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PETROLEUM DEVELOPMENTS IN SOUTH AMERICA
AND CARIBBEAN AREA IN 1959¹

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ABSTRACT

Exploration and production activities in 1959 were stimulated in Argentina and Brazil, in a politically inspired effort to achieve self-sufficiency in petroleum, but were depressed in Venezuela, which sells the bulk of its production in competition with other major producing areas of the world.

In South America as a whole, crude oil production in 1959 was 3,244,900 b/d, only fractionally higher than in 1957. There were appreciable increases, as compared with 1957, in Argentina, Brazil, Colombia, and Trinidad, totalling 113,100 b/d; this was offset by a decrease of 69,000 b/d in Venezuelan production.

Exploration activities were maintained at a high level in Brazil, Argentina, Bolivia, and Colombia but decreased considerably in Venezuela, where large concession areas were voluntarily surrendered.

INTRODUCTION

Exploration activities in 1959 were carried out against a generally depressing background of chronic world oversupply of petroleum, which has every appearance of continuing for some years. In Venezuela, there has been a severe curtailment of exploratory activities, arising partly out of this general state of affairs but doubtless also resulting from the increased taxes imposed in 1958 as well as official insistence that private enterprise will not be granted new areas for oil development in the future. By contrast, exploration is being vigorously pursued in some other countries of the sub-continent, particularly in Brazil and Argentina, mainly in an effort to bridge the wide gaps which exist between oil production and consumption in these countries. Substantial progress is being made in both cases.

Crude-oil production in South America, including the island of Trinidad, averaged 3,244,900 b/d during 1959, representing about 17% of the world's production during the year. The consumption of petroleum in South America, on a crude-equivalent basis, amounted to roughly 1 million b/d; the area was therefore a net exporter of more than 2 million b/d of petroleum during 1959.

South American output of crude was almost 6% higher in 1959 than in 1958, but only 1½% greater than in 1957. A high proportion of the production continued to come from Venezuela, which contributed 83.8% of the total during 1959, compared with 86.8% in 1957. Colombia remained the second largest producer in 1959 and Argentina took third place from Trinidad.

In Central America, exclusive of Mexico, and

in the Caribbean islands, the only regular production of crude oil was in Cuba, which averaged 500 b/d in 1959.

The following table shows the annual crude-oil production of South American countries during the past 3 years, and also their cumulative production to the beginning of 1960.

PRODUCTION OF CRUDE OIL
Thousands of Barrels

	1957	1958	1959	Cumulative
Venezuela	1,016,900	951,000	1,011,000	12,831,000
Colombia	45,327	46,582	53,332	888,850
Argentina	33,946	35,709	47,450	739,638
Trinidad	34,064	37,355	40,919	667,919
Brazil	10,106	18,923	23,590	63,026
Peru	19,222	18,732	17,733	559,222
Chile	4,337	5,368	6,423	27,796
Bolivia	3,575	3,436	3,170	24,836
Ecuador	3,303	3,187	2,823	77,853
Total	1,168,780	1,120,492	1,206,476	15,880,146

The daily average production in U. S. barrels and the change from 1957 to 1959 was as follows:

Thousands Barrels Daily

	1957	1958	1959	Increase or (Decrease) 1957/1959
Venezuela	2,780.0	2,606.0	2,711.0	(69.0)
Colombia	124.2	127.6	146.0	21.8
Argentina	91.0	97.8	130.0	32.0
Trinidad	91.3	102.3	110.7	17.4
Brazil	27.7	51.8	64.6	36.9
Peru	52.7	51.3	48.6	(4.1)
Chile	11.9	15.1	17.6	5.7
Bolivia	9.8	9.4	8.7	(1.1)
Ecuador	9.0	8.7	7.7	(1.3)
Total	3,201.6	3,070.2	3,244.9	43.3

ACKNOWLEDGMENTS

Grateful acknowledgment is made to the following, who contributed the reviews of petroleum developments in the countries mentioned.

BOLIVIA	L. E. Schlatter, Cia. Petrolera Boliviana Shell, La Paz
BRAZIL	Petrobras Exploration Department, Rio de Janeiro

¹ Manuscript received, April 27, 1960.

² Shell Oil Company.

