

U.S. GEOLOGICAL SURVEY CIRCULAR 1096



Statistics of Petroleum Exploration in the  
Caribbean, Latin America, Western Europe,  
the Middle East, Africa, Non-Communist  
Asia, and the Southwestern Pacific

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# Statistics of Petroleum Exploration in the Caribbean, Latin America, Western Europe, the Middle East, Africa, Non-Communist Asia, and the Southwestern Pacific

By EMIL D. ATTANASI and DAVID H. ROOT

A summary of the geographic location, amount, and results of petroleum exploration, including an atlas showing explored and delineated prospective areas through 1990. This report updates and expands Circular 981

U.S. GEOLOGICAL SURVEY CIRCULAR 1096

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# Statistics of Petroleum Exploration in the Caribbean, Latin America, Western Europe, the Middle East, Africa, Non-Communist Asia, and the Southwestern Pacific

By Emil D. Attanasi and David H. Root

## Abstract

This circular presents a summary of the geographic location, amount, and results of petroleum exploration, including an atlas showing explored and delineated prospective areas through 1990. The data show that wildcat well drilling has continued through the last decade to expand the prospective area by about 40,000 to 50,000 square miles per year. However, the area delineated by 1970, which represents only about one-third of the prospective area delineated to date, contains about 80 percent of the oil discovered to date. This discovery distribution suggests that, from an overall prospective, the industry was successful in delineating the most productive areas early. The price increases of the 1970's and 1980's allowed the commercial exploration and development of fields in high-cost areas, such as the North Sea and Campos Basin, Brazil. Data on natural-gas discoveries also indicate that gas will be supplying an increasing share of the worldwide energy market.

The size distribution of petroleum provinces is highly skewed. The skewed distribution and the stability in province size orderings suggest that intense exploration in identified provinces will not change the distribution of oil within the study area. Although evidence of the field-growth phenomenon outside the United States and Canada is presented, the data are not yet reliable enough for projecting future growth. The field-growth phenomenon implies not only that recent discoveries are substantially understated, but that field growth could become the dominant source of additions to proved reserves in the future.

## INTRODUCTION

The intention of this report is to summarize, for the general reader, basic statistics of petroleum exploration in the areas outside the United States and Canada and outside former and current Communist areas of Eastern Europe and

Asia. This report updates and expands our original report entitled "Statistics of Petroleum Exploration in the Non-Communist World Outside the United States and Canada," U.S. Geological Survey Circular 981 (Root and others, 1987). During the last 40 years, even though the United States and Canada accounted for most of the world's drilling, most of the oil was discovered outside of these areas. U.S. and Canadian petroleum industries are mature, and domestic exploration potential is better known than that in the rest of the world. This report, therefore, focuses on areas outside of the United States and Canada. The unavailability of reliable data on exploratory wells and oil and gas fields for the republics of the former Soviet Union, formerly Communist Eastern European countries, and Communist Asian countries necessitated that these countries still be excluded from this study. As private exploration is permitted, perhaps historical exploration data and the new data from ongoing exploration activities will be assembled and made available to researchers. Hereafter, we refer to the study area as the areas outside the United States and Canada and outside the areas formerly or currently Communist in Eastern Europe and Asia.

Where possible, the revisions to most of the original data series published in U.S. Geological Survey Circular 981 have been extended through 1990. The series that related to the crew months of geologic and geophysical activity was discontinued. The data had come from the annual foreign developments issues of the *Bulletin of the American Association of Petroleum Geologists* (AAPG). This annual collection of regional and individual country reports did not cover all areas having exploration, and the crew-month data were frequently not accurately reported. In the absence of wildcat drilling, crew-month activity provides evidence that areas have been screened and also indicates the intensity of predrilling evaluation. In recent years, the AAPG report writers focused more on describing results of certain strategic exploratory wells rather than on presenting a full accounting of geologic and geophysical

activity and exploration wells. Moreover, because of the changes in technology during the last 30 years, annual amounts of crew-month activity are not comparable in terms of both cost and the information value of data collected.

Exploration well data are from AAPG; some were published in the annual foreign developments issues of the *AAPG Bulletin*, and some were published in the *International Petroleum Encyclopedia* (Penn Well Publishing Company, 1986–90). Wildcat well data were taken from the well computer tape released by Petroconsultants S.A., Geneva, in January 1991. Reported discoveries of crude oil and natural gas are from the field tape received in January 1991 from Petroconsultants. The field data were augmented by additional data from W.D. Dietzman (retired) and Gary Long, both of the Energy Information Administration Office, U.S. Department of Energy, Dallas, Tex. (written commun., 1990). The data were subjected to additional validation tests, and corrections were then made as necessary. Unless otherwise stated, all field-size estimates used here are based on this data set. In this report, oil and gas discovered were classified as offshore only when the field containing the resource was entirely offshore.

In addition to updating most of the original data presented in U.S. Geological Survey Circular 981, this report presents new topics and data series. The field-growth (reserve-appreciation) phenomenon is discussed, and natural-gas discovery data are also presented for the study area. Because of product distribution problems and a limited international market, natural gas has not been an economic commodity for many countries. However, the share of natural gas in the overall worldwide energy market is beginning to increase.

Even with some data deficiencies, the information provides a summary, based on the historical results of exploration, of available knowledge on the petroleum potential of a country. The assemblage of this information is time consuming, costly, and beyond the reach of individual analysts, many private organizations, and the public. By placing this information in the public domain, we hope it will be of assistance to those responsible for planning or evaluating exploration programs in industry, government, and international agencies.

This report summarizes basic statistics of petroleum exploration drilling and discovery. The discussion initially focuses on numbers of exploration wells and wildcat wells drilled each year by country (tables 1 and 2). Graphs (figs. 1–15) show aggregate and regional trends in exploration and oil and gas discoveries, as well as the regional distribution of petroleum provinces. The phenomenon of growth in field-size estimates over time is discussed and shown to lead to substantial revisions in the interpretation of historical discovery data (fig. 16). Maps show the area that has been drilled, and accompanying graphs (figs. 17–54) show expansion of the areas explored and trends in the amounts of oil discovered in newly drilled areas.

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## EXPLORATION AND DISCOVERIES SINCE 1950

### Exploration

Exploration and wildcat well data are summarized in tables 1 and 2. The exploration well data for 1950–80 represent the compilations presented in the regional reports by various writers published in the annual foreign developments issues of the *AAPG Bulletin*. Exploration well data for 1980–85 were taken from both the annual summary of the AAPG data and the compilations of the AAPG data published by the *International Petroleum Encyclopedia*. Data for 1985–89 are from the *International Petroleum Encyclopedia*. AAPG exploration wells include new-field wildcat wells, new-pool wildcat wells, extension wells, and deeper pool tests. The AAPG data are compiled from summaries that provide aggregate numbers of exploration wells spudded or completed during the year. These reports do not generally contain information about individual wells.

Wildcat well data are from the Petroconsultants well tape released in January 1991. The Petroconsultants wildcat wells summarized in table 2 are only new-field wildcat wells. The Petroconsultants data included longitude and latitude, well depth, and formations penetrated.

Because India, Iraq, and several other countries regarded the petroleum industry as vital to national security, information about drilling was regarded as a state secret, and dissemination of such information was prohibited. Drilling levels from these countries may be substantially understated.

U.S. and Canadian exploration and wildcat drilling have typically accounted for 70 to 90 percent of drilling outside of Eastern Europe and Communist Asia. For example, in 1989 the AAPG reported that the United States and Canada had 3,056 wildcat wells, and the Petroconsultants data show wildcat drilling in the study area to be 1,006. For exploration wells, comparable numbers are 8,257 and 1,354, respectively. Comparison of absolute drilling levels is misleading. A significant proportion of wildcat and exploration drilling done outside the United States and Canada is directed at testing new plays and provinces, whereas nearly all of U.S. and Canadian drilling is in productive plays and provinces that are mature from an exploration standpoint.

The time profile in the growth of cumulative wildcat wells drilled since 1950 is presented on a regional basis in figure 1. The most wildcat wells in the study area were

drilled in Western Europe; the number of wildcat wells decreases for South America, Africa, non-Communist Asia, the southwestern Pacific, and the Middle East. The gross number of cumulative wildcat wells drilled may not accurately measure the level of exploration effort or the degree to which an area has been evaluated. Many of the wildcat wells in Western Europe were drilled to find small onshore oil and gas fields that could be commercially developed because of Europe's advanced infrastructure and established markets. In comparisons of gross drilling statistics, these wells are given the same weight as the expensive high-risk wells drilled in the North Sea. Alternatively, information gathered from a few wildcat wells may allow the reconstruction of geologic history, which may indicate that the province is too immature geochemically to have generated hydrocarbons. There may be little further drilling. Although drilling in such an area appears to be sparse, the area may actually be considered to be evaluated.

Regional levels of cumulative offshore wells drilled in the study area are shown in figure 2. Even though in 1990 offshore wells represented 43 percent of the annual wildcat drilling, on a cumulative basis, offshore wildcats accounted for just under a quarter of cumulative wildcats in the study area. In Western Europe, offshore discoveries accounted for 90 percent of total crude oil discoveries, while, for non-Communist Asia and the southwestern Pacific, they accounted for 64 and 72 percent of total discoveries. Table 3 presents data showing the regional distribution of cumulative wildcat wells and discoveries. Offshore drilling and production costs are typically higher than costs for similar depths and fields onshore. The growth in offshore exploration in many instances reflects the perceived superiority of the offshore prospects to remaining onshore prospects in terms of field size. In other instances, lower infrastructure costs are associated with offshore field development when compared to those required for development of remote onshore prospects.

The level of annual wildcat drilling for the study area increased very little relative to the crude-oil price increases in the 1970's (fig. 3). Outside of the members of the Organization of Petroleum Exporting Countries (OPEC), the price increases in the 1970's allowed drilling and development in high-cost areas such as the North Sea and the Campos Basin in deep water off Brazil. For the study area, in 1970 about one-third of the wildcat wells were offshore. In 1980, offshore wildcat wells accounted for 46 percent of the wildcats drilled in the study area. By the 1981-85 period, about half of the average annual oil discovered in the study area outside of the Middle East was offshore.

## Discoveries

For the study area, annual oil discovery rate, oil discovery rate per well, and the annual gas discovery rate in

5-year intervals from year-end 1950 to year-end 1985 are presented in figures 4A, 4B, and 4C, respectively. Because there are probably unreported 1990 discoveries, the discovery rate for the last interval runs from 1986 to 1989. The annual oil discovery rate (fig. 4A) shows that, from 1955 to 1985, offshore discoveries accounted for at least one-third of the annual average oil discovered in the study area. The oil discovery rate per well (fig. 4B) for the study area has declined from over 50 million barrels of oil per well in the early 1950's to 7 million barrels in the early 1980's. Through the late 1970's, the discovery rate was over about 20 billion barrels of oil per year, and about half the oil was discovered offshore. Figure 4C shows that at least half of the natural gas reported discovered since the 1970's was offshore. However, reported quantities of gas discoveries are probably incomplete or understated because gas is still not commercially developable in many countries.

The regional annual oil discovery rates and oil discovery rates per well are shown in figures 5 and 6. The Middle East dominates average annual oil discovered and oil-per-well discovery rates. In South America, the annual and per-well oil discovery rates declined in the 1960's and 1970's and then increased in the 1980's (see figs. 5 and 6) because of large deep-water discoveries (Campos Basin, Brazil) and discoveries in deep horizons of provinces in eastern Venezuela. The North Sea discoveries accounted for the increase in average annual oil and per-well discovery rates in Western Europe. However, average annual and per-well oil discovery rates have declined dramatically in Western Europe since they reached a maximum during 1970-75.

Petroleum exploration in the period from 1955 to 1960 resulted in major discoveries in North Africa and Nigeria. Figures 5 and 6 show that, since that period, average annual and per-well discovery rates have declined dramatically in Africa. After 1975, most of the oil was discovered offshore.

Offshore discoveries accounted for most of the oil discovered since 1965 in non-Communist Asia. The per-well Asian discovery rates increased in 1960-70 as exploration shifted offshore. Nearly all the oil discovered in the southwestern Pacific was offshore.

The regional average annual gas discovery rates are presented in figure 7. The quality, reliability, and availability of gas data will not support the intensive analysis that crude-oil data have been subjected to. Historically, natural-gas discoveries and the associated gas in crude-oil fields have been underreported. Even in the United States, it is estimated that at least 24 trillion cubic feet of associated gas was flared between 1935 and 1971 (Rotty, 1974). The development of seamless pipe, which permitted transmission of natural gas long distances without significant product losses, allowed gas producers to expand gas markets beyond their immediate location. The gas price increases in the 1970's and 1980's provided incentives for U.S. gas

producers to search intensively for and develop moderate-size gas fields. Even with well-organized gas markets, half of the gas wells drilled in the United States have been drilled since 1974. The halfway point for oil wells drilled was in 1954. Areas outside of the United States are generally not as far along in exploration and development of their gas resources. Outside the United States there is evidence that gas is becoming more than simply a byproduct of oil production.

In most of the published international data, no distinction is made between associated or dissolved gas, which is associated with and frequently entrained in crude oil, and nonassociated gas. Nonassociated gas reservoirs are generally developed for natural gas as the primary product. Under this definition, about three-fourths of the U.S. gas is nonassociated. Because Petroconsultants provides field rather than reservoir estimates of ultimate oil and gas recovery, a field was classified as either a crude oil field having associated gas or a nonassociated gas field on the basis of the field's gas-to-liquids ratio.

Nonassociated gas fields were defined as having gas-to-liquids ratios of at least 20,000 cubic feet to one barrel of liquids. By this definition, at least 80 percent of the gas reported by Petroconsultants in Western Europe, Asia, and the southwestern Pacific is in nonassociated gas fields (see table 3). For the whole study area, 64 percent of gas was classified as nonassociated. With the exception of Western Europe and Africa, most areas had at least two-thirds of their nonassociated gas discovered since 1970. In the study area, 60 percent of the nonassociated gas, but only 25 percent of the oil, was discovered since 1970. This indicates that active exploration for, and development of, gas are relatively recent phenomena.

Without more detailed information on the geologic nature of oil and gas occurrence, it is not possible to accurately estimate the degree that identified gas resources may be understated. For the United States and Canada, the overall gas-to-oil ratio is between 5 and 6, that is, thousands of cubic feet per barrel of crude oil. For the study area, this ratio is 2.5; on the basis of regions, the ratios, from lowest to highest, are as follows: South America, 1.4; the Middle East, 1.8; Africa, 2.5; Asia, 6.7; Western Europe, 8.0; and the southwestern Pacific, 14.3. Regions with advanced domestic and export gas markets have the highest ratios.

## SIZE DISTRIBUTION OF PETROLEUM PROVINCES

### Study Area

The rate of oil discovered per wildcat well is determined, in part, by the size distribution of undiscovered fields within a petroleum province. Original province field-size distributions are typically highly skewed, where a few

large fields are so large that they contain most of the recoverable oil in a province. The distribution is important because once these very large fields are discovered, improvements in geologic understanding or exploration technology will generally be insufficient to sustain the initial discovery rate. The discovery rate drops because the remaining fields are orders of magnitude smaller than the large discoveries. Improvements in technology and geologic understanding, however, will help to mitigate exploration risks.

Within a province, rapidly declining discovery rates produce declining returns to exploration, and they, in turn, encourage explorationists to begin exploring new provinces. The size distribution of provinces is also skewed when size is measured in terms of barrels of recoverable oil. The ultimate recovery of oil in provinces is not nearly as well defined as that in fields because provinces are not as completely delineated and evaluated as individual fields. Petroleum exploration continues in both new and old provinces. Comparison of province size is necessarily confined to hydrocarbons discovered to date and omits the undiscovered portion of the province.

As a result of differences in geologic interpretations and availability of data, there is now no universally accepted set of definitions and delineations of the world's petroleum provinces. Fields contained in the files of Petroconsultants are cross-referenced by specific province names provided by Petroconsultants. In order to enhance the chances that province names corresponded to accepted nomenclature, the province names were chosen from the set provided by Petroconsultants that represented the greatest level of aggregation in the geologic and geographic sense.

Collectively, fields in the study area were designated with 351 unique province names. For the purposes of this report, a province is considered significant if it has at least one field containing at least 100 million barrels of recoverable crude oil discovered by 1991. According to this designation, there were 99 different significant provinces in the study area. Table 4 lists the 99 significant provinces by region, with estimates of the amount of oil and gas discovered through 1990 in each province. The significant provinces account for just over 99 percent of the 1,144 billions of barrels of recoverable oil found in the study area.

Figure 8 shows the size distribution of the 99 significant provinces in the study area. The distribution is highly skewed. The largest province, the Arabian Basin, accounted for almost half of the discovered oil in the study area. The largest four provinces in terms of discovered oil accounted for more than 70 percent of the total oil discovered and about 85 percent of the gas discovered in the study area. On a regional basis, the distribution of known recoverable oil is as follows: the Middle East, 62 percent; South America, 12 percent; Africa, 10 percent; Mexico and Western Europe, 5 percent each; Asia, 4 percent; and the

southwestern Pacific, 0.5 percent. Central America and the Caribbean do not contain any significant provinces.

Figures 9 to 12 display, for four regions, the temporal ordering of the first discovery in each significant province as well as the relative size of each province in terms of oil discovered. The significant provinces in seven regions are discussed below.

## Mexico

Discoveries in Mexico's largest provinces, the Tampico-Misantla Basin and the Salina Basin, occurred before 1905. The Tampico-Misantla Basin includes the Golden Lane area and the giant Chicontepec field, which is estimated to contain over 12 billion barrels of recoverable oil. The Salina Basin is in the Chiapas-Tobasco region and contains the Reforma area fields, including the Bermudez Complex. The large offshore discoveries in the Gulf of Campeche, which extend the Cantarell Complex, were made in the late 1970's. The most recent discoveries of at least 100 million barrels were in the Salina Basin and occurred in 1982.

## South America

Maracaibo Basin, Eastern Venezuela Basin, and the Greater Furrial Trend<sup>1</sup> contain the largest quantities of discovered oil in South American onshore basins. Oil in each of these provinces was discovered before 1930. Together the three provinces account for about 70 percent of the oil discovered in South America. The largest South American field, Bolivar Coastal located in Venezuela and Colombia, is credited with 36.7 billion barrels of oil (BBO). About 18 percent of the oil and 28 percent of the gas discovered in South America are offshore. The seven significant South American provinces that had reported discoveries since 1985 are Maracaibo Basin, Greater Furrial Trend, Neuquen Basin, Llanos Basin, Austral Basin, Campos Basin, and Santos Basin. Venezuela accounts for 77 percent of the oil discovered in South America.

## Western Europe

Of the oil and gas discovered through 1990 in Western Europe, 90 percent of the oil and 60 percent of the gas were in offshore fields. The North Sea Graben, the largest province in Western Europe, accounts for more than three-fourths of the oil discovered in that region. Many of the onshore provinces, particularly in southern Europe, are considered to be gas prone rather than oil prone. Since

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<sup>1</sup>Although many geologists consider the Greater Furrial Trend to be a play in the Eastern Venezuela Basin, Petroconsultants lists it as a separate province.

1985, seven of the twenty-one provinces of Western Europe have had discoveries of at least 100 million barrels in size. These discoveries have been made in the North Sea Graben, the Vestland Arch, the East Shetland Platform, the Norwegian-Danish Basin, the Kristiansund-Bodo Fault Complex, the Voring Basin, and the Anglo-Paris Basin.

## Middle East

The Arabian Basin and the Zagros Fold Belt together account for three-fifths of the oil in the study area. Both were identified before 1940. The Arabian Basin contains 25 supergiant fields (defined as having at least 5 BBO). The world's two largest oil fields, Ghawar and Burgan, both containing more than 80 BBO of recoverable oil, are also in the Arabian Basin. There are five supergiant fields in the Zagros Fold Belt. Offshore fields contain about one-fifth of the oil and one-third of the gas in the Middle East. With the exception of the Qom Basin, all the significant provinces in the Middle East have reported new discoveries of at least 100 million barrels since 1985.

## Africa

Of the 13 significant petroleum provinces in Africa, the 4 largest contain more than 80 percent of the oil discovered to date. Most of the oil in Africa, as well as nearly all of the significant provinces, was identified after 1950. Africa's three supergiant fields—Hassi Messaoud, with 11 BBO in the Hassi Messaoud High; Sarir, with 5 BBO in the Sirte Basin; and Amal, with 6 BBO also in the Sirte Basin—are all in North Africa. Only the Niger Delta, the Gabon Coastal Basin, and the Lower Congo Basin have reported individual discoveries of at least 100 million barrels of oil or greater since 1985. About one-fourth of the oil and 16 percent of the gas in Africa are in offshore fields. Initial African discoveries were along coastal areas in North Africa. During the 1970's and 1980's, exploration was carried to some interior areas. The very low gas-to-oil ratios in most of the African provinces probably reflect understatement of the gas resources discovered because of low commercial value.

## Non-Communist Asia

In non-Communist Asia, 13 of the 23 significant provinces were already identified with discoveries by the end of 1950. Thus far, no supergiant fields have been discovered in this area. However, 6 of the 23 provinces had discoveries of at least 1 BBO. These provinces are Kutei Basin, Baram Delta, Central Sumatra Basin, Malaya Basin, West Java Basin, and Bombay Basin; together they account for nearly three-fourths of the oil discovered. Offshore fields contain 43 percent of the oil and 60 percent of the gas.

The five provinces having 100-million-barrel discoveries since 1985 are the South Sumatra Basin, Baram Delta, West Java Basin, Bombay Basin, and Cauvery Basin.

## Southwestern Pacific

The significant provinces of the southwestern Pacific are in Australia and Papua New Guinea. The Gippsland Basin accounts for about three-fourths of the oil discovered. Offshore fields contain 86 percent of the oil and 71 percent of the gas. Discoveries of at least 100 million barrels of oil have been reported since 1985 in the North Carnarvon Basin and Papuan Fold Belt.

## DELINEATED PROSPECTIVE AREA

### Explored and Delineated Prospective Areas

Oil and gas exploration has typically been confined to only a small fraction of the land area of any given country. Petroleum exploration is generally focused on sedimentary basins where oil and gas might have formed. Sedimentary basins are not uniformly distributed throughout the world. Moreover, only relatively small fractions of most sedimentary basins have been intensively drilled. The geologic information used to site exploration and development wells obviously cannot be replicated by any single source, but the well locations, density of drilling, and results of exploration reflect the industry's collective evaluation of the area.

Drilling density is often used to gauge the exploration maturity of an area. However, drilling density is more often calculated relative to the area within a given political boundary rather than relative to the area of interest to explorationists. The concepts of prospective and explored areas are introduced to allow the delineation of areas that have been subjected to a minimum threshold level of exploration. The explored area is a part of the prospective area where the density of wells probably precludes very large or giant discoveries.

As used here, the prospective area delineated by drilling, that is, the *delineated prospective area*, is defined as that area reasonably close to wells and interior to the area drilled. The area is computed as the combined area of triangles having a well at each vertex. Only the triangles small enough to be covered by a circle of 20-mile radius are used. The 20-mile radius was chosen to correspond to the scale convenient for presentation in this report and to the precision of drilling and discovery data available. A much smaller radius than 20 miles would have produced numerous holes in the prospective areas evaluated, whereas a much larger radius would have resulted in a loss of resolution in defining the prospective area. The delineated prospective area within 2 miles of a well is called the *explored area*. Except at depths not already tested, it is

unlikely that very large fields remain to be discovered in explored areas because such fields typically have planar surface areas much larger than 2 square miles. The recently discovered deep giant field El Furrial (in Venezuela) is just such an exception. In the study area, the total explored areas account for only 19 percent of the delineated prospective area. Much of the delineated prospective area may never become as densely drilled as explored areas because it was found to be unproductive and not worth further evaluation.

The algorithm for computing and locating the delineated prospective area began with the identification of possible locations with grid points at a 2.8-mile spacing. Each grid point was identified by longitude and latitude. Field locations and all available well locations (for exploration, development, and production wells) were used in the computations. If the wells were redundant, that is, close to each other, they did not generally add to the prospective area. The well and field locations were compared to nearby wells and grid points to determine whether any grid point close to a well (or field) met the criteria for inclusion in the prospective area. Each grid point in the prospective area was also designated with the year that the point became part of the prospective area and whether the grid point was closest to a field or well. Grid points closest to the fields were assigned the oil and gas associated with the field. Although the nearest grid points of an isolated well are shown on the maps in figures 17–54, such grid points add only 1 square mile to the total delineated prospective area.

The method of calculating prospective and explored areas has been refined somewhat from the procedures used in U.S. Geological Survey Circular 981. The earlier method treated grid points along the north-south and east-west axes differently than grid points in other directions. In the method used here, all directions are treated the same. Also, all isolated wells are now assigned an area of 1 square mile, rather than the 8 square miles assigned by the earlier method. Therefore, prospective and explored areas in some countries are smaller in this circular than in Circular 981 even where the number of wildcat wells has increased.

### Delineated Prospective Area by Region— Exploration and Discovery

Computations of delineated prospective areas and explored areas for individual countries are presented in figures 17–54. Figures 13 and 14 and table 5 summarize the results when the individual country computations are aggregated to the regional level. Figures 13A and 14 show the profiles of the growth in prospective and explored areas when expressed on the bases of wildcat wells. The shape of the curve indicates whether wildcat wells were opening new areas or whether they followed earlier drilling and were sited in areas already classified as prospective. A linear curve indicates that there was a constant increment in prospective area with each wildcat well drilled. A rollover

in the graph signifies that a larger proportion of the wildcat wells were sited in areas already considered prospective. Alternatively, an increase in the slope implies that wildcat wells were opening new areas.

Figures 13B and 15 show the profiles of cumulative oil discovered through 1990 when the discovery date is replaced by the date when the nearest grid point to the discovery became part of the delineated prospective area. A rolling over of the curve suggests that the newly added prospective area is not as rich in terms of discovered oil as the older areas. If the industry were operating so that the most productive areas were explored early, a rollover in the graph would occur. A graph with a constant slope implies that the newly added area is just as productive as the old area, whereas a graph with an increase in slope signifies that the latest prospective area is richer than the early prospective area. These figures reflect the quality of the prospective area as well as the efficiency of the industry's exploration program.

Figures 13A and 13B show the aggregate profiles for the study area. The delineated prospective area accounts for about 7 percent of the land area, and the explored area amounts to 19 percent of the delineated prospective area. About half of the total prospective area was delineated by 1970. This area contained about 80 percent of the oil discovered to date. Since 1970, the growth of prospective and explored areas has been relatively constant while the amount of oil discovered per square mile of prospective area has dropped dramatically.

The delineated prospective area in South America has more than doubled since 1970. The area added since 1971 contains about 16 percent of the cumulative oil (see figs. 14 and 15). Most of the oil in the recently added prospective area is in the Campos Basin, a deep-water Brazilian offshore province. In South America, total prospective area amounts to about 6.2 percent of the land area, and the explored areas amount to about one-fourth of the prospective area. Although South America and Western Europe have about the same number of wildcat wells and prospective area, Western Europe has half the oil. The prospective area profile for Western Europe (fig. 14) shows a steep increase in prospective area per wildcat well in the late 1960's, reflecting the exploration of the North Sea provinces. The prospective area delineated after 1971 accounts for less than half the total prospective area but has nearly 70 percent of the oil discovered. North Sea exploration added new prospective area, and this new area contains most of Western Europe's discovered oil.

The Middle East accounts for 62 percent of the oil discovered in the study area. Supergiant fields that were discovered early dominated the discovery history of the area. Nearly 90 percent of the oil discovered was located in the area that became prospective by 1971 (see fig. 15).

Africa has about the same prospective area as Western Europe but is not nearly as well explored. Africa's

prospective area represents less than 4 percent of the land area. Most of the interior regions of Africa have not had sufficient exploration to be classified as part of the prospective area. Even though the growth in prospective area in Africa has been at a relatively constant rate in terms of area added per wildcat well, the prospective area delineated by 1971 contains almost 90 percent of the region's oil (see figs. 14 and 15).

In non-Communist Asia, only 21.4 percent of its prospective area was delineated before 1971 (fig. 14). This early area contains 62 percent of the oil discovered (fig. 15). Since 1970, Indonesia has had its prospective area quadruple, and all other countries in the region have had their prospective areas at least double in size.

In the southwestern Pacific, 80 percent of the oil was discovered in the prospective area delineated by 1971. Even though the southwestern Pacific is comparable to non-Communist Asia in land area, its prospective area had cumulative discoveries that are much smaller. Natural gas is regarded as an economic commodity in both regions, and so part of the wildcat drilling was directed at gas.

### **Other Applications of Delineated Prospective Area**

The concept of delineated prospective area can be applied (1) to partition areas for discovery-process modeling and (2) to characterize the relative richness of older or newly added prospective areas. In the first application, the concept of the delineated prospective area is used as a tool for identifying wildcat wells and discoveries within bounded areas so that discovery decline functions can be used to project future discoveries. In particular, the partitioning of areas is used to separate the confounding effects of crowding of wildcat wells in areas that have already had some exploration from the erratic arrival of discoveries in newly opened areas. Typically, the prospective area is partitioned into an early and late part, and then wildcat wells and discoveries are assigned to each part on the basis of location. The empirical discovery rate for the early part generally shows sufficient regularity that it can be estimated. The discovery-rate function for the late part is estimated by using the rate of decline for the early part, but adjustments compensate for the relative richness of the two different areas; specifically, the decline rate for the early area and the discovery sizes for the late area are used to estimate the ultimate number of fields in the late area (see Attanasi and Root, 1988, for details).

A second application of prospective area is to determine the relative richness of new areas that have recently been the target of petroleum exploration. The graph showing the expansion of the delineated prospective area in the whole study area (fig. 13A) indicates that about 40,000 to 50,000 square miles of new prospective area is added per year or about 50 square miles per wildcat well. Figure 13B

shows the quantities of crude oil found to date in the prospective area in the study area when the areas are ordered according to the date when their location was classified as prospective. About a third of the prospective area accounts for 80 percent of the discoveries. There continue to be major discoveries, but the flattening of the curve indicates that the area delineated early is richer than the areas delineated later. This shape suggests that, in the aggregate for the study area, explorationists have been relatively efficient in delineating the richest area early. For regions where changes in economics or the state of technology were required to make an area commercially attractive, such as the North Sea of Western Europe or the deep waters off of Brazil, South America, the slope of the graph of oil ordered by prospective area sharply increases (see fig. 15). This shape indicates that relatively large quantities of oil were discovered in the more recently added prospective areas.

## GROWTH IN ESTIMATES OF FIELD SIZES

In the United States and Canada, it has long been recognized that the initial estimates of field size (ultimate recoverable oil) are conservative and tend to increase as the fields are developed and placed into production. During the period from 1977 through 1988, oil and gas estimates of ultimate recovery in pre-1978 discoveries in the lower 48 United States increased by 21 billion barrels (from 145 to 166 billion barrels) and by 148 trillion cubic feet (from 735 to 883 trillion cubic feet), respectively (Energy Information Administration, 1990). Reserve appreciation in old fields typically accounts for two-thirds to three-fourths of annual additions to U.S. proved reserves.

Several explanations are given for the field-growth phenomenon. Initial engineering estimates are conservative because the economic penalties for overestimation are more severe than those for underestimation. Initial engineering estimates need only be detailed enough to estimate a minimum threshold field size that will allow an operator to proceed with field development and therefore are not intended to measure the full potential of the new discovery.

Field growth is also an economic phenomenon. During periods of high prices, development drilling is generally accelerated and at higher intensity (that is, closer well spacing). For example, in the United States, natural gas in pre-1967 discoveries grew 35 trillion cubic feet from 1967 to 1977 (American Petroleum Institute, American Gas Association, and Canadian Petroleum Association, 1967-78). These same fields also grew 87 trillion cubic feet from 1977 to 1987 (Energy Information Administration, 1990). Price increases allowed the commercial use of enhanced oil-recovery techniques in California's heavy-oil fields, resulting in a 20 percent increase in estimates of California's ultimate oil recovery in the period from 1977 to 1988.

There is evidence that field growth also occurs outside of the United States and Canada, but available data are probably not yet reliable enough to develop traditional growth factors that would permit projection of additions to reserves from growth in identified fields. Petroconsultants provides field estimates of ultimate recovery of oil and gas in field file tapes issued four times a year to subscribers. Figure 16A shows cumulative discoveries in the five main regions of the study area from 1900 to 1980 computed from the data on the first tape issued in each of years 1981, 1984, 1987, and 1990. Figure 16B shows cumulative discoveries for the same regions as in figure 16A except that data for the Middle East are omitted. The figures show increases in the estimates of cumulative oil from more recent tapes. Some of the apparent growth is, however, due to missing discovery data.

Missing data account for about half the difference between the 1981 and 1984 curves in figure 16A and for about two-fifths of the difference between these curves in figure 16B. The missing data are fields discovered before 1980 but added to the Petroconsultants' data by 1984. Less than 10 percent of the difference between the 1984 and 1990 curves in figure 16A,B was the result of missing data. Table 6 shows how the estimates of cumulative oil discovered from 1900 to 1980 in the study area regions changed from the 1984 to 1990 tapes.

Even though data presented in figure 16 and table 6 provide evidence of field growth outside of the United States and Canada, little is known about how the estimates of ultimate field recovery were made and if the method has been applied consistently. The field-growth phenomenon explains why proved reserves in the study area continued to increase even though estimates of aggregate annual discoveries are much smaller than annual production. It implies not only that recent discoveries are substantially understated, but that field growth could become the dominant source of additions to proved reserves in future years.

## SUMMARY AND CONCLUSIONS

Data on wildcat wells showed exploration drilling continuing at a relatively constant rate in spite of significant changes in world oil prices. Price increases appear to have allowed commercial exploration and development of fields in high-cost areas, such as the North Sea and Campos Basin. The proportion of wildcat wells drilled offshore in the study area has increased dramatically over the last 30 years, and recent data show that about 4 of 10 new wildcat wells drilled in the study area are offshore wells. If the pattern of wildcat drilling is analyzed in relation to the growth in prospective area, one can conclude that drilling in the study area has continued to open up new areas at nearly a constant increment per wildcat well.

Although the annual oil discovery rate in the 1980's is lower than that in the 1970's, it is too early to tell the extent

of the decline. Discovery data for the latter part of the decade are incomplete, and it is likely that the estimated sizes of the discoveries in the early 1980's will be revised substantially upward as development and production occur. Comparison of the gas-to-oil ratios in areas having markets for gas with those having no markets suggests that gas contained in new discoveries for the study area has historically been understated. Since 1970, most of the natural gas discovered is in nonassociated gas fields, suggesting, perhaps, that gas is starting to be regarded as a commercial commodity.

The size distribution of petroleum provinces is highly skewed. In particular, of the 99 significant provinces identified in the study area, the largest 4 account for 70 percent of the oil. Discovery statistics indicate that most of the large provinces continue to have discoveries of at least 100 million barrels. The skewed distribution in province sizes and stability in province size orderings suggest that intense exploration in identified provinces will not change the distribution of oil within the study area.

The notion of prospective area was devised to identify areas that have been subjected to a minimum threshold of exploration. The matching of discoveries with prospective area and the dates when the field location became part of the prospective area allows construction of profiles of the discovered oil ordered by prospective area. For most regions, profiles showed that the industry had identified the most productive areas early in the exploration process. The North Sea discoveries of Western Europe and the Campos Basin discoveries in South America are exceptions, representing late prolific prospective areas.

The reader can examine the location of the prospective and explored areas for individual countries and small groups of countries in figures 17–54. Maps are labeled with the names of petroleum provinces and the year of the earliest discovery we know of in each province. Profiles showing the growth in prospective and explored areas as well as the oil discovered by prospective area are also presented. The salient statistics about exploration and petroleum provinces in each country or group of countries are presented in figures 17–54.

Evidence of the field-growth phenomenon outside the United States and Canada was demonstrated. However,

without estimates of ultimate field recovery consistently constructed over a number of years, the data are not reliable enough to project the magnitude of the expected field growth into the future. Because a significant component of field growth is driven by economic forces, the magnitude of the potential additions to proved reserves from this source may not become apparent until (if ever) the fields in the study area are as intensively developed as those in the United States and Canada.

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## TABLES 1-6

[Figures 1-54 follow table 6]

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**Table 1.** Exploration wells by year, 1950–89, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific

[Data for 1950–80 are from the annual foreign developments issues of the *Bulletin of the American Association of Petroleum Geologists* (AAPG). Data for 1980–85 are from these annual issues and from compilations of the AAPG data published in the *International Petroleum Encyclopedia*. Data for 1985–89 are from the *International Petroleum Encyclopedia*]

Area	1950	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Mexico .....	100	129	111	128	121	114	113	108	76	133	176	160	133	99	109	139	153	135	151	134
<b>Caribbean</b>																				
Bahamas .....	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Cuba <sup>1</sup> .....	0	0	0	1	0	31	45	27	28	10	0	11	4	0	7	0	0	0	0	0
Haiti .....	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Dominican Republic .....	0	0	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0	1	7
Jamaica .....	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Barbados .....	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	9	1	0	0
Lesser Antilles <sup>2</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal .....	0	0	0	1	1	34	45	31	32	11	2	11	4	0	7	0	9	1	1	7
<b>Central America<sup>3</sup></b>																				
Belize .....	0	0	0	0	0	1	1	1	6	0	0	1	4	1	0	0	0	2	0	0
Honduras .....	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Guatemala .....	0	0	0	0	0	0	0	0	5	0	3	2	1	0	0	0	0	0	2	0
Nicaragua .....	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	5
Costa Rica .....	0	0	0	0	0	3	2	0	1	2	2	0	1	2	0	0	0	0	0	0
Panama .....	0	0	0	0	0	0	1	1	2	0	0	1	3	0	0	0	0	0	0	0
Subtotal .....	0	0	0	0	0	4	4	3	14	2	5	4	9	4	0	0	0	3	4	6
<b>South America</b>																				
Colombia .....	4	8	50	14	24	20	18	26	32	60	50	39	20	22	30	20	24	18	21	30
Venezuela .....	66	99	111	151	178	165	140	174	193	110	72	80	64	51	53	56	26	31	29	33
Trinidad and Tobago .....	9	9	7	5	9	10	22	19	12	17	24	31	20	37	53	37	36	14	23	20
Guyana .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0	0
Suriname .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	4	17
French Guiana <sup>4</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecuador .....	2	4	25	24	23	26	16	25	3	6	8	4	0	0	6	21	31	14	8	8
Peru .....	32	43	38	62	55	24	31	16	14	3	21	26	25	26	8	30	24	50	36	38
Bolivia .....	2	1	0	0	6	2	5	0	9	12	18	14	13	10	13	16	15	28	28	15
Uruguay .....	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraguay .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Brazil .....	6	4	4	6	6	10	8	38	56	92	95	76	70	89	86	98	98	110	115	86
Chile .....	5	4	6	12	20	13	15	17	20	19	11	14	19	14	14	8	15	10	17	19
Argentina .....	0	23	47	40	54	48	51	38	33	0	121	84	130	76	55	78	116	92	85	86
Subtotal .....	126	195	288	314	376	318	306	353	372	319	420	368	361	325	319	364	390	377	366	352

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	TOTAL
Mexico.....	130	129	143	104	98	87	79	79	83	83	85	63	65	65	44	78	68	27	33	24	4089
<b>Caribbean—Continued</b>																					
Bahamas.....	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4
Cuba <sup>1</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	165
Haiti.....	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	5
Dominican Republic.....	2	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	19
Jamaica.....	1	1	1	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0	0	13
Barbados.....	1	2	0	0	0	0	0	0	1	0	0	3	0	0	10	5	2	0	0	2	39
Lesser Antilles <sup>2</sup> .....	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2
Subtotal.....	5	4	1	0	0	0	0	4	1	3	0	5	6	0	10	5	4	0	0	2	247
<b>Central America<sup>3</sup>—Continued</b>																					
Belize.....	0	0	5	3	0	4	0	0	0	2	0	3	2	0	1	3	0	0	0	0	40
Honduras.....	0	1	3	3	0	1	0	0	2	0	2	0	0	0	0	0	0	0	0	0	14
Guatemala.....	0	0	1	1	2	3	5	0	0	3	4	6	9	0	0	4	4	0	2	4	61
Nicaragua.....	8	3	0	0	3	2	0	3	3	0	0	0	0	0	0	0	0	0	0	0	31
Costa Rica.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	2	1	20
Panama.....	0	1	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	16
Subtotal.....	8	5	9	7	7	11	5	3	6	6	6	9	11	0	1	7	4	3	4	8	182
<b>South America—Continued</b>																					
Colombia.....	16	17	20	20	24	14	21	27	29	30	34	114	73	35	42	67	44	49	85	72	1363
Venezuela.....	38	44	64	63	76	35	45	48	46	63	142	351	250	19	18	6	25	177	17	23	3432
Trinidad and Tobago.....	21	35	23	15	13	14	12	17	8	13	13	16	23	11	4	14	8	8	6	8	696
Guyana.....	0	1	0	0	2	3	1	0	0	0	0	1	2	0	0	0	0	0	0	0	19
Suriname.....	7	1	0	0	0	1	0	0	1	0	0	0	3	0	3	8	9	9	11	8	86
French Guiana <sup>4</sup> .....	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Ecuador.....	20	15	20	8	5	3	3	5	3	9	0	3	5	10	3	2	4	9	14	11	406
Peru.....	28	21	25	31	43	43	36	37	28	3	13	17	12	23	29	13	11	13	8	7	1043
Bolivia.....	10	4	8	4	7	7	16	14	13	12	6	19	18	9	3	11	4	10	12	13	407
Uruguay.....	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	3	1	0	0	8
Paraguay.....	0	11	6	0	0	1	1	3	3	1	0	1	1	0	0	0	1	2	1	1	36
Brazil.....	100	87	80	78	86	87	105	100	89	134	166	245	328	262	243	229	163	176	160	115	4186
Chile.....	24	20	33	20	25	23	22	7	14	22	16	62	41	5	7	13	18	35	26	17	722
Argentina.....	113	145	110	139	117	78	83	143	81	71	110	127	107	130	136	161	92	45	102	120	3467
Subtotal.....	377	401	389	378	398	310	347	401	317	358	500	956	863	504	488	524	382	534	442	395	15873

<sup>1</sup>Data for Cuba for 1960–89 are incomplete.

<sup>2</sup>For this report, the Lesser Antilles are considered to consist of the islands from Grenada to St. Thomas, except Barbados, which is listed separately.

<sup>3</sup>No exploration wells were reported for El Salvador.

<sup>4</sup>French Guiana is listed separately although it is an overseas department of France.

**Table 1.** Exploration wells by year, 1950–89, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued

Area	1950	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
<b>Western Europe<sup>5</sup></b>																				
Norway.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	11	14
Svalbard <sup>6</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden.....	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	3	1	1
Denmark.....	2	2	1	3	0	0	2	0	9	2	0	0	0	0	0	0	3	1	7	2
Ireland.....	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0
United Kingdom.....	2	1	1	4	7	15	10	6	17	9	8	4	0	6	5	21	33	39	39	55
Netherlands.....	11	11	7	17	14	9	7	8	8	11	4	4	4	4	23	40	10	4	19	35
Belgium.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Germany.....	63	125	140	80	103	107	113	107	123	99	76	53	49	46	16	36	57	40	42	45
France.....	31	17	34	42	42	17	42	98	138	132	111	104	102	105	78	58	30	23	15	23
Switzerland.....	0	0	0	1	0	0	0	0	1	0	3	2	1	2	3	2	1	0	0	0
Austria.....	0	0	0	0	0	0	15	21	13	17	17	11	11	11	13	17	16	8	14	19
Italy.....	6	3	35	26	27	41	56	72	72	80	78	68	83	69	70	37	46	24	31	38
Greece.....	0	0	0	0	2	0	1	8	1	0	0	6	6	9	0	2	1	10	0	0
Portugal.....	1	0	0	0	14	6	1	2	5	8	1	1	1	4	0	0	0	0	0	0
Spain.....	2	3	3	2	4	12	15	17	15	13	9	14	19	23	11	15	17	14	17	9
Malta.....	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Subtotal.....	118	162	221	175	214	207	262	339	402	372	307	267	278	283	219	228	216	171	196	241
<b>Middle East</b>																				
Turkey.....	1	4	4	2	1	0	0	7	11	21	21	39	19	16	14	23	31	21	21	11
Cyprus.....	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Syria.....	1	0	0	0	0	0	1	0	1	4	2	0	0	0	0	0	1	0	1	1
Lebanon.....	0	0	0	1	0	0	0	0	0	0	1	0	0	2	6	0	1	1	0	0
Israel.....	0	0	0	1	1	8	10	7	7	4	6	4	7	6	12	10	11	10	12	5
Jordan.....	0	0	0	0	0	0	0	1	1	3	1	0	0	0	1	5	0	0	0	1
Iraq.....	1	2	0	6	5	4	8	6	7	5	10	5	0	0	0	0	0	0	0	2
Iran.....	2	0	1	0	0	0	2	4	2	3	3	6	9	8	16	7	19	40	9	11
Saudi Arabia.....	0	7	6	1	2	6	3	1	0	0	10	10	8	2	3	7	3	8	6	3
Kuwait.....	0	2	2	0	2	1	2	1	2	3	2	8	3	6	5	6	5	1	1	0
Former Neutral Zone <sup>7</sup> .....	3	1	1	0	3	2	1	0	0	0	1	4	7	9	0	2	3	2	0	0
Bahrain.....	4	11	0	0	9	4	2	0	0	1	0	1	1	3	0	1	1	0	0	0
Qatar.....	0	0	1	2	0	1	1	0	0	0	3	1	1	4	6	0	0	5	0	0
Oman.....	0	0	0	0	0	0	1	1	0	1	2	0	3	2	0	1	0	0	0	5
Yemen.....	0	0	0	0	0	0	0	0	0	0	0	2	4	0	1	1	0	0	0	0
United Arab Emirates.....	0	1	1	0	1	1	2	2	3	4	4	0	4	5	8	5	16	11	13	12
Subtotal.....	12	28	16	14	24	27	33	30	34	49	66	80	66	63	72	68	91	99	63	52

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	TOTAL
<b>Western Europe<sup>5</sup>—Continued</b>																					
Norway.....	13	13	14	13	18	14	21	14	14	26	35	41	50	50	18	43	41	33	—	23	525
Svalbard <sup>6</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	1	1
Sweden.....	0	5	22	21	25	31	5	7	32	11	21	18	19	15	20	16	0	6	—	17	298
Denmark.....	3	3	1	4	3	5	7	5	3	2	4	5	5	13	4	15	8	7	—	4	135
Ireland.....	0	3	3	3	4	7	6	6	15	8	3	11	4	6	7	6	7	4	—	5	114
United Kingdom.....	34	32	34	55	74	93	70	72	45	60	81	92	123	141	64	187	210	142	—	184	2075
Netherlands.....	27	29	33	18	19	24	26	28	28	31	37	38	58	49	27	52	41	35	—	45	895
Belgium.....	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	—	0	4
West Germany.....	24	27	26	22	30	26	29	37	27	49	37	65	62	44	48	44	34	24	—	12	2187
France.....	14	7	11	11	9	11	15	14	17	24	24	38	50	28	40	49	78	38	—	47	1767
Switzerland.....	0	0	0	1	0	0	0	1	1	0	1	3	4	0	0	0	0	1	—	1	29
Austria.....	15	25	21	21	24	37	36	26	33	28	26	33	37	21	23	23	13	24	20	12	701
Italy.....	27	40	43	24	20	24	25	20	61	43	60	91	103	66	77	73	117	96	88	38	2098
Greece.....	2	1	2	3	4	0	1	5	3	5	5	5	14	5	6	5	2	3	—	4	121
Portugal.....	0	0	0	0	3	8	8	1	0	2	0	1	2	3	0	1	0	0	0	0	73
Spain.....	7	13	7	19	10	16	23	18	18	18	24	33	19	24	15	21	18	12	—	10	559
Malta.....	0	1	2	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	7
Subtotal.....	166	199	219	216	243	296	272	254	297	307	359	478	551	465	349	535	569	425	108	403	11589
<b>Middle East—Continued</b>																					
Turkey.....	34	21	25	35	37	56	53	33	26	12	29	19	50	35	19	24	25	31	37	39	907
Cyprus.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Syria.....	1	1	1	0	1	0	0	0	0	3	2	4	4	20	30	11	24	10	14	20	158
Lebanon.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Israel.....	8	6	4	2	1	9	12	12	5	7	11	8	14	18	0	2	3	2	1	3	249
Jordan.....	0	3	0	0	0	0	0	0	1	0	0	0	0	5	0	0	0	0	0	0	22
Iraq.....	1	0	1	3	2	1	2	5	0	0	0	0	0	0	0	0	2	10	19	2	109
Iran.....	8	10	6	36	26	26	26	25	17	2	5	1	0	0	0	7	0	0	0	0	337
Saudi Arabia.....	2	4	10	7	9	21	16	12	8	37	40	49	25	4	0	7	6	0	3	3	349
Kuwait.....	1	2	2	0	0	0	2	1	0	7	0	24	8	29	11	2	0	2	0	2	145
Former Neutral Zone <sup>7</sup> .....	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	44
Bahrain.....	0	0	1	1	0	1	0	0	1	0	1	14	0	0	0	0	0	0	0	0	57
Qatar.....	3	4	5	1	0	0	2	0	2	2	4	2	4	2	3	3	0	0	7	3	72
Oman.....	2	10	16	7	0	0	0	9	19	19	17	29	31	37	29	39	32	36	40	44	432
Yemen.....	0	0	0	0	0	0	1	1	2	1	4	4	0	1	5	3	0	28	33	92	
United Arab Emirates.....	14	9	15	16	12	9	20	9	0	0	14	13	26	34	17	27	13	0	8	4	353
Subtotal.....	75	70	86	109	88	123	134	107	80	91	124	167	168	184	110	120	117	91	157	153	3341

<sup>5</sup>No exploration wells were reported for Andorra, Finland, Iceland, Liechtenstein, Luxemburg, or Monaco. Dashes in 1988 column indicate data not available.

<sup>6</sup>Svalbard (or Spitsbergen) is a group of islands in the Arctic Ocean north of and belonging to Norway.

<sup>7</sup>The former Neutral Zone was located between Kuwait and Saudi Arabia.

**Table 1.** Exploration wells by year, 1950-89, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued

Area	1950	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
	<b>Africa<sup>8</sup></b>																			
Morocco.....	20	66	38	53	40	26	12	5	5	3	4	13	8	3	8	5	12	9	8	14
Algeria.....	14	12	11	11	18	22	46	30	39	37	48	64	62	25	46	24	17	17	17	31
Tunisia.....	3	0	3	7	12	5	4	4	5	5	0	1	8	4	4	7	7	10	5	4
Libya.....	0	0	0	0	0	0	0	4	25	41	98	125	173	245	167	136	62	41	80	70
Egypt.....	6	0	0	0	3	4	2	5	5	2	6	4	6	12	9	8	14	7	21	23
Western Sahara.....	0	0	0	0	0	0	0	0	0	0	2	13	30	7	4	3	4	5	0	1
Mauritania.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Mali.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Niger.....	0	0	0	0	0	0	0	0	0	0	0	0	6	1	2	0	0	0	0	0
Chad.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sudan.....	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	0	0	0	0	0
Senegal.....	0	0	0	0	0	0	0	0	3	11	5	8	1	0	0	0	2	5	2	3
The Gambia.....	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Guinea-Bissau.....	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	2	3
Guinea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Sierra Leone.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liberia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ivory Coast.....	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Ghana.....	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	1	1	0	0
Togo.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Benin.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Nigeria.....	0	0	1	2	10	7	4	1	17	37	25	15	5	22	37	65	66	79	38	27
Cameroon.....	0	0	14	3	2	2	3	3	1	1	0	0	0	0	0	1	0	4	1	1
Equatorial Guinea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Gabon.....	0	0	0	0	0	0	0	0	25	19	7	8	15	4	2	8	9	10	10	20
Central African Republic.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Congo.....	0	0	0	0	0	0	0	0	2	1	6	1	2	1	0	0	0	0	0	1
Zaire.....	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0
Ethiopia.....	1	0	1	1	0	6	0	0	0	0	0	0	0	1	0	1	2	0	0	2
Kenya.....	0	0	0	0	0	0	1	0	1	2	2	1	1	2	0	0	0	1	1	0
Somalia.....	0	0	0	0	0	0	0	2	2	5	4	3	4	0	1	4	1	1	2	2
Uganda.....	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Angola.....	0	0	0	3	4	1	8	6	4	10	11	10	6	10	6	10	15	24	55	31
Zambia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanzania.....	0	0	0	0	0	0	1	0	4	5	5	0	1	0	0	0	0	0	0	0
Mozambique.....	0	0	0	2	0	0	1	2	0	0	0	1	3	2	0	5	1	16	0	0
Burundi.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Namibia.....	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0
Lesotho.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madagascar.....	0	1	2	0	0	3	3	4	5	3	6	0	0	1	0	1	0	0	0	0
South Africa.....	0	0	0	0	1	1	3	0	0	0	0	0	1	0	0	0	6	2	2	9
Mauritius.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seychelles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal.....	47	79	70	82	90	78	90	69	144	183	232	273	337	343	288	279	219	233	251	248

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	TOTAL
<b>Africa—Continued</b>																					
Morocco.....	1	8	7	4	2	5	8	5	4	7	10	14	11	8	5	6	5	7	2	0	471
Algeria.....	37	25	10	13	9	17	11	15	23	33	32	1	1	2	3	25	30	25	14	18	935
Tunisia.....	6	13	12	9	16	8	10	10	11	13	15	33	21	14	17	15	6	16	10	8	361
Libya.....	51	41	34	25	32	45	22	33	41	28	37	43	34	61	51	45	27	41	25	26	2009
Egypt.....	33	22	26	15	12	20	34	30	24	33	45	64	82	70	45	76	54	55	58	43	978
Western Sahara.....	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72
Mauritania.....	2	0	1	1	3	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	13
Mali.....	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	3
Niger.....	0	0	0	0	0	6	0	0	0	3	3	0	1	1	0	0	0	0	0	0	23
Chad.....	0	0	0	0	4	4	4	3	5	1	0	0	0	0	0	4	4	0	0	0	29
Sudan.....	0	0	0	0	0	1	2	1	4	6	8	14	17	24	4	6	2	1	0	4	100
Senegal.....	5	6	1	0	0	1	2	1	0	0	0	0	1	0	0	0	0	0	0	0	57
The Gambia.....	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	4	10
Guinea-Bissau.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	11
Guinea.....	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Sierra Leone.....	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
Liberia.....	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	8
Ivory Coast.....	0	0	2	1	1	3	1	10	5	3	2	10	14	4	5	3	0	0	1	1	70
Ghana.....	11	2	1	1	1	5	0	2	1	2	0	1	1	0	2	2	2	11	0	3	54
Togo.....	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	5
Benin.....	4	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	12
Nigeria.....	31	55	61	45	51	33	21	24	35	22	31	26	30	24	12	17	29	44	42	47	1138
Cameroon.....	6	2	5	3	5	7	7	32	21	25	17	18	11	4	6	9	5	0	3	1	223
Equatorial Guinea.....	0	1	0	0	0	0	0	0	0	0	0	0	4	0	1	1	0	1	0	0	14
Gabon.....	13	11	17	15	13	23	19	19	20	22	15	23	16	11	18	13	12	16	20	26	479
Central African Republic.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Congo.....	1	2	7	4	6	4	0	0	6	11	11	5	9	4	3	9	5	10	10	7	128
Zaire.....	2	1	6	3	0	4	2	1	5	1	0	3	4	4	3	1	2	1	4	1	52
Ethiopia.....	1	0	3	5	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	28
Kenya.....	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	2	3	4	25
Somalia.....	0	0	1	0	1	1	0	1	0	0	1	0	3	0	2	2	1	1	2	1	48
Uganda.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Angola.....	25	29	15	8	20	10	0	6	6	6	2	14	23	22	13	20	17	24	29	19	522
Zambia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3
Tanzania.....	0	0	0	0	2	0	3	1	0	1	0	0	2	1	2	3	0	2	0	0	33
Mozambique.....	12	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	53
Burundi.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Namibia.....	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	11
Lesotho.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Madagascar.....	1	8	1	2	4	1	0	0	0	0	0	0	0	0	0	5	3	2	0	0	56
South Africa.....	15	13	10	18	5	7	8	12	9	12	8	12	10	11	10	16	32	17	17	19	286
Mauritius.....	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Seychelles.....	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	3
Subtotal.....	262	249	223	176	191	208	154	208	220	231	239	284	298	265	206	284	241	280	247	235	8336

\*No exploration wells were reported for Botswana, Burkina Faso (formerly Upper Volta), Cape Verde, Comoros, Djibouti, Malawi, Rwanda, Sao Tome and Principe, Swaziland, or Zimbabwe.

