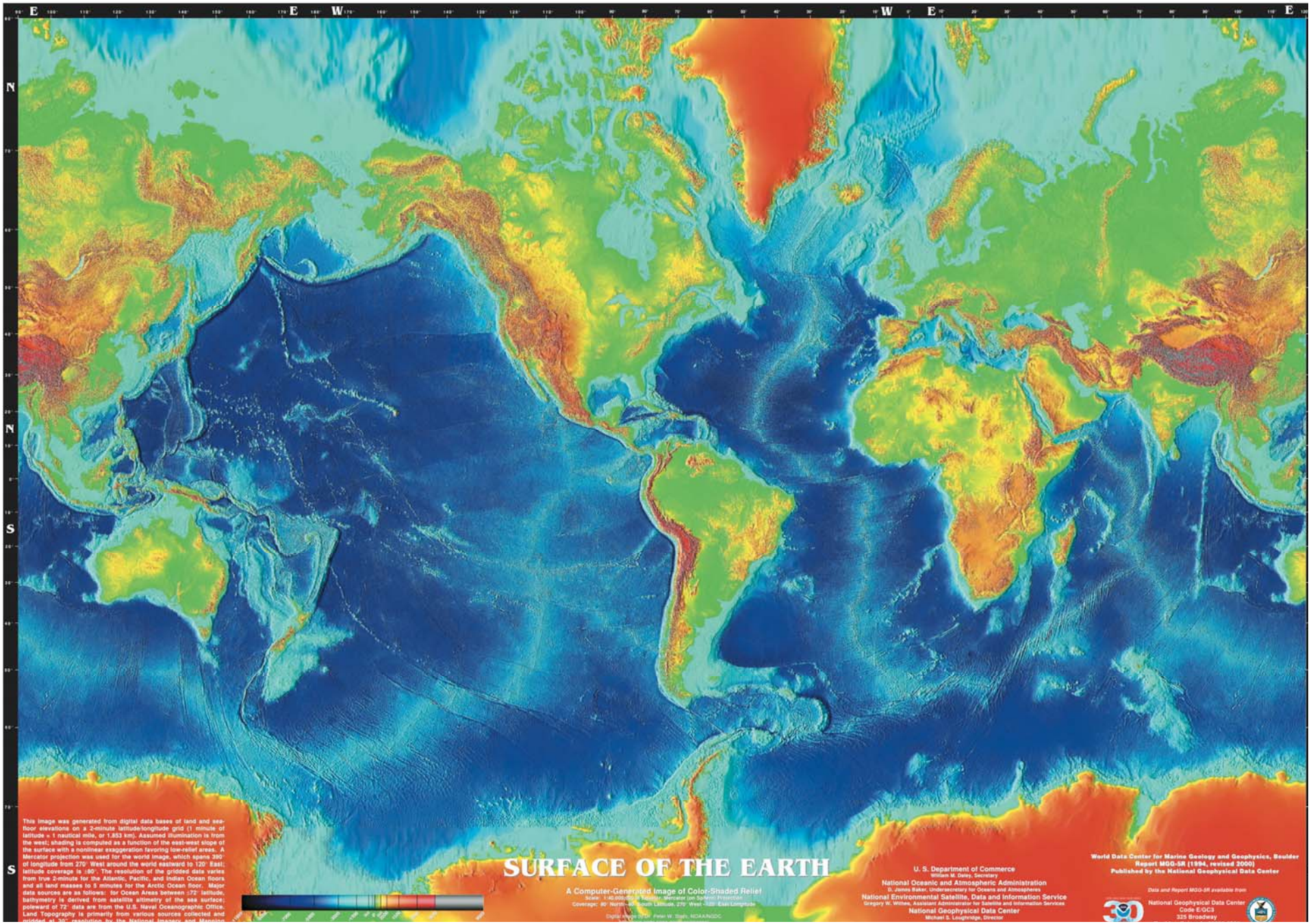
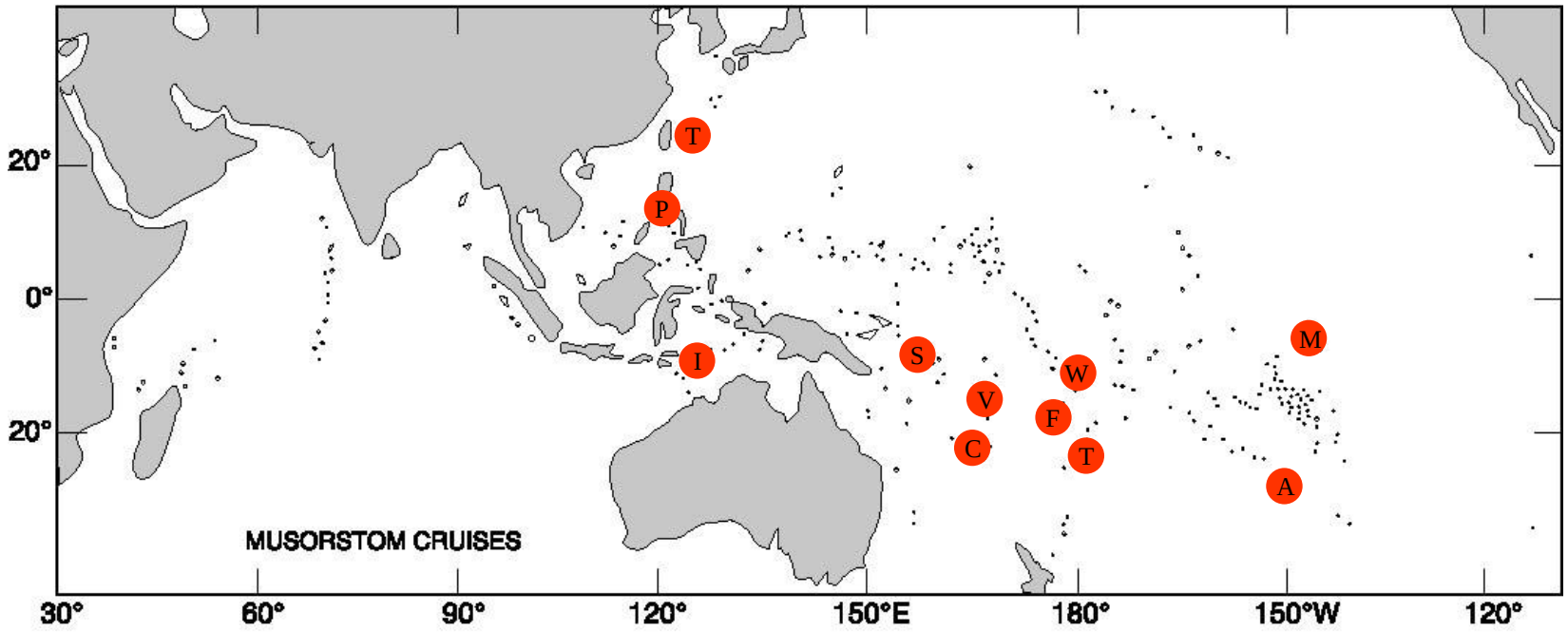
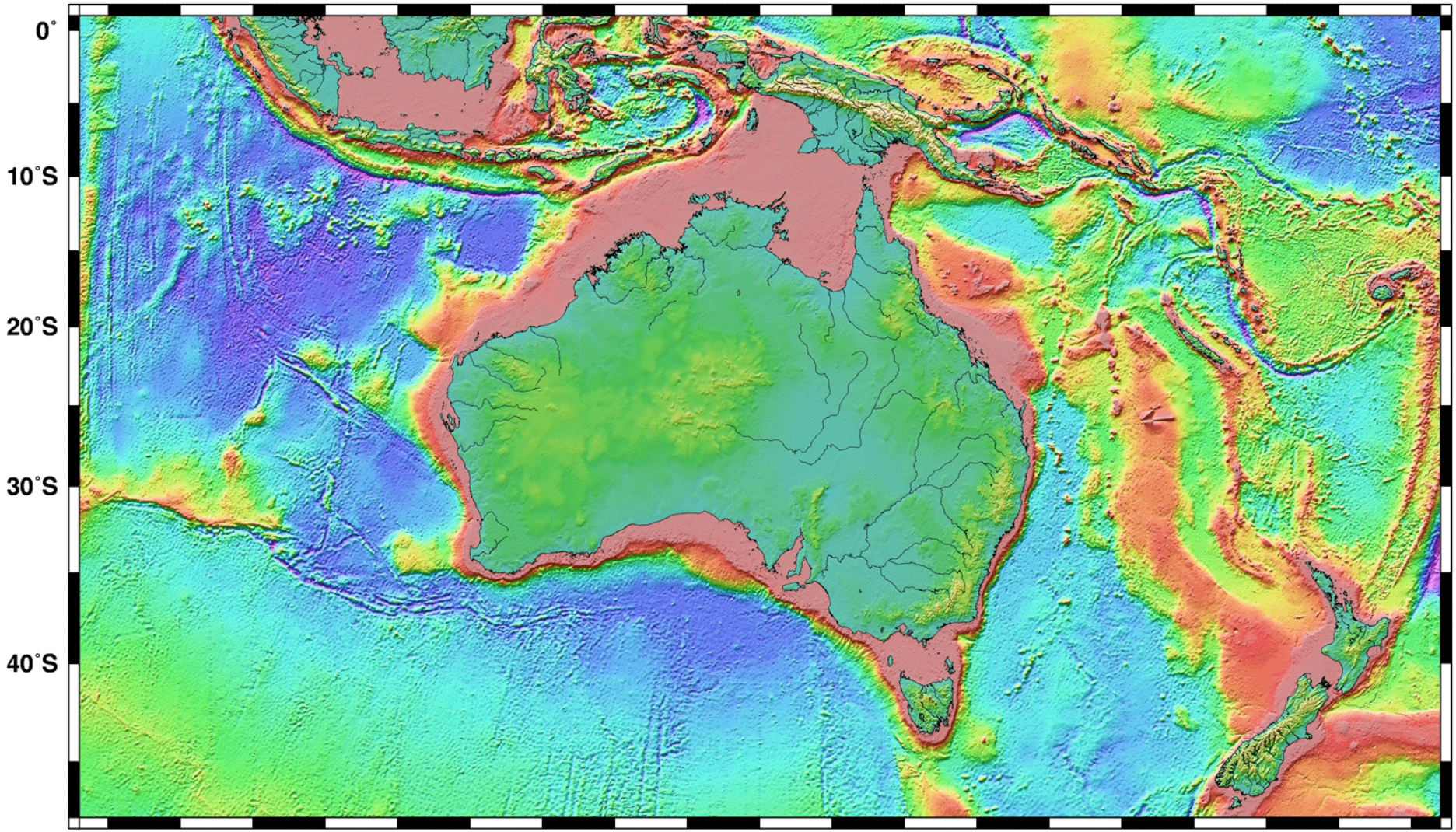
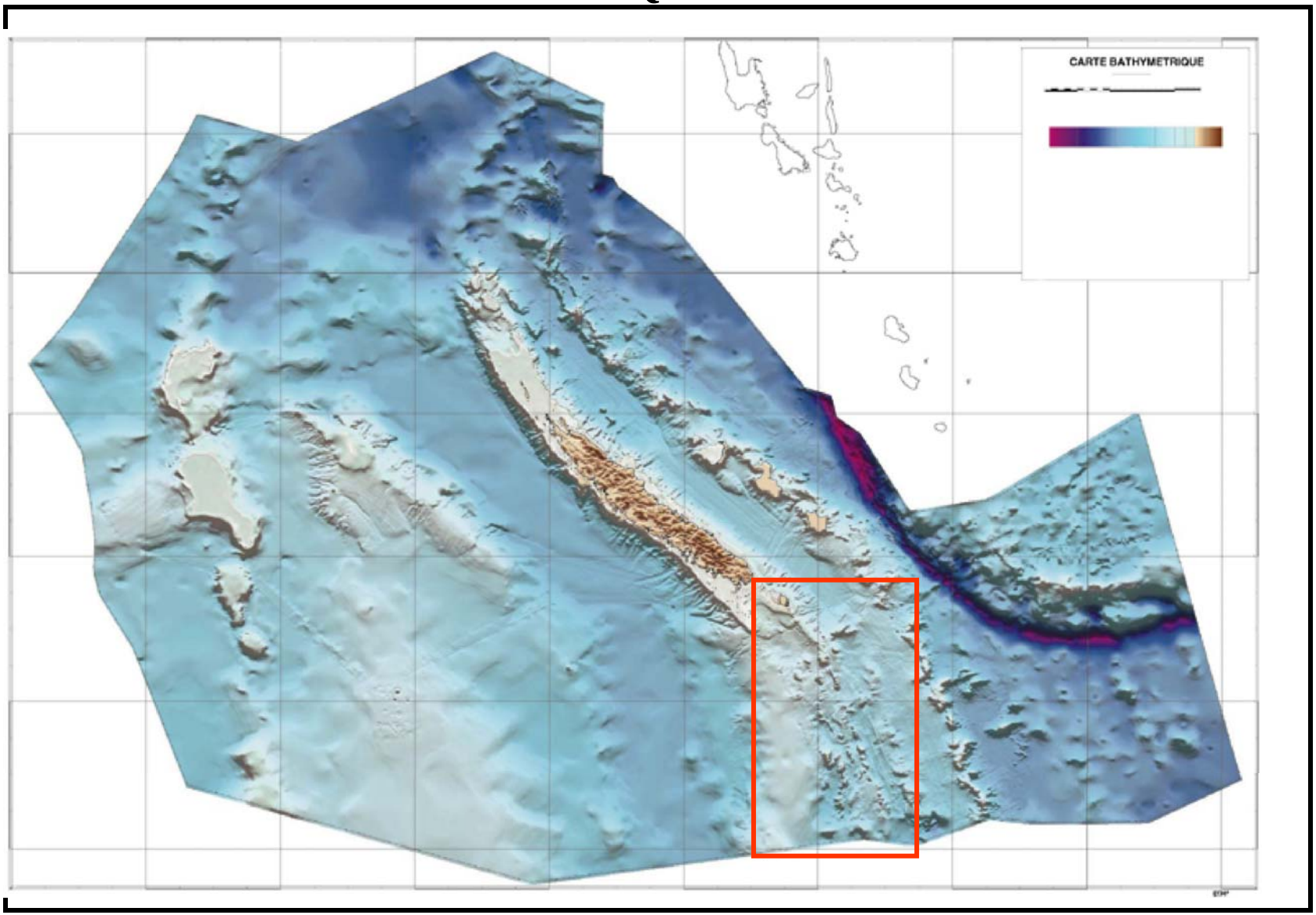

