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Foreign Development Papers, 1979<sup>1</sup>

T. H. Murray, Jr.<sup>2</sup>

This issue of the *Bulletin* contains 7 foreign development papers covering 6 areas of the world exclusive of the United States and Canada. These areas are shown on the map in Figure 1. Area 5 is divided into 2 parts, the Middle East (excluding Israel) and the Middle East (Israel only). Area 7 is also divided into 2 parts, Southwest Pacific (Australia) and Southwest Pacific (New Zealand and Southwest Pacific Islands). Each paper is a review of the significant oil and gas exploration/production activities in each area, as interpreted by the various authors and their colleagues. It is the informed commentary by the authors which sets these papers apart from a set of statistics and materially increases their value to the reader.

To prepare these papers, well data, land status, production statistics, and geophysical activity information must be accumulated from a myriad of sources, such as foreign governments, oil companies, scouting services, individual consultants, and local representatives. Because of the diversity of these sources, the information is in many different formats and languages. The information is often difficult to obtain and may be incomplete. The compilation and organization of the data are far more difficult and complex than similar work for the United States and Canada. As was the case last year, authors experienced difficulty obtaining the necessary information in several areas.

This year several of our veteran authors retired after many years of faithful service and great difficulty was experienced in replacing them. Of particular note in this regard is the contribution made by Dr. H. V. Dunnington of Berkshire, England. He spent much of his valuable time in first locating an author for the Europe area, and then assisting with the gathering of data through his many contacts. We owe Dr. Dunnington a tremendous vote of thanks for his untiring efforts. Unfortunately, an author could not be found to coordinate Area 1, South America, Central America, and the Caribbean leaving a signi-

ficant gap in this issue. If anyone reading this would like to volunteer to be the Area 1 author next year, or knows of a likely candidate, please let me know as soon as possible.

The authors of these papers and those who assisted them have done an outstanding job this year and have made a very valuable contribution to our knowledge of worldwide petroleum activity. They all worked voluntarily and gave freely of their time and energy. Their in-depth knowledge, personal expertise, and the extent of their efforts are clearly reflected in the following papers. It is equally important to recognize the substantial contribution of the authors' employers, without whose cooperation many would have been unable to complete their task. Finally, I would like to acknowledge with personal thanks the following authors and their employers.

1. SOUTH AMERICA, CENTRAL AMERICA, AND CARIBBEAN  
Not covered in this report
2. EUROPE  
Cynthia Kat, British National Oil Corp., Glasgow, Scotland

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<sup>2</sup>Chevron Overseas Petroleum, San Francisco, California 94120.

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1737

3. NORTH AFRICA  
Marc-A. Nicod, Petroconsultants S.A., Geneva,  
Switzerland
4. CENTRAL AND SOUTH AFRICA  
C. A. Rachwal and E. R. Destefano, Gulf Oil  
Exploration and Production Co.-International,  
Houston, Texas
5. MIDDLE EAST (EXCLUDING ISRAEL)  
Darwin O. Hemer, Mobil Oil Corp., New York,  
New York  
John F. Mason, Consultant, Princeton, New Jersey  
Gregory C. Hatch, Texaco Inc., White Plains,  
New York
6. MIDDLE EAST (ISRAEL)  
Not covered in this report
7. FAR EAST  
G. L. Fletcher, Atlantic Richfield Indonesia Inc.,  
Jakarta, Indonesia
8. AUSTRALIA  
E. F. Durkee, Worldwide Exploration Consultants,  
Denver, Colorado
9. NEW ZEALAND AND SOUTHWEST PACIFIC  
ISLANDS  
H. R. Katz, New Zealand Geological Survey,  
Lower Hutt, New Zealand

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## South America, Central America, the Caribbean, and Mexico

Clyde Deal<sup>1</sup>

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### ARGENTINA

During 1980, exploration, drilling and production increased, with YPF very active in its exclusive areas, plus numerous private national and foreign companies jointly active under 15 risk contracts (Law 21778) from YPF. The risk contract areas amount to 110,914 km<sup>2</sup> onshore and offshore, over which seismic survey coverage totaled 438 km onshore and 29,293 km. For its account on exclusive area, YPF had 1 marine and 20 land seismic crews operating and surveyed 31,170 km. In addition, private, national, and foreign companies are active in 28 exploration and secondary recovery contracts. (See Tables 9-13 and Figure 1.)

In the year, the private companies drilled 7 exploratory and 279 development holes, and YPF 103 exploratory and 582 development holes. YPF reports significant discoveries at the following sites: in the Northwest basin and Aguarague Range, a test confirms the gas potential of the Devonian rocks; in the Neuguen basin, the Rincon Chico X-1 and Puerto Bravo X-1 tests yielded important volumes of gas condensate and oil from Jurassic and Cretaceous rocks. Shell is credited with an oil discovery among the private companies, but no additional information is given.

Production of oil is up 4% from 1979 to 28,580,300 m<sup>3</sup>, with YPF producing 65%, private companies under contract 34%, and old mining concessions producing the remainder. Gas production was up 5% from 1979 to 13,204,054 m<sup>3</sup>. Various details are shown in Tables 9-13 and Figure 1.

### BAHAMAS, 1979

No acreage was held in the Bahamas by any oil company during 1979. No exploration was conducted during the year, and no wildcat wells were drilled. There is neither oil nor gas production in the Bahamas.

### BARBADOS

#### 1979

At the end of 1979, Mobil Oil was sole rightholder, with a production license covering 89 km<sup>2</sup> and an exclusive exploration permit covering 343 km<sup>2</sup>. Mobil Oil bought General Crude's interest in Barbados in the middle of 1979.

Mobil Oil recorded about 1,000 km of marine seismic line (about one month of work).

No exploratory drilling activity was in progress during the year. Development drilling operations were continued in the Woodbourne field with one rig, drilling about 10 wells during the year.

Crude oil production averaged 770 bbl/d during 1979, and the natural gas output averaged 1,770 mcf/d, including about 1,370 mcf/d associated gas from the Woodbourne field.

#### 1980

On January 8, 1980, an agreement was signed between the government and Mobil Oil, permitting Mobil to conduct seismic surveys on and offshore Barbados. After completing the program, the government will enter negotiations with Mobil in view of reaching an agreement, the terms and conditions of which would grant to Mobil a concession to search and produce petroleum.

During 1980, Mobil conducted a 600-km seismic survey as part of the planned 1,609-km program.

No drilling was conducted during the year. The last well drilled was General Crude's Ince 1 well, which reportedly discovered heavy oil in 1978. Mobil continued development drilling in its Woodbourne field, using one rig (seven wells were completed during the year).

Crude oil production averaged 915 bbl/d (up 17.7% compared to 1979). Natural gas output averaged 1,975 mcf/d, or an increase of 31.6% compared to 1979.

### BELIZE

#### 1979

As of December 31, 1979, a total of 35,355 km<sup>2</sup> was held in the country. In January 1979, Central Exploration was granted a prospecting license covering 4,869 km<sup>2</sup> in the northern part of the country. The Panamerican Oil and Gas Company was assigned 20 OPL's covering 7,800 km<sup>2</sup>, mainly in deep waters of the Caribbean Sea. Northern Michigan acquired 10% in the acreage operated by Anschutz. A group formed by Esso, Ajax, Dril Petroleum, and Canadian Superior relinquished all their rights covering 4,027 km<sup>2</sup> offshore in southeast Belize. (See Table 14.)

From early August through October, Placid and Spartan conducted an onshore and offshore survey in the Cetumal Bay area, the northern part of the country, using a GSI crew.

Two wells were drilled during the year for a total of 5,038 km<sup>2</sup>. Onshore Esso, in a joint venture with Canadian Superior, abandoned the Monkey River 1 well in the Toledo district (south Belize), while offshore, Anschutz drilled unsuccessfully its first well, Spanish Outlook 1, in the Caribbean Sea. The Westdrill jack-up was used.

#### 1980

At the end of 1980, a total of 33,288 km<sup>2</sup> were held under petroleum rights onshore and offshore by Anglo American, the Anschutz group, Central Exploration, Nigas, Pan American, and Placid/Spartan. In early 1980, the Esso/Canadian Superior venture surrendered the Toledo block covering 6,267 km<sup>2</sup> in the southern part of the country. In November

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<sup>1</sup>Buttes Resources Company, Dallas, Texas.  
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Guatemala expired in April 1980 and was not renewed.

### GUYANA

1979

Two exploration contracts were signed during 1979. The first one was with the Denison/Seagull venture, for a 11,370-km<sup>2</sup> shelf block. The second one was onshore in Takutu basin (8,651 km<sup>2</sup>) for Home Oil et al. Thus at the end of 1979, a total of 20,021 km<sup>2</sup> were under petroleum rights. No activity was reported during the year. The last well drilled was the Deminex Essequibo offshore well in 1976.

1980

At the end of 1980, Home et al. and Major Crude Oil were rightholders over 18,492 km<sup>2</sup>. Early in 1980, the Seagull/Denison group fully relinquished their 11,350-km<sup>2</sup> offshore block, and Major Crude obtained a 9,842-km<sup>2</sup> block over part of the Seagull acreage.

A national petroleum company is likely to be established. The World Bank conducted a re-evaluation program of the country's potential and will grant a loan to help the country in an exploration program. The group operated by Home Oil recorded 500 km of onshore seismic lines in the Takutu basin license. A complementary seismic program was started in early 1981.

No drilling was conducted during 1980. Last activity was in 1976 when Deminex drilled the Essequibo 2 well. Home Oil has plans to start drilling in 1981 or 1982.

### HAITI

1979

In 1979, the contract by Hideca was transferred to Anschutz, and Crux was awarded a service contract for prospecting in the Artibonite Valley area. A group of Haitian independents was granted a 1,500-km<sup>2</sup> block. Neither exploration nor drilling activity was conducted during 1979. Last activity in the country was in 1977, when Hideca conducted field geological work and Crux drilled 3 dry holes in the offshore.

1980

About 23,000 km<sup>2</sup> were held at the end of 1980 by Anschutz, Crux, and a Haitian group of independents. Offshore, Anschutz conducted a seismic survey off the southern coast of the country. Onshore, Anschutz recorded 230 km of line in the Plateau Central area, and Crux also recorded seismic lines in the plain of Cul de Sac. No drilling was conducted, Anschutz' earlier plans were apparently postponed to 1981. Last drilling activity in the country was in 1977, when Crux drilled 3 offshore dry wells.

### HONDURAS

This article covers developments for both 1979 and 1980. One main activity during the period was the drilling of 2 wells by Texaco/Amerada Hess on their concession off the north coast. Both tests were unsuccessful. A second important effort was a seismic reconnaissance program by Texaco under a 1980 reconnaissance permit covering most of the northeastern shelf. The survey began in November and was continuing at year end. (See Table 75 and Figure 11.)

There has been no major concession activity since the last acreage map published in this paper for the year 1978. The

latest official land map available at the Mines and Hydrocarbons Office shows 2 new concession applications, wholly or mainly onshore, in the western part of the country, totaling approximately 465,000 ha. No field work has been reported.

The concession picture offshore is essentially unchanged from 1978. However, according to indications in early 1981, the 3 present concessionaires along the north coast (Anschutz, Esso, and Texaco/Amerada Hess) planned to relinquish their acreages soon.

Among several Latin American countries, Honduras has expectations of World Bank financing for a major update, nationwide, of hydrocarbons potential. A proposed initial 4-part program, first drawn up in 1980, would comprise seismic reprocessing, establishment of an exploration data bank, training in accounting controls, and drafting of new petroleum legislation. During the middle of 1981, some aspects of the project were still under discussion.

### JAMAICA

Significant pre-drilling exploration activity has taken place in Jamaica during 1979 and 1980. A new petroleum law, enacted in June 1979, was set up by the Petroleum Corporation of Jamaica (PCJ), with the responsibility to explore, develop and manage petroleum resources. PCJ is entering into contractual arrangements with foreign companies for petroleum exploration and production based on a production-sharing agreement. A new feature of the Jamaican production-sharing model is the minimum 12.5% royalty. In addition, the foreign contractor pays corporate taxes and gives PJC a negotiated split on production and an option to have a carried interest. Contracts are granted for a total of 25 yr with an exploration period of 6 yr. (See Figure 12.)

PCJ is conducting an onshore exploration by itself, concentrating primarily on the areas shown in the figure. In 1979, Horizon Exploration Ltd. of the United Kingdom concluded 416 line km of seismic geophysical data in parts of western and northern Jamaica. A number of prospective drilling targets have been identified by geophysics and surface mapping, and in December 1980 the Inter-American Development Bank approved a loan of US\$23.5 million to the government, which will cover the major portion of the cost of a 7-well drilling program. The first phase of this activity, which involves the drilling of 3 wells, or 30,000 ft of hole, is scheduled to begin in November 1981, with Parker Drilling Company of Tulsa, Oklahoma, as contractor. Target depths for the program range from 7,000 to 10,000 ft, with the main objective horizons being Upper Cretaceous sandstones and limestones in structural traps.

The primary target offshore is the Pedro Bank, with an area of 9,405 km<sup>2</sup> which has been divided in 5 blocks. The dry Pedro Bank well, drilled in 1970, did not reveal much new information on the potential of the area, because new seismic data (4,065 km acquired on a 5 x 7 km grid in 1978) indicated that the 'anticline' on which it was drilled had only a thin stratigraphic section above a granodiorite pluton. A large part of the Pedro Bank has good petroleum prospectivity in tilted and deformed fault blocks, unconformity and stratigraphic traps. There are thick sedimentary sections, which include marine shales, sandstones, and porous limestones.

In May 1980, a production-sharing contract was signed by block C between Petroleum Corporation of Jamaica and Union Texas and AGIP as partners, with Union Texas as the operator.

Union Texas is committed to drill the first well to a depth of at least 8,000 ft by May 1982. Compagnie Generale de Geophysique (CGG) collected over 1,000 km of delineation seismic data over block C during December 1980. The Union

**Deal: South America, Central America, the Caribbean, and Mexico**

received for the two blocks offered in 1979 in the Gulf of Panama. At the end of 1980, there was no exploration activity under way in Panama. Sossa/Tacoma's Canazas 1 in the Bayano subbasin was the last well drilled and was abandoned in 1979. There was no wildcat drilling during 1980. Canazas 2 is expected to spud in 1981 by Sossa/Norsul. (See Table 95 and Figure 15.)

**PARAGUAY**

This article covers developments for both 1979 and 1980. Activities for 1979, previously unreported, are included in the tables. (See Figure 16 and Tables 96 and 97.)

For 1980, the only reported field effort was land seismograph work by Pecten Paraguay (Shell USA) on extensive holdings (5,990,000 ha) farmed in from Trend Resources International in the Parana basin, eastern Paraguay. The most recent exploratory drilling was Gloria-1 by Cia. Petrolera del Chaco (CPC) in 1979. This was the fourth test since 1975, all unsuccessful, in the Tertiary/Cretaceous Pirity basin of western Paraguay, a northeastward extension of Argentina's Oran basin. (See Figure 16 and Tables 96 and 97.)

There were major changes in acreage holdings in the north-western part of the country during 1979 and 1980. Texaco/Marathon released all of their remaining acreages in 1979. Esso/Texaco/Marathon relinquished a prospection permit in 1980. Formal release of the law 488 exploration concession (CPC/Esso/Aminoil) along the Argentine frontier, in the Pirity basin, was completed in early 1981.

Immediately east of the law 488 acreage, the associated companies CPC and Repsa have reduced their law 487 exploration concession by about half (to approximately 700,000 ha), and at mid-1980, they were in the process of renouncing some smaller holdings nearby.

A 1980 edition of a government acreage map shows Piper Oil Company holding a prospection permit (roughly 1,900,000 ha) in far northern Paraguay. According to the same source, Chaco Exploration Company, unrelated to CPC, has a concession of about 550,000 ha, also in the north, a small portion of the company's former much larger area.

