# GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Eichhornia crassipes***

***Eichhornia crassipes*** 简体中文 正體中文 **System:** Terrestrial

| Kingdom | Phylum | Class | Order | Family |
|---|---|---|---|---|
| Plantae | Magnoliophyta | Liliopsida | Liliales | Pontederiaceae |

**Common name** water hyacinth (English), wota haisin (English, Papua New Guinea), jacinthe d'eau (French), floating water hyacinth (English), bung el ralm (Palauan), bung el ralm (English, Palau), mbekambekairanga (Fijian), water orchid (English), wasserhyazinthe (German), jal khumbe (English, Fiji), jacinto-aquatico (Portuguese), lechuguilla (Spanish), jal kumbhi (Hindi, India), jacinto de agua (English, Puerto Rico), lila de agua (English, Dominican Repbulic), riri vai (English, Cook Islands), bekabe kairanga (English, Fiji), lirio acuatico (English), aguapé (Portuguese, Brazil)

**Synonym**
*Pontederia crassipes* , Mart. (basionym)
*Eichhornia speciosa* , Kunth
*Piaropus crassipes* , (Mart.) Raf.
*Heteranthera formosa*
*Piaropus mesomelas*

**Similar species** *Limnobium spongia*

**Summary** Originally from South America, Eichhornia crassipes is one of the worst aquatic weeds in the world. Its beautiful, large purple and violet flowers make it a popular ornamental plant for ponds. It is now found in more than 50 countries on five continents. Water hyacinth is a very fast growing plant, with populations known to double in as little as 12 days. Infestations of this weed block waterways, limiting boat traffic, swimming and fishing. Water hyacinth also prevents sunlight and oxygen from reaching the water column and submerged plants. Its shading and crowding of native aquatic plants dramatically reduces biological diversity in aquatic ecosystems.

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**Species Description**
*E. crassipes* is a free-floating aquatic macrophyte growing generally to 0.5m in height but to nearly 1 metre in height in some southeast Asian locations (Gopal 1987, in Batcher Undated). *E. Crassipes* may form dense floating mats. Its leaves are thick, waxy, rounded, and glossy and rise well above the water surface on stalks. They are broadly ovate to circular, 10-20cm in diameter, with gently incurved, often undulate sides. Leaf veins are dense, numerous, fine and longitudinal. Leaf stalks are bulbous and spongy. The stalk is erect, to 50cm long, and carries at the top a single spike of 8-15 showy flowers. The flowers have six petals, purplish blue or lavender to pinkish, the uppermost petal with a yellow, blue-bordered central splotch. Its roots are purplish black and feathery (Gopal 1987, in Batcher Undated).\r\n
*E. Crassipes* forms a shoot consisting of a branched, stoloniferous rhizome, 6cm in diameter and up to 30cm in length, with several short internodes. Each node bears a leaf and roots. Axillary buds, which can also form stolons, grow at an angle of 60 degrees from the rhizome and remain at that angle or bend upward in dense stands, or become horizontal in open stands. Plants on the edge of a mat form stolon buds while those in the middle may not. Stolons are purplish violet and extend up to 50cm or more in length and are highly variable in diameter (Gopal 1987, in Batcher Undated).\r\n
Leaves form as the axillary bud grows, rupturing a tubular leaf-like structure called a \"prophyll.\" As the internode between the first leaf and the prophyll elongates, roots are produced at the node bearing the primary leaf. Foliage leaves are formed after. Foliage leaves are petiolate with a glossy sheen, and are arranged spirally, appearing to be in a rosette. Each leaf consists of a petiole, isthmus (between petiole and blade) and blade. The petiole bears a large membranous stipule, which forms a sheath around the next younger leaf. Petioles are spongy and measure up to 5cm in diameter and 30-50cm in length (maximum 125cm). They may be elongated, swollen in the middle and tapering towards the blade or they may form a bulbous float (Gopal 1987, in Batcher Undated) containing air-filled lacunate tissue (Sculthorpe 1985, in Batcher Undated).\r\n
As much as 50% of a single water hyacinth’s biomass can be roots. Roots are adventitious and fibrous, 10-300cm in length. As many as 70 lateral roots percm give the roots a feathery appearance. They are dark violet to bluish or pinkish violet (though whitish if grown in total darkness) and contain soluble pigments, including anthocyanins that may protect the root from herbivory (Gopal 1987, in Batcher Undated).\r\n
Flowers are borne terminally on a lavender spike on an elongated peduncle and are subtended by two bracts. The lower bract has a distinct blade. Each spike has 4-25 flowers (maximum 35) with 8-15 being the most common. The perianth tube is 1.5-1.75cm long with a green base and pale top. Tepals are ovate to oblong, thin, lilac and up to 4cm long. The posterior tepal (labellum) has a central bright yellow diamond-shaped region surrounded by a deep blue border with bright red radiating lines. When young, this labellum has a green spot. There are six stamens (sometimes 5 or 7) having curved filaments with glandular hairs. Three are small and close to the perianth tube. Anthers are violet and measure 1.4-2.2mm long (Gopal 1987, in Batcher Undated). \r\n
The fruit is a thin-walled capsule enclosed in a relatively thick-walled hypanthium developed from the perianth tube. Mature seeds can number 450 per capsule, are 4 x 1mm, with an oval base and tapering apex. The coat has 12-15 longitudinal ridges (Gopal 1987, in Batcher Undated).

