

## **Evidence of the presence of intracellular bacterial Wolbachia in insects living in mangrove of Guadeloupe.**

Suzanne Conjard, Yancy Billard, Anne-Marie Macal, Mélanie Manikon,  
Kassandra Romany, Olivier Gros

► **To cite this version:**

Suzanne Conjard, Yancy Billard, Anne-Marie Macal, Mélanie Manikon, Kassandra Romany, et al.. Evidence of the presence of intracellular bacterial Wolbachia in insects living in mangrove of Guadeloupe.. Caribbean Academy of Science 2021 Guyana, Aug 2021, en ligne, Guyana. hal-03342587

**HAL Id: hal-03342587**

**<https://hal.univ-antilles.fr/hal-03342587>**

Submitted on 13 Sep 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# EVIDENCE OF THE PRESENCE OF INTRACELLULAR BACTERIAL WOLBACHIA IN INSECTS LIVING IN MANGROVE OF GUADELOUPE

Suzanne CONJARD, Yancy BILLARD, Anne-Marie MACAL, Mélanie MANIKON, Kassandra ROMANY & Olivier GROS



Institut de Systématique, Évolution, Biodiversité, ISYEB, UMR 7205, MNHN/CNRS Sorbonne Univ./EPHE/Univ. Antilles. Équipe Biologie de la mangrove. UFR SEN, 97100 Pointe-à-Pitre, Guadeloupe.  
Corresponding authors: suzanne.conjard@gmail.com

## Introduction

*Wolbachia* is an intracellular bacterial symbiont that colonizes nearly 60% of Arthropods. This bacterium has the ability to manipulate the sex ratio of the infected host in several ways: production of infected females, feminization of males, destruction of infected male embryos, and cytoplasmic incompatibility between infected males and uninfected females. Transmission of the bacterium can be either vertical or horizontal (WERREN, 1997).

Among insects of the superfamily Gerroidea (Hemiptera: Gerromorpha) from Guadeloupe in Lesser Antilles, *Wolbachia* was detected in three species: *Limnogonus franciscanus* (Stål, 1859), *Rhagovalia plumbea* Uhler, 1894, and *Rheumatobates trinitatis* (China, 1943). Two new strains of *Wolbachia* were detected in these Gerroidea. *Limnogonus franciscanus* and *Rheumatobates trinitatis* are infected by the same *Wolbachia* strain (WLfran) (CONJARD *et al.*, 2021), and *Rhagovalia plumbea* is infected with a strain previously observed in *Scirtothrips perseae* (RIGMAN-JONES *et al.*, 2007). Gerroidea are skittering insects that live on the surface of water bodies, both salt, and fresh (HECKMAN, 2011). These insects have an opportunistic carnivorous diet, feeding on preys that fall into the water surface: springtails, copepods, flies, leafhoppers, ants or spiders (ANDERSEN & POLHEMUS, 1976). By looking for *Wolbachia* in Arthropods evolving in the same habitats as Gerroidea, if they share the same strain, it will be possible to validate the transmission of the bacterium in a horizontal way and thus by predation. Thus, we hope to have first indications of the interactions between these Arthropods.

## Results

### "BAIE À CHAT"

DESCRIPTION OF THE ENVIRONMENT: Marine fringe of the mangrove coastline. Bay little sheltered from the swell. Mangrove with *Rhizophora mangle*.

GERROIDEA PRESENT: *Rheumatobates trinitatis* (Photo 8) infected with WLfran strain and *Rhagovalia plumbea* (Photo 7) infected with a strain observed in *Scirtothrips perseae*.

INSECTS TESTED AGAINST THE PRESENCE OF *WOLBACHIA*: 3 species

SPECIES COLLECTED AND TESTED:

ANTS *Azteca delpini antillana* (Photo 1)  
SPIDERS *Leucauge* sp. (Photo 2)  
TERMITE *Nasutitermes* sp. Dudley, 1890



