

Petroleum Developments in South America, Central America, and Caribbean Area in 1975¹

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Abstract The review for 1975 presents information on petroleum developments in 30 countries and areas. Hydrocarbons were produced in 11 countries with total reported production of 1,308,847,000 bbl of oil and 1,056,076 MMcf of gas. Oil production decreased 15.7% from the 1974 level with Venezuela accounting for most of the volume decline by reducing production to 2,346,700 b/d. Since 1958 this was the first year that Venezuelan production dropped below one billion bbl. Ecuador's production declined by 9.1% to 160,911 b/d because of continued governmental restriction, a major pipeline break, and full storage terminals. Other countries also reported production declines with the exception of Trinidad and Barbados.

Total wells drilled (1,557) decreased by 173 or 10% from the 1974 level with the sharpest decline in Venezuela (132) and Argentina (54). Brazil and Peru reported increases of 52 and 9 wells, respectively. Brazil reported 19 offshore and 23 onshore rigs and Argentina had 63 operating rigs. The number of exploratory wells completed (321) represents a 20.7% decrease from 1974 completions. However, Brazil, Peru, and Chile maintained their 1974 level of exploratory drilling. Successful exploratory completions decreased by 30.5%. Of the countries with major drilling programs Trinidad, Venezuela, Chile, and Argentina recorded the highest exploratory-well success ratios (64, 49, 30, and 28% respectively).

Exploration-drilling results offshore Caribbean-Belize (1 well); Guatemala (1 well); Honduras (1 well); Nicaragua (2 wells); Costa Rica (1 well); and offshore Guiana basin, Guyana (3 wells); Surinam (1 well); and French Guiana (1 well) continued to be disappointing. However, Brazil reported 7 offshore and 2 onshore new-field discoveries; Peru and Colombia reported 2 and 3 new-field discoveries, respectively. Successful outposts were reported in Guatemala with Rubelsanto 2 and 3.

Geologic and geophysical party-months of field work (1,030) registered a 10.4% decrease from 1974 reflecting 137.4 party-months (-19.9%) of surface geology, 835.0 party-months (-7.6%) of seismic, 41.8 party-months (-32.5%) of gravity, and 6.6 party-months (65%) of magnetometer surveys. "Other" exploration party-month activity (principally topographic and SLAR) registered a 70.2-party-month increase. Argentina and Brazil maintained their 1974 level of seismic activity with 264 and 116 party-months respectively. Bolivia increased surface geologic and seismic activity to 64 and 142 party-months.

Brazil during 1975 decided to adapt a service-contract basis for allowing foreign companies to bid for 1 onshore and 9 offshore blocks. Chile also invited operation-contract bids for 7 areas, 3 offshore and 4 onshore.

The end of the "concession era" occurred on December 31, 1975, in Venezuela. All areas under concession or service contract were nationalized by decree. The state will form 14 state-owned companies including CVP from concessions and assets of the 20 former concessionaires.

INTRODUCTION

Exploration activities and production in the review area declined in 1975. This decrease is particularly disturbing in view of the continued energy crisis.

Petroleum production decreased 15.7% to 1,308,847,000 bbl in the 11 producing countries. Venezuela's long-range conservation program and other factors reduced production by 21%, and for the first time in 17 years, to less than a billion bbl (Table 1). Only 2 countries reported increased petroleum production, Trinidad and Tobago (+15.9%), and Barbados (+107%). The offshore area was the source of Trinidad's production increase.

Total wells drilled (1,557) represent a 10% decrease from 1974 (Table 3). Argentina (552), Venezuela (284), Brazil (228), Trinidad (189), and Peru (161) were the leaders in drilling. Brazil's continued intensive exploration drilling on the continental shelf resulted in 7 new-field discoveries. Otherwise, offshore exploratory drilling in French Guiana (1), Surinam (1), Guyana (3), Costa Rica (1), Nicaragua (2), Honduras (1), Guatemala (1), Belize (1), and Peru (2) had negative results. Onshore, Brazil, Colombia, and Peru reported 2, 3, and 2 new-field discoveries, respectively.

Hydrocarbon exploration or related activity is reported for 30 countries or areas in Latin America and the Caribbean; 21 had field-party effort. Party-months of geologic-geophysical exploration (1,030.3) declined by 10.4% not including 64.7 party-months of topographic effort reported by Argentina and Colombia. Peru reported the greatest party-month decline (-65.6%), and Argentina (393.7), Bolivia (229), Brazil (116), Chile (52), and Venezuela (64) maintained or increased party-month activity over the 1974 level. In seismic work Argentina was the leader with 263.9 party-months followed by Bolivia, Brazil, and Peru with 142, 116, and 105 respectively. In Peru

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Developments in South American and Caribbean Area

1641

5 contract blocks, 1 offshore and 4 in the Oriente, were relinquished following a series of 7 new-field-wildcat failures. Guatemala reported successful east and west confirmation wells of the Rubelsanto-1 discovery reported in 1974.

A major highlight of the year was Brazil's decision to allow foreign companies to qualify for service contracts. About 40 companies were advised they had prequalified for service contracts in April 1976. Petrobras is offering 10 blocks (1 onshore and 9 offshore) for service-contract bids (Fig. 4). In addition, Chile invited operation-contract bids for 7 areas, 3 offshore and 4 onshore. Companies interested in areas not included in the first offering were invited to make direct solicitation to ENAP for such areas.

The "concession era" in Venezuela was terminated on December 31, 1975, when all areas under concession were nationalized by decree. Properties of the 20 former concessionaires after adjustments occasioned by transfers, withdrawals, and geographic consolidations were organized into 14 state-owned companies including CVP operating 3,040,049 ha.

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1642

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ARGENTINA (Tables 5-11)

Statistical Data on State Oil Company activities furnished by PEDRO H. LESTA of YPF and private company data by MARCELO R. YRIGOYEN, Esso S.A.P.A., both of Buenos Aires

Exploration and production operations in Argentina are almost completely under the direction of Yacimientos Petrolíferos Fiscales (YPF), the state oil company, either through its own operations or under operating contracts which it has with private companies.

Oil production in 1975 was 22,916,658 cu m (144,141,195 bbl), a decrease of 4.6% from 1974 (Tables 1, 2). Production came from 9 provinces in the country and these in order of volume of production were Mendoza, Chubut, Santa Cruz, Rio Negro, Neuquén, Jujuy, Tierra del Fuego, La Pampa, and Salta (Table 10).

During 1975 an average of 62.8 drilling rigs was active—26.3 on exploration and 36.5 on development drilling. A total of 552 wells was completed and 7 additional were being tested; of the total, 78 were exploratory wells and 22 of these were successful—17 producing oil and 5 gas (Tables 4, 6).

Geologic and geophysical work was at about the same active pace as last year; an average of 22 seismic parties was in the field and surface geology, gravity, and magnetic works also were carried out as were special topographic surveys (Table 5).

The only exploratory drilling by a private company was the dry hole Cerro Alquitrán-2 by Cadipsa in the southern part of the province of Mendoza.

BAHAMAS (Fig. 1)

By Ministry of Development, Nassau

Bahama National Oil Co. Ltd. (Bahamas California) maintained license holdings, under the "old" Petroleum Law, covering the central to western part of Little Bahama Bank (Fig. 1). Companies that have submitted license applications in the areas of the Bahamas Platform and the Blake Plateau continued to await issuance of the Petroleum Regulations.

No exploratory wells were drilled in 1975. With the exception of a joint U.S. Geological Survey-Institut Française du Pétrole research geophysical survey in the area extending from the northernmost part of the Bahamas to Cape Hatteras (Blake Plateau and adjacent continental shelf), no geophysical or geologic field parties were active.

chanical difficulties at a depth of 3,844 ft (1,172 m). After extensive testing, the well was abandoned on December 2. Redrill, Rubelsanto-4A, was spudded about 500 ft (150 m) south, and at year end was drilling at a depth of 5,013 ft (1,528 m) toward a projected TD of 11,500 ft (3,505 m).

Two rigs, a land-based Loffland rig and a Heli-rig operated by Parker, were utilized in the course of drilling operations at Rubelsanto during 1975.

Fairly extensive road systems either had been initiated or were in planning stages during 1975, which are to provide access for projected wildcat drilling in the southern and western reaches of the concession area during 1976.

On March 8, the Zamora/Centram combine spudded Manglar-1 at a location (Table 54) in the Gulf of Honduras, in 153 ft (47 m) of water. The well was abandoned in April at a depth of 6,348 ft (1,935 m) with no reported encouragement. At total depth, the well was in Tertiary age rocks. Cia. Zamora, a wholly owned subsidiary of West Coast Petroleum of Calgary, was operator for the drilling operation. The *Western Delta* jack-up was used. This rig then was moved to a nearby location, Amatique-1, but because of sea-bottom conditions, the *Western Delta* could not be positioned, and the rig subsequently was released.

In mid-November an additional offshore test, Manabique-1, was spudded on the consortium's holdings in the gulf region, and at year end this test was reported to be drilling at a depth of 3,903 ft (1,190 m). Cia. Centram, a subsidiary of International Nickel Co. of Canada Ltd., is operator of the Manabique well.

The Centram/Zamora combine reported no exploratory work, other than drilling, during 1975.

In mid-year 1975, title to the former Weissenberg holdings was transferred to the Shenandoah group in undivided interests as follows: Shenandoah Oil Corp. (operator) 25%; Saga Petroleum AS & Co. 25%; and Basic Resources International S.A. 50%. The group has conducted exploratory drilling on the 374,499-ha. concession area for the last several years, essentially as a petroleum contractor to Weissenberg. In the course of the transfer, contract conditions were renegotiated, to include a 51%/49% production-sharing arrangement. The group still operates under the provisions of the "old" Petroleum Code (Decree 345, 1955) and its Regulations (Decree 445, 1955). No additional contracts will be allowed under this legislation.

Decree Law 62-74, the petroleum law governing production sharing, which was published in June 1974, was replaced in December 1975 by Decree 96-75. This was done to overcome certain inconsistencies and limitations in the former leg-

islation which were considered inconvenient for the interest of the government. Principal highlights of Decree 96-75 are as follows:

1. The government will receive at least 55% of the hydrocarbons produced, and its share will increase in relation to the volume produced.

2. The share to the government will include taxes paid by the contractor on income.

3. The duration of the contract for petroleum operations shall not exceed 25 years, and the area assigned to each contractor shall not exceed 200,000 ha.

4. Fifty percent of the contract acreage must be relinquished by the end of the fifth year.

5. Hydrocarbons considered to be the remuneration of the contractor are subject to an undefined export tax.

6. A one-million-Quetzal (\$1 million) signature bonus will be required.

The contract areas corresponding to the new law have not yet been defined, nor have regulations or model service contracts been established to implement this legislation. Thus, at the conclusion of nearly 4 years of work toward establishing service contracts, year end 1975 saw the government still frustrated in its attempt to provide foreign companies now interested in exploring in the country with the completed mechanism for doing so. At the end of 1975 a mixture of more than 30 independents and majors was on record as having filed on various of the fourteen, 200,000-ha. blocks which earlier were defined in conjunction with the Decree Law 62-75 legislation (see Fig. 13).

FRENCH GUIANA (Fig. 14)

One new-field wildcat, Sinnamary-1 operated by Elf/ERAP, offshore at long. 53°22'47"W, lat. 6°22'49"N, was abandoned May 21, 1975, at TD 2,104 m in basement rock.

No other exploration activity was reported.

GUYANA (Fig. 15; Table 55)

Offshore exploratory drilling continued to be disappointing in 1975, with 3 new-field wildcats abandoned. Total wildcat footage drilled was 25,227 (7,689 m). Shell drilled 2 tests, Abary-1 and Mahaica-2, and Deminex drilled Essequibo-1.

