

## Pesticide Bioaccumulation in *Pterois volitans* of Guadeloupe Island (Lesser Antilles)

### Bioacumulación de Pesticida en el Pez León *Pterois volitans* en Guadeloupe (Antillas menores)

### Bioaccumulation de Pesticide dans le Poisson-lion *Pterois volitans* en Guadeloupe (Petites Antilles)

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#### EXTENDED ABSTRACT

Coastal waters of Guadeloupe are contaminated by chlordecone, an organo-chlorinated pesticide widely used in the past by the banana industry. Chlordecone was used in Guadeloupe and Martinique (Lesser Antilles) to fight against the banana weevil between 1972 and 1993. Due to the persistence of this molecule in the natural environment, around 25% of the land surface used for agriculture is still contaminated by chlordecone. The pesticide ends up in the sea due to runoff waters, particularly abundant on this part of the island. Bouchon and Lemoine (2003) described for the first time the contamination of marine fauna in Guadeloupe.

First observations of the lionfish *Pterois volitans* in Guadeloupe were reported in 2009. Nowadays, it represents one the most common top predators of the coral reef trophic web. Lionfish are abundant around the island. Fighting against its expansion can go through an important fishing pressure and its large promotion on fish markets. But before supporting the consumption and the commercialization of lionfish, the regional authorities asked for a study on its contamination by chlordecone. Due to its position at the summit of the trophic web, lionfish are exposed to potential bioaccumulation of pollutants like pesticides. The limit of chlordecone authorized for human consumption is 20 µg/kg of wet weight.

The principal objective of this study was to evaluate the level of contamination in lionfish by chlordecone in order to:

- i) Authorize or not its commercialization, and
- ii) Show a potential bioaccumulation of this molecule into the trophic food web.

This study was carried out in Guadeloupe, Lesser Antilles (16°15'N; 61°34'W). Between April and July 2014, 82 lionfish were collected by spearfishing. These results completed a preliminary study done in 2013, during which 42 samples of lionfish were analyzed. Studied sites were distributed on an increasing distance gradient from banana cultures areas, today known for their contamination by chlordecone. All samplings were geo-localized. Total length, standard length, and weight were taken for each specimen.

A sample of the white dorsal muscle was used to measure the concentration of chlordecone in each individual. Quantitative analyses of chlordecone were conducted by the laboratory LABOCEA, using a liquid chromatography coupled with mass spectrometry in tandem (UPLC-MS/MS). Concentrations of chlordecone were expressed in µg/kg of wet weight. The lower quantification limit was 3 µg/kg w.w.

Concentrations of chlordecone varied from 3 µg/kg of chlordecone (lower limit of quantification by the analysis protocol) to 144 µg/kg. The most contaminated fish were located downstream the contaminated rivers and banana plantation, that is in the southeast of Guadeloupe (Figure 1). Along the southern coast (the most contaminated areas), mean concentration of chlordecone was 46 µg/kg. On others areas, mean concentration of chlordecone was 7 µg/kg. Distribution of the concentrations of chlordecone was inversely related to the distance between sampling sites and banana culture zones.

Among the most contaminated four sites, concentrations of chlordecone increased with the total length of fish showing a bioaccumulation of the molecule with fish age.

The level of contamination of lionfish was compared to the contamination of six commercial species: *Acanthurus bahianus*, *Haemulon plumierii*, *Ocyurus chrysurus*, *Pseudupeneus maculatus*, *Sparisoma chrysopterygum* and *Mulloidichthys martinicus*. In the contaminated areas, the mean concentration of chlordecone measured in lionfish was around two times higher than the mean concentration of others fish species (46 µg/kg for lionfish and 25 µg/kg for others species). In the others marine areas, with low level of contamination, the mean concentration of lionfish (7 µg/kg) was similar to that of others fish species (5 µg/kg).

Lionfish are contaminated downstream of the banana plantations, in the marine areas located along the southern side of Guadeloupe. In 2009, regional authorities marked out an area of banned fishing that corresponded to the contaminated coastal marine zones. At the boundaries of this area, an area of fishing restrictions has been established. Due to its contamination, the lionfish *Pterois volitans* has been added to the list of species for which fishing is forbidden in the area of fishing restriction. In the others marine areas of Guadeloupe, the contamination of lionfish is low, and consequently, the local population can consume lionfish.