Photo 1 *Azteca delpini antillana*

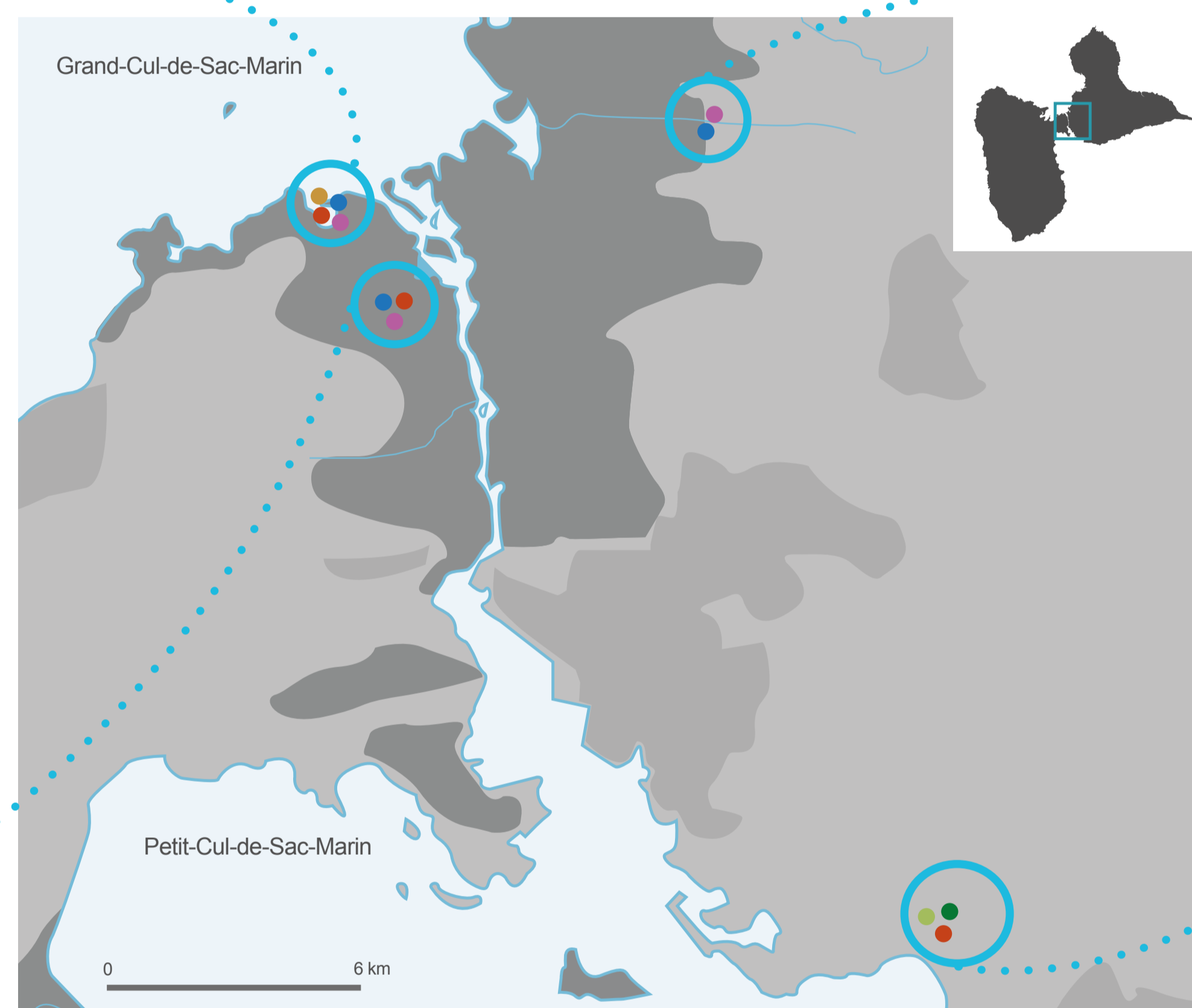


Photo 2 *Leucauge* sp.

### THE BACTERIAL SYMBIONT STRAINS INVOLVED

(The color code corresponds to each *Wolbachia* strain identified)

Strain 1: *Wolbachia* endosymbiont of *Limnogonus franciscanus* WLfran MW114524.1  
Strain 2: *Wolbachia* endosymbiont of *Scirtothrips perseae* DQ075191.1  
Strain 3: *Wolbachia* endosymbiont of *Sericomyrmex* sp. LC027865.1  
Strain 4: New strain *Wolbachia* endosymbiont of *Leucauge* sp.  
Strain 5: New strain *Wolbachia* endosymbiont of *Brachycera*  
Strain 6: New strain *Wolbachia* endosymbiont of *Miridae*



### "MAISON DE LA MANGROVE"

DESCRIPTION OF THE ENVIRONMENT: *Pterocarpus officinalis* swampy backwater mangrove and wet grassland pond.

GERROIDEA PRESENT: *Limnogonus franciscanus* (Photo 6) infected with WLfran strain

INSECTS TESTED AGAINST THE PRESENCE OF *WOLBACHIA*: 12 species

SPECIES COLLECTED AND TESTED:

ANTS *Odontomachus bauri* Emery, 1892 ; *Nylanderia* sp. Emery, 1906  
BUG Hemiptera  
DRAGONFLIES *Ischnura ramburii* (Selys, 1857); *Micrathyria aequalis* Hagen, 1861  
LEAFHOPPER *Hortensia similis* (Walker, 1851)  
SPIDERS *Alpaida* sp. Pickard-Cambridge, 1889; *Dolomedes* sp. Latreille, 1804;  
*Leucauge* sp.; *Lyssomanes michae* Brignoli, 1984; *Pisauridae* sp. Simon, 1890  
TERMITE *Nasutitermes* sp. Dudley, 1890



Photo 3 *Acromyrmex octospinosus*



Photo 4 *Miridae*



Photo 5 *Brachycera*

### "MANCHE À EAU"

DESCRIPTION OF THE ENVIRONMENT: Lagoon in the coastal mangrove. Space sheltered from the sea swell and composed of *Rhizophora mangle*

GERROIDEA PRESENT: *Rheumatobates trinitatis* infected with WLfran strain

INSECTS TESTED AGAINST THE PRESENCE OF *WOLBACHIA*: 9 species

SPECIES COLLECTED AND TESTED:

ANTS *Azteca delpini antillana*; *Camponotus sexguttatus* Fabricius, 1793; *Gnamptogenys striatula* Mayr, 1884  
CRICKETS Gryllinae  
FLY Muscidae  
MOTHS Lepidoptera  
SOWBUGS Isopoda  
SPIDERS *Alpaida* sp. Pickard-Cambridge, 1889; *Leucauge* sp.



