

## Review of 1970 Petroleum Developments in South America, Central America, and Caribbean Area<sup>1</sup>

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**Abstract** This review includes information on petroleum developments during 1970 in 30 countries. Petroleum was produced in 10 countries and total production was 1,737,678,000 bbl (4,760,290 b/d), an increase of 2.4% from the previous year. Venezuela furnished 78% of the total as it produced at a high rate of 3,708,000 b/d and registered an increase of 3.2% from the previous year's production. The largest percentage increase in production was 10.1 by Argentina, as the average rate was 392,347 b/d. Production increased 3.7% in Colombia, but declined in all other countries.

A total of 1,978 wells was drilled, 351 more than in 1969. Exploration drilling was carried out in 15 countries; however, commercial production was not found in any new country this year. Party-months of geologic and geophysical work were: surface geology, 329; seismograph, 659; gravity, 52; magnetometer, 13; other, 53. Forty-two percent of this work was in Argentina and 17% was in Brazil.

Successful exploration drilling was featured in eastern Ecuador and in the offshore southeast of Trinidad; on the discouraging side was the unsuccessful offshore drilling in Argentina and Nicaragua. Significant for future exploration was the awarding of exploration blocks in the North Coast Marine Area of Trinidad, the contracting for exploration of large areas of the llanos of Colombia, and further progress toward the awarding of service contracts for 5 blocks in south Lake Maracaibo.

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### INTRODUCTION (Tables 1-4)

Petroleum production in 1970 from 10 countries in the review area was 1,737,678,000 bbl, an increase of 2.4% from the previous year (Table 1). Venezuela continued to furnish most of the production (78%) as oil was produced at a rate of 3,708,000 b/d, up 3.2% from last year. Production also increased in Argentina (10.1%) and in Colombia (3.7%), but decreased in all other countries (Table 2). The decline in Ecuador will be reversed soon, as the pipeline from the eastern part of the country to the Pacific coast is completed and that area is to be placed on production in 1972; the active industry effort in this area suggests that it will become one of the important producing regions of South America.

Party-months of exploration effort are shown in Table 3. Argentina and Brazil were leaders in this effort as each country's part of the total was 42% and 17%, respectively.

Notable accomplishments during 1970 were the increase in production by Venezuela and Argentina and the continued successful exploration drilling in eastern Ecuador and in the southeastern offshore of Trinidad. Also signifi-

Table 1. Annual Oil Production, 1966-1970 (1,000 of Bbl)

| Country        | 1966             | 1967             | 1968              | 1969             | 1970             | Total<br>Cumulative<br>Production |
|----------------|------------------|------------------|-------------------|------------------|------------------|-----------------------------------|
| Venezuela      | 1,230,298        | 1,292,787        | 1,319,356         | 1,311,831        | 1,353,422        | 26,316,182                        |
| Argentina      | 104,756          | 115,237          | 125,474           | 130,031          | 143,207          | 1,877,835                         |
| Colombia       | 72,843           | 70,582           | 64,828            | 77,122           | 79,951           | 1,614,917                         |
| Brazil         | 42,430           | 53,521           | 58,787            | 63,043           | 59,968           | 542,042                           |
| Trinidad       | 55,603           | 65,202           | 66,904            | 57,418           | 51,215           | 1,245,786                         |
| Peru           | 23,027           | 25,857           | 27,056            | 26,330           | 26,269           | 815,389                           |
| Bolivia        | 6,105            | 14,392           | 14,974            | 14,758           | 8,819            | 103,768                           |
| Chile          | 12,429           | 12,369           | 13,695            | 13,350           | 12,432           | 159,855                           |
| Ecuador        | 2,660            | 2,272            | 1,815             | 1,608            | 1,495            | 104,225                           |
| Cuba           | 491              | 807              | 1,000*            | 900              | 900              | 10,505**                          |
| Barbados       | 9                | 8                | --                | --               | --               | 17                                |
| <b>Total</b>   | <b>1,550,671</b> | <b>1,653,234</b> | <b>1,693,889*</b> | <b>1,696,391</b> | <b>1,737,678</b> | <b>32,790,521</b>                 |
| Percent change | +6.6%            | +2.4%            | +0.15%            | +2.4%            |                  |                                   |

\*Adjustment.

