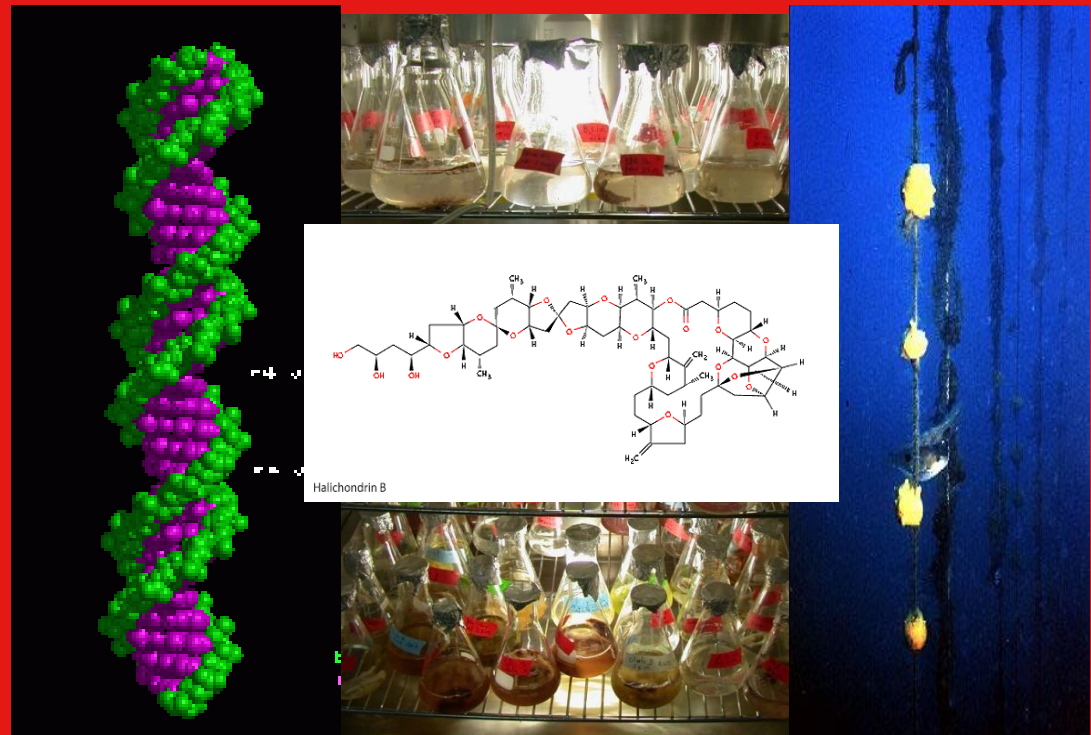


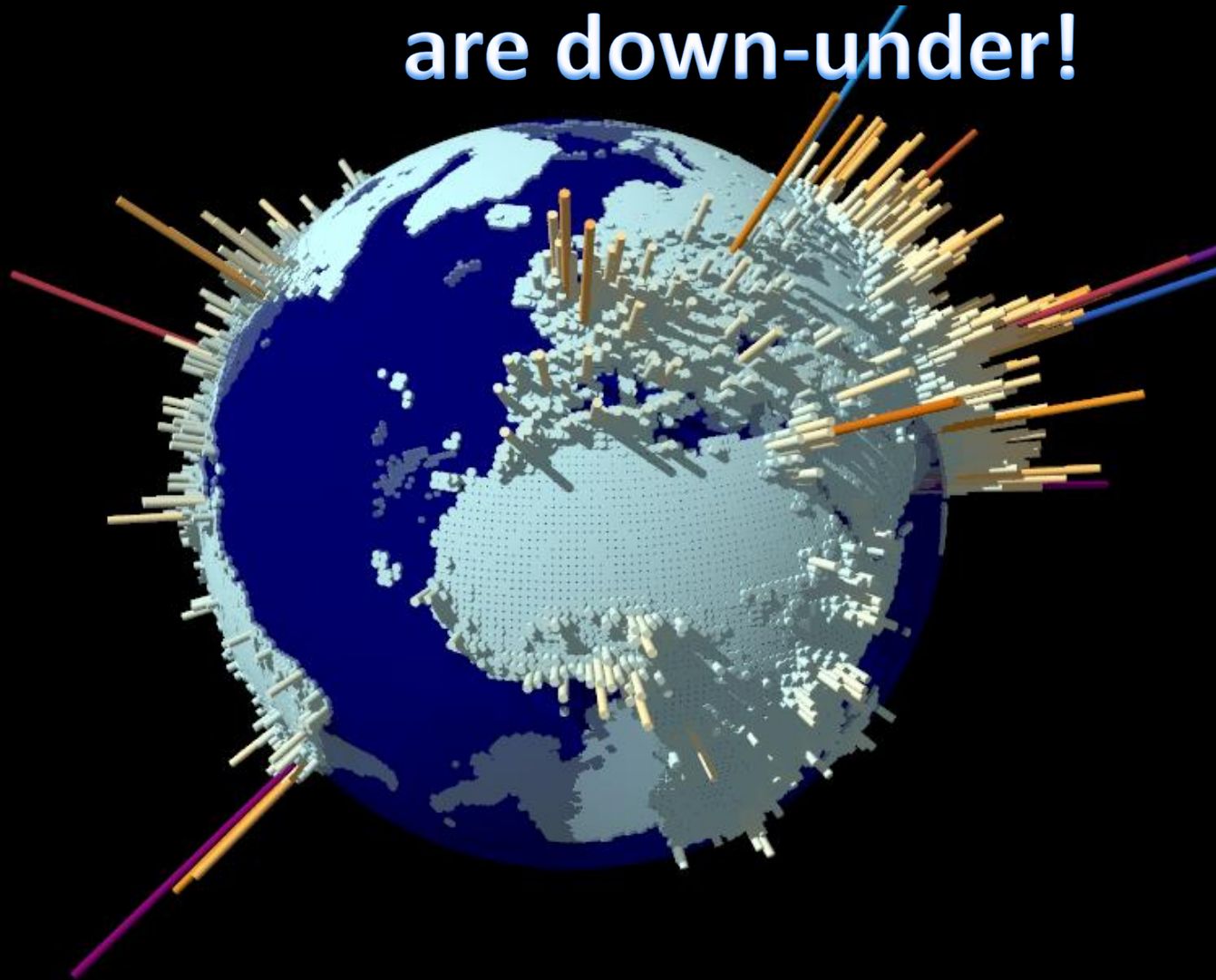
# Mapping Marine Bioactives in Tairāwhiti



