Sargassum muticum 简体中文 正體中文

System: Marine

Kingdom	Phylum	Class	Order	Family
Plantae	Phaeophycophyta	Phaeophyceae	Fucales	Sargassaceae

Common name Japweed (English), Tama-hahaki-moku (Japanese), Japans bessenwier (Dutch), Wireweed (English), Japanischer Beerentang (German), sargasso (Spanish), sargasse (French), strangle weed (English), Japansk drivtang (English), sargassosn&#65533;rje (Swedish), Butbl&#65533;ret sargassotang (Danish)

Synonym *Sargassum kjellmanianum* , f. *muticus* Yendo

Similar species *Halidrys siliquosa, Cystoseira spp.*

Summary Sargassum muticum is a large brown seaweed that forms dense monospecific stands. It can accumulate high biomass and may quickly become a strong competitor for space and light. Dense Sargassum muticum stands may reduce light, decrease flow, increase sedimentation and reduce ambient nutrient concentrations available for native kelp species. Sargassum muticum has also become a major nuisance in recreational waters.

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Species Description
MarLIN (2003) states that, \"*Sargassum muticum* is a large brown seaweed (with a frond often over 1m long), the stem has regularly alternating branches with flattened oval blades and spherical gas bladders. It is highly distinctive and olive-brown in colour.\" Arenas *et al.* (2002) report that, \"The growth form of *S. muticum* is modular and approaches the structural complexity of terrestrial plants. A plant (genet) of *S. muticum* is attached to the substratum by a perennial holdfast that gives rise to a single stem. Every year, several apically extending main branches emerge from the stem and produce well-developed secondary branches, which in turn may give rise to higher-order branches.\"

Lifecycle Stages
Although *Sargassum muticum* is a perennial, its numerous fronds senesce in the early fall and only the basal holdfast portion over winters in an inactive state. In early spring each holdfast produces many fronds which can grow as tall as 3m or more. The fronds extend vertically into the water column because of the small pneumatocysts along the primary axis of each frond which make it positively buoyant. *S. Muticum* has Aulacaspis yasumatsui life cycle. Reproductive structures called receptacles are borne along the primary axes of the fronds and contain both oogonia and antheridia. After eggs are released from the oogonia they adhere to the external surface of the receptacle where they are fertilized. Fertilized embryos remain attached to the receptacle until they develop tiny, adhesive rhizoids, at which point they are released and recruit to the substratum in close proximity to the parent plant (Britton-Simmons, 2004).

Habitat Description
Arenas *et al.* (2002) report that, \"The species occupies mainly sheltered shores, where it often forms dense monospecific stands.\" Staehr *et al.* (2000) found that, \"*S. muticum* prefers hard substrate to settle and develop, and Wernberg-Møller *et al.* (1998) showed that the abundance of *S. muticum* in Limfjorden was significantly related to substrate composed by stones with a diameter larger than ca 10cm, whereas smaller stones, gravel and sand were unsuitable substrate for grown specimens.\"

Reproduction
Arenas *et al.* (2002) report that, \"The responses of *Sargassum muticum* to crowding are closely linked to the way this aggressive invader colonizes and occupies new habitat. It is self-fertile and has effective means of long-range dispersal, as drifting fragments become fertile while suspended. The embryos of *S. muticum*, however, are fast-sinking, multicellular propagules, which account for especially dense local colonization patterns. The growth form of *S. muticum* is similar to the phalanx strategy of terrestrial clonal plants, with a very compact structure of closely spaced ramets. It combines the fast growth of the ramets (main branches) with the persistence of the perennial basal part. The morphological plasticity of the species in the production of modules (main branches) and branch elongation reduces interference among neighbours, allowing plants to grow in locally dense populations with low mortality and diminishing the effects of density on reproduction. *S. muticum* also exhibits mechanisms to compensate for eventual canopy losses, further enabling rapid colonization, and consolidation and persistence of local populations, preventing invasion by other species.\"

General Impacts
Critchley *et al.* (1986) report numerous impacts caused by *Sargassum muticum*: \"1) Physical hindrance of small boats with outboard engines of up to 20h.p.; 2) Clogging of intake pipes, both of boats and industrial installations; 3) Floating mats of *Sargassum muticum* foul commercial fishing lines and nets (reports confirmed from Canadian and British sources); 4) Floating debris tends to be concentrated by buoyant fronds forming floating mats and creating an eyesore; 5) Large mats of weeds are eventually cast up on shores and cause problems when rotting, i.e. producing offensive smells on resort beaches; 6) Dense growths of *Sargassum muticum* on oyster beds, in British Columbia, made it difficult to see cultured oysters. It was also feared that the buoyant fronds of *Sargassum* attached to the oyster shells could carry them out of the culture area. The extensive development of *Sargassum* populations on French oyster beds may hinder the growth and harvesting of the shellfish; 7) Large dense stands of *Sargassum* may cause loss in amenity and recreational use of water areas, e.g. swimming, skiing, sail boarding, dinghy sailing and fishing; 8) The presence of dense Sargassum stands may affect species diversity of indigenous marine fauna and flora in intertidal pools and the shallow subtidal region.\"
Staehr *et al.* (2000) states that, \"Once established in a new area, *S. muticum* can accumulate high biomass and may therefore be a strong competitor for space and light. Experiments have indicated that successful settlement and initial development of germlings depend on the availability of cleared substrate with low or no competition from other algae. When first established, however, *S. muticum* may efficiently prevent settling and development of other algae due to high recruit densities and fast growth. Critchley *et al.* (1986) showed that the irradiance was reduced by 95% within the uppermost 5cm of a dense *S. muticum* surface canopy, thus preventing understory algae to develop and thrive.\"
Britton-Simmons (2004) states that, \"Dense *S. muticum* stands may reduce light, dampen flow, increase sedimentation and reduce ambient nutrient concentrations available for native kelp species. Because kelps are an important source of carbon in coastal food webs and the algal communities they are associated with provide habitat and food for a wide variety of marine animals, any negative effects of *S. muticum* on these communities may have broader consequences for this ecosystem.\"
Den-Hartog (1997) states that, \"*S. muticum* is able to replace the eelgrass beds in littoral pools with a mixed substratum of sand, gravel, stones and shell grit. In this way *S. muticum* restricts considerably the environment where eelgrass beds can maintain themselves as permanent communities.\"

