

Gambierdiscus found in Crete

Ciguatera intoxication observed in Canary Islands





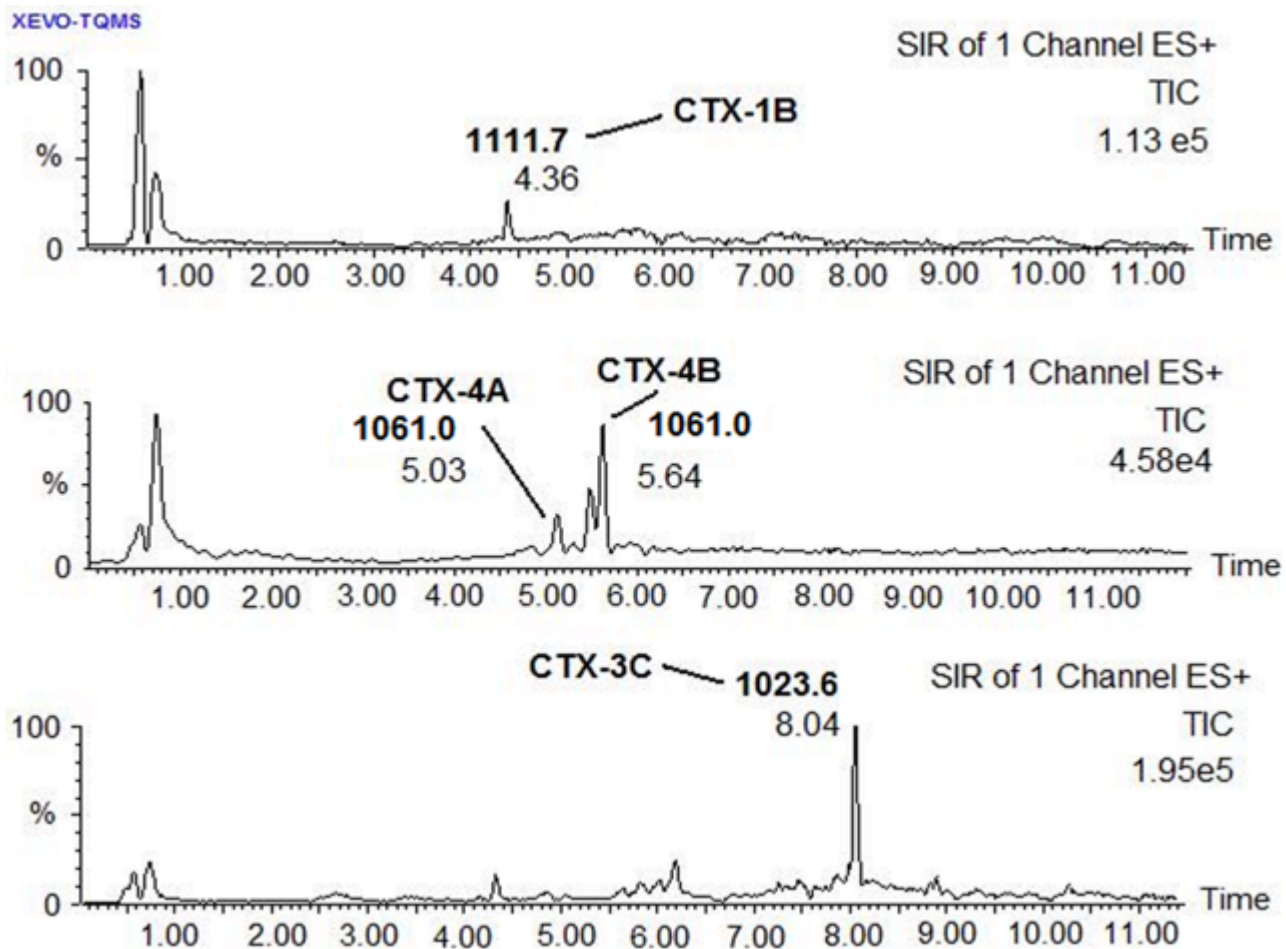


*Seriola fasciata*  
*Seriola dumerili*

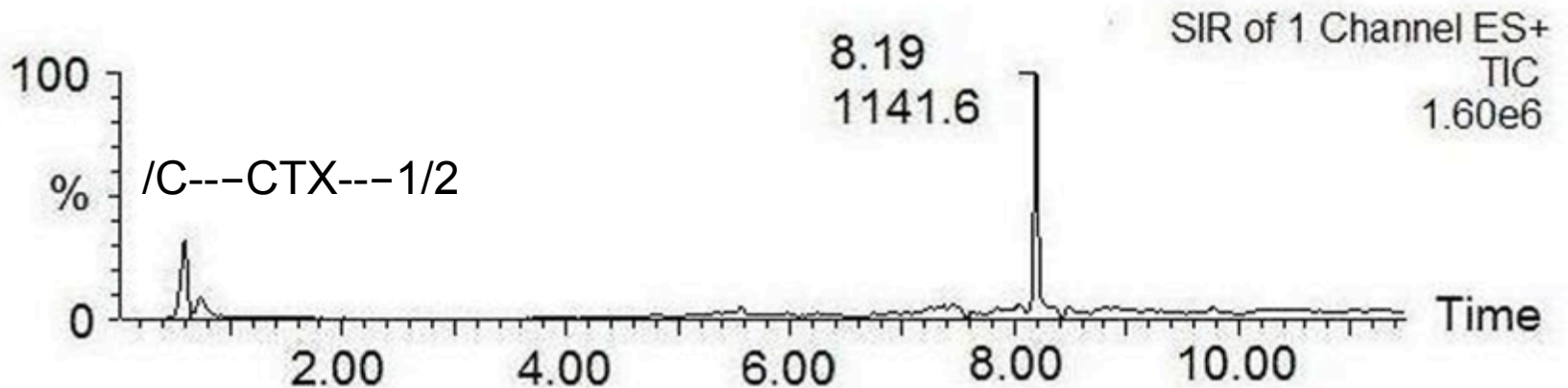
