DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1973/32

PETROLEUM EXPLORATION ACTIVITY IN AUSTRALIA AND PAPUA NEW GUINEA 1972-1973

by

E.R. Smith

Record No. 1973/32

Petroleum Exploration Activity in Australia and Papua New Guinea 1972-1973

by

E.R. Smith

Bureau of Mineral Resources, Geology and Geophysics
Department of Minerals and Energy

Canberra, A.C.T.

CONTENTS

FIGURES

ABSTRACT

A highlight of 1972 has been the continued success on the Northwest Shelf where it has become apparent that the reserves of natural gas are very large. There have also been two promising oil discoveries in this area.

Significant new gas fields were discovered in the Cooper Basin, which have finally assured sufficient reserves for the Sydney market. However the development of the Tirrawarra oil field has been disappointing.

Petroleum exploration activity in Australia and Papua New Guinea improved slightly during 1972, mainly because of increased activity in offshore areas. It is likely that this trend will continue through 1973.

ACKNOWLEDGEMENTS

This paper is based largely on information supplied by petroleum exploration companies and their co-operation is gratefully acknowledged. It is presented with the permission of the Director, Bureau of Mineral Resources, Geology and Geophysics, Canberra, A.C.T.

PETROLEUM EXPLORATION IN 1972

Over the last few years the areal distribution of exploration in Australia has developed a rather set pattern. In the land areas of Australia, exploration work has been concentrated in the Surat, Cooper, Canning, and Perth Basins. Offshore, it has been the Bass Strait and the Northwest Shelf/ Timor Sea areas which have attracted most attention. This pattern was maintained during 1972 and is likely to continue through 1973. Exploration activity elsewhere in Australia has been intermittent.

Developments in offshore areas

Developments in the Rankin area of the Northwest Shelf have overshadowed other areas during the past year. Stepout wells in the North Rankin and Goodwyn structures indicated important extensions to these gas fields. In addition, two recent wells, Eaglehawk No. 1 and Goodwyn No. 3, have given promising flows of oil. The flow from Eaglehawk is particularly pleasing in that the oil was of low gravity in contrast to the high-gravity oil of most other Australian discoveries. A considerable amount of new seismic work (about 16 000 miles) was shot in the Northwest Shelf/Timor Sea area and 23 wells were completed.

The other important offshore area is Bass Strait, where wildcat drilling was resumed after a 1-year moratorium. Eleven wildcat wells were drilled and it appears that 3 small oil fields may have been indicated, but their commercial significance is still being evaluated.

Two wells were drilled in the Great Australian Bight, but unfortunately little information is available. Other offshore wells were drilled in the Carnarvon Basin and the Gulf of Papua.

Developments in onshore areas

Although overshadowed by the publicity given to the Northwest Shelf, drilling in the Cooper Basin has been quite successful. Of eight new field wildcats, five were completed as gas wells and these finally assured sufficient reserves for the Sydney market. However this success was tempered by the less encouraging results of the Tirrawarra wells. This oil field has not developed as well as was expected, but it is still hoped that enough petroleum liquids will be proved in this and other fields in the area to warrant eventual commercial production of the liquids.

In contrast to the Cooper Basin, drilling on the Roma Shelf has not enjoyed as much success as in recent years. Only two wells out of eight drilled were completed as gas wells, and both were within existing fields. Another 10 wells were drilled in the Surat Basin, only one of which is a possible gas well. The results of drilling in the Surat Basin have been very disappointing during 1972.

Likewise, results in the Perth Basin have been most disappointing. Further investigation of the Walyering gas discovery showed that the field was very small, and a deep test on a promising location on the Gingin structural trend was unsuccessful.

Operators continued working steadily in the onshore Canning Basin, but to date any encouragement received has been mostly theoretical rather than tangible.

Elsewhere in Australia exploration during 1972 has been rather sporadic. A number of shallow holes were drilled in the Carnarvon Basin; about eight months of seismic work was carried out and one well drilled in the Otway Basin; a small amount of seismic work was done and four wells drilled in western Queensland; and some minor work was carried out elsewhere.

