR**

[Helichrysum melitense](#) **CR**

[Armeria berlengensis](#) **CR**

[Calendula maritima](#) **CR**

[Cremnophyton lanfrancoi](#) **CR**

[Rumex rupestris](#) **VU**

## BIBLIOGRAPHY

52 references found for *Carpobrotus edulis*

### Management information

Donaldson, D.R., Moore, W.S., Koehler, C.S. and Joos, J.L. 1978. Scales threaten iceplant in Bay Area. California agriculture. October. P. 4-7.

[European and Mediterranean Plant Protection Organization \(EPPO\), 2002. Reporting Service 2002, No. 7.](#)

**Summary:** Available from: <http://archives.eppo.org/EPPOReporting/2002/Rse-0207.doc> [Accessed 5 March 2008]

[European and Mediterranean Plant Protection Organization \(EPPO\), 2006. Guidelines for the management of invasive alien plants or potentially invasive alien plants which are intended for import or have been intentionally imported. EPPO Bulletin 36 \(3\), 417-418.](#)

[Fraga, P., Estau, L., Olives, J., Da Cunha, G., Alarcon, A., Cots, R., Juaneda, J. and Riudavets, X. 2006. Eradication of \*Carpobrotus\* \(L.\) N.E. Br. in Minorca.](#)

**Summary:** This paper reports on the eradication of *Carpobrotus edulis* from the majority of Minorca in the Balearic Islands.

Available from: [http://www.iucn.org/places/medoffice/invasive\\_species/case\\_studies/eradication\\_carpobrotus\\_minorca.pdf](http://www.iucn.org/places/medoffice/invasive_species/case_studies/eradication_carpobrotus_minorca.pdf) [Accessed 16 August 2006]

[Kim, A. Undated. Determining an effective buffer against reinvasion of restored sand dunes.](#)

**Summary:** This paper provides information and recommendations about the restoration of dune communities after the removal of *C. edulis*.

Available from: <http://socrates.berkeley.edu/~es196/projects/2002final/Kim.pdf> [Accessed 5 September 2006]

[Pacific Island Ecosystems at Risk \(PIER\). 2005. \*Carpobrotus edulis\* \(L.\) L.Bolus, Aizoaceae. PIER species lists.](#)

**Summary:** PIER provide general information about invasive species, this page details *Carpobrotus edulis*.

Available from: [http://www.hear.org/pier/species/carpobrotus\\_edulis.htm](http://www.hear.org/pier/species/carpobrotus_edulis.htm) [Accessed 6 September 2006]

[Schmalzer, P. and Hinkle, C. 1987. Species biology and potential for controlling four exotic plants \(\*Ammophila arenaria\*, \*Carpobrotus edulis\*, \*Cortaderia jubata\* and \*Gasoul crystallinum\* on Vandenberg Air Force Base, California. The Bionetics Corp., NASA.](#)

**Summary:** This paper provides an overview of the history of the spread of *C. edulis*, and outlines some of the management options.

Available from:

[http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19880008764\\_1988008764.pdf#search=%22schmalzer%20and%20hinkle%20carpobrotus%22](http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19880008764_1988008764.pdf#search=%22schmalzer%20and%20hinkle%20carpobrotus%22) [Accessed 6 September 2006]

[Suehs, C.M., Affre, L. and Medail, F. 2004b. Invasion dynamics of two alien \*Carpobrotus\* \(Aizoaceae\) taxa on a Mediterranean island: II. Reproductive strategies. \*Heredity\*. 92: 550-556.](#)

**Summary:** This paper discusses the reproductive strategies of two species of *Carpobrotus* in the Mediterranean region.

[Tassan, R.L., Hagen, K.S. and Cassidy, D.V. 1982. Imported natural enemies established against iceplant scales in California. California Agriculture 36: 16-17.](#)

**Summary:** This paper provides a brief history of the introduction of two hymenopteran wasps to control iceplant scale in California and describes early successes in the establishment of these wasps.

