REPORT GPH 116

TOTAL MINERARIA S.p.A.

BR 145 MI

SEISMIC INTERPRETATION

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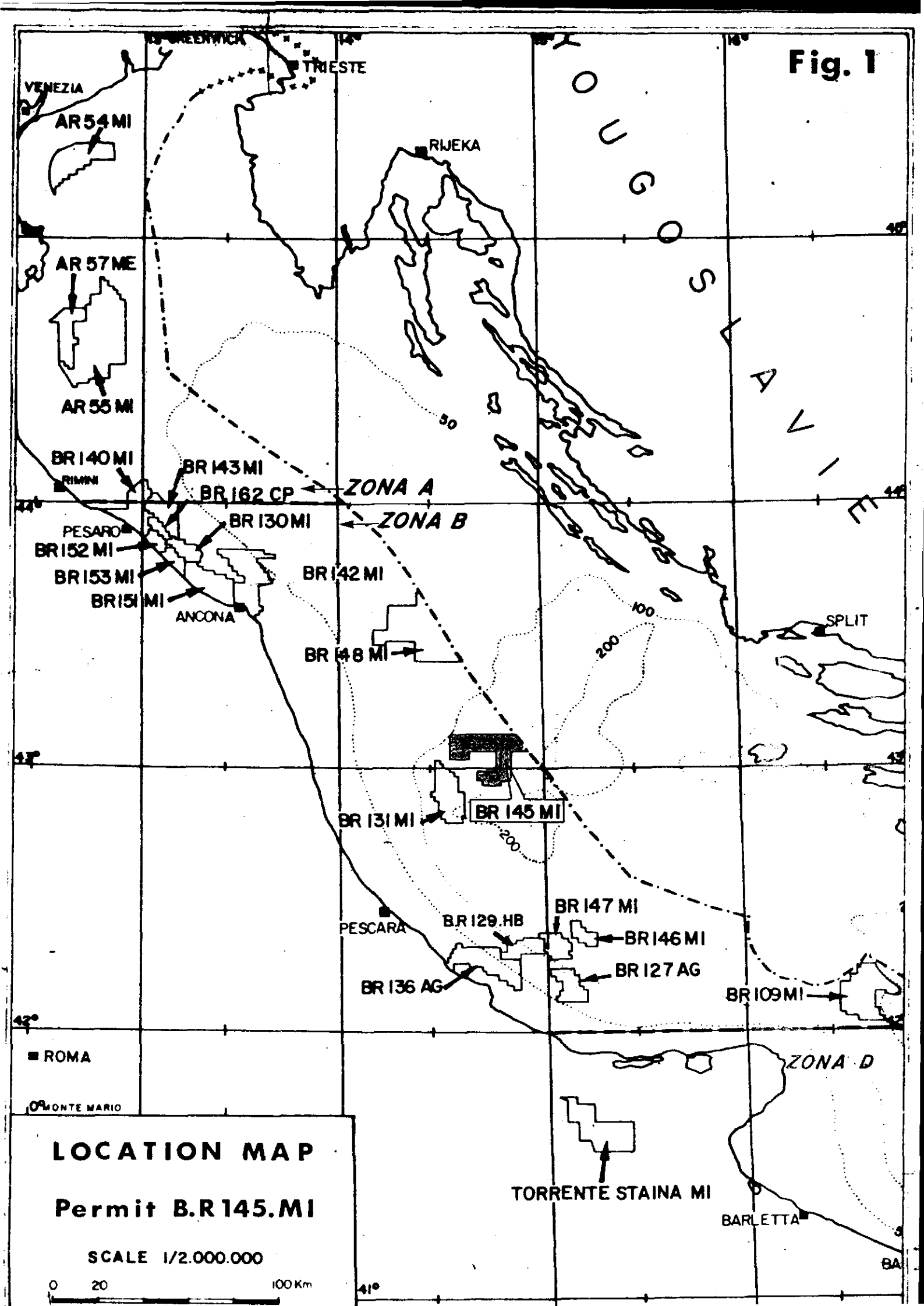