Although no wells were drilled in Papua New Guinea during 1972, I feel it has been an important year there. Some large seismic programs were undertaken in western Papua, totalling in all about 24 months and 1000 miles and the quality of the seismic data has generally been quite good, in contrast to previous work in Papua. In addition, the cost of seismic work has been reduced to about $4000 to $5000 per mile. This may seem astronomical to geophysicists working in Australia, but when it is considered that some previous work has cost in excess of $10 000 per mile, a marked improvement has been attained.

Level of exploration activity during 1972

To measure the level of exploration activity during 1972 relative to previous years, I have used the following indicators - number of active exploration units, number of exploration wells completed, and exploration footage drilled.

Figure 1 shows the number of units engaged on exploration for each year since 1965, the lower graph showing seismic crews and the upper one drilling rigs.

The lower graph shows that the number of active seismic crews in 1971 and 1972 has been about 40 per cent lower than in the previous two years and has been at its lowest level since the peak year, 1965. There was an increase of about one crew-year (about 10 percent) from 1971 to 1972, owing to an increase to 3½ crew-years in operating marine crews; this figure includes the marine crew employed by the Bureau of Mineral Resources, which will not be operating in 1973. The number of active crews on land remained constant at about 7 crew-years.

Looking at the upper graph of Figure 1, we see that the number of active exploration drilling units has remained approximately constant, within limits of plus or minus 10 percent, at about 13 to 14 rigs for the past six years. This level is about half the peak year of 1965. Comparing 1972 with 1971, there was a decrease from 14 to13 rigs working, but there was a shift from onshore to offshore. There was an average of about 6 offshore rigs operating during 1972 compared with 5 in 1971, whereas there were only 7 rigs operating onshore in 1972 compared with 9 in 1971.

To summarise the suggestions of these indicators, I would say that as an indication of actual activity the drilling rig indicator shows that there has been little significant change in total activity for the past six years and that the trend last year was towards increased offshore activity and less onshore activity. As an indication of future drilling activity the seismic indicator would not suggest that an increase is likely, particularly onshore.

The next two indicators present a slightly more encouraging picture. Figure 2 shows the number of exploration wells completed in each year since 1965. After a serious drop in 1971, the total number of wells has recovered somewhat. There has been an increase in 1972 of about 25 percent over 1971, which is almost entirely accounted for by the increase in offshore wells drilled - up from 21 to 38. This is the highest number of wells ever drilled offshore in one year. In contrast to the offshore position, the number of onshore wells drilled in 1972 was about the same as in 1971, and is at its lowest level in recent years.

Figure 3, which shows the exploration footage drilled each year, presents a similar picture to the previous figure. Total 1972 footage is up by 28 percent, offshore footage up by 98 percent, and onshore footage down by 8 percent. Offshore footage is the highest ever (46 percent up on previous highest in 1969), while onshore footage is the lowest for several years. As the number of offshore drilling rigs only increased from 5 to 6, the figures indicate a more efficient use of these rigs in 1972.

An interesting comparison which emerges from these figures is that the average depth of wells drilled in offshore areas in 1972 was about 10 000 feet, whereas that of onshore wells was only about 5700 feet. About 12 wells drilled onshore had total depths less than 2000 feet.

Although expenditure is not a reliable guide to exploration activity, it is useful to examine the figures, which are shown in Figure 4. In the three years 1969 to 1971, expenditure on exploration has remained at a fairly constant level, slightly in excess of $90,000,000. Figures for 1972 are not yet available, but it is expected that total expenditure will be about the same. However, it is likely that the expenditure on offshore exploration will be greater than in 1971, with a corresponding decrease in onshore expenditure.

PREDICTIONS FOR 1973

Offshore

Although one offshore drilling rig left Australian waters early in the year, it is likely that the average number of rigs operating during 1973 will be about the same as in 1972, i.e. six, or perhaps slightly higher. The number of wells planned for 1973 is about 40, also about the same as in 1972. However, it is likely that less seismic mileage will be surveyed in 1973. This decrease will be due largely to the cessation of the Bureau of Mineral Resources marine program for the time being, but company seismic activity is also likely to be down.

