

Scientific research results
from the deep seabed:

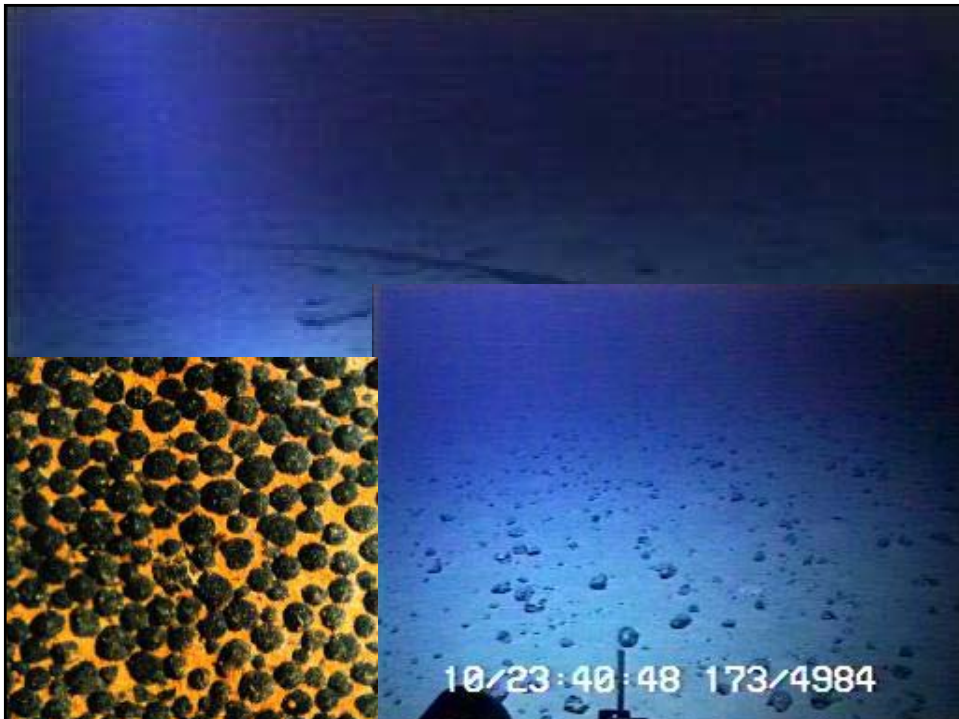
*Discoveries, applications and
conservation issues at
hydrothermal vents*

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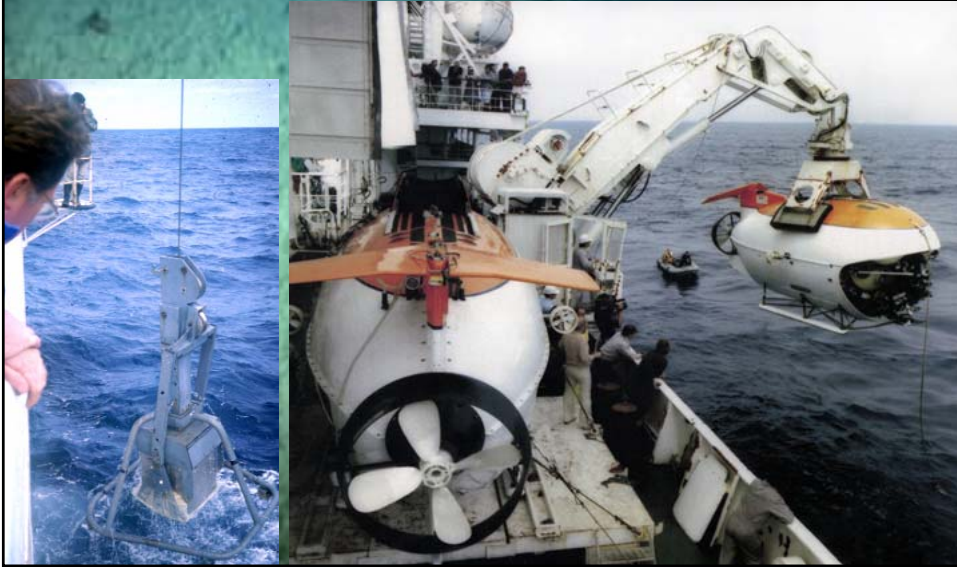


