

U. S. Naval Oceanographic Office, Bathymetry
Div.

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CLASSIFICATION OF BATHYMETRIC FEATURES

Terms and Definitions are those approved by the
GEBCO Advisory Committee in May 1964.

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SEA FLOOR NAMES IN PRINCIPLE AND PRACTICE

By
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Previously presented at the 4th U.N. Regional Cartographic Conference for Asia and the Far East at Manila, November-December 1964 and the Xth Pan American Consultation on Cartography Pan American Institute on Geography and History in Guatemala City, Guatemala 25 June-10 July 1965.

Bathymetry as a science has been long recognized as a branch of marine geology. The bathymetric chart is a primary tool for the interpretation of the geologic structure and origin of 70% of the earth's surface. These charts are also useful to the geophysicist in interpreting anomalous recordings and establishing geodetic positions; to the oceanographer for predicting physio-chemical characteristics of the water; and to the navigator for use in fixing a position at sea.

In the not too distant past, laymen and seagoing peoples alike assumed the oceans to be deep, flat-bottomed basins, and before that they were assumed to be bottomless. Even at the present time, unless a person has a specific interest in or a necessity to know about the sea floor, it is unlikely that he is aware of the extreme diversity of sizes, shapes, and distribution of features making up the grandest landscape on earth. The belief that the oceans were featureless, flat-bottomed basins continued until methods of taking deep lead-line soundings were developed.

The history and evolution of bathymetric nomenclature is essentially a history of the status of knowledge about the sea floor. Undoubtedly, the first undersea features to be named were those on the continental or island shelves that could be seen from the surface. These features are rocks, reefs, banks, and shoals. On nearly all modern charts, the terms bank and shoal have been used interchangeably to indicate an area where the depth to the bottom is less than in surrounding areas. These features were of great importance to the navigator as many of them constituted dangers to navigation and others could be used as check points in their navigation. For centuries, these were the only bathymetric features known, and, as sailors became more bold and entered "blue waters," they carried over the practice of calling every area of lesser depth than the surrounding sea floor, a bank or shoal. Fishermen found that these shoal areas were highly productive of fish and developed the habit of calling every area where the fishing was good, a fishing bank. The prefix "fishing" has fallen into disuse and the term bank remains, designating not only shallow areas on the continental shelf, but also deep areas productive of fish.

The idea of a continental shelf appears to have originated during the 18th century. The concept of a 100-fathom or 200-meter depth to the edge, and the extent of the shelf were the result of two factors. The 100-fathom contour was the deepest contour shown on general nautical charts, and this depth was the limit of depth that could be sounded without special deep sea winches. Therefore, the 100-fathom contour divided the deep seas from the shallow epicontinental seas, and the density of soundings, even to this day, is far greater on the shelf than in the deep oceans.

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The increase in bathymetric data is shown by the charts produced since Matthew Fontaine Maury, who in 1854 prepared the first published bathymetric chart of the North Atlantic Ocean which was based upon 180 soundings. By 1895, Bartholomew's chart showed 5,969 soundings. The General Bathymetric Chart of the Oceans (1922-27) showed 17,800 soundings. Between 1925 and 1930, the German research vessel, METEOR, increased the number of soundings in the Atlantic by about 30,000 depth determinations taken by the echo method. By way of contrast, during present deep-sea surveys, a sounding is taken every second and is plotted at one to three minute intervals. In other words, about 86,000 soundings are recorded each day, and in a week of surveying, on a large scale, a ship will have covered an area about 17×24 miles with 600,000 soundings.

The necessity for an accurate and universal system of nomenclature for submarine relief features became apparent when, with the advent of echo soundings, our earlier concept of a flat sea floor was upset. Attempts, however, to name the major features on the bottom were made as early as 1877. These early attempts at nomenclature were on an individual basis, but in 1899 the VII International Geographical Congress formed a committee on "Nomenclature of Ocean Bottom Features." As a result of the efforts of this Committee, 18 terms were adopted for use on the First Edition of the "General Bathymetric Chart of the Oceans." In 1924, the International Hydrographic Bureau took up the study, and in 1942 completed it with a list of 13 major terms. In 1936, the Congress of the International Association of Physical Oceanography (IAPO) appointed a committee to establish the characteristics and names of the principal divisions of the sea floor. This committee made no final decisions and reached no conclusions as World War II interrupted its work. In 1948, IAPO again established an international committee with the object of formulating general principles and establishing international names. This committee completed its work and published a list of 23 terms and definitions of undersea features. Sparked by the British National Committee on the Nomenclature of Ocean Bottom Features, this committee developed the systematic and scientific approach to the problem used by later committees.

New developments in the technique of echo soundings, the rapid acquisition of data, and the great increase in preparation of bathymetric charts and articles pointed up the need for a more detailed and all inclusive system of nomenclature. In 1960, the United States Board on Geographic Names established the first official intergovernmental committee dealing with undersea names. This committee examined a list of 68 terms and officially defined and adopted 42 of them. As a result of this action, IAPO delegated the responsibility of resolving the various systems of nomenclature for use on the General Bathymetric Chart of the Oceans (GEBCO) to the GEBCO Advisory Committee. At a meeting held in Monaco, in May of 1964, an agreement was reached that should have a far-reaching effect on the names appearing on charts throughout the world. The following is a list of the terms and definitions agreed upon by this international committee, and the accompanying illustrations show the relative configuration of the features:

1. Province (morphological)

A region composed of a group of similar physiographic features whose characteristics are markedly in contrast with surrounding areas (rarely used in marine cartography).

1a. Continental Borderland

A region adjacent to a continent, normally occupied by or bordering a Continental Shelf, that is highly irregular with depths well in excess of those typical of a Continental Shelf.

2. Continental (or Island) Shelf

A zone adjacent to a continent (or around an island) and extending from the low water line to the depth at which there is usually a marked increase of slope to greater depth.

3. Shelf Edge (Shelf Break)

The line along which there is a marked increase of slope at the outer margin of a continental (or island) shelf.

4. Continental (or Island) Slope

The declivity seaward from a shelf edge into greater depth.

5. Continental Rise

A gentle slope with a generally smooth surface, rising toward the foot of the continental slope.

6. Deleted (Continental Terrace)

7. Deleted (Island Shelf)

8. Deleted (Island Slope)

9. Archipelagic Apron

A gentle slope with a generally smooth surface on the sea floor, particularly found around groups of islands or seamounts.

10. Fan

A gently sloping, fan-shaped feature normally located near the lower termination of a canyon.

11. Levee

An embankment bordering the sides of a canyon or channel.

12. Bank

An elevation of the sea floor located on a continental (or island) shelf and over which the depth of water is relatively shallow but sufficient for safe surface navigation.

13. Shoal

An offshore hazard to navigation with a least depth of ten fathoms or twenty metres or less, composed of unconsolidated material.

14. Reef

An offshore consolidated rock hazard to navigation with a least depth of ten fathoms or twenty metres or less.

15. Plateau

A comparatively flat topped elevation of the sea floor of considerable extent across the summit and usually rising more than 100 fathoms or 200 metres on all sides.

16. Seamount (Peak)

An isolated or comparatively isolated elevation rising 1000 metres or more from the sea floor and of limited extent across the summit.

17. Tablemount (Guyot)

A seamount having a comparatively smooth flat top.

18. Knoll (Hill)

An elevation rising less than 500 fathoms or 1000 metres from the sea floor and of limited extent across the summit.

19. Deleted (Tableknoll)

20. Seamount Range

Several seamounts having connected bases and aligned along a ridge or rise.

21. Seamount Chain

Several seamounts in a line with bases separated by a relatively flat sea floor.

22. Seamount Group

Several closely-spaced seamounts not in a line.

23. Cordillera

An entire mountainous system, including all the subordinate ranges, interior Plateaus, and Basins.

24. Deleted (Bench)(Terrace)

25. Rise (Arch, Swell)

A long, broad elevation that rises gently and generally smoothly from the sea floor.

26. Ridge

A long, narrow elevation of the sea floor with steep sides and irregular topography.

27. Spur

A subordinate elevation, ridge, or rise projecting outward from a larger feature.

28. Sill

The low part of the ridge or rise separating ocean basins from one another or from the adjacent sea floor.

29. Deleted (Sill Depth)

30. Gap

A break in a ridge or rise.

31. Saddle

A low part between elevations on a ridge or between seamounts.

32. Escarpment (Sea Scarp, Scarp)

An elongated and comparatively steep slope of the sea floor, separating flat or gently sloping areas.

33. Fracture Zone

A linear extensive zone of unusually irregular topography of the sea floor characterized by large seamounts, steep-sided or asymmetrical ridges, troughs, or escarpments.

34. Plain

A flat, gently sloping or nearly level region of the sea floor. (For example, abyssal plain.)

35. Basin

A depression of the sea floor more or less equidimensional in form and of variable extent.

36. Deleted (Deep)

37. Trench

A long, narrow and deep depression of the sea floor, with relatively steep sides.

38. Trough

A long depression of the sea floor, normally wider and shallower than a trench.

39. Channel (Seachannel)

A long, narrow, U-shaped or V-shaped shallow depression of the sea floor, usually occurring on a gently sloping plain or fan.

40. Canyon (Submarine Canyon)

A relatively narrow, deep depression with steep slopes, the bottom of which grades continuously downward.

41. Valley (Submarine Valley)

A relatively shallow, wide depression with gentle slopes, the bottom of which grades continuously downward. This term is used for features that do not have canyonlike characteristics in any significant part of their extent.

42. Strath

A broad elongated depression with relatively steep walls located on a continental shelf. The longitudinal profile of the floor is gently undulating with greatest depth often found in the inshore portion.

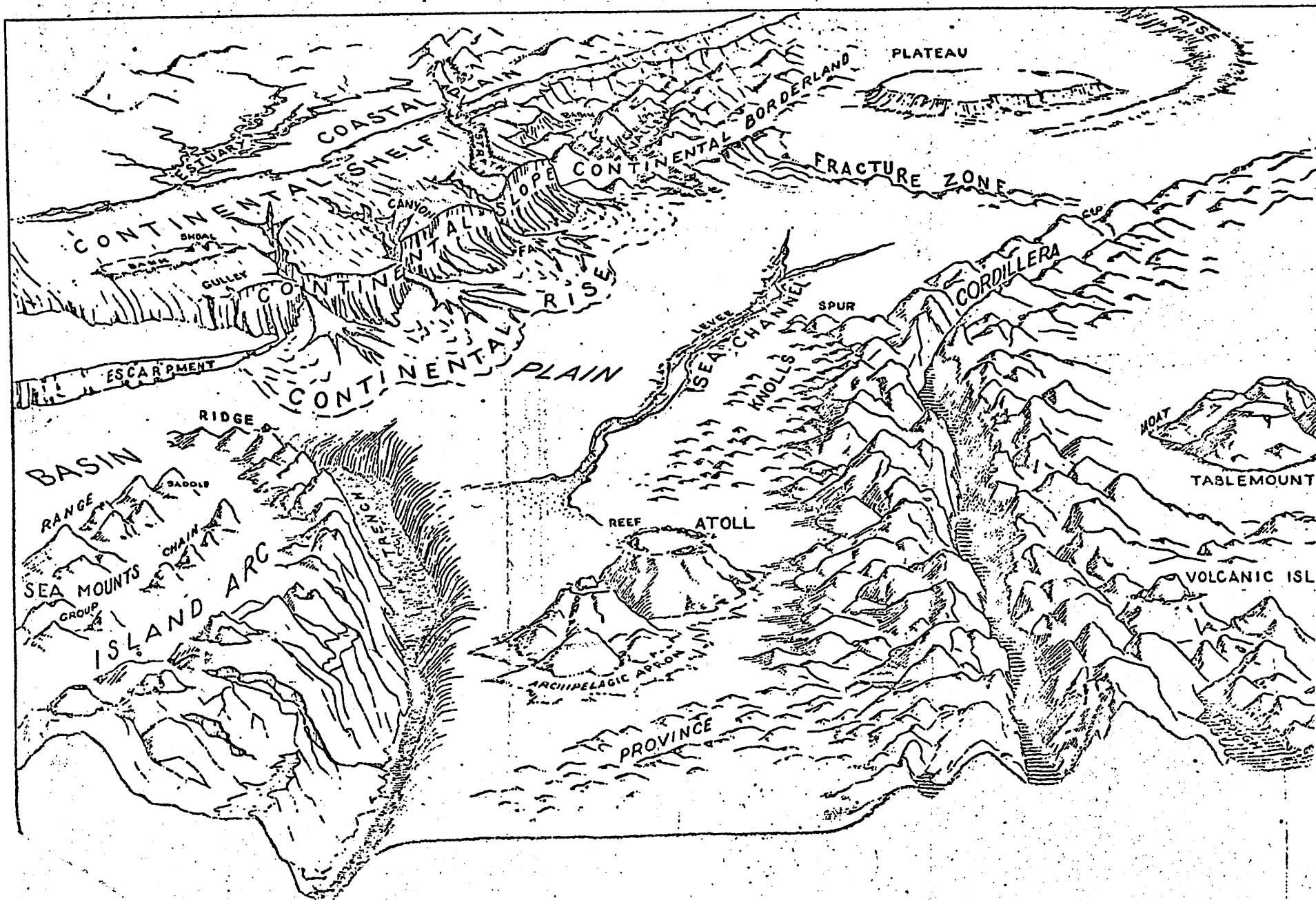
43. Moat (Sea-moat)

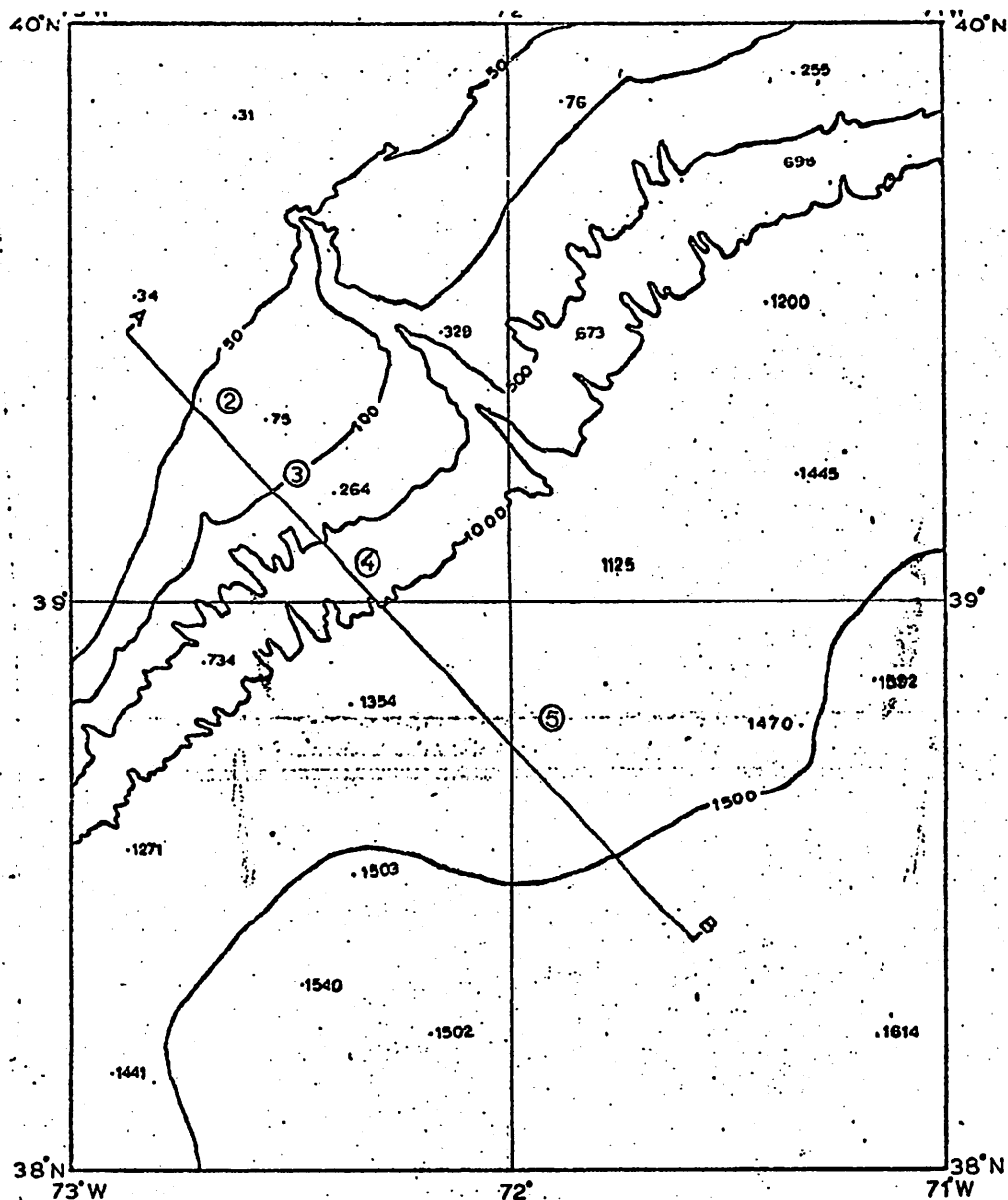
An annular depression that may not be continuous, located at the base of many seamounts or islands.

44. Gully

Small valleys cut into soft sediments on the continental shelf or continental slope.

45. Deleted (Rift)





Continental (or Island) Shelf

A zone adjacent to a continent (or around an island) and extending from the low water line to the depth at which there is usually a marked increase of slope to greater depth.