OXOCO and COMORO relinquished their concessions without drilling.

HAITI (Fig. 11)

By Petroconsultants S.A., Geneva, Switzerland

Under terms of an option to earn an interest in the Wendell Phillips permit, Weeks Natural Resources carried out a 2-week seismic survey in

mum basis required withdrew when a government commission was preparing to negotiate.

The government has been reported to be preparing a second call for bids, but no further information on this matter is available.

The Government of El Salvador will receive technical assistance from ARPEL (Asistencia Reciproca Petrolera Estatal Latinoamericana) and from Colombian ECOPETROL for an evaluation of the country's offshore potential.

SURINAM (Fig. 14)

Elf-SURINAM drilled 1 new-field wildcat, N. Coronie-1, offshore at long. 55°24'01" W, lat. 7°19'16" N, which was abandoned November 12, 1975, in Lower Cretaceous sedimentary rocks at TD 5,406 m.

Elf-Shell-Euratrep reduced their holdings in January 1975 by 12,890 sq km retaining 57,490 sq km.

TRINIDAD AND TOBAGO (Fig. 22; Tables 63-69)

By Ministry of Petroleum and Mines, Port of Spain

Crude Oil Production

Crude oil production in 1975 continued to rise, in spite of set-backs caused by industrial unrest during March and April. Offshore production strengthened by Amoco's prolific East Coast fields continued to dominate the oil producing scene, and accounted for almost 60% of all oil produced in the country.

An average of 215,400 BOPD was produced during the year, the first time in Trinidad's oil-producing history that the 200,000-BOPD level consistently was maintained. Production for the year was 78,620,938 bbl, which was an increase of 15% over last year's figures. It is significant that the daily production per producing well averaged 78 bbl in 1975 as compared to 57 bbl 2 years ago.

As was expected, Amoco Trinidad Oil Co. continued to be the country's leading producer and averaged 124,675 b/d for the year, which was an increase of 54% on its output of last year.

Amoco was the only company in the country to increase its production during the year. The average marine well in Trinidad produced 492 BOPD, whereas the average Amoco well—whose producers are all marine—produced 2,011 BOPD. These figures illustrate the major contribution of the Amoco fields.

Trinidad Northern Areas Ltd. daily production fell by 4,100 bbl to 47,930 bbl. This is the first time since 1966 that TNA's production has fallen below 50,000 BOPD. Production by this marine producing company was affected by industrial unrest early in the year and a fire which put a

production platform out of action, and even at year end production did not reach the level attained in the first 2 months of the year. It is expected that with increased drilling activity in 1976 production again should top the 50,000-BOPD mark.

As Table 68 shows, the land producers fared no better in 1975 than they did in the previous year for all declined in production. The crippling effect of industrial action, which it is estimated accounted for a loss in excess of 2,000,000 bbl of crude over 2 months, counteracted to some extent the large increase in production in the East Coast marine fields.

The steady decline in the production of Trinidad-Tesoro Petroleum Co. Ltd. which began in mid-1974 continued throughout 1975, and was aggravated by industrial unrest, and a fire at the company's Trintes platform off Point Galeota. The company produced oil at an average daily rate of 17,808 bbl, which was 18% less than its producing rate during the previous year.

Although Texaco Trinidad Inc. continued their development drilling and secondary recovery program its production fell by an alarming 26% from the 1974 figures, and the company produced oil at an average rate of 18,535 b/d. This great drop in production was despite the fact that the company's production was boosted by 650 b/d from Tricentrol Ltd. whose assets were acquired by Texaco on January 1, 1975.

Drilling

The performance of the drilling sector of the industry also was affected adversely by industrial unrest in the country during March and April. Cumulative footage drilled in 1975 fell short of the previous year's figure by 8%. Of the 839,649 ft (255,913 m) drilled in 1975, 81% was achieved as a result of the drilling of development wells (Table 65). During the year the number of rigs operating was slightly more than in 1974, however, as 145.5 rig-months were achieved compared with 142.5 in the previous year. Table 64 gives a summary of wells completed in 1975.

The tempo of offshore drilling activity was stepped up in 1975 when 477,195 ft (145,442 m), that is, 57% of total footage, was drilled for the year. This figure was 53% more than the offshore footage drilled in 1974. An average of 9 rigs operated in offshore areas during 1975 as compared with 7 during the previous year.

Development—Development drilling was reduced in the early part of the year and, as a result, 155 successful development wells were completed in 1975 as compared with 186 during the year before. Development footage drilled in 1975 was

1660

L. E. Hatfield and C. H. Neff

TABLE 1. ANNUAL OIL PRODUCTION, 1971-1975 (1,000 of Bbl)

Country	1971	1972	1973	1974	1975	Total Cumulative Production
Venezuela	1,295,400	1,178,478	1,228,598	1,086,331	856,544	31,961,168*
Argentina	154,422	158,704	153,760	151,088*	144,141	2,639,837
Colombia	78,145	71,089	66,861	60,875	56,743	1,941,768
Brazil	62,246	61,085	62,119	64,752	62,765	854,990
Trinidad	47,148	51,211	60,670	68,136	78,621	1,553,192
Ecuador	1,629	28,579	76,221	64,616	58,733	333,710
Peru	22,589	23,635	25,666	26,142	26,404	941,422
Bolivia	13,206	15,967	17,261	16,597	14,732	186,564*
Chile	12,882	12,526	11,429	10,055	8,946	215,692
Cuba (c)	1,423	1,281	1,440	1,095	1,095	16,800
Barbados	-	-	62	69*	123	243
Total	1,689,090	1,692,555	1,704,087	1,551,716	1,308,847	40,645,386
Percent Change	-5.1	+6.3	-8.9	-15.7		

*Adjusted.
(c) All figures are estimated.

TABLE 2. 1975 DAILY OIL PRODUCTION

Country	B/D	% Change from 1974
Venezuela	2,346,695	- 21.1
Argentina	394,907	- 4.6
Trinidad and Tobago	215,400	+ 15.4
Brazil	171,959	- 3.1
Ecuador	160,911	- 9.1
Colombia	155,461	- 6.8
Peru	73,340	- 6.2
Bolivia	40,362	- 11.2
Chile	24,509	- 11.0
Cuba	3,000*	
Barbados	336	+107.0**
Total	3,586,880	

*Estimated.
**1974 Production Revised.

TABLE 3. 1975 DRILLING STATISTICS

Country	Total Footage Drilled	Total Wells Drilled	Explor. Wells Compl.	Explor. Wells Successful
Argentina	3,386,707	552	78	22
Barbados	32,471	5	-	-
Belize	16,221	4	4	-
Bolivia	121,150	16	7	-
Brazil	1,308,010	228	87	17
Chile	406,910	62	23	7
Colombia	197,683	28	14	3
Costa Rica	6,844	1	1	-
Ecuador	109,142	15	3	2
French Guiana	6,303	1	1	-
Guatemala	30,531	3	3	1
Guyana	25,227	3	3	-
Honduras	6,466	1	1	-
Nicaragua	15,557	2	2	-
Paraguay	1,623	1	1	-
Peru	1,180,576	161	43	11
Surinam	17,737	1	1	-
Trinidad	839,649	189	14	9
Venezuela	2,090,601	284	35	17
Total	9,800,008	1,557	321	69

Developments in South American and Caribbean Area

1661

TABLE 4. 1975 EXPLORATION ACTIVITY IN PARTY-MONTHS

Country	Surf. Geol.	Seis.	Grav.	Neg.	Other	Total
Argentina	55.0	263.9	12.0	2.1	60.7*	393.7
Barbados	-	0.5	-	-	-	0.5
Belize	-	1.0	-	1.0	0.5**	2.5
Bolivia	64.5	141.8	13.5	-	9.0***	228.9
Brazil	-	116.0	-	-	-	116.0
Chile	2.0	38.0	12.0	-	-	52.0
Colombia	8.7	45.6	-	-	-	54.3
Ecuador	1.0	6.0	-	-	4.0*	11.0
Guatemala	5.2	3.3	3.7	-	-	12.2
Haiti	-	0.5	-	-	-	0.5
Honduras	-	0.5	0.5	0.5	-	1.5
Lesser Antilles	-	0.5	-	-	-	0.5
Netherlands Antilles	-	0.5	-	-	-	0.5
Nicaragua	-	0.5	-	-	-	0.5
Panama	-	0.5	-	-	-	0.5
Paraguay	1.0	27.2	-	3.0	-	31.2
Peru	-	105.0	-	-	-	105.0
Puerto Rico	-	0.5	-	-	-	0.5
Trinidad	-	12.7	-	-	-	12.7
Uruguay	-	6.5	-	-	-	6.5
Venezuela	-	64.0	-	-	-	64.0
Total	137.4	835.0	41.8	6.6	74.2	1,095.0

* Principally Topographic.
**Resistivity.
***Side-Looking Radar.

TABLE 5. ARGENTINA, PARTY-MONTHS OF GEOLOGICAL AND GEOPHYSICAL EXPLORATION IN 1975

Area	Surf. Geol.	Seismic	Gravity	Refrac-tion	Mag-netic	Topo-graphy	Total
Northwest	24.0	43.5	-	-	-	7.8	75.3
Chaco - Parana	-	64.5	11.3	-	-	4.2	80.0
Cuyeno	-	22.9	-	0.1	-	3.0	26.0
Neuquén	22.0	67.0	0.5	-	-	21.0	110.5
Valdes Peninsula	-	-	-	-	-	0.3	0.3
Gulf of San Jorge	9.0	12.0	-	-	-	9.7	30.7
Austral	-	48.0	0.2	0.6	-	14.0	62.8
Offshore	-	-	-	-	-	-	-
Colorado	-	2.4	-	-	1	-	3.4
Offshore	-	-	-	-	1	-	2.6
Austral	-	1.6	-	-	-	-	2.1
Continental Shelf	-	2.0	-	-	0.1	-	2.1
Totals	55.0	263.9	12.0	0.7	2.1	60.0	393.7

TABLE 6. ARGENTINA, SUMMARY OF WELL COMPLETIONS IN 1975*

	Oil	Gas	Abd.	Total	Testing
Exploratory Drilling	17	5	56	78	(7)
Development Wells	324	37	113	474	(-)
Totals	341	42	169	552	(7)

*Includes YPF, YPF Contractors, and Private Companies.

TABLE 7. ARGENTINA, SUMMARY OF DRILLING IN 1975

	Meters Drilled	Average Number of Rigs
Exploration Wells	217,388	26.3
Development Wells	814,830	36.5

Developments in South American and Caribbean Area

1675

TABLE 54. GUATEMALA, SUMMARY OF EXPLORATORY DRILLING IN 1975

Well Name	Location	Basis for Location	Explor. Class.	Comp. Date	Total Depth (feet)	Deepest Formation	Result Remarks
SHEHARDOAH							
Rubelsanto-2	15° 58' 58" N 90° 26' 27" W	Seis/Grav. Surf. Geolo.	NPW	May 19	8,063	Cretaceous	2544 BOPD 34/64 choke
Rubelsanto-3	15° 58' 34" N 90° 23' 06" W	Seis/Grav. Surf. Geol.	NPW	---	9,553	Cretaceous	Testing oil year end
Rubelsanto-4	15° 59' 08" N 90° 25' 22" W	Seis/Grav. Surf. Geol.	NPW	Dec. 2	3,844	Cretaceous	Lost Hole
Rubelsanto-4A	15° 59' 08" N 90° 25' 22" W	Seis/Grav. Surf. Geol.	NPW	---	5,013	Cretaceous	Drilling
CIA. ZAMORA (WEST COAST PETRO)							
Manglar-1	15° 56' 15" N 88° 20' 16" W	Seis/Geol.	NFW	Apr. 18	6,348	Tertiary	Abandoned
CIA. CENTRAM (INT'L NICKEL)							
Manabique-1	15° 58' 12" N 88° 33' 14" W	Seis/Geol.	NFW	---	3,903	Tertiary	Drilling

TABLE 55. GUYANA, 1975 SUMMARY OF WILDCAT DRILLING

Well Name	Location	Basis for Location	Explor. Class.	Total Depth (feet)	Deepest Formation	Result Remarks
SHELL GUYANA LTD.						
Abary-1	Offshore-Guana	Geophysics	NFW	13,091	U. Cretaceous	Abandoned-Dry Hole
Mahaica-2	Offshore-Guana	Geophysics	NFW	7,500	Paleocene	Abandoned-Dry Hole
DEMINEX						
Essequibo-1	Offshore-Guana	Geophysics	NFW	11,199	Lower Miocene	Abandoned-Dry Hole

TABLE 56. PARAGUAY, ACREAGE HOLDINGS AT YEAR-END 1973 (HA.)