Early in 1981, the government acquired a 60% interest in the lone refinery in the country, formerly 100% owned and operated by the private company Refineria Paraguaya S.A. (Repsa). The resulting mixed company is Petropar.

**PERU**

See Tables 1-8 and Figure 14.

**PUERTO RICO**

**1979**

No developments in the rightholding situation took place during 1979. At year end, applications filed in 1976 by Mobil, Sun, Exxon, Superior, and Kestern International were still waiting for government approval. Neither exploration nor drilling activities were reported during the year, but Codremi, the government corporation, has plans to shoot land seismic between San Juan and Vega Baja. This seismic survey could be followed by a drilling program.

**1980**

During early 1980, the President of the United States signed legislation giving Puerto Rico jurisdiction on 10.35 sea mi (16.65 km) offshore. With this jurisdiction, they can begin negotiations with international companies on seismic anomalies found back in 1974.

Corporacion de Desarrollos de Recursos Minerales (Codremi) conducted field reconnaissance, shallow sampling, and other geological studies and recommended an exploratory drilling program for 1981 in areas near Ponce and Juana Diaz. No exploratory drilling was in progress in 1980.

**EL SALVADOR**

**1979**

No petroleum rights are valid in the country, and no activity was reported during 1979. Last activity was in 1974 under a program sponsored by the United Nations and the government of Salvador, when seismic and aeromagnetic surveying was conducted.

**1980**

No rights are currently held in the country, and no activity was conducted during the year. Last activities consisted of geophysical surveys carried out in 1974 over the Pacific shelf and sponsored by the United Nations and the government. No drilling has ever been conducted in the country.

**SURINAM**

This article covers both 1979 and 1980. The Esso/Elf/Shell combine continues to be the major concessionaire. There was no field activity in this area during the 2-yr period. The most recent seismograph work was in 1977, and the latest drilling was in 1978. (See Figure 9.)

For the first time since the late 1960s, new petroleum rights were granted in December 1980. The recently constituted Staats Olie Maatschappij Suriname N.V. (State Oil Company Suriname N.V.) and Suriname Gulf Oil Company signed a service contract on near offshore acreage totaling approximately 1,400,000 ha. Early in 1981, there were reports that the new state oil company might acquire and itself operate a coastal, onland concession of roughly 225,000 ha in north-central Surinam.

As one aspect of the major political and administrative changes in the country during 1980, the long time Geologisch Mijnbouwkundige Dienst (GMD), or Geological and Mining Services, has been reorganized. Some personnel are now with the state oil company, and others are part of a newly designated National Geological Survey.

**TRINIDAD**

**1979**

**Crude Oil Production.** The country's crude oil production in 1979 was 78.25 million bbl, which is 6.6% lower than 1978. The decline was attributed to a 6.24 million bbl production difference experienced by Amoco. Amoco's share of the offshore production, nevertheless, accounted for 56% of the country's total production. (See Tables 98-104.)

Trinidad Northern Areas Limited (TNA) averaged production of 44,235 bbl/d. TNA was prevented from recording an increase this year in their production due to a fire on a compressor station coupled with the sanding-up of good producers.

Land production averaged 37,543 bbl/d, or 17.5% of the country's total production for 1979. This figure represents a decrease of 2.2% from 1978's level.

Trinidad Tesoro was the leading producer, with an average production of 21,464 bbl/d. This 5.2% increase from last year is due to new well production in their McKenzie field.

Texaco Trinidad's production averaged 18,649 bbl/d, which

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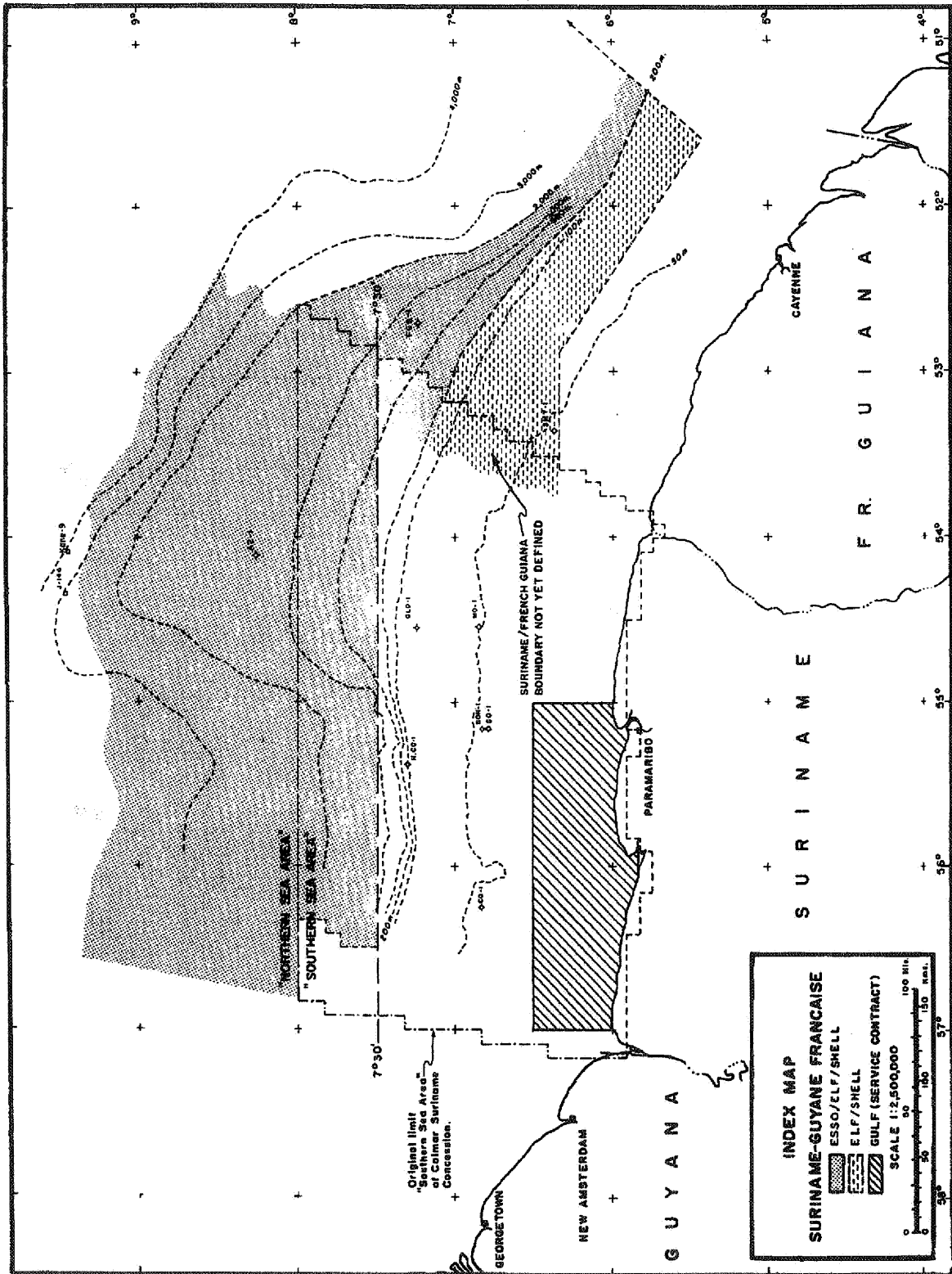


Figure 9.

# Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1981<sup>1</sup>

CLYDE S. DEAL<sup>2</sup>

## ABSTRACT

Petroleum developments in 1981 continued in the pattern of recent years of increasing exploration and exploitation in response to the second catastrophic surge in crude oil prices thrust on the world economy in 1979. Production of crude oil increased in Argentina, Brazil, Chile, Colombia, Guatemala, and Mexico, whereas Venezuela, Trinidad, Peru, and Bolivia experienced declines. Exploratory surveys, exploratory drilling, and development drilling all increased in most of the countries reporting.

Significant successful exploratory drilling is reported for several countries. In Argentina, the producing zone of the Austral basin has been extended farther offshore, and is reportedly productive in what is apparently the upper Malvinas basin. In Brazil, extensions to several producing areas are reported in the Campos basin. Also, the Jurua gas province of western Amazonas reportedly had an encouraging extension. Colombia had several discoveries in the Magdalena basins, but the 2 Llanos discoveries are considered much more significant.

For a variety of reasons, several countries have undertaken or are undertaking changes in laws and regulations to attract foreign companies into exploration "risk" ventures. In some countries, exploitation ventures are also offered.

## INTRODUCTION

A brief review of developments for the entire region and a means for easy comparison between countries are presented in Tables 1 to 4. Data on petroleum production, exploratory and development drilling, and exploratory surveys activity are summarized and compiled in Tables 1, 2, and 4. Table 3 lists important exploratory tests by country with some pertinent data; the type of information released, however, varies considerably, and it is planned to upgrade this aspect in future reports, if the contributors agree.

Although not within the technical realm of this report, changes are evolving in the economic and political environments bearing on the petroleum industry. During 1981 (possibly earlier in some countries), several governments directed a variety of communications to companies engaging in foreign petroleum exploration and

development seeking to incite interest in modifying contract conditions that have been restrictive in nature. Also, changes are reported in tax laws and various regulations relating to operations.

## ACKNOWLEDGMENTS

The compiler of these data and notes thanks the individuals and their companies or government agencies for the time, effort, and material they have contributed. The specific individuals and the companies are named in the heading for each country report. As in the past, Petroconsultants S.A., Geneva, Switzerland, has made a major contribution, which is greatly appreciated. Thanks are also extended to the management of Buttes Resources Co. for their approval of participation in the project. Finally, the diligent assistance of Cara Reynolds of the Buttes' staff is greatly appreciated.

## ARGENTINA (Figs. 1, 2; Tables 5, 6)

By M. Turic, YPF, and M.R. Yrigoyen, Esso, Buenos Aires

Successful exploratory drilling offshore southern Argentina by international companies operating under risk contracts for YPF was the outstanding activity in Argentina in 1981. Other phases had varying degrees of increase over activity in 1980. Development wells increased about 8.5%, and oil and gas production was up a modest amount. Seismic surveying was down, from the record in 1980 of 60,901 km to 41,512 km in 1981. The bulge in seismic surveying in 1980, mainly offshore southern Argentina, culminated in the spectacular exploratory drilling of 1981. Although few data have been released, it appears the discoveries have all been in the basal Cretaceous to uppermost Jurassic Springhill sandstone. Whether any indications of hydrocarbons were encountered in other rocks in the Malvinas basin by the Esso test was not revealed, and thus the petroleum potential of the Malvinas basin continues in the realm of geologic speculation.

Elsewhere in Argentina, YPF reported successes at Sierra de Aguarague in the Northwest (Noroeste) basin. This enhances the potential of the Devonian rocks on this extensive trend. In the Neuquina basin, at several areas where Jurassic and Cretaceous rocks are productive, additional drilling has increased reserves. There were 14 new fields discovered and 11 previous discoveries extended.

Under provisions of Law No. 21,788, 16 private companies (both national and international, some individually but most in groups), are operating under contracts to

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<sup>1</sup>Manuscript received and accepted, August 19, 1982.

<sup>2</sup>Buttes Resources Co., 5151 Belt Line Road, Dallas, Texas 75240.

**Oriente Region**

Fiscalized production declined from the Oriente fields from 77.6 million bbl in 1979 to 74.1 million bbl during 1980. The chief causes of this decline were a pipeline break in early March that required more than 6 days to repair, and frequent stoppages of the Trans-Ecuadorian Pipeline because of full tankage at the Balao Terminal on the Pacific coast. Average production during the year for the CEPE-*Texaco* consortium was 198,892 BOPD, and for the CEPE-CEPCO group 4,043 BOPD.

In 1981, production increased to 76,352,625 bbl (208,614 BOPD) from the Oriente. The incorporation of additional fields by the CEPE-*Texaco* consortium more than offset the decline in production from Lago Agrio. There were continued interruptions of pipeline transmission because of full tankage at Balao.

There were 5 successful exploratory tests completed in the Oriente region in 1980, and 1 success out of 3 attempts during 1981. Wildcat footage amounted to 59,505 ft in 1980 and 9,230 ft in 1981.

Development drilling increased significantly from 1979 when there were 12 completions and a total drilled footage of 130,083. In 1980, there were 20 completions and 161,692 ft drilled; in 1981, there were 26 completions and 228,480 ft drilled. At the end of 1981, there were 5 rigs active on development drilling in the Oriente.

CEPE, owned by the Ecuadorian government, was by far the most active exploration company operating in the Oriente during 1980 and 1981. In the 2-year period, CEPE completed 36 party-months of surface geologic studies and 22.5 months of digital seismic work. CGG, the seismic contractor, surveyed 1,895 line-km during 11 months in 1980 and 1,861 line-km in 11.5 months during 1981. CEPE successfully completed 4 rank wildcats northeast of the CEPE-*Texaco* contract area during 1980, but drilled 2 noncommercial outpost wells in the Bermejo area in 1981. CEPE also drilled 3 successful development wells in 1980 and 15 in 1981. One development well was a mechanical failure.

*Texaco Petroleum Co.*, as operator for the CEPE-*Texaco* consortium, used the CGG seismic crew on contract to CEPE for a 67 km detail survey in late 1981. The company successfully completed 1 exploratory well in 1980 and another in 1981. During 1980, *Texaco* completed 10 successful and 3 dry development wells. Two of the dry holes were noncommercial suspensions from 1979. Ten development wells were completed for the consortium in 1981, of which 2 were dry.

City Ecuadorian Production Co. drilled 4 successful development wells in 1980 and was drilling a well in the Fanny field at the end of 1981.

YPF of Argentina was inactive during 1980 and 1981. It holds 60,000 ha. (148,260 acres) in the Oriente, but the contract for the block expires in 1982.

**EL SALVADOR**

By *Petroconsultants S.A.*, Geneva, Switzerland

No rights were held in the country in 1981. Last activities reported consisted of geophysical surveys carried

out over the Pacific shelf in 1974 under a program sponsored by the United Nations and the El Salvador government.

No wells for hydrocarbons have ever been drilled in the country.

**FRENCH GUIANA**

By *P. Jacobsen, Jr.*, Esso, Coral Gables, Florida

No acreage rights were held in French Guiana at year end. The Marine Permit comprising the off-shelf, deep-water area of the Esso/Elf-Eurafrep/Shell group and the on-shelf area of Elf-Eurafrep/Shell have expired. There were no field activities during the year. Latest activities were geophysical and exploratory drilling in 1977 and 1978.

**GUATEMALA (Fig. 11)**

By *Petroconsultants S.A.*, Geneva, Switzerland, and *Texaco*

The highlight of petroleum development in Guatemala in 1981 was the *Texaco* discovery at Xan-1 in the north-western part of the country, the area closest to the prolific Mexican oil region. In all, 11 exploratory tests were drilled or drilling during the year and 2 development wells were completed (see details on Table 3 and Fig. 11)

Production increased from an average of 4,310 to 6,600 BOPD.

**HAITI**

By *Petroconsultants S.A.*, Geneva, Switzerland

At year end, a total of 25,644 km<sup>2</sup> was held by 5 different companies and/or groups.

In April 1981, the Haitian authorities awarded 6 onshore and offshore oil exploration permits totaling 2,535 km<sup>2</sup> in the northern plain area to First City Development of Haiti.

Onshore, about 200 km of seismic lines were acquired by Anschutz in the central plain area.

No well was drilled during the year, but Anschutz reported plans to drill in 1982.

**HONDURAS (Fig. 12)**

By *P. Jacobsen, Jr.*, Esso, Coral Gables, Florida

Only limited exploration activity has been disclosed for Honduras for 1981. As anticipated a year ago, Anschutz, Esso, and *Texaco/Amerada Hess* officially renounced their respective concessions along the north coast of the country. It is believed that these were the last full-fledged exploration rights in Honduras. No field work was reported.