SURFACE OF THE EARTH
A Computer-Generated Image of Color-Shaded Relief
This image was generated from digital data bases of land and sea-floor elevations on a 2-minute latitude-longitude grid (1 minute of latitude = 1 nautical mile, or 1,853 km). Assumed illumination is from the west; shading is computed as a function of the east-west slope of the surface with a nonlinear exaggeration favoring low-relief areas. A Mercator projection was used for the world image, which spans 360° of longitude from 270° West around the world eastward to 120° East; latitude coverage is ±90°. The resolution of the gridded data varies from true 2-minute for the Atlantic, Pacific, and Indian Ocean floors and all land masses to 5 minutes for the Arctic Ocean floor. Major data sources are as follows: for Ocean Areas between ±72° latitude, bathymetry is derived from satellite altimetry of the sea surface; poleward of 72° data are from the U.S. Naval Oceanographic Office. Land Topography is primarily from various sources collected and
U. S. Department of Commerce
William M. Daley, Secretary
National Oceanic and Atmospheric Administration
D. James Baker, Undersecretary for Oceans and Atmospheres
National Environmental Satellite, Data and Information Service
Gregory W. Withee, Assistant Administrator for Satellite and Information Services
National Geophysical Data Center
Michael S. Loughridge, Director
World Data Center for Marine Geology and Geophysics, Boulder
Report MGG-5R (1994, revised 2000)
Published by the National Geophysical Data Center
Data and Report MGG-5R available from:
National Geophysical Data Center
Code E/GC3
325 Broadway



Campagnes MUSORSTOM (1976-2002)

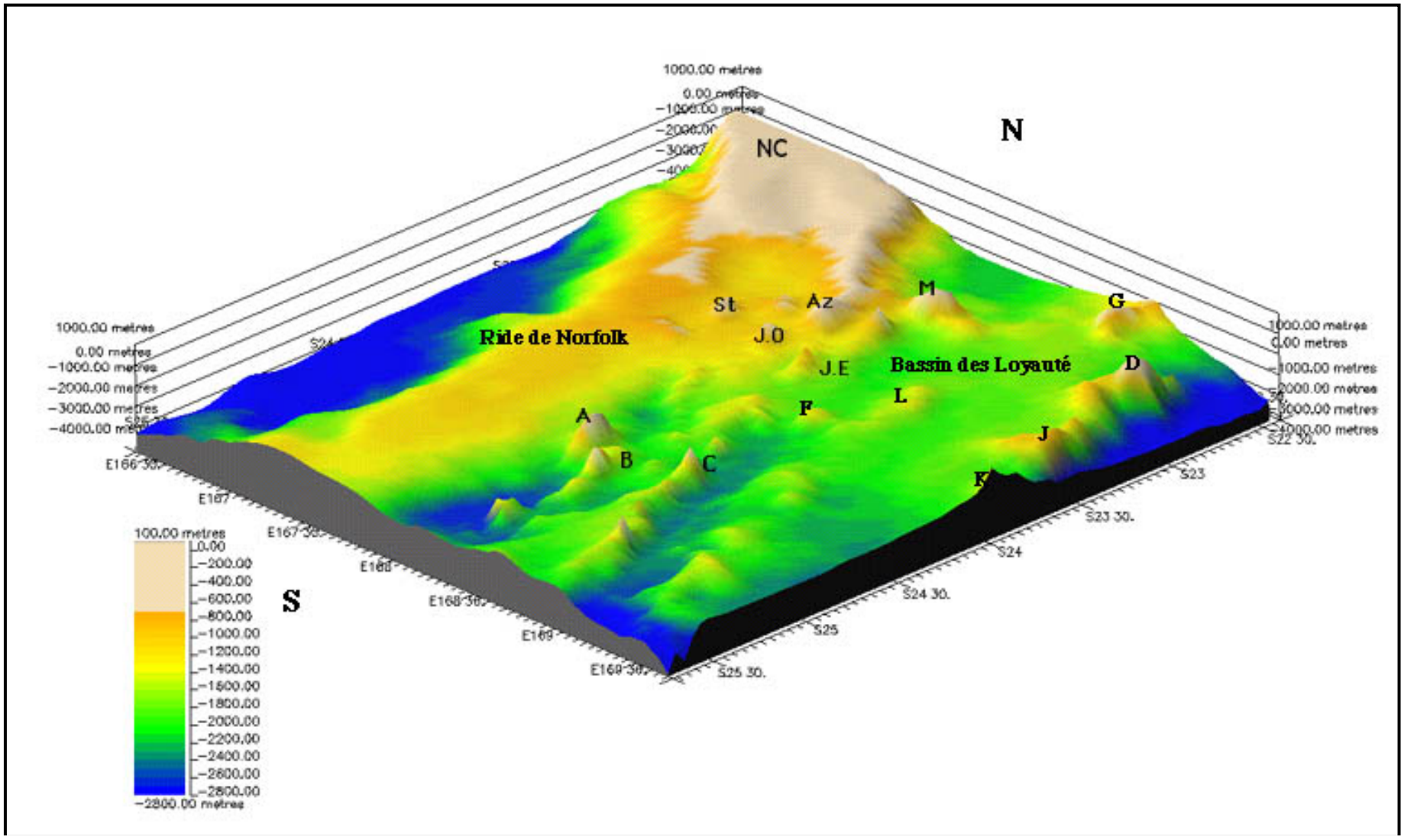

0˚
10˚S
20˚S
30˚S
40˚S
90˚E
100˚E
110˚E
120˚E
130˚E
140˚E
150˚E
160˚E
170˚E
180˚
Topography Version 8.2, SIO, November 17, 2000
GMT 2003 Mar 20 13:08:32

CARTE BATHYMETRIQUE DE LA ZONE ECONOMIQUE EXLUSIVE



NORFOLK RIDGE SEAMOUNTS ARCHIPELAGO

3 D VIEW OF NEW CALEDONIA



Beam trawl :
4 . 2 m Wide

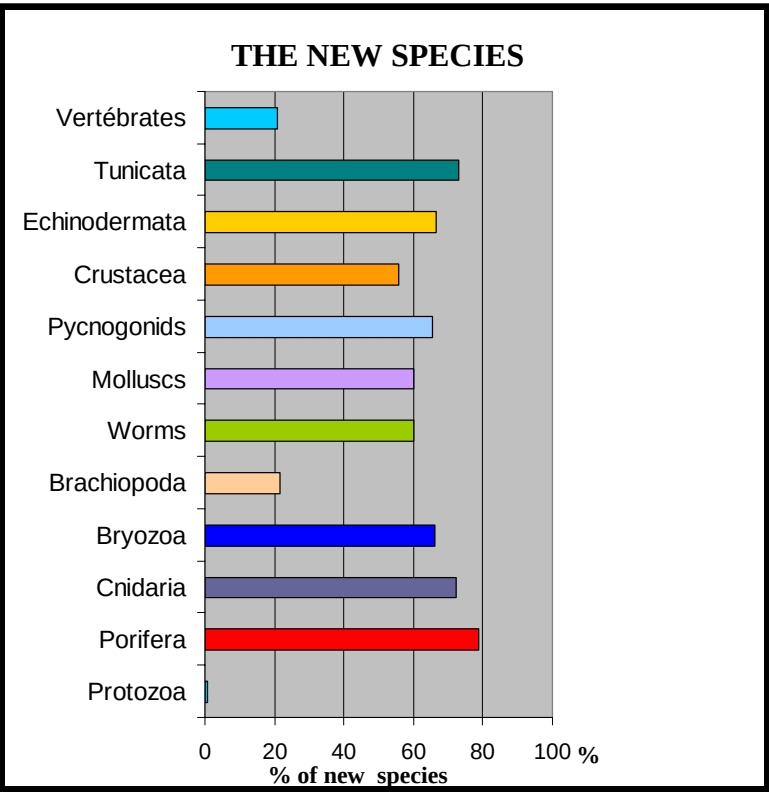
Warren Dredge


R.V. ALIS - 28 M
CC 683407

ZOOLOGICAL RESULTS IN THE NEW CALEDONIAN EEZ (August 2002)

GROUPS	FAMILIES	GENERA	SPECIES	NEW SPECIES	% NEW OF SPECIES
Protozoa	29	83	124	1	0.8
Porifera	54	111	170	134	78.8
Cnidaria	8	18	72	52	72.2
Bryozoa	60	123	201	133	66.1
Brachiopoda	13	18	23	5	21.7
Worms	6	13	20	12	60
Molluscs	73	200	619	371	59.9
Pycnogonids	8	22	61	40	65.5
Crustacea	94	295	633	354	55.9
Echinodermata	14	27	33	22	66.7
Tunicata	13	37	63	46	73
Vertebrates	68	143	240	50	20.8
TOTAL	**440**	**1090**	**2259**	**1220**	**54**

Stylasterid Corals



- **The deep-sea fauna is very rich (> 2000 species)**

- **More than half of the species collected were new to science**

CARTE BATHYMETRIQUE

Système géodésique : WGS84
Projection : Mercator à S21°30'
Echelle 1: 500 000

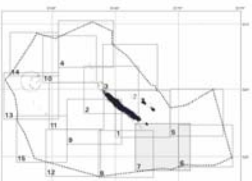
Côte

- Terres émergées
- Récifs
- Lacs
- Côtes
- Récifs
- Cours d'eau
- Limite Zone Economique