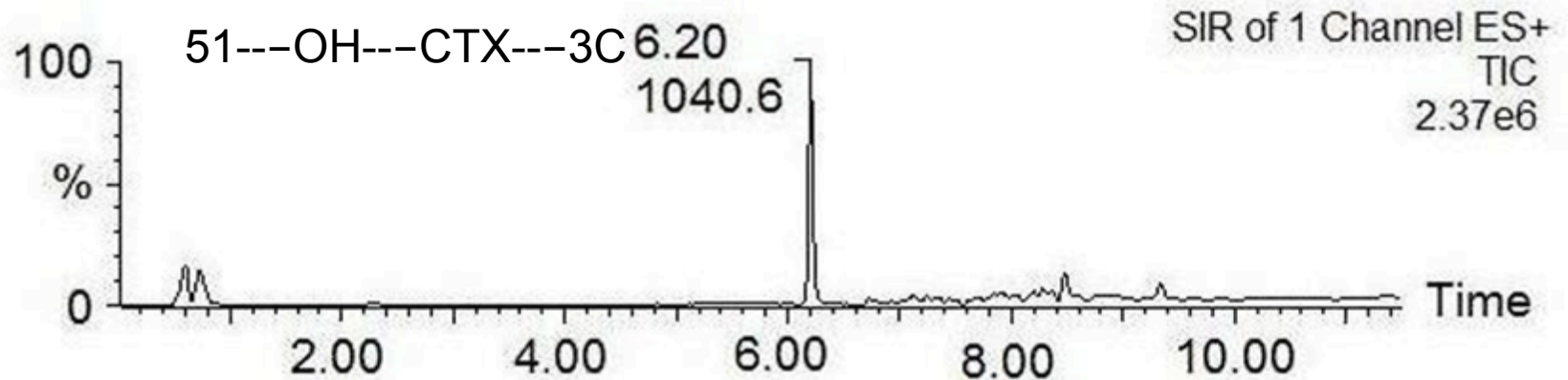


**July 2008:** Severe intoxication in Madeira reported by Portuguese authorities (11 fisherman)

Chromatograms, using selected ion recording (SIR) UPLC mode of  
A fish sample of *Seriola dumerili*,