Judging from official releases, the remaining acreage interests as of early 1982 comprised several pending applications for concessions by *Welsh Energia y Petroleo, S.A.*, *Petroleos Yojoa, S.A.*, and *Aracca Petroleum Corp.* (Fig. 12). The actions of the first 2 companies go back to 1980 or earlier, but *Aracca Petroleum's* applications, for 2 inner offshore blocks, were filed in 1981.

*Texaco's* 1980 Reconnaissance Permit, off the north-eastern coast, continued in force through the report year.



Clyde S. Deal

Three companies have formally applied for onshore and offshore exploration concessions: Universal Drilling S.A., Universal Exploration S.A., and Transworld Exploration S.A. Three other companies are reportedly negotiating for rights: Sanchez O'Brien Mineral Corp., Rio Tinto Zinc, and Chinese Petroleum Corp. of Taiwan. In addition, the Mexican state oil company, Pemex, is reportedly considering conducting some exploration in the country, and Ultramar is assumed to be negotiating for exploration rights. All awards are pending enactment of new legislation.

Following the granting of a US\$6 million loan by the World Bank, the Bureau of Mines announced a major exploration program to reevaluate the hydrocarbon potential of the country. No field exploration activity was conducted in 1981; however, Sossa is planning an aeromagnetometry survey. In October, Sossa completed drilling the 1,219 m Canazas 2 well and abandoned it as dry. The company plans to drill up to 8 wells in the Darien area during the next 3 years. The next one should be the Norsul Yape 1 well.

In July 1981, construction of the 125-km Trans-Isthmus pipeline started, the completion of which is scheduled for 1982.

The Legislative Commission is revising the petroleum legislation. Enactment of the new law is expected during 1982.

#### PARAGUAY (Fig. 15; Table 28)

By P. Jacobsen, Jr., Esso, Coral Gables, Florida

Exploration activity in 1981 continued at about the same moderate level of recent years. It was centered on the Paraguay side of the Parana basin, covering the southeastern half of the country. That entire region is now held under various acreage rights. The only reported field work was by Pecten (Shell USA) and partners on their major concessions in the Parana basin. Significant was the first exploratory test of the western flank of the basin in Paraguay, Asuncion-1, which was drilled to a total depth of 3,223 m and was dry and abandoned at year end. A second wildcat, Asuncion-2, about 40 km farther north, was spudded in early 1982. The projected total depth as announced is 10,000 ft.

The expanded acreage holdings at year end are shown in Table 28. The areas are approximate and derive from an updated government map issued in early 1982. Prospection permits, granted for 1 year and renewable, confer limited rights and priorities, but concessions grant full-blown exploration and exploitation rights by contract laws enacted by the National Congress. One highlight of acreage activity was Occidental Petroleum's acquisition of an interest in the Pecten/Trend venture.

Pecten, as operator, reported 7.5 months (approximately 600 km) of portable seismograph effort, mainly in the northern half of its acreage. United Geophysical was the contractor.

#### PERU (Fig. 16; Table 29)

By O. Nieto Polo, Petroperu, Lima

Although Petroperu reported a slight decrease of 1% in production for 1981, all other activities have increased, and the magnitude of increase could very well reverse the decline in production by next year. Further increase in developments may be forecast for 1982 with 2 new operators in Peru. Superior Oil Co. will explore Block 2 in the Oriente, and Cia Shell Exploradora y Productora del Peru will work in Blocks 38 and 42 in the southern area of the Oriente. Superior spudded an exploratory test late in the year.

In exploration activities, seismic surveying was carried on by Petroperu for 2.7 party-months. Occidental surveyed for 1.0 party-month and Belco for 0.1 party-month, both presumably offshore.

Exploratory drilling jumped some 65% to 150,098 ft in 17 tests. This resulted in 1 gas and 9 oil discoveries for a success rate of 59%. Development drilling was up 21% to 913,213 ft, in a total of 160 holes. Production data are reported on Table 1.

#### PUERTO RICO

By Luis Blanche, Codremi, Puerto Rico, and by Petroconsultants, S.A., Geneva, Switzerland

It is reported by Codremi (Corporacion de Desarrolla de los Recursos Mineros [Minerals Resources Development Corp.]) that a comprehensive study of geologic and geophysical data of the area is being done by United States consultants. Environmental Impact Statements covering the onshore and offshore areas were completed early in 1981 and have been accepted.

The last activity was in 1959-60, when Kewanee drilled 4 dry tests.

#### SURINAME (Fig. 17; Table 30)

By P. Jacobsen, Jr., Esso, Coral Gables, Florida

Activities during 1981 centered on Gulf Oil's inner offshore risk-contract area. The newly established state oil company, Suriname N.V., directed a shallow-well program, operated by Gulf, on the adjoining coastal lowlands. The off-shelf, deeper water concession of Esso-Elf/Shell was inactive during the year.

For the contract area, Gulf reported 1,908 km of conventional streamer-detector seismograph coverage, and 576 km of shallow-water work in the near offshore. The energy source was airguns in both of these surveys. Western Geophysical did the field work.

The government has released, through Gulf, some information on the onshore drilling. The 1981 tests are but the latest of a number of wells drilled since the mid-1960s along the coastal plain to shallow, heavy-oil objectives. The 1981 wells, TA-5, TA-6, and TA-7, are located in a cluster 1 to 2 km apart.

Table 27. Discoveries in Mexico in 1981

Area Well	Prod.	Area Well	Prod.
		<u>Monclova</u>	
		Galaxia 1	Gas
		Gato 101	Gas
<u>Chicontepec</u>		Hechicera 1	Gas
		Omega 1	Gas
Abedul 1	Oil	Prieto 1	Gas
Bornita 1	Oil	Progreso 1	Gas
Camaitlan 1-A	Oil	Vivanco 1	Oil
Placetas 1-A	Oil	Zuloaga 1	Gas
Tlacolula 1001	Oil		
Urano 1	Oil		
		<u>Agua Dulce</u>	
		Magallanes 502	Oil
<u>El Plan</u>			
		<u>Reynosa</u>	
Chamihua 2	Oil	Calabaza 1	Gas
<u>Comalcalco</u>		Primo 1	Gas
		Verano 1	Gas
Cardenas 201	Oil		
Iris 101	Oil	<u>Baja California (Offshore)</u>	
Mora 1	Oil		
Sunuapa 201	Oil	Extremeno 1	Gas

Table 28. Acreage Holding at Year End in Paraguay in 1981

Company(ies)	Area km <sup>2</sup> *	
	Prosp.	Permit Concession
Bryant, Murphy/Sundance		32,500
Chaco Exploration	3,500	5,500
Chesapeake International	32,000	
Cia. Petrolera del Chaco/REPSA		7,000
Northern Michigan	27,500	
Pecten (Shell U.S.A.)/Oxy/Trend		60,000
Piper Oil		19,000
Sundance Resources	23,000	
<b>Totals</b>	<b>86,000</b>	<b>124,000</b>

\*Approximate and unofficial.

Table 29. Production and Developments by Areas in Peru in 1981

COMPANY Area, Year Discovered	Producing		Holes 1981			Total Holes	Rigs at Year End	Production MM bbl		
	Unit	Age	Prod.	Dry	Footage			1980	1981	Cumulative
Petroperu										
Talara Area, 1869	Penn. ss	Eocene	26	3	126,606	6,390	-	2.20	2.28	560.6
Lima Area, 1901	Penn. ss	Eocene	61	0	339,175	3,412	5	12.32	13.06	345.4
Aqua Caliente, 1939		Cretaceous	-	-	-	35	-	.09	.07	13.9
Maguia, 1957		Cretaceous	-	-	-	22	-	.33	.27	9.4
Block 8 (OPS), 1971		Cretaceous	4	1	65,523	83	2	7.57	6.71	40.3
Petroperu-Belco										
Offshore, 1955		Eocene	44	5	238,059	845	3	10.21	9.77	155.7
Petroperu-Occidental										
Blocks 1-AA & 1-B, 1972		Cretaceous	14	2	143,850	120	2	38.65	38.23	147.1
<b>TOTAL</b>			<b>149</b>	<b>11</b>	<b>913,213</b>		<b>12</b>	<b>71.37</b>	<b>70.41</b>	

Table 30. Coastal Plain Shallow Holes in Suriname in 1981

Well Name	Location (UTM)		Remarks
	X	Y	
Tambaredjo-5	311,880	968,090	Swabbed 64 BOPD; 16.8° API.
Tambaredjo-6	313,620	968,580	
Tambaredjo-7	311,440	968,900	

Government drilling program operated by Gulf Oil.

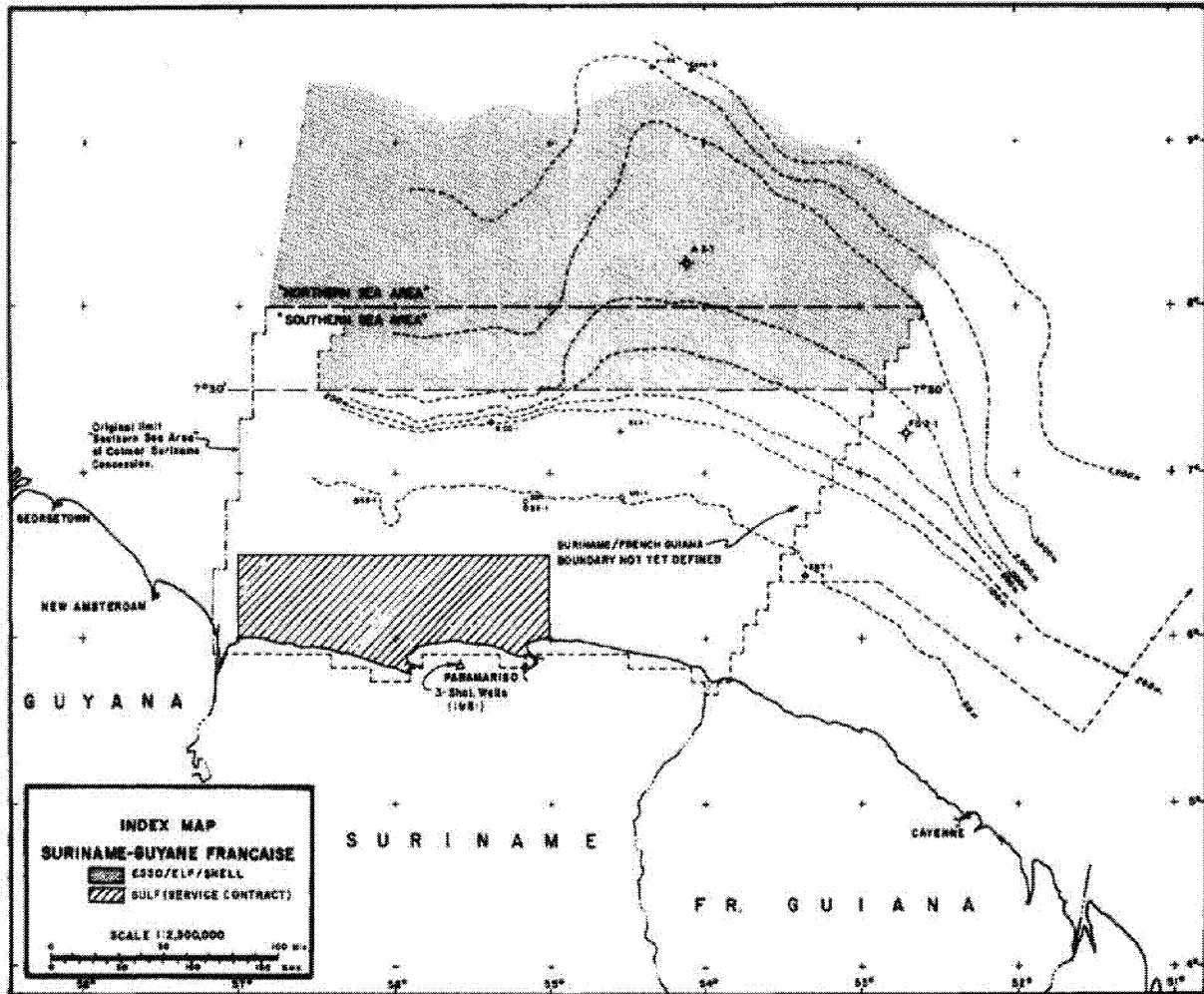


FIG. 17—Exploratory rights and shallow holes in Suriname in 1981, with offshore holes in Suriname and French Guiana for prior years.

## Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1982<sup>1</sup>

CLYDE S. DEAL<sup>2</sup>

### ABSTRACT

Petroleum developments in the region in 1982 had a more varied pattern than in 1981 when all aspects were upbeat with varying degrees of increases. In 1982, Brazil, Mexico, and Guatemala had striking increases in oil production; Bolivia, Chile, and Colombia had moderate increases; and Argentina, Trinidad, and Venezuela reported declines.

In exploration, Argentina reported several additional offshore Tierra del Fuego discoveries in the Cretaceous Springhill and 2 more encouraging gas discoveries in the Noroeste basin. Bolivia reported an oil discovery from Silurian rocks more generally considered a gas objective. Brazil extended and confirmed the Western Amazonas gas area with 2 discoveries. Colombia added 2 more spectacular oil discoveries in the Llanos basin to follow up 2 similar finds in 1981. Several countries reported that discoveries have increased the national reserves of hydrocarbons.

Considering the social, political, and economic problems in several countries, along with the worldwide depression and petroleum surplus, developments in the region have been on the whole favorable.

### INTRODUCTION

Tables 1, 2, 3, and 4 provide summaries of production, exploratory and development drilling, exploratory surveying activity, and significant exploratory tests drilled. These tables provide a quick review of the region. Most of the countries reported on these tables have a short text report with supplementary tables to provide some detail and a figure showing approximate hole locations.

In Belize, Dominican Republic, and Honduras, which have had some limited exploration in the past, government agencies (with financial assistance from the World Bank) have prepared comprehensive reviews of all exploration information. In Honduras and the Dominican Republic, outside technical assistance was involved. There is more information from these 3 countries than can be conven-

iently included in this report, but additional information can be obtained from AAPG.

The last part of this report contains brief commentaries on 13 countries which had limited or no activity in 1982. Petroconsultants provided the bulk of information on these countries.

### ARGENTINA (Figs. 1, 2; Table 5)

By M. Turic, YPF, and M. R. Yrigoyen, Esso, Buenos Aires

Exploration in Argentina in 1982 was down from 1981, but the 44% exploratory drilling success rate was an improvement from 1981. The 107 exploratory tests resulted in 37 oil and 10 gas discoveries, and 12 earlier discoveries were extended. At year end, YPF estimated Argentina proven reserves as  $386,119 \times 10^3 \text{ m}^3$  of oil and  $691,571 \times 10^6 \text{ m}^3$  of gas. Since 1982 production was  $27,919 \times 10^3 \text{ m}^3$  of oil and  $15,213 \times 10^6 \text{ m}^3$  of gas, and additions to reserves were  $28,345 \times 10^3 \text{ m}^3$  of oil and  $57,400 \times 10^6 \text{ m}^3$  of gas, there was a net reserve increase of  $425 \times 10^3 \text{ m}^3$  of oil and  $42,187 \times 10^6 \text{ m}^3$  of gas.

Oil reserves are distributed in the principal basins as follows: Austral, 4% onshore and 2% offshore; San Jorge, 37%; Neuquina, 41%; Cuyana, 9%; and Noroeste, 6%. Oil production was down 1.6% from 1981 because of a decline in activity by the private sector which accounts for 35% of total production. The problems derive from pricing disagreements. Gas production increased as anticipated.

Significant oil and gas accumulations were discovered in the Austral offshore, where Total (operator)-Deminex-Bridas-Arfranco carried on a very active program, and Royal Dutch Shell and Esso concluded their drilling programs. Again, as in 1981, all discoveries were from the sandstone reservoirs of the basal Cretaceous Springhill Formation. Initial productions are on the order of 1,200 to 3,800 BOPD with production from between 3,000 and 5,000 ft. The discoveries reported both last year and this year are excellent examples of trend exploration.