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BRITISH GUIANA	Y. Bonillas, California Exploration Company, San Francisco, California
CHILE	Empresa Nacional del Petroleo, Santiago
COLOMBIA	Olián Shockley, Colombia-Cities Service Petroleum Corporation, Bogota
ECUADOR	T. R. Wilson, Anglo Ecuadorian Oilfields Ltd., Guayaquil
PERÚ	A. Lyndon Bell, International Petroleum Company, Lima
TRINIDAD	The Petroleum Association of Trinidad, Port of Spain
VENEZUELA	Neal R. Van Middlesworth, Venezuelan Oil Scouting Agency, Caracas
GUATEMALA AND BRITISH HONDURAS	H. H. WILSON, Petroleum Investments (Overseas) Ltd., Guatemala City
COSTA RICA, EL SALVADOR, HONDURAS, NICARAGUA, PANAMA	Henk Worries, Union Oil Company of California, San José, Costa Rica
BAHAMAS, CUBA, DOMINICAN REPUBLIC, HAITI, JAMAICA, PUERTO RICO	Luis Blanché, Harry Wassall & Associates, Havana

HIGHLIGHTS

Following are some highlights of petroleum developments in South and Central America during 1959.

In Venezuela, there was much less exploratory and drilling activity than in 1958, and considerable concession acreage was surrendered by the operators. Geophysical exploration decreased to less than half the previous year and the number of active drilling rigs fell from 80 in the first quarter of 1959 to 55 in the fourth. Production averaged 2,711,000 b/d in 1959, which was higher than in 1958 but somewhat less than in 1957. Important discoveries were made in Lake Maracaibo on concessions granted in 1956 and 1957, and also in Eastern Venezuela; in general, these new pools were in the vicinity of existing oil fields. The results of wildcat drilling in the Barinas basin were disappointing.

In Colombia, there was a considerable increase in exploratory drilling in 1959, but the results were not particularly encouraging, although a fair discovery was made in the Middle Magdalena Valley. Crude-oil production increased appreciably as compared with 1958.

In Argentina, drilling and pipeline construction activities increased, largely as a result of contracts with various foreign operators and financial groups made in 1958 and 1959. These activities were already reflected in a substantial

increase in production. Considerable areas are also subject to exploration under some of these contracts.

In Trinidad, the scope of oil-industry operations in 1959 was much the same as in 1958, although there was some increase in crude-oil production and footage drilled. A unique operation was the drilling of an offshore discovery well from a floating barge and later successfully completing the well to the surface.

In Brazil, the massive exploratory effort continued in all major sedimentary basins, and there was increased emphasis on exploratory and development drilling. New oil pools were discovered in the Recôncavo basin and there were promising indications of production in two other sedimentary basins. Crude production reached 76,000 b/d by the end of 1959, which was almost triple the rate in 1957, and proved reserves probably passed the half-billion-barrel mark.

In Peru, a considerable area of petroleum concessions is being surrendered in the Marañon basin, as the result of disappointments in wildcat drilling. In the producing areas of the Pacific Coast, development drilling was resumed about mid-year, after the government granted a measure of relief in controlled product prices, but crude production in 1959 was less than in 1958 due to fewer well completions.

In Central America, petroleum exploration activity was characterized mainly by seismic surveys and the drilling of wildcat wells. No significant oil or gas discoveries were made and the results so far appear to be rather disappointing.

In Cuba, there has been no significant oil or gas discovery since 1954, and exploration activity continued to decline. The enactment of a new petroleum law, which included extremely high government royalties and drastic limitation of concession areas, resulted in the complete cessation of exploration activity by private enterprise. A government oil agency has been set up to carry out such activities in the future.

VENEZUELA (Figs. 1, 2, 3; Table A)

By NEAL R. VAN MIDDLESWORTH, Venezuelan Oil Scouting Agency, Caracas

Crude-oil production in Venezuela in 1959 totalled 1,011,000,000 bbls. (2,711,000 b/d), a 6.4% increase over the 2,606,000 b/d of 1958 and

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PRODUCTION IN ECUADOR (IN BARRELS)

	1958	1959	Cumulative to Dec. 31, 1959
Anglo-Ecuadorian Oilfields Ltd.	2,409,177	2,256,177	61,932,787
Tennessee del Ecuador, S.A.	474,789	330,735	10,010,074
Carolina Oil Company	200,140	150,969	2,916,175*
Petropolis Oil Company	46,128	40,374	1,473,704*
Concepcion Ecuadorian Oilfields	56,920	44,947	1,520,443
	3,187,154	2,823,202	77,855,183*

* Possibly incomplete and subject to revision.

party-months in surface exploration. 7,265 sq. km. in Western Ecuador were covered by aerial photography, and 23 stations on concession boundaries were surveyed and monumented; of these 5 stations within the Daule concession were fixed by Tellurometer survey. Of 5 exploratory wells drilled, 3 were on the Engunga concession; all were dry holes.