	Contract-Law	Prospection Permit
L. H. Banks		1,036,000
Cis Petrolera del Chaco		179,000
Esso		7,968,620
Esso/Aminofil	1,740,900	
Esso/NEPSA/Chaco	1,680,000	
REPSA/Chaco	120,000	
Texaco	3,100,000	595,000
Trend		7,500,000
Totals	6,640,900	17,278,620

TABLE 57. PERU, PARTY-MONTHS OF GEOPHYSICAL EXPLORATION IN 1975

Company	Seismograph
Petroperu	54
Andes	6
Deminex	3
Getty	5
Hispanofil	6
Oceanic	4
Cities Service	6
Phillips	5
Signal	8
Total	98
Total	105

TABLE 58. PERU, SUMMARY OF WELL COMPLETIONS OF 1975

	Oil	Gas	Abd.	Total	Testing	Susp.
Exploratory Tests	11	-	32	43	2	2
Development Wells	100	2	5	107	7	-
Totals	111	2	37	150	9	2

TABLE 59. PERU, SUMMARY OF DRILLING 1975

	Footage Drilled	Rigs Active 12/31/75
Exploratory Wells	536,830	6
Development Wells	643,746	10

Developments in South American and Caribbean Area

1695

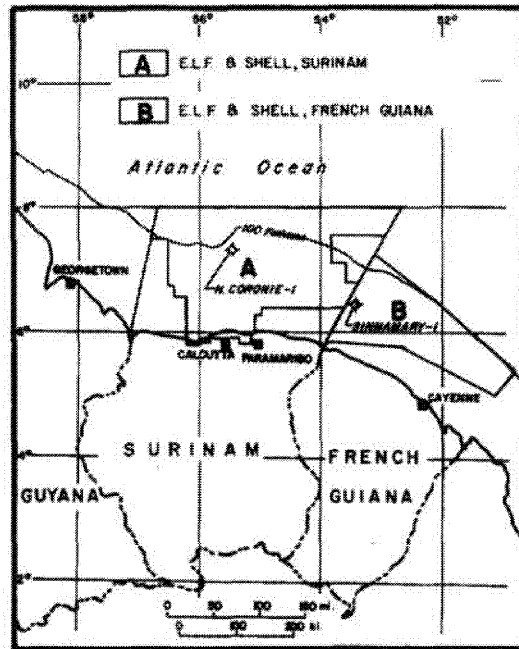


FIG. 14—French Guiana and Suriname, 1975 concessions and exploratory drilling.

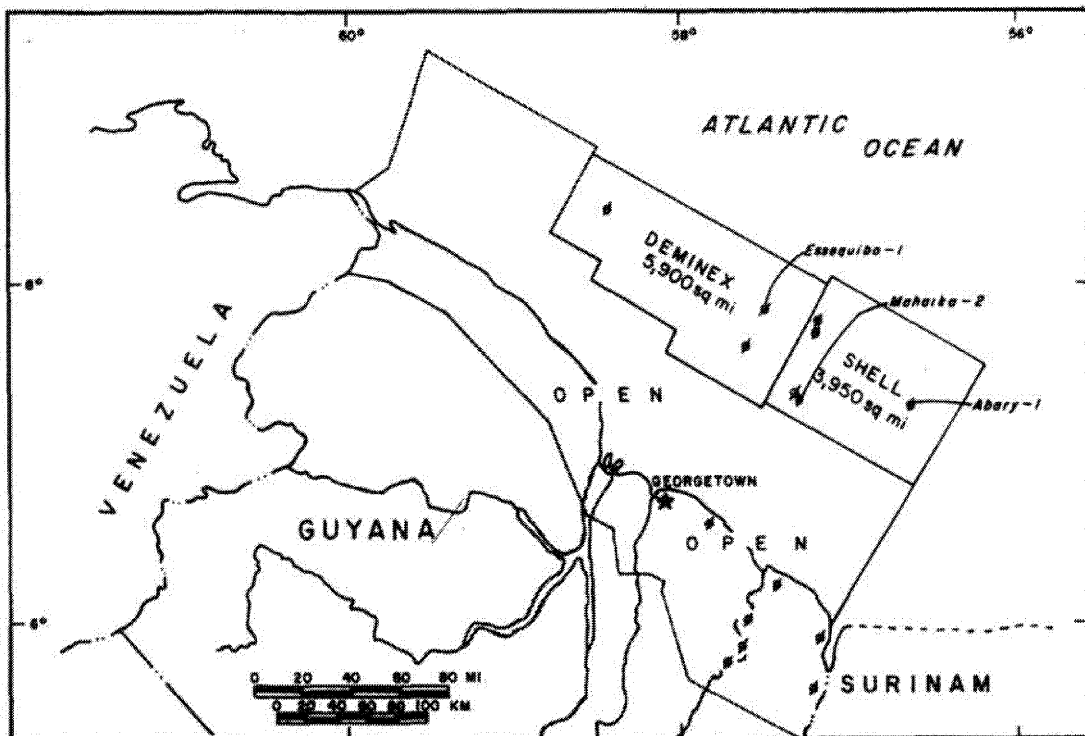


FIG. 15—Guyana, 1975, oil exploration licenses and drilling from current and previous years.

Petroleum Developments in South America, Central America, Mexico, and Caribbean Area in 1976¹

F. L. AMATO²

Abstract The review for 1976 presents information on petroleum developments in 31 countries from South America, Central America, the Caribbean area, and Mexico. Hydrocarbons were produced in 12 of these countries, for a total reported production of 1,634,099,000 bbl of oil. Complete statistics on gas production were not available to determine total production. Because the statistics for Mexico are included in this year's report, oil production showed a gain of 24%, although without the addition of Mexico's production the total would have shown a drop of 1.1%. For the second year in a row, Venezuela's production was below 1 billion bbl, as production was down 22.3% from 1975. Argentina, Bolivia, and Peru all had slight increases in production, and Ecuador had a 16.2% increase.

Nationalization of Venezuela's oil industry occurred January 1, 1976, when state companies took over the rightholdings and interests of former private companies. This change makes the state corporation, Petrol-eos de Venezuela, the 9th largest oil company in the world.

Activity by private companies in Argentina was negligible in 1976, but they are expected to become more active as contractors for the state company.

Colombia experienced an 80% increase in development drilling. Two new-field discoveries were made, but their significance is unproved.

In Trinidad, there was a significant increase in offshore activity, which resulted in 5 new gas wells and 1 oil discovery from the 14 wildcats drilled.

Ecuador experienced a slight increase in development and exploratory drilling and a considerable increase in production. Of the three wildcats completed, 1 was a successful extension well; the other 2 were dry.

Guatemala had a commercial discovery in the Rubelsanto field, and experienced its first oil production ever, although the amount was insignificant.

This is the first year that the report from Mexico has been included in these development papers. Mexico had dramatic successes in the Southeast Reforma area and the offshore Gulf of Campeche area. Of the 79 exploratory wells drilled in Mexico in 1976, there were 19 new-field discoveries (8 oil and 11 gas) and 5 new-pool discoveries.

INTRODUCTION

The review for 1976 presents information on petroleum developments from 31 countries or areas in South America, Central America, the Caribbean, and Mexico. Hydrocarbons were produced in 12 of these countries with total reported production of 1,624,099,000 bbl of oil. Complete statistics on gas production were not available, although gas is produced in some of these countries. Oil production showed a gain of 24%; this gain is a result of the addition of Mexican pro-

duction which was not included in previous years. Without the Mexican production, there was approximately a 1% decrease in total production. Table 1 shows annual oil production from 1972 to 1976. Daily production for 1976 is shown in Table 2. Table 3 summarizes exploration activity in party-months for each country reporting. A summary of wildcat and development drilling for Argentina, Bolivia, Chile, Colombia, Ecuador, and Peru is given in Table 4.

ACKNOWLEDGMENTS

The writer acknowledges with thanks and appreciation the collaboration and professional dedication of the many geologists, companies, and government offices and their associated secretarial and drafting assistants that have made possible the compilation of this review.

I specifically acknowledge the efforts of the following writers in preparing texts and/or furnishing statistical information. Special thanks are due Petroconsultants S.A., Geneva, Switzerland, for permission to draw from the data of their "1976 Annual Reviews" in areas where specific information was unattainable. The following list also will serve as an alphabetic index of countries and areas covered in this review.

ARGENTINA

Marcelo R. Yrigoyen, Esso S.A.P.A., Buenos Aires, and Petroconsultants S.A., Geneva, Switzerland

BAHAMAS

Petroconsultants S.A., Geneva, Switzerland

BARBADOS

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BELIZE

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BOLIVIA

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CHILE

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² Manuscript received and accepted, August 2, 1977.

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South America, Central America, Mexico, and Caribbean

1579

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COSTA RICA
Petroconsultants S.A., Geneva, Switzerland

CUBA
Francois Merminod, Petroconsultants S.A., Geneva, Switzerland

DOMINICAN REPUBLIC
José Carvajal, Petroconsultants S.A., Geneva, Switzerland

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GUATEMALA
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GUYANA
Petroconsultants S.A., Geneva, Switzerland

HAITI
José Carvajal, Petroconsultants S.A., Geneva, Switzerland

HONDURAS
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NICARAGUA
Petroconsultants S.A., Geneva, Switzerland

PANAMA
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PARAGUAY
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PERU
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PUERTO RICO
Petroconsultants S.A., Geneva, Switzerland

EL SALVADOR
José Carvajal, Petroconsultants S.A., Geneva, Switzerland

SURINAM
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TRINIDAD AND TOBAGO
Petroconsultants S.A., Geneva, Switzerland

URUGUAY
Petroconsultants S.A., Geneva, Switzerland

VENEZUELA
Neal R. VanMiddlesworth, Venezuelan Oil Scouting Agency (VOSA), Caracas, and Petroconsultants S.A., Geneva, Switzerland

ARGENTINA (Tables 5-17)
By MARCELO R. YRIGOYEN, Esso S.A.P.A., Buenos Aires (private companies), and PETROCONSULTANTS S.A., Geneva (YPF activities)

Activity by private companies during the past year was almost negligible, being restricted to production of a small amount of oil and natural gas, drilling of 1 wildcat well, and drilling of a few development wells. The production figures reported herein correspond to the old concessions granted prior to the Petroleum Reserve Law passed in 1935. In Argentina, the state-owned oil agency, Yacimientos Petrolíferos Fiscales (YPF), and its contractors carried out most of the exploration, development, and production activities during the report period. For this reason, activities by private companies such as Amoco (which drilled 35 development wells) and Cities Service, who acted as contractors for YPF, will be reflected in the state-agency reports (Tables 9-17).