The Abyssal Plain

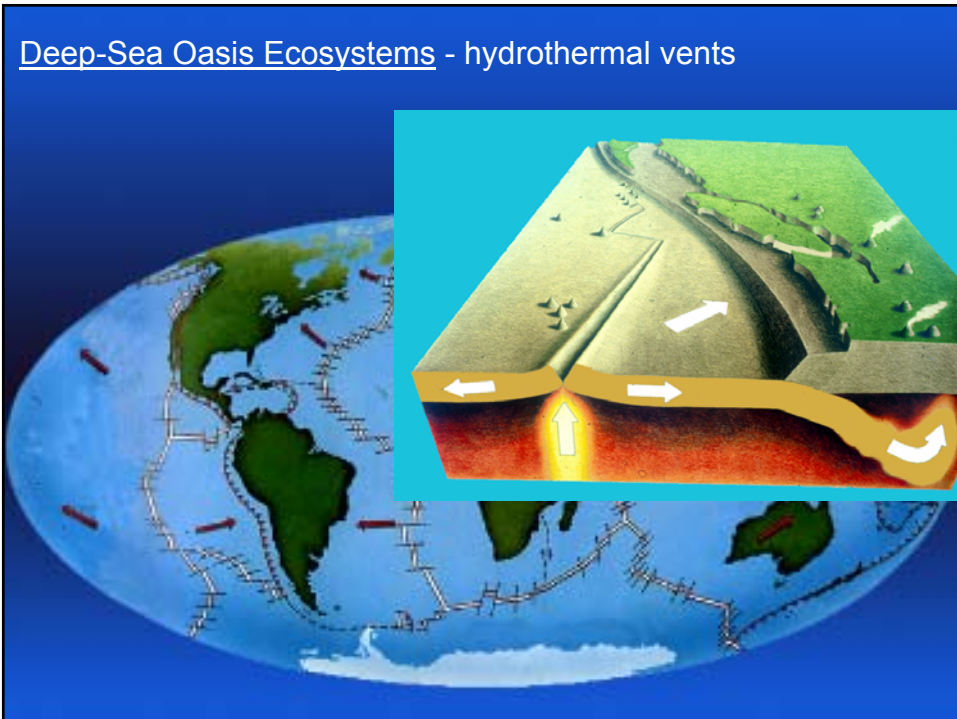
- Benthic ecosystem entirely dependant on food imports from ocean surface
- Animals feed on organic debris or fallen carcasses
- Low abundance, slow growth - food scarce but high biodiversity
- Poorly sampled - 1 million to 10 million species



Marine Scientific Research - a major user of the deep seabed



Deep-Sea Oasis Ecosystems - hydrothermal vents





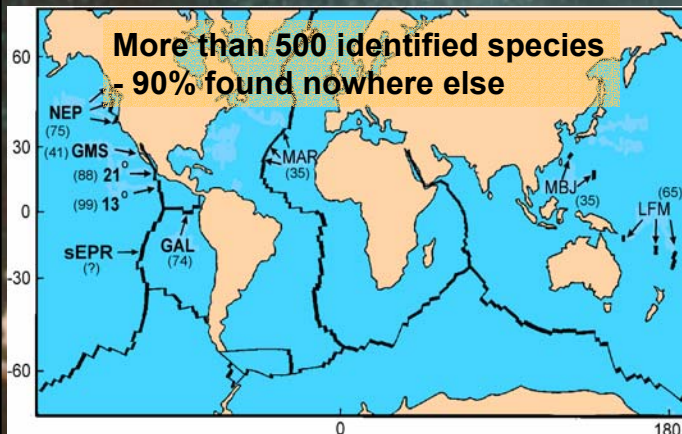
Hydrothermal vent ecosystems

Specialised animals and microbes colonise seafloor vents

H₂S and other substances provide energy for *chemosynthesis* of new organic matter

