ANN. INST. GEOL. PUBL. HUNG. | vol. LXX. | Budapestini, 1987

Proceedings of the VIIIth RCMNS Congress

THE PRESENT-DAY TARANTO GULF AND THE MIOCENE IRPINIAN BASIN FOREDEEPS OF THE SOUTHERN APENNINES (ITALY)

by

T. PESCATORE and M. R. SENATORE

Introduction. The Southern Apennine chain derives from the Cenozoic deformation of the continental margin of the Adria plate.

During the Burdigalian a sedimentary basin was formed (Irpinian basin, COCCO et al., 1972; PESCATORE, 1978) on the front of the thurst sheets.

The aim of this paper is to compare the Miocene foredeep with the Taranto gulf (Fig. 1), the present day foredeep of the Apennine chain (SELLI and ROSSI, 1975; PELFIORE et al., 1981).

The Irpinian basin and the Taranto gulf can be considered sensu lato foredeep areas. Different depocenters can be distinguished: piggyback (ORI and FRIEND, 1984) basins (on the thrust sheets), foredeep sensu stricto at the toe of the thrust sheets and minor foreland basins.

Morphological framework of the Taranto gulf

Three sectors can be distinguished in the gulf of Taranto having specific morphological characters and different areas of sedimentation (Fig. 2).

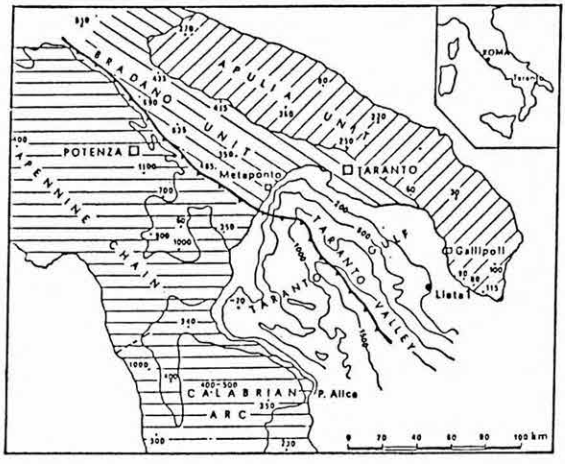

Fig. 1. Situation map

The map reports the values of uplift and subsidence (—) in meters for the last million years. Bathymetry is in meters. The toothed line corresponds to the front of the allochthonus thrust sheet of the Apennines. Lista 1 is well (Agip, 1977)

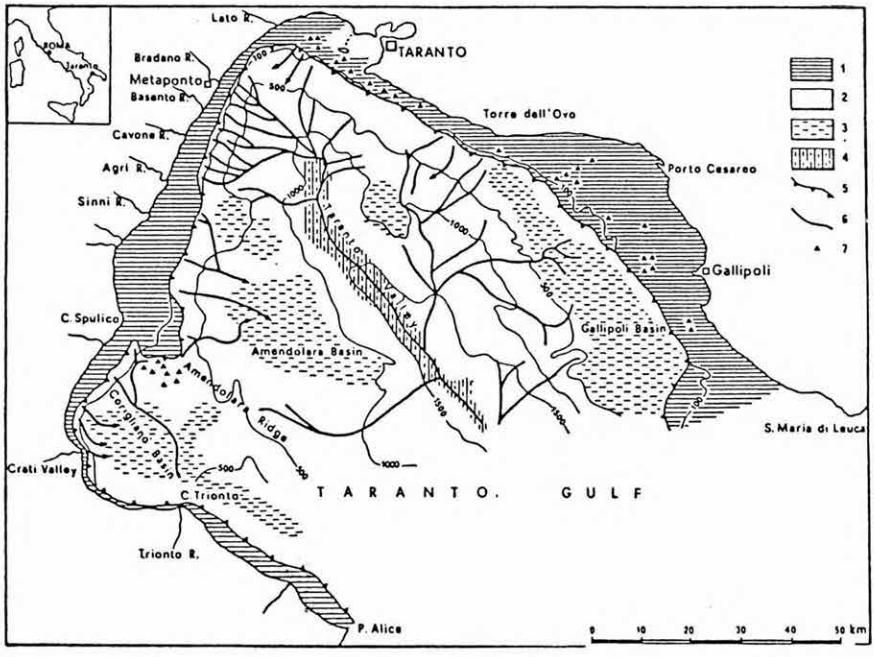

Fig. 2. Morphology map of the gulf of Taranto

1 Continental shelf, *2* continental slope and ridges, *3* flat areas (basins), *4* Taranto valley (foredeep basin), *5* shelf break, *6* main channels, *7* corraline algal banks