Shelf Edge (Shelf Break)

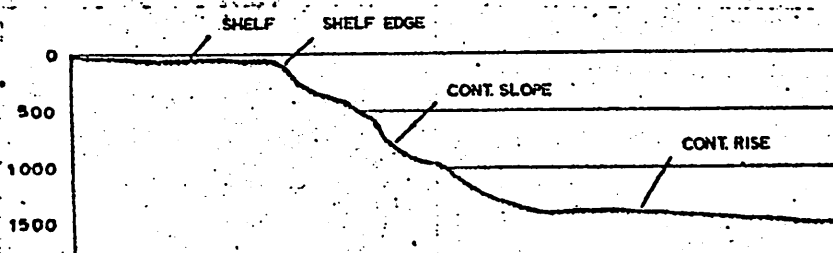
The line along which there is a marked increase of slope at the outer margin of a continental (or island) shelf,

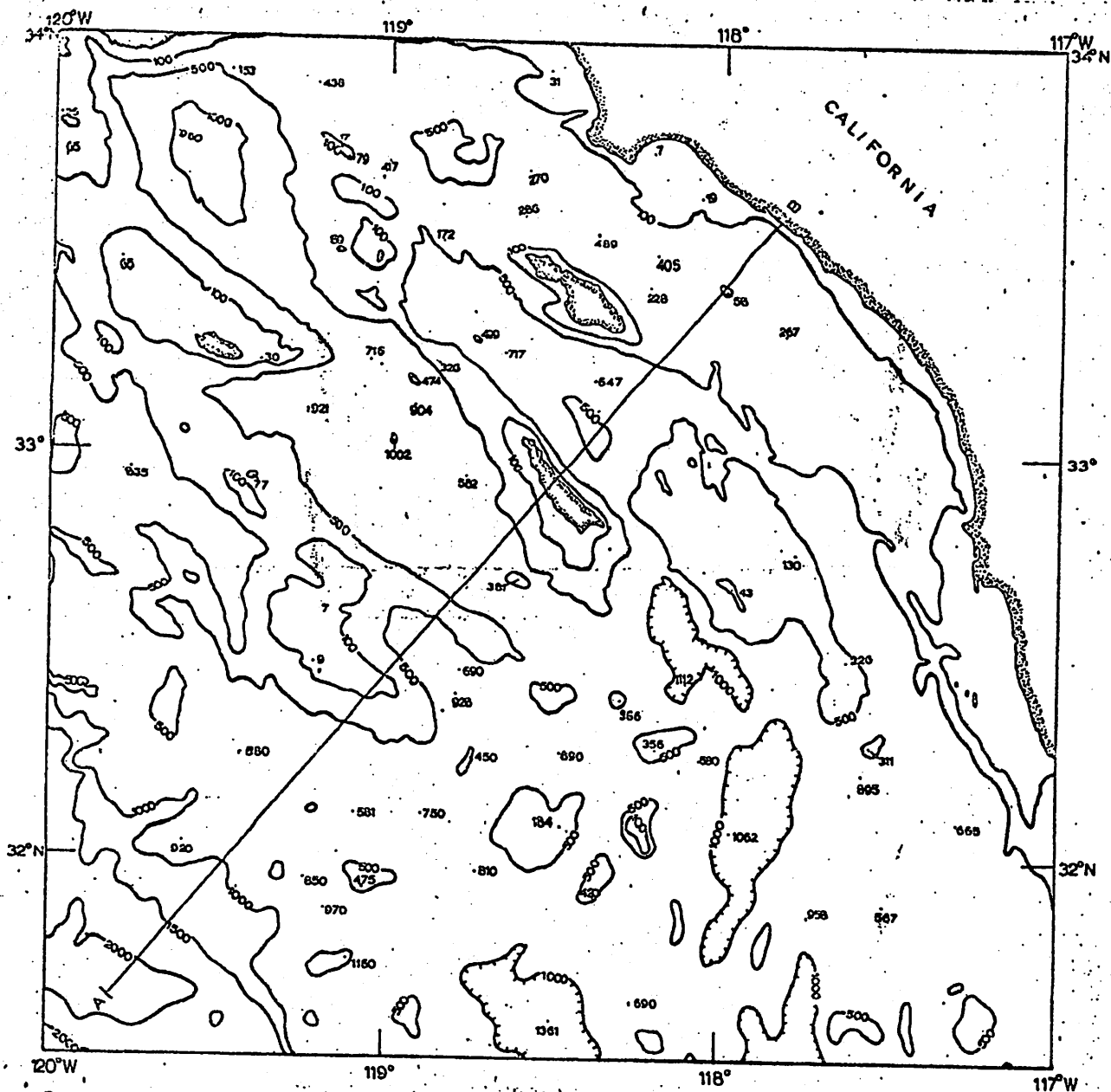
Continental (or Island) Slope

The declivity seaward from a shelf edge into greater depth.

Continental Rise

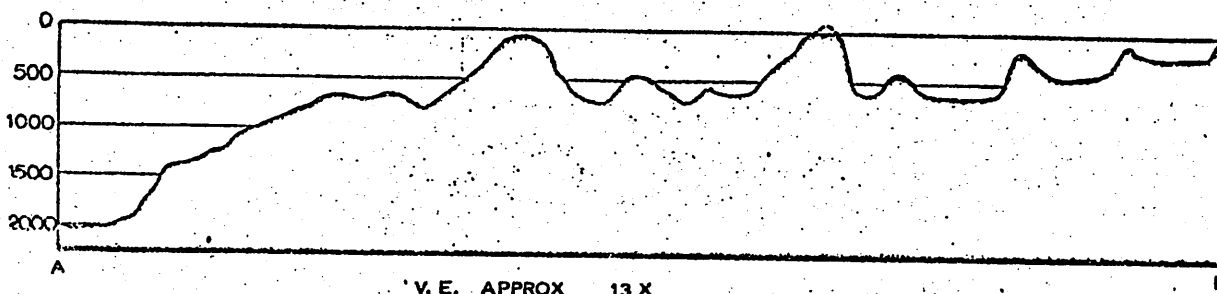
A gentle slope with a generally smooth surface, rising toward the foot of the continental slope.

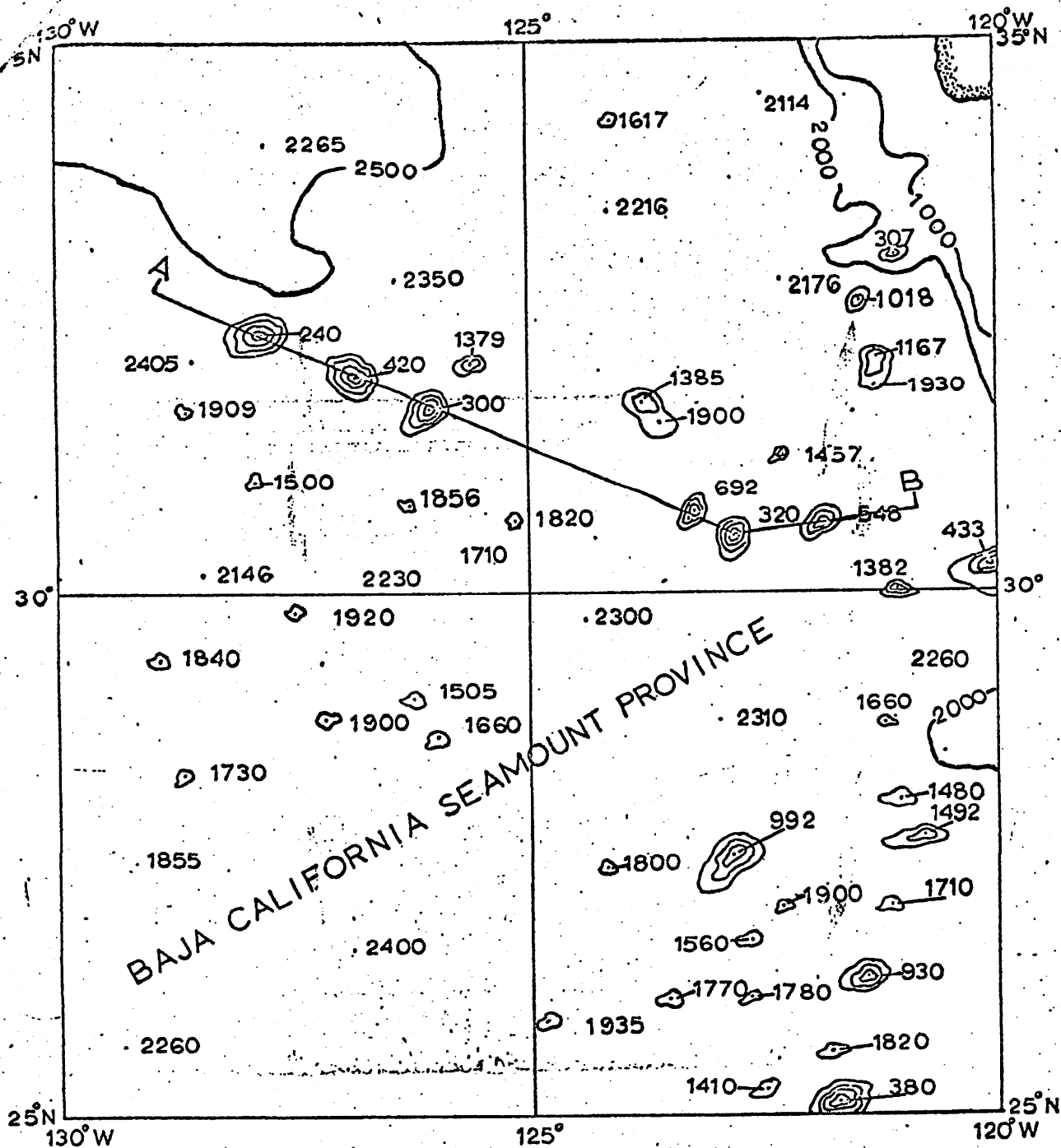




Continental Borderland

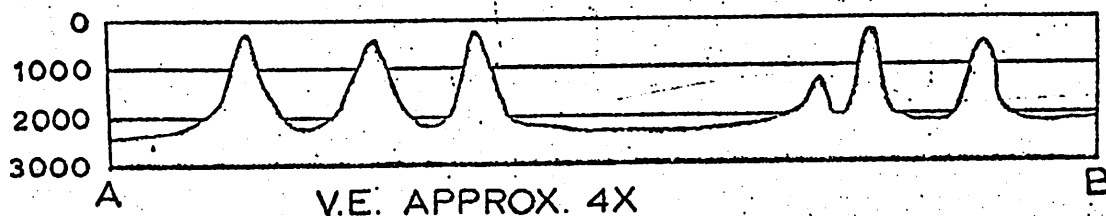
A region adjacent to a continent, normally occupied by or bordering a Continental Shelf, that is highly irregular with depths well in excess of those typical of a Continental Shelf.

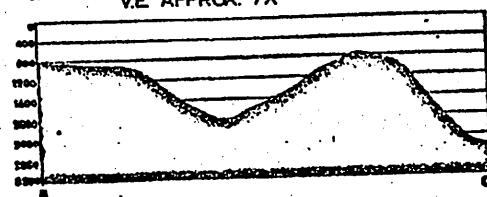
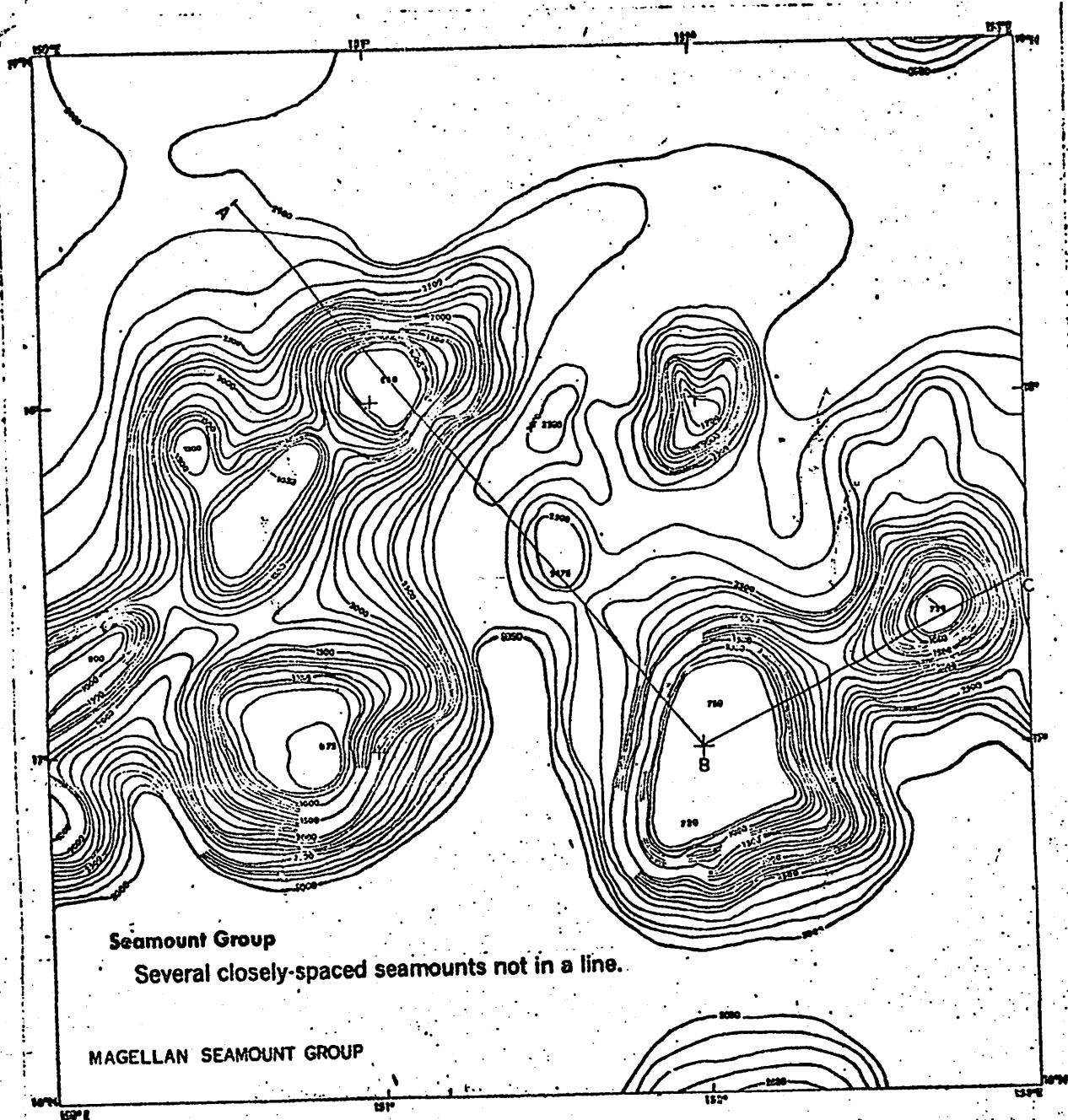




Province (morphological)

A region composed of a group of similar physiographic features whose characteristics are markedly in contrast with surrounding areas (rarely used in marine cartography).





Saddle
A low part between elevations on a ridge or between seamounts.



Seamount Chain

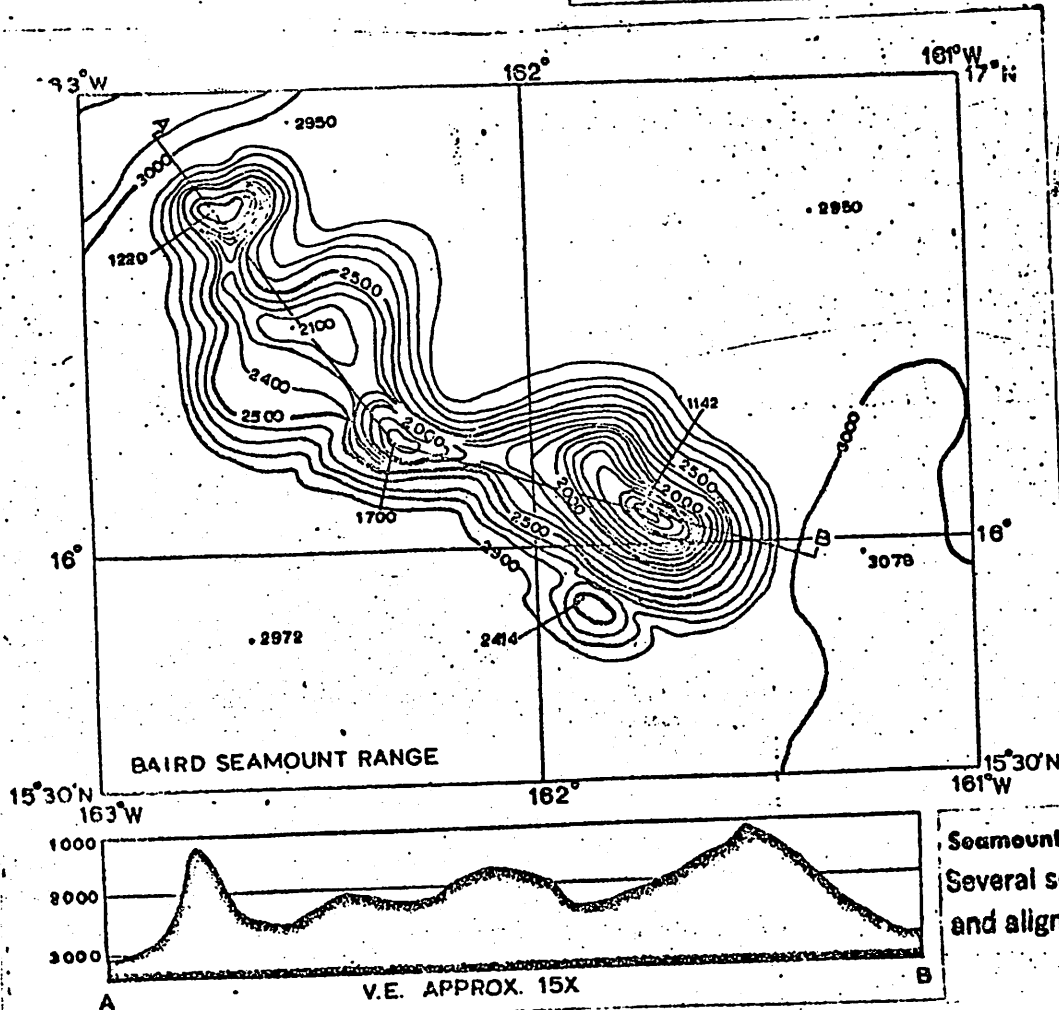
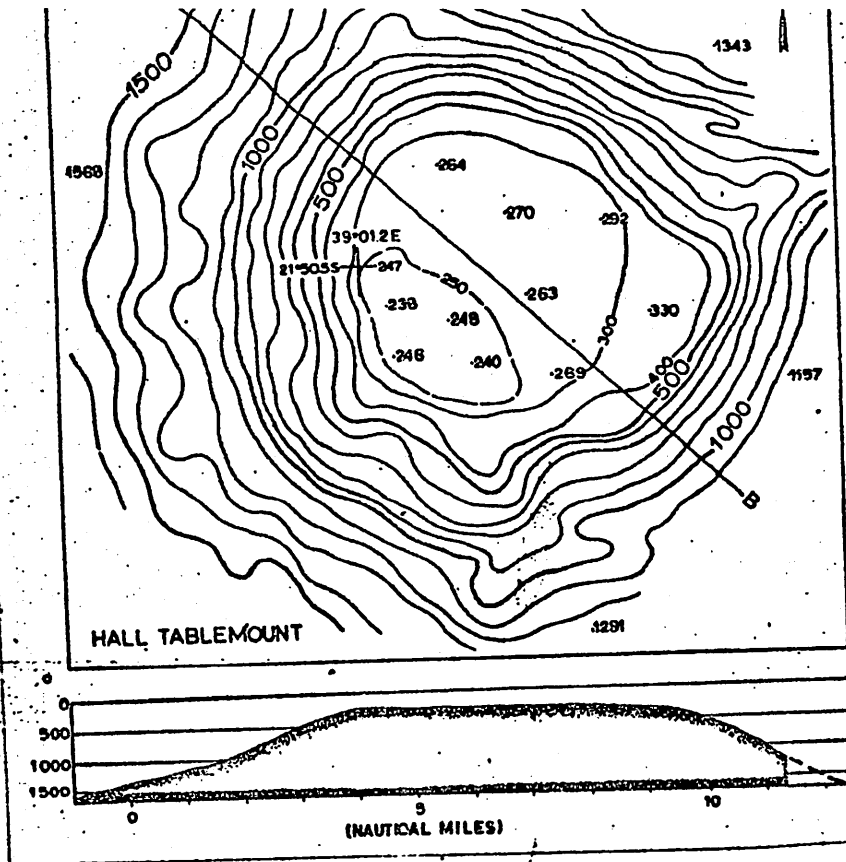
Several seamounts in a line with bases separated by a relatively flat sea floor.