**Table 1.** Exploration wells by year, 1950-89, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued

Area	1950	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
<b>Non-Communist Asia<sup>9</sup></b>																				
Pakistan .....	1	0	3	0	2	2	2	9	3	9	6	4	4	3	3	4	3	6	5	4
Maldives .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India .....	2	0	0	2	4	0	3	10	5	6	7	3	0	5	0	0	0	0	0	10
Bangladesh .....	0	0	0	0	0	0	0	0	0	0	4	1	4	0	0	0	0	0	0	0
Myanmar .....	0	0	0	0	0	0	0	0	2	4	3	3	15	0	0	0	0	0	0	0
Thailand .....	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0
Sri Lanka .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia .....	0	1	1	4	3	10	7	8	2	2	9	6	8	3	4	0	9	12	17	22
Brunei .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Indonesia .....	19	24	14	9	7	7	9	23	12	19	20	1	3	28	19	14	3	5	17	34
Japan .....	1	6	3	25	39	40	18	45	79	72	44	98	95	55	95	105	78	67	71	49
South Korea .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taiwan .....	3	0	0	0	2	5	4	6	0	5	4	7	4	5	1	5	6	8	15	15
Philippines .....	3	0	3	1	0	0	1	2	4	9	32	12	8	2	15	0	0	0	0	0
Subtotal .....	29	31	24	41	57	64	44	103	107	127	132	135	141	101	137	128	99	98	125	139
<b>Southwestern Pacific<sup>10</sup></b>																				
Papua New Guinea .....	8	5	8	1	12	14	7	8	8	5	5	0	1	0	0	1	2	4	8	4
Oceania <sup>11</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Australia .....	0	1	1	2	20	37	61	47	27	52	23	17	53	107	137	155	100	83	86	51
New Zealand .....	0	0	0	0	0	0	0	0	0	1	2	1	2	4	8	7	3	1	1	10
Subtotal .....	8	6	9	3	32	51	68	55	35	58	30	18	56	111	145	163	105	88	95	65
GRAND TOTAL .....	440	630	739	758	915	897	965	1091	1216	1254	1370	1316	1385	1329	1296	1369	1282	1205	1252	1244

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	TOTAL
<b>Non-Communist Asia<sup>9</sup>—Continued</b>																					
Pakistan .....	6	4	3	3	5	5	1	4	6	11	10	13	10	14	17	26	15	9	31	20	286
Maldives .....	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2
India .....	0	0	7	10	0	0	1	0	0	0	0	17	0	11	37	87	49	37	51	0	364
Bangladesh .....	0	0	0	1	0	2	5	5	2	0	0	5	2	1	0	0	0	2	5	0	39
Myanmar .....	1	0	6	0	6	10	9	0	0	0	11	17	19	0	45	9	3	3	4	0	170
Thailand .....	0	1	4	3	14	10	17	3	8	10	14	21	30	38	38	28	7	23	50	0	323
Sri Lanka .....	0	0	0	0	1	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0	6
Malaysia .....	14	11	19	18	31	11	12	14	16	58	44	61	25	20	16	25	14	13	13	17	580
Brunei .....	0	0	6	10	0	0	11	3	7	5	1	4	6	6	14	9	13	12	13	0	125
Indonesia .....	87	138	140	169	168	184	130	115	146	154	182	224	204	267	216	208	122	75	103	102	3421
Japan .....	0	4	8	36	28	25	19	29	36	25	24	27	27	23	18	16	17	12	11	9	1479
South Korea .....	0	0	1	5	0	2	0	0	0	0	2	1	0	1	0	2	1	0	3	0	18
Taiwan .....	5	9	5	18	17	18	10	15	20	18	30	16	13	18	4	12	13	9	13	0	358
Philippines .....	2	17	8	10	7	13	8	15	18	23	23	17	13	4	3	0	0	2	7	6	288
Subtotal .....	115	184	207	283	277	280	227	203	259	304	341	426	349	403	408	422	254	197	304	154	7459
<b>Southwestern Pacific<sup>10</sup>—Continued</b>																					
Papua New Guinea .....	2	2	1	6	0	3	2	1	1	0	0	14	2	4	5	5	3	5	15	23	195
Oceania <sup>11</sup> .....	0	2	0	0	0	0	0	0	0	3	2	0	4	0	0	0	0	0	0	0	11
Australia .....	110	65	92	61	51	20	17	17	51	49	67	125	149	182	263	267	139	167	140	63	3155
New Zealand .....	10	9	6	0	0	5	7	3	3	2	4	8	6	15	8	25	24	0	0	5	180
Subtotal .....	122	78	99	67	51	28	26	21	55	54	73	147	161	201	276	297	166	172	155	91	3541
<b>GRAND TOTAL .....</b>	<b>1260</b>	<b>1319</b>	<b>1376</b>	<b>1340</b>	<b>1353</b>	<b>1343</b>	<b>1244</b>	<b>1280</b>	<b>1318</b>	<b>1437</b>	<b>1727</b>	<b>2535</b>	<b>2472</b>	<b>2087</b>	<b>1892</b>	<b>2272</b>	<b>1805</b>	<b>1729</b>	<b>1450</b>	<b>1465</b>	<b>54657</b>

<sup>9</sup>No exploration wells were reported for Afghanistan, Bhutan, Nepal, or Singapore.

<sup>10</sup>No exploration wells were reported for New Caledonia (an overseas territory of France).

<sup>11</sup>For this report, Oceania is considered to consist of Fiji, Kiribati, Nauru, Solomon Islands, Tonga, Tuvalu, Vanuatu (formerly New Hebrides), and Western Samoa.

**Table 2.** Wildcat wells by year, 1951-90, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific

[Data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva. Column denoted "Unkn" means year unknown; these wells are not plotted in the graphs]

Area	Pre-1951	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Mexico .....	68	8	5	3	9	8	10	9	10	10	21	21	15	0	2	0	1	0	2	1
<b>Caribbean</b>																				
Bahamas .....	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Cuba <sup>1</sup> .....	11	0	1	0	3	11	29	22	22	13	4	6	1	0	6	2	0	0	1	2
Haiti .....	4	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0
Dominican Republic .....	2	0	0	0	0	0	0	0	4	0	2	3	0	0	0	0	0	2	0	6
Jamaica .....	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Barbados .....	1	0	0	0	2	2	1	0	0	1	0	0	0	0	0	0	9	2	0	0
Lesser Antilles <sup>2</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal .....	19	0	1	0	5	15	32	25	26	16	6	9	1	0	6	2	9	4	1	8
<b>Central America<sup>3</sup></b>																				
Belize .....	0	0	0	0	0	0	2	1	6	2	0	1	1	1	0	0	0	2	0	0
Honduras .....	2	0	0	0	0	0	1	1	0	0	0	0	0	1	0	2	4	1	0	1
Guatemala .....	1	0	0	0	0	0	0	0	1	5	2	2	1	0	0	0	0	0	1	0
Nicaragua .....	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	5
Costa Rica .....	6	0	0	0	0	3	2	2	1	3	2	0	1	2	0	0	0	0	0	0
Panama .....	11	0	0	0	0	0	2	1	2	2	0	1	4	0	0	0	0	0	0	0
Subtotal .....	25	0	0	0	0	3	7	6	10	12	4	4	7	4	0	2	4	4	3	6
<b>South America</b>																				
Colombia .....	174	9	7	15	21	13	13	20	34	27	37	33	18	24	23	18	20	18	21	20
Venezuela .....	808	58	52	62	63	98	83	75	122	75	33	36	14	9	1	12	5	12	3	7
Trinidad and Tobago .....	31	1	5	4	6	8	9	2	9	11	7	6	7	14	7	8	3	3	9	5
Guyana .....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Suriname .....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	6	1	4	4
French Guiana <sup>4</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecuador .....	39	1	1	1	4	0	0	3	0	5	9	1	0	1	1	0	0	3	4	5
Peru .....	29	4	6	5	13	11	12	7	8	2	11	12	4	4	0	7	4	6	6	4
Bolivia .....	22	0	0	0	1	1	2	1	11	7	12	12	16	10	10	7	12	15	11	1
Uruguay .....	26	0	0	0	0	1	1	0	2	1	0	0	0	0	0	0	1	0	0	0
Paraguay .....	5	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	3	0	0
Brazil .....	22	4	4	4	2	9	2	18	28	39	46	32	39	45	38	46	45	61	56	40
Chile .....	14	5	6	12	17	8	2	8	6	3	16	13	21	14	13	14	15	12	16	19
Argentina .....	308	15	23	31	32	29	37	24	23	69	111	77	99	55	50	82	76	72	66	55
Subtotal .....	1481	97	104	134	159	178	161	158	244	242	282	222	218	176	144	195	187	208	196	160

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	Unkn	TOTAL
Mexico .....	0	0	0	0	0	0	1	21	14	5	2	4	0	0	0	0	0	0	1	0	0	0	251
<b>Caribbean—Continued</b>																							
Bahamas.....	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	5
Cuba <sup>1</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	184	320
Haiti .....	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
Dominican Republic .....	1	0	0	0	0	0	0	0	0	3	0	1	1	0	0	0	0	0	0	0	0	5	30
Jamaica.....	1	1	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	11
Barbados .....	1	2	0	0	0	0	0	0	1	0	0	0	0	0	0	5	1	0	0	1	0	31	60
Lesser Antilles <sup>2</sup> .....	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3
Subtotal.....	4	4	0	1	0	0	0	4	1	3	0	2	6	0	0	5	2	0	0	3	0	220	440
<b>Central America<sup>3</sup>—Continued</b>																							
Belize .....	0	0	5	2	1	4	0	2	0	2	0	3	2	2	0	3	0	0	0	0	2	0	44
Honduras .....	0	1	3	3	0	1	0	0	2	0	2	0	0	1	0	0	0	0	0	0	0	0	26
Guatemala .....	3	2	3	3	1	2	3	4	0	1	3	7	9	4	1	4	1	0	3	1	0	0	68
Nicaragua.....	8	3	0	0	2	3	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	1	36
Costa Rica.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	25
Panama.....	0	1	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	0	0	31
Subtotal.....	11	7	11	8	6	11	3	8	6	4	5	10	11	7	1	8	1	1	3	4	2	1	230
<b>South America—Continued</b>																							
Colombia.....	19	18	19	18	16	10	12	14	17	22	28	55	63	23	37	49	41	57	79	52	46	34	1294
Venezuela .....	1	2	18	18	10	5	11	4	9	20	105	118	119	37	16	13	9	4	5	3	1	13	2169
Trinidad and Tobago .....	7	15	14	9	7	7	10	6	4	3	2	6	9	2	1	2	0	1	1	3	1	26	291
Guyana.....	0	1	0	0	2	3	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	13
Suriname .....	4	1	0	0	0	1	0	0	1	0	0	1	3	6	0	3	0	0	0	1	0	11	51
French Guiana <sup>4</sup> .....	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ecuador .....	11	13	18	8	5	1	1	4	3	9	7	1	5	7	1	2	5	8	15	11	3	8	224
Peru.....	11	4	12	13	15	38	10	11	7	1	4	7	7	14	18	3	3	6	2	3	0	5	349
Bolivia .....	4	3	6	4	5	6	12	8	9	8	4	12	7	4	2	7	1	3	3	5	1	0	265
Uruguay .....	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	2	2	0	0	0	24	64
Paraguay .....	0	11	5	0	0	1	1	3	3	1	0	1	1	0	0	0	1	1	1	1	1	0	43
Brazil .....	42	56	52	58	53	70	76	63	82	105	119	126	152	165	151	107	85	84	76	60	45	11	2418
Chile.....	17	18	32	20	27	19	18	5	3	1	4	15	5	8	7	1	10	9	8	14	9	62	546
Argentina.....	98	125	93	118	91	63	68	90	55	47	61	74	69	114	120	137	72	71	67	70	59	58	3154
Subtotal.....	214	267	269	266	231	225	222	208	195	218	334	416	442	380	353	324	229	246	257	223	165	253	10883

<sup>1</sup>Data for Cuba for 1960-90 are incomplete.

<sup>2</sup>For this report, the Lesser Antilles are considered to consist of the islands from Grenada to St. Thomas, except Barbados, which is listed separately.

<sup>3</sup>No wildcat wells were reported for El Salvador.

<sup>4</sup>French Guiana is listed separately although it is an overseas department of France.

**Table 2. Wildcat wells by year, 1951–90, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued**

Area	Pre-1951	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
<b>Western Europe<sup>5</sup></b>																				
Norway.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	10	15
Svalbard <sup>6</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Sweden.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	0
Denmark <sup>7</sup> .....	7	4	4	3	0	0	0	0	9	2	0	0	0	0	0	0	3	2	6	2
Ireland.....	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0
United Kingdom.....	129	1	1	5	6	11	6	4	17	10	11	9	3	7	6	28	31	41	35	52
Netherlands.....	35	12	7	8	11	9	5	7	6	9	4	2	4	2	23	33	9	2	15	29
Belgium.....	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0	0
West Germany.....	188	74	73	75	105	96	114	97	115	87	73	47	48	18	57	33	54	35	50	43
France.....	112	39	42	33	36	53	65	82	114	125	106	102	101	100	77	59	31	26	13	24
Switzerland.....	5	0	0	1	0	0	0	0	1	0	3	2	1	2	2	3	0	0	0	0
Austria.....	12	0	0	0	0	0	2	7	4	13	15	12	9	11	11	12	13	9	16	20
Italy.....	41	3	7	25	20	32	42	80	66	91	101	85	109	90	79	46	66	30	28	48
Greece.....	3	0	0	0	0	0	1	1	1	0	0	6	5	7	2	2	0	10	0	0
Yugoslavia.....	15	3	1	2	1	3	2	3	2	6	3	3	5	6	5	6	5	8	5	6
Portugal.....	12	1	1	3	2	3	1	2	5	8	1	1	1	4	0	0	0	0	0	0
Spain.....	45	2	3	3	7	3	11	12	12	20	10	15	16	23	10	15	18	12	17	10
Malta.....	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Subtotal.....	604	139	139	158	188	211	249	295	352	372	328	284	306	274	273	237	233	181	197	249
<b>Middle East</b>																				
Turkey.....	16	3	5	2	2	1	0	8	9	19	20	35	18	12	14	26	28	18	27	13
Cyprus.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Syria.....	9	1	0	0	0	0	1	0	2	4	3	1	4	2	0	0	1	0	0	0
Lebanon.....	1	0	0	1	0	0	0	0	0	0	1	1	0	2	0	0	1	0	0	0
Israel.....	1	0	0	0	2	6	9	9	8	5	4	6	5	3	8	11	11	7	9	5
Jordan.....	0	0	0	0	0	0	0	1	1	3	1	0	0	1	0	2	0	0	0	0
Iraq.....	52	1	1	4	1	2	2	5	4	5	9	8	0	0	0	0	0	0	0	2
Iran.....	48	2	0	0	2	0	1	1	2	4	3	9	8	6	6	9	17	21	17	13
Saudi Arabia.....	12	2	0	0	0	0	1	1	1	0	0	0	0	3	2	2	3	8	7	4
Kuwait.....	2	1	1	0	1	1	1	0	1	3	0	1	4	12	1	2	5	1	0	0
Former Neutral Zone <sup>8</sup> .....	2	0	2	1	3	2	1	0	0	0	1	3	7	3	0	1	3	2	0	0
Bahrain.....	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	0	0	0
Qatar.....	1	0	1	2	0	1	1	0	0	3	1	5	4	3	1	1	4	3	2	2
Oman.....	0	0	0	0	0	1	0	6	3	8	8	1	3	3	4	1	9	2	3	6
Yemen.....	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	1	0	0	0	0
Abu Dhabi <sup>9</sup> .....	0	1	0	0	1	0	1	1	1	0	0	0	4	1	4	3	4	5	7	8
Al Fujayrah <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Dubai <sup>9</sup> .....	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	1	0
Ra's al Khaymah <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Ajman <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sharjah <sup>9</sup> .....	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	0
Umm al Qaywayn <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Subtotal.....	145	11	11	10	12	14	18	32	33	52	53	67	62	53	46	63	87	69	74	56

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	Unkn	TOTAL
<b>Western Europe<sup>5</sup>—Continued</b>																							
Norway.....	12	12	12	15	15	15	20	10	15	15	20	21	31	27	30	25	25	17	19	14	23	6	430
Svalbard <sup>6</sup> .....	0	1	2	2	2	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12
Sweden.....	0	4	10	13	14	27	6	7	34	11	12	18	15	11	11	15	0	5	12	12	26	12	279
Denmark <sup>7</sup> .....	3	2	0	4	2	3	8	9	3	2	6	2	5	10	6	13	2	3	2	4	2	1	134
Ireland.....	0	3	2	4	4	6	5	6	16	8	2	8	4	6	7	6	7	4	4	4	4	0	116
United Kingdom.....	29	33	34	56	68	79	63	74	36	38	34	54	81	82	123	120	128	85	103	105	142	43	2023
Netherlands.....	24	28	22	20	17	22	21	25	22	19	28	28	44	40	39	42	33	29	26	29	35	19	844
Belgium.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	7
West Germany.....	28	26	25	28	29	25	28	27	30	30	25	34	41	30	32	28	22	14	14	6	10	96	2110
France.....	13	8	10	12	9	11	14	14	17	22	21	39	37	23	36	50	71	26	35	33	23	32	1896
Switzerland.....	0	0	0	1	0	0	0	1	1	0	1	1	3	0	0	0	0	0	1	0	0	0	29
Austria.....	15	25	16	15	18	33	20	38	20	22	17	20	20	18	20	11	11	13	17	6	10	62	613
Italy.....	34	42	47	30	23	28	29	23	61	40	53	73	76	49	60	52	85	72	70	29	28	105	2198
Greece.....	2	1	2	4	3	0	1	5	4	5	5	8	11	7	7	4	2	3	4	3	0	10	129
Yugoslavia.....	6	10	1	16	10	6	6	7	18	16	13	10	16	13	13	25	13	4	5	10	6	33	347
Portugal.....	0	0	0	0	3	7	9	1	0	2	0	1	3	2	0	1	0	0	3	0	2	0	79
Spain.....	8	12	6	17	8	15	19	16	18	14	22	22	11	18	14	17	16	12	8	8	4	7	556
Malta.....	0	0	3	1	0	0	0	0	0	0	1	0	2	0	0	1	0	0	0	0	0	0	9
Subtotal.....	174	207	192	238	225	278	249	264	295	244	260	339	400	336	398	410	415	288	322	264	315	429	11811
<b>Middle East—Continued</b>																							
Turkey.....	36	18	23	29	33	43	41	24	22	10	23	19	30	24	16	20	23	27	34	32	24	9	836
Cyprus.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Syria.....	0	0	0	0	1	2	12	5	11	4	2	3	3	1	4	5	16	5	12	3	7	16	140
Lebanon.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Israel.....	8	4	5	2	1	9	8	15	5	0	7	6	8	10	4	1	3	3	1	2	3	13	227
Jordan.....	2	4	2	0	1	0	0	0	1	0	0	0	0	2	4	0	1	2	6	3	1	0	38
Iraq.....	0	1	0	3	3	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	3	114
Iran.....	14	11	9	19	21	21	19	11	12	5	1	0	1	0	0	0	0	0	3	0	1	1	318
Saudi Arabia.....	4	6	7	4	6	5	3	4	5	6	5	2	3	1	2	0	0	0	2	4	1	1	116
Kuwait.....	2	1	1	1	0	0	1	1	0	0	0	0	0	0	2	1	0	0	1	0	0	3	51
Former Neutral Zone <sup>8</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	32
Bahrain.....	0	0	1	1	0	1	0	0	1	0	1	0	0	0	0	2	0	0	0	0	0	1	14
Qatar.....	2	3	3	2	0	0	1	1	1	4	1	0	2	1	0	0	0	1	6	2	3	2	68
Oman.....	3	11	14	12	4	9	11	8	10	14	17	16	21	18	37	26	33	24	20	18	31	1	416
Yemen.....	0	0	2	0	0	0	1	1	1	2	1	4	3	0	3	5	17	9	4	2	4	3	67
Abu Dhabi <sup>9</sup> .....	13	9	1	9	10	6	6	2	5	7	1	6	8	10	7	9	3	0	1	1	3	0	158
Al Fujayrah <sup>9</sup> .....	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
Dubai <sup>9</sup> .....	0	1	1	1	0	0	4	1	0	2	2	1	3	0	6	5	1	2	2	1	1	0	40
Ra's al Khaymah <sup>9</sup> .....	0	1	1	0	0	0	1	1	0	0	1	0	1	2	2	2	1	0	1	0	0	0	16
Ajman <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Sharjah <sup>9</sup> .....	0	1	1	0	1	0	0	0	1	0	2	1	1	2	2	2	0	1	0	0	0	0	21
Umm al Qaywayn <sup>9</sup> .....	0	1	0	0	0	0	2	1	1	0	0	1	1	1	0	0	1	0	0	0	0	0	10
Subtotal.....	85	72	71	83	81	96	113	78	78	55	65	59	86	73	89	76	101	74	91	66	82	53	2695

<sup>5</sup>No wildcat wells were reported for Andorra, Finland, Iceland, Liechtenstein, Luxemburg, or Monaco. Data for Yugoslavia are incomplete.

<sup>6</sup>Svalbard (or Spitsbergen) is a group of islands in the Arctic Ocean north of and belonging to Norway.

<sup>7</sup>Data for Denmark include five wildcat wells drilled in Greenland—one drilled in 1976 and four drilled in 1977.

<sup>8</sup>The former Neutral Zone was located between Kuwait and Saudi Arabia.

<sup>9</sup>One of the seven United Arab Emirates.

**Table 2.** Wildcat wells by year, 1951–90, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued

Area	Pre-1951	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
<b>Africa<sup>10</sup></b>																				
Morocco.....	8	9	6	16	14	11	8	5	3	4	3	14	13	2	8	6	11	9	9	15
Algeria.....	4	8	8	8	23	25	35	29	39	37	53	63	66	64	46	19	14	18	13	30
Tunisia.....	14	0	4	7	15	4	5	4	5	5	0	1	7	4	5	6	7	10	5	3
Libya.....	0	0	0	0	0	0	0	7	24	31	72	91	112	145	134	114	60	40	76	73
Egypt.....	117	1	0	0	3	5	4	6	7	3	8	10	8	10	9	9	14	7	23	25
Western Sahara.....	0	0	0	0	0	0	0	0	0	0	1	9	14	7	4	3	4	5	0	1
Mauritania.....	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
Mali.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Niger.....	0	0	0	0	0	0	0	0	0	0	0	0	6	1	2	0	0	0	0	0
Chad.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sudan.....	0	0	0	0	0	0	0	0	0	0	0	1	3	2	0	0	0	0	0	0
Senegal.....	0	0	0	0	0	1	1	0	3	7	6	7	2	0	0	0	2	5	2	3
The Gambia.....	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Guinea-Bissau.....	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	2	3
Guinea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sierra Leone.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liberia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ivory Coast.....	0	0	0	0	0	0	0	2	3	1	1	1	0	0	0	0	0	0	0	0
Ghana.....	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	2	0	0
Togo.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benin.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Nigeria.....	0	0	1	1	3	6	2	1	17	35	23	17	6	17	32	60	66	81	39	22
Cameroon.....	0	0	0	3	4	0	2	2	1	1	0	0	0	0	0	1	0	4	0	1
Equatorial Guinea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0
Gabon.....	0	3	9	9	5	8	4	11	24	19	8	8	15	5	1	8	8	10	11	21
Central African Republic.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Congo.....	0	0	0	0	0	0	0	1	1	1	6	1	2	1	0	0	0	0	0	1
Zaire.....	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	3	0	0	0	0
Ethiopia.....	7	0	0	0	1	8	7	0	0	0	0	0	0	1	0	1	2	0	0	2
Kenya.....	0	0	0	0	0	0	0	0	0	0	2	1	1	1	1	0	0	1	1	0
Somalia.....	0	0	0	0	0	0	1	4	7	6	3	3	2	3	1	3	1	1	2	2
Angola.....	0	0	0	3	4	1	1	5	4	7	24	10	3	9	4	16	8	15	44	27
Zambia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanzania.....	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	0	0	0	0
Mozambique.....	0	0	0	2	0	0	1	2	0	0	0	1	3	1	0	5	1	15	0	0
Zimbabwe.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burundi.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Namibia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesotho.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madagascar.....	3	0	2	3	0	1	3	3	5	3	6	0	0	1	1	1	0	0	0	0
South Africa.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4	3	11
Mauritius.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seychelles.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal.....	154	21	30	52	72	71	77	86	143	161	218	242	265	275	249	256	200	228	236	243

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	Unkn	TOTAL
<b>Africa<sup>10</sup>—Continued</b>																							
Morocco.....	1	7	6	3	4	4	6	2	4	7	10	11	6	4	4	6	4	7	1	0	1	154	426
Algeria.....	39	26	9	9	15	17	28	23	8	4	2	1	0	3	3	4	3	3	10	15	9	9	842
Tunisia.....	5	11	13	9	16	8	8	8	7	12	16	33	21	11	12	12	7	12	9	8	7	16	372
Libya.....	47	41	31	25	18	42	24	26	36	21	21	34	27	40	37	22	14	16	13	15	4	58	1591
Egypt.....	35	23	20	16	14	19	35	43	29	30	34	49	47	40	31	57	56	49	45	31	22	28	1022
Western Sahara.....	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	65
Mauritania.....	2	0	1	1	3	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	14
Mali.....	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	3
Niger.....	0	0	0	0	0	7	0	0	0	3	3	0	2	0	0	0	0	0	0	0	2	0	26
Chad.....	0	0	0	0	4	2	4	3	5	1	0	0	0	0	0	4	4	0	0	2	1	0	30
Sudan.....	0	0	0	0	0	1	2	1	4	5	2	11	11	11	3	6	2	1	0	4	0	0	70
Senegal.....	5	5	1	0	0	1	2	1	0	0	0	0	1	0	1	0	0	0	1	2	0	13	72
The Gambia.....	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
Guinea-Bissau.....	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	14
Guinea.....	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sierra Leone.....	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
Liberia.....	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	7
Ivory Coast.....	0	0	2	1	1	0	0	3	5	3	1	8	11	2	7	1	0	0	1	0	0	0	54
Ghana.....	9	1	1	1	1	4	0	1	1	1	0	2	1	0	0	2	0	1	0	3	1	0	36
Togo.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	3
Benin.....	4	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Nigeria.....	24	53	55	41	52	32	16	28	31	27	33	26	24	21	13	17	17	17	25	25	25	5	1036
Cameroon.....	6	2	4	2	3	7	4	24	13	13	18	17	9	3	5	4	3	0	0	0	0	0	156
Equatorial Guinea.....	0	1	0	0	0	0	0	0	0	0	0	0	4	0	1	1	1	0	1	0	0	0	15
Gabon.....	12	11	17	13	15	17	14	16	11	19	15	22	15	12	15	13	7	5	18	25	21	10	510
Central African Republic.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Congo.....	2	2	7	6	6	4	0	0	5	7	9	8	9	4	3	7	3	8	5	3	8	2	122
Zaire.....	0	1	7	4	0	4	2	1	2	1	0	3	4	4	4	1	1	0	3	1	0	0	49
Ethiopia.....	1	0	2	5	3	0	0	1	0	0	0	0	0	2	1	1	0	0	0	0	1	6	52
Kenya.....	0	2	0	0	0	1	2	0	1	0	0	2	1	0	0	1	1	0	3	4	1	0	27
Somalia.....	0	0	0	1	1	1	1	1	0	0	1	0	3	0	2	2	0	1	2	0	3	0	58
Angola.....	18	30	11	6	28	9	1	5	4	3	3	11	18	22	11	17	16	16	17	10	16	29	486
Zambia.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
Tanzania.....	0	0	0	0	2	0	2	0	0	1	0	0	2	2	2	2	1	2	0	0	2	0	22
Mozambique.....	10	6	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	52
Zimbabwe.....	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Burundi.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Namibia.....	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6
Lesotho.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Madagascar.....	1	8	1	2	4	1	0	0	0	0	0	0	0	8	4	4	3	2	0	0	1	0	71
South Africa.....	15	18	11	17	2	15	15	11	10	6	8	3	4	10	12	14	21	14	15	19	14	17	293
Mauritius.....	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Seychelles.....	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
Subtotal.....	242	252	202	166	194	199	166	199	176	166	178	243	222	199	173	204	167	157	171	168	142	363	7628

<sup>10</sup>No wildcat wells were reported for Botswana, Burkina Faso (formerly Upper Volta), Cape Verde, Comoros, Djibouti, Malawi, Rwanda, Sao Tome and Principe, Swaziland, Uganda, or Zambia.

**Table 2. Wildcat wells by year, 1951–90, for the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific—Continued**

Area	Pre-1951	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
<b>Non-Communist Asia<sup>11</sup></b>																				
Afghanistan.....	0	0	0	0	0	0	0	0	0	0	1	1	4	0	4	0	0	0	0	0
Pakistan.....	21	0	4	0	1	2	3	10	12	8	2	2	2	3	4	2	3	2	4	2
Maldives.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India.....	4	0	0	2	0	0	1	2	4	3	7	3	8	5	8	13	8	6	9	2
Bangladesh.....	4	0	0	1	0	1	0	0	1	2	5	1	2	1	0	1	0	1	0	2
Myanmar.....	2	0	0	0	0	0	0	0	1	4	0	0	3	0	0	0	0	0	0	0
Thailand.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Sri Lanka.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malaysia.....	20	1	5	4	2	7	4	4	1	1	2	5	5	2	3	0	4	11	12	22
Brunei.....	14	1	0	1	1	4	0	1	0	1	0	1	1	1	0	0	1	0	2	4
Indonesia.....	56	5	5	2	8	7	4	7	5	6	5	3	3	8	15	6	6	8	19	28
Japan.....	0	0	0	0	0	0	0	0	1	3	1	5	0	3	3	3	3	4	3	6
South Korea.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0
Taiwan.....	7	0	0	0	0	1	1	0	2	1	0	0	1	0	4	3	7	8	5	10
Philippines.....	20	0	3	1	0	0	1	3	4	13	17	14	10	3	16	0	0	0	0	0
Subtotal.....	148	7	17	11	12	22	14	27	31	42	40	35	39	26	57	28	32	46	55	78
<b>Southwestern Pacific<sup>12</sup></b>																				
Papua New Guinea.....	29	0	1	0	0	5	2	2	4	2	2	0	1	1	1	1	0	4	8	4
Australia.....	206	1	2	3	5	32	38	32	30	34	19	17	68	101	132	145	90	78	74	91
New Zealand.....	52	0	1	0	0	2	2	2	0	3	1	3	3	4	9	6	3	5	4	8
Fiji.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal.....	287	1	4	3	5	39	42	36	34	39	22	20	72	106	142	152	93	87	86	103
GRAND TOTAL.....	2931	284	311	371	462	561	610	674	883	946	974	904	985	914	919	935	846	827	850	904

Area	1970	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	Unkn	TOTAL
<b>Non-Communist Asia<sup>11</sup>—Continued</b>																							
Afghanistan.....	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	22
Pakistan.....	3	0	4	3	6	4	2	2	3	4	2	8	3	10	18	15	15	8	19	18	9	11	254
Maldives.....	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
India.....	5	2	4	6	4	6	17	15	16	11	10	15	5	20	28	21	33	35	32	45	72	91	578
Bangladesh.....	0	0	0	0	0	0	6	3	1	0	1	2	2	0	0	0	1	4	2	0	0	0	44
Myanmar.....	0	0	3	2	7	8	10	0	0	1	0	5	4	4	5	5	0	2	3	2	2	2	75
Thailand.....	0	1	4	3	13	6	16	0	1	1	3	12	12	23	11	8	2	14	12	2	9	0	155
Sri Lanka.....	0	0	0	0	1	1	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	7
Malaysia.....	44	22	21	22	11	23	5	11	18	36	22	26	10	5	5	11	2	6	7	16	26	16	480
Brunei.....	2	1	5	5	1	13	9	3	6	3	1	3	6	3	9	3	2	2	5	4	6	1	126
Indonesia.....	84	135	117	145	150	131	106	79	95	113	117	128	136	150	122	119	68	54	93	69	72	95	2584
Japan.....	0	4	7	13	19	23	16	18	21	14	9	9	8	7	9	11	12	7	8	9	6	3	268
South Korea.....	0	0	0	5	0	2	0	0	0	0	0	0	0	1	0	0	0	1	2	1	2	0	21
Taiwan.....	5	7	3	15	14	16	8	9	7	9	9	6	0	6	4	5	3	1	0	2	0	43	222
Philippines.....	0	6	9	10	8	12	8	13	13	18	23	13	14	3	1	0	0	3	6	5	4	14	288
Subtotal.....	144	179	178	229	235	245	207	154	181	210	197	229	200	232	212	198	137	134	191	175	208	283	5125
<b>Southwestern Pacific<sup>12</sup>—Continued</b>																							
Papua New Guinea.....	2	2	1	5	2	3	2	1	1	0	1	0	1	1	4	3	2	3	3	10	14	1	129
Australia.....	93	57	73	50	42	19	14	16	43	43	56	100	149	139	152	187	105	155	128	88	115	84	3106
New Zealand.....	10	10	9	2	1	5	6	2	8	1	4	5	2	7	17	17	16	10	9	5	5	2	261
Fiji.....	0	0	0	0	0	0	0	0	0	0	2	1	4	0	0	0	0	0	0	0	0	0	7
Subtotal.....	105	69	83	57	45	27	22	19	52	44	63	106	156	147	173	207	123	168	140	103	134	87	3503
<b>GRAND TOTAL.....</b>	<b>979</b>	<b>1057</b>	<b>1006</b>	<b>1048</b>	<b>1017</b>	<b>1081</b>	<b>983</b>	<b>955</b>	<b>998</b>	<b>949</b>	<b>1104</b>	<b>1408</b>	<b>1523</b>	<b>1374</b>	<b>1399</b>	<b>1432</b>	<b>1175</b>	<b>1068</b>	<b>1176</b>	<b>1006</b>	<b>1048</b>	<b>1689</b>	<b>42566</b>

<sup>11</sup>No wildcat wells were reported for Bhutan, Nepal, or Singapore.

<sup>12</sup>No wildcat wells were reported for New Caledonia (an overseas territory of France), Kiribati, Nauru, Solomon Islands, Tonga, Tuvalu, Vanuatu (formerly New Hebrides), or Western Samoa.

**Table 3. Regional distribution of total and offshore wildcat wells drilled through 1990 and discoveries in terms of estimated ultimate recovery**

[Drilling data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva (see table 2). Drilling data for Mexico, India, and some countries in the Middle East are known to be incomplete. Oil and gas data are from a computer tape released in January 1991 by Petroconsultants and are supplemented by field estimates from the Dallas Field Office of the Energy Information Administration (written commun., November 1990). BBO, billion ( $\times 10^9$ ) barrels of oil; TCF, trillion ( $\times 10^{12}$ ) cubic feet]

	Total			Offshore		
	Wildcat wells	Oil (BBO)	Gas (TCF)	Wildcat wells	Oil (BBO)	Gas (TCF)
Mexico.....	251	61.6	38.5	17	22.3	13.9
Caribbean.....	440	.109	.166	20	.021	.005
Central America.....	230	.068	.001	66	0	0
South America.....	10,883	135	180	1,430	24.4	52.6
Western Europe*.....	11,464	58	467	3,310	52.2	286
Middle East.....	2,695	712	1,410	338	126	441
Africa.....	7,628	120	305	2,007	29.7	48.4
Non-Communist Asia.....	5,125	49.3	322	2,197	21.5	200
Southwestern Pacific.....	3,503	6.58	98.7	619	5.43	70.1
<b>Total study area.....</b>	<b>42,219</b>	<b>1,141.657</b>	<b>2,821.367</b>	<b>10,004</b>	<b>281.551</b>	<b>1,112.005</b>

\*Data for Western Europe exclude data for Yugoslavia, which are incomplete.

**Table 4.** Year of first discovery and cumulative recoverable oil and gas discoveries through 1990 in the 99 significant petroleum provinces in the study area

[The study area is the world outside the United States, Canada, Eastern Europe, and Communist areas of Asia. Each significant province has at least one field containing 100 million barrels of recoverable oil. Data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva, and are supplemented by field estimates from the Dallas Field Office of the Energy Information Administration (written commun., November 1990). Data for oil discoveries in four areas are graphed in figures 9–12]

Petroleum province, country	Year of first discovery	Oil, cumulative recoverable discoveries through 1990, in barrels $\times 10^6$	Gas, cumulative recoverable discoveries through 1990, in cubic feet $\times 10^9$
<b>Mexico</b>			
Tampico-Misantla Basin .....	1901	21,687	5,261
Salina Basin .....	1904	24,034	17,782
Tamaulipas Arch .....	1909	291	0
Cantarell Complex (Campeche Shelf) .....	1948	15,035	8,015
Total .....		61,047	31,058
<b>South America (fig. 9)</b>			
Progreso Basin, Peru and Ecuador .....	1863	152	504
Eastern Venezuela Basin, Trinidad and Tobago and Venezuela .....	1867	25,428	25,911
Talara Basin, Peru .....	1875	2,442	2,629
Southern Range Uplift, Trinidad and Tobago .....	1912	288	356
Maracaibo Basin, Venezuela .....	1914	59,667	17,370
San Jorge Basin, Argentina .....	1916	3,893	6,491
Middle Magdalena Basin, Colombia .....	1918	2,379	3,097
Catatumbo Basin, Colombia .....	1920	473	922
Falcon Basin, Venezuela .....	1921	371	395
Neuquen Basin, Argentina .....	1922	2,668	25,895
Sub-Andean Zone, Argentina, Bolivia, and Peru .....	1926	289	16,653
Serrania Interior Oriental Belt, Venezuela .....	1928	922	2,358
Greater Furrrial Trend, Venezuela .....	1929	9,253	6,918
Cuyo Basin, Argentina .....	1932	1,484	356
Reconcavo Basin, Brazil .....	1939	1,608	2,001
Llanos Basin, Colombia .....	1948	2,413	71
Barinas-Apure Basin, Colombia and Venezuela .....	1948	1,671	13
Putumayo Basin, Colombia .....	1949	370	1,261
Austral Basin, Argentina .....	1949	759	12,676
Upper Magdalena Basin, Colombia .....	1950	968	243
Sergipe-Alagoas Basin, Brazil .....	1957	736	1,379
Napo Basin, Ecuador .....	1967	3,748	659
Ariari-Apiay Block, Colombia .....	1969	255	221
Maranon Basin, Peru .....	1971	1,163	78
Potiguar Basin, Brazil .....	1973	428	747
Campos Basin, Brazil .....	1975	10,005	11,654
Santos Basin, Brazil .....	1979	120	333
Total .....		133,953	141,191

**Table 4.** Year of first discovery and cumulative recoverable oil and gas discoveries through 1990 in the 99 significant petroleum provinces in the study area—Continued

Petroleum province, country	Year of first discovery	Oil, cumulative recoverable discoveries through 1990, in barrels × 10 <sup>6</sup>	Gas, cumulative recoverable discoveries through 1990, in cubic feet × 10 <sup>9</sup>
<b>Western Europe<sup>1</sup> (fig. 10)</b>			
Po Basin, Italy .....	1866	225	15,093
Northwest German Basin, Germany, Denmark, and Netherlands.....	1874	2,329	150,921
Anglo-Paris Basin, France and United Kingdom ...	1895	913	440
Carpathian Flysch Zone, Austria.....	1930	654	1,425
Anglo-Dutch Basin, Netherlands and United Kingdom.....	1939	910	80,268
Aquitaine Basin, France .....	1939	512	10,749
Ibleian Platform, Italy and Malta .....	1952	553	144
Caltanissetta Basin, Italy.....	1956	174	38
North Sea Graben, United Kingdom, Norway, Denmark, Germany, and Netherlands.....	1966	44,023	108,354
Vestland Arch, Norway and United Kingdom.....	1968	1,555	2,577
Catalano-Balearic Basin, Spain.....	1970	330	140
North Aegean Sea Basin, Greece .....	1971	173	160
Mid North Sea High, United Kingdom.....	1971	240	2
Norwegian-Danish Basin, Norway .....	1972	195	35
Adriatic Basin, Italy (and E. Europe) .....	1972	706	8,925
East Shetland Platform, United Kingdom.....	1975	742	320
West Shetland Basin, United Kingdom.....	1977	840	650
Horda Platform, Norway.....	1979	404	44,214
Kristiansund-Bodo Fault Complex, Norway.....	1981	1,345	7,734
Trondelag Platform, Norway .....	1984	464	610
Voring Basin, Norway.....	1985	138	2,685
Total .....		57,425	435,484
<b>Middle East</b>			
Zagros Fold Belt, Iran, Iraq, Syria, and Turkey....	1903	133,132	576,982
Arabian Basin, Iran, Iraq, Saudi Arabia, Kuwait, former Neutral Zone, <sup>2</sup> Bahrain, Qatar, Syria, Oman, and United Arab Emirates .....	1932	566,628	770,433
Qom Basin, Iran .....	1956	175	1,138
Oman Basin, Oman .....	1957	9,379	9,593
Taurus-Zagros Foothill Belt, Turkey .....	1961	620	281
Ma'rib-Al Jawf Basin, Yemen.....	1984	1,427	12,500
Shabwa, Yemen.....	1987	500	0
Total .....		711,861	1,370,927

**Table 4.** Year of first discovery and cumulative recoverable oil and gas discoveries through 1990 in the 99 significant petroleum provinces in the study area—Continued

Petroleum province, country	Year of first discovery	Oil, cumulative recoverable discoveries through 1990, in barrels × 10 <sup>6</sup>	Gas, cumulative recoverable discoveries through 1990, in cubic feet × 10 <sup>9</sup>
<b>Africa (fig. 11)</b>			
Gulf of Suez Basin, Egypt .....	1886	9,459	4,893
Pelagian Basin, Libya and Tunisia .....	1949	2,237	5,685
Niger Delta, Cameroon, Equatorial Guinea, and Nigeria .....	1954	32,107	72,247
Illizi Basin, Algeria .....	1956	2,532	27,226
Hassi Messaoud High, Algeria .....	1956	12,746	22,982
Atchan Uplift, Algeria and Libya .....	1956	1,553	5,271
Gabon Coastal Basin, Gabon .....	1956	2,605	795
Lower Congo Basin, Angola, Congo, Gabon, and Zaire .....	1957	6,790	7,971
Sirte Basin, Libya .....	1958	44,049	22,478
Ghadames Basin, Algeria, Libya, and Tunisia .....	1958	2,447	7,526
Oued Mya Basin, Algeria .....	1961	1,099	702
Muglad Basin, Sudan .....	1979	499	0
Atchan Saddle, Libya .....	1984	230	0
Total .....		118,353	177,776
<b>Non-Communist Asia (fig. 12)</b>			
North Sumatra Basin, Indonesia .....	1885	711	25,927
East Java Basin, Indonesia .....	1888	386	7,697
Mizoram-Manipur Foothills, India .....	1889	344	1,360
South Sumatra Basin, Indonesia .....	1896	2,915	5,386
Kutei Basin, Indonesia .....	1897	3,349	29,540
Tarakan Basin, Indonesia .....	1900	447	1,502
Central Burma Basin, Myanmar .....	1902	656	7,210
Baram Delta, Malaysia and Brunei .....	1910	6,074	25,562
Potwar Basin, Pakistan .....	1915	360	2,669
Central Sumatra Basin, Indonesia .....	1920	13,399	2,060
Salawati Basin, Indonesia .....	1936	724	493
Barito Basin, Indonesia .....	1937	180	66
Tiga Pulah Arch, Indonesia .....	1940	137	0
Assam Basin, India .....	1953	1,585	1,785
Cambay Basin, India .....	1958	1,391	3,858
Narmada Graben, India .....	1960	637	528
Balingian Basin, Malaysia .....	1962	470	808
Malaya Basin, Malaysia and Indonesia .....	1969	4,697	18,487
West Java Basin, Indonesia .....	1969	2,915	6,641
Sunda Basin, Indonesia .....	1970	1,141	639
West Natuna Basin, Indonesia .....	1972	396	2,329
Bombay Basin, India .....	1974	4,494	16,278
Cauvery Basin, India .....	1979	186	326
Total .....		47,594	161,151
<b>Southwestern Pacific</b>			
Gippsland Basin, Australia .....	1924	4,546	10,844
North Carnarvon Basin, Australia .....	1953	695	2,773
Papuan Fold Belt, Papua New Guinea .....	1956	260	3,975
Bonaparte Basin, Australia .....	1964	375	6,779
Total .....		5,876	24,371

<sup>1</sup>The Pannonian Basin, which extends into Austria, is a significant province only in Eastern Europe.

<sup>2</sup>The former Neutral Zone was located between Kuwait and Saudi Arabia.

**Table 5.** Regional distribution of land area, delineated prospective area, explored area, and rate of addition to prospective area

[Mexico is excluded from this table because drilling data are substantially incomplete. Data from figures 17–54. Some data in the last two columns are also shown in figures 14 and 15]

Region	Land area (mi <sup>2</sup> )	Prospective area through 1990 (mi <sup>2</sup> )	Explored area through 1990 (mi <sup>2</sup> )	Rate of addition to prospective area, 1981–90 (mi <sup>2</sup> /wildcat well)	Percentage of total prospective area delineated by 1971	Percentage of oil discoveries in area delineated by 1971
Caribbean .....	85,172	12,345	1,797	31.6	86.2	44.0
Central America .....	212,318	14,007	1,605	75.3	32.0	88.2
South America .....	6,863,319	430,794	105,895	33.7	46.2	83.8
Western Europe .....	2,224,255	479,186	106,340	24.5	55.4	30.2
Middle East .....	2,388,187	222,333	31,128	61.2	39.5	87.1
Africa .....	11,644,658	459,860	77,425	47.0	56.3	89.7
Non-Communist Asia .....	3,443,324	295,445	50,997	57.6	21.4	62.0
Southwestern Pacific .....	3,293,782	220,211	32,854	64.0	40.5	79.4
Total .....	30,155,015	2,134,181	408,041	42.3	45.9	82.3

**Table 6.** Estimates of ultimate recovery of cumulative oil discovered by region from 1900 to 1980 as recorded by Petroconsultants in the first tapes issued in 1981, 1984, 1987, and 1990

[Oil in barrels × 10<sup>6</sup>. Data are graphed in figure 16]

Region	Petroconsultants' tape			
	1981	1984	1987	1990
South America .....	37,597	66,432	66,260	81,578
Western Europe .....	27,270	31,069	31,899	35,847
Middle East .....	421,907	516,908	525,658	643,802
Africa .....	72,216	78,510	86,829	84,471
Non-Communist Asia .....	23,280	28,516	33,199	38,951
Total .....	582,270	721,435	743,845	884,649

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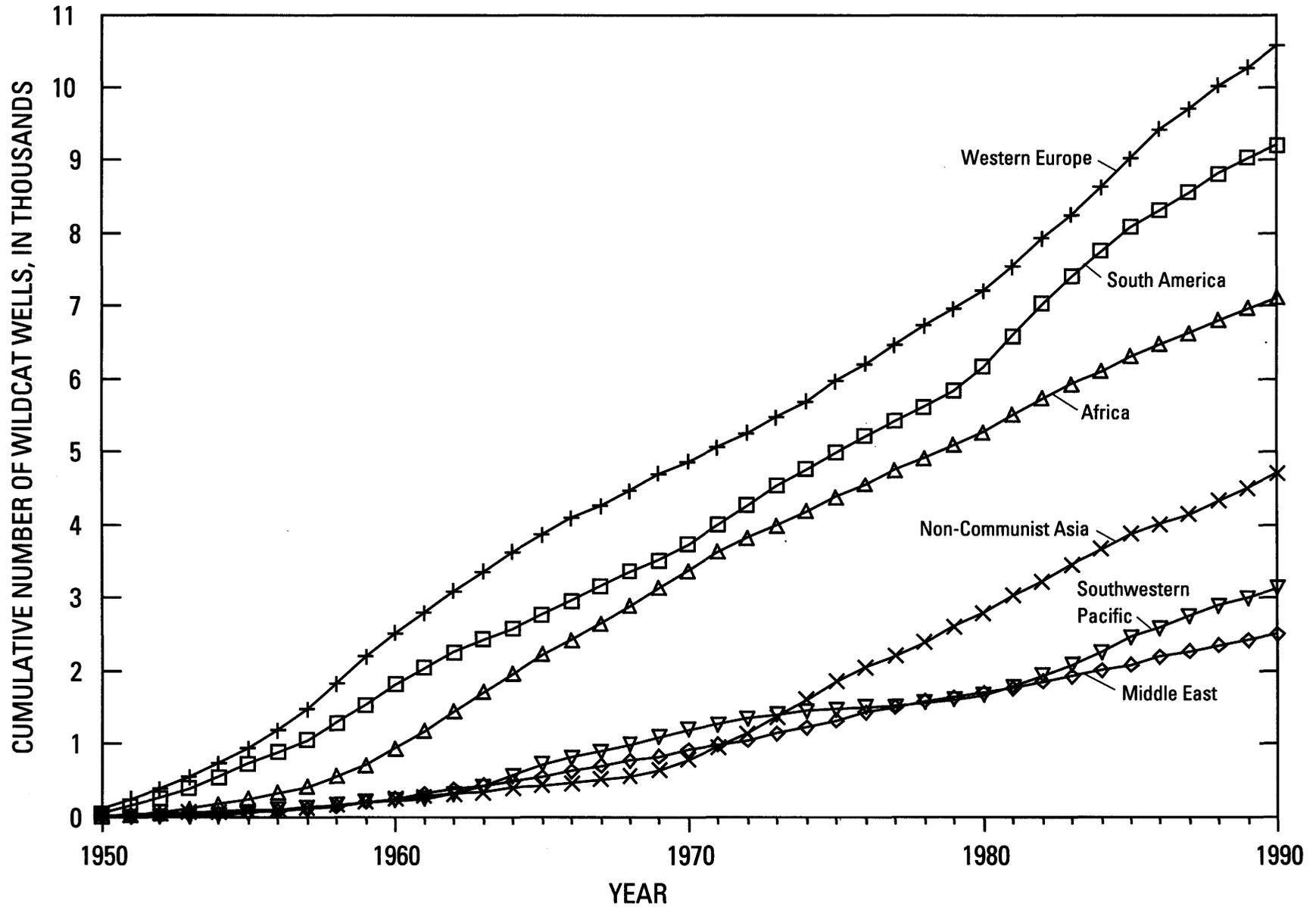
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## FIGURES 1–16

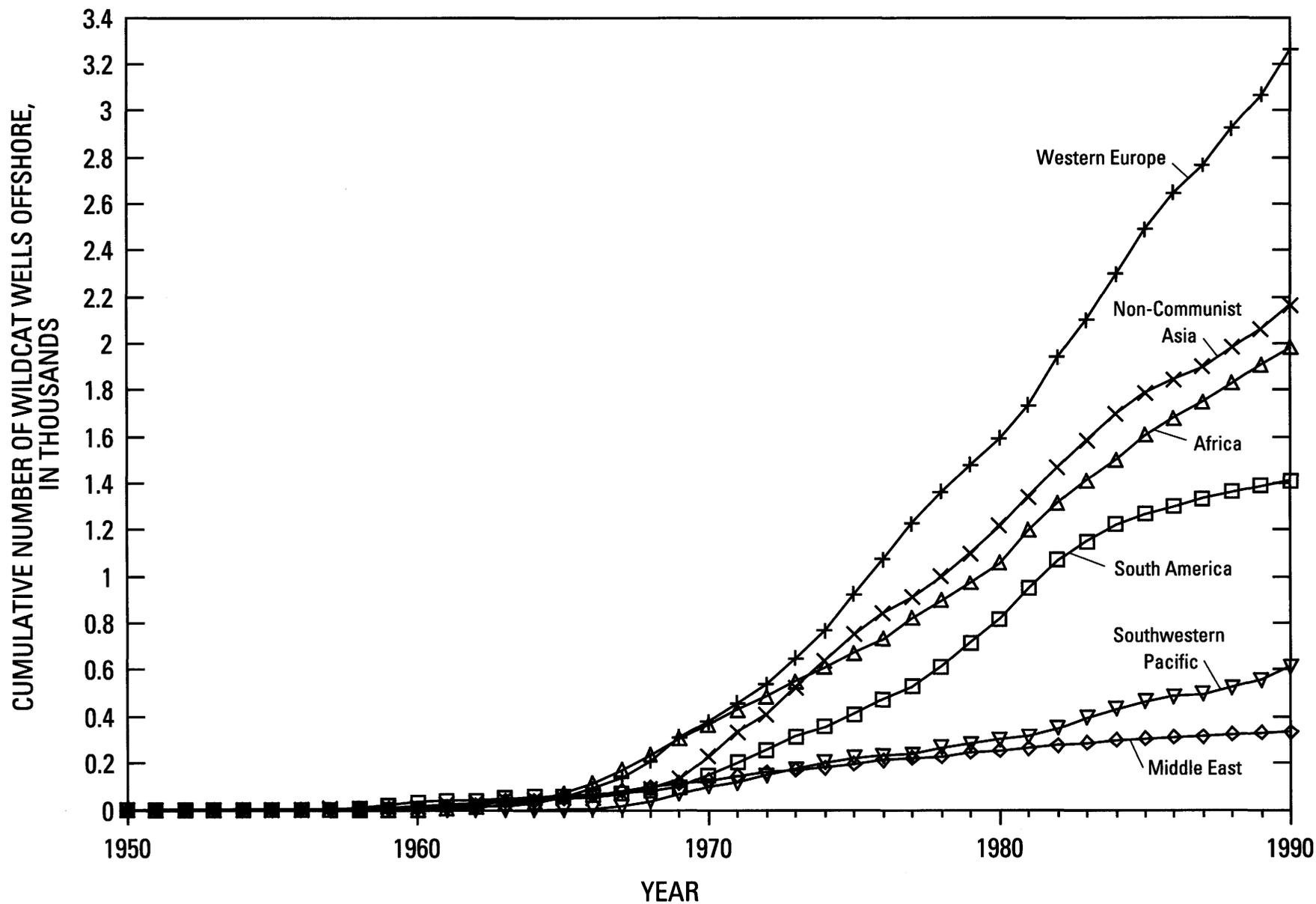
[An introduction to figures 17–54 and the figures themselves follow figure 16]

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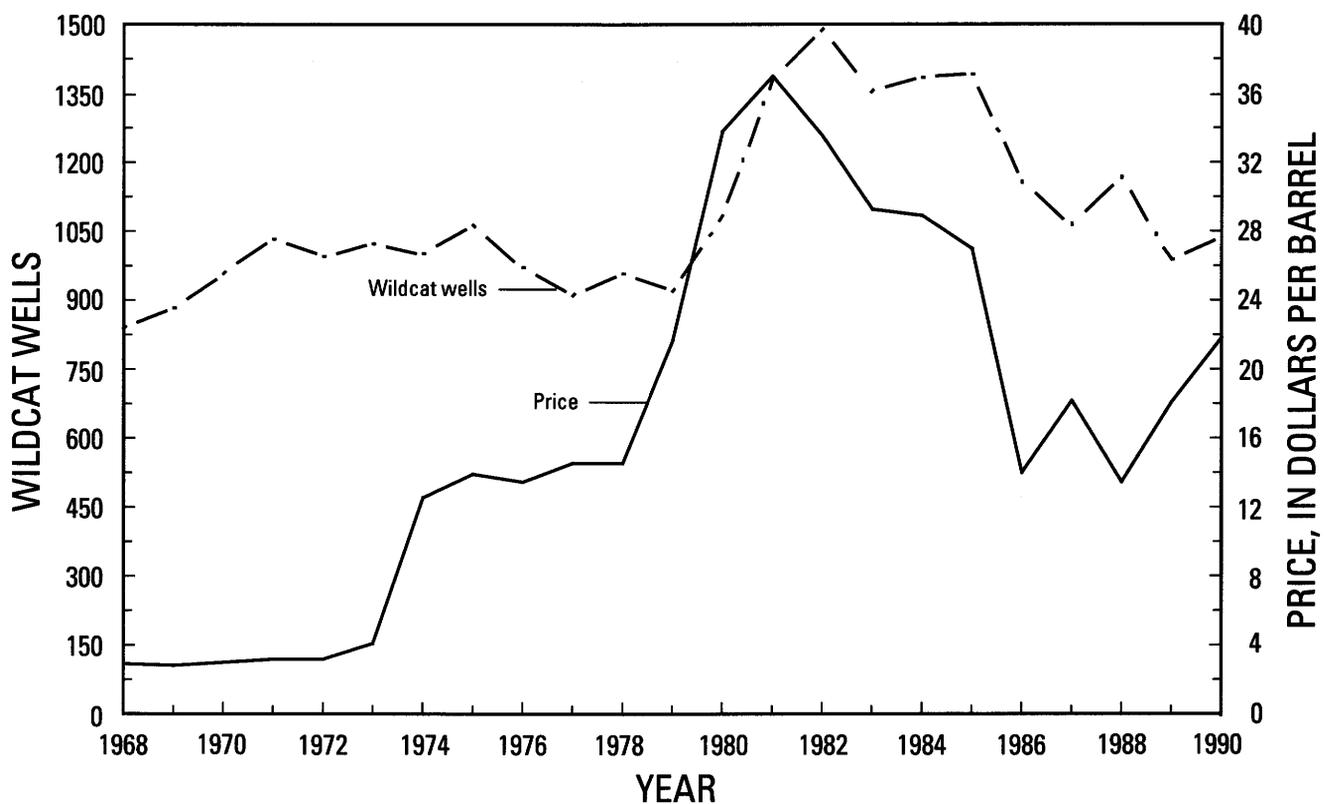
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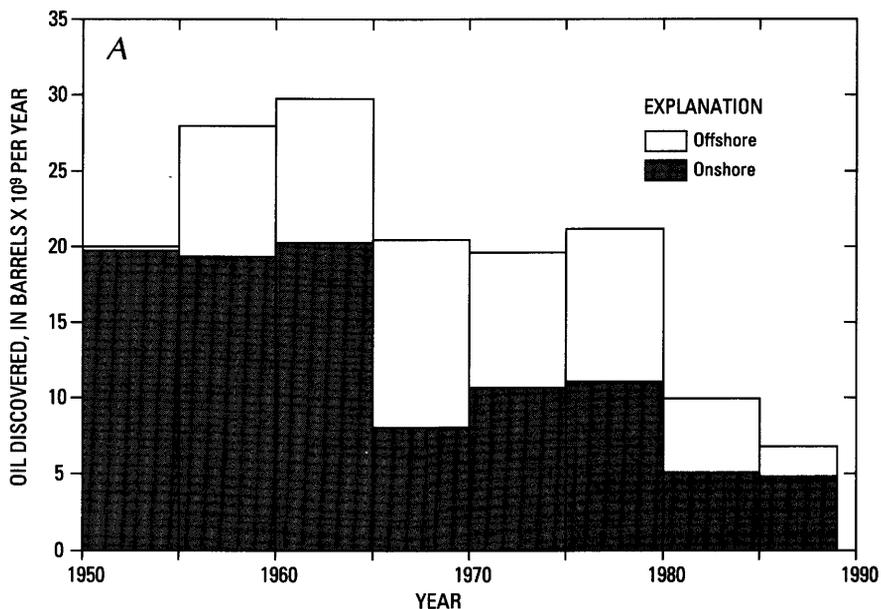
**Figure 1.** Time profiles of the cumulative number of offshore and onshore wildcat wells drilled in South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific, 1950–90. Data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva, and are given by country and year in table 2.

