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Report to the GEBCO Sub-committee on Undersea Feature Names on the work carried out at the British Oceanographic Data Centre (BODC) with the GEBCO Gazetteer of Undersea Feature Names

Pauline Weatherall and Ray Cramer: BODC, Joseph Proudman Building, 6 Brownlow Street, Liverpool, L3 5DA, UK (paw@bodc.ac.uk, rnc@bodc.ac.uk)

Images and documents referenced in this report can be accessed from:

Images: ftp://ftp.pol.ac.uk/pub/bodc/gebco/scufn/images/
Documents: ftp://ftp.pol.ac.uk/pub/bodc/gebco/scufn/documents/

Background

At BODC we maintain and make available the GEBCO Digital Atlas (GDA). The GEBCO Gazetteer of Undersea Feature Names is an integral part of this collection of data sets. We have been working with the gazetteer data set with a view to:

- Updating the version of the gazetteer that is used in the GDA
- Providing the data set as a web feature service
- Making the data set available to users in more Geographic Information System (GIS)-friendly formats such as Shapefile and Keyhole Markup Language (KML)

As part of this work we have created a database to hold the gazetteer data from which we plan to generate the outputs listed above. During the database creation we have carried out a number of quality control checks on the data set and investigated if additional points are needed to help define the shape and extent of some features.

This report details our progress with this work and makes a number of proposals concerning how we can take this work forward working in collaboration with SCUFN, the International Hydrographic Bureau (IHB), the US National Geophysical Data Center (NGDC) and the Composite Gazetteer of Antarctica (CGA).

There is a great deal of interest from users world-wide in getting access to a more GIS-friendly version of the gazetteer data set. It would be better if this were made available with the approval of SCUFN rather than individual organisations reformatting the spreadsheet version of the data set into GIS formats.

Creating a database for the gazetteer data set

We have been working with the **Microsoft Excel spreadsheet** form of the gazetteer supplied by the IHB and available via the web. Using software, written in-house, we have created database tables from the

information contained in the spreadsheet. The data have been split into three separate tables linked by a key field:

Feature table, containing the following attribute fields:

Name, Generic Type, History, Remarks, Proposer, Accredited, Discoverer

Chart table, containing the following attribute fields:

Chart reference

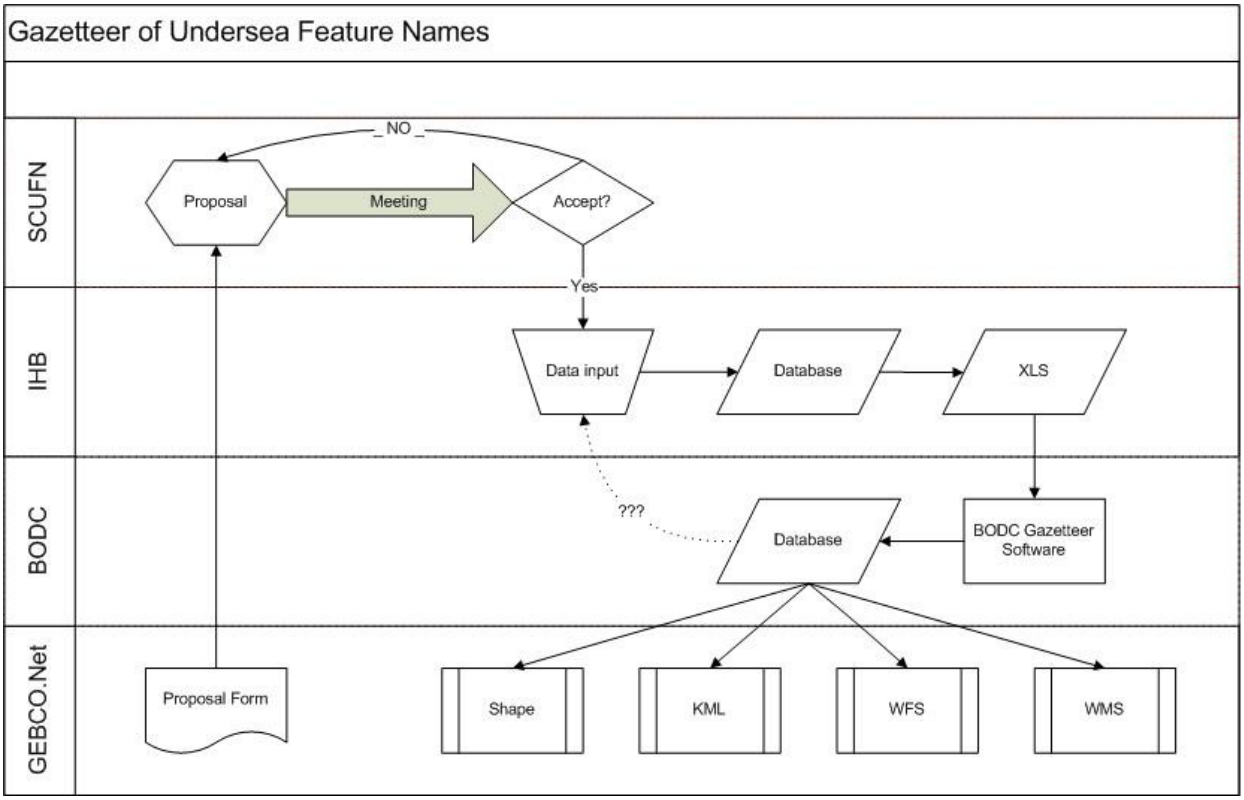
Position table, containing the following attribute fields:

Original latitude, original longitude, decimal latitude, decimal longitude, co-ordinate order

The information for the 'Proposer', 'Accredited' and 'Discoverer' fields, listed above, is taken from the 'History' field from the spreadsheet data set.

When an updated version of the gazetteer spreadsheet file is made available by the IHB, the software can be used to identify the differences between the existing and new versions of the gazetteer and the database tables can be updated accordingly.

The following diagram illustrates the flow of the procedure from the submittal of a name proposal to the creation of outputs for external users. Note the question mark for the flow of information from the gazetteer database created at BODC back to the IHB. This is one of the issues that we would like guidance on, i.e. how best can we provide useful feedback to SCUFN and the IHB on any possible errors in the gazetteer data set?



Carrying out quality control checks on the data set

The gazetteer reformatting software carries out a number of quality control checks on the data set during the reformatting process. This includes checks for missing hemisphere information for the feature co-ordinates. In addition, the software includes the capability to carry out a number of checks on the format of the text in the History, Remarks, Proposer, Accredited and Discoverer attribute fields. These include checks for extra spaces in the text, e.g. before and after ‘)’. A summary of the results of these checks is included in Annex I.

From the database, the data were then converted to Shapefile format and plotted against the GEBCO bathymetric data sets. Viewing the data in a GIS has highlighted a number of issues such as possible errors in the plotting order of co-ordinates for some features and possible errors in co-ordinate positions. The results of these checks are included in Annex I.

Plotting the data in a GIS also highlighted the need to add additional points to the current list of co-ordinates for some features to help define their shape and extent. For example the Mid-Atlantic Ridge is currently defined by two co-ordinates. More co-ordinates may be needed to label this feature on a map or in a GIS.

We have also done some work on identifying additional points to help define the shape and extent of some features. **However, these additions need to be approved by SCUFN before the data set can be made available for general release**. A list of features which may need additional points is included in

Annex II. This list includes a 'priority' list of features which may need to be investigated first. A full list of suggested additional points is included in the accompanying document, 'ufn_additional_points.doc'.

Collaboration with CGA

In order to harmonize with the work being undertaken by Ralf Krocker at the Alfred Wegener Institute (AWI) with the CGA gazetteer we have visited AWI to discuss our work with the GEBCO gazetteer and look forward to further collaboration in the future.

Questions, future plans and proposals

Once any errors in the gazetteer data set have been corrected we can make the data available to external users through the GDA and as Shapefiles, KML and a web feature service. We already have defined extra points for use in displaying the gazetteer data in the GDA; any user of the spreadsheet version of the gazetteer will have run into the same problems of the feature extents. We list below some of the problems and proposed solutions where possible.

