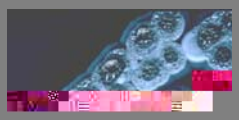
Towards a practical knowledgebase for marine genetic resources



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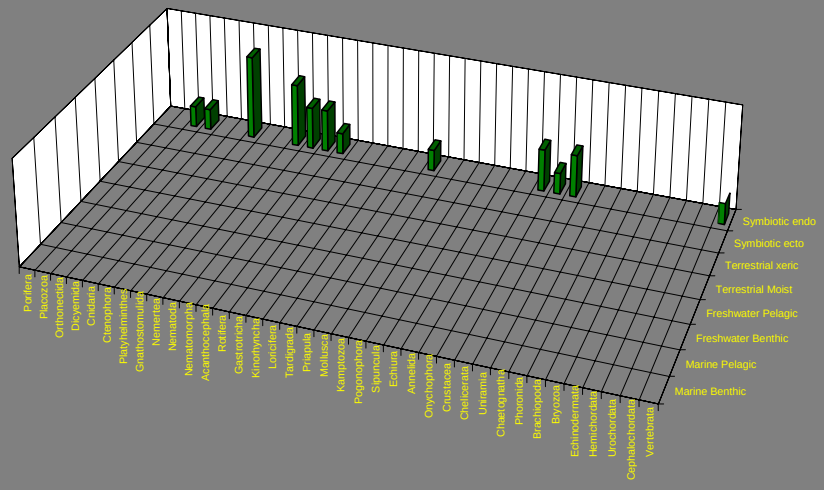
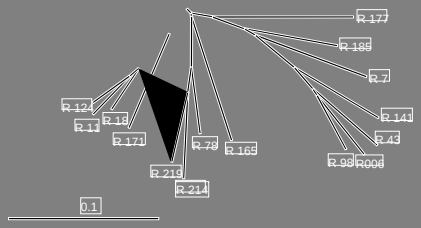


Superimposed with bacterial symbiont diversity



Natural Products "Renaissance" (with a twist)

Paterson and Anderson, Science 21 October 2005

A significant cumulative effort in ocean exploration

'Parents' of marine science:

- Indigenous observations over millennia
- Aristotle 384-322BC
- Charles Darwin HMS *Beagle* 1831-36
- Challenger 1872-75

Where is the data?
How can we access it?

- Specialist data
- Published Literature
- Portals for metadata
- Networked datasets
- Integrated datasets

The published literature

Literature Databases

- Cambridge Scientific Abstracts
- Aquatic Sciences & Fisheries Abstracts
- Zoological Record
- Biosis
- MarineLit
- Patent databases

Citation & Indexing services

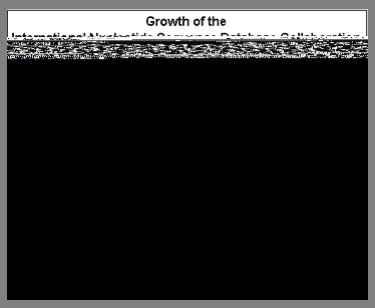
- Web of Science
- Google Scholar

Citation data management

- Ref works
- Endnote

Data Networks/Repositories
Nucleotide sequences

- INSDC (international Nucleotide Sequence Database Collaboration) www.insdc.org
  - GenBank®, DDBJ, EMBL
  - Annotated collection of all publicly available DNA sequences
  - Submission of sequences required by many journals prior to publication
  - Online submission, update and review
  - Country of origin identified
  - No restriction on use or distribution
  - 73078143 loci, 77248690945 bases, from 73078143 reported sequences (June 15 2007)