[The World Conservation Union \(IUCN\). 2005. Study on invasive plants in the Mediterranean Basin. IUCN, Centre for Mediterranean Cooperation, Conservatoire Botanique National Méditerranéen. September 2005.](#)

**Summary:** This paper outlines some of the problems which occur with invasive plants in the Mediterranean region.

Available from:

[http://www.iucn.org/places/medoffice/invasive\\_species/docs/study\\_invasive\\_plants.pdf#search=%22carpobrotus%20epo%22](http://www.iucn.org/places/medoffice/invasive_species/docs/study_invasive_plants.pdf#search=%22carpobrotus%20epo%22) [Accessed 6 September 2006]

[Varnham, K. 2006. Non-native species in UK Overseas Territories: a review. JNCC Report 372. Peterborough: United Kingdom.](#)

**Summary:** This database compiles information on alien species from British Overseas Territories.

Available from: <http://www.jncc.gov.uk/page-3660> [Accessed 10 November 2009]

### General information

Global Invasive Species Database (GISD) 2026. Species profile *Carpobrotus edulis*. Available from:

<https://www.iucngisd.org/gisd/species.php?sc=1010> [Accessed 31 January 2026]

Albert, M.E., D Antonio, C.M. and Schierenbeck, K.A. 1997. Hybridization and introgression in *Carpobrotus* spp. (Aizoaceae) in California. I. Morphological evidence. *American Journal of Botany*. 84 (7): 896-904.

**Summary:** This paper examines the morphological evidence for hybridisation between *C. edulis* and *C. chilensis* in California.

Atkinson, I.A.E. 1997. Problem weeds on New Zealand islands. *Science for Conservation*: 45. Department of Conservation, New Zealand.

**Summary:** This paper provides information on the problem weeds which occur on New Zealand's offshore islands.

Bourgeois, K., Suehs, C.M., Vidal, E. and Medail, F. 2005. Invasional meltdown potential: Facilitation between introduced plants and mammals on French Mediterranean islands. *Ecoscience*. 12 (2): 248-256.

**Summary:** This paper discusses the interaction between *Carpobrotus* spp. and introduced rats and rabbits on French Mediterranean islands.

Brandes, D. 2001. *Urban flora of Sousse (Tunisia)*.

**Summary:** This paper reports on the plant species which can be found in Sousse, Tunisia.

Available from:

[http://bib1p1.rz.tu-bs.de/docportal/servlets/MCRFileNodeServlet/DocPortal\\_derivate\\_00001189/Document.pdf;jsessionid=0000B4nj9XmHcyBllaYikYzWhRk?hosts=local](http://bib1p1.rz.tu-bs.de/docportal/servlets/MCRFileNodeServlet/DocPortal_derivate_00001189/Document.pdf;jsessionid=0000B4nj9XmHcyBllaYikYzWhRk?hosts=local) [Accessed 6 September 2006]

Campelo, F., Marchante, H. and Freitas, H. 1999. Ecology and population dynamics of the invasive exotic species *Carpobrotus edulis* in the Portuguese sandy coast. *Proceedings 5th International Conference on the Ecology of Invasive Alien Plants*. 13-16 October 1999. La Maddalena, Sardinia, Italy.

**Summary:** This abstract provides basic information on the invasion of *C. edulis* in Portugal.

Available from: [http://www.lboro.ac.uk/research/cens/invasives/5iceap\\_title.htm](http://www.lboro.ac.uk/research/cens/invasives/5iceap_title.htm) [Accessed 9 August 2006]

Campos, J.A., Herrera, M., Biurrun, I. and Loidi, J. 2004. The role of alien plants in the natural coastal vegetation in central-northern Spain. *Biodiversity and Conservation*. 13: 2275-2293.

**Summary:** This paper provides basic information about invasive plants in central-northern Spain.

Chinnoch, R.J. 1972. Natural hybrids between *Disphyma* and *Carpobrotus* (Aizoaceae) in New Zealand. *New Zealand Journal of Botany*. 10: 615-626.

**Summary:** This paper presents evidence for the hybridisation of *C. edulis* with the endemic *Disphyma australe* in New Zealand.

Available from: <http://www.rsnz.org/publish/nzjb/1972/42.pdf> [Accessed 11 August 2006]

Cronk, Q.C.B. 1989. The past and present vegetation of St Helena. *Journal of Biogeography*. 16 (1): 47-64.

**Summary:** This paper provides information on the flora of St Helena, including introduced plants.

D Antonio, C.M. 1990b. Seed production and dispersal in the non-native, invasive succulent *Carpobrotus edulis* (Aizoaceae) in coastal strand communities of Central California. *Journal of Applied Ecology*. 27 (2): 693-702.

**Summary:** This paper looks at the production and dispersal of the seed of *C. edulis* in California.

D Antonio, C.M. 1993. Mechanisms controlling invasion of coastal plant communities by the alien succulent *Carpobrotus edulis*. *Ecology*. 74 (1): 83-95.