Bathymétrie

- Contours simples
- Maîtresses

CARTE DE SITUATION



TYPES D'ACQUISITIONS

ORIGINE DES DONNÉES

ZoNéCo

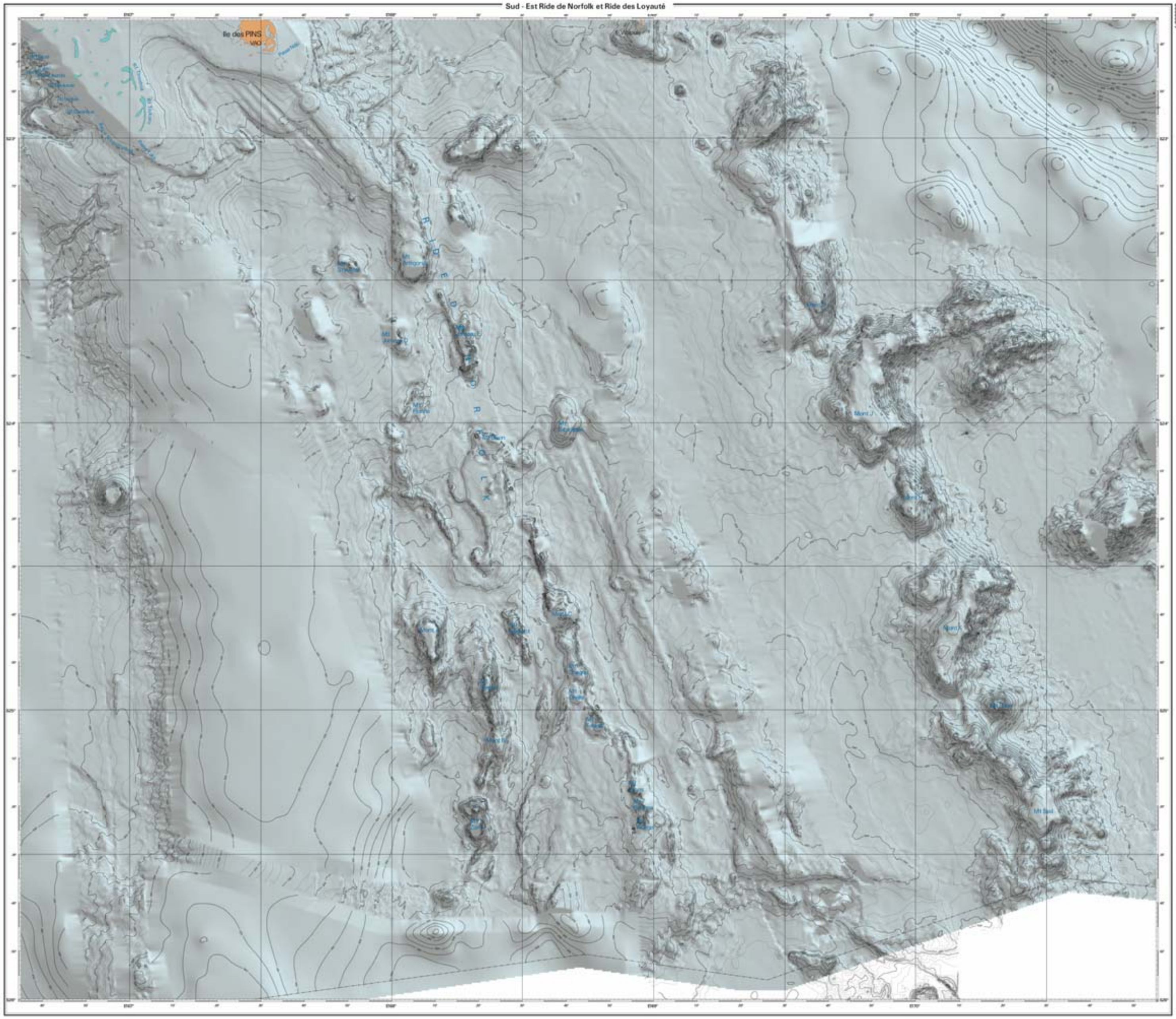
PROGRAMME D'ÉVALUATION DES RESSOURCES MARINES DE LA ZONE ÉCONOMIQUE DE NOUVELLE-CALÉDONIE

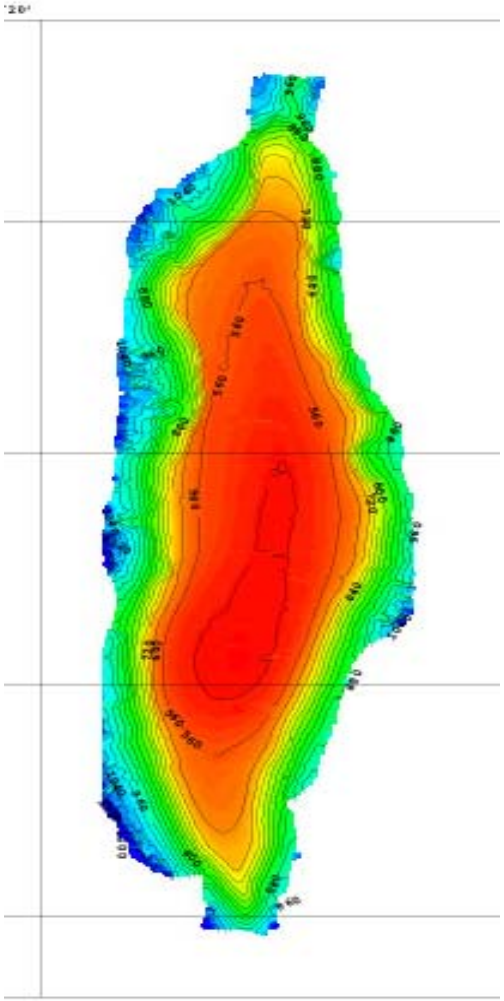
Partenaires: ÉTAT, NOUVELLE-CALÉDONIE, PROVINCES DE NOUVELLE-CALÉDONIE, IFREMER, IRD, Météo-FRANCE, OPT, SHOM, UNC.