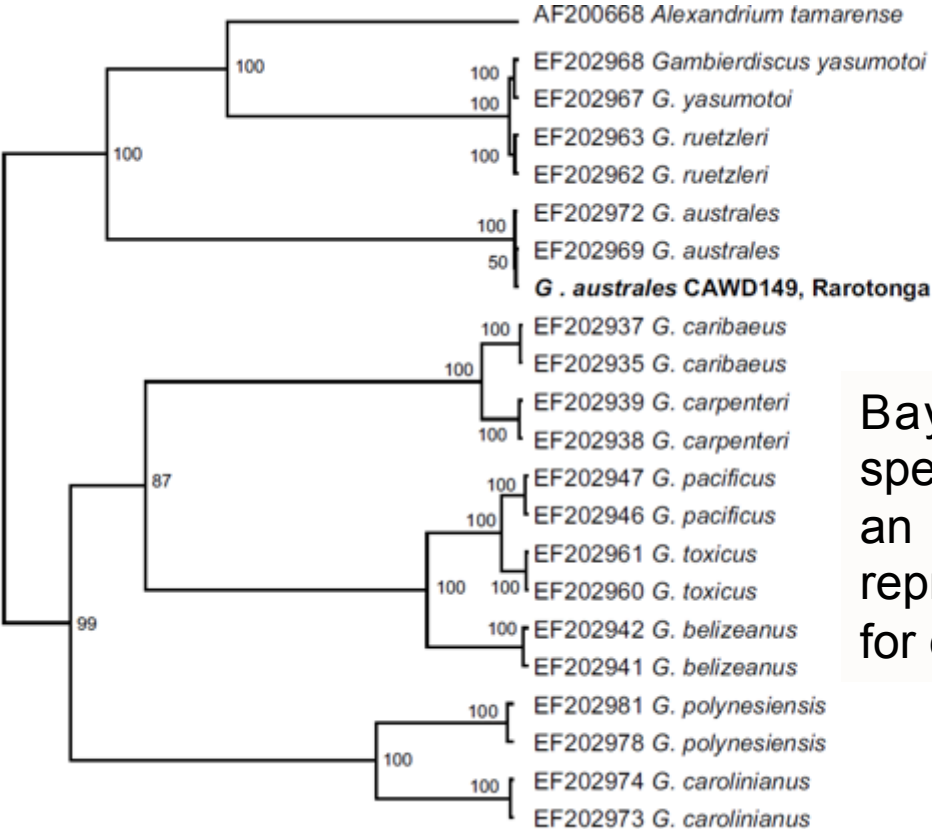
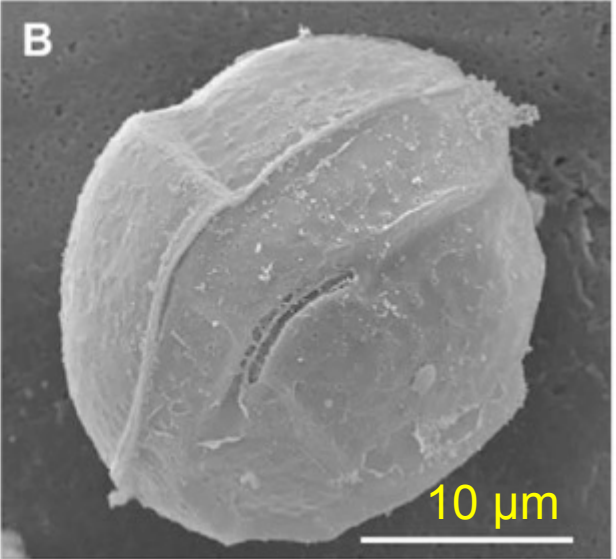
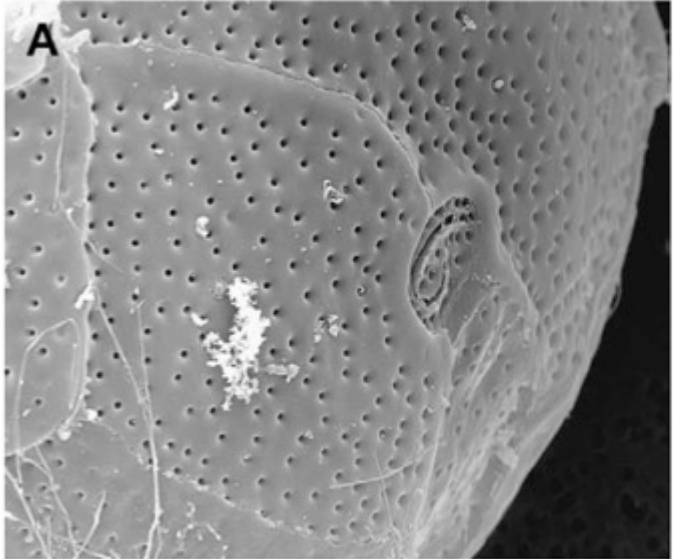


Selected ion recording (SIR) chromatogram  
from a *Seriola dumerili* on the UPLC



Lack of standards is a major issue

Scanning electron micrographs of *Gambierdiscus australes* and *Ostreopsis* sp. respectively, from Rarotonga, Cook Islands.