Management Info
JNCC (2002) states that, \"Removing sargassum by hand is extremely time-consuming and needs to be repeated, probably indefinitely. Removal by trawling, cutting and suction has also been tried. Chemical methods using herbicide have been tried but failed due to lack of selectivity and the large doses needed. Small germlings can be consumed by molluscs and amphipods but this has no restrictive effect on *S. muticum*. Whatever method is used the alga always quickly regrows and effective methods for its permanent removal have not been found, although cutting and suction is the preferred method applied.\"
Nyberg and Wallentinus (2005) rank *Sargassum muticum* eight among 20 highest ranked introduced macroalgae in Europe. The authors study quantitatively ranked species traits which facilitate introduction and predominance using interval arithmetic to search for common patterns among 113 marine macroalgae introduced in Europe. From the abstract Nyberg and Wallentinus (2005) “Three main categories were used: dispersal, establishment and ecological impact. These were further subdivided into more specific categories, a total of 13. Introduced species were compared with the same number of native species randomized from the same families as the introduced. Invasive species (i.e. species having a negative ecological or economical impact) were also compared with non-invasive introductions, separately for the three algal groups. In many categories, as well as when adding all species, the introduced species ranked more hazardous than the native species and the invasive species ranked higher than the non-invasive ones. The ranking within the three main categories differed, reflecting different strategies between the species within the three algal groups. When all categories (excluding salinity and temperature) were summed, the top five risk species, all invasive, were, in descending order, *C. fragile* spp. *tomentosoides*, *Caulerpa taxifolia*, *Undaria pinnatifida*, *Asparagopsis armata* and *Grateloupia doryphora*, while *Sargassum muticum* ranked eight and *Caulerpa racemosa* ten. Fifteen of the twenty-six species listed as invasive were among the twenty highest ranked”.
Chemical: Critchley *et al.* (1986) also reports that, \"The effects of a wide range of herbicides on the growth of *S. muticum* have been tested and evaluated by Lewey (1976) and Lewey & Jones (1977). However, none of those compounds tested were found satisfactory for use, due to lack of selectivity, the large doses required, the period of time the herbicides need to be in contact with the alga and the problem of chemical application in the marine environment. The most effective herbicides of those tested were Diquat, Stomp, copper sulphate, sodium hypochlorite, K-lox and Nortron. However, all these compounds affected not only *S. muticum* but also other algae tested.\"
Biological: Critchley *et al.* (1986) tested a wide range of biological control agents, but found that they were ineffective. Most species that were studied for control would feed on *S. muticum* but preferred other species more. The authors state that, \"It was concluded that no marine herbivore was likely to restrict *S. muticum* distribution appreciably within southern England.\"

Pathway
S. muticum was introduced to Washington State in the early 20th century, probably with shipments of Japanese oysters that were imported for aquaculture beginning in 1902 (Britton-Simmons, 2004).

Principal source: Staehr *et al.* 2000. Invasion of *Sargassum muticum* in Limfjorden (Denmark) and its possible impact on the indigenous macroalgal community.

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

Review: Dr. Marit Ruge Bjaerke Section for Marine Biology and Limnology Department of Biology University of Oslo Norway

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ALIEN RANGE

[3] ATLANTIC - NORTHEAST **[1]** BELGIUM

[3] CANADA
[4] FRANCE
[1] GUERNSEY
[4] ITALY
[1] MEDITERRANEAN & BLACK SEA
[2] NETHERLANDS
[1] PORTUGAL
[2] SWEDEN
[7] UNITED STATES
[2] DENMARK
[1] GERMANY
[1] IRELAND
[1] JERSEY
[2] MEXICO
[7] NORWAY
[6] SPAIN
[14] UNITED KINGDOM

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Invasive species - Algae is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Algas [Accessed 30 July 2008]
Spanish:
La lista de especies del Sistema de informaci&#65533;n sobre especies invasoras de m&#65533;xico cuenta actualmente con informaci&#65533;n aceca de nombre cient&#65533;fico, familia, grupo y nombre com&#65533;n, as&#65533; como h&#65533;bitat, estado de la invasi&#65533;n en M&#65533;xico, rutas de introducci&#65533;n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p&#65533;gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci&#65533;n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci&#65533;n novedades, para conocer los cambios.
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