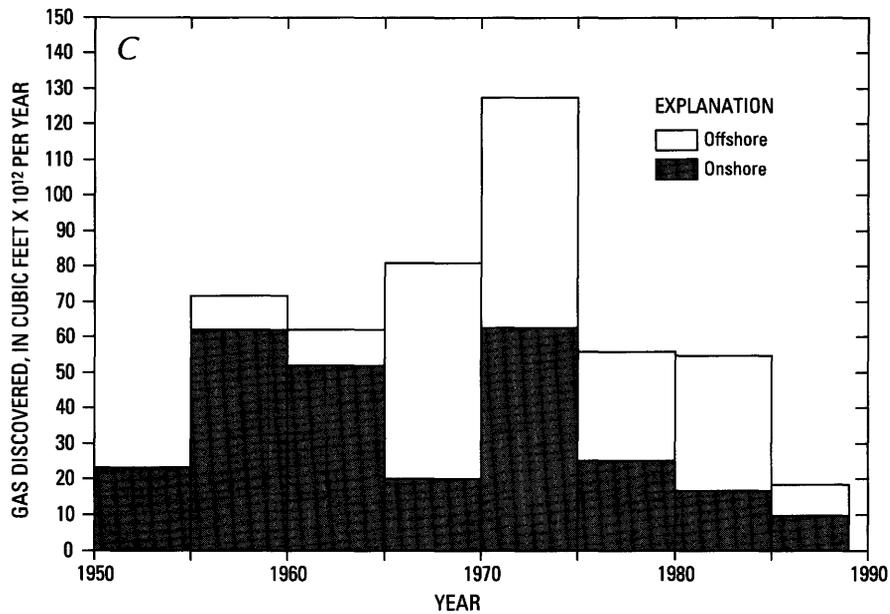
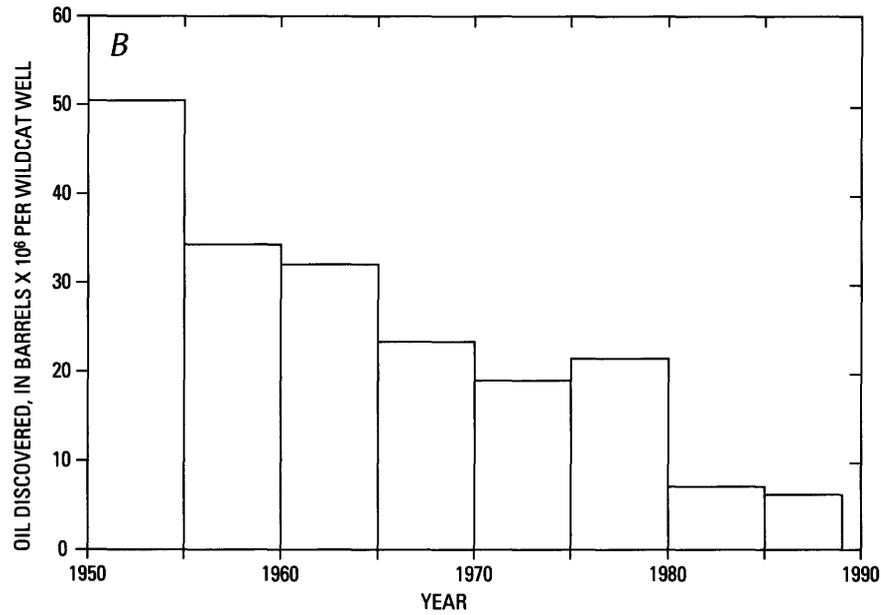


**Figure 2.** Time profiles of the cumulative number of offshore wildcat wells drilled in South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific, 1950–90. Data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva.

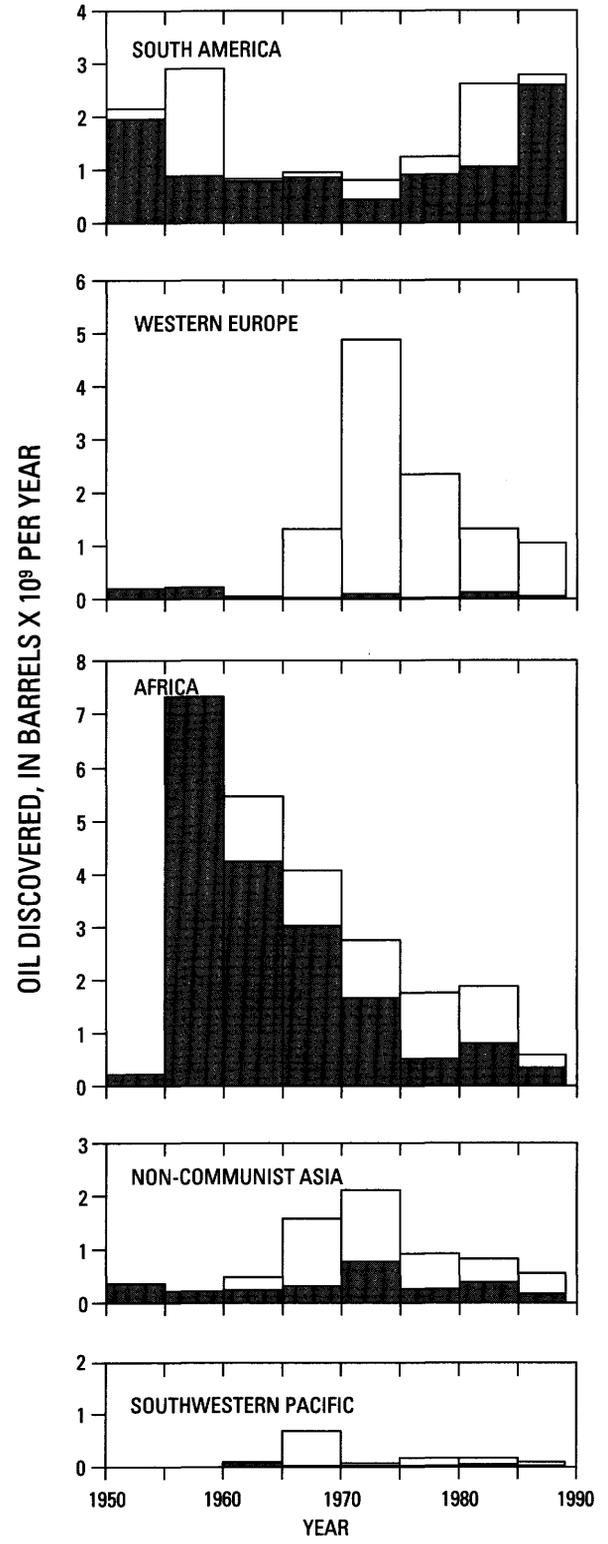
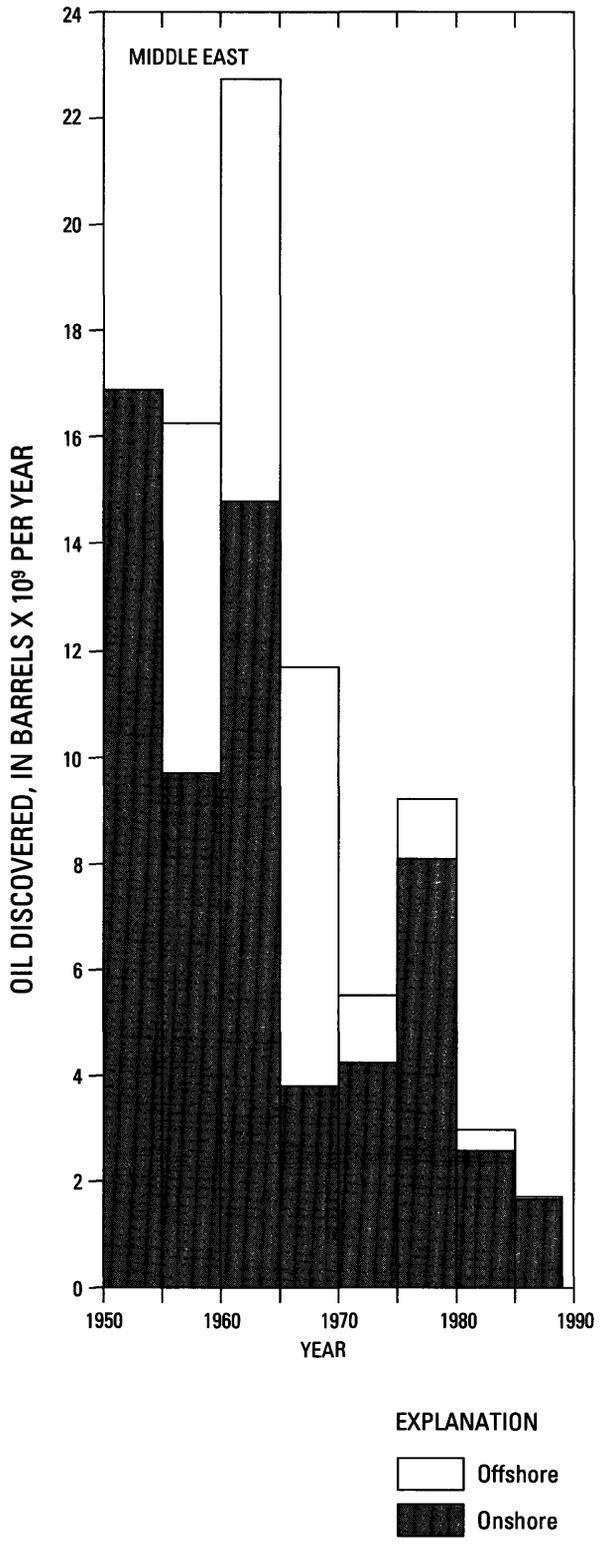


**Figure 3.** Time profile of annual wildcat drilling in the study area and U.S. refiners' crude-oil acquisition price, 1968-90. Wildcat well data are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva, and crude-oil acquisition prices are from the American Petroleum Institute's *Basic Petroleum Data Book*, January 1992. Prices are in current dollars.

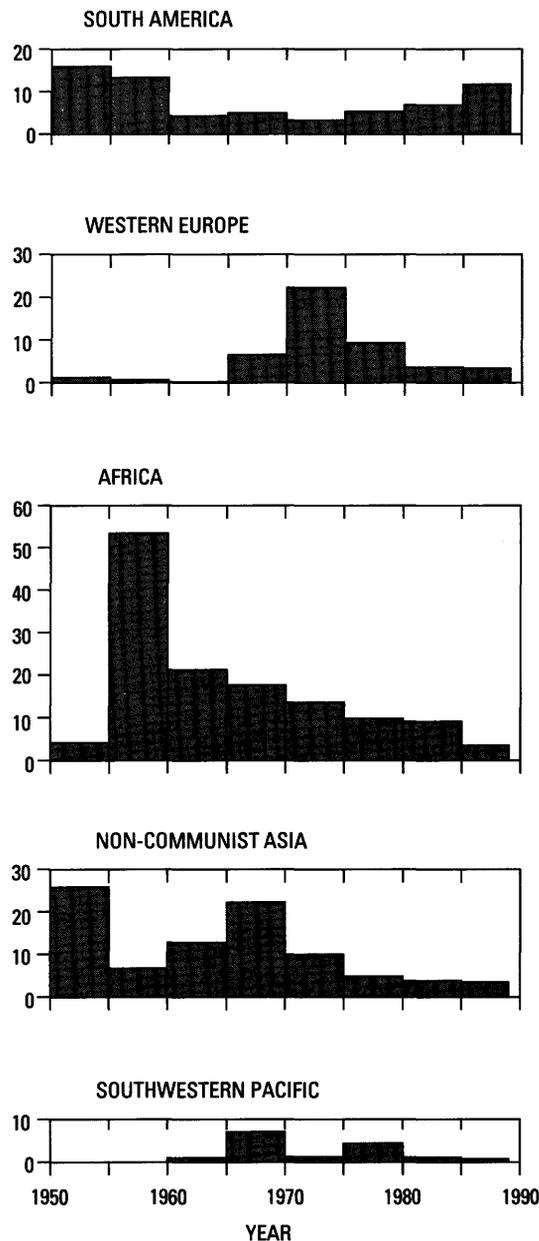
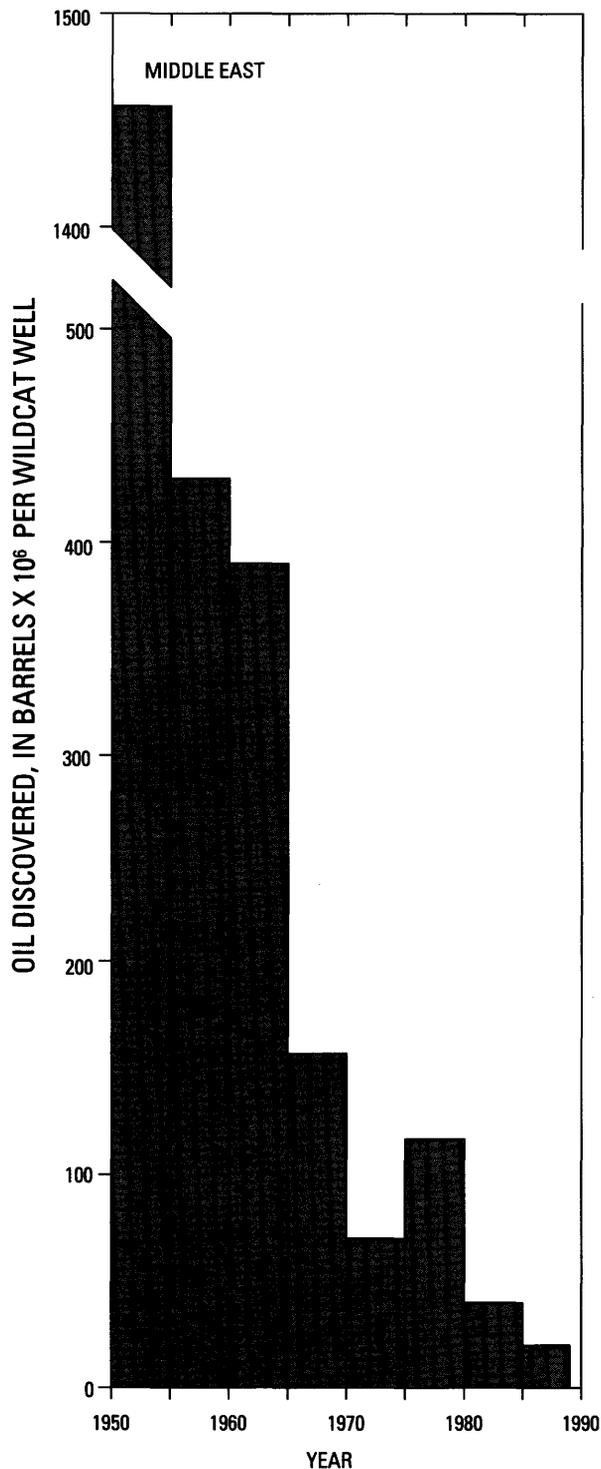




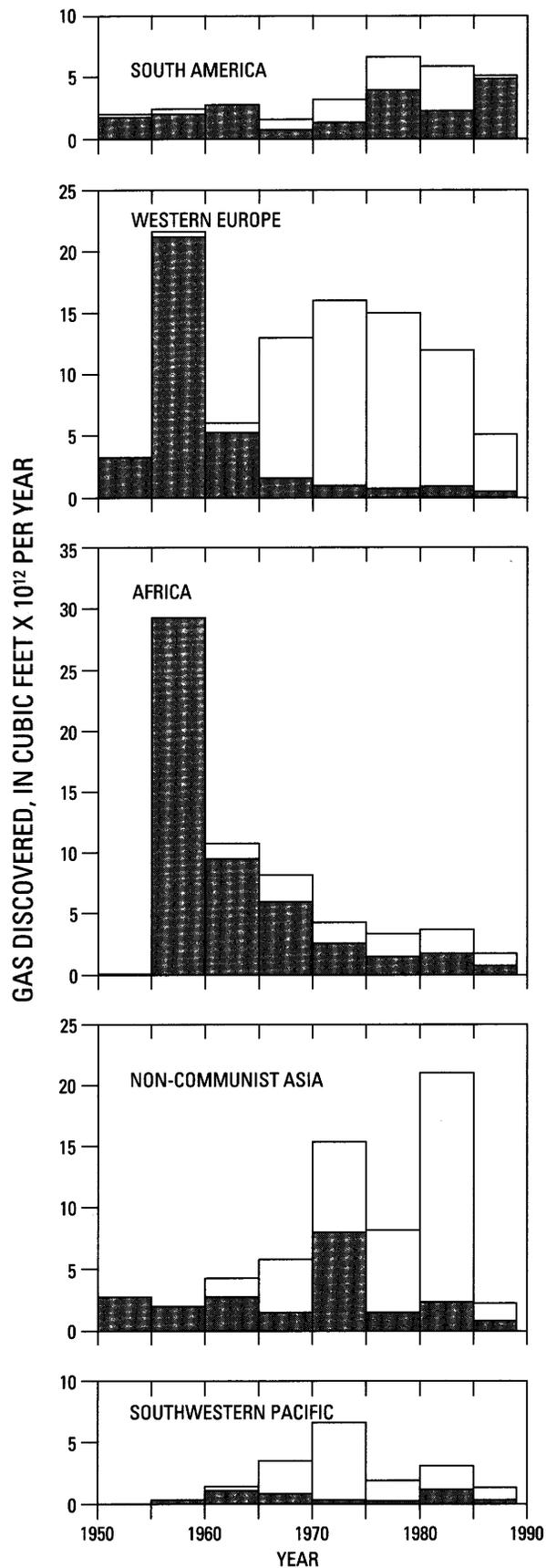
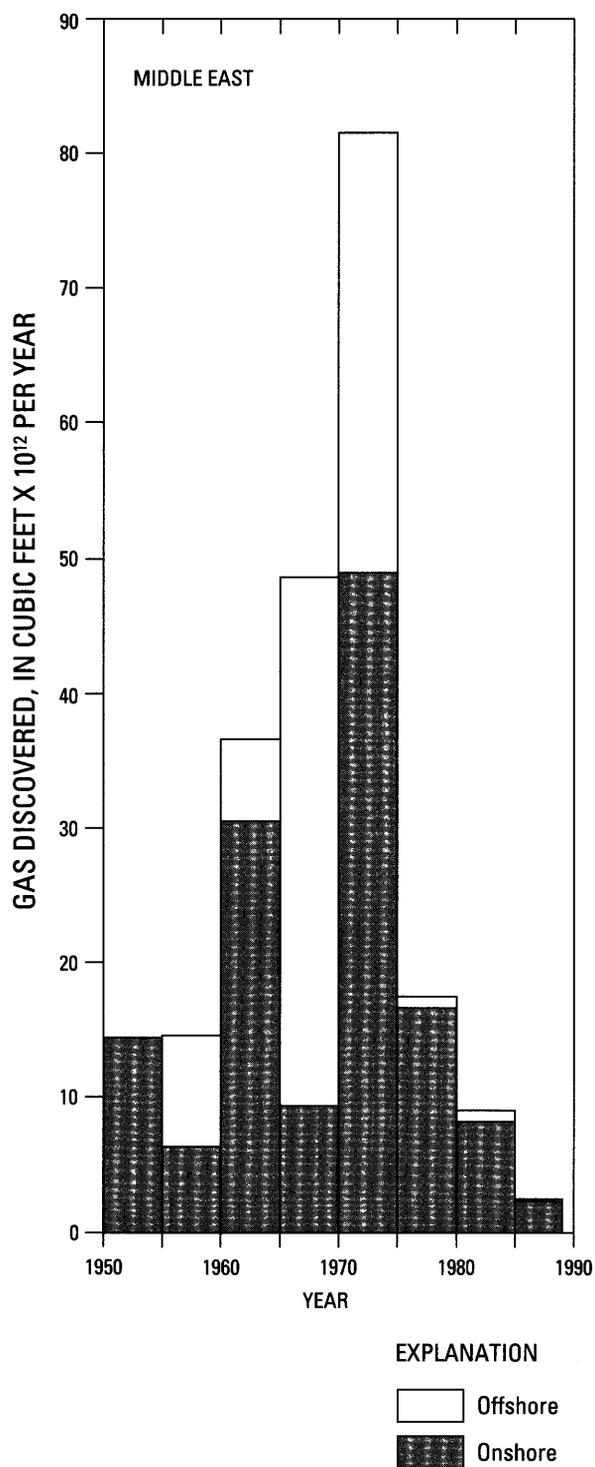
↖ **Figure 4.** Oil and gas discovery rates for the study area. *A*, Annual onshore and off-shore oil discovery rates. *B*, Amount of oil discovered per wildcat well. *C*, Annual onshore and offshore gas discovery rates. For figure 4A–C, data are averaged for 5-year periods, 1951–85, and the 4-year period, 1986–89. The estimates are from a computer tape released in January 1991 by Petroconsultants, and supplemental information on oil was provided by the Dallas Field Office of the Energy Information Administration. Oil or gas discovered was classified as offshore only when it was found in a field that was entirely offshore.



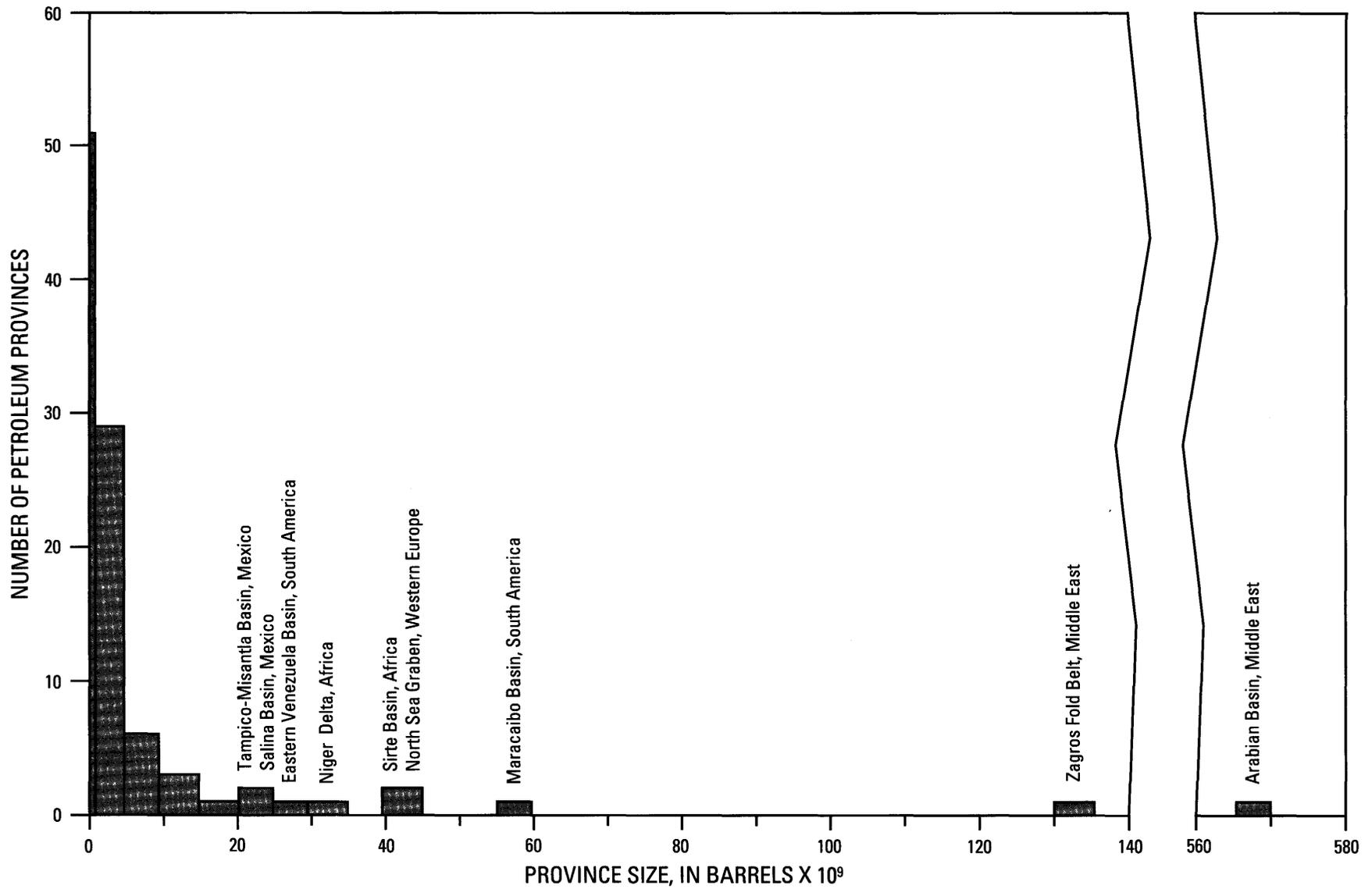
**Figure 5.** Annual offshore and onshore regional oil discovery rates for South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. Data are averaged for 5-year periods, 1951–85, and the 4-year period, 1986–89. The field estimates of recoverable oil are from a computer tape released in January 1991 by Petroconsultants and were supplemented by information provided by the Dallas Field Office of the Energy Information Administration. Oil discovered was classified as offshore only when it was found in a field that was entirely offshore.



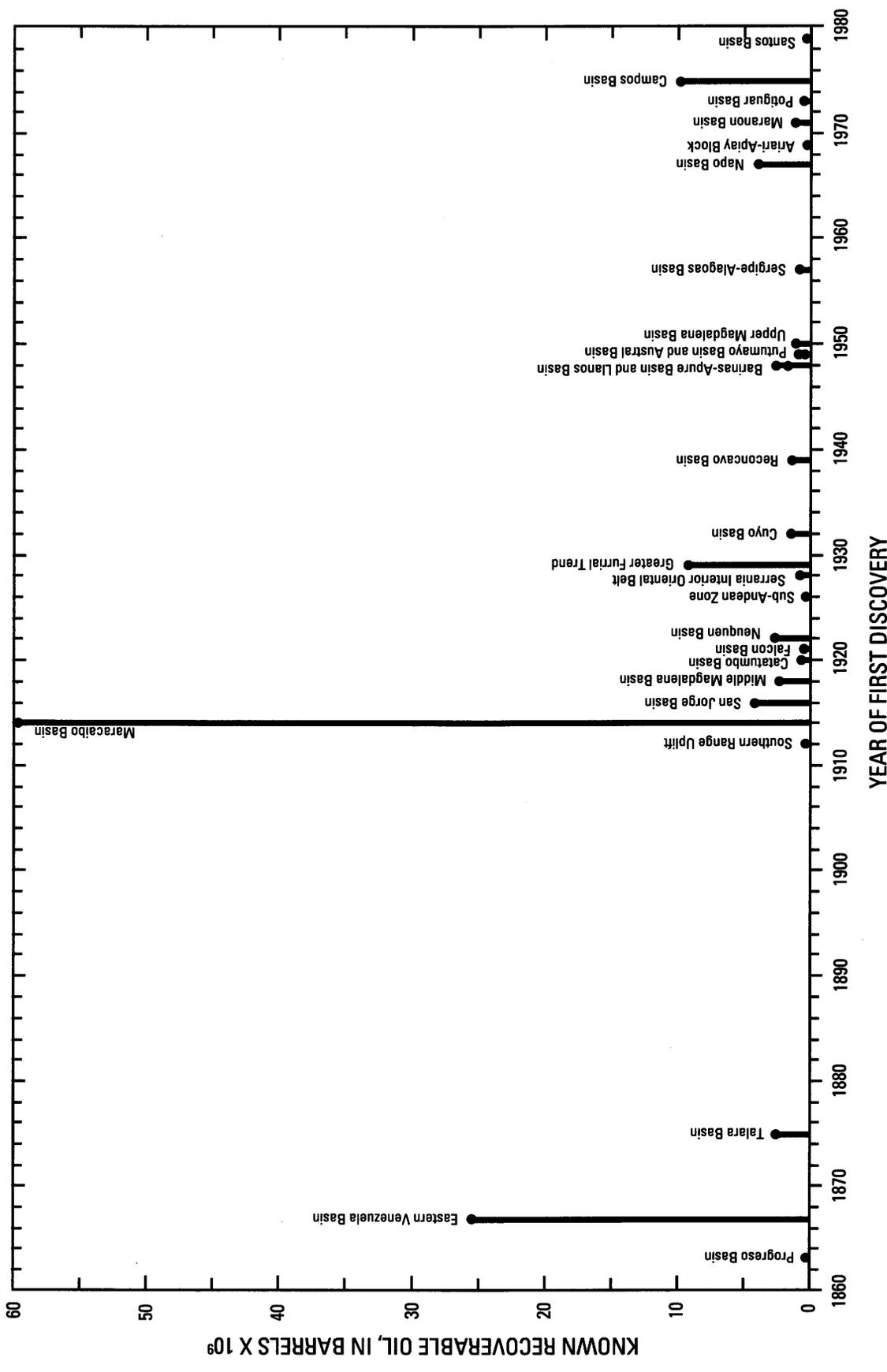
**Figure 6.** The amount of oil discovered per wildcat well for South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. Data are averaged for 5-year periods, 1951–85, and the 4-year period, 1986–89. The vertical scale of the graph for the Middle East is half the scale of the other graphs; even so, the discovery rate in the first period requires the graph to be broken. Wildcat-well data are from a computer tape released in January 1991 by Petroconsultants. The field estimates of recoverable oil are from a computer tape released in January 1991 by Petroconsultants and were supplemented by information provided by the Dallas Field Office of the Energy Information Administration.



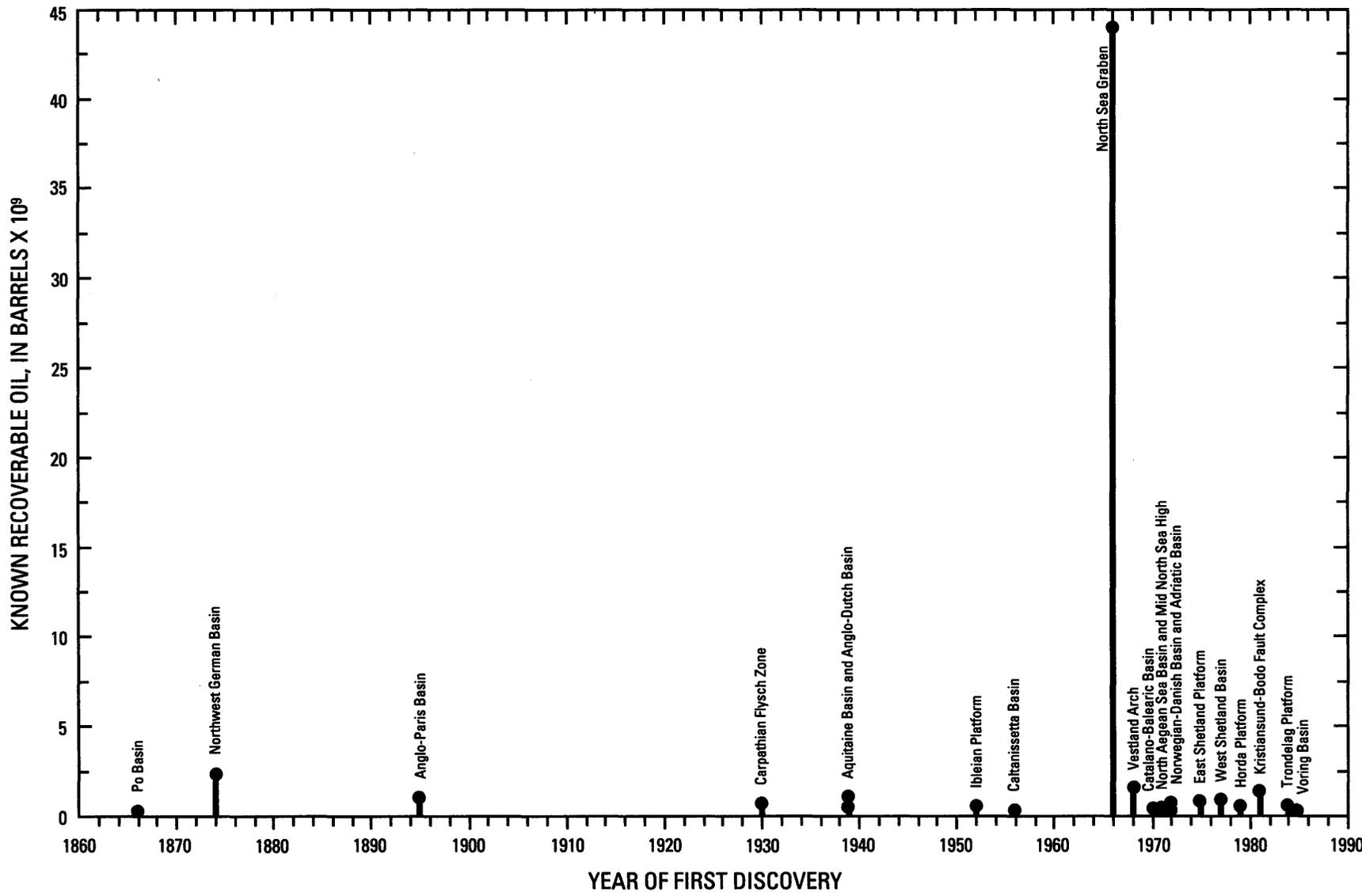
**Figure 7.** Annual offshore and onshore regional gas discovery rates for South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. Data are averaged for 5-year periods, 1951–85, and the 4-year period, 1986–89. The field estimates of recoverable gas are from a computer tape released in January 1991 by Petroconsultants. Gas discovered was classified as offshore only when it was found in a field that was entirely offshore.



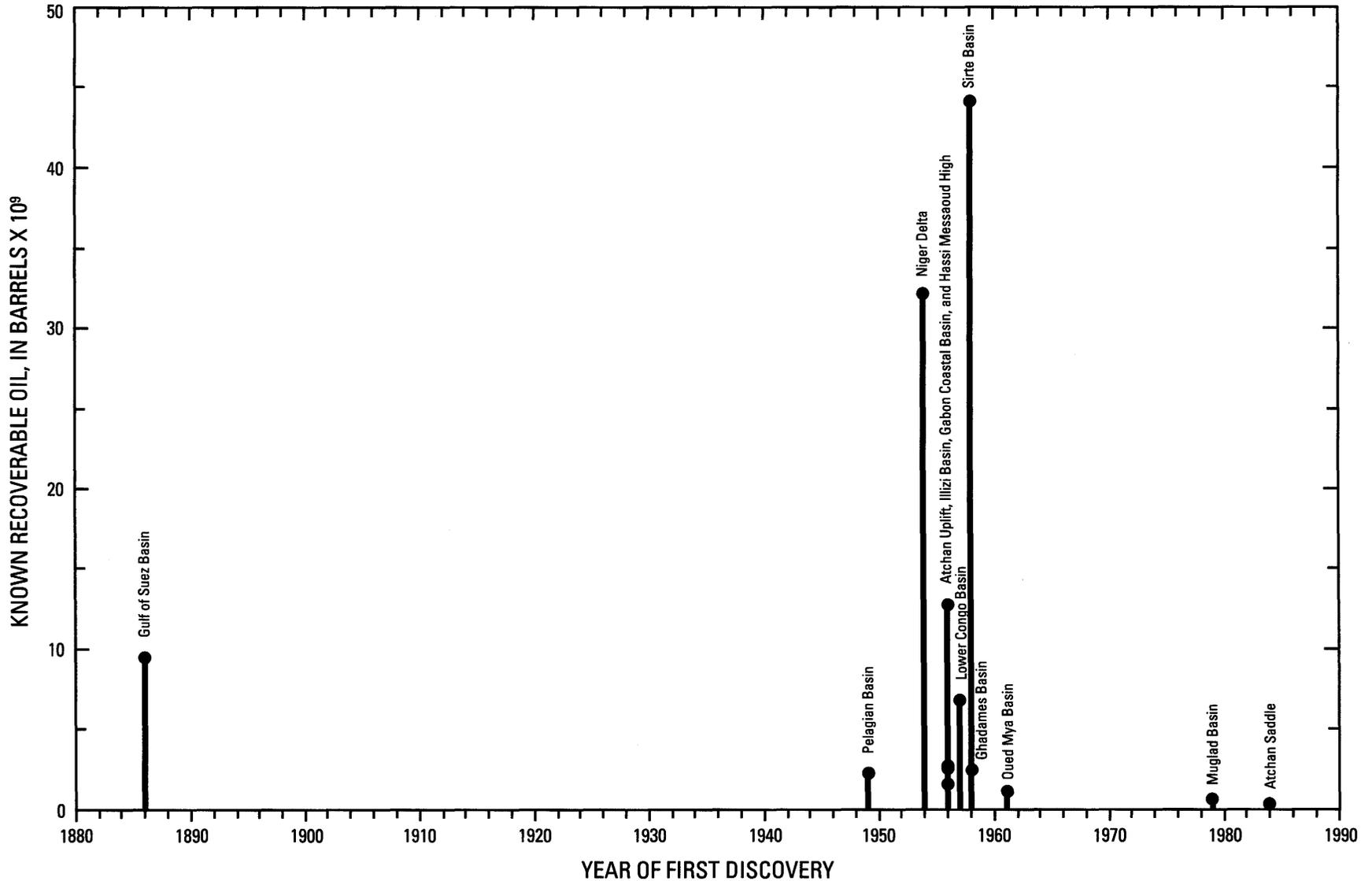
**Figure 8.** Frequency distribution of sizes of the 99 significant petroleum provinces identified through 1990 in the study area. Estimates of recoverable oil in each province are from a computer tape released in January 1991 by Petroconsultants, and supplemental information was provided by the Dallas Field Office of the Energy Information Administration. Each significant province has at least one field containing 100 million barrels of recoverable crude oil. All the significant provinces are named in table 4; the largest provinces are labeled in this graph.



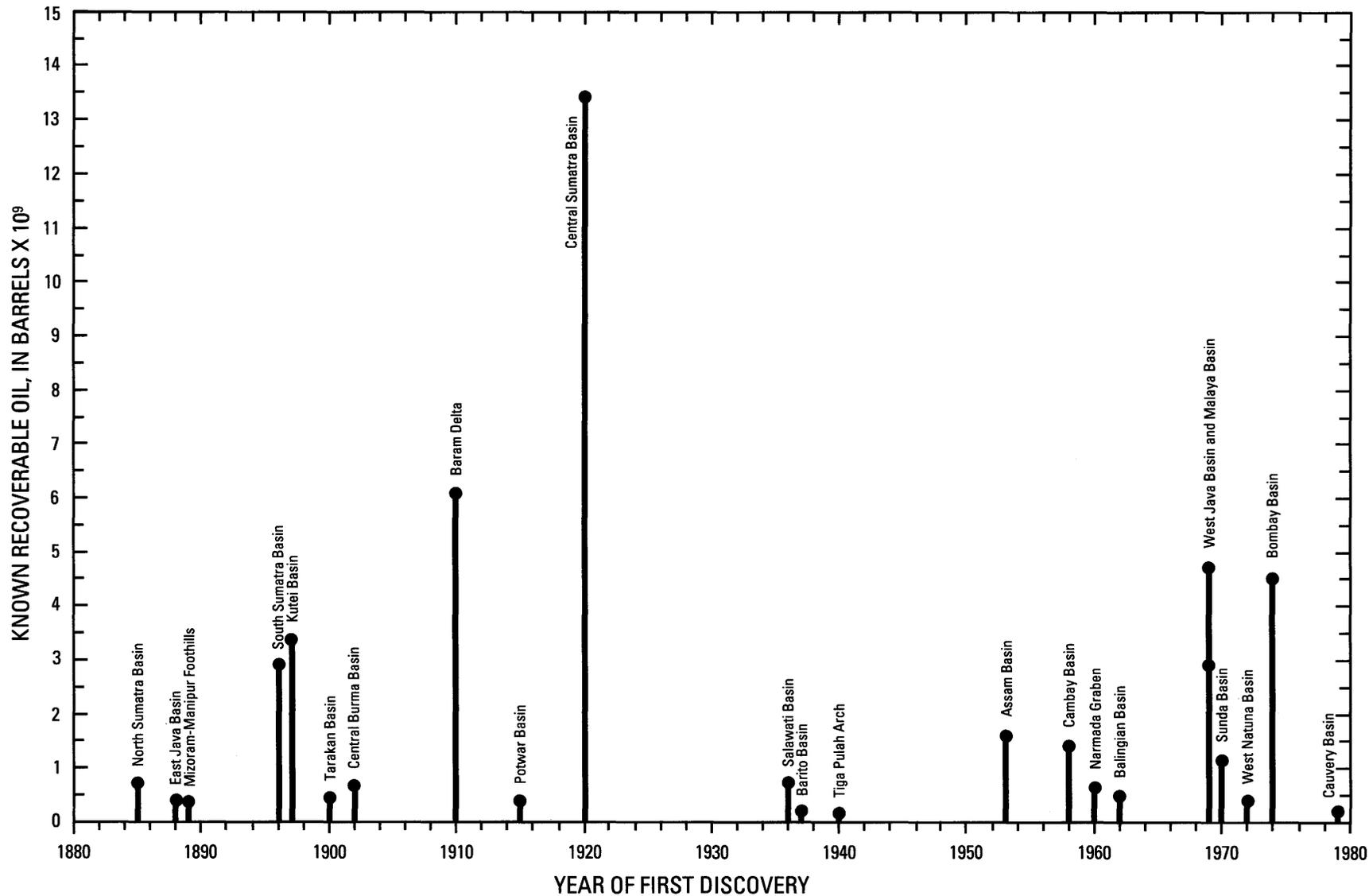
**Figure 9.** Historical sequence by year of the first discovery in each significant petroleum province of South America. Heights of the spikes show the magnitude of total oil discovered through 1990 in each province. Discovery dates, discovery magnitudes, and province names are from a computer tape released in January 1991 by Petroconsultants and were supplemented by field estimates from the Dallas Field Office of the Energy Information Administration. Province discovery estimates are also given in table 4.



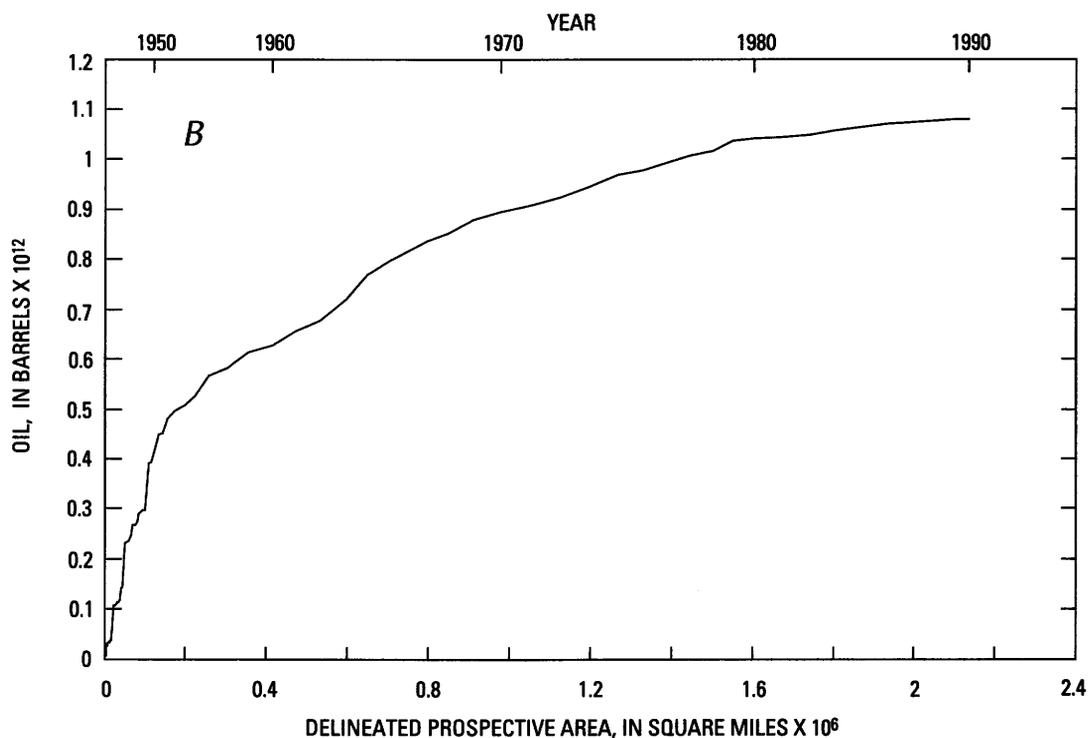
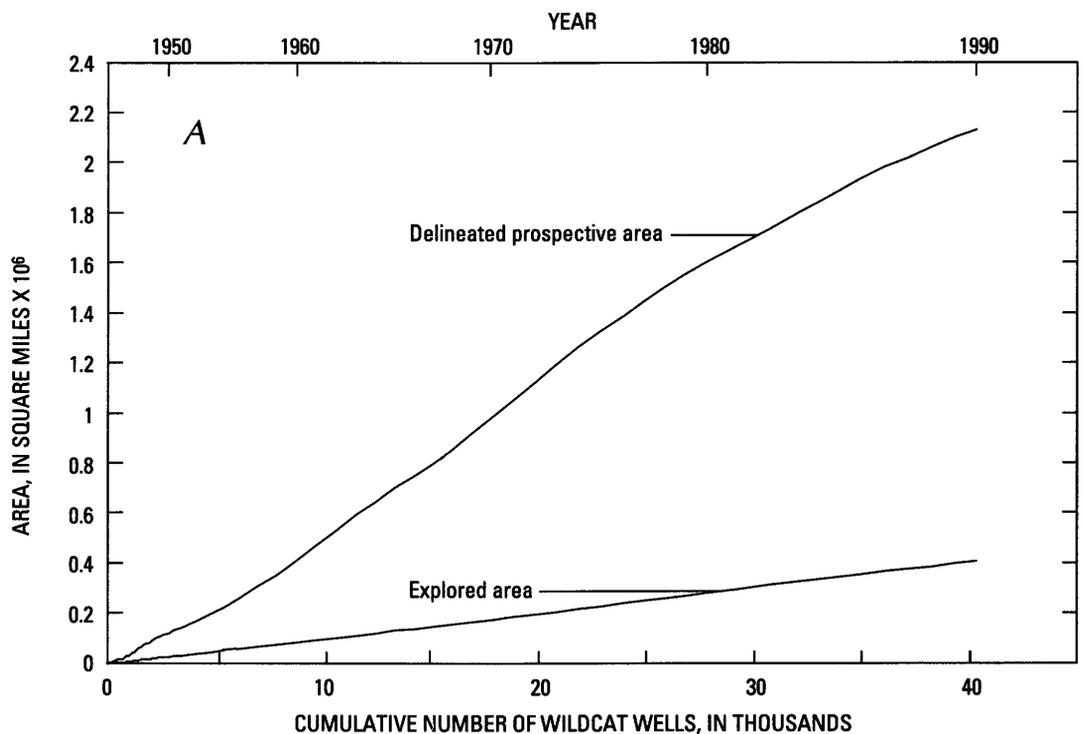
**Figure 10.** Historical sequence by year of the first discovery in each significant petroleum province of Western Europe. Heights of the spikes show the magnitude of total oil discovered through 1990 in each province. Discovery dates, discovery magnitudes, and province names are from a computer tape released in January 1991 by Petroconsultants and were supplemented by field estimates from the Dallas Field Office of the Energy Information Administration. Province discovery estimates are also given in table 4.



