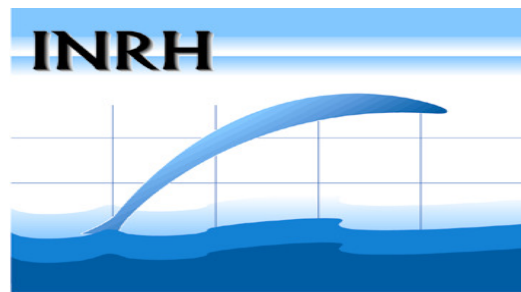


RETROSPECTIVE OF TWO DECADES OF HAMFUL ALGAE MONITORING IN MOROCCO



Institut National de Recherche Halieutique
المعهد الوطني للبحث في الصيد البحري

Prof. Hamid TALEB

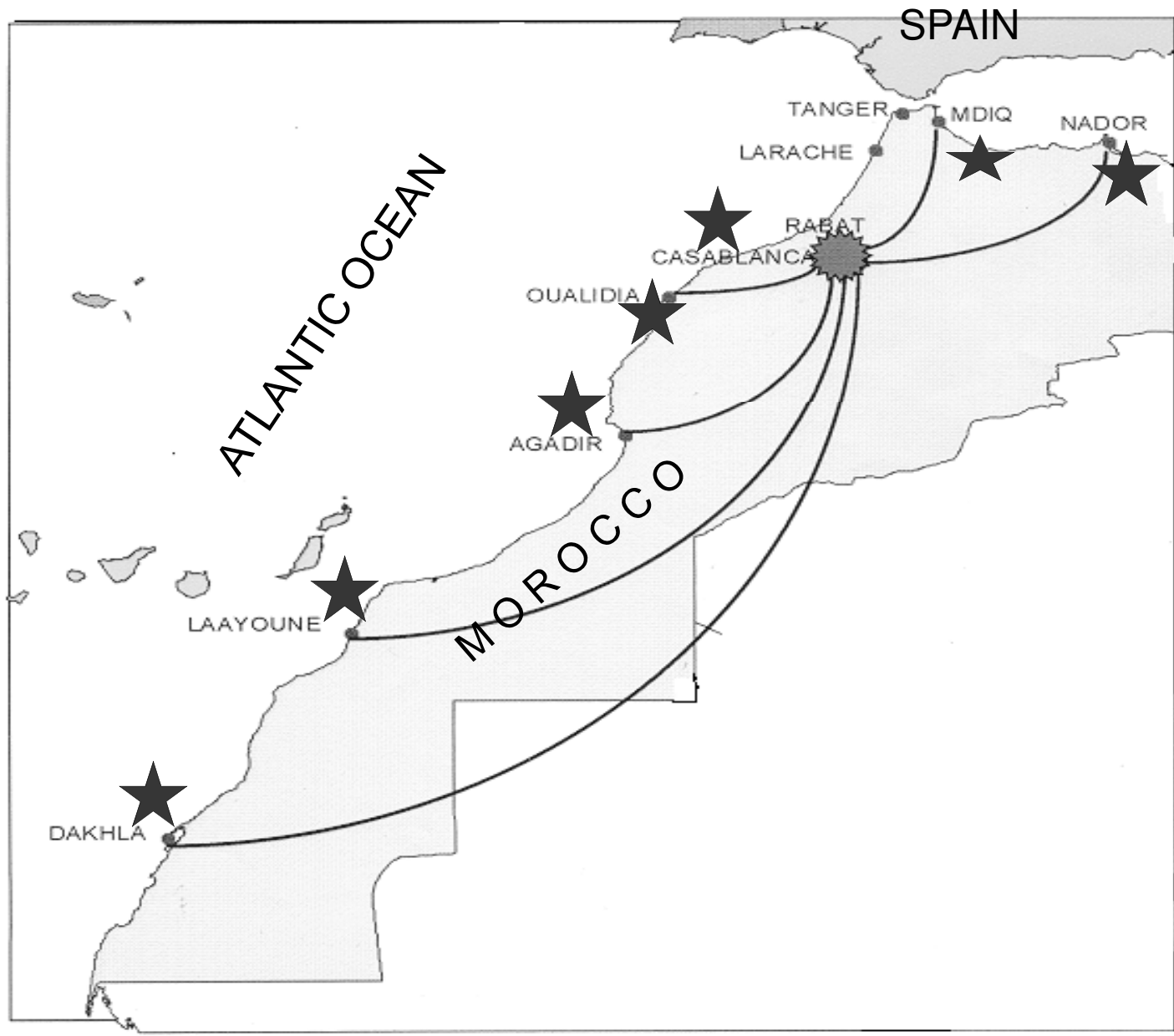
Marine Biotoxine Lab.
Institut National de Recherche Halieutique
Casablanca, Maroc



He also infiltrated in the Mediterranean ...

RESEAU DE SURVEILLANCE DE
SALUBRITE DU LITTORAL (R.S.S.L)

MONITORING NETWORK OF HARMFUL ALGAE



Network objectives

- **Protect the consumer**
- **Assure a regular monitoring of the national seashore safety**
- **Alert the public of the HAB event occurrence**

Monitoring :

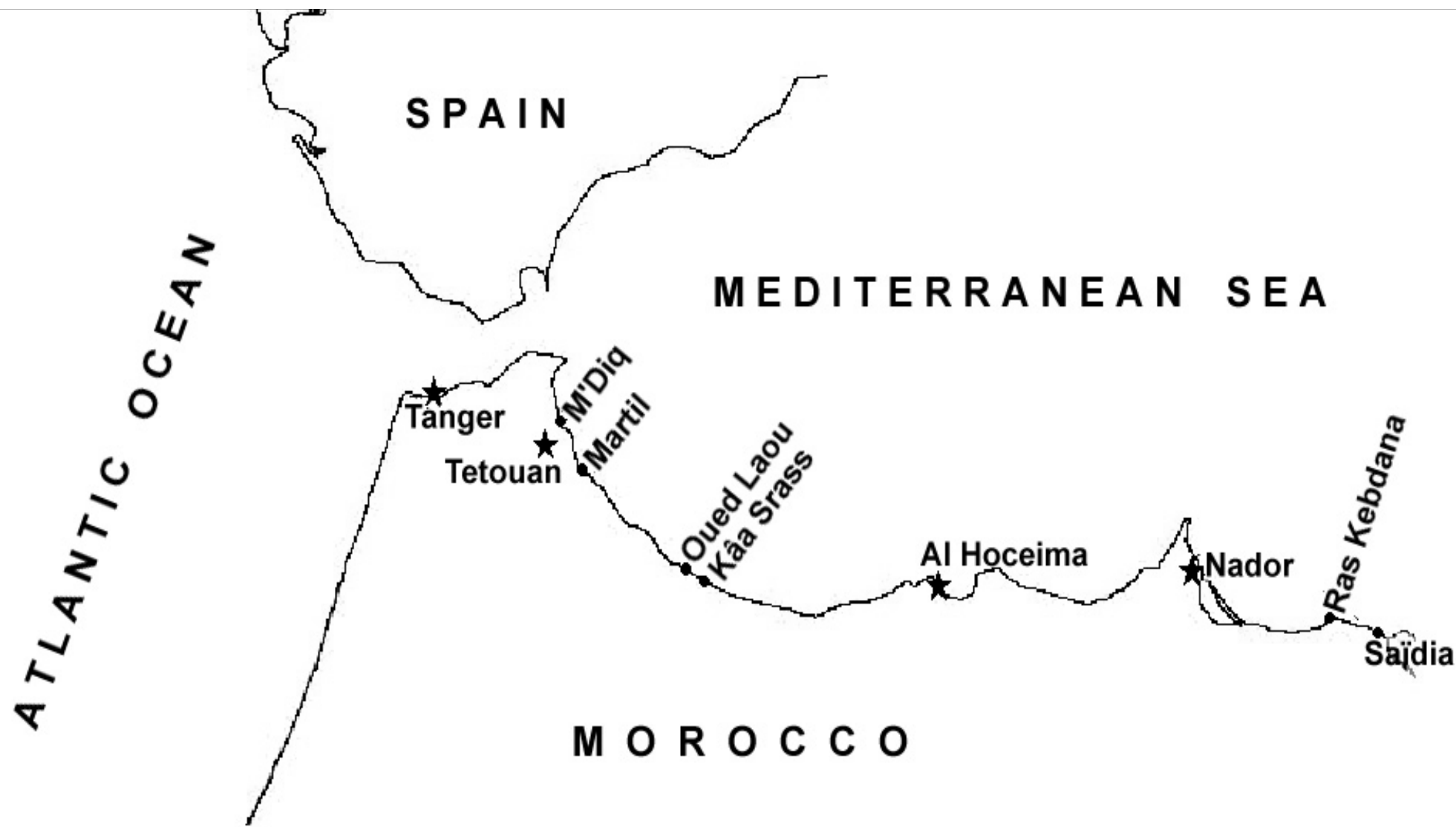
- **Algae identification & quantification**
- **Biotoxins assays**
 - **PSP : Paralytic Shellfish poisoning**
 - **ASP : Amnesic Shellfish poisoning**
 - **LSP : Lipophilic Toxins :**
 - **DSP : Diarrhetic Shellfish poisoning (OA, DTXs, YTXs, PTXs)**
 - **AZP : Azaspiracids**
- **Trigger alert**

Monitoring Outcomes

- **Identification of microalgae species responsible of harmfulness**
- **Identification of biotoxin produced**
- **Détermination of the predilection periods of HAB occurrence**
- **Identification of risk areas exposed to recurrent attacks by HABs**

HABs LINKED WITH PSP TOXINS PRODUCTION

**IN THE MEDITERRANEAN
SEA**



SPAIN

MEDITERRANEAN SEA

ATLANTIC OCEAN

Tanger

Tetouan

M'Diq
Martil

Oued Laou
Kâa Srass

Al Hoceima

Nador

Ras Kebdana

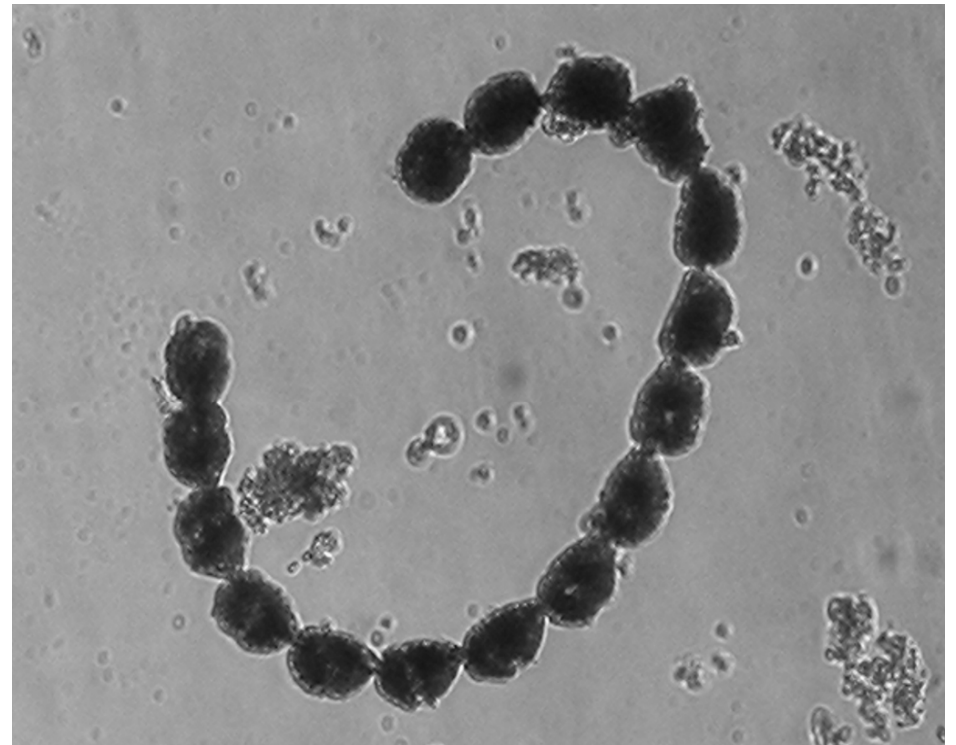
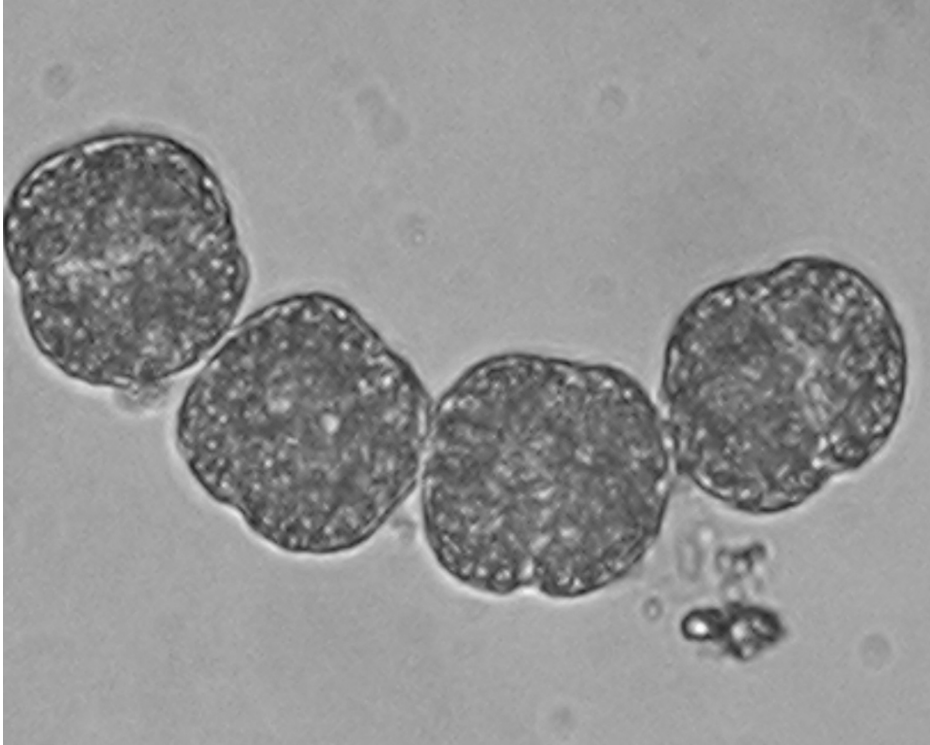
Saïdia