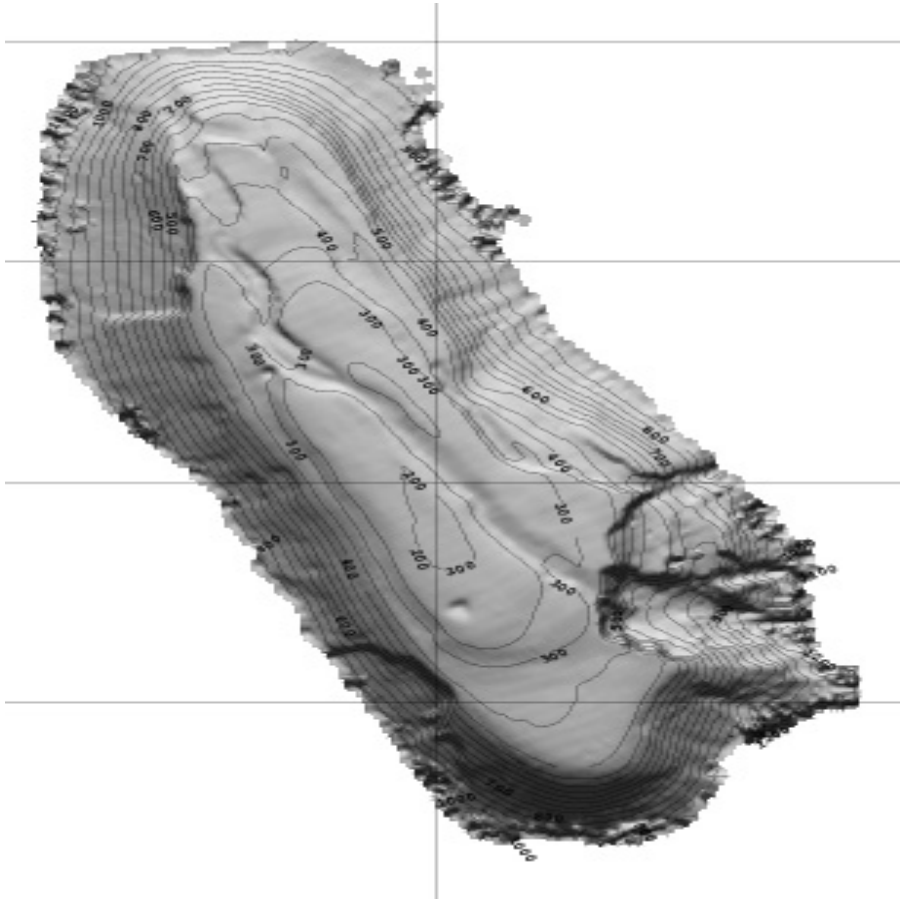
S00000-7

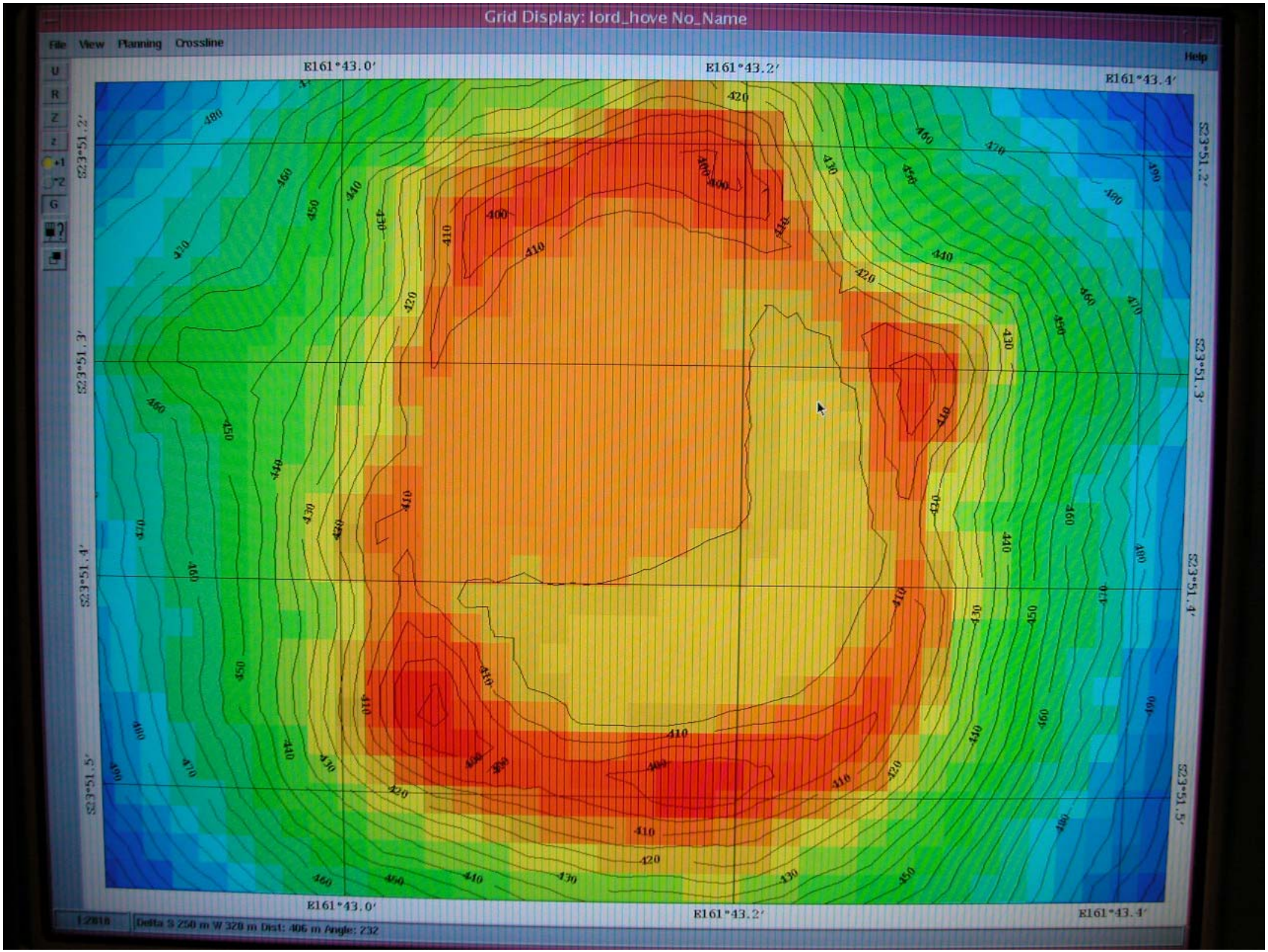
CETTE CARTE NE DOIT PAS ÊTRE UTILISÉE POUR LA NAVIGATION

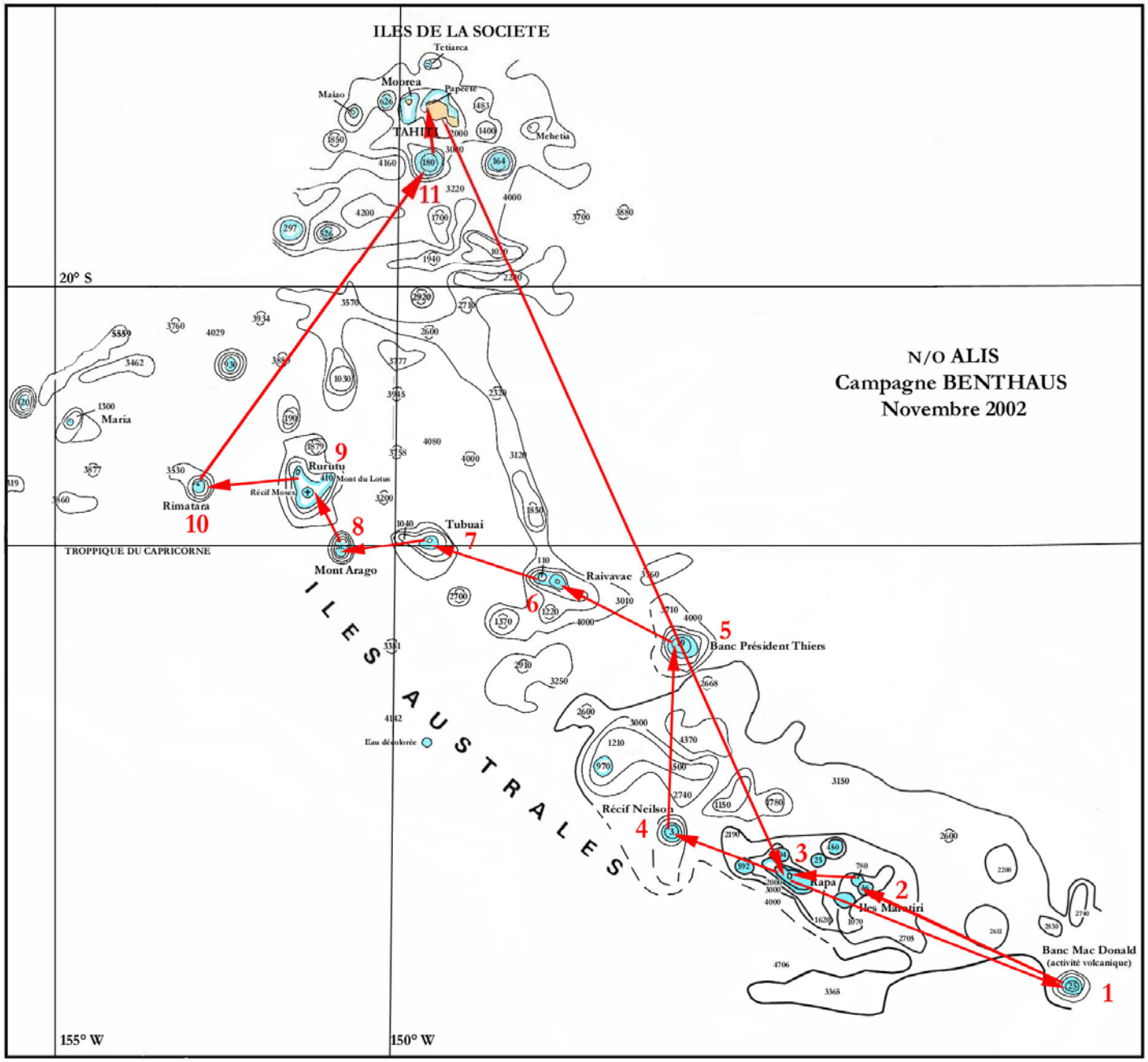
Sud - Est Ride de Norfolk et Ride des Loyauté

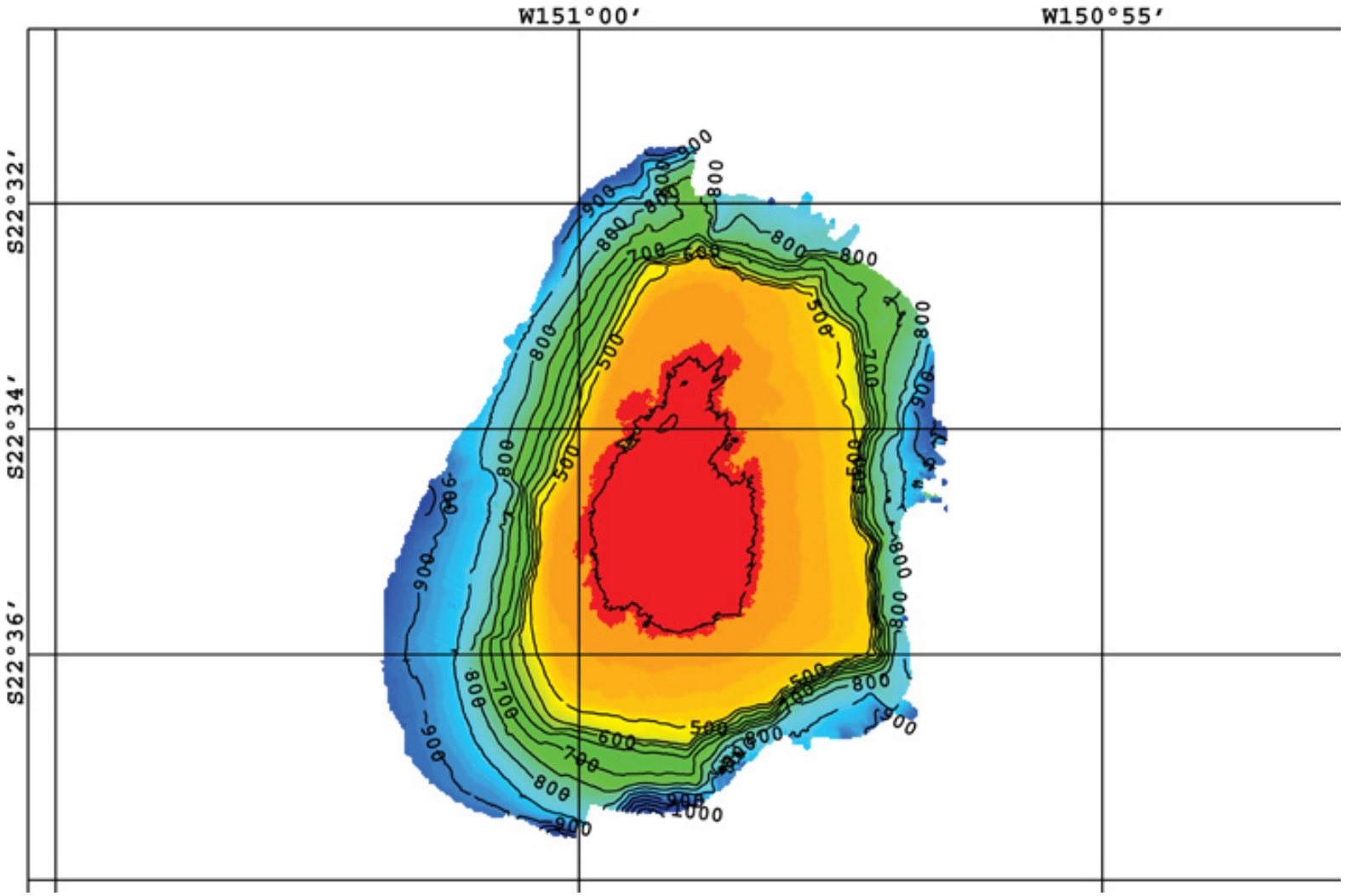







Grid Display: lord_hove No_Name
File View Planning Crossline
Help
E161°43.0′
E161°43.2′
E161°43.4′
S23°51.2′
S23°51.3′
S23°51.4′
S23°51.5′
1:2818
Delta S 250 m W 328 m Dist: 406 m Angle: 232