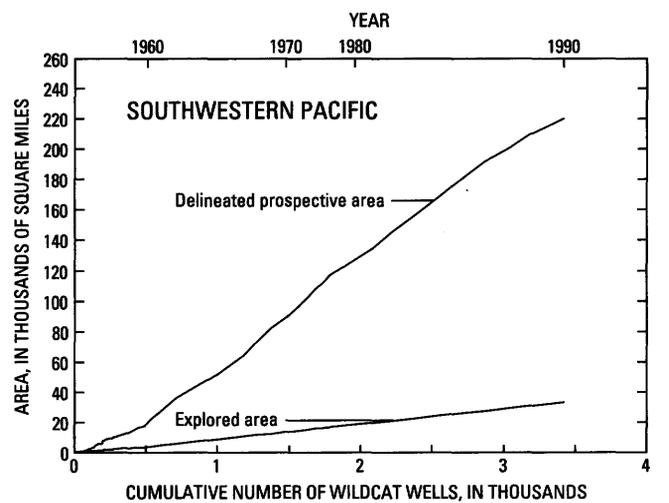
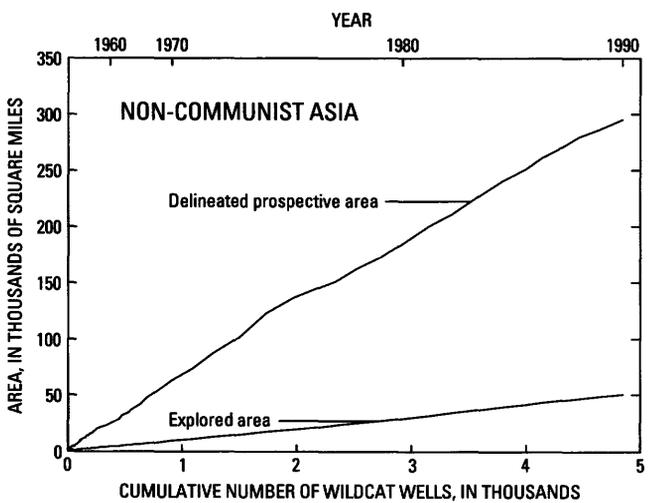
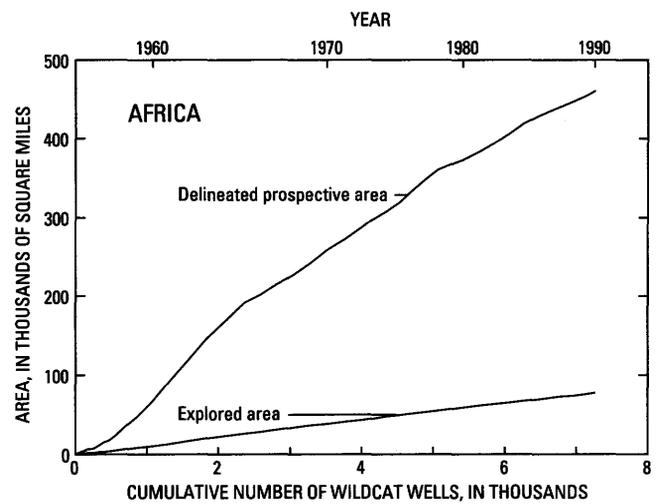
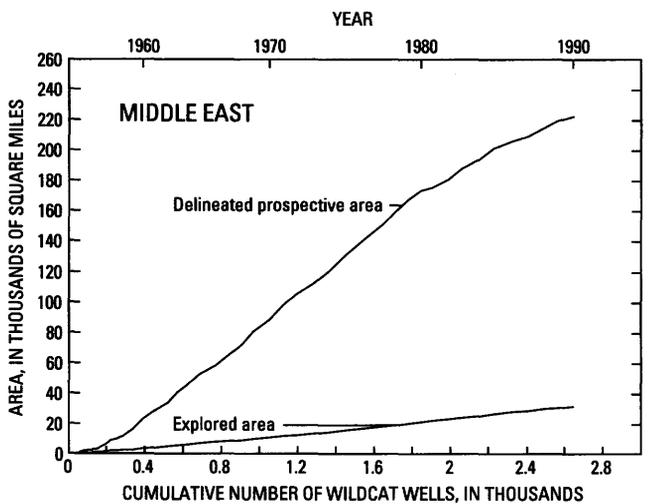
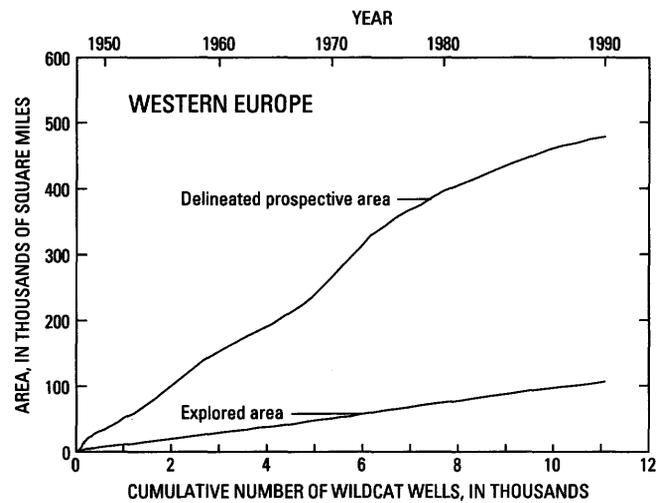
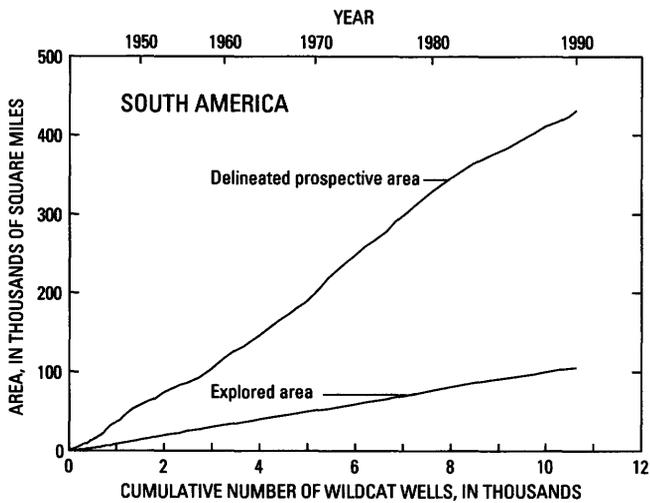
**Figure 11.** Historical sequence by year of the first discovery in each significant petroleum province of Africa. Heights of the spikes show the magnitude of total oil discovered through 1990 in each province. Discovery dates, discovery magnitudes, and province names are from a computer tape released in January 1991 by Petroconsultants and were supplemented by field estimates from the Dallas Field Office of the Energy Information Administration. Province discovery estimates are also given in table 4.



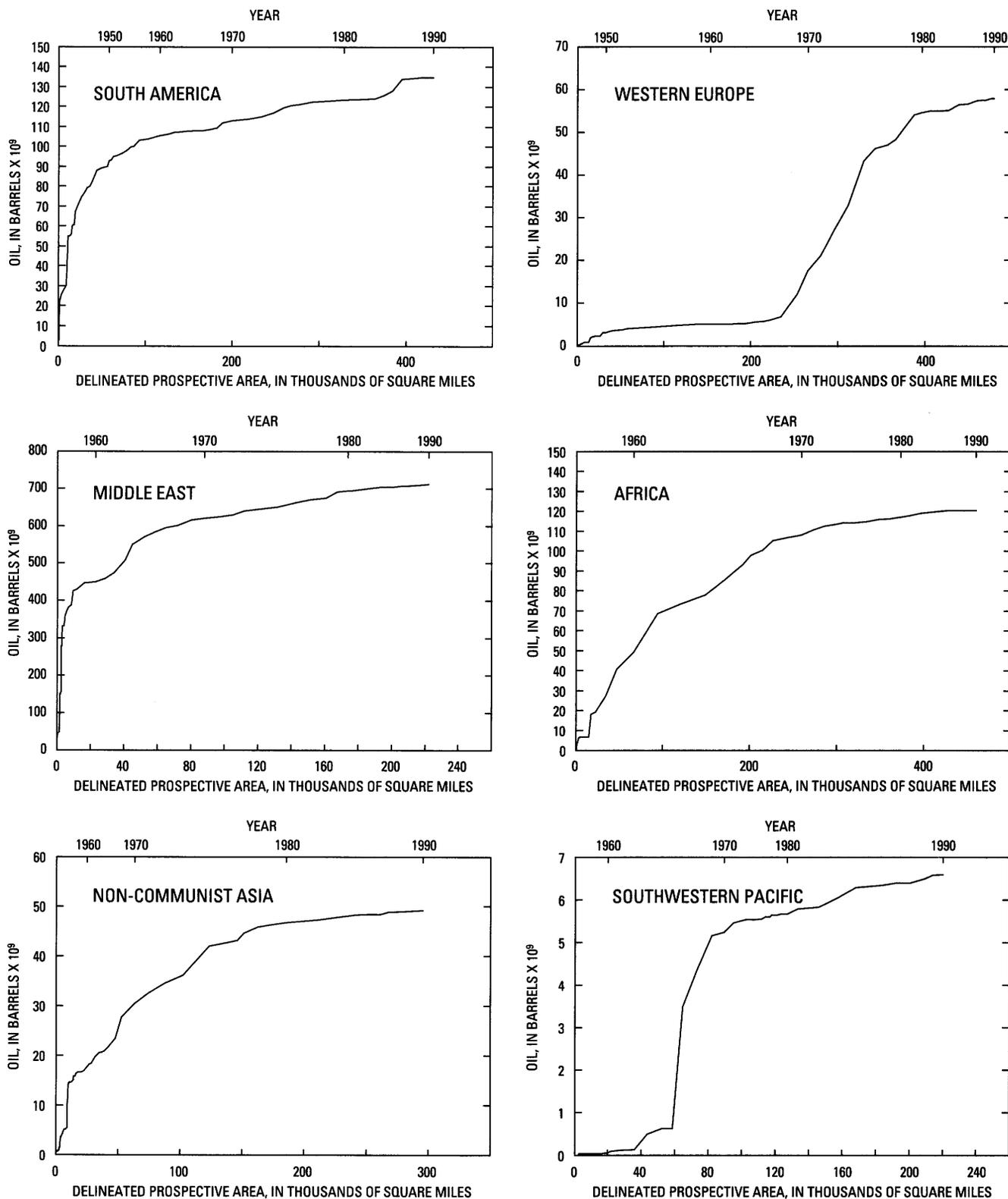
**Figure 12.** Historical sequence by year of the first discovery in each significant petroleum province of non-Communist Asia. Heights of the spikes show the magnitude of total oil discovered through 1990 in each province. Discovery dates, discovery magnitudes, and province names are from a computer tape released in January 1991 by Petroconsultants and were supplemented by field estimates from the Dallas Field Office of the Energy Information Administration. Province discovery estimates are also given in table 4.



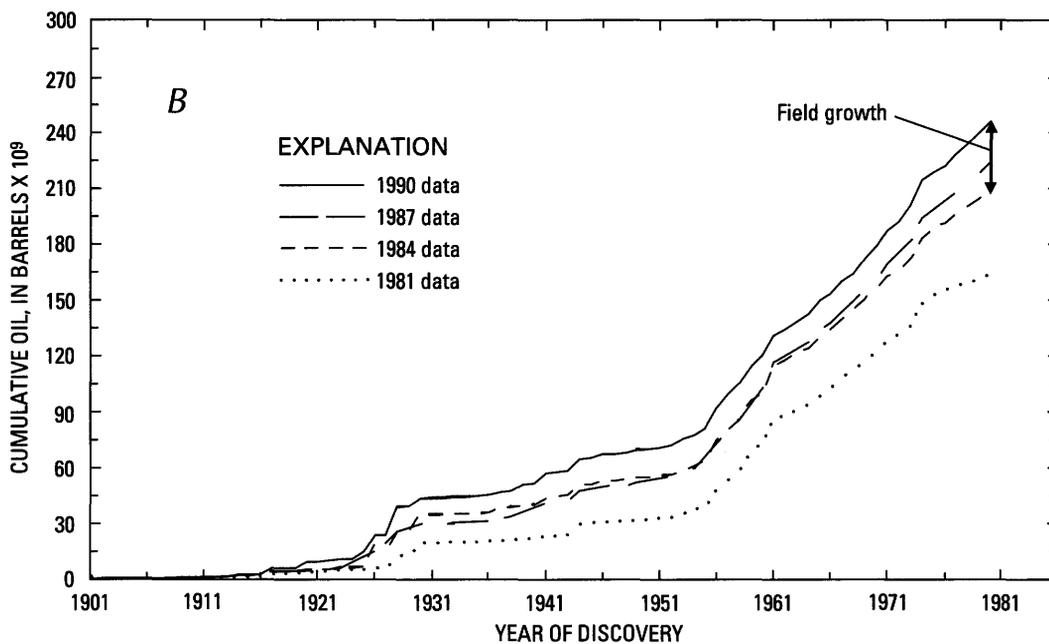
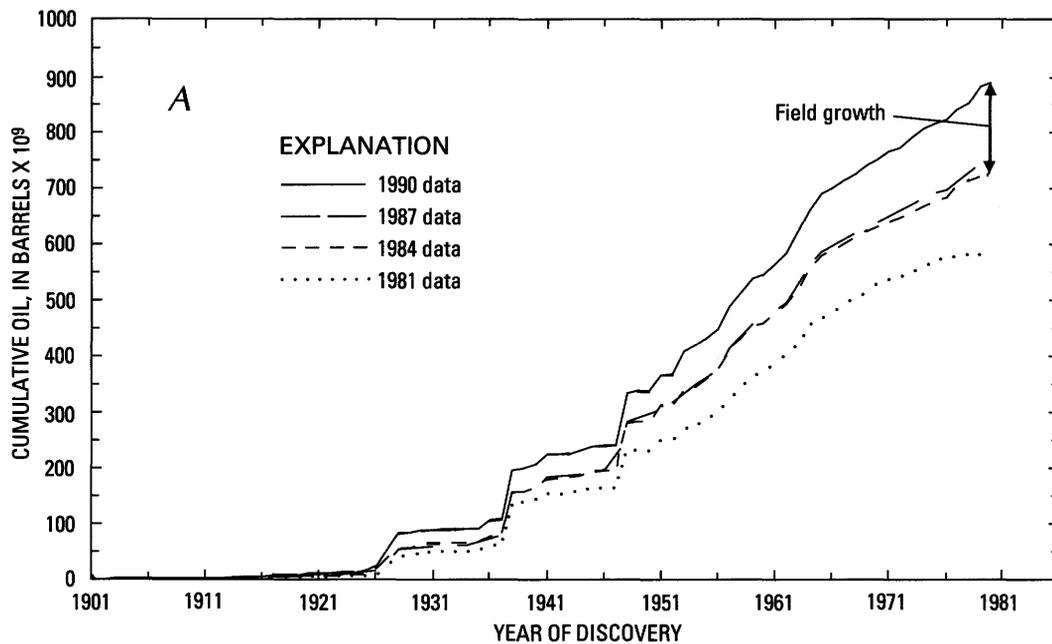
**Figure 13.** Growth in delineated prospective area and explored area and growth in oil discovered in the study area. *A*, Growth in prospective and explored areas delineated by wells drilled through 1990 in the study area. *B*, Oil discovered through 1990 graphed by the year its field location was classified as part of the delineated prospective area in the study area. Well data are from a computer tape released in January 1991 by Petroconsultants. Calculation of delineated prospective and explored areas is explained in the text. Estimates of recoverable oil in each field are from a computer tape released in January 1991 by Petroconsultants and were supplemented by information provided by the Dallas Field Office of the Energy Information Administration.



**Figure 14.** Growth in prospective area and explored area delineated by wells drilled through 1990 for South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. The graphs are at different scales. Well data are from a computer tape released in January 1991 by Petroconsultants. Calculation of delineated prospective and explored areas is explained in the text.



**Figure 15.** Oil discovered through 1990 graphed by the year its field location was classified as part of the delineated prospective area for South America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. The graphs are at different scales. Calculation of delineated prospective area is explained in the text. Estimates of recoverable oil in each field are from a computer tape released in January 1991 by Petroconsultants and were supplemented by information provided by the Dallas Field Office of the Energy Information Administration.



**Figure 16.** Growth in fields discovered by 1980 in five regions. *A*, Cumulative amounts of oil discovered in South America, Western Europe, the Middle East, Africa, and non-Communist Asia calculated from field estimates of ultimate recovery as recorded in field tapes received from Petroconsultants at 3-year intervals in 1981, 1984, 1987, and 1990. The difference between the 1981 and 1984 curves is primarily due to late reporting of earlier discoveries. Actual field growth is approximated by the difference between the 1984 and 1990 curves. *B*, Data on the same regions as in figure 16A, except data for the Middle East are excluded.



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## FIGURES 17-54

Figures 17-54 show the delineated prospective areas, explored areas, and known petroleum provinces of the Caribbean, Latin America, Western Europe, the Middle East, Africa, non-Communist Asia, and the southwestern Pacific. No figure was prepared for Mexico because data were incomplete. Each figure contains a map, two graphs (except figures 36, 42, and 46, which have only one graph each because oil field sizes are not available), and a summary of exploration data. If significant petroleum provinces are present in the mapped area, a table provides information on them. Definitions of terms and sources of information in figures 17-54 are given below.

**Maps.**—All maps were drawn by ARC/INFO software (1987, Environmental Systems Research Institute, Redlands, Calif.); country boundaries are from the World Data Bank II released by the U.S. Central Intelligence Agency and are not necessarily correct. Scales are not provided as the scale varies within many of the maps. The methods for computing and identifying the delineated prospective and explored areas are explained in the text and differ from those used in U.S. Geological Survey (USGS) Circular 981. If only part of a country is shown, no explored or delineated prospective area was identified in the rest of the country. The grid point closest to a well drilled inside the country mapped may plot as an isolated circle outside the border of that country.

Names of known petroleum provinces (called basins on some maps) and years of first discoveries in them in each country are shown on each map and are from a computer tape released in January 1991 by Petroconsultants S.A., Geneva. Of all the known petroleum provinces shown in figures 17-54, 99 have at least one field containing 100 million barrels and were therefore classified as significant (see table 4). Information on the significant provinces is given in the tables facing the maps.

**Graphs.**—The graphs show (1) the growth in delineated prospective area and explored area in relation to the cumulative number of wildcat wells drilled in a country or group of countries through 1990 and (2) the profile of discovered oil cumulated through 1990 ordered by when its field location was classified as part of the delineated prospective area. Years are shown at the top of both graphs. Wildcat wells are from a computer tape released in January 1991 by Petroconsultants. The well data graphed are those in table 2 minus the wells whose dates or coordinates are unknown; some wells are assigned to a country in table 2 but lack coordinates and cannot be used to delineate prospective area. Estimates of recoverable oil and gas in each province are from a computer tape released in January 1991 by Petroconsultants and from supplemental information provided by the Dallas Field Office of the Energy Information Administration of the U.S. Department of Energy (written commun., 1990).

Many wildcat wells drilled before 1950 were not recorded in our data so that the delineated prospective and explored areas as of 1950 are underestimated. Records of followup drilling after 1950 probably result in an overestimate of the rate of increase in the delineated prospective area after 1950. Nonetheless, we believe that the growth in delineated prospective area after 1970 is real and is not an artifact of earlier missing data. Rate of growth in explored area has been relatively constant since 1950.

**Summaries of exploration data.**—Land areas are from individual country entries in *The Random House College Dictionary* (Random House, Inc., 1973). Computation of the delineated prospective areas and the explored areas is explained in the text. Wildcat wells are from a computer tape released in January 1991 by Petroconsultants; the 1990 totals are those in table 2 minus the wells whose dates or coordinates are unknown. Current growth in delineated prospective area per wildcat well is derived from the graph showing growth in prospective area. Reported discoveries of recoverable crude oil and gas are from a Petroconsultants computer tape released in January 1991 and from the Dallas Field Office of the Energy Information Administration of the U.S. Department of Energy (written commun., 1990). The information on discoveries is incomplete.

For consistency with USGS Circular 981, the oil richness indices have been calculated and presented in figures 17-54. This index is defined as the number of barrels of recoverable crude oil discovered through 1990 divided by the number of square miles in the delineated prospective area. The factor tends to be largest in areas such as the Middle East where exploration has been concentrated in a few very prolific areas. As shown by the accompanying graphs, most oil is concentrated in a small part of the prospective area, and the total resources of a country should not be estimated by multiplying the richness by a higher figure for the prospective area.

**Tables of significant provinces.**—The tables contain provinces that are significant in the country mapped and provinces that are significant in neighboring countries but that have not had discoveries of 100 million barrels of oil in the country mapped. Some of the extensions of significant provinces contain only natural gas and natural gas liquids.

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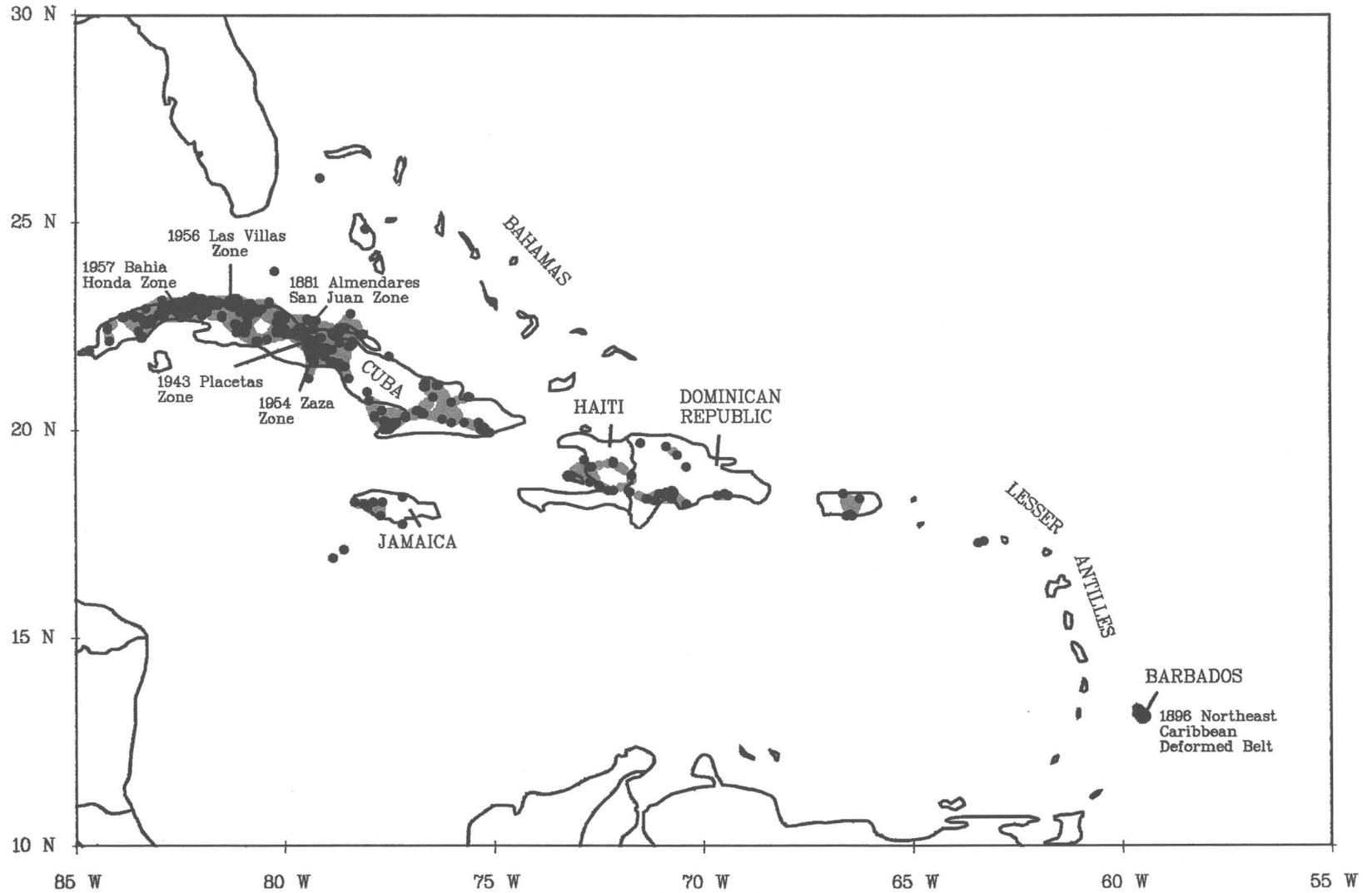
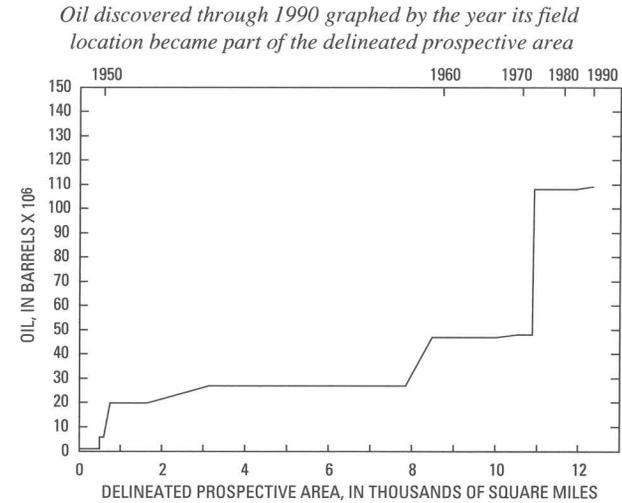
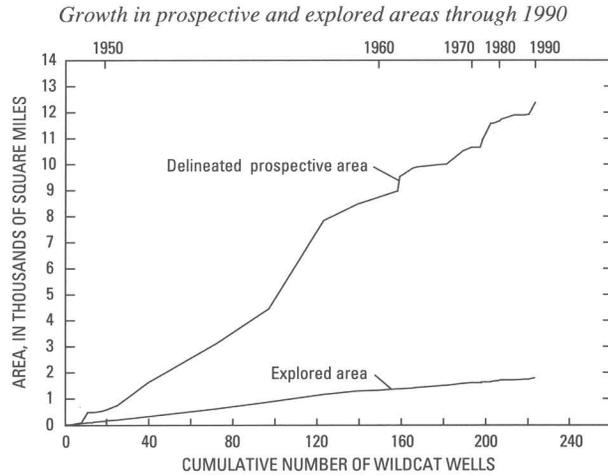


Figure 17. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of the Caribbean.



*Exploration data*

Country	Land area (mi <sup>2</sup> )
Bahamas .....	4,404
Cuba <sup>1</sup> .....	44,218
Haiti .....	10,714
Dominican Republic .....	19,129
Jamaica .....	4,413
Barbados .....	161
Lesser Antilles <sup>2</sup> .....	2,133
<b>Total .....</b>	<b>85,172</b>

Delineated prospective area through 1990: 12,345 mi<sup>2</sup>

Explored area through 1990: 1,797 mi<sup>2</sup>

Wildcat wells through 1990: 223

Current growth in delineated prospective area per wildcat: 141 mi<sup>2</sup>

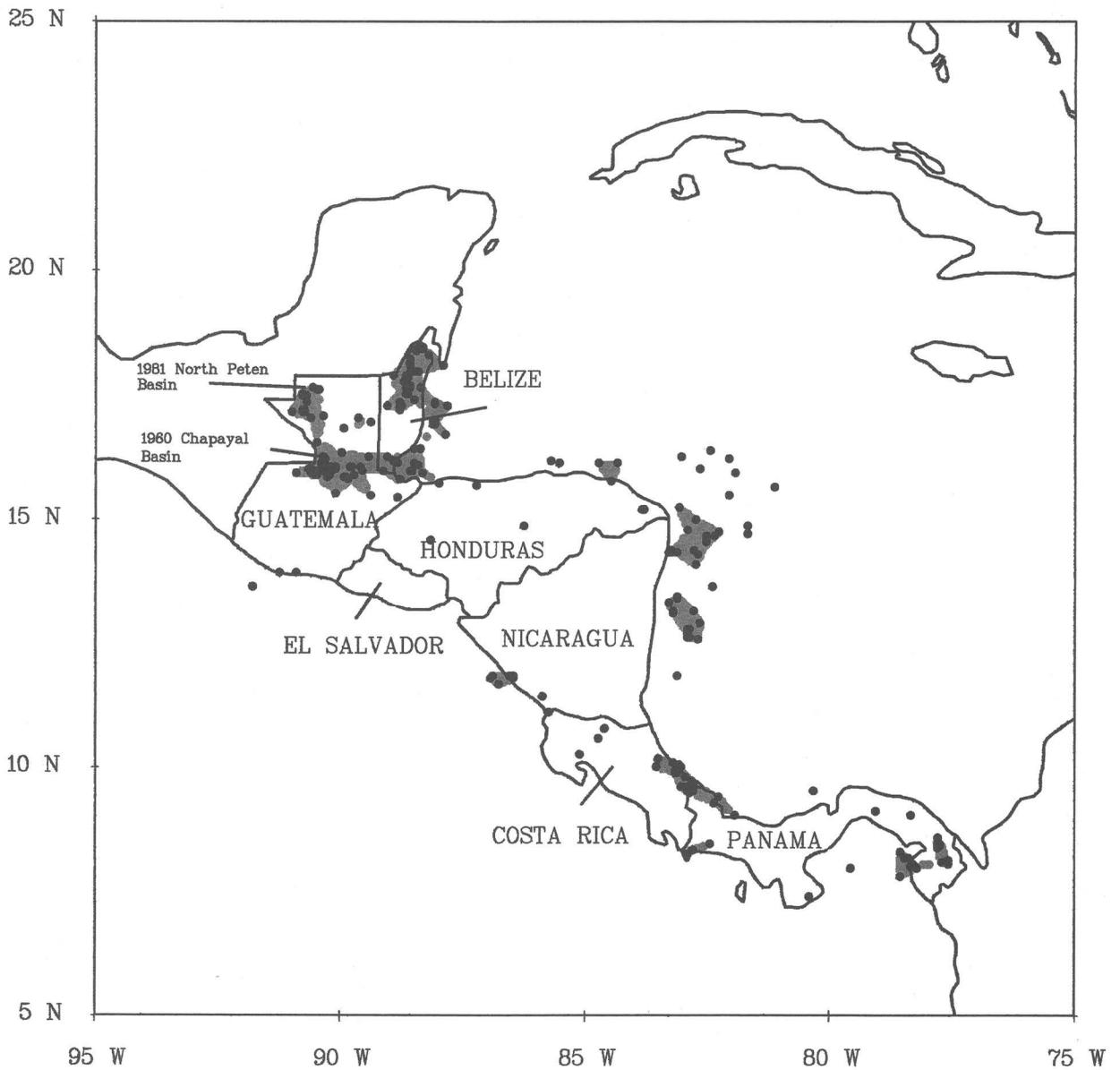
Reported discoveries of recoverable crude oil and gas through 1990:  
0.109 × 10<sup>9</sup> bbl oil and 0.166 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.008 \times 10^6 \text{ bbl/mi}^2$$

<sup>1</sup>Data for Cuba are incomplete since 1960.

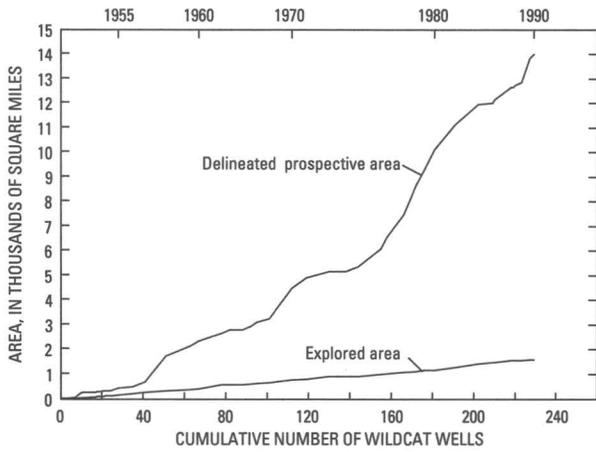
<sup>2</sup>For this report, the Lesser Antilles are considered to consist of the islands from Grenada to St. Thomas, except Barbados, which is listed separately.

**Figure 17.** Continued.

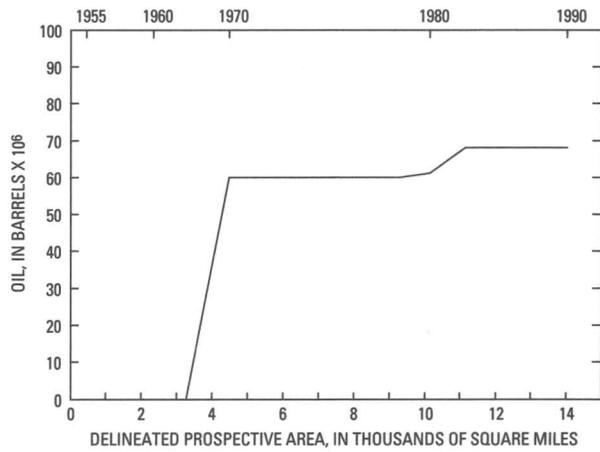


**Figure 18.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Central America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Belize	8,867
Honduras	43,277
Guatemala	42,042
Nicaragua	57,143
El Salvador	13,176
Costa Rica	19,238
Panama	28,575
Total	212,318

Delineated prospective area through 1990: 14,007 mi<sup>2</sup>

Explored area through 1990: 1,605 mi<sup>2</sup>

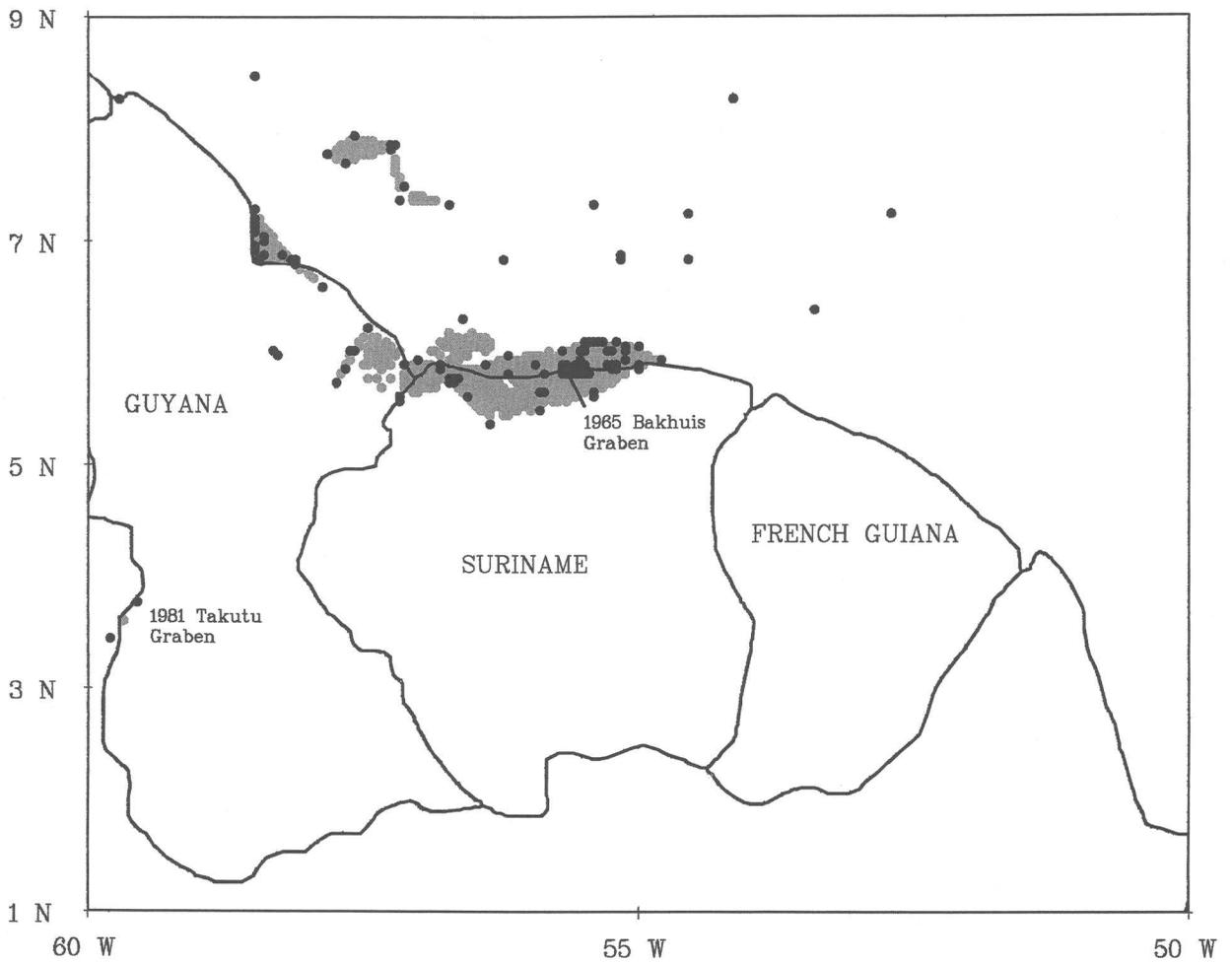
Wildcat wells through 1990: 229

Current growth in delineated prospective area per wildcat: 87 mi<sup>2</sup>

Reported discoveries of recoverable crude oil through 1990:  
0.068 × 10<sup>9</sup> bbl

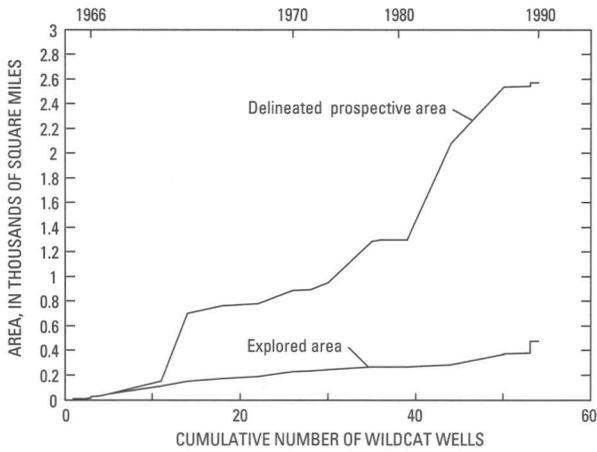
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.005 \times 10^6 \text{ bbl/mi}^2$$

Figure 18. Continued.

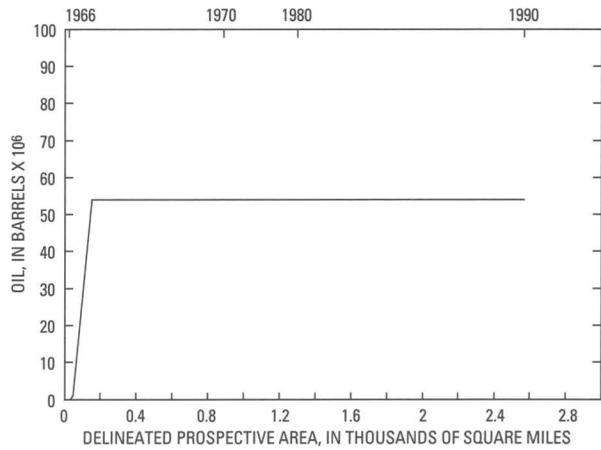


**Figure 19.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Guyana, Suriname, and French Guiana, South America. French Guiana is listed separately although it is an overseas department of France.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Guyana	82,978
Suriname	60,230
French Guiana	35,135
Total	178,343

Delineated prospective area through 1990: 2,568 mi<sup>2</sup>

Explored area through 1990: 479 mi<sup>2</sup>

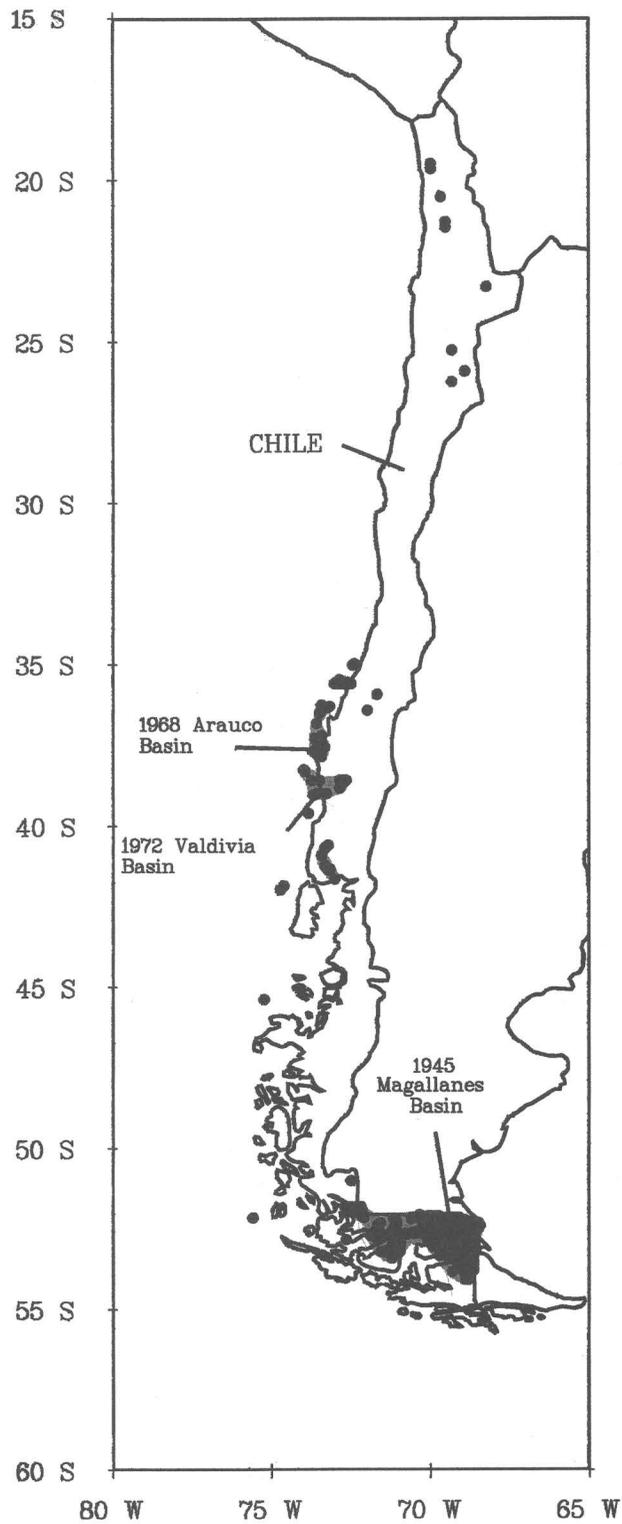
Wildcat wells through 1990: 54

Current growth in delineated prospective area per wildcat: 6 mi<sup>2</sup>

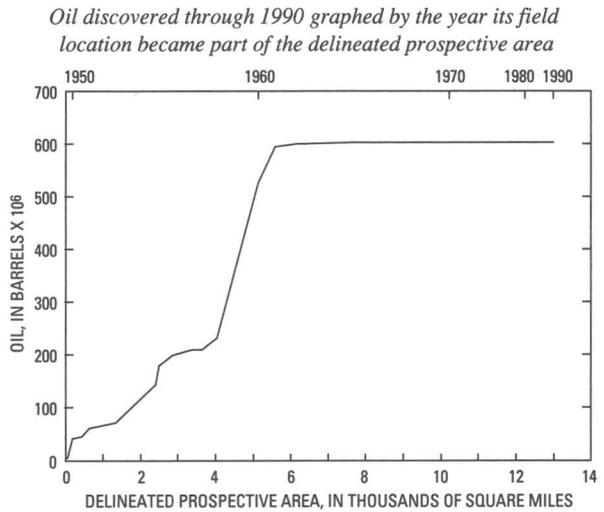
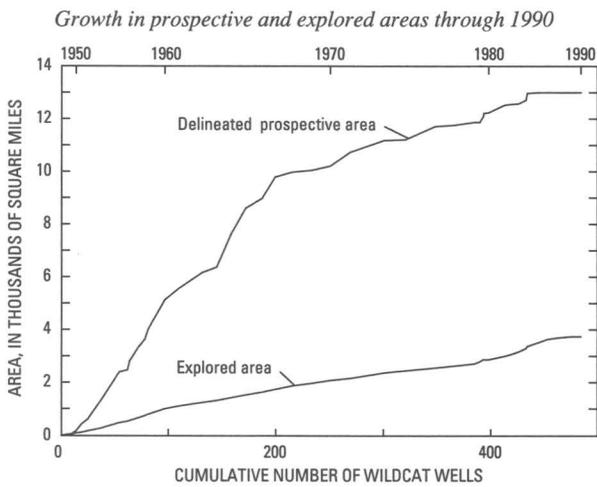
Reported discoveries of recoverable crude oil through 1990:  
0.054 × 10<sup>9</sup> bbl

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.019 \times 10^6 \text{ bbl/mi}^2$$

Figure 19. Continued.



**Figure 20.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Chile, South America.



*Exploration data*

Land area: 286,396 mi<sup>2</sup>

Delineated prospective area through 1990: 12,985 mi<sup>2</sup>

Explored area through 1990: 3,762 mi<sup>2</sup>

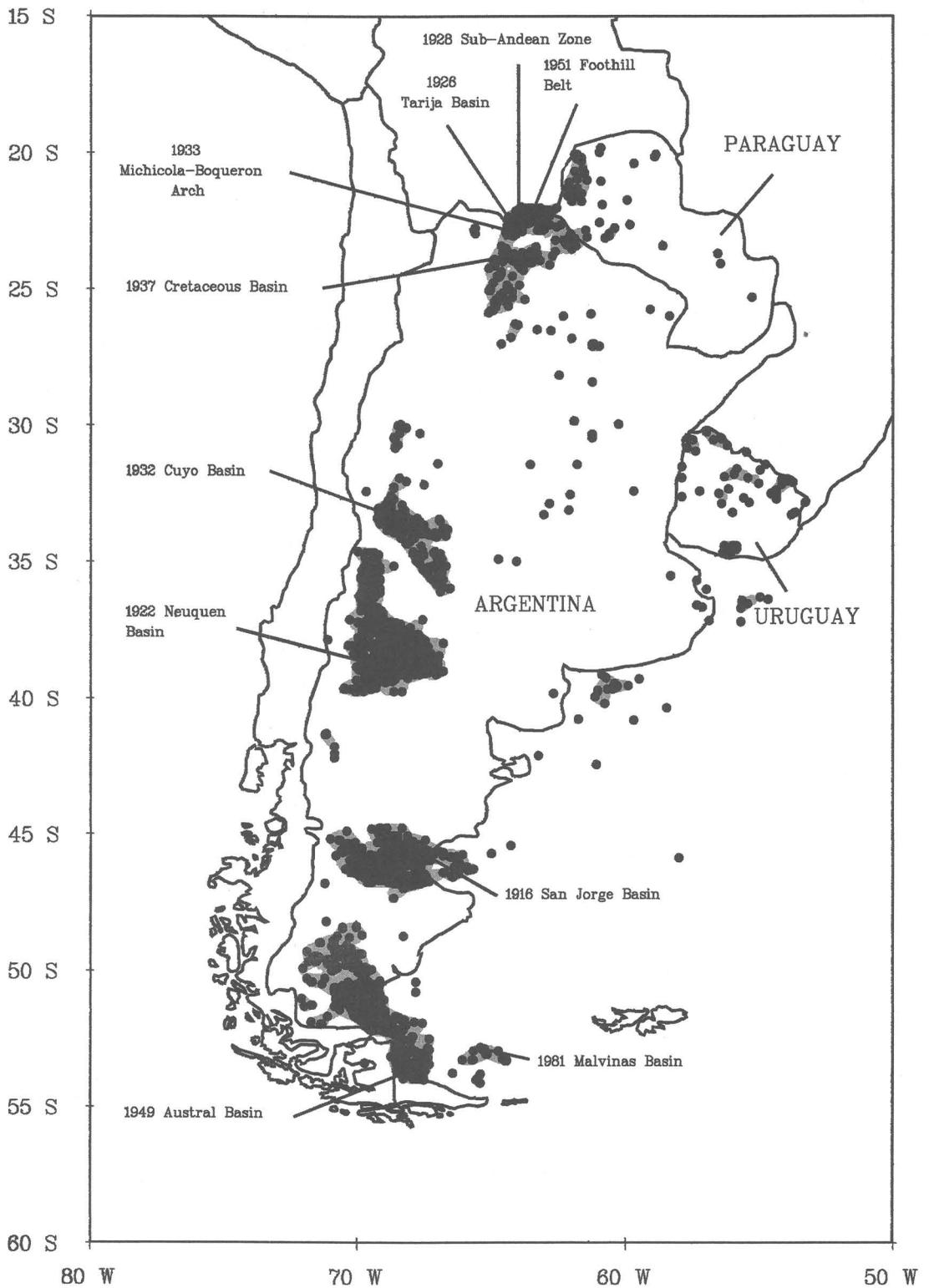
Wildcat wells through 1990: 484

Current growth in delineated prospective area per wildcat: 5 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
 $0.602 \times 10^9$  bbl oil and  $9.79 \times 10^{12}$  cubic feet gas

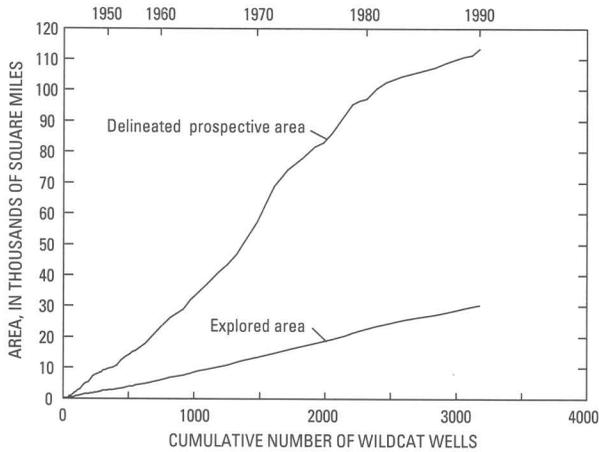
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.046 \times 10^6 \text{ bbl/mi}^2$$

**Figure 20.** Continued.

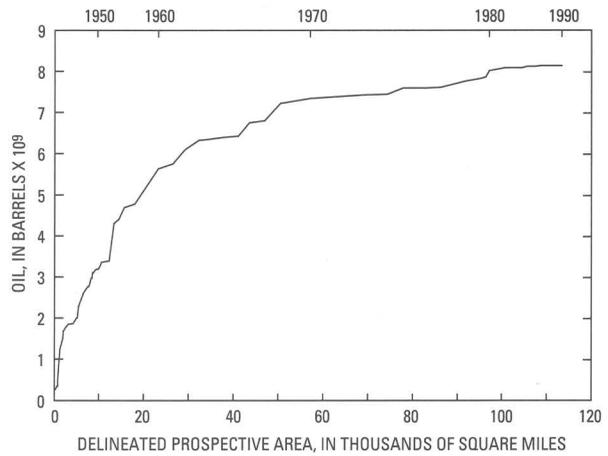


**Figure 21.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Argentina, Uruguay, and Paraguay, South America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Argentina	Cumulative discoveries in this province in Argentina through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
San Jorge Basin	1916	2,517	3,893	6,491
Neuquen Basin	1922	1,209	2,668	25,895
Sub-Andean Zone	1928	110	142	348
Cuyo Basin	1932	1,056	1,484	356
Austral Basin	1949	100	759	12,676
Total		4,992	8,946	45,766

Exploration data

Country	Land area (mi <sup>2</sup> )
Argentina	1,084,120
Uruguay	72,172
Paraguay	157,047
Total	1,313,339

Delineated prospective area through 1990: 113,354 mi<sup>2</sup>

Explored area through 1990: 30,303 mi<sup>2</sup>

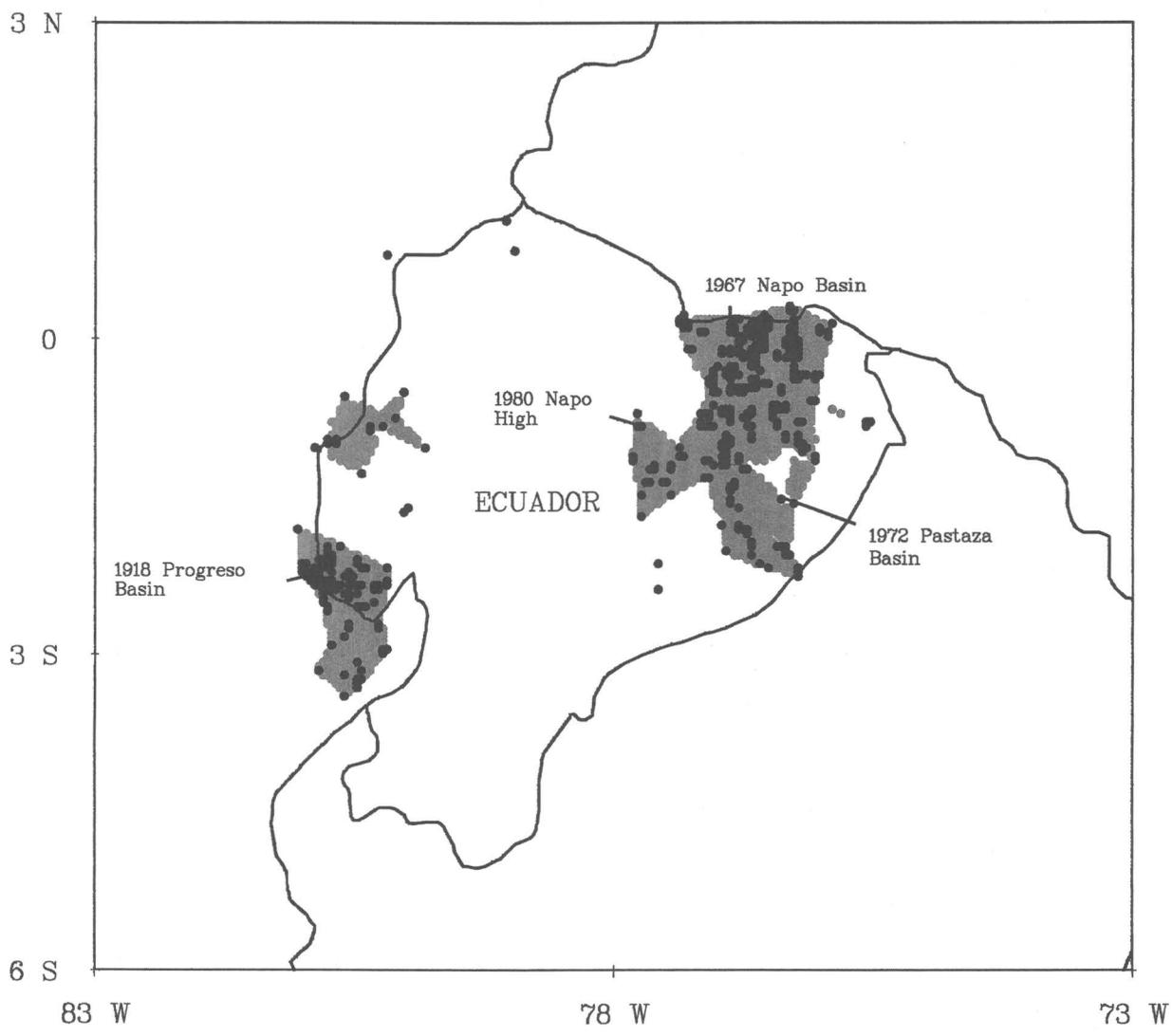
Wildcat wells through 1990: 3,179

Current growth in delineated prospective area per wildcat: 33 mi<sup>2</sup>

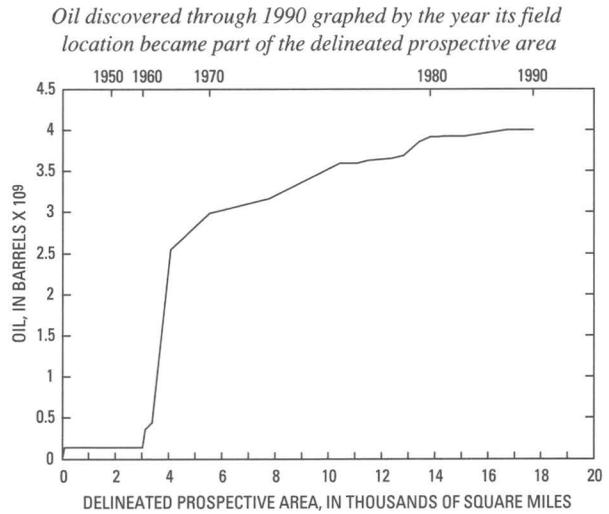
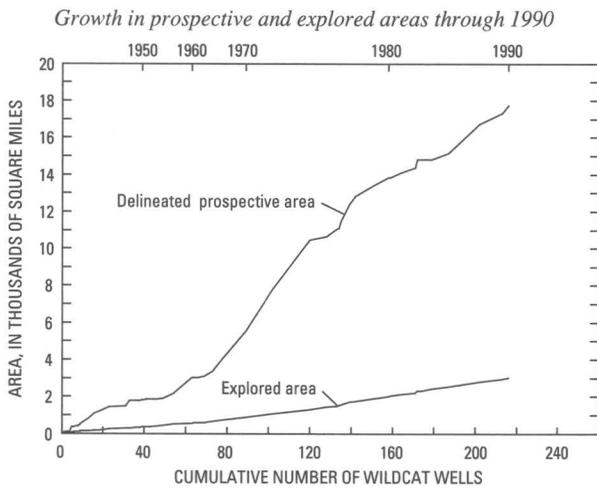
Reported discoveries of recoverable crude oil and gas through 1990:  
8.13 × 10<sup>9</sup> bbl oil and 49.4 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.072 \times 10^6 \text{ bbl/mi}^2$$

Figure 21. Continued.