**Summary:** This paper looks at the factors involved in the successful invasion of *C. edulis* in coastal plant communities in California.

D Antonio, C.M. and Mahall, B.E. 1991. Root profiles and competition between the invasive, exotic perennial, *Carpobrotus edulis*, and two native shrub species in California coastal scrub. *American Journal of Botany*. 78 (7): 885-894.

**Summary:** This paper discusses the mechanisms of competition between *C. edulis* and native shrubs in coastal scrub communities in California.

D Antonio, C.M., Odion, D.C. and Tyler, C.M. 1993. Invasion of maritime chaparral by the introduced succulent *Carpobrotus edulis*. The roles of fire and herbivory. *Oecologia*. 95: 14-21.

**Summary:** This paper discusses the relationship between the spread of *C. edulis* in maritime chaparral post-burning, and herbivory.

Di Tomaso, J.M. 2005. Don't plant a pest initiative. In: *Invasive plants in Mediterranean Type Regions of the World* (Ed. by S Brunel). Council of Europe publishing. Strasbourg. p. 345.

**Summary:** This short report provides suggestions for alternative plants to *C. edulis* which can be used in California.

Available from: [www.eppo.org/MEETINGS/2005\\_meetings/workshop\\_invasive/Declaration\\_Meze.pdf](http://www.eppo.org/MEETINGS/2005_meetings/workshop_invasive/Declaration_Meze.pdf) [Accessed 16 August 2006]

Draper, D., Rossello-Graell, A., Garcia, C., Tauleigne Gomes, C. and Sergio, C. 2003. Application of GIS in plant conservation programmes in Portugal. *Biological Conservation*. 113: 337-349.

**Summary:** This paper discusses the spread of *C. edulis* in Portugal.

D Antonio, C.M. 1990a. *Invasion of coastal plant communities by the introduced succulent, *Carpobrotus edulis* (Aizoaceae)*. PhD dissertation. University of California, Santa Barbara. 212p.

**Summary:** Most of the work in this dissertation is published in manuscripts listed below except for soil chemistry data which are otherwise unpublished.

Available from: <http://www.lib.umi.com/dissertations/> [Accessed 9 November 2006]

Fletcher, R. 2001. *Australian new crops: Listing of useful plants of the world*.

**Summary:** This website provides information on the uses of various plants from around the world.

Available from: <http://www.newcrops.uq.edu.au/listing/carpobrotusedulis.htm> [Accessed 21 August 2006]

Gallagher, K.G., Schierenbeck, K.A. and D Antonio, C.M. 1997. Hybridization and introgression in *Carpobrotus* spp. (Aizoaceae) in California. II. Allozyme evidence. *American Journal of Botany*. 84 (7): 905-911.

**Summary:** This paper discusses the hybridisation between *C. edulis* and *C. chilensis* in California.

Garzon, O., Castillo, J.M., Figueroa, M.E. 2006. Competition between the invasive species *Carpobrotus edulis* and the endemic species *Limonium emarginatum* in Gibraltar Strait. In: *Invasive plants in Mediterranean Type Regions of the World* (Ed. by S Brunel). Council of Europe publishing. Strasbourg. p. 345.

**Summary:** This short report details the interactions between *C. edulis* and *Limonium emarginatum* in Spain.

Available from: [www.eppo.org/MEETINGS/2005\\_meetings/workshop\\_invasive/Declaration\\_Meze.pdf](http://www.eppo.org/MEETINGS/2005_meetings/workshop_invasive/Declaration_Meze.pdf) [Accessed 16 August 2006]

Grossinger, R., Alexander, J., Cohen, A.N. and Collins, J.N. 1998. Introduced tidal marsh plants in the San Francisco Estuary. *Regional distribution and priorities for control*. San Francisco Estuary Institute.

**Summary:** This paper provides details on the introduced plant community of the San Francisco Estuary, which includes *C. edulis*.

Available from: [www.sfei.org/ecoatlas/Plants/docs/images/intrtmr.pdf](http://www.sfei.org/ecoatlas/Plants/docs/images/intrtmr.pdf) [Accessed 16 August 2006]

[Halvorson, W.L. 1992. Alien plants at Channel Islands National Park. Chapter 6 in: Stone, C.P., Smith, C.W. and Tunison, J.T. \(Eds\). Alien plant invasions in native ecosystems of Hawaii: Management and research.](#)

**Summary:** This paper gives information about the introduced species in California's Channel Islands National Park.

Available from: [http://www.botany.hawaii.edu/faculty/duffy/book/1992\\_chap/06.pdf](http://www.botany.hawaii.edu/faculty/duffy/book/1992_chap/06.pdf) [Accessed 16 August 2006]

[Lambrinos, J.G. 2000. The impact of the invasive alien grass \*Cortaderia jubata\* \(Lemoine\) Stapf on an endangered mediterranean-type shrubland in California. \*Diversity and Distributions\*. 6: 217-231.](#)

**Summary:** This paper primarily addresses the impact *Cortaderia jubata* has on a rare shrubland community in California.

