

A new bathymetric chart of the Red Sea

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[Chart in accompanying wallet]

A new bathymetric chart of the Red Sea has been drawn from the most recent compilation of passage soundings combined with the results of detailed surveys. (Submitted as a written contribution after the meeting.)

In the course of the preparation of the new edition of the G.E.B.C.O. † series of world bathymetric charts, the responsibility for the collection of soundings in the Red Sea was given by the International Hydrographic Bureau to the Hydrographic Department in the U.K. Compilations dated March 1968, submitted to the I.H.B. for this purpose, have been used as a basis for drawing the Red Sea chart for the Atlas of Geology and Geophysics of the International Indian Ocean Expedition, both in metres at a 500 m interval and in fathoms at a 100-fathom interval. Since bathymetry is so basic in discussing the structure and evolution of the Red Sea, it is considered worth while to publish in these proceedings the more detailed of these two charts so that reference can be made to it by other contributors.

The source material for the chart consists largely of soundings obtained on passage by ships passing through the length of the Red Sea, giving rise to a concentration of tracks in the central region. Transverse lines of soundings have been obtained by research ships concerned with Red Sea structure, notably by S.S. *Aragonese* in 1961 (Allan, Charnock & Morelli 1964) which made fifty-four crossings of the central region. Detailed surveys have been made in the area of the hot brine deeps by R.V. *Chain* (Ross 1969) and the contoured results of these have been integrated into the new chart. The compilation of oceanic soundings prepared by the Hydrographic Department do not contain the results of hydrographic surveys made of the shallower inshore regions of the Red Sea. Selected soundings of these surveys appear on Admiralty navigation charts 8, 63, 138, 141 and 6 at a scale of 1:750 000, and these have been used to provide data for the areas not covered by the oceanic sounding sheets. In all 25 000 soundings have been used to produce the contour chart.

The accuracy of position determination in the Red Sea is usually poor. No radio aids cover the area and very few soundings are controlled by satellite navigation. Celestial observations are difficult because of high refraction, hazy atmosphere and poor horizons, and dead reckoning between fixes is disturbed by strong and variable surface currents. Inshore surveys are only as accurate as the knowledge of the position of the coastline and islands used as visual marks, many of which are poorly surveyed. The mean track spacing in the central region is of the order of 8 km or less, which is less than the probable accuracy of position. Hence no improvement in the contouring of the bathymetry could be achieved by more passage data in these areas since they only add extra confusion. Further improvements will only come, therefore, from closely spaced and well controlled surveys.

† General Bathymetric Chart of the Ocean.

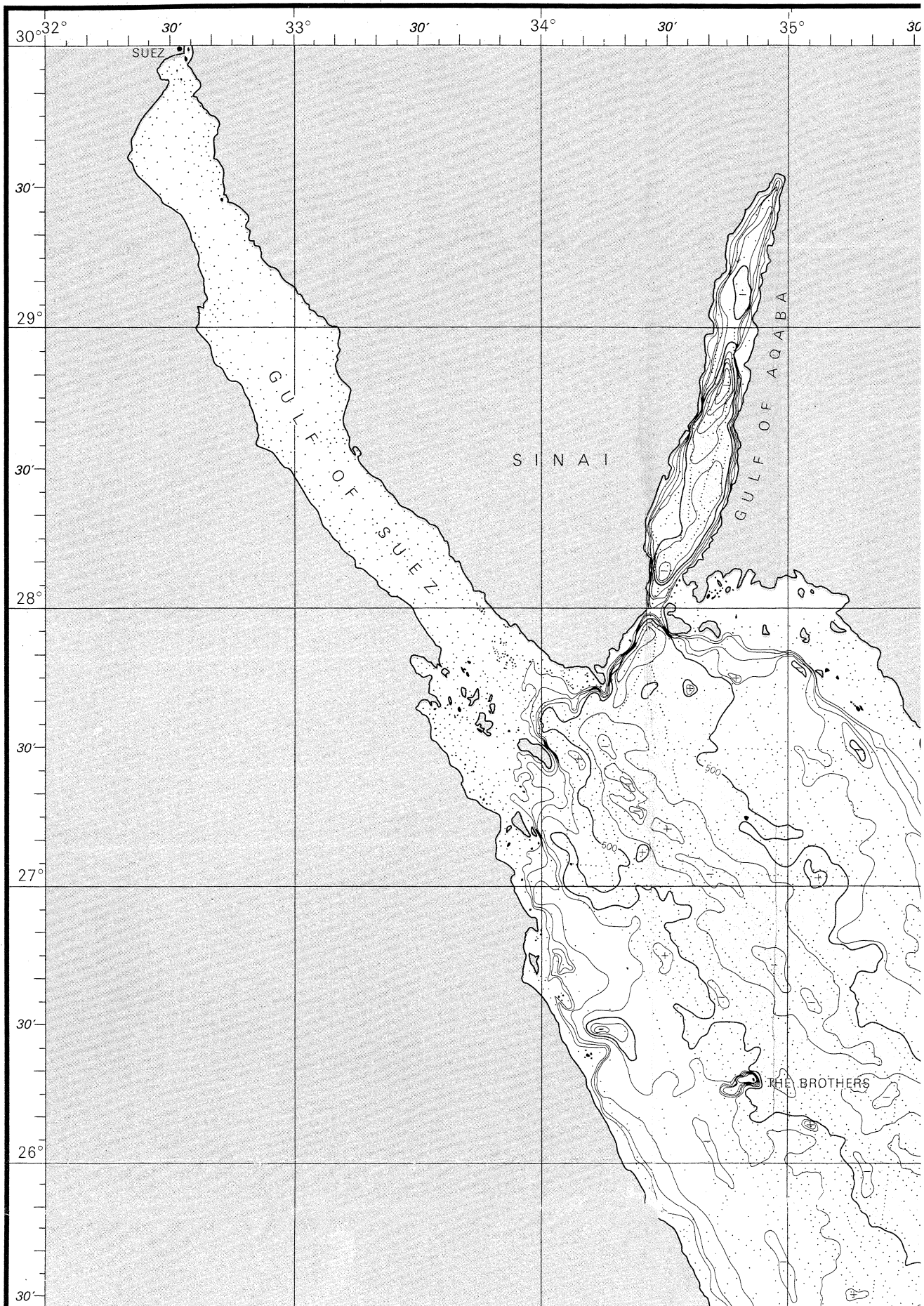
Contouring was carried out at a scale of 1:1 000 000 with reference, where available, to echo sounding profile records. Inevitably conflicts arose between soundings badly positioned and judgements were based on a knowledge of the source of the data and of the nature of the features of the bottom. Local highs and lows are shown on the chart by plus and minus signs.

It is not intended here to discuss the bathymetric features of the Red Sea since these have been described by Drake & Girdler (1964) and are also dealt with elsewhere in this volume (Phillips & Ross, p. 143). However, some features of the bathymetry have emerged that were not shown in an earlier bathymetric chart compiled by the Nato Research Centre at La Spezia in 1964, and published as Admiralty Chart C. 6359 in 1965. Many of the cliffs between depths of 180 and 550 m (100 and 300 fathoms) along the coastlines are revealed to be much steeper and somewhat closer inshore than previously shown. Similarly, at the south end the cliffs of the central rift valley are steeper. More important are the newly found narrow deeps which occur at the base of the margin cliffs in the northern half of the Red Sea. Notable examples are off Jidda at 21° 15' N, 38° 55' E, at 22° N 37° E and on both sides of the northern Red Sea at about 27° N. These marginal deeps were revealed by the coastal hydrographic surveys and may well be more extensive and more continuous than is shown by the 100-fathom interval of this chart. They may have considerable tectonic significance.

The scale, projection and cartography of this chart are designed to make it a companion to the bathymetric chart of the Gulf of Aden also presented in this volume (Laughton, Whitmarsh & Jones, in accompanying wallet).

REFERENCES (Laughton)

- Allan, T. D., Charnock, H. & Morelli, E. 1964 Magnetic, gravity and depth surveys in the Mediterranean and Red Sea. *Nature, Lond.* **204**, 1245–1248.
- Drake, C. L. & Girdler, R. W. 1964 A geophysical study of the Red Sea. *Geophys. J.* **8**, 473–495.
- Laughton, A. S., Whitmarsh, R. B. & Jones, M. T. 1970 The evolution of the Gulf of Aden. *Phil. Trans. Roy. Soc. Lond. A* **267**, 227–266. (This volume.)
- Phillips, J. D. & Ross, D. A. 1970 Continuous seismic reflexion profiles in the Red Sea. *Phil. Trans. Roy. Soc. A.* **267**, 143–152. (This volume.)
- Ross, D. A. 1969 Bathymetry and continuous seismic profiling. Chap. 14 of *Hot brines and recent heavy metal deposits in the Red Sea* (Degens, E. T. and Ross, A., eds.). New York: Springer-Verlag.