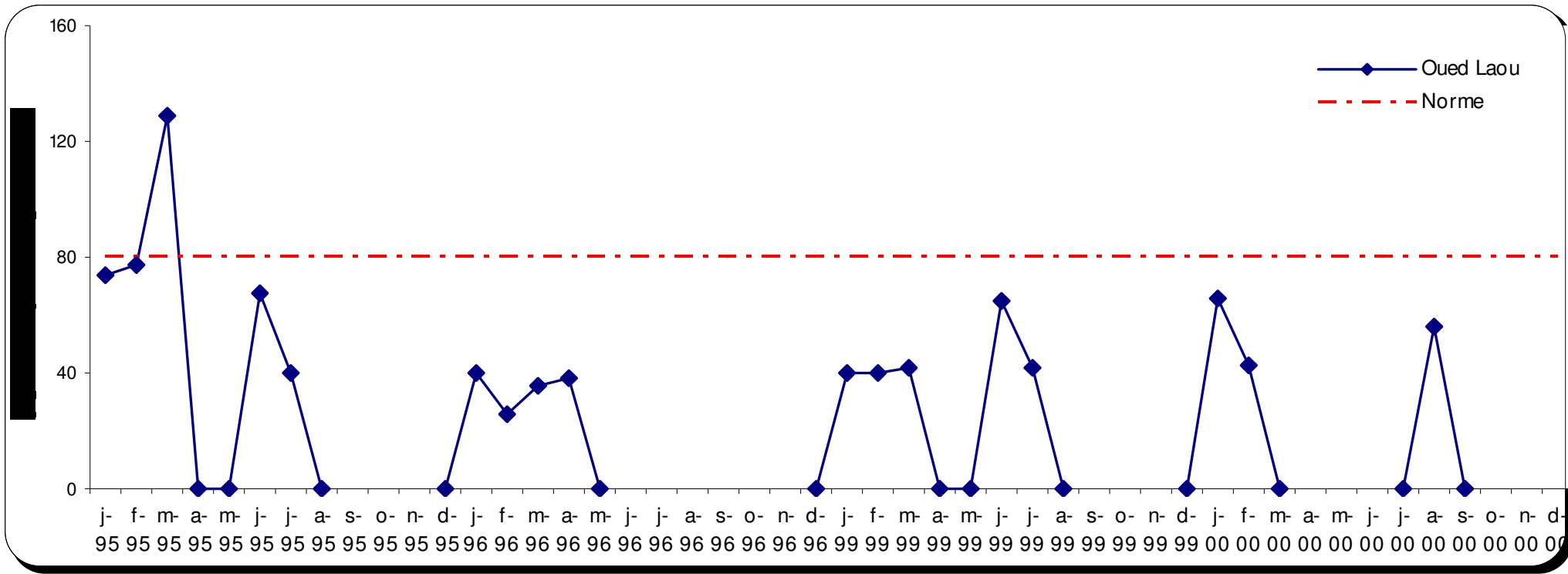
MOROCCO



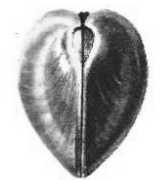
Photo. B. Rijal leblad
INRH - Tangerang

Gymnodinium catenatum

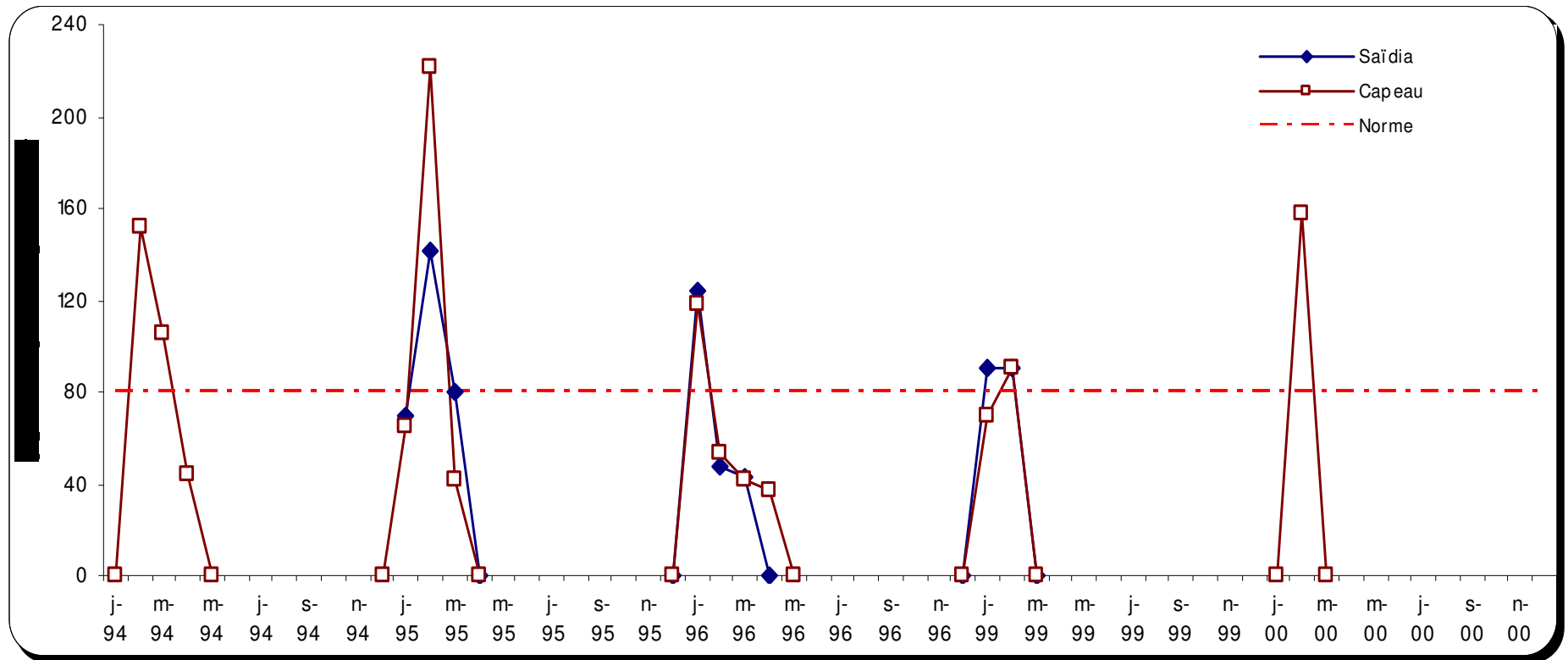




Evolution des toxines PSP dans les vernis en Méditerranée



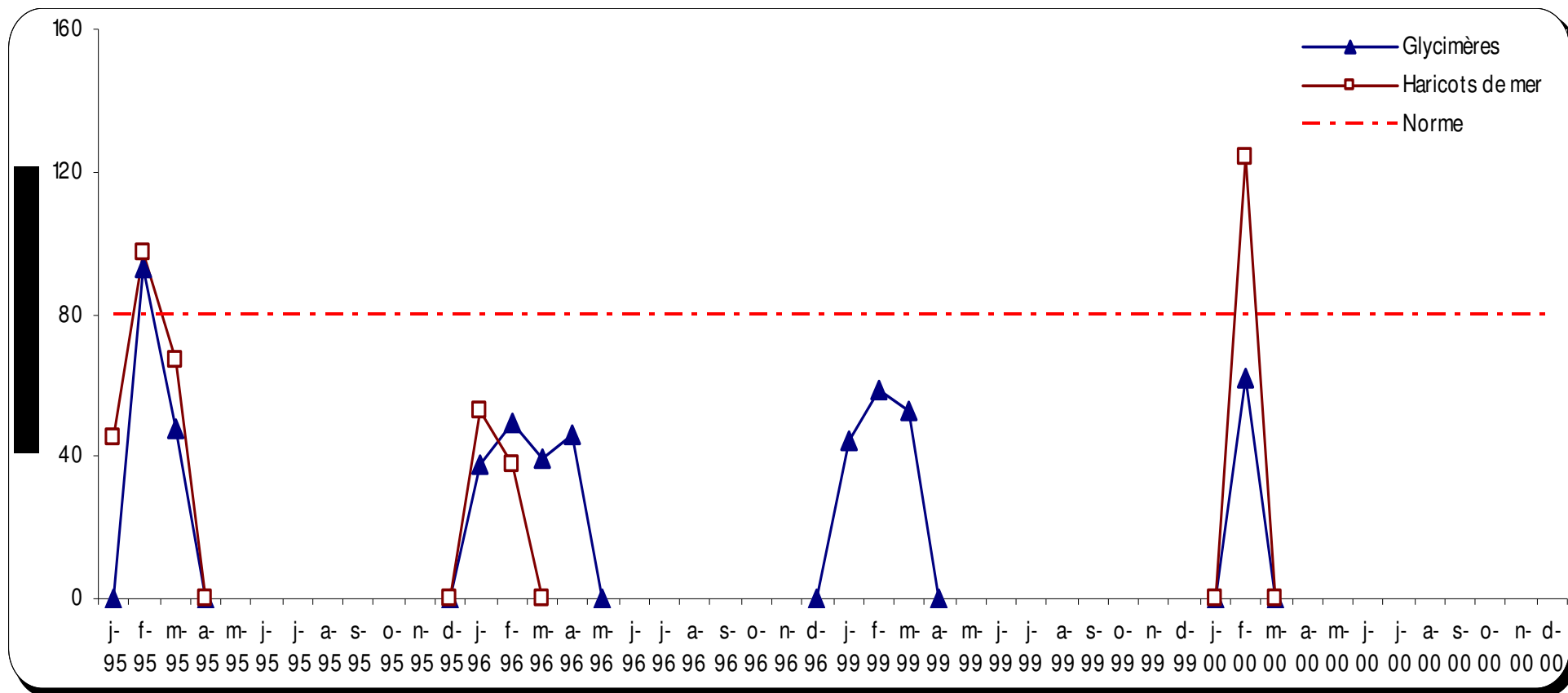
Vernis (Callista chione)



Evolution des taux de toxines PSP dans les praires en Méditerranée orientale



Praire (Venus gallina)

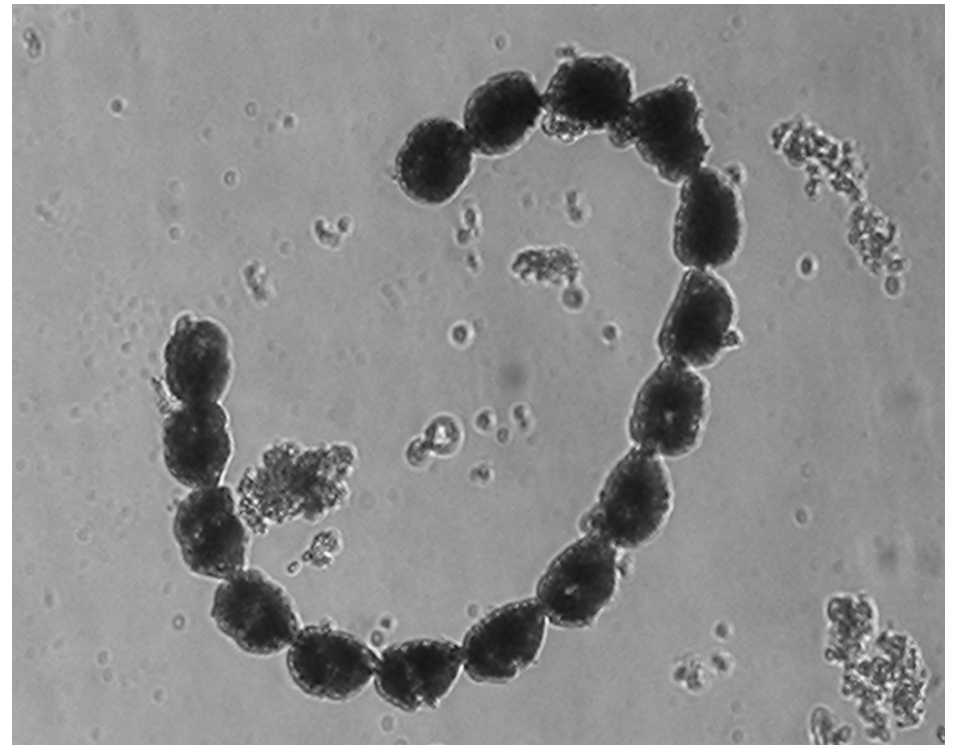
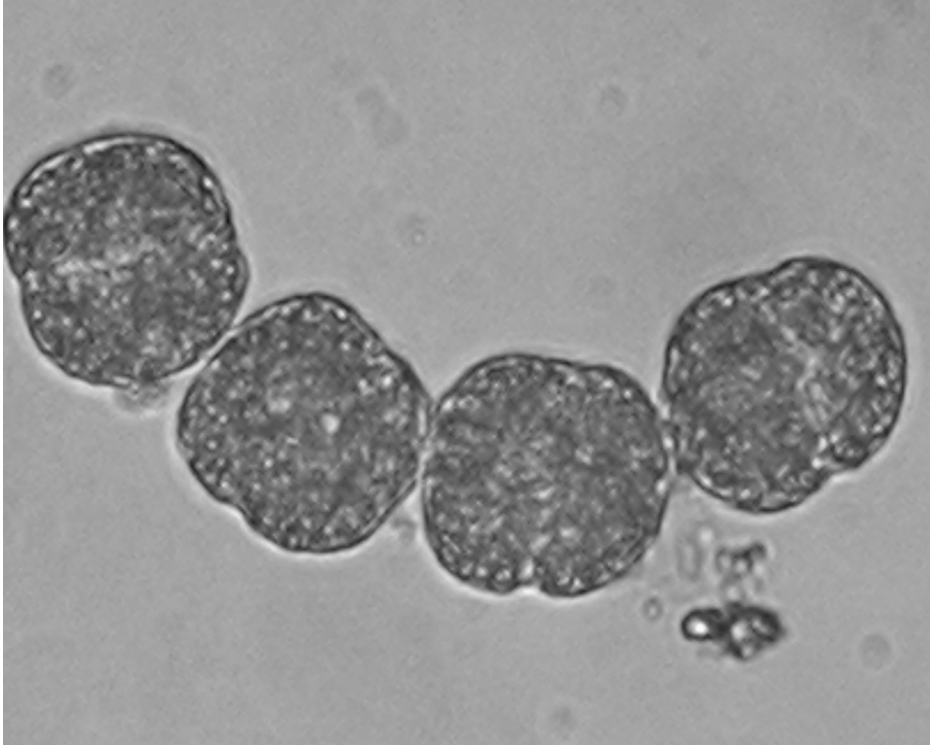