Seamount (Peak)

An isolated or comparatively isolated elevation rising 1000 meters or more from the sea floor and of limited extent across the summit.

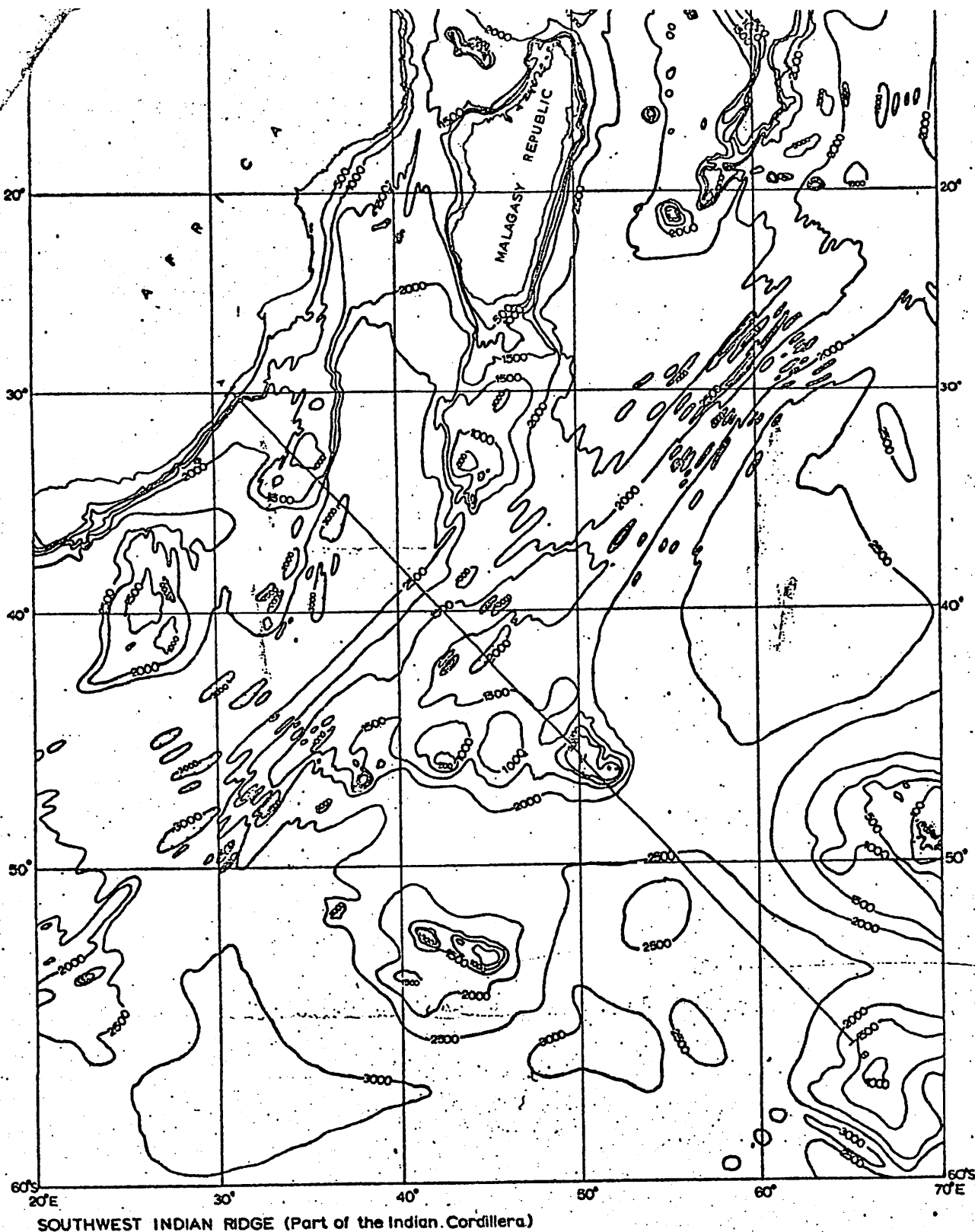
Tablemount (Guyot)

A seamount having a comparatively smooth flat top.



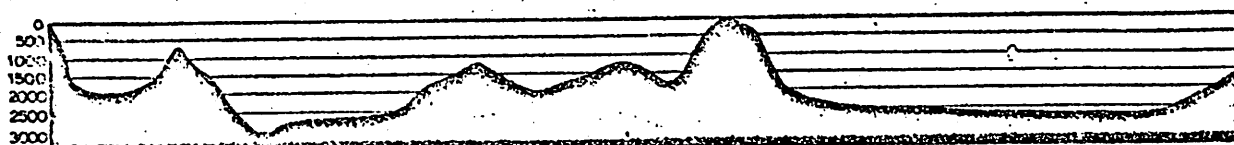
Seamount Range

Several seamounts having connected bases and aligned along a ridge or rise.



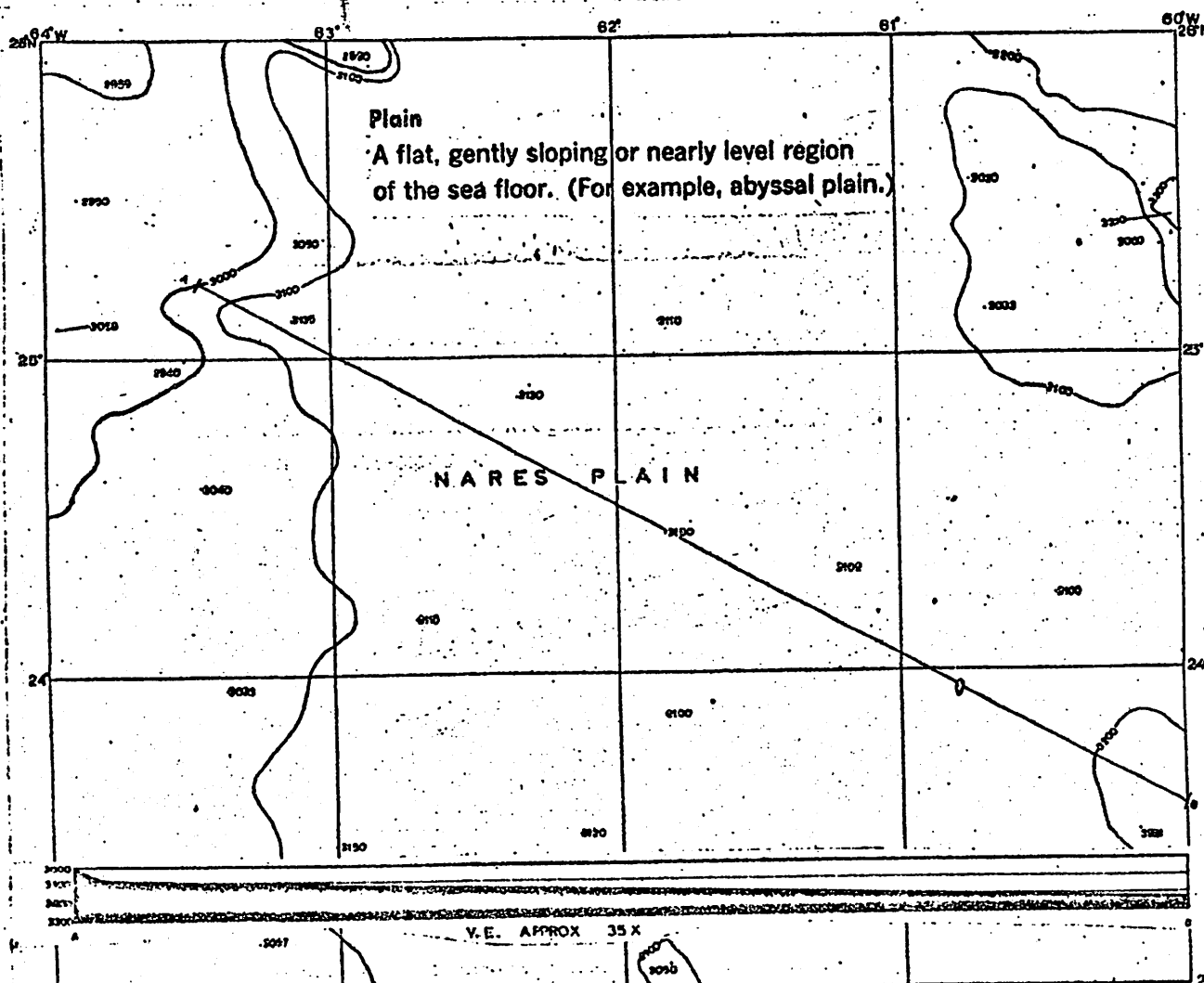
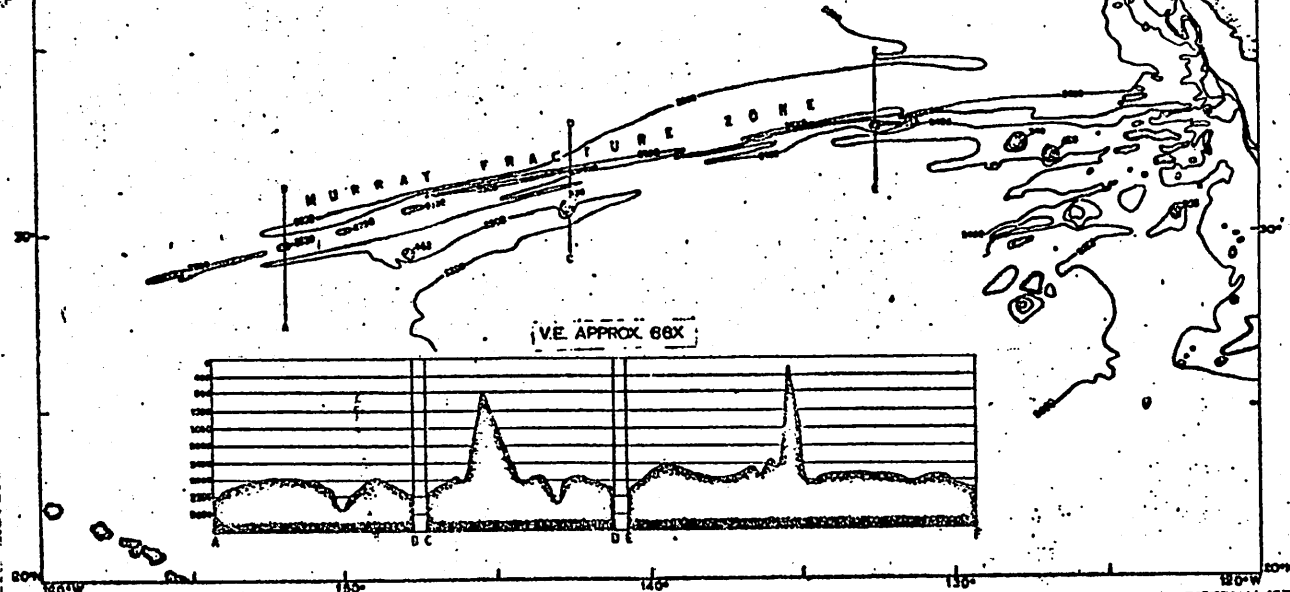
Cordillera

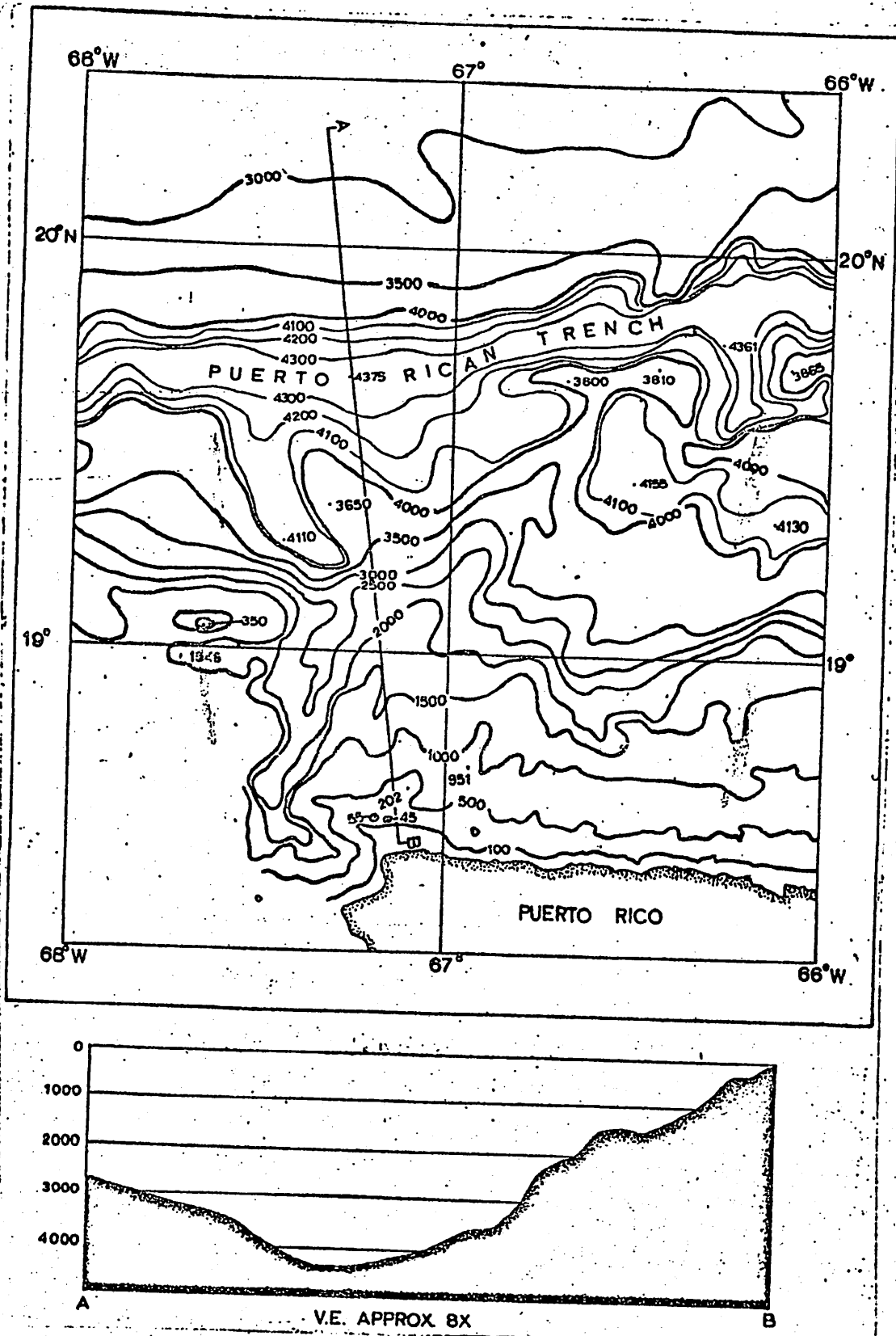
An entire mountainous system, including all the subordinate ranges, interior Plateaus, and Basins.