A highlight of 1973 is the appearance of the Sedco 445 deep-water drilling vessel in Australian waters. It has been brought here by Shell and will drill two holes to the north and northwest of Australia in water depths in excess of 600 feet. The first offshore well in eastern Papua New Guinea will also be drilled this year, in the Trobriand Islands area.

The majority of the wells will again be drilled off the northwest coast and in Bass Strait.

Onshore

I expect that the activity in onshore areas during 1973 will be at about the same level as for the last two years. The seismic work planned should keep about 6 or 7 seismic crews active. Drilling rig activity should be about the same also, with the expected number of wells being between 50 and 60. Footage drilled may increase slightly, however, as I do not expect as many shallow wells to be drilled during this year.

As in recent years, most drilling activity will be in the Cooper and Surat Basins, and in Western Australia, where about 20 percent of the exploration wells are expected to be drilled. Drilling will be undertaken in Papua New Guinea where 2 or 3 wells may be drilled.

Exploration in the Amadeus Basin will be resumed with a fairly extensive seismic survey and some further investigation of the Palm Valley gas field.

The "Vibroseis"* method of seismic prospecting is being revived in Australia and there are likely to be 3 crews operating during the year. At least one will offer a digital processing unit which can be located in the field and is capable of producing final stacked sections within a day of field recording. This crew will carry out an extensive survey in the eastern Canning Basin.

CONCLUSIONS

The overall picture I have presented for petroleum exploration in Australia and Papua New Guinea indicates that the level of activity improved slightly during 1972 and will probably continue at about the same level in 1973, but that this level is still slightly below that of 1969 and 1970. Although it may be argued that this rate of activity is adequate to discover sufficient gas reserves, it certainly has not been adequate in the last few years to ensure the continuing discovery of sufficient oil reserves for Australia's needs.

It is interesting to examine exploration activity as it is divided between marine and land areas. The justification for this division is that different types of equipment are required and costs are vastly different.