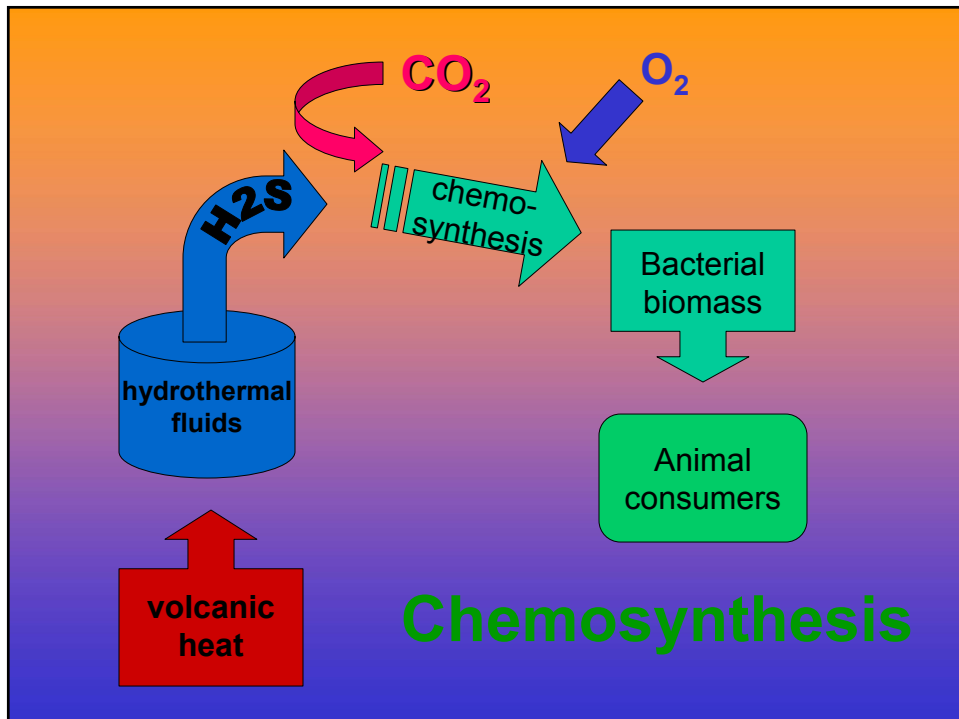
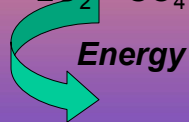
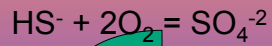
High biomass and rapid growth

Global distribution of known hydrothermal vent species



Chemosynthesis

- transforms CO_2 into sugars and other organic molecules using chemical energy

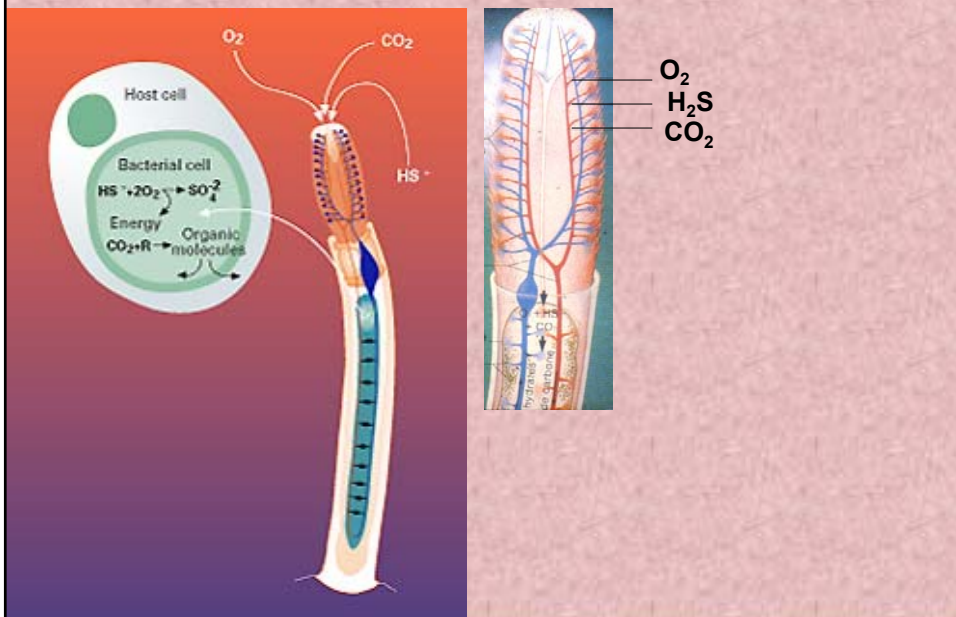


The tube worm symbiosis



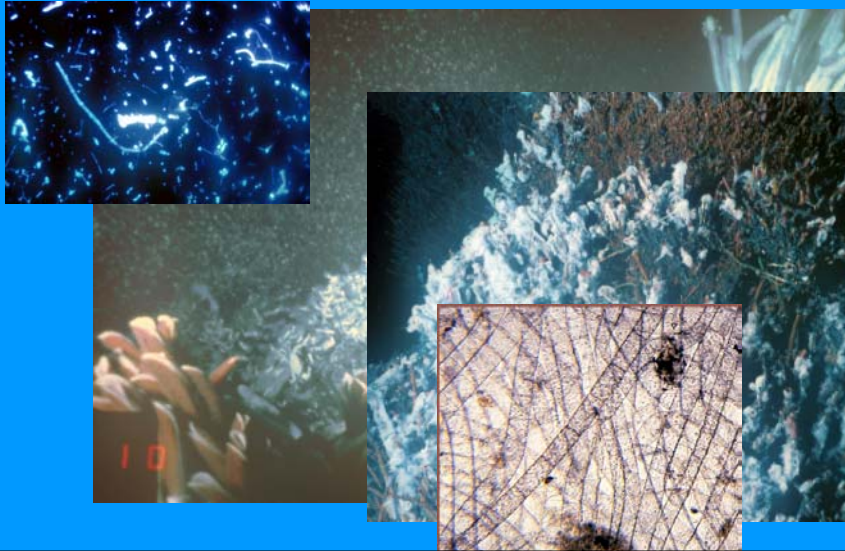
- Most highly evolved hydrothermal vent symbiosis
- Giant tube worms have no mouth or digestive system
 - entirely dependent on symbionts for food