Glycimères et haricots de mer à Cap de l'eau



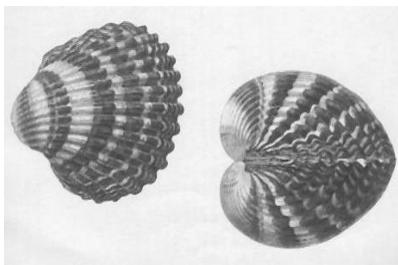
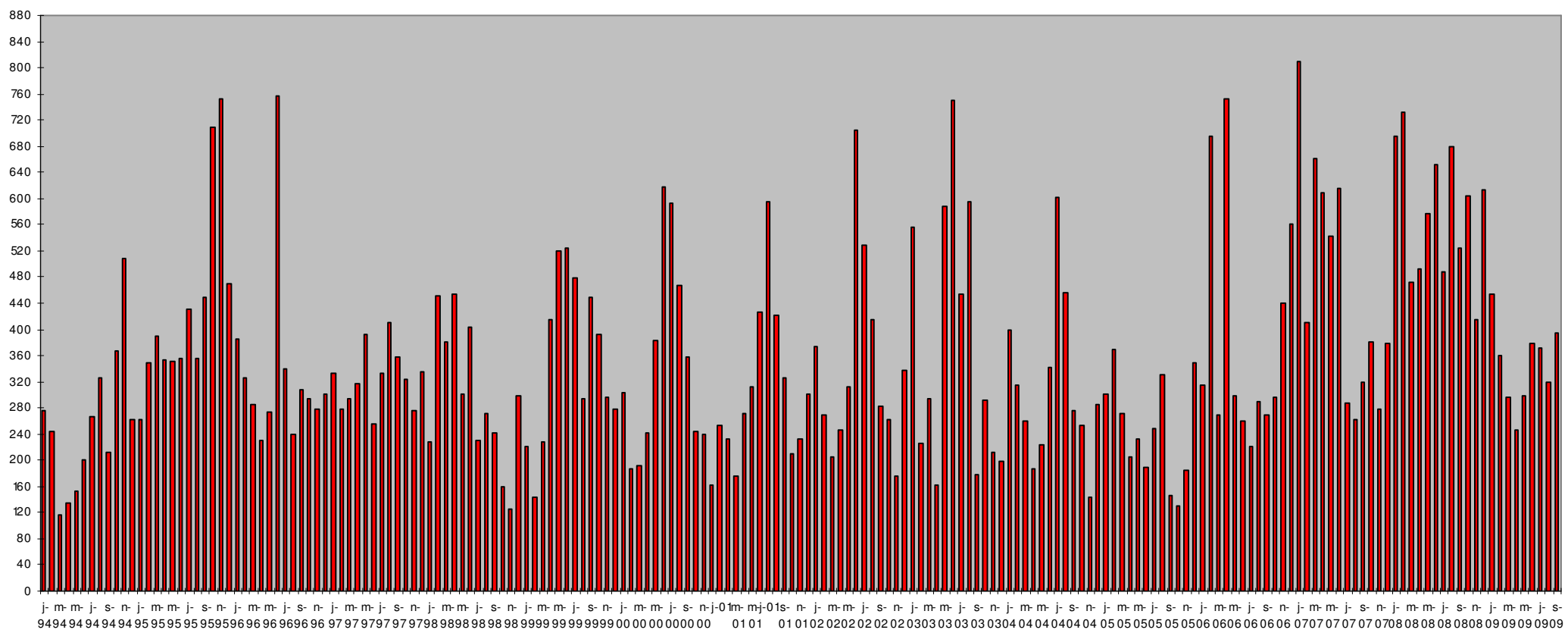
Haricot de mer (Donax trunculus)

Gymnodinium catenatum



Composition des toxines PSP dans les coquillages et *G. catenatum* ($\mu\text{g } \%$)

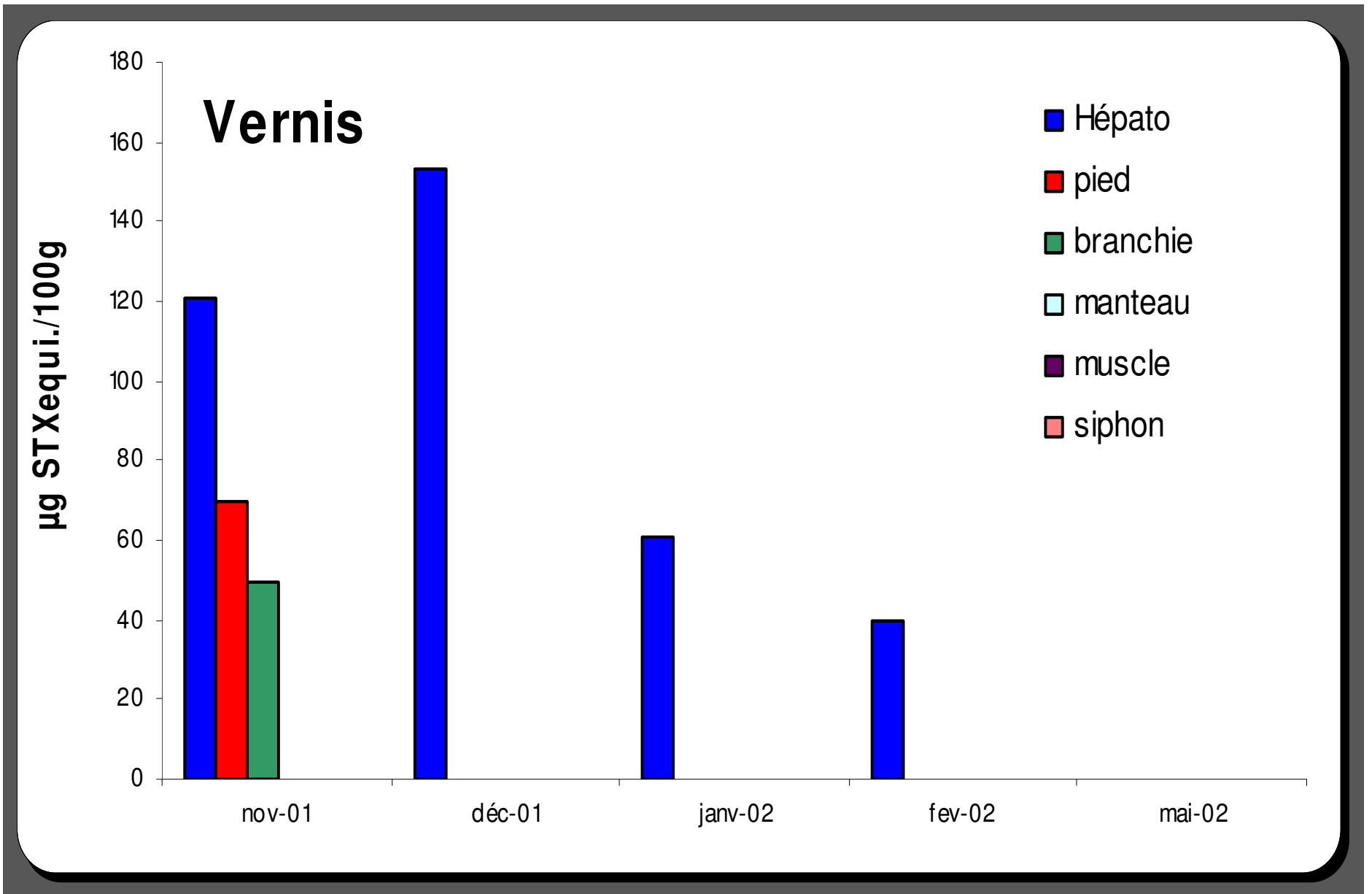
	Vernis (<i>Callista chione</i>)	Glycimère (<i>Glycimeris pilosa</i>)	<i>Haricots de mer</i> (<i>D. trunculus</i>)	<i>G. catenatum</i>
STX	ND	ND	ND	ND
NeoSTX	ND	3%	2%	ND
GTX2	6%	11%	9%	1%
GTX3	ND	ND	ND	ND
GTX4	ND	ND	ND	1%
dcGTX2	3%	4%	4%	6%
dcGTX3	4%	8%	6%	2%
B-toxins	10%	5%	8%	2%
dcSTX	6%	14%	5%	11%
C-toxins	74%	65%	66%	77%



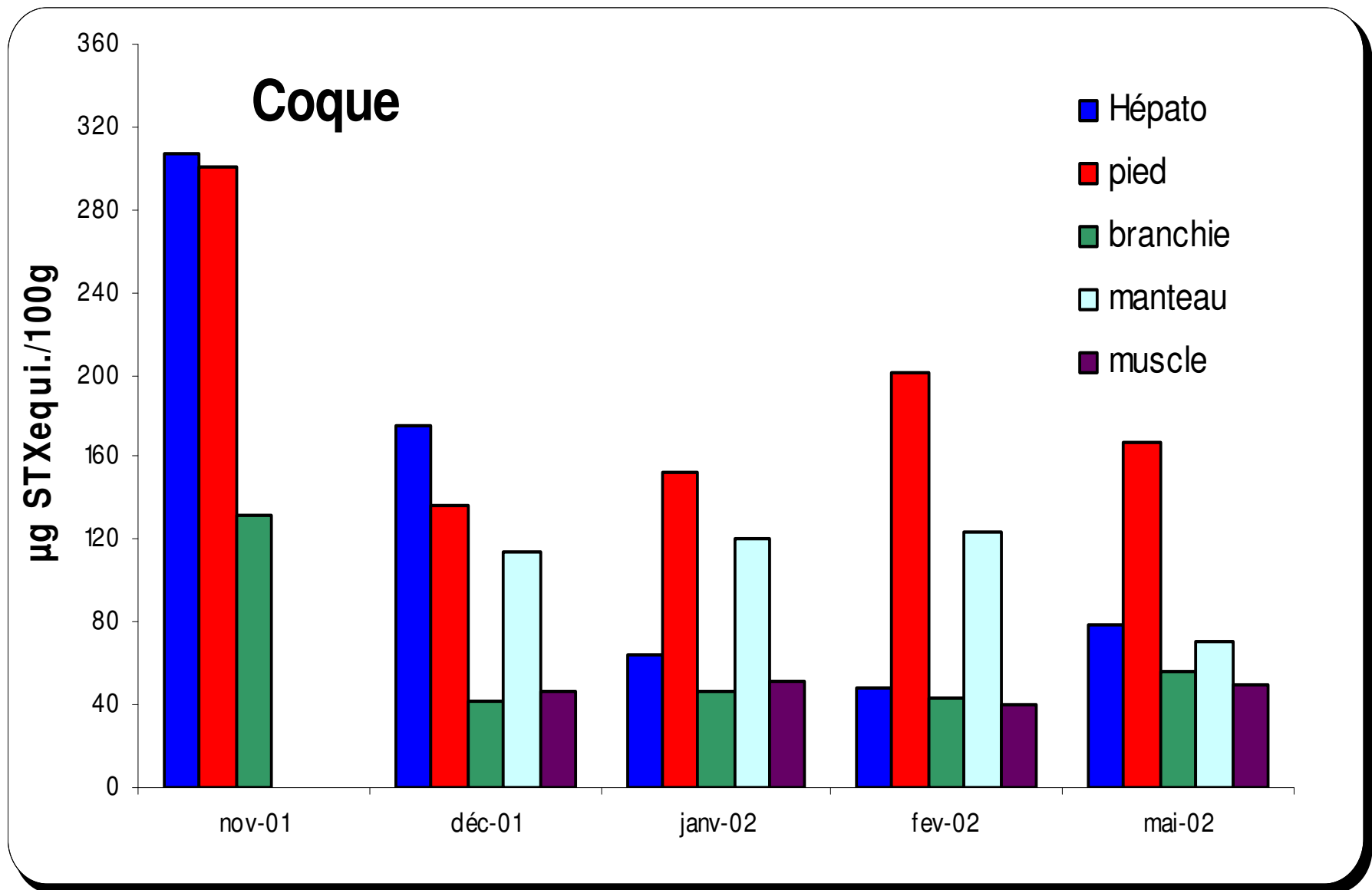
Cookles (*Acanthocardia tuberculatum*)