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30'

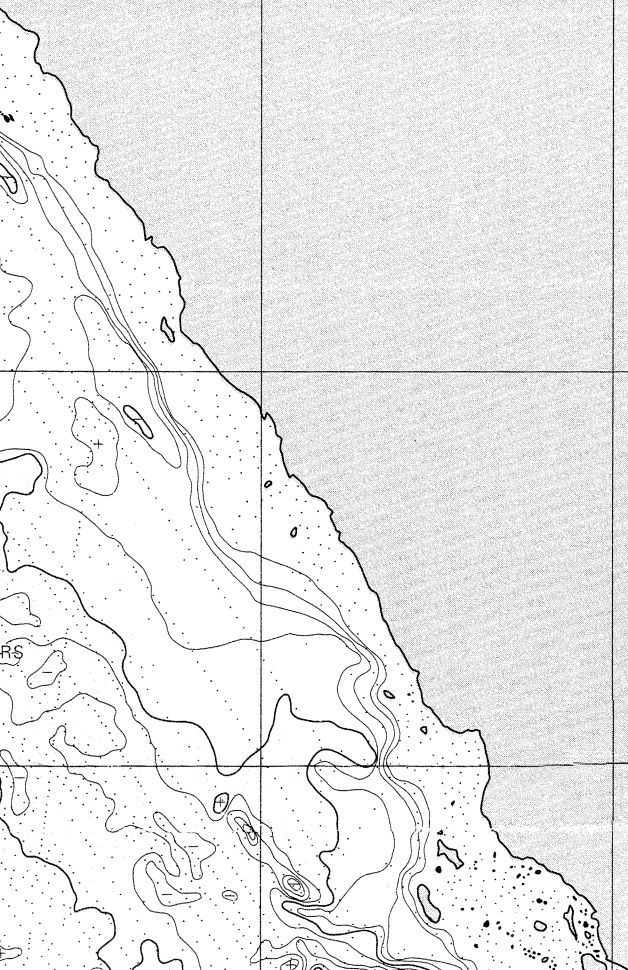
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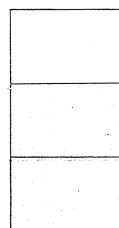
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THE RED SEA

EXPLORED BY A. S. LAUGHTON
National Institute of Oceanography
Great Britain.

SCALE 1:2,000,000 at 33° N

Projection: Mercator

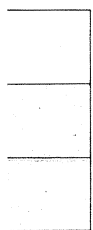
Soundings: in 100 fathom intervals. All depths in fathoms,
rounded according to Matthews tables (1939) H.D. 282

Soundings: Contours are based on collected oceanic soundings
available up to May 1968 from Hydrographic Department,
Ministry of Defence (Navy)

KEY



Limits of survey of the hot salty holes
by R.V. Chain (1966).



0
500
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1500

Contour intervals in fathoms.

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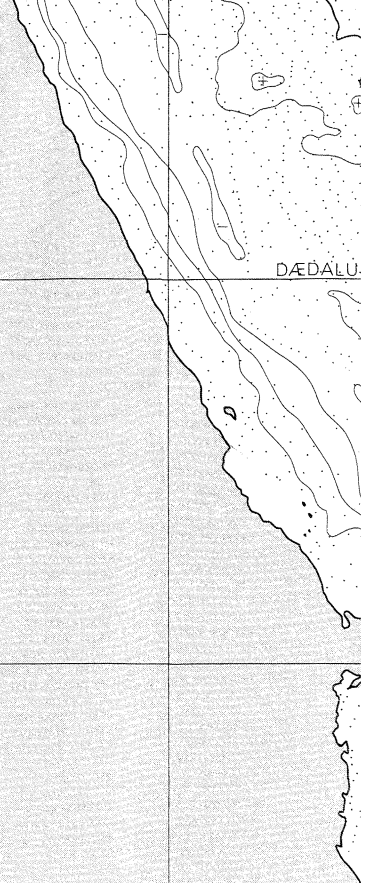
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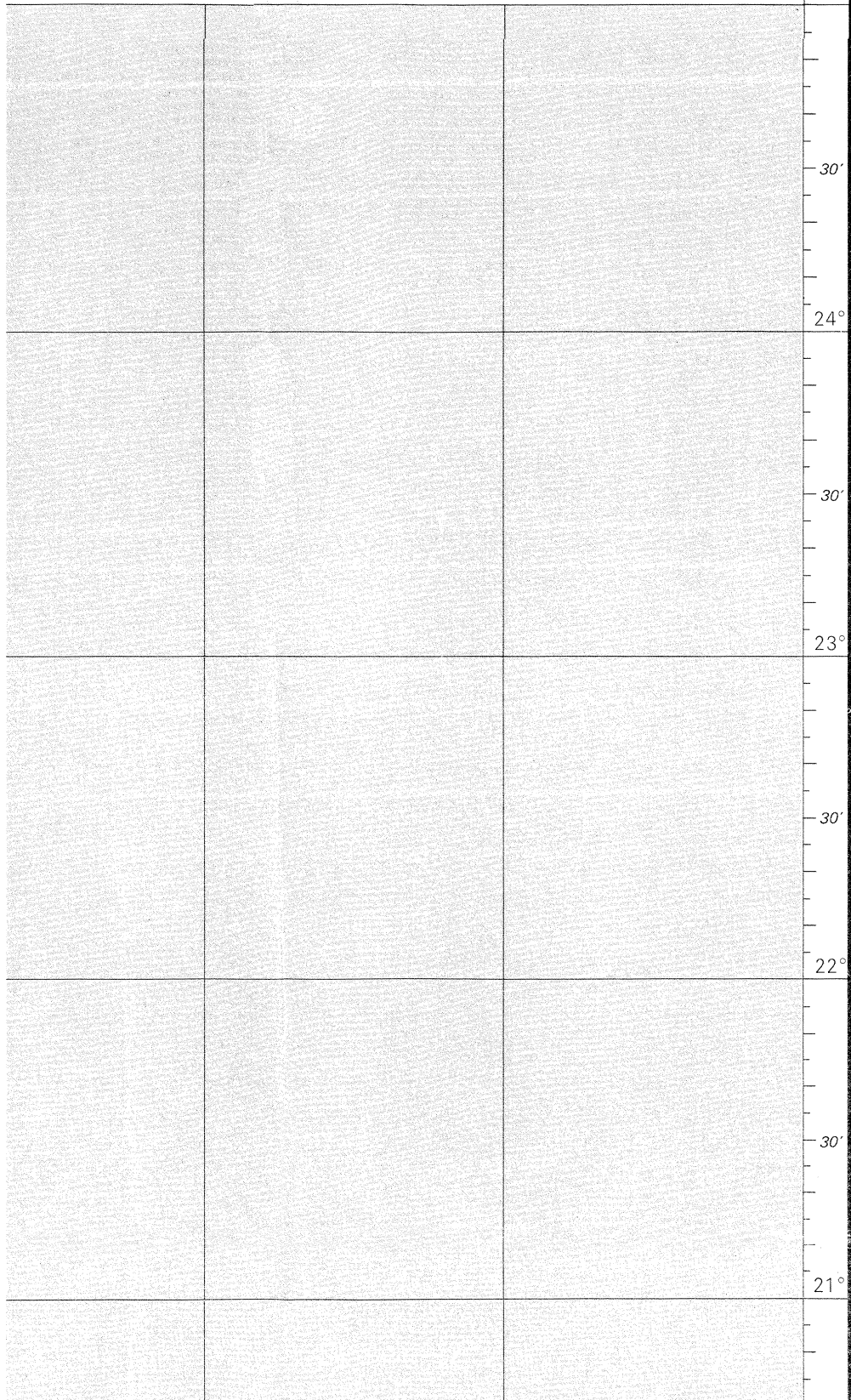
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ATLANTIS II DEEP