Fig. 1
VENEZIA
TRIESTE
RIJEKA
AR 54 MI
AR 57 ME
AR 55 MI
BR 140 MI
RIMINI
BR 143 MI
BR 162 CP
ZONA A
ZONA B
BR 130 MI
PESARO
BR 152 MI
BR 153 MI
BR 151 MI
ANCONA
BR 142 MI
BR 148 MI
SPLIT
BR 131 MI
BR 145 MI
PESCARA
B.R 129.HB
BR 147 MI
BR 146 MI
BR 127 AG
BR 136 AG
BR 109 MI
ROMA
MONTE MARIO
ZONA D
TORRENTE STAINA MI
BARLETTA
BA
50
100
200
200
44°
43°
42°
41°
LOCATION MAP
Permit B.R 145.MI
SCALE 1/2.000.000
0 20 100 Km

INTRODUCTION

In the period May 20 to June 15, 1981 the north-eastern part of BR. 145 MI licence has been interpreted on the base of the 1981'C.G.G. survey, the 1978'SEFEL lines and some lines traded with AGIP.

The particular interest on this area is due to the possible presence, below the Schlier marls (and conformable with them) of the Bryozoa limestone (gas bearing in the onshore wells CIGNO, VALLECUPA, CUPELLO, MONTECILFONE, and VILLALFONSINE) which represents a primary resevoir due to its characteristics of porosity and permeability.

Here under are listed the lines utilized :

- BR. 145. 11-12-18-19 shot in 1978 by GEOPHYSICAL OFFSHORE EXPLORATION (Air- Gun), processed by SEFEL and reprocessed by SEICOM DELTA (Encl.s 1,2,3 and 4) : G.O.E. Lines
- BR. 145.81. 01-02-03-04-05-06-07-08-09-10 shot in 1981 by C. G.G.(Vaporchoc) and processed by SEICOM DELTA (Encl. 5).
- BR. 62-63-64-68-236 shot in 1968 and processed by G.S.I. (Air-Gun).
- BR. 335 W shot in 1971 and processed by W.G.C..

The following colour displays of the first two sets have also been utilized :

- Average Strength (BR. 145.... and BR. 145.81....);
- Average Frequency (BR. 145....)
- Interval velocity (BR. 145....)
- Polarity (BR 145.11.)

CHAPTER 1

MAPPED HORIZONS

The following horizons have been mapped:

a) horizon in the Lower Quaternary ("9")

b) base of th . Quaternary ("D10")

c) base of the Pliocene ("D20")

d) top of the Bryozoa.

e) bottom of the Bryozoa limestone ("26")

The data of the wells RIGEL and EDMOND 1 tris, which are the closest to the area, have not been used, since these wells have been drilled in completely different structural situations.

The base of the Quaternary has been calibrated on the data of the well BONACCIA 1 (BR. 148 MI licence), but the attribution is questionable since the tie lines utilized (1967 G.S.I. ministerial survey) have been uncorrectly processed (normalization, filters, coverages).
The horizon D 20 (base Pliocene) gave no problem in this connection since it is present all over the area as a strong positive reflection due to the passage from a low velocity sequence (shales of the Lower Pliocene) to the high velocity interval of the Messinian evaporites.

The first strong positive reflection below the evaporites has been interpreted as the top of the Bryozoa limestone: in fact

contd...

we expect the thickness of the evaporites plus the Schlier marls to be 60 to 80 m maximum, which is represented by one single phase in the seismic trace.

The passage to the limestone gives rise to a positive reflection which can be followed as a generally continuous horizon in the area under study.

The second positive reflection below the evaporites has been mapped as base of the Bryozoa limestone: however the horizon is not calibrated from wells and one may also expect our calibration to be one phase too high.

The Lower Pliocene (the top of which is a strong well defined reflection in all the area) was not considered a possible target since, from available well data, it seems to be mostly shaly: however the colour display of the average frequency shows, over the Messinian channel, strong absorptions of the high frequencies which can be reasonably attributed to the presence of gas bearing sandy levels.