[Ledda, L. and Brundu, G. 1999. Irrigation and exotic species in Sardinia \(Italy\). \*Proceedings 5th International Conference on the Ecology of Invasive Alien Plants\*. 13-16 October 1999. La Maddalena, Sardinia, Italy.](#)

**Summary:** This abstract reports on the impacts of *C. edulis* in Sardinia, Italy.

Available from: [http://www.lboro.ac.uk/research/cens/invasives/5iceap\\_title.htm](http://www.lboro.ac.uk/research/cens/invasives/5iceap_title.htm) [Accessed 9 August 2006]

[LIFE. 2004. Newsflash Life Unit - Directorate General Environment, European Commission. Newsletter, May 2004.](#)

[Malan, C. and Notten, A. 2006. \*Carpobrotus edulis\* \(L.\) L. Bolus.](#)

**Summary:** This website provides information about *C. edulis* in its native South Africa.

Available from: <http://www.plantzafrica.com/plantcd/carpobed.htm> [Accessed 11 August 2006]

[Mediterranean Institute of Ecology and Paleoecology \(IMEP\). 2001. \*Carpobrotus edulis\* and \*Carpobrotus acinaciformis\* - how to tell them apart in the field.](#)

**Summary:** This website provides information on distinguishing *C. edulis* from its congeners.

Available from: <http://science.ceh.ac.uk/epidemie/EPIDEMIE%20test/Project%20literature/Carpobrotus%20descriptions.htm> [Accessed 25 August 2006]

[Mullin, B.H., Anderson, L.W.J., Di Tomaso, J.M., Eplee, R.E. and Getsinger, K.D. 2000. Invasive plant species. Council for Agricultural Science and Technology \(CAST\) Issue Paper Number 13.](#)

**Summary:** This paper discusses major invasive weed species in the USA.

Available from: [http://www.cast-science.org/pdf/nnpl\\_ip.pdf](http://www.cast-science.org/pdf/nnpl_ip.pdf) [Accessed 16 August 2006]

[Stevens, D. & Lanfranco, E. 2006. \*Cheirolophus crassifolius\*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1](#)

**Summary:** Available from: <http://www.iucnredlist.org/apps/redlist/details/61621/0> [Accessed 1 March 2012]

[Suehs, C., Affre, L. and Medail, F. 1999. Ecological and genetic features of the invasion by the alien \*Carpobrotus\* \(Aizoaceae\) plants in Mediterranean island habitats. \*Proceedings 5th International Conference on the Ecology of Invasive Alien Plants\*. 13-16 October 1999. La Maddalena, Sardinia, Italy.](#)

**Summary:** This abstract provides basic information on the invasion of *C. edulis* in Mediterranean France and Corsica.

Available from: [http://www.lboro.ac.uk/research/cens/invasives/5iceap\\_title.htm](http://www.lboro.ac.uk/research/cens/invasives/5iceap_title.htm) [Accessed 9 August 2006]

[Suehs, C.M., Affre, L. and Medail, F. 2004a. Invasion dynamics of two alien \*Carpobrotus\* \(Aizoaceae\) taxa on a Mediterranean island: I. Genetic diversity and introgression. \*Heredity\*. 92: 31-40.](#)

**Summary:** This paper discusses the genetic diversity and introgression between two species of *Carpobrotus* in the Mediterranean region.

[Suehs, C.M., Charpentier, S., Affre, L. and Medail, F. 2006. The evolutionary potential of invasive \*Carpobrotus\* \(Aizoaceae\) taxa: are pollen-mediated gene flow potential and hybrid vigor levels connected? \*Evolutionary Ecology\*. 20: 447-463.](#)

**Summary:** This study examined the pollination and gamete production of *C. affine acinaciformis*, an introgressed derivative of *C. acinaciformis* and *C. edulis*.