"the coast upon which the sun  
shines across the water"



# Worlds growing populations: health solutions to new needs are down-under!



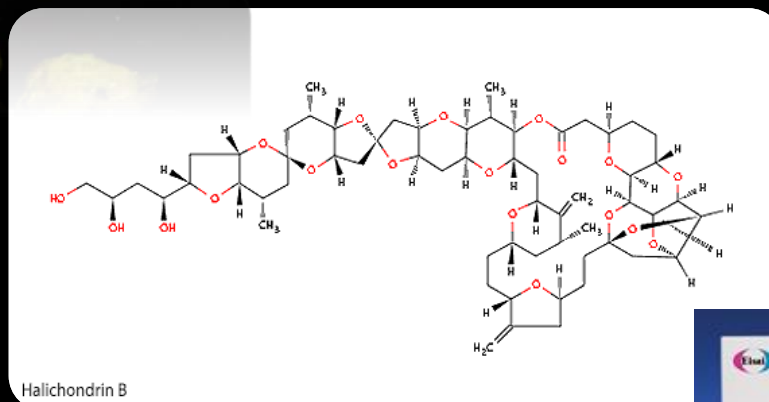
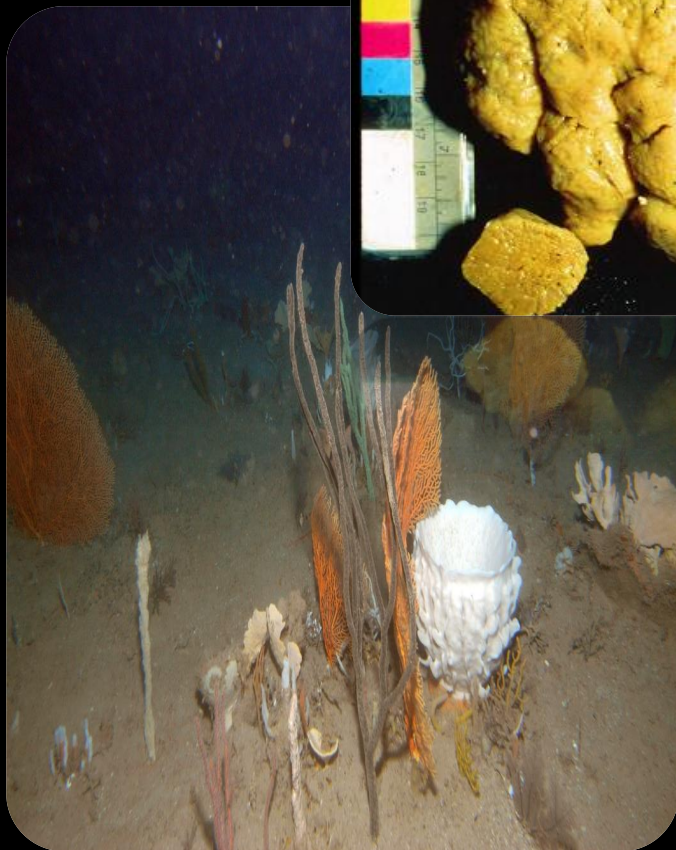
7.6  
Billion  
now