Data set errors

1. How best can we provide feedback to SCUFN and the IHB on the possible errors that we have found in the gazetteer data set?
    a) Define the errors and send them to IHB, as done with the annexes of this report? This paper trail is pretty cumbersome.
    b) Update the records within the IHB database system, using a local copy. Sending this to IHB does not provide checks for validity of the edits.

    We appreciate that resources might not be easy to find. Can we help in anyway in the initial correcting of the IHB gazetteer database? For example, we propose that we would carry out b) above, working through the data in Annex I, to speed things up in the first instance.

Additional points and database format

2. A number of features have been identified which may need additional points to define their shape and extent. We would propose that a number of priority features are investigated first with others being worked on later. Would it be useful if the features were split into groups by geographic region? Could members of SCUFN provided feedback for features which fall in their geographic area of expertise?

3. We propose to store the additional points defined for some features (as listed in ufn_additional_points.doc) in the IHB gazetteer database.

4. Any co-ordinate that is to be used within a GIS or digital system must be in decimal format. We propose that the co-ordinate information provided in the gazetteer spreadsheet (exported from the IHB database) be written in decimal rather than as text in degrees minutes and seconds.

5. We propose that the output of the co-ordinate positions be changed from a list of latitudes and longitudes into a form such as well known text form.
    For example: 12.345 N 123.456 W
    12.456 N 123.567 W
    12.567 N 123.678 W could become something like

LINESTRING (12.345 123.456, 12.456 123.567, 12.567 123.678)

Data dissemination

6. For the delivery of the data to external users we propose that the following attribute fields are delivered with the data in Shapefile and web feature service form:

   Name, Generic Type, History, Remarks, Accredited, Proposer

The information for the 'Proposer', 'Accredited' and 'Discoverer' fields, listed above, is taken from the 'History' field from the spreadsheet data set.

Future work

7. We propose that SCUFN consider expanding the description of the extent of features, for example, basins and abyssal plains, by using polygons with a view to extending this to cover the entire seabed. The storage of this data also needs to be considered. Should some generic feature types, such as canyons, always be defined by more than one point?

8. We propose that we work with colleagues at NGDC concerning the display of the gazetteer data on the web.

9. We propose that we work with CGA colleagues concerning harmonizing the GEBCO and CGA gazetteers.

Annex I

The following errors were identified in the September 2008 spreadsheet version of the gazetteer data set. If required, shapefile versions of the gazetteer data set can be provided to help with data visualisation work.

1. Missing hemisphere information

The following is a list of features with missing hemisphere information. Full details can be given on request. The missing hemisphere information may be due to an export problem from the IHB gazetteer database as the missing information seems to be present in the IHB version of the database.

Atlantis II Seamounts
Black Mud Levee
Scholl Deep
Schrick Knoll
Bungo Seamount
Currituck Seamount
Eistla Seamount
Fe'e Seamount
Hatherton Seamounts
Kaijin Knoll
Kaiwhata Bank
Kaula Seamount
Kaula Seamount
Kertz Seamount
Keto Knoll
Koki Seamount
Kort Seamount
Lee Hill
McArthur Escarpment
McArthur Escarpment
Meiosei Seamount
Mikura Seamount
Mitin Ridge
Musatov Seamount
Nishi - Joo Seamount
Opahi Seamount
Pallada Guyot
Pukaki Seachannel
Rassokho Seamounts
Shinkov Seamount
Smith Canyon
Svendsen Ridge
Teplov Seamount
Yukhov Seamount
Yuwan Seamount
ZHUKOV Seamount

2. Co-ordinate format problems

1. **Daini-Atsumi Knoll** Longitude co-ordinate: 137°20'.5 E - should longitude value be written 137°20.5' E?

2. **Fe'e Seamount** Latitude co-ordinate: 19 0' 29.0 - presume this should be 19 0' 29.0" S?

3. Miscellaneous co-ordinate information problems

1. **Kaede Seamount** Longitude co-ordinates - hemisphere for longitude co-ordinate is given as 'N'

2. **Pegas Guyot** There are two entries in the database for this feature, one entry has co-ordinates of: 150°35' N, 152°05' E

4. Duplicate feature names

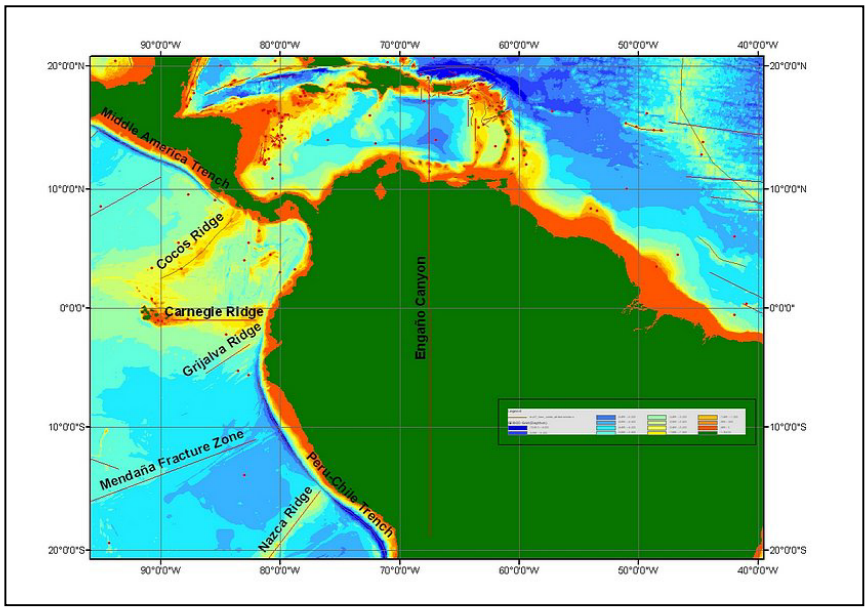
Please note that the following features may have duplicate entries in the gazetteer spreadsheet file

Albatross Bank
Bowers Canyon
Healy Seamount
Hodgkins Seamount and Hodgkins Seamounts – the position of these two features are very close together.
Jones Seamount
Kiwi Seamount
Murray Canyon (3 entries)
Pegas Guyot
Penguin Bank
Petrel Bank
Santa Lucia Bank
Suruga Seamount

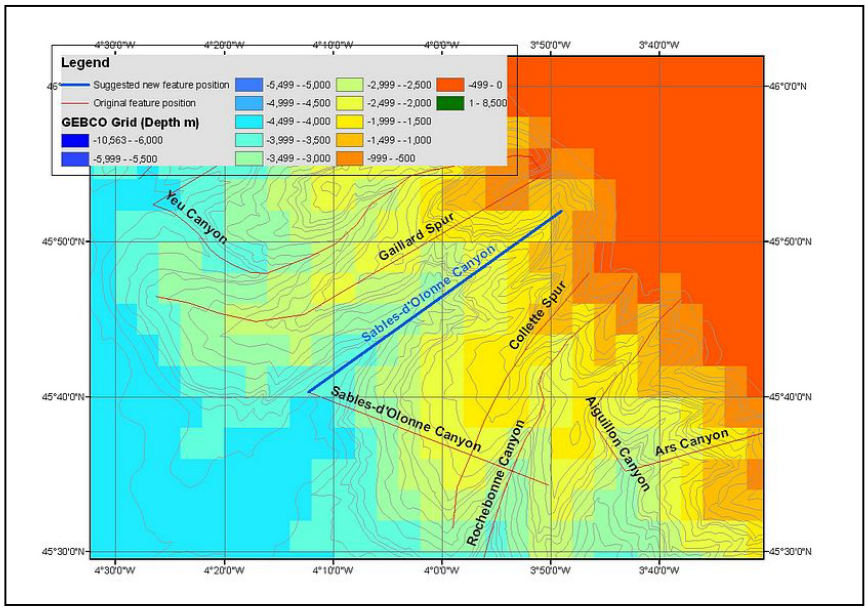
5. Possible co-ordinate position errors

References are to image files which illustrate the suggested changes. The images can be accessed from ftp://ftp.pol.ac.uk/pub/bodc/gebco/scufn/images/

