

*Undaria pinnatifida* [简体中文](#) [正體中文](#)

**System:** Marine

Kingdom	Phylum	Class	Order	Family
Plantae	Phaeophycophyta	Phaeophyceae	Laminariales	Alariaceae

<b>Common name</b>	miyeuk (Korean), wakame (Japanese), apron-ribbon vegetable (English), Japanese kelp (English), Asian kelp (English), qundaicai (Chinese), haijiecai (Chinese)
<b>Synonym</b>	<i>Alaria pinnatifida</i> , Harvey1860 <i>Ulopteryx pinnatifida</i> , (Harvey) Kjellman 1885
<b>Similar species</b>	<i>Alaria esculenta</i> , <i>Saccorhiza polyschides</i> , <i>Undaria undarioides</i> , <i>Undaria peterseniana</i> , <i>Ecklonia radiata</i>
<b>Summary</b>	The kelp ( <i>Undaria pinnatifida</i> ) is native to Japan where it is cultivated for human consumption. It is an opportunistic weed which spreads mainly by fouling ship hulls. It forms dense underwater forests, resulting in competition for light and space which may lead to the exclusion or displacement of native plant and animal species.



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

## Species Description

*Undaria pinnatifida* is a brown seaweed that can reach an overall length of 1-3 metres. It is an annual species with two separate life stages. The macroscopic stage (the sporophyte), usually present through the late winter to early summer months and a microscopic stage (the gametophyte), present during the colder months. The sporophyte is golden-brown in colour, with a lighter coloured stipe. It has a strap-like midrib full length of thallus, 1-3cm wide; edges of midrib expanded as thin membranous pinnatifid blade; pinnae 50-80cm long, blade dotted with white cryptostomata and dark gland cells, terminates well short of base; naked basal section of midrib forms stipe. As sporophytes mature two thickened fluted sporophylls develop, one along each edge of stipe, and bend laterally around stipe with folds becoming interleaved, always in two discrete pieces. The gametophyte is microscopic. The spiral sporophyll and the midrib are the key identification features.

## Lifecycle Stages

The life cycle of *U. pinnatifida* is complex. The macroscopic sporophytes grow during winter and release spores as summer approaches. These spores which are microscopic disperse and settle down to germinate into gametophytes, when conditions are favourable these gametophytes produce sperms and eggs which fertilise and grow into the plant i.e. the sporophyte. Temperature, light and depth are all important cues in development (NIMPIS, 2002).

## Uses

Overwhelmingly the main use of undaria is as human food. It is essentially a staple of the Japanese and Korean diets and is also widely consumed in Japan.

## Habitat Description

*Undaria pinnatifida* is described as an opportunistic seaweed able to rapidly colonise new or disturbed substrata and artificial floating structures. It occurs in dense, vigorous stands on benthic shores, forming thick canopy over the biota in a wide range of shores varying in exposure, from low tide level down to 15m in clear waters. *Undaria* inhabits cold temperate coastal areas and grows best in waters below 12° C. Sporophytes are reported to degrade at temperatures above 20° C and die at temperatures greater than 23° C. *Undaria pinnatifida* grows in a wide range of wave exposures from sheltered marinas to the open coast, and extends vertically from the low intertidal to 18m depth (although it is most common between 1 and 3m depth). It tolerates a wide range of irradiance from full sunlight to very low light levels, but is unlikely to invade areas with a high fresh water input.

*Undaria* can grow on any hard surface including artificial substrates such as rope, pylons, buoys, the hulls of vessels, bottles, floating pontoons and plastic. On natural substrates, *undaria* inhabits stable rocky reefs, mobile cobble habitats, mudstone, and in primarily soft sediment habitats attaches to hard surfaces such as shell. It can also grow on seagrass (while a small sporophyte), the shells of abalone and bivalves, invertebrates and epiphytically on other seaweeds (MFish, 2001).

## Reproduction

Asexual/sexual. Annual heteromorphic life cycle alternative between the diploid macroscopic sporophyte and the haploid microscopic gametophyte (NIMPIS, 2002).

## General Impacts

The impacts of *Undaria pinnatifida* are not well understood and are likely to vary considerably depending on the location. *Undaria* can change the structure of ecosystems, especially in areas where native seaweeds are absent (MFish, 2001).

NIMPIS, 2002 states that *U. pinnatifida* has the potential to become a problem for marine farms by increasing labour and harvesting costs due to fouling problems on fin fish cages, oyster racks, scallop bags and mussel ropes. Heavy fouling may also restrict water flow through cages.