Tableau comparatif des profils toxiques
des coques et *G. catenatum* ($\mu\text{g } \%$)

	Coque (<i>A. tuberculatum</i>)	<i>G. catenatum</i> *
STX	8%	ND
NeoSTX	2%	ND
GTX2	8%	1%
GTX3	1%	ND
GTX4	ND	1%
dcGTX2	1%	6%
dcGTX3	1%	2%
B-toxins	13%	2%
dcSTX	65%	11%
C-toxins	1%	77%



Répartition des toxines PSP dans les organes des vernis



Répartition des toxines PSP dans les organes des coques

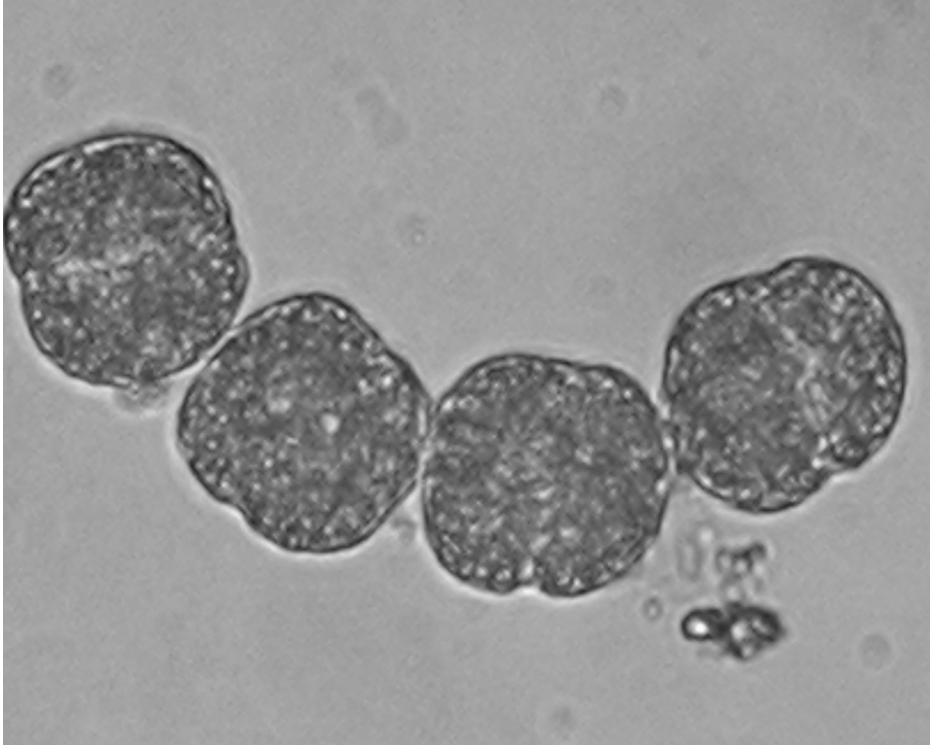
Je pense qu'il ne faut pas distinguer entre mer méditerranéenne et océan atlantique dans le cas des efflorescences parce que tout le mal vient de l'atlantique et c'est très lié. Bien que nous nous sommes réunis ici pour parler de la méditerranéenne surtout je vais briser le tabou et parler de l'atlantique parce que ça mérite d'être dit et tout le mal en matière d'efflorescence nous vient de l'atlantique nous vient d'ici.

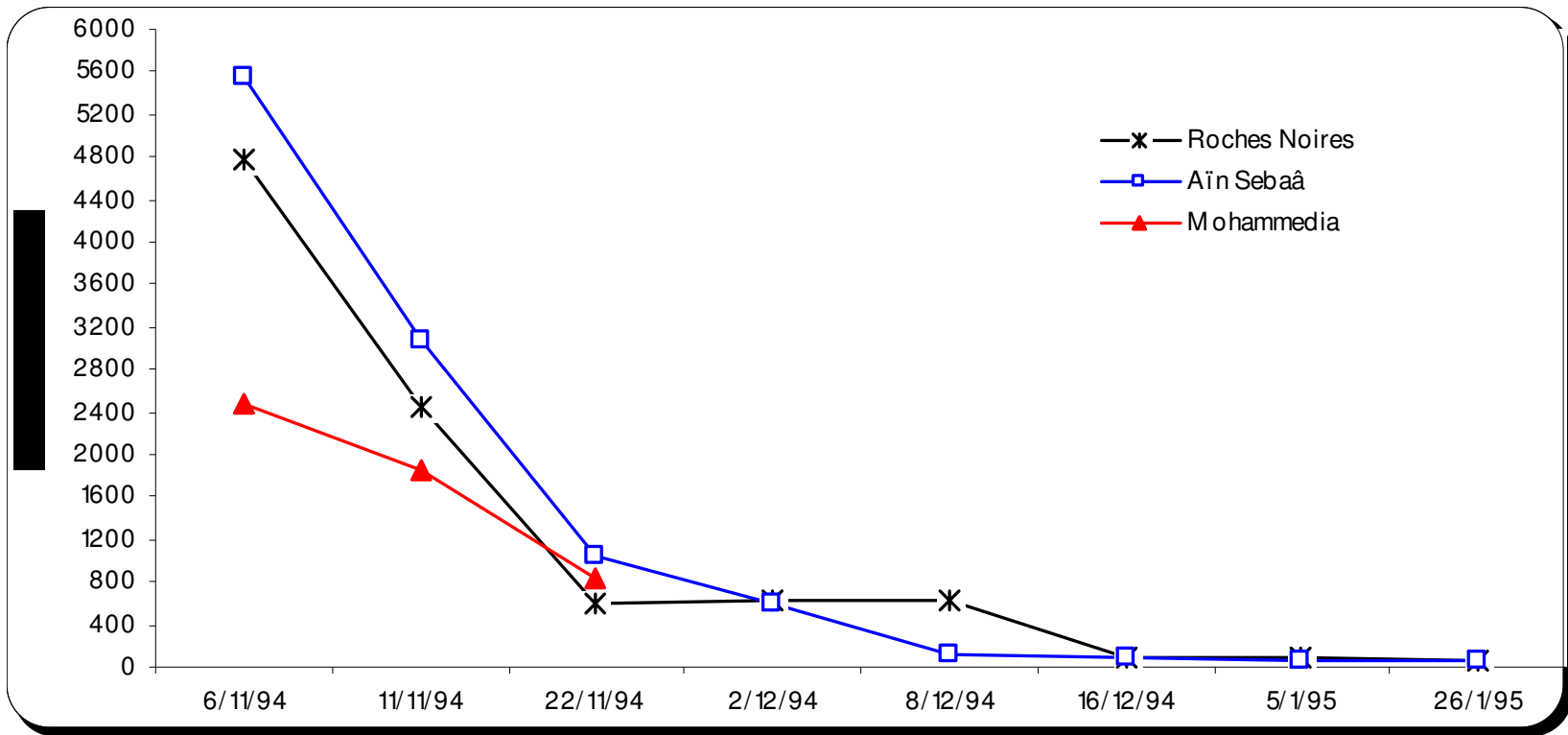
IN ATLANTIQUE



He also infiltrated in the Mediterranean ...

Gymnodinium catenatum





Evolution of PSP toxines in mussels in novembre 1994 outbreaks

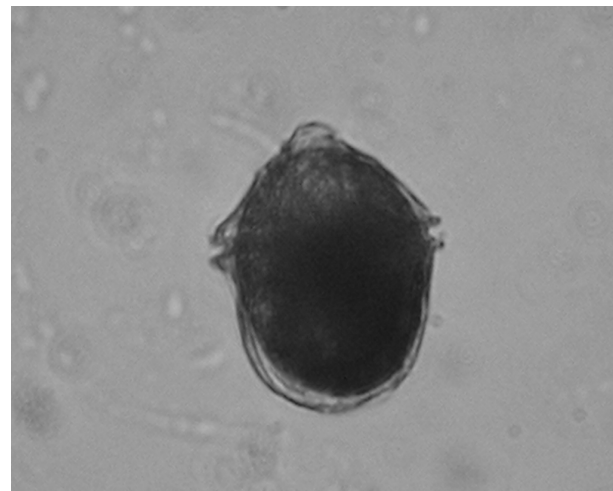
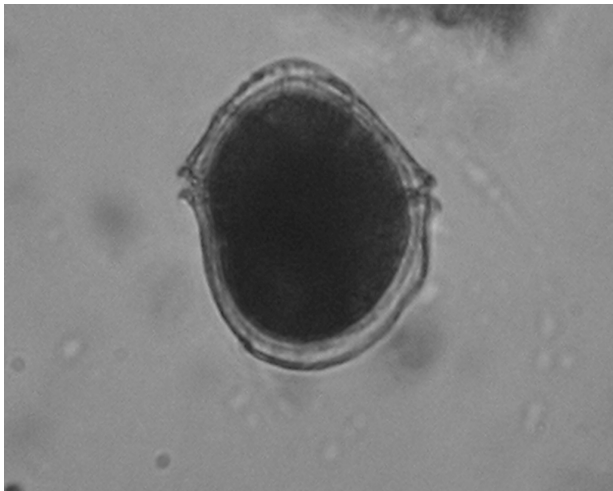
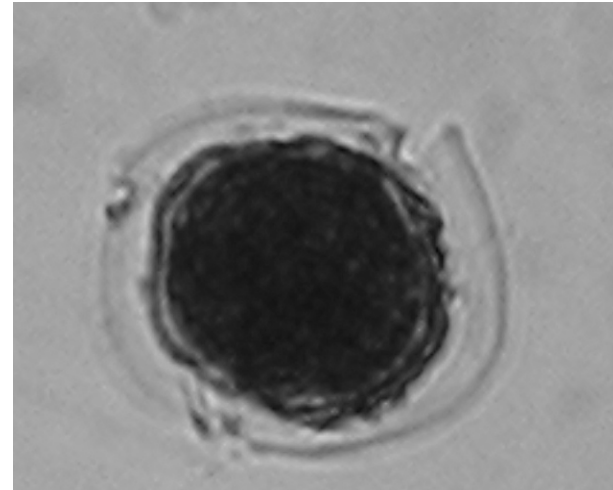
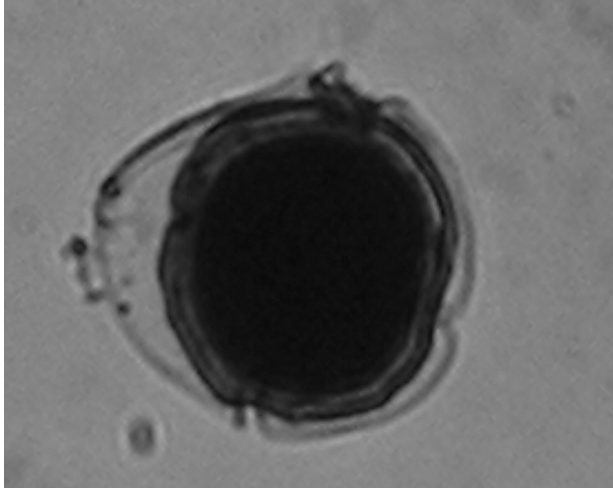


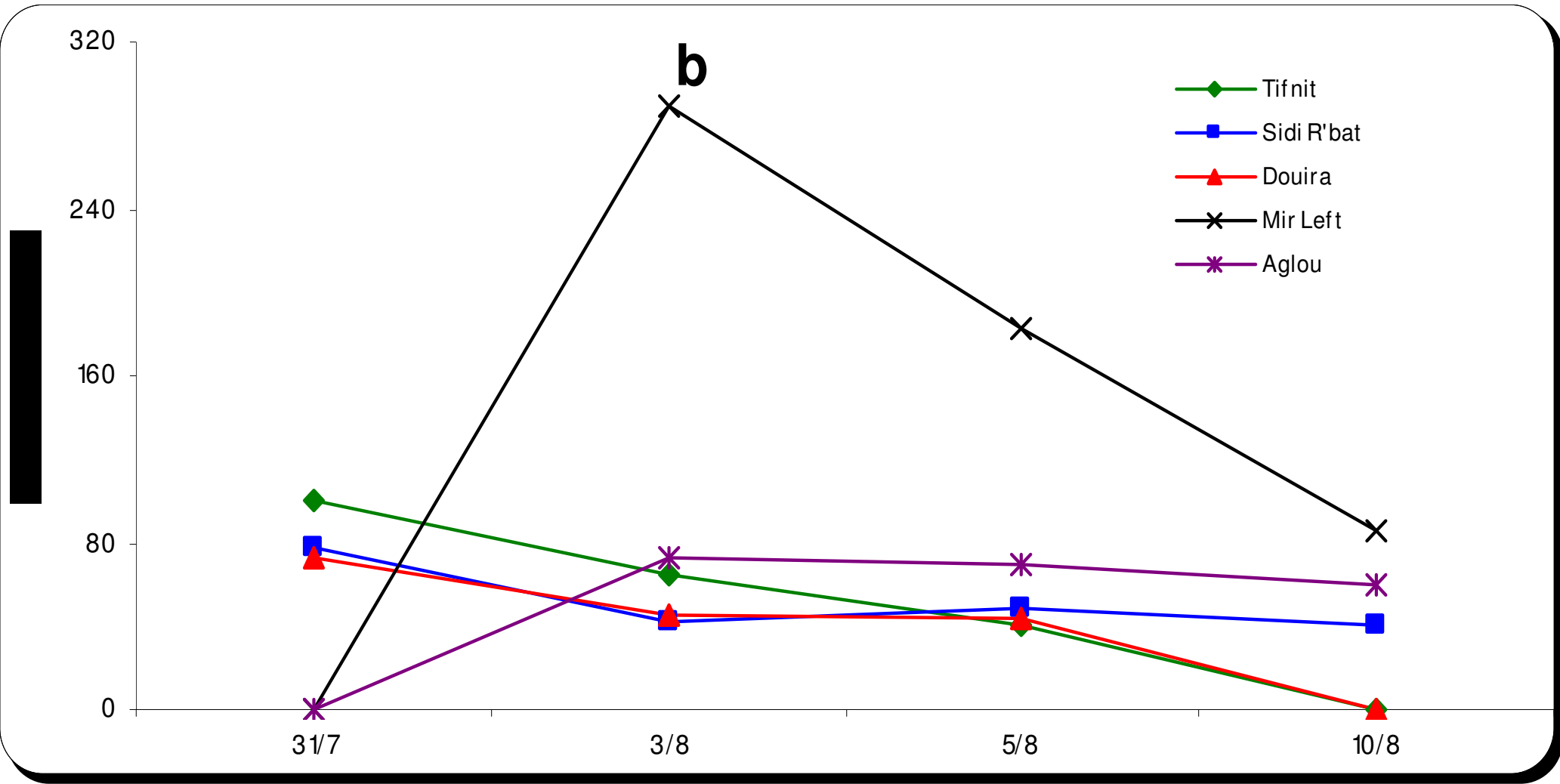
Moules (*M. Galloprovincialis*)