1. Engaño Canyon Should the first latitude co-ordinate of 18°56' S be 18°56' N?, see engano_canyon.jpg

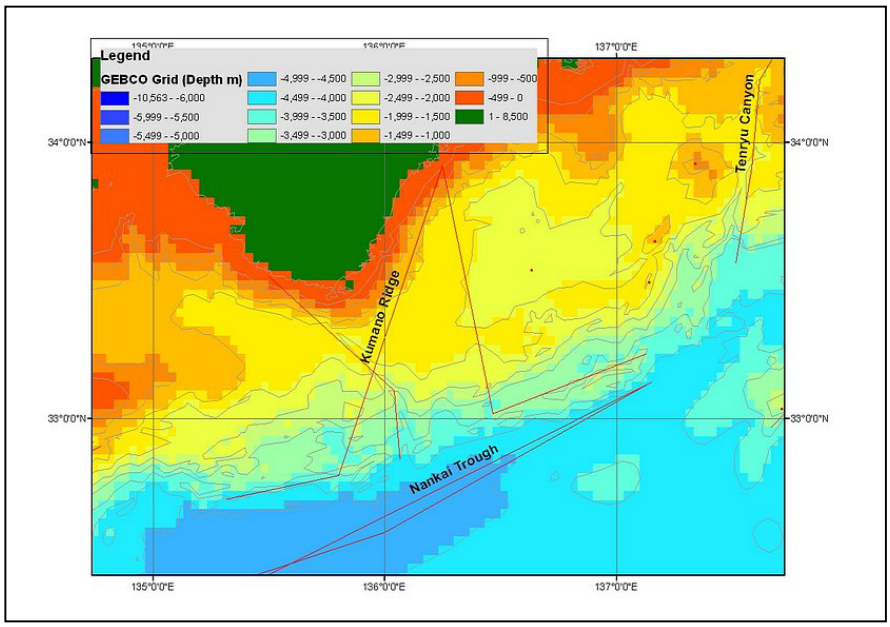


2. Sables d'Olonne Canyon The co-ordinate 45°34.3' N 03°50.2' W appears to be wrong, suggest moving it to: 45° 52'N, 03° 49'W



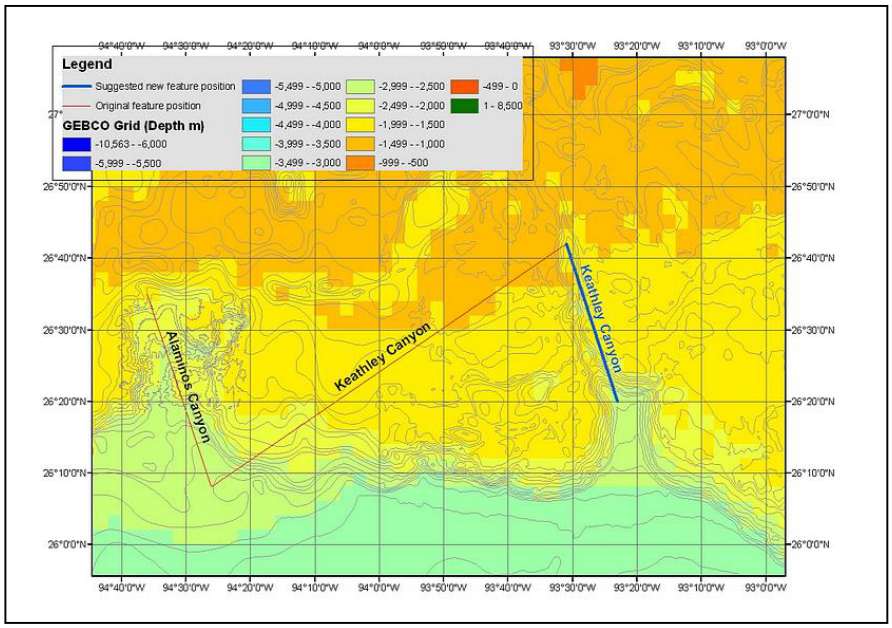
3. Man Trough The feature appears to be in the wrong position, should the latitude co-ordinates be S rather than N?, current co-ordinates:
66°30'00" N, 82°20'00" E ; 65°40'00" N 96°00'00" E

4. Kumano Ridge Is the co-ordinate: 33°55.0' N 136°15.0' E correct? – see kumano_ridge.jpg

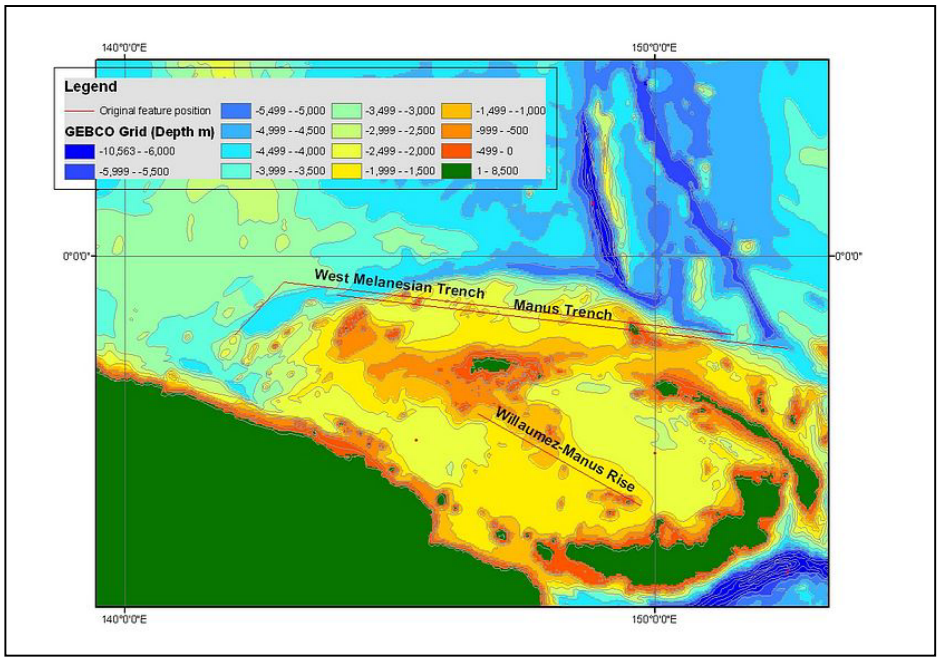


5. Muroto Valley and Muroto Ridge - Both features have the same sets of co-ordinates but the are ordered differently.

6. Keathley Canyon The co-ordinate 26°08' N 94°26' W appears to be wrong. Suggest moving the co-ordinate to 26° 20'N 93° 23'W. see keathley_canyon.jpg



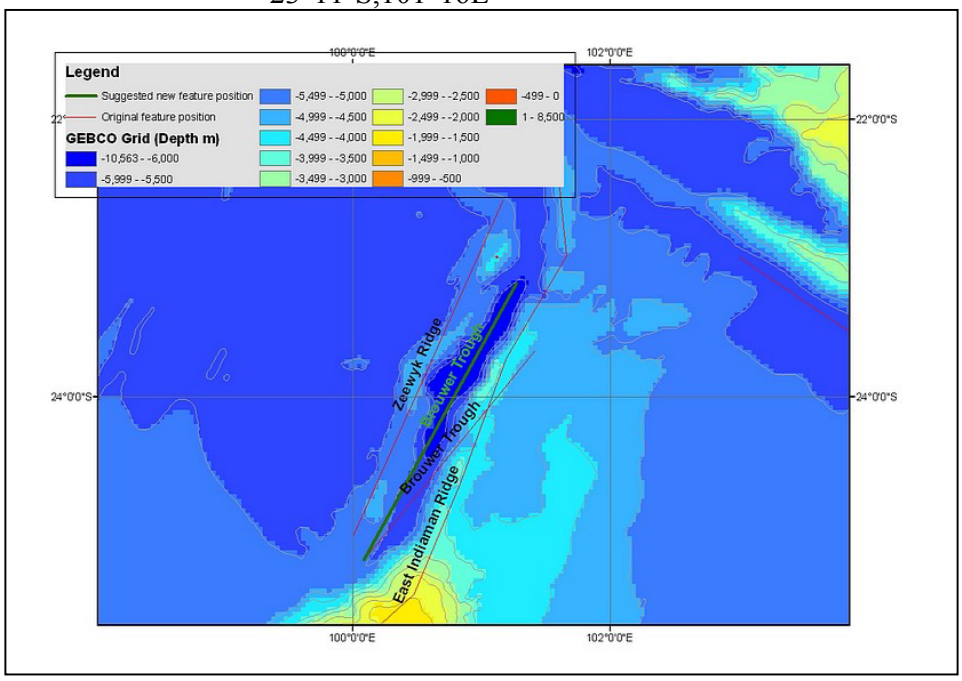
7. West Melanesian Trench and Manus Trench - are the co-ordinates correct? see west_melanesian_trench.jpg



