

**EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION  
ORGANISATION EUROPEENNE ET MEDITERRANEEENNE  
POUR LA PROTECTION DES PLANTES**

**07-13375  
P IAS Point 9.1**

### **Report of a Pest Risk Analysis**

This summary presents the main features of a pest risk analysis which has been conducted on the pest, according to EPPO Decision support scheme for quarantine pests.

**Pest:** *Cabomba caroliniana* Gray.  
**PRA area:** EPPO region  
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EPPO Secretariat  
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### **STAGE 1: INITIATION**

**Reason for doing PRA:** Found in the Netherlands, with an invasive behaviour.

The plant is also recorded in England, Hungary, Belgium, but is not widespread and although it is naturalized there, it is not known as spreading or being invasive.

**Taxonomic position of pest:** Plantae - Cabombaceae

### **STAGE 2: PEST RISK ASSESSMENT**

#### **Probability of introduction**

##### *Entry*

Geographical distribution: **EPPO Region:** Belgium, Hungary, the Netherlands, the United Kingdom (introduced into England).

**Asia:** China, India, Malaysia, Japan.

**Oceania:** Australia (New South Wales, Northern Territory (Invasive), Queensland (Invasive), Victoria) New Caledonia, New Guinea.

**North America** (native except in the North-East and in the West): USA (Alabama, Arkansas, California (invasive non-native), Connecticut (invasive non-native), Delaware, District of Columbia, Georgia, Florida, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts (invasive non-native), Michigan (invasive non-native), Missouri, New Hampshire (invasive non-native), New Jersey (invasive non-native), New York (invasive non-native), North Carolina, Oklahoma, Ohio (invasive non-native), Oregon (invasive non-native), Pennsylvania (invasive non-native), Rhode Island (invasive non-native), South Carolina, Tennessee, Texas,

Vermont, Virginia, Washington (invasive non-native)), Canada (Ontario(invasive non-native)).

**Southern America** (native): southern Brazil (Mato Grosso, Rio Grande do Sul, Sao Paulo), northeast Argentina (Buenos Aires, Cordoba, Corrientes, Entre Rios, Rio Negro, Santa Fe), Paraguay (Central, Paraguari), Uruguay.

Note: The plant is present in New Zealand and has been traded for over 30 years, but has not naturalized.

Major host plants or habitats

*C. caroliniana* grows in the mud of slow flowing or stagnant freshwaters. It grows in streams, small rivers, ponds, lakes, reservoirs, sloughs, ditches and canals.

Which pathway(s) is the pest likely to be introduced on:

In Europe, the plant is imported as an aquarium plant. The main pathway for spread from the intended habitat (aquaria) to the unintended habitat (aquatic habitats) is unintentional release by man (dumping of aquarium) or misuse of the plant in exterior (as a pond plant).

*Establishment*

Plants or habitats at risk in the PRA area:

Aquatic habitats: streams, small rivers, ponds, lakes, reservoirs, sloughs, ditches and canals.  
Freshwater ecosystems may be vulnerable and protected.

Climatic similarity of present distribution with PRA area (or parts thereof):

As it has spread in the US and in Canada, it has shown its ability to thrive well outside the range of the warm, humid climates it is said to prefer in the literature, to areas with “rain throughout the year and an average temperature of 15-18°C” (Mackey & Swarbrick, 1997; Wilson, 2001). It can survive when the surface of the water body is frozen.

The areas the most at risk are the freshwater ecosystems of the Mediterranean Basin:

Algeria, France, Greece, Italy, Jordan, Morocco, Portugal, Spain, Tunisia, Turkey, Ukraine (Coast).

The plant is still absent from the Mediterranean area while it is present in other EPPO countries. This may be explained because aquariophily may be less developed in Mediterranean countries.

Aquatic ecosystems of the Western and Central Europe (see in Appendix 1 Climex climate match with Portland (USA) and Ottawa (Canada) are also at risk in:

Albania, Algeria, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Germany, Hungary, Israel, Montenegro, Moldova, The Netherlands, Northern Ireland, Poland, Republic of Macedonia, Romania, Serbia, Slovakia, Slovenia and Switzerland. The Panel estimates that the plant may not grow in the United Kingdom because summers are not long enough.

The level of uncertainty is medium to high and The interpretation of the Climex maps have to be used with care since the species is a submerged aquatic plant.