A sophisticated symbiosis



Free-living bacteria

- suspended particles and biofilms



Hydrothermal vent food chains



Vent fauna and mineral deposits - a surprising intimacy



Faunal mosaic
colonises active
edifices



Critical issues in predicting effects of mining

- Mining of active hydrothermal sites
 - % loss of seafloor vent habitat
 - plume fallout in areas not directly mined
 - geographic range of affected species
 - uniqueness of local gene pool

Critical issues in predicting effects of mining cont'd

- Long-lived hydrothermal sites
 - primary targets for mining - accumulate large sulphide deposits
 - highest biodiversity
 - major breeding populations for surrounding region

Genetic resources of hydrothermal vent ecosystems



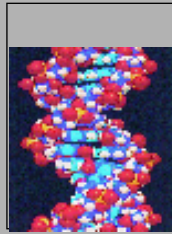
- Little systematic or large scale bioprospecting
 - no urgency
 - very costly
- Interesting spin-offs from basic research

Genetic Resources - extreme enzymes

Polymerase enzyme



Polymerase chain reaction(PCR)



- DNA fingerprinting
- Genome mapping

Cyclodextrin production

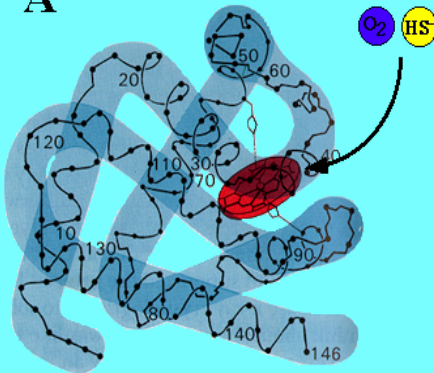
Corn starch

Thermophile enzyme
Cyclodextrins

- Drug delivery
- Stabilize food flavors

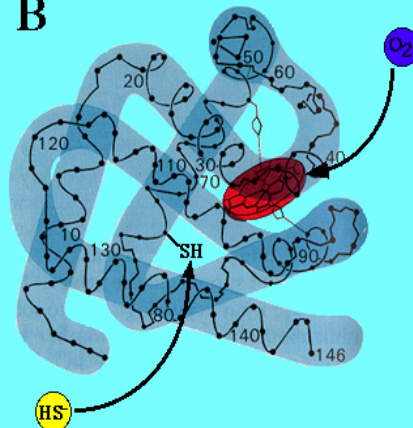
Genetic Resources - novel biochemical systems

A



Normal haemoglobin

B



Tube worm haemoglobin

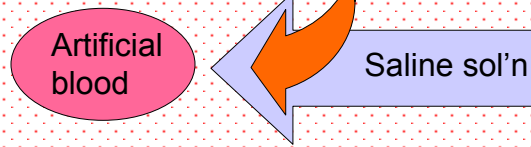
Artificial human blood from marine worms?

