S.I.L. Congress, Barcelona, August 1992

Presentation of the control programme of *Simulium buissoni* in Nuku-Hiva (French Polynesia).

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INTRODUCTION

Nuku-Hiva is one of the Marquesas Islands, the most isolated archipelago in the world. Isolation and separation of the islands have favoured speciation of the Simuliidae (CRAIG & SECHAN 1991). Of these species, *Simulium buissoni* Roubaud, locally called the "nono", is seriously anthropophilic and is so abundant that inhabitants abandon whole valleys to avoid it. To reduce the serious biting and permit development of tourist trade, medical entomologists of ORSTOM and Louis Malardé Medical Research Institute, Papeete, initiated studies on the biology of this insect in the early 1970's to lead to a control programme for the 90's (SECHAN *et al.* 1988).

Nuku-Hiva is the only inhabited island where *Simulium buissoni* breeds. It is a high volcanic island consisting in three volcanic calderas and can be divided into three regions (i) the inside region of the first caldera, where the biggest village, Taiohae, is located (ii) the region between the main calderas with plateaux at about 900 m altitude. This receives the most precipitation and

has the two largest rivers, Hakaui and Taipivai (iii) the outer region of the third caldera can be further divided into two zones: the Eastern that receives trade winds which bring precipitation, and the Western which is the driest part of Nuku-Hiva (fig. 1).

The climate of Nuku-Hiva is tropical-humid. The drier season is from September to January, but considerable variation can occur between years. Rainfall, steep terrain, low water retention of soils and basaltic rocks produces numerous streams. During the dry season total length of flowing streams is 440 km.

ROUBAUD (1906) described *Simulium buissoni* from females collected by BUISSON. Total development takes 10 to 11 days at low altitude and 14 to 18 at higher elevations. Females bite only during daytime, with two maxima during the dry season but only one during the rainy season. Up to 25,000 bites/person/day have been recorded. The gonotrophic cycle takes about 6 days for nulliparous females and 7 days for parous ones (PICHON & SECHAN 1973).

I - NON-TARGET FAUNA

The invertebrate fauna of the rivers had low diversity and abundance (no Plecoptera, Ephemeroptera or Trichoptera). Seventy-four taxa have been identified, not different from that reported from Moorea, in the Society Archipelago (RESH *et al.* 1990). Oligochaeta, Crustacea and Diptera were the dominant groups (FOSSATI & GIBON 1991, FOSSATI *et al.* 1992, WENDLING 1992). *Macrobrachium spp.* (Crustacea Decapoda) are the only freshwater animals commonly eaten in Polynesia (DANIGO 1991). The freshwater

fish fauna of the Marquesas Islands is poor, but of interest because of strong endemism (MARQUET 1986).

II - HISTORY OF THE CONTROL PROGRAMME

The first study of the Marquesan Islands from a medical entomology point of view took place during an assignment regarding filariasis and an early control attempt was made using a carnivorous fish, *Kuhlia rupestris* Lacépède, but to no effect (PICHON 1970). The first attempt with the insecticide Temephos showed a good carry and no visible effects on non-target fauna (PICHON & SECHAN 1973). A new programme using species replacement with non-anthropophilic simuliids was attempted in 1974 (PICHON 1974), but was not successful (*in* KLEIN *et al.* 1982). Another experiment to compare Temephos, Teknar^{R} and Bactimos^{R} showed that the former had the longest carry (KLEIN *et al.* 1983). In 1986, the whole drainage basin of Taiohae was treated with Temephos each week for two months (SECHAN *et al.* 1986). The results were excellent and led to an agreement between Nuku-Hiva Island, Malardé Research Institute (Papeete), FIDES (French Polynesia), ORSTOM (France), FIDES (France) and FED (CEE) to eradicate the scourge of the "nono" from Nuku-Hiva (SECHAN *et al.* 1988).

III - IMPLEMENTATION OF THE PROGRAMME

Preparation began in 1990 with the first hydrological and hydrobiological assessments (CHOURET & ROBIN 1991, GIBON & FOSSATI 1991). It was followed in February 1991 by recruitment of the first field workers who began to map and provide access to all flowing waters. All rivers flowing during the dry season were measured, which allowed determination of number of treatment

points and amount of insecticide needed (GUILLET 1992). The first tests of the effects of Temephos on *Macrobrachium spp.* showed an absence of 24 hours mortality up to dosage of 6 mg/l/10min (FOSSATI *et al.* 1992). This stage will end in the middle of 1992 dry season (October), when all rivers will be accessible.

The treatment stage will be most important in regards to number of persons involved (5 researchers and about 80 field workers). Each week, for two months, each section of each river with flowing water will be treated with Temephos (0.25 mg/l/10min for streams < 15 l/s discharge and 0,125 mg/l/10min for larger rivers) to destroy all larvae of *S. buissoni* and prevent any re-establishment. Problems with treatments or serious mortality of non-target invertebrates or vertebrates will be monitored with an entomological survey and a hydrobiological warning-network (FOSSATI 1992).

The last stage of the programme will be a one-year survey after completion of treatments to detect any re-establishment of simuliid adults or larvae. The non-target fauna will also be observed to assess any global effects on aquatic fauna (FOSSATI 1992).

EXPECTED RESULTS

Results that will accrue from the control programme of *Simulium buissoni* are (i) disappearance of the nuisance caused by *S. buissoni*, improvement of health conditions for local inhabitants, possibility of tourist and other economic developments (ii) installation of hydrologic equipment and training of local people (iii) better knowledge of the hydrology and hydrobiology of the island.

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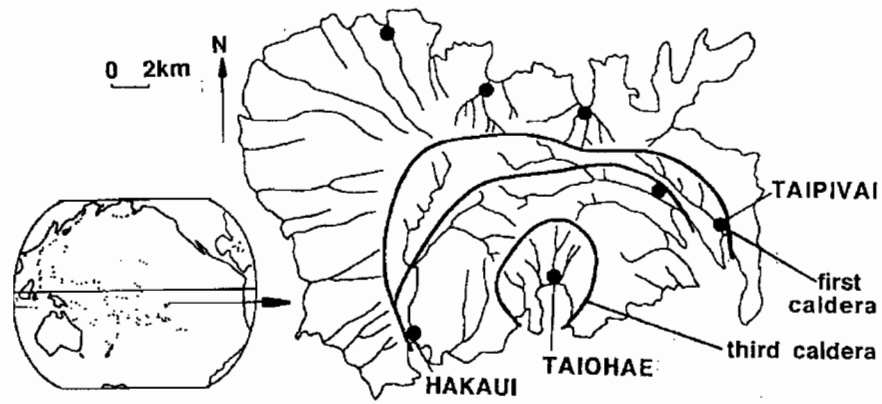
Fig. 1 : Geomorphic map of Nuku-Hiva, with villages indicated.



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Verhandlungen - Internationale Vereinigung für Theoretische und Angewandte Limnologie, 26, 2145-2147

S.I.L. Congress, Barcelone (ESP), 1992/08

ISSN 0368-0770