In the future, activities of private companies acting as YPF contractors will increase, as the number of companies having YPF contracts has increased. In mid-1976, YPF called for bids for contracts on primary and secondary exploitation work in 9 oil fields of the Cuyo, Neuquén, and San Jorge sedimentary basins. Their objective is to reactivate production in these fields and to obtain adequate installations to start secondary recovery operations. The companies submitted their proposals at the end of November and the final awarding was under process by year end.

Among the plans announced by the government are several projects for the utilization of private capacity, technology, and capital in the area of hydrocarbon exploration and production, both on land and offshore. These projects still are waiting for clarification of legislation and for tender specifications.

Geothermal, Oil Shale, and/or Tar Belt Activity

Some geothermal exploration was the only activity in this category that was carried out in Argentina in 1976. On February 17, 1976, YPF spudded the EGNCS-1 well, with a projected TD of 1,500, in the central-eastern Andean ranges, near Copahue, close to the Argentina-Chile border. On March 31, 1976, drilling was suspended at 954 m owing to unfavorable climatic conditions. An average temperature of 195°C was logged, which corresponds to an actual bottom-hole temperature of 220 to 230°C. In the area of Copahue, famous for its thermal bath resorts, exploratory work is planned to continue in the next summer season.

On the basis of the recent organization of a Geothermic Studies Committee as a multistate agency, the commencement of several exploratory works, and the geothermal drilling activities at Copahue, it is presumed that a systematic search for geothermal energy in Argentina may

road surfacing, and about 17% of which was trucked to Guatemalan industrial plants to establish its suitability for local consumption.

The Centram group's exploration rights include 3,228 sq km divided among 9 contiguous blocks both onshore and offshore near the Caribbean port of Puerto Barrios and near Lake Izabal. The group shot about 170 km of marine seismic lines off the north coast during 1976. The terms of their contract with the government require the drilling of 2 wells. Centram completed their first test, the offshore Manglar 1 in block 93, in April 1975.

A new drilling unit, the drillship *Eastwind*, was brought in and the second test, the Manabique 1, was spudded in November 1975. It was drilled to 4,437 ft and was abandoned because of mechanical problems in January 1976. A replacement test, the Manabique 1B, was started but it reached only 1,867 ft in February before it too had to be abandoned because of mechanical difficulties. The second replacement, the Manabique 1C, was drilled to a depth of 13,875 ft and set a Guatemala depth record. It bottomed in sediments of probable Jurassic age after penetrating Tertiary shales and Cretaceous carbonate rocks and anhydrites. The well logged numerous gas shows, but was abandoned in August after several unsuccessful tests.

The combine asked for and received a 2-year extension on their exploration rights, effective April 4, 1976. The group now is considering a third location, but at year end had not reached a decision.

In February the government announced the formation of a state agency to administer the country's oil operations. The new organization is to be known as the Comision Nacional Petrolera (National Petroleum Commission). Also in February, the government delineated 5 blocks to be offered to companies on a production-sharing basis. These blocks, designated A, B, C (later amended to AA, BB, and CC), D, and E, total about 9,375 sq km. The first 3 lie between the Shenandoah and Centram tracts and contain about 5,435 sq km, and the latter 2 are in the extreme northwest part of the country and contain 3,940 sq km. These exploration parcels will be offered for bids when a model contract has been drafted; at year end this legislation was still in preparation.

Geothermal

Guatemala has 22 geothermal prospects and, during 1976, 2 of these, Moyuta and Zunil, were probed by the Instituto Nacional de Electrificación (INDE).

Moyuta, 200 sq km in size, is located 80 km southeast of Guatemala City and 40 km northwest of the Ahuachapan geothermal plant in El Salvador. Surface exploration work done between 1972 and August 1976 culminated with the definition of 3 anomalous areas. The INDE 1 well was started in August 1976 on the most representative anomaly. The expected reservoir rock, a Tertiary andesitic formation, was tight and the stabilized bottom-hole temperature was relatively low, 95°C at 2,625 ft (800 m). The INDE 2 well was started in November on a fault zone indicated by a geoelectric discontinuity. This well found high permeability, and the stabilized temperature was 104°C at 656 ft (200 m), followed by a temperature reversal to 67°C at 1,148 ft (350 m), and then a normal gradient to 97°C at TD of 3,294 ft (1,004 m). In terms of the geothermal cycle of reservoir development, the Moyuta prospect has reached a senile stage—the fractures are healed and no definite cap rock is present. Additional work is planned to evaluate fully the geothermal potential of this prospect.

Zunil, 35 sq km, is located 106 km west of Guatemala City in the Samala River graben. Exploration work was started in 1973 with the assistance of the Japanese government. The area has strong geothermal activity at the surface, with heavy concentration of elements indicating high temperature (above 200°C). The potential reservoir area has been nearly defined and decisions are pending to begin "deep" exploratory drilling.

FRENCH GUIANA

By PETROCONSULTANTS S.A., Geneva

In early 1977, offshore marine permits were held by 2 groups: the SNEA group with 13,000 sq km on the shelf, and the Esso group with 11,000 sq km between the 200-m and 2,000-m isobaths. In late 1975, the acreage held by the SNEA group was reduced from 26,500 sq km to about 13,000 sq km and on January 27, 1977, it was officially announced that the eastern seaward part of the permit was limited to the 2,000-m isobath. During 1976, Esso dropped its share in the shelf area and became operator beyond the 200-m isobath. A deep-water marine seismic survey was conducted from late May to middle July 1976 by Esso over both French Guiana and Surinam.

GUYANA

By PETROCONSULTANTS S.A., Geneva

Demnux is the sole rightholder in the country with a 16,213-sq km offshore license.

In the fall of 1976, Demnux abandoned Essequibo 2 at 14,280 ft. This was the only activity

South America, Central America, Mexico, and Caribbean

1587

reported in the country during the year under review and no further plans have been announced.

HAITI 1976 (Fig. 2)

By JOSÉ CARVAJAL, Petroconsultants S.A., Geneva

On June 22, 1976, Cruz International, a wholly owned subsidiary of Southern Cross Ltd. of Denver, signed a 25-year production-sharing contract with the government to explore an onshore and offshore area covering 6,367 sq km. The government of Haiti will receive 20% of net profits, and a 50% income tax from the company, which corresponds to a 60-40 split in favor of the state. Mapco Inc., Sundance Oil, and other undisclosed interests later joined Cruz in this venture.

A similar contract was signed with Hidrocarburos y Derivados C.A., a private Venezuelan firm, to explore a 27,900-sq km area, but limits have not been disclosed.

These are the first rights granted in the country since the cancellation in late 1975 of the 86,000-sq km held by Wendall Phillips onshore and offshore.

On January 7, 1977, the Cruz group spudded 1 Cul de Sac in Cul de Sac Bay about 20 km NNW of Port of Prince using the Reading and Bates *J. W. Bates*. This is the first well drilled in Haitian waters. Coordinates are lat. 18°41'08.3"N, long. 72°29'03.6"W. Water depth is 300 ft. The well was completed at a TD between 7,000 and 9,000 ft, and apparently confirmed the presence of a reef. A second well was drilled to about 6,000 ft, and the third well was spudded in March.

HONDURAS

By PETROCONSULTANTS S.A., Geneva

Anschutz applied for additional onshore and offshore acreage. Esso was granted a short-term reconnaissance permit to shoot 5 lines in the Caribbean. On January 18, 1977, an application filed by Esso to explore 4 blocks in the Caribbean Sea was accepted by the government. The 4 blocks cover part of the Reconnaissance Permit previously granted to Qedco. Onshore rights were relinquished by Petroleos Hondureños and Petroleos de Atlantida, and are pending government approval. Phillips completed marine seismic work in its deep-water acreage in the Caribbean during May.

JAMAICA

By PETROCONSULTANTS S.A., Geneva

No petroleum rights have been in force in Jamaica since early 1975. Some applications filed in 1973 may still be awaiting Government approval. Last exploration and wildcat activities carried out by the Weaver group date back to 1973. The state

company Petrojam was to start building an 80,000-BOPD refinery in September 1976.

LESSER ANTILLES (Figs. 5, 6)

By M. GODEL, Petroconsultants S.A., Geneva

Late in 1976, Antigua Minerals Exploration Ltd. (AME) was awarded exploration rights for a 6-year period in an unspecified area offshore Antigua in the Leeward Islands area, and General Crude held exploration rights on the Grenadine-St. Vincent shelf of the Windward Islands.

In February 1976, the Island of Antigua elected to return to the colonial fold of the British Empire.

No exploration work was in progress during 1976 and no plans for the immediate future have been released.

The Saba Bank area of the Leeward Islands is under jurisdiction of the Netherlands Antilles and is included in that report.

MEXICO (Tables 53-55; Fig. 7)

By RICARDO ACOSTA ESTÉVEZ, Petróleos Mexicanos, Mexico City

This study presents a summary of Pemex exploration activities performed during the year 1976, principally in regard to results obtained through exploratory drilling.

Summary

Drilling—In 1976, Petroleos Mexicanos (Pemex) drilled a total of 336 wells of which 79 were exploratory and 257 were development (Table 53). The total meters drilled in 1976 was 938,103 corresponding to 252,453 m in exploratory wells and 685,650 m in development wells with an average TD per well of 3,196 m for exploratory and 2,664 m for development wells.

Of the 79 exploration wells drilled, 64 were new-field wildcats, 12 new-pool wildcats, and 3 stratigraphic tests. Of this group, 4 did not reach their objective because of mechanical difficulties, 19 were new-field discoveries (8 oil, 11 gas), and 5 discovered new-pool extensions. The success rate for new-pool wildcats, discounting those suspended for mechanical reasons, was 30% and for new-field wildcats, 46%. Of the 257 development wells drilled, 200 were producers (77.8%).

Oil and gas production and reserves—The annual production of crude condensate and liquids in 1976 was 327,284,673 bbl showing an increase over 1975 of 10.9%. Of gas, 771,774 MMcf was produced in 1976, an increase of 2% from 1975. At year end, total proved reserves of hydrocarbons (gas and oil) reached a peak of 11.16 billion bbl of crude oil.

Exploration field parties—During 1976, 32 surface and 23 subsurface geologic field parties were

1590

F. L. Amato

ry out a drilling program although plans are still in a preliminary stage.

PANAMA (Fig. 8)

By JOSÉ CARVAJAL, Petroconsultants S.A., Geneva

Panama Exploration Inc., a wholly owned subsidiary of Texaco, holds 5 blocks totaling 5,069 sq km in the Caribbean Sea, and Kuadi Oil has a small block covering 81 sq km in southeastern Panama.

In late May 1976, the Legislative Commission authorized the government to sign a production-sharing contract with Diamond Shamrock Oil and Gas of Amarillo, Texas, to explore 7 blocks totaling 3,078 sq km in the Tuira-Chucunaque and Sambu basins in southeastern Panama. However, in the fall of 1976, Diamond Shamrock declined to sign the contract as the company and the government did not agree on the terms.

In early 1977, Sossa Petroleum filed an application for 2,399 sq km in the area of the City of Panama and in southeastern Panama including the Gulf of San Miguel.

Activities during 1976 were limited to a 1-week marine seismic survey carried out by Texaco in the Caribbean Sea. The company-owned *Trinity* seismic ship was used.

The government plans to carry out marine seismic surveys in the Gulf of Panama and in the Gulf of Chiriqui. Results will be offered to companies on a nonexclusive basis. In addition, the Bureau of Mineral Resources intends to undertake an exploratory drilling program in southeastern Panama in 1977.