Composition toxinique des bivalves des côtes atlantiques ($\mu\text{g } \%$)

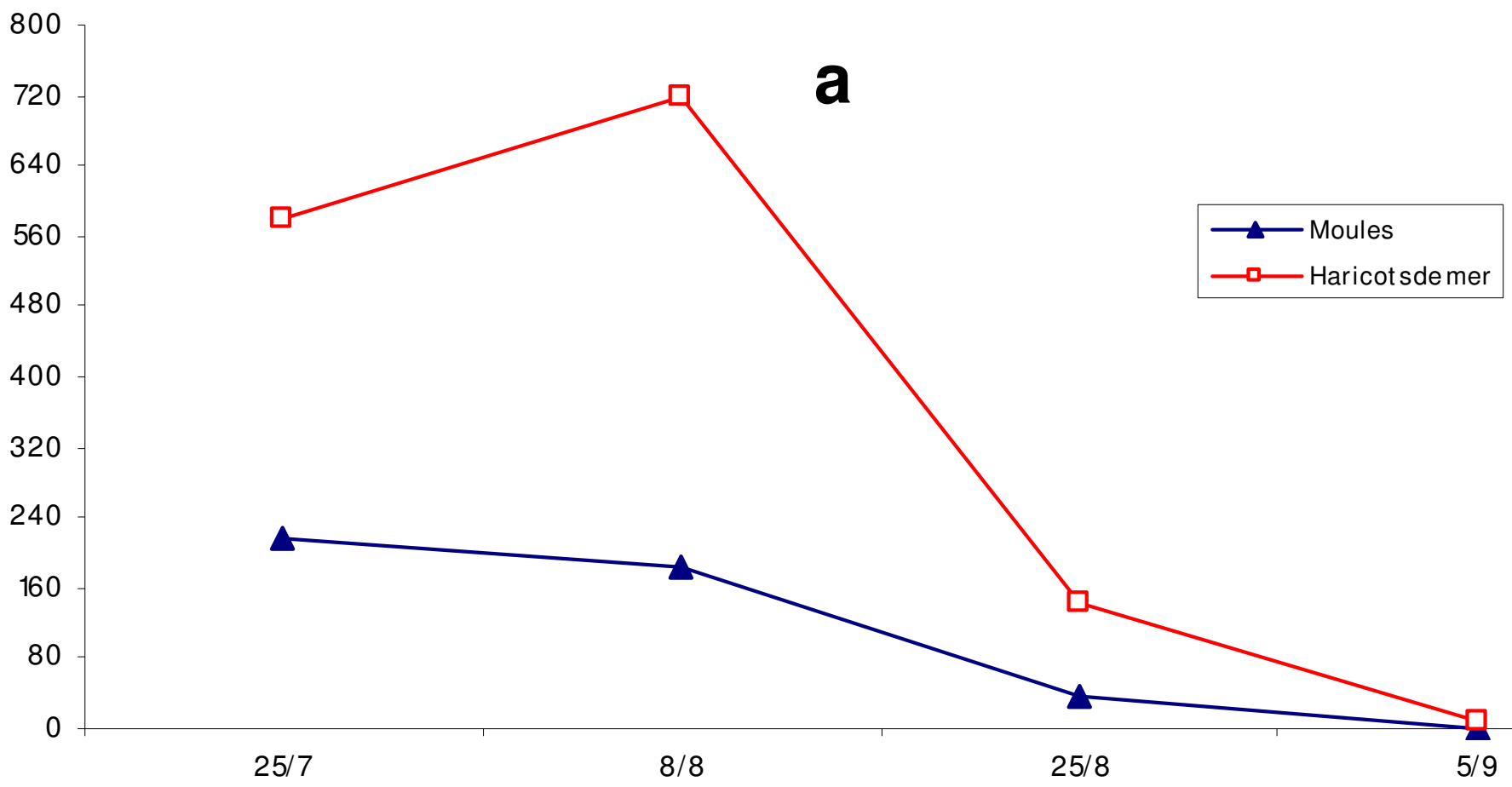
Espèces	Moules
Location	Aïn Sebaâ (Casablanca)
Date de prélèvement	Nov. 1, 1994
dcGTX2+3	9%
C-toxines	19%
dcSTX	20%
GTX1/4	1%
B-toxines	9%
NEO	45%
STX	ND

Alexandrium sp.

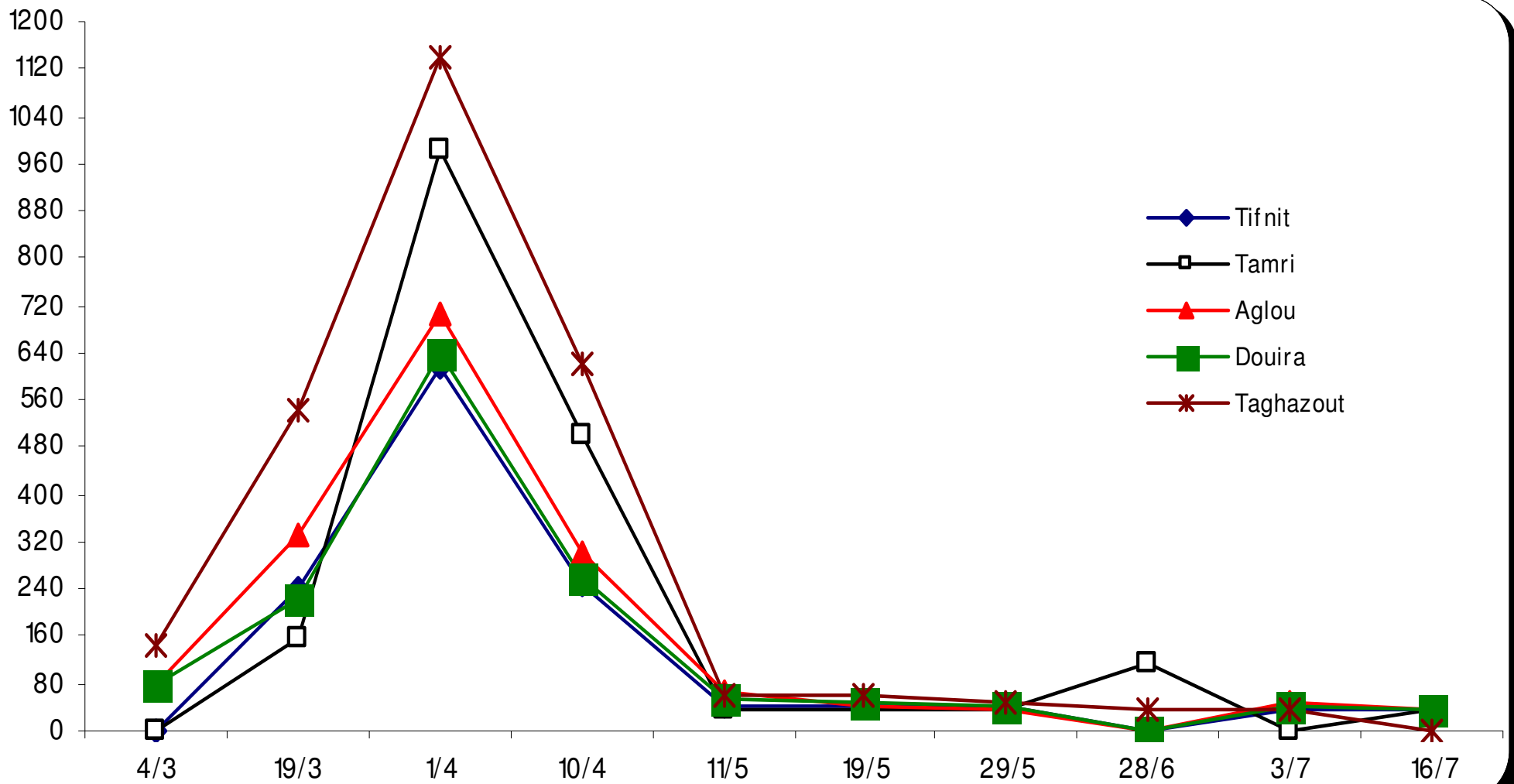




Evolution of PSP toxins in mussels from Agadir 1998



Evolution of PSP toxins in marine beans from Agadir 1998



Evolution of PSP toxins in mussels from Agadir 1999

Composition toxinique des bivalves
des côtes atlantiques sud ($\mu\text{g } \%$)

Espèces	Moules	Haricots de mer
Location	Taghazout (Agadir)	Aghroud (Agadir)
Date de prélèvement	Mars 30, 1999	Juin 28, 1999
dcGTX2+3	ND	ND
C-toxines	ND	ND
dcSTX	0.2%	ND
GTX1/4	98%	100%
B-toxines	ND	ND
NEO	ND	ND
STX	2%	ND

Composition toxinique des bivalves des côtes atlantiques ($\mu\text{g } \%$)

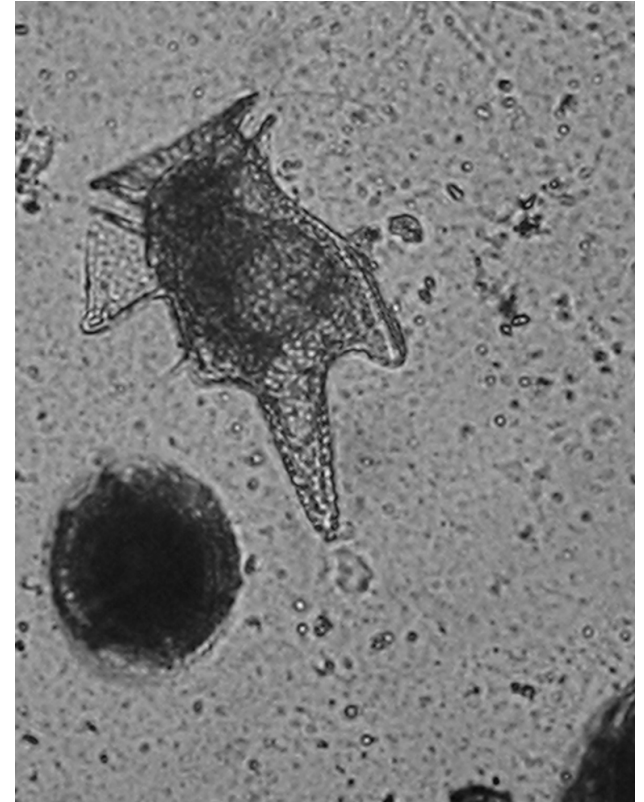
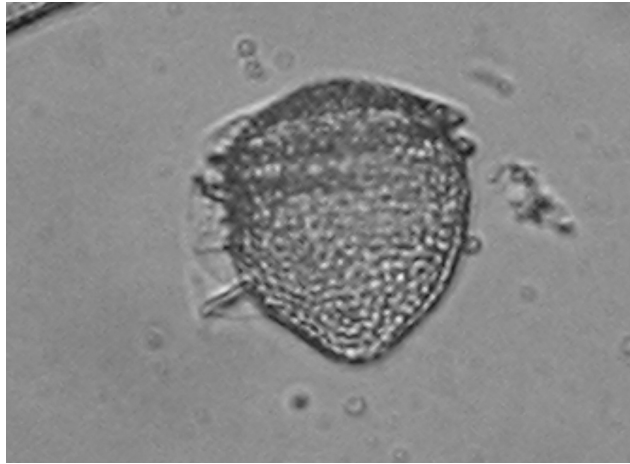
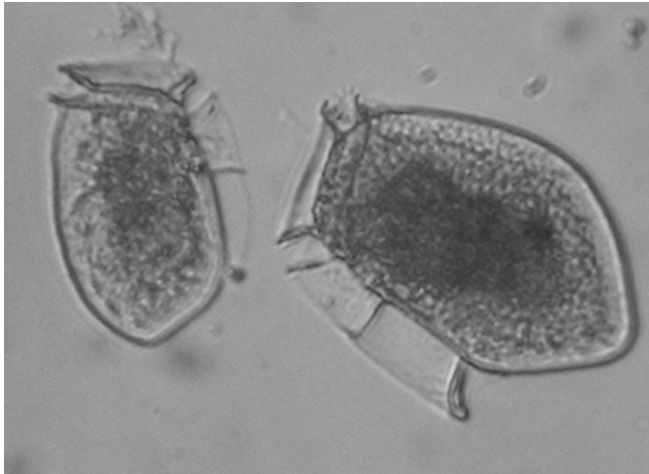
Espèces	Moules	Haricots de mer
Location	Taghazout (Agadir)	Aghroud (Agadir)
Date de prélèvement	Mars 30, 1999	Juin 28, 1999
dcGTX2+3	ND	ND
C-toxines	ND	ND
dcSTX	0.2%	ND
GTX1/4	98%	100%
B-toxines	ND	ND
NEO	ND	ND
STX	2%	ND