The Department of Conservation in its brochure "Gorse of the Sea" state that *undaria* could foul mussel farms, salmon farms and boats. Heavy infestations of *undaria* may also clog marine farming machinery, slow growth of mussels and restrict water circulation. Heavy fouling of boats seriously decreases their efficiency.

## Management Info

Preventative measures: *Undaria* has a microscopic phase in its life cycle, and it is thought that eradication of this species is unlikely to succeed. The approach to *undaria* management would thus be to slow its spread and reduce the chances of it reaching new locations. In addition to natural dispersal the role of human mediated vectors; ballast water, attachment to hulls, marine equipment etc plays a major role in the spread of *undaria*. Vector management and awareness would go a long way in slowing its spread. In the long-term, it is hoped that eventually there could be systems to treat vessel hulls with UV light or high-pressure, heated water to kill harmful spores and bacteria quickly and efficiently (MPA NEWS, December 2004/ January 2005).

A two year study was undertaken for the Department of Environment and Heritage (Australia) by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to identify and rank introduced marine species found within Australian waters and those not found within Australian waters.

All of the non-native potential target species identified in this report are ranked as high, medium and low priority, based on their invasion potential and impact potential. A hazard ranking of potential domestic target species based on invasion potential from infected to uninfected bioregions identifies *Undaria pinnatifida* as a 'medium priority species' - these species have a reasonably high impact/or invasion potential.

For more details, please see [Hayes et al. 2005](#).

The rankings determined in Hayes et al. 2005 will be used by the National Introduced Marine Pest Coordinating Group in Australia to assist in the development of national control plans which could include options for control, eradication and/or long term management.

## Pathway

The accidental translocation of undaria through aquaculture and fisheries activities. The release of the species in ballast water discharged from vessels. Various types and life stages of species can be transported in ballast water. This vector can introduce species through a variety of means. Three examples are: (1) The spawning of a fouling species on a vessel in port (2) The dislodgement of fouling species from a vessel in port and (3) The sinking of fouled vessels either deliberate or accidental. The accidental release of undaria, imported for human consumption, it is a staple in the Japanese and Korean diets.

## Principal source:

**Compiler:** Dr. Marc Verlaque, CNRS Centre d'Océanologie de Marseille, France & IUCN/SSC Invasive Species Specialist Group (ISSG)

**Review:** Dr. Marc Verlaque, CNRS Centre d'Océanologie de Marseille, France.

**Publication date:** 2007-05-31

## ALIEN RANGE

[1] ATLANTIC - NORTHEAST

[1] AUSTRALIA

[1] ITALY

[1] MEDITERRANEAN & BLACK SEA

[1] PACIFIC - NORTHEAST

[2] UNITED STATES

[1] ATLANTIC - NORTHWEST

[1] FRANCE

[1] JERSEY

[6] NEW ZEALAND

[1] PACIFIC - SOUTHWEST

## BIBLIOGRAPHY

39 references found for *Undaria pinnatifida*

### Management information

Brown, M. T. and Lamare, M. D. 1994. The distribution of *Undaria pinnatifida* (Harvey) Suringar within Timaru harbour, New Zealand. Japanese Journal of Phycology 42: 63-70.

Castric Fey, A., Beupoil, C., Bouchain, J., Pradier, E. and L Hardy Halos, M. T. 1999. The introduced alga *Undaria pinnatifida* (Laminariales, Alariaceae) in the rocky shore ecosystem of the St Malo area: morphology and growth of the sporophyte. Botanica Marina 42: 71-82.

Castric Fey, A., Girard, A. and L Hardy Halos, M. T. 1993. The distribution of *Undaria pinnatifida* on the coast of the Saint Malo (Brittany, France). Botanica Marina 36: 351-358.

Cecere, E., Petrocelli, A. and Saracino, O. D. 2000. *Undaria pinnatifida* (Fucophyceae, Laminariales) spread in the central Mediterranean: its occurrence in the Mar Piccolo of Taranto (Ionian Sea, southern Italy). Cryptogamie, Algologie 21: 305-309.

Curiel, D., Guidetti, P., Bellemo, G., Scattolin, M., Marzocchi, M. 2002. The introduced alga *Undaria pinnatifida* (Laminariales, Alariaceae) in the Lagoon of Venice. Hydrobiologia. vol. 477, no. 1, pp. 209-219.

**Summary:** Study on undaria invasion in Venice, Italy.

Fletcher, R. L. and Farrell, P. 1999. Introduced brown algae in the North East Atlantic, with particular respect to *Undaria pinnatifida* (Harvey) Suringar. Helgolander Meeresuntersuchungen 52: 259-275.