Texaco plans to drill an offshore well off the Bocas del Toro Province in the Caribbean, but drilling schedule is not available.

PARAGUAY (Tables 56-57)

By PETROCONSULTANTS S.A., Geneva

On March 10, Texaco was awarded another reconnaissance permit (16,180 sq km) in northern Chaco; thus, by year end Texaco held permits for all the northern part of the country. In late June, Marathon Oil Co. agreed to purchase a 50% interest in Texaco's acreage which covers about 53,000 sq km. Esso/Aminoil converted its reconnaissance permits to an exploration permit prior to drilling Berta 1.

A GSI crew completed 2 crew-months of seismic work for Esso/Aminoil early in the year, and then was active for the last 5 months of the year in Texaco/Marathon's northern Chaco acreage. During August, Trend conducted a short gravity survey in its large Parana basin block.

Esso/Aminoil spudded Berta 1 in the Pirity basin on April 15 and abandoned the well at 15,700

ft in early July. At year end, Texaco/Marathon announced plans to spud a test at Bahia Negra near the border with Brazil.

PERU (Tables 58-63)

By FERNANDO ZUÑIGA Y RIVERO, Petróleos del Perú, Lima

Geophysical activities have continuously decreased and reached a standstill at the end of 1976. Petróleos del Perú and Occidental Petroleum continued exploration and development in the jungle areas. In northwestern Peru, the development was carried on by Petróleos del Perú and Belco Petroleum.

Production reached its highest point in 1976 as a result of the coming into production—even though limited—of the eastern fields. This increase will be larger in 1977, when the North Peruvian pipeline begins operation.

PUERTO RICO

By PETROCONSULTANTS S.A., Geneva

In early 1976, the exploration permit held by the state-owned company, Autoridad de Fuentes Fluviales (AFF), reverted to the new government company, Corporation de Desarrollos de Recursos Minerales (CODREMI). This permit covers a 5,145-sq km block in northern onshore and offshore areas. Onshore and offshore exploration concessions held by Oceanic and Puerto Rico Petroleum, covering 6,536 sq km and 625 sq km, respectively, expired in late 1975.

Puerto Rico invited applications for rights in the offshore both north and west of San Juan. Negotiations with Mobil, Sun, Occidental, Exxon, Superior Oils, and Kestern International Petroleum Operations (KIPO) were suspended until spring when the new administration will take office.

No exploration activity took place during 1976 except for limited reconnaissance geologic field studies by various interested private companies.

EL SALVADOR

By JOSÉ CARVAJAL, Petroconsultants S.A., Geneva

No rights currently are held in the country. During 1976, the government did a reevaluation study of the Pacific offshore potential with the technical assistance of ARPEL and Colombian Ecopetrol. This may be followed by an invitation to foreign companies to bid for offshore acreage.

SURINAM

By PETROCONSULTANTS S.A., Geneva

Rights held as of December 31, 1976, consisted of 1 license located mainly in deep-water acreage north of lat. 7°30' held by a group operated by

Esso. However, the eastern seaward limit of the license is undefined.

During the year, the Elf group surrendered the part of its southern license south of lat. 7°30', and the northern part of the license is now part of the northern license operated by Esso.

A deep-water marine seismic survey was conducted by Esso from late May through mid-July over both Surinam and French Guiana using the *Kirsten Bravo* ship.

TRINIDAD (Tables 64-69)

By PETROCONSULTANTS S.A., Geneva

In mid-1976, a statutory 50% acreage reduction took place in the northern offshore rights. Total area held by the various rightholders at the end of 1976 was 1,524 sq km onshore and 15,592 sq km offshore.

A 300-km sparker survey carried out in Texaco's eastern offshore area was the only geophysical operation reported during 1976.

Whereas there are no complete data available on the land wildcat drilling, the offshore activities have increased considerably compared with 1975, mainly in the eastern offshore area, but also in the northern offshore. Four mobile drilling units were active: *Mariner III*, *Pat Rutherford*, *Sedco 135*, and *Western Pacesetter II*, all semisubmersibles. Of a total of 14 wildcats drilled during 1976, there were 5 gas discoveries. Three of these in the northern offshore were by the Deminex group—LL-9-1, KK-4-3, and KK-6-2. In the eastern offshore, the Texaco group tested commercial gas in Barracuda 1 and Kiskadee 1. Deminex/Mobil reported gas shows in the eastern offshore well Red Snapper 1. One oil discovery was reported from the Amoco well West Poui 1 off southeast Trinidad.

Offshore, about 140 field wells were drilled during 1976, mainly by Amoco in the eastern offshore and by Trinmar in the western offshore. Total hole drilled was about 290,000 ft. Complete information is available only for Amoco's fields where 13 oil wells, 2 gas completions, and 1 dry hole were drilled from fixed platforms in the Poui, Samaan, and Teak fields. An estimated 36 offshore rig-months were spent during 1976. Very incomplete data are available from the onshore development drilling. Approximately 100 wells were drilled in about 50 rig-months. Principal land operators were Texaco, Tesoro, and Trintoc.

The average crude oil production was 212,215 b/d, only 1.5% below the 1975 level. Amoco has been the most important oil producer in Trinidad accounting for more than half of the country's oil output. All of Amoco's oil fields are in the eastern offshore area. Unofficial natural gas figures indi-

cate a daily average production of 350 MMcf, of which 140 MMcf is used as fuel, 25 MMcf went into the petrochemical industry, about 7 MMcf was reinjected, and almost 180 MMcf was lost or flared.

URUGUAY (Tables 70-71)

By PETROCONSULTANTS S.A., Geneva

There were no developments in the rightholding situation during 1976. Chevron is still the only foreign rightholder with a 26,000-sq km offshore block.

Ancap, the state company, contracted a YPF seismic crew to shoot 234 line-km in the Artigas Department between February 25 and April 28. During April, Chevron conducted about 0.5 crew-month of marine seismic work from the Uruguayan Navy vessel *Huracan*. The work was conducted by Chevron geologists using equipment contracted from Ocean Research Ltd.

Wildcat Drilling

Chevron spudded 2 wildcats off Uruguay during 1976 using the *Bideford Dolphin* semisubmersible. The first test, Lobo 1 (TD 8,900 ft), was located 160 km off Punta del Este. The second well, Gaviotin 1 (TD 11,910 ft), was 54 km west-southwest of Lobo 1. Both wells were abandoned in basalt, and the *Bideford Dolphin* was moved back to work for Chevron off Spain. At the end of 1976, Chevron was negotiating with Ancap on whether to continue drilling offshore Uruguay.

VENEZUELA (Figs. 9, 10; Tables 72-76)

By NEAL R. VANMIDDLESWORTH, Venezuelan Oil Scouting Agency (VOSA), Caracas; and PETROCONSULTANTS S.A., Geneva

In January 1976, Venezuela's petroleum industry was nationalized. The former private companies accepted a compensation totaling about \$1 billion. The new state petroleum corporation, Petroven (Petroleos de Venezuela—PDVSA), is the holding company for the 14 state oil companies which correspond to the rightholdings and assets of respective former private companies (see Table 72). When Petroven took control it became the 9th largest oil company in the world, with production potential of more than 2,500,000 BOPD, refining capacity of 1,554,000 b/d, storage capacity of 122 million bbl, 6,228 km of oil pipeline and 3,059 km of gas line, 193 injection plants, and personnel of 23,600.

Drilling

Rig-months totaled 210 (209 in 1975), for an average of 17.5 rigs—8 or 45% on wildcats and 9.5 or 55% on outpost and development drilling

Petroleum Developments in South America, Central America, Mexico, and Caribbean Area in 1977¹

F. L. AMATO²

Abstract The review for 1977 presents information on petroleum developments in 31 countries from South America, Central America, the Caribbean area, and Mexico. Hydrocarbons were produced in 13 of these countries, for a total reported production of 1,685,223,000 bbl of oil. Statistics on gas production were not available on all countries so total gas production could not be determined. Argentina, Mexico, Peru, and Trinidad had increases in production.

Major increases in development drilling were experienced in Argentina (private companies), Bolivia, Chile, and Colombia. Ecuador and Peru had slight decreases.

Continued exploratory efforts resulted in significant new discoveries in Bolivia, Brazil, Chile, Colombia, Peru, Trinidad, and Venezuela. Recent exploratory successes in Mexico continued, as evidenced by the increase of reserves to 16 billion bbl from 11 billion bbl established at the end of 1976.

INTRODUCTION (Tables 1-4)

Information on petroleum developments from 31 countries in South America, Central America, the Caribbean, and Mexico is available for the 1977 review. Hydrocarbons were produced in 13 of these countries with total reported production of 1,685,223,000 bbl of oil. Complete statistics on gas production are not available, although gas is produced in some of these countries. Oil production for the year 1977 showed a gain. Table 1 shows annual oil production from 1973 to 1977. Daily production for 1977 is shown in Table 2. Table 3 summarizes exploration activity in party-months for each country reporting. A summary of wildcat and development drilling for applicable Latin American countries is given in Table 4.

Significant exploration highlights are the following.

1. Argentina: New offshore exploration areas in the South Atlantic were granted to private companies in early 1978, and new calls for bids for primary and secondary exploration contracts should be granted in late 1978.

2. Bolivia: Tesoro discovered the new gas and oil field of La Vertiente. Occidental discovered the small Techí field and 3 small fields were discovered by YPF.

3. Brazil: Important discoveries were made along the coast of Ceara, Espirito Santo, and Rio de Janeiro in the Campos basin.

4. Chile: A new gas field was discovered in the Springhill district, and in the Straits of Magellan

new fields and onshore field extensions were proven through drilling of 21 exploratory wells.

5. Colombia: Nine new association contracts were signed between Ecopetrol and private companies for a total area of 2,841,596 ha. Texaco made a significant discovery in Cartagena 2 (offshore Caribbean), with a cumulative flow of 42,440 MCFGD from 4 zones. Discoveries were made by Intercol in the Sucre area, and Ecopetrol in the Middle Magdalena Valley.

6. Guatemala: Shenandoah West Chinaja 1A, an exploratory well 12 km northeast of Rubelsanto was drilled to TD of 10,877 ft and produced at a rate of 6,833 BOPD of 32 to 35° API oil from 2 zones between 3,651 and 3,813 ft in the Cretaceous Coban Formation. Oil production from the Rubelsanto field for local consumption and road building was 48,000 bbl. The government approved a 12-in., 200-km pipeline from Rubelsanto to the Caribbean coast.

7. Mexico: A total of 79 exploratory wells was completed, resulting in 17 new oil fields and 9 gas fields. Total proved reserves in Mexico were placed at 16 billion bbl at year end, which represents a 43% increase from the 11.1 billion bbl at the end of 1976.

8. Peru: In April 1977, the Transandean pipeline linking the northeastern Oriente field to the Pacific coast at Bayovar became operative resulting in total production exceeding 100,000 BOPD at year end.

9. Trinidad: Trinidad and Tobago experienced a record high level of production with 229,081 BOPD. The increase was the result of Amoco's offshore production rise from 117,800 BOPD in 1976 to 135,483 BOPD in 1977.

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South America, Central America, Mexico, and Caribbean

2045

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ARGENTINA (Fig. 1; Tables 5, 6, 8-12)

Private Company Activities by Marcelo R. Yrigoyen, Esso S.A.P.A.

YPF Activities by José Alberto Suarez Lynch, YPF

As in the previous report, private activities in Argentina during the last year were almost negligible with only 3 development wells drilled by Astra C.A.P.S.A. With the exception of individual production by companies shown on Table 9, all other activities by private companies were performed in the capacity of contractors of the state oil agency and are therefore included in YPF tables.