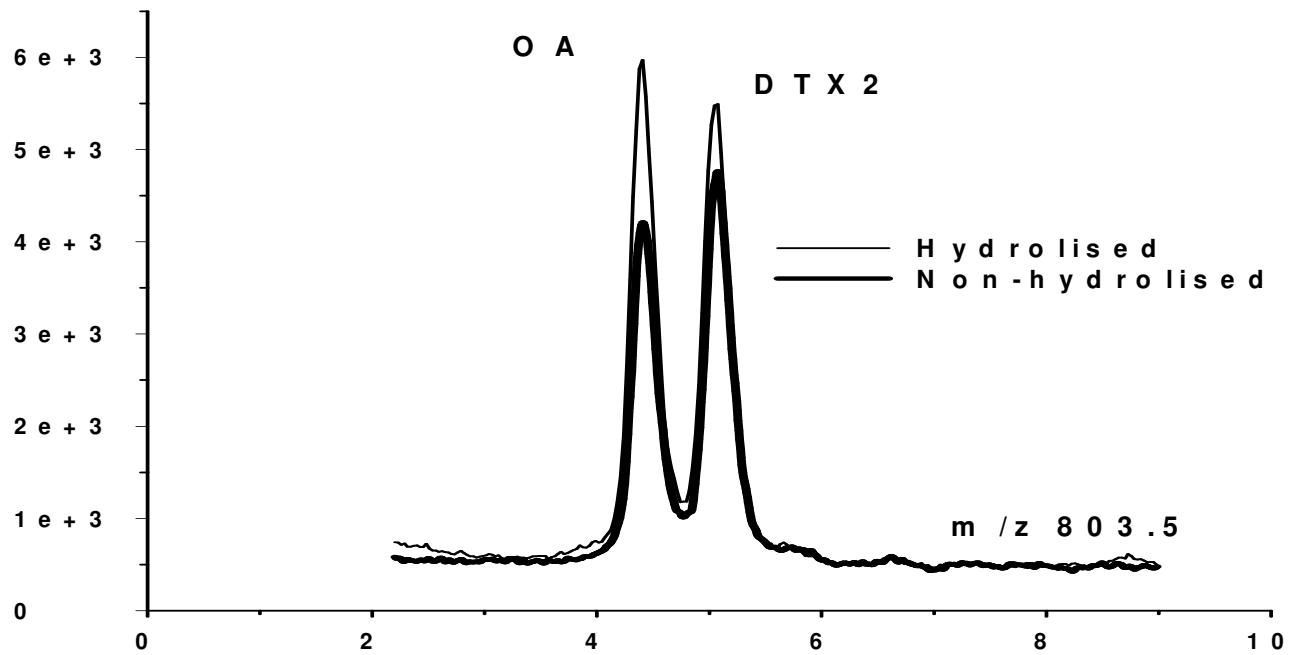
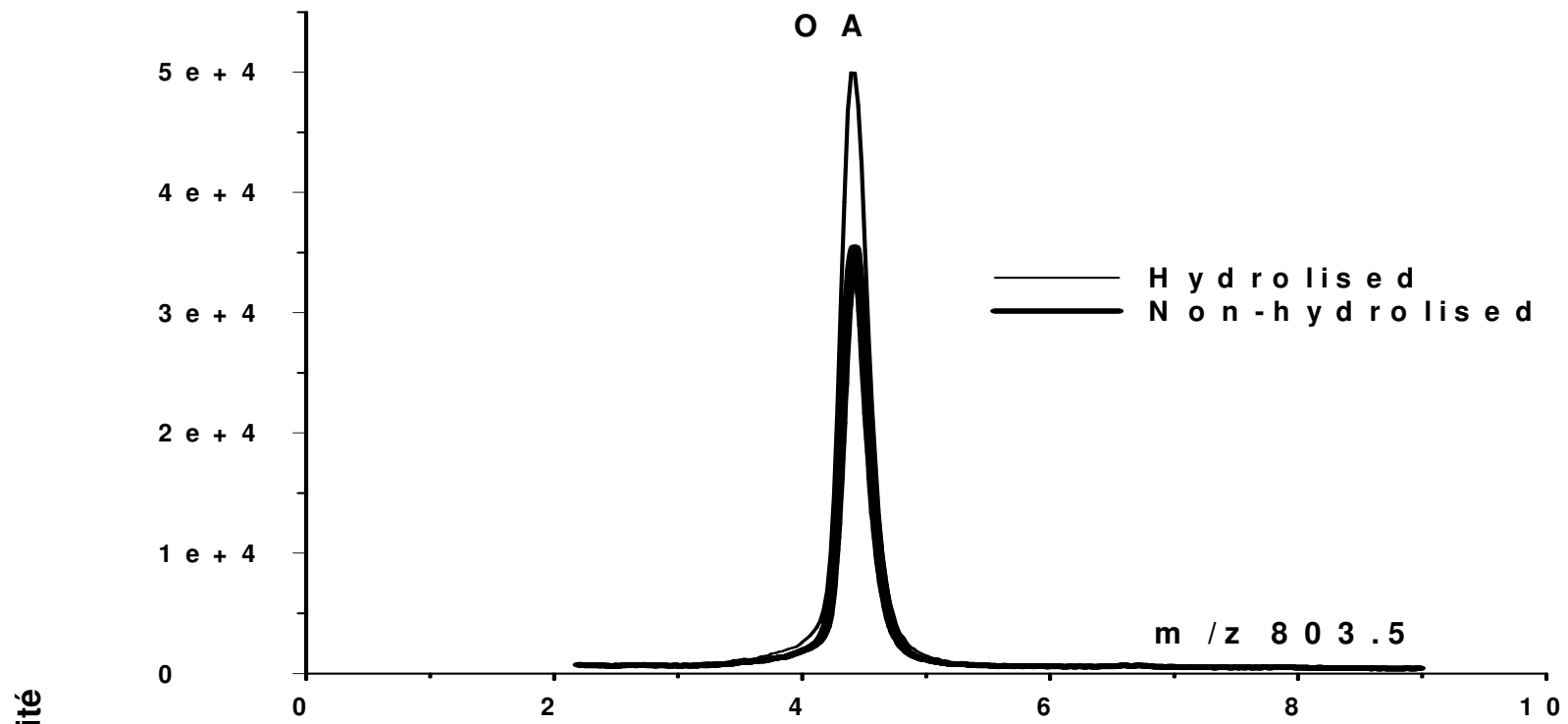
ND = Non décelable ;

Les résultats présentés dans ce tableau sont obtenus par la méthode de Lawrence.