\*\*Estimated.

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cant as an indication of possible future production was the very strong exploration play that is developing in the llanos of eastern Colombia, awarding of new exploration blocks off the north coast of Trinidad, and the probable awarding of service contracts for 5 blocks in the south part of Lake Maracaibo. On the discouraging side was the unsuccessful offshore exploratory drilling in Argentina and Nicaragua.

Although the area covered by this review has not experienced the spectacular increase in production rate achieved in other parts of the world, it has nevertheless had substantial growth over the past 10 years. My first association with this review was for the year 1961; at that time there were 8 producing countries and production that year was 1,318,610,000 bbl (3,612,678 b/d); in 1970 there were 10 countries which produced 1,737,678,000 bbl (4,760,290 b/d), an increase in production rate of 32%. Ten years ago, as now, Venezuela dominated the production, furnishing 81% then and 78% for the current year. Is there any area that is likely to challenge Venezuela for this dominant position? Probably not for many years at least, since new producing areas in that country are likely to be opened up in south Lake Maracaibo, Gulf of Venezuela, and the Orinoco delta.

ACKNOWLEDGMENTS

Only through the efforts of many individuals and organizations is a review such as this possible; I am indebted to the following for their part in contributing sections and/or supplying information for this review of petroleum developments during 1970 in South America, Central America, and the Caribbean area.

Table 2. 1970 Daily Oil Production

| Country   | B/D       | % Change from 1969 |
|-----------|-----------|--------------------|
| Venezuela | 3,708,000 | +3.2               |
| Argentina | 392,347   | +10.1              |
| Colombia  | 219,043   | +3.7               |
| Brazil    | 164,297   | -4.9               |
| Trinidad  | 140,315   | -10.8              |
| Peru      | 71,971    | -0.2               |
| Chile     | 34,059    | -6.9               |
| Bolivia   | 24,163    | -40.2              |
| Ecuador   | 4,095     | -7.0               |
| Cuba      | 2,000*    | --                 |
| Total     | 4,760,290 |                    |

\* Estimated.

Table 3. 1970 Exploration Activity in Party-Months

| Country            | Surf. Geol. | Seis. | Grav. | Air-Mag. | Other | Total  |
|--------------------|-------------|-------|-------|----------|-------|--------|
| Argentina          | 112.0       | 341.9 | 14.0  | --       | --    | 467.9  |
| Bahamas            | --          | 2.7   | --    | --       | 0.8   | 3.5    |
| Bolivia            | 38.3        | 30.0  | 2.3   | --       | 7.2   | 77.8   |
| Brazil             | 72.0        | 92.0  | --    | 6.0      | 24.0  | 194.0  |
| British Honduras   | --          | 0.5   | --    | 0.3**    | 6.0   | 6.8    |
| Chile              | 2.0         | 24.0  | --    | 2.0      | 7.0   | 35.0   |
| Colombia           | 21.2        | 57.1  | 3.2   | 0.3      | 1.7   | 83.5   |
| Cuba               | 12.0        | 12.0  | 12.0  | --       | --    | 36.0   |
| Dominican Republic | 3.0         | 1.0   | --    | --       | --    | 4.0    |
| Ecuador            | 11.2        | 57.6  | 0.5   | --       | --    | 69.3   |
| Guatemala          | 7.0         | 6.0   | --    | --       | --    | 13.0   |
| Honduras           | --          | 4.5   | 2.5*  | 1.5*     | --    | 8.5    |
| Lesser Antilles    | --          | 0.5   | --    | --       | --    | 0.5    |
| Nicaragua          | 2.0         | 2.4   | --    | 1.0      | --    | 5.4    |
| Panama             | 24.0        | --    | --    | --       | --    | 24.0   |
| Paraguay           | --          | 6.0   | --    | --       | 6.0   | 12.0   |
| Peru               | 12.0        | 2.0   | 16.0  | --       | --    | 30.0   |
| Uruguay            | --          | 1.0   | --    | --       | --    | 1.0    |
| Venezuela          | 6.5         | 16.0  | 1.0*  | 1.0*     | --    | 24.5   |
| Trinidad           | --          | 1.9   | --    | --       | --    | 1.9    |
| Puerto Rico        | 6.0         | --    | --    | 0.5      | --    | 6.5    |
| Total              | 329.2       | 659.1 | 51.5  | 12.6     | 52.7  | 1105.1 |