California Ecuador Petroleum Company virtually completed its geological mapping program in coastal Ecuador and spent most of the year in the geological and geophysical evaluation of its concessions. During the year the company acquired additional 109,000 acres offshore to bring its total concession holdings to approximately 2,875,000 acres. The first of 3 offshore stratigraphic tests, South Ancon No. 1, was drilled on a seismic structure and plugged and abandoned in the Azucar at 4,440 ft. as a significant dry hole. The second offshore wildcat Golfo No. 1, was drilling at 3,166 ft. at the end of the year.

COMPLETION SUMMARY FOR 1959

	Oil	Gas	Dry	Total	% Success.
Explor. wells	Nil	Nil	6*	6	Nil
Devel. wells	21†	Nil	1‡	22	95

* 2 wells 4,000-5,500 ft., 3 wells 3,000-4,000 ft., 1 offshore well 4,440 ft.
† 8 wells 4,000-5,100 ft., 11 wells 3,000-4,000 ft., 2 wells 1,500-1,500 ft.
‡ 1,620 ft. deep.

BRITISH GUIANA

By Y. BONILLAS, California Exploration Company, San Francisco, California

At the beginning of the current year, the California Oil Company (British Guiana) Limited holds concession rights on approximately 16,000 sq. mi. of coastal and offshore British Guiana. During the latter part of 1958 a marine seismic survey was conducted on the offshore portion of the licensed area. No further field operations were conducted in this concession during 1959.

COSTA RICA (Fig. 14)
PANAMA, NICARAGUA, EL SALVADOR, AND
HONDURAS

By HENK WORRIES, Union Oil Company of California, San José, Costa Rica

COSTA RICA

Drafting of the proposed petroleum law was not completed and the Compañía Petrolera de Costa Rica, Ltda. (Union Oil Company of California) remained the sole operating exploration group in Costa Rica during 1959.

Operations were continued under a joint agreement with Gulf Oil Corporation, entered into in September, 1958, whereby Gulf will earn an undivided 50% interest in Union's holdings both in Costa Rica and Panamá. Cia. Petrolera continued as the operator.

Two exploration wells and a core-hole were drilled in 1959. Parismina CH-1 was drilled on a seismic high to a depth of 1,135 ft. in upper Miocene shale during April. Porvenir N° 1 was spudded May 15 on a surface anticline, and was abandoned July 3 at 6,755 ft. as a result of stuck drill pipe. Limón N° 1 was spudded on October 14 and was abandoned on December 20 at total depth of 10,181 ft. At the end of the year, preparations were being made to move Drilrexco's Oilwell 96 rig to Tigre N° 1 and an access road to this location was under construction.

During 1959, one geological party spent 5 months in the field, detailing surface structures in Limón Province. The reflection seismograph survey, started during the previous year, was completed about mid-March, 1959. The United Geophysical Company Inc. party made a check-survey across several indicated surface anticlines and magnetometer highs in Limón Province, including some offshore extensions. Total length of seismic profile for the entire operation was 164 kms.; about 77% of this was done off the coast.

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PETROLEUM DEVELOPMENTS IN SOUTH AMERICA
AND CARIBBEAN AREA IN 1960¹

E. W. CLARK ET AL.²
New York, N. Y.

ABSTRACT

Exploration activities continued at a high level in Argentina and Brazil, but declined practically to a standstill in Venezuela.

South American production of crude averaged almost 3,500,000 b/d in 1960, and was 5% higher than in 1959; most of the increase came from Venezuela, Argentina, and Brazil.

The Government of Venezuela set up an agency to operate as a national oil company, thus increasing to eight the number of governments in the Western Hemisphere participating directly in petroleum exploration and production operations by this means.

INTRODUCTION

In general, the exploration and production operations of the oil industry in South America continued to grow in 1960, although the emphasis varied from one country to another, mainly in response to politically generated influences. For the continent as a whole, crude-oil production averaged 3,474,100 b/d during 1960, an increase of 175,500 b/d or 5%, as compared with 1959. It is a fair assumption that proved reserves increased proportionally.

If the demand for petroleum products in South America had been satisfied entirely from indigenous crude, there would have been an exportable surplus of about 2,500,000 b/d of crude in 1960. As it was, however, significant quantities of Middle Eastern and Russian oils were imported into some South American countries having crude deficiencies, thus increasing the quantity of South American crude seeking markets in North America and Western Europe.

The following table shows the annual crude oil production of individual countries in the last three years, and also their cumulative production to the beginning of 1961.

¹ Manuscript received, April 28, 1961.

² Shell Oil Company.