ILES DE LA SOCIETE
Tetiarca
Moorea
Papeete
Maiao
TAHITI
Mehetia
11
20° S
N/O ALIS
Campagne BENTHAUS
Novembre 2002
Maria
9
Ruriutu
Mont du Lotus
Récif Moses
Rimatara
10
8
Tubuai
7
TROPPIQUE DU CAPRICORNE
Mont Arago
ILES AUSTRALES
Raivavae
6
5
Banc Président Thiers
Eau décolorée
Récif Neilson
4
3
Rapa
2
Iles Marotiri
Banc Mac Donald
(activité volcanique)
1
155° W
150° W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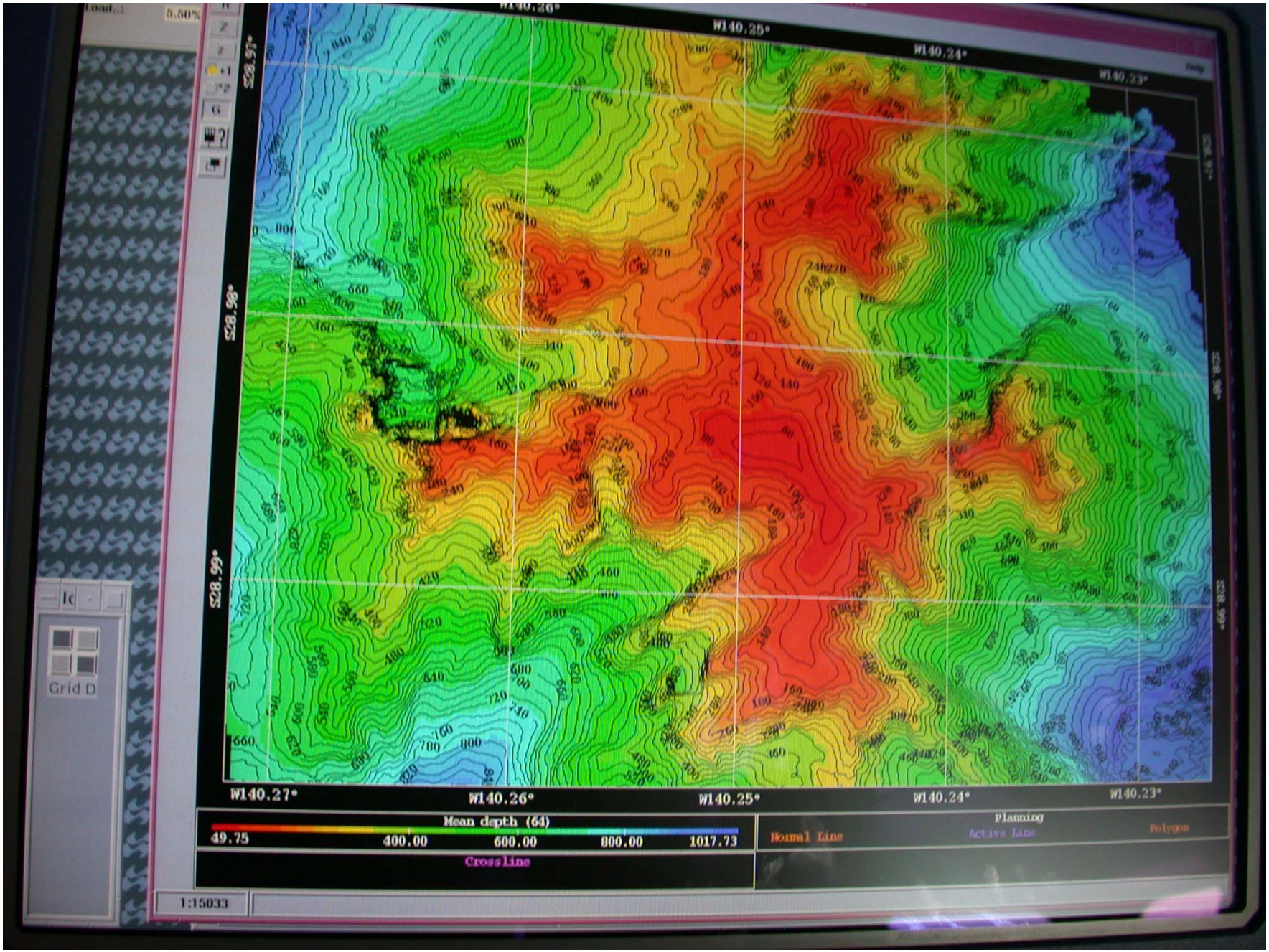
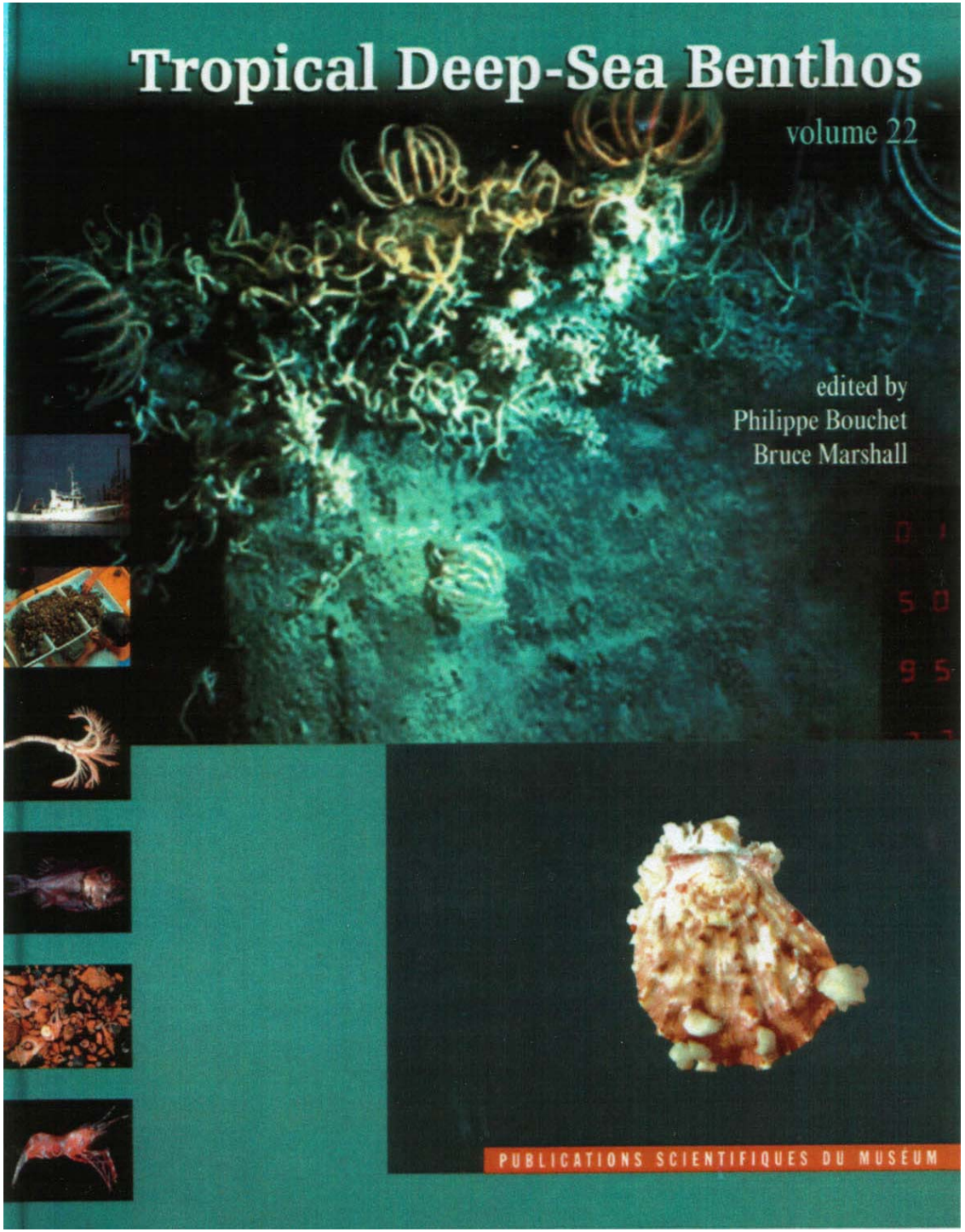
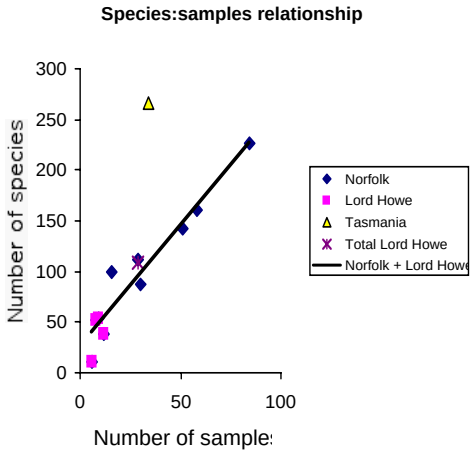
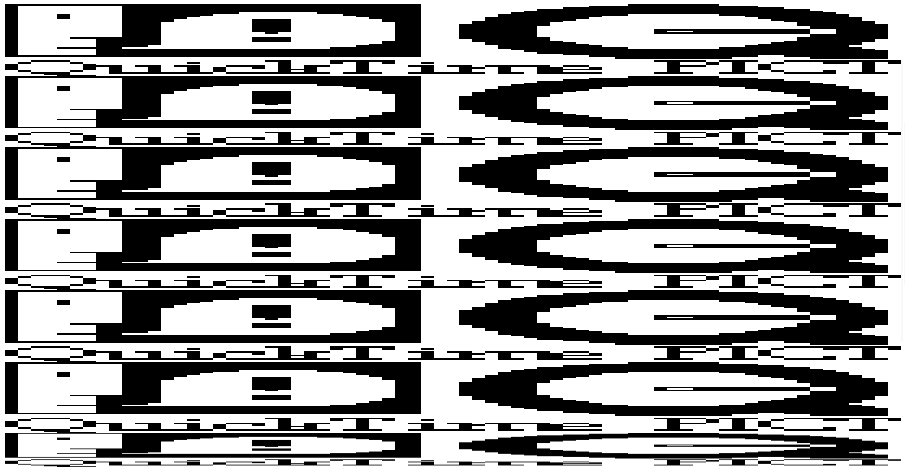
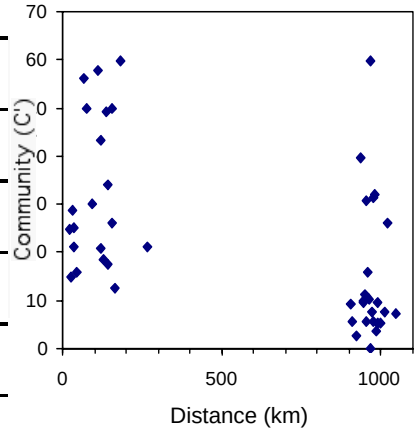
W150°55′
S22°32′
S22°34′
S22°36′


W140.27°
W140.26°
W140.25°
W140.24°
W140.23°
S28.97°
S28.98°
S28.99°
Mean depth (64)
49.75
400.00
600.00
800.00
1017.73
Crossline
Planning
Normal Line
Active Line
Polygon
1:15033
Grid D


Tropical Deep-Sea Benthos
volume 22
edited by
Philippe Bouchet
Bruce Marshall
PUBLICATIONS SCIENTIFIQUES DU MUSÉUM


Species:samples relationship
Number of species
Number of samples
0
50
100
150
200
250
300
Norfolk
Lord Howe
Tasmania
Total Lord Howe
Norfolk + Lord Howe




Community (C')
Distance (km)
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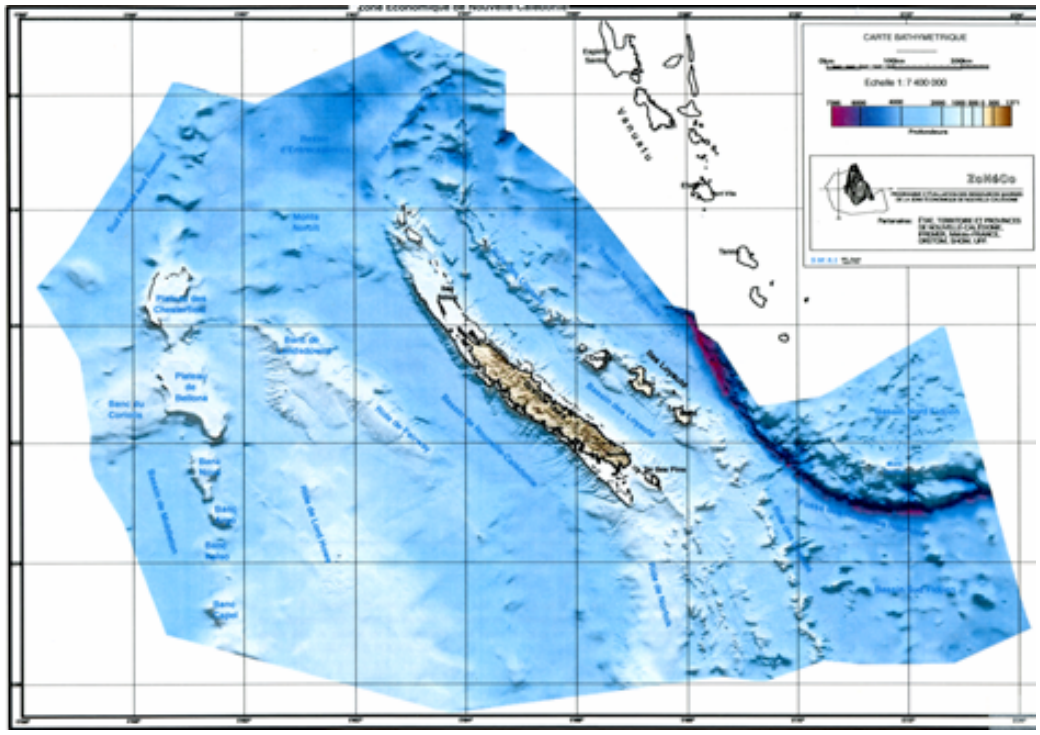
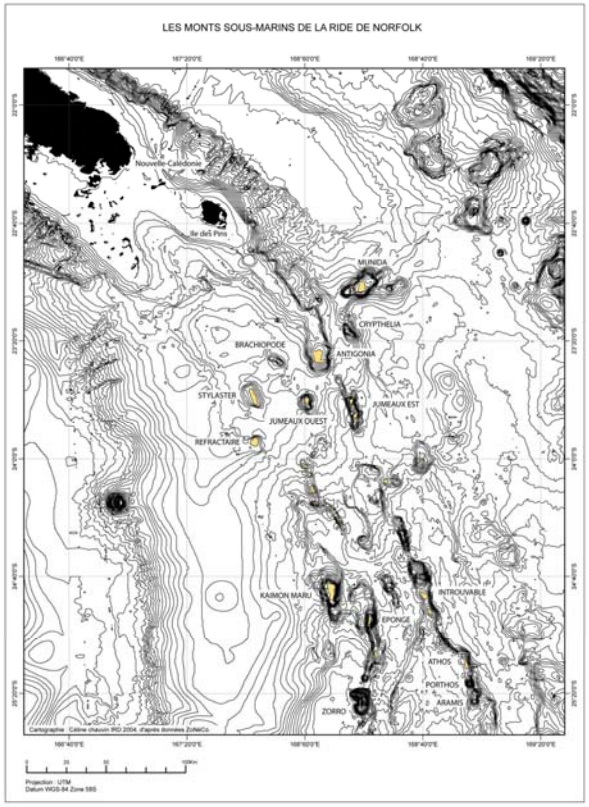
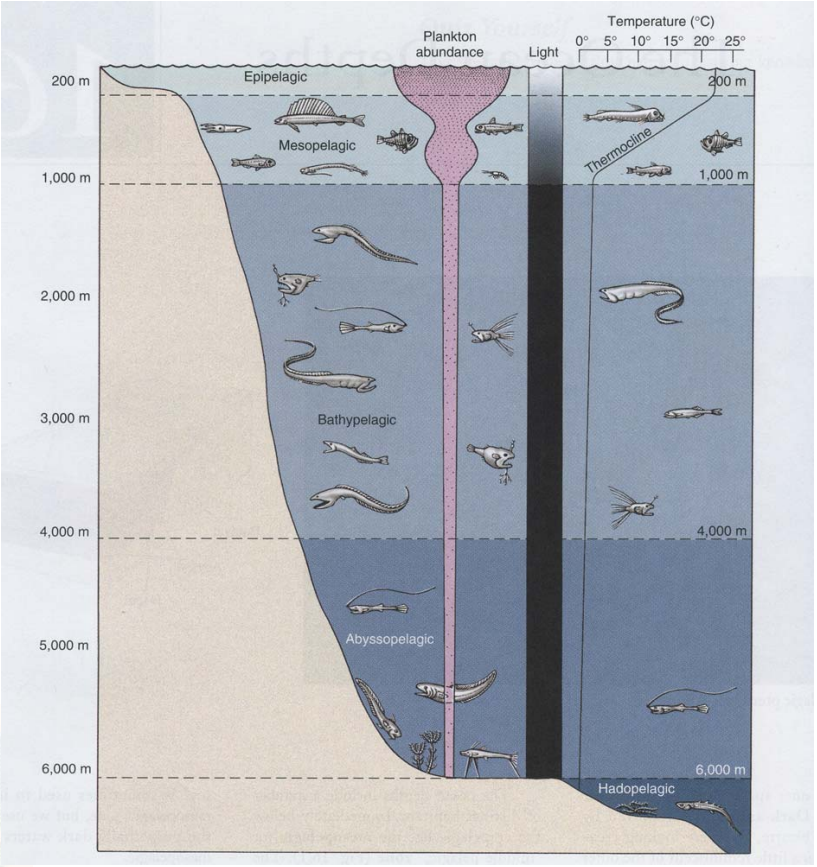
10
20
30
40
50
60
70
0
500
1000