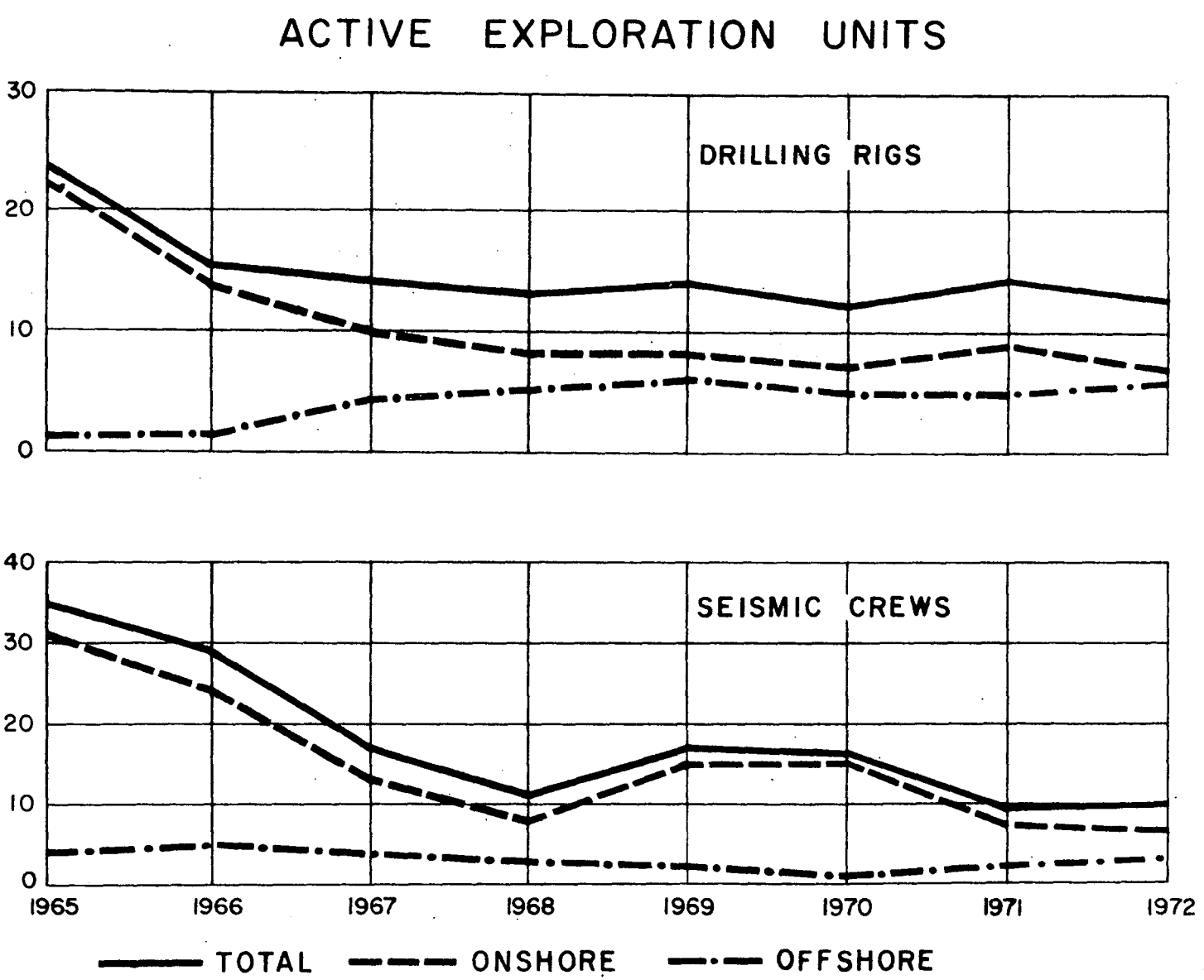
In offshore areas there was a significant increase in activity during 1972 and this level should be maintained during 1973. The current level is the highest so far attained. With the continuing success on the Northwest Shelf during 1972, and relinquishments of areas scheduled for 1974-1975, I expect a healthy increase in offshore activity in the next few years. However, to keep things in perspective I would remind you that whereas there will be 4 or 5 rigs operating on the Northwest Shelf this year, about 40 rigs are expected to be in operation in the North Sea, which is of comparable size to the Northwest Shelf.

* Trade mark of Continental Oil Co.

The outlook is not so rosy in our onshore areas. Activity has been at a fairly low level for a few years and in 1972 was down slightly on 1971. I do not expect it to improve significantly in 1973. No doubt an important reason for the lack of activity in large sedimentary areas of Australia is the apparent low prospectivity of these areas. However, from the national viewpoint it is important that we know what our petroleum resources are, and some of these areas require more drilling before their prospects can be assessed more soundly and their petroleum resources estimated.

The low level of activity has a secondary effect which concerns me. Because of the small number of drilling rigs and seismic crews being employed, an operator does not have a wide choice of contractors or equipment. To obtain the type of unit he desires, an operator often has to mobilise the unit from overseas, thus increasing the effective cost of exploration. Basically, the problem is that the level of exploration in Australia is not sufficiently high to maintain a large number of contractors and to justify the retention of the latest equipment permanently in Australia.

Fig. I.


ACTIVE EXPLORATION UNITS
DRILLING RIGS
30
20
10
0
SEISMIC CREWS
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971
1972
TOTAL
ONSHORE
OFFSHORE

XM-33

Fig.2.