CHAPTER 2

QUALITY OF THE SEISMIC DATA

The quality of the seismic data is generally good, except that of the lines BR. 236 and BR. 355W, traded with AGIP, which have been utilized as back reference and not for the interpretation itself.

The BR. 145 ... sections have been corrected of about 50 ms twt since this was the time difference with respect to the B.R145.81... sections: this was probably due to different deconvolutions of the Air-Gun and the Vaporchoc sections (these last ones may be considered as zero phase sections), and to serious topographic problems on the G.O.E. survey.

The colour displays have also been utilized to derive maps of the energy of the reflections as well for horizon 9 in the Quaternary than for the top of the Bryozoa limestone, however the comparison between the 1980 and 1981 sets is not direct as the scales for the colour display are not the same.

Moreover, the colour displays of lines BR. 145.81.01 and BR. 145.81.06 have not been corrected for the source and cable depths so they have a static error of about 13 ms twt.

CHAPTER 3

DESCRIPTION OF THE ENCLOSURES

3.1. Seismic lines BR.145.12, BR.145.18 (SEFEL and SEISCOM DELTA processings) and BR. 145.81.03 (Encl.s 1,2,3,4 and 5).

3.2. Location map (Encl. 6)

The map indicates all available data over the area including the lines traded with AGIP.

3.3. Structural sketch (encl.7)

From a structural point of view, the permit is interested, in the middle part, by a regional E - W wrench fault and by conjugate strike - slip faults on which the Messinian channel has developed.

3.4. 9 (encl. 8)

The mapped horizon, which is our secondary target, has a relatively strong gradient only in the southern part of the area.

The energy of the reflection is very discontinuous probably due to a strong variability in the sand/shale ratio.

The Velans show a decrease in the interval velocity from 2000-2100 m/s to 1550-1600 m/s vertically and, moving from the zone where the bright effect is present, from 1550-1600 m/s to 1800-1850 m/s. It doesn't seem, however, that it exists an appreciable seismic closure at this level.

3.5. D 10 (Encl.9)

The base of the Quaternary shows the same behaviour but this map is less reliable than the other ones, due to the fact that

contd...

the intersections between the G.O.E. and the C.G.G. lines have strong and variable time differences, in spite of the corrections applied.

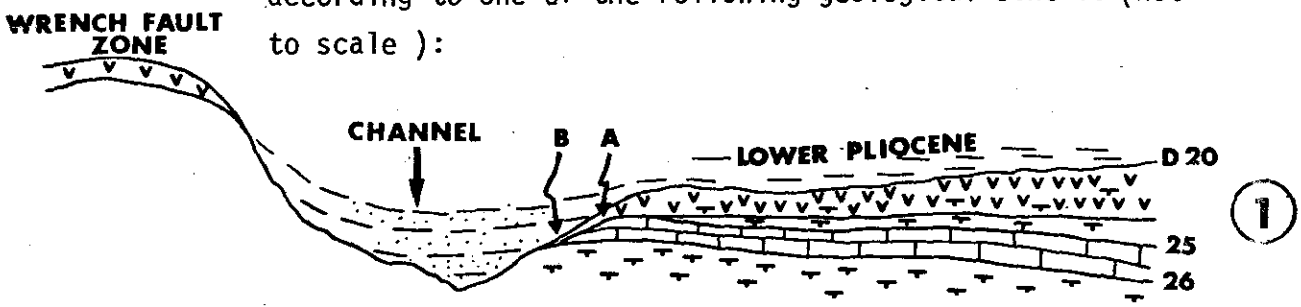
3.6 D 9 (Encl. 10)