**Notes**
A useful resource on the spread, impact and control of water hyacinth is: *M.H. Julien, M.P. Hill, T.D. Center and Ding Jianquig (eds.). Biological and Integrated Control of Water Hyacinth Eichhornia crassipes (Proceedings PR102 2001)*.

**Uses**
There has been some use of *E. crassipes* for the removal of nutrients and heavy metals from sewage and sludge ponds (bioremediation) (Vietmeyer 1975, in Batcher Undated). In Kenya the experimental use of water hyacinth as an organic fertiliser and animal feed has been undertaken in places such as flower farms (The Nation Nairobi 2004). However there is some controversy as to the effect of the fertiliser on the soil due to its highly alkaline PH value (>9). \r\n
In China the weed was widely used as animal food from the 1950s to the 1970s. As at that time, the economy in rural areas was very depressed and there was great shortage of food for animals. It was also used for fertiliser in a few areas. Since the end of 1980s the use of water hyacinth has fallen greatly and its sole use now is for feeding ducks and as a test plant for the purification of polluted water (Jianqing *et al*. 2001).

**Habitat Description**
Water hyacinth now flourishes in all continents but Europe (Lindsey and Hirt 1999, in Williams Undated) where it does exist but doesn't flourish as a result of climatic conditions. *E. crassipes* grows in shallow temporary ponds, wetlands and marshes, sluggish flowing waters, lakes, reservoirs and rivers (Batcher Undated). Plants can tolerate extremes of water level fluctuation and seasonal variations in flow velocity, and extremes of nutrient availability, pH, temperature and toxic substances (Gopal 1987, in Batcher Undated).\r\n
Growth by water hyacinth is largely exuberated by nutrient rich waters, particularly those rich in nitrogen, phosphorus and potassium (FAO Undated). Originating from the tropical regions of South America, this weed exhibits frost sensitivity (Biosecurity New Zealand Undated) and does not tolerate brackish water (Holm *et al*. 1977). Salinity can limit or modify its distribution (for example, in the coastal lagoons of West Africa, where water hyacinth accumulates during the wet season and is reduced to saline regions during the dry season).

**Reproduction**
Water hyacinth reproduces both vegetatively and sexually (Penfound and Earle 1948, Gopal and Sharma 1981, in Langeland and Burks Undated.). The plant flowers year-round in mild climates, producing abundant amounts of long-lived seeds (Penfound and Earle 1948; Sculthorpe 1971; FAO Undated). However it has been reported that sexual reproduction is limited and although the plant flowers profusely few observers have seen seeds or seedlings in the field (Gopal 1987, in Batcher Undated). Maximum fruiting occurs in 90% humidity and at 22.5°C to 35°C (Gopal 1987, in Batcher Undated). Several species of bee pollinate the flowers and several researchers report a highlvel of self-compatibility (Batcher Undated). High light intensity and altering high and low temperatures (5°C to 40°C) favour germination (Batcher Undated).\r\n
Vegetative reproduction is more important. Water hyacinth grows and spreads rapidly under favourable temperature and nutrient conditions (Batcher Undated). Stolon buds develop that bear offshoots from axillary buds and stolons are readily distributed by water currents, winds and boat traffic.