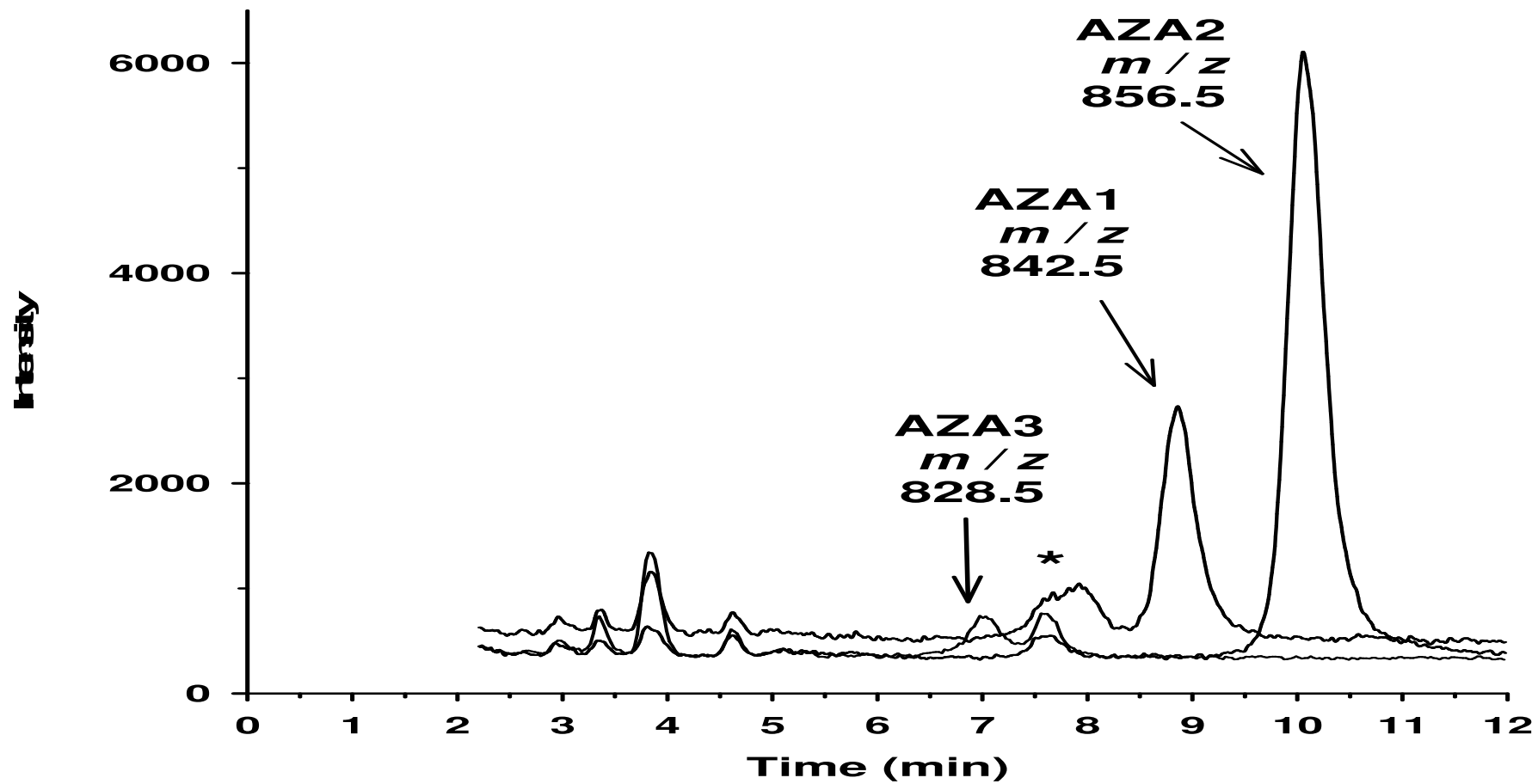
HABs LINKED WITH LSP TOXINS PRODUCTION

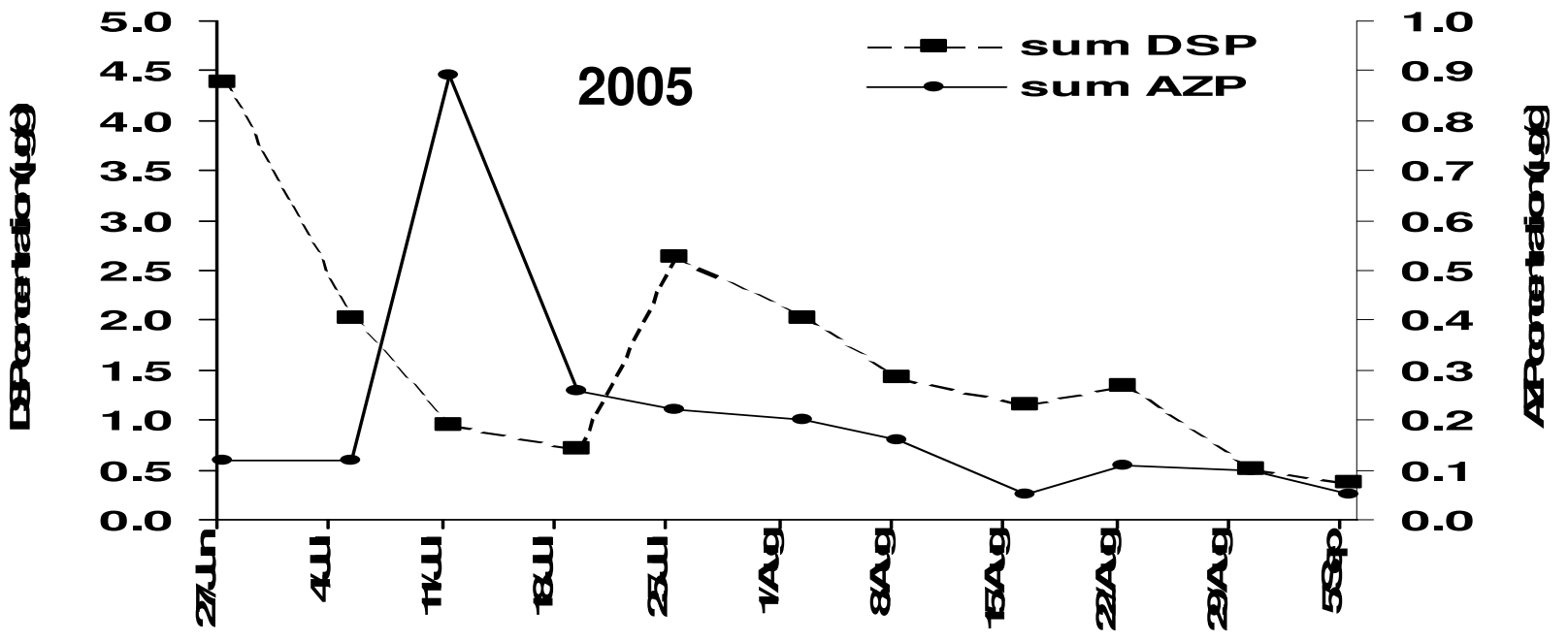
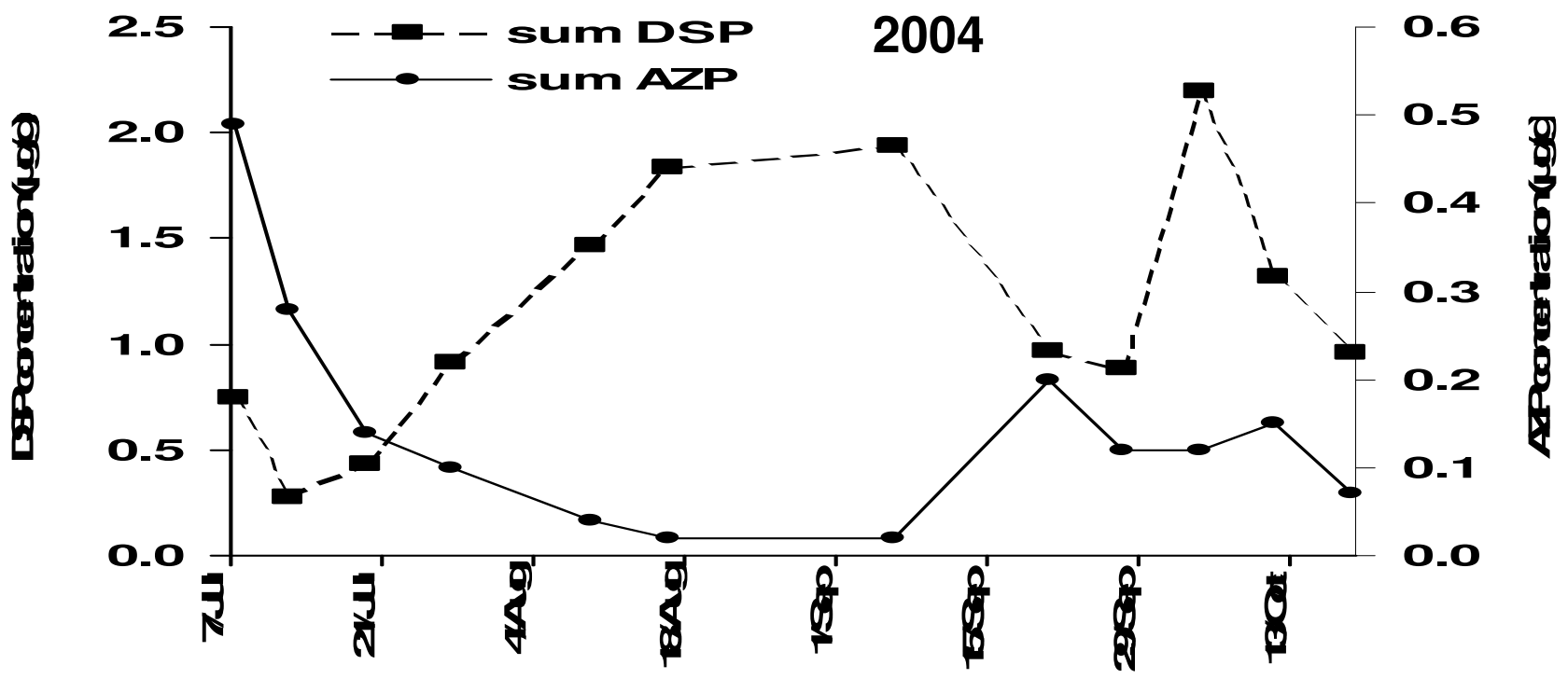
Dinophysis spp.

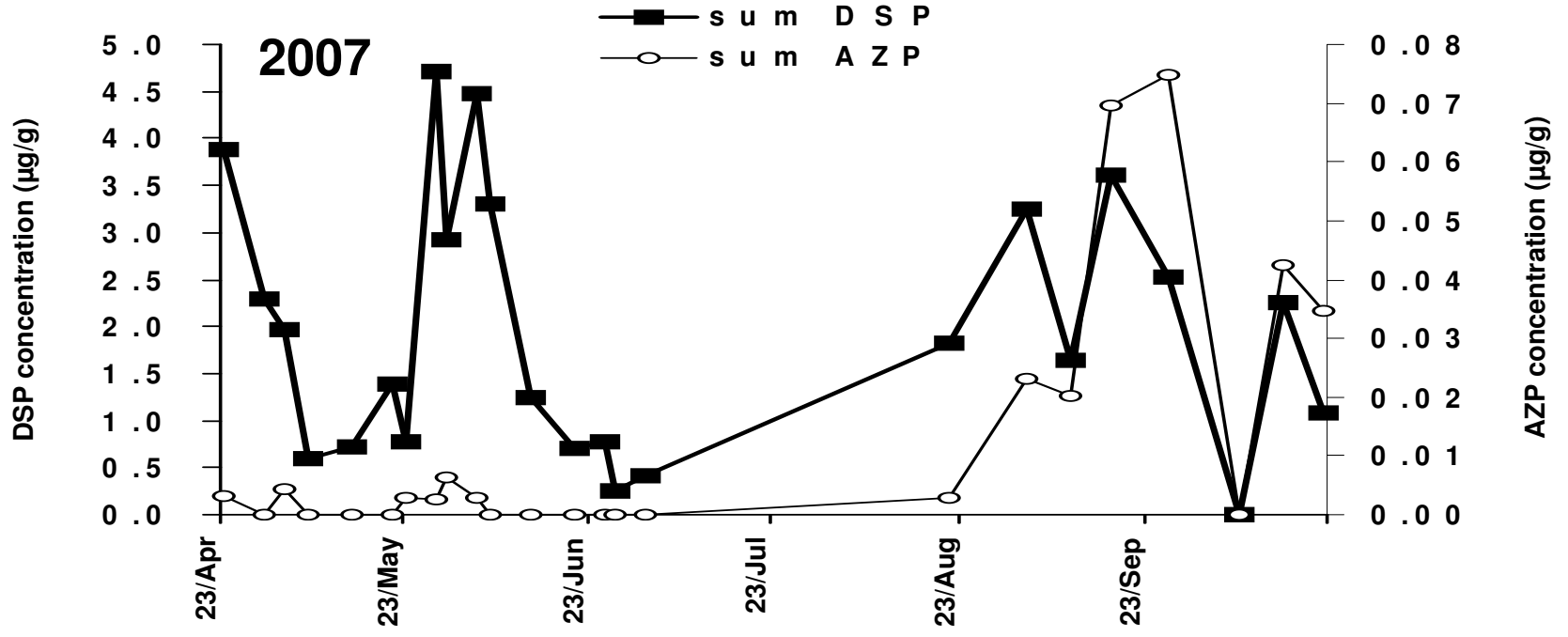
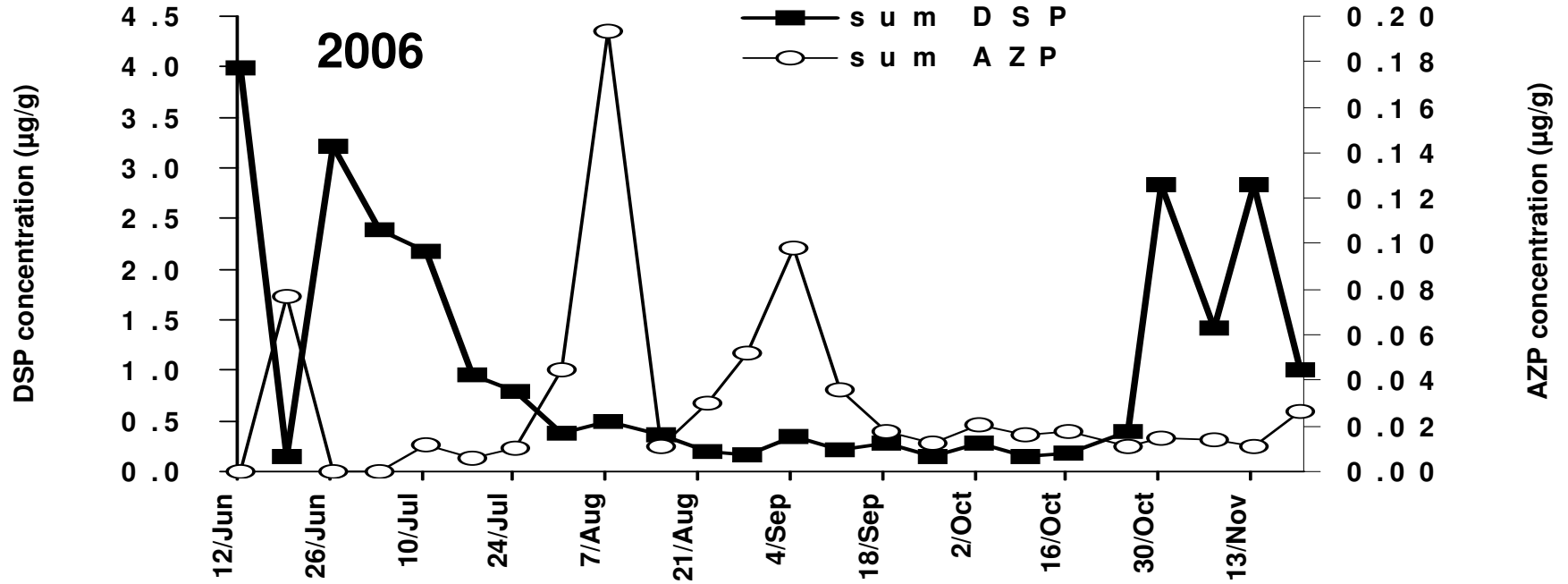




Temps (min)







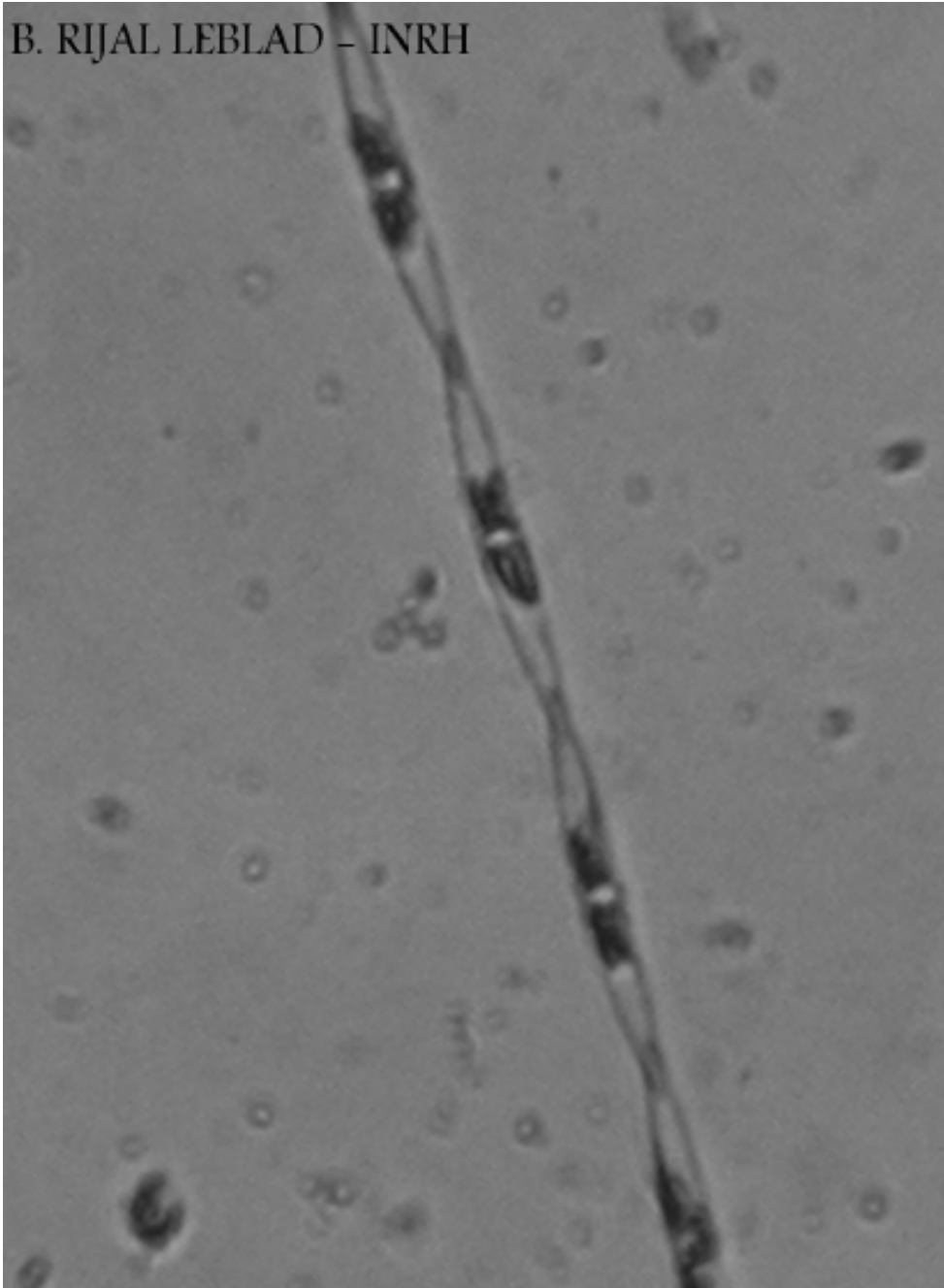
Microalgae species producing lipophilic toxins

- DSP (AO & DTXs)
 - ❖ *Dinophysis acuminata*,
 - ❖ *Dinophysis fortii*,
 - ❖ *Dinophysis sacculus*,
 - ❖ *Dinophysis norvegica*.
 - ❖ *Prorocentrum lima*