PRODUCTION OF CRUDE OIL

	<i>(Thousands of Barrels)</i>			<i>Cumulative</i>
	<i>1958</i>	<i>1959</i>	<i>1960</i>	
Venezuela	951,000	1,011,000	1,041,672	13,873,000
Argentina	35,709	44,578	63,846	800,602
Colombia	46,582	53,332	55,666	944,516
Trinidad	37,355	40,919	42,357	720,276
Brazil	18,923	24,506	35,563	99,505
Peru	18,732	17,733	19,253	578,477
Chile	5,568	6,423	7,231	35,031
Bolivia	3,436	3,170	3,572	28,408
Ecuador	3,187	2,823	2,799	80,652
Total	1,120,492	1,204,484	1,271,961	17,160,467

The daily average production and the change from 1959 to 1960 were as shown below.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to the following, who contributed the reviews of petroleum developments in the countries mentioned.

ARGENTINA	Juan J. Zunino, Yacimientos Petroliferos Fiscales, Buenos Aires
BOLIVIA	L. E. Schlatter, Cia. Petrolera Boliviana Shell, La Paz
BRAZIL	F. W. Lange, Petroleo Brasileiro S. A., Rio de Janeiro
BRITISH GUIANA	Y. Bonillas, California Exploration Company, San Francisco, California
CHILE	Empresa Nacional del Petroleo, Santiago
COLOMBIA	Olián Shockley, Colombia Cities Service Petroleum Corporation, Bogota

	<i>(Thousands of Barrels Daily)</i>			<i>Increase or (Decrease) (1959-60)</i>	
	<i>1958</i>	<i>1959</i>	<i>1960</i>	<i>Bbls.</i>	<i>Per Cent</i>
Venezuela	2,606.0	2,771.0	2,846.1	75.1	2.7
Argentina	97.8	122.1	174.5	52.4	43.0
Colombia	127.6	146.1	152.1	6.0	4.1
Trinidad	102.3	110.7	115.7	5.0	4.5
Brazil	51.5	67.1	97.2	30.1	44.9
Peru	51.3	48.6	52.6	4.0	8.2
Chile	15.3	17.6	19.7	2.1	11.9
Bolivia	9.4	8.7	9.8	1.1	12.2
Ecuador	8.7	7.7	7.4	(0.3)	(3.9)
Total	3,070.2	3,299.6	3,475.1	175.5	5.3%

of gun perforation, both in recompletions and in the original completion of wells.

Tennessee del Ecuador terminated its second year of operation in western Ecuador after having completed 5 wildcat ventures as dry holes, 2 being located north of Guayaquil; 3 development wells were completed as marginal producers. Two to three field parties have been active in surface exploration, completing 26 party-months.

In the coastal areas of western Ecuador, 4,764 sq. km. were covered by aerial photography; 7 stations on concession boundaries were surveyed and monumented, completing the marking of concessions totalling 1,288,577 hectares in western Ecuador.

California Ecuador Petroleum Company completed two offshore tests during the year. Golfo No. 1 was abandoned at 4,107 ft. with significant shows in the Azucar sandstone, and Santa Clara No. 1 was abandoned and plugged at a depth of 4,987 ft. This company ceased active operations in Ecuador in July and has now been reduced to a small organization in Quito.

a reconnaissance gravity survey covering the on-shore coastal area. No further field operations were conducted during the term of the license.

GUATEMALA AND BRITISH HONDURAS (Figs. 16,17)

By H. H. WILSON, Petroleum Investments (Overseas) Guatemala

GUATEMALA

During 1960 the tempo of exploration in the Petén carbonate province of northern Guatemala slowed down considerably.

One drilling string of tools was kept permanently in this area by Ohio who completed Chinajá No. 1 as a dry hole and then drilled a second dry hole at San Román No. 1. Atlantic introduced a rotary rig for one month with which it deepened the cable-tool hole at San Francisco; this well was also abandoned as a dry hole.

One portable Rayflex seismic crew completed 5½ party-months of detailing for Delhi-Taylor

COMPLETION SUMMARY, ECUADOR, 1960

	Oil	Gas	Dry	Total	% Success.
Exploratory wells	—	—	8 ^a	8	Nil
Semi-exploratory wells	2	—	1	3 ^b	66.6
Development wells	63	—	1	64 ^a	98.4

^a 5 wells, 3,800 ft.-6,000 ft.
1 well to 753 ft.
2 offshore wells; 4,107 ft. and 4,987 ft.

^b 3 wells, 3,800 ft.-5,500 ft.

^a 4 wells 5,000-6,000 ft.
16 wells 4,000-5,000 ft.
9 wells 3,000-4,000 ft.
35 wells 1,200-2,100 ft.