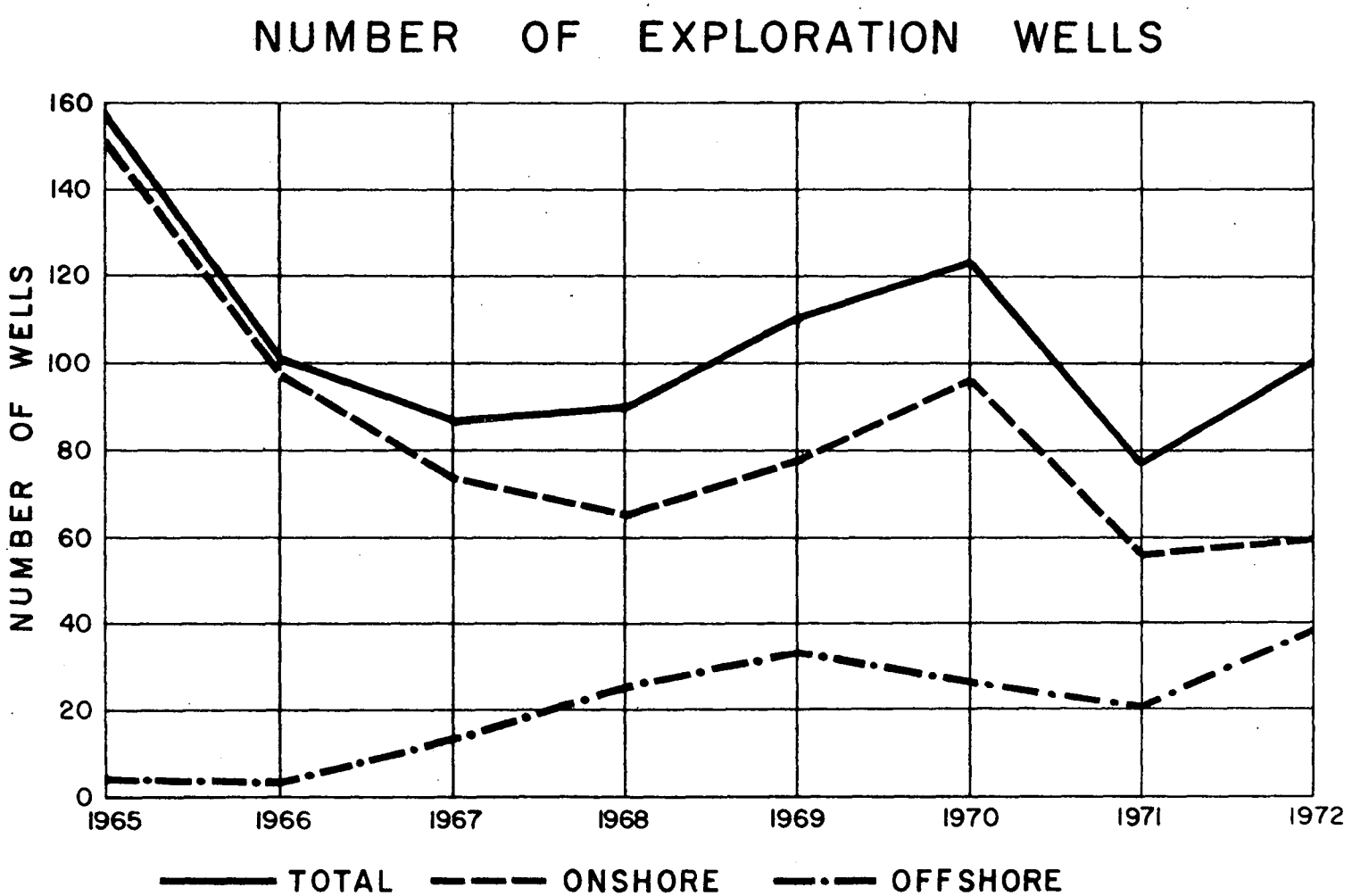

NUMBER OF EXPLORATION WELLS
NUMBER OF WELLS
160
140
120
100
80
60
40
20
0
1965
1966
1967
1968
1969
1970
1971
1972
TOTAL
ONSHORE
OFFSHORE

Fig. 3.