Fracture Zone

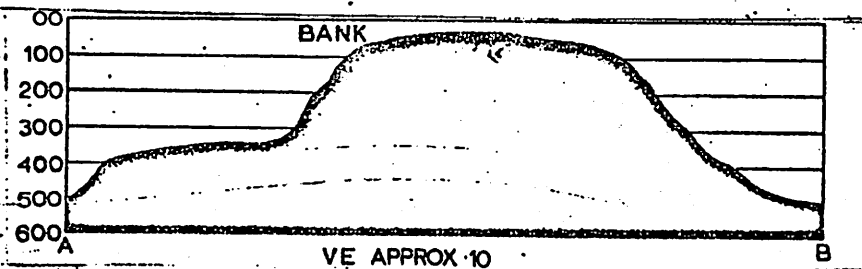
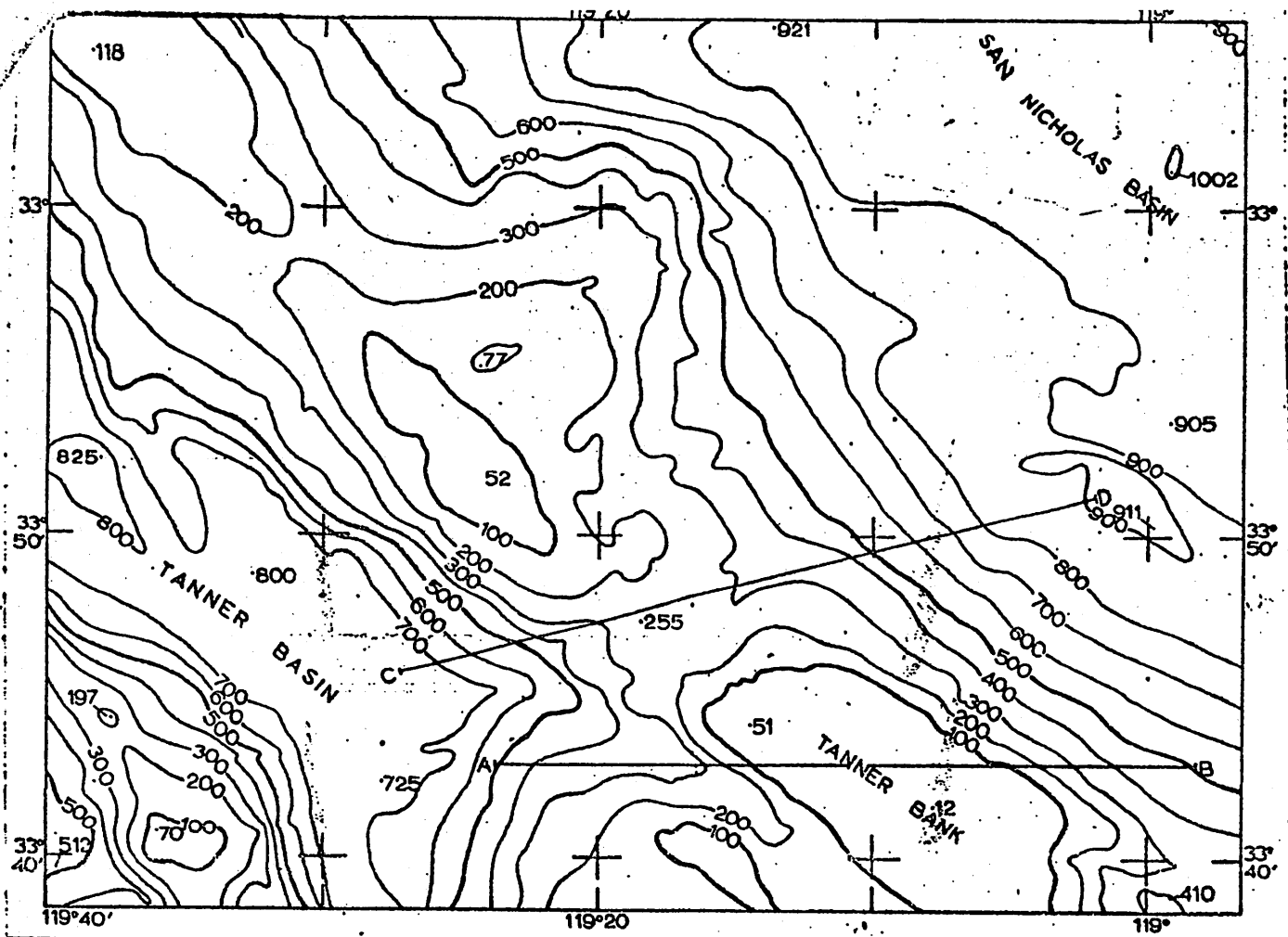
A linear extensive zone of unusually irregular topography of the sea floor characterized by large seamounts, steep-sided or asymmetrical ridges, troughs, or escarpments.



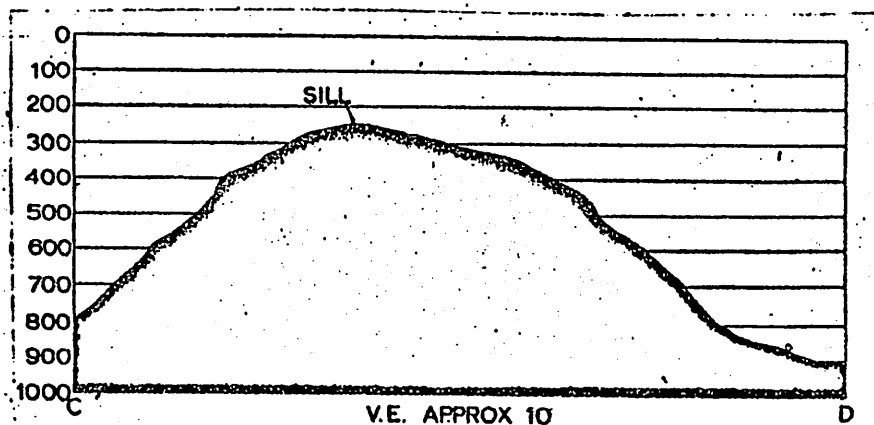


Trench

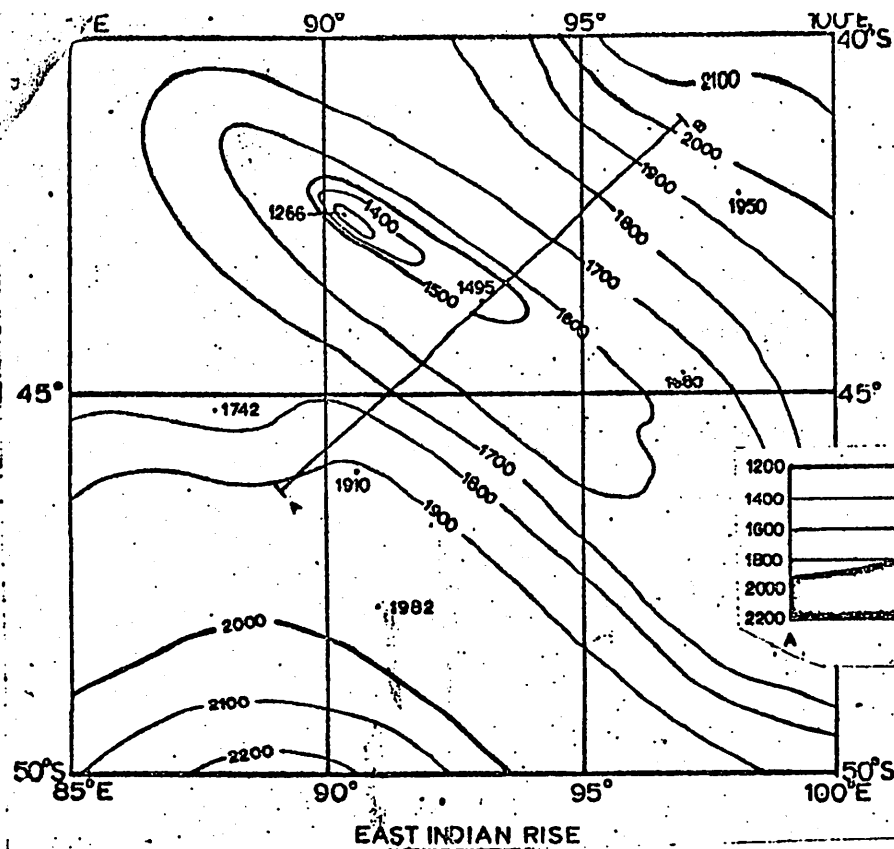
A long, narrow and deep depression of the sea floor, with relatively steep sides.



Bank An elevation of the sea floor located on a continental (or island) shelf and over which the depth of water is relatively shallow but sufficient for safe surface navigation.



Sill The low part of the ridge or rise separating ocean basins from one another or from the adjacent sea floor.

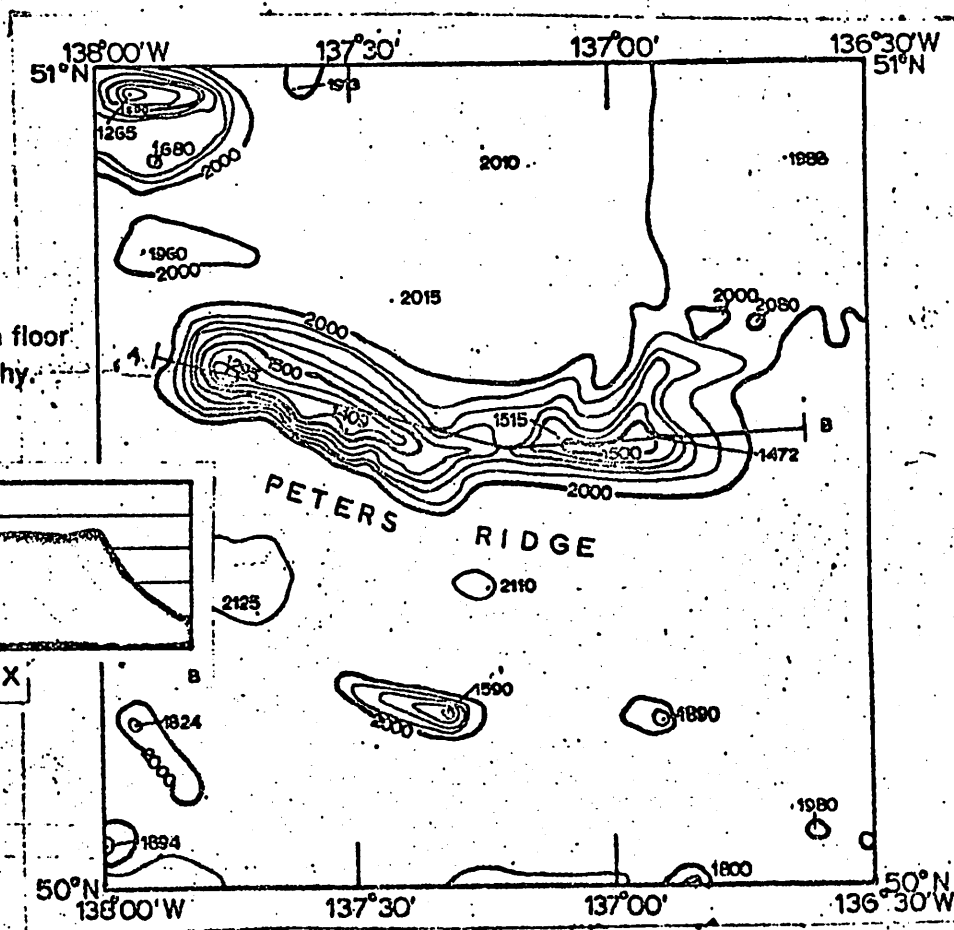
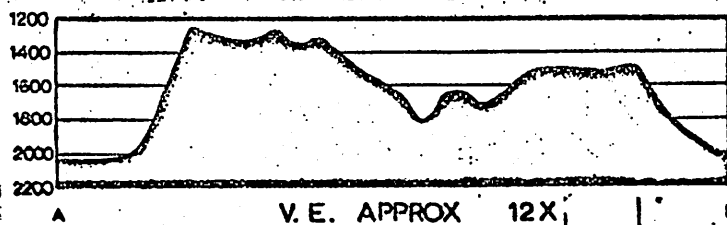


Rise (Arch, Swell)

A long, broad elevation that rises gently and generally smoothly from the sea floor.

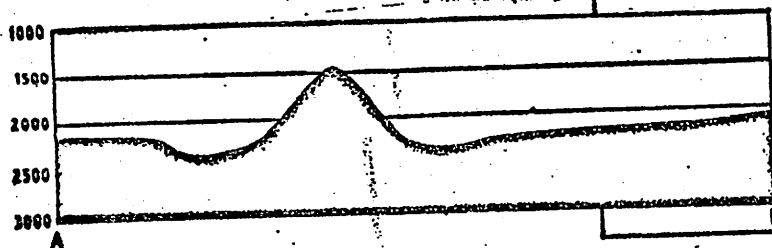
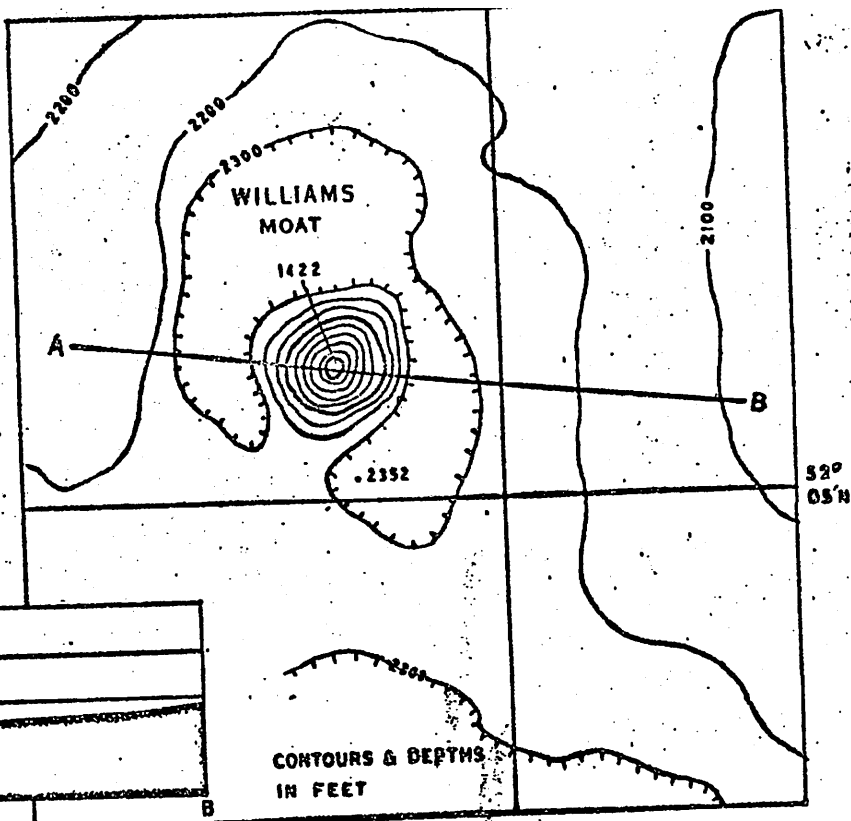
Ridge

A long, narrow elevation of the sea floor with steep sides and irregular topography.

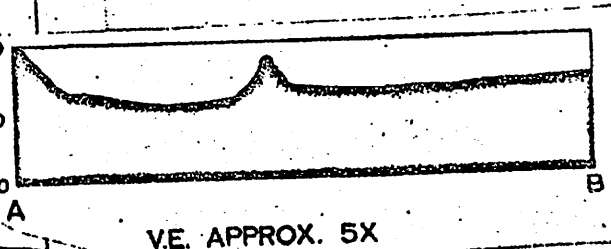
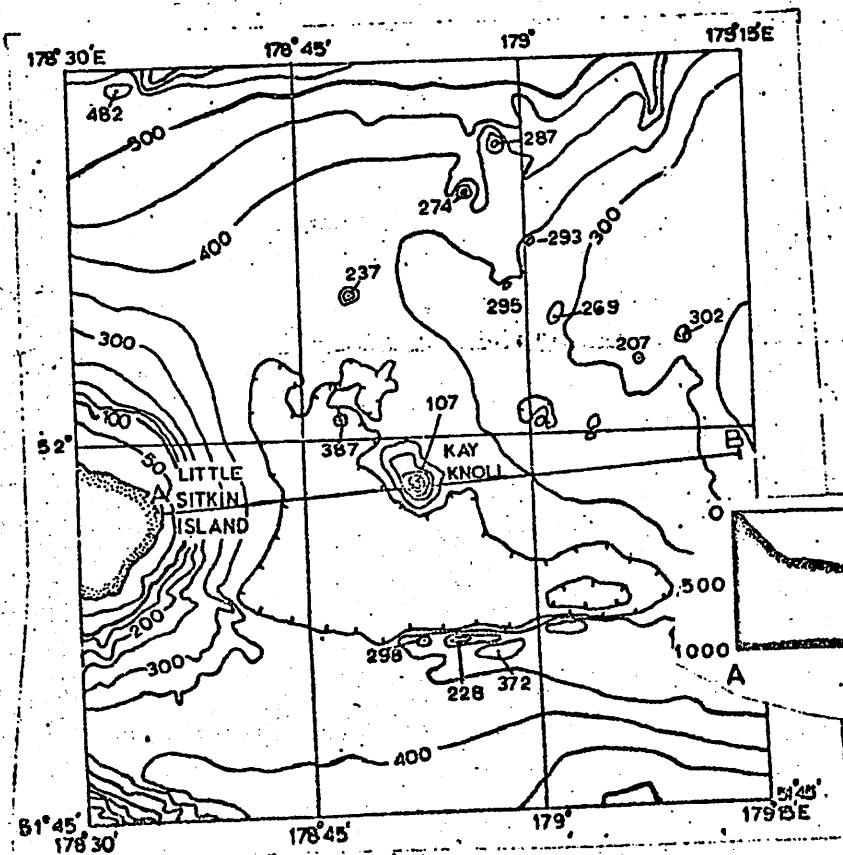


Moat (Sea-moat)

An annular depression that may not be continuous, located at the base of many seamounts or islands.