8. **Brouwer Trough,** should the co-ordinates be repositioned? See brouwer_trough.jpg

Current co-ordinates: 25°10' S,100°05' E
23°40' S, 101°25' E

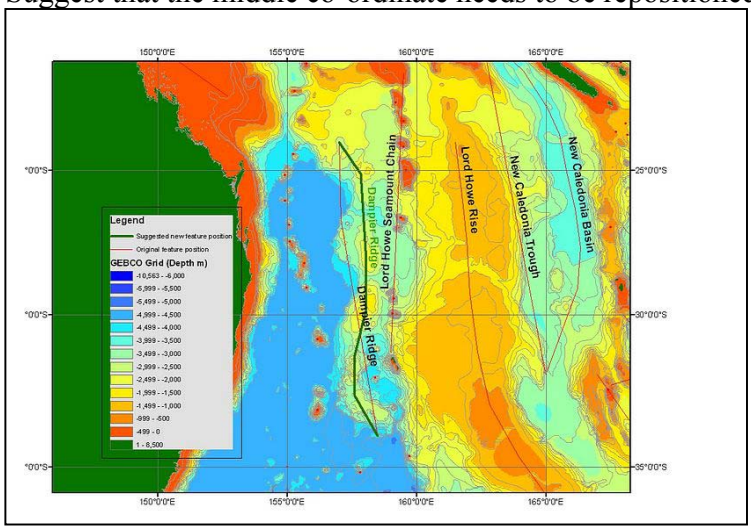
Suggest change to: 25°10' S,100°05' E
23°11'S,101°16E



9. Dampier Ridge (see above) – are the co-ordinates correct?, see dampier_ridge.jpg

Current co-ordinates: 24°00' S, 157°00' E
26°45' S, 157°05' E
34°00' S, 158°30' E

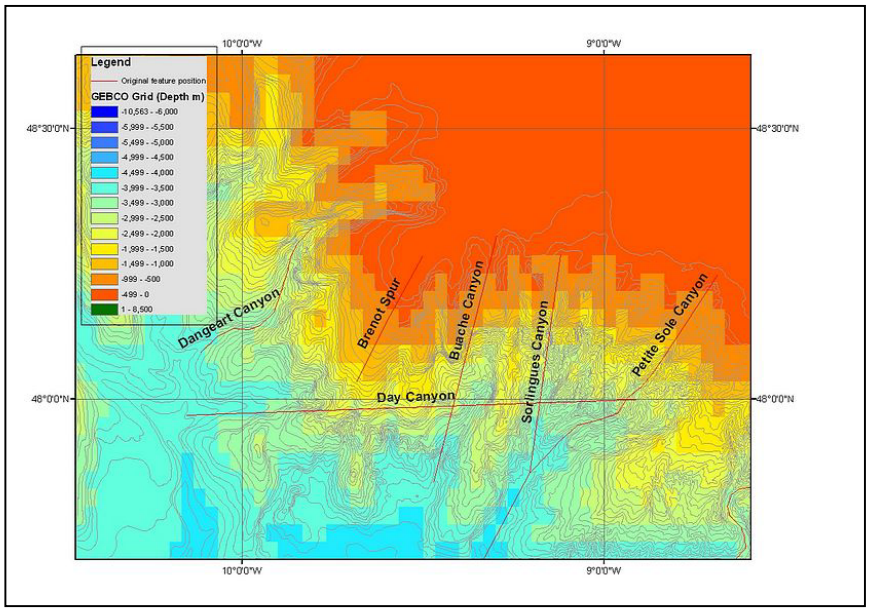
Suggest that the middle co-ordinate needs to be repositioned and/or needs additional points.



10. Day Canyon – are the co-ordinates correct? See day_canyon.jpg

Current co-ordinates: 48°00' N, 08°53' W

47°58.2' N 10°09.3' W



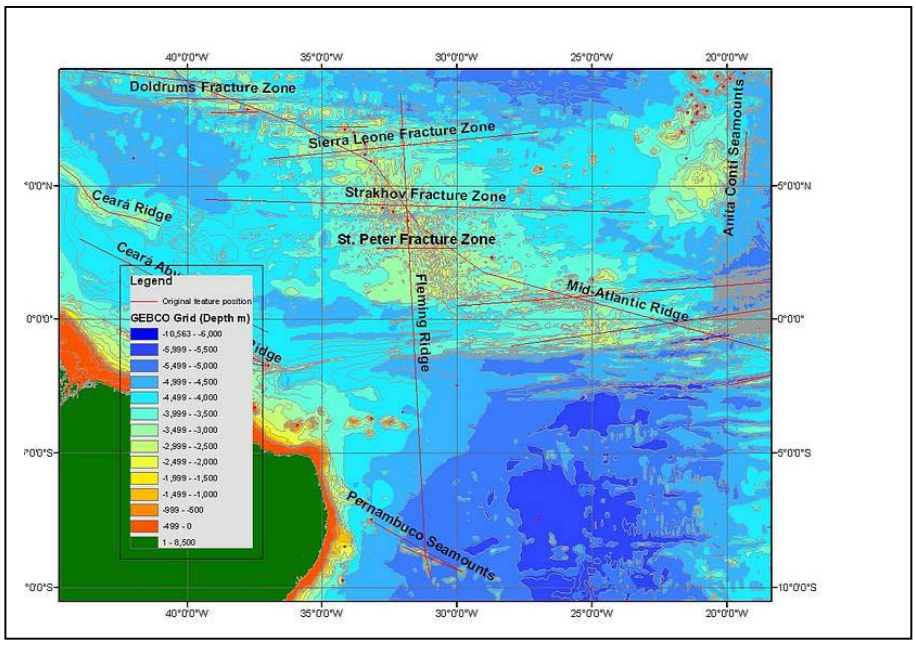
11. Fleming Ridge are the co-ordinates correct? See fleming_ridge.jpg

Current co-ordinates: 8°26' N 32°05' W

8°44.5' S 31°11' W

9°38' S 31°00' W

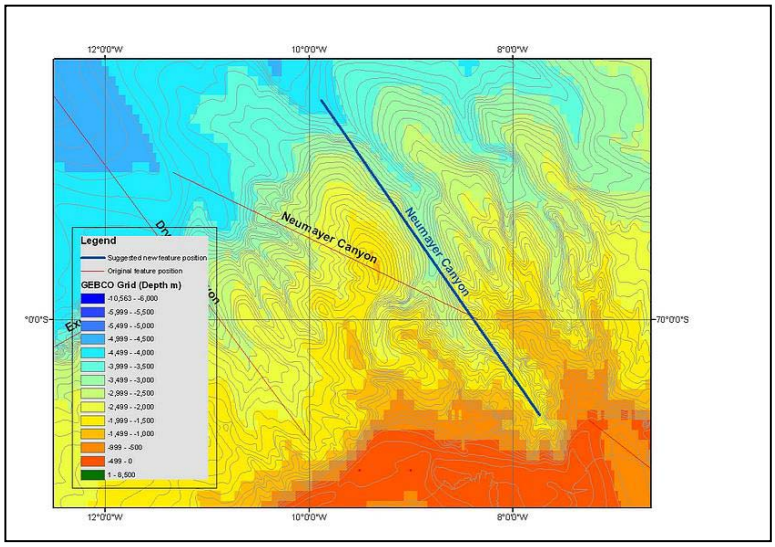
Suggest that the first co-ordinate should be: 8°26' S 32°05' W