Western sector. This sector extends between the margin of the Taranto valley and the land. The shelf is either prograding or regrading (MOUGENOT et al., 1983). Two basins are individualized, Corigliano and Amendolara basins, separated by a ridge (Amendolara ridge).

Central sector. The central sector is the Taranto valley, a NW—SE trough located between the allochthonous thrust sheets to the west and the Apulia foreland to the east. The terrigenous materials from the shelf accumulate in the valley; there are some channels coming from the Apulia sector which carry into the valley bioclastic calcareous deposits. The coarser materials are transported into the valley by turbidity currents (SENATORE et al., 1982).

Eastern sector. The eastern sector is situated between the valley of Taranto and Apulia. The shelf is characterized by Holocene terraces; the slope by slump deposits which cover more than 30% of its surface. This sector comprises two Plio—Quaternary depocenters. The most extended one, the Gallipoli basin, has Plio—Quaternary deposits more than 500 m thick; they lie unconformably on the carbonate rocks of the Apulia foreland (Lieta 1 Well; AGIP, 1977).

Structural framework of the Taranto gulf

Our knowledge of the tectonic structures of the gulf of Taranto is based principally on the interpretation of seismic profiles (FINETTI, 1976; ROSSI et al., 1983; TRAMUTOLI et al., 1984; CELLO et al., 1981).

Using FINETTI's interpretation (1976) and the observations by TRAMUTOLI et al. (1984), it is possible to individualize the following principal elements in the gulf of Taranto:

— The western sector represents the continuation southward of the allochthonous Apennine units. It is characterized by an imbricate structure with two main thrusting fronts. Towards the west the fronts limit asymmetrical basins, where sedimentation occurred during deformation.

— The Taranto valley is the central sector of the gulf: this is a trough at the toe of the allochthonous thrust sheets, the foredeep sensu stricto of the Apennine chain.

— The eastern sector (Apulia margin) is the foreland, with Plio—Quaternary basins.

Irpinian basin

The Irpinian units or Irpinids, at the present outcrop in Campania and Lucania, along two major belts, both trending northwest—southeast (PESCATORE, 1978; 1985). The southwestern belt includes terrigenous deposits resting unconformably on the older allochthonous thrust sheets (Castelvetere Formation—upper part—and Gorgoglione Flysch) while the northeastern belt is formed by calcareous and terrigenous turbidites conformably following the underlying deposits (Serra Palazzo Formation and Faeto Formation).

The palaeogeographic domains existing during the Mesozoic and Early Cenozoic in this sector of the Adria continental margin, from west to east, have been named as follows: Campania-Lucania platform, Lagonegro basin, Abruzzi-Campania platform, Molise basin and Apulia platform (IPPOLITO et al., 1975).

Upper Oligocene—Lower Miocene terrigenous successions consisting of an alternation of quartzose sandstone and pelites (Numidian Flysch, Auct., OGNIBEN, 1969) represent the beginning of the terrigenous synorogenetic sedimentation in the external domain of the Southern Apennines.

In the Burdigalian an important tectonic pulse significantly modified the preexisting domain. In particular, it deformed the terrains of the Campania-Lucania platform and in part the ones of the Lagonegro basin, which structured the Irpinian basin. Depocenters may be separated into three groups (Fig. 3):

1 Upon the allochthonous thrust sheets: terrigenous successions are deposited at the base of the slope (Castelvetere Formation—upper part—) or in elongate deepsea fans parallel to the structural belts (Gorgoglione Flysch).

The terrigenous deposits (arkosic—lithic) were supplied by erosion of the thrust sheets.

2 At the front of the thrust sheets: a calcareous and terrigenous succession was deposited at the toe of the thrust sheets (Serra Palazzo Formation).