\*Grav-magnetic in connection with marine seismic.  
\*\*Magnetics in connection with marine seismic.

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Table 4. 1970 Drilling Statistics

| Country            | Total Wells Drilled | Explor. Wells Comp. | Explor. Wells Successful |
|--------------------|---------------------|---------------------|--------------------------|
| Argentina          | 579                 | 113                 | 24                       |
| Bahamas            | 2                   | 1                   | 0                        |
| Barbados           | 2                   | 1                   | 0                        |
| Bolivia            | 33                  | 10                  | 5                        |
| Brazil             | 212                 | 100                 | 25                       |
| Chile              | 66                  | 24                  | 8                        |
| Colombia           | 58                  | 16                  | 3                        |
| Dominican Republic | 2                   | 2                   | 0                        |
| Ecuador            | 37                  | 20                  | 14                       |
| Jamaica            | 1                   | 1                   | 0                        |
| Nicaragua          | 8                   | 8                   | 0                        |
| Peru               | 137                 | 28                  | 11                       |
| Surinam            | 7                   | 7                   | 0                        |
| Venezuela          | 699                 | 38                  | 15                       |
| Trinidad           | 135                 | 21                  | 8                        |
| Total              | 1978                | 390                 | 113                      |

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ARGENTINA (Fig. 1; Tables 5–11)

Information furnished by SALVADOR A. ALVAREZ BER-  
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Private Companies

Exploration

Geologic and geophysical exploratory effort  
in Argentina was at high level during 1970 as  
shown by Table 5. The 341 party-months of  
seismic work dominated this effort and was  
19% higher than in 1969. Notable this year  
also was the increased exploratory drilling in  
offshore areas.

YPF had an average of 23 seismic parties  
in the field and, although these were spread  
throughout the various known basins, the most  
work was in the Northwest, Cuyo, Neuquén,  
and Austral basins. Private industry explora-  
tion was featured by wildcat drilling; how-  
ever, considerable reflection seismic work was  
done also in the new exploration permit areas  
of Río Atuel, Ramblones, and Bermejo and  
in the Chihuido del Medio area which Amoco  
contracted from YPF.

One major new exploration permit area was  
awarded by the government during 1970, the  
eighth area to be opened for bids by the gov-  
ernment under Petroleum Law 17,319 of 1967.  
Early in the year bids were asked on the "Zona  
Magallanica" Exploration Tender covering an