12. Neumayer Canyon are the co-ordinates correct? See neumayer_canyon.jpg

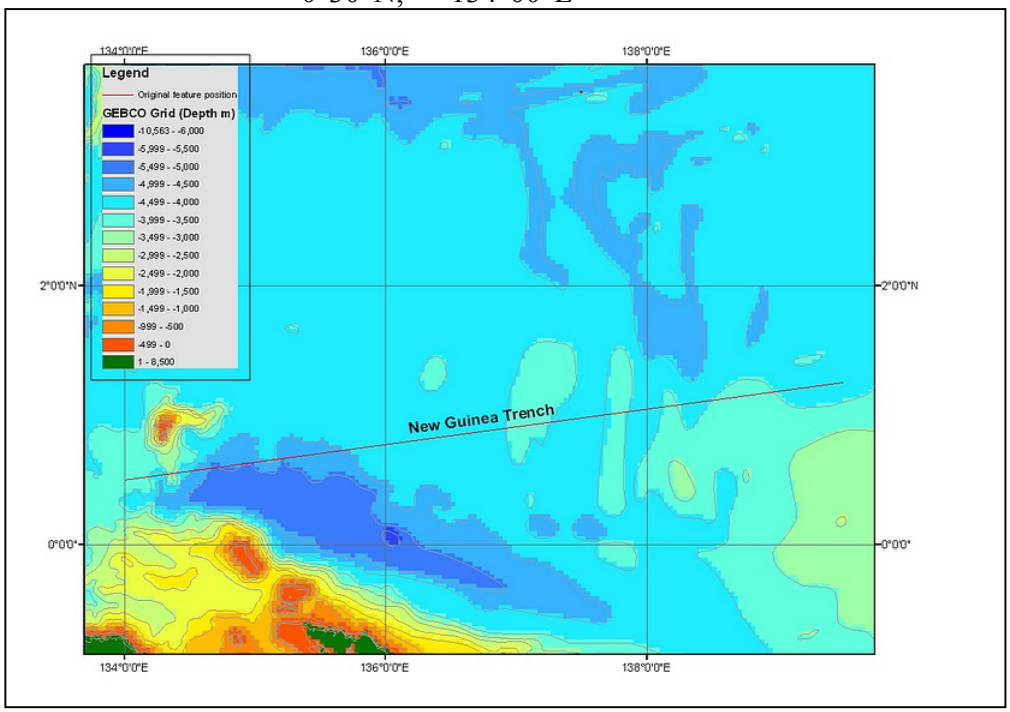
current co-ordinates: 69°30' S,11°20' W
70°00' S,8°20' W

Suggest: 69° 15'S, 9° 53'W
70° 19'S, 7° 44'W

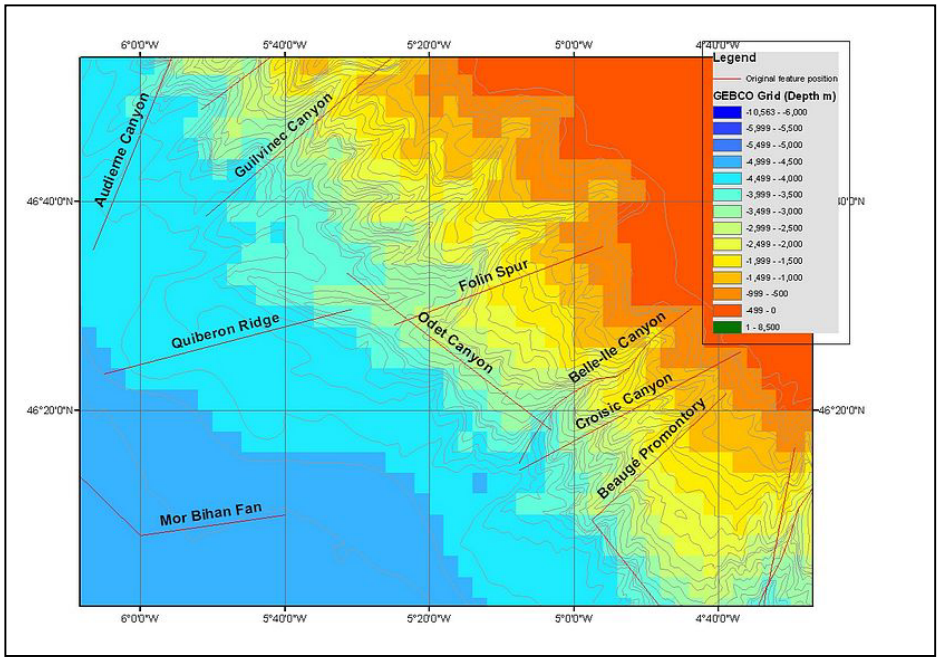


13. New Guinea Trench are the co-ordinates correct? See new_guinea_trench.jpg

Current co-ordinates: 1°15.5' N, 139°30' E
0°30' N, 134°00' E



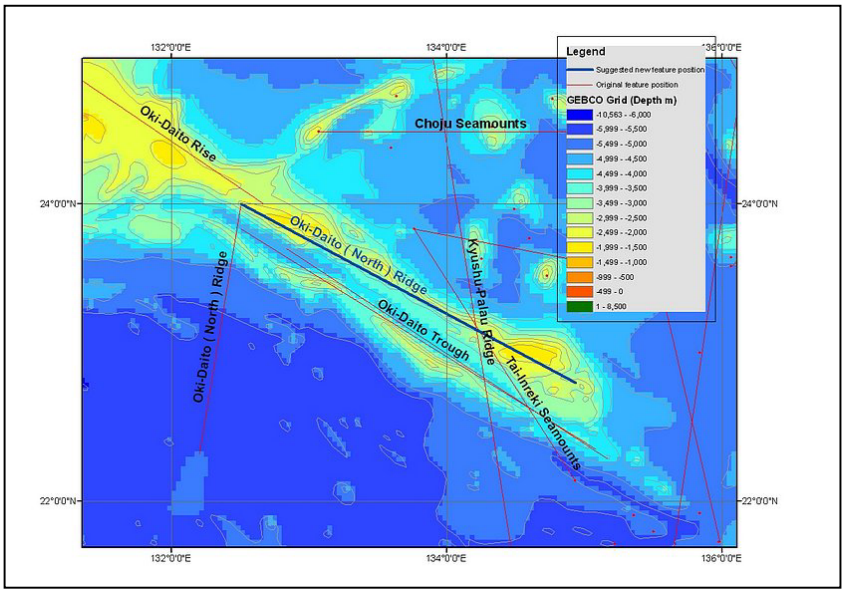
14. Odet Canyon and Quiberon Ridge are the co-ordinates correct? See odet_canyon.jpg

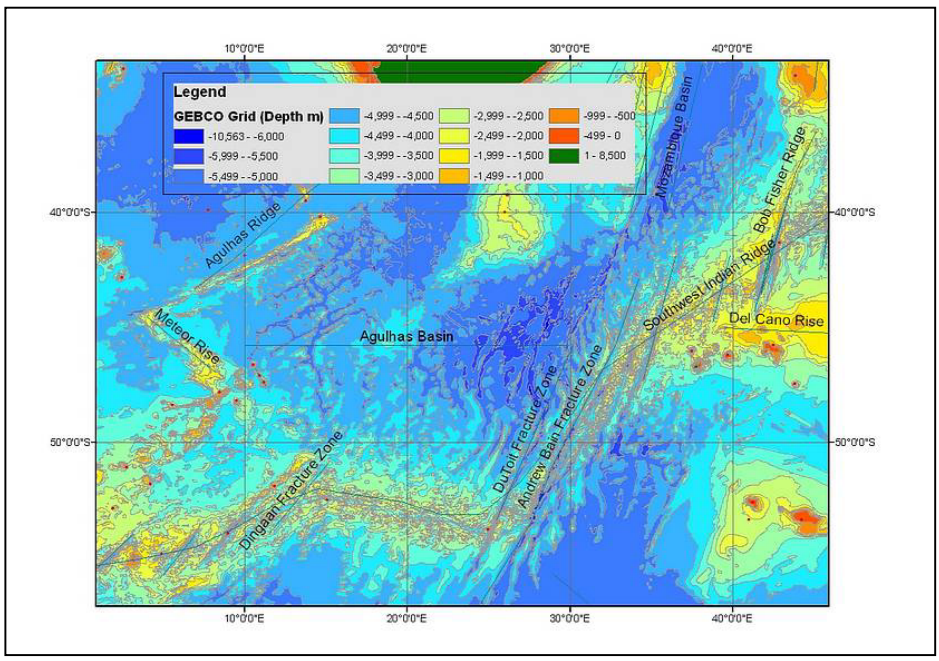


15. Oki-Daito (North) Ridge are the co-ordinates correct? See oki_daito_north_ridge.jpg

Oki Daito (North) Ridge current co-ordinates: 24°00' N ,132°30' E
22°19' N, 132°12' E