CARTE BATHYMETRIQUE
Echelle 1:7 400 000
ZoNéCo


LES MONTS SOUS-MARINS DE LA RIDE DE NORFOLK
Nouvelle-Calédonie
Ile des Pins
MUNIDA
CRYPTHELIA
BRACHIOPODE
ANTIGONIA
STYLASTER
JUMEAUX EST
JUMEAUX OUEST
REFRACTAIRE
KAIMON MARU
INTROUVABLE
EPONGE
ATHOS
PORTHOS
ARAMIS
ZORRO



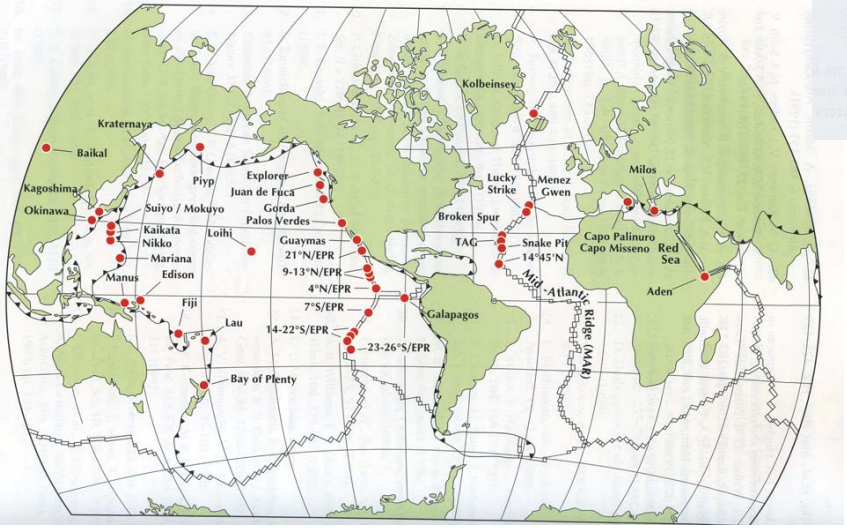
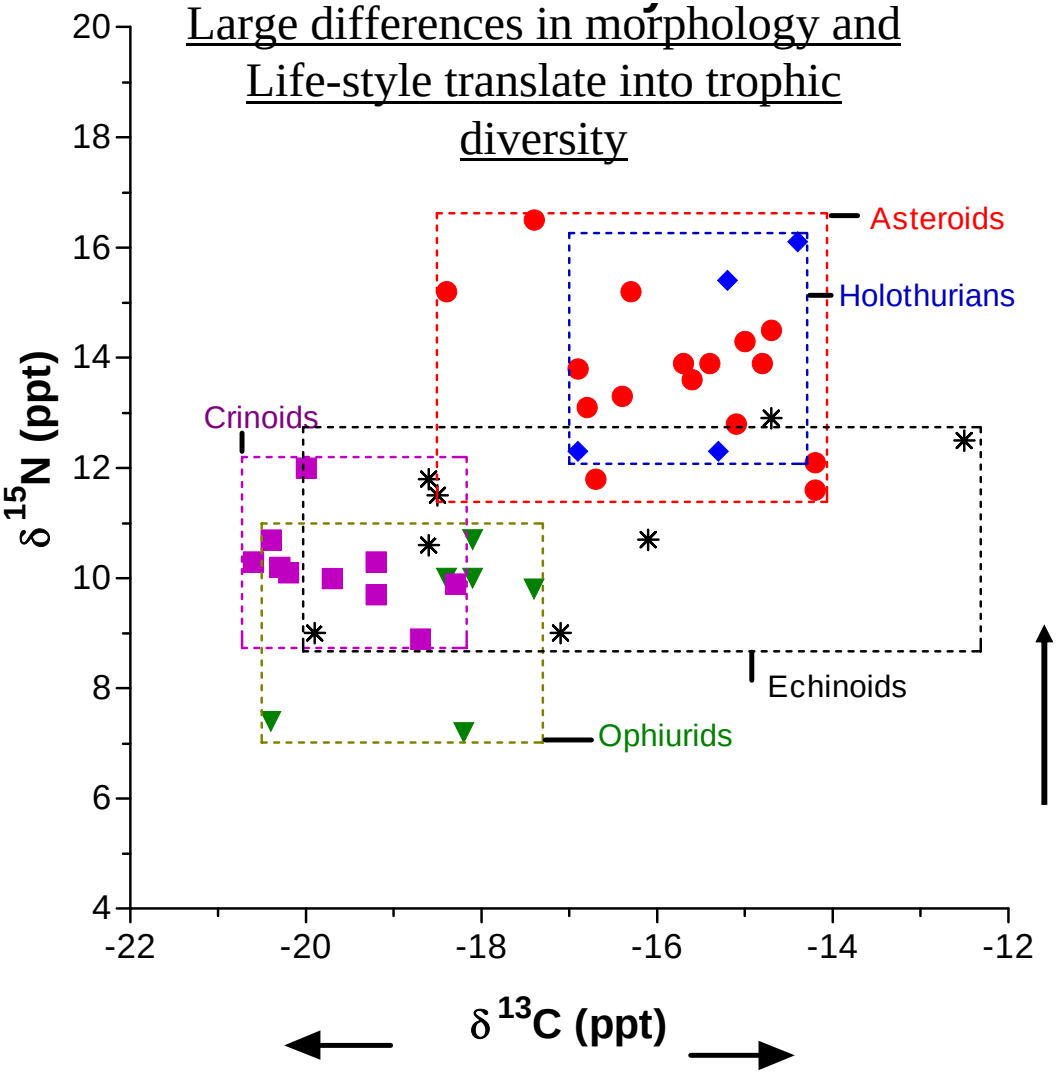


Figure 1 Geographic location of known hydrothermal zones with associated fauna. Characteristics of each zone are given in Table 1.

Echinoderms
Large differences in morphology and Life-style translate into trophic diversity



Echinoderms appear To derive carbon from a Variety of sources and Feed at multiple trophic levels

Increasing Trophic Level And/or utilsation of Biologically-processed ('old') nitrogen

Carbon from Surface Phytoplankton Production ('fresh' C) and or some import of terrestrial matter