In the Noroeste basin, continuing deep exploratory drilling for Silurian Devonian reservoirs by YPF and private companies resulted in gas reserve increases on the order of 1.5 tcf. In the Neuquina basin, a formerly overlooked oil zone, a shallow 2,000-ft deep Cretaceous carbonate zone, might be of considerable importance over a broad regional extent. In the Mendoza area of the Neuquina basin, excellent reservoir conditions are reported in acid igneous bodies.

Private companies continued to be active in 15 exploration tracts. In addition to the successes of Total et al in the

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<sup>1</sup>Manuscript received and accepted, August 5, 1983.

<sup>2</sup>Buttes Resources Co., 5151 Belt Line Road, Dallas, Texas 75240.

The compiler of these data and notes thanks the individuals and their companies or government agencies for the time, effort, and material they have contributed. The specific individuals and companies are named in the heading for each country report. As in the past, Petroconsultants S.A. has made a major contribution, which is greatly appreciated. Thanks are also extended to the management of Buttes Resources Co. for their approval of participation in the project. Finally, the diligent assistance of Cara Reynolds of the Buttes staff is greatly appreciated.

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Before the change of programs, hydrocarbons were found in Rio Caribe RC-2 (5,367 BOPD and 26.7 MMCFGD, dual) and in Dragon DR-3 (22.4 MMCFGD). Patao Sur PAS-1 also produced gas. Uquir UQ-1 was a dry hole. Ensenada de Barcelona EBC-3X and 4X were abandoned, but there is reason to believe that they were gas-producing also.

Three new-field wildcats drilled in the Old Tucupita field of the Delta Amacuro turned up dry. In other old areas, Totumo 14RN-1X in the Perija district of Zulia was a new-field discovery (2,084 BOPD), and so were Soledad 4 (294 BOPD) and Casma 5E (1,982 BOPD, dual) in Monagas, and Tarra T-228AX (520 BOPD) in the Colon district of Zulia.

A series of new-field and new-pool wildcats was drilled in the state of Falcon, which has never been an important producer. Except for 2 abandonments, nothing has been reported about results in the other 6 or 8 wells, all suspended.

Drilling and production have been dwindling in the state of Guarico for the last 20 years, but recently several rigs have been drilling there, looking primarily for gas. In 1982, wildcat 29-PL-7X in the Yucal-Placer area of northern Guarico flowed 12.38 MMCFGD, and wells in other fields have produced lesser amounts of condensate and gas.

In the old Los Lanudos/Concepcion area northwest of Maracaibo, not drilled for many years, several wildcats flowed gas at rates averaging 4 MMCFGD.

Wildcatting in prolific older areas continued to give good results. An example is Ceuta 76-Z-26X, in Lake Maracaibo, which flowed 4,179 BOPD from the Misoa as a new-pool discovery.

An average of 14 seismic crews shot a total of 12,991 km on land in Anzoategui (3,260 km), Zulia (3,126 km), Guarico (2,695 km), Apure (1,671 km), the Orinoco oil belt (1,136 km), and Falcon (1,103 km). In addition, a Teleseis crew shot 485 km in the waters of the Gulf of Paria.

#### COUNTRIES OF LIMITED ACTIVITY

*By Petroconsultants S.A., Geneva, Switzerland*

##### BAHAMAS (Fig. 3)

Exploration areas were awarded to Getty Oil in 2 licenses of 17,150 km<sup>2</sup> off Great Bahama, and to Natomas/BP in 2 licenses of 6,860 km<sup>2</sup> off Andros. Breaco was awaiting an award north of Great Bahama. The government conducted a speculative 3,000-km seismic survey in 1982, and late in the year 2 seismic survey boats were active over the recently awarded license areas.

##### COSTA RICA

While new petroleum legislation is pending, the government announced early in 1982 it was considering opening 16 areas for exploration. A World Bank loan of \$3.9 million was made for offshore seismic work in the Pacific and Caribbean. Pemex continued assisting the government

company, Recope, in its activities with an extensive seismic survey in the Lower Talamanca, and a 3-month survey combining seismic, gravity, and surface geology was carried on in the Limon basin. An exploratory test, San Jose 1, was started in May. At year end, it was reported to be at 10,000 ft with a planned total depth of 19,000 ft. The well is located in the vicinity of old Gulf and Union exploratory tests which allegedly reported up to 1,000 BOPD. A seismic survey was done in the Caribbean by the University of Vancouver under a technical aid contract.

##### CUBA

Reliable information is difficult to obtain and the following are best-guess judgments from various sources. Epep, the government agency, is thought to have continued operating 6 to 8 heavy rigs and a few smaller units. Activity was on the north coast east of Havana and Matanzas, where reportedly significant discoveries have been made in recent years. Production amounted to about 7,000 BOPD and may exceed that. Natural gas production was 14,000 MCFGD.

It has been confirmed that offshore areas have been offered to European companies, but no details are known.

##### FRENCH GUIANA

There was no activity during the year, but Esso, Elf, Shell, and Eurafrep are reportedly applying jointly for a deep-water area of 5,845 km<sup>2</sup>.

##### GUYANA

In the Takutu basin, the Karanambo discovery was significant, but the apparent lack of follow-up activity is not encouraging. The discovery tested 420 BOPD from Triassic basalts. Home Oil's second exploratory effort, Lethem 1, was dry. Offshore, Denison conducted a 694-km seismic survey.

##### HAITI

A government seismic marine survey of 1,000 km was the only activity during 1982. An exploratory test programmed by Anschutz was deferred until 1983. At year end, 2 groups held 10,255 km<sup>2</sup> under license, a sharp decrease from 1981.

##### LEEWARD AND WINDWARD ISLANDS

There was no activity in 1982, but 4 exploration licenses totaling 22,610 km<sup>2</sup> were held. In the British Virgin Islands, Mobil and Weeks/Brenda/Noranda each held a license; in Antigua, Aladdin had 1 license; and in the Grenadine-St. Vincent area, Oxoco/Araca held 1.

##### NETHERLAND ANTILLES

Saba Bank 2 was drilled and abandoned by Petrofina for the Weeks group as the only activity. There appeared to be considerable application and license activity while the government is considering new legislation.

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**South America, Central America, Caribbean Area, and Mexico**

**NICARAGUA**

There was no activity in 1982. The last exploratory drilling was Texaco's Centeno 1 in 1978 in the Caribbean offshore. It was dry and abandoned. Braspetro sought an 18,000 km<sup>2</sup> tract in the Pacific offshore early in 1982, but withdrew from the venture in early 1983.

**PANAMA**

A 250-km marine seismic survey (which ocean was not reported) was the only activity. New petroleum legislature was to be enacted and applications for areas, dating from 1980, continued pending. Meanwhile, the World Bank reportedly extended a loan of \$6 million. Sossa Petroleum held 2,175 km<sup>2</sup> in 6 blocks in the onshore Darien basin and, with Aracca and Oxoco Captn, held a 400 km<sup>2</sup> offshore block in the Gulf of San Miguel.

**SURINAME**

Gulf Oil surveyed 1,224 km of seismic lines early in 1982 and drilled 3 dry holes late in the year in its 13,744 km<sup>2</sup> shelf area. Esso relinquished its deep-water tract at year end. There was no activity by the government in the Tambaredjo heavy oil area.

**EL SALVADOR**

No activity nor areas to be explored were reported. The last efforts were reportedly in 1976 when Arpel (Latin American National Oil Companies Aid Group) and Ecopetrol of Colombia were to assist in an evaluation of the Pacific offshore.

**URUGUAY**

Ancap had a 1,404-km marine seismic survey carried out in March and April 1982 in an area 180 km east of Montevideo.

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South America, Central America, Caribbean Area, and Mexico

Table 1. Summary of Annual Production of Oil and Gas in South America, Central America, Caribbean Area, and Mexico, 1978 to 1982

COUNTRY	OIL (in million bbl)					Cumulative	BOPD (1,000 bbl)		G A S (b cft)		Cum. to 12/31/82 (tcf)	Ave. Daily (bct)		
	1978	1979	1980	1981	1982		1978	1979	1980	1981			1982	
ARGENTINA	164.5	170.8	179.7	181.3	175.6	3,575.3	481.1	405.0	443.1	466.3	467.2	537.2	7.524	1.488
BARBADOS	0.3	0.2	0.3	0.2	0.26	-	0.7	-	-	-	-	0.38	-	0.001
BOLIVIA	11.8	10.2	8.7	8.0	8.9	261.7	24.4	154.8	157.1	168.9	175.4	187.8	1.904	0.514
BRAZIL	58.5	60.4	66.4	77.9	97.7	1,335.7	267.6	68.3	67.0	77.8	87.4	106.9	1.105	0.293
CHILE	6.3	7.5	12.2	15.1	15.6	288.9	42.7	217.8	202.4	190.6	179.4	178.3	5.177	0.490
COLOMBIA	47.4	45.0	45.6	48.8	51.8	2,278.8	141.8	146.6	152.3	159.5	168.8	174.4	3.347	0.478
CUBA (a)	-	-	-	-	-	estimated	7.5	-	-	-	-	-	-	0.014
ECUADOR	73.7	78.1	74.6	76.8	76.9	848.9	210.9	12.4	14.9	13.6	13.6	13.8	-	0.037
GUATEMALA	0.3	0.6	1.8e	1.5c	2.3e	-	6.2	-	-	-	-	-	-	-
MEXICO	485.2	506.0	-	843.9a	1,002.4a	-	2,746.4	-	-	-	-	1,482.2a	1,549.9	-
PERU	55.1	70.0	71.4	70.5	71.2	1,347.9	195.1	52.8	53.3	50.8	49.2	47.2	-	0.129
TRINIDAD- TOBAGO	83.8	78.2	77.6	69.1	66.6	2,087.8	177.0	157.9	169.7	197.8	195.7	203.9	4,132.3	0.558
VENEZUELA	790.4	860.1	794.1	772.3	690.6	37,522.6	1,892.0	-	-	-	-	-	-	-

(a) Petroconsultants (e) estimated (c) corrected

Table 2. Summary Exploratory and Development Drilling 1982 in South America, Central America, the Caribbean and Mexico

COUNTRY Operator	EXPLORATORY						DEVELOPMENT						Remarks		
	Oil	Gas	Dry	% Success	Holes	Totals ft or m	Rigs <sup>(1)</sup>	Oil	Gas	Dry	% Success	Holes		Totals ft or m	Rigs <sup>(1)</sup>
ARGENTINA															
YPF	26	7	45	42	78	204,371m	16	453	21	49	90	523	985,546m	26	
Private	11	3	15	48	29	56,815m	6	166	3	23	88	192	524,449m	14	
BARBADOS	-	-	-	-	-	-	-	16	-	-	100	16	101,384'	1	
BELIZE	-	-	2	0	2	12,766'	-	-	-	-	-	-	-	-	
BOLIVIA															
YPFB	2	7	7	56	16	38,424m	3	6	0	2	75	8	28,150m	-	
Private	0	1	1	50	2	7,329m	0	2	2	1	80	5	8,129m	-	
BRAZIL															
Petrobras	88	6	204	32	304	602,963m	40	611	26	110	85	814	771,780m	54	
Private	1	-	29	3	30	109,180m	5	-	-	-	-	-	-	-	
CHILE															
ENAP	16	8	16	60	40	Remarks	nr	53	8	16	79	77	Remarks	-	228,584m all drlg. 4 land & 3 marine rigs
Private	0	0	1	0	1	2,541m	-	-	-	-	-	-	-	-	
COLOMBIA	15	2	56	23	73	473,056'	5	84	2	8	91	94	803,100'	11	Plus 2 Strat Tests totalling 3006' See Table 10
CUBA	-	-	-	-	-	?	-	-	-	-	-	-	?	-	
DOMINICAN REP.	-	-	1	0	-	3,948m	-	no development	-	-	-	-	-	-	
ECUADOR	2	-	3	40	5	90,934'	3	21	-	1	95	22	169,737'	3	
GUATEMALA	1	0	8	11	9	100,786'	?	2	-	1	66	3	19,506'	?	
GUYANA	1	0	1	50	2	3,449m	0	no development	-	-	-	-	-	-	
JAMAICA	0	0	4	0	4	49,139'	0	no development	-	-	-	-	-	-	
MEXICO	10	8	47	28	70(1)	287,476m	164	56	51	-	-	288	915,757m	(1) 5 Strat Tests 17 water injection	
PARAGUAY	0	0	1	0	1	2,926m	-	no development	-	-	-	-	-	-	
PERU	6	2	4	67	12	135,938'	3	128	2	17	88	187	1,079,803'	13	
SURINAME	0	0	3	0	3	7,478m	0	no development	-	-	-	-	-	-	
TRINIDAD-TOBAGO	9	1	13	43	23	53,057m	3	160	4	13	93	92	199,880m	8	15 injection holes
VENEZUELA															
			see text					see text							

(1) Rigs active at year end.