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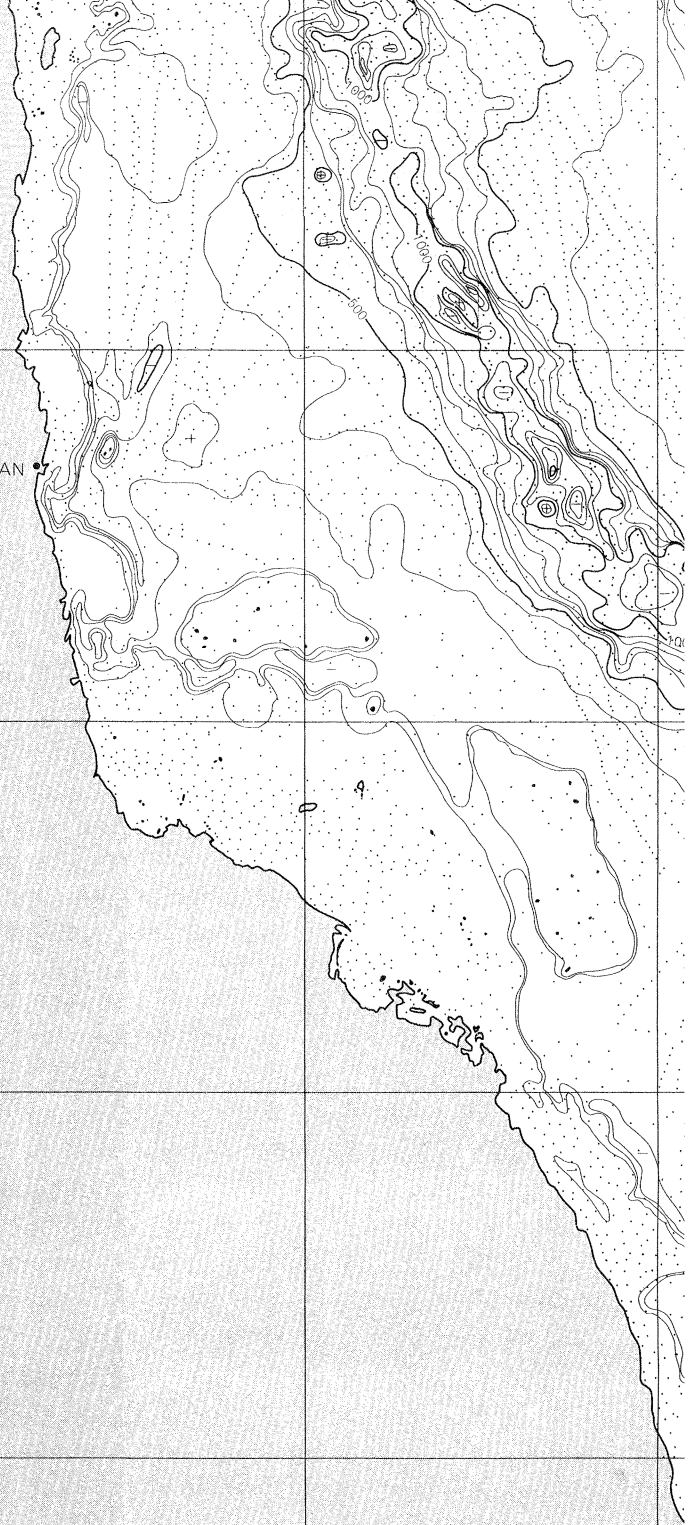
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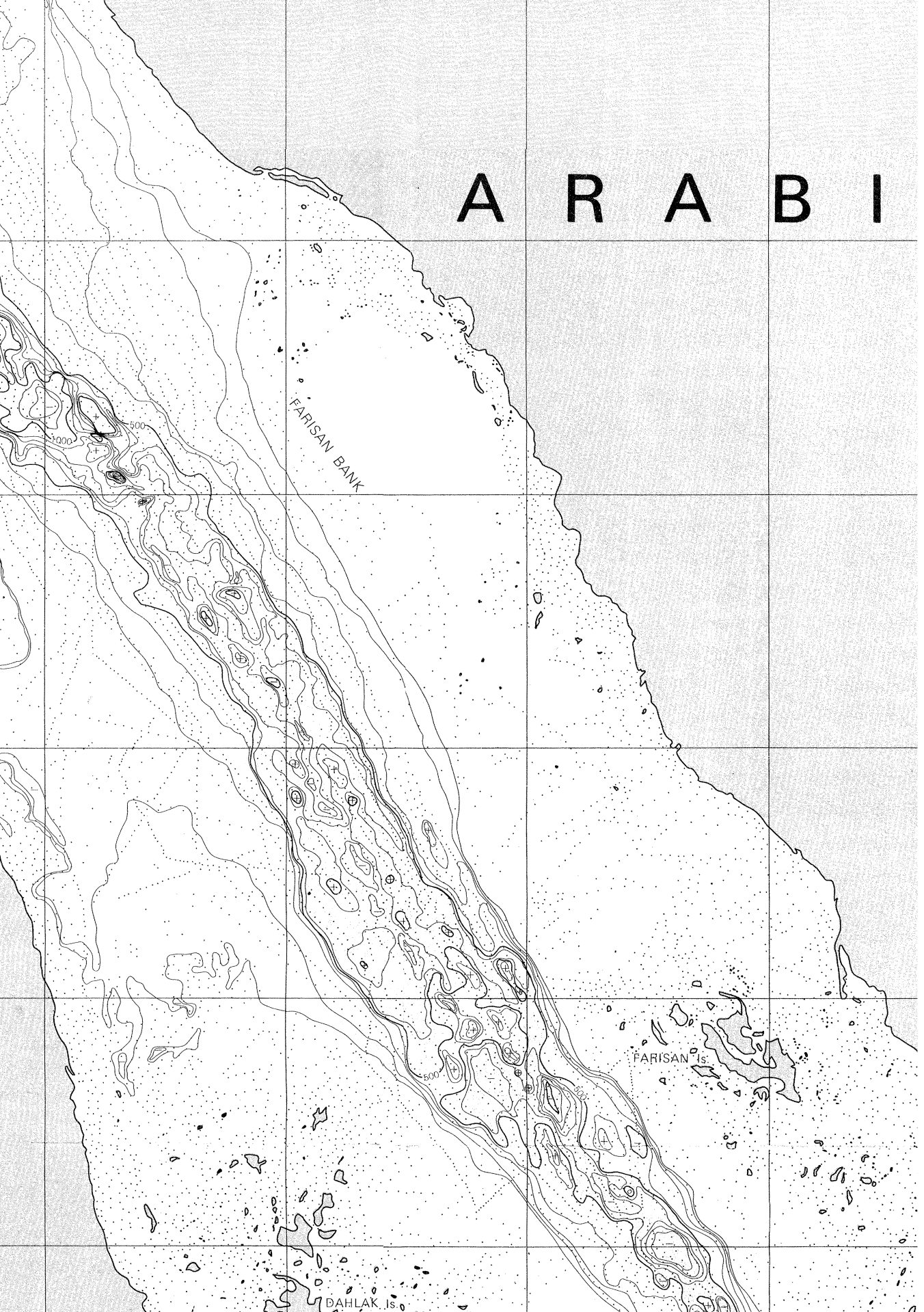
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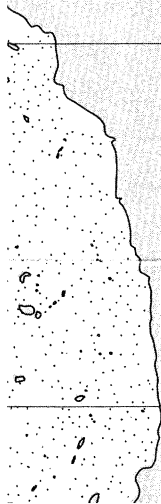
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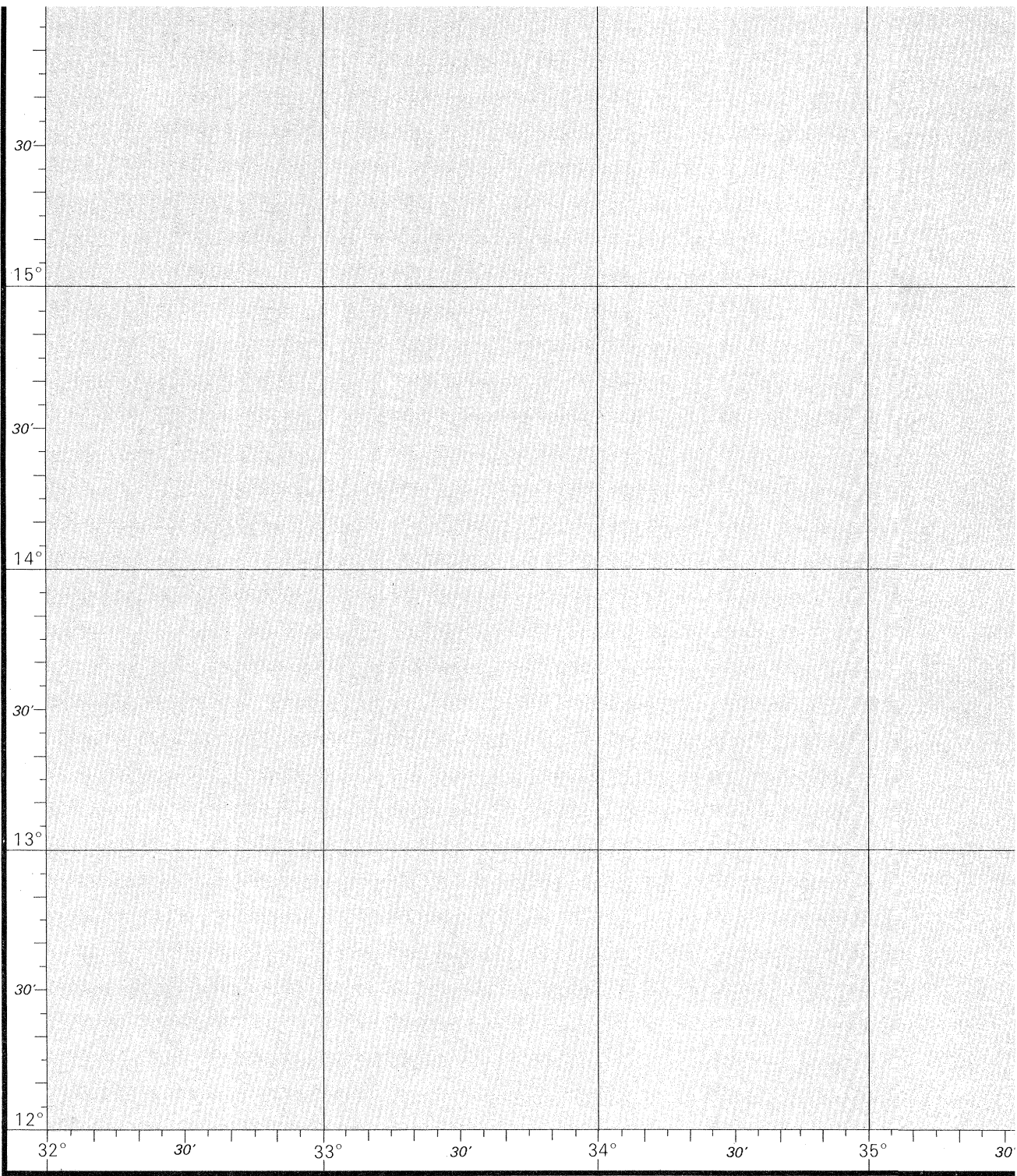