to

11.2  
Billion  
2100



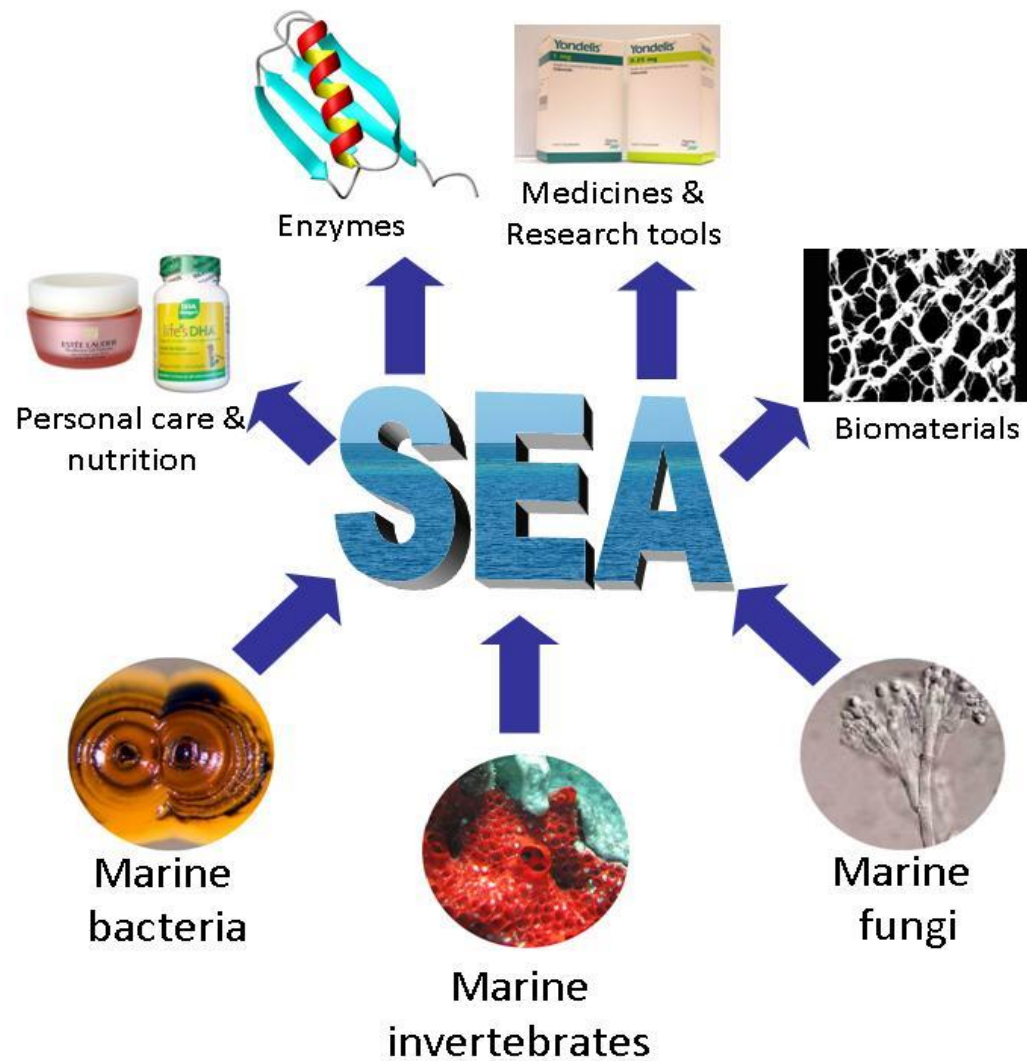
# What links a sponge, a crab, and cancer drug discovery?..... find out later!



Halichondrin B

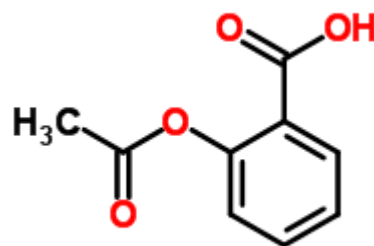
Halichondrin B



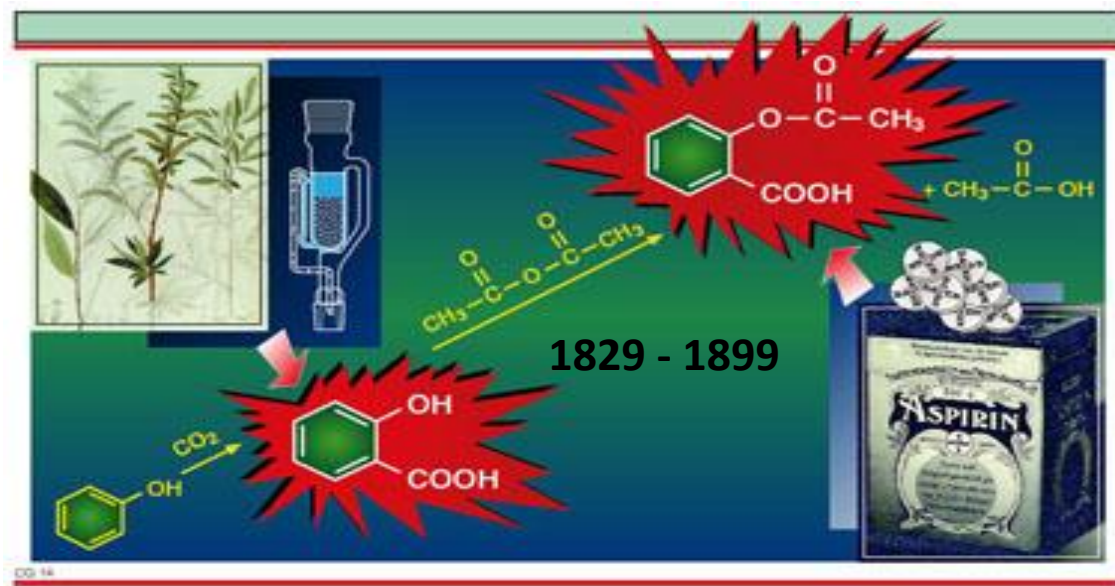




# Aspirin



acetylsalicylic acid  
(2-Acetoxybenzoic acid)





# Useful Biochemicals from Nature



160. Наперстянка шерстистая — *Digitalis lanata* Ehrh.