Photo 6 *Limnogonus franciscanus*



Photo 7 *Rhagovalia plumbea*



Photo 8 *Rheumatobates trinitatis*

### "ÉTANG FRÉCHOU"

DESCRIPTION OF THE ENVIRONMENT: Pond with trees, *Annona glabra*, at the bottom of a gully surrounded by a grassy lawn.

GERROIDEA PRESENT: *Limnogonus franciscanus* not infected, *Microvelia pulchella* Westwood, 1834, not infected

INSECTS TESTED AGAINST THE PRESENCE OF *WOLBACHIA*: 6 species

SPECIES COLLECTED AND TESTED:

ANTS *Acromyrmex octospinosus* (Photo 3)  
BUG *Miridae* (Photo 4)  
CRICKET *Orphulella* sp. Giglio-Tos, 1894  
FLY *Brachycera* (Photo 5)  
LEAFHOPPER *Hortensia similis* (Walker, 1851)  
TERMITE *Nasutitermes* sp. Dudley, 1890

In this situation, *L. franciscanus* and *R. trinitatis* are infected with a single *Wolbachia* strain WLfran. However, in some cases, *L. franciscanus* may not be infected with *Wolbachia*, or may have a completely different, as yet unknown strain. Individuals of *M. pulchella* collected were tested negative for *Wolbachia*.

The same strain detected in the two mangrove *Azteca delpini antillana* Forel, 1899 and *Acromyrmex octospinosus* (Reich, 1793) was already described from *Sericomyrmex* sp. (LC027865.1). This strain must be specific to ants regardless of its habitat.

Whatever they are collected, *Leucauge* sp. White, 1841 individuals were positive for a new strain of *Wolbachia* that appears to be specific to this host species.

The two unidentified species that belong to the orders *Miridae* and *Brachycera* each have a new strain of *Wolbachia* observed in the "Étang à Fréchou".

## Conclusion

None of the Arthropods tested here had a *Wolbachia* strain in common with Gerroidea. Thus, even if these Arthropods are likely to be putative preys for Gerroidea, it does not seem that *Wolbachia* is transmitted through feeding in these insects. The *Wolbachia* endosymbiont must be transmitted vertically (from parent to child) and not horizontally (environmentally by food predation) (WERREN & WINDSOR, 2000).

To improve the robustness of these data, it will be interesting to increase the number of samples taken at each site (especially at "Baie à Chat") or to try to collect the same species of preys at each site (*Leucauges* sp. or other ant species).

## References

- Andersen, N.M., Polhemus, J.T. 1976. Water-striders (Hemiptera: Gerridae, Veliidae, etc.) 187-224, in: Cheng, L., 1976. Marine Insects. North-Holland Publishing Company, Amsterdam.
- Conjard, S., Meyer D.F., Aprelon R., Pages-Martinez N. & Gros O. 2021. Evidence of new strains of *Wolbachia* symbiont colonising semiaquatic bug (Hemiptera: Gerroidea) in the mangrove of the Lesser Antilles. *Symbiosis*, submitted for publication SYMB-D-20-00259.
- Genaro, J.A., Juarrero, C. 2010. Carta informativa de los zoólogos de invertebrados de las Antillas. *Cocuyo*, (18) : 1-66.
- Heckman, C.W. 2011. Encyclopedia of South American aquatic insects: Hemiptera – Heteroptera. Springer, Washington.

- Maréchal, P. 2011. Araignées des antilles. *PLB Édition*, Baie-Mahault, Guadeloupe, 64 p.
- Meurgey, F., Guezennec, C. & Guezennec, P. 2017. Insectes des antilles. *PLB Édition*, Baie-Mahault, Guadeloupe, 128 p.
- Meurgey, F., Ramage, T. 2020. Challenging the Wallacean shortfall: A total assessment of insect diversity on Guadeloupe (French West Indies), a checklist and bibliography. *Insecta Mundi*, (0786) : 1-183.
- Rugman-Jones, P.F., Hoddle, M.S. & Stouthamer, R. 2007. Population genetics of *Scirtothrips perseae*: tracing the origin of a recently introduced exotic pest of Californian avocado orchards, using mitochondrial and microsatellite DNA markers. *Entomologia Experimentalis et Applicata*, 124(1): 101-115.
- Werren, J.H. 1997. Biologie of *Wolbachia*. *Annual Review of Entomology*, 42(1): 587-609.
- Yokoyama, M. 2013. The incomplete guide to the wildlife of Saint Martin. *Mark Yokoyama*, Saint-Martin, 131 p.