Biologically-processed (recycled) 'old' carbon And /or Increasing carnivory

Palinustus unicornis

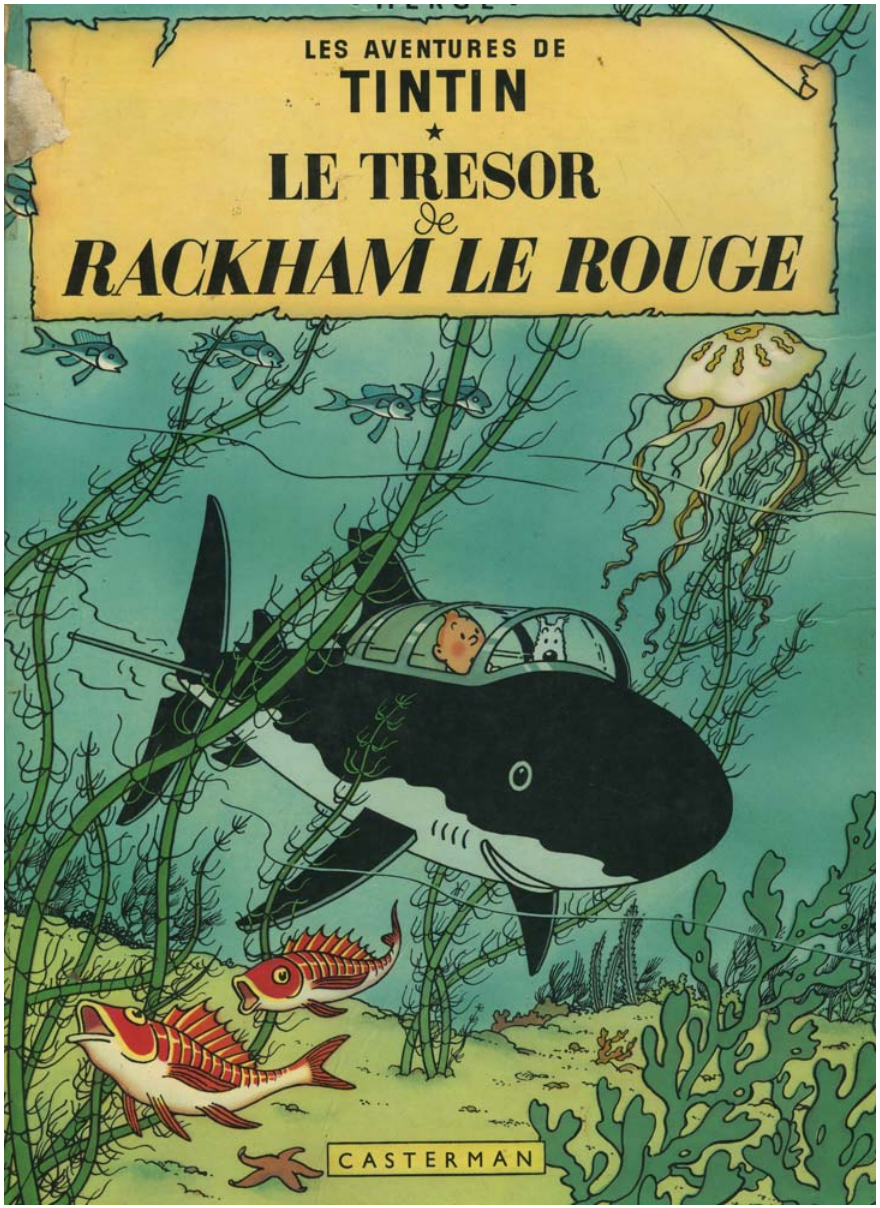
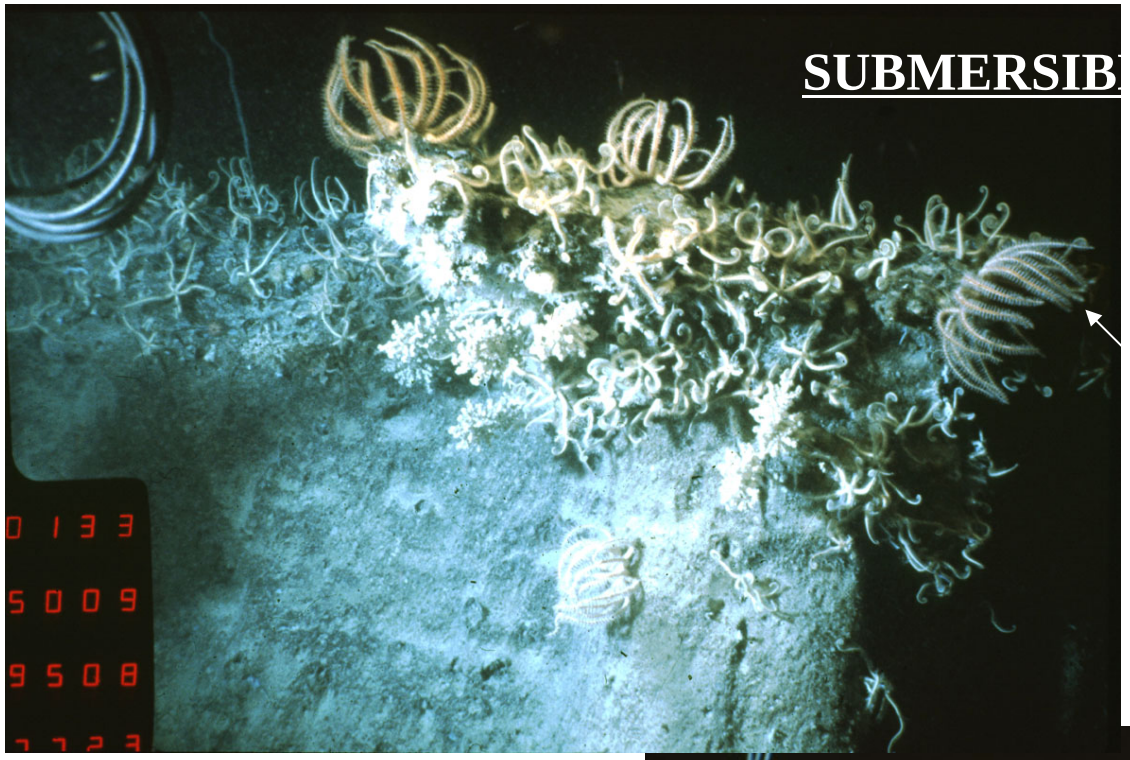
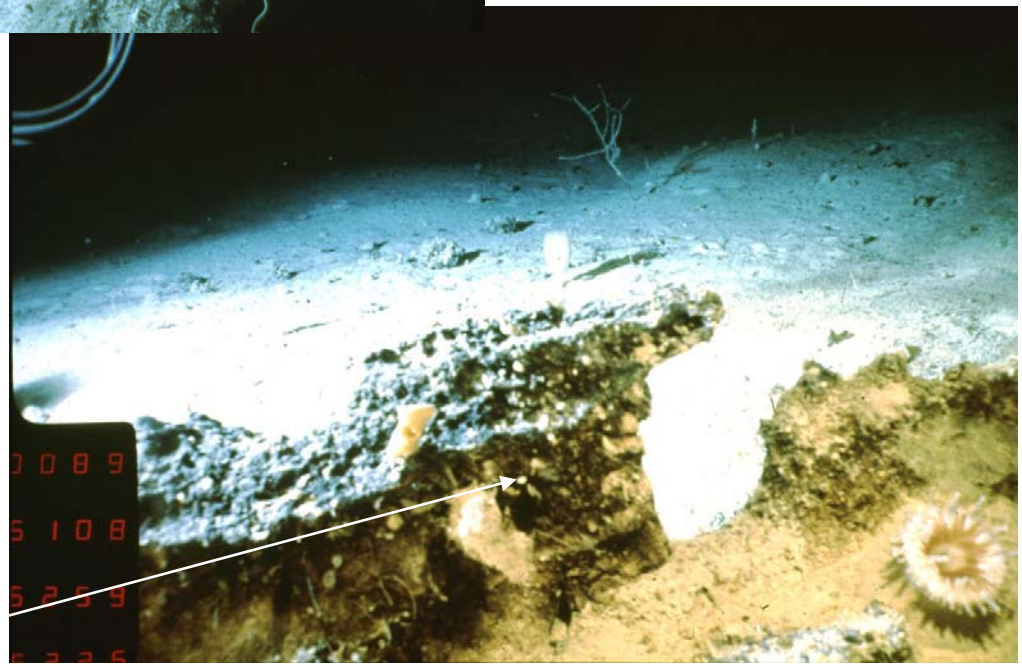
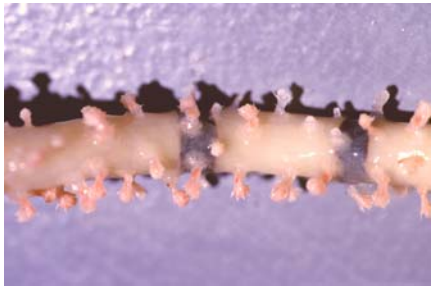


Figure 19.32 Some of the submersibles used for investigation of the deep ocean. (a) The French submersible, *Cyana*, capable of operating to depths of 4000 m. The hull is titanium, and the submersible carries a pilot, navigator, and one scientist. It is usually equipped with underwater lights, an arm, claw, and video. (Courtesy of Professor P. Tyler, SOC.) (b) The Russian *Mir I* submersible, capable of operating to 6000 m carrying two pilots and a scientist. The hull is titanium. The submersible is here carrying a (red) sediment trap, and still and video cameras; it has been used to investigate hydrothermal systems in the North Atlantic (see Chapter 13). (Courtesy of Professor P. Tyler, SOC.) (c) The US *Johnson Sealink* submersible in preparation for deployment. It is capable of operating to 900 m with a pilot and scientist in the front compartment and with a technician and second scientist in an aft compartment. The sphere is acrylic. In addition to lights and cameras, the submersible has a manipulation claw. (Courtesy of Professor P. Tyler, SOC.) (d) The US Navy-owned Deep Submergence Vehicle (DSV) *Alvin* operated by the Woods Hole Oceanographic Institution. A typical 8 hr dive takes two scientists and pilot to 4500 m with 4 hours on the bottom for observation, photography, and experiments. Three video and two 800 frame cameras are usually carried, together with two hydraulic arms and instruments such as corers, temperature probes, water samplers, and a biological sample pump. (Courtesy of Woods Hole Oceanographic Institution.)


SUBMERSIB




Homo sapiens : 53 years
©Marc LE CHELARD
©Marc LE CHELARD



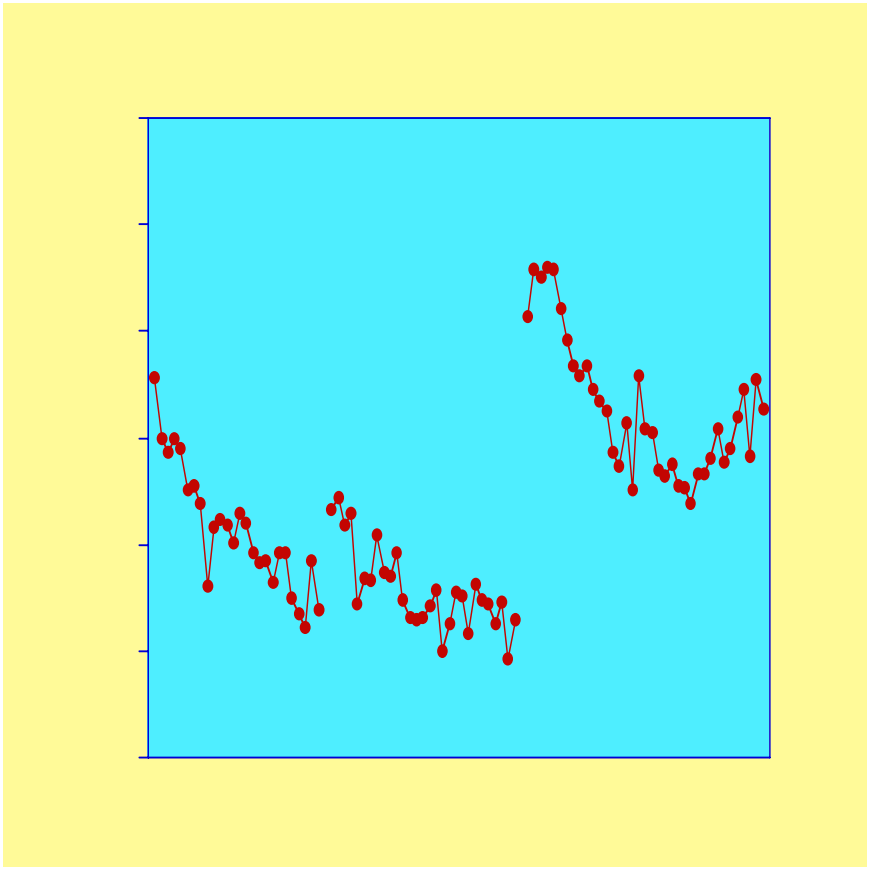
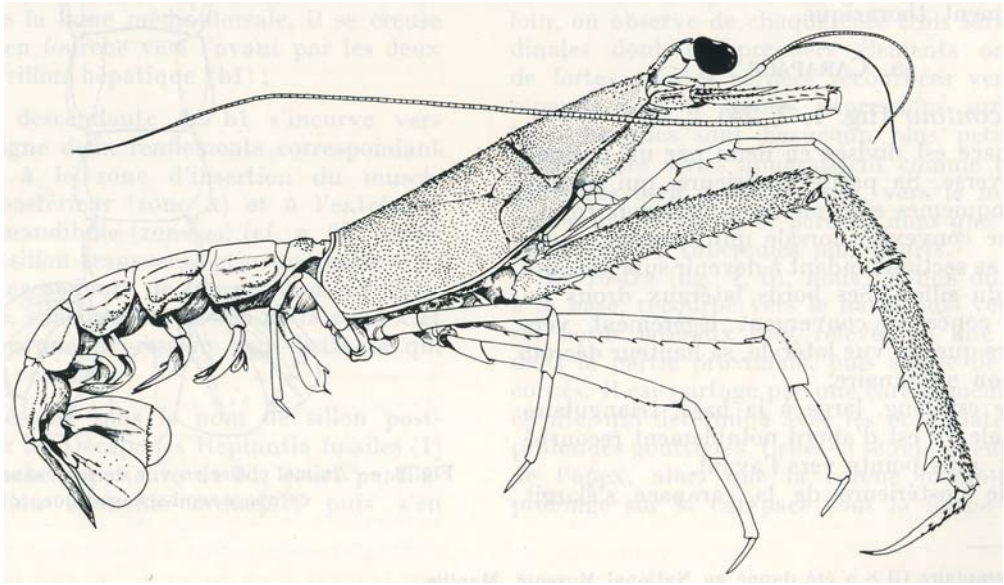


Fig. 10. – Example of temperatures measured on 3 samples (A-C) of isidid gorgonians from the seamounts of Norfolk Ridge. A : Graphic with on the left Mg/Ca (molar), on the right water temperature with the scale of 1° C on the graph. B: A cross crossing of Isidid gorgonian showing the growth rings and the radial samples serie. (from Richer de Forges, S., 2002, modified by T. Corrège).