La belladone (*Atropa belladonna*), la stramoine (*Datura stramonium*) et la mandragore (*Mandragora officinarum*) sont des plantes «magiques» appartenant à la famille des Solanacées.

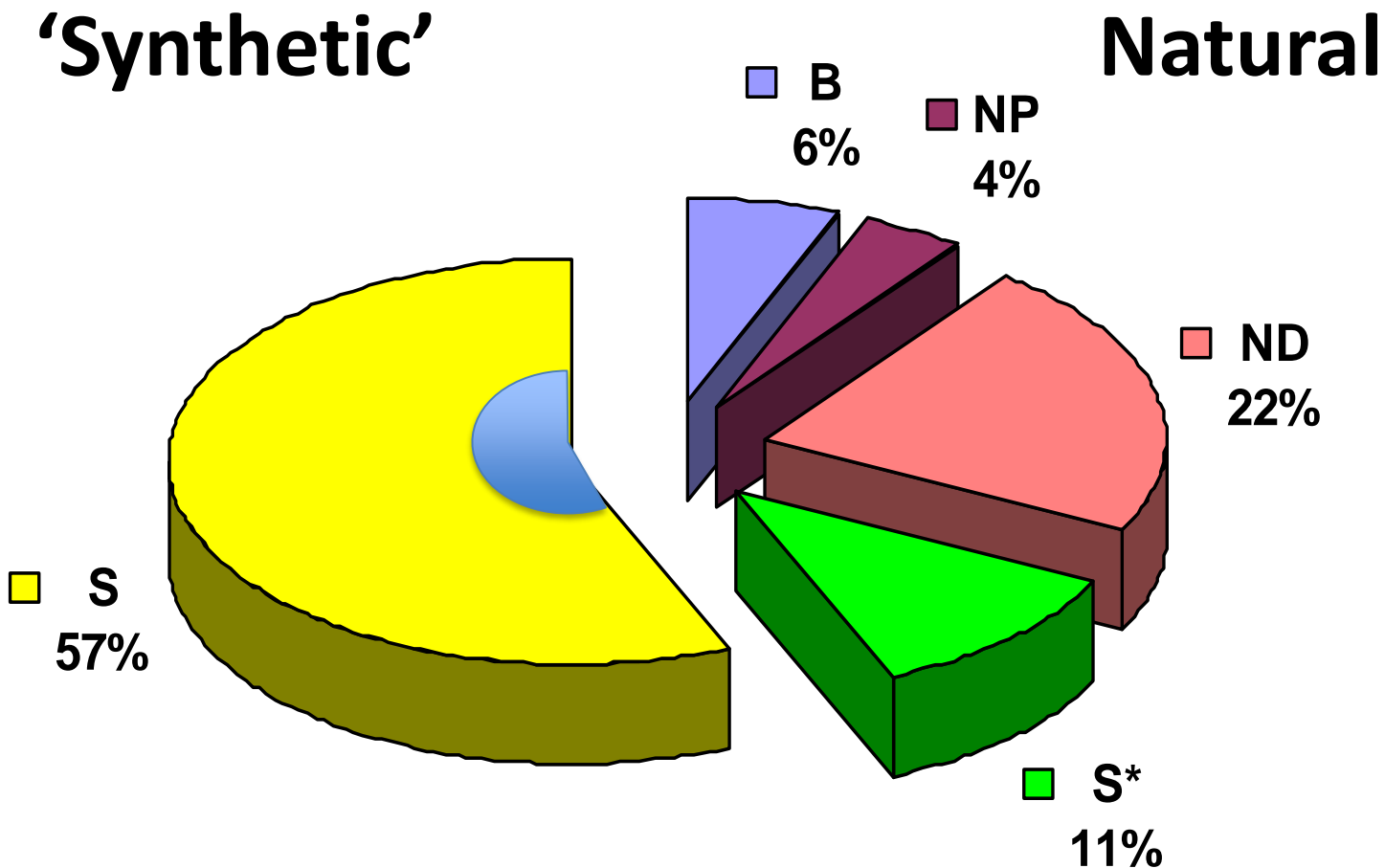
Hostettmann, K. *Tout Savoir sur le Pouvoir des Plantes*. 1997:134