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Table 4. Continued

BASIN Region Operator	Name	Location degrees minutes seconds	Spud Date (Completion)	TD ft or m	Fm./Age at TD	Producing Zone (Fm./Age)	Remarks IP/day
Coastal Area CEPE	Golfo de Guayaquil-1	80-35-12.4	Jan. 7 (May 12)	13,868'	Dos Bocas/Olig.		Abnd. after testing non commercial oil & gas.
	Amistad Sur-1	80-29-24 3-18-41	July 14 (Oct. 6)	16,090'	Dos Bocas/Olig.		Abnd. w/o testing.
	Tenguel-1	80-29-16.4 3-03-32.6 W & N	Oct. 19 Drilling	13,500'			Drilling.
Hispanoil	San Diego-1	16-3-33	4 Dec. 81 (30 Sept 82)	13,636'	-	GUATEMALA	Disc.
	Tzulul-1	15-55-3	29 May 81 (20 Feb 82)	14,550'	-		Abd.
	San Jorge-1	15-51-09	12 Mar 82 (16 Aug 82)	9,382'	Coban		Abd.
	Santa Amelia-1	89-54-17 17-39-26	26 May 82 (1 Oct 82)	13,225'	Coban		Abd.
	Guayacon-1	90-33-22 17-37-00 90-26-51	13 Oct 82 Drilling	13,173'	-		Drig.
	SNEA	San Roman-2	16-12-50	4 Dec 81 (30 Sep 82)	13,636'	Lower Cabon	
East Chisec-1		90-19-32 15-53-29	17 Apr 82 (1 Sep 82)	4,869'	Coban		Testing.
Soledad-1		90-16-27 16-15-21	4 Jul 82 (17 Jul 82)	2,050'			Abandoned.
Tierra Blanca-1		90-21-40 16-8-33 90-21-35	9 Nov 82	-	-		Drilling.
TEXACO	Escondido-1	17-30-17	5 May 81 (7 Mar 82)	12,677'	-		Abandoned.
	Itzamna-1	90-45-40 17-29-41 90-41-50 N & W	12 Mar 82 (16 May 82)	8,050'	-		Abandoned.
Takatu HOME OIL	Lethem 1	59-47-36	31 Oct 82 (16 Jan 82)	2,823m	Roraima Basalts (?)	Pre-Cambrian (?)	Minor oil staining.
	Karanambo-1	3-27-3 59-33-33 3-46-11 W & N	10 Feb 82 (21 June 82)	2,882m	Apoteri Basalts (?)	Triassic (?)	420 BOD, 40 ° API & GOR approx. 500
Offshore	Union Texas Arawak 1	17-08-23 78-33-24	16 Dec 81 (24 Apr 82)	15,053'	Middle Eocene		Abd. No shows.
	Onshore PCJ	Hertford 1	18-15-37	6 Nov 81 (11 Feb 82)	9,956'	Late Santonian-Early Campanian	
Windsor 1		18-25-25	23 Feb 82 (19 Jul 82)	12,820'	Albian		Abd. Oil & gas shows.
Retrieve 1		77-11-41 18-16-30 77-53-24 S & W	28 Jul 82 (21 Oct 82)	11,310'	Cenomanian		Abd. Oil show.
Parana Basin Shell	Asuncion-2	23-41-47 56-35-2	Jan 82 (May 82)	2,926m	-		Abandoned.
	Northwest PetroPeru Belco	5950-Portachuelo	-	Mar. 29	4,516'	Balcones/Paleocene	Mogollon/Eocene
5925-Tairnan		-	Jul. 20	9,166'	Balcones/Paleocene	Mogollon/Eocene	Testing.
5970-Ronchudo		-	Dec. 7	7,060'	Mogollon/Eocene	Mogollon/Eocene	Waiting for test.
5945-Calamar		-	Feb. 17	9,000'	Mogollon/Eocene	Mogollon/Eocene	158 BOPD.
Z2A-3Q-461-X-NHS1		-	Sept. 19	2,902'	Mogollon/Eocene	Parinas/Eocene	Testing.
Z2A-33-479-XD-LT8		-	Nov. 30	4,856'	Chacra/Eocene	- / -	Abandoned.
Z2A-15-476-XD-PN2		-	-	-	- / -	- / -	Drilling.
Z1A-33-16-X-CX12		-	-	-	- / -	- / -	Drilling.
Z2A-24A-403-X-MLX9		-	Feb. 7	10,771'	Balcones/Paleocene	- / -	Abandoned.
Z2A-29-443-X-PV13		-	Feb. 8	4,100'	Palegreda/Eocene	Parinas/Eocene	60 BOPD.
Z2A-29-409-XD-PVX13	-	Feb. 28	5,074'	Balcones/Paleocene	Basal Salina/Eocene	960 BOPD.	
Z1A-40-15X-CX11	-	Apr. 27	8,648'	Zorritos/Miocene	Zorritos/Miocene	Gas: 28 MCFD.	
Z2A-16-455-XD-PN4	-	Aug. 8	9,050'	Mogollon/Eocene	Mogollon/Eocene	Testing.	
East PetroPeru Occidental Superior	91XD-San Juan	-	Oct. 26	10,764'	Agua Caliente/Cretaceous	Chonta/Cretaceous	100 BOPD, 24° API
	31X-Pacaya	-	Nov. 26	3,609'	Chonta/Cretaceous	Cachiyacu/Cretaceous	174 BOPD, 29.3° API
	1A-44-93XD-Tambo Sur	-	May 20	14,120'	Cushabatay/Cretaceous	Cushabatay/Cretaceous	180 BOPD, 43.5° API
	1B-55-30X-Jibarito Sur	-	Jan. 9	11,040'	Agua Caliente/Cretaceous	Vivian/Cretaceous	120 BOPD, 33.8° API
	1X-Chapuli	-	Sept. 29	17,031'	Cushabatay/Cret.	- / -	Abandoned.
Shelf GULF	B/34-1	5-59-22 56-11-26	8 Jun 82 (25 Jun 82)	1,684m	- / -	- / -	Abandoned.
	I/23-1	6-18-45	27 Jun 82 (20 Aug 82)	4,249m	- / -	- / -	Abandoned.
	I/10-1	6-05-41	23 Aug 82 (3 Sep 82)	1,545m	- / -	- / -	Abandoned.
		55-11-22					

\* L = Lower; U = Upper  
(1) reference not given.



## Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1983<sup>1</sup>

DANIEL M. TAPPEMEYER<sup>2</sup>

### ABSTRACT

Petroleum exploration in the region was generally less in 1983 than in 1982. Brazil, Colombia, Ecuador, and Barbados increased crude production, whereas Argentina, Bolivia, Brazil, Colombia, Ecuador, Mexico, and Trinidad-Tobago reported increases in gas production.

Although drilling activities remained low compared to past years, significant oil discoveries were reported in Colombia, Mexico, and Brazil. In Colombia, Cano Limon field is reported to be the largest field found in the Llanos region. In Brazil, important oil discoveries were made offshore in the Para, Potiguas, and Ampos basins. In Mexico, discoveries were reported in the Cerro Azul, Poza Rica (Chicontepec, Villahermosa, and Tabasco) areas onshore and in the Bay of Campeche offshore. In Argentina, discoveries were made in the San Jorge basin and the Noreste Tarija basin.

### INTRODUCTION

Hydrocarbon exploration in South America, Central America, and the Caribbean area decreased in 1983 or remained at a low level, primarily due to decrease in oil demand. The summaries in Tables 1-3 generally reflect this downturn in activity. Some countries, however, continued to find new reserves despite the downturn in exploration activity.

Figure 1 shows the approximate location of petroleum discoveries cited in this report. Major discoveries were made in the San Jorge and Noreste Tarija basins of Argentina. Four new gas fields were discovered in the upper Amazon basin of Brazil. In Chile, exploratory drilling continued in the Magellan basin. In Ecuador, 4 discoveries were reported in the Oriente area. In Colombia, the Cano Limon oil field is the largest discovered to date in the Llanos Orientales region. In Venezuela, a new oil field was discovered in the extreme western part of the country.

### ARGENTINA (Figure 2; Tables 4, 5)

By M. Turic and E. Freytes, YPF,  
and M.R. Yrigoñen, Esso, Buenos Aires

In 1983, exploratory drilling (130 wildcats and 338,054 m drilled) in Argentina increased 12% compared with 1982

activity. The exploratory success rate, however, was only 27% against 44% the previous year. Similarly, seismic and geologic effort was also down from 1982. No seismic work was done offshore, and marine exploration was restricted to the drilling of 6 wildcats.

Production of oil (27,866,301 m<sup>3</sup>) and gas (16.9 billion m<sup>3</sup>) was practically the same as in 1982. This was due mainly to reduced private-company production (oil prices paid to contractors remained as before) and to the inability of the state oil company, Yacimientos Petroliferos Fiscales (YPF), to develop all its productive potential.

Major discoveries by YPF included oil in the western part of San Jorge basin (Upper Cretaceous), and gas and condensate discoveries in west Tarija basin (Silurian-Devonian) and in Oran basin (uppermost Cretaceous). Production from nonmarine sandy reservoirs of the Bajo Barreal Formation (Upper Cretaceous) in the Mata Magallanes Oeste x-1 and Pampa del Setenta X-2 wildcats has renewed hopes for the western flank of the San Jorge basin.

In the Noroeste Tarija basin, results of the Aguas Blancas xp-13, a deeper pool test, showed the productive capacity of the Devonian marine shelf reservoirs in the Santa Rosa Sandstone. The Santa Rosa Sandstone could have good possibilities in several other structures in the area.

Private-company exploratory activity was limited during 1983 and was carried out in 7 risk contract blocks onshore and in 2 blocks offshore, as well as in 2 old concession areas. Wildcats decreased 50% to 16, and seismic data acquisition was 19,858 km or 76% less than in 1982. On the South Atlantic shelf, the Total-Deminex-Bridas-Asfranco consortium continued its exploratory program off Tierra del Fuego by drilling 6 new-field oil and gas discoveries in the Lower Cretaceous Springhill reservoir.

Exploration reactivation in 1983 in 2 oil concession areas was successful. Petroquímica Comodoro Rivadavia drilled a new-field discovery in the Sindicato concession on the north flank of San Jorge basin, and Capsa had a new-field discovery (with an initial potential of 300 BOPD, flowing) in the small La Paloma mining concession in the northern part of Neuquen basin.

After an unsuccessful exploration effort at the end of the first 3-year exploratory period, Esso (together with Astra, Perez Companc, and Cadipsa) returned both offshore Tierra del Fuego risk contract blocks (CMA 12-TFE-1 and CMA-13-TFE-2) to YPF. A total of 13 wells (11 dry and 2 noncommercial new-field discoveries) were drilled in both areas. During the second half of 1983, YPF awarded to Cadipsa the Cerro Wenceslao exploitation contract area on the south flank of the San Jorge basin. Several companies entered into their second exploration period (2

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<sup>2</sup>Sun Exploration and Production Co., P. O. Box 2880, Dallas, Texas 75221.

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Finally, I thank Glenn Brackin, Beverly Kelach, Janet Moeri, Tracy Uster, and Beatrice Whitton for their assistance in preparing this review.

produced a record 76,861,117 bbl (210,578 BOPD) during the year, more than 3,000,000 more than in 1982. Cepe produced 8,003,529 bbl (21,927 BOPD), an increase of more than 6,600,000 bbl. The Cepe-Cepco consortium production amounted to 1,375,074 bbl (3,767 BOPD) in 1983.

#### GUATEMALA

By Petroconsultants S.A., Geneva, Switzerland

In late 1983, the Guatemalan government enacted a new hydrocarbon law (Decree 109-83) in order to attract more foreign companies to the country.

At the end of 1983, 3 groups held 3 licenses over 5,953 km<sup>2</sup> compared to 4 groups and 8,886 km<sup>2</sup> at the end of 1982.

Two licenses were relinquished: Hispanoil's Block AA in central Guatemala, and Texaco's Block D in the north. Amoco, which had interests in Block D, no longer shared rights in Guatemala at the end of 1983. In addition, Hispanoil surrendered Block E, close to Block D, in January 1984.

Elf Aquitaine and Texaco shot 1,284 km of land seismic in 10.6 months, 742 km more than in 1982.

Three new wells were spudded in 1983. Four tests were abandoned as dry, whereas Elf's Tierra Blanca 1 tested 6,000-7,000 BOPD from the Cretaceous Coban C formation at about 3,390 m. A shallower test (3,311 m) yielded 480-600 BOPD. API gravity is said to be 19°.

No development drilling was performed in 1983.

Crude oil production averaged about 6,900 b/d, about 10% more than in 1982. The recent Tierra Blanca 1 oil discovery made by Elf in central Guatemala went on stream in July 1983 at a rate of more than 1,000 BOPD.

#### GUYANA (Figure 8)

By B. Sacre, Ministry of Energy and Mines, Georgetown, and S.R. Lawrence, Exploration Consultants Ltd., England

No exploration or development activities took place in Guyana in 1983. Currently, 2 groups hold exploration concessions. Dennison/Seagull holds 5,198 km<sup>2</sup> and has conducted 2,500 km of seismic. At year end, Home et al held 5,190 km<sup>2</sup> in the Takutu basin. They have obtained 1,200 km of seismic data concentrated in the western section of their concession, and drilled 2 exploration wells in 1982. Home is considering further exploration activities following its 400 BOPD 42° discovery well, Karanambo 1.

The government, through the Ministry of Energy and Mines and with consultants, will be conducting a full geologic and petroleum-potential appraisal of Guyana's basin areas. Exploration companies will be invited to tender for unlicensed areas late in 1985, but expressions of interest are welcome at any time.

#### HONDURAS

By Carlo Hugo Rivera M., Direccion General de Minas e Hidrocarburos, Secretaria de Recursos Naturales, Tegucigalpa.

One wildcat well, La Mision 1, is currently being drilled by Peysa concession holders onshore in the Uhua basin.

The comprehensive study of onshore and offshore geologic and geophysical data began in 1982 by Direccion

General de Minas e Hidrocarburos and by consultants from Sunmark Worldwide Services, Inc., of Dallas, Texas, is nearly completed. The work is expected to be reported to the international petroleum community in the fall of 1984.

New petroleum laws for Honduras are planned for 1984.

#### JAMAICA (Figure 9)

By R. M. Wright, PCJ, Kingston

Exploration in Jamaica in 1983 was highlighted by a comprehensive study of onshore geologic data gathered by the Petroleum Corp. of Jamaica (PCJ) and by former concession holders. The work was supported by a grant from PetroCanada International Assistance Corp. (PCIAC).

Offshore, 2,940 km of seismic data were collected on the South Coast Shelf and on the Eastern Banks by Sefel under a PCIAC grant. On the basis of these data, as well as a 1982 GSI nonexclusive survey, an offshore well on New Bank, about 20 km offshore the South Coast, has been programmed for a depth of approximately 10,000 ft.

#### MEXICO

By Petroconsultants S.A., Geneva, Switzerland

Production of hydrocarbons in Mexico decreased in 1983. Oil production went down by 2.9% and gas production by 4.5%, but natural gas liquids output rose by 3.9%. At year end, Pemex estimated proven hydrocarbon reserves at 72.5 billion BOE, up about 0.5 billion BOE compared with the figure at the end of 1982. According to Pemex, this increase comes from the Villahermosa area, the recent discovered Chuc and Zazil-Ha fields in the Bay of Campeche, and a revision of reserves in the giant Cantarell field.

Exploration activity levels decreased by about 30%, with an average of 98 parties active. These consisted of 22 land and 2 marine (1 shallow and 1 deep water) seismic parties, 18 gravity and magnetometry (including 2 magnetotelluric) parties, 55 field geology (37 surface and 18 subsurface) parties, and 1 geochemical party. Seismic programs in shallow water off Nayarit, along the central Pacific coast, were suspended in May. Deep water seismic surveys were conducted in the Gulf of Mexico.

Exploratory and development drilling decreased significantly compared to 1982. In 1983, 65 exploratory wells were completed, resulting in 11 onshore oil wells, 6 onshore gas wells, 44 dry holes, and 4 stratigraphic tests. Offshore, 5 dry holes were drilled in the Bay of Campeche. Successful oil wells were Chunco 1 and Piedra de Cal 1-A in Cerro Azul; Huetjutla 1, San Nicolas 1, and Tantoyuca 101-A in Chicontepec; Eden 1, Jolote 1-E, and Puerto Ceiba 1 in Comalcalco; Lacamango 300 in El Plan; Silvita 1 in Poza Rica; and Tecominoacan 101-B in Villahermosa. Successful gas wells were Candelilla 1 in Monclova; China 101, Explorador 1, Mata 1, and Negritos 1 in Reynosa; and Agave 201 in Villahermosa.

Negritos 1, in the Burgos basin, is 40 km south of the present producing zone. Tecominoacan 101-B, Jolote 1-E,

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and Eden 1, close to the fields of Cardenas, Mora, and Bellota, indicate the possible existence of a large structural complex. Wells in the Chiapas-Tabasco area produced about 4,000 b/d of light crude from producing zones at an average depth of 5,200 m. Puerto Ceiba 1, producing from the Tertiary, confirmed the extension of the producing sand zones from Ogarrio and Castarrical fields to the Arrastradero area.

#### PARAGUAY

By Petroconsultants S.A., Geneva, Switzerland

There was neither exploration nor drilling in 1983. No major changes were reported during 1983. The 8 reconnaissance permits granted in 1981 for 1 year were probably extended until 1984.

#### PERU (Figure 10; Table 12)

By Jose Zegarra Ciquero, PetroPeru, Lima

In 1983, exploration in Peru increased with respect to 1982, but the exploratory drilling success rate went down from 67% to 32%. The 23 exploratory wells resulted in 5 oil wells, 2 gas wells, and 15 dry holes. One well was testing at year end. Five private companies continued to be active in Peru. They drilled 19 of the 23 exploratory wells.

The 7-32-6X Pastococha 1 exploratory well was a significant discovery. This well was drilled by Hamilton-PetroInca in Block 7 in the Marañon basin and reached a depth of 14,200 ft. The oil production comes from sandstone reservoirs of the Upper Cretaceous Chonta Formation. The initial production was about 556 BOPD.

Development drilling decreased in 1983 due to climatic problems. New development wells totaled 103, and the footage drilled was about 616,097 ft.

Annual oil production decreased by 12% from 1982, mainly due to heavy rains in the northwest region.