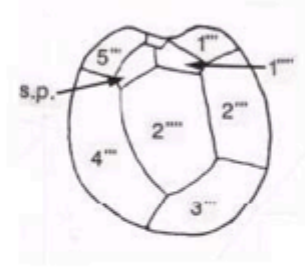
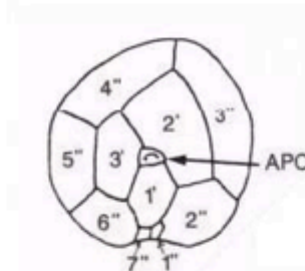
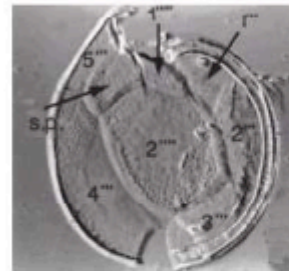
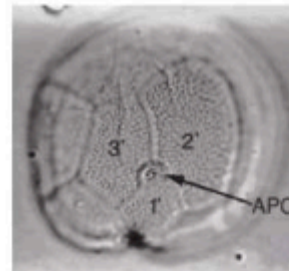
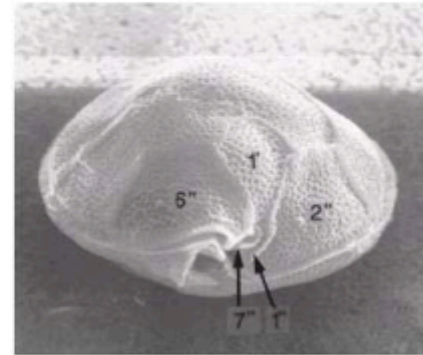
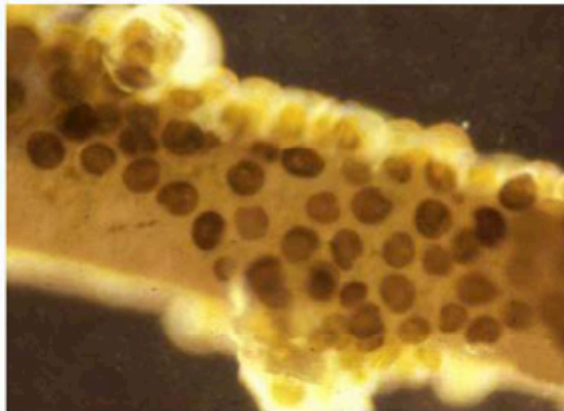


Bayesian analysis of *Gambierdiscus* species with *Alexandrium tamarensis* as an outgroup. Numbers at branch points represent Bayesian posterior probabilities for each cluster.