Recently (April 1978), offshore exploration areas in the South Atlantic were granted to private companies, and new calls for bids for exploration and for primary and secondary exploitation contracts to be granted during the current year have

2052

F. L. Amato

the 5 previously designated areas AA, BB, CC, D, and E.

Governmental Activities

In September, the draft of a model production-sharing contract was offered by the government to interested foreign companies and their comments were invited. In December, the Guatemalan Congress passed Decree 96-75, detailing the terms of the new model contract and the new petroleum law. At year end this long-awaited legislation was pending presidential signature. Further, during December, Decree 66-77 was passed, whereby a hydrocarbon export tax was defined as being 2% of the sales price realized.

The Shenandoah and Centram groups continue to operate under the old Petroleum Code of 1955 (Decree 345).

Geothermal

Guatemala has 22 geothermal prospects. To date, 3 of these, all in volcanic terrane, have been investigated by the Instituto Nacional de Electrificación (INDE). Moyuta prospect, located 80 km southeast of Guatemala City, was evaluated in 1976. The second of 2 wells drilled, INDE-2, was completed in early 1977 (see 1976 Developments, AAPG *Bulletin*, v. 61, p. 1586), and indicated that the Moyuta prospect is in a senile stage in the geothermal cycle of reservoir development.

The Zunil prospect is 106 km west of Guatemala City and occupies an area of 35 sq km. Prior to drilling, 5.2 km and 1.1 km of reflection and refraction seismic work, respectively, and 100 sq km of gravity and magnetic work were acquired in the area. Five core holes were drilled in 1977, with a total footage of 4,926 (1,501.4 m); core recovery amounted to 60%. Well Z-4, drilled to 902 ft (275 m), flowed a mixture of hot water and vapor with a bottom-hole temperature of 205°C (401°F). Optimism is high and this area occupies top priority in INDE's geothermal program.

A third area, Amititlan prospect, is located 20 km south of Guatemala City between the Pacaya Volcano and Lake Amatitlan. The numerous hot springs, known for over 1,000 years, give vivid testimony to the region's geothermal potential. Reconnaissance mapping was begun in May 1977, but was later discontinued owing to the higher priority of the Zunil prospect area.

FRENCH GUIANA (Fig. 6)

By P. Jacobsen, Jr., Esso Inter-America Inc.

For the decade 1966-75, Elf and Shell (SIPM) jointly were active in exploring major marine-

acreage holdings embracing both French Guiana waters and the neighboring Surinam offshore on the west. The original concession areas covered much or all of the continental shelf, but they also extended in effect indefinitely northward into much deeper waters. The greater part of the Elf-Shell effort was on the shelf. This emphasis changed in 1976, when Esso became a partner and the operator in the deeper water portions of the concessions.

In French Guiana, the Esso-Elf-Shell area is defined on the south by straight-line segments which correspond approximately to the 200-m isobath. Elf-Shell retain an adjoining area on the outer shelf. These 2 blocks comprise the remainder of the so-named Guyane marine permit. This license was originally open-ended on the north, but with the latest renewal, to September 1980, the seaward limit was fixed at the 2,000-m isobath, which for lack of close control is only approximately known. Also, the French Guiana-Surinam boundary has not been formally established. For these various reasons, the acreage of the Esso-Elf-Shell and Elf-Shell holdings cannot be closely stated.

A coordinated French Guiana-Surinam seismograph survey in 1976 included about 600 km in French Guiana waters. A second Esso-operated survey of similar scope was carried out in August-September 1977 (by CGG). The French Guiana part totaled 1,320 km and took about 2 weeks.

In a reorganization of French state oil companies during 1976, a resulting new company, Société Nationale Elf-Aquitaine (SNEA) replaced Erap as the nominal titleholder of the Guyane permit.

GUYANA

By Petroconsultants S.A.

Petroleum Rights

No rights are currently held in the country since Deminex relinquished its offshore license in April 1977.

Exploration and Drilling

Last activity reported from the country was the abandonment by Deminex of the offshore wildcat, Essequibo 2, at 14,280 ft TD, in the fall of 1976.

HAITI (Tables 7, 35)

By Petroconsultants S.A.

Summary

About 31,900 sq km were held on December 31, 1977, by the Crux group and Hideca. The Cul-

South America, Central America, Mexico, and Caribbean

2059

During 1977, *Corporacion de Desarrollos de Recursos Minerales (CODREMI)*, a government-owned company, was sole right holder onshore and offshore Puerto Rico. Applications filed by Mobil, Sun, Exxon, Superior Oil, and Kestern International Petroleum Operations (KIPO) for 5 blocks offshore both north and west of San Juan were pending at the end of 1977.

Negotiations with these companies await the completion of the Ambient Impact Statement, the settlement of the Puerto Rico offshore jurisdiction zone, and the enactment of the new Mineral Law Regulations.

In 1977, the National Science Foundation carried out a 7-month marine seismic survey, and the U.S. Geological Survey conducted a general hydrographic study.

CODREMI reportedly planned for exploratory drilling onshore early in 1978.

EL SALVADOR

By Petroconsultants S.A.

Petroleum Rights

No rights are currently held in El Salvador. The government is reported to have contracted American and Canadian firms to prepare a new legislation.

To attract foreign companies to bid for offshore acreage, the government enacted in 1974 an offshore legislation, but results of the bidding were unsuccessful.

Exploration and Drilling

No activities related to exploration for hydrocarbons were reported for 1977.

SURINAM (Fig. 6)

By P. Jacobsen, Jr., Esso Inter-America Inc.

As described under the paragraphs on French Guiana, Esso joined the previous partners Elf and Shell (SIPM) in 1976, and became the operator in the outer offshore part of the so-called Colmar Suriname Concession. The southern limit of the Esso-Elf-Shell area is 7°30'N lat., which coincides roughly with the edge of the continental shelf. In that same year Elf-Shell relinquished its remaining on-shelf acreage to the south.

The northern limit of the Colmar Suriname license is not specified, but under the 1965 concession agreement with the government, the rights extend northward "as far as the country has or will have claims with respect to minerals exploration and exploitation." Related to the matter of seaward jurisdiction, the Suriname Parliament in

early 1978 legislated a 200-n. mi limit, a step adjoining countries had taken several years ago.

Neither Surinam's western offshore boundary with Guyana, nor the eastern boundary with French Guiana, has been formally established. A joint Surinam and France Boundary Commission reportedly held several negotiating sessions during the year.

A coordinated French Guiana and Surinam seismograph program of 1976 included about 2,050 km in Surinam waters. A second Esso-operated project of similar scope was made by CGG in 1977. The Surinam coverage was 540 km and required about 10 days.

An ocean-current survey, begun in October 1976, was completed in early 1977; it was conducted by E G & G International using the vessel *State Horn*, separately chartered from Tracor Marine. The current measurements were made on the Demerara Rise in water depths to 1,200 m.

Esso, as operator, spudded a first deep-water well in November (A2-1) at N8°16'20", W54°07'40", in 3,940 ft (1,201 m) of water. SEDCO is the drilling contractor, using the new floating rig SEDCO 472.

The Paramaribo press reported around mid-year that the private Venezuela company *Sociedad Anonima Petrolera Las Mercedes* had been granted a 120,000-ha. onshore concession toward the northwestern part of the country. A program of shallow drilling was to have begun within a few months, presumably to evaluate heavy-oil occurrences on the coastal plain first known in the middle 1960s. Commencement of these activities had not yet been announced at year end.

Bauxite mining and processing continue to be Surinam's major industry, and efforts toward development of further bauxite deposits and other mineral resources are also progressing. Of particular interest is a major government undertaking (known collectively as the West Suriname Project) in the northwestern part of the country. The project is aimed principally at eventual exploitation of a relatively low grade but extensive bauxite find of some years ago in the rather remote Bakhuis Mountains. Access roads, a railroad, and a large hydroelectric installation are in varying stages of construction or planning.

Note—We take this opportunity to express regret at having omitted, through oversight, the 1976 Surinam and French Guiana reports prepared by P. Jacobsen of Esso Inter-America.

TRINIDAD (Fig. 10; Tables 5-7, 45-57)

By Trinidad Ministry of Petroleum and Mines

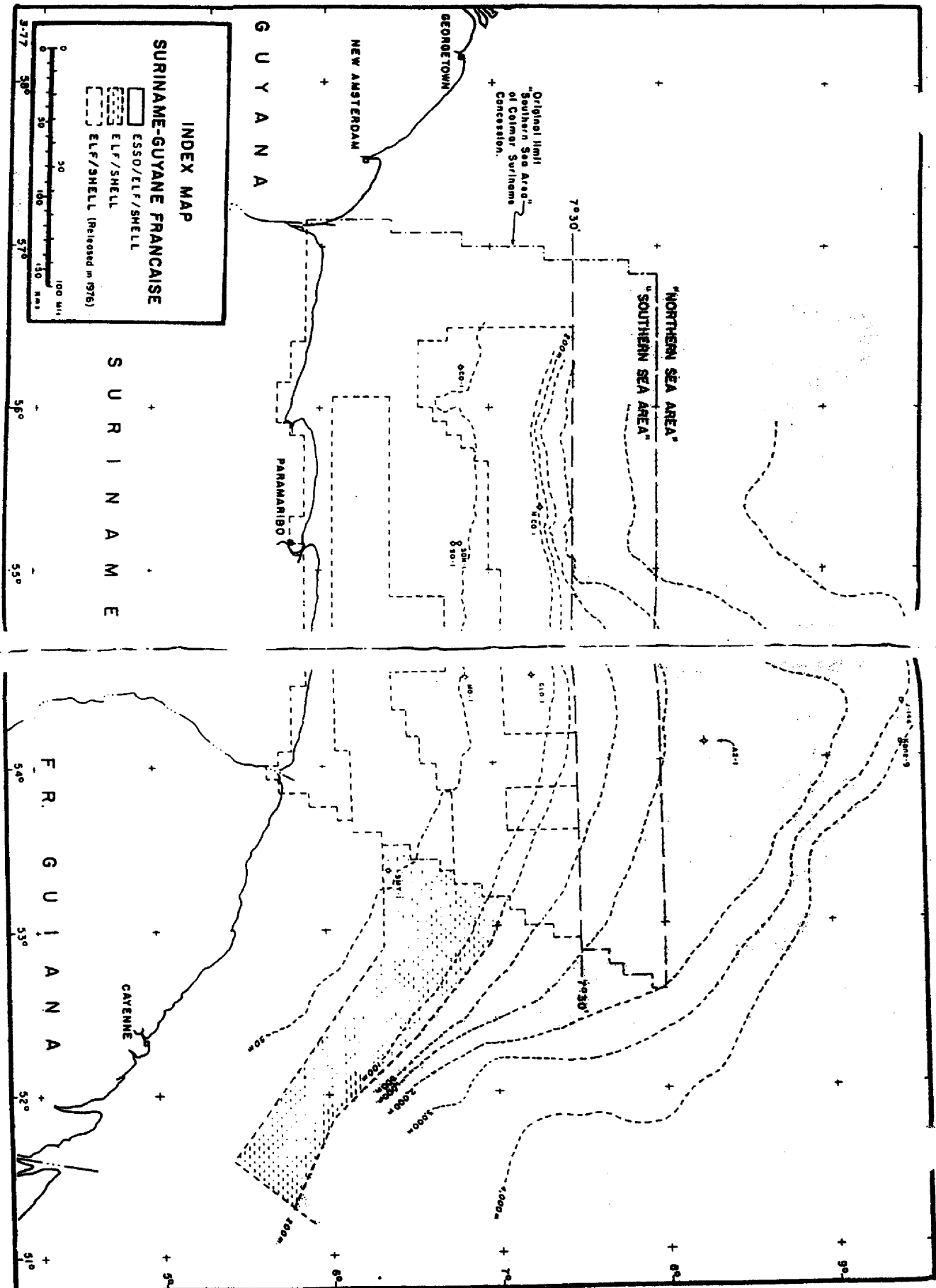


FIG. 6—Suriname and French Guiana, concession area at 1977 year end, 1977 exploration well, and offshore exploration wells of prior years.