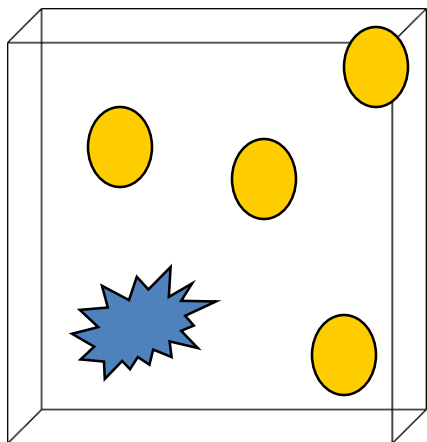
# Sources of Current Drugs, 1983-2010



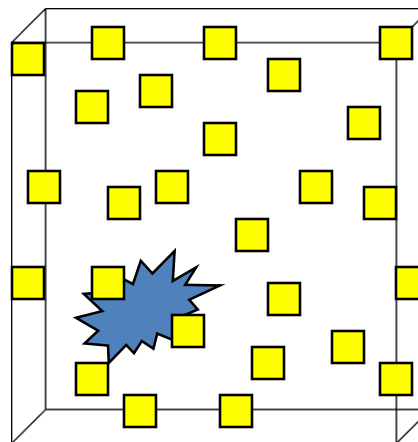


# Sources of Biomedical Molecular Diversity

Combinatorial



Natural



Sensitivity region of desired biomed activity

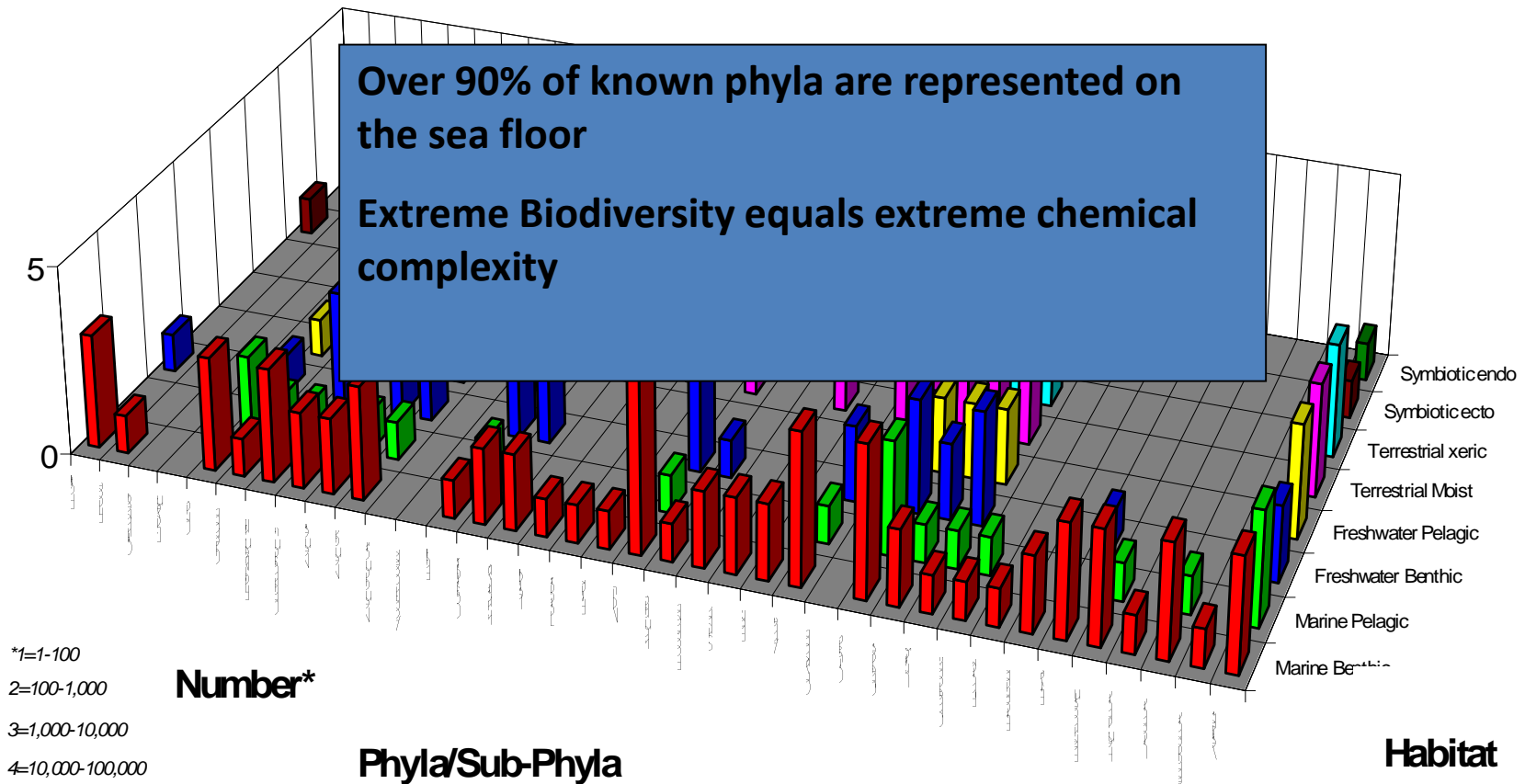


Cluster of synthetic compounds



Biological compounds

## Phyla & Distribution in the Animal Kingdom



Battershill C, Jaspers M, Long P. (2005) Marine Biodiscovery: new drugs from the ocean depths. *Biologist* 52 (2): 107-114

Munro MHG, Blunt JW, Dumdei EJ, Hickford SJH, Lill RE, Li S, Battershill CN, Duckworth AR. (1999). The discovery and development of marine compounds with pharmaceutical potential. *Journal of Biotechnology* 70:15-25.



# WORLD OCEAN CENSUS

CENSUS  
OF MARINE LIFE



A GLOBAL SURVEY OF MARINE LIFE

DARLENE TREW CRIST \* GAIL SCOWCROFT \* JAMES M. HARDING, JR.

FOREWORD BY SYLVIA EARLE

## CoML

- 250,000 species
- Over 1 million??!

