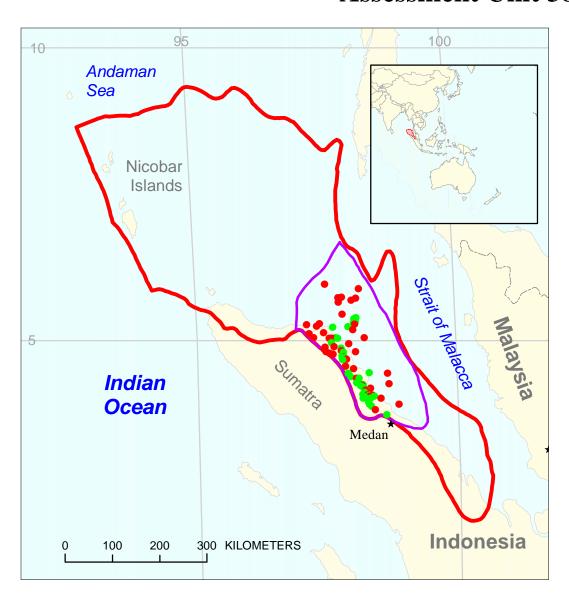
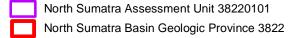
North Sumatra Assessment Unit 38220101





USGS PROVINCE: North Sumatra Basin (3822) **GEOLOGIST:** M.G. Bishop

TOTAL PETROLEUM SYSTEM: Bampo-Cenozoic (382201)

ASSESSMENT UNIT: North Sumatra (38220101)

DESCRIPTION: Onshore and offshore Tertiary rift basins oriented north-south formed on the southern edge of the Sunda Shelf with early lacustrine depositional history followed by marine incursion from the south and carbonate platform deposition and reef formation on paleohighs. Late Miocene compression resulted in a foreland basin with clastic input from the rising mountains to the south, and later, detached folding. Offshore areas are primarily in waters of Indonesia.

SOURCE ROCKS: Late Oligocene to Early Miocene transgressive black shales of the Bampo Formation (Black Claystone/Black Mudstone) were deposited in lacustrine to restricted marine environments. Organic matter dominated by land plant detritus yields Type III kerogen, average TOC of 0.5 wt. % and low HI. Southeastern portions of the assessment unit contain more oil prone facies, northwestern areas gas prone facies exist.

MATURATION: Began in the deepest half grabens at about 11 Ma and continues.

MIGRATION: The first stage in the Early Miocene, the second stage was during Plio-Pleistocene faulting and folding related to the formation of the Barisan Mountains.

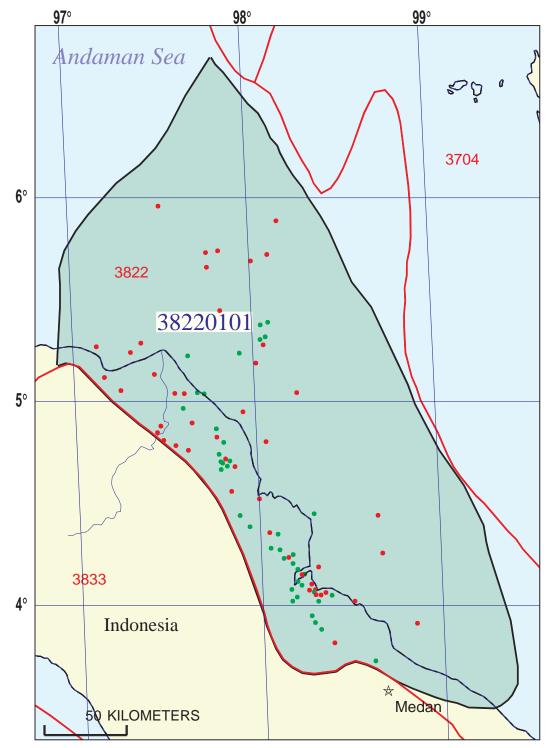
RESERVOIR ROCKS: The most important reservoir rocks are Miocene platform carbonates and reefs of the Belumai and Peutu formations.

TRAPS AND SEALS: Carbonate reservoir rocks are involved in anticline traps and combination faulted stratigraphic traps. Carbonate reefs and buildups are found on top of and around basement highs. Regional shales of the Middle Miocene Baong Formation seal most of the reservoirs. Intraformational seals also form important traps.