# Le principal agent étiologique de la ciguatéra: Le dinoflagellé *Gambierdiscus toxicus*

Scale bar=20µm

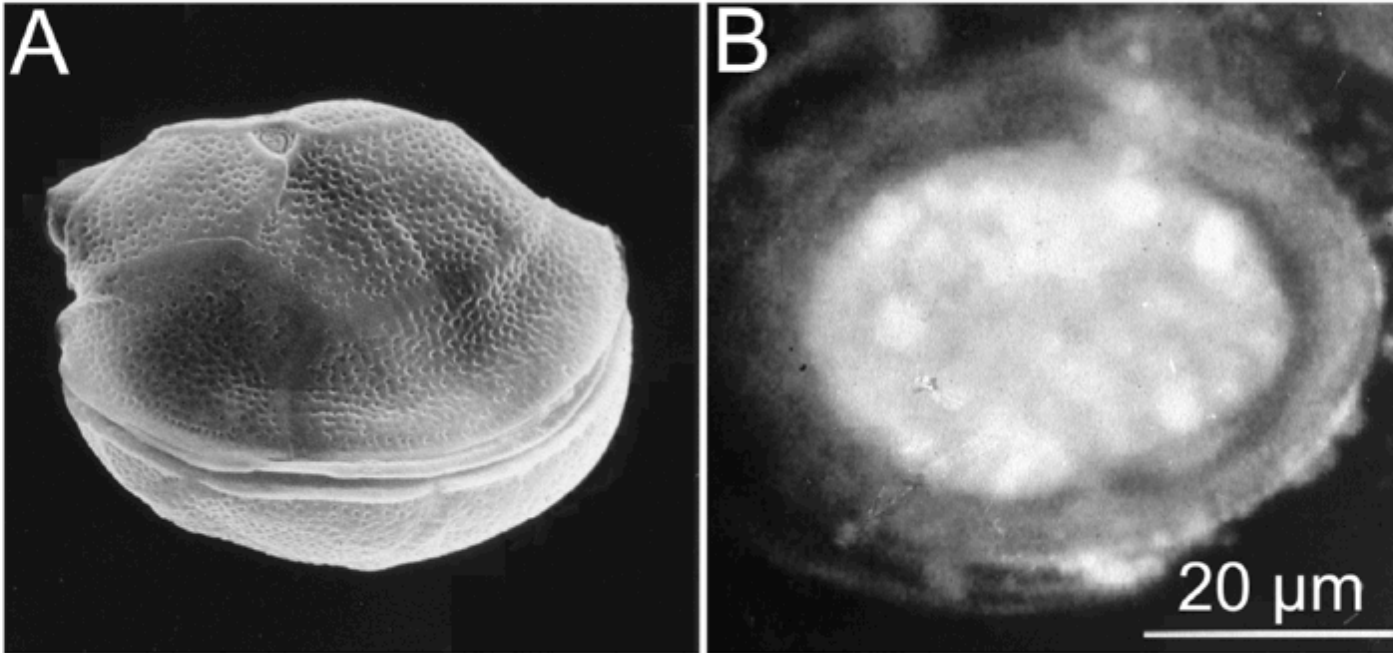


Photomicrograph by Yasuwo Fukuyo

Bien que d'autres genres de dinoflagellés potentiellement toxiques aient été également identifiés dans les eaux tropicales et que leur implication dans l'ichtyosarcotisme ciguatérique reste à être établi



## Le dinoflagellé *Gambierdiscus toxicus*

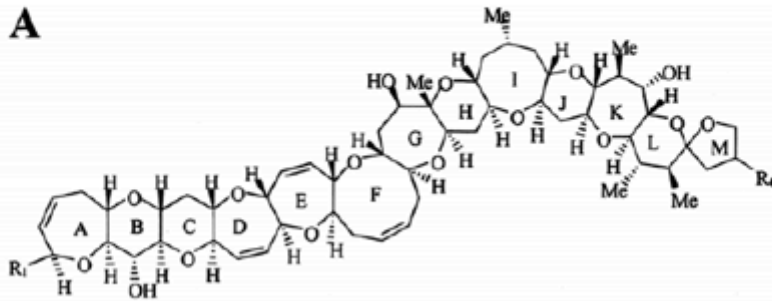


- Dinoflagellé fortement endémique dans le Pacifique sud, l'océan Indien et la mer des Caraïbes
- Différentes souches: une même morphologie générale mais une grande diversité génétique
- Seules certaines souches sont génétiquement capables de produire des ciguatoxines

- Pourquoi certains dinoflagellés sont-ils toxiques et comment produisent-ils les toxines ?
- Quel est le rôle des bactéries dans la production de toxines ?

# Les ciguatoxines: Une famille d'une vingtaine de polyéthers cycliques

**A**

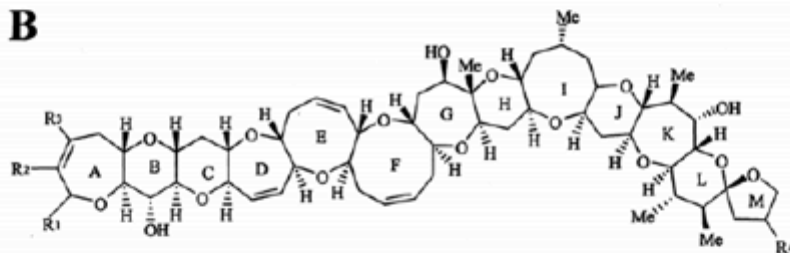


Type I: 60 atomes de carbone

Toxins, [M+H] <sup>+</sup>	Origin	R <sub>1</sub>	R <sub>4</sub>
P-CTX-1B, 1111	moray-eel	-CH=CH-CHOH-CH <sub>2</sub> OH	OH
P-CTX-2A2, 1095	moray-eel	-CH=CH-CHOH-CH <sub>2</sub> OH	H
P-CTX-2B2, 1095	moray-eel	-CH=CH-CHOH-CH <sub>2</sub> OH	H
P-CTX-4A, 1061	parrot fish <i>G. toxicus</i>	-CH=CH-CH=CH <sub>2</sub>	H
P-CTX-4B, 1061	<i>G. toxicus</i>	-CH=CH-CH=CH <sub>2</sub>	H

- liposolubles
- thermostables

**B**



Type II: 57 atomes de carbone

Toxins, [M+H] <sup>+</sup>	Origin	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>
P-CTX-2A1, 1057	moray-eel parrot fish	H	OH	OH	H
P-CTX-3B, 1023	parrot fish	H	H	H	H
P-CTX-3C, 1023	moray-eel parrot fish <i>G. toxicus</i>	H	H	H	H