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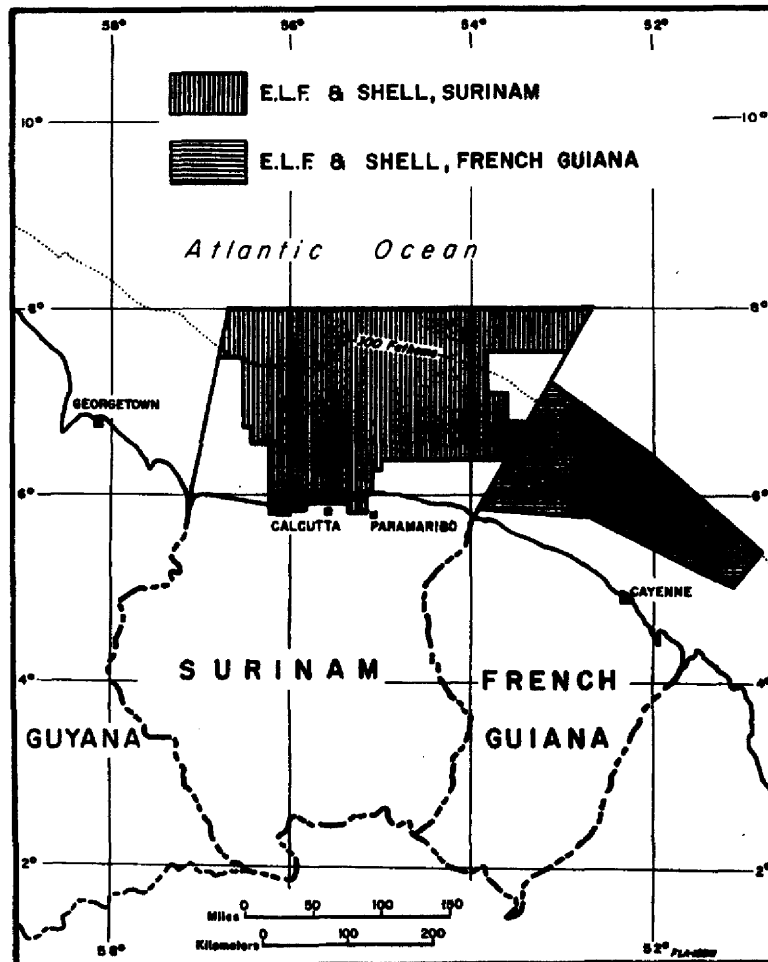


FIG. 16.—French Guiana and Surinam concessions, end of 1970.

110,000 ha. According to scouting sources, Recursos alone is acting similarly as Petroleum Contractor for neighboring Weissenberg Martínez acreage in west-central Guatemala.

Compañía Centram, S.A., a joint enterprise of the International Nickel and Hanna Min-

ing Cos., has acquired 5 of the Reserves parcels (252,826 ha.), in east-central Guatemala. Added to adjoining acreage already held, Centram's holdings now total 329,234 ha. West-coast Production Co. Ltd., a Canadian company, has taken over the actual exploration work under a working agreement.

Elsewhere in the Petén, 14 National Reserves parcels (725,206 ha.) are under active application by local interests.

Along the Pacific coast, the 4-company Texaco Group (including Mobil, Superior, and Tenneco) and Esso continue to be the only active concessionaires. The Texaco Group made major relinquishments (801,831 ha.) onshore and in the immediate offshore, which now become National Reserves. The Group retains Exploration Rights totaling 352,285 ha. and

Table 46. Party-Months of Geologic and Geophysical Exploration in Guatemala, 1970

| Company      | Surf. Geol. | Sels. | Total |
|--------------|-------------|-------|-------|
| Texaco Group | —           | 4.0** | 4.0   |
| Centram*     | 3.0         | —     | 3.0   |
| Monsanto     | 4.0         | 2.0   | 6.0   |
| Total        | 7.0         | 6.0   | 13.0  |

\* Operated by Westcoast Production Co. Ltd.  
\*\* Land reflection.

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has pending a 92,838-ha. application on adjoining continental shelf acreage. Esso was awarded a new Exploration Right (125,366 ha.) on the continental shelf and applied for another (82,231 ha.). Together with previous holdings, Esso's acreage interests now come to 343,237 ha. Relatively small amounts of acreage continue under application by local entities.

The composite Guatemala acreage picture at year end 1970 was:

|                             |               |
|-----------------------------|---------------|
| Exploration Rights          | 1,316,974 ha. |
| Applications (approx.)      | 1,327,000 ha. |
| National Reserves (approx.) | 3,778,000 ha. |

Monoil Guatemala's activity in the southwestern Petén, originally directed to sulfur evaluation in this area of Mesozoic salt domes, has now been oriented to oil exploration. Surface geologic and seismograph work were carried out in 1970; and 5 shallow core holes were drilled. Four of the holes had oil shows in cores and the fifth flowed gas with salt water. Centram/Westcoast did surface geologic work; and they began a marine seismograph survey late in 1970, to be more fully reported next year. The Texaco Group did an onland reflection seismograph (Vibroseis) survey. Field party effort is detailed in Table 46.