Aspects of the pest's biology that would favour establishment

*C. caroliniana* grows quickly and produces a large amount of plant material. It spreads via rhizomes or from vegetative reproduction by stem fragments. A detached piece of the plant can regenerate into a full plant as long as it has at least one pair of leaves, and pieces as short as 10 mm may be viable. In late summer, *C. caroliniana* stems become brittle, and plants tend to break apart, creating opportunities for spread. According to Wilson *et al.* (2001), in colder climates the terminal ends that remain attached to the stem overwinter under snow and ice.

In the Netherlands, patches of *C. caroliniana* have shown to out-compete the exotic plant *Myriophyllum heterophyllum*, which covers several kilometres of canal and has been managed by the local Water Board.

Characteristics (other than climatic) of the PRA area that would favour establishment:

Establishment is unlikely to be prevented by competition or natural enemies. Existing practices of mechanical waterway maintenance tend to cut off plants and spread the fragments. These fragments root easily and form new plants, enabling new stands to establish.

Which part of the PRA area is the endangered area:

Slow flowing or standing fresh water bodies in western, central and southern Europe.

## POTENTIAL ECONOMIC CONSEQUENCES

**How much economic impact does the pest have in its present distribution:**

*C. caroliniana* is a highly competitive, densely growing and persistent plant. Upon introduction into a new water body it progressively colonizes near shore areas, where it intercepts sunlight to the exclusion of other submerged plants, crowds out native plants, clogs waterways, disrupting natural flow and hindering recreational activities such as fishing and boating. In Australia, the weed can smother native submerged plants such as pondweeds (*Potamogeton spp.*), stoneworts (*Chara spp.*), hornwort (*Ceratophyllum demersum*), and water nymph (*Najas tenuifolia*) (Mackey and Swarbrick, 1997). It may also reduce germination of desirable native emergent plants. It is likely that infestations of *C. caroliniana* affect light level in the water column, shading out other submerge plants (Wilson, 2001). In relatively shallow lakes and ponds, fanwort can colonize the entire water body. When dense mats of *C. caroliniana* decay, the available oxygen in the water may be depleted and cause foul-smelling water. The resulting low oxygen conditions can lead to fish kills and harm other aquatic organisms (Commonwealth of Massachusetts). In Northern Queensland, native animals' numbers such as platypus and water rat are lower in infested creeks (Australian Department of the Environment and Heritage, 2003).

On the other hand, according to Champion *et al.* (2004), the plant is present in New-Zealand and has been traded for over 30 years, but has not naturalized and experimental studies showed that *C. caroliniana* had no significant impact on either native or other introduced plants under experimental conditions.

In the PRA area, the plant has been sold for many years as an aquarium plant in the EPPO region and has not been widely found in the wild. When it is found in the wild, it is naturalized but not considered invasive (Belgium, England, Hungary). The plant is only considered invasive near Loosdrecht in the Netherlands and smothers native vegetation (T Rooeteveel, pers. com., 2007).

**Describe damage to potential hosts in PRA area:**

**How much economic impact would the pest have in the PRA area:** Costs of management in natural and protected environments may exist, as well as in canals. The plant could have a negative impact on other aquatic plants and on the structure of aquatic ecosystems. In the Netherlands (Loosdrecht), the plant smothered native vegetation and completely clogged the canal so that boating, fishing and swimming became impossible. Management action for one site invaded and for one year cost 350,000 and reduced the infestation by 75% (T Rotteveel, pers. com., 2007).

However, the plant has been sold for many years as an aquarium plant in the EPPO region and has not been widely found in the wild. When it is found in the wild, it is naturalized but not considered invasive (other sites in the Netherlands, Hungary, and England). American and Australian ecosystems are considered moreover more vulnerable than European and Mediterranean ones, although aquatic ecosystems are among the most fragile.

## CONCLUSIONS OF PEST RISK ASSESSMENT

**Summarize the major factors that influence the acceptability of the risk from this pest:**

**Estimate the probability of entry:** **Medium**

The plant has already entered the PRA area. The only pathway is the trade of *C. caroliniana* as an aquarium plant, its accidental release in nature or misuse as a pond plant.

**Estimate the probability of establishment:** **Low to medium**

The plant entered but disappeared from Scotland (Ton Rooeteveel, pers. com.) and England (Preston *et al.*, 2002) and even if present in England since 1969, it did not

spread or become invasive there, nor in Belgium or Hungary.