# Marine Biodiversity: Aotearoa

- EEZ 4<sup>th</sup> largest
- 1% earth surface
- 250,000 spp world
- 17,135 spp NZ
- 14% of species
- Endemism 60%+

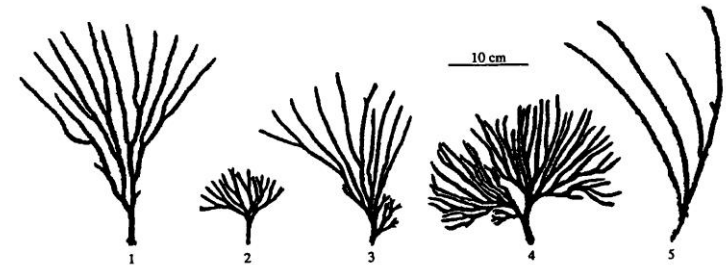
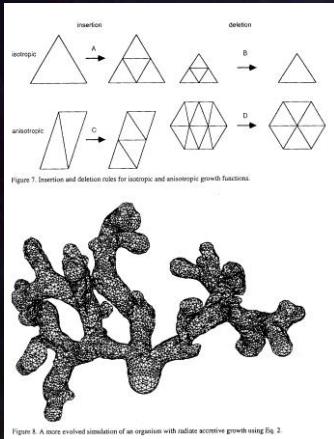


Fig. 1 Digitised images of five of the sponge specimens, showing a range of morphologies