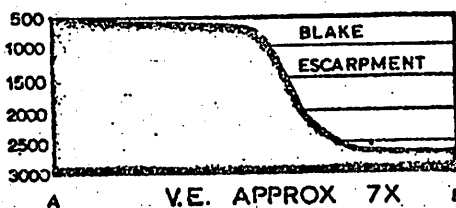
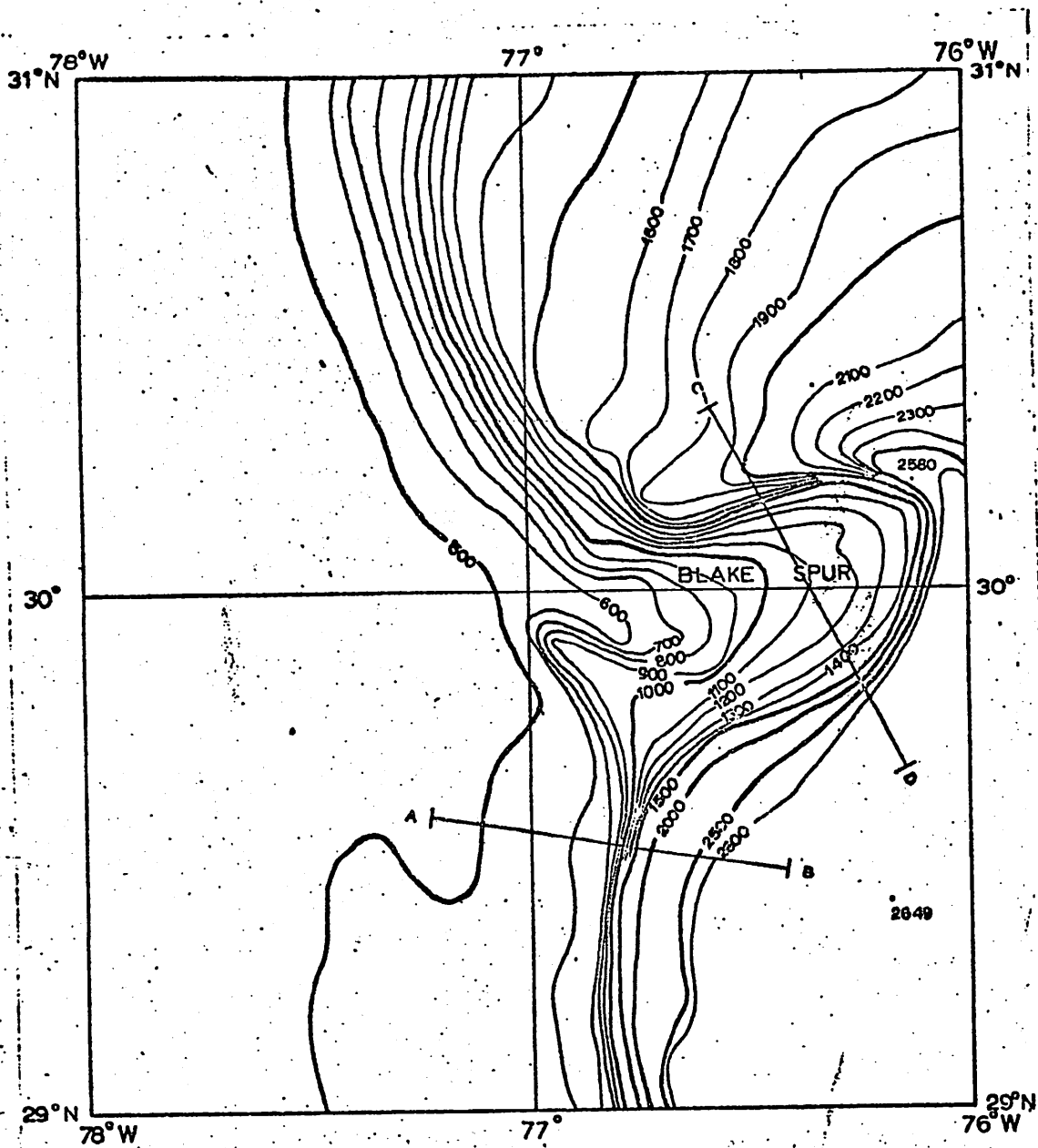
CONTOURS & DEPTHS
IN FEET



V.E. APPROX. 5X

Knoll (Hill)

An elevation rising less than 500 fathoms or 1000 meters from the sea floor and of

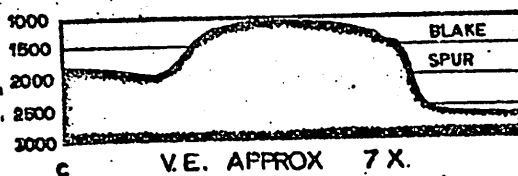


Escarpment (Sea Scarp, Scarp)

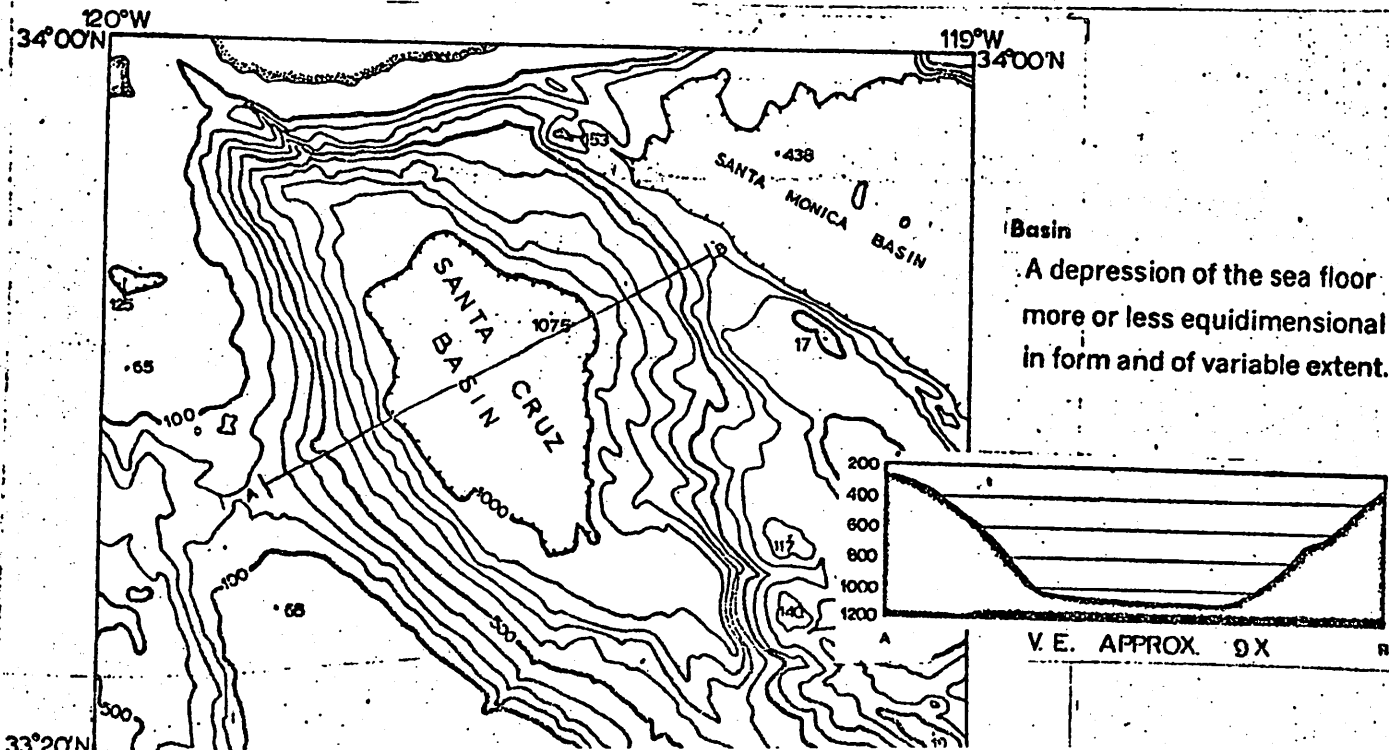
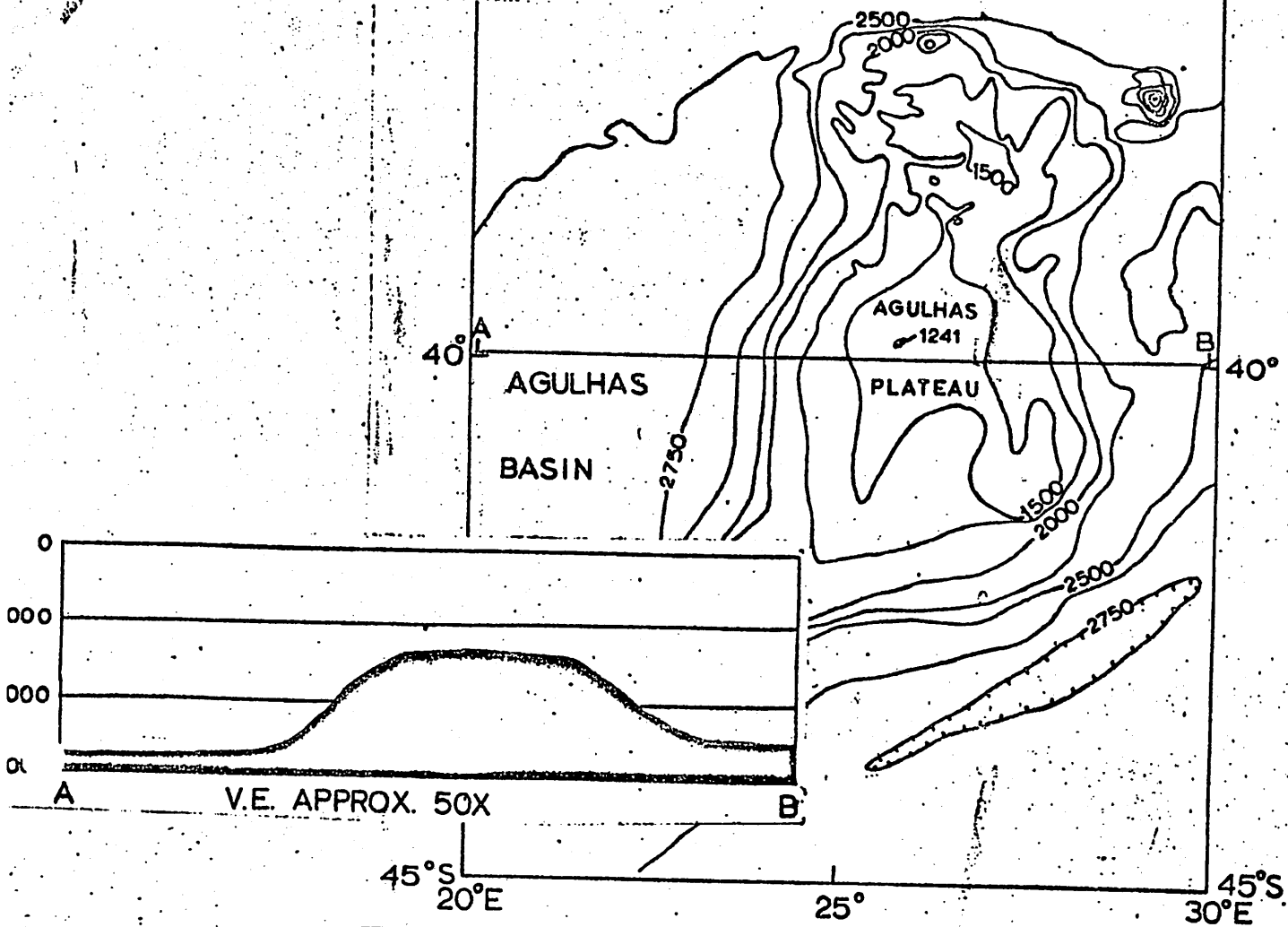
An elongated and comparatively steep slope of the sea floor, separating flat or gently sloping areas.

Spur

A subordinate elevation, ridge, or rise projecting outward from a larger feature.

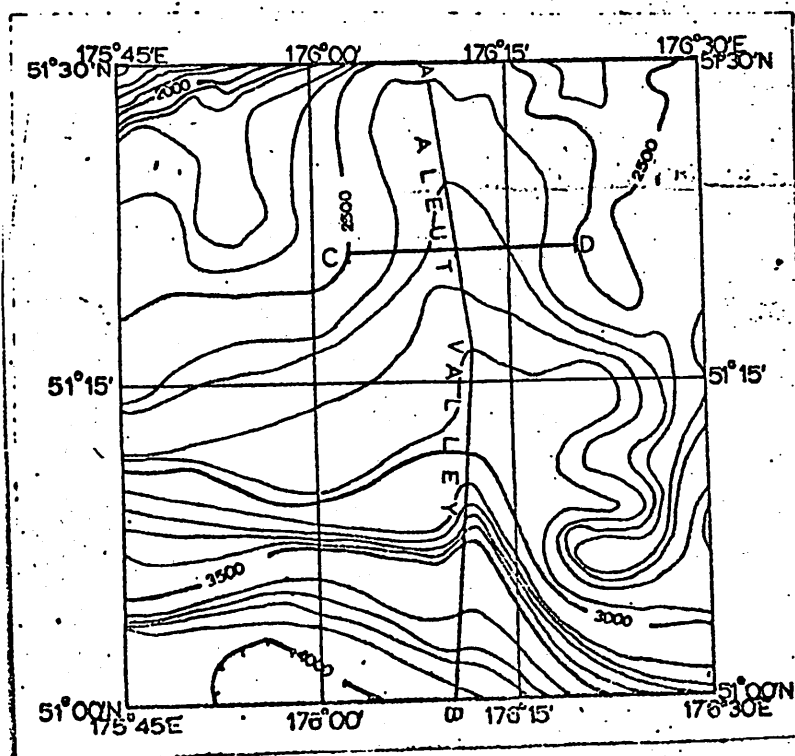
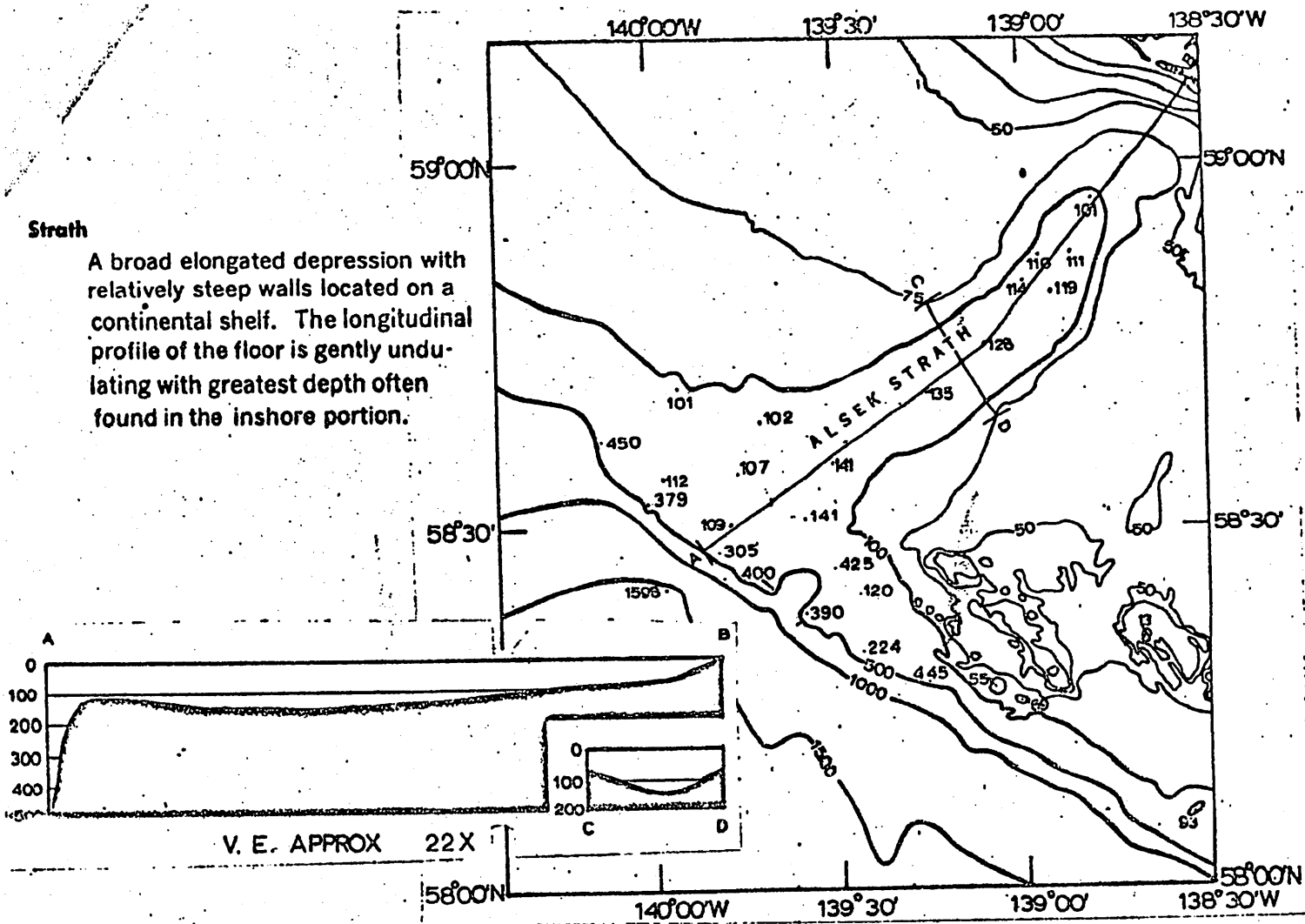


A comparatively flat topped elevation of the sea floor of considerable extent across the
 limit and usually rising more than 100 fathoms or 200 meters on all sides.