The Mediterranean area would be the most at risk. Experimental studies have shown that it did not naturalize in New-Zealand and is not a threat while natural ecosystems there are supposed to be more fragile than the European and Mediterranean ones.

One hypothesis is that it has maybe not yet expressed its potential invasiveness in the EPPO region. It could also be a successful integration of an exotic plant in European and Mediterranean ecosystems.

**Estimate the potential economic impact:**

- colonization of ditches, clogging of canals and swimming, boating and fishing: moderately likely
- threat to natural ecosystems: moderately likely
- Dense infestations can degrade aesthetic and scenic quality, directly influencing tourism and real estate values: unlikely

**Degree of uncertainty**

Degradation of water supply: unlikely

The following uncertainties have been identified :

- reasons for invasiveness in only one site over three in the Netherlands. Hypothesis are differences in genotypes on the 3 sites, differences in chemical water quality, *Cabomba* being possibly sensitive to CO2 levels in water, and the higher amount of nutrient load.
- The reason why the plant is not recorded in Mediterranean countries which are countries supposed to be the most at risk. May this be explained with aquariophiles hobbies which may be less developed in the Mediterranean area? It is in fact mainly traded in anglo-saxon websites.

**OVERALL CONCLUSIONS**

The plant would really represent a threat if released in huge quantities in the wild.

As it is an aquarium plant, releases in the wild are just accidents, but they have proven to happen.

The plant may have the potential to establish and to be a threat in the Mediterranean area.

**STAGE 3: PEST RISK MANAGEMENT**

**IDENTIFICATION OF THE PATHWAYS**

**Pathways studied in the pest risk management** Unintentional release in the wild: escape from aquaria dumping or misuse in exterior (while it is intended for aquarium use):

- Other pathways identified but not studied**
- Contaminant of other ordered aquatic plants (unlikely, information missing)
  - Intentional plantings in the wild by the trade to multiply for retail sale (national pathway)

- Natural spread of the plant as it reproduces vegetatively (national pathway not considered)

## IDENTIFICATION OF POSSIBLE MEASURES

### Trade of the species as an aquarium plant

#### Possible measures for pathways

Measures related to consignments:

High level of protection: Prohibition of the introduction, trade, transport and possession of the plant.

Measures related to the crop or to places of production: Not relevant.

#### Other possible measures

- Lower level of protection: prohibition of planting or cause to grow the plant in the wild (national measure).
- eradication and monitoring/surveillance in the countries where it is invasive (the Netherlands), surveillance in the countries where it occurs but is not invasive (England, Belgium, Hungary) and surveillance of wet ecosystems in the countries the most at risk where it is absent (Mediterranean countries).
- Publicity: International Organization(s) of aquariophilists and aquatic plants producers shall be informed of the problem and work should be undertaken with them on codes of conduct to use appropriately these plants, to avoid their release in the wild, and inform consumers.

## EVALUATION OF THE MEASURES IDENTIFIED IN RELATION TO THE RISKS PRESENTED BY THE PATHWAYS

#### Degree of uncertainty

There is an uncertainty on the applicability of the higher level of protection, which would not be easily understood by aquarium plants producers and users, considering that *C. caroliniana* is a very popular and a widely traded aquarium plant.

Partnership and dialogue with these professions may prove more efficient.

## CONCLUSION:

### Recommendation for possible measures (type presentation):

Plants of <i>Cabomba caroliniana</i> traded for aquarium purposes	Prohibition of entry, trade, possession and transport ( <u>only if the high level of protection is chosen</u> ).
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## Annexe 1

### *Cabomba caroliniana* climatic prediction

Document prepared by the EPPO Secretariat

The CLIMEX model is a computer programme aiming at predicting the potential geographical distribution of an organism considering its climatic requirements. It is based on the hypothesis that climate is an essential factor for the establishment of a species in a country.