**Equals 240 billion Elephants in Weight!!** (CoML, 2010)



**End to end would extend  $10^7$  Light Yrs**

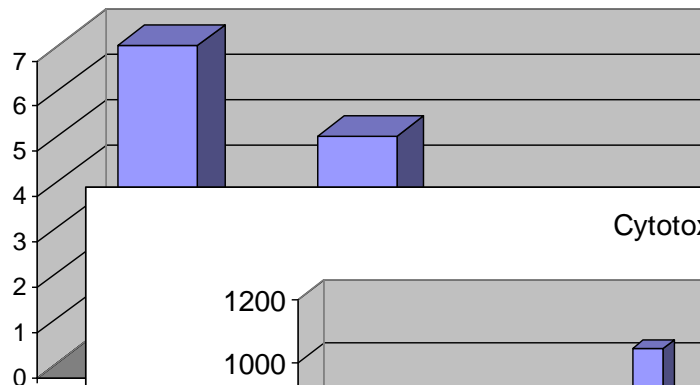
**Or**

**60 Galaxies**

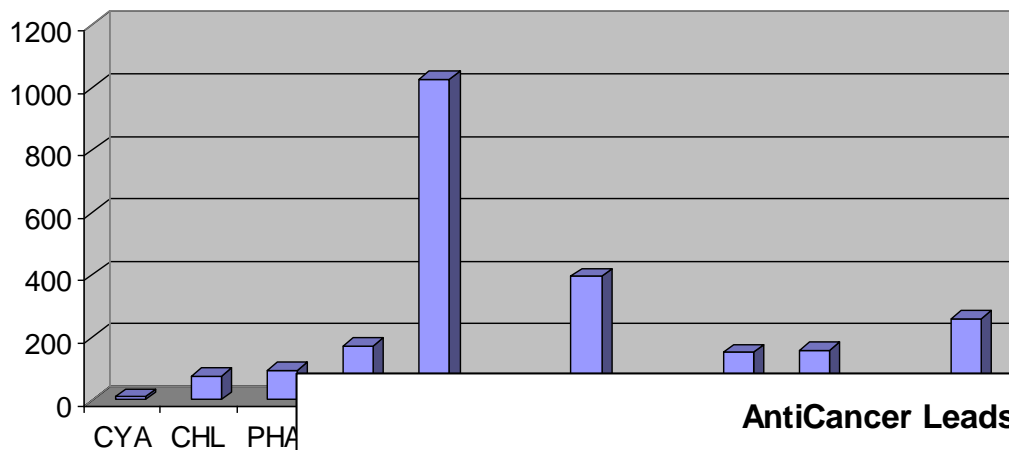
C Suttle, 2010



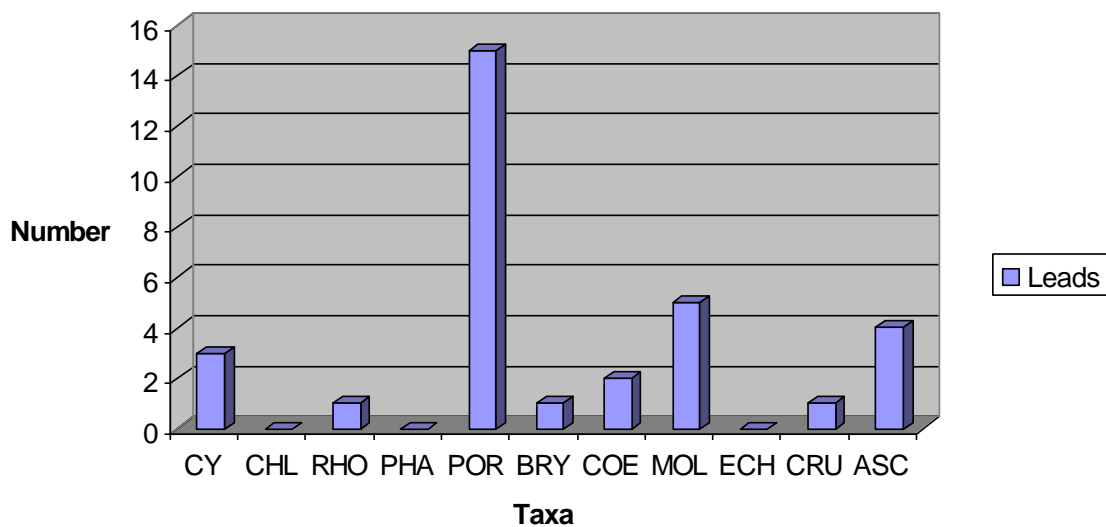
### Anticancer Sponge Leads



### Cytotoxic Extracts



### AntiCancer Leads



## Review articles

Therapeutic agents from the sea: biodiversity, chemo-evolution insight and advances to the end of Darwin's 200th year

David J Newman, Gordon M Cragg and Christopher N Battershill



Cancer

Environmental  
remediation

Viral

Industrial Enzymes

Toxin detection

Antibiotics

**AGRICHEMICALS**  
**AQUACHEMICALS**

Paints

Mineral Processing

Central Nervous System

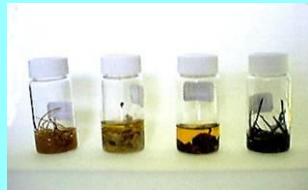
UV Blocking



# Marine Biorepository – Targeted Discovery

Macro-organisms (sponges etc)

Cryopreserved pure cultures



extracts



ferment  
and extract



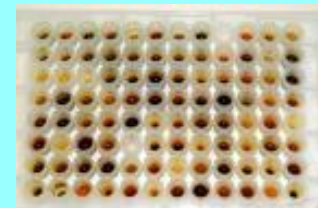
Frozen bulk



compounds



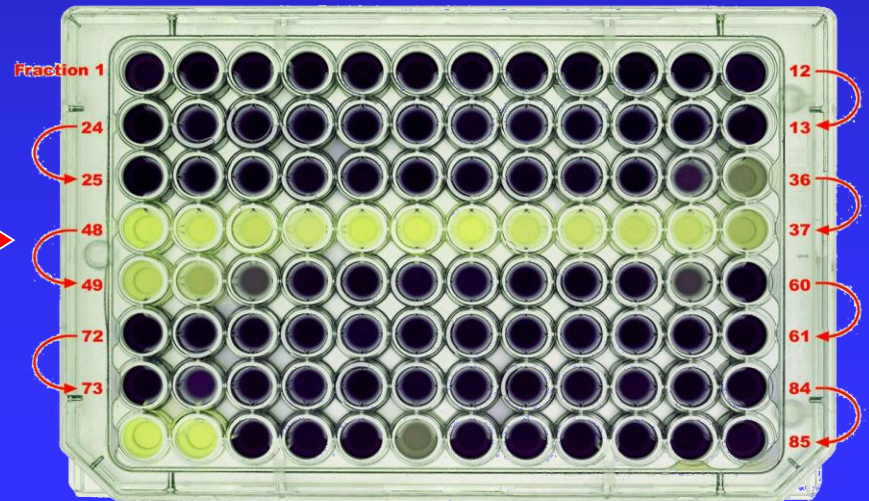
fractions



96 well plates

# Dereplication

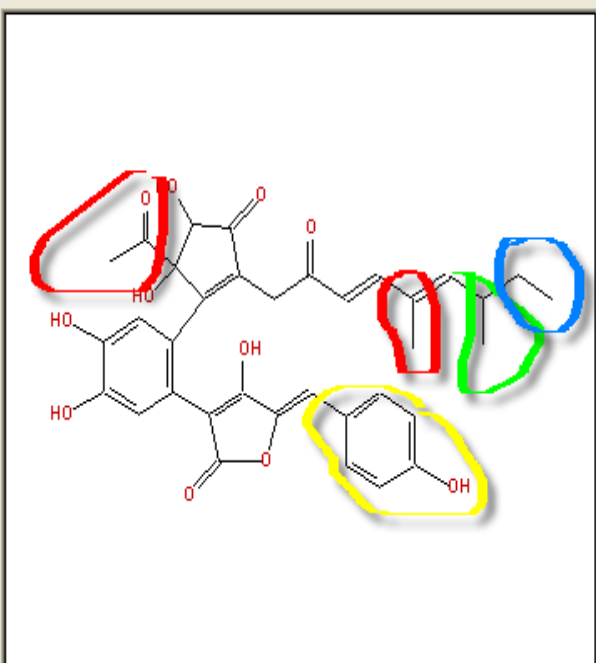
- (Bioactive) extracts analysed by HPLC 250-50  $\mu\text{g}$ 
  - HPLC eluant collected into microtitre plate
  - Daughter plates assayed for activity
- Obtain UV, Mass spectral and NMR data from the bioactive region(s) of the microtitre plate



# The AntiMarin Database

All 56,000 structures in AntiMarin are coded with the numbers of each structural feature that could be deduced from  $^1\text{H}$  NMR spectra

structure



UV\_Neutral  
MeOH (292, 45500) (333sh, )