Fletcher, R. L. and Manfredi, C. 1995. The occurrence of *Undaria pinnatifida* (Phaeophyceae, Laminariales) on the South Coast of England. Botanica Marina 38: 355-358.

Floc h, J. Y., Pajot, R. and Mouret, V. 1996. *Undaria pinnatifida* (Laminariales, Phaeophyta) 12 years after its introduction into the Atlantic Ocean. Hydrobiologia 326/327: 217-222.

Floc h, J. Y., Pajot, R. and Wallentinus, I. 1988. The Japanese brown alga *Undaria pinnatifida* on the coasts of France and the possibilities of its establishment in European waters. International Council Exploration Sea, CIES, Bergen 10 October 198. 16pp.

Forrest, B. 2000. A management strategy for the Asian kelp *Undaria*? Aliens 12.

Forrest, B. M., Brown, S. N., Taylor, M. D., Hurd, C. L. and Hay, C. H. 2000. The role of natural dispersal mechanisms in the spread of *Undaria pinnatifida* (Laminariales, Phaeophyceae). Phycologia 39: 547-553

**Summary:** Study of dispersal of *Undaria pinnatifida*.

Hay, C. H. 1990. The dispersal of sporophytes of *Undaria pinnatifida* by coastal shipping in New Zealand, and implications for further dispersal of *Undaria* in France. British Phycological Journal 25: 301-313.

Hay, C. H. and Luckens, P. A. 1987. The Asian kelp *Undaria pinnatifida* (Phaeophyta, Laminariales) found in a New Zealand harbour. New Zealand Journal Botany 25: 364-366.

[Hayes, K., Sliwa, C., Migus, S., McEnnulty, F., Dunstan, P. 2005. National priority pests: Part II Ranking of Australian marine pests. An independent report undertaken for the Department of Environment and Heritage by CSIRO Marine Research.](#)

**Summary:** This report is the final report of a two year study designed to identify and rank introduced marine species found within Australian waters (potential domestic target species) and those that are not found within Australian waters (potential international target species).

Available from: <http://www.marine.csiro.au/crimp/reports/PriorityPestsFinalreport.pdf> [Accessed 25 May 2005]

[Hewitt, C.L., Campbell, M.L. and Gollasch, S. 2006. Alien Species in Aquaculture. Considerations for responsible use. IUCN, Gland, Switzerland and Cambridge, UK. viii + 32 pp.](#)

**Summary:** This publication aims to first provide decision makers and managers with information on the existing international and regional regulations that address the use of alien species in aquaculture, either directly or indirectly; and three examples of national responses to this issue (New Zealand, Australia and Chile).

Available from: <http://data.iucn.org/dbtw-wpd/edocs/2006-036.pdf> [Accessed 22 September 2008]

[McEnnulty, F.R., Jones, T.E. and Bax, N.J. \(2001\). The Web-Based Rapid Response Toolbox](#)

**Summary:** Web publication: Date of release: June 2001, Date of access: 26/03/2004.

[Ministry of Fisheries 2001. Marine Biosecurity: Action Plan for Unwanted Species \*Undaria pinnatifida\*](#)

**Summary:** Available from: [http://biodiversity.govt.nz/pdfs/seas/undaria\\_action\\_plan\\_dec01.pdf](http://biodiversity.govt.nz/pdfs/seas/undaria_action_plan_dec01.pdf) [Accessed 9 July 2007]

[MPA NEWS: International News and Analysis on Marine Protected Areas. Vol. 6, No. 6 December 2004/ January 2005. Invasive Species: Their Threat to MPAs, and How Practitioners Are Responding.](#)

[National Introduced Marine Pest Information System \(NIMPIS\), 2002. \*Undaria pinnatifida\* species summary. National Introduced Marine Pest Information System \(Eds: Hewitt C.L., Martin R.B., Sliwa C., McEnnulty, F.R., Murphy, N.E., Jones T. & Cooper, S\).](#)

**Summary:** Description and other Species information. Web publication [Accessed: 3/25/2004].

Saito, Y. (1975). *Undaria*. IN: Advance of phycology in Japan, (Tokida, J., Hirose, H. Eds) Dr. W. Junk b.v., The Hague 304-320.

Sanderson, J. C. 1990. A preliminary survey of the distribution of the introduced macroalga, *Undaria pinnatifida* (Harvey) Suringar on the coast of Tasmania, Australia. *Botanica Marina* 33: 153-157.