- AZP
 - ❖ *Prorocentrum crassipes*

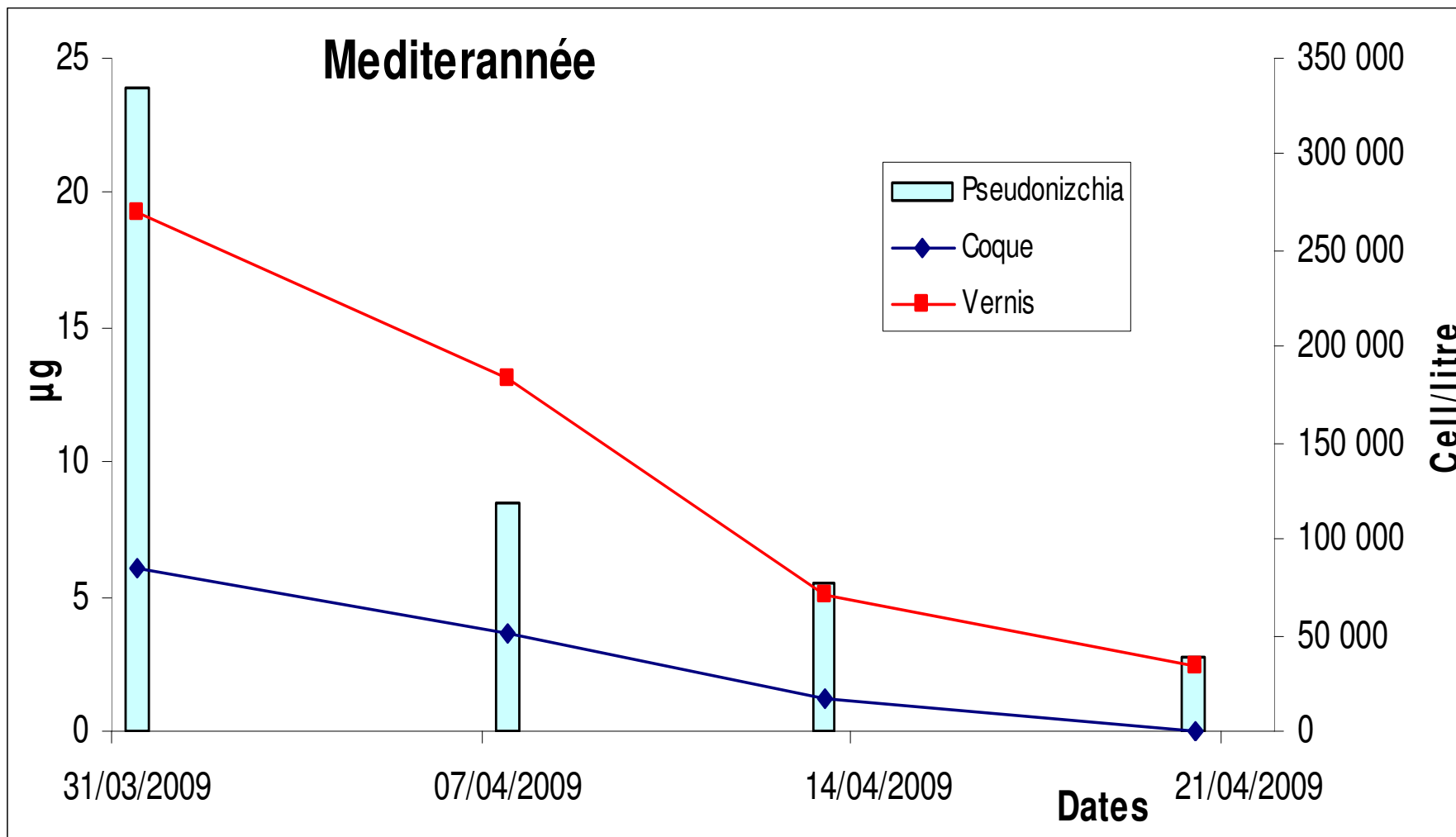
HABs LINKED WITH ASP TOXINS PRODUCTION

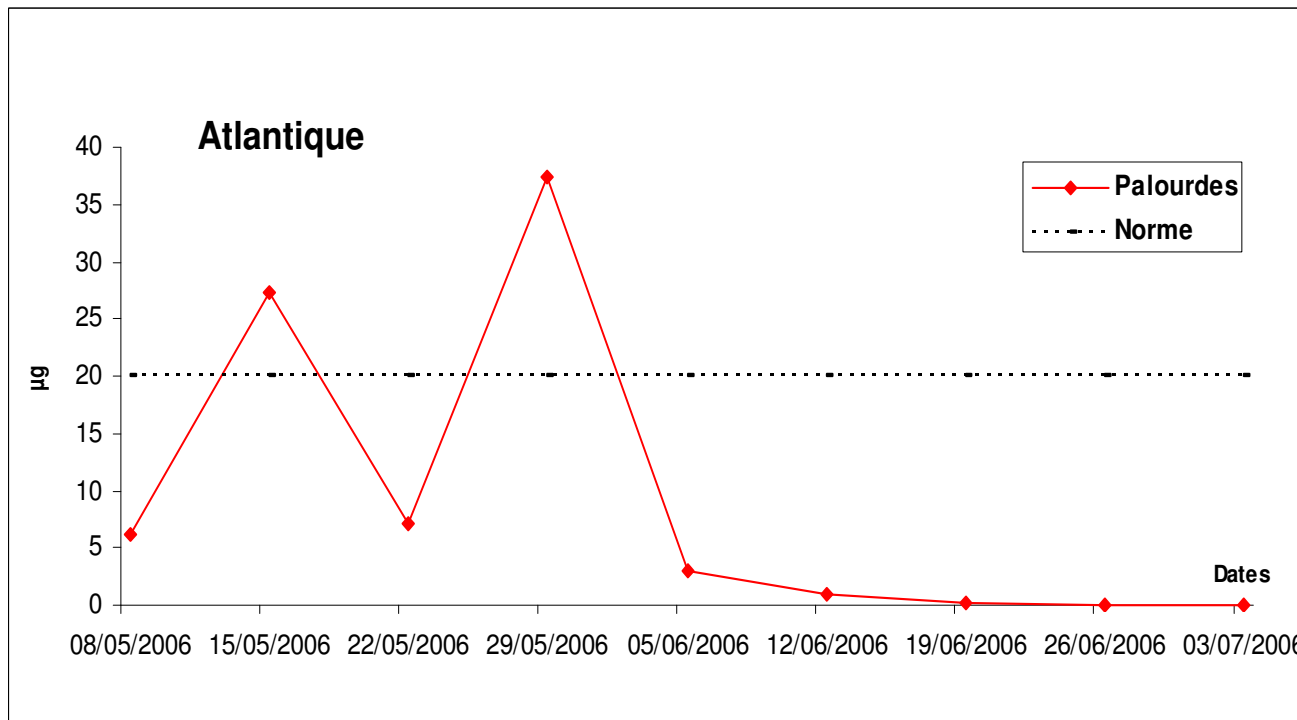
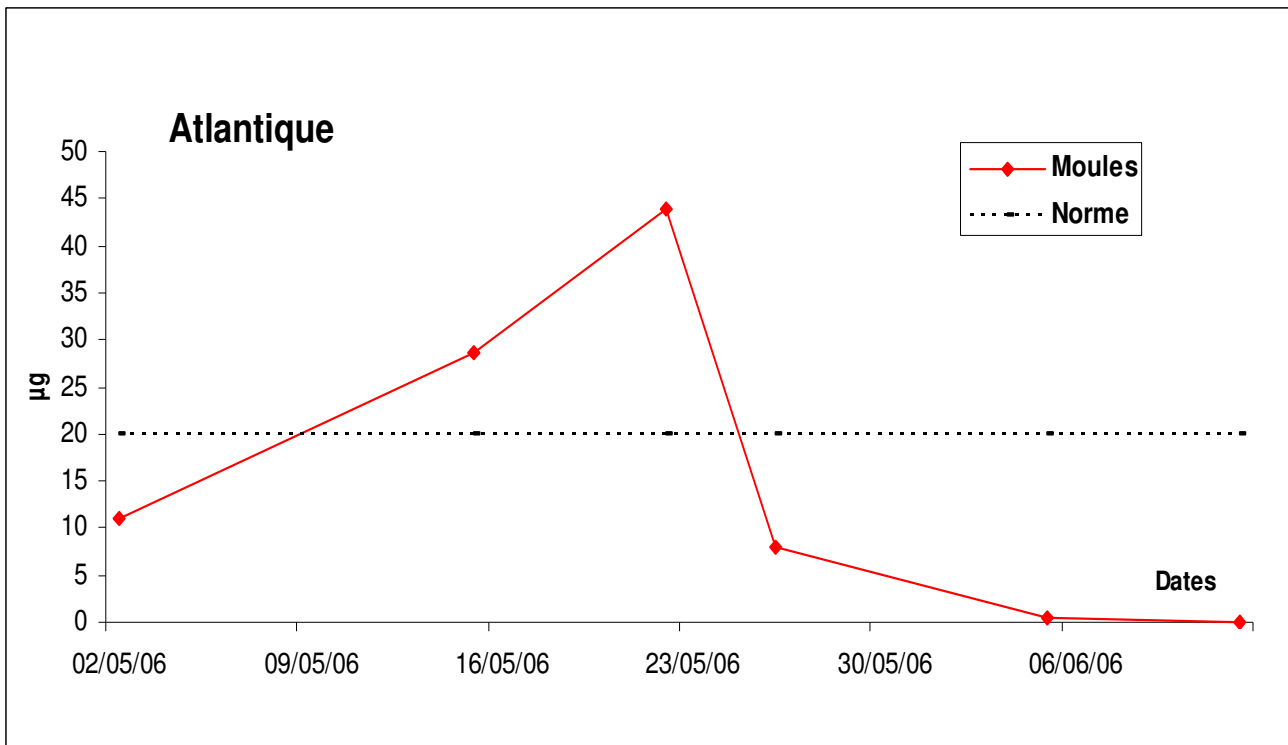
B. RIJAL LEBLAD - INRH



Pseudo-nitzschia multiseries

Méditerranée





CONCLUSION

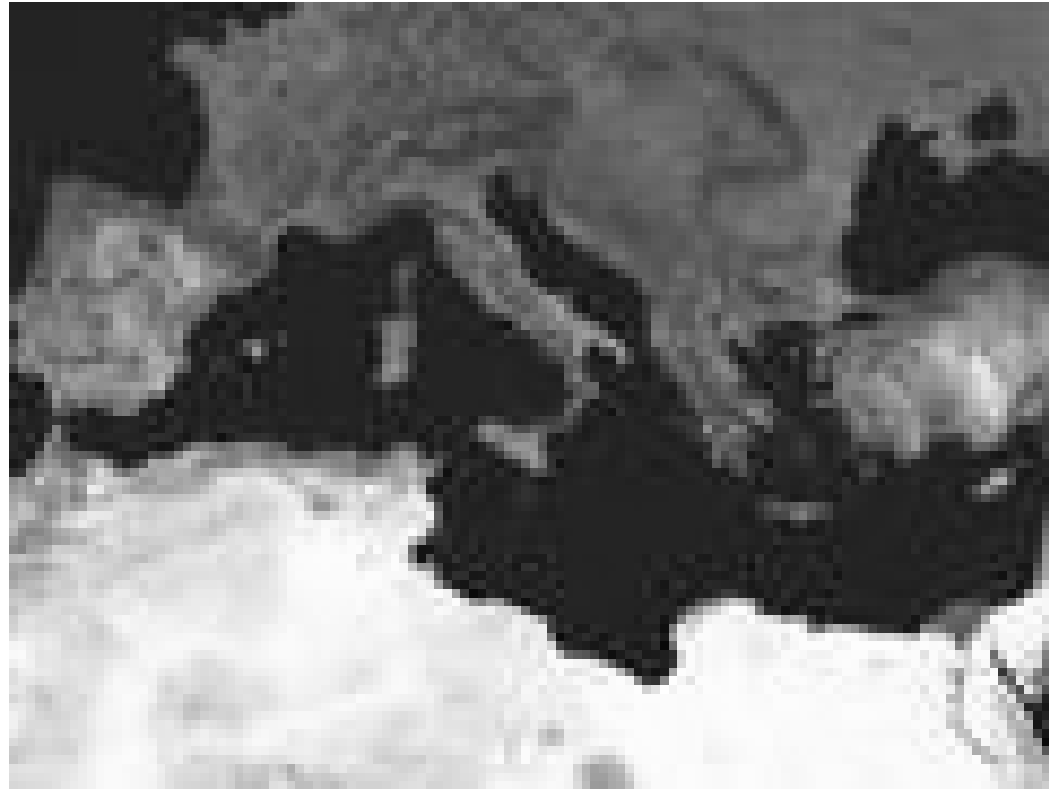
- Mediterranean bivalve molluscs contamination by the PSP occurs seasonally in winter and summer
- *Gymnodinium catenatum* : Phytoplankton species producing PSP toxins in the Mediterranean and North of Atlantic
- *Alexandrium sp.* : Phytoplankton species producing PSP toxins in the South of Atlantic
- North of Atlantic : contamination of bivalve molluscs by the LSP is seasonal and occurs in summer
- Mediterranean : Contamination by LSP is rare and occurs occasionally with brief duration
- *Dinophysis sp., prorocentrum lima* : DSP producers
- *prorocentrum crassipes* : LSP producer
- *Pseudo-nitzschia multiseries* : ASP producer

ICI je voudrais attirer votre attention sur *Ostreopsis Ciguatera*





Ciguatera



Ostreopsis cell