UV\_Basic

UV\_Acid

All CH3  
4

Singlet CH3  
2

Doublet CH3  
1

Triplet CH3  
1

methoxy  
0

sp3\_methylene  
2

sp3\_methine  
2

all\_alkene  
5

vinyl  
0

disub11\_alk  
0

trisub\_alkene  
2

all\_single\_co  
7

pri\_single\_co  
0

sec\_single\_co  
1

pri\_aceta  
0

tert\_acetal  
0

all\_carbonyl  
4

aldehyde  
0

acetyl  
1

acid\_este  
1

amide  
0

B1  
0

B12  
0

B13  
0

B14  
1

B123  
0

B135  
0

B1234  
0

B1235  
0

B1245  
1

B12345  
0

Py2  
0

Py4  
0

Py23  
0

Py24  
0

Py25  
0

Py26  
0

Py34  
0

Py234  
0

Py235  
0

Py236  
0

Py245  
0

Py246  
0

Py345  
0

ID Number  
23683

formula  
C<sub>35</sub>H<sub>34</sub>O<sub>11</sub>

molweight  
630.638

HRMS  
630.209595

HRMSP  
631.217407

HRMSN  
629.202881

HRMSNa  
653.199402

Name  
Kodaistatin-A

Source  
Aspergillus terreus Thom DSM 11247



Microsoft Access - Field Trip Details

Go Back

MNUM	Box	Location	collected wt (g)	current wt (g)	Comments
2	CITES (1)	T27300	231	231	

Microsoft Access - macro\_image\_full : Form



History of Frozen

MNUM Name

Record: 1 of 1

Form View

Microsoft Access - MMV\_display : Form

MNUM: 17605

Phylum: CNIDARIA

Class: ANTHOZO

Order: SCLERAC

Family: FAVIIDAE

Genus: PLATYSY

Species: DAEDALE

Local Names:

Relaxation: NO

Size Range:

Epibiont: 0

Cyanobacteria: U

Zooxanth: N

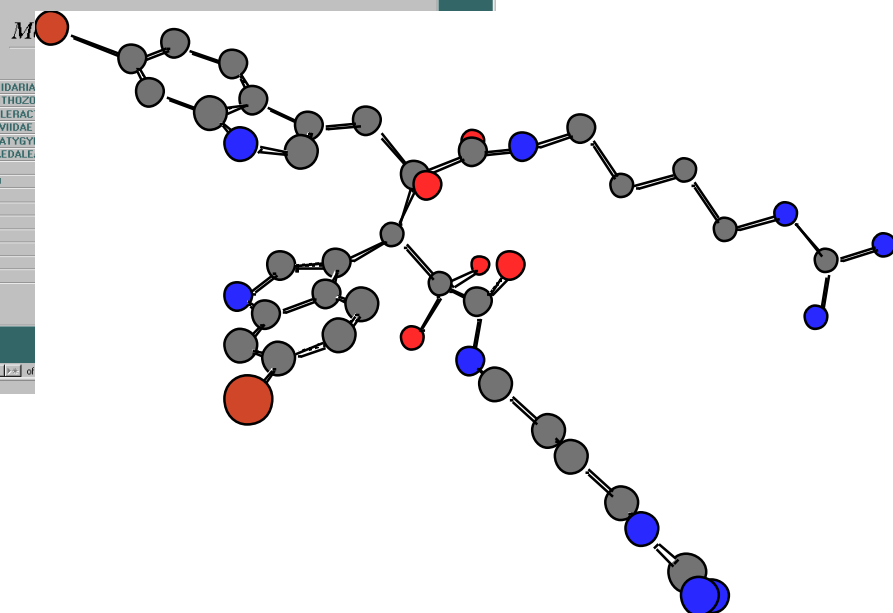
Symbiont:

Micro Only: Y

Cites:

Record: 1 of 1

Form View



Form View

Order

Family

Genus

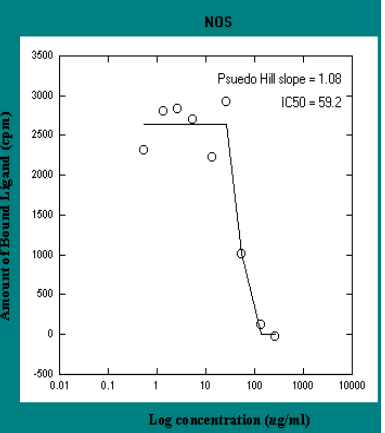
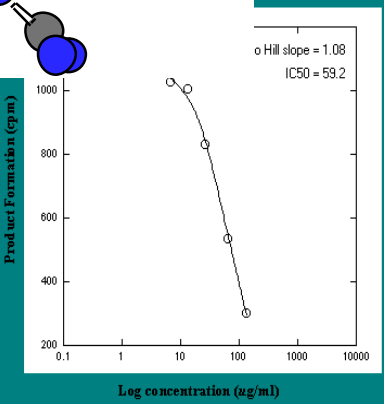
Species

Local name

Search

MNUM: 17605

Go Back



# BIODISCOVERY

Natural System  
Biodiversity

**SMART BIODISCOVERY USES CLUES  
FROM NATURE  
Or  
Chemical Ecology**

Natural System  
Targeted  
Molecular  
Process

Pharmaceuticals, Agrichemicals, Sunscreens, Seafood toxin testing,  
Antifoulants, Bioremediation, Environmental monitoring,  
Industrial enzymes.

