



Red Sea Salt Basin Assessment Unit 20710202



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-  Red Sea Basin Geologic Province 2071

USGS PROVINCE: Red Sea Basin (2071)

GEOLOGIST: S.J. Lindquist

TOTAL PETROLEUM SYSTEM: Maqna (207102)

ASSESSMENT UNIT: Red Sea Salt Basin (20710202) (hypothetical)

DESCRIPTION: The Red Sea basin originated as an Oligocene cratonic rift between the northeastern part of the African continent and the Saudi Arabian peninsula. It has been undergoing sea floor spreading for the last 5 m.y. This completely offshore assessment unit includes areas basinward of assessment unit 20710201 but excludes the axial rift where sea floor spreading is occurring. The assessment unit encompasses portions of Egypt, Sudan, Eritrea, Saudi Arabia, and Yemen and is roughly 300,000 sq km in area.

SOURCE ROCKS: Miocene (and some Pliocene) oil-and-gas-prone syn-rift and post-rift shales from a variety of laterally limited depositional settings ranging from marine to terrigenous. They typically average 1 to 4 wt. % TOC (maximum 30 wt. %), with variable thicknesses.

MATURATION: Dominantly Late Miocene to Recent, 10 to 0 Ma. Thermal gradients here are highest of any of the Red Sea Province assessment units.

MIGRATION: Migration paths are expected to be simple and short in distance.

RESERVOIR ROCKS: Miocene and younger sandstones and carbonates from depositional environments ranging from deep marine to deltaic, coastal and subaerial. Arithmetic average of porosity is about 22 percent and of permeability about 1 D.

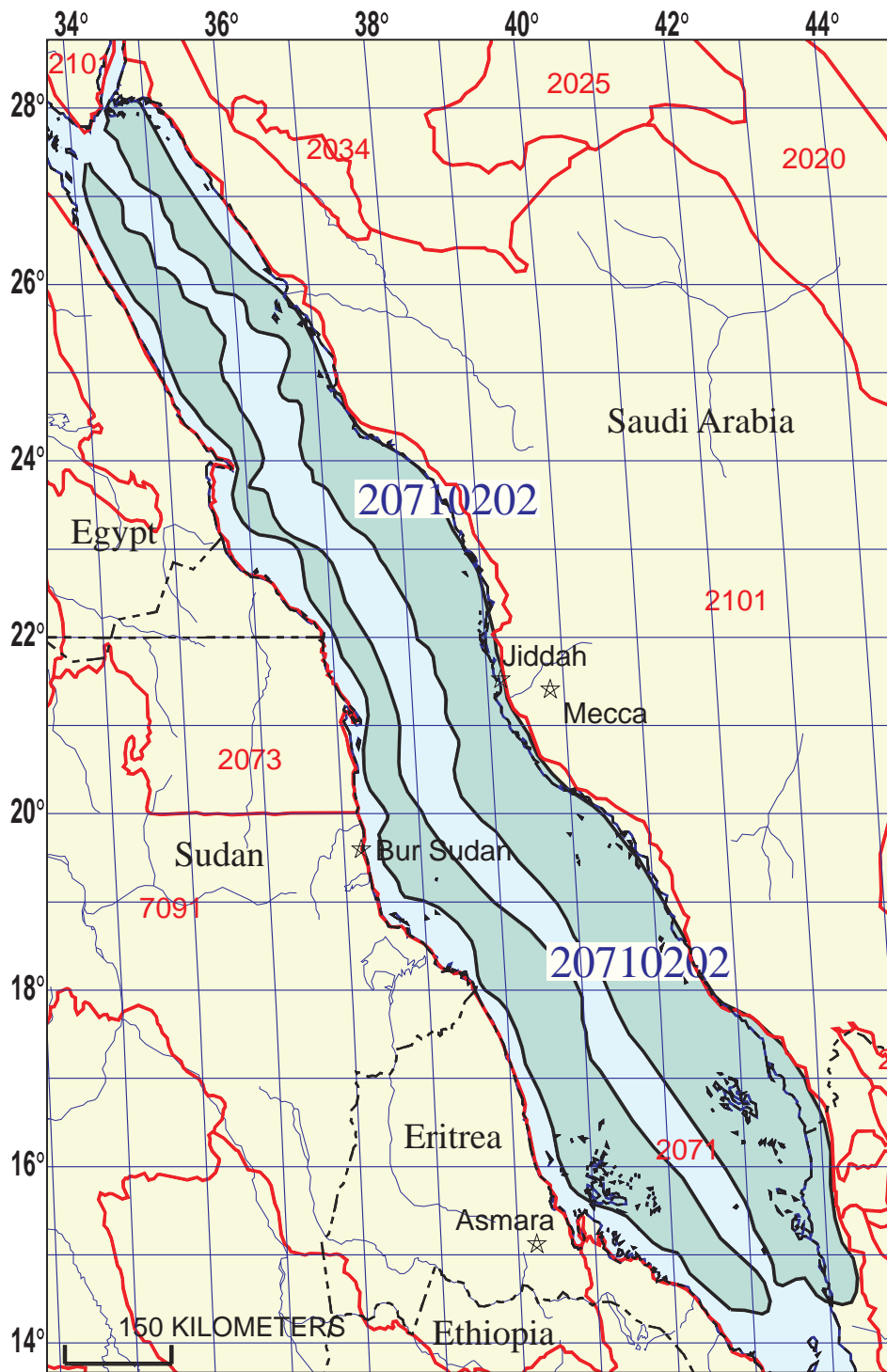
TRAPS AND SEALS: Traps are expected to be both stratigraphic and structural, related to salt tectonism. The regional seal is extensive Upper Miocene and Pliocene salts, evaporites and shales to hundreds of meters in thickness.