**Figure 22.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Ecuador, South America.



*Significant petroleum provinces*

Significant petroleum province	Year of first discovery in this province in Ecuador	Cumulative discoveries in this province in Ecuador through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Progreso Basin.....	1918	130	145	464
Napo Basin.....	1967	2,853	3,748	659
Total.....		2,983	3,893	1,123

*Exploration data*

Land area: 104,510 mi<sup>2</sup>

Delineated prospective area through 1990: 17,715 mi<sup>2</sup>

Explored area through 1990: 3,015 mi<sup>2</sup>

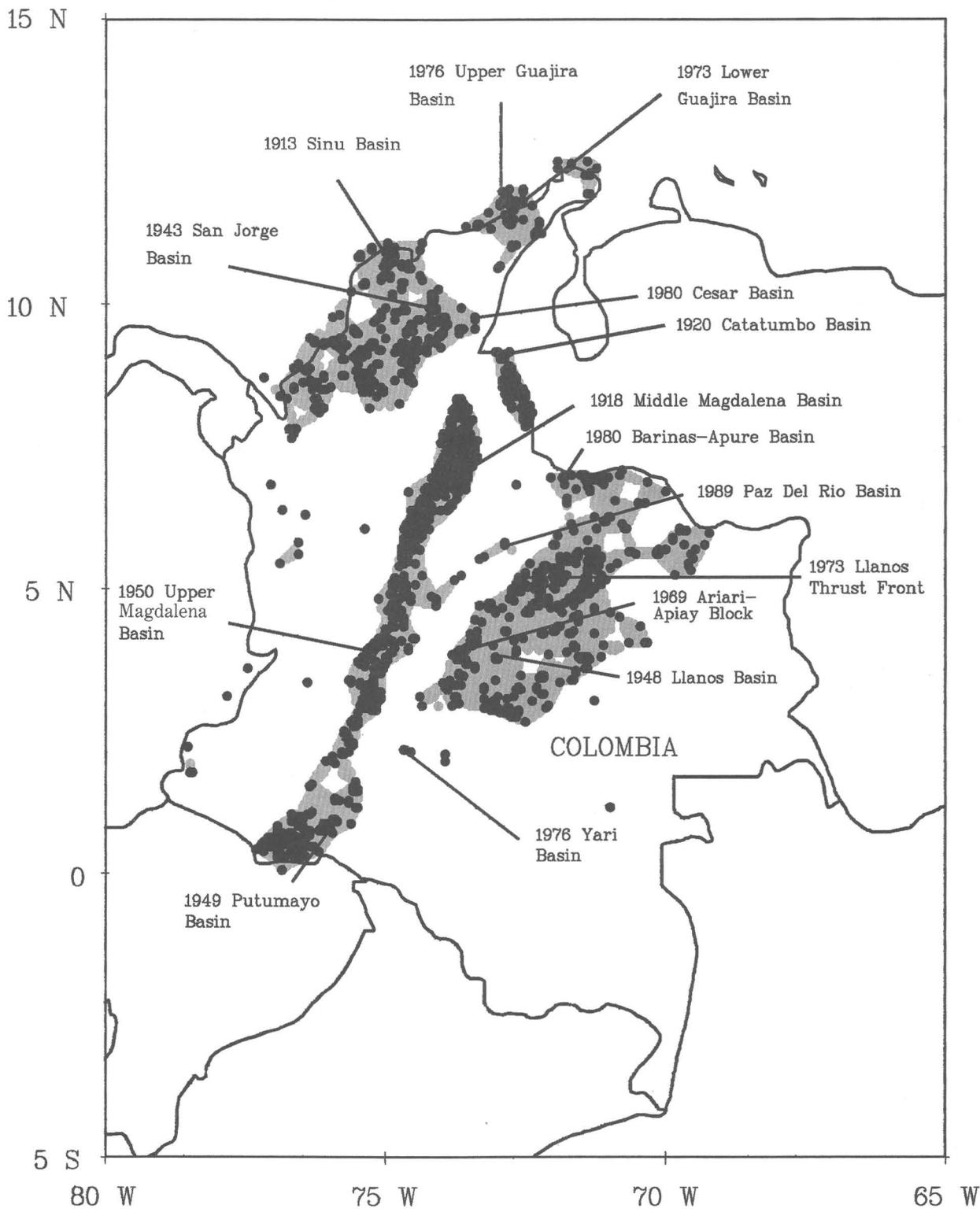
Wildcat wells through 1990: 216

Current growth in delineated prospective area per wildcat: 125 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
4.0 × 10<sup>9</sup> bbl oil and 1.12 × 10<sup>12</sup> cubic feet gas

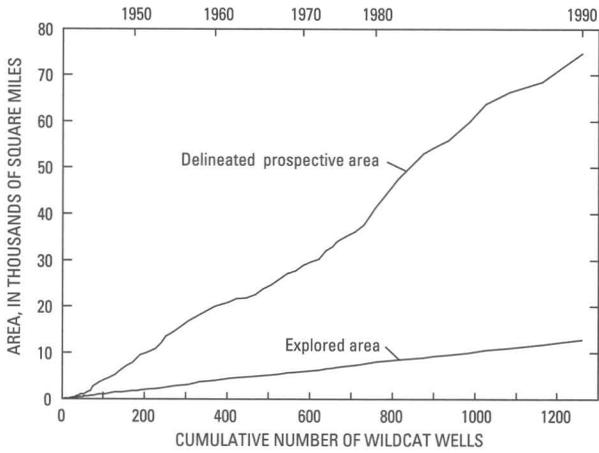
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.226 \times 10^6 \text{ bbl/mi}^2$$

**Figure 22.** Continued.

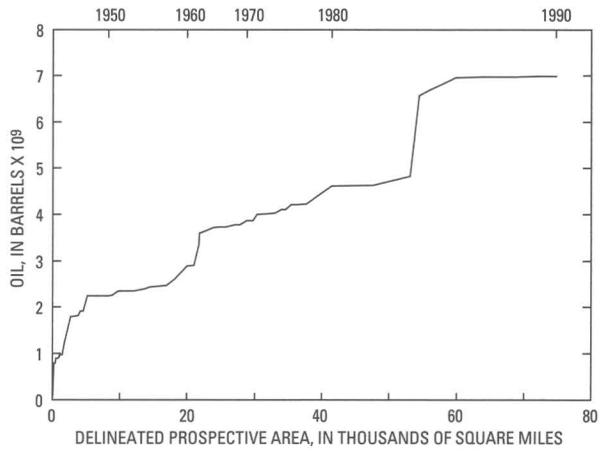


**Figure 23.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Colombia, South America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Colombia	Cumulative discoveries in this province in Colombia through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Middle Magdalena Basin .....	1918	1,902	2,379	3,097
Catatumbo Basin .....	1920	400	473	922
Llanos Basin .....	1948	2,050	2,413	71
Putumayo Basin .....	1949	242	370	1,261
Upper Magdalena Basin .....	1950	534	968	243
Ariari-Apiay Block .....	1969	100	255	221
Barinas-Apure Basin .....	1980	0	9	10
Total .....		5,228	6,867	5,825

Exploration data

Land area: 439,828 mi<sup>2</sup>

Delineated prospective area through 1990: 74,725 mi<sup>2</sup>

Explored area through 1990: 12,852 mi<sup>2</sup>

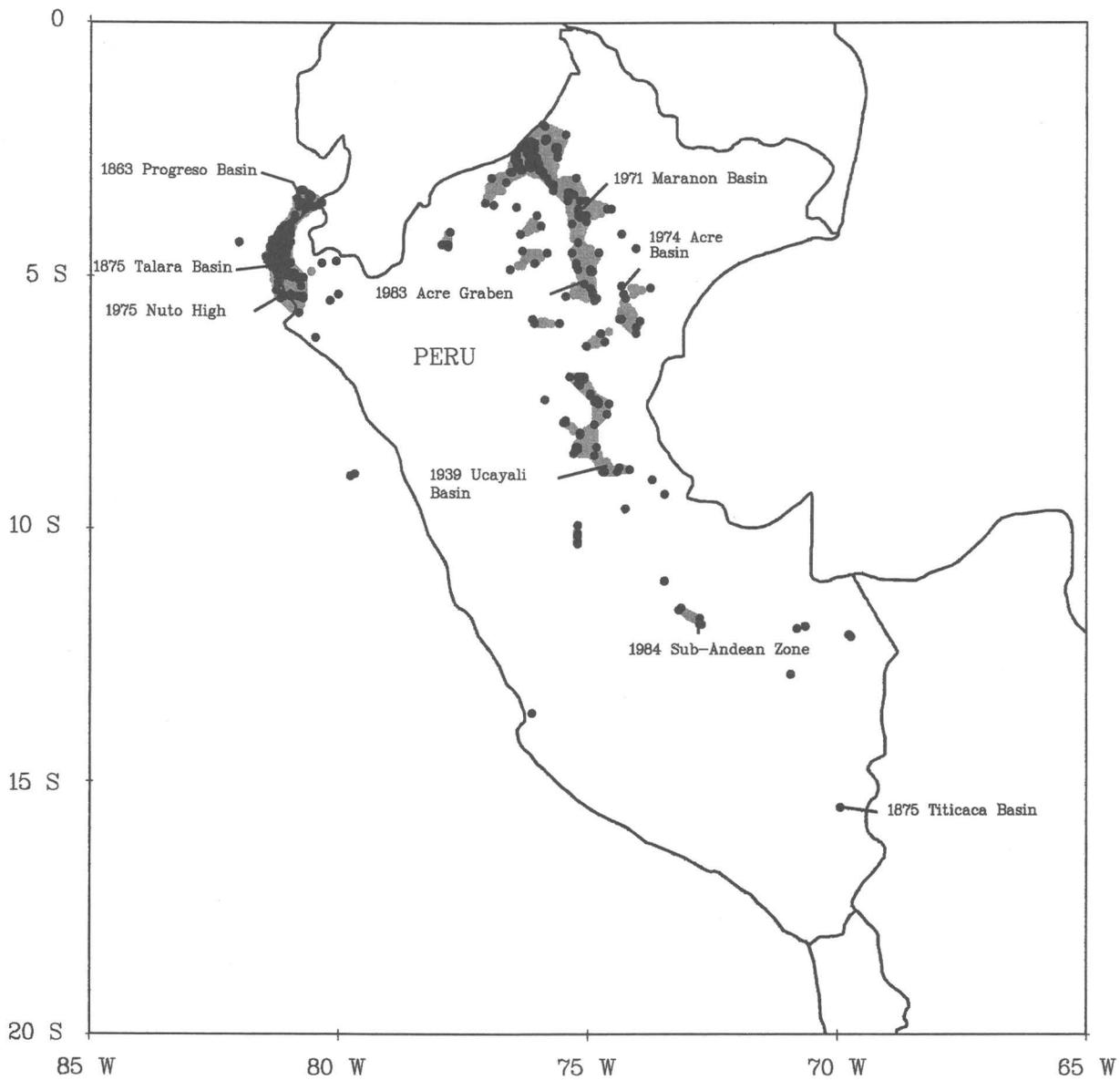
Wildcat wells through 1990: 1,260

Current growth in delineated prospective area per wildcat: 64 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
6.99 × 10<sup>9</sup> bbl oil and 11.4 × 10<sup>12</sup> cubic feet gas

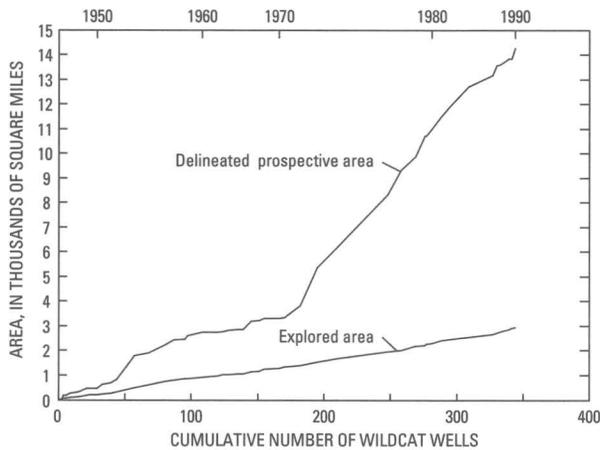
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.094 \times 10^6 \text{ bbl/mi}^2$$

Figure 23. Continued.

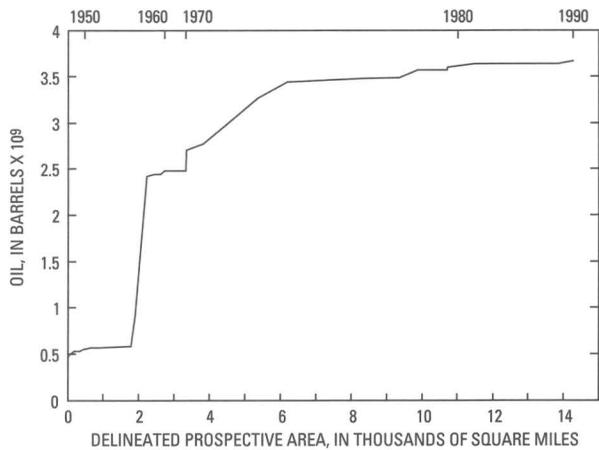


**Figure 24.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Peru, South America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Peru	Cumulative discoveries in this province in Peru through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Progeso Basin .....	1863	0	7	40
Talara Basin .....	1875	2,226	2,442	2,629
Maranon Basin .....	1971	564	1,163	78
Sub-Andean Zone .....	1984	0	0	16,000
<b>Total .....</b>		<b>2,790</b>	<b>3,612</b>	<b>18,747</b>

Exploration data

Land area: 496,222 mi<sup>2</sup>

Delineated prospective area through 1990: 14,259 mi<sup>2</sup>

Explored area through 1990: 2,948 mi<sup>2</sup>

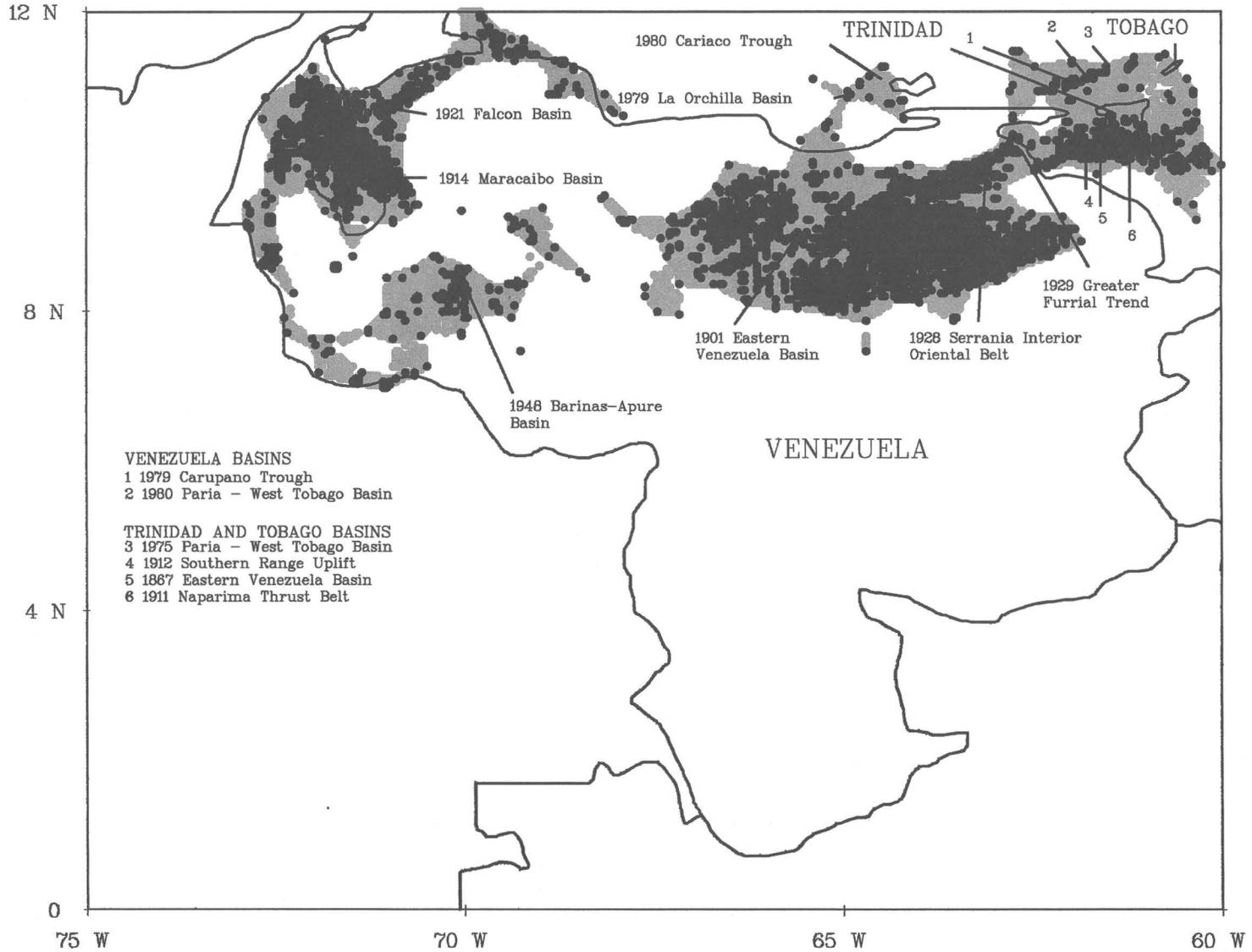
Wildcat wells through 1990: 344

Current growth in delineated prospective area per wildcat: 138 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
3.67 × 10<sup>9</sup> bbl oil and 19.7 × 10<sup>12</sup> cubic feet gas

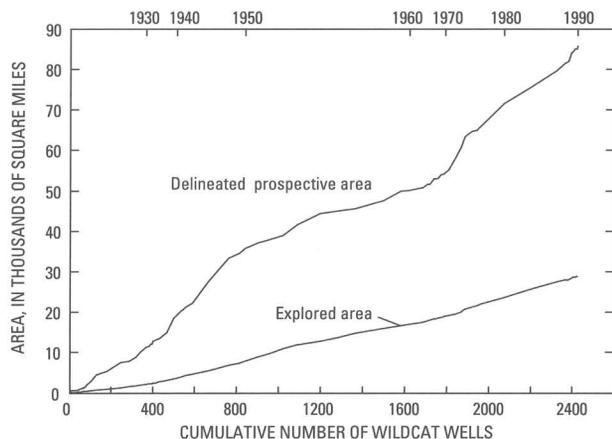
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.257 \times 10^6 \text{ bbl/mi}^2$$

Figure 24. Continued.

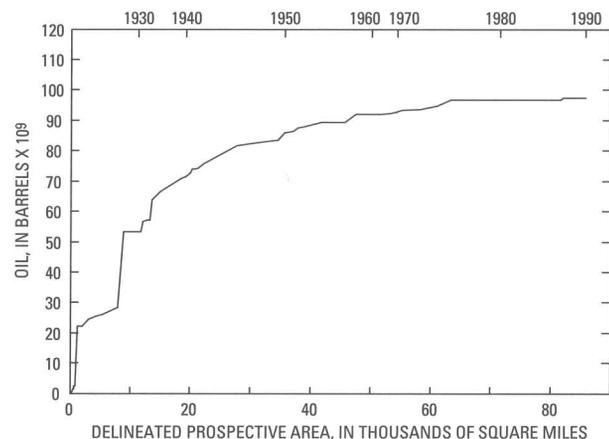


**Figure 25.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Venezuela and Trinidad and Tobago, South America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Venezuela . . . . .	352,143
Trinidad and Tobago . . . . .	1,980
Total . . . . .	354,123

Delineated prospective area through 1990: 85,636 mi<sup>2</sup>

Explored area through 1990: 28,884 mi<sup>2</sup>

Wildcat wells through 1990: 2,421

Current growth in delineated prospective area per wildcat: 72 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 97.7 × 10<sup>9</sup> bbl oil and 63.2 × 10<sup>12</sup> cubic feet gas

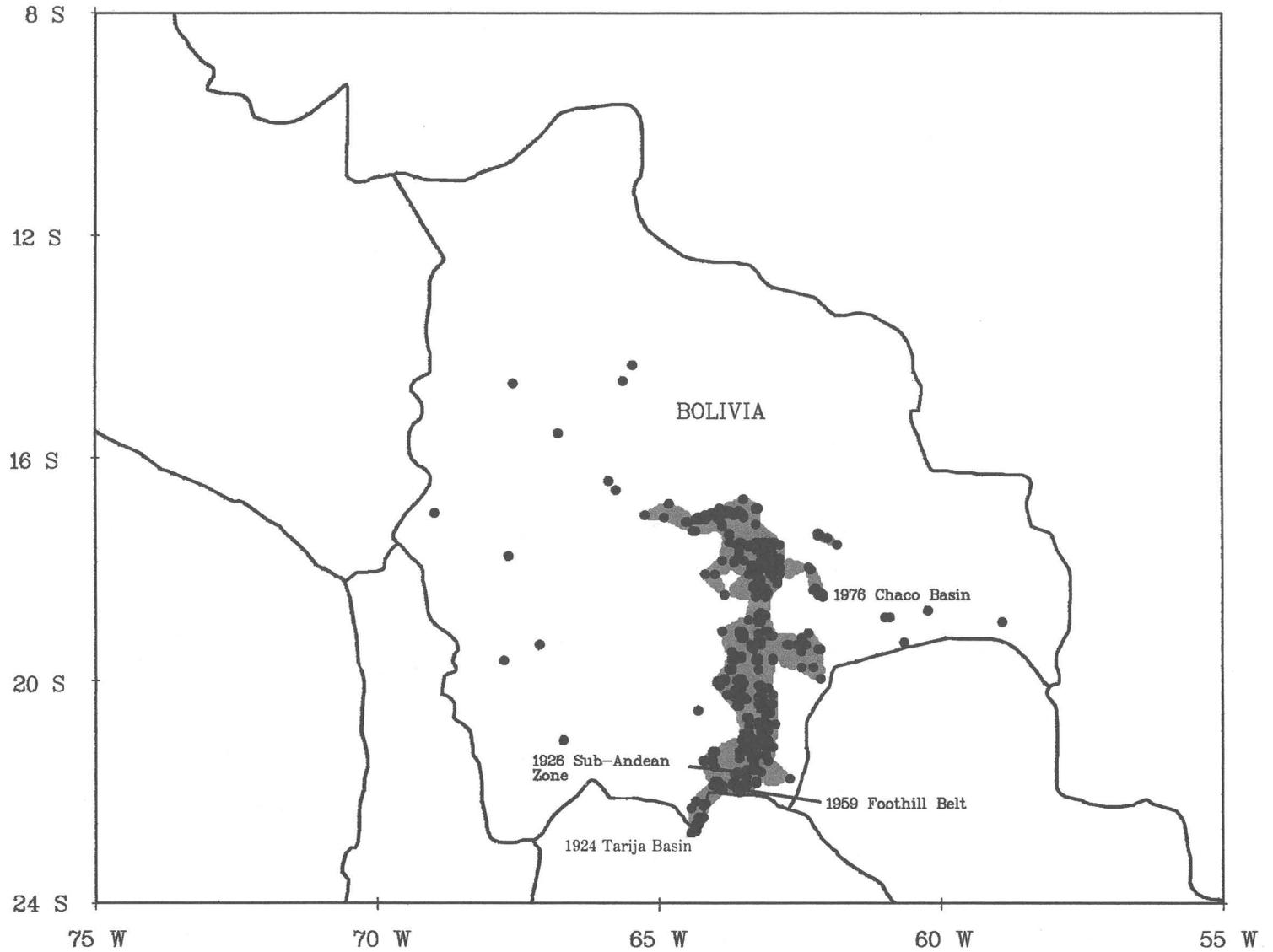
Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 1.139 × 10<sup>6</sup> bbl/mi<sup>2</sup>

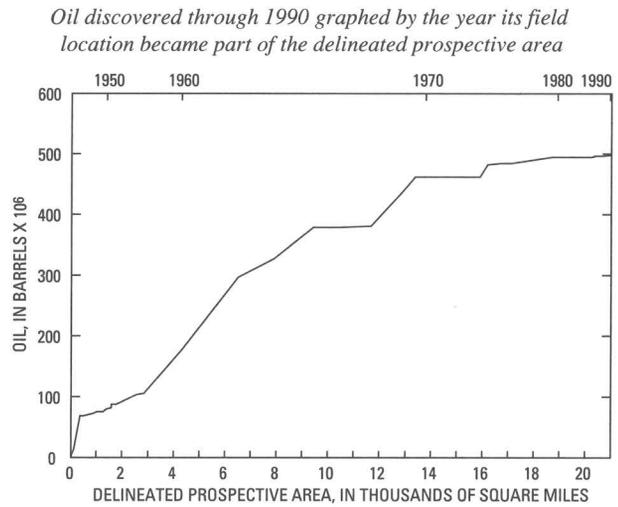
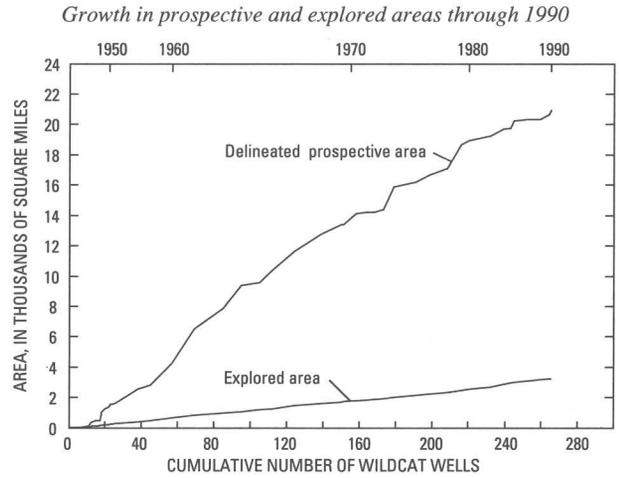
Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Venezuela</b>				
Eastern Venezuela Basin . . .	1901	17,940	21,737	11,131
Maracaibo Basin . . . . .	1914	58,879	59,667	17,370
Falcon Basin . . . . .	1921	100	371	395
Serrania Interior Oriental Belt	1928	810	922	2,358
Greater Furrial Trend . . . . .	1929	9,064	9,253	6,918
Barinas-Apure Basin . . . . .	1948	1,513	1,662	3
Total . . . . .		88,306	93,612	38,175
<b>Trinidad and Tobago</b>				
Eastern Venezuela Basin . . .	1867	2,579	3,691	14,780
Southern Range Uplift . . . . .	1912	255	288	356
Total . . . . .		2,834	3,979	15,136

Figure 25. Continued.



**Figure 26.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Bolivia, South America.

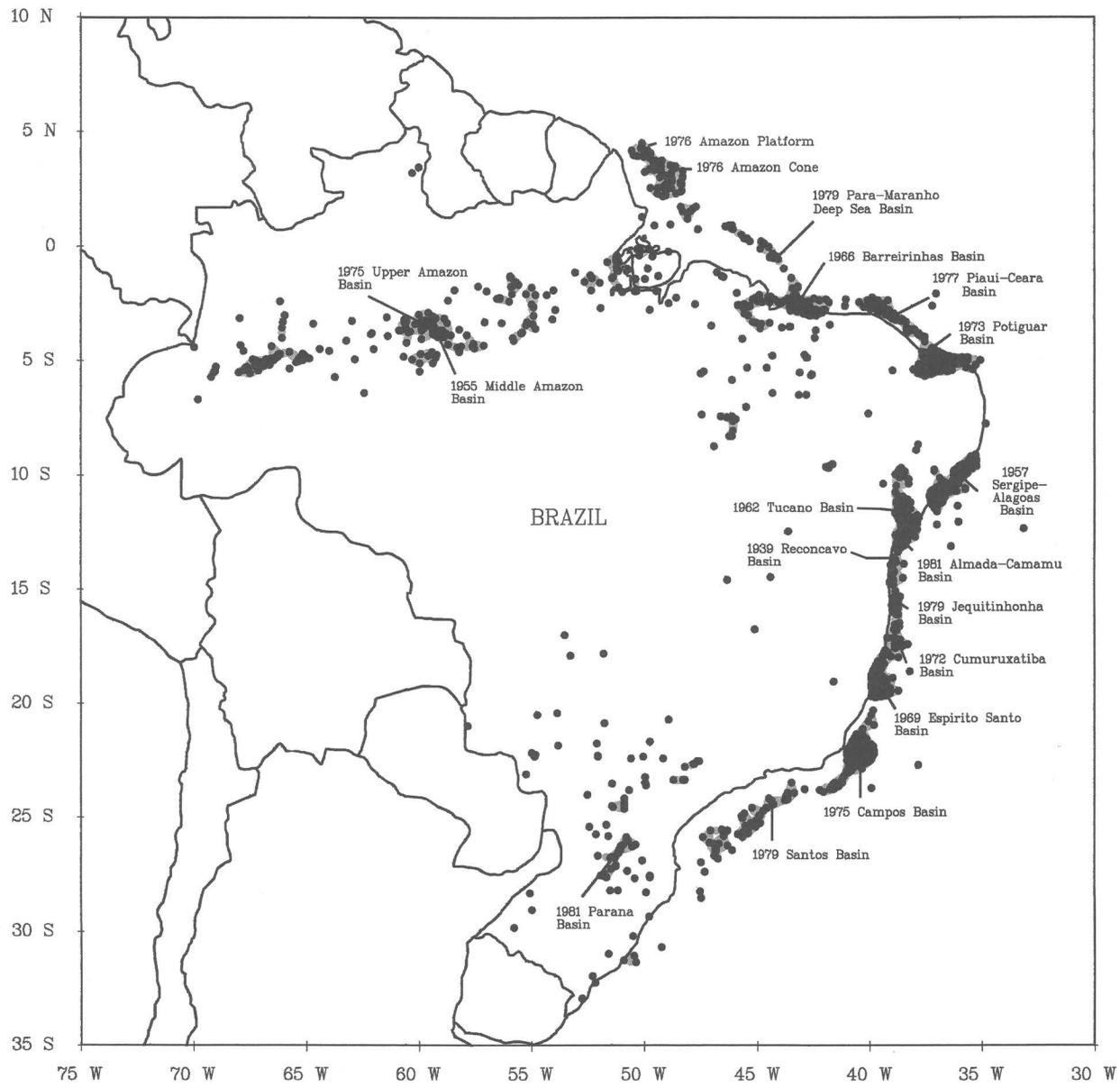


*Exploration data*

Land area: 404,388 mi <sup>2</sup>	Reported discoveries of recoverable crude oil and gas through 1990: $0.498 \times 10^9$ bbl oil and $6.33 \times 10^{12}$ cubic feet gas
Delineated prospective area through 1990: 20,937 mi <sup>2</sup>	
Explored area through 1990: 3,252 mi <sup>2</sup>	Richness = $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$
Wildcat wells through 1990: 265	= $0.024 \times 10^6$ bbl/mi <sup>2</sup>
Current growth in delineated prospective area per wildcat: 98 mi <sup>2</sup>	

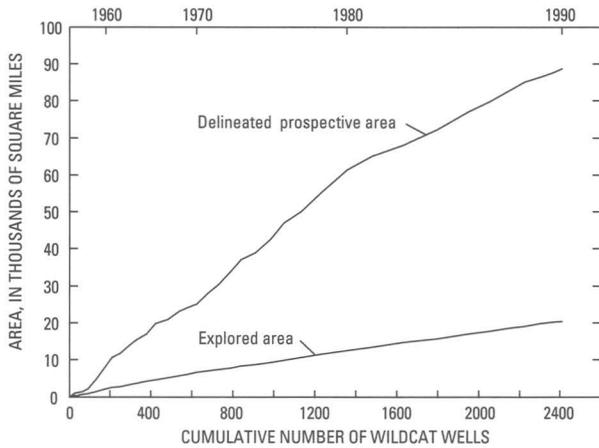
*Significant petroleum province*

Significant petroleum province	Year of first discovery in this province in Bolivia	Cumulative discoveries in this province in Bolivia through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Sub-Andean Zone . . . . .	1926	0	147	305

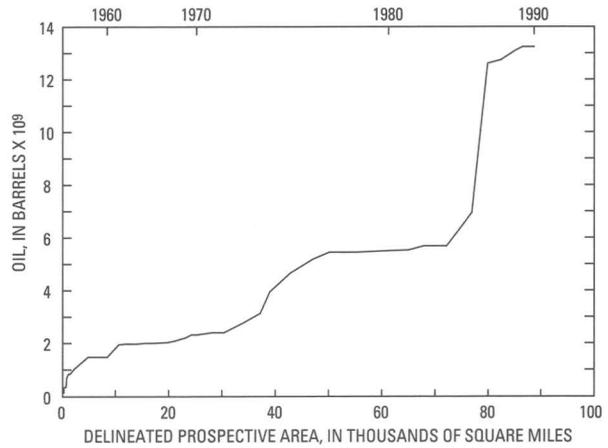


**Figure 27.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Brazil, South America.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Brazil	Cumulative discoveries in this province in Brazil through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Reconcavo Basin	1939	1,285	1,608	2,001
Sergipe-Alagoas Basin	1957	330	736	1,379
Potiguar Basin	1973	227	428	747
Campos Basin	1975	9,244	10,005	11,654
Santos Basin	1979	120	120	333
Total		11,206	12,897	16,114

Exploration data

Land area: 3,286,170 mi<sup>2</sup>

Delineated prospective area through 1990: 88,615 mi<sup>2</sup>

Explored area through 1990: 20,400 mi<sup>2</sup>

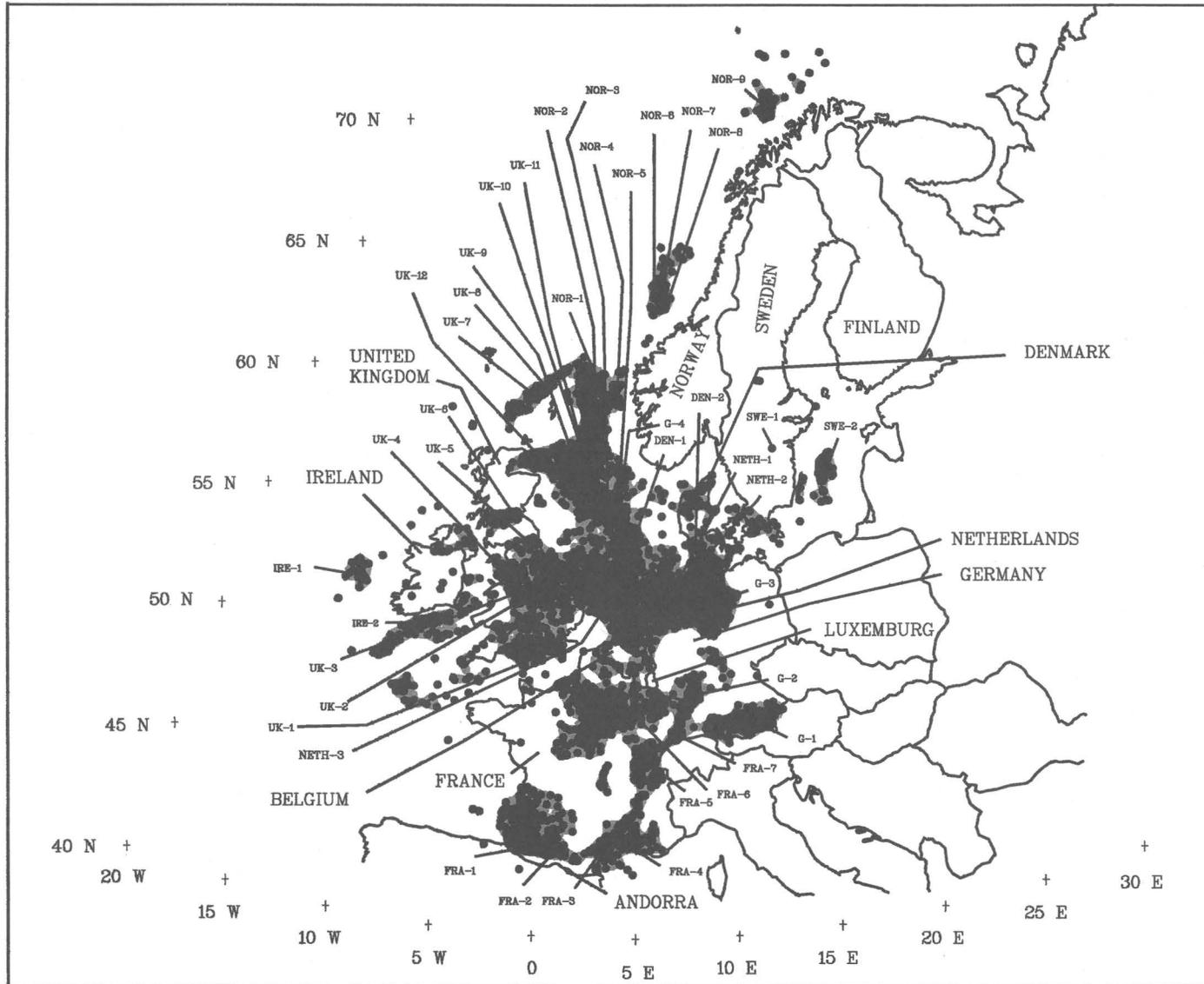
Wildcat wells through 1990: 2,407

Current growth in delineated prospective area per wildcat: 23 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
13.28 × 10<sup>9</sup> bbl oil and 19.1 × 10<sup>12</sup> cubic feet gas

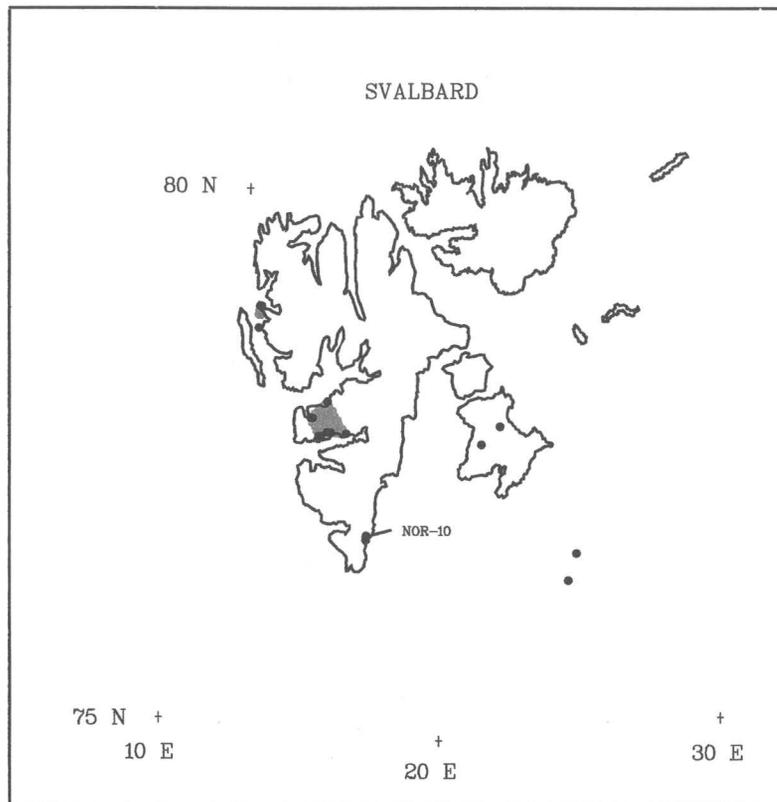
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.149 \times 10^6 \text{ bbl/mi}^2$$

Figure 27. Continued.



**Figure 28.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of the northern part of Western Europe.

Area north of mainland Norway



**EXPLANATION OF PROVINCE DESIGNATIONS**

**DENMARK**

- DEN -1 1966 North Sea Graben
- 2 1980 Northwest German Basin

**FRANCE**

- FRA -1 1967 North Pyrenean-North Cantabrian Zone
- 2 1939 Aquitaine Basin
- 3 1924 Languedoc-Provence Basin
- 4 1951 Golfe Du Lion-Camargue Basin
- 5 1957 Jura Fold Belt
- 6 1954 Anglo-Paris Basin
- 7 1952 Upper Rhine Graben

**IRELAND**

- IRE -1 1978 Porcupine Basin
- 2 1971 Celtic Sea Graben

**NETHERLANDS**

- NETH -1 1943 Northwest German Basin
- 2 1949 Anglo-Dutch Basin
- 3 1968 North Sea Graben

**NORWAY**

- NOR -1 1987 More Basin
- 2 1968 Vestland Arch
- 3 1969 North Sea Graben
- 4 1979 Horda Platform
- 5 1972 Norwegian-Danish Basin
- 6 1985 Voring Basin
- 7 1981 Kristiansund-Bodo Fault Complex
- 8 1984 Trondelag Platform
- 9 1981 South Barents Sea Basin
- 10 1977 Vestspitsbergen Trough (small map)

**SWEDEN**

- SWE -1 1987 Fennoscandian Shield
- 2 1968 Baltic Depression

**UNITED KINGDOM**

- UK -1 1895 Anglo-Paris Basin
- 2 1938 Welsh Platform
- 3 1918 Pennine High
- 4 1939 East Irish Sea Basin
- 5 1939 Anglo-Dutch Basin
- 6 1938 Midland Valley Graben
- 7 1977 West Shetland Basin
- 8 1984 Faroes-Shetland Trough
- 9 1969 North Sea Graben
- 10 1975 East Shetland Platform
- 11 1972 Vestland Arch
- 12 1971 Mid North Sea High

**GERMANY**

- G -1 1883 Molasse Basin
- 2 1935 Upper Rhine Graben
- 3 1874 Northwest German Basin
- 4 1974 North Sea Graben

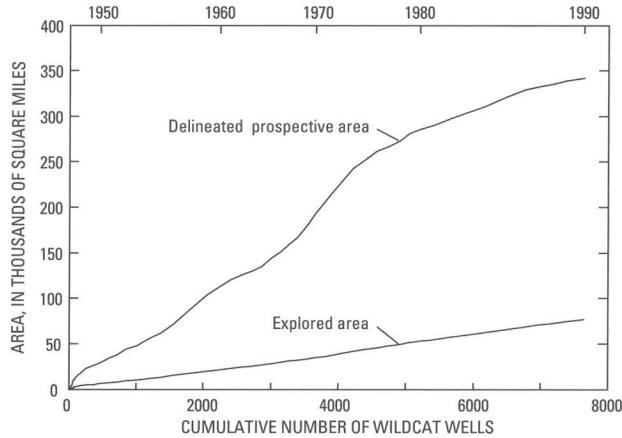
Figure 28. Continued.

## Significant petroleum provinces

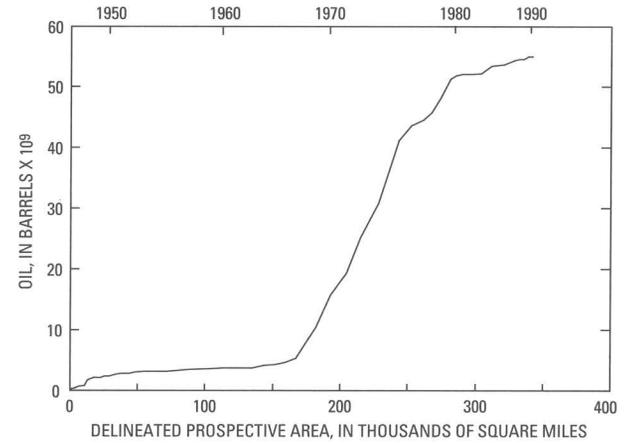
Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>United Kingdom</b>				
Anglo-Paris Basin .....	1895	550	597	332
Anglo-Dutch Basin .....	1939	0	87	53,748
North Sea Graben .....	1969	23,083	27,325	39,451
Mid North Sea High .....	1971	120	240	2
Vestland Arch .....	1972	0	50	600
East Shetland Platform .....	1975	542	742	320
West Shetland Basin .....	1977	800	840	650
Total .....		25,095	29,881	95,103
<b>France</b>				
Aquitaine Basin .....	1939	226	512	10,749
Anglo-Paris Basin .....	1954	0	316	108
Total .....		226	828	10,857
<b>Netherlands</b>				
Northwest German Basin .....	1943	385	385	117,224
Anglo-Dutch Basin .....	1949	232	823	26,520
North Sea Graben .....	1968	0	86	1,735
Total .....		617	1,294	145,479
<b>Germany (formerly Federal Republic of Germany)</b>				
Northwest German Basin .....	1874	666	1,944	33,696
North Sea Graben .....	1974	0	0	175
Total .....		666	1,944	33,871
<b>Norway</b>				
Vestland Arch .....	1968	1,291	1,505	1,977
North Sea Graben .....	1969	14,232	15,371	60,526
Norwegian-Danish Basin .....	1972	150	195	35
Horda Platform .....	1979	404	404	44,214
Kristiansund-Bodo Fault Complex .....	1981	1,228	1,345	7,734
Trondelag Platform .....	1984	428	464	610
Voring Basin .....	1985	138	138	2,685
Total .....		17,871	19,422	117,781
<b>Denmark</b>				
North Sea Graben .....	1966	894	1,241	6,467
Northwest German Basin .....	1980	0	0	1
Total .....		894	1,241	6,468

Figure 28. Continued.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
United Kingdom	93,377
Ireland	27,137
France	212,736
Netherlands	13,433
Belgium	11,779
Luxemburg	999
Germany <sup>1</sup>	94,905
Norway <sup>2</sup>	124,555
Denmark	16,576
Sweden	173,394
Finland	130,119
Andorra	191
Monaco (not shown)	.5
Greenland <sup>3</sup>	840,000
Iceland (not shown)	39,698
<b>Total</b>	<b>1,778,899.5</b>

Delineated prospective area through 1990: 342,007 mi<sup>2</sup>

Explored area through 1990: 77,207 mi<sup>2</sup>

Wildcat wells through 1990: 7,634

Current growth in delineated prospective area per wildcat: 11 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
55.0 × 10<sup>9</sup> bbl oil and 436 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.161 \times 10^6 \text{ bbl/mi}^2$$

<sup>1</sup>Statistics here are for the part of Germany formerly known as the Federal Republic of Germany. Data were not complete for the rest of the country.

<sup>2</sup>Norway includes Svalbard.

<sup>3</sup>Greenland is listed separately here although it is part of Denmark. Greenland is not shown on the map, and its five wildcat wells and the explored and delineated prospective areas defined by them are not included in the data given here.

Figure 28. Continued.

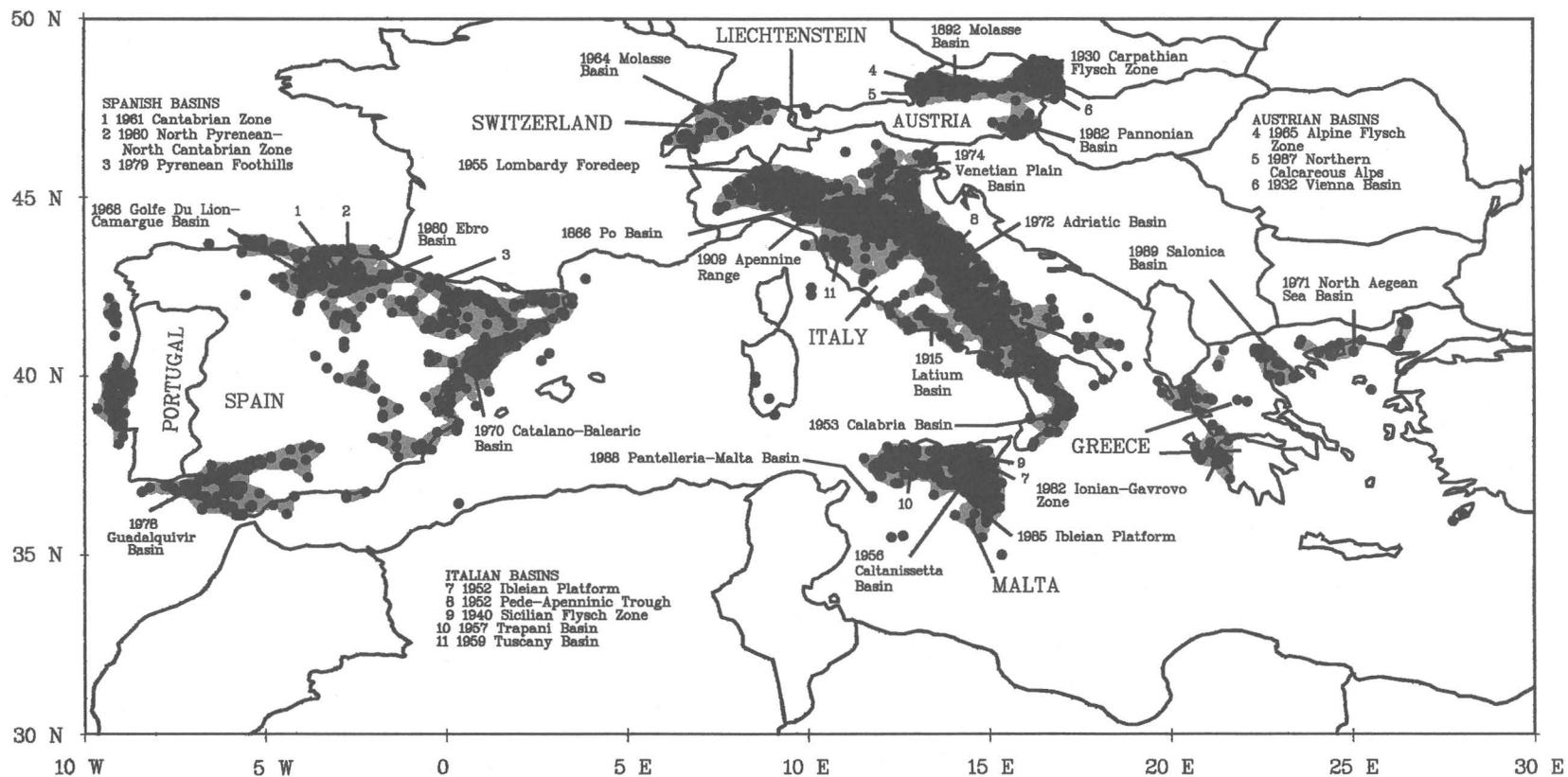
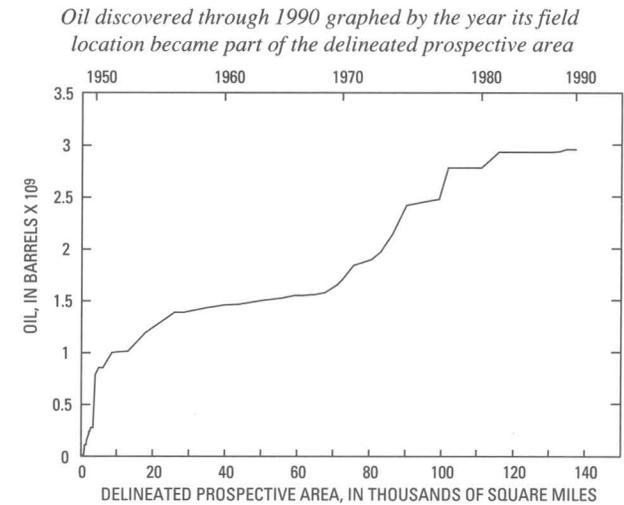
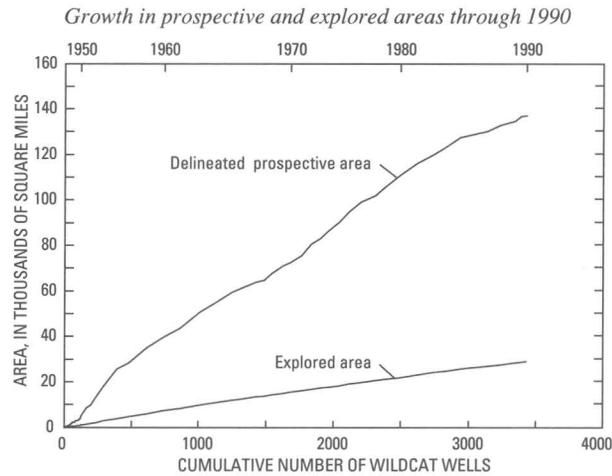


Figure 29. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of the middle and southern parts of Western Europe.