#### PUERTO RICO

By Luis Blanche, Codremi, Guaynabo

A geologic study by Meyerhoff and Kriegg, commissioned by Corporacion de Desarrolla de los Recursos Mineras (Codremi), highlighted the following areas as having oil exploratory value: the offshore between San Juan and Agudilla in northern Puerto Rico, Santa Isabel to 60 km west of Cabo Rojo south of the island, and the basin north of Isla de Mona, in the Mona Channel between Puerto Rico and Hispaniola.

Public hearings were held in 1983 on regulations for prospecting, leasing, and producing oil and gas.

#### TRINIDAD AND TOBAGO

By Ministry of Energy and Natural Resources, and Petroconsultants S.A., Geneva, Switzerland

Both exploration and development activity decreased in Trinidad and Tobago in 1983. Five exploration wells total-

ing 39,148 ft were drilled by Trintoc. In the western offshore area, 2 exploratory wells were drilled, 1 each by Texaco and TNA, for a total of 16,457 ft. Of the 171 development wells completed, 162 were producers. No exploration field surveys took place in 1983. No changes in the rightholding situation took place.

#### URUGUAY

By Petroconsultants S.A., Geneva, Switzerland

No changes took place in petroleum legislation, and no new developments were reported in the rightholding situation in 1983.

No geophysical exploration or drilling operations were reported in 1983.

#### VENEZUELA

By Neal R. VanMiddlesworth, Vosa, Caracas

In 1983, production declined by 98,000 BOPD (5%) to an average of 1,793,000 BOPD. Total oil production for the year was 654,729,000 bbl, bringing cumulative production to 38,177,309,000 bbl. Proven reserves at year end stood at 25.8 billion bbl, not including the 1.2 trillion bbl of estimated in-situ heavy and extra heavy crudes in the Orinoco Belt. Production potential rose slightly in 1983 to 2,551,000 BOPD.

The number of rigs drilling, which had increased from 17 to 76 in the previous 7 years, declined to 52 in 1983. Economic conditions forced a drastic devaluation of the national currency early in the year. With the budget reductions occasioned by this devaluation, the number of rigs drilling averaged 71 in the first quarter and 42 in the fourth, a 49% decline.

Wells drilled to final depth in 1983 totaled 944, of which 588 were completed and 356 were suspended at year end. In addition, 320 wells (35% of the total) that had been drilled and suspended in previous years were completed in 1983.

The wildcat program was much reduced, from 250 tests in 1982 to 123 in 1983. Of the 66 wildcats completed or abandoned, 24 belonged to 1983 and 42 had been suspended in earlier years. Also, 57 wells were drilled to final depth and suspended.

Offshore wildcatting consisted of 1 dry and abandoned hole off northeastern Paraguana Peninsula, and 4 holes in the Delta Amacuro of eastern Venezuela. Of the latter, Tajali T.JL-1 was dry and abandoned. Three others were tight holes, but there is reason to believe that these gave no positive results.

The only new-field discovery was Machiques MACH-1, which bottomed at 17,005 ft and tested 1,440 BOPD from the Cretaceous. Several deep new-pool and deeper pool wildcats west of Lake Maracaibo were successfully completed from the Cretaceous at rates of up to 3,379 b/d of 36° oil. A new-pool test in the lake itself, West Urdaneta UD-209, went to 17,170 ft and tested 3,188 BOPD.

Two new-field wildcats were drilled in virgin areas of western Apure state, apparently seeking extensions of the Barinas basin. The first, La Ceiba LCB-1X, went to 9,350

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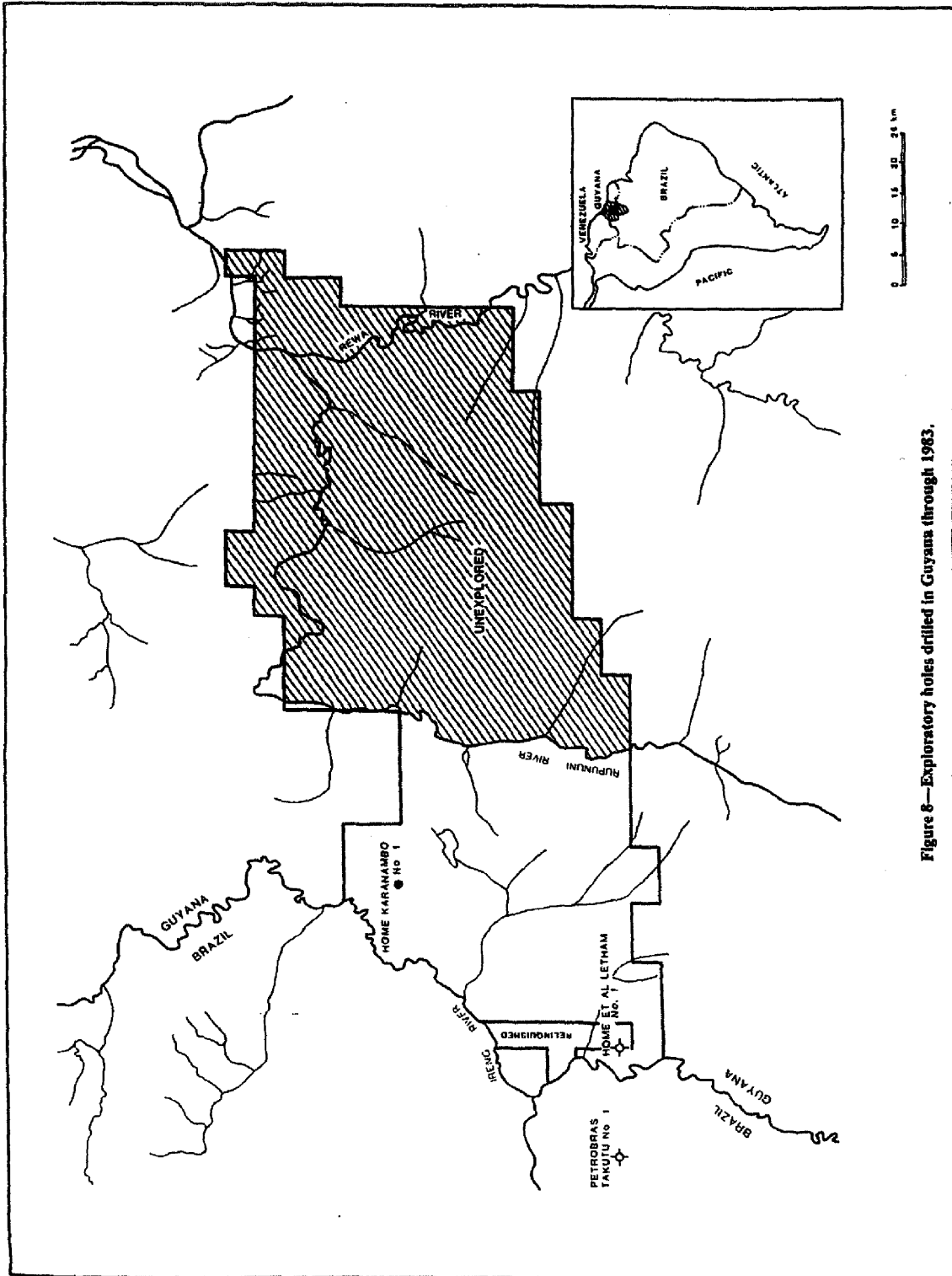


Figure 8—Exploratory holes drilled in Guyana through 1963.

## Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1984<sup>1</sup>

DANIEL M. TAPPEMEYER<sup>2</sup>

### ABSTRACT

For the 25 countries described in the region, exploration activity continued to be centered in proven petroleum provinces in 1984. Exploration activity increased in Brazil, Colombia, and Venezuela. Important, successful exploration efforts continued in areas around Cano Limon field in Colombia, and Guafita and La Victoria fields in Venezuela. Notable discoveries in South America included the 42-46-1X San Martin Cretaceous discovery by Shell in the Ucayali basin in Peru, the significant oil and gas discovery at Palmar Largo ES-1 by YPF in Argentina, and the first offshore gas discovery, the Pecten 1-SPS-20 wildcat in the Santo basin in Brazil.

Oil production increased in Barbados, Brazil, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. A notable increase (40%) in oil production occurred in Brazil. Gas production increased in Argentina, Barbados, Colombia, Peru, and Trinidad and Tobago.

### INTRODUCTION

Petroleum developments in South America, Central America, the Caribbean area, and Mexico are reported for 25 countries in 1984. Table 1 is a summary of exploratory drilling for these countries. Of the countries reporting, only 2, Colombia and Peru, had increased exploration drilling activity compared to 1983. Other activity did not notably vary from 1983, except in Venezuela where exploration drilling decreased by about 50%.

Table 2 shows oil production increases for 8 countries: Barbados, Brazil, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. A significant increase (40%) in oil production occurred in Brazil. Increases in gas production were reported in Argentina, Barbados, Brazil, Chile, Colombia, Peru, and Trinidad and Tobago. Venezuela gas production is estimated to have remained at about 3.1 tcf/day. Mexico gas production is reported to be down from 1983.

Tables 3-8 list significant tests and exploration activity in those countries for which data are available. In Brazil,

Colombia, and Venezuela, exploration activity increased considerably in 1984.

ARGENTINA (Figure 1; Table 5)  
By M. Turic and E. Freytes, YPF, and  
M. R. Yrigoyen, Esso, Buenos Aires

In 1984, exploratory drilling in Argentina increased 5% in the number of wells and 12% in footage (136 wildcats and 379,652 m drilled) compared with 1983 activity. The exploratory success rate was 28.6%, also higher than the 27% of 1983.

Seismic activity on land was 4% higher than that of 1983, and marine seismic work covered 3,740 km of lines in the Magallanes (or Marine Austral) basin. 1984 oil production (27,156,857 m<sup>3</sup>) was lower than in 1983, but natural gas production (18.6 billion m<sup>3</sup>) increased more than 10% compared with 1983.

Several new oil and gas fields and pools were discovered by YPF (the Argentina state oil agency), Bidas (private-risk contractor), and concessionaire Capsa in 1984. These hydrocarbon discoveries are located in all the traditional productive basins and have production mainly from Cretaceous and Jurassic reservoirs. The first major discovery was YPF's Palmar Largo es-1, located in the eastern portion of the Noroeste (Oran) basin in Formosa Province, close to the Paraguayan border. Initial production tests yielded 241 m<sup>3</sup> of oil/day and 33,800 m<sup>3</sup> of gas/day, but during the first semester, oil production went up to more than 550 m<sup>3</sup> of oil/day from a Paleocene vugular basaltic reservoir. The second major discovery was drilled by Bidas in the Tarija basin in Salta Province. The Yacuy X-1001 obtained an initial production of 449 m<sup>3</sup> of oil/day plus 284,800 m<sup>3</sup> of gas/day from Lower Devonian Santa Rosa sandstones.

Several minor discoveries were made by YPF and Capsa in the Cuyo, Neuquina, San Jorge, and Austral basins onshore. No drilling activity was carried out offshore, and the only exploratory effort on the Atlantic shelf was restricted to marine seismic survey in the Total-Deminex-Bidas exploratory area under risk contract.

### BAHAMAS

By Petroconsultants S.A., Geneva, Switzerland

On December 31, 1984, 4 offshore licenses (8 permits) totaling 47,155 km<sup>2</sup> on the Great Bahama Bank were held by 7 companies. In 1984, 1 exploration license was reported as awarded to Tenneco in 1983. Also, permission for non-exclusive marine seismic surveys was granted to GSI and Petroleum Service (Bahamas).

Lonrho Exploration and Pecten joined Arco as equal partners in 2 offshore permits. Applications filed (1981) by

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<sup>2</sup>Sun Exploration and Production Company, P.O. Box 2880, Dallas, Texas 75221.

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The Ecuadorian government continued negotiations for the 4 blocks it received bids for in 1983. In early 1985, new contracts were signed for the Oriente area with Occidental and a consortium of Esso (80%) and Hispanoil (20%). Two additional offshore blocks near the old producing area on the Santa Elena Peninsula are expected to be signed in May 1985. Late in 1984, the Ecuadorian government indicated that additional blocks would be available as risk-contract areas for competitive bidding. In early 1985, 2 blocks in the Oriente and 2 onshore West Coast blocks were designated, and about 25 foreign companies have shown interest in the areas.

There was no exploratory or development drilling in the coastal region during 1984. The increased production from 760 BOPD in 1983 to 1,139 BOPD in 1984 was accomplished by workovers. Nineteen party-months of seismic were completed in 1984, including a 3-D survey offshore. There were also 2 party-months of stratigraphic studies carried out in the coastal province. In the Oriente region, Corporation Estatal Petrolera Ecuatoriana (Cepe) drilled 2 unsuccessful Cretaceous wildcats, 1 north of Sansahuari field and 1 in the southeastern Oriente. The government-owned company also drilled, for its own account, a deep sub-Cretaceous test in the Cepe-Texaco consortium Sacha field. Texaco returned its rights to sub-Cretaceous exploration and exploitation to the government in 1983. The Cepe-Texaco group drilled an exploratory well west of Auca field in 1984, but the well was temporarily suspended at year end awaiting final testing. Cepe recorded nearly 640 km of seismic in the Oriente region and also completed 2 months of geologic field studies in its westernmost contract area.

Annual production from the Oriente area rose sharply from 1983. The Cepe-Texaco consortium produced a record 80,233,251 bbl (219,217 BOPD) during the year, with most of the added production coming from Cononaco field, where 6 development wells were completed. Cepe also increased production by nearly 3.8 million bbl, partially by bringing new fields on stream. Cepe's production averaged 31,706 BOPD. The Cepe-Cepco consortium production totaled 1,524,663 bbl (4,166 BOPD) during 1984. Because of added Oriente production and new operators (Occidental and the Esso-Hispanoil consortium) starting exploratory work, Cepe has initiated work to increase the pumping capacity of the Trans-Ecuadorian Pipeline to 300,000 b/d. This project will be completed during the first semester of 1985.

**GUATEMALA**

By Petroconsultants S.A., Geneva, Switzerland

On December 31, 1984, 2 groups held 2 land concessions of more than 3,983 km<sup>2</sup> in Guatemala compared to 3 groups with 3 concessions covering 5,953 km<sup>2</sup> at the end of 1983.

Hispanoil (operator), Elf, and Braspetro relinquished Block "E" (1,970 km<sup>2</sup>) in the north of the country early in 1984. Elf Aquitaine surrendered its rights in Block "I" in central Guatemala in October, but continued to act as drilling operator at Rubelsanto to fulfill its obligations. Hispanoil, as new operator, and Basic will equally share this block when the government authorizes Elf to withdraw from the country.

The government offered 3 exploitation contracts to develop the Xaan 1, San Diego 1, and Yalpemech 1 abandoned oil discoveries in north and central Guatemala.

Two land rigs were active in exploratory drilling. A total of 7,510 m were drilled in 3 wells (16.1 rig-months) compared to 8,358 m drilled in 8 wells (15.2 rig-months) in 1983. Texaco suspended Bolonkitu 1, which will be tested in 1985, and spudded Paso Caballos 1 in north Guatemala. Elf was active at Rubelsanto 101 in central Guatemala. The well was re-entered for testing deeper zones.

No development drilling was reported during 1984.

1984 crude oil production from 5 fields in central Guatemala averaged about 4,500 b/d, about 35% less than in 1983.

**GUYANA**

By Steve Lawrence, Exploration Consultants Ltd.,  
Henley-on-Thames, England

No exploration or development activities took place in Guyana in 1984. At year end, only Home Oil retained exploration rights, with its 5,190 km<sup>2</sup> in the interior Takutu basin. Dennison/Seagulls license covering 5,198 km<sup>2</sup> in the southern offshore area was withdrawn by the government in late 1984.

Early in 1985, Home Oil withdrew from its Takutu concession, thus rendering all of Guyana's sedimentary areas unlicensed for petroleum exploration. The government, through the Ministry of Energy and Mines, has completed a full geologic and petroleum-potential appraisal of both the offshore Guyana and Takutu basins. Data and interpretation packages are available through the Ministry of Energy and Mines in Georgetown.

