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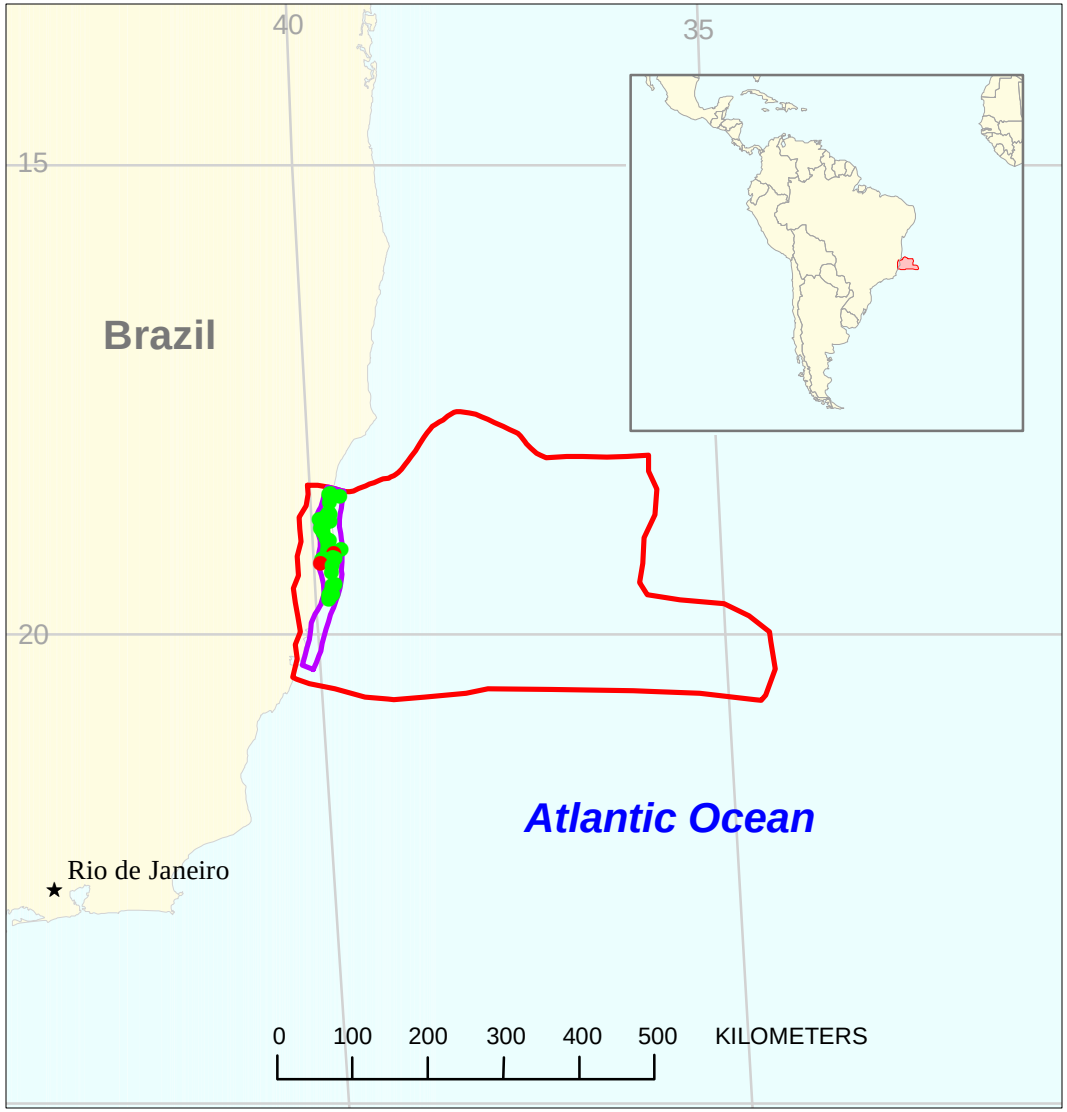
Espirito Santo Shelf
Assessment Unit 60340101



Geologic Summary

Detailed map of this assessment unit

Exploration/Discovery-History Data

- Plots of Known Field Sizes
- Plots of Grown Resources
- Tables

Assessment Input Data

Assessment Results

- Assessment Unit Summary
- Detailed Assessment Results
- Undiscovered Field-Size Distributions

USGS PROVINCE: Espirito Santo Basin (6034) **GEOLOGIST:** C.J. Schenk

TOTAL PETROLEUM SYSTEM: Cretaceous Composite (603401)

ASSESSMENT UNIT: Espirito Santo Shelf (60340101)

DESCRIPTION: This assessment unit is defined by fluvial, deltaic, and canyon-fill turbidite sandstones that occur in the narrow shelf area and immediately seaward of the shelf in the Espirito Santo Basin. The assessment unit extends from the Aptian hingeline in the west to the shelf break in the east, and from the Vitorio Arch in the south to the north where the basin narrows due to the Abrolhos Volcanic Complex.

SOURCE ROCKS: Main source rocks are synrift Barremian Cricare shales with TOC values greater than 5 percent; another potential source is Mariricu mudstone of Alagoas (Aptian) age with TOC values as high as 4 percent.

MATURATION: Maturation of Barremian shales and Alagoas shales is interpreted to have occurred in mid-Tertiary time based on temperatures and thickness of rock units from seismic lines.

MIGRATION: Migration was largely vertical from Barremian shales in rift-related structures up faults into fluvial-deltaic sandstones and canyon-fill turbidite sandstones. The turbidites are in close proximity to the source due to downcutting of the canyons.

