

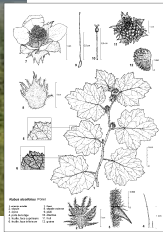
Biological control of *Rubus alceifolius* (Rosaceae) in La Réunion Island (Indian Ocean): from investigations of the plant to the release of the bio-control agent, *Cibdela janthina* (Argidae)

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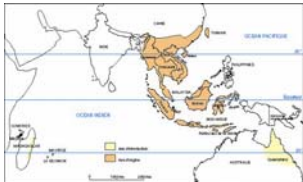
Invasion by *R. alceifolius*
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The giant bramble (*Rubus alceifolius* Poir., Rosaceae), introduced at La Réunion Island by 1850, soon became invasive. Towards the end of the twentieth century it was considered one of the most threatening plant of the island. It invades forest gaps, secondary forests, field crop borders, tracks, road and river sides, etc. from sea level up to 1700 m of elevation. To date, mechanical and/or chemical control, are not sustainable because of small surface areas concerned, ecotoxicological impact and financial cost (2 million € per year). In 1997, a ten year research programme was launched with the aim of developing a biological control against this weed.

Botanical plate of *R. alceifolius*
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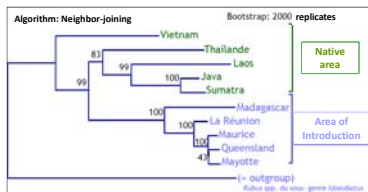
World distribution and genetic analysis



- ▶ Native to South-east Asia, (China, Vietnam, Laos, Thailand, Indonesia)
- ▶ Introduced in La Réunion, Madagascar, Comores, Mauritius and Australia (Queensland).

World distribution map of the giant bramble
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- ▶ ALFP studies showed that *R. alceifolius* is clonal in La Réunion, Mauritius, Queensland, Mayotte, poorly variable in Madagascar and divers in the native range (Indonesia-Sumatra, Vietnam, Thailand).
- ▶ Populations in the area of introduction are genetically different to those of the native range.
- ▶ In the area of introduction it reproduces by apomyctic seeds.



Genetic diversity of native and introduced populations,
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The biological control agent: *Cibdela janthina*

Adult of *C. janthina*
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- ▶ *Cibdela janthina* (Klug) (Hymenoptera: Argidae).
- ▶ Biology and specificity studies in Sumatra and in La Réunion under quarantine.
- ▶ highly specific, showing good ecological and biological traits (climate matching, high fecundity, gregarious larvae, huge defoliation, multivoltine).



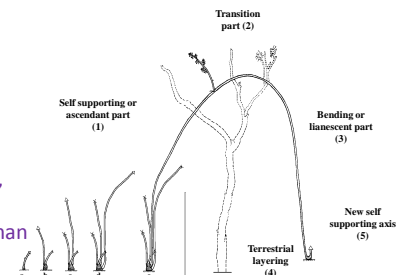
Gregarious larvae of *C. janthina*
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1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008

Growth strategy, multiplication and spread

- ▶ *R. alceifolius* is mid of a bush and a liana.
- ▶ Flowering and fruiting from 0 up to 1100 m.
- ▶ Only vegetative growth above 1100 m.
- ▶ Multiplication occurs by seeds, layerings and cuttings.
- ▶ Spread is due to birds and human activities.



Different phases of *R. alceifolius* growth
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Surveys for potential biological control agents

- ▶ Surveys in Vietnam, Laos Thailand, Indonesia (Sumatra), China and La Réunion.
- ▶ 3 pathogens and 51 insects collected.
- ▶ 2 rusts, 2 beetles, 1 weevil and 1 sawfly studied.



Hamaspora acutissima, *Gerwasia rubi*, *Phaedon fulvescens*, *Cleorina modiglianii*, *Alcidodes* sp., *Cibdela janthina*, © T. Le bourgeois, Cirad

Introduction and release of *C. janthina* in La Réunion

- ▶ Introduction and acclimation in 2007.
- ▶ Release in 01/2008.
- ▶ Start spreading and controlling *R. alceifolius*.
- ▶ To date, under evaluation.

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