suggest: 24°00' N ,132°30' E
22° 48'N, 134° 56'E





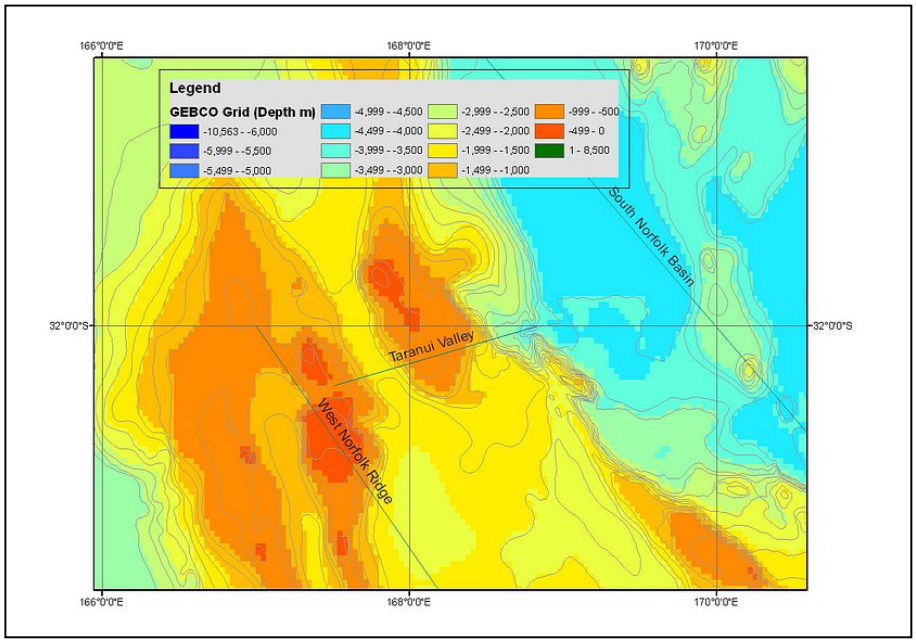
16. Agulhas Basin (above) are the co-ordinates correct? See agulhas.jpg

17. Suruga Seamount - there are two entries in the spreadsheet for this feature

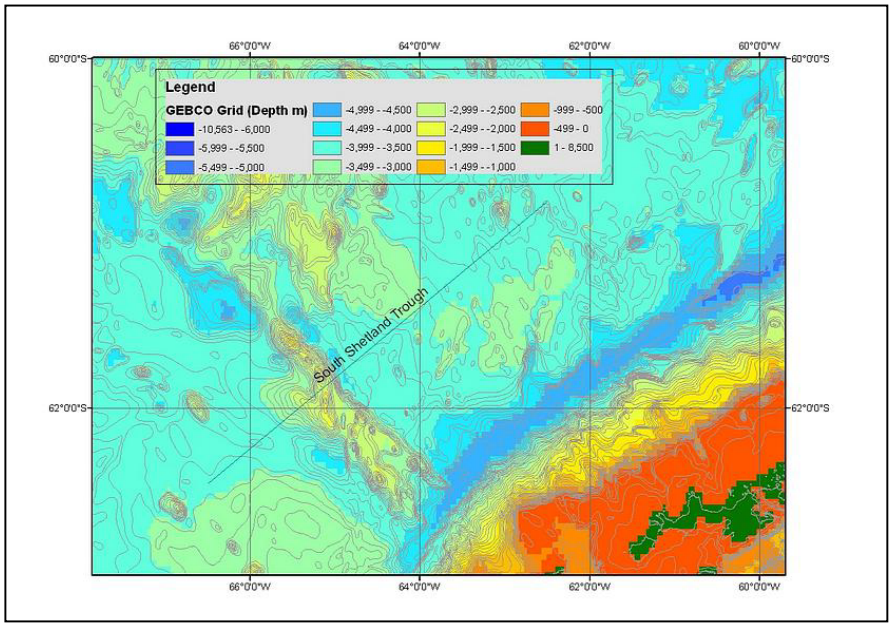
a) 34°20.0' N, 138°30.0' E
b) 32°05.0' N, 138°40.0' E

and 14°14' N, 142°53' E

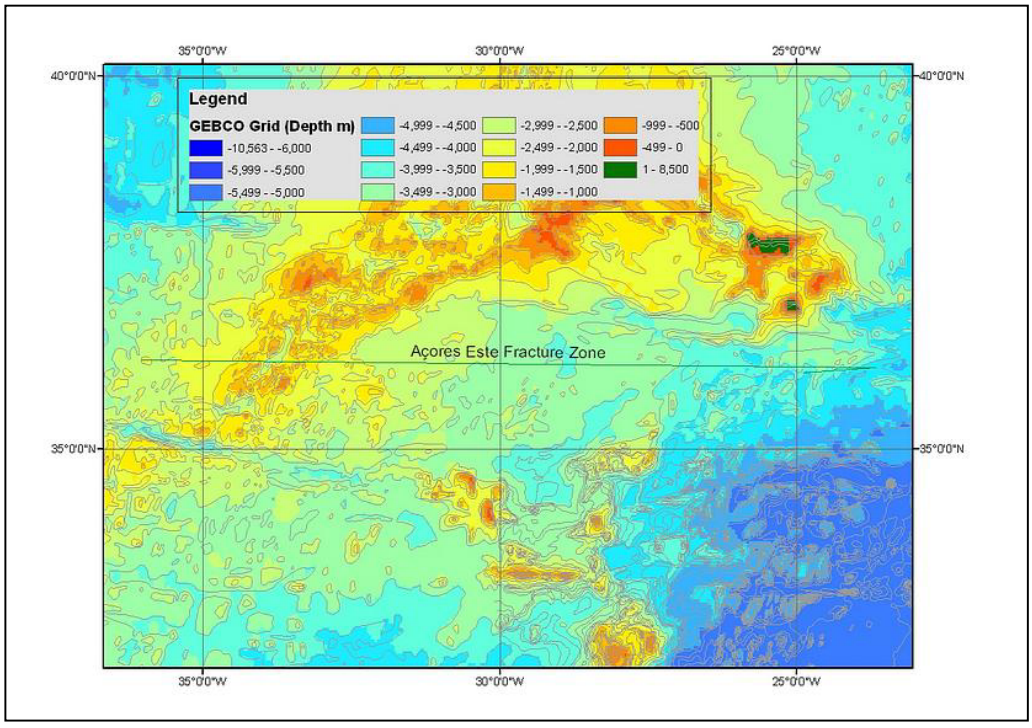
18. Taranui Valley – are the co-ordinates correct? See taranui_valley.jpg