REFERENCES:

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- Kirby, G.A., Morley, R.J., Humphreys, B., Matchette-Downes, C.J., Sarginson, M.J., Lott, G.K., Nicholson, R.A., Yulihanto, B., Widiastuti, R., Karmajaya, Sundoro, Fitris, F., Sofyan, S., and Sri Wijaya, 1993, A re-evaluation of the regional geology and hydrocarbon prospectively of the onshore central North Sumatra Basin: Proceedings, Indonesian Petroleum Association Twenty Second Annual Convention, October, 1993, p. 243-264.
- Pertamina BPPKA, ed., 1996, Petroleum geology of Indonesian basins principles, methods and application: Volume I North Sumatra Basin: Pertamina BPPKA, Jakarta, Indonesia, 85 p.

Ryacudu, R., Djaafar, R., and Gutomo, A., 1992, Wrench faulting and its implication for hydrocarbon accumulation in the Kuala Simpang area-North Sumatra Basin: Proceedings, Indonesian Petroleum Association Twenty First Annual Convention, October, 1992, p. 93-116.



North Sumatra Assessment Unit - 38220101

EXPLANATION

- Hydrography
- Shoreline

- Geologic province code and boundary 3822

- Country boundary
- Gas field centerpoint

Assessment unit 38220101 -Oil field centerpoint code and boundary

Projection: Robinson. Central meridian: 0

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

Date:	5/25/99							
Assessment Geologist:								
Region:	Asia Pacific				Number:	3		
Province:	North Sumatra Basin				Number:	3822		
Priority or Boutique								
Total Petroleum System:	Bampo-Cenozoic				Number:	382201		
Assessment Unit:	North Sumatra				Number:	38220101		
 Notes from Assessor 	MMS growth function.							
CHARACTERISTICS OF ASSESSMENT UNIT Oil (<20,000 cfg/bo overall) or Gas (≥20,000 cfg/bo overall): Gas								
What is the minimum field size? 1 mmboe grown (≥1mmboe) (the smallest field that has potential to be added to reserves in the next 30 years)								
Number of discovered fields e	xceeding minimum size:		Oil:	36	Gas:	44		
Established (>13 fields)	X Frontier (1	-13 fields)	Н	ypothetical	(no fields)			
Median size (grown) of discov	ered oil fields (mmboe): 1st 3rd	15	2nd 3rd	11	3rd 3rd	6		
Median size (grown) of discov	ered gas fields (bcfg): 1st 3rd	72	2nd 3rd	86	3rd 3rd	106		
Assessment-Unit Probabiliti Attribute 1. CHARGE: Adequate petro	eum charge for an undis		eld <u>></u> minimum	size		1.0		
2. ROCKS: Adequate reservo						1.0		
3. TIMING OF GEOLOGIC EV	ENTS: Favorable timino	g for an un	discovered fiel	d <u>></u> minim	um size	1.0		
Assessment-Unit GEOLOGIC	C Probability (Product o	of 1, 2, and	3):		1.0			
4. ACCESSIBILITY: Adequa	te location to allow explo	ration for a	an undiscovere	ed field				
<u>></u> 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:	` ,	10	_median no.	20	max no.	40		
Gas fields:	min. no. (>0)	20	median no.	60	max no.	120		
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	1	median size	3	max. size	100		
Gas in gas fields (bcfg):		6	median size median size	60	max. size	4000		
Cao in gao noido (borg)		<u> </u>			max. SIZE	7000		

Assessment Unit (name, no.) North Sumatra, 38220101

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed	d but unknown values)
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Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)	1000	2000	3000
NGL/gas ratio (bngl/mmcfg)	30	60	90
Gas fields:	minimum	median 10	maximum 20
Liquids/gas ratio (bngl/mmcfg) Oil/gas ratio (bo/mmcfg)			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

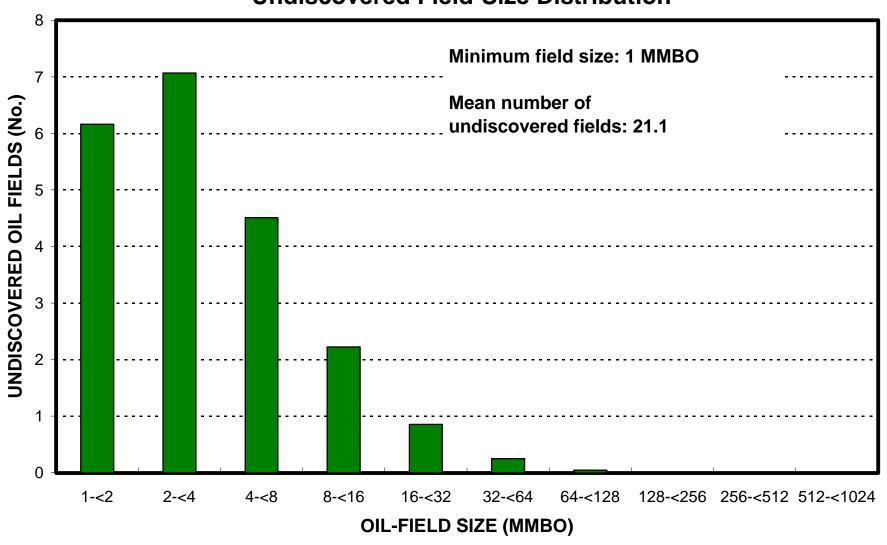
Oil Fields:	minimum	median	maximum
API gravity (degrees)	19	50	55
Sulfur content of oil (%)	0.01	0.03	0.1
Drilling Depth (m)	300	1500	3500
Depth (m) of water (if applicable)	0	70	200
2 op 11. (11.) 0. maio: (1. app.10a210)			