RESERVOIR ROCKS: Major reservoirs include fluvial-deltaic sandstones of Aptian-Albian age with porosity as much as 25 percent and permeabilities as high as 1000 mD, Upper Cretaceous-Tertiary turbidite reservoirs, and minor Albian shelf carbonates.

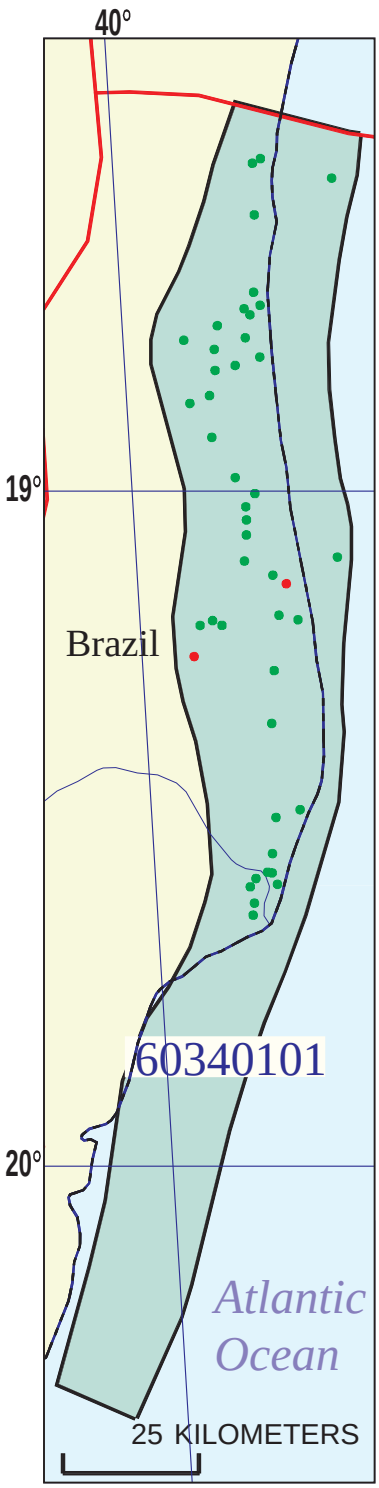
TRAPS AND SEALS: Traps are mainly related to rift-related extensional structures and to Alagoas fluvial-deltaic sands sealed by salt. Traps in canyon-fill turbidites are mainly stratigraphic. Seals in the transitional reservoirs are related to the presence of Alagoas salt, and seals in the turbidites are intraformational mudstones.

REFERENCES:

Cainelli, C., and Mohriak, W.U., 1998, Geology of Atlantic eastern Brazilian basins; Brazilian Geology Part 2: 1998 American Association of Petroleum Geologists International Conference and Exhibition, Short Course, Rio de Janeiro, chapter paginated.

Chang, H.K., Kowsmann, R.O., Figueiredo, A.M.F., and Bender, A.A., 1992, Tectonics and stratigraphy of the East Brazil Rift System–an overview: Tectonophysics, v. 213, p. 97-138.

Estrella, G., Mello, M.R., Gaglianone, P.C., Azevedo, R.L.M., Tsubone, K., Rossetti, E., Concha, J., and Bruning, I.M.R.A., 1984, The Espirito Santo Basin (Brazil) source rock characterization and petroleum habitat, *in* Desmaison, G., and Murris, R.J., eds., Petroleum Geochemistry and Basin Evaluation: American Association of Petroleum Geologists Memoir 51, p. 253-271.



Espirito Santo Shelf
Assessment Unit - 60340101

EXPLANATION

- Hydrography
- Shoreline
- 6034 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 60340101 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:……..	11/17/99		
Assessment Geologist:……..	C.J. Schenk		
Region:……..	Central and South America	Number:	6
Province:……..	Espirito Santo Basin	Number:	6034
Priority or Boutique……	Boutique		
Total Petroleum System:……	Cretaceous Composite	Number:	603401
Assessment Unit:……..	Espirito Santo Shelf	Number:	60340101
* Notes from Assessor	MMS growth function.		

CHARACTERISTICS OF ASSESSMENT UNIT

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

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 exceeding minimum size:…… Oil: 21 Gas: 1
Established (>13 fields) X Frontier (1-13 fields) _____ Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd 9 2nd 3rd 2.2 3rd 3rd 1.5
Median size (grown) of discovered gas fields (bcfg):
1st 3rd _____ 2nd 3rd _____ 3rd 3rd _____

Assessment-Unit Probabilities:

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

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):…….. 1.0

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)	3	median no.	20	max no.	45
Gas fields:……min. no. (>0)	_____	median no.	_____	max no.	_____

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	2	max. size	20
Gas in gas fields (bcfg):……min. size	_____	median size	_____	max. size	_____

Assessment Unit (name, no.)
Espirito Santo Shelf, 60340101

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	600	1200	1800
NGL/gas ratio (bngl/mmcfg)……	10	20	30

Gas fields:	minimum	median	maximum
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)……	15	30	45
Sulfur content of oil (%)……			
Drilling Depth (m) ……	1000	2000	3500
Depth (m) of water (if applicable)……	0	10	20

Gas Fields:	minimum	median	maximum
Inert gas content (%)……			
CO_2 content (%)……			
Hydrogen-sulfide content (%)……			
Drilling Depth (m)……			
Depth (m) of water (if applicable)……			

Assessment Unit (name, no.)
Espirito Santo Shelf, 60340101

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

1. Brazil represents 100 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		40	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Espirito Santo Shelf, AU 60340101
Undiscovered Field-Size Distribution