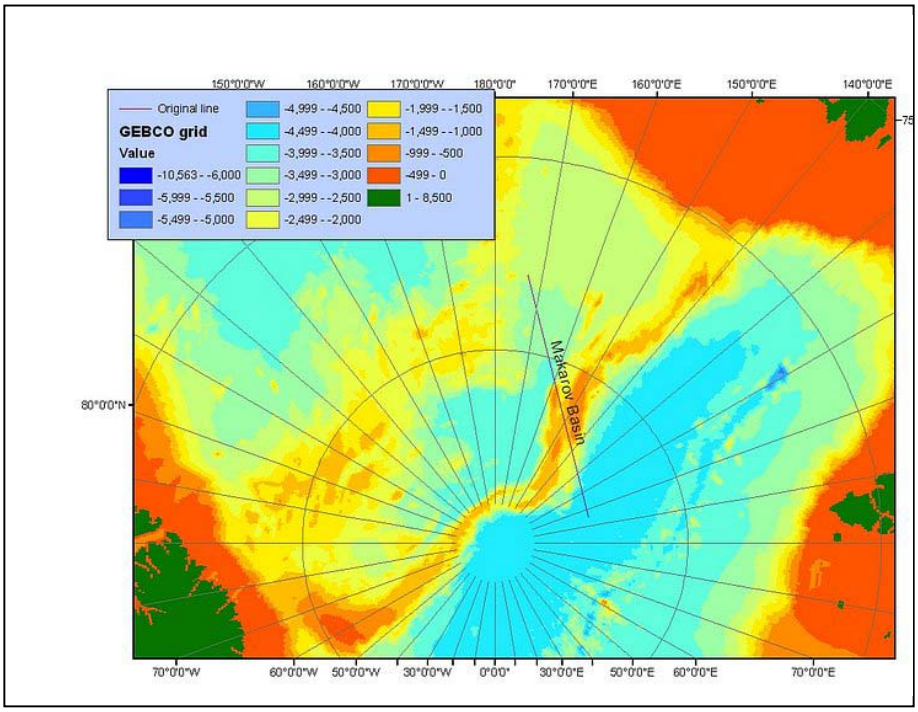
19. South Shetland Trough – are the co-ordinates correct? See south_shetland_trough.jpg



20. Açores Este Fracture Zone longitude co-ordinate 36° 03'W – is this correct ? see acores_este_fracture_zone.jpg



21. Are the co-ordinates for **Makarov Basin** correct? – see makarov_basin.jpg



6. Miscellaneous

New Caledonia Basin and New Caledonia Trough Both features have the same co-ordinates.

Guilcher There is no generic feature type given for this name.

7. The following features appear to have their co-ordinates in the wrong order for plotting:

The following table lists those features whose co-ordinates may be in the wrong order for plotting and gives a suggested alternative ordering. In some instances, this may be a problem on export from the IHB gazetteer database.

Feature name	Current co-ordinate order Longitude, Latitude	Suggested co-ordinate order Longitude, Latitude
Avon Canyon	3.9,6.1333 3.8833,6.3333 3.8333,5.9667	3.8833,6.3333 3.9,6.1333 3.8333,5.9667
Bob Fisher Ridge	42.3,-41.5 41.75,-43.75 43.1333,-40 43.8333,-38 45.1667,-36	41.75,-43.75 42.3,-41.5 43.1333,-40 43.8333,-38 45.1667,-36

Gloria Fracture Zone	-23.5,36.8833 -24.1833,36.7833 -22.7167,36.9333	-24.1833,36.7833 -23.5,36.8833 -22.7167,36.9333
Gonzalo Velho Cabral Escarpment	-25.0833,36.55 -25.5667,36.5 -24.5833,36.65	-25.5667,36.5 -25.0833,36.55 -24.5833,36.65
Hirondelle Basin	-26.4167,38.25 -26.8333,38.5 -26.0333,37.9167	-26.8333,38.5 -26.4167,38.25 -26.0333,37.9167
John Harrison Ridge	41.75,-43.6667 42.4333,-41 42.2167,-42.6667	41.75,-43.6667 42.2167,-42.6667 42.4333,-41
Johs Van Hurtere Hills	-28.4333,38.4833 -28.8333,38.6 -28.0333,38.4167	-28.8333,38.6 -28.4333,38.4833 -28.0333,38.4167
L'Espérance Seamounts	-26.9,40.4 -27.1,40.5167 -26.5833,40.1	-27.1,40.5167 -26.9,40.4 -26.5833,40.1
Malaguana-Gadao Ridge	143.5833,12.9167 143.3667,12.6667 143.75,13.3333	143.3667,12.6667 143.5833,12.9167 143.75,13.3333
Medio-Atlantica Ridge	-31,39 -33,37.4 -30.3833,40.7167	-33,37.4 -31,39 -30.3833,40.7167
Mungo Park Seamounts	1.6667,1.4167 2.75,-0.6667 2.1667,0.3333	1.6667,1.4167 2.1667,0.3333 2.75,-0.6667
Nankai Trough	135,32.3 136,32.5833 137.15,33.133 134.5,32.0	137.15,33.133 136,32.5833 135,32.3 134.5,32.0
Paul de Chaillu Seamounts	3.4167,-1.25 6.5,-2.5 5,-1.9167	3.4167,-1.25 5,-1.9167 6.5,-2.5
Pernambuco Seamounts	-32.0,-8.5 -29.8333,-9.41667 -33.21667,-7.51667	-29.8333,-9.41667 -32.0,-8.5 -33.21667,-7.51667
Pico Trough	-27.2167,36.75 -28.3167,36.85 -26,36.65	-28.3167,36.85 -27.2167,36.75 -26,36.65
Pierre Brazza Seamounts	3,-3.5 4.8333,-6 3.9167,-4	3,-3.5 3.9167,-4 4.8333,-6
Princesse Alice Bank	-29.15,37.7833 -28.8667,37.6333 -29.6833,37.8833	-28.8667,37.6333 -29.15,37.7833 -29.6833,37.8833
Santa Maria Hills	-26.8667,36.9 -27.5833,37 -26.3167,36.8	-27.5833,37 -26.8667,36.9 -26.3167,36.8
São Miguel Hole	-24.85,37.6 -25.1333,37.6833 -24.7167,37.35	-25.1333,37.6833 -24.85,37.6 -24.7167,37.35
Shichiyo Seamount Chain	140.8,27.6667 140.3367,29.4833 140.6333,28.5667	140.3367,29.4833 140.6333,28.5667 140.8,27.6667
Shikoku Basin	137,26 136,32 138.5,23.5	136,32 137,26 138.5,23.5

SHOM Seamounts	-27,40 -27.0833,40.5833 -26.9,39.5667	-27.0833,40.5833 -27,40 -26.9,39.5667
Sofu Basin	139.2833,29.8333 139.0833,28.25 139.1667,28.6667	139.2833,29.8333 139.1667,28.6667 139.0833,28.25
Trident Ridge	-27.5,36.6 -28.8667,36.8667 -25.65,36.5	-28.8667,36.8667 -27.5,36.6 -25.65,36.5
Sigsbee Abyssal Plain	-89.6833,24.0833 -94.85,25.5167 -90.4333,24.9333 -94.6833,22.65 -91.45,22.7833	-94.6833,22.65 -91.45,22.7833 -89.6833,24.0833 -90.4333,24.9333 -94.85,25.5167

8. Text field formatting checks

During the creation of database files from the spreadsheet form of the gazetteer data set the following checks were carried out on the format of the text fields:

- **Double space characters - 748 features**, e.g. for Adare Trough - in the 'History' field for this feature there is an extra space after the comma in the following text: "Named after the nearby land feature "Cape Adare", which was named after an officer on the Ross expedition in the 1840s."

- **Bracket followed by a space character - 96 features**, e.g. Beiju Bank – in the 'Remarks' field there is an extra space character after the first bracket: "Accepted as Bank (instead of Seamount as shown on the chart).Taken from Japanese Bathymetric Chart No. 6725.Shown as Beiju Seamount in ACUF Gazetteer."

- **Blank space followed by a bracket - 61 features**, e.g. Beiju Bank – see the above example

- **Space followed by a full stop - 214 features**, e.g. Aegis Spur – in the History field there is an extra space character before the fullstop. "Name given by Dutch scientists , AEGIS is the name of a Dutch Research Vessel ."