Gymnocrinus

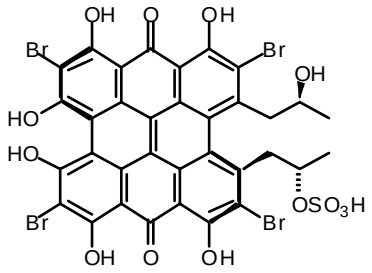
aledonicrinus vaubani

olki

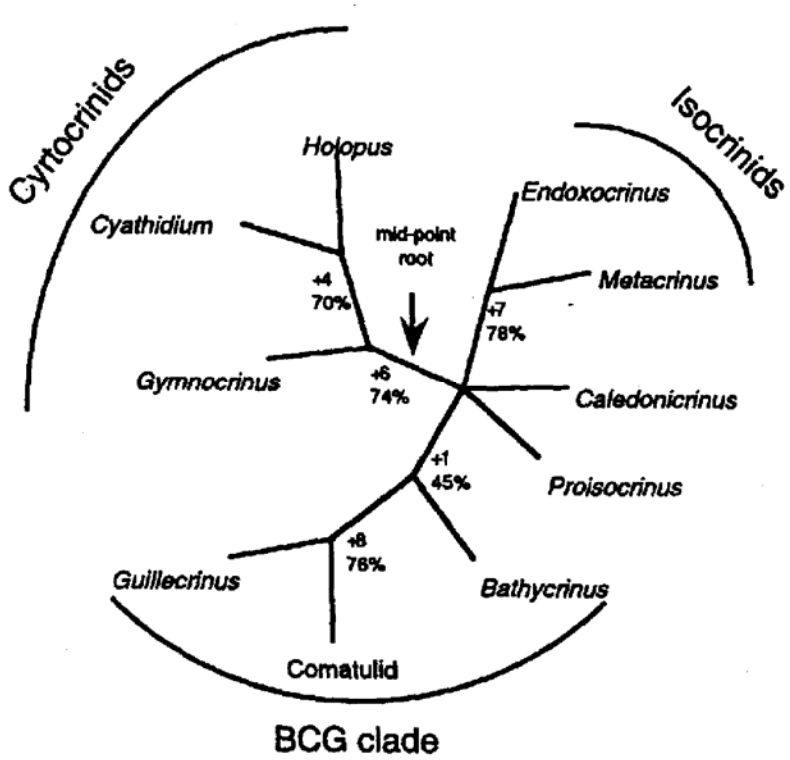


- Lord Howe Ridge seamounts

ON SEAMOUNTS THE GREAT DIVERSITY OF LIFE INDUCE A CORNUCOPIA OF CHEMICAL PRODUCTS



Isogymnochrome D



Crinoid Phylogeny

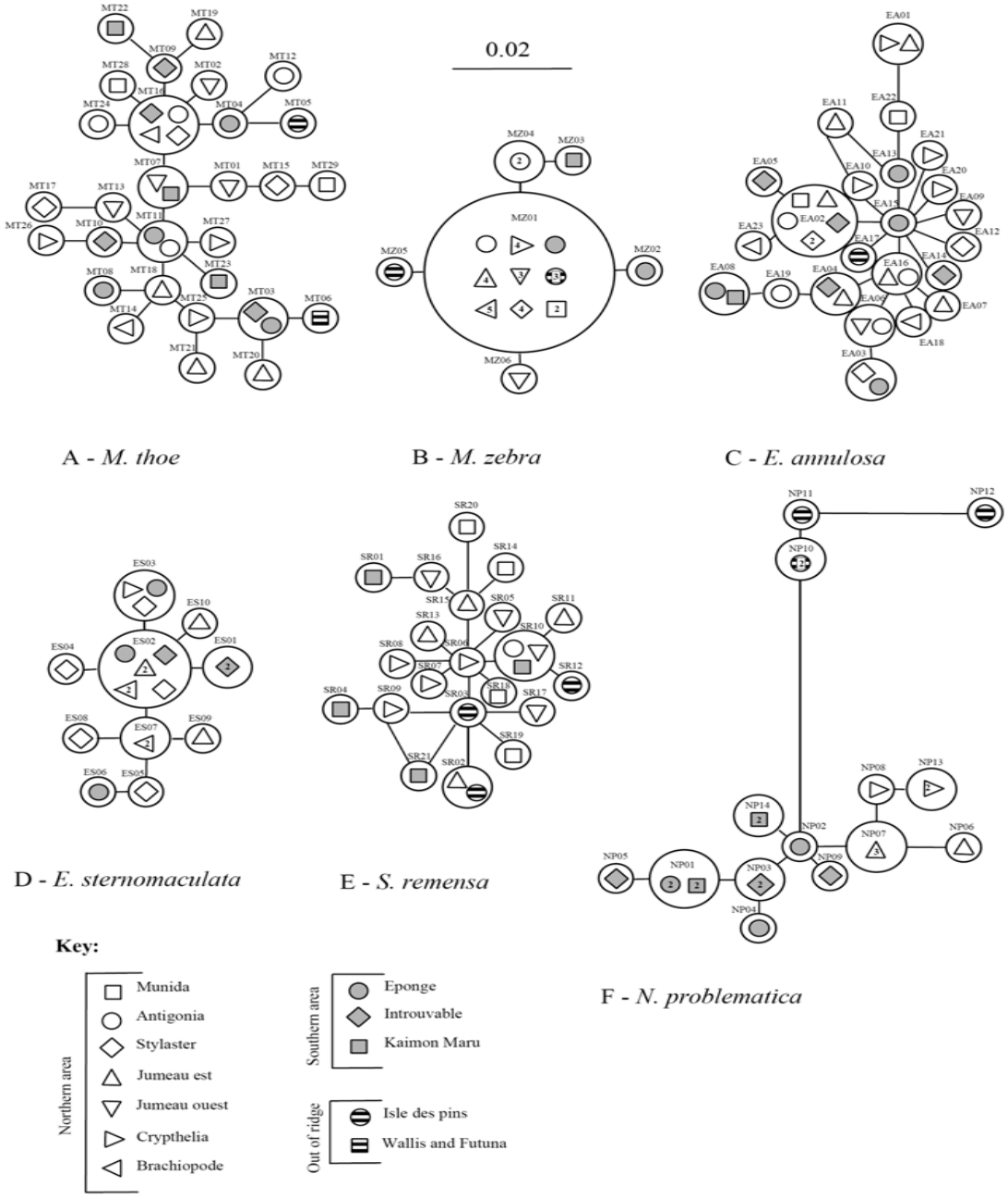
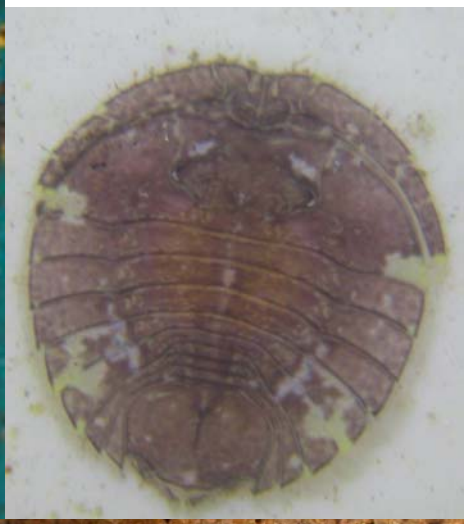
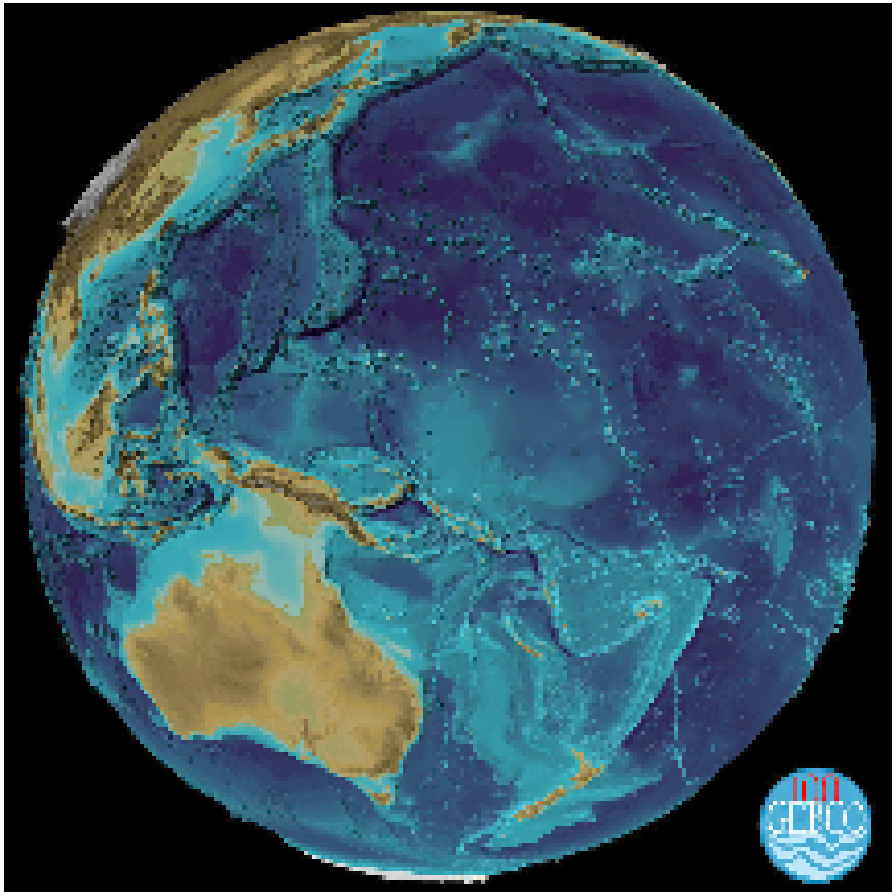
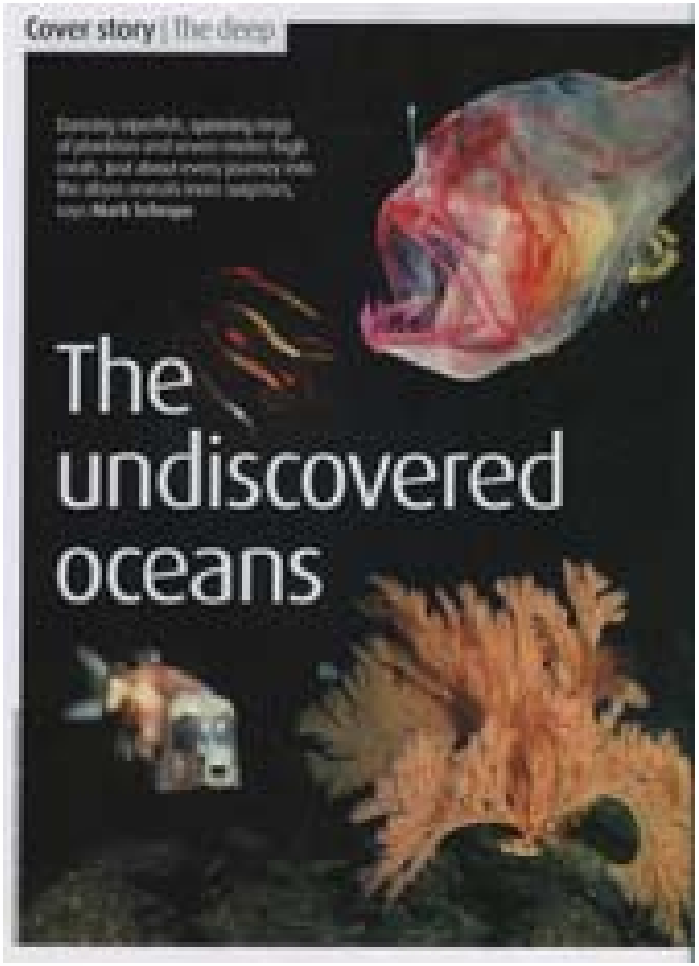


Figure 3 - Minimum spanning networks constructed using Tamura-Nei distances between mitochondrial COI haplotypes (represented by circles); areas proportional to the number of individuals sharing a given haplotype. The symbols inside the circle represent the localities where the haplotype was found (see key).






Cover story | The deep
The undiscovered oceans

?