PRODUCTION IN ECUADOR IN BARRELS

	1959	1960	Cumulative to Dec. 31, 1960
Anglo-Ecuadorian Oilfields, Ltd.	2,256,177	2,346,410	64,279,197
Tennessee del Ecuador, S. A.	330,735	250,231	10,260,305
Carolina Oil Company	150,969	125,261	3,041,436
Petropolis Oil Company	40,374	37,066	1,510,770
Concepcion Ecuadorian Oilfields	44,947	39,952	1,560,395
	2,823,202	2,798,920	80,652,103

BRITISH GUIANA

By Y. BONILLAS, California Exploration Company, California

In April, 1960, the California Oil Company (British Guiana) Limited relinquished its concession rights on approximately 16,000 sq. mi. of coastal and offshore British Guiana. This concession was first acquired in April, 1958, and during the latter part of that year exploratory field operations were commenced. These included a marine reflection and refraction seismic survey conducted on the offshore part of the license and

who had taken over Texas' acreage in northwestern Petén.

Most concessionaires confined their exploration to geological structure mapping, reconnaissance geology, and regional basin evaluation, which accounted for a total of 52 geological party-months.

The concession situation was modified considerably during 1960 by relinquishments, pooling agreements, and changes of ownership. The most important changes are listed.

1. The Atlantic, Sohio, Tidewater Group, Hawthorne Investments and Belco Petroleum relinquished all their acreage in Guatemala.

PETROLEUM DEVELOPMENTS IN SOUTH AMERICA AND CARIBBEAN AREA¹

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ABSTRACT

This review covers 25 reporting countries in South America and the Caribbean area. During the review year, geological and geophysical field effort was expended in search of new petroleum reserves in 16 of the 25 countries but this effort totalled only 1,298 party-months—down 25% from the preceding year. Wildcat drilling in 1961 increased 7.2% over the 1960 figure. During the year 374 exploratory wells were drilled in 14 of the reporting countries and 87 of these wildcats were completed as oil or gas producers for a success ratio of 30%. Finally, oil production for the year from the subject area totalled 1,318,610,000 bbls., up 4.2% over the preceding year. Some 80% of this total production came from Venezuela; 8 other countries—all of which have been on a producing basis for many years—provided the remainder. No new countries came on production during 1961. Substantial net acreage relinquishments of concession areas during the year by private companies are reported from Colombia, Bolivia, Venezuela, and Peru.

INTRODUCTION

Exploration and production operations of the oil industry in South America and the Caribbean area continued to grow through 1961. The year's production from this important segment of the world was up 4.2% over that of 1960 and totalled 1,318,610,000 bbls.—about 19% of Free World oil production, or 16% of total world production for the same period. The 8 oil producing countries of the South American continent together with the Island of Trinidad have through 1961 accounted for about 14% of total cumulative world oil production. The great bulk of this production comes, and has come, from one country—Venezuela. Table I shows the annual crude oil production of the 9 individual producing countries over the past 5 years, and also their cumulative production through 1961.

Geological and geophysical effort was expended in the search for new discoveries and new reserves, not only in the nine countries with established production but in neighboring countries as well, and totalled 1,298 party-months in 1961. This total effort was expended in 16 countries and, when compared with the preceding year, records a downswing in party-months of about 25% for this type of work—a continuing reflection of the current world supply position as well as of several politically generated influences. This downward trend in exploration effort was seen in the data from almost every country reporting—with the outstanding exception of Chile where an increase of 10% was posted. It is of some interest to find that almost

60% of the total geological and geophysical field effort in 1961 was expended in 2 countries—Argentina and Brazil—neither of which are net exporters of petroleum or petroleum products. These 2 countries received about 50% of the 1960 effort.

Over-all exploratory drilling was up 7.4% in 1961. During the year 374 exploratory wells were completed in this great area against 348 in 1960. Of these wildcats, 87 were completed as oil or gas producers, for a success ratio of 30%. Forty-three per cent (160) of the 374 exploratory wells were drilled in Argentina and Brazil. Combined depth of the 374 exploratory wells is 2,975,000 ft., for an average depth of 7,955 ft. New drilling depth records were mentioned during the year in Brazil, British Honduras, Chile, Colombia, Guatemala, and Peru.

Private companies recorded substantial net acreage relinquishments of concession areas in Colombia, Bolivia, Venezuela, and Peru. The action was drastic in Colombia where about 56% of the total acreage under concession was renounced.

On a broad regional geologic basis the most significant discoveries of 1961 may have been (1) the finding of high-gravity oil production (Caranda) and of condensate production (Rio Grande), both in relatively shallow Tertiary beds in the Bolivian Chaco, and (2) the establishment of condensate production from Cretaceous beds in the Oriente of Peru.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to the following companies and individuals for their part in supplying information toward, or in contributing

¹ Manuscript received, May 7, 1962.