Silva, P.C. Woodfield, R.A. Cohen, A.N. Harris, L.H. Goddard, J.H.R. 2002. First report of the Asian kelp *Undaria pinnatifida* in the northeastern Pacific Ocean. *Biological Invasions* vol. 4, no. 3, pp. 333-338.

**Summary:** Distribution of *undaria* in the Pacific.

Tasman District Council (TDC) 2001. Tasman-Nelson Regional Pest Management Strategy

[The Biosecurity Strategy for New Zealand, August, 2003](#)

[Undaria Brochure. Department of Conservation and Ministry of Fisheries, New Zealand.](#)

[Undaria kelp \*Undaria pinnatifida\* Part 1, Identification Guide, Department of Fisheries, New Zealand.](#)

[Undaria kelp \*Undaria pinnatifida\* Part 2, Identification Guide, Department of Fisheries, New Zealand.](#)

## General information

Boudouresque, Charles & Gerbal, Maryse & Knoepffler-Peguy, Michèle. (1985). L'algue japonaise *Undaria pinnatifida* (Phaeophyceae, Laminariales) en Méditerranée. *Phycologia*. 24. 364-366. 10.2216/i0031-8884-24-3-364.1.

Casas, G. N. and Piriz, M. L. 1996. Surveys of *Undaria pinnatifida* (Laminariales, Phaeophyta) in Golfo Nuevo, Argentina. *Hydrobiologia* 326/327: 213-215.

[Dept. of Fisheries. Introduced Marine Aquatic Invaders.](#)

**Summary:** Available from: <http://www.fish.wa.gov.au/hab/broc/marineinvader/marine11.html> [Accessed 24 September 2004]

[Guiry, M.D. & Nic Dhonncha, E., 2005. \*Undaria pinnatifida\* AlgaeBase version 3.0. World-wide electronic publication, National University of Ireland, Galway.](#)

**Summary:** AlgaeBase is a database of information on algae that includes terrestrial, marine and freshwater organisms.

[AlgaeBase](#) is available from: <http://www.algaebase.org>; *Undaria pinnatifida* information is available from:

[http://www.algaebase.org/speciesdetail.lasso?species\\_id=350&sk=0&from=results&-session=abv3:82D8C9F5076c500931kSpSC20074](http://www.algaebase.org/speciesdetail.lasso?species_id=350&sk=0&from=results&-session=abv3:82D8C9F5076c500931kSpSC20074) [Accessed 04 March 2005].

[JNCC Adviser To Government](#)

**Summary:** Available from: [http://www.jncc.gov.uk/marine/non\\_native/dns/d2\\_1\\_3\\_2.htm](http://www.jncc.gov.uk/marine/non_native/dns/d2_1_3_2.htm) [Accessed 24 September 2004]

Knoepffler-Péguy, M., Noailles, M. C., Boudouresque, C. F. and Abelard, C. 1990. Phytobenthos des Pyrénées Orientales: complément à l'inventaire, présence d'espèces non-indigènes (Sargassum et *Undaria*). *Bulletin Société Zoologique France* 115: 37-43.

Leliaert, F., Kerckhof, F. and Coppejans, E. 2000. Eerste waarnemingen van *Undaria pinnatifida* (Harvey) Suringar (Laminariales, phaeophyta) en de epifyt *Pterothamnion plumula* (Ellis) Nageli (Ceramiales, Rhodophyta) in Noord Frankrijk en België. *Dumortiera*.

Perez, R., Kaas, R. and Barbaroux, O. 1984. Culture expérimentale de l'algue *Undaria pinnatifida* sur les côtes de France. *Science et Pêche* 343: 15pp.

Perez, R., Lee, J. Y. and Juge, C. 1981. Observations sur la biologie de l'algue japonaise *Undaria pinnatifida* (harvey) Suringar introduite accidentellement dans l'étang de Thau. *Science et Pêche* 325: 12pp.

Rismondo, A., Volpe, S., Curiel, D. and Solazzi, A. 1993. Segnalazione di *Undaria pinnatifida* (Harvey) Suringar a Chioggia (Laguna Veneta). *Società Veneziana Scienze Naturali, Lavori* 18: 329-330.

Santiago Caamano, J., Duran Neira, C. and Acuna Castroviejo, R. 1990. Aparición de *Undaria pinnatifida* en las costas de Galicia (España). Un nuevo caso en la problemática de introducción de especies foráneas. *CIS Santiago de Compostela, Informes Tecnicos* 3.

[Sea Fishing and Aquaculture, Dept. of Primary Industries, Water and Environment](#)

**Summary:** Available from: <http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/ALIR-4Z56E6?open> [Accessed 24 September 2004]