Texaco's refinery at the city of Escuintla, midway to the Pacific coast from Guatemala City, was expanded during the year for an increase in capacity from 8,000 to 15,000 b/d.

One major development in nonhydrocarbon minerals was reported in the press in early 1971. After prolonged negotiations, International Nickel Co. of Canada has reached agreement with the Guatemala government on the working of lateritic nickel ores in east-central Guatemala. Inco's local affiliate, Exploraciones y Explotaciones Mineras Izabal, S.A. (Exmibal), reportedly estimates ultimate investment at \$250 million.

Guatemala's Instituto Geográfica Nacional has announced a new, updated geologic map of the country, at a scale of 1:500,000.

#### GUYANA (Fig. 18)

By SOBHARAM SINGH, Director, Geological Surveys and Mines, Georgetown

No work was done during 1970 by Continental Oil Co./Tenneco (Guyana) Inc., nor Guyana Shell Ltd. By year end, the 2 companies intimated to the government that they had reached agreement for a joint drilling operation to test a potential structure defined by seismic surveys which extends across the licenses of both companies and is on the continental shelf

approximately 100 mi from the coastline. One well will be drilled in the Guyana Shell prospecting license and drilling is to commence about May 1971. The hole will be approximately 12,000 ft deep and located in water depth of 450 ft. The cost, which is estimated will be in the vicinity of US \$6 million, will be shared by Guyana Shell and Continental/Tenneco. Continental/Tenneco was granted permission by the Guyana government to assign shares of their interest to a number of other companies including Texas Pacific Oil Co., Ada Oil Co., Seagram's Ltd., and Deminex.

During the year 2 oil exploration licenses, covering 2,225 sq mi and 1,660 sq mi, respectively, were granted to Comoro (Fig. 18). Another oil exploration license was granted to Oxoco over an area of 830 sq mi of the continental shelf.

At year end, an agreement was signed between the government of Guyana and Canadian International Development Agency for a loan to carry out an aeromagnetic survey of a large part of the country, including the Takutu sedimentary basin and followup seismic surveys in the Takutu basin. It is hoped that after the completion of these surveys in 1971 a much better picture of the potential of this basin for oil and evaporites will emerge.

#### HAITI

According to available information, there were no oil licenses held in the country in 1970 and no drilling or exploration has been reported for several years. The last well drilled in Haiti was drilled in the late 1950s.

#### HONDURAS (Fig. 19; Table 47)

By L. B. SNEDDEN, Signal Oil and Gas Company, Los Angeles, California

During 1970, all offshore acreage remained almost as at the end of 1969. Mobil acquired the Texas Independent Oil Co. concessions and Shell acquired an additional 136,069 ha. offshore and 65,297 adjacent onshore. Concessions held by various operators are as shown on Figure 19.

Geophysical work was done to the extent shown in Table 47.

#### JAMAICA (Fig. 20; Table 48)

By W. G. CHAMBERS, Department of Mines, Kingston

##### Land Holdings

Signal Exploration (Jamaica) Co., a wholly-owned subsidiary of Signal Oil & Gas Co. of