² Gulf Oil Corporation.

TABLE I. ANNUAL PRODUCTION, 1957-1961
(Thousands of Barrels)

Country	1957	1958	1959	1960	1961	Total Cumulative Production (Millions)
Venezuela	1,014,900	951,000	1,011,000	1,041,672	1,065,734	14,939.
Argentina	33,946	35,709	44,578	63,846	84,257	885.
Colombia	45,327	46,582	53,332	55,666	53,383	999.
Trinidad	34,064	37,355	40,919	42,357	45,768	756.
Brazil	10,106	18,923	24,506	29,613	34,807	127.
Peru	19,222	18,732	17,733	19,255	19,371	598.
Chile	4,337	5,568	6,423	7,243	9,278	44.
Ecuador	3,303	3,187	2,823	2,800	3,022	84.
Bolivia	3,575	3,436	3,170	3,574	2,990	31.
Totals	1,168,780	1,120,492	1,204,484	1,266,026	1,318,610	18,463.
Per cent change		-4.1%	+7.4%	+5.1%	+4.2%	

whole sections to, this 1961 Review of Petroleum Developments in South America and the Caribbean Area. These sections, country by country, covering 25 countries and arranged in alphabetical order, comprise the remainder and the bulk of this review. Wherever desirable and possible, pertinent maps and statistical tables accompany these sections on the individual countries. The reader is referred to these country-by-country reports for local highlights and details.

ARGENTINA	Juan J. Zunino, Yacimientos Petroliferos Fiscales, Buenos Aires
BAHAMAS	W. C. Lamb, Gulf Oil Corp., Coral Gables, Florida
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BRAZIL	Pedro de Moura, Petroleo Brasileiro S. A., Rio de Janeiro
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BRITISH HONDURAS	Owen D. Thomas, Phillips Petroleum Co., Bartlesville, Oklahoma
CHILE	Carlos Santa Maria, Empresa Nacional del Petroleo, Santiago
COLOMBIA	W. Ernest Aitken, Colombia-Cities Service Petroleum Corporation, Bogota
COSTA RICA	J. Roger Heggblom, Caribbean Gulf Oil Co., San Jose
CUBA	Harry Wassall and Assoc., Inc., Geneva, Switzerland
DOMINICAN REPUBLIC	Harry Wassall and Assoc., Inc., Geneva, Switzerland
ECUADOR	Anglo-Ecuadorian Oilfields, Ltd., Guayaquil
GUATEMALA	W. A. Petersen, The Ohio Oil Co. of Guatemala, Guatemala C. A.
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PARAGUAY	J. D. Nunnally, Delhi Taylor Oil Corp., Dallas, Texas (Literature reference only)
PERU	Victor Benavides, International Petroleum Co., Lima
PUERTO RICO	Harry Wassall and Assoc., Inc., Geneva, Switzerland
EL SALVADOR	Harry Wassall and Assoc., Inc., Geneva, Switzerland
SURINAM	Richard A. Mills, Colmar Surinam Oil Co., Paramaribo
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VENEZUELA	Neal R. Van Middlesworth, Venezuelan Oil Scouting Agency, VOSA, Caracas

ARGENTINA (Fig. 1; Tables II-V)

(By JUAN J. ZUNINO, Yacimientos Petroliferos Fiscales, Buenos Aires)

The production of petroleum during 1961 in Argentina was 13,416,704 cubic meters (84,256,901 bbls.), an increase of 32% over the 1960 production of 10,150,646 cu. m. (63,746,056 bbls.).

Gas production in 1961 was 4,564 million cu. m.

TABLE II. PRODUCTION OF CRUDE OIL BY COMPANIES IN ARGENTINA, 1961

	Development Contracts	Cubic Meters	Barrels
Pan American (Chubut)		2,070,371	(13,001,930)
Tennessee S.A. (Tierra del Fuego)		464,319	(2,917,179)
Esso Argentina Inc. (Neuquén)		9,923	(62,316)
C. M. Loeb Rhoades (Santa Cruz)		272	(1,708)
Cities Service D.C. (Mendoza)		1,217,013	(7,642,842)
Subtotal		3,762,098	(23,625,975)
<i>Old Concessions</i>			
Cia. Atuel (El Sosneado) (Mendoza)		788	(4,949)
Esso S.A.P.A. (Neuquén)		9,353	(58,737)
Astra (Chubut)		68,086	(427,580)
Petroquímica (Chubut)		73,392	(460,902)
Diadema Argentina (Chubut)		368,401	(2,313,558)
Subtotal		520,020	(3,265,726)
YPF		9,134,586	(57,365,200)
Total		13,416,704	(84,256,901)