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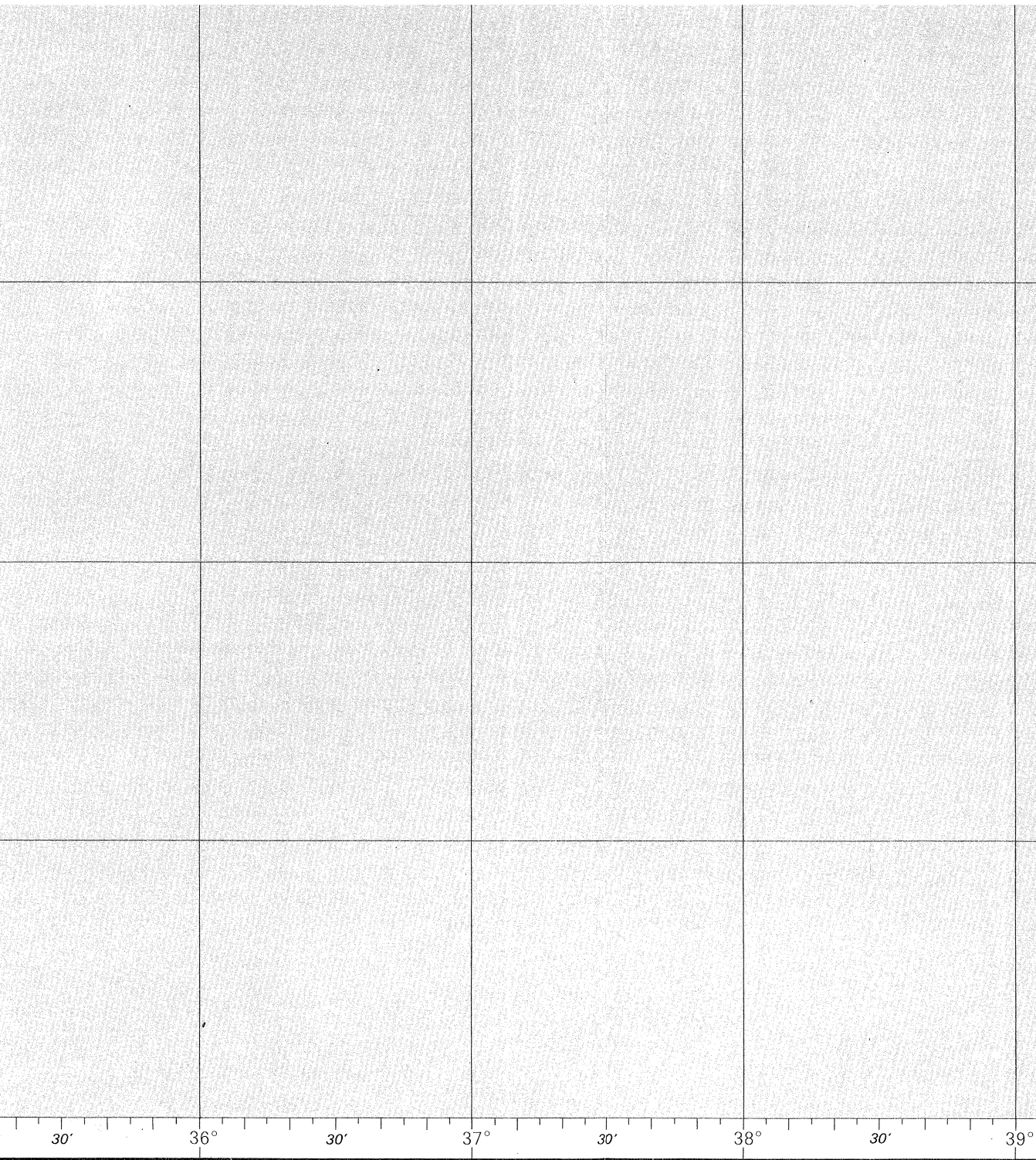
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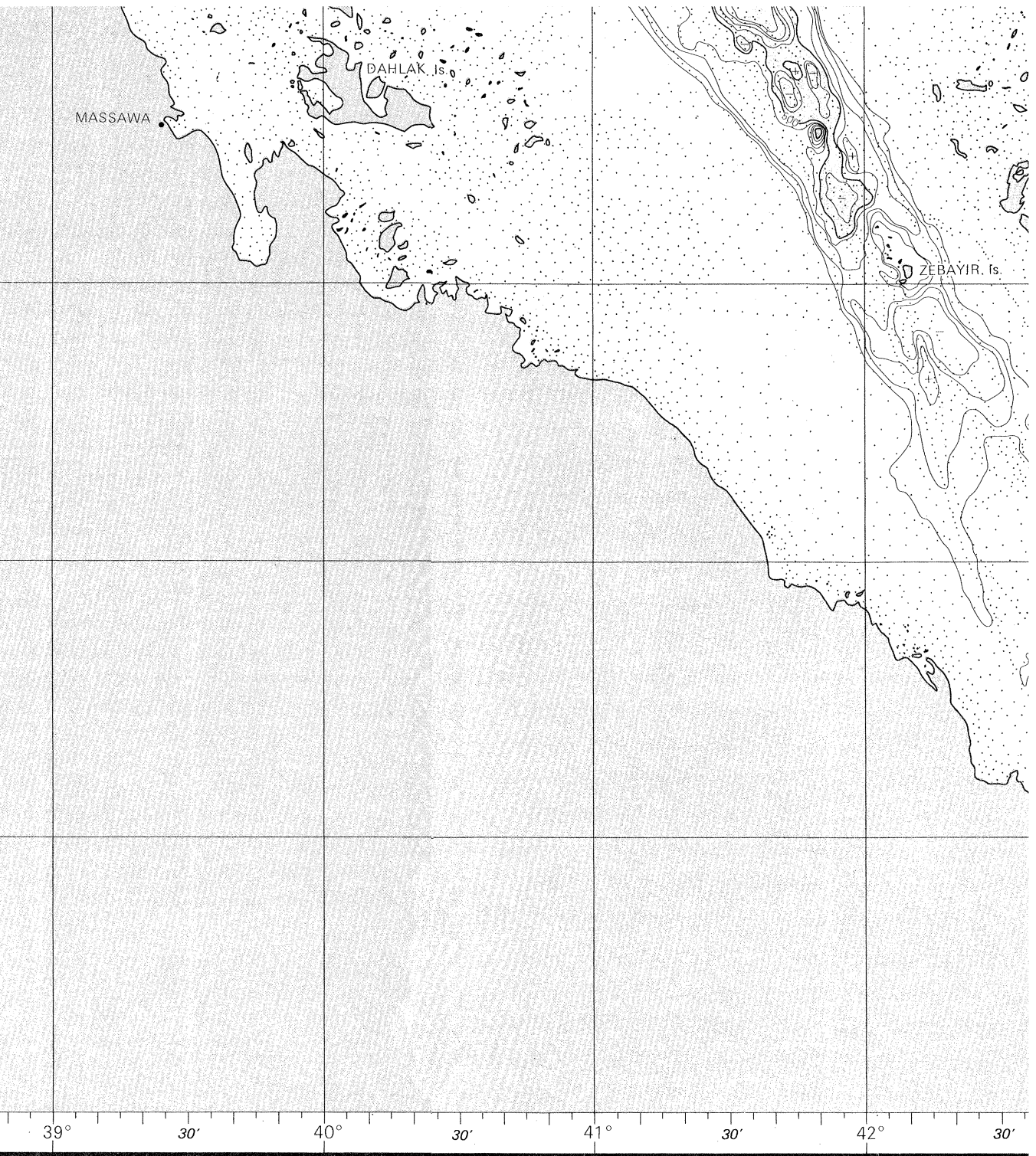
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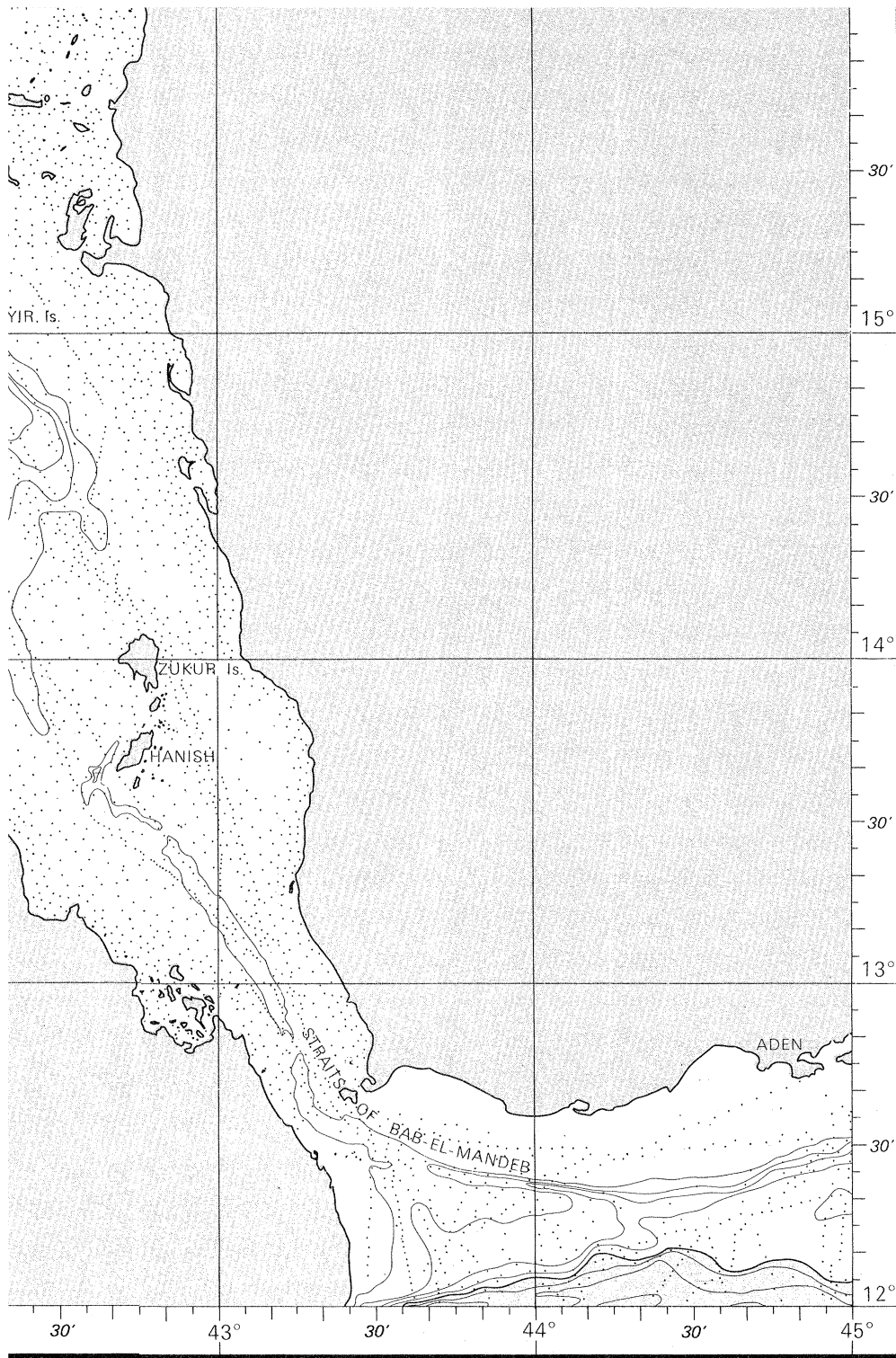
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THE RED SEA