Gas Fields:	minimum	median	maximum
Inert gas content (%)	0.05	3.1	14
CO ₂ content (%)	0.1	15	90
Hydrogen-sulfide content (%)	0	0	0
Drilling Depth (m)	300	2500	4000
Depth (m) of water (if applicable)	0	70	600

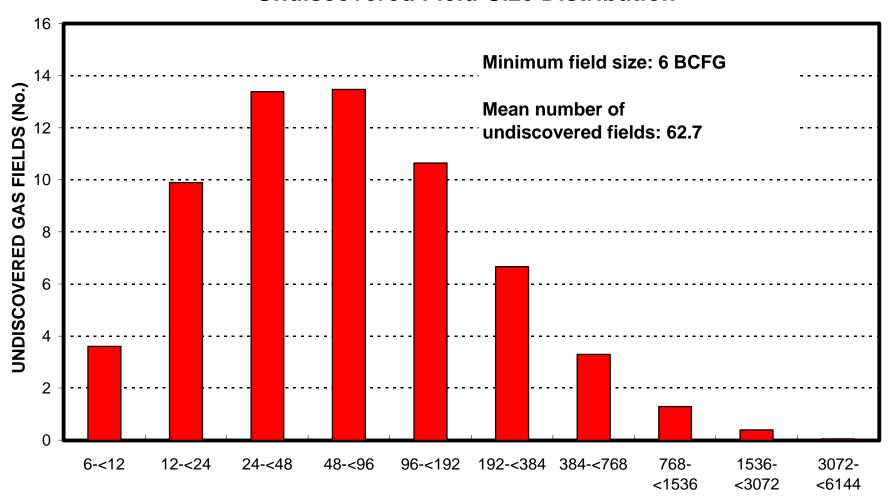
ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

1. Indonesia	represents	91	areal % of	the total ass	essment u	nit
Oil in Oil Fields: Richness factor (unitless multipli	ier).	minimum		median		maximum
Volume % in parcel (areal % x ri			=	91		
Portion of volume % that is offsh			_	50		
1 order of volume 70 that is one	1010 (0 10070)		_			
Gas in Gas Fields:		minimum		median		maximum
Richness factor (unitless multipli	ier):					
Volume % in parcel (areal % x ri			_	91		
Portion of volume % that is offsh			_	50		
			_			
2. Malaysia	represents	6	_areal % of	the total ass	essment u	nit
Oil in Oil Fields:		minimum		median		maximum
Richness factor (unitless multiple			_			
Volume % in parcel (areal % x ri			_	6		
Portion of volume % that is offsh	nore (0-100%)		_	100		
Gas in Gas Fields:		minimum		median		maximum
Richness factor (unitless multiple	ier):		_			
Volume % in parcel (areal % x ri	ichness factor):		_	6		
Portion of volume % that is offsh	nore (0-100%)		_	100		
3. Thailand	represents	3	areal % of	the total ass	essment u	nit
•			_			
Oil in Oil Fields:		minimum		median		maximum
Richness factor (unitless multiple	ier):		_			
Volume % in parcel (areal % x ri	ichness factor):		_	3		
Portion of volume % that is offsh	nore (0-100%)		_	100		·
Coo in Coo Fields:		minimum		median		movimum
Gas in Gas Fields: Richness factor (unitless multipli	ior\:	minimum		median		maximum
Volume % in parcel (areal % x ri			_	3		
Portion of volume % that is offsh			_	100		
i ortion or volume /o mat is onsi	101 0 (0-100 /0)			100		

North Sumatra, AU 38220101 Undiscovered Field-Size Distribution



North Sumatra, AU 38220101 Undiscovered Field-Size Distribution



GAS-FIELD SIZE (BCFG)