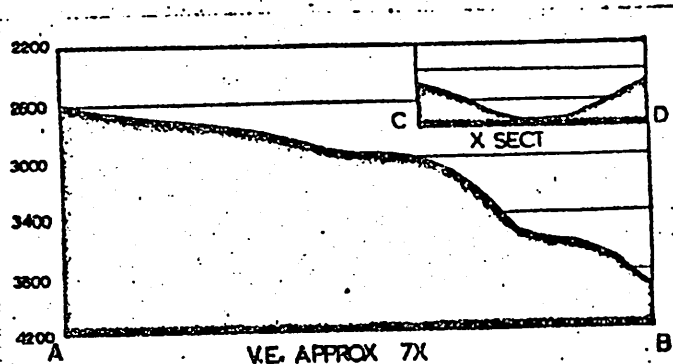
Strath

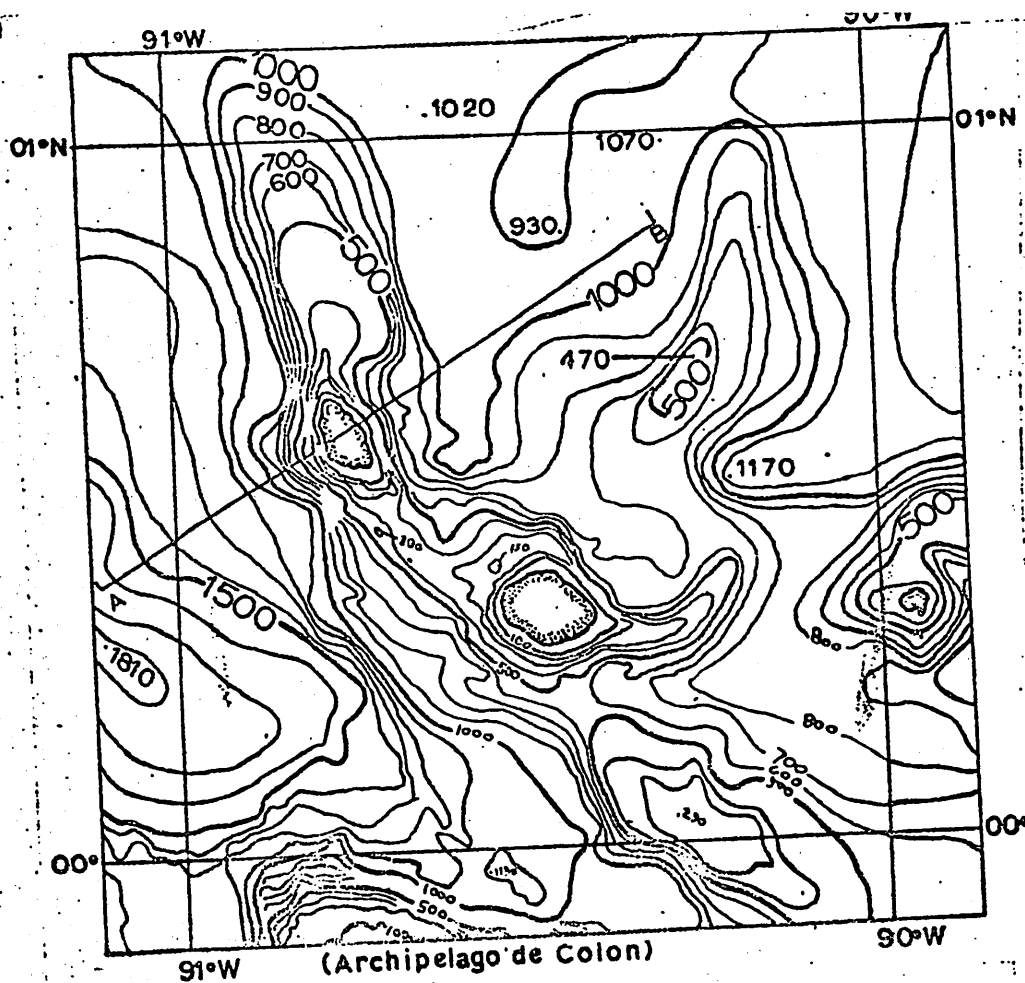
A broad elongated depression with relatively steep walls located on a continental shelf. The longitudinal profile of the floor is gently undulating with greatest depth often found in the inshore portion.



Valley (Submarine Valley)

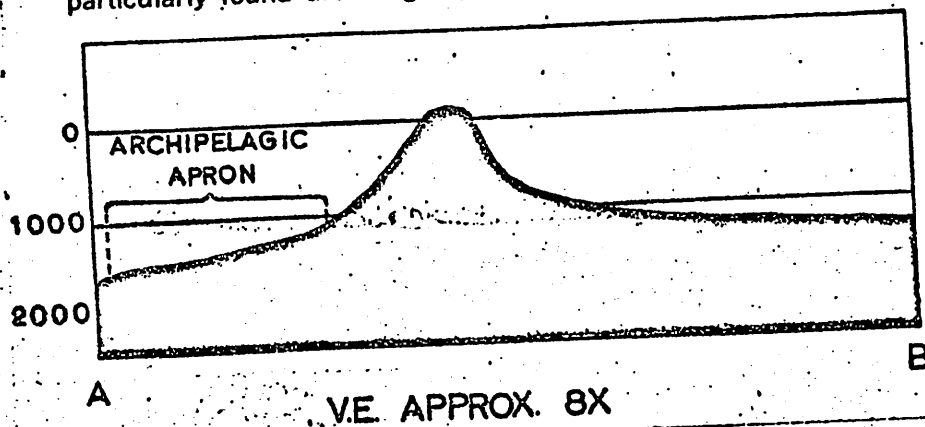
A relatively shallow, wide depression with gentle slopes, the bottom of which grades continuously downward. This term is used for features that do not have canyonlike characteristics in any significant part of their extent.

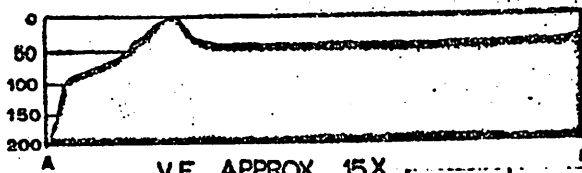




Archipelagic Apron

A gentle slope with a generally smooth surface on the sea floor, particularly found around groups of islands or seamounts.

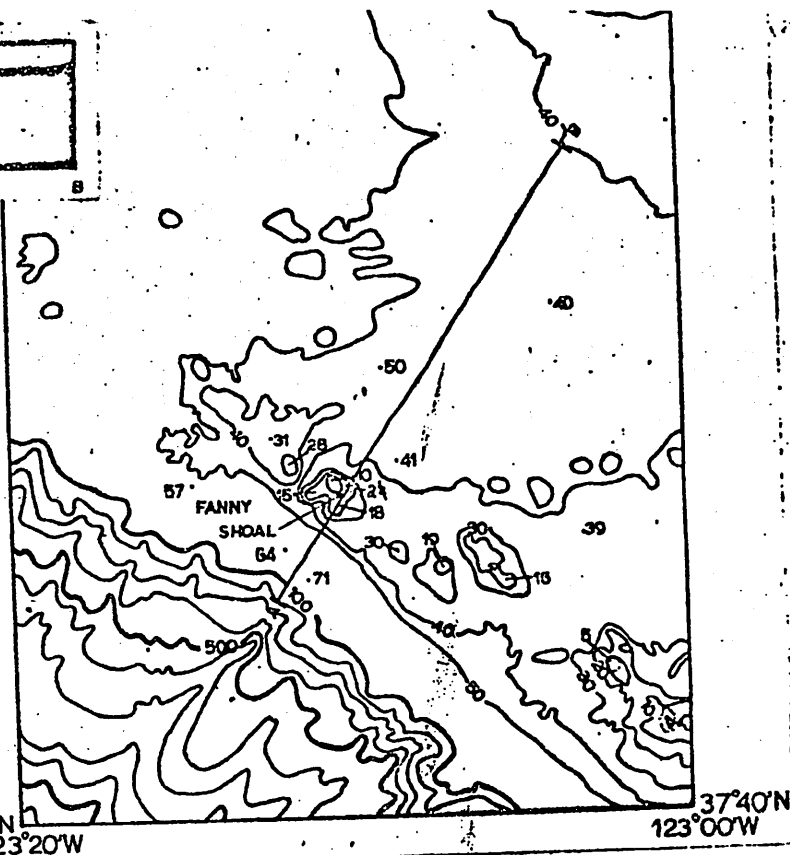




V.E. APPROX 15X

Shoal

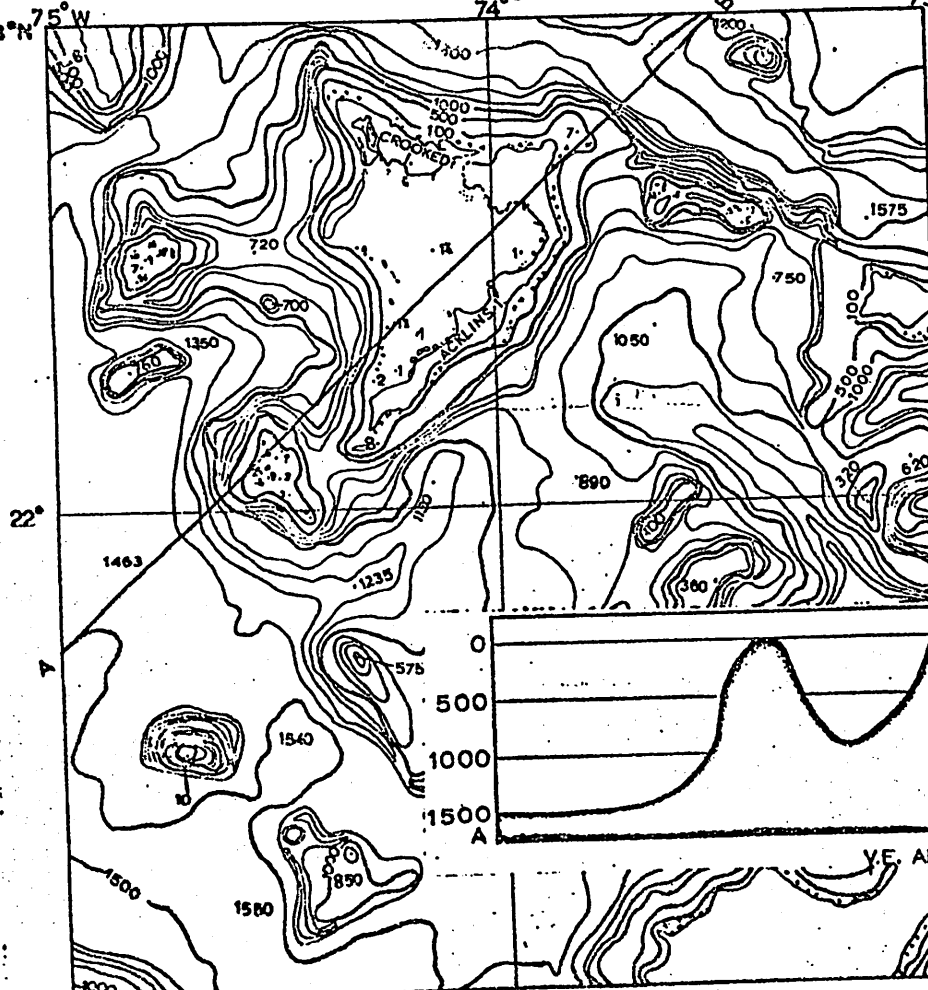
An offshore hazard to navigation with a least depth of ten fathoms or twenty meters, or less, composed of unconsolidated materials.



23°N 75°W

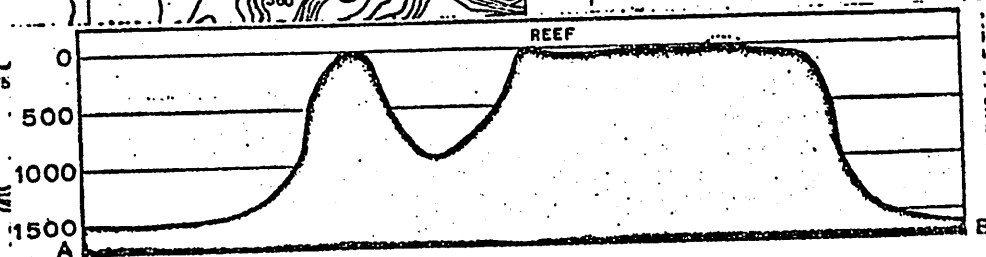
74°

73°W 23°N



Reef

An offshore consolidated rock hazard to navigation with a least depth of ten fathoms or twenty meters or less.



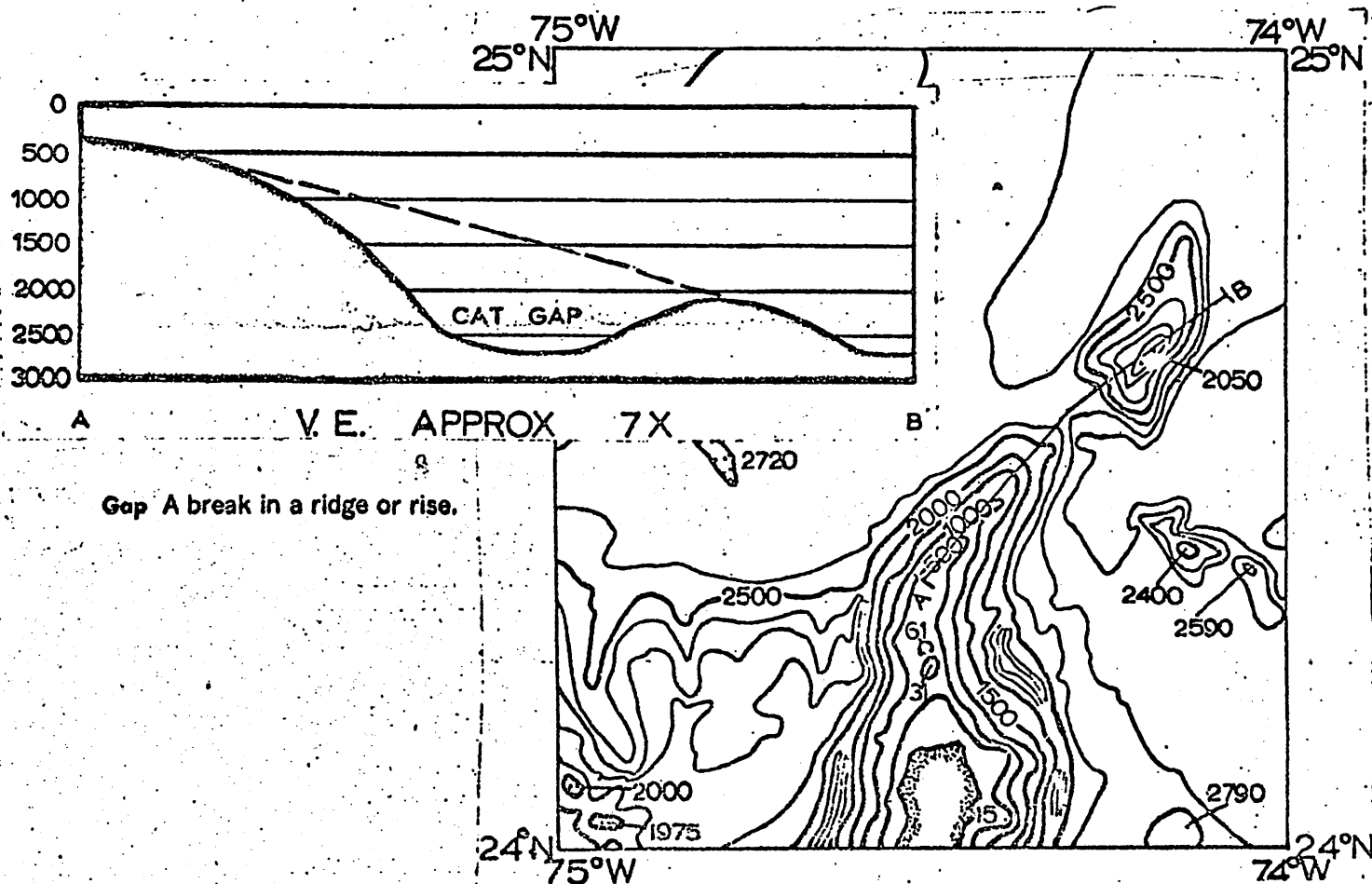
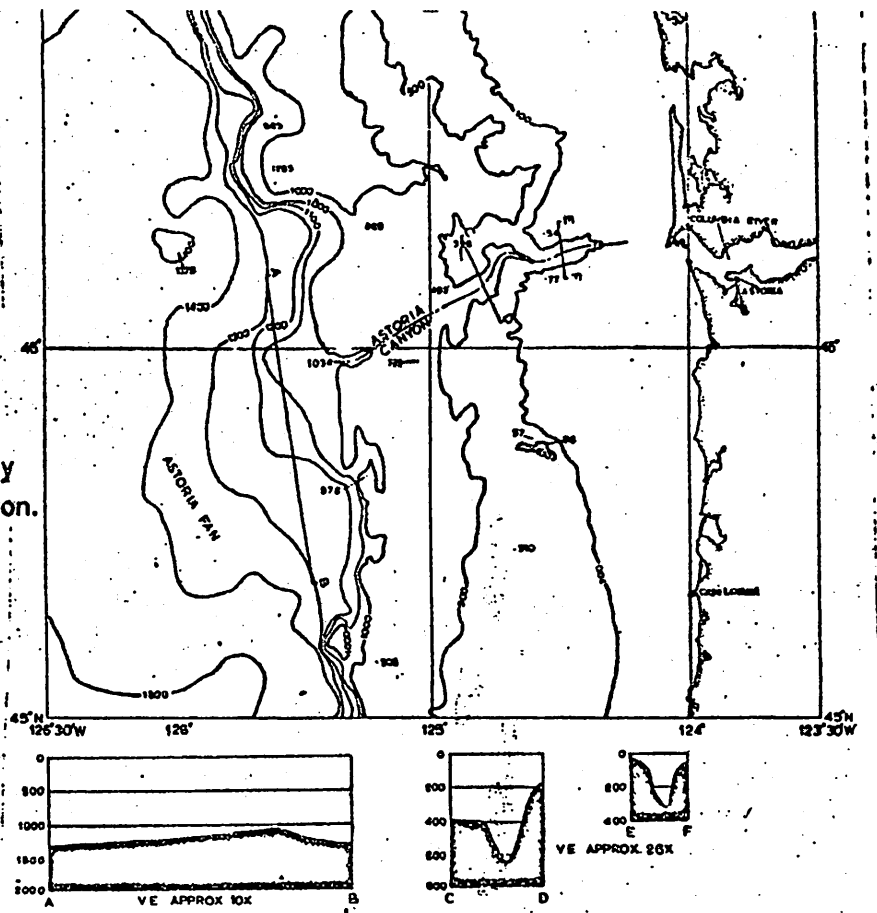
V.E. APPROX 19X

Canyon (Submarine Canyon)

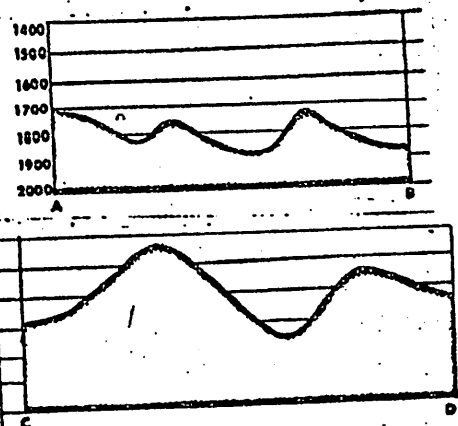
A relatively narrow, deep depression with steep slopes, the bottom of which grades continuously downward.