CONTOURED BY A. S. LAUGHTON
National Institute of Oceanography
Great Britain.

SCALE 1:2,000,000 at 33° N

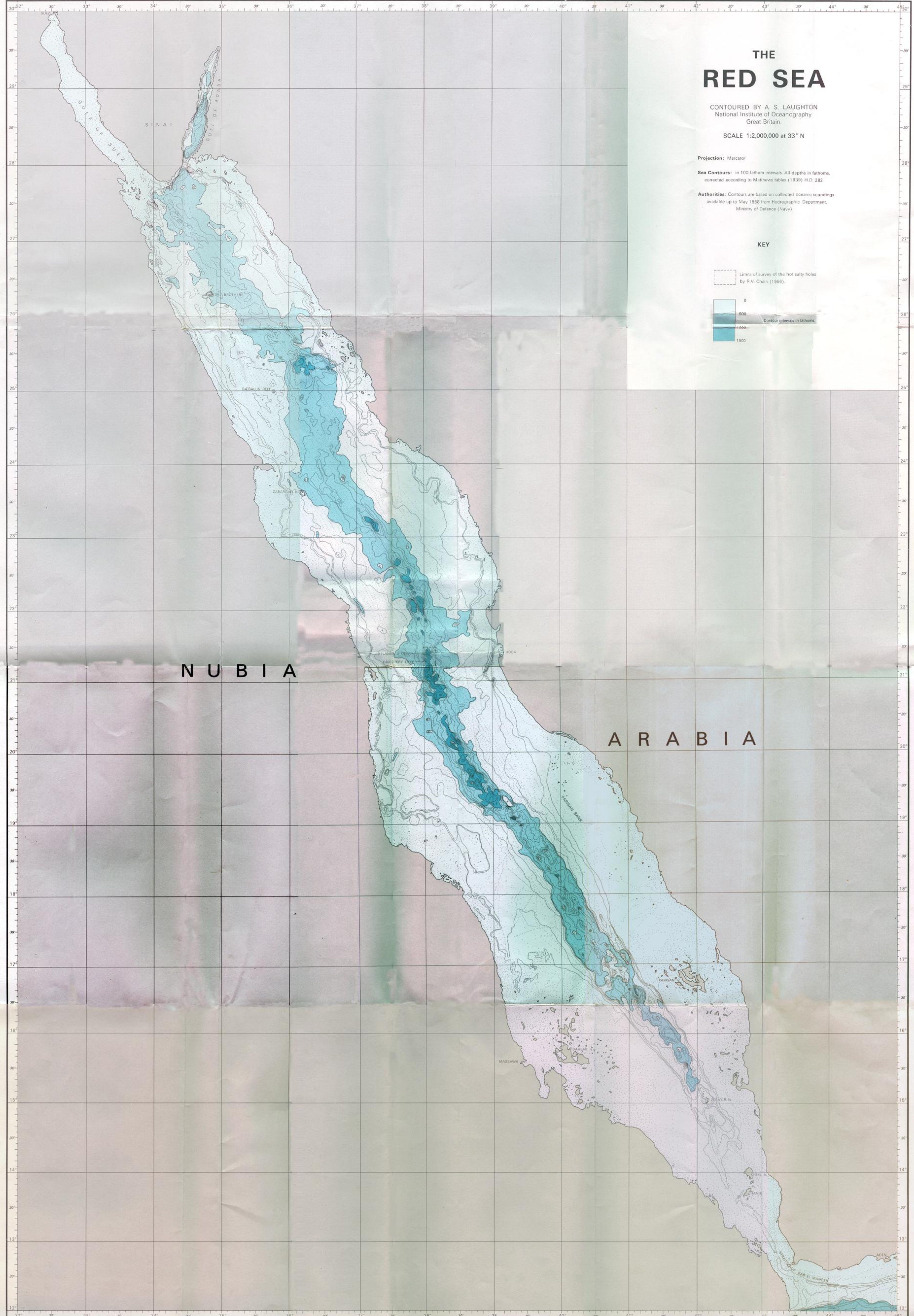
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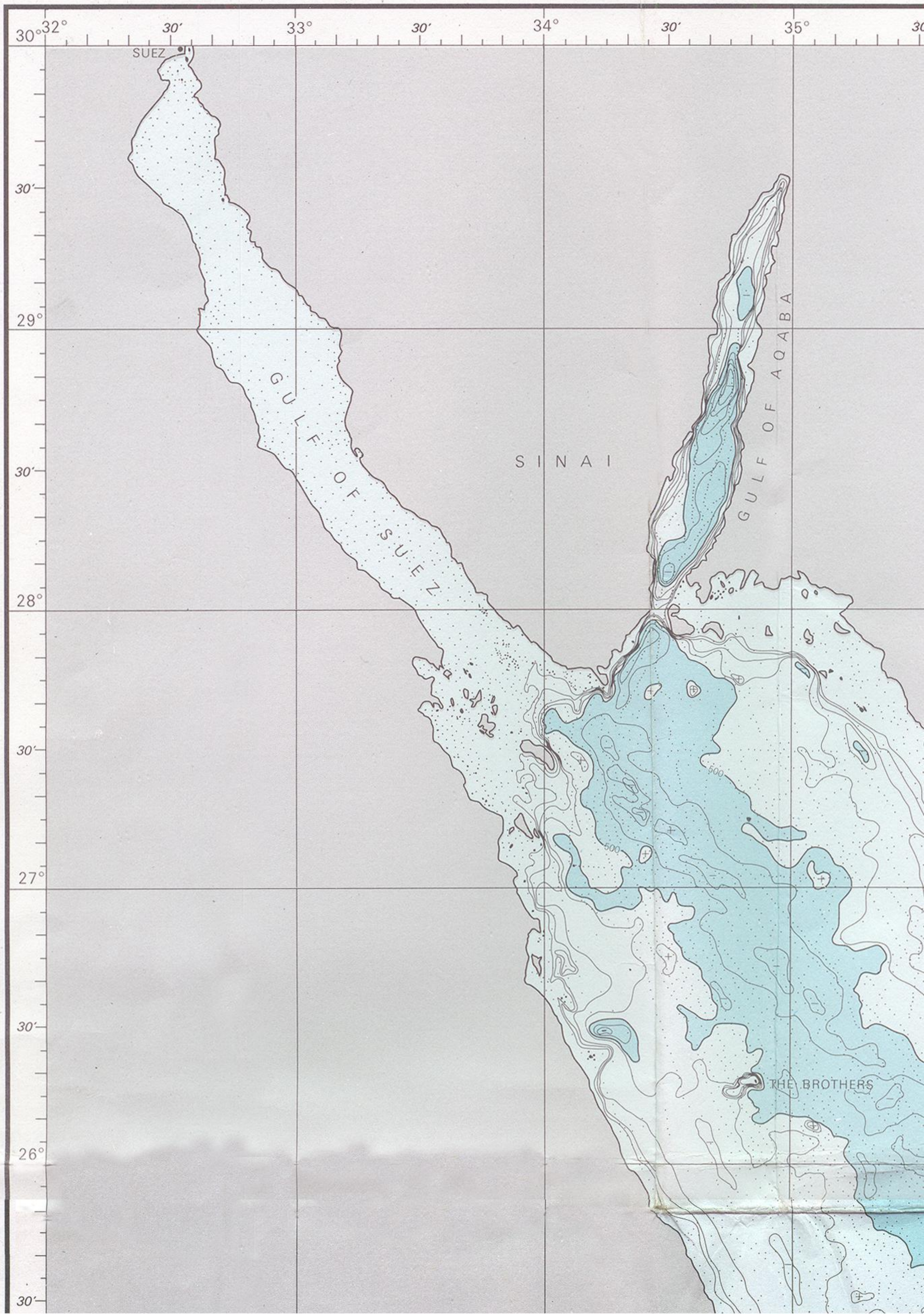
Sea Contours: in 100 fathom intervals. All depths in fathoms, corrected according to Mathews tables (1939) H.D. 282