The contamination of lionfish increases with its size, indicating a bioaccumulation of the molecule. Lionfish are likely to strongly bioaccumulate pollutants like pesticides principally because of its top position in the coral reef food web.

Due to its sedentary behavior and its high capacity to accumulate chlordecone, lionfish could be used as a sentinel species to follow the level of contamination of marine fauna by chlordecone.

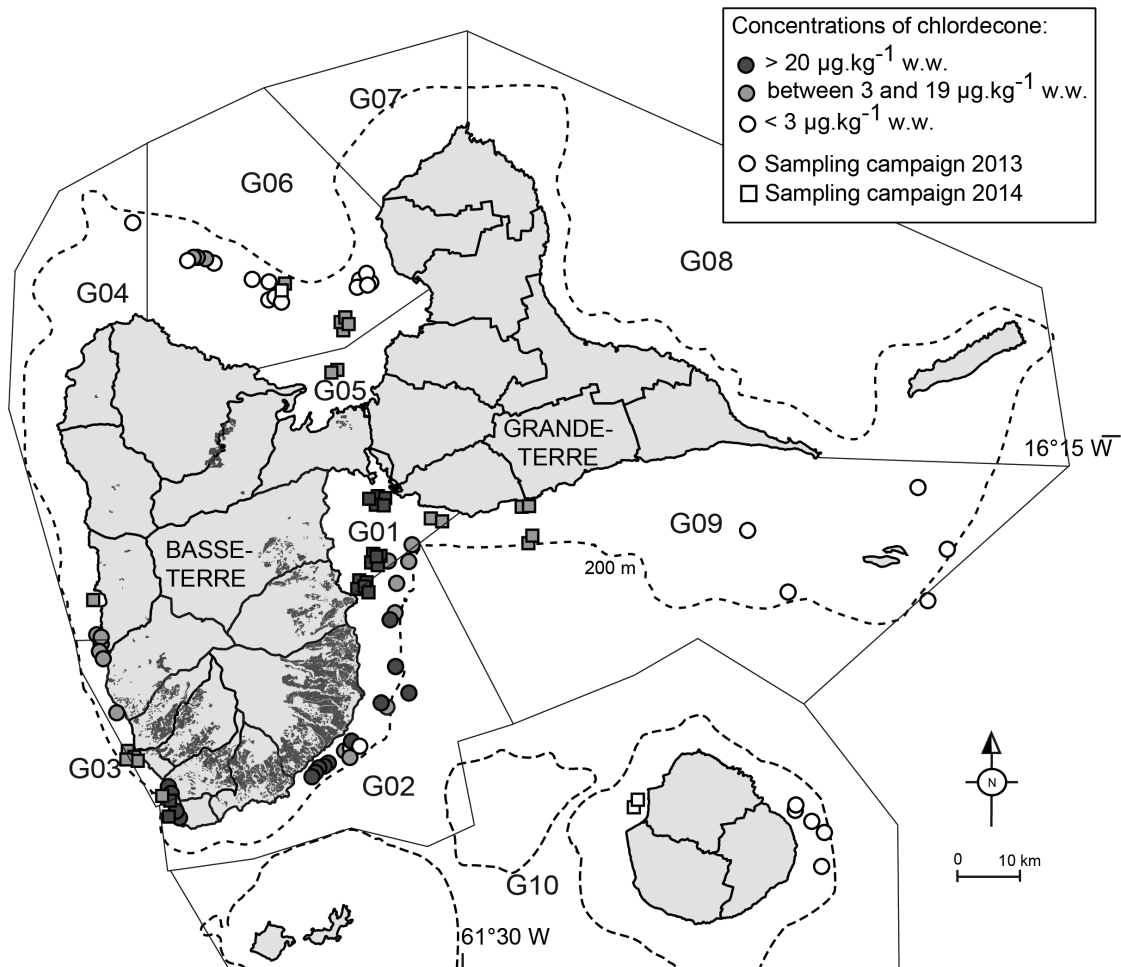
KEY WORDS: Bioaccumulation, pesticide, lionfish, Caribbean, chlordecone

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**LITERATURE CITED**

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**Figure 1.** Concentrations of chlordecone (in µg/kg wet weight) measured in lionfish around Guadeloupe. Terrestrial areas in gray indicate banana plantations.