Fan

A gently sloping, fan-shaped feature normally located near the lower termination of a canyon.



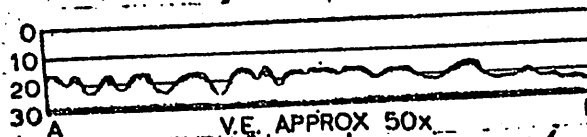
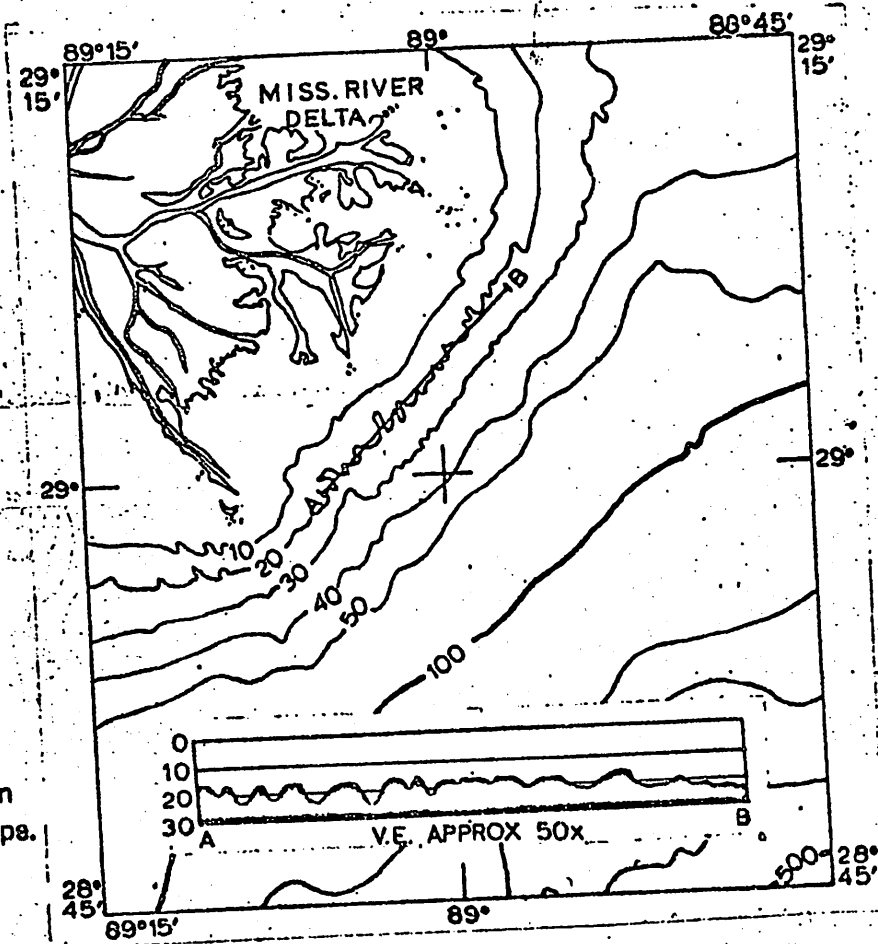
Gap A break in a ridge or rise.



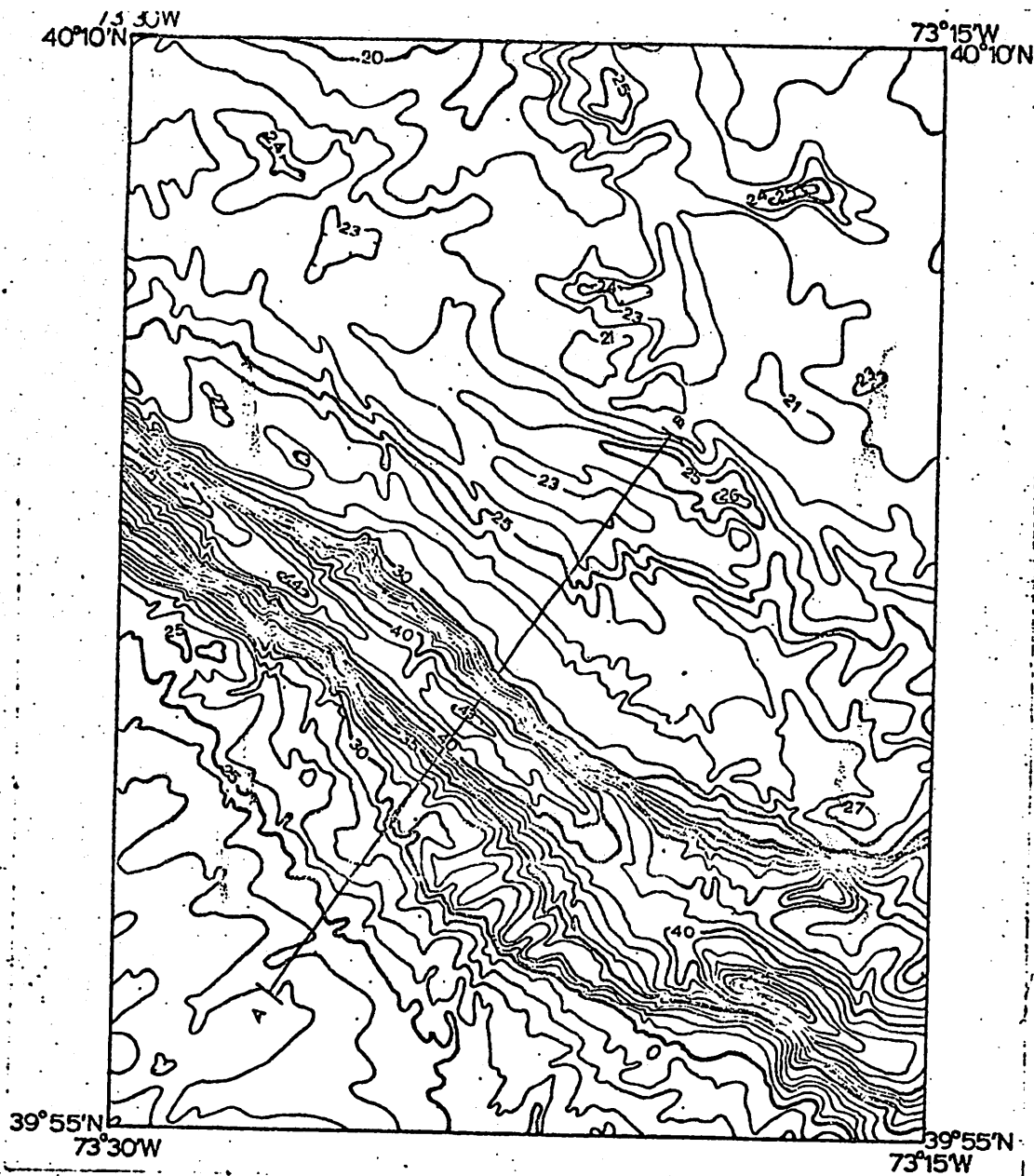
Channel (Seachannel)
A long, narrow, U-shaped or V-shaped shallow depression of the sea floor, usually occurring on a gently sloping plain or fan.

Gully

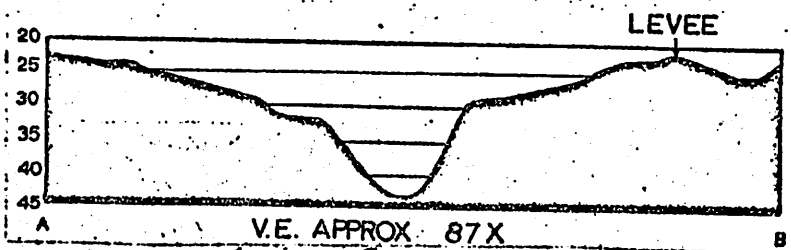
Small valleys cut into soft sediments on the continental shelf or continental slope.



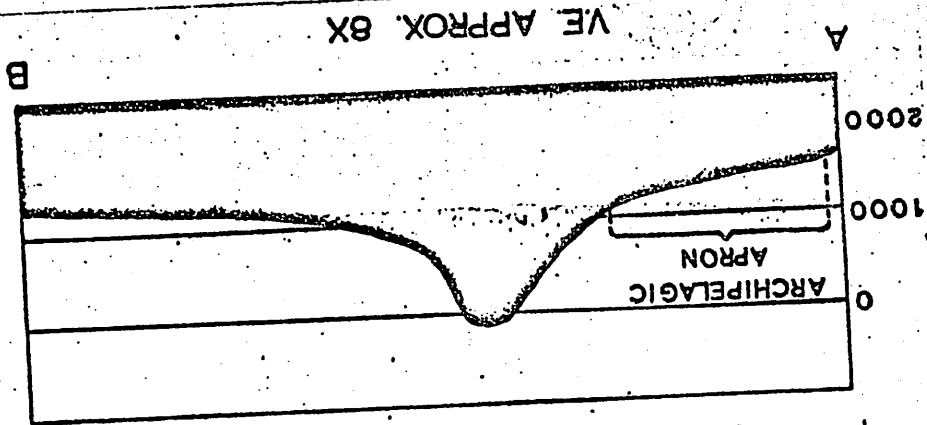
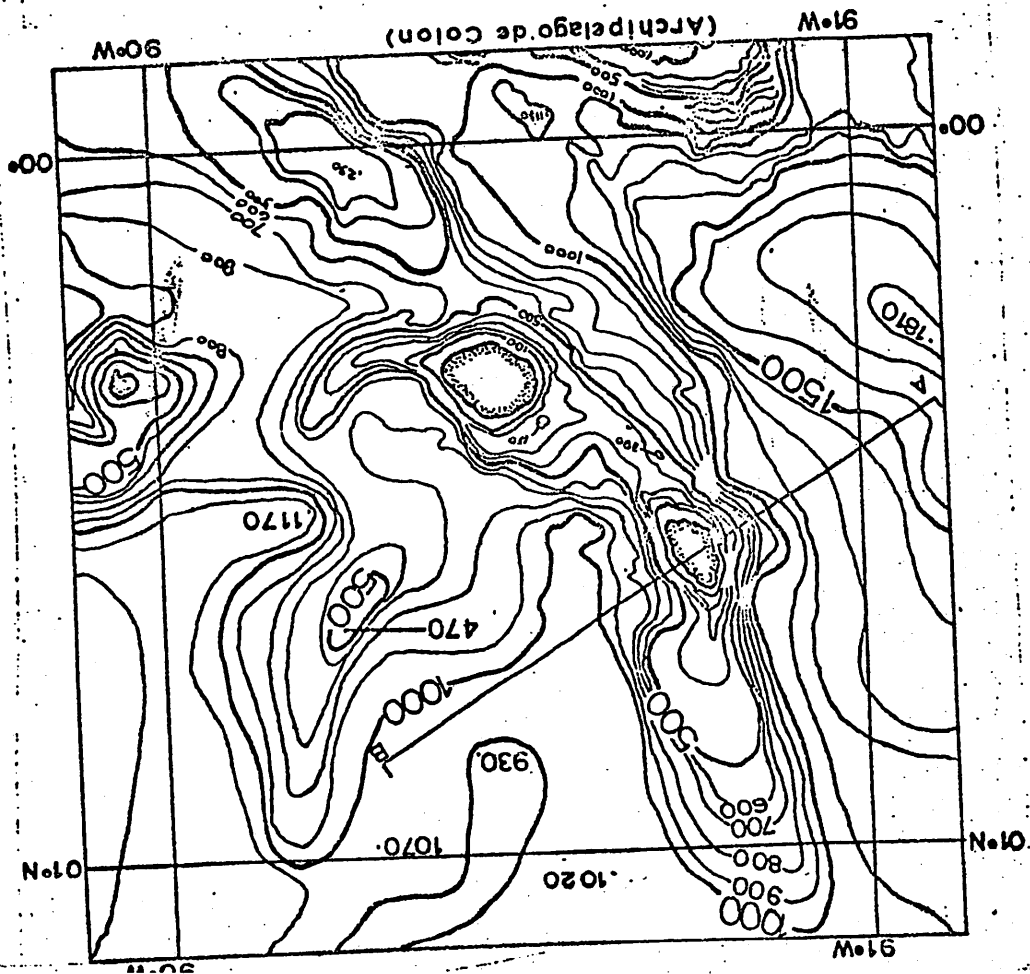
V.E. APPROX 50x

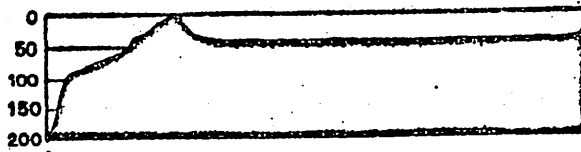


Levee An embankment bordering the sides of a canyon or channel.



Archipelagic Apron
A gentle slope with a generally smooth surface on the sea floor, particularly found around groups of islands or seamounts.

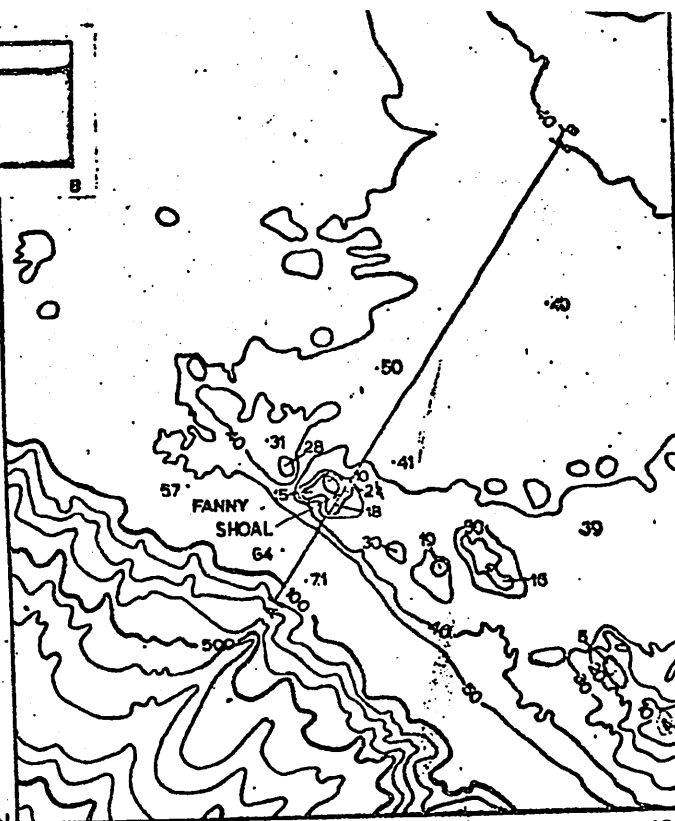




V.E. APPROX 15X

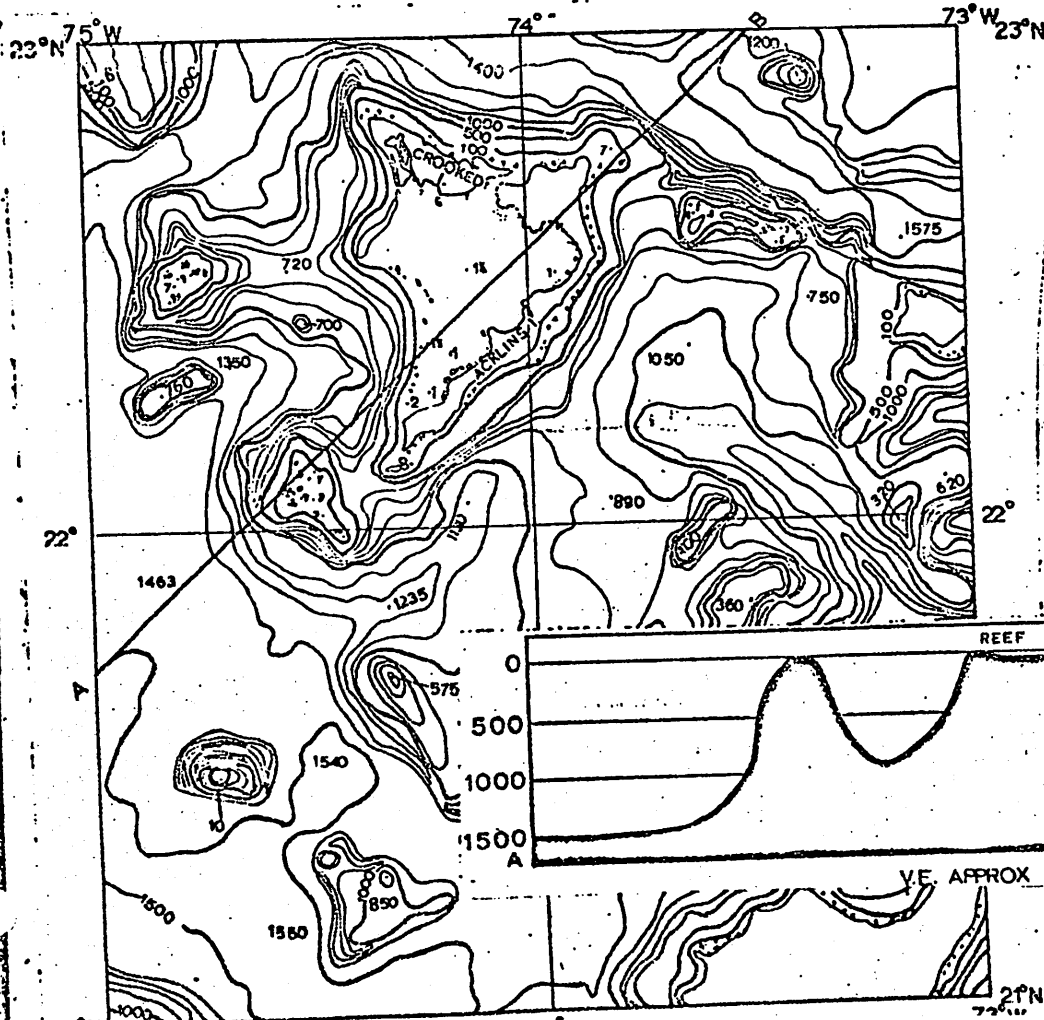
Shoal

An offshore hazard to navigation with a least depth of ten fathoms or twenty meters, or less, composed of unconsolidated materials.