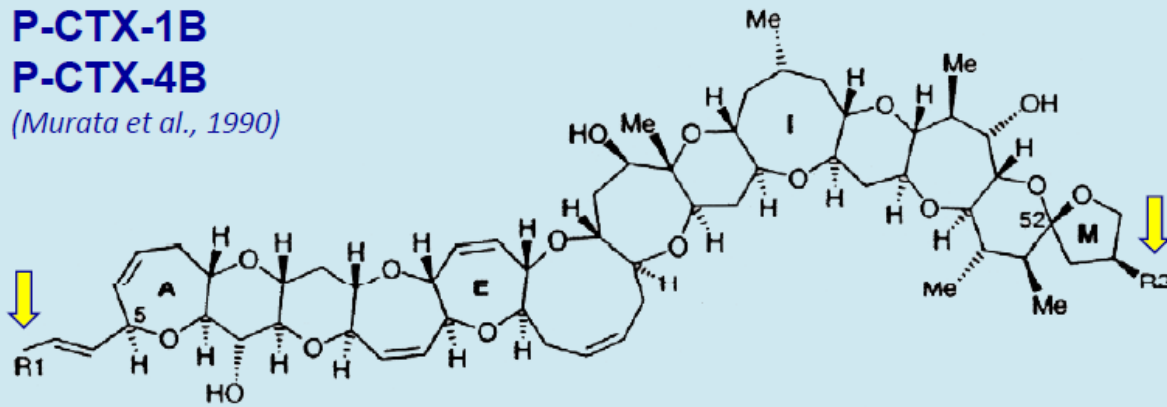
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## P-CTX-1B

## P-CTX-4B

(Murata et al., 1990)

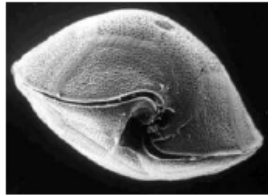


## Ciguatoxines du Pacifique



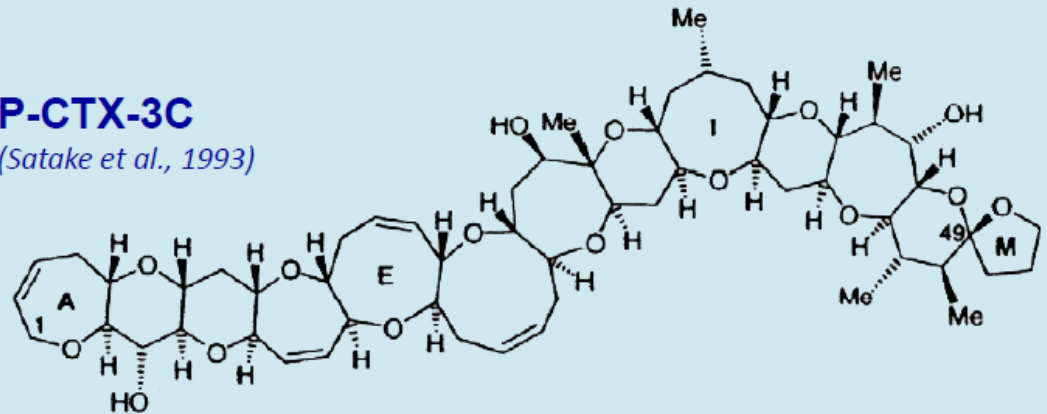
*Gymnothorax javanicus*

*Gambierdiscus toxicus*



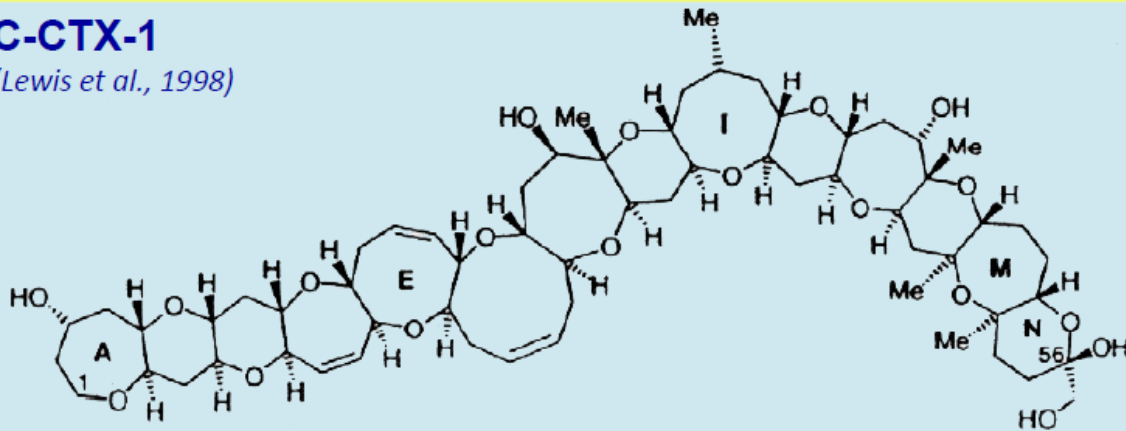
## P-CTX-3C

(Satake et al., 1993)



## C-CTX-1

(Lewis et al., 1998)