**HONDURAS**

By D. M. Tappmeyer, Sun Exploration and Production  
Company, Dallas, Texas

A country-wide aeromagnetic survey for the government was started in 1984, with 5,256 km flown by year end. This survey is part of the Direccion General de Minas e Hidrocarburos (DGMH) study of the hydrocarbon potential of the country, funded by the World Bank.

Other exploration activity included a combined gravity and magnetometry survey, and field work by Petronic in its Corinto permit, northwest of Managua.

Two exploration concessions and a reconnaissance permit were granted. The government passed new petroleum legislation in 1984.

**JAMAICA**

By Raymond Wright, Petrojamaica

In 1984, a relatively low level of exploration activity took place in Jamaica. The Petroleum Corporation of Jamaica, with the assistance of Petro-Canada International Assistance Corporation, conducted field mapping with emphasis on Upper Cretaceous and Lower Tertiary lithofacies studies and reservoir valuation. These studies were supported by shallow corehole drilling.

In the second half of 1984, Phoenix Corporation of McLean, Virginia, began a reinterpretation of aeromagnetic data, and a contract was signed with Geco Geophysical

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In 1984, PetroPeru signed contracts with Texaco in June for Block 6, and Shell in November for Blocks 49-51.

**SURINAME**

By Petroconsultants S.A., Geneva, Switzerland

At the end of 1984, no foreign rightholders were in the country. In February 1984, Gulf fully relinquished the 13,744 km<sup>2</sup> in the Saramacca concession (PSC) on the shelf. On December 19, 1984, Energy World Trade filed an application for rights in Suriname. Staatsolie, the state company, continued its operations at the Tambaredjo oil field.

No exploration activity was reported in 1984. In 1983, a 505-km shallow water seismic program and a geochemical survey was conducted by Gulf.

In 1984, 3 onshore exploratory and delineation wells totaling 4,701 ft were drilled by Staatsolie in 0.6 rig-months, compared to 6 offshore wells and about 13,500 ft drilled by Surinam Gulf in 1983. These 3 wells in the Tambaredjo field area were abandoned with oil shows.

In 1984, 12 development wells and 13,330 ft were drilled by Staatsolie in 4.5 rig-months in the onshore Tambaredjo field, compared to 7 wells drilled by the same company in 1983. Eight wells were completed as oil producers and 4 were abandoned as dry.

In 1984, heavy (16°) oil production from the onshore Tambaredjo area amounted to 245,000 bbl (670 BOPD), up 109% from 320 BOPD in 1983.

**PUERTO RICO**

By Luis Blanche, Guaynabo

With the approval in 1984 of the regulation for prospection, leasing, and producing oil and gas and the completion in 1984 of an Environmental Impact Statement, all legal resources for oil exploration and exploitation are available. It is expected that the new government administration, inaugurated in January 1985 will enter negotiations in the near future with interested companies for the exploration of several promising oil areas.

A geologic report on Puerto Rico by Meyerhoff and Kriegg has been completed. It compiles past geologic, seismic, and drilling studies as well as new studies.

**TRINIDAD AND TOBAGO**

By Ministry of Energy and Natural Resources, Port of Spain, and Petroconsultants S.A., Geneva, Switzerland

In 1984, a major project was launched by the government in order to stimulate exploration activity in marine areas around Trinidad and Tobago. 24,600 km<sup>2</sup> of marine acreage off the north and east coasts of the islands was opened for bidding. A total of 13,000 km of marine seismic data, acquired by Western Geophysical Company of America for the government in 1980-1981, is now available. Magnetic, gravity, and water-depth data were acquired with the seismic data. The offshore areas were advertised for competitive bidding in 1984.

A 3-D Telseis marine seismic program for Trinmar/Trintoc by Western Geophysical Company of America was shot in the southwest Soldado area off Trinidad. No other companies carried out seismic surveys in Trinidad and Tobago in 1984.

Only 4 exploratory wells were drilled in 1984. Offshore, Trinidad Northern Areas Ltd. (TNA) drilled S-567 in Soldado field (TD 8,733 ft). Onshore, QU 352ST was drilled by Tesoro in Quarry field (TD not available), and TNA drilled CO-132ST in Catshill field (TD 8,500 ft). Trintoc's FC-331ST was spudded in late 1984 in Point Fortin Central field. Seven other Trintoc wells drilled several years ago were completed in November. One was an oil well, 2 were gas wells, 1 was abandoned, and the status for 3 is not available. In 1983, 5 onshore wells were completed by Trintoc, and 1 offshore well was drilled by Texaco and TNA.

Development drilling increased in 1984, with 202 wells spudded compared to 164 in 1983. Footage drilled totaled 643,900 ft compared to 548,661 ft drilled in 1983. Onshore, PCO, Tesoro, Trintoc, and Texaco were active in most of the southwest Trinidad fields; offshore, Amoco continued operations in the eastern Teak and Cassia fields. TNA had further development the Soldado area off southwest Trinidad, and Tesoro continued activities in its Galeota field.

Crude oil production increased by 5.6% from 1983, reaching an average of 168,758 BOPD, 76% of which was produced by Amoco and TNA from their offshore fields. Daily gas production averaged 582,000 mcf, an 8.9% rise from 1983. This rise could be linked to the recent building of a new pipeline joining Amoco's offshore fields to the industrial western coast of Trinidad.

**URUGUAY**

By Petroconsultants S.A., Geneva, Switzerland

No changes took place in petroleum legislation and no developments occurred in the rightholding situation during 1984. Neither exploration nor drilling activities were reported during the year, except that a cooperation agreement in oil exploration was signed by Argentina and Uruguay.

**VENEZUELA (Figure 8; Table 8)**

By Neal Van Middlesworth, VOSA, Caracas

Production stayed virtually flat at 1,795,160 BOPD, but annual production rose by 2.3 million bbl (mainly because of the extra leap-year day) to 657,028,599 bbl, bringing the cumulative total to 38,834,337,000 bbl. Proven crude reserves at year end were 28,028,000,000 bbl (an 8% increase), not including the estimated 1.23 trillion bbl of heavy and extra-heavy crudes in the Orinoco belt. Total onshore and offshore gas reserves at the end of 1983 were 100 tcf, equal to 20 billion bbl of oil.

For the second year, the number of rigs actively drilling declined by 40%, from 52 to 31, presumably a result of budgetary cuts imposed by the drastic devaluation of the currency in 1983. Outpost and development drilling occupied 76% of the total rig time of 372 rig-months, and wild-cat tests occupied 24%. Rig time was almost evenly divided between western Venezuela (52%) and eastern Venezuela (48%).

Wells of all classifications drilled to total depth in 1984 totaled 445 (53% less than in 1983), of which 307 were completed as producers, 3 abandoned, and 135 suspended. In addition, 518 wells drilled and suspended in prior years were completed as producers (62% more than in 1983), and 26

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were abandoned. Of five 1984 new-field wildcats, 3 were new-field discoveries, 1 a new pool find, and 1 was abandoned. Two of these discoveries opened up a new and highly important oil province in southwestern Venezuela's state of Apure. Operator Corpoven calculates that 300 million bbl of new reserves were proven by the 5 wells drilled in 1984, and that the total will reach 1.4 billion bbl of 30°-35° oil when additional exploratory work is completed. Details of testing in the 4 wells completed and 1 suspended in Guafita and La Victoria fields are not available. Final depths of the wells ranged from 7,850 to 9,100 ft. Four additional locations have been selected. Both fields lie close to the Colom-

bian border and adjacent to Cano Limon field. A geologic surprise occurred in testing well QQ-674 in the old heavy-oil Quiriquire field. This well, drilled as an outpost in 1983, was deepened in 1984 and tested 450 b/d of 30°-35° oil, confirming the presence of oil in the Eocene and in the Cretaceous at about 12,000 ft.

An average of 5 seismic crews shot 5,195 km in 1984, 14% more than in 1983. Two-thirds of the total line, 3,464 km, was shot in western Venezuela, including 1,174 km in Lake Maracaibo's Ambrosio area and the Urdaneta corridor. The remainder was shot in eastern Venezuela's Anzoategui, Guarico, and Monagas States.

Table 1. Exploratory and Development Drilling in South America, Central America, Caribbean Area, and Mexico in 1984

COUNTRY Operator	EXPLORATORY						DEVELOPMENT					
	Oil	Gas	Dry	% Success	Totals Drilled	ft or m	Oil	Gas	Dry	% Success	Totals Holes	ft or m
ARGENTINA												
YPF	25	9	92	27	126	360,049 m	-	-	-	-	-	-
Private	5	-	5	50	10	19,603 m	-	-	-	-	-	-
BARBADOS	2	5	3	80	10	-	-	-	-	-	20	-
BELIZE	-	-	1	-	2	9,228 ft	-	-	-	-	-	-
BOLIVIA												
YPF	-	-	3	-	3	17,185 ft	-	4	4	100	8	26,830 m
Private	-	-	-	-	-	2,000 ft	-	-	-	-	-	-
BRAZIL												
Petrobras	80	7	140	38	230	-	589	13	118	83	724	-
Private	-	1	15	1	17	-	-	-	-	-	-	-
CHILE												
ENAP	1	1	4	29	7	22,000 ft	52	1	22	71	75	135,000 m
COLOMBIA	20	-	22	47	42	323,220 ft	72	-	8	90	80	1,077,653 ft
CUBA	-	-	-	-	-	-	-	-	-	-	-	-
DOMINICAN REP.	-	-	-	-	-	-	-	-	-	-	-	-
ECUADOR	-	-	3	-	3	-	22	-	-	100	22	-
GUATEMALA	-	-	-	-	-	7,510 m	-	-	-	-	-	-
GUYANA	-	-	-	-	-	-	-	-	-	-	-	-
JAMAICA	-	-	-	-	-	-	-	-	-	-	-	-
MEXICO	11	3	30	32	59	304,800 ft	161	29	34	85	224	-
PARAGUAY	-	-	-	-	-	-	-	-	-	-	-	-
PERU	7	1	21	28	31	-	111	1	9	93	156	-
SURINAME	-	-	3	-	3	4,701 ft	8	-	4	67	12	13,330 ft
TRINIDAD-TOBAGO	1	2	1	33	9	31,198 m	134	3	10	82	167	643,921 ft
VENEZUELA	14	-	4	78	18	300,008 m	385	-	3	80	484	828,885 m

Table 2. South America, Central America, Caribbean Area, and Mexico Production Summary, 1980-1984

COUNTRY	OIL (million bbl)					Cumulative Bbls. (1,000 bbl)	BOPO (1,000 bbl)	GAS (bcf)					Cum. To 12/83 (tcf)	Avg. Daily (bcf)
	1980	1981	1982	1983	1984			1980	1981	1982	1983	1984		
ARGENTINA	179.7	181.3	175.6	175.3	170.8	3921.6	466.6	466.3	467.2	537.2	596.8	658.5	8.781	1.799
BARBADOS	0.3	0.2	0.26	0.38	0.63	-	1.77	-	-	0.38	.75	0.89	-	.002
BOLIVIA	8.7	8.0	8.9	8.1	7.6	277.4	20.88	168.9	175.4	187.8	178.1	173.2	2.255	0.474
BRAZIL	66.4	77.9	97.7	120.4	173.4	-	460.0	77.8	87.4	106.9	142.	173.	-	0.388
CHILE	12.2	15.1	15.6	14.3	14.0	317.2	38.4	190.6	179.4	178.3	169.5	172.9	5.560	0.472
COLOMBIA	45.6	48.8	51.8	55.5	61.12	2386.67	166.9	159.5	168.8	174.4	183.1	183.21	3.713	.501
CUBA(a)	-	-	-	12.0	-	-	-	-	-	-	.014	-	-	-
ECUADOR	74.6	76.8	76.9	86.5	93.8	1029.4	259.3 <sup>b</sup>	13.6	13.6	13.8	14.8	14.5	-	-
GUATEMALA	1.8 <sup>c</sup>	1.5 <sup>b</sup>	2.3 <sup>c</sup>	-	-	-	-	-	-	-	-	-	-	-
MEXICO	707.0	843.9 <sup>a</sup>	1002.4 <sup>a</sup>	972.9 <sup>a</sup>	982.5 <sup>d</sup>	16635.4	2684.5 <sup>a</sup>	1298.6	1482.2 <sup>a</sup>	1549.9	1479.6	1373.5 <sup>d</sup>	-	3.753
PERU	71.4	70.5	71.2	62.5	67.4	1476.7	185.1 <sup>a</sup>	50.8	49.2	47.2	42.1	45.5	-	-
SURINAM	-	-	-	-	.2	-	.67	-	-	-	-	-	-	-
TRINIDAD-TOBAGO	77.6	89.1	64.6	58.3	62.0	2208.2	169.5 <sup>a</sup>	197.8	195.7	203.9	220.6	252.4	4605.4	-
VENEZUELA	794.1	772.3	690.6	654.7	657.0	38834.3	1795.0	-	-	-	-	-	-	-

<sup>a</sup>Data from Petroconsultants. <sup>b</sup>Corrected. <sup>c</sup>Estimated. <sup>d</sup>Data from Morse & Company.



## Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1985<sup>1</sup>

W. DAVID WIMAN<sup>2</sup>

### ABSTRACT

Exploration activity in South America, Central America, the Caribbean area, and Mexico in 1985 was concentrated in proven petroleum provinces. Successful exploration and development efforts were most intense in Colombia and Venezuela, where activity centered around the Cano Limon field area. Initial production of 30,000 BOPD from Cano Limon started in December, raising Colombia again to the ranks of an exporting nation. Another significant discovery in Colombia was San Francisco field in the Upper Magdalena basin. Argentina reported significant discoveries by YPF in the Northwest Cretaceous and Neuquen basins and by Total offshore Tierra del Fuego. Brazil continued to discover major reserves in the offshore Campos basin in ever-increasing water depths. At year end, Venezuela was drilling Furrial-1 in eastern Venezuela. The well is reported to be the outstanding discovery of 1985, if not of the last 2 decades.

### INTRODUCTION

Petroleum developments in 27 countries are reported for 1985. Drilling activity for 14 countries is summarized in Table 1. Argentina, Bolivia, Chile, Colombia, Guatemala, Mexico, Suriname, and Trinidad-Tobago reported increased exploration drilling activity in 1985 compared to 1984.

Oil production increased in Barbados, Brazil, Colombia, Ecuador, Suriname, and Trinidad-Tobago (Table 2). Increased gas production was reported for Argentina, Barbados, Brazil, Ecuador, and Trinidad-Tobago (Table 2).

Tables 3-7 list significant tests and exploration activities in those countries for which data are available.

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### ARGENTINA (Figure 1; Table 5)

By M. Turic and E. Freytes, YPF, Buenos Aires,  
and M. R. Yrigoyen, Esso, Buenos Aires

In 1985, exploratory drilling in Argentina increased 15% in number of wells and decreased 5% in footage drilled (161 wildcats and 364,211 m) compared with 1984. The exploratory success rate was 27.3%, slightly lower than the 28.6% of 1984.

Seismic activity was conducted only on land, with a total of 19,182 line-km, 8% lower than in 1984. Geologic field mapping almost tripled that of 1984 with a total of 5,664 km<sup>2</sup>.

Several new oil and gas fields were discovered by YPF (the Argentina state oil agency) and by the Total Austral consortium. The most significant discoveries were made in the south flank of the Cretaceous Olmedo subbasin (northwest of Oran basin), and in the Neuquen and offshore Austral (or Magallanes) basins. In the first, 2 new-field discoveries are worth mentioning: Puesto Climaco x-1 and Vinalar Norte x-1, with 3,724 BOPD and 7,724 BOPD initial production tests, respectively, from the Upper Cretaceous Yacoraite limestone reservoir. In the northern segment of the Neuquen basin, YPF also discovered a new oil field in the highly thrustured foldbelt of the Andes, where Vega Grande x-1 initially produced 1,635 BOPD and 7.2 MCFGD flowing from fractured Tertiary andesites intruded into the Neocomian Agrio Formation. Finally, an important offshore discovery by Total Austral was made east of Tierra del Fuego Island. Pleyade x-1 yielded 3,459 BOPD and 24.5 MCFGD in initial tests. The other new-field discoveries are located in the traditionally productive basins and have production mainly from Cretaceous, Jurassic, and Triassic reservoirs, in order of importance.