Petroleum Developments in South America, Central America, Mexico, and Caribbean Area in 1978¹

F. L. AMATO²

Abstract The review for 1978 presents information on petroleum developments in 30 countries from South America, Central America, and the Caribbean area. Hydrocarbons were produced in 12 of these countries, for a total reported production of 1,292,427,218 bbl of oil. Statistics on gas production were not available for all countries so total gas production could not be determined. Argentina, Trinidad, Peru, Ecuador, and Barbados had increases in production. A summary on Mexico is included but, in the future, Mexico will be reported under "North American Drilling Activities."

Major increases in development drilling were experienced in Barbados, Brazil, Colombia, Trinidad, Ecuador, and Peru. Chile and Venezuela had slight decreases.

INTRODUCTION (Tables 1-7)

Information on petroleum developments from 30 countries in South America, Central America, and the Caribbean is available for the 1978 review. Hydrocarbons were produced in 12 of these countries with total reported production of 1,292,427,218 bbl of oil. Complete statistics on gas production are not available, although gas is produced in some of these countries. Table 1 shows annual oil production from 1974 to 1978. Daily production for 1978 is shown in Table 2. Table 3 summarizes exploration activity in party-months for each country reporting. A summary of wildcat and development drilling for applicable Latin American countries is given in Table 4. Available gas production statistics are given in Table 5. A detailed summary of completion and exploration is shown in Tables 6 and 7.

Significant exploration highlights are the following.

1. Argentina: Continued exploratory efforts in the South Mendoza-Neuquen basin resulted in discovery of 11 new oil and gas fields.
2. Brazil: The first commercial discovery in the Alto Amazonas basin, 700 km southeast of Manaus, was made with the well 1-JR-1-AM producing 260,000 cu m gas/day on a 3/4-in. choke.
3. Guatemala: Three new contract areas for exploration rights were granted to oil companies during 1978.
4. Peru: An all-time production record of 186,877 BOPD was reached in November owing mostly to the throughput of Occidental's new northern branch feeder line becoming operational in early 1978.
5. Trinidad: Oil production in Trinidad and Tobago reached a new high in February of 240,

333 b/d largely because of Amoco's maximum production level of 148,590 b/d.

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The writer acknowledges with thanks and appreciation the collaboration and professional dedication of the many geologists, companies, and government offices and their associated secretarial and drafting assistants who have made possible the compilation of this review.

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ARGENTINA (Tables 8-12; Fig. 1)

Private Company Activities by Marcelo R. Yriogoyen; YPF Activities by Juan A. Robbiano

Petroleum exploration activity in Argentina by YPF (state owned) during 1978 was located in onshore and offshore sedimentary basins. The main exploration program was in South Mendoza-Neuquén basin, and resulted in discovery of 11 new oil and gas fields. Exploration efforts have confirmed the oil possibilities of the western region of the Golfo San Jorge basin. Puesto Quiroga x-1 and Paso Rio Mayo were 2 significant new-field wildcats. Exploratory drilling in the Golfo San Jorge offshore discovered noncommercial oil and gas.

An extensive program of seismic onshore and offshore marine work was carried out during 1978. A total of 20,901 km of seismic survey was run.

Wildcat drilling by YPF during 1978 totaled 254,477 m, development drilling totaled 1,440,335 m, for an overall total of 1,694,812 m drilled.

During 1978, 766 development wells were completed, including 646 oil wells, 20 gas wells, 89 dry holes, and 11 injection wells.

Total oil production was 26,009,577 cu m, 4.7% above production of the previous year. Oil production averaged 71,259 cu m/day. Total gas production during the year amounted to 11,468,817,682 cu m. Proved oil reserves are now estimated at 385,507,000 cu m and gas reserves reached a volume of 432,320 million cu m.

A risk contract was negotiated between YPF and Total-Deminex-Bridas-Arffranco for exploration and exploitation of an offshore area in the Austral basin. The area under contract is 10,655 sq km, and it extends seaward from the Tierra del Fuego shoreline to 67°W on the Atlantic platform.

Private company activities (independent of YPF, the state oil company) during 1978 were of small significance, with only 7 development wells drilled and no wildcats. The amount of crude oil produced by private companies was also small. However, during 1978, private companies were a relatively significant factor in overall activities as contractors to YPF in many primary and secondary exploitation operations or under risk contracts (Risk Contract Law No. 21778 was enacted in April 1978). As these contract operations will be reported by YPF in its annual statistics, no further reference is made here.

under certain conditions. SGI's properties include a 25% undivided interest in the Guatemalan exploration Rights 87 through 92, a 37.5% beneficial interest in production from the Rubelsanto oil field, and a 30% beneficial interest in any production from the remaining rights. Closing date for the contract of sale is July 31, 1979.

Hispanoil Activities

Hispanoil area AA is located in the Alta Verapaz/Petén Departments east of and contiguous to Basic's rights. Two crews conducted field geology in the southern and western mountains of Guatemala in October and November, and in area AA in December. Western Geophysical and CGG were awarded the contracts for the ± 500 km Vibroseis and ± 200 km portable seismic programs, respectively. Traverse cutting was begun in December for the Vibroseis program, while portable work was scheduled for early 1979. Hispanoil intended to spud its first well in the last third of 1979.

Getty Activities

Getty area BB is also located in the Alta Verapaz/Petén Departments east of and bordering the Hispanoil area. Activities began in mid-year and 6 party-months of field geology and seismic were reported. Getty's 500 to 750 km Vibroseis program is being conducted by Western Geophysical party V-10. Progress during 1978 included 300 km of 24-fold seismic, and surface geologic work along the seismic lines and some rivers. Getty plans to spud its first well by midyear 1979.

Centram Activities

Summary from Petroconsultants S.A.

The government granted a 2-year extension until April 4, 1980, of the exploration period for Rights 93 through 97. Rights 82 through 85 were not renewed.

About 75 km of land seismic was shot by Western Geophysical in Rights 82, 84, and 97. Additionally, Petty Ray shot about 300 km of marine seismic in Lake Izabal in Rights 93, 94, and 97 under Arco's supervision. Arco signed an agreement to conduct seismic work at its own risk in order to make a decision whether to drill a well to earn an interest in the Centram area. However, Arco did not exercise its option after the seismic work.

Geothermal

Information provided by Hugo R. Bethancourt, INDE

The Instituto Nacional de Electrificación (INDE) continued work on the Zunil and Amatitlán prospects located 105 km west and 20 km south of Guatemala City. Preliminary exploration work was also carried out in San Marcos, Momostenango, and Sololá areas located 143, 105, and 75 km west of Guatemala City.

Work continued in the Zunil prospect totaling 83 sq km of gravity and 100 sq km of magnetic work. About 8,961 chemical analyses were conducted on 602 samples taken from vapor-flowing wells and surface springs. Samples from wells Z-2, Z-4, and Z-6 indicate 0.15, 0.033, and 0.13% by volume of noncondensable gases, which are considered highly satisfactory regarding plant construction design. Phase II, or drilling of deep wells, was started including the drilling of reduced-diameter holes in wells drilled in 1977. Wells Z-2 (TD 647 m), Z-5, Z-6, and Z-8 were completed, and wells Z-7 and Z-9 are nearly at completion. Total footage drilled and/or cored was 1,310 m. Core recovery ranged from 60 to 100%. Maximum recorded temperatures were respectively 257, 175, 157, and 187°C in wells Z-2, Z-3, Z-5, and Z-7. Wells Z-2, Z-4, and Z-6 are flowing a mixture of hot water and vapor.

Work on the Amatitlán prospect included surface geologic mapping and location of hot springs, 10 sq km of gravity, and 140 sq km of magnetometry. About 3,481 chemical analyses were carried out in 277 samples from hot springs and existing wells.

In addition, geologic-geochemical reconnaissance work was done on the geothermal zones of San Marcos, and geochemical sampling in the Momostenango, Atilán, Nueva Santa Rosa, and Nahualate river; samples were analyzed with 388 chemical analyses.

FRENCH GUIANA (Table 48; Fig. 11)

By P. Jacobsen, Jr.

The major activity was drilling of the deep-water exploratory well FG2-1 by Esso, as operator, with partners Elf, Shell (SIPM), and EURA-FREP. The test was dry and abandoned (Table 48). The drilling was done by the floating rig *Sedco-472*, specially outfitted for work in deeper waters. The ship came to French Guiana at midyear from a similar operation in the adjoining Surinam offshore.

There was no geophysical work in 1978.

Esso increased its equity in both the French Guiana off-shelf area and the associated Surinam holdings, from 33 1/3% to 45%, this being an option under the global 1975 farm-in agreement.

Elf and Shell continue to hold their separate

1754

F. L. Amato

interest in on-shelf acreage. There was no activity for that area during the year.

GUYANA

By Petroconsultants S.A.

No rights are currently held in the country and no recent application was reported. A 16,213-sq km offshore oil prospecting license held by the German Deminex was relinquished about April 1977. A bill was issued in late 1978 by the government to prepare for establishment of a state-owned company, the Guyana Petroleum Corp., to be responsible for promoting oil exploration in the country and controlling downstream operations.

No exploration or drilling activity took place in 1978.

HAITI

By Petroconsultants S.A.

Rightholding Situation

More than 4,800 sq km was held in the fall of 1978 by 2 companies, the United States Crux and the Venezuelan Hideca. As during previous years, only very scanty information was received on the rightholding situation.

Agreement with Hideca extended—The exploration permit held by Hideca since October 8, 1976, expired in August 1978 but was extended without new terms being known. It appears that most acreage originally granted (27,900 sq km) was relinquished and that one block (Block A) was retained in an onshore area extending north of the Etang Saumatre and probably corresponding to the Artibonite basin. Information received in March 1979 from Hideca mentions that the company is committed to undertake additional work and is looking for a farmout to drill 1 or several tests.

Crux relinquishment—Contrary to our 1977 annual review, the Cul de Sac block was not relinquished in 1977, but the block Plaine du Nord was relinquished in 1978. The acreage held by the company at the end of 1978 was 4,826 sq km.

Exploration

Hideca—During 1977, Hideca conducted surface geologic studies including mapping with Landsat data. In addition, land gravimetry measurements were made on a surface covering approximately 30 sq km. Areas surveyed are mainly located near Thomassique (Plaine Centrale basin) and Mirebalais (Artibonite basin).

Surface geology and review work were conducted during 1978.

Wildcat Drilling

No drilling activity took place during 1978 and none is planned for the near future.

HONDURAS (Table 49; Fig. 12)

By P. Jacobsen, Jr.

Exploration activity was mainly directed to marine acreage granted in 1977 and early 1978 off the north coast of the country. Detailed seismograph surveys were carried out by Esso and Texaco/Amerada. Esso drilled 2 exploratory wells, both abandoned dry.

Acreage holdings at year end are shown in Figure 12. Anschutz holds 590,000 ha., Esso 611,000, and Texaco/Amerada 179,000. The Esso acreage is of 2 types: 2 southerly blocks, largely on the continental shelf, which are former National Reserves areas awarded in competitive bidding, and with specific work commitments; and adjoining on the north, a belt of off-shelf parcels held under the more general terms of the petroleum law. The Texaco/Amerada block was also awarded through competitive bidding. The 2 Anschutz concessions are held under the regular terms of the petroleum law.

