Azolla pinnata

System: Terrestrial

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Phylum</th>
<th>Class</th>
<th>Order</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plantae</td>
<td>Pteridophyta</td>
<td>Filicopsida</td>
<td>Hydropteridales</td>
<td>Azollaceae</td>
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</tbody>
</table>

Common name       mosquito fern (English), ferny azolla (English), water velvet (English)

Synonym

Similar species  Azolla

Summary
Azolla pinnata can spread rapidly, and has the ability to survive on moist soil in and around rivers, ditches, and ponds. It forms dense surface mats, which degrade water quality by reducing oxygen levels, and can interfere with boating, fishing and recreational activities.

Species Description

"Plants small, 1.5 - 2.5cm long, with a more or less straight main axis with pinnately arranged side branches, progressively longer towards the base, thus roughly triangular in shape, the basal branches themselves becoming pinnate and eventually fragmenting as the main axis decomposes to form new plants. Roots with fine lateral rootlets, having a feathery appearance in the water. Leaves minute, 1 -2mm long, overlapping in 2 ranks, upper lobe green, brown green or reddish, lower lobe translucent brown; minute, short, plae, +/- cylindrical unicellular hairs often present on the upper lobes. When fertile, round sporocarps 1 - 1.5mm wide can be seen on the under side at the bases of the side branches. The leaves often have a maroon-red tinge and the water can appear to be covered by red velvet from the distance. The upper surface of the leaves are totally water-repellant, and if completely submerged the plants quickly refloat with the right side up."

Uses
Azolla is useful as a "soybean plant in rice field", because it can assimilate atmospheric nitrogen gas owing to the nitrogen fixation by cyanobacteria (blue green alga) living in the cavities located at the lower side of upper (dorsal) lobes of leaf. (Duke)

Habitat Description
It has the ability to survive on moist soil in and around rivers, ditches, and ponds which may allow the plant to survive low water levels and periods of drought. (NC Aquatic Fact Sheet)
Reproduction
Generally it multiplies vegetatively, and by spores. In the right conditions A. pinnata can double its biomass in 5 to 10 days in the field. (Duke)

Nutrition
Azolla species can often grow on nitrogen poor water due to nitrogen fixing ability. However will grow very rapidly in high nitrogen habitats.

General Impacts
Azolla pinnata can spread very quickly forming dense vegetative masses on areas of still water. This in turn limits light available to other aquatic plants and oxygen used by other aquatic life. It forms dense mats that choke out other species. A. pinnata is on the US noxious weed list. In New Zealand has replaced a native floating fern, Azolla rubra, over most of northern New Zealand. Azolla lives in symbiosis with blue-green algae (cyanobacteria), taking advantage of their ability to fix nitrogen. It is sometimes introduced and used by farmers as a natural fertilizer for this reason.

Management Info
Chemical: Fact sheet on control of Azolla from Queensland, Australia, DNR.

Biological: There was some success in management of A. pinnata using weevils in South Africa although the study was aimed primarily at Azolla filiculoides.

Pathway
Possible introduced to New Guinea with cattle. Azolla lives in symbiosis with blue-green algae (cyanobacteria), taking advantage of their ability to fix nitrogen. It is sometimes introduced and used by farmers as a natural fertilizer for this reason. (PIER, 2003)

Principal source: Pacific Islands Ecosystems at Risk, (PIER)

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG)

Review:

Pubblication date: 2010-05-26

ALIEN RANGE
[1] NEW ZEALAND
[1] UNITED STATES

BIBLIOGRAPHY
32 references found for Azolla pinnata

Management information

Summary: Fact sheet


Summary: This report is the first stage in a three-stage development of a Border Control Programme for aquatic plants that have the potential to become ecological weeds in New Zealand.


Summary: This report is the second stage in the development of a Border Control Programme for aquatic plants that have the potential to become ecological weeds in New Zealand. Importers and traders in aquatic plants were surveyed to identify the plant species known or likely to be present in New Zealand. The Aquatic Plant Weed Risk Assessment Model was used to help assess the level of risk posed by these species. The report presents evidence of the various entry pathways and considers the impact that new invasive aquatic weed species may have on vulnerable native aquatic species and communities.


Summary: Discusses the use of land and freshwater snails as biological control agents against other snails and against aquatic weeds. Recommends snails not be used for biocontrol.


Summary: This paper uses Spartina species characteristics to predict which Spartina species will invade specific sites along the U.S. Pacific coast. Mean tidal ranges were then used to predict the extent of spatial spread of a Spartina sp. after colonization.

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.


McConnachie A.J.; M.P. Hill, and M.J. Byrne., 2004. Field assessment of a frond-feeding weevil, a successful biological control agent of red waterfern, Azolla filiculoides, in southern Africa Biological Control 29 326-331


PIER (Pacific Island Ecosystems at Risk), 2003. Azolla pinnata

Summary: Ecology, synonyms, common names, distributions (Pacific as well as global), management and impact information.


General information


Summary: A comprehensive summary and critical review of information on the biology of the bullfrog related to its ecology, status, culture and management. Literature through 1982 is included.

Global Invasive Species Database (GISD) 2015. Species profile Azolla pinnata.


Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to scientific names, family, and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php?Portalada), under the section Novedades for information on updates.


Summary: Spanish:
La lista de especies del Sistema de información sobre especies invasoras de México cuenta actualmente con información acerca de su nombre científico, familia, grupo y nombre común, así como información sobre el estado de la especie en México, la ruta de introducción y enlaces a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una línea directa a la p?gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php?Portalada), en la sección Novedades, para conocer los cambios.


Duke, J.A. Innovative Biological Technologies for Lesser Developed Countries.


Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.


Kay, S. and Hoyle, S. 2000. Aquatic Weed Fact Sheet - Azolla pinnata. NC State University


Summary: Native yellow-legged frogs, Rana boylii, were almost an order of magnitude less abundant in reaches where bullfrogs were well established. Competition from large overwintering bullfrog larvae significantly decreased survivorship and growth of native tadpoles.


Summary: A paper on the productivity of A. pinnata and of the effects of different environmental factors on its productivity.


Summary: Bibliographic review of biology, taxonomy, life history, anatomy, distribution, and impacts of zebra mussels, drawing from European literature. An annotated bibliography of European literature is included.


Summary: Series of chapters on the biology, ecology, and genetics of zebra mussels in North America, case histories of their impacts on public facilities, and methods developed for control.

Summary: Study on feeding strategies, population dynamics and adaption of coypus.
Zurek, S. E. Giant Reed (Arundo donax) factsheet. Invasive Alien Plant Species of Virginia, Virginia Native Plant Society.

Summary: Factsheet.