In early 1985, the Argentina government began implementing a new exploration and production policy, and a new exploration model contract was enacted in order to reactivate exploration activities by private companies. On September 30, YPF called for the first round of bids on 32 blocks of the 165 blocks in which prospectable areas of the country have been divided. (The entire exploration area to be tendered is outlined in Figure 1.)

### BAHAMAS

By Petroconsultants S.A., Geneva, Switzerland

As of December 31, 1985, 7 offshore licenses covering 18,782 km<sup>2</sup> on Grand Bahama Bank were held by 1 company and 1 two-company partnership.

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abandoned oil discoveries: San Diego-1, Yalpemech-1, and Xaan-1. Esso was awarded Contract 3-85 on September 5, to explore 6 blocks covering 2,983 km<sup>2</sup>. On December 10, Amoco reached an agreement on Contract 4-85 for exploration on 3 blocks covering a total of 1,499 km<sup>2</sup> in west-central Guatemala. On November 29, the government awarded Basic Resources and FIPP, a Dutch-based company, Contract 6-85 on 3 blocks totaling 1,238 km<sup>2</sup> in the Peten basin. Basic holds 90% interest and FIPP 10%. Texaco (operator), Hispanoil, and Braspetro relinquished Block L (1,984 km<sup>2</sup>) in the northwestern part of the country in September.

Three rigs were active drilling exploratory wells in 1985. A total of 9,498 m was drilled in 1985 compared to 7,510 m in 1984, up 26%. Hispanoil completed El Sauce-1 (TD 2,230 m) as an oil well in September (1,020 BOPD), and spudded the Rubelsuj-1 wildcat in October. Texaco drilled 3 unsuccessful wildcats: Paso Caballos-1, Ocultun-1, and Chocop-1.

No development drilling was reported during 1985.

1985 crude oil production averaged 3,760 BOPD from 4 fields in central Guatemala, 23% less than 1984.

GUYANA

By Steve Lawrence, Exploration Consultants Ltd.,  
Henley-on-Thames, England

Home Oil withdrew from its Takutu concession early in 1985. Since then, no petroleum exploration licenses have been in force in Guyana. The government, through the Ministry of Energy and Mines, is actively promoting the 2 main sedimentary areas, the coastal and offshore Guyana basin and the onshore Takutu basin. A new petroleum law was enacted early in 1986, and a round of licensing is planned for 1986.

HONDURAS

By Petroconsultants S.A., Geneva, Switzerland

The new petroleum legislation, decree no. 194-84, was presented in September and is based on production-sharing terms. Prior leaseholders were recognized with a total of 25,410 km<sup>2</sup> held under the previous concession law. The Director General of Mines and Hydrocarbons (DGMH) plans a round of competitive bidding in 1986.

A nonexclusive, high-sensitivity aeromagnetic survey comprising 41,400 line-km was flown in 1985 by Aero Service.

JAMAICA

By Petroconsultants S.A., Geneva, Switzerland

No exploration rights were held in 1985. Petrojamaica acquired 490 line-km of seismic data and conducted 12 party-months of geologic field mapping.

MEXICO

By Petroconsultants S.A., Geneva, Switzerland

Exploration activity, including seismic, geologic, gravity, magnetic, and geochemical, increased 11.7% to a total of 1,340 crew-months compared to 1,199 crew-months in 1984. In 1985, crude oil production averaged 2.63 million b/d (1.7 million offshore in Bay of Campeche), down 2.0% from 2.68 million b/d in 1984. Natural gas output was 3.6 bcf/day, down 4.0% from 3.75 bcf/day in 1984. Condensate production was 114,761 b/d, up 0.4% from 114,274 b/d in 1984. Proven reserves of petroleum declined to 71 billion bbl compared to 72 billion bbl at the end of 1984.

Exploratory drilling in 1985 was carried out with an average of 92 land and marine rigs, the equivalent of 1,104 rig-months, up 8% from 1,020 rig-months in 1984. Drilling activity in 1985 increased to 78 wells (68 onshore and 10 offshore), with a total of 288,401 m drilled, compared to 68 wells and 304,800 m drilled in 1984. Drilling resulted in 12 oil wells (11 onshore, 1 offshore), 7 gas wells, 5 stratigraphic tests, and 11 special project wells. Two new wildcat areas, Lacantum in the southeast near Guatemala, and Salina in central Mexico, were discovered.

Most of the exploratory drilling took place in the districts of Reynosa and Monclavo (northeast zone), Villahermosa and Comalcalco (southeast zone), and Ebano (central zone). There were 6 Mesozoic discoveries in Chiapas and Tabasco states (southeast zone). In the offshore Obregon basin, Gulf of California, Extremeno 201 well found gas and condensate.

An average of 108 rigs were active in development drilling during 1985, with 219 wells completed (735,566 m drilled) in about 1,296 rig-months. This compares to 228 wells (754,064 m) and 1,320 rig-months in 1984. In all, 145 oil, 26 gas, 41 dry, and 7 water-injector wells were reported in 1985.

NETHERLANDS ANTILLES

By Petroconsultants S.A., Geneva, Switzerland

The government is expected to publish information on new petroleum legislation. The Petrofina group surrendered its rights in the Saba Bank Shelf area in late 1985. Partners were Occidental (45%), Weeks (10%), and Arkla (5%).

No exploration activity was conducted during 1985.

NICARAGUA

By Petroconsultants S.A., Geneva, Switzerland

No petroleum rights are held in Nicaragua, as all have expired or been voided. Publication of new petroleum legislation is pending. A team of Soviet geologists and geophysicists is assessing Nicaragua's hydrocarbon potential. A short gravity-magnetometry survey and geologic field studies were conducted by Petronic south of Managua. Soviet scientists will use the results of the survey when recommending a drill site.

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PARAGUAY

By Petroconsultants S.A., Geneva, Switzerland

Five groups held 8 permits in Paraguay on December 31, 1985, covering a total of 180,070 km<sup>2</sup>. In October, Mobil (Superior) farmed out an 80% interest in its 32,800-km<sup>2</sup> block in the Parana basin to Adams Resources, which then became operator. Occidental (operator) and Shell entered into a joint-venture agreement on the Boqueron block (28,500 km<sup>2</sup>) in the Chaco basin. Also, the 2 companies acquired interests (45% each) in the Anschutz block (29,200 km<sup>2</sup>) in the Chaco basin and the Chesapeake block (11,750 km<sup>2</sup>) in the Pirity basin. The 3 blocks are located in western Paraguay. Pecten relinquished acreage in the Parana basin in eastern Paraguay.

Geosource conducted a 113-km seismic survey for Anschutz. Occidental spudded the Carmen-1 wildcat in the Chesapeake block in October.

PERU

By Petroconsultants S.A., Geneva, Switzerland

In August, several oil contracts were rescinded by government decree. At year end, negotiations were continuing for Occidental's northern jungle area and Occidental and Bidas' Talara onshore consortium; however, Belco's offshore installations were reportedly seized in late 1985.

Exploration drilling decreased sharply in 1985, with 13 wells drilled compared to 32 in 1984, down 59%. This decrease occurred mainly because Belco drilled only 8 offshore wells compared to 26 in 1984. Five wells were drilled onshore, 3 in the Talara basin by Petroperu, 1 dry hole in the Ucayali basin by Petroperu, and 1 dry hole in the Maranon basin by Texaco on a farm-out from Union Texas.

Development drilling decreased from 148 wells in 1984 to 147 wells in 1985. Production was approximately 190,000 BOPD, up slightly from 1984.

Seismic activity was reported by Shell, which acquired 1,926 line-km in its jungle block. Petroperu reported 770 km of gravity acquisition in the East Talara basin, and started a survey in the central jungle block 50.

SURINAME

By Petroconsultants S.A., Geneva, Switzerland

A 6,900-km<sup>2</sup> offshore license was granted in 1985 to Suriname Petroleum Company (Nomeco, 40%; Austra Tex, 20%; Base Resources Ltd., 20%; and Suriname Aluminum, 20%). Staatsolie continued developing the Tambaredjo heavy oil field.

Six delineation/exploratory wells and 2 stratigraphic tests in the Tambaredjo area were drilled and abandoned by Staatsolie, compared to 3 in 1984, up 167%.

Four development wells were completed in 1985, down 67% from 12 wells in 1984. Production increased from 670 BOPD in 1984 to 1,138 BOPD in 1985, up 69.9%.

TRINIDAD AND TOBAGO

By Ministry of Energy and Natural Resources, Port of Spain, and Petroconsultants S.A., Geneva, Switzerland

In March, the government of Trinidad and Tobago (GOTT) acquired the assets of Texaco Trinidad Inc. (TTI), except for TTI's 50% interest in east coast marine area Block 6 and a 33% interest in Trinidad Northern Areas Ltd. (TNA). The leases will be operated by Trinidad and Tobago Oil Company (Trintoc). In November, GOTT also acquired the remaining assets of Trinidad-Tesoro Petroleum Company, whose leases will be operated by Trinidad and Tobago Petroleum Company Ltd. (TTPC).

Amoco acquired 10,368 line-km of seismic data off the east coast, Trinmar finished a 3-D survey in the Gulf of Paria covering about 300 line-km, and Trintoc acquired 84 line-km off the east coast.

In 1985, 15 exploratory and semiexploratory wells were completed, compared to 4 in 1984. Development drilling decreased, with 197 completions in 1985 compared to 202 in 1984. Footage drilled in 1985 totaled 168,962 m, compared to 196,311 m in 1984. Offshore, Amoco used 2 of its 3 rigs for workovers, drilling 16,793 m in 1985, a 34% decrease from 1984. TNA developed the Main and Southwest Soldado fields, drilling 27,689 m in 1986, 32% less than 1984. Eighteen wells were drilled with 17 oil completions and 1 well abandoned. TTPC drilled 77,415 m in 1985, with 67 development and 8 exploratory and semiexploratory wells. TTOC drilled 70,250 m in 68 wells for a 29% increase over the consolidated 1984 totals of TTOC and Textrin. Premire Consolidated Oil (PCOL) drilled 16 development and 2 semiexploratory wells.

Crude oil production in 1985 averaged 176,052 b/d, an increase of 3.6% from 1984. Offshore oil production accounted for 77.5% of the total. Gas production in 1985 is estimated to have averaged 717 mmcf/day, 19% higher than the estimate for 1984.

URUGUAY

By Petroconsultants S.A., Geneva, Switzerland

No foreign companies held licenses, and no exploration or drilling activities were reported in 1985.

According to the latest information, Western Geophysical conducted a 1,200-km onshore seismic survey in 1984 for Ancap in northern Uruguay. Also, Braspetro interpreted an onshore gravity survey of the same area for Ancap as part of a technical assistance agreement between Uruguay and Brazil.

VENEZUELA

By Eugene Van Middlesworth and Neal Van Middlesworth, VOSA S.R.L., Caracas

Production for 1985 fell 7% to 611,419,964 bbl (1,675,123 b/d), with Corpoven producing 16.5%, Lagoven 40%, Maraven 27.7%, and Meneven 15.8%. Production in eastern Venezuela totaled 131,596,656 bbl

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(21.5%), which includes 13,134,757 bbl from the Orinoco tar belt; western Venezuela totaled 470,188,369 bbl (76.9%); and the Apure-Barinas area totaled 9,634,929 bbl (1.6%).

The number of rigs drilling new holes rose slightly, from an average of 31 in 1984 to 33 in 1985, with a high of 38 in September and a low of 27 in May. Rig-months in 1985 totaled 395, compared to 372 rig-months in 1984. Outpost and development drilling accounted for 66% of this total, leaving wildcat drilling at 134 rig-months (34%). Eastern Venezuela accounted for 44% (13% wildcat, 31% outpost/development) and western Venezuela, 56% (21% wildcat, 35% outpost/development).

Of the 561 wells completed or abandoned in 1985, 345 were wells suspended in prior years (327 completed, 18 abandoned). Wells drilled in 1985 totaled 355 (20% less than in 1984), including 214 wells completed, 2 abandoned, and 139 drilled and suspended at year end.

Six new-field wildcats were drilled in 1986, of which 5 remained suspended at year end and 1 was abandoned (Corpovent's Amparo-1X and Guasualito-1X were preparing for

abandonment). Maraven drilled and abandoned a new-field test, PGN-1X, in Paraguana, Falcon state, and suspended SLA-8-2X in Block A of south Lake Maracaibo. Meneven drilled and suspended a new-field test, MGPA-1X, in Guarico state, where there have been excellent gas shows.

Lagoven was drilling Furrial-1 in eastern Venezuela. The well is reported to have discovered nearly 1 billion bbl of oil and 2.7 tcf of gas.

Corpovent drilled 11 new-pool tests with very good results in the Guafita-La Victoria area of Apure state. Initial production ranged from 2,500 to 3,500 BOPD, and gravities were 29-35°. Strangely for Venezuela, there was no associated gas in this light crude. This area offsets the Cano Limon trend of Colombia.

An average of 11 seismic crews shot 15,477 km of line in 1985, almost 300% more than in 1984. Eastern Venezuela accounted for 5,440 km (35%), of which 4,140 km was land and 1,300 km was marine; western Venezuela accounted for 10,037 km (65%), of which 3,364 km was land and 6,673 km was marine (5,257 km or 33% was shot in Lake Maracaibo).

Table 1. Exploratory and Development Drilling in South America, Central America, Caribbean Area, and Mexico in 1985

COUNTRY Operator	EXPLORATORY						DEVELOPMENT					
				%	Totals					%	Totals	
	Oil	Gas	Dry	Success	Drilled	Meters	Oil	Gas	Dry	Success	Drilled	Meters
ARGENTINA												
YPF	27	7	113	23	147	337,088	671	21	80	90	772	1,702,257
Private	7	3	4	71	14	27,123	81	2	8	91	91	216,943
BARBADOS	4	-	1	80	5	10,366	17	-	-	100	17	25,941
BELIZE*	-	-	3	0	3	4,033	-	-	-	-	-	-
BOLIVIA												
YPFB	1	5	4	60	10	22,005	2	6	-	100	8	18,185
Private	-	-	1	0	1	934	-	-	-	-	-	-
BRAZIL												
Petrobras	47	12	124	32	204	486,982	634	25	122	85	845	1,111,998
Private	10	-	12	45	25	32,826	-	-	-	-	-	-
CHILE (ENAP)	1	3	9	31	13	40,610	51	2	17	76	70	125,894
COLOMBIA												
Ecopetrol	7	-	0	100	7	22,400	36	-	2	95	38	82,585
Private	22	-	38	63	60	145,095	48	1	2	96	51	184,093
ECUADOR												
CEPE	2	-	1	50	2	8,757	8	-	-	100	8	29,193
CEPE-Texaco	-	-	-	-	-	-	11	-	-	100	11	33,201
GUATEMALA*	1	-	3	25	4	9,498	-	-	-	-	-	-
JAMAICA	-	-	-	-	-	-	-	-	-	-	-	-
MEXICO*	12	7	59	24	78	288,401	145	26	48	78	219	735,566
PERU*	-	-	-	-	13	36,341	-	-	-	-	147	246,897
SURINAME*	-	-	8	0	8	2,503	4	-	-	100	4	4,425
TRINIDAD-TOBAGO	6	-	8	43	14	30,440	177	-	6	97	183	168,962
VENEZUELA	-	-	-	-	6	-	214	-	2	-	355	-

\*Data from Petroconsultants.