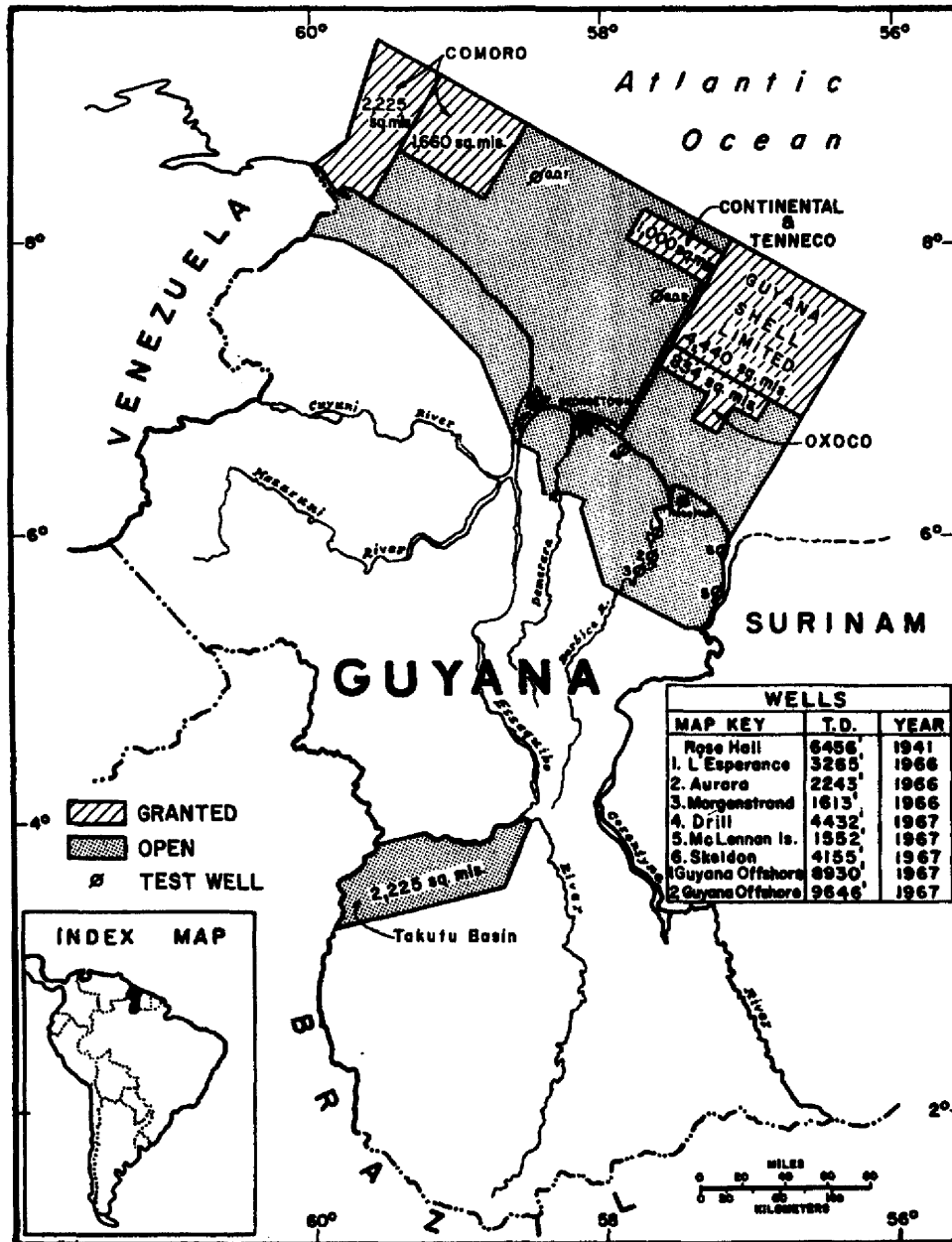


FIG. 18.—Guyana, 1970 oil exploration licenses and drilling from previous years.

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government has not taken any decision regarding this matter. There is no oil legislation.

**SURINAM (Fig. 16)**

By R. GAGEONNET and MR. GUICHARD, ELF, Paris, France, and Bataafse Internationale Petroleum Maatschappij N.V., The Hague, Netherlands

The second term of the offshore concession held by a group consisting of ELF (47%), EURAFREP (3%), and Shell (50%) expires January 30, 1971. An extension for another period of 4 years has already been granted; however, a certain number of blocks must be relinquished. The blocks that will be returned are mainly in the southern part of the concession and after these are dropped, the concession will consist of an area of 70,389 sq km in 820 blocks, bounded on the north by 8°N. lat. and having an outline as shown on Figure 16.

The concession agreement requires, as a minimum, the drilling of 4 wells in each 4-year period. A 4-well program was started January 6, 1970, and completed June 2, using Skinner Drilling Co. as contractor. These wells were in the southern onshore part of the concession near the coastline. The wells and depths were: Burnside-1, 1,368 m; Saramacca Mouth-1, 823 m; Tapoeria-1, 696 m; and Jonkermans-1, 786 m. Total drilled was 3,673 m (12,051 ft). All wells reached basement; there were no shows of oil.