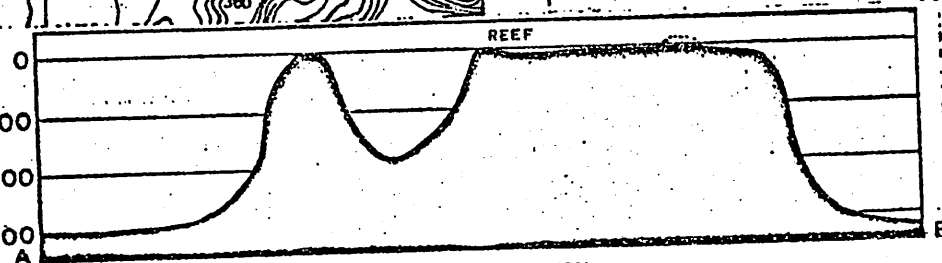
37°40'N
123°20'W

37°40'N
123°00'W



Reef

An offshore consolidated rock hazard to navigation with a least depth of ten fathoms or twenty meters or less.



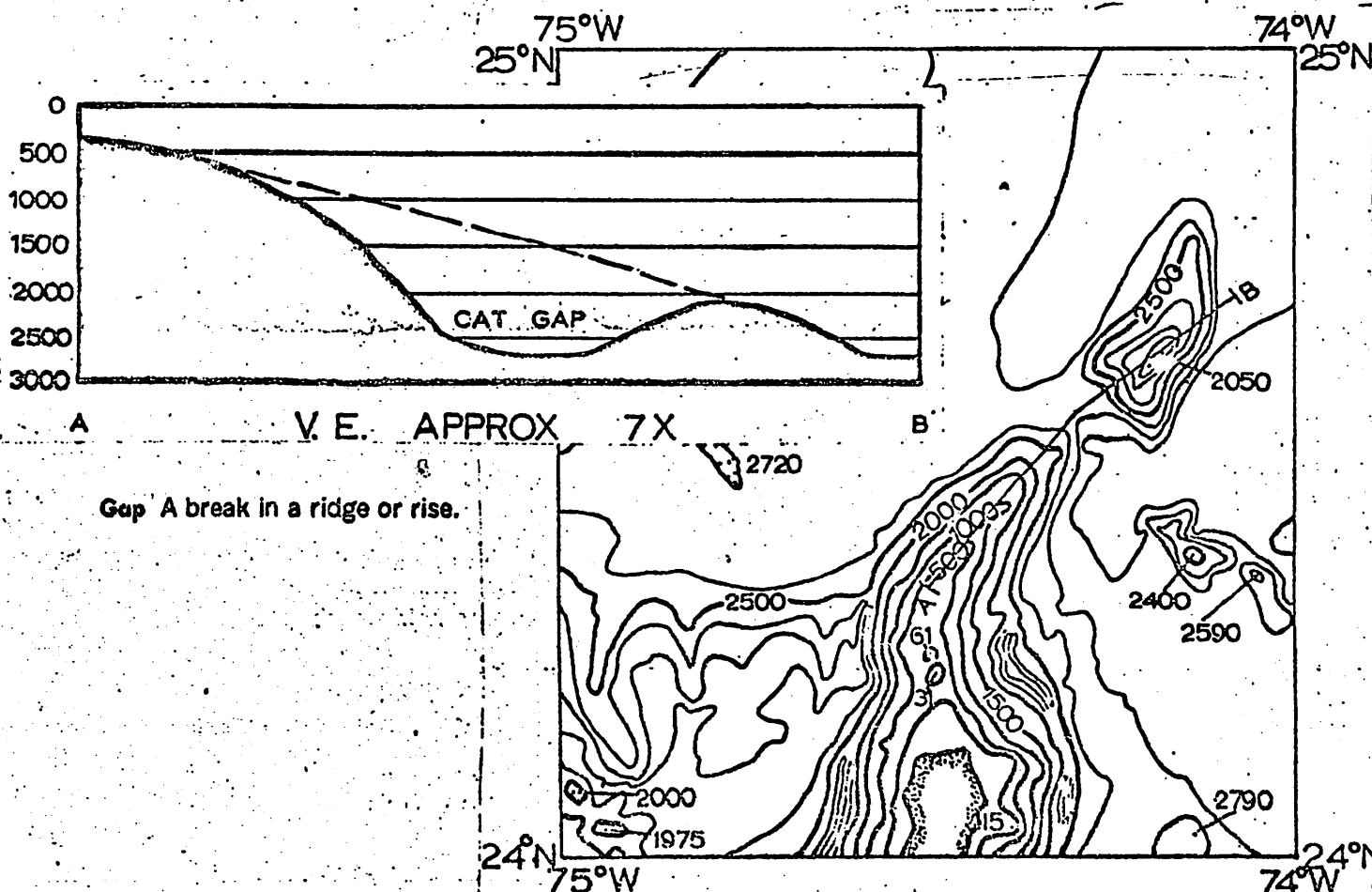
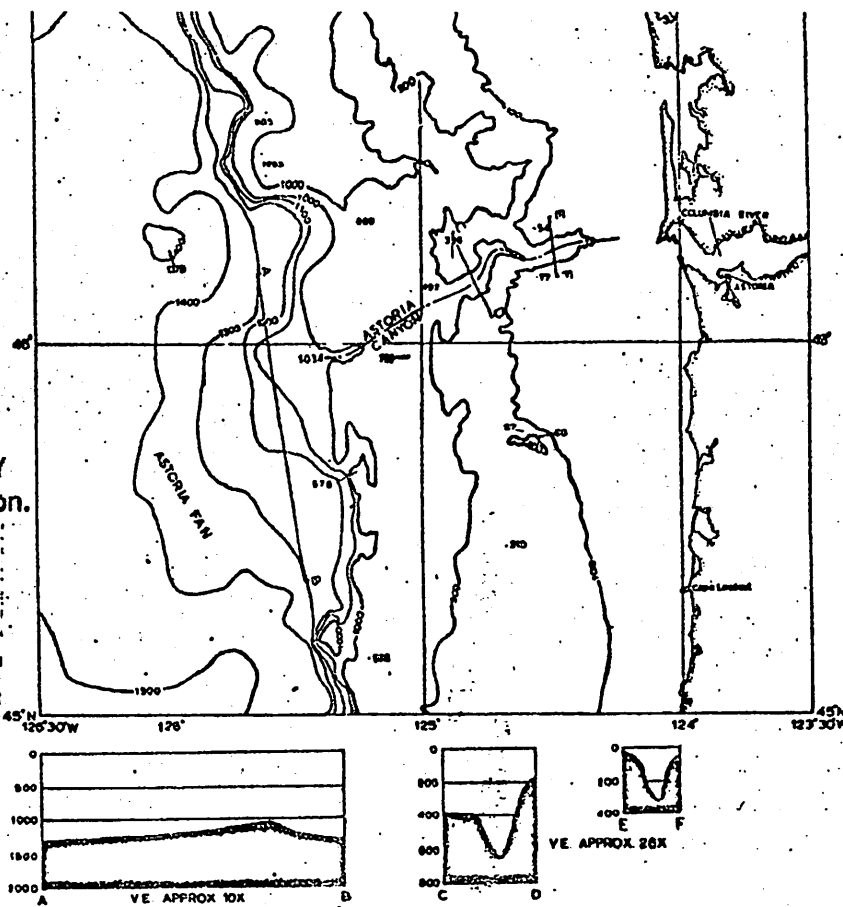
V.E. APPROX 19X

Canyon (Submarine Canyon)

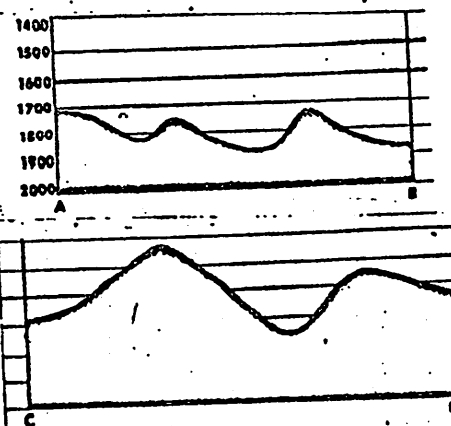
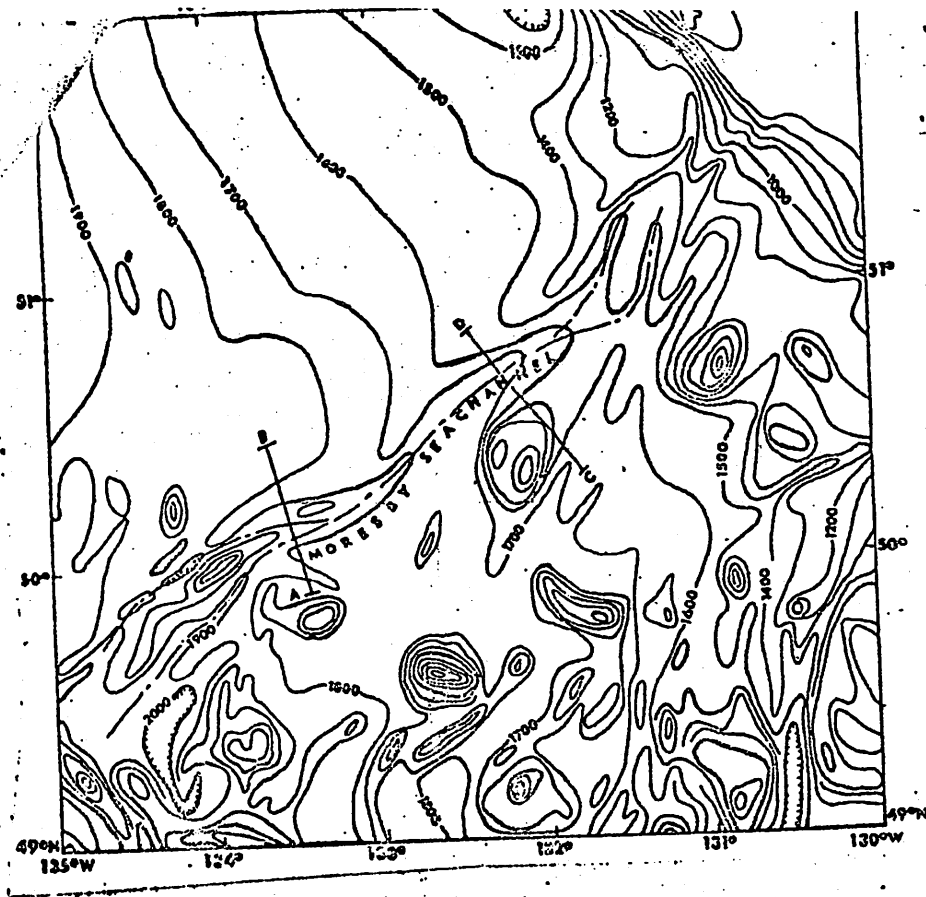
relatively narrow, deep depression with steep slopes, the bottom of which grades continuously downward.

Fan

A gently sloping, fan-shaped feature normally located near the lower termination of a canyon.



Gap A break in a ridge or rise.

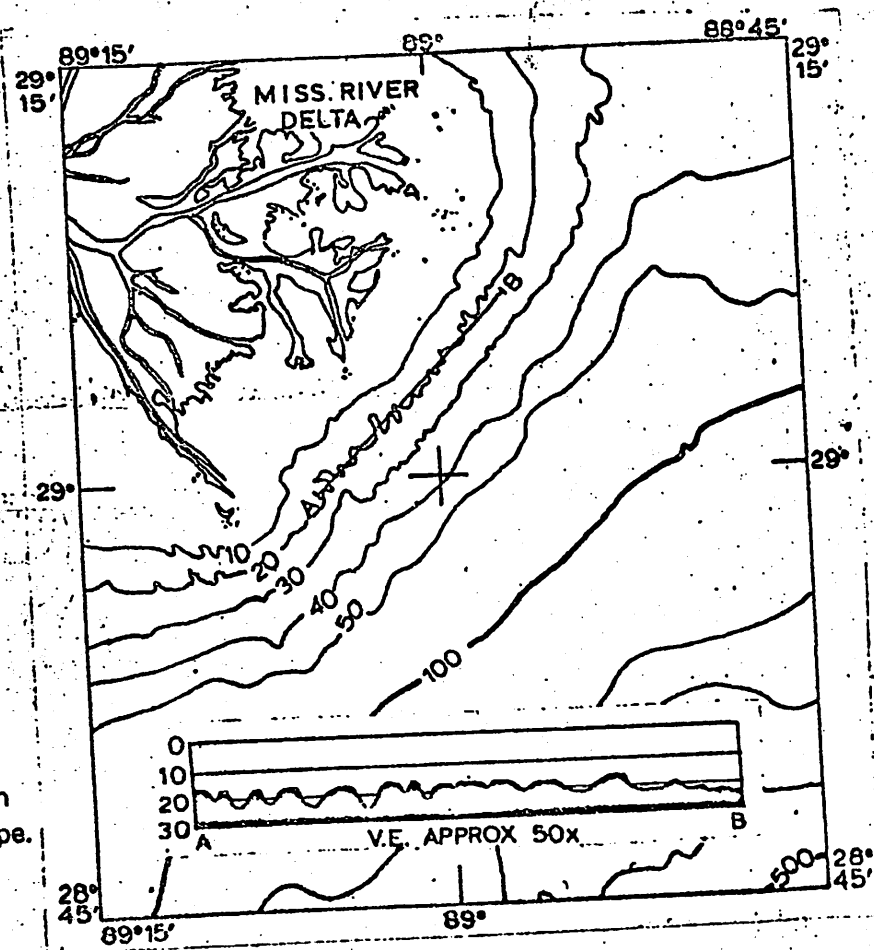


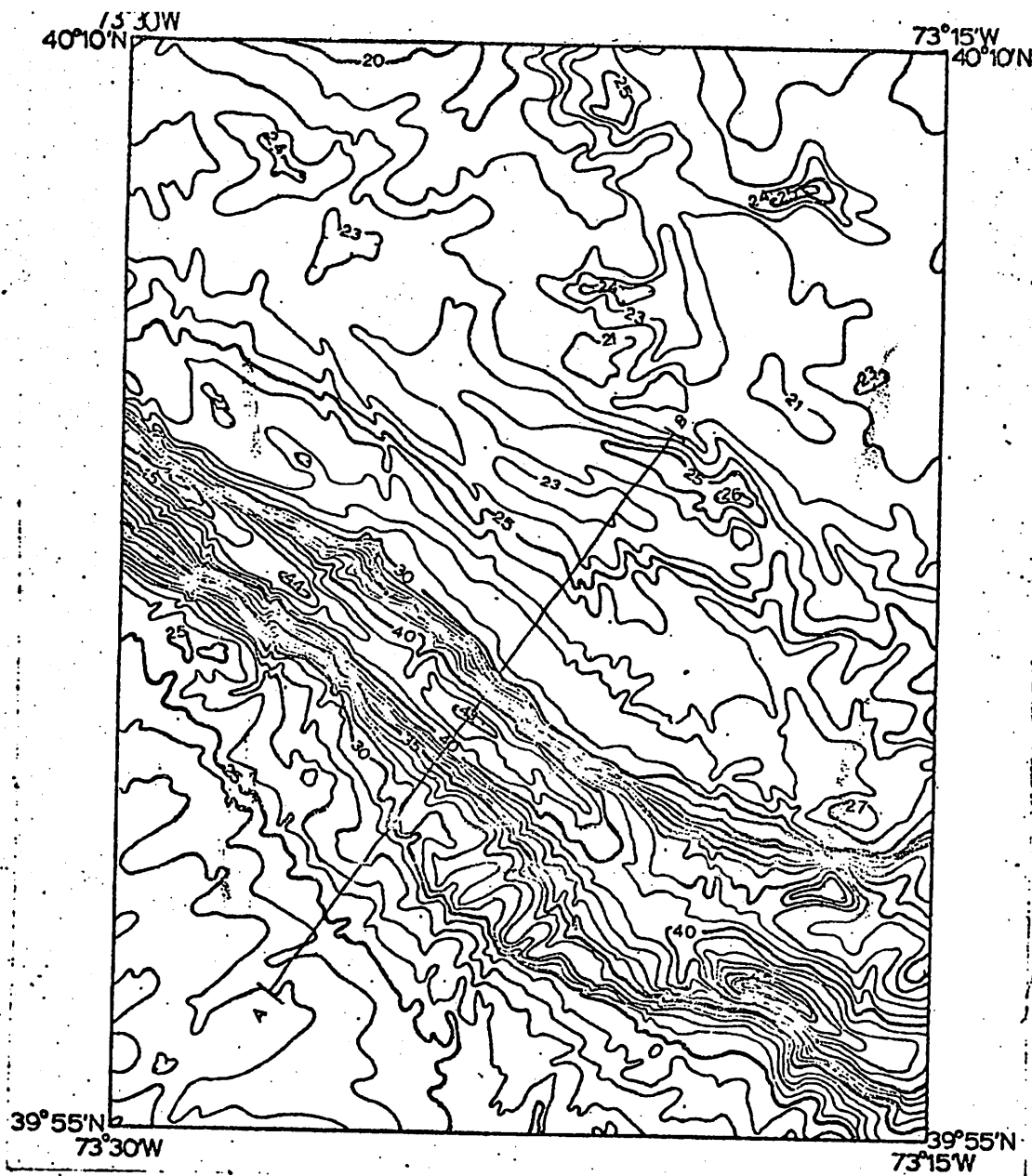
Channel (Seachannel)

A long, narrow, U-shaped or V-shaped shallow depression of the sea floor, usually occurring on a gently sloping plain or fan.

Gully

Small valleys cut into soft sediments on the continental shelf or continental slope.





Levee An embankment bordering the sides of a canyon or channel.