**General Impacts**
*E. crassipes* is one of the world's worst weeds (Holm *et al*. 1977, in Room and Fernando 1992). People have spread it to most tropical and subtropical regions in the world where it forms thick mats that cover rice paddies, clog irrigation channels, impede navigation, halt fishing, sweep away buildings during floods and foster breeding by disease-transmitting mosquitoes (Carter 1950, Chow *et al*. 1955, Williams 1956, Kotalawala 1976, in Room and Fernando 1992). Doubling in biomass every 6 to 18 days, the exact time being dependent on location and time of year (Lindsey and Hirt 1999, in Williams Undated), this weed rapidly invades water-ways and has caused problems for people around the globe. Populations living along Lake Victoria in Africa have been negatively affected by the weed which clogged water ways, resulted in the closure of a hydroelectric plant at Jinga and increased cases of vector borne diseases (Williams Undated). In Papua New Guinea water hyacinth disrupted water transport by canoes, dinghies and larger vessels, obstructing people's access to schools, health centres, government services, food gardens, fishing grounds and local markets (Julien and Orapa 2001, in Plant Protection Services 2006). \r\n
Invasive plant theory predicts that a release from environmental constraints due to altered hydrology can often lead to a successful invasion (Galatowitsch *et al*. 1999, in Toft 2000). In other words: disrupted or modified environments that have been altered by humans pave the way for invasive species' establishment. Disruptions of wetland ecosystems involving irrigation canals, hydroelectric projects and construction of artificial lakes have made areas particularly susceptible to invasion by water hyacinth (Barret 1989, in Toft 2000). Dams are thought to have exuberated the effects of water hyacinth in the Sacramento/San Joaquin Delta in California, where the weed was present in 1947 but did not begin to hinder boat traffic until the 1980s (Toft 2000).\r\n
Environmental problems associated with the water hyacinth are exuberated in warm areas where the weed grows throughout the year and develops into dense large, free-floating, monospecific islands or mats which compete with other aquatic species for light, nutrients and oxygen (Gopal 1987, in Batcher Undated; FDEP Undated; Toft 2000). These mats shade out native submersed plant species and uproot native emergent species (FDEP Undated). They reduce dissolved oxygen levels and light, significantly altering ecosystems and plant and animal communities. Low oxygen levels harms native fish populations (FDEP Undated) and fish spawning areas may be reduced, as well as critical waterfowl habitat degraded (Schmitz *et al*. 1993, in Batcher Undated). Mats also deposit large amounts of organic matter which increases the organic content of sediments and greatly accelerates succession patterns, allowing emergent and riparian vegetation to colonise (Penfound and Earle 1948, Trivedy *et al*. 1978, Gopal 1987, Woods 1997, in Toft 2000).\r\n
*E. crassipes* has a detrimental impact on water use by humans. In drainage canals it reduces the flow, which can result in flooding and damage to canal banks and structures. In irrigation canals it impedes flow and clogs intakes of pumps used for irrigation. Water flow patterns have been disrupted in utility cooling reservoirs. Water hyacinth interferes with navigation of both recreational and commercial craft, negatively impacting fisherman, sports-fisherman, water-skiers and swimmers in recreational waters. Limitations on water use can reduce real estate values and tourism (Batcher Undated). Economic losses may be the result of attempts to control the weed. Manual removal of the weed in China alone cost an estimated 100 million RMB yuan (US$12m) each year but was neither economic nor effective (Jianqing *et al*. 2001).

**Management Info**
Control strategies must address both watershed management (to reduce nutrient supply) and direct weed control (eg: by introduction of biological control agents) (FAO Undated). Nutrient run-off into infestations should be minimised. Heavy nutrient loadings in water come from erosion of cultivated land, cattle yards, domestic and municipal sewerage outfalls and wastewater discharges from factories. This nutrient inflow can be reduced or prevented by treating water before discharging it into waterways (Burton 2005).
\r\nPreventative measures: A Risk assessment of *Eichhornia crassipes* for Australia and the Pacific was prepared by Pacific Island Ecosystems at Risk (PIER) using the Australian risk assessment system (Pheloung, 1995). The result is a score of 14 and a recommendation of: reject the plant for import (Australia) or species likely to be a pest (Pacific).
\r\nMechanical: Small infestations of *E. crassipes* can be controlled by pulling (Randall and Rice. Unpub., in Batcher Undated). Specially designed harvesting machines may also be utilised. Permanent drainage of the water body will control *E. crassipes* (Smith *et al*. 1984) but may not be appropriate if the area is environmentally valuable. \r\n
\r\nClick here for Information about chemical and biological control

**Pathway**
In the 1950s and 1960s, water hyacinth was distributed widely into almost all provinces in China for animal food. After artificial transplanting and mass rearing and breeding, water hyacinth was distributed to further areas in the 1970s (Jianqing *et al*. 2001).Water hyacinth has an attractive purple flower which has made it a favourite amongst ornamental pond and botanical garden enthusiasts. As a result humans have spread it widely and due to its fast growth rate it now flourishes in all continents but EuropeMost spread can be attributed to deliberate planting of water hyacinth in ponds or dams as an ornamental, or use in aquariums. Unwanted plant material is discarded into creeks, rivers and dams is a major mode of dispersal (Burton 2005).Water hyacinth has an attractive purple flower which has made it a favourite amongst ornamental pond and botanical garden enthusiasts. As a result humans have spread it widely and due to its fast growth rate it now flourishes in all continents but Europe (Lindsey and Hirt 1999, in Williams Undated).Seeds are translocated by machinery (Burton 2005).