*Exploration data*

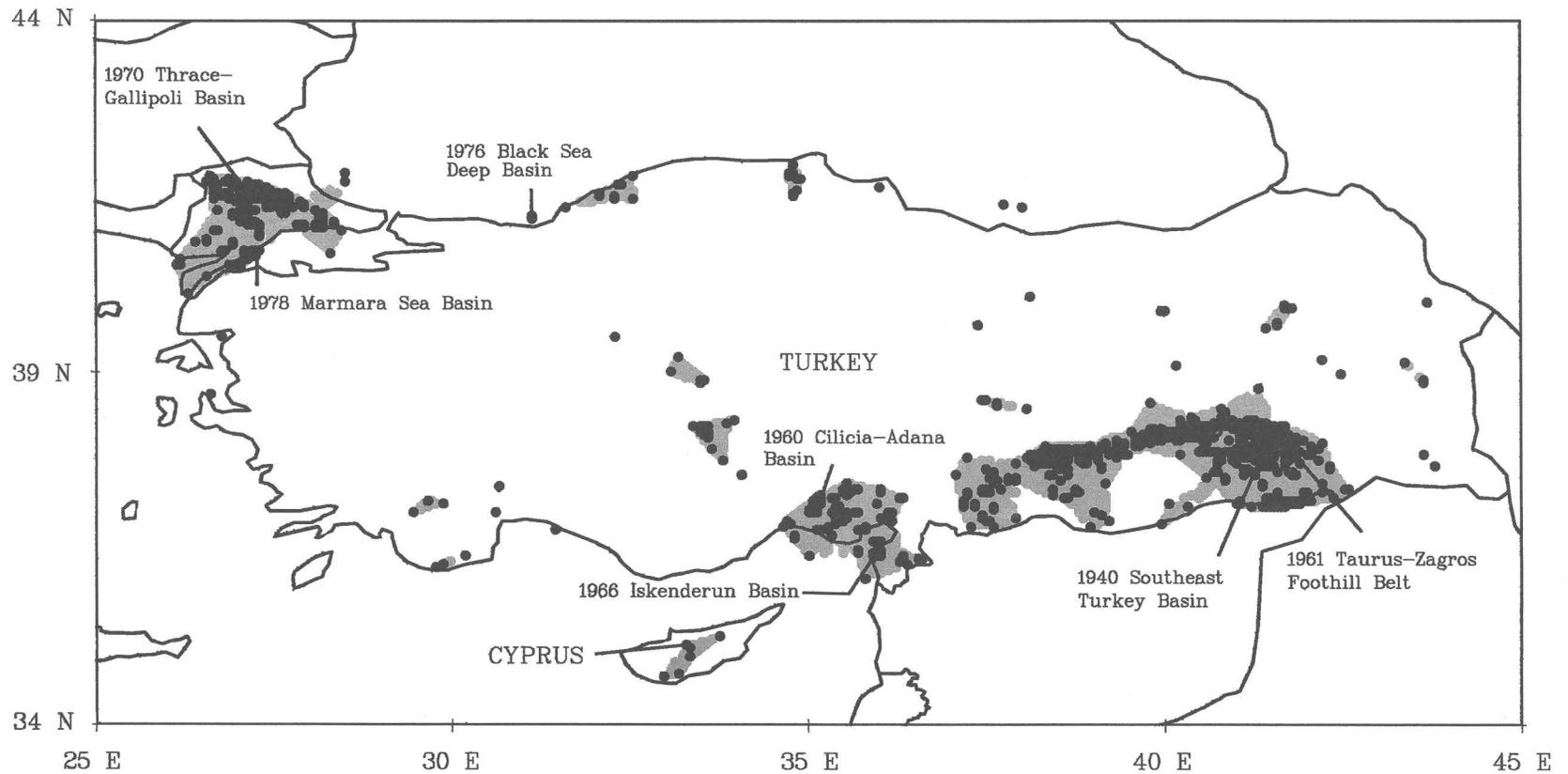
Country	Land area (mi <sup>2</sup> )	Delineated prospective area through 1990: 137,179 mi <sup>2</sup>
Austria	32,381	Explored area through 1990: 29,133 mi <sup>2</sup>
Liechtenstein	65	
Italy	116,294	Wildcat wells through 1990: 3,429
Switzerland	15,944	
Greece	50,147	Current growth in delineated prospective area per wildcat: 10 mi <sup>2</sup>
Portugal	35,414	
Spain	194,988	Reported discoveries of recoverable crude oil and gas through 1990: 2.95 × 10 <sup>9</sup> bbl oil and 30.5 × 10 <sup>12</sup> cubic feet gas
Malta	122	
Total	445,355	

Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$   
 $= 0.022 \times 10^6 \text{ bbl/mi}^2$

*Significant petroleum provinces*

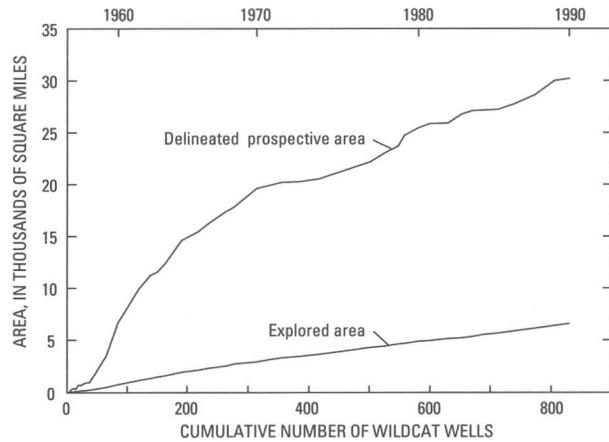
Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil in 100-million-barrel fields (10 <sup>6</sup> bbl)	Crude oil in all fields (10 <sup>6</sup> bbl)	Gas in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Austria</b>				
Carpathian Flysch Zone	1930	500	654	1,425
<b>Italy</b>				
Po Basin	1866	150	225	15,093
Ibleian Platform	1952	445	518	144
Caltanissetta Basin	1956	144	174	38
Adriatic Basin	1972	278	360	821
Total		1,017	1,277	16,096
<b>Greece</b>				
North Aegean Sea Basin	1971	172	173	160
<b>Spain</b>				
Catalano-Balearic Basin	1970	159	330	140
<b>Malta</b>				
Ibleian Platform	1985	0	35	0

Figure 29. Continued.

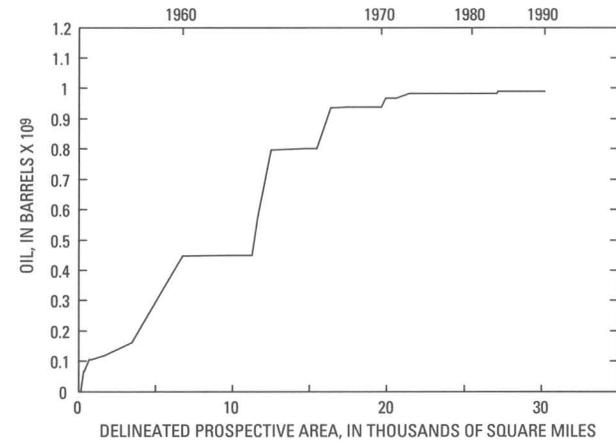


**Figure 30.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Turkey and Cyprus, Middle East.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Turkey . . . . .	296,184
Cyprus . . . . .	3,572
Total . . . . .	299,756

Delineated prospective area through 1990: 30,168 mi<sup>2</sup>

Explored area through 1990: 6,618 mi<sup>2</sup>

Wildcat wells through 1990: 829

Current growth in delineated prospective area per wildcat: 7 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 0.989 × 10<sup>9</sup> bbl oil and 1.18 × 10<sup>12</sup> cubic feet gas

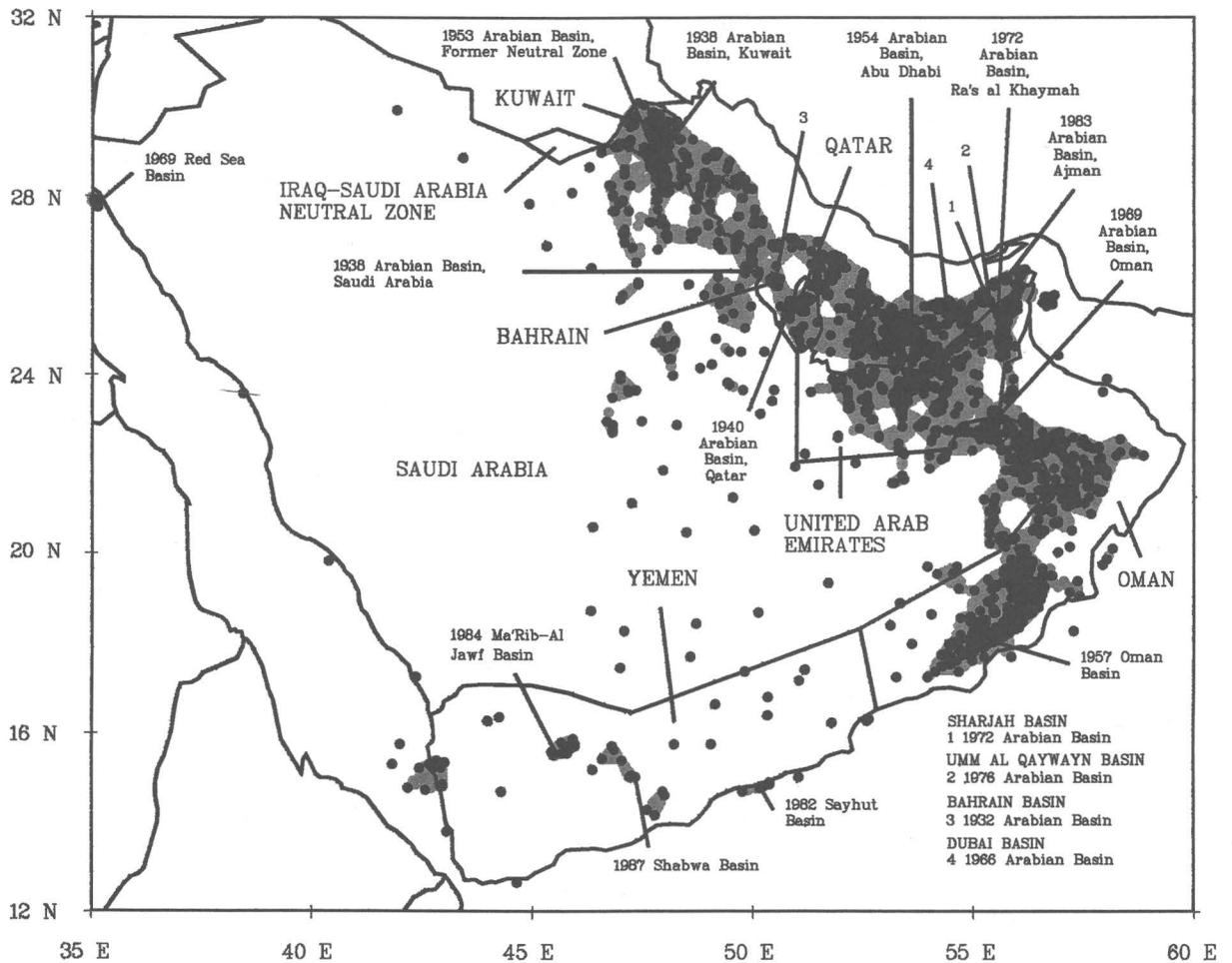
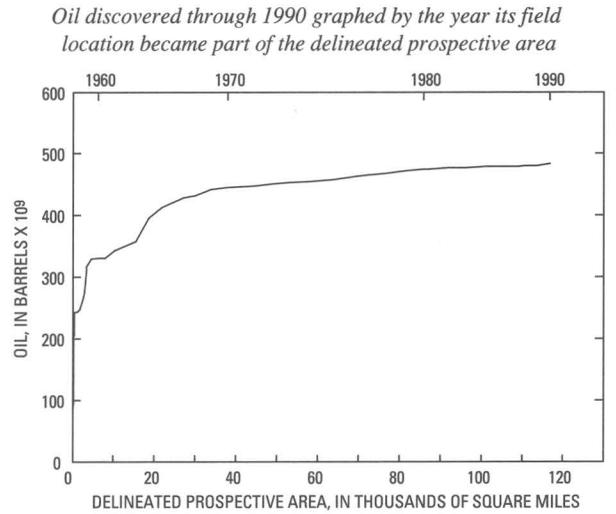
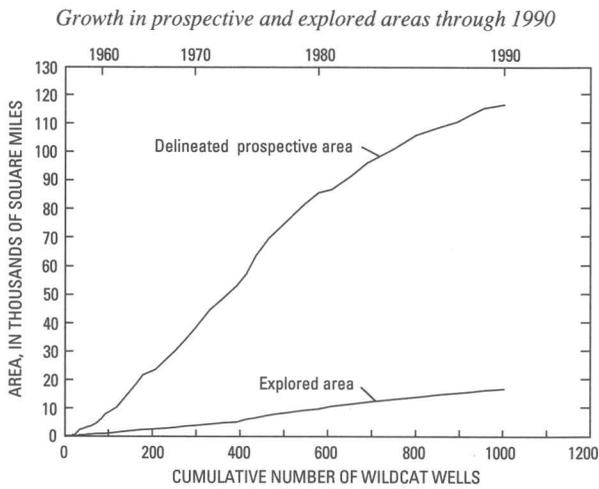
Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 0.033 × 10<sup>6</sup> bbl/mi<sup>2</sup>

Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Turkey	Cumulative discoveries in this province in Turkey through 1990		
		Crude oil	Gas	
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Southeast Turkey Basin (Zagros Fold Belt) . . . . .				
	1940	210	362	391
Taurus-Zagros Foothill Belt . . . . .				
	1961	112	620	281
Total . . . . .		322	982	672

Figure 30. Continued.



**Figure 31.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of the Arabian Peninsula, Middle East.

Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Saudi Arabia</b>				
Arabian Basin .....	1938	255,024	255,351	148,613
<b>Kuwait</b>				
Arabian Basin .....	1938	110,080	110,080	62,226
<b>Former Kuwait-Saudi Arabia Neutral Zone</b>				
Arabian Basin .....	1953	18,605	18,609	11,715
<b>Bahrain</b>				
Arabian Basin .....	1932	1,005	1,005	12,500
<b>Qatar</b>				
Arabian Basin .....	1940	8,300	8,550	168,565
<b>Oman</b>				
Oman Basin .....	1957	6,916	9,379	9,593
Arabian Basin .....	1969	520	762	2,776
Total .....		7,436	10,141	12,369
<b>Abu Dhabi*</b>				
Arabian Basin .....	1954	68,652	69,793	129,157
<b>Ajman*</b>				
Arabian Basin .....	1983	0	0	250
<b>Dubai*</b>				
Arabian Basin .....	1966	5,175	5,195	4,850
<b>Umm al Qaywayn*</b>				
Arabian Basin .....	1976	0	0	750
<b>Ra's al Khaymah*</b>				
Arabian Basin .....	1972	1,943	1,943	1,293
<b>Sharjah*</b>				
Arabian Basin .....	1972	505	505	7,100
<b>Yemen</b>				
Ma'Rib-Al Jawf Basin .....	1984	1,204	1,427	12,500
Shabwa Basin .....	1987	500	500	0
Total .....		1,704	1,927	12,500

\*One of the seven United Arab Emirates. (Umm al Qaywayn is also spelled Uhm Al Qawai, and Ra's al Khaymah is also spelled Ras Al Khaim.)

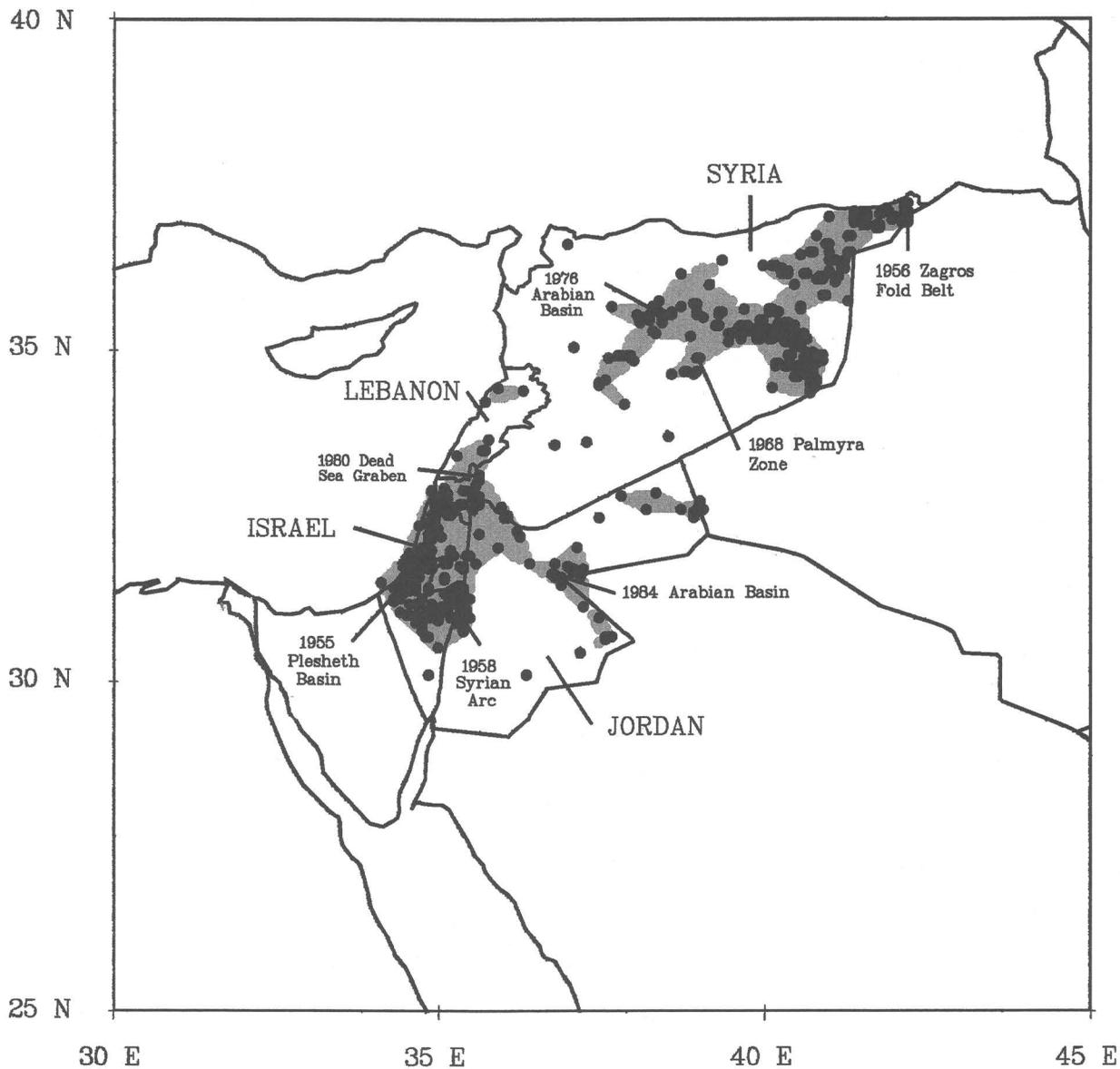
Exploration data

Country	Land area <sup>1</sup> (mi <sup>2</sup> )	Delineated prospective area through 1990: 116,689 mi <sup>2</sup>
Saudi Arabia .....	830,000	Explored area through 1990: 16,745 mi <sup>2</sup>
Kuwait .....	6,880	Wildcat wells through 1990: 1,002
Iraq-Saudi Arabia Neutral Zone .....	1,360	Current growth in delineated prospective area per wildcat: 43 mi <sup>2</sup>
Bahrain .....	239	Reported discoveries of recoverable crude oil and gas through 1990: 483 × 10 <sup>9</sup> bbl oil and 572 × 10 <sup>12</sup> cubic feet gas
Qatar .....	4,250	
Oman .....	82,000	
United Arab Emirates <sup>2</sup> .....	32,300	
Yemen .....	204,000	
Total .....	1,161,029	Richness = $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 4.140 \times 10^6 \text{ bbl/mi}^2$

<sup>1</sup>Land areas from *World Factbook 1991* (U.S. Central Intelligence Agency, 1991).

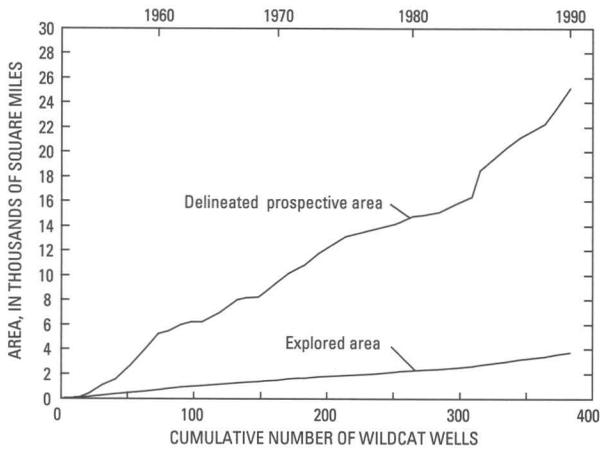
<sup>2</sup>Outlines of individual emirates in the United Arab Emirates are not shown.

Figure 31. Continued.

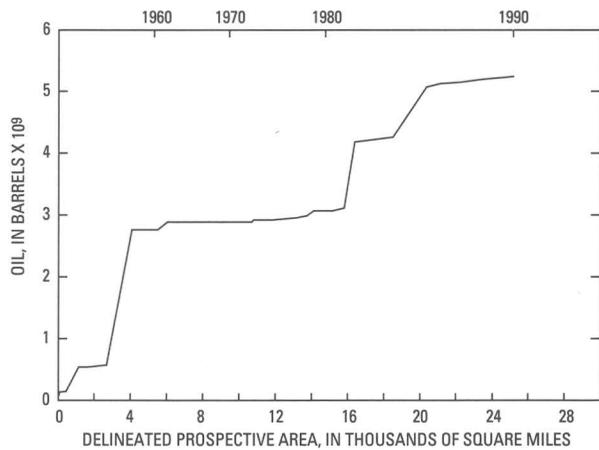


**Figure 32.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Syria, Lebanon, Israel, and Jordan, Middle East.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Syria</b>				
Zagros Fold Belt .....	1956	2,687	2,984	3,035
Arabian Basin .....	1976	1,601	2,183	1,015
Total .....		4,288	5,167	4,050
<b>Jordan</b>				
Arabian Basin .....	1984	0	50	410

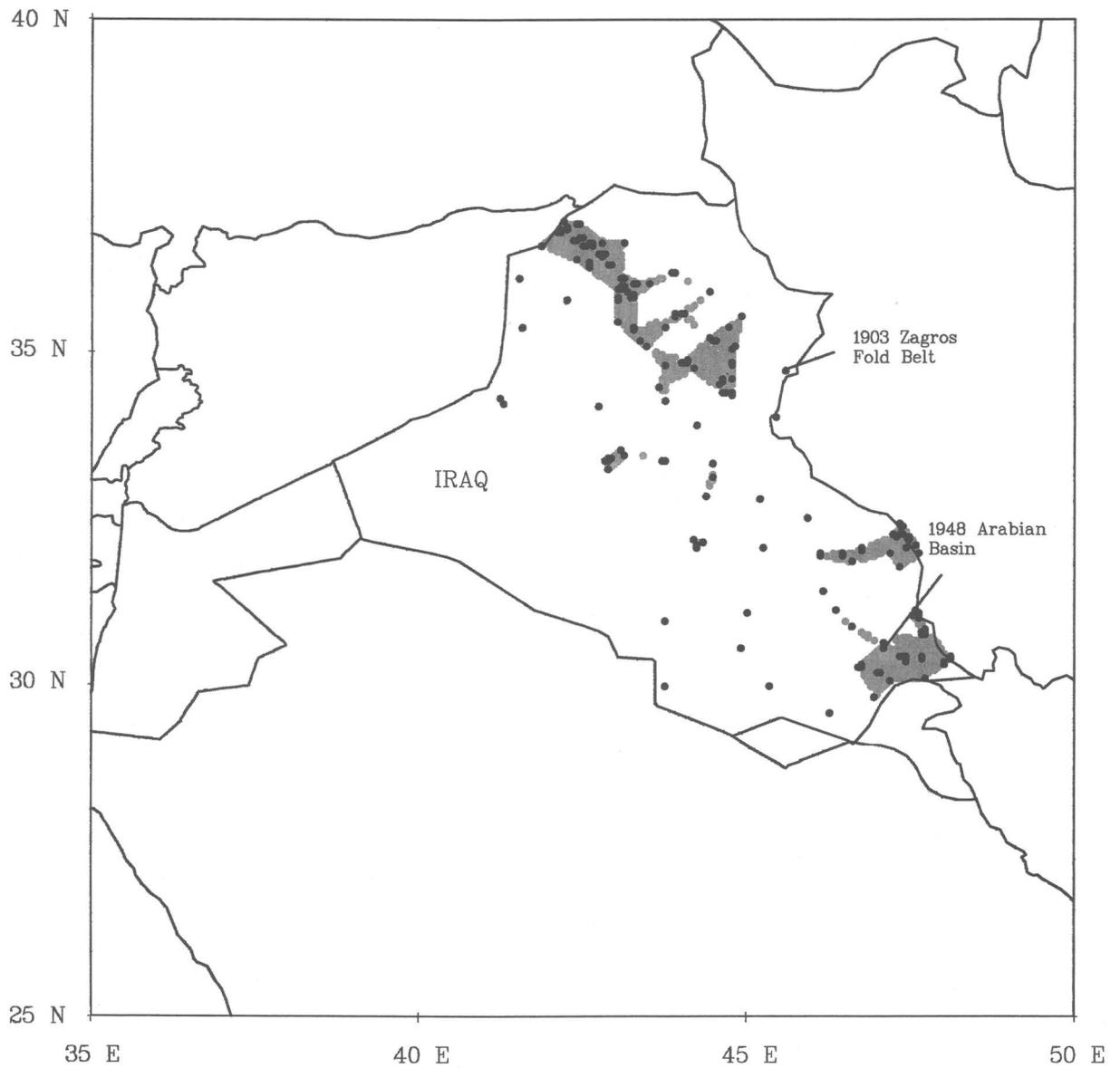
Exploration data

Country	Land area (mi <sup>2</sup> )
Syria .....	71,227
Lebanon .....	3,927
Israel .....	7,984
Jordan .....	37,264
Total .....	120,402

Delineated prospective area through 1990: 25,153 mi<sup>2</sup>  
 Explored area through 1990: 3,742 mi<sup>2</sup>  
 Wildcat wells through 1990: 383  
 Current growth in delineated prospective area per wildcat: 155 mi<sup>2</sup>  
 Reported discoveries of recoverable crude oil and gas through 1990:  
 5.24 × 10<sup>9</sup> bbl oil and 6.46 × 10<sup>12</sup> cubic feet gas

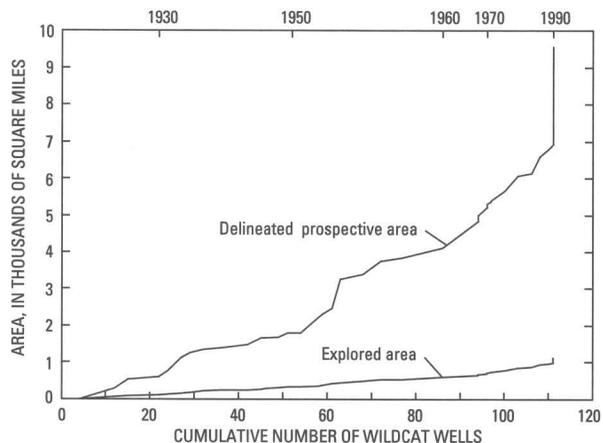
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.208 \times 10^6 \text{ bbl/mi}^2$$

Figure 32. Continued.

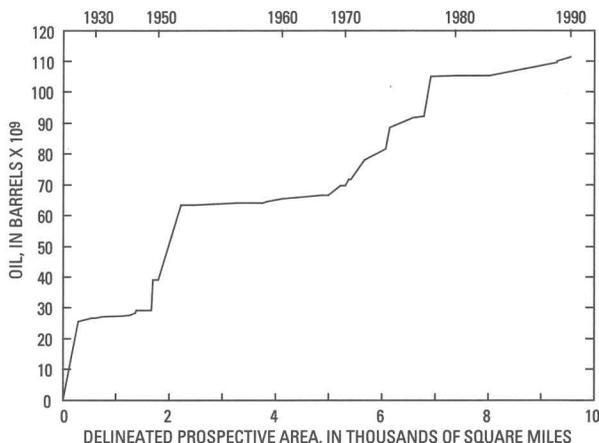


**Figure 33.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Iraq, Middle East.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Iraq	Cumulative discoveries in this province in Iraq through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Zagros Fold Belt .....	1903	38,673	39,434	18,833
Arabian Basin .....	1948	71,885	71,905	42,035
Total .....		110,558	111,339	60,868

Exploration data

Land area: 172,000 mi<sup>2</sup>

Delineated prospective area through 1990: 9,550 mi<sup>2</sup>

Explored area through 1990: 1,120 mi<sup>2</sup>

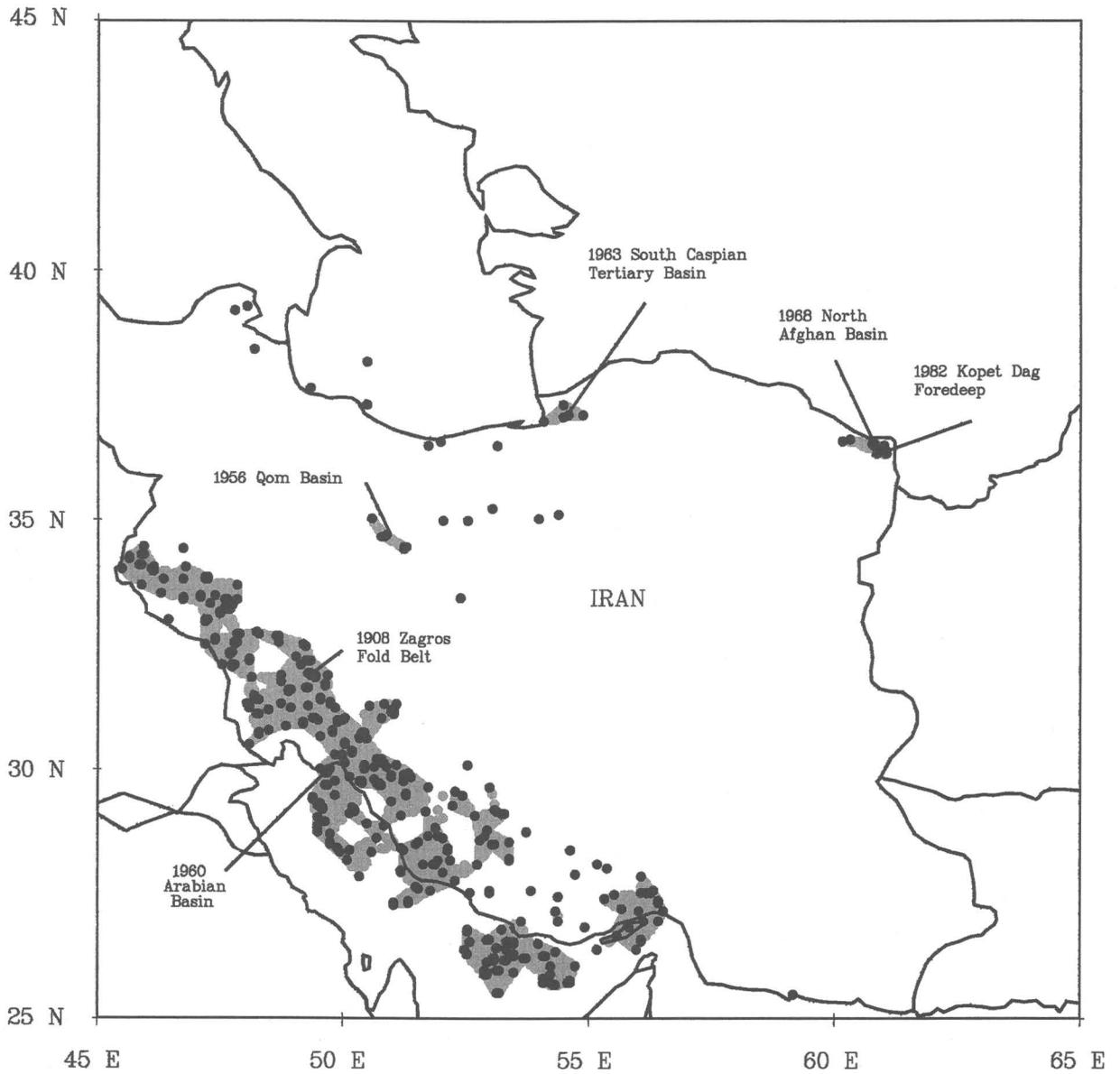
Wildcat wells through 1990: 111

Current growth in delineated prospective area per wildcat: 125 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
111 × 10<sup>9</sup> bbl oil and 60.9 × 10<sup>12</sup> cubic feet gas

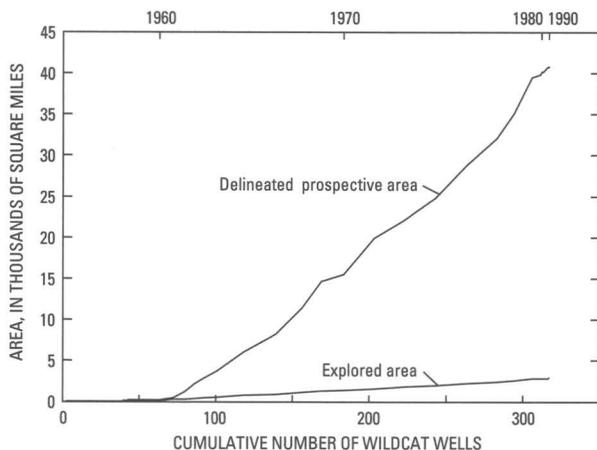
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 11.658 \times 10^6 \text{ bbl/mi}^2$$

Figure 33. Continued.

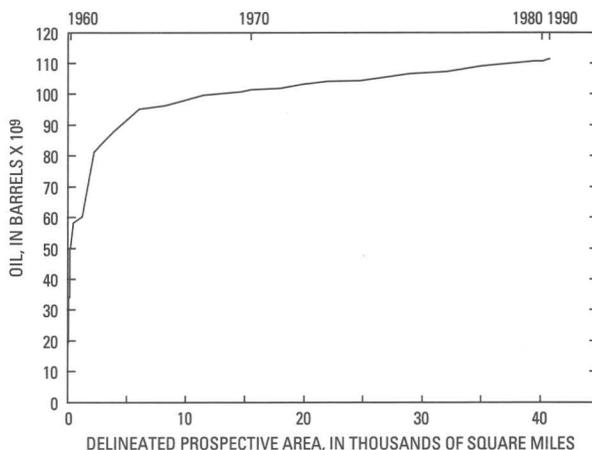


**Figure 34.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Iran, Middle East.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Iran	Cumulative discoveries in this province in Iran through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Zagros Fold Belt	1908	89,802	90,352	554,723
Qom Basin	1956	125	175	1,138
Arabian Basin	1960	20,694	20,747	177,588
Total		110,621	111,274	733,449

Exploration data

Land area: 635,000 mi<sup>2</sup>

Delineated prospective area through 1990: 40,773 mi<sup>2</sup>

Explored area through 1990: 2,903 mi<sup>2</sup>

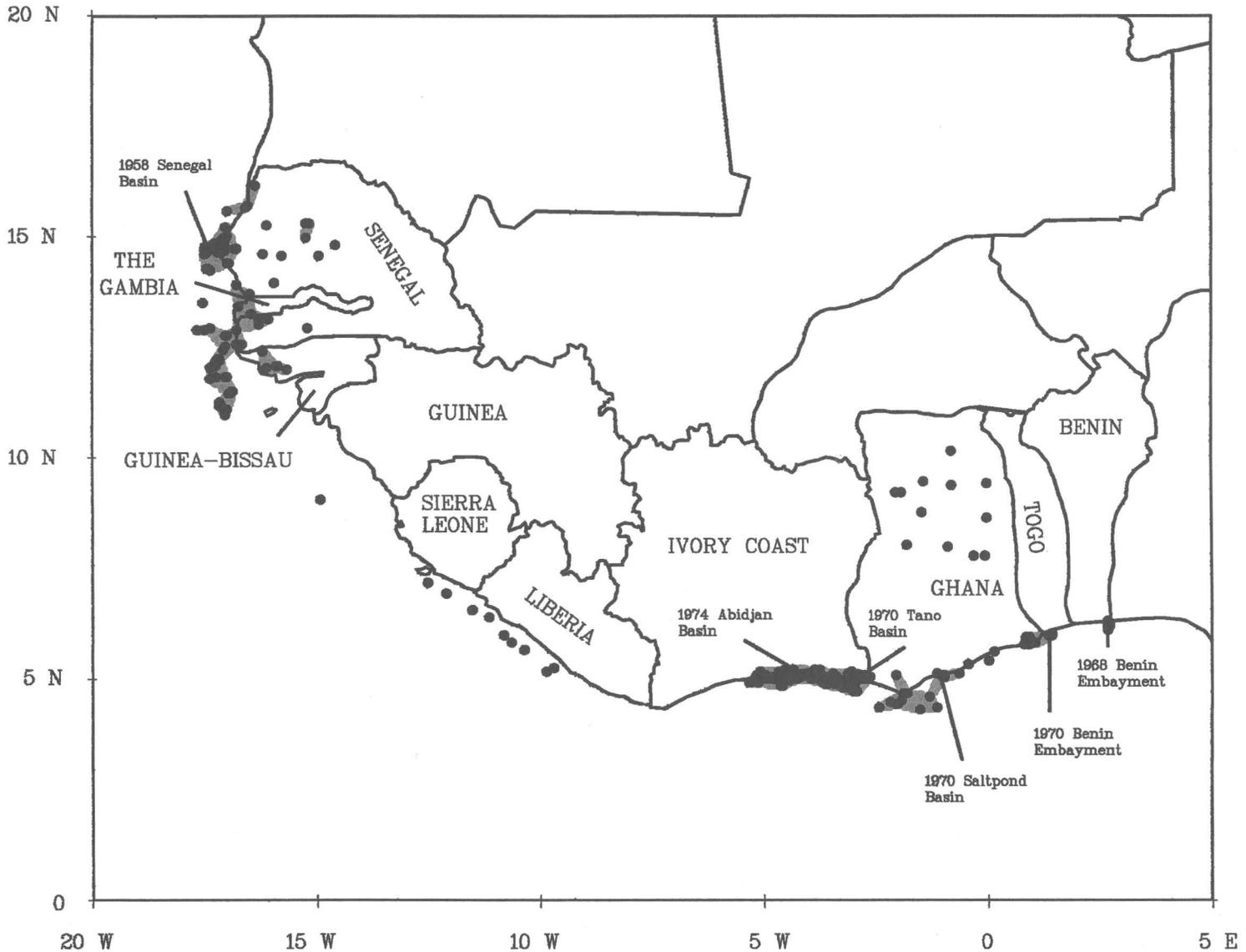
Wildcat wells through 1990: 317

Current growth in delineated prospective area per wildcat: 73 mi<sup>2</sup>

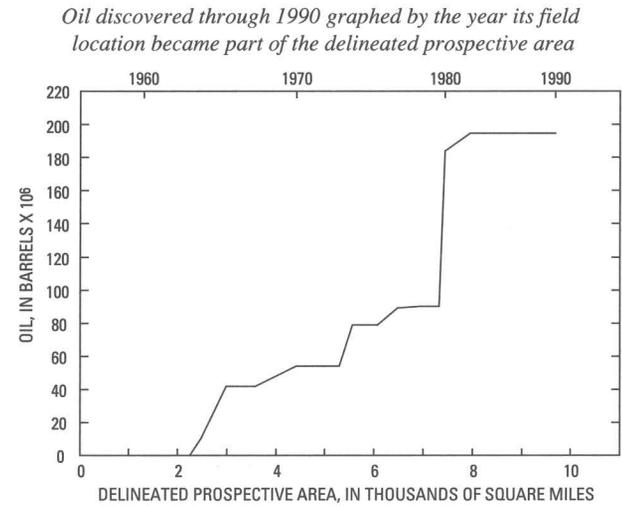
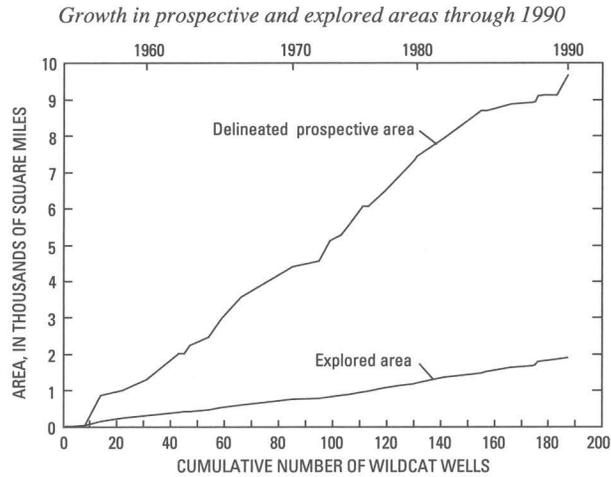
Reported discoveries of recoverable crude oil and gas through 1990:  
111 × 10<sup>9</sup> bbl oil and 770 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 2.473 \times 10^6 \text{ bbl/mi}^2$$

Figure 34. Continued.



**Figure 35.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Senegal, The Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, and Cape Verde, Africa. Because Cape Verde is west of the area mapped and has no reported wells, it is not shown.



*Exploration data*

Country	Land area (mi <sup>2</sup> )
Senegal	76,084
The Gambia	4,003
Guinea-Bissau	13,948
Guinea	96,900
Sierra Leone	27,925
Liberia	43,000
Ivory Coast	127,520
Ghana	91,843
Togo	21,830
Benin	43,484
Cape Verde (not shown)	1,557
Total	548,094

Delineated prospective area through 1990: 9,680 mi<sup>2</sup>

Explored area through 1990: 1,913 mi<sup>2</sup>

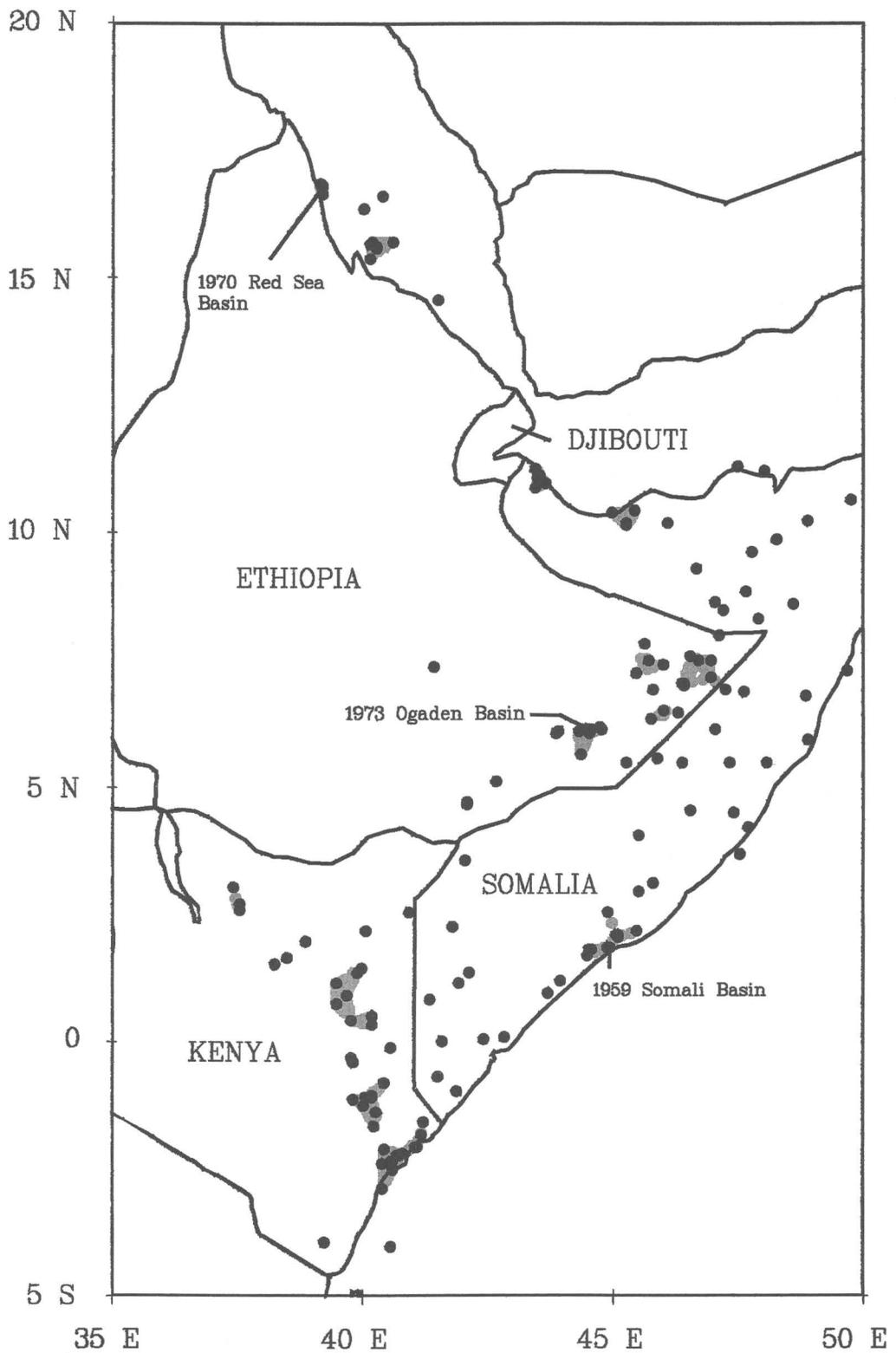
Wildcat wells through 1990: 187

Current growth in delineated prospective area per wildcat: 63 mi<sup>2</sup>

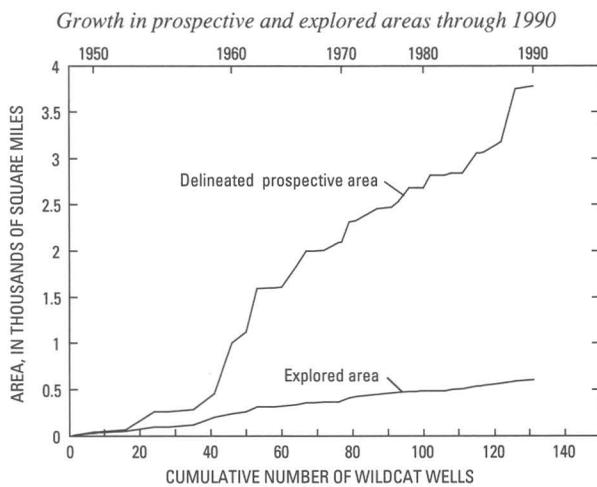
Reported discoveries of recoverable crude oil and gas through 1990:  
 $0.195 \times 10^9$  bbl oil and  $0.968 \times 10^{12}$  cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.020 \times 10^6 \text{ bbl/mi}^2$$

Figure 35. Continued.