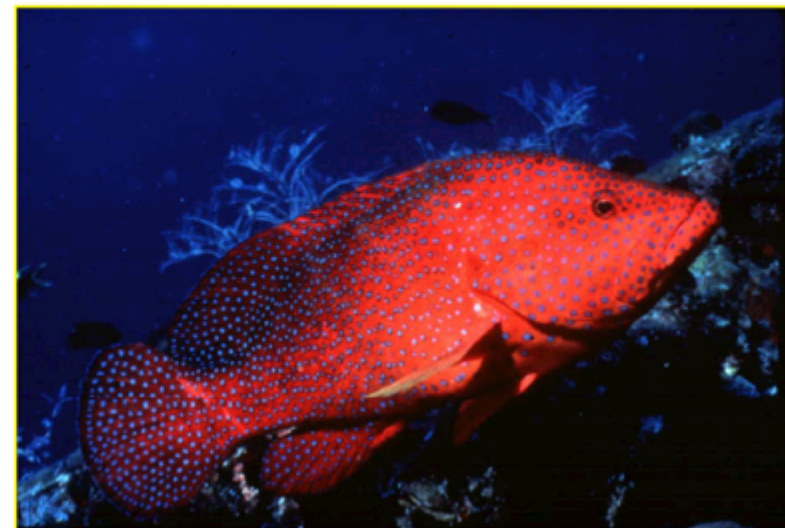
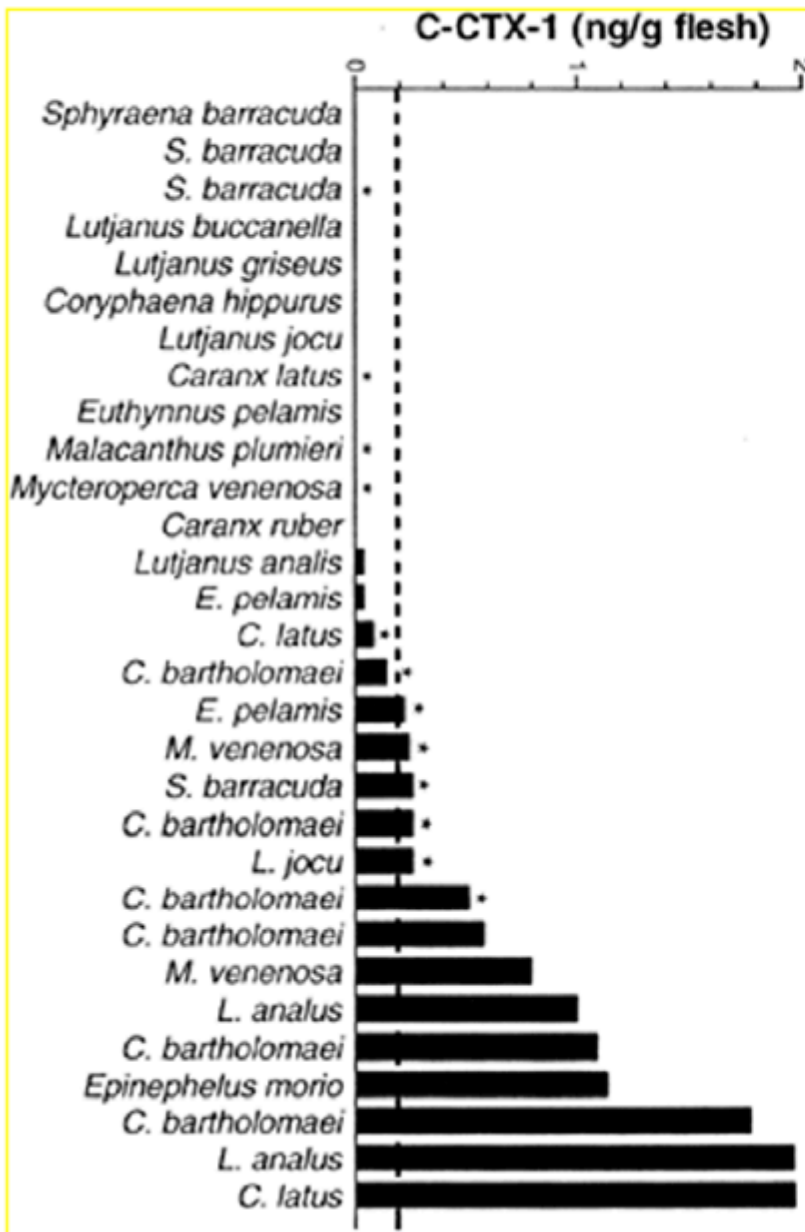
## Ciguatoxines des Caraïbes