**Principal source:**

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

**Review:**

**Pubblication date:** 2006-08-04

**ALIEN RANGE**

**[1]** AMERICAN SAMOA
**[1]** BAHAMAS
**[1]** BENIN
**[1]** BRAZIL
**[1]** BURKINA FASO
**[1]** CAMBODIA
**[1]** CAYMAN ISLANDS
**[7]** CHINA
**[1]** COLOMBIA
**[1]** CONGO, THE DEMOCRATIC REPUBLIC OF THE
**[1]** COSTA RICA
**[1]** CUBA
**[1]** ECUADOR
**[7]** AUSTRALIA
**[1]** BANGLADESH
**[1]** BERMUDA
**[1]** BRUNEI DARUSSALAM
**[1]** BURUNDI
**[1]** CAMEROON
**[1]** CHILE
**[1]** CHRISTMAS ISLAND
**[1]** CONGO
**[2]** COOK ISLANDS
**[1]** COTE D'IVOIRE
**[1]** DOMINICAN REPUBLIC
**[1]** EGYPT

**[1]** EQUATORIAL GUINEA
**[2]** FIJI
**[1]** GABON
**[1]** GUADELOUPE
**[1]** GUATEMALA
**[1]** GUINEA-BISSAU
**[1]** HONDURAS
**[1]** INDIA
**[1]** ISRAEL
**[1]** JAPAN
**[2]** KENYA
**[1]** LAO PEOPLE'S DEMOCRATIC REPUBLIC
**[1]** LIBERIA
**[1]** MALAWI
**[1]** MALDIVES
**[1]** MARTINIQUE
**[1]** MEXICO
**[1]** MOZAMBIQUE
**[1]** NAURU
**[1]** NEW ZEALAND
**[1]** NIGERIA
**[2]** NORTHERN MARIANA ISLANDS
**[1]** PANAMA
**[1]** PERU
**[1]** PORTUGAL
**[1]** REUNION
**[1]** RUSSIAN FEDERATION
**[1]** SAINT LUCIA
**[1]** SENEGAL
**[1]** SINGAPORE
**[1]** SOUTH AFRICA
**[1]** STATE OF PALESTINE
**[1]** SWAZILAND
**[1]** TAIWAN
**[1]** THAILAND
**[2]** UGANDA
**[1]** UNITED STATES MINOR OUTLYING ISLANDS
**[1]** VENEZUELA
**[2]** VIRGIN ISLANDS, BRITISH
**[2]** ZIMBABWE
**[1]** ETHIOPIA
**[4]** FRENCH POLYNESIA
**[1]** GHANA
**[1]** GUAM
**[1]** GUINEA
**[1]** HAITI
**[1]** HONG KONG
**[2]** INDONESIA
**[1]** JAMAICA
**[1]** JORDAN
**[1]** LAKE VICTORIA
**[1]** LEBANON
**[1]** MADAGASCAR
**[1]** MALAYSIA
**[2]** MARSHALL ISLANDS
**[1]** MAURITIUS
**[4]** MICRONESIA, FEDERATED STATES OF
**[1]** MYANMAR
**[1]** NEW CALEDONIA
**[1]** NICARAGUA
**[1]** NORFOLK ISLAND
**[3]** PALAU
**[1]** PAPUA NEW GUINEA
**[1]** PHILIPPINES
**[1]** PUERTO RICO
**[1]** RIVER NILE
**[1]** RWANDA
**[1]** SAMOA
**[1]** SIERRA LEONE
**[1]** SOLOMON ISLANDS
**[1]** SRI LANKA
**[1]** SUDAN
**[1]** SYRIAN ARAB REPUBLIC
**[2]** TANZANIA, UNITED REPUBLIC OF
**[1]** TOGO
**[30]** UNITED STATES
**[1]** VANUATU
**[1]** VIET NAM
**[1]** ZAMBIA

**Red List assessed species 21: EX = 1; CR = 4; EN = 3; VU = 5; NT = 4; LC = 4;**

Allotoca diazi **CR**
Aythya nyroca **NT**
Chloropeta gracilirostris **VU**
Cyprinus intha **EN**
Haliaeetus leucoryphus **VU**
Mutela franci **VU**
Oxyura maccoa **NT**
Puntius compressiformis **CR**
Rynchops albicollis **VU**
Tachybaptus pelzelnii **VU**
Villorita cyprinoides **LC**
Aythya innotata **CR**
Biomphalaria tchadiensis **EN**
Citharidium ansorgii **LC**
Dendrocygna bicolor **LC**
Microrasbora rubescens **EN**
Ottelia scabra **NT**
Pollimyrus petricolus **LC**
Rhodonessa caryophyllacea **CR**
Steatocranus irvinei **NT**
Tachybaptus rufolavatus **EX**

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**Summary:** Contains names, description, diagnostic characteristics, pest weed status, references and a stewardship summary that includes information on habitat, ecology, biology, impacts, management, monitoring, research.

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**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.
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The Guidebook is available from: http://legacy.sfei.org/nis/index.html
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