Authorities: Contours are based on collected oceanic soundings available up to May 1968 from Hydrographic Department, Ministry of Defence (Navy)

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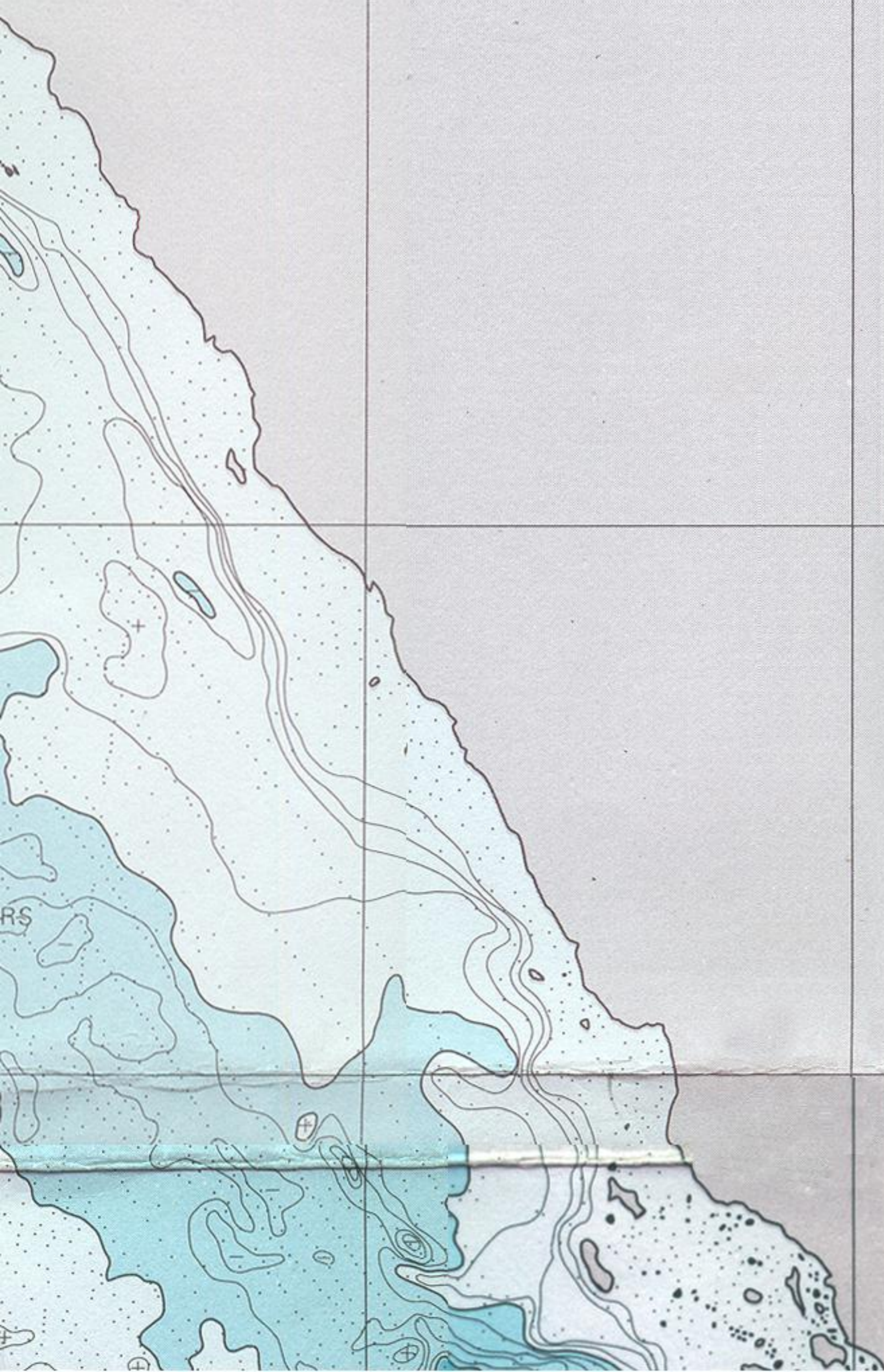
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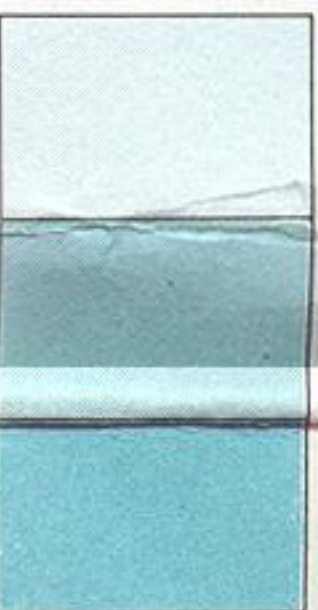