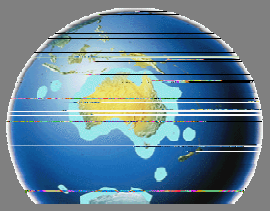


www.ncbi.nlm.nih.gov/Genbank/

- Data searching & analysis tools
  - eg. BLAST

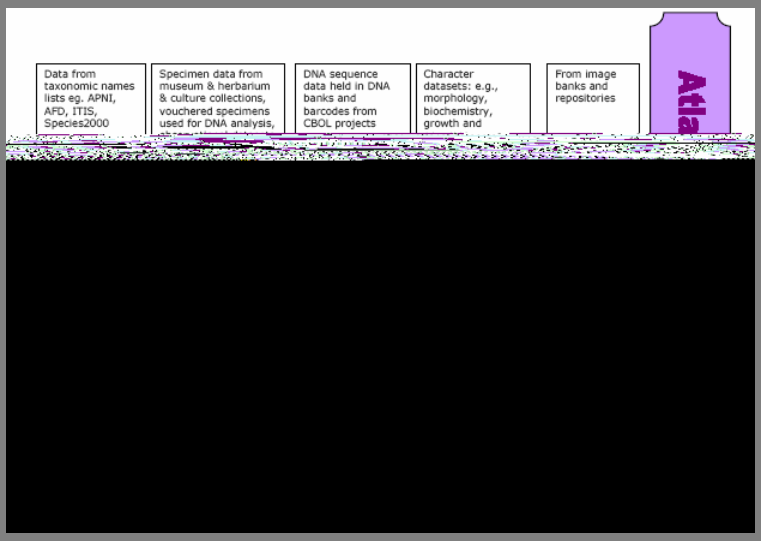
Specialist data – find the people

Location of specimen and data holdings reflects historical location of the specialists



UN Atlas of the Oceans

- UN-Oceans coordination portal
- 14 Global partners and 8000 individual members.



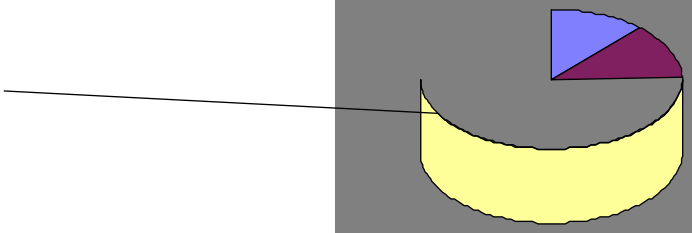
- It’s expensive ($40M, over 5 years)
- Consistency in taxonomy is an issue

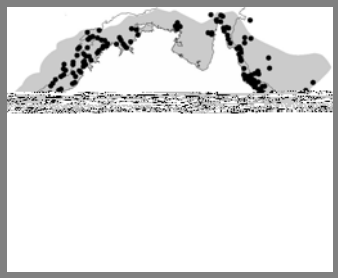
- Growing global network
- Assess and explain the diversity, distribution and abundance of marine life in the world's oceans
- past, present and future
- 2000 to 2010
- 50+ countries, 300+ scientists, 17 major projects
- Link to the Barcode of Life initiative

Oceans Present: Realm Projects

CoML defines its realms & zones in 2003 Baseline Report, *The Unknown Ocean*

AIMS Bioresources Library – integrated MGR dataset





A Bioresources Library for screening and biodiscovery (past, present, future)