In its onshore concession, SSEPM (Shell Suriname Exploratie en Productie Maatschappij) completed drilling operations on March 6, 1970. Three wells were drilled, thereby completing the 20-well program (started in 1969) as required by concession agreement. Total footage of the 3 wells drilled amounted to 2,925 ft. On account of the negative results of these wells, SSEPM surrendered its onshore holdings and terminated the concession agreement as of January 10, 1970.

**URUGUAY**

On December 29, 1969, the government agency, ANCAP (Administración Nacional de Combustibles, Alcohol y Portland), received bids from geophysical companies for an offshore seismic survey which was to include processing and interpretation. CGG (Compagnie Generale de Geophysique) was awarded the contract and carried out the program in 1970.

**VENEZUELA (Figs. 24, 25; Tables 59-65)**

By NEAL R. VANMIDDLESWORTH, Venezuelan Oil Scouting Agency (VOSA), Caracas

Table 59. Production in Venezuela

|                          | Total Bbl 1970 | B/D 1970  | B/D 1969  |
|--------------------------|----------------|-----------|-----------|
| <b>WESTERN VENEZUELA</b> |                |           |           |
| Lake Maracaibo           | 893,675,250    | 2,448,400 | 2,411,200 |
| Other Zulia              | 201,642,100    | 552,500   | 507,100   |
| Barinas                  | 21,031,850     | 57,600    | 58,200    |
| Falcón                   | 404,800        | 1,100     | 1,200     |
| Subtotal                 | 1,116,754,000  | 3,059,600 | 2,977,700 |
| <b>EASTERN VENEZUELA</b> |                |           |           |
| Anzoátegui               | 164,552,900    | 450,800   | 455,100*  |
| Monagas/Delta            | 64,323,000     | 176,200   | 144,800   |
| Guárico                  | 7,792,400      | 21,400    | 16,500*   |
| Subtotal                 | 236,668,300    | 648,400   | 616,400   |
| Grand Total              | 1,353,422,300  | 3,708,000 | 3,594,100 |

\* Adjustment.

**Production**

Production for the year averaged 3,708,000 b/d for a modest increase of 113,900 b/d, 3.2% over the 1969 figure of 3,594,100 b/d, and a new record. On a 7-day basis, records were established by the industry (3,961,400 b/d) and by Creole Petroleum (1,762,294 b/d), but these were freakishly high. Companies consistently making new highs toward the end of the year were CVP (53,700 b/d), Pan American (22,500 b/d), and Mito Juan (4,300).

Table 59 compares production from the principal producing areas. Western Venezuela accounted for 83% of the total, as in 1969, and for the fourth consecutive year produced over 1 billion bbl. Lake Maracaibo and the land areas of Zulia showed modest gains, while Falcón and Barinas declined moderately. In Eastern Venezuela, the state of An-

Table 60. Daily Average Production\* (in Bbl) by Operating Companies in Venezuela

| Company      | 1970      | 1969      |
|--------------|-----------|-----------|
| Creole       | 1,509,200 | 1,464,200 |
| Shell        | 964,900   | 921,300   |
| Mene Grande  | 498,800   | 470,600   |
| Sun          | 236,700   | 248,300   |
| Texas        | 151,900   | 173,300   |
| Mobil        | 110,700   | 102,200   |
| Chevron      | 57,200    | 49,000    |
| Phillips     | 47,900    | 52,300    |
| CVP          | 44,900    | 28,100    |
| Sinclair     | 43,700    | 51,300    |
| Pan American | 11,800    | 100       |
| Signal       | 10,300    | 10,300    |
| Continental  | 7,800     | 11,000    |
| Mito Juan    | 3,800     | 2,100     |
| La Nación    | 2,900     | 300       |
| Las Mercedes | 2,800     | 3,600     |
| Talon        | 2,700     | 3,400     |
| Orocual      | —         | 2,700     |

\* Includes production operated for others.