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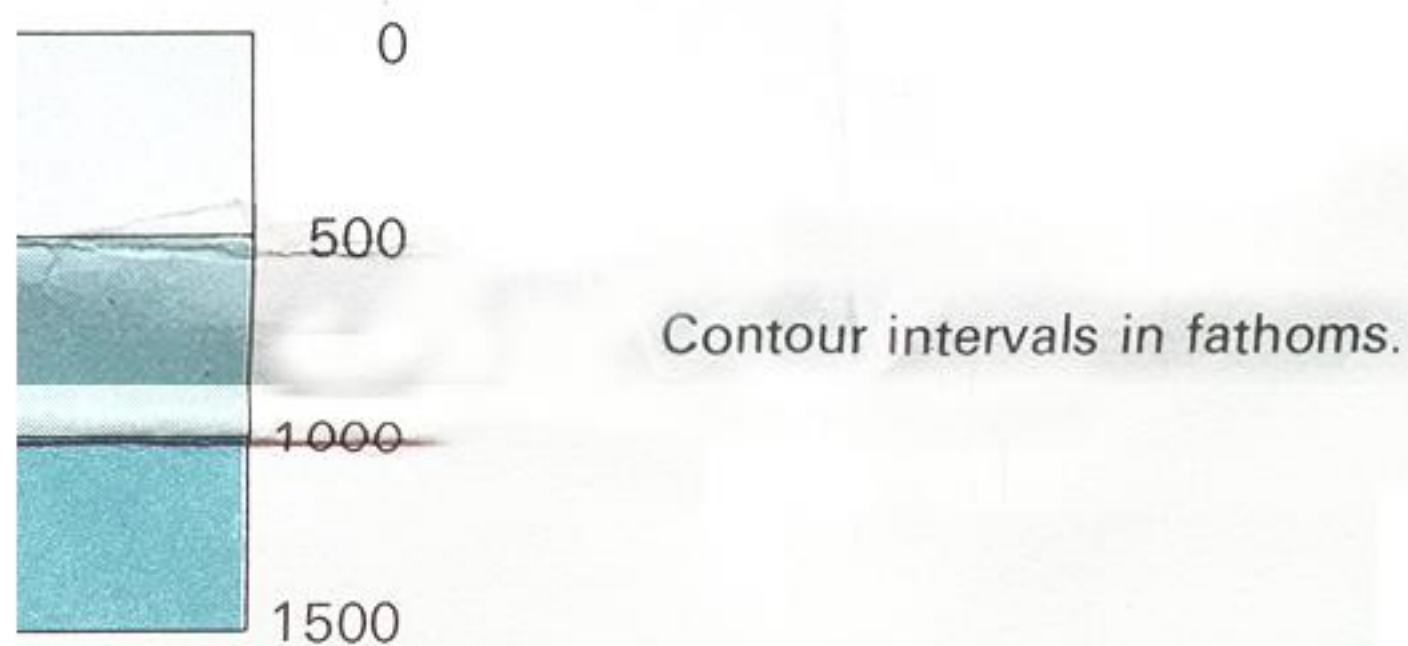
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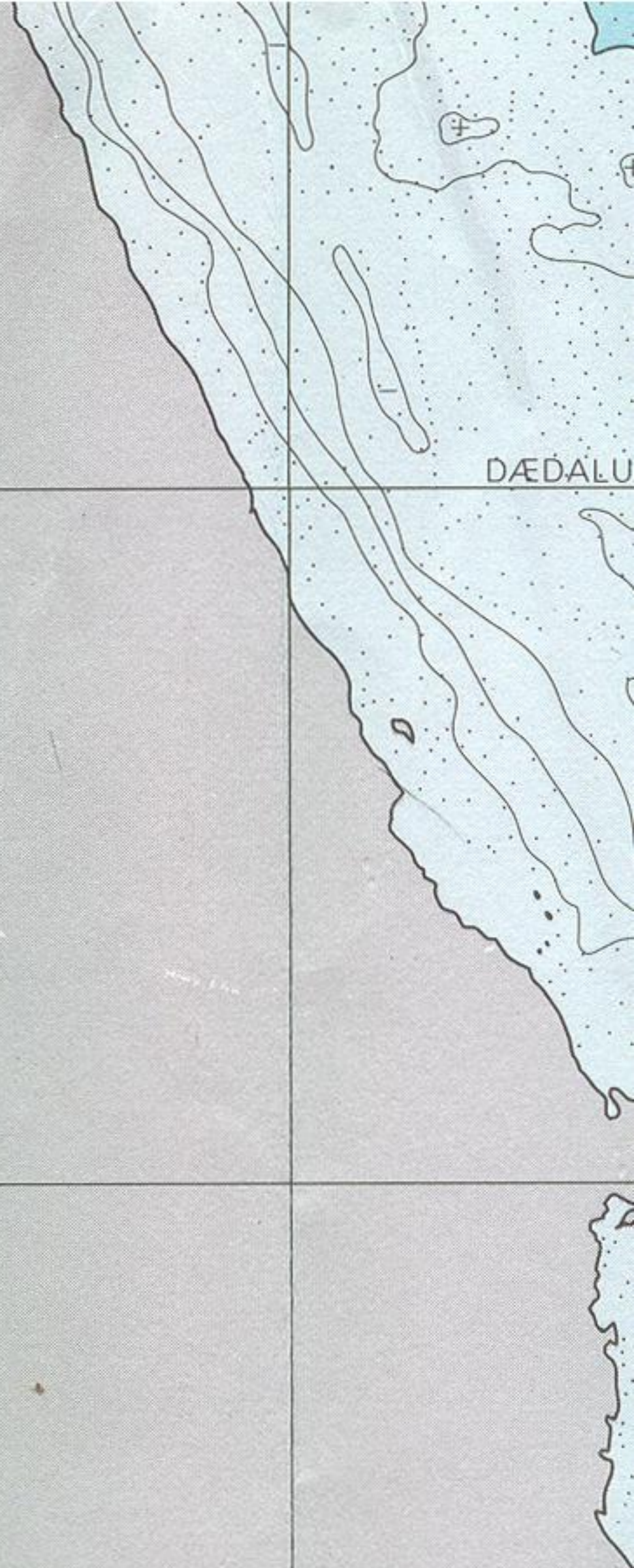
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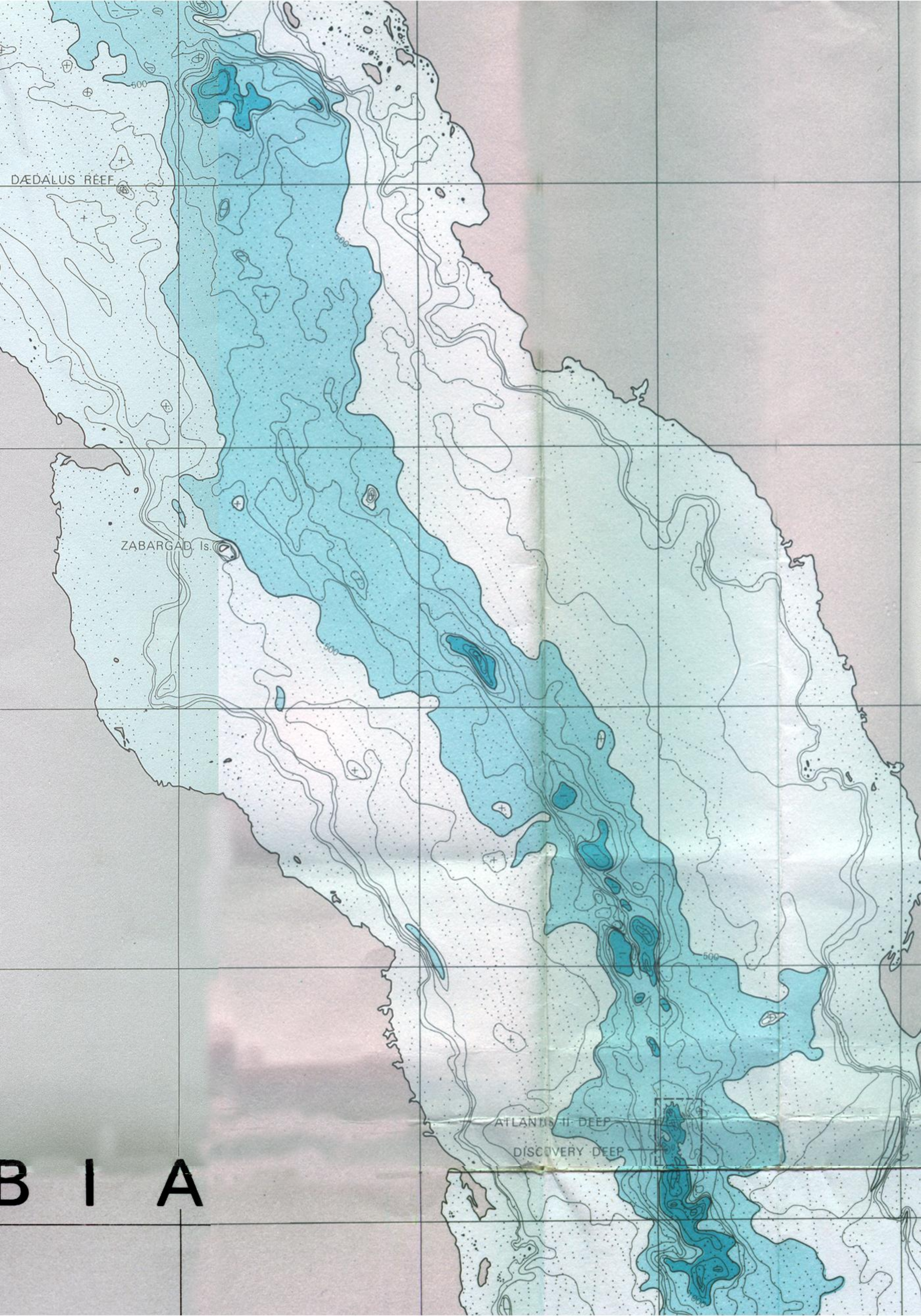
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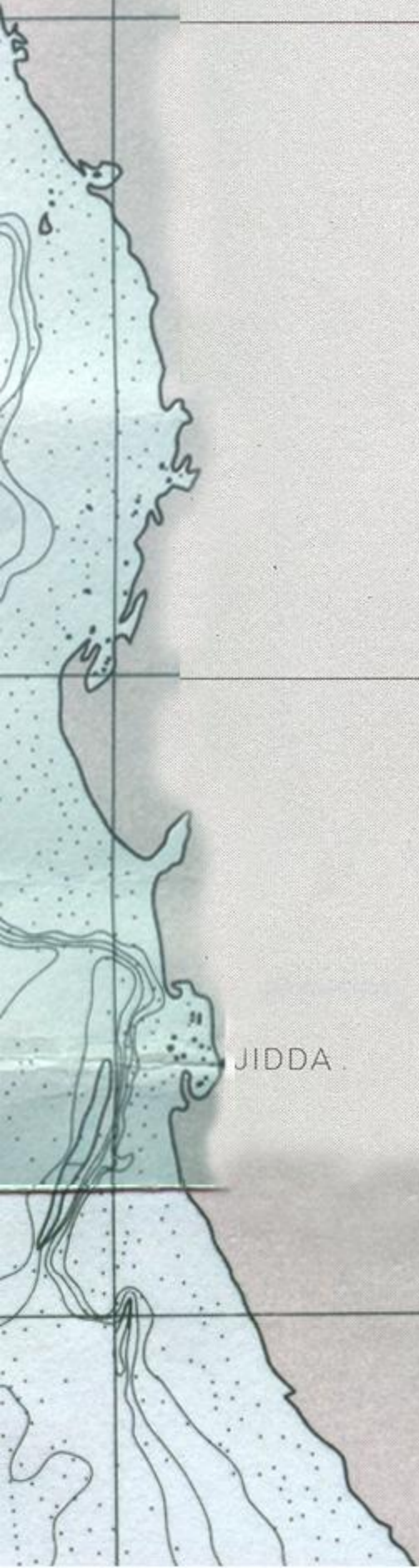