**Figure 36.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Ethiopia, Djibouti, Somalia, and Kenya, Africa.



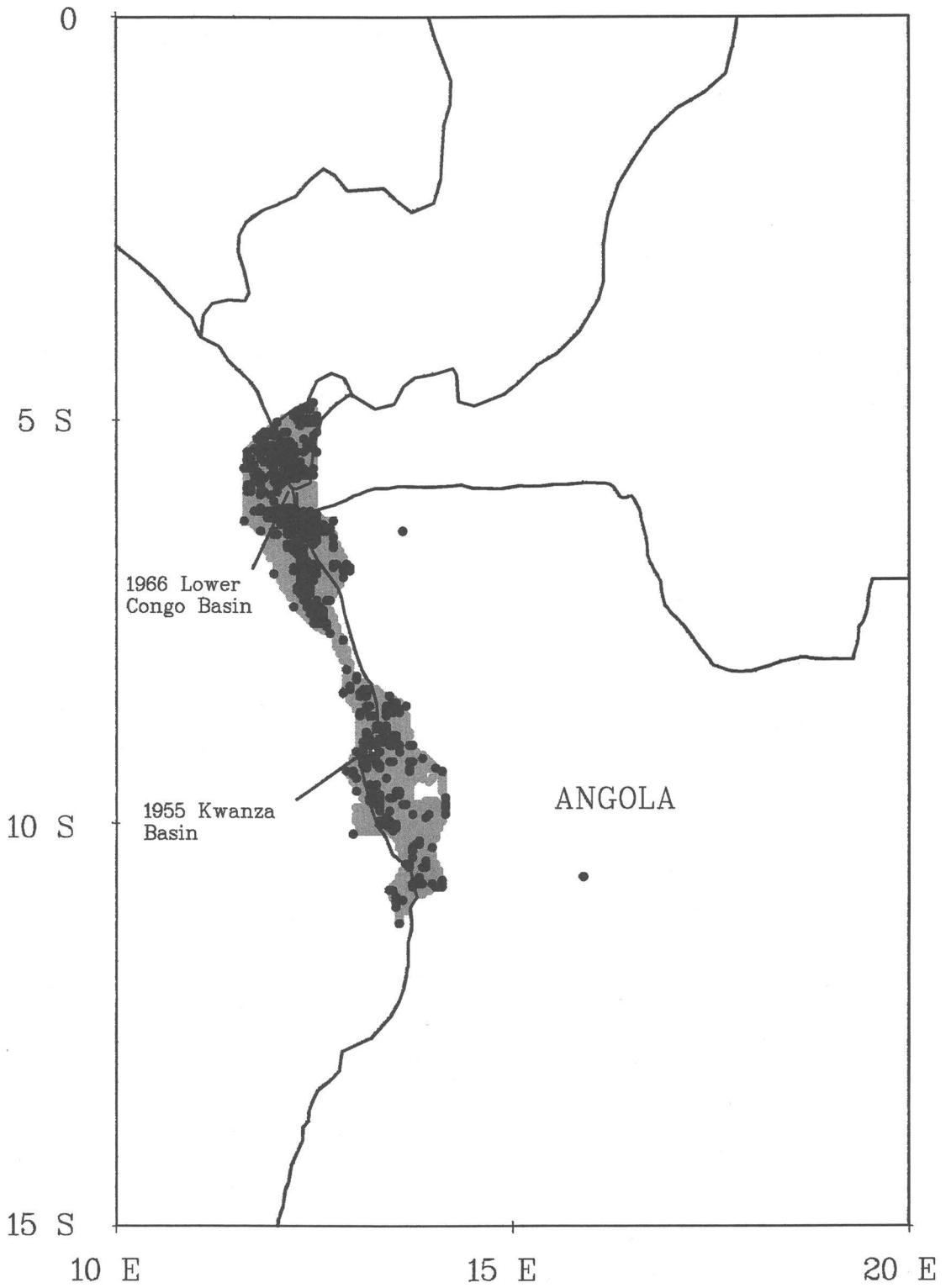
*Exploration data*

Country	Land area (mi <sup>2</sup> )
Ethiopia .....	409,266
Djibouti .....	8,492
Somalia .....	246,198
Kenya .....	223,478
Total .....	887,434

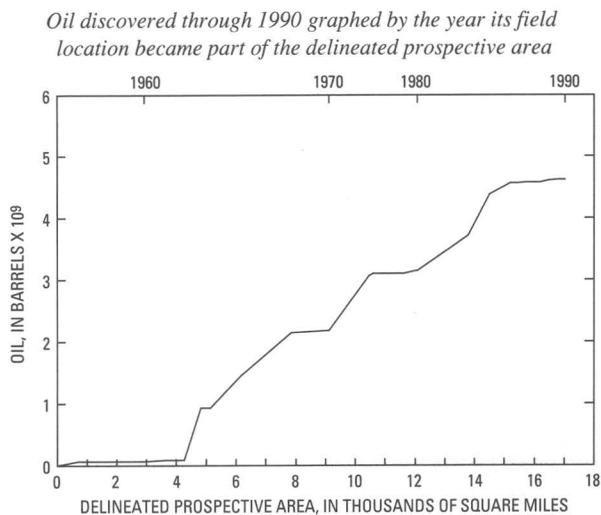
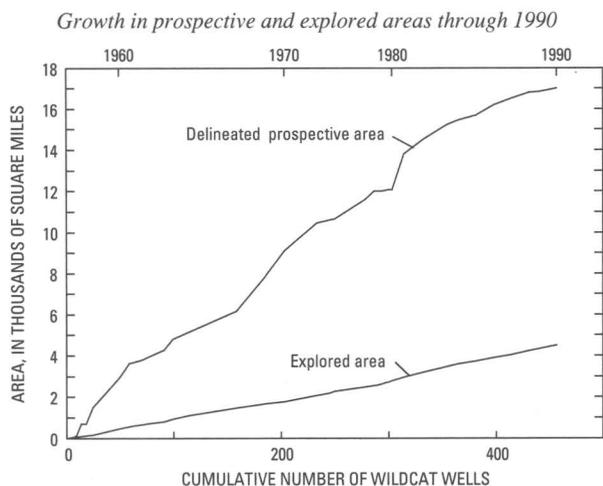
  

Delineated prospective area through 1990: 3,781 mi <sup>2</sup>
Explored area through 1990: 603 mi <sup>2</sup>
Wildcat wells through 1990: 131
Current growth in delineated prospective area per wildcat: 66 mi <sup>2</sup>
Field sizes not available for oil; reported discoveries of recoverable gas through 1990: $3.01 \times 10^{12}$ cubic feet

**Figure 36.** Continued.



**Figure 37.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Angola, Africa.



*Significant petroleum province*

Significant petroleum province	Year of first discovery in this province in Angola	Cumulative discoveries in this province in Angola through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Lower Congo Basin .....	1966	3,532	4,518	6,712

*Exploration data*

Land area: 481,226 mi<sup>2</sup>

Delineated prospective area through 1990: 17,021 mi<sup>2</sup>

Explored area through 1990: 4,496 mi<sup>2</sup>

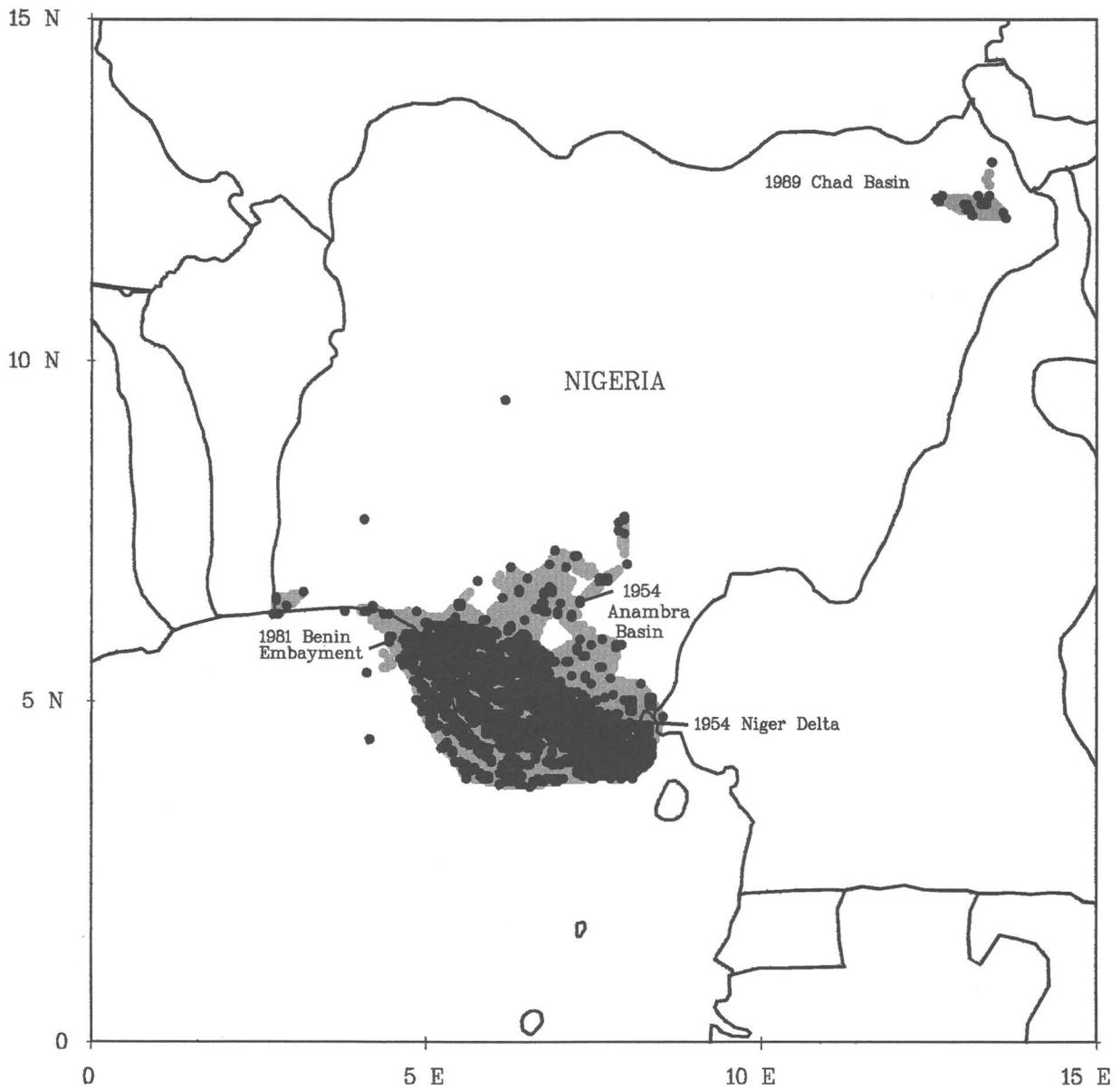
Wildcat wells through 1990: 457

Current growth in delineated prospective area per wildcat: 11 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
4.62 × 10<sup>9</sup> bbl oil and 6.76 × 10<sup>12</sup> cubic feet gas

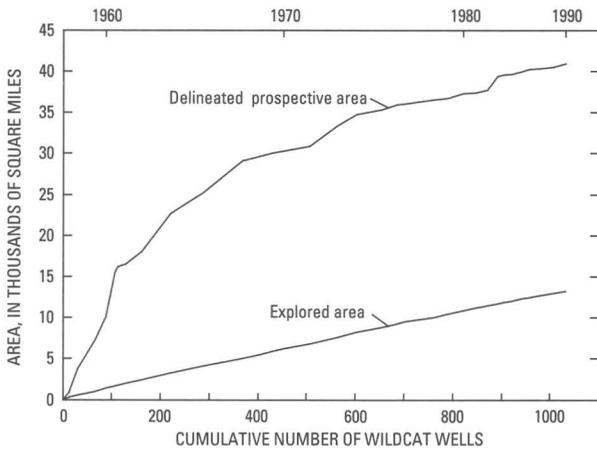
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.272 \times 10^6 \text{ bbl/mi}^2$$

**Figure 37.** Continued.

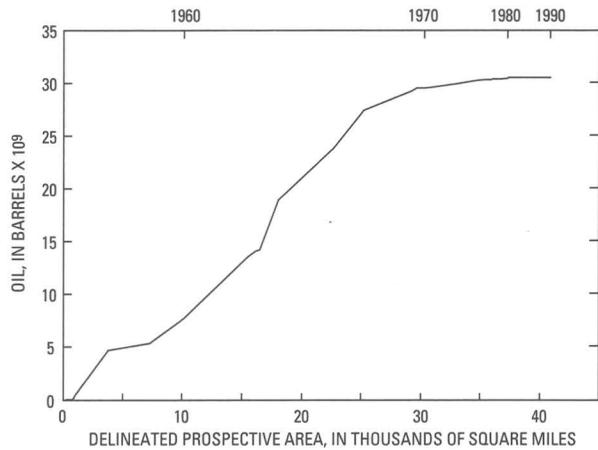


**Figure 38.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Nigeria, Africa.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum province

Significant petroleum province	Year of first discovery in this province in Nigeria	Cumulative discoveries in this province in Nigeria through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Niger Delta .....	1954	22,284	30,499	69,763

Exploration data

Land area: 356,599 mi<sup>2</sup>

Delineated prospective area through 1990: 40,902 mi<sup>2</sup>

Explored area through 1990: 12,245 mi<sup>2</sup>

Wildcat wells through 1990: 1,031

Current growth in delineated prospective area per wildcat: 15 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 30.5 × 10<sup>9</sup> bbl oil and 69.8 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.746 \times 10^6 \text{ bbl/mi}^2$$

Figure 38. Continued.

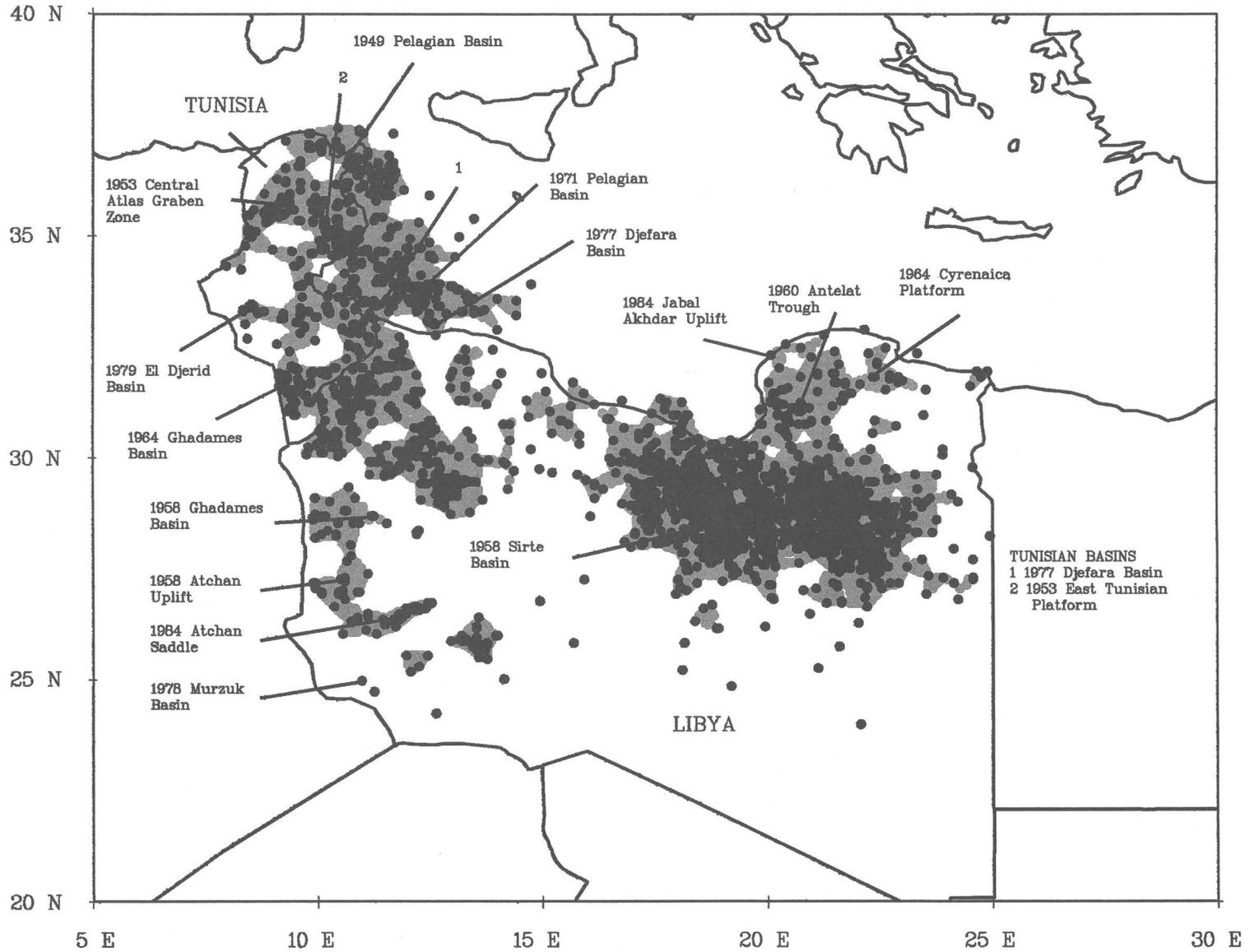
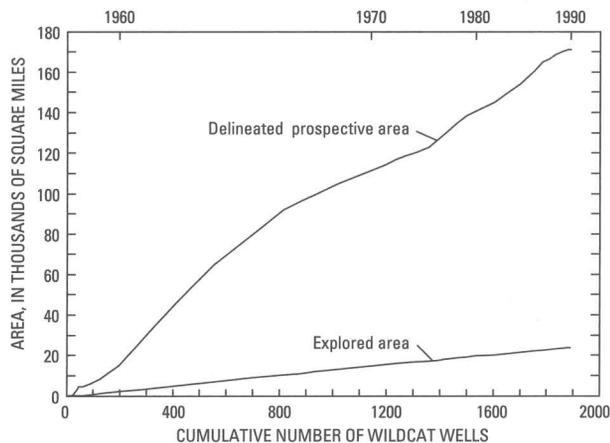
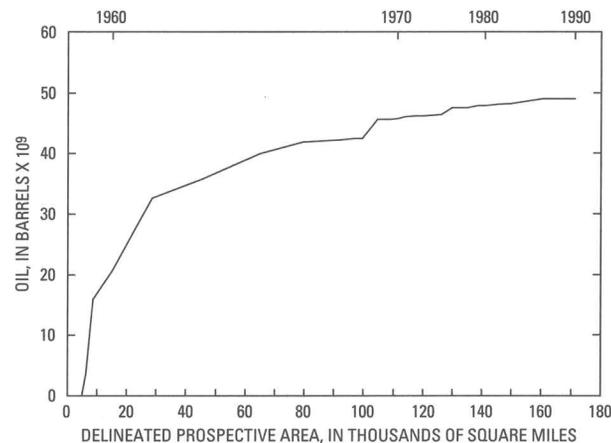


Figure 39. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Tunisia and Libya, Africa.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Tunisia . . . . .	48,330
Libya . . . . .	679,400
Total . . . . .	727,730

Delineated prospective area through 1990: 171,114 mi<sup>2</sup>

Explored area through 1990: 23,916 mi<sup>2</sup>

Wildcat wells through 1990: 1,889

Current growth in delineated prospective area per wildcat: 46 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 49.0 × 10<sup>9</sup> bbl oil and 33.8 × 10<sup>12</sup> cubic feet gas

Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 0.286 × 10<sup>6</sup> bbl/mi<sup>2</sup>

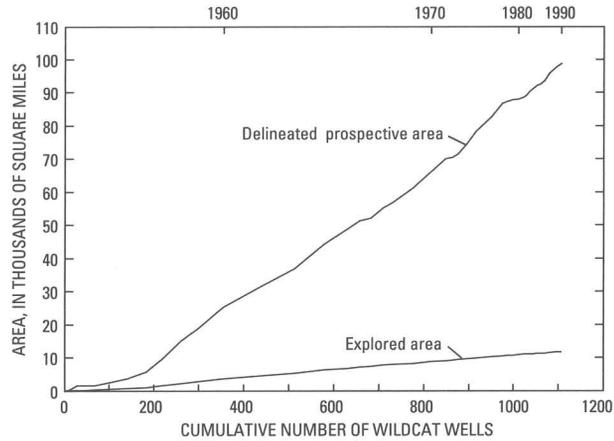
Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Tunisia</b>				
Pelagian Basin . . . . .	1949	336	777	1,940
Ghadames Basin . . . . .	1964	793	892	1,611
Total . . . . .		1,129	1,669	3,551
<b>Libya</b>				
Sirte Basin . . . . .	1958	41,462	44,049	22,478
Atchan Uplift . . . . .	1958	0	9	1,610
Ghadames Basin . . . . .	1958	150	1,269	2,162
Pelagian Basin . . . . .	1971	1,250	1,460	3,745
Atchan Saddle . . . . .	1984	110	230	0
Total . . . . .		43,972	47,017	29,995

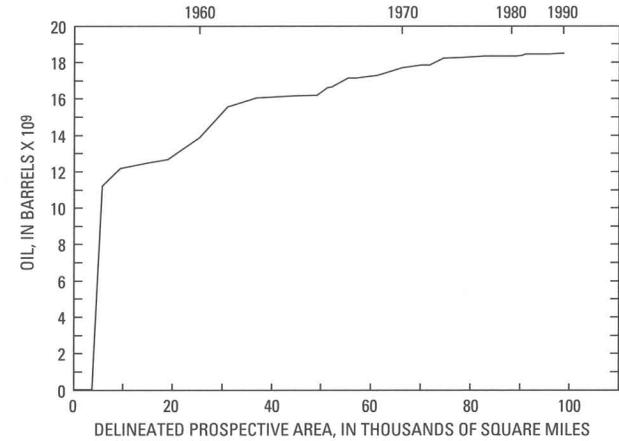
Figure 39. Continued.



Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Morocco . . . . .	172,104
Algeria . . . . .	919,595
Total . . . . .	1,091,699

Delineated prospective area through 1990: 98,674 mi<sup>2</sup>

Explored area through 1990: 11,815 mi<sup>2</sup>

Wildcat wells through 1990: 1,105

Current growth in delineated prospective area per wildcat: 94 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 18.5 × 10<sup>9</sup> bbl oil and 157 × 10<sup>12</sup> cubic feet gas

Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 0.187 × 10<sup>6</sup> bbl/mi<sup>2</sup>

Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Algeria	Cumulative discoveries in this province in Algeria through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Hassi Messaoud High . . . . .	1956	12,499	12,746	22,982
Illizi Basin . . . . .	1956	1,906	2,532	27,226
Atchan Uplift . . . . .	1956	1,522	1,544	3,661
Oued Mya Basin . . . . .	1961	582	1,099	702
Ghadames Basin . . . . .	1963	130	286	3,753
Total . . . . .		16,639	18,207	58,324

Figure 40. Continued.

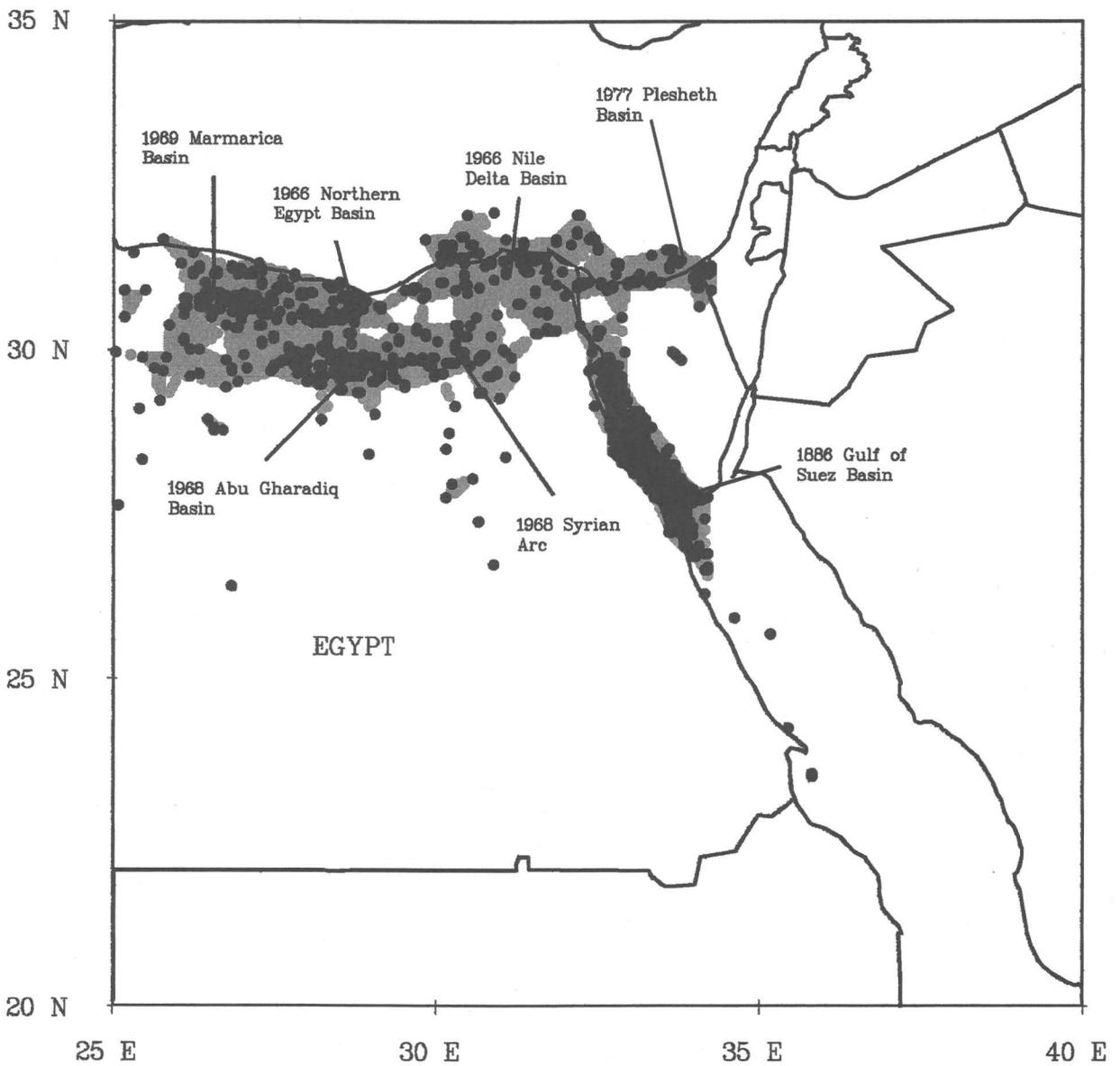
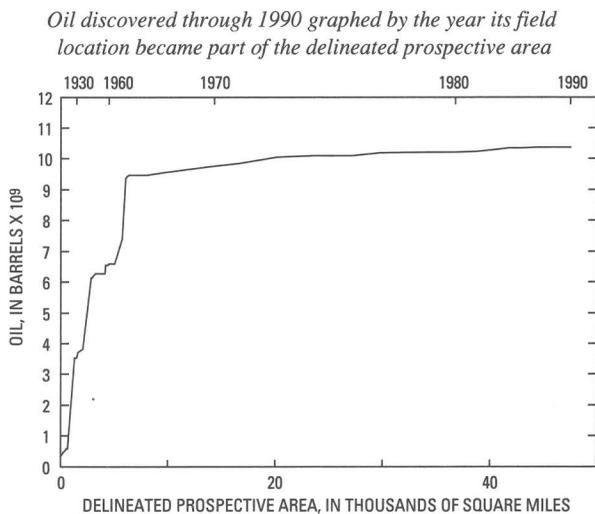
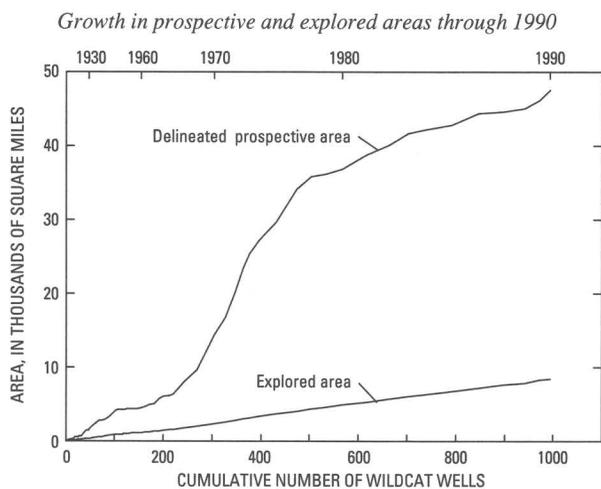


Figure 41. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Egypt, Africa.



*Significant petroleum province*

Significant petroleum province	Year of first discovery in this province in Egypt	Cumulative discoveries in this province in Egypt through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Gulf of Suez Basin . . . . .	1886	8,101	9,459	4,893

*Exploration data*

Land area: 386,198 mi<sup>2</sup>

Delineated prospective area through 1990: 47,540 mi<sup>2</sup>

Explored area through 1990: 8,463 mi<sup>2</sup>

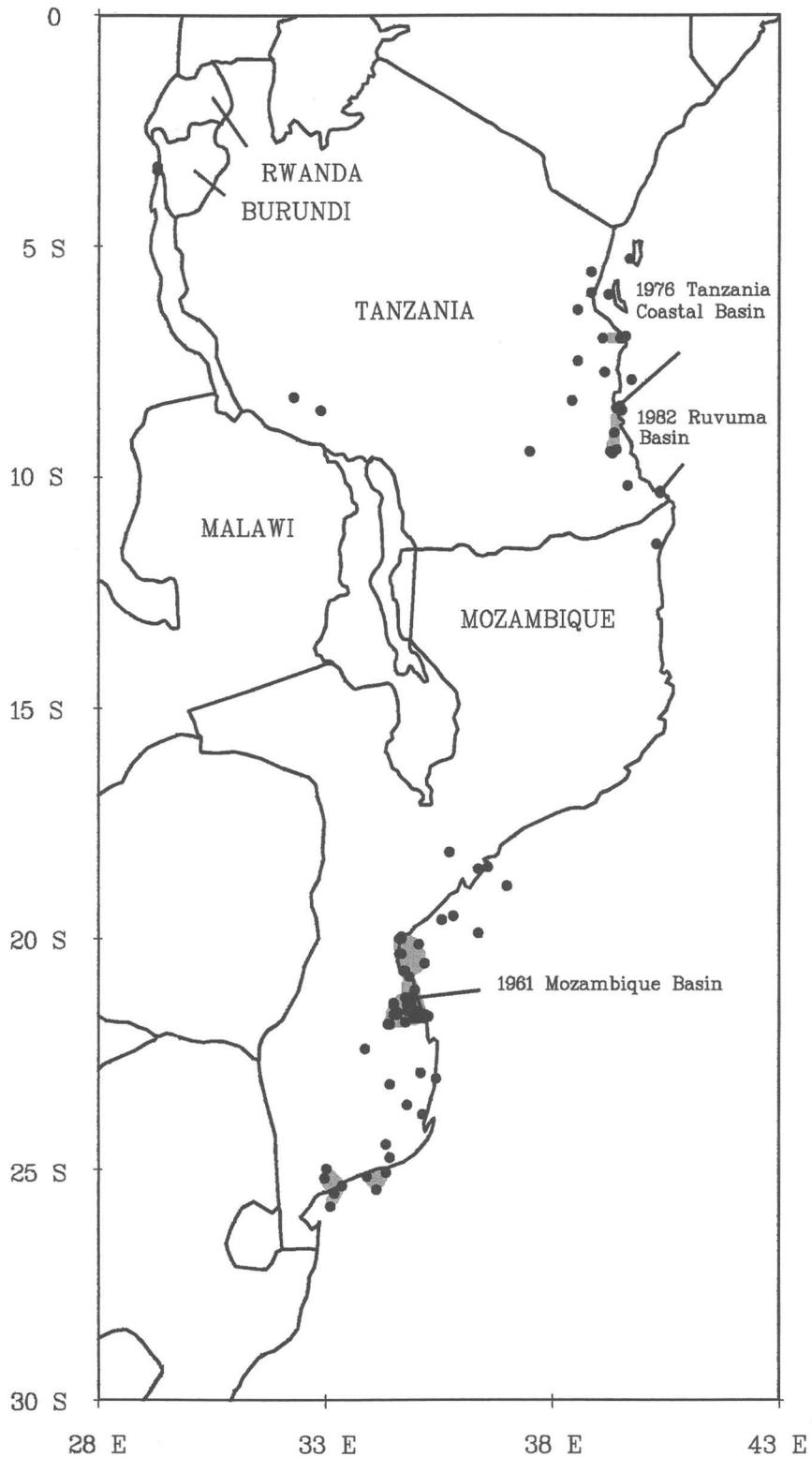
Wildcat wells through 1990: 994

Current growth in delineated prospective area per wildcat: 62 mi<sup>2</sup>

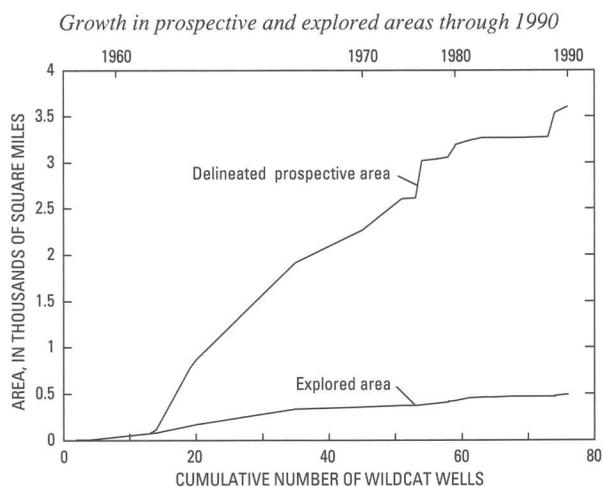
Reported discoveries of recoverable crude oil and gas through 1990:  
10.3 × 10<sup>9</sup> bbl oil and 17.4 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.218 \times 10^6 \text{ bbl/mi}^2$$

**Figure 41.** Continued.



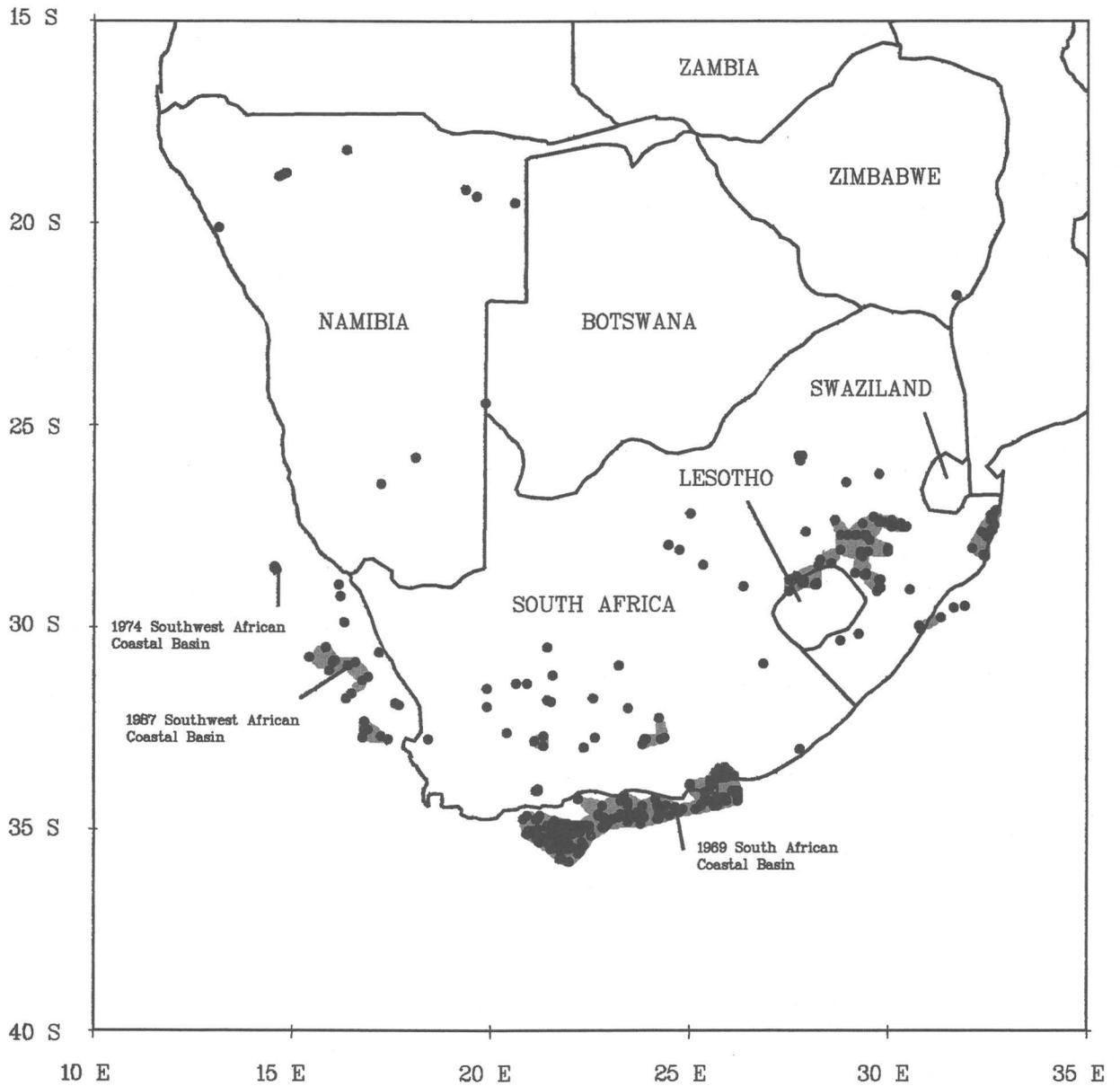
**Figure 42.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Tanzania, Malawi, Mozambique, Burundi, and Rwanda, Africa.



*Exploration data*

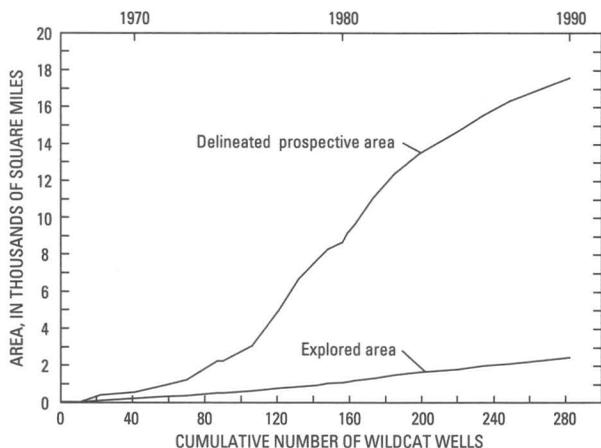
Country	Land area (mi <sup>2</sup> )	
Tanzania .....	362,820	Delineated prospective area through 1990: 3,606 mi <sup>2</sup>
Malawi .....	49,177	Explored area through 1990: 491 mi <sup>2</sup>
Mozambique .....	297,731	Wildcat wells through 1990: 76
Burundi .....	10,747	Current growth in delineated prospective area per wildcat: 33 mi <sup>2</sup>
Rwanda .....	10,169	Field sizes not available for oil; reported discoveries of recoverable gas through 1990: 5.29 × 10 <sup>12</sup> cubic feet
Total .....	730,644	

Figure 42. Continued.

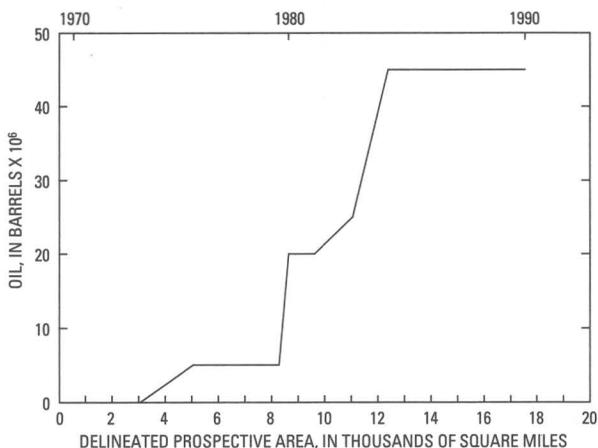


**Figure 43.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Swaziland, Namibia, Lesotho, Zimbabwe, Zambia, Botswana, and South Africa, Africa.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Swaziland.....	6,704
Namibia.....	317,725
Lesotho.....	11,716
Zimbabwe.....	150,338
Zambia.....	288,130
Botswana.....	275,000
South Africa.....	472,000
Total.....	1,521,613

Delineated prospective area through 1990: 17,564 mi<sup>2</sup>

Explored area through 1990: 2,420 mi<sup>2</sup>

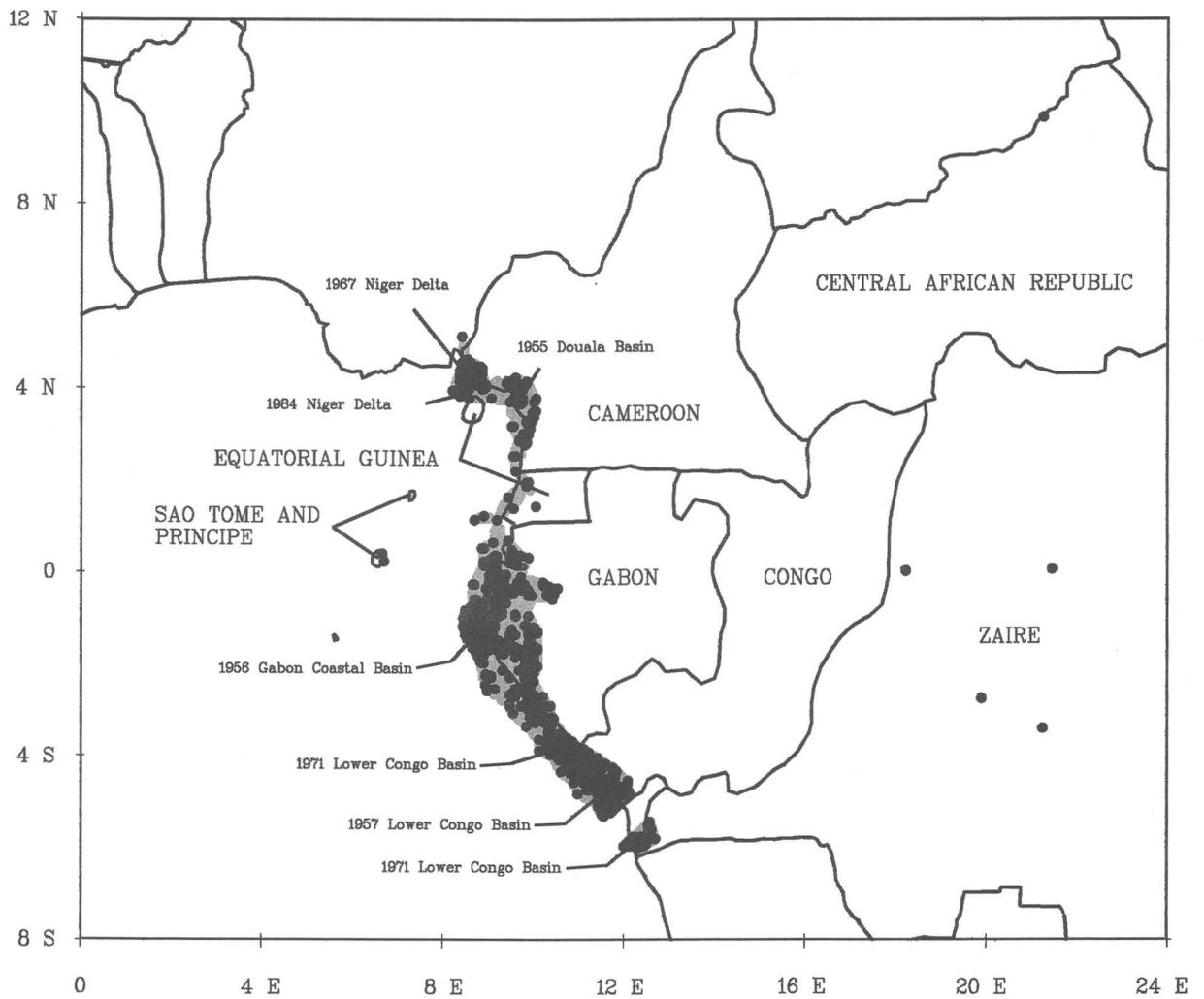
Wildcat wells through 1990: 282

Current growth in delineated prospective area per wildcat: 38 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
 $0.045 \times 10^9$  bbl oil and  $4.42 \times 10^{12}$  cubic feet gas

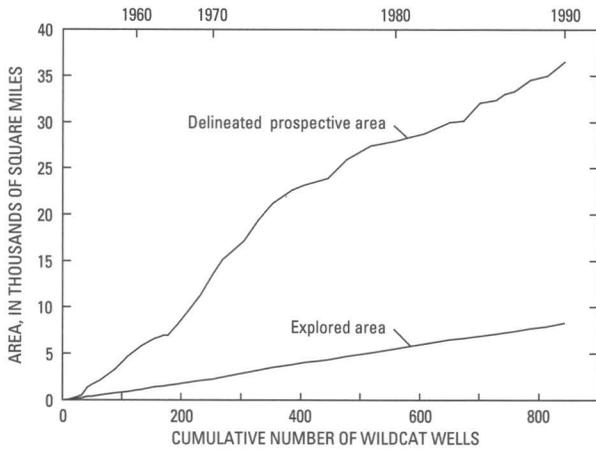
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.002 \times 10^6 \text{ bbl/mi}^2$$

Figure 43. Continued.

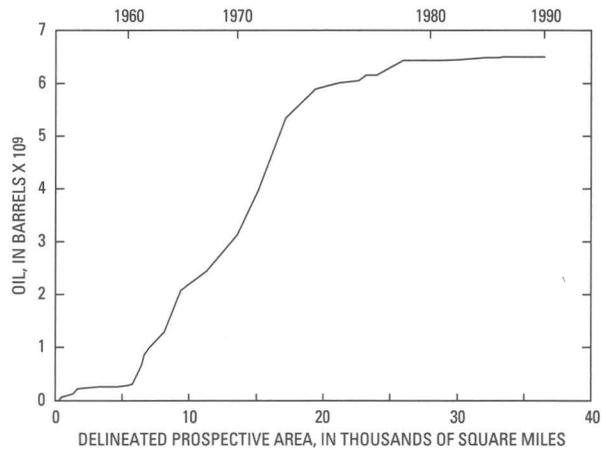


**Figure 44.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Cameroon, Central African Republic, Equatorial Guinea, Gabon, Sao Tome and Principe, Congo, and Zaire, Africa.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Cameroon</b>				
Niger Delta .....	1967	806	1,608	1,632
<b>Equatorial Guinea</b>				
Niger Delta .....	1984	0	0	852
<b>Gabon</b>				
Gabon Coastal Basin .....	1956	1,704	2,605	795
Lower Congo Basin .....	1971	106	209	0
Total .....		1,810	2,814	795
<b>Congo</b>				
Lower Congo Basin .....	1957	1,409	1,721	1,185
<b>Zaire</b>				
Lower Congo Basin .....	1971	182	342	74

Exploration data

Country	Land area (mi <sup>2</sup> )
Cameroon .....	183,350
Central African Republic .....	238,000
Equatorial Guinea .....	10,824
Gabon .....	102,290
Sao Tome and Principe .....	372
Congo .....	132,046
Zaire .....	905,063
Total .....	1,571,945

Delineated prospective area through 1990: 36,500 mi<sup>2</sup>

Explored area through 1990: 8,308 mi<sup>2</sup>

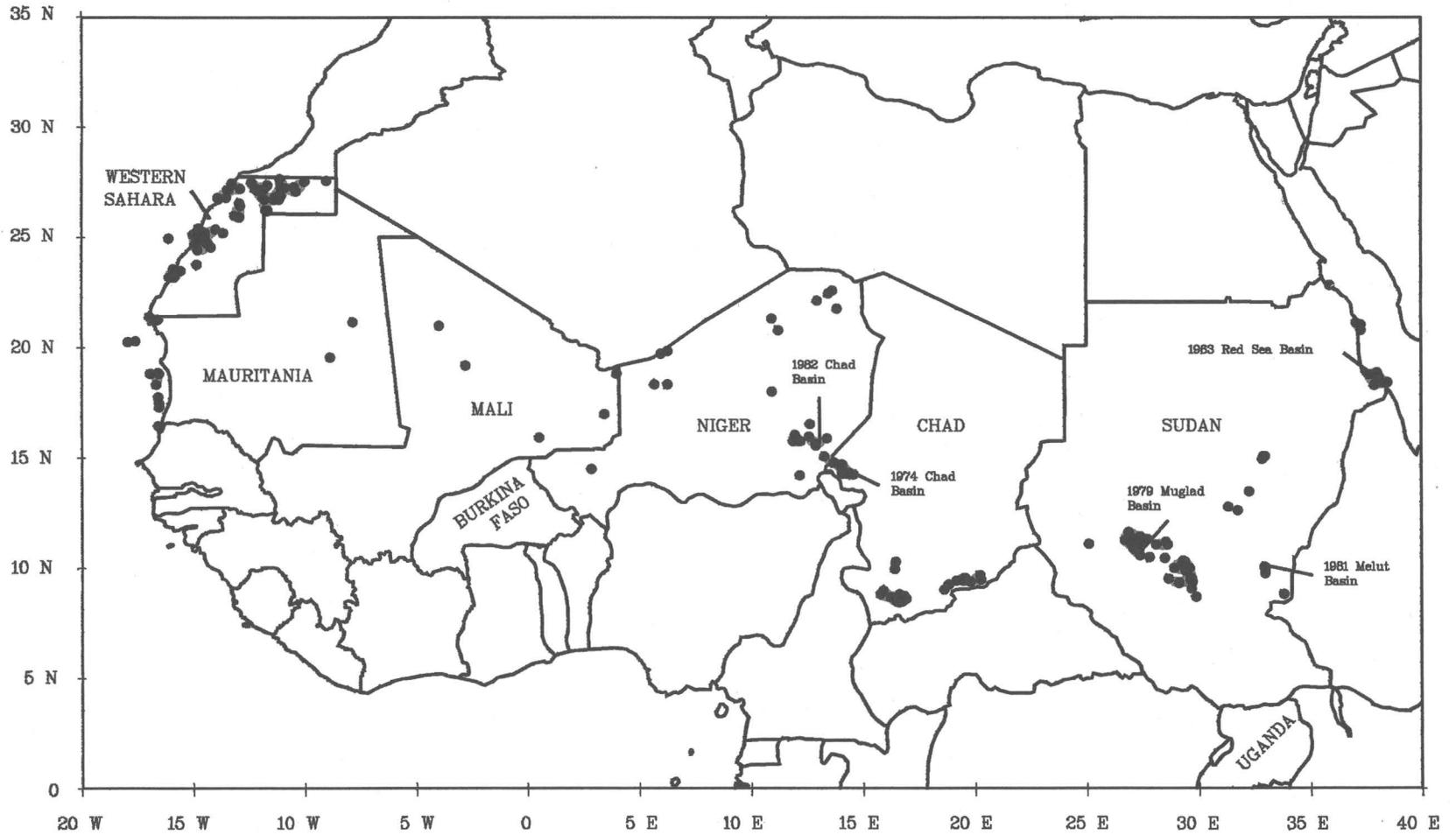
Wildcat wells through 1990: 843

Current growth in delineated prospective area per wildcat: 51 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
6.49 × 10<sup>9</sup> bbl oil and 5.67 × 10<sup>12</sup> cubic feet gas

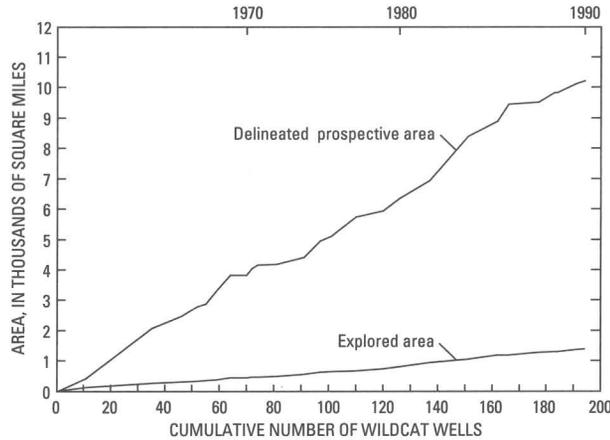
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.178 \times 10^6 \text{ bbl/mi}^2$$

Figure 44. Continued.

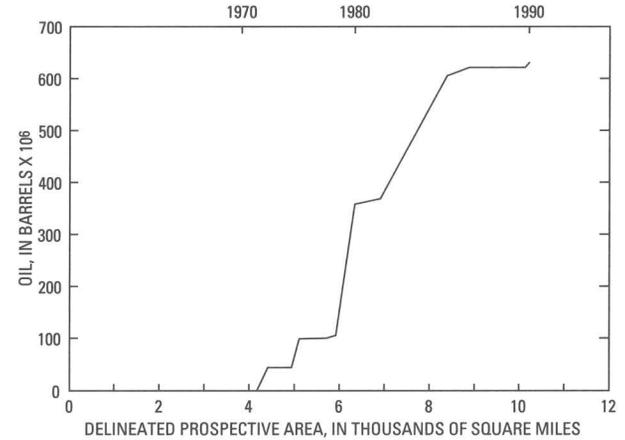


**Figure 45.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Western Sahara, Mauritania, Mali, Burkina Faso (formerly Upper Volta), Niger, Chad, Sudan, and Uganda, Africa.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )
Western Sahara	102,703
Mauritania	418,120
Mali	463,500
Burkina Faso	106,111
Niger	458,976
Chad	501,000
Sudan	967,500
Uganda	93,981
Total	3,111,891

Delineated prospective area through 1990: 10,204 mi<sup>2</sup>

Explored area through 1990: 1,386 mi<sup>2</sup>

Wildcat wells through 1990: 194

Current growth in delineated prospective area per wildcat: 30 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 0.630 × 10<sup>9</sup> bbl oil and 1.01 × 10<sup>12</sup> cubic feet gas

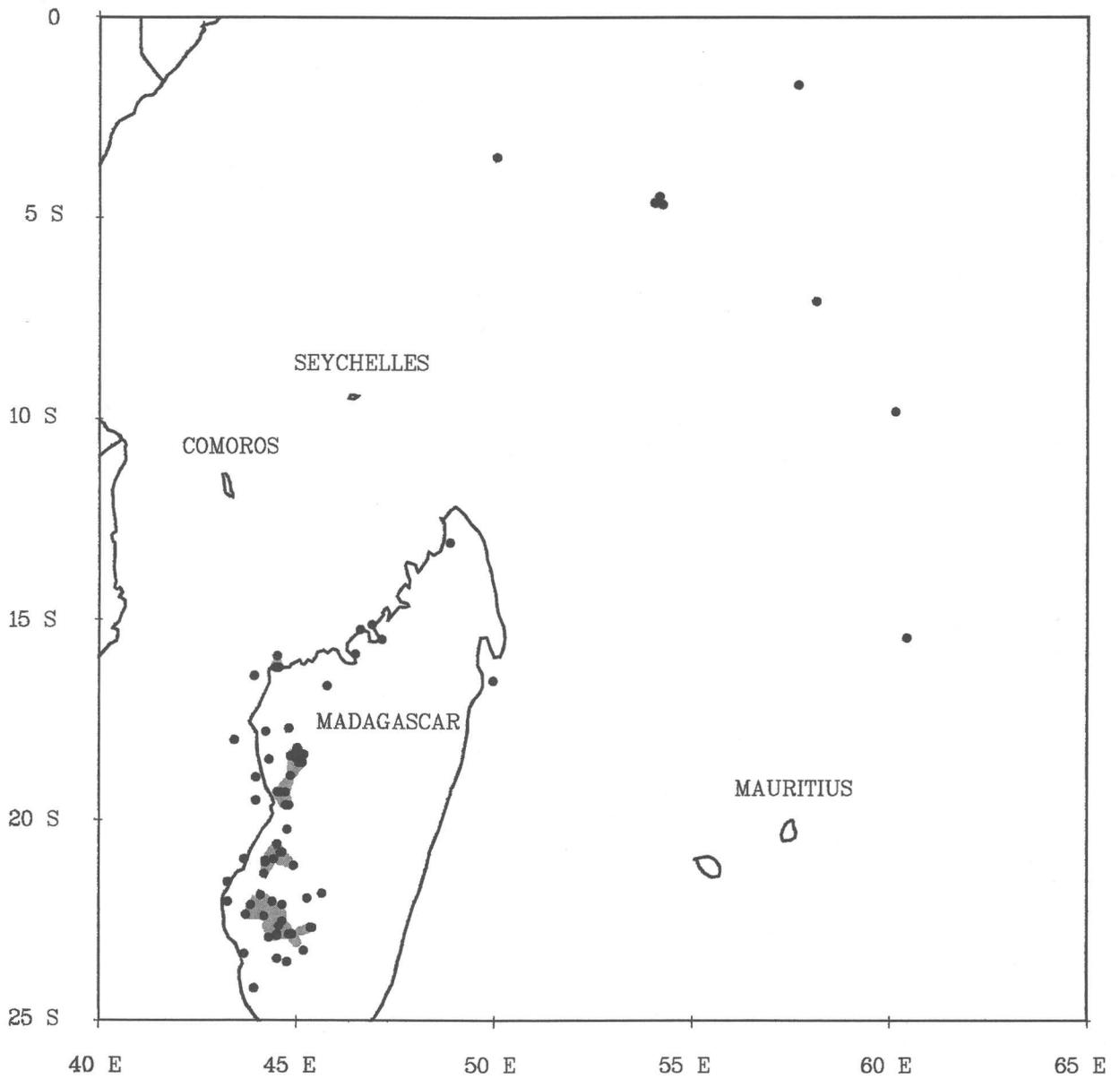
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$$

$$= 0.062 \times 10^6 \text{ bbl/mi}^2$$

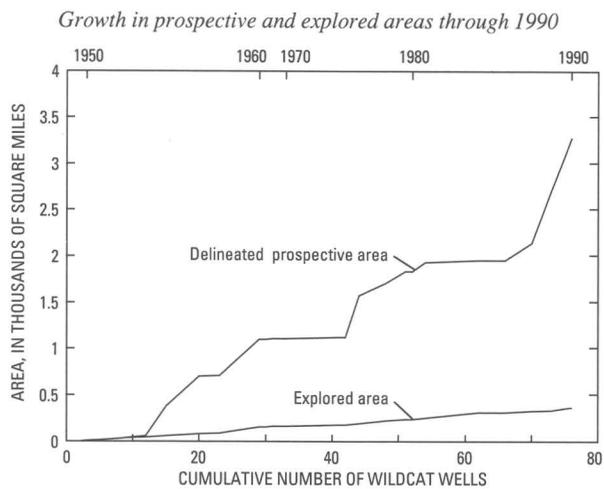
Significant petroleum province

Significant petroleum province	Year of first discovery in this province in Sudan	Cumulative discoveries in this province in Sudan through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Muglad Basin	1979	465	499	0

Figure 45. Continued.