*Caranx latus*





# La quantité de ciguatoxines varie selon l'espèce pisciaire considérée ...



# Problems and gaps

- Poor quality and lack of representativeness of data
  - eg. notification of fish poisoning cases depends on many factors, including initial presentation to health services, recognition and recording from local to national and regional levels)
- Consequently the true burden (health, productivity, economic, social) is not well known

# What works well?

- Local knowledge is thought to be effective in indentifying toxic species, seasons and locations (but note empirical study suggesting this is not always true)
- Communicable disease surveillance systems are effective in some countries



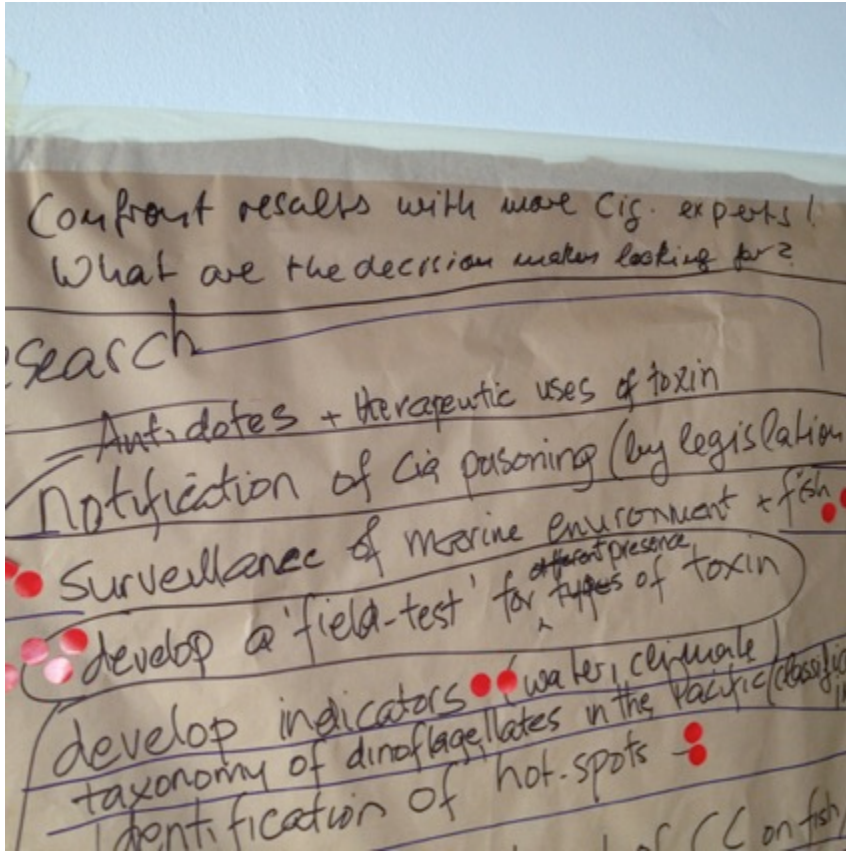
# Priorities for research

- Analyse relationships between physical environment, marine ecosystem parameters, fish toxicity, and health impacts (based on improved surveillance)
- Develop indicators/predictors of risk (hot-spots)

# Innovation

- Ideas varied in scale from remote sensing of environmental parameters to molecular biology (and several in between)
- Develop a cheap, accurate field test for toxicity
- Systematic data collection for representativeness (long term, standard methods across countries)
- Sample/data bank of T cells from affected people
- Molecular genetics of mechanisms of action (eg role of TRVPA1 in cold allodynia)

# Questions remaining



- Ask other experts for feedback on the ideas
- What are the decision makers after?



Quality Problems  
Data collection - access to data

Complexity of issue

Population increase

lack of measurement of burden of cig. etc. (so)

Ownership of data - access

Poor health systems (not enough resources)

Working well

Implicated species known to locals

Treatment (some areas)

Traditional medicines

Surveillance (Marine dept)

Innovation

Vaccine

take

T-lymphocytes from intoxicated patients → develop effective antibodies, Molecular cloning

Remote sensing on health of people

With regard to the case studies that we have seen, what is typical (also exist in other cases you know) in terms of problems and gaps, and also in terms of what is working well?

As a consequence where are priorities for research, technology and innovation in order to reduce hazards for human health, the environment, and the economy?

## ... ainsi que le type de ciguatoxines pour un poisson donné



**Murène du Pacifique**

(% par poids de chair)

P-CTX-1B	33 %	
P-CTX-2A	16 %	
P-CTX-2B1		13 %
P-CTX-2B2		9 %
P-CTX-3C	10 %	
ND		19 %



**Poisson perroquet du Pacifique**

(% par poids de chair)

P-CTX-4A	17%	
P-CTX-3B	28%	
P-CTX-2C	13%	
P-CTX-2A1		5%
P-CTX-3C	23%	
ND		14%