The Honduras Mines & Hydrocarbons office reports that the various other applications or concessions shown in last year's review are now without effect. All of these areas had been inactive for several years.

Esso carried out a 3,230-km seismograph survey early in the year, including some coverage on the eastern Anschutz concession. Texaco/Amerada ran a 780-km program near year end. These surveys were made by the respective company geophysical ships *Kirsten Bravo* (Esso) and *Percheron* (Texaco).

To complement its offshore studies, Esso headed a 1-month reconnaissance geologic effort on the mainland. This was a cooperative project with the Mines & Hydrocarbons Office; both Esso and government geologists participated.

The exploration drilling by Esso is summarized in Table 49. This 2-well program completed the company's work commitments under the concession contract for the 2 "National Reserves" blocks.

JAMAICA

By Petroconsultants S.A.

Rightholding Situation

No petroleum rights have been valid in Jamaica since April 1975, when the Weaver group licenses were terminated. However, the government plans to offer offshore blocks in the Pedro Bank area in early 1979.

Production

For the first time since 1962, the country again produced from March 1978 more crude oil than the domestic consumption, which currently averages about 130,000 BOPD.

An all-time record was reached in November with a daily average of 186,877 bbl, whereas the year's average was 153,089 BOPD, 66.7% more than during 1977 with 91,859 BOPD. This increase of production was mainly due to the throughput of Occidental's new northern branch feeder line which became fully operational in early 1978. At year end, Occidental production averaged about 100,000 BOPD of which 50% is exported.

Petroperu may also step up oil production in the northern jungle fields after the completion of the 81-km spur line from the Pavayacu field to Corrientes (Trompeteros field).

The new transport facilities allowed production to start from several Occidental and Petroperu fields (Capahuari North and South, Carmen, Shiyayacu Northeast, Huayuri South, and Tambo for Occidental; Pavayacu, Yanayacu, and Capirona for Petroperu).

It is reported that 1979 crude oil production will pass the 200,000-BOPD mark after Occidental starts additional production from 1-A and 1-B block fields. It is expected that the first results from the Occidental-Bridas group's secondary recovery project in the northwestern area will be obtained in 2 years or more.

Peru will be exporting about 48,000 b/d of crude oil in the first quarter of 1979 of which about 30,000 bbl belongs to Petroperu. Exports are expected to increase by another 20,000 b/d in the second quarter when the capacity of Occidental's feeder line will be increased with the completion of booster station.

PUERTO RICO

By Roland Umiker

During 1978, CODREMI (Corporacion de Desarrollos de Recursos Minerales) a government-owned company, was sole rightholder onshore and offshore Puerto Rico. The only exploration activity reported was carried out by the U.S. Geological Survey, which conducted marine geologic and hydrologic studies, together with shallow seismic work. CODREMI has plans to shoot seismic surveys over 2 previously outlined structures near Dorado, between San Juan and Vega Baja; drilling will follow subsequently.

EL SALVADOR

By Petroconsultants S.A.

No rights are currently held in El Salvador. Last activities reported in the country consisted of geophysical surveys (seismic and air magnetometer) carried out in 1974 over the Pacific shelf and sponsored by the United Nations and the government of El Salvador.

In 1976, the government initiated a reevaluation of the Pacific offshore with the technical assistance of ARPEL (Latin America state oil companies) and Colombian Ecopetrol. No wells have ever been drilled for hydrocarbons in El Salvador.

SURINAM (Table 77; Fig. 11)

By P. Jacobsen, Jr.

The major activity in Surinam was completion of the deep-water exploratory well A2-1 by Esso (as operator), with partners Elf, Shell (SIPM), and EURAFREP. This test was dry and abandoned. At the end of January 1979 the companies made an obligatory relinquishment of acreage, in the southwestern part of the jointly held area (Fig. 11). A concession to private Venezuelan interests for evaluation and exploitation of known shallow heavy-oil deposits on the northwestern coastal plain has been under consideration by the government since 1977, but no final action has yet been taken. There was no geophysical activity in Surinam during 1978.

The A2-1 wildcat (coordinates 8°16'22"N, 54°07'42"W) was the first well drilled by the floating rig *Sedco-472*, especially engineered for work in deeper waters. When spudded in late 1977, the wildcat set a water-depth record (3,940 ft, 1,201 m) for the industry. Drilled on a seismic location, the A2-1 bottomed in Neocomian at a total depth of 16,173 ft (4,929 m).

The acreage relinquishment (386,000 ha.) was in compliance with reductions at 4-year intervals stipulated by the concession contract (Colmar Agreement).

In exercise of an option under the 1975 farm-in agreement, Esso increased its equity in both the Surinam and the associated French Guiana holdings from the original 33 1/3% to 45%.

TRINIDAD (Tables 60-64)

By Trinidad Ministry of Petroleum and Mines

Crude Oil Production

Oil production in Trinidad and Tobago reached the highest level ever attained in February of 1978, 240,333 b/d. This peak in production coincided with the Amoco Trinidad Oil Co. maximum production level of 148,590 BOPD and production for this year was 83.7 million bbl, for an

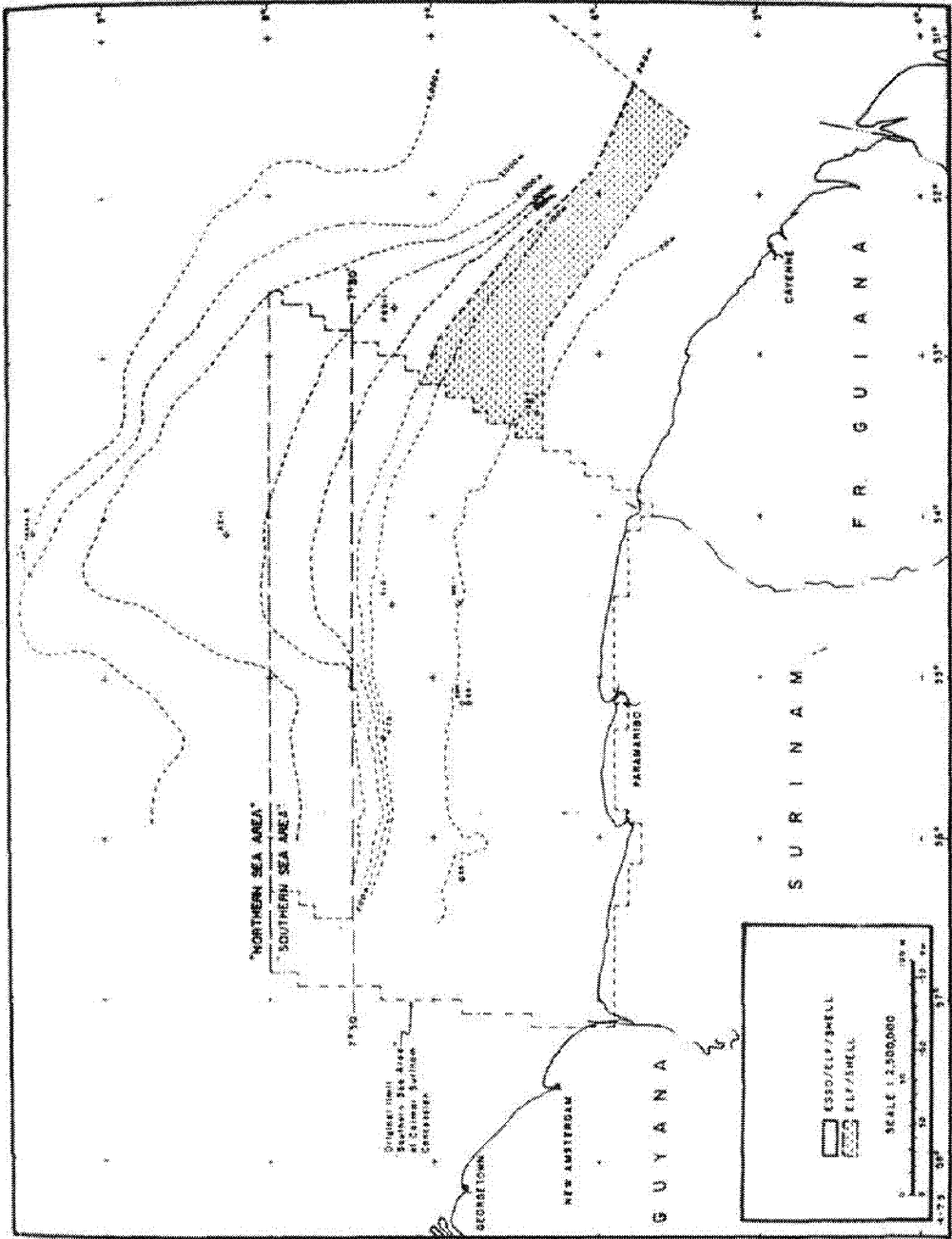


FIG. 11—Exploratory wells in 1978 and offshore tests of prior years, and concessions held in early 1979, Surinam and French Guiana.

1782

F. L. Amato

Table 45. Ecuador Contract Areas (in Hectares)

Company	12/31/77	12/31/78	Increase (Decrease)
CEPE			
Oriente	---	1,500,000	1,500,000
Occidente	---	500,000	500,000
CEPCO	48,056.15	48,056.15	---
Texaco-CEPE	491,355	491,355	---
Northwest	200,000	200,000	---
YPF	200,000	160,000	(40,000)
Total	939,411.15	2,899,411.15	1,960,000

Table 46. Guatemala Geologic and Geophysical Exploration in 1978

	Surf. Geol.	Land Seis.		Marine Seis.		Total
	Party- Months	Party- Months	Line- Km	Party- Months	Line- Km	
Basic	5	---	---	---	---	5
Centram	---	2.5	75	1.5	300	4
Hispanoid	6	---	---	---	---	6
Getty	6	6.0	300	---	---	12
Total	17	8.5	375	1.5	300	27

Table 47. Guatemala Exploration Drilling in 1978

Well Name	Location	Basis for Loc.	Well Classification		Comp. Date (m/d)	TD (ft)	Fm. at TD	Remarks
			Original	Final				
BASIC								
West Chinaja 2 & ST	16°00'21.6"N 90°19'36"W	Seis./Surf.	Ext.	Dry	04/78	4,401	Cret.	Pressure observa- tion well
Chisec	15°52'49.6"N 90°29'47.7"W	Surf./Subsurf.	NFW		Drig.	4,510 ST	Coban Fm.	Drig.

Table 48. French Guiana Wildcat Drilling, 1978

Operator Well Name	Location	Basis for Loc.	Explor. Class	TD (BSL)		Deepest Fm.	Remarks
				ft	m		
Esso FG2-1	7°15'40"N 52°43'31"W	Seis.	NFW	12,896	3,930	Basalt Neocomian (?)	D&A, water depth 2,688 ft

Table 49. Honduras Wildcat Drilling, 1978

Operator Well Name	Location	Basis for Loc.	Explor. Class	TD (BSL)		Deepest Fm.	Remarks
				ft	m		
Esso Gracias a Dios-1	16°97'40"N 84°42'55"W	Seis.	NFW	7,864	2,397	E. Cret.	D&A, water depth 1,107 ft
Punta Patuca-1	16°07'24"N 84°19'48"W	Seis.	NFW	10,240	3,121	U. Cret. (?)	D&A, water depth 559 ft

Table 50. Nicaragua Wildcat Wells Drilled in 1978

Operator Well	Class	Location	Water Depth ft (m)	TD ft (m)	Prob. Objective	Rig	Spud / Comp.	Final Status
Tuapi	Wildcat	14°39'17"N 82°20'34"W	77	12,868 (3,922)	Eocene	Glomar Grand Isle	02/26/78 02/26/78	P&A