- **Space character followed by a comma - 135 features**, e.g. Athos Canyon - in the "proposer" field for this feature, there is an extra space before the first comma: "R. Le Suavé & J- F Bourillet , IFREMER, France., Jun. 2000"

- **Extra carriage returns - 22 features**, e.g. Wenzel Seamount – in the "Remarks" field there are additional carriage returns: "Minimum Depth:2220 m Total Relief:1200 m
  The seamount is rectangular in shape, with dimensions of about 10 km by 15 km. It is characterized by a local deep of about 100 m at the top."

9. Incorrect chart references

Features incorrectly referenced to GEBCO chart 5.18

Over 400 features may be incorrectly referenced to chart 5.18. A full list of those features involved can be given on request.

The following feature may be incorrectly referenced to 5.07

Tryal Ridge – suggest it should be 5.09
Mid-Atlantic Ridge – suggest it should be 5.08

The following feature may be incorrectly referenced to 5.10

Barcoo Bank – suggest 5.06
Shikoku Basin – suggest 5.06

The following feature may be incorrectly referenced to 5.11

Fe'e Seamount – suggest 5.07
Kaula Seamount – suggest 5.16
Hinz Seamount – suggest 5.16
Wenzel Seamount – suggest 5.16
Eotvos Seamount – suggest 5.16
Gololobov Bank – suggest 5.13

The following feature may be incorrectly referenced to 5.12

Prilyudko Seamount – suggest 5.04

The following feature may be incorrectly referenced to 5.14

Anashkin Seamount – suggest 5.17

The following feature may be incorrectly referenced to 5.15

Kurentsov Ridge – suggest should be 5.14

The following features may be incorrectly referenced to the IBCEA chart series

Whitney Ridge
Sigsbee Deep
Pegas Guyot

Annex II

The following features may need additional points to define their shape:

183 features have been identified that may need additional points to define their extent and shape. A 'priority list' is given below. Images showing the feature with and without the additional points have been produced for the features in the priority list. The image file name indicates the feature shown in the image, e.g. caroline_seamounts.jpg for an image of Caroline Seamounts.

Document, ufn_additional_points_priority_list.doc contains the images along with the suggested additonal points. A list of the suggested points for **all** features in this section is given in document 'ufn_additional_points.doc'.

Images: ftp://ftp.pol.ac.uk/pub/bodc/gebco/scufn/images/
Documents: ftp://ftp.pol.ac.uk/pub/bodc/gebco/scufn/documents/

Those features marked with (*) are included in CGA proposals.

Priority list:

Caroline Seamounts
Central Indian Ridge
Chagos-Laccadive Ridge
Louisville Ridge
Southeast Indian Ridge *
Southwest Indian Ridge *
South New Hebrides Trench
Charlie-Gibbs Fracture Zone
Chile Trench *
East Pacific Rise *
East Scotia Ridge *
Emperor Seamount Chain
Gakkel Ridge
Great Barrier Reef
Hellenic Trench
Java Ridge
Kuril-Kamchatka Trench
Lomonosov Ridge
Macquarie Ridge
Magellan Seamounts
Mariana Trench
Mendocino Fracture Zone
Mid-Pacific Seamounts
Mid-Atlantic Ridge
Middle America Trench
Nansen Basin
New Caledonia Basin
Ninetyeast Ridge
North Scotia Ridge
Northwest Atlantic Mid-Ocean Channel
Norwegian Trough
Ontong Java Rise
Peru-Chile Trench
Shatsky Rise
South Scotia Ridge
Sunda Trench
Walvis Ridge
Pacific-Antarctic Ridge *
Hawaiian Ridge
Aleutian Trench

All:

Admiralteystvo Trough
Aegis Spur
Agulhas Ridge
Aiguillon Canyon
Algerian Basin
Alula-Fartak Trough
Amirante Trench
Anegada Ridge
Angola Basin
Arguin Canyon
Ascension Fracture Zone
Aucklands Escarpment
Baeyer Canyon *
Bahama Ridge
Baldaque da Silva Passage
Baoulé Canyon
Belle-Ile Canyon
Black Mud Canyon
Blake Canyon
Blake Ridge
Bode Verde Fracture Zone
Bryant Canyon
Campbell Escarpment
Campeche Escarpment
Cap Ferret Canyon
Cape Range Escarpment
Carlsberg Ridge

Carnarvon Canyon
Caroline Seamounts
Cayman Ridge
Ceará Ridge
Cedros Trench
Central Indian Ridge
Chagos-Laccadive Ridge
Louisville Ridge
Palau Trench
Papagayos Ridge
Petite Sole Canyon
Petrock Valley
Pornic Canyon
Porthos Canyon
Porto Valley
Southeast Indian Ridge *
Southwest Indian Ridge *
Yucatán Escarpment
Chain Ridge
Charlie-Gibbs Fracture Zone
Chile Trench *
Cocos Ridge
Collette Spur
Congo Canyon
Corveiro Canyon
Côte d'Ivoire Escarpment
Cretan-Rhodes Ridge
Crozon Canyon
Dangeart Canyon
Delesse Spur
Diamantina Escarpment
Dirck Hartog Ridge
Douarnenez Canyon
East Indiaman Ridge
East Mediterranean Ridge
East Pacific Rise
East Scotia Ridge *
Emperor Seamount Chain
Falkland Escarpment
Fimbul Canyon *
Florida Valley
Foundation Seamounts
Fowlers Canyon
Gaillard Spur
Gakkel Ridge
Galicia Escarpment
Gardiner Seamounts
Gauss Fracture Zone
Gazelle Fracture Zone
Geraldton Canyon
Grand Cess Canyon
Great Abaco Canyon
Great Bahama Canyon
Great Barrier Reef
Habibas Escarpment
Hellenic Trench
Hermine Canyon
Herodotus Trough
Houtman Canyon
Hovgaard Ridge
Indus Canyon
Investigator Ridge
Jan Mayen Fracture Zone
Jan Mayen Ridge
Japan Trench
Java Ridge
Kallinago Trough
Kermadec Trench
Knipovich Ridge
Koppe Canyon *
Kuril-Kamchatka Trench
Küre Escarpment
La Rochelle Canyon
La Romanche Fracture Zone
Labrador Trough
Lamjaybir Canyon
Lampaul Canyon
Le Trou Sans Fond Canyon
Lomonosov Ridge
Lord Howe Rise
Macquarie Ridge
Magellan Seamounts
Marcus-Wake Seamount Group
Mariana Trench
Marie-Galante Canyon
Mendocino Fracture Zone
Mid-Atlantic Ridge
Middle America Trench
Mid-Pacific Seamounts
Mona Trough
Mona Spur
Montserrat Valley
Moonless Seamounts
Moresby Canyon
Nansen Basin
Nazaré Canyon
New Caledonia Basin
Ninetyeast Ridge
North Scotia Ridge
Northwest Atlantic Mid-Ocean Channel
Norwegian Trough
Novaya Zemlya Trough
Nullarbor Canyon
Ogasawara Ridge
Ometepec Canyon
Ontong Java Rise
Ouessant Canyon
Pabillo Canyon
Penhors Canyon
Peru-Chile Trench
Pioneer Fracture Zone
Pribylov Canyon
Puerto Rico Trench
Puysegur Trench
Redonda Valley
Rochebonne Canyon
Rockall Bank
Rockall Trough
Saikaido Seamount Chain
Saint-Nazaire Canyon
São Gabriel Valley
São Rafael Canyon
Saya de Malha Bank
Sculpin Ridge
Setúbal Canyon
Shamrock Canyon
Shatsky Rise
Sonja Ridge
Sonne Ridge
South New Hebrides Trench
South Scotia Ridge *
St. Croix Ridge
St. Kitts Valley
Sunda Trench
Tabou Canyon
Tanoûdêrt Canyon
Tonga Trench
Umnak Canyon
Valencia Trough
Vema Seachannel
Viaud Ridge
Wallaby-Cuvier Escarpment

Walvis Ridge
West Florida Escarpment
West Mariana Ridge
Whidbey Canyon
Yap Trench
Yeu Canyon
Zenkevich Rise
Zhemchug Canyon
Zhemchug Spur
Pacific-Antarctic Ridge *
Bounty Seachannel
Hawaiian Ridge
Bowers Ridge
Aleutian Trench