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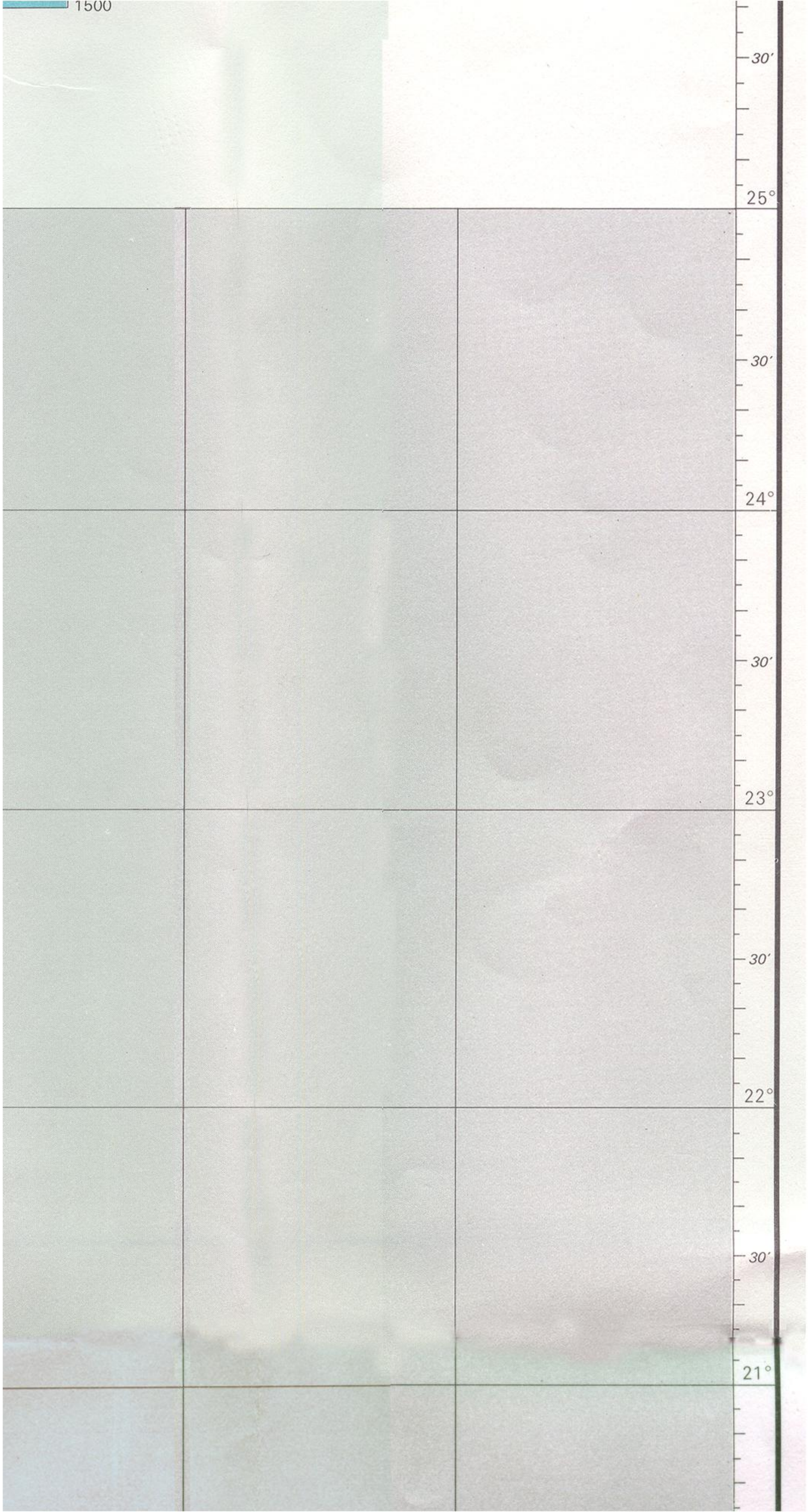
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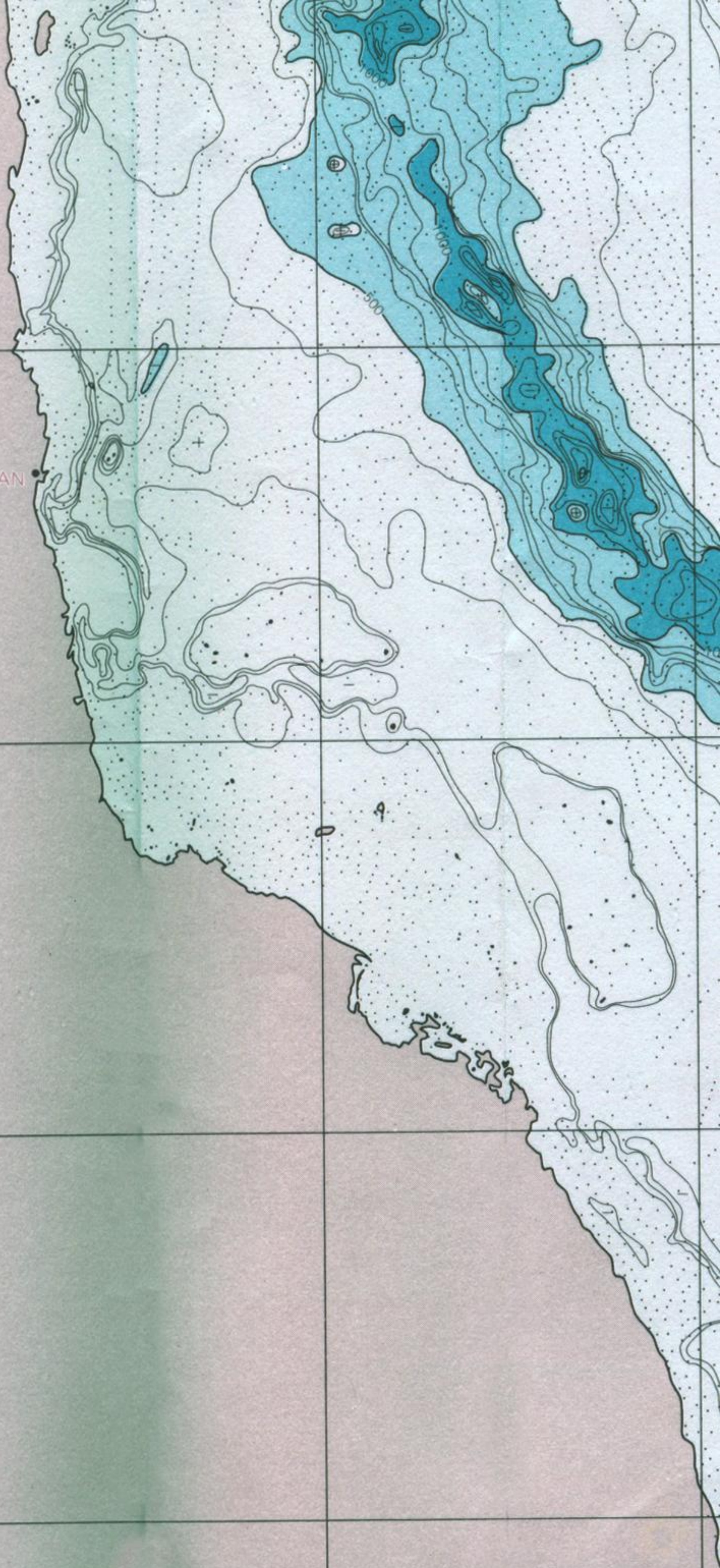
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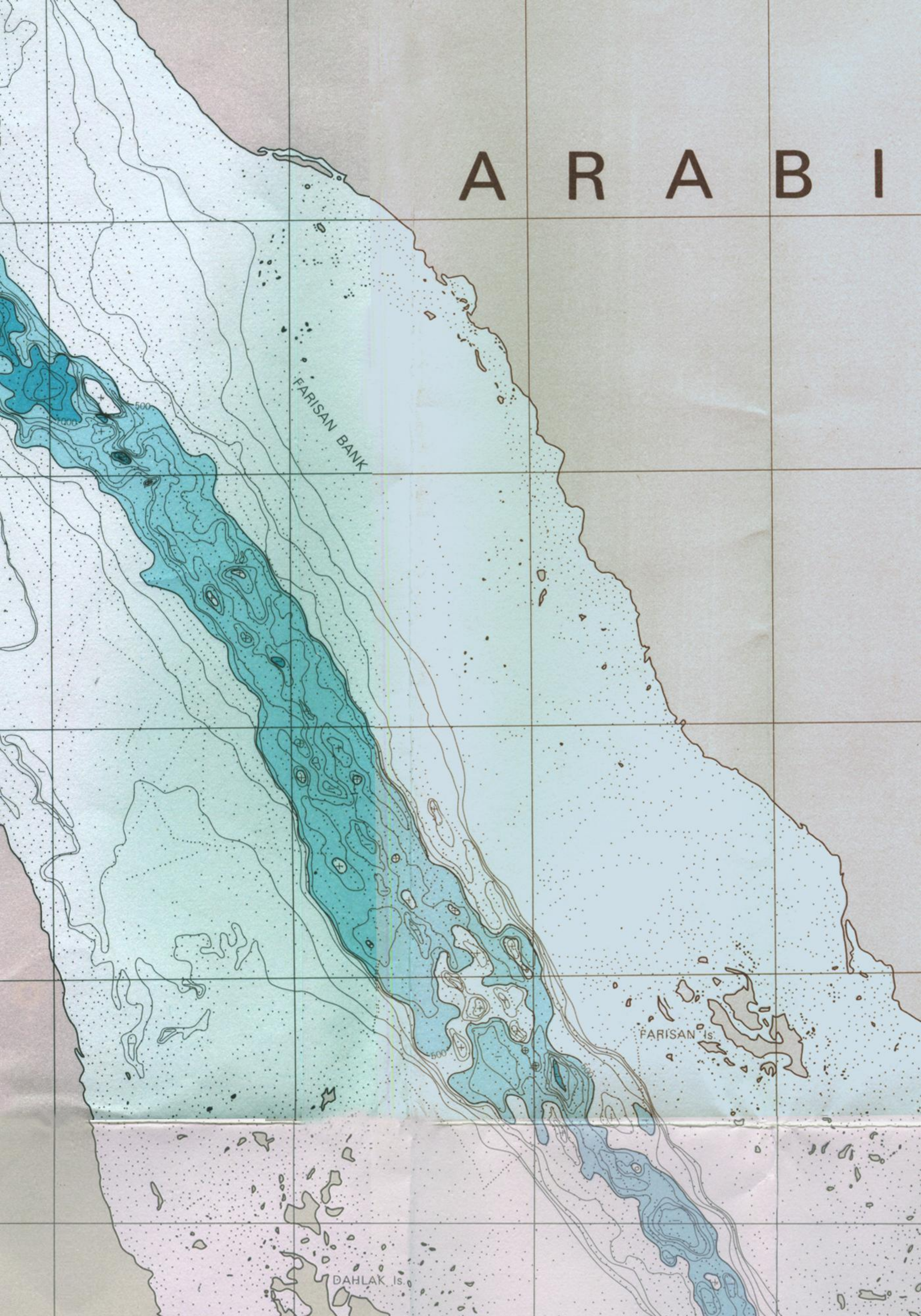
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