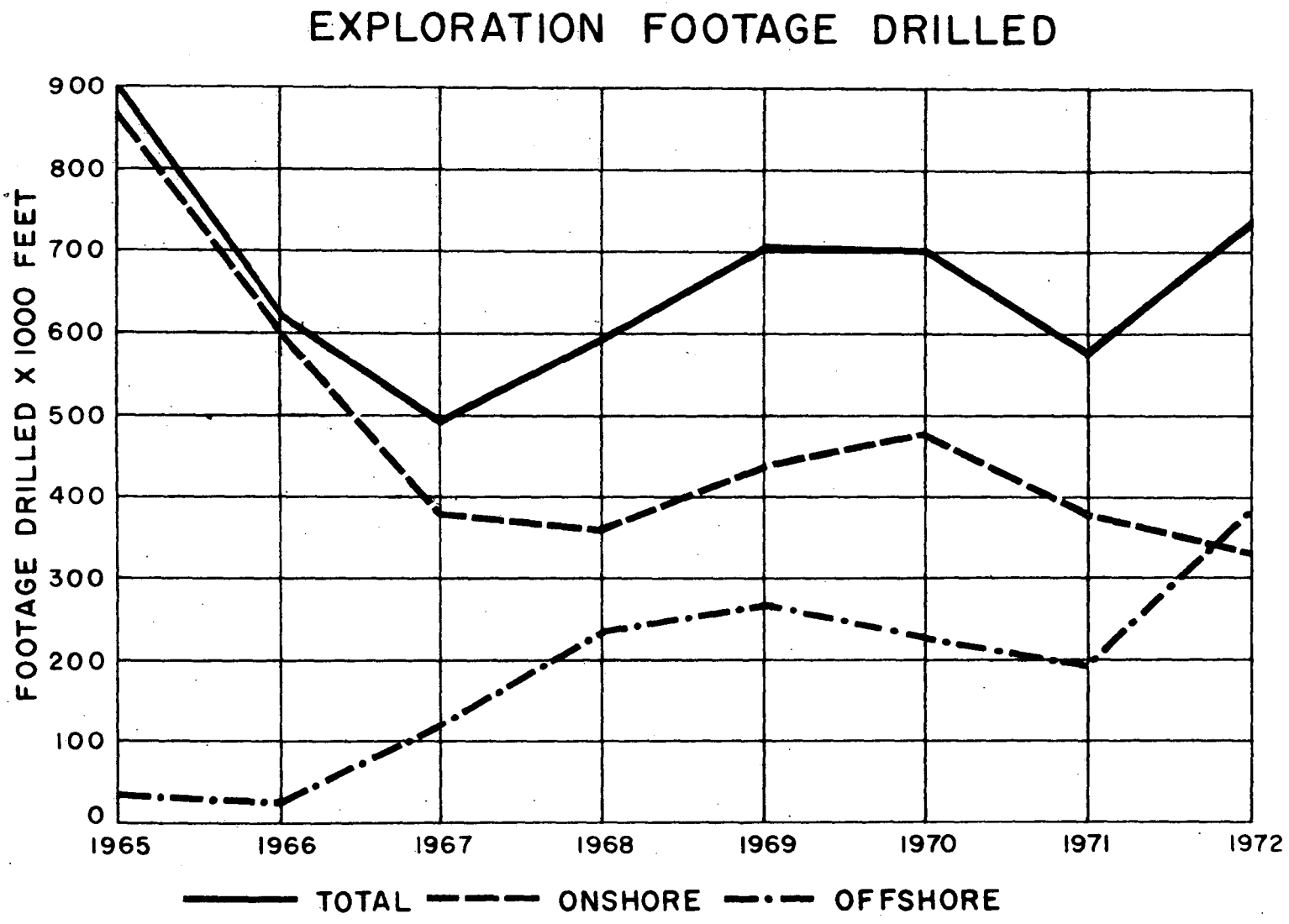
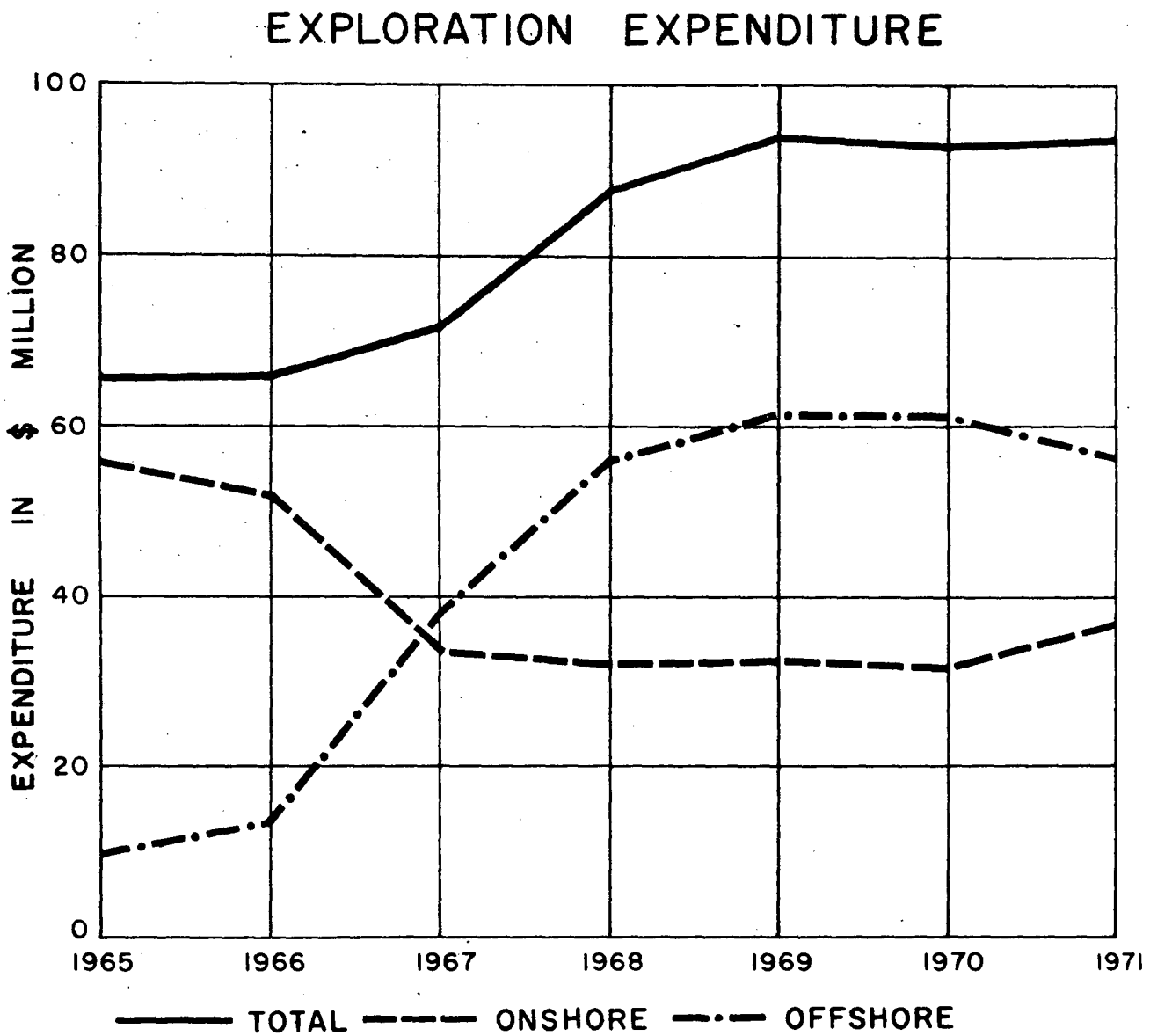

EXPLORATION FOOTAGE DRILLED
FOOTAGE DRILLED X 1000 FEET
900
800
700
600
500
400
300
200
100
0
1965
1966
1967
1968
1969
1970
1971
1972
TOTAL
ONSHORE
OFFSHORE

Fig. 4.


EXPLORATION EXPENDITURE
EXPENDITURE IN $ MILLION
100
80
60
40
20
0
1965
1966
1967
1968
1969
1970
1971
TOTAL
ONSHORE
OFFSHORE