DEVELOPMENTS IN SOUTH AMERICA AND CARIBBEAN AREA 1103

SERGIPE-ALAGOAS BASIN

In 64 rig-months a total of 133,066 ft. of exploratory hole was drilled in the states of Sergipe and Alagoas. Two discoveries were made during the year in the Rio São Francisco embayment, which still is considered one of the most promising areas. Significant shows of oil were encountered in several wells drilled in the southwestern part of the basin in the State of Sergipe.

One geological party and 2 reflection seismograph crews were active in the area. Offshore seismic surveys along the coastal waters of Sergipe and Alagoas were completed during January, 1961.

RECONCAVO-TUCANO BASINS

Approximately 223,987 ft. of exploratory hole was drilled in the Reconcavo and Tucano basins. Total rig-months for the year was 107. Discoveries in 1961 in this area were as follows.

Cb-1-Ba (Canabrava)	Candeias "A" zone
Csx-1-Ba (Cassarongongo Extension)	Candeias "A" zone and Ilhas Formation
Go-1-Ba (Gomo)	Ilhas formation
Me-2-Ba (Mapele)	Exact zone unknown-well on fire
RG-1-Ba (Roca Grande)	Sandstone in Candeias formation
IB-1-Ba (Ilha de Bimbarra)	Gas producer in Candeias "A" zone

A total of 169 proven field wells were drilled. Of these, 133 were oil, 2 were gas, and 34 were dry. Distribution by fields is as follows.

1. Agua Grande	36
2. Buracica	36
3. Candeias	4
4. Cassarongongo	18
5. Dom João	33
6. Sauipe	1
7. Itaparica	2
8. Socorro	1
9. Taquipe	29
10. Gomo	1
11. Jacuibe	1
12. Brejinho	3
13. Canabrava	4

During the year, 3 surface geological parties, 5 seismograph crews, and 3 gravity crews were active in the basin. Marine seismic surveys were conducted in the Todos os Santos Bay.

ESPIRITO SANTO BASIN

One rig drilled a stratigraphic test on the Island of Santa Barbara, 55 km. off the coast. Total depth of the well was 4,585 ft.

Marine seismic surveys were carried out along the coastal waters of the basin.

PARANÁ BASIN

In the Paraná basin, 58,466 ft. of exploratory

hole was drilled by 6 rigs. The most significant event was the discovery of gas in a well (TVst-1-SC) drilled in the state of Santa Catarina.

Two surface geological parties, 1 seismic refraction crew, 1 gravity crew, and 2 electric-resistivity crews were active in the basin.

Five shallow holes were drilled in the Pantanal region in Mato Grosso to test the thickness of the sedimentary section. A thickness of less than 500 meters of young sediments was encountered.

BRITISH GUIANA

(By P. H. A. MARTIN-KAYE, Director, Geological Survey, Georgetown)

There was no oil exploration in British Guiana in 1961. However, this does not mean that there is no interest and the outlook seems to be showing progressively more promise.

Palynological and other studies on cores from the recent water and stratigraphic test hole, Shelter Belt No. 3 in Georgetown, sponsored by the Geological Survey, have shown that the coastal sediments include an important development of middle and lower Tertiary, and perhaps Cretaceous rocks. Some marine fossils were found and it is reasonable to suppose that the marine element will strengthen over the 90-mi. width of the shelf. It is already known from earlier offshore seismic work that these sediments attain very substantial thicknesses. This has changed the picture considerably from a year or two ago when all of the coastal sequence was regarded as of very young age and, coupling this with the fact that traces of heavy oil have been found at the basement in 2 deep boreholes, we are able to hold new hopes for the offshore.

BRITISH HONDURAS (Fig. 8)

(By OWEN D. THOMAS, Phillips Petroleum Co., Bartlesville, Okla.)

During 1961 exploration activity in British Honduras was not as intense as in the previous year. No geological field parties or seismic crews were in the field. Phillips Petroleum Company and British Honduras Gulf Oil Company remained the principal concession holders.

Phillips drilled its third exploration well, No. 1 Palmetto Cay, about 3 mi. offshore and 5 mi. south of Placentia Village and spudded the fourth well, No. 1 Cocoa Plum Cay, about 9 mi. offshore east-southeast of Stann Creek just off the northern tip of Cocoa Plum Cay.