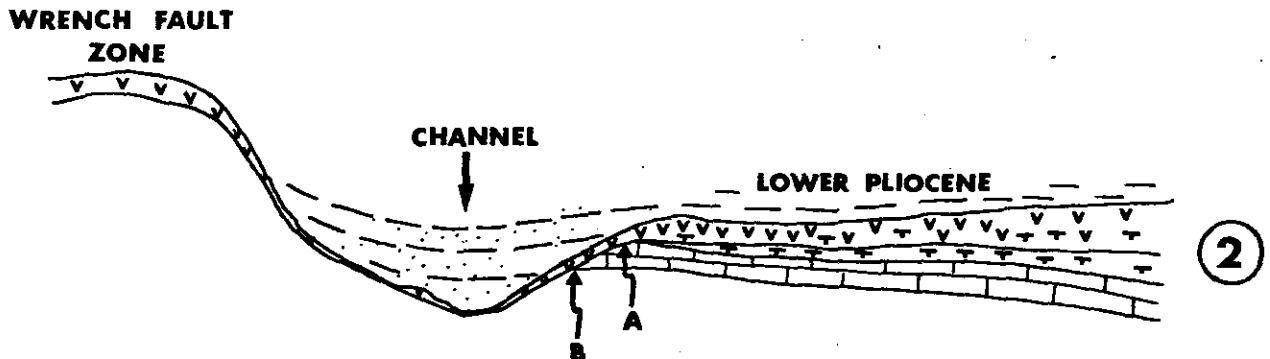
The base of the Pliocene has two seismic closures: one north of the permit and the other one in the permit with a small gradient and a culmination towards the border of the channel.

In the southern part of the channel, the top of the Messinian evaporites has a strong gradient towards the high area built by the wrenching.

3.7 25 (Encl.s 11 and 12)

The top of the Bryozoa limestone which is the first target, shows a structure which develops in the SE-NW direction in the northern border of the channel, the highest part being at the intersection between lines BR 145.11 and BR. 145. 81. 03. Some small secondary highs are also noticed. The structure is sealed by the Lower Pliocene shales towards the channel and has a seismic closure of about 35 ms owt in the other directions (areal closure 60 km^2). Anyhow, the above cross-point is not the most suitable one for a well location: in fact due to erosion, the thickness of the reservoir progressively reduces towards the channel, according to one of the following geological schemes (not to scale):





The area between A and B is dotted on the map.

3.8. 25 Isobaths (Encl. 13)

The velocities used to derive the limestone isobaths are indicated in the legend.

Only the Velans of the new lines have been considered since they seemed more reliable: the RMS velocities have been slightly corrected using the velocity survey of BONACCIA 1 (BR 148. MI licence) which shows a high similarity between the RMS and the Average velocities.

The isobaths show the same " hummocky " panorama (probably caused by erosion) as the corresponding isochrons.

3.9. 26 (Encl. 14)

The base of the limestone has a slightly regular behavior.

3.10 26-25 (Encl. 15)

The isopachs of the Bryozoalimestone are very irregular over the area of interest and show a strong reduction of thickness towards the cannel where eventually the sequence lacks.

CHAPTER 4

PROPOSED WELL LOCATION

There are two locations which seem to be the most suitable for the area:

A. Tie of lines BR.145.12 (Encl.s 1 and 3) and BR. 145.81.03 (Encl. 5); it is located over a considerable thickness of Bryozoa limestone but marginally over the amplitude anomaly in the Quaternary.

B. Tie of lines BR.145.12 and BR.145.18 (Encl.s 2 and 4); it is over a reduced thickness of Bryozoa limestone and marginally over the shallow anomaly; it is also over a deep seated amplitude anomaly (at about 2250 m) which is obvious on the above lines, though small in extent.

About the nature of the deep anomaly, the most reliable hypotheses are the following:

a. Lithological factors (porosity, facies and thickness changes)

b. Fluid content

In both cases its exploration could be interesting for

extrapolations to the surrounding areas and developments in the case of a success.

CONCLUSIONS

Besides the Brizoa limestone, which is a rather new target for the offshore, the discovery of BONACCIA makes the area particularly attractive for Lower Quaternary targets, even if this part of the permit doesn't seem to be the most suitable one for shallow investigations.

As regards the deep targets, apart the wrench fault area which has been condemned by the negative results of the wells RIGEL 1 and EDMOND 1 tris, the southern part of the permit and the area between the wrench fault zone and the Messinian channel warrant a better investigation.