Human blood

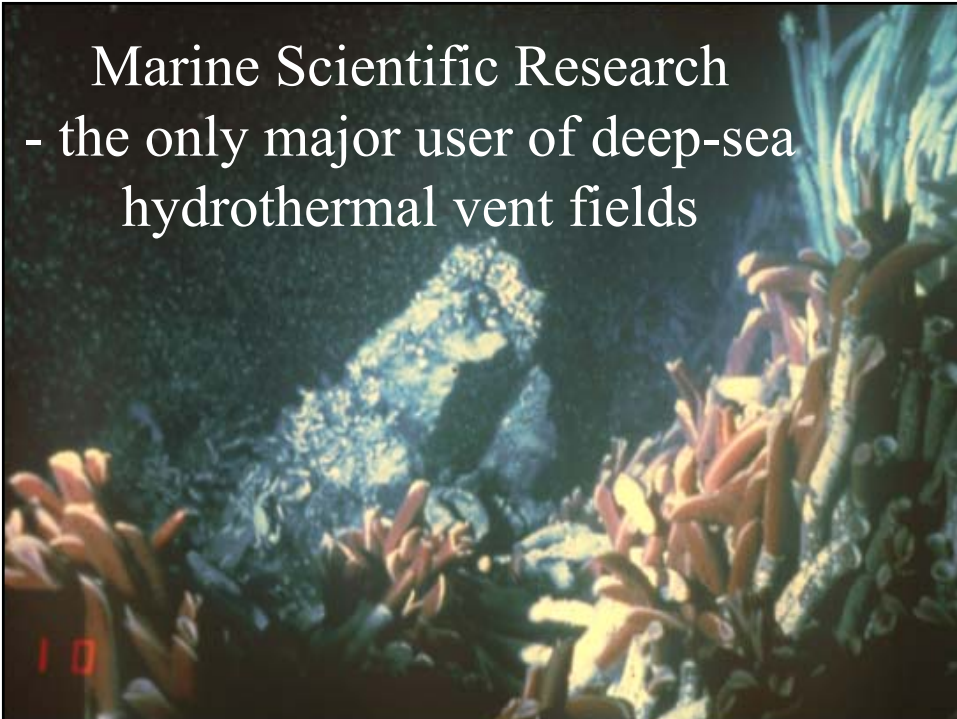
- Nutrient/ waste transport
- Immune system
- Gas (O_2/CO_2) transport



Worm
haemoglobin

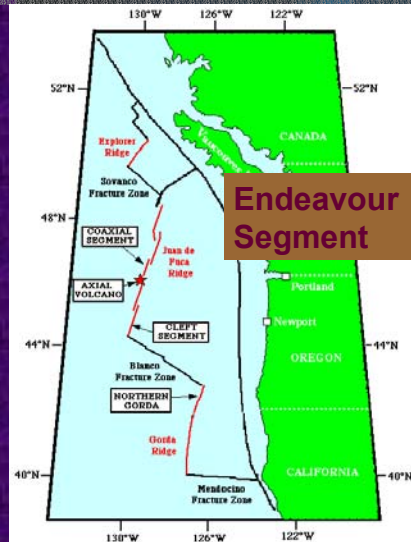


Marine Scientific Research
- the only major user of deep-sea
hydrothermal vent fields



The Endeavour Hydrothermal Vents Marine Protected Area

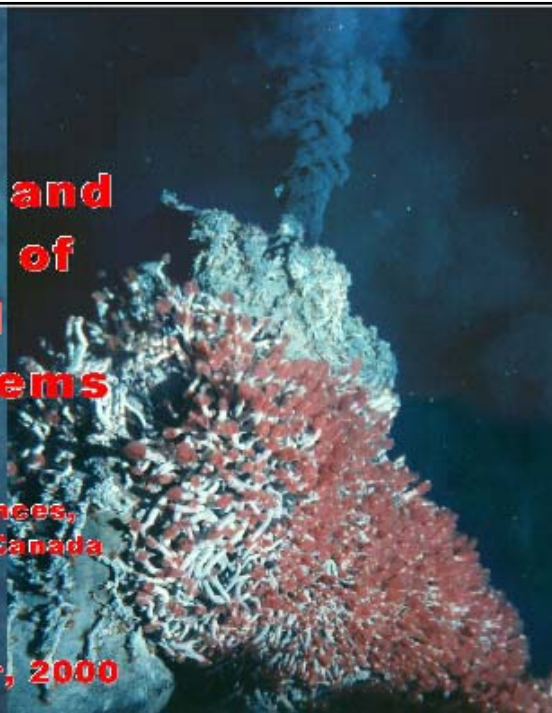
- Pilot MPA in 1998
- Stakeholder consultation
- Formal declaration 2003
- Management plan



InterRidge Workshop on management and conservation of hydrothermal vent ecosystems

Institute of Ocean Sciences,
Sidney (Victoria), B.C., Canada

28 - 30th September, 2000



Code of Conduct for the Sustainable Scientific Use of Marine Hydrothermal Vent Sites

Basic Principles

Organizations and individuals undertaking marine scientific research (MSR) activities should commit themselves to the following basic principles:

1. Identify and comply with international, national and sub-national laws and policies;
2. Minimise or eliminate actual or potential conflicts or interference with existing or planned MSR activities;
3. Minimise or eliminate adverse environmental impacts through all stages of an activity.