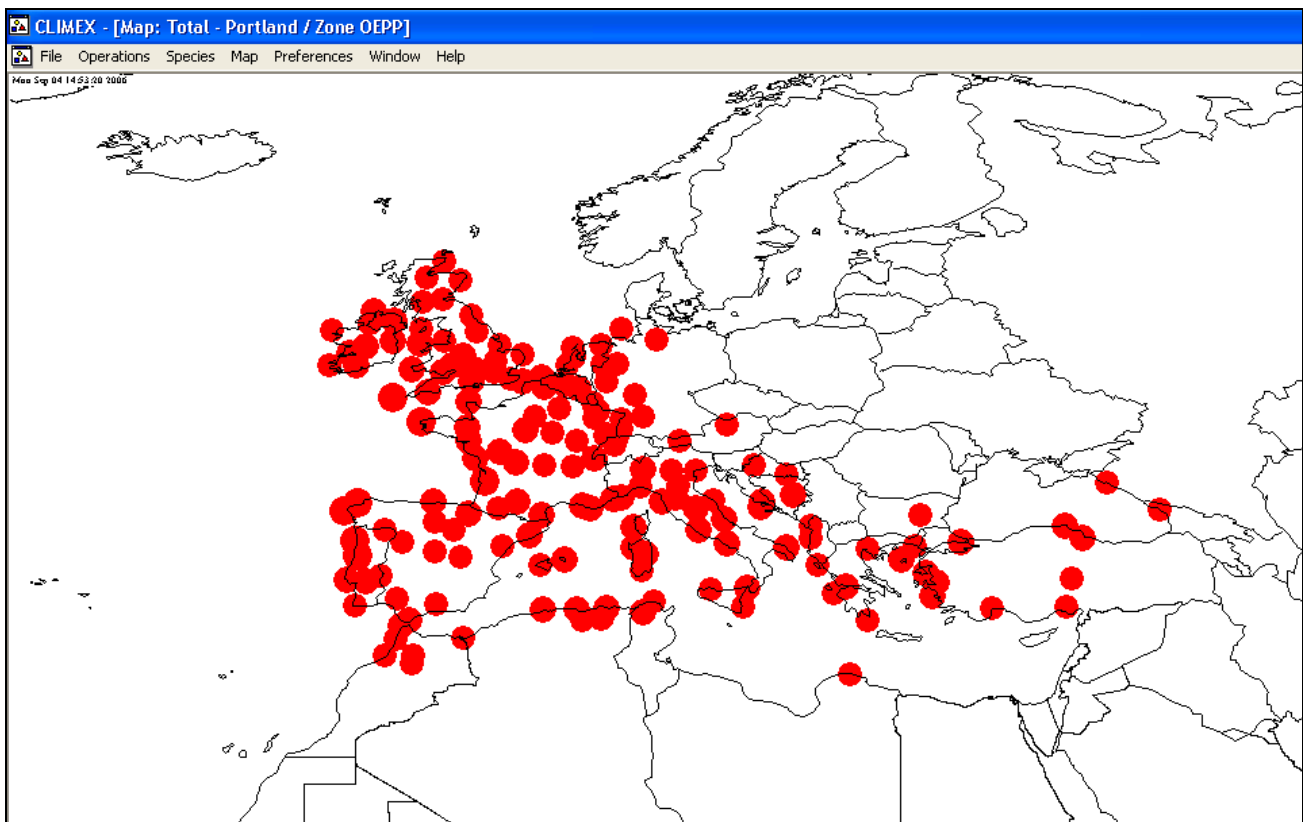
CLIMEX provides tools for predicting and mapping the potential distribution of an organism based on:

- (a) climatic similarities between areas where the organism occurs and the areas under investigation (Match Index),
- (b) a combination of the climate in the area where the organism occurs and the organism's climatic responses, obtained either by practical experimentation and research or through iterative use of CLIMEX (Ecoclimatic Index).

Only match Climate studies have been undertaken for this plant. Being an aquatic plant, a climatic prediction is quite difficult to perform.

#### Match Climate with Portland

*Cabomba caroliniana* is recorded in Longview, in Washington State (USA). Portland is a close place to Longview. This is the only place where the plant is recorded in Washington, but it is considered a problematic aquatic plant there.





## Match climate with Ottawa

In Canada, the plant is present in Kasshabog Lake, in the Kawartha Lakes of southern Ontario and has spread since the record of 2001. This appears to be the most northern site colonized by *C. caroliniana* to date in North America, and possibly in the world (exact localisation in Japan is unknown) (Wilson *et al.*, 2001). It has been reported from several bays in Kasshabog Lake (occupying approximately 16% of the lake's surface area), and has also spread south of Kasshabog Lake, down the North River into South Lake (about 8 km) and south out of South Lake and into Big Bass Bay (about 3 km). It spreads by fragments that are carried on the currents down the river. It grows in very dense monocultures where it occurs, and has been shown to replace native species.

Ottawa is a close location of Kasshabog Lake.