Cancer

Environmental remediation

Viral

Industrial Enzymes

Toxin detection

Agrichemical

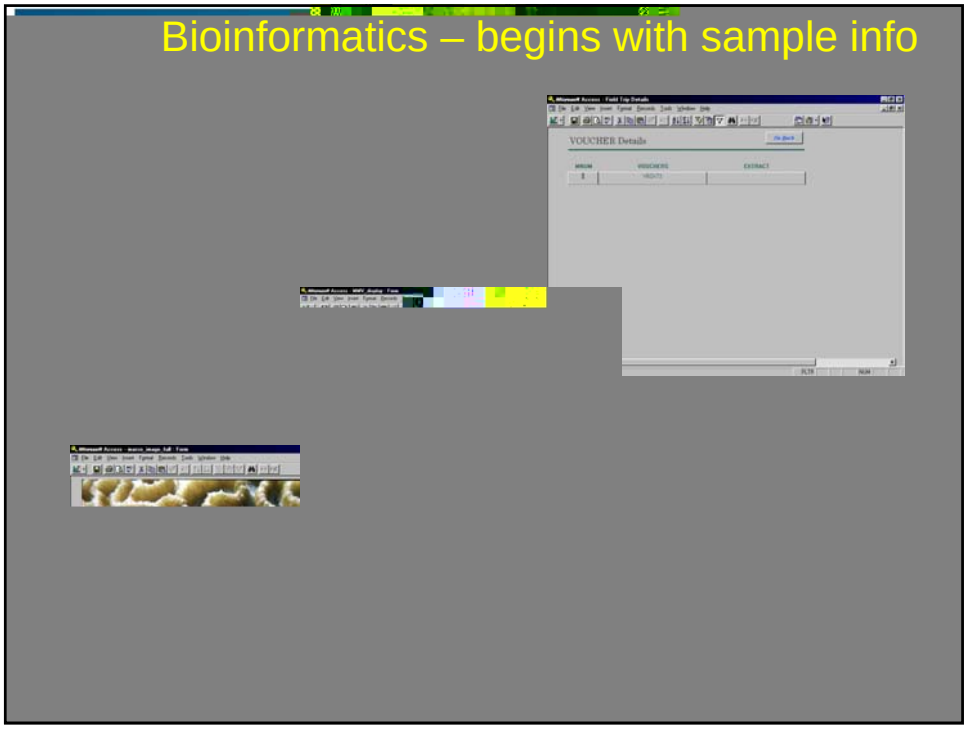
Antibiotics

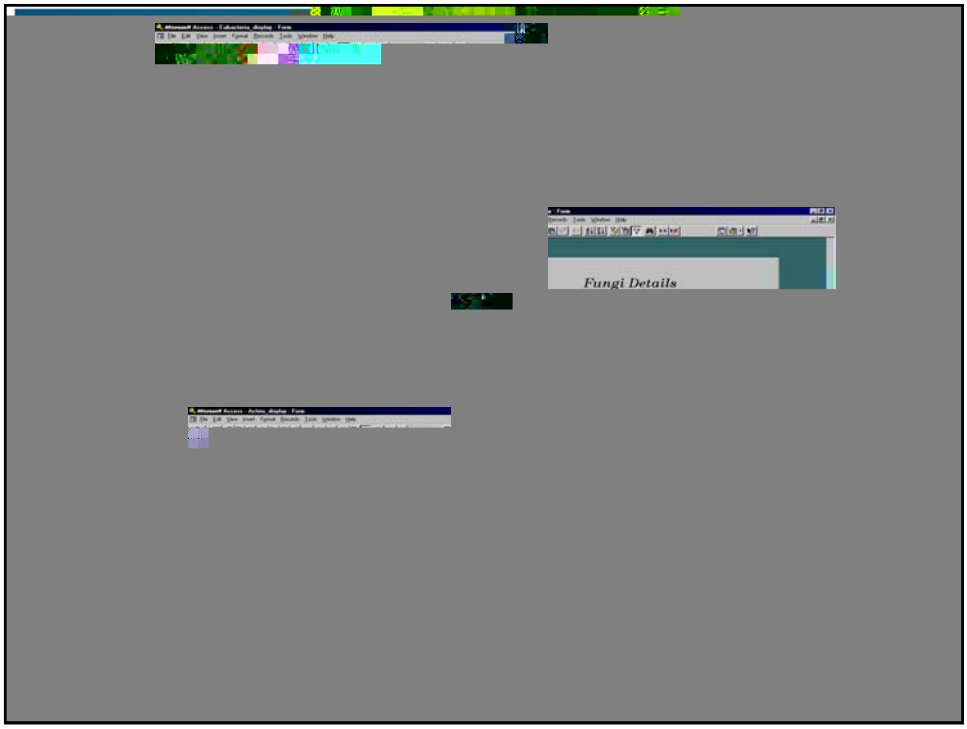
Mineral Processing

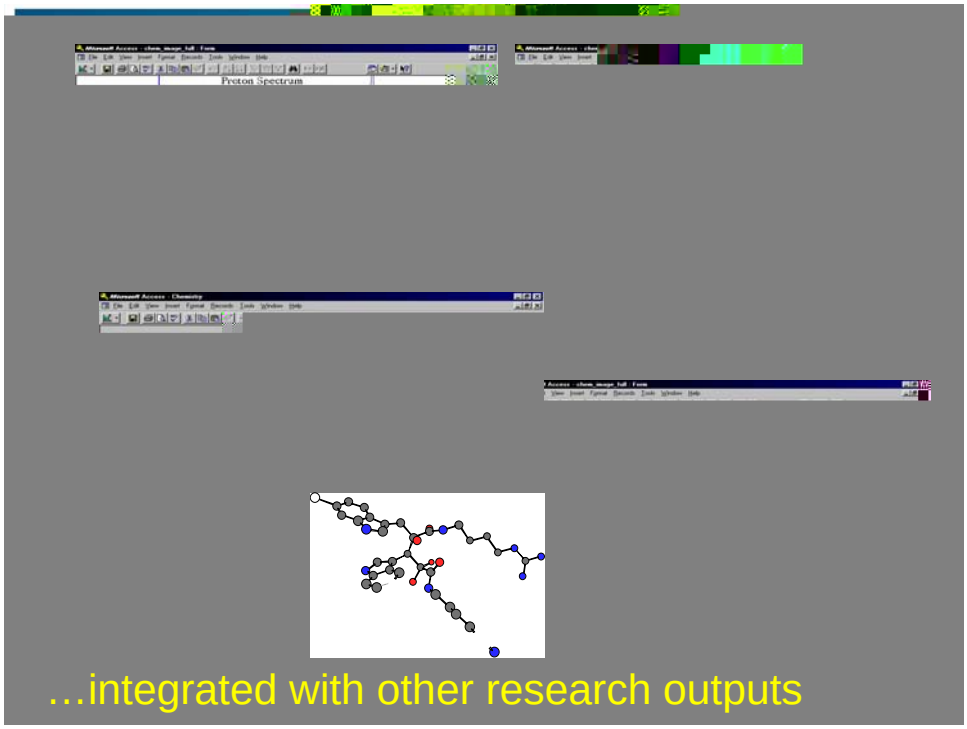
Paints

Central Nervous System

Bioinformatics – begins with sample info



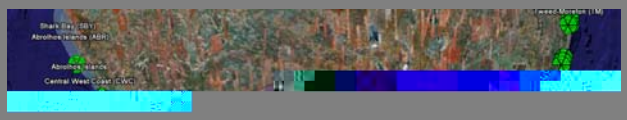




…integrated with other research outputs

Integrated tool for data mining.

eg. Regional and taxonomic patterns in anti-microbial activity



Analysis at a range of scales

Google Earth interface facilitates good visualisation of multi-variate data

Understanding the chemical ecology
Apply data-mining to enhance biodiscovery

- Elaborate leads
  - identifying other material with similar taxonomy/ecology/ screening profile/chemistry
  - Naturally occurring analogues
  - Re-supply without re-collecting
- Predict results of future screening based on past profile
  - Compile list of pre-leads
  - Targeted biodiscovery with ex-situ material

Summary

- Tools exist to access marine biodiversity and genetic resources data that is in the global public domain
- Major networking projects underway to bring together independent geo-referenced datasets (CoML, ALA)
- Consistency in taxonomy is a big issue in networking independent datasets

- Integrated informatics is the ideal
  - Integrate biodiversity data (ecosystems, species (macro and micro), genomes (and meta-genomes)), with natural products research outputs(instrument outputs, structures of compounds, proteins, enzymes etc), and screening results