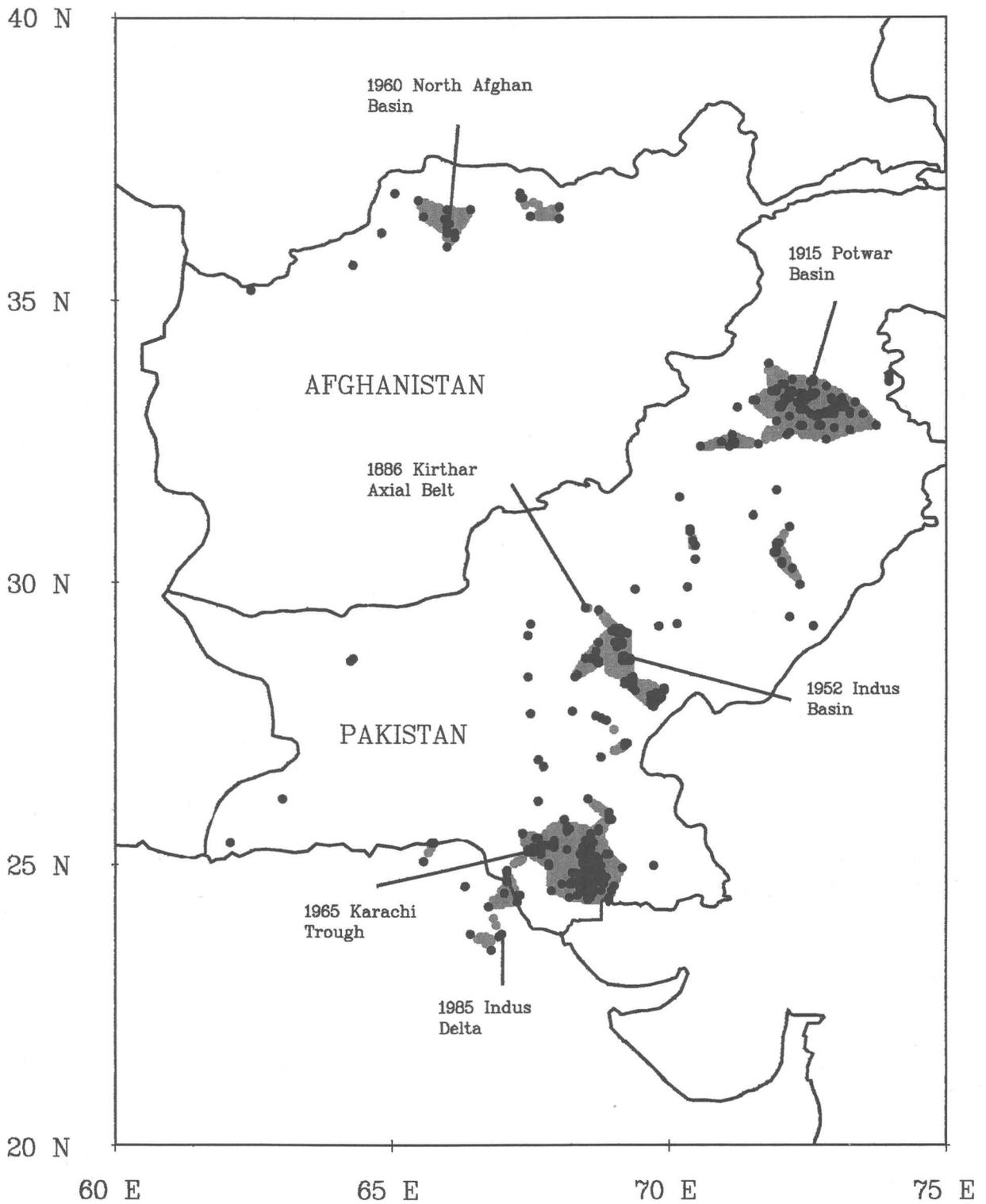
**Figure 46.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Madagascar, Mauritius, Seychelles, and Comoros, Africa.



*Exploration data*

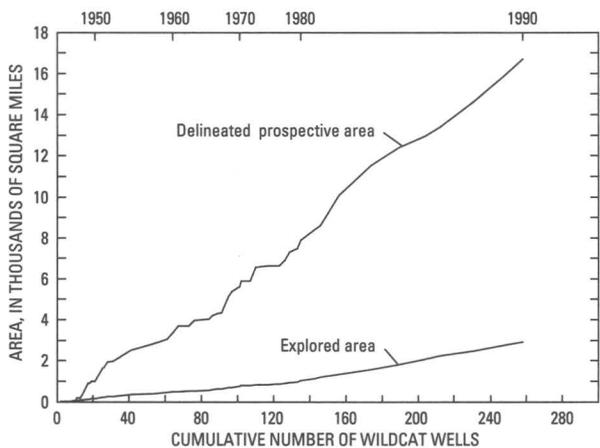
Country	Land area (mi <sup>2</sup> )	
Madagascar .....	227,800	Delineated prospective area through 1990: 3,274 mi <sup>2</sup>
Mauritius .....	809	Explored area through 1990: 369 mi <sup>2</sup>
Seychelles .....	156	Wildcat wells through 1990: 76
Comoros .....	820	Current growth in delineated prospective area per wildcat: 59 mi <sup>2</sup>
<b>Total</b> .....	<b>229,585</b>	Reported discoveries of recoverable crude oil and gas through 1990: Field sizes not available

**Figure 46.** Continued.

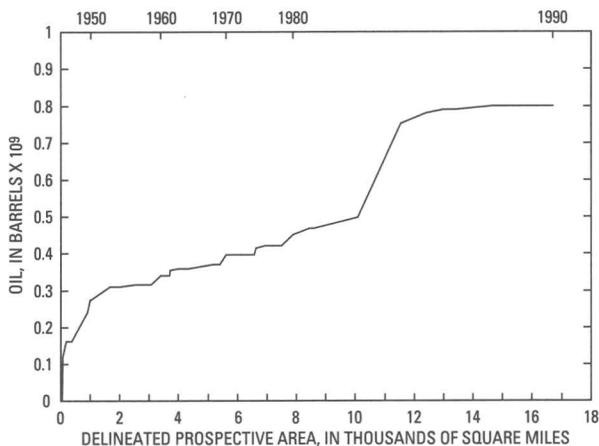


**Figure 47.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Afghanistan and Pakistan, Asia.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Significant petroleum province

Significant petroleum province	Year of first discovery in this province in Pakistan	Cumulative discoveries in this province in Pakistan through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Potwar Basin .....	1915	115	360	2,669

Exploration data

Country	Land area (mi <sup>2</sup> )
Afghanistan .....	250,000
Pakistan .....	310,236
Total .....	560,236

Delineated prospective area through 1990: 16,707 mi<sup>2</sup>

Explored area through 1990: 2,928 mi<sup>2</sup>

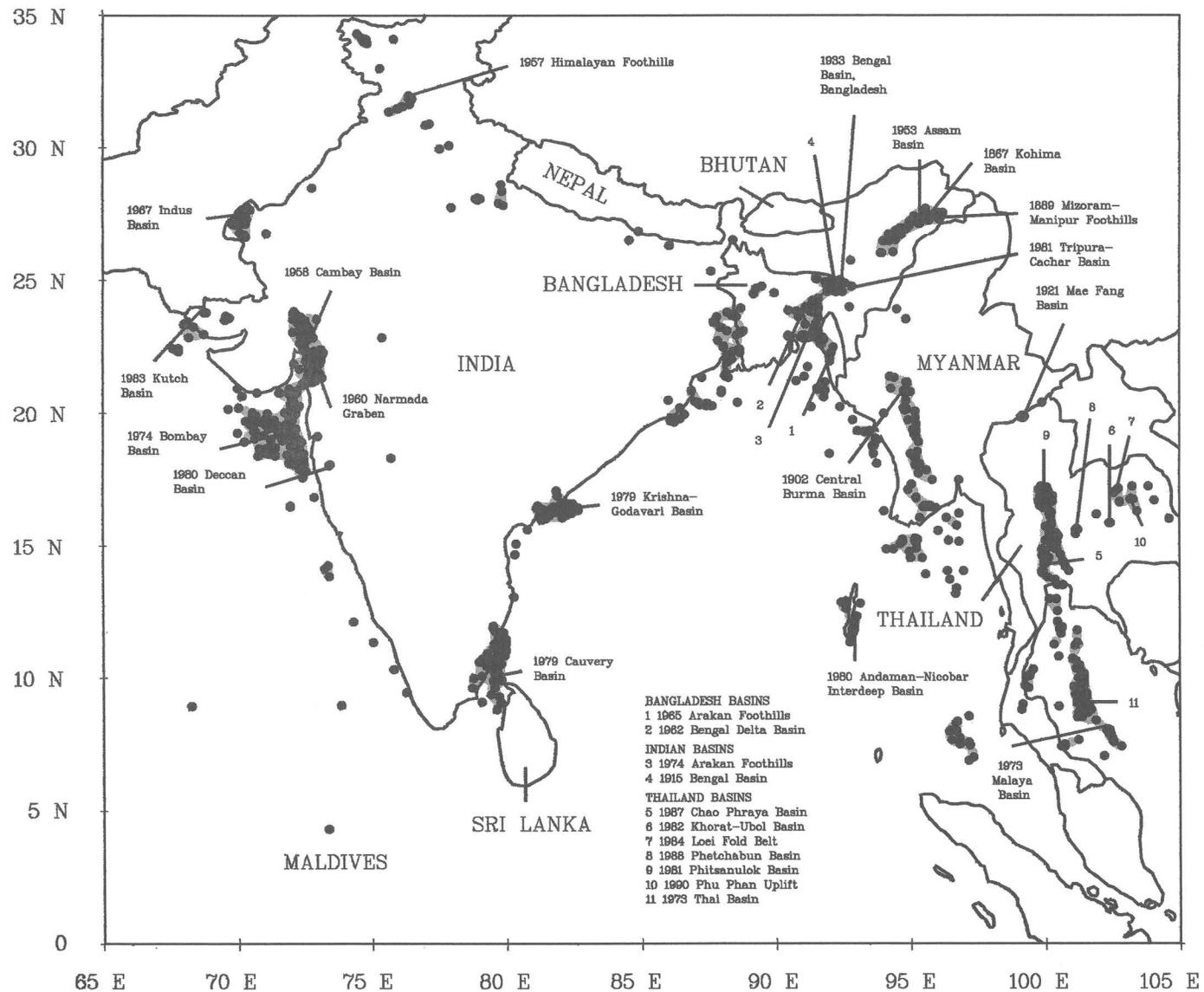
Wildcat wells through 1990: 258

Current growth in delineated prospective area per wildcat: 78 mi<sup>2</sup>

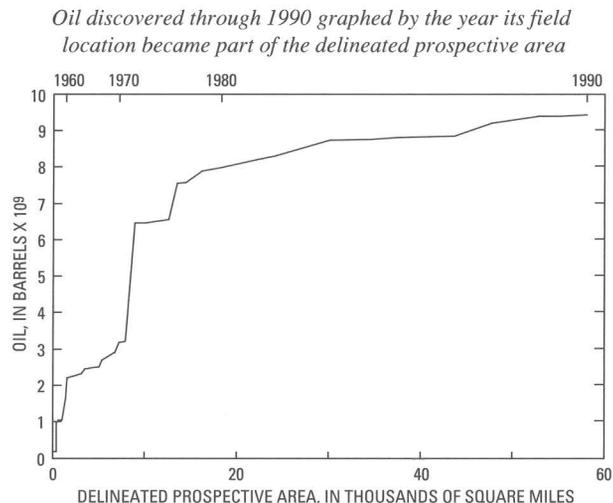
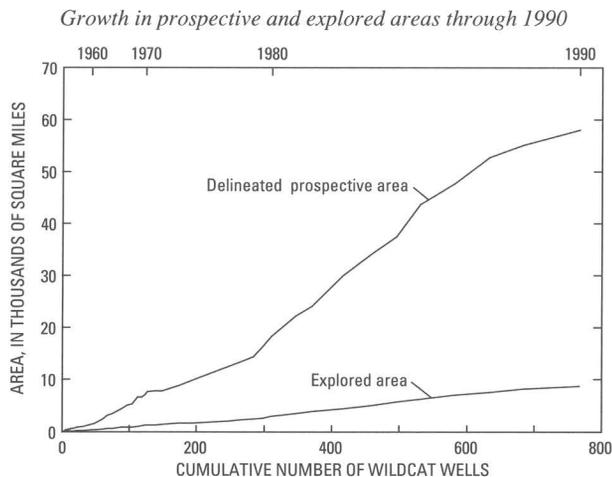
Reported discoveries of recoverable crude oil and gas through 1990:  
0.8 × 10<sup>9</sup> bbl oil and 30.6 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.048 \times 10^6 \text{ bbl/mi}^2$$

Figure 47. Continued.



**Figure 48.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Maldives, India, Bangladesh, Myanmar (formerly Burma), Thailand, Sri Lanka, Nepal, and Bhutan, Asia. Some explored area is shown for the Maldives, although the islands themselves are not shown.



*Exploration data*

Country	Land area (mi <sup>2</sup> )
Maldives (not shown) . . . . .	115
India . . . . .	1,246,880
Bangladesh . . . . .	54,501
Myanmar . . . . .	261,789
Thailand . . . . .	198,242
Sri Lanka . . . . .	25,332
Nepal . . . . .	54,000
Bhutan . . . . .	19,300
Total . . . . .	1,860,159

Delineated prospective area through 1990: 58,014 mi<sup>2</sup>

Explored area through 1990: 8,785 mi<sup>2</sup>

Wildcat wells through 1990: 767

Current growth in delineated prospective area per wildcat: 35 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 9.44 × 10<sup>9</sup> bbl oil and 57.6 × 10<sup>12</sup> cubic feet gas

Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 0.162 × 10<sup>6</sup> bbl/mi<sup>2</sup>

*Significant petroleum provinces*

Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>India</b>				
Mizoram-Manipur Foothills . . . . .	1889	146	344	1,360
Assam Basin . . . . .	1953	1,395	1,585	1,785
Cambay Basin . . . . .	1958	835	1,391	3,858
Narmada Graben . . . . .	1960	600	637	528
Bombay Basin . . . . .	1974	4,103	4,494	16,278
Cauvery Basin . . . . .	1979	140	186	326
Total . . . . .		7,219	8,637	24,135
<b>Myanmar</b>				
Central Burma Basin . . . . .	1902	574	656	7,210

Figure 48. Continued.

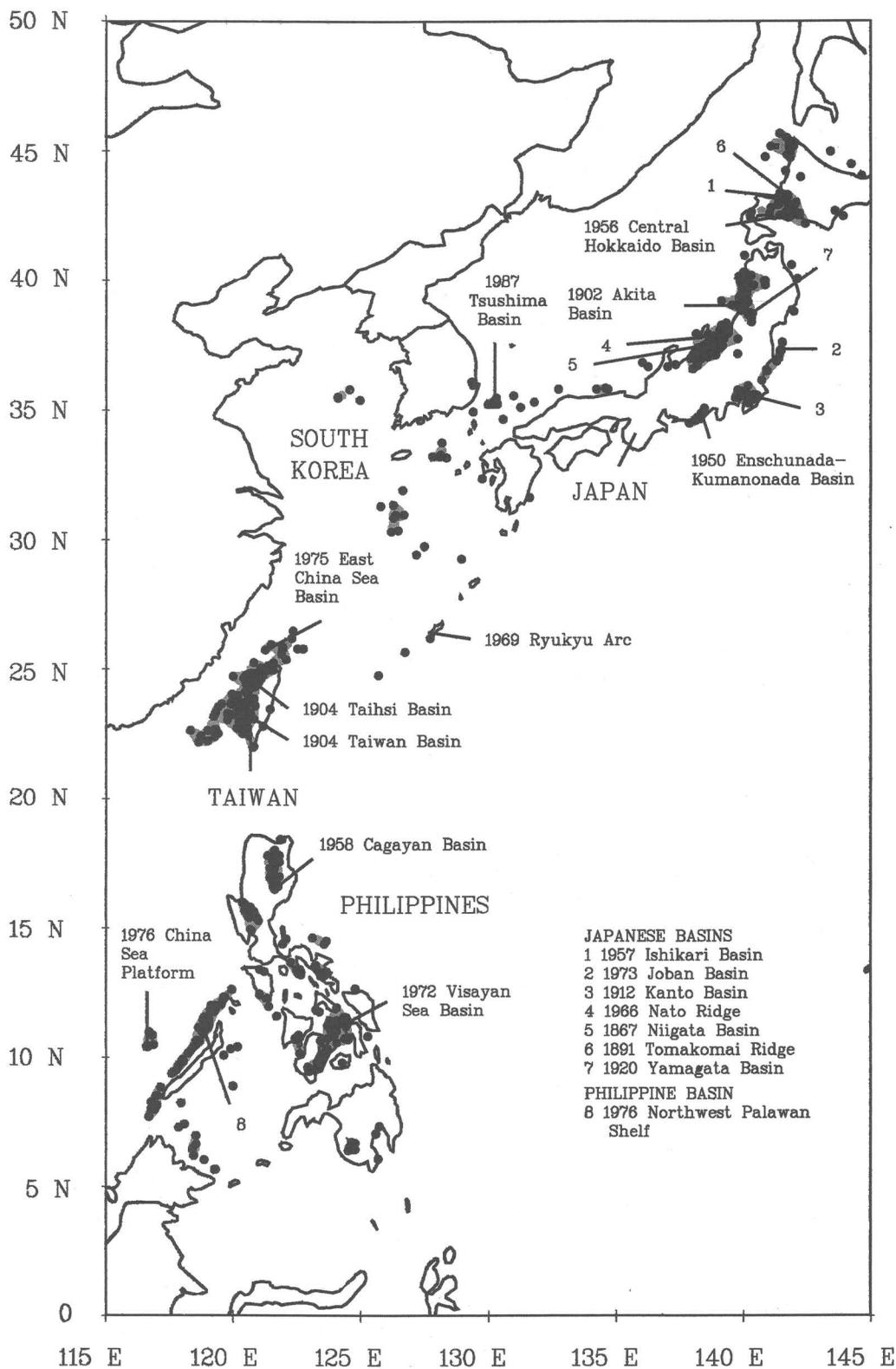
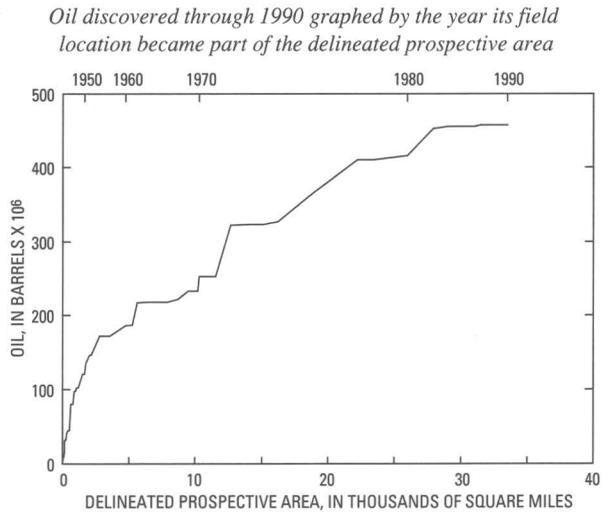
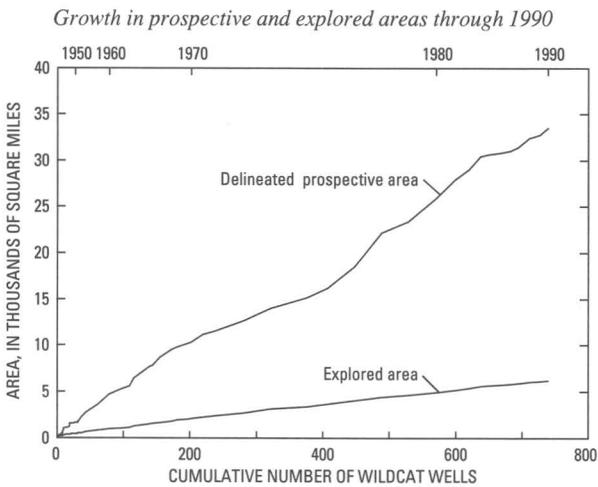


Figure 49. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Taiwan, Philippines, Japan, and South Korea, Asia.



*Exploration data*

Country	Land area (mi <sup>2</sup> )
Taiwan.....	13,890
Philippines.....	114,830
Japan.....	141,529
South Korea.....	36,600
Total.....	306,849

Delineated prospective area through 1990: 33,526 mi<sup>2</sup>

Explored area through 1990: 6,201 mi<sup>2</sup>

Wildcat wells through 1990: 739

Current growth in delineated prospective area per wildcat: 62 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990:  
 $0.457 \times 10^9$  bbl oil and  $14.4 \times 10^{12}$  cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.014 \times 10^6 \text{ bbl/mi}^2$$

Figure 49. Continued.

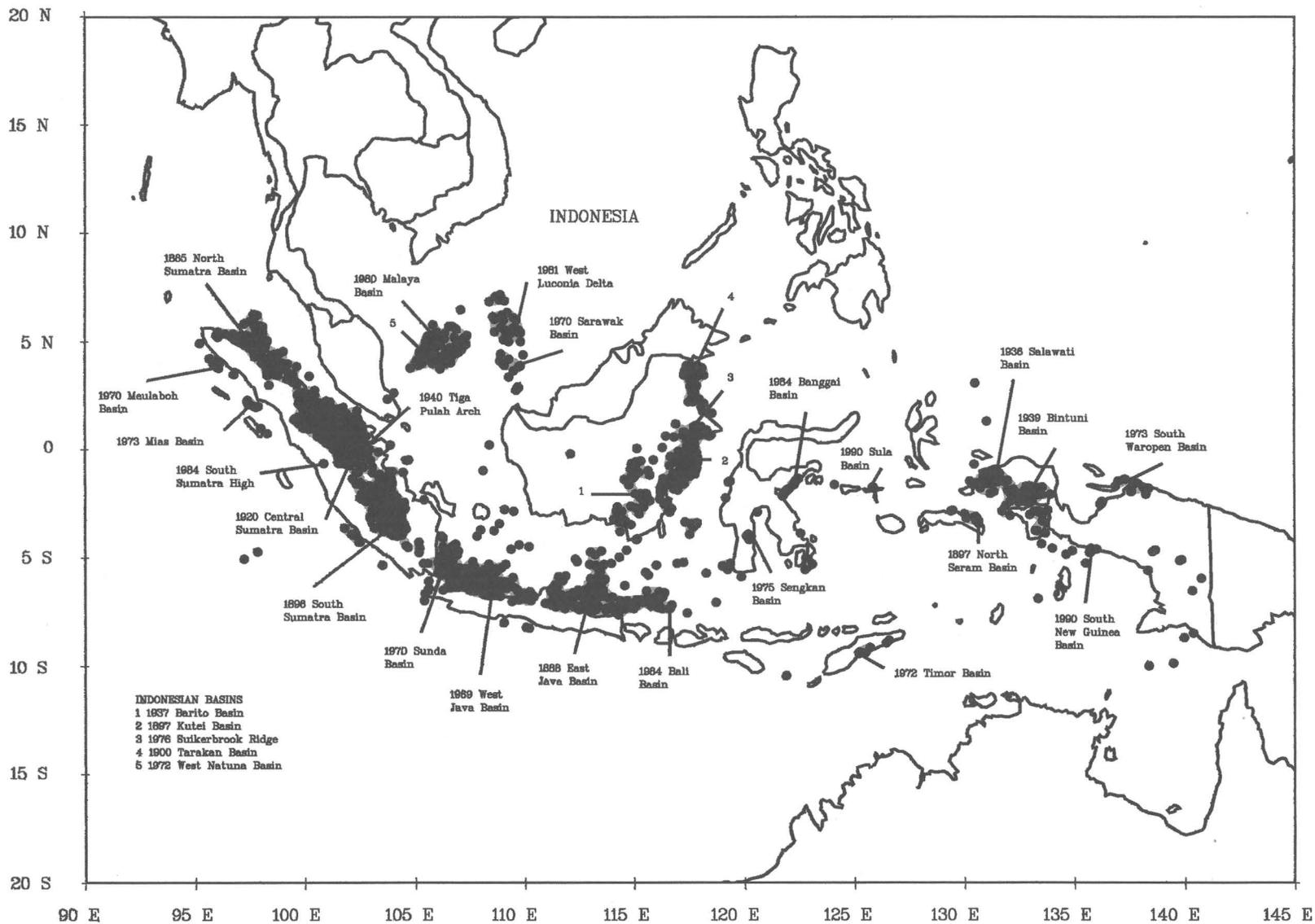
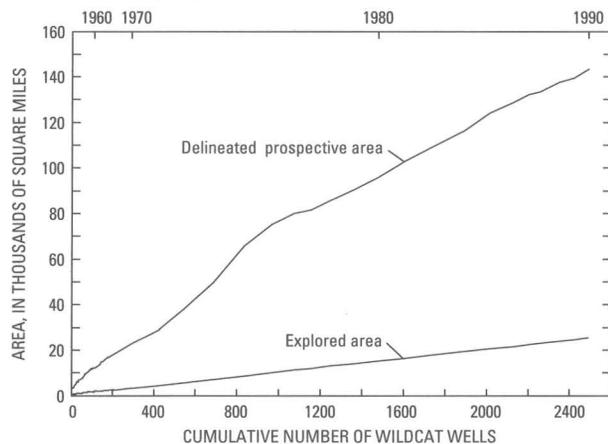
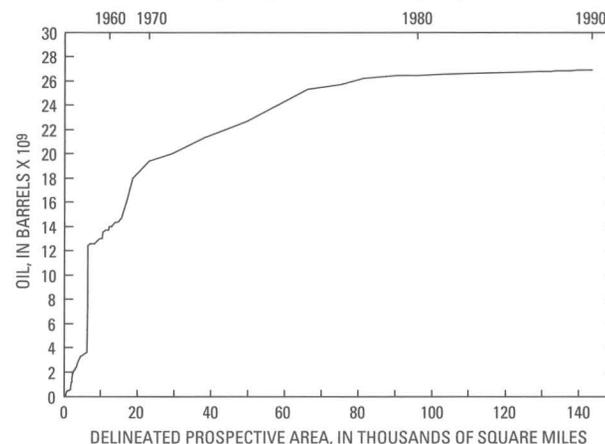


Figure 50. Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Indonesia, Asia.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

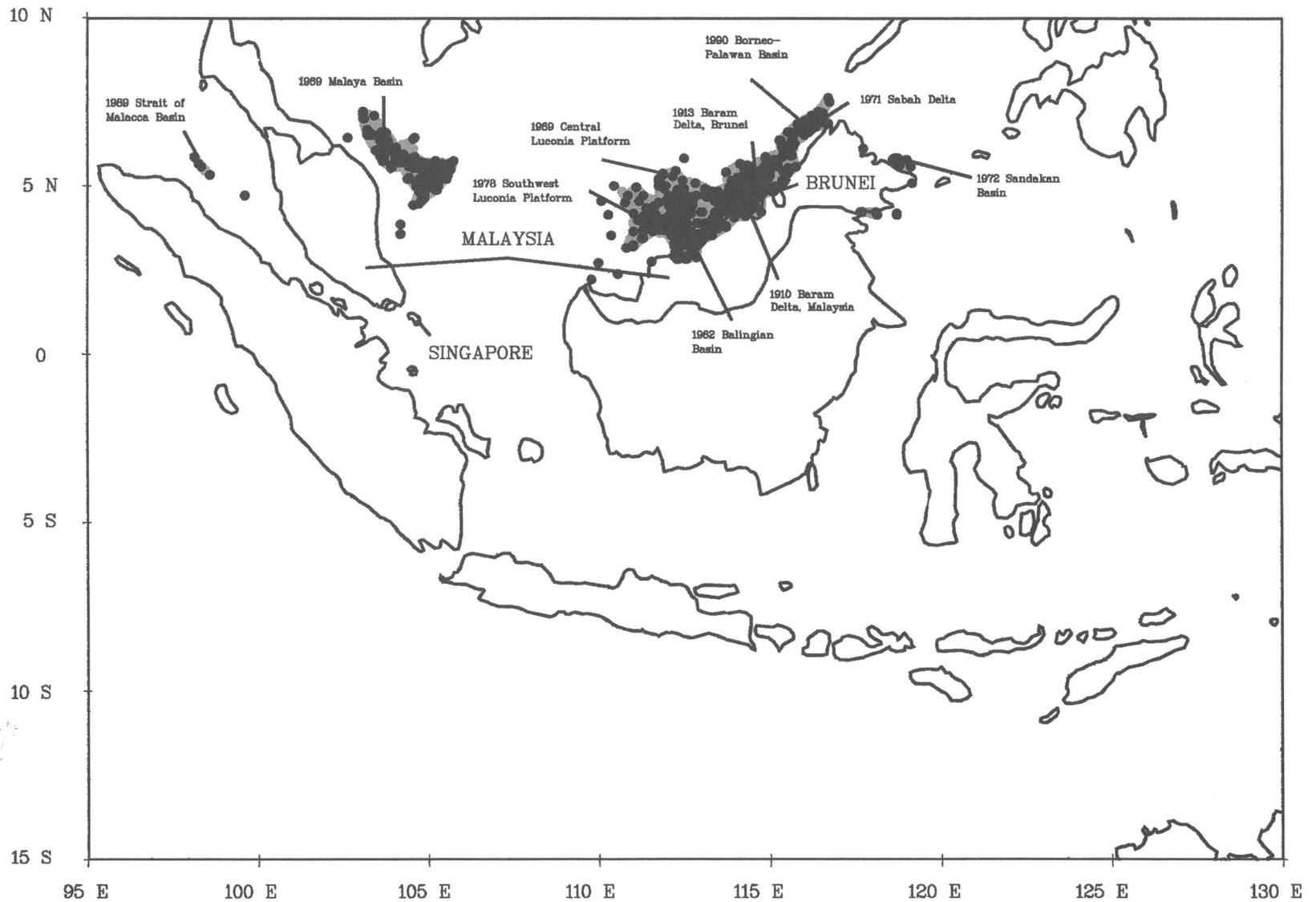
- Land area: 587,330 mi<sup>2</sup>
- Delineated prospective area through 1990: 143,351 mi<sup>2</sup>
- Explored area through 1990: 25,800 mi<sup>2</sup>
- Wildcat wells through 1990: 2,489
- Current growth in delineated prospective area per wildcat: 51.7 mi<sup>2</sup>
- Reported discoveries of recoverable crude oil and gas through 1990:  
26.9 × 10<sup>9</sup> bbl oil and 154.0 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.188 \times 10^6 \text{ bbl/mi}^2$$

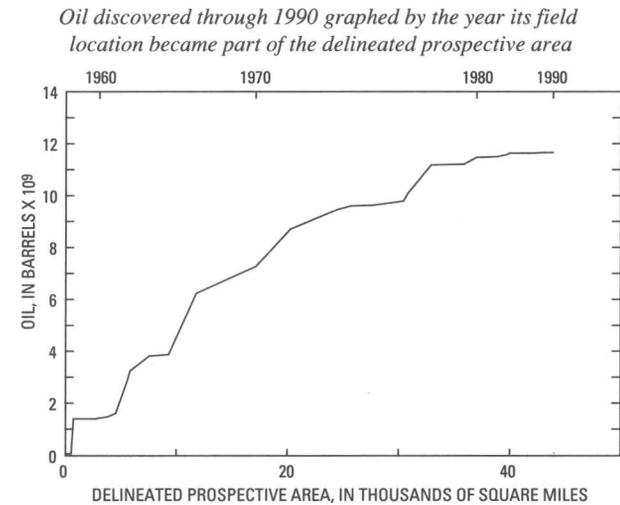
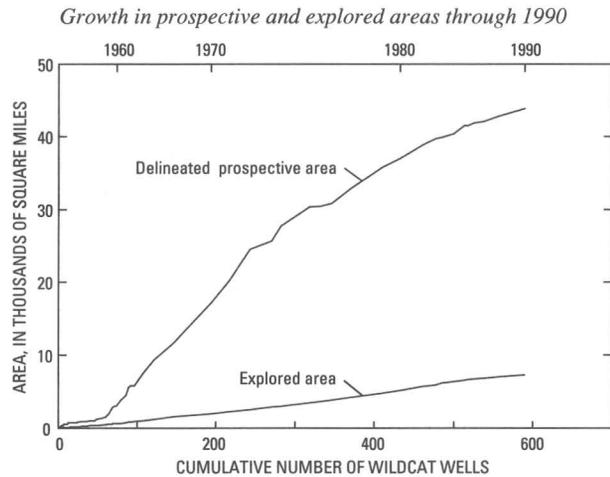
Significant petroleum provinces

Significant petroleum province	Year of first discovery in this province in Indonesia	Cumulative discoveries in this province in Indonesia through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
North Sumatra Basin . . . . .	1885	260	711	25,927
East Java Basin . . . . .	1888	100	386	7,697
South Sumatra Basin . . . . .	1896	1,421	2,915	5,386
Kutei Basin . . . . .	1897	2,655	3,349	29,540
Tarakan Basin . . . . .	1900	325	447	1,502
Central Sumatra Basin . . . . .	1920	11,397	13,399	2,060
Salawati Basin . . . . .	1936	351	724	493
Barito Basin . . . . .	1937	137	180	66
Tiga Pulau Arch . . . . .	1940	122	137	0
West Java Basin . . . . .	1969	1,812	2,915	6,641
Sunda Basin . . . . .	1970	662	1,141	639
West Natuna Basin . . . . .	1972	215	396	2,329
Malaya Basin . . . . .	1980	0	138	95
<b>Total . . . . .</b>		<b>19,457</b>	<b>26,838</b>	<b>82,375</b>

Figure 50. Continued.



**Figure 51.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Malaysia, Brunei, and Singapore, Asia.



*Exploration data*

Country	Land area (mi <sup>2</sup> )
Malaysia . . . . .	126,310
Brunei . . . . .	2,220
Singapore . . . . .	220
Total . . . . .	128,750

Delineated prospective area through 1990: 43,847 mi<sup>2</sup>

Explored area through 1990: 7,283 mi<sup>2</sup>

Wildcat wells through 1990: 589

Current growth in delineated prospective area per wildcat: 39 mi<sup>2</sup>

Reported discoveries of recoverable crude oil and gas through 1990: 11.7 × 10<sup>9</sup> bbl oil and 65.3 × 10<sup>12</sup> cubic feet gas

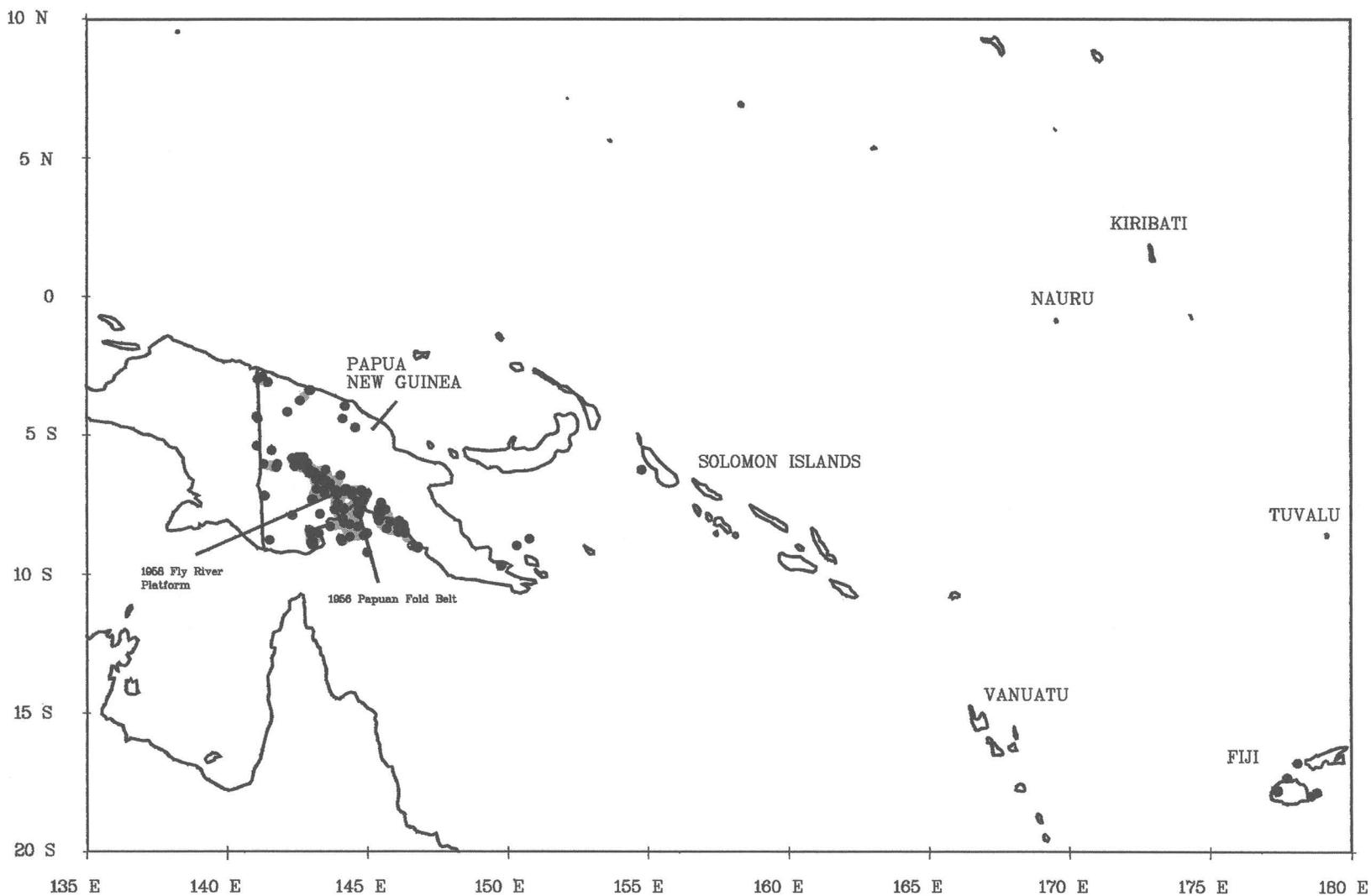
Richness =  $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$

= 0.266 × 10<sup>6</sup> bbl/mi<sup>2</sup>

*Significant petroleum provinces*

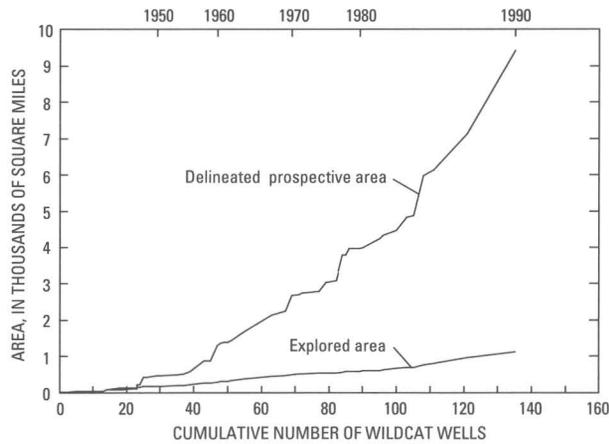
Significant petroleum province	Year of first discovery in this province in this country	Cumulative discoveries in this province in this country through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
<b>Malaysia</b>				
Baram Delta . . . . .	1910	1,977	2,173	5,775
Balingian Basin . . . . .	1962	100	470	808
Malaya Basin . . . . .	1969	3,916	4,559	18,392
Total . . . . .		5,993	7,202	24,975
<b>Brunei</b>				
Baram Delta . . . . .	1913	3,482	3,901	19,787

Figure 51. Continued.

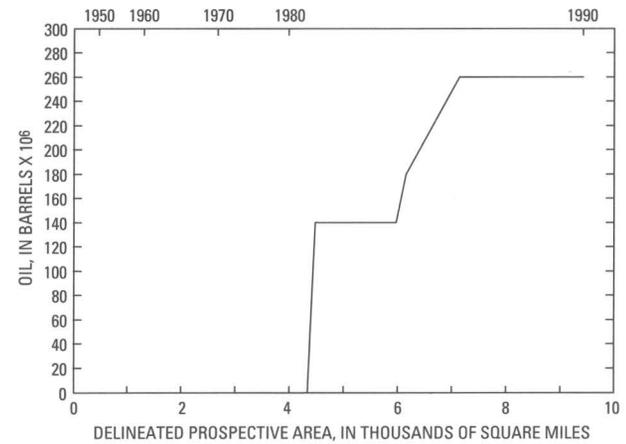


**Figure 52.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Papua New Guinea and Oceania, southwestern Pacific. For this report, Oceania is considered to consist of Vanuatu (formerly New Hebrides), Tonga, Solomon Islands, Fiji, Nauru, Kiribati, Tuvalu, and Western Samoa. Because Tonga and Western Samoa are east of the area mapped and have no reported wells, they are not shown.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Country	Land area (mi <sup>2</sup> )	Delineated prospective area through 1990: 9,415 mi <sup>2</sup>
Papua New Guinea <sup>1</sup>	182,700	Explored area through 1990: 1,117 mi <sup>2</sup>
Vanuatu	5,700	Wildcat wells through 1990: 135
Tonga (not shown)	270	Current growth in delineated prospective area per wildcat: 136 mi <sup>2</sup>
Solomon Islands	11,458	Reported discoveries of recoverable crude oil and gas through 1990: 0.260 × 10 <sup>9</sup> bbl oil and 7.89 × 10 <sup>12</sup> cubic feet gas
Fiji	7,040	
Nauru	8	
Kiribati	266	
Tuvalu	10	
Western Samoa (not shown)	1,133	
Total	208,585	

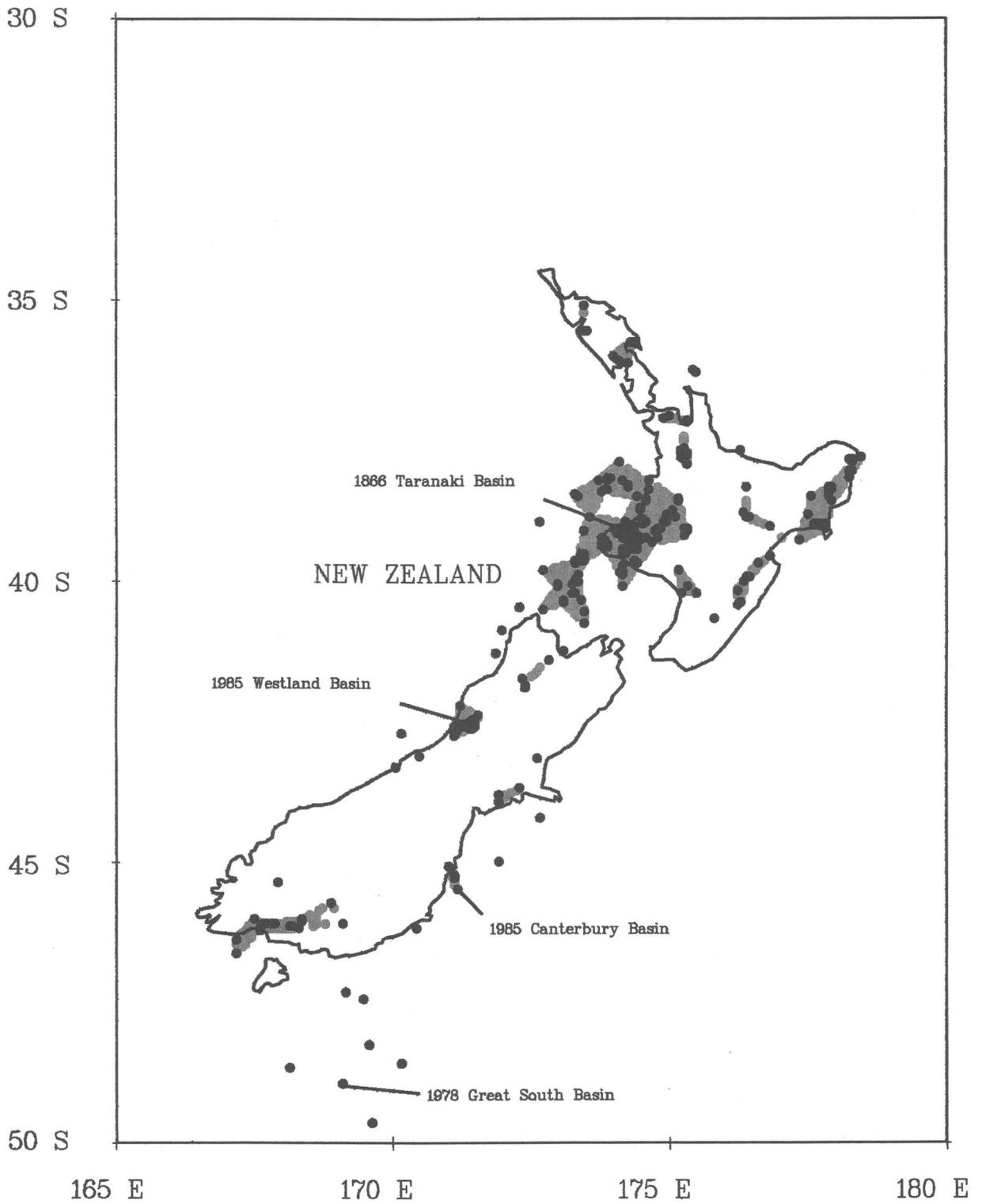
$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.028 \times 10^6 \text{ bbl/mi}^2$$

Significant petroleum province

Significant petroleum province	Year of first discovery in this province in Papua New Guinea	Cumulative discoveries in this province in Papua New Guinea through 1990		
		Crude oil in 100-million-barrel fields (10 <sup>6</sup> bbl)	Crude oil in all fields (10 <sup>6</sup> bbl)	Gas in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Papuan Fold Belt	1956	140	260	3,975

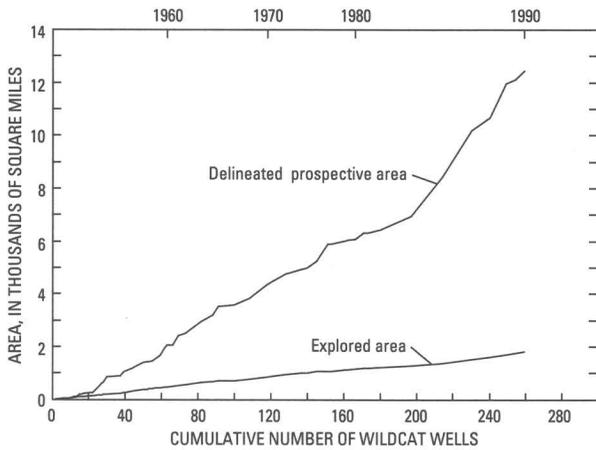
<sup>1</sup>Land area for Papua New Guinea is from Webster's New Collegiate Dictionary (G. & C. Merriam Company, 1975).

Figure 52. Continued.

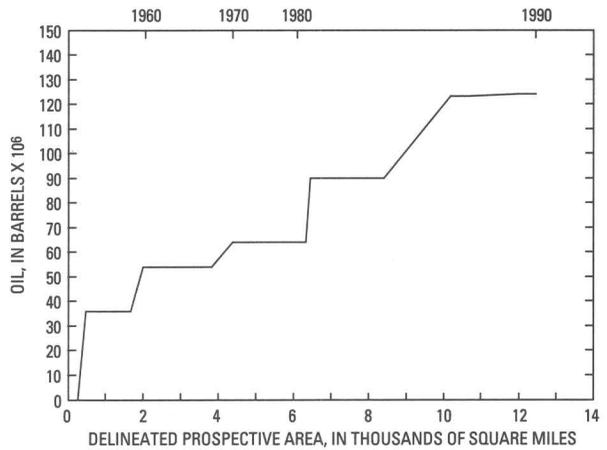


**Figure 53.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of New Zealand, southwestern Pacific.

Growth in prospective and explored areas through 1990



Oil discovered through 1990 graphed by the year its field location became part of the delineated prospective area



Exploration data

Land area: 103,416 mi<sup>2</sup>

Delineated prospective area through 1990: 12,442 mi<sup>2</sup>

Explored area through 1990: 1,816 mi<sup>2</sup>

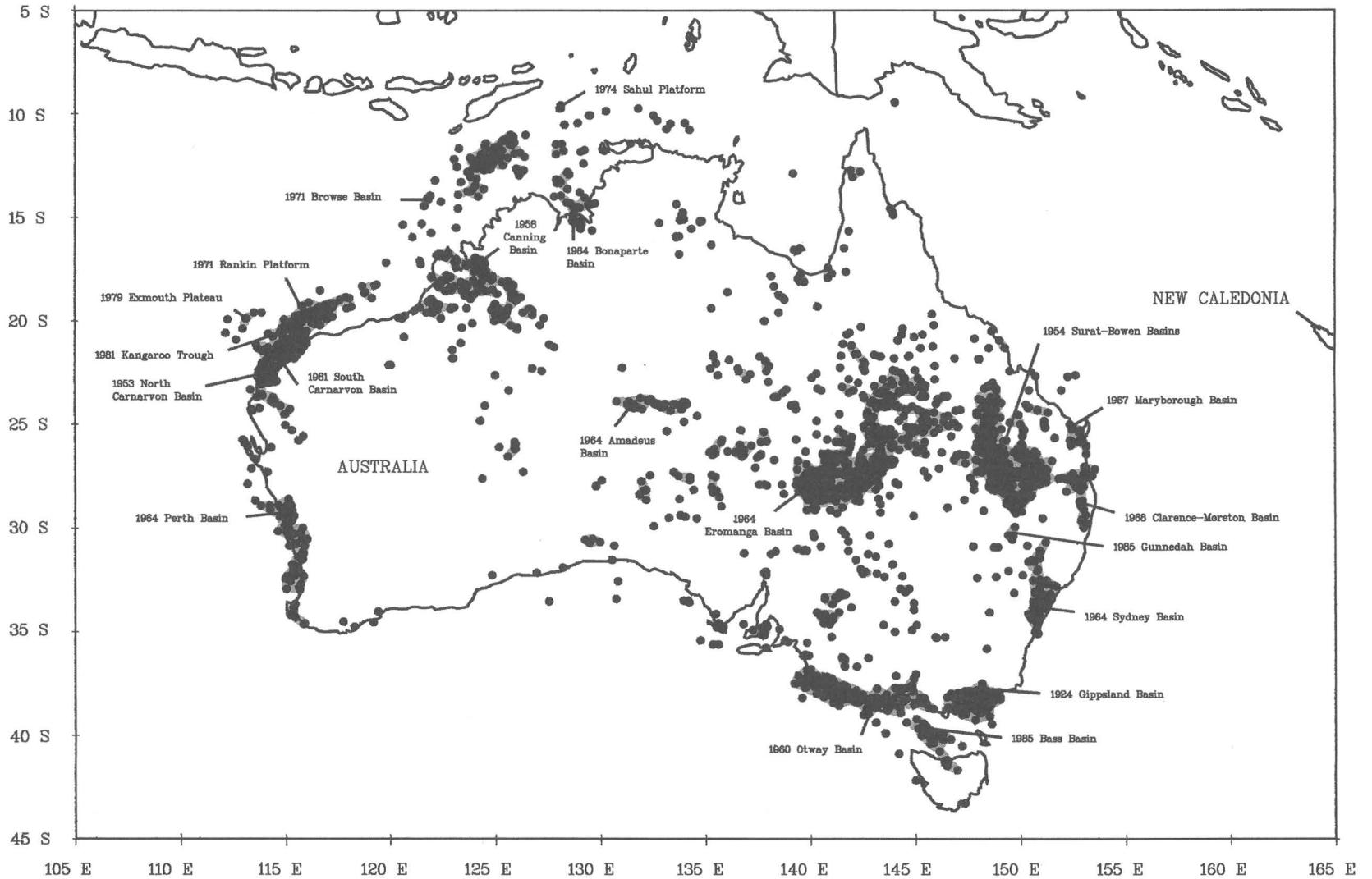
Wildcat wells through 1990: 259

Current growth in delineated prospective area per wildcat: 69 mi<sup>2</sup>

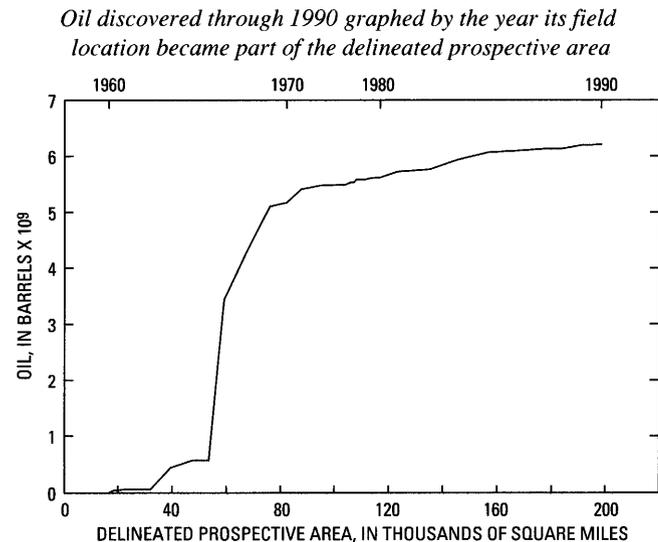
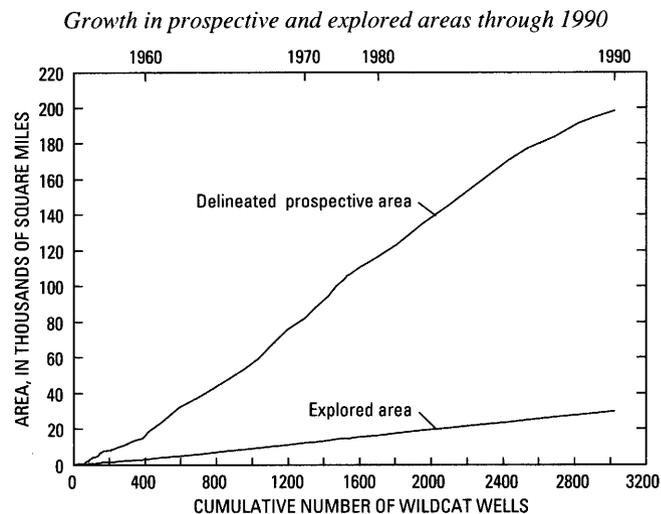
Reported discoveries of recoverable crude oil and gas through 1990:  
 0.124 × 10<sup>9</sup> bbl oil and 7.08 × 10<sup>12</sup> cubic feet gas

$$\text{Richness} = \frac{\text{total oil discoveries}}{\text{total delineated prospective area}} = 0.010 \times 10^6 \text{ bbl/mi}^2$$

Figure 53. Continued.



**Figure 54.** Delineated prospective areas (gray circles), explored areas (black circles), and known petroleum provinces of Australia and New Caledonia, southwestern Pacific. New Caledonia is an overseas territory of France.



*Exploration data*

Country	Land area (mi <sup>2</sup> )	Delineated prospective area through 1990: 198,354 mi <sup>2</sup>
Australia . . . . .	2,974,581	Explored area through 1990: 29,921 mi <sup>2</sup>
New Caledonia . . . . .	7,200	Wildcat wells through 1990: 3,022
Total . . . . .	2,981,781	Current growth in delineated prospective area per wildcat: 33 mi <sup>2</sup>
		Reported discoveries of recoverable crude oil and gas through 1990: 6.20 × 10 <sup>9</sup> bbl oil and 83.7 × 10 <sup>12</sup> cubic feet gas
		Richness = $\frac{\text{total oil discoveries}}{\text{total delineated prospective area}}$
		= 0.031 × 10 <sup>6</sup> bbl/mi <sup>2</sup>

*Significant petroleum provinces*

Significant petroleum province	Year of first discovery in this province in Australia	Cumulative discoveries in this province in Australia through 1990		
		Crude oil		Gas
		in 100-million-barrel fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>6</sup> bbl)	in all fields (10 <sup>9</sup> ft <sup>3</sup> )
Gippsland Basin . . . . .	1924	4,185	4,546	10,844
North Carnarvon Basin . . . . .	1953	454	695	2,773
Bonaparte Basin . . . . .	1964	176	375	6,779
Total . . . . .		4,815	5,616	20,396

Figure 54. Continued.



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