DEVELOPMENTS IN SOUTH AMERICA AND CARIBBEAN AREA 1131

PUERTO RICO

(By HARRY WASSALL & ASSOCIATES, INC., Geneva, Switzerland)

No oil exploration or drilling developments were reported on Puerto Rico during 1961. Kewanee Interamerican Oil Company continues to hold its acreage position.

SURINAM

(By RICHARD A. MILLS, Colmar Surinam Oil Co., Paramaribo)

Colmar Surinam Oil Company carried out the only oil exploration activity undertaken in Surinam in 1961. This company holds concessions over 14,000,000 acres located in the coastal area and extending seaward off the north coast to the edge of the continental shelf. Two party-months of overwater seismic work were carried out by the company under contract with Marine Geophysical International, Inc. This survey was continuing at year's end.

TRINIDAD

(Tables XXXIX-XLI)

(By THE PETROLEUM ASSOCIATION OF TRINIDAD, Port-of-Spain)

The following statistics summarize the over-all drilling and producing activities in Trinidad.

During the year, the operations of Apex (Trinidad) Oilfields Ltd., Kern Trinidad Oilfields Ltd., and Trinidad Petroleum Development Co. Ltd., came under the management of BP (Trinidad) Limited. In the following review, the operations of Apex (Trinidad) Oilfields Ltd. cover the period January to May (inclusive) and of Kern Trinidad Oilfields Ltd. the period from January to June (inclusive). The year's operations for Trinidad Petroleum Development Co. Ltd. appear under B. P. (Trinidad) Limited.

GEOLOGICAL AND EXPLORATORY DRILLING

Apex (Trinidad) Oilfields Ltd. drilled no exploratory wells during the period and no surface geological work was done.

TABLE XXXIX. SUMMARY OF DRILLING AND PRODUCTION IN TRINIDAD

	1961	1960
Total crude production (bbls.)	45,767,772	42,357,329
Average number of drilling strings	23	27
Wells completed	288	312
Producers (oil or gas)	243	277
Success ratio	85%	89%
Footage drilled	1,426,004	1,407,952

TABLE XL. PRODUCTION STATISTICS, TRINIDAD, 1960-1961

Company	Crude Oil (Bbls.)		Natural Gas (MMCF)	
	1960	1961	1960	1961
BP GROUP				
Apex	2,741,897	3,196,506	3,308	4,701
Kern	1,028,249	962,111	930	842
T.P.D.	6,205,600	6,270,656	16,401	16,726
	9,975,746	10,429,273	20,639	22,269
Dominion	212,861	119,695	2,790	2,521
P.C.O.L.	387,158	296,392	176	65
Shell	7,205,870	6,449,822	20,093	17,814
T.C.O.	1,307,191	1,168,094	9,310	9,384
Texaco	17,222,517	17,944,961	39,156	41,657
T.N.A.	6,044,583	9,358,676	5,488	8,625
C. D. Jones	1,403	859	—	—
	42,357,329	45,767,772	97,652	102,335
C.H.P.S. Production (excluded from above)			199,159 bbls.	
Total cumulative production to end of 1961—Oil			756 million bbls.	
—Gas			1,284,858 MMCF (est.)	
Number of wells producing during December, 1961			3,249	
Number of wells shut-in as of December 31, 1961			2,693	

BP (Trinidad) Limited drilled 12 appraisal wells on land. In the Mackenzie lease, Mackenzie 7 was drilled 2,000 ft. south of the Los Bajos fault and was completed as a small producer from the Cruse sands. In the Moruga North lease, 3 dip-line wells (MN-146, 149 and 167) were unsuccessful in establishing production from the Herrera sands in separate thrust blocks of the Southern Range anticline. Mandingo 5 found the Herrera sands shaled out on the north flank of the Barrackpore anticline and was abandoned. In Moruga West, the outstep well, MW-175, failed to find downdip fault accumulations of oil in the Herrera sands. In the Erin lease, 4 appraisal wells were drilled, but only Er-10 was successful. AEr-1 was abandoned, and Ex-11 and AEr-IX have yet to prove commercial production. Er-12 was drilled as a pup well to Er-10 to evaluate shallower sands. Lz-2 was drilled on the Lizard lease to explore the deep Herrera sands, but they were found dominantly wet and the well was abandoned. Eight semi-appraisal wells were drilled in the Palo Seco and Quarry leases, and 3 producers and 1 dry hole were completed in each area.

In the North Marine offshore lease, NM-3 and NM-3X failed to find oil-bearing extensions of the oil and gas accumulation found in NM-2, and both wells were abandoned. At the year-end, an exploration well (SM-1) was drilling in the South Coast lease.

One field party has been augering in the Table-