REFERENCES:

Journal of Petroleum Geology, 1989, v. 12, no. 2.

Journal of Petroleum Geology, 1992, v. 15, no. 2.

Lindquist, S.J., 1998, The Red Sea basin province—Sudr-Nubia(!) and Maqna(!) petroleum systems: U.S. Geological Survey Open-File Report 99-50-A, 21 p., 11 figs., 2 tables.



Red Sea Salt Basin Assessment Unit - 20710202

EXPLANATION

- Hydrography
- Shoreline
- 2071 Geologic province code and boundary
- - - Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 20710202 — Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

**SEVENTH APPROXIMATION
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS**

Date:..... 11/20/98
 Assessment Geologist:..... T.S. Ahlbrandt
 Region:..... Middle East and North Africa Number: 2
 Province:..... Red Sea Basin Number: 2071
 Priority or Boutique..... Priority
 Total Petroleum System:..... Maqna Number: 207102
 Assessment Unit:..... Red Sea Salt Basin Number: 20710202
 * Notes from Assessor Used MMS growth factor.

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (≥20,000 cfg/bo overall):... Oil

What is the minimum field size?..... 10 mmboe grown (≥1mmboe)
 (the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:..... Oil: 0 Gas: 0
 Established (>13 fields) Frontier (1-13 fields) Hypothetical (no fields) X

Median size (grown) of discovered oil fields (mmboe):
 1st 3rd 2nd 3rd 3rd 3rd
 Median size (grown) of discovered gas fields (bcfg):
 1st 3rd 2nd 3rd 3rd 3rd

Assessment-Unit Probabilities:

<u>Attribute</u>	<u>Probability of occurrence (0-1.0)</u>
1. CHARGE: Adequate petroleum charge for an undiscovered field ≥ minimum size.....	0.9
2. ROCKS: Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size.....	0.9
3. TIMING OF GEOLOGIC EVENTS: Favorable timing for an undiscovered field ≥ minimum size	0.9

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):..... 0.73

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field
 ≥ minimum size..... 1.0

UNDISCOVERED FIELDS

Number of Undiscovered Fields: How many undiscovered fields exist that are ≥ minimum size?:
 (uncertainty of fixed but unknown values)

Oil fields:.....min. no. (>0) 1 median no. 25 max no. 50
 Gas fields:.....min. no. (>0) 1 median no. 50 max no. 100

Size of Undiscovered Fields: What are the anticipated sizes (**grown**) of the above fields?:
 (variations in the sizes of undiscovered fields)

Oil in oil fields (mmbo)..... min. size 10 median size 15 max. size 500
 Gas in gas fields (bcfg):..... min. size 60 median size 90 max. size 2400

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

<u>Oil Fields:</u>	minimum	median	maximum
Gas/oil ratio (cfg/bo).....	1000	2000	3000
NGL/gas ratio (bngl/mmcf).....	20	30	40
<u>Gas fields:</u>	minimum	median	maximum
Liquids/gas ratio (bngl/mmcf).....	30	40	50
Oil/gas ratio (bo/mmcf).....			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

<u>Oil Fields:</u>	minimum	median	maximum
API gravity (degrees).....	40	48	55
Sulfur content of oil (%).....	0.5	0.8	1
Drilling Depth (m)	1000	3000	5000
Depth (m) of water (if applicable).....	20	50	1000
<u>Gas Fields:</u>	minimum	median	maximum
Inert gas content (%).....			
CO ₂ content (%).....			
Hydrogen-sulfide content (%).....	1000	3000	5000
Drilling Depth (m).....	20	50	1000
Depth (m) of water (if applicable).....			

**ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT
 TO COUNTRIES OR OTHER LAND PARCELS** (uncertainty of fixed but unknown values)

1. Egypt represents 8.3 areal % of the total assessment unit

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>8.3</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>100</u>	_____
<u>Gas in Gas Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>8.3</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>100</u>	_____

2. Sudan represents 11.6 areal % of the total assessment unit

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>11.6</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>100</u>	_____
<u>Gas in Gas Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>11.6</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>100</u>	_____

3. Eritrea represents 17.7 areal % of the total assessment unit

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>17.7</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>97.9</u>	_____
<u>Gas in Gas Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>17.7</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>97.9</u>	_____

4. Yemen represents 8.3 areal % of the total assessment unit

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>8.3</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>68.2</u>	_____
<u>Gas in Gas Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>8.3</u>	_____
Portion of volume % that is offshore (0-100%):.....	_____	<u>68.2</u>	_____

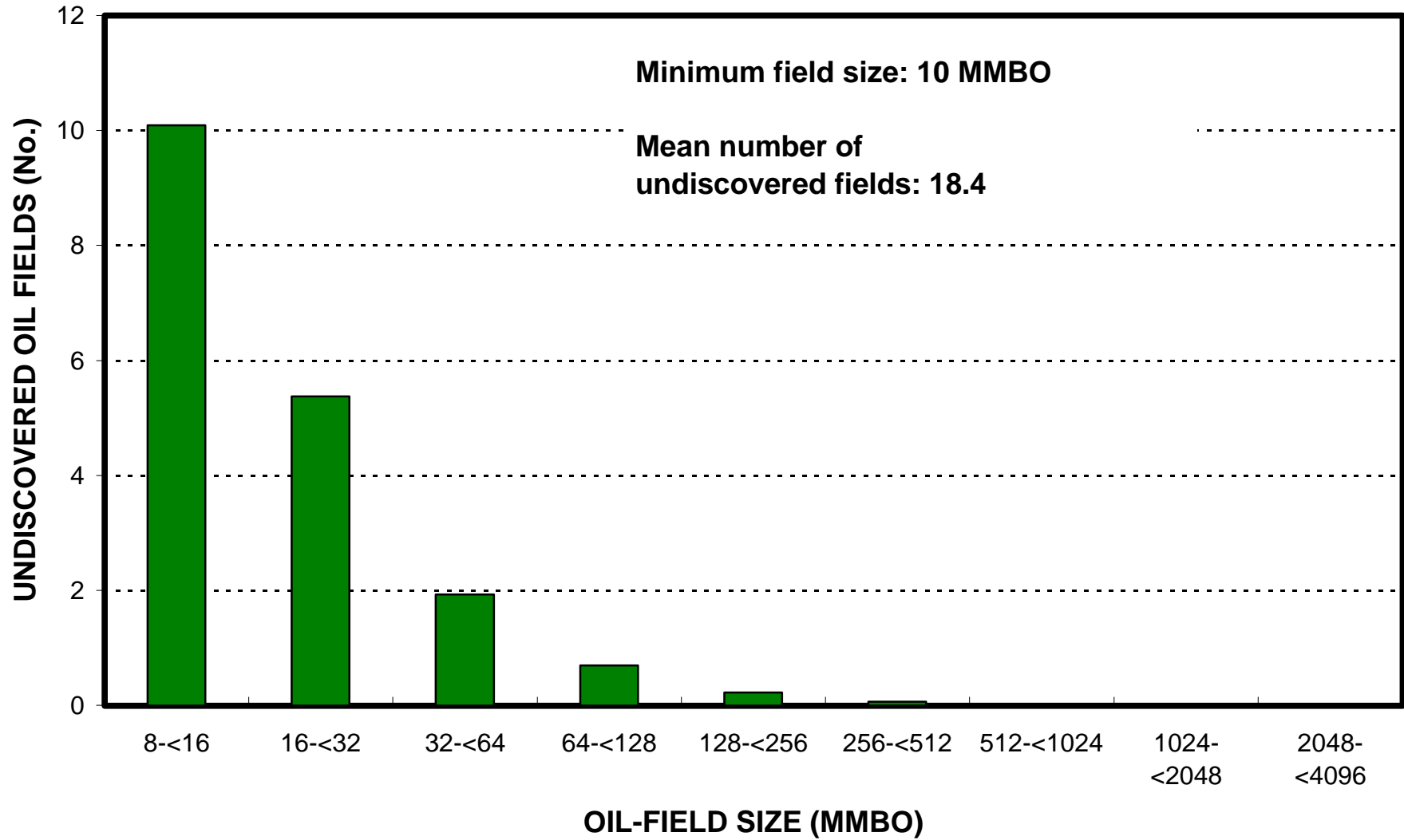
5. Saudi Arabia represents 54.1 areal % of the total assessment unit

<u>Oil in Oil Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>54.1</u>	_____
Portion of volume % that is offshore (0-100%).....	_____	<u>96.4</u>	_____

<u>Gas in Gas Fields:</u>	minimum	median	maximum
Richness factor (unitless multiplier):.....	_____	_____	_____
Volume % in parcel (areal % x richness factor):...	_____	<u>54.1</u>	_____
Portion of volume % that is offshore (0-100%).....	_____	<u>96.4</u>	_____

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Undiscovered Field-Size Distribution



Red Sea Salt Basin, AU 20710202

Undiscovered Field-Size Distribution