[Tauleigne Gomes, C., Draper, D. and Rossell, A. 1999. Impacte of \*Carpobrotus edulis\* \(L.\) N.E. Br. on the autochthon vegetation of the protected area Reserva Natural das Berlengas \(Portugal\). \*Proceedings 5th International Conference on the Ecology of Invasive Alien Plants\*. 13-16 October 1999. La Maddalena, Sardinia, Italy.](#)

**Summary:** This abstract provides basic information on the invasion of *C. edulis* in the Reserva Natural das Berlengas in Portugal.

Available from: [http://www.lboro.ac.uk/research/cens/invasives/5iceap\\_title.htm](http://www.lboro.ac.uk/research/cens/invasives/5iceap_title.htm) [Accessed 9 August 2006]

[Universitat de les Illes Balears. Undated. Herbari virtual de les Illes Balears: \*Carpobrotus edulis\* \(L.\) L. Bolus.](#)

**Summary:** This website gives basic information about alien plants in the Balearic Islands.

Available from: <http://herbarivirtual.uib.es/eng/especie/5152.html> [Accessed 27 August 2006]

[USDA-ARS, National Genetic Resources Program. Germplasm Resources Information Network - \(GRIN\) 2006. National Germplasm Resources Laboratory, Beltsville, Maryland. Online database.](#)

**Summary:** The GRIN database provides basic taxonomic information about species.

Available from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?101172> [Accessed 07 August 2006]

[Vila, M. and D Antonio, C.M. 1998b. Fruit choice and seed dispersal of invasive vs noninvasive \*Carpobrotus\* \(Aizoaceae\) in coastal California. \*Ecology\*. 79 \(3\): 1053-1060.](#)

**Summary:** This paper discusses the preferences of mammalian herbivores for the fruits of *Carpobrotus* spp. in California.

[Vila, M. and D Antonio, C.M. 1998. Fitness of invasive \*Carpobrotus\* \(Aizoaceae\) hybrids in coastal California. \*Ecoscience\*. 5 \(2\): 191-199.](#)

**Summary:** This paper discusses the hybridisation between *C. edulis* and *C. chilensis* in California.

[Vila, M. and D Antonio, C.M. 1998c. Hybrid vigor for clonal growth in \*Carpobrotus\* in coastal California. \*Ecological Applications\* 8: 1196-1205.](#)

**Summary:** This paper presents results of an experiment outplanting cloned fragments of *Carpobrotus edulis*, *C. chilensis* and hybrids into three different coastal habitats.

[Vila, M., Weber, E. and D Antonio, C.M. 2000. Conservation implications of invasion by plant hybridisation. \*Biological Invasions\*. 2: 207-217.](#)

**Summary:** This paper discusses the implications of hybridisation of invasive species, including *C. edulis*.

[Vila, M., Weber, E., and D Antonio, C.M. 1998. Flowering and mating system in hybridizing \*Carpobrotus\* \(Aizoaceae\) in coastal California. \*Canadian J. Botany\* 76: 1165-1169.](#)

**Summary:** This paper presents results of experimental pollination and pollinator exclusion studies on *C. edulis*, *C. chilensis* and their hybrids in California.

Wallentinus, I. 2002. Introduced marine algae and vascular plants in European aquatic environments. In: Leppäkoski, E, Gollasch, S, Olenin, S eds., *Invasive Aquatic Species of Europe. Distribution, Impact and Management*, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp 27-52.

**Summary:** This appendix lists the marine algae and vascular plants which have been introduced to European waters, and gives their distributions.

Available from: [http://www.ku.lt/nemo/aqua\\_app\\_wallentinus.pdf](http://www.ku.lt/nemo/aqua_app_wallentinus.pdf) [Accessed 11 August 2006]

World Conservation Union (IUCN). 2006. *The top 50 Mediterranean island plants: *Apium bermejoi**. IUCN Species Survival Commission.

**Summary:** This paper presents an overview of the endangered plant *Apium bermejoi* from the Balearic Islands.

Available from: [http://www.iucn.org/themes/ssc/our\\_work/plants/Top50/English/pdfs/Apium\\_bermejoi.pdf](http://www.iucn.org/themes/ssc/our_work/plants/Top50/English/pdfs/Apium_bermejoi.pdf) [Accessed 21 August 2006]

Zedler, P.H. and Scheid, G.A. 1988. Invasion of *Carpobrotus edulis* and *Salix lasiolepis* after fire in a coastal chaparral site in Santa Barbara County, California. *Madrono*. 35 (3): 196-201.

**Summary:** This paper reports on the invasion of *C. edulis* following fire in California.