3 In the areas not yet deformed, i.e. the Molise basin, turbidite and hemipelagic calcareous successions were deposited (Faeto Formation). The clastic materials were fed from carbonate platforms.

Sedimentation occurred while the axis of the foredeep migrated eastward as suggested by the diachronism of the terrigenous facies, more recent towards the east, and the regressive trend of the successions (PESCATORE, 1978).

Sedimentation in the Irpinian basin terminated as a result of a new and important tectonic pulse in the Early Tortonian.

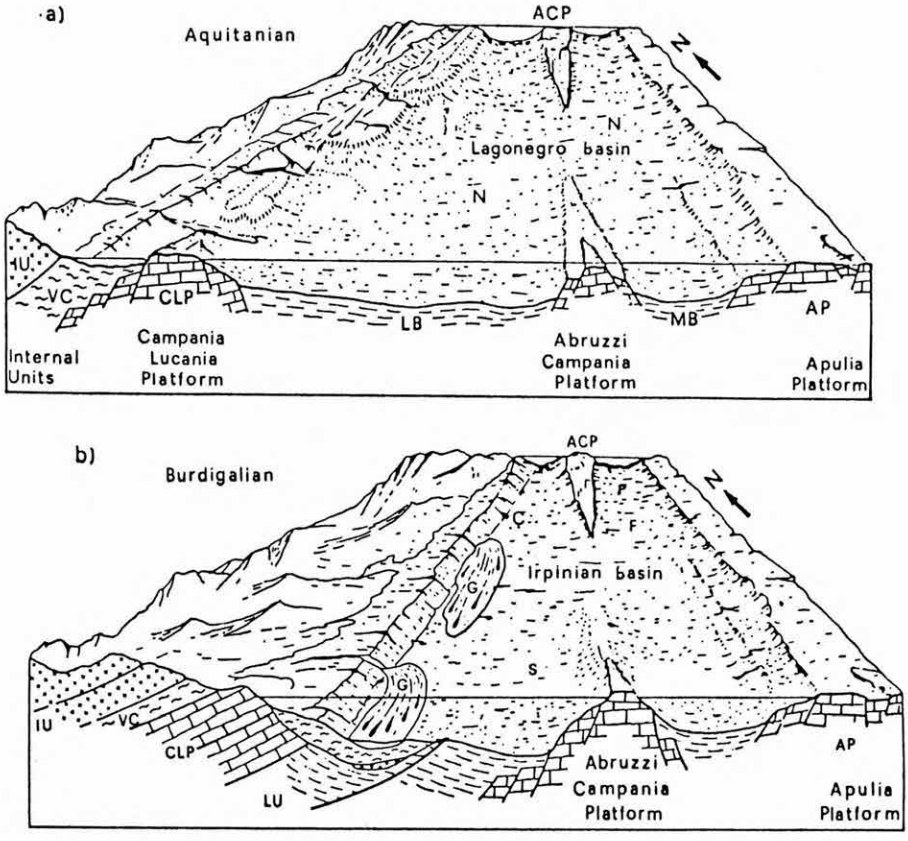

Fig. 3. Palaeogeographic scheme before (a) and after (b) the Burdigalian tectonic pulse

IU = Alpine and Apennine units, VC = variegated clays, CLP = Campanian Lucania platform, LB = Lagonegro basin, ACP = Abruzzi Campania platform, MB = Molise basin, AP = Apulia platform, N = Numidian flysch (quartzose sandstones), LU = Lagonegro unit, G = Gorgoglione flysch, C = Castelvetere Formation (upper part), S = Serra Palazzo Formation, F = Faeto Formation.—Not in scale

Discussion

The distribution of the Irpinian Units and the Plio—Quaternary depocenters in the gulf of Taranto shows, from west to east, the same succession of basins (Fig. 4).

Table 1

	Irpinian basin	Gulf of Taranto
	Castelvetere Formation —upper part—	Amendolara basin
PIGGYBACK BASINS	Gorgoglione Flysch	Corigliano basin
FOREDEEP BASIN	Serra Palazzo Formation	Taranto valley
FORELAND BASIN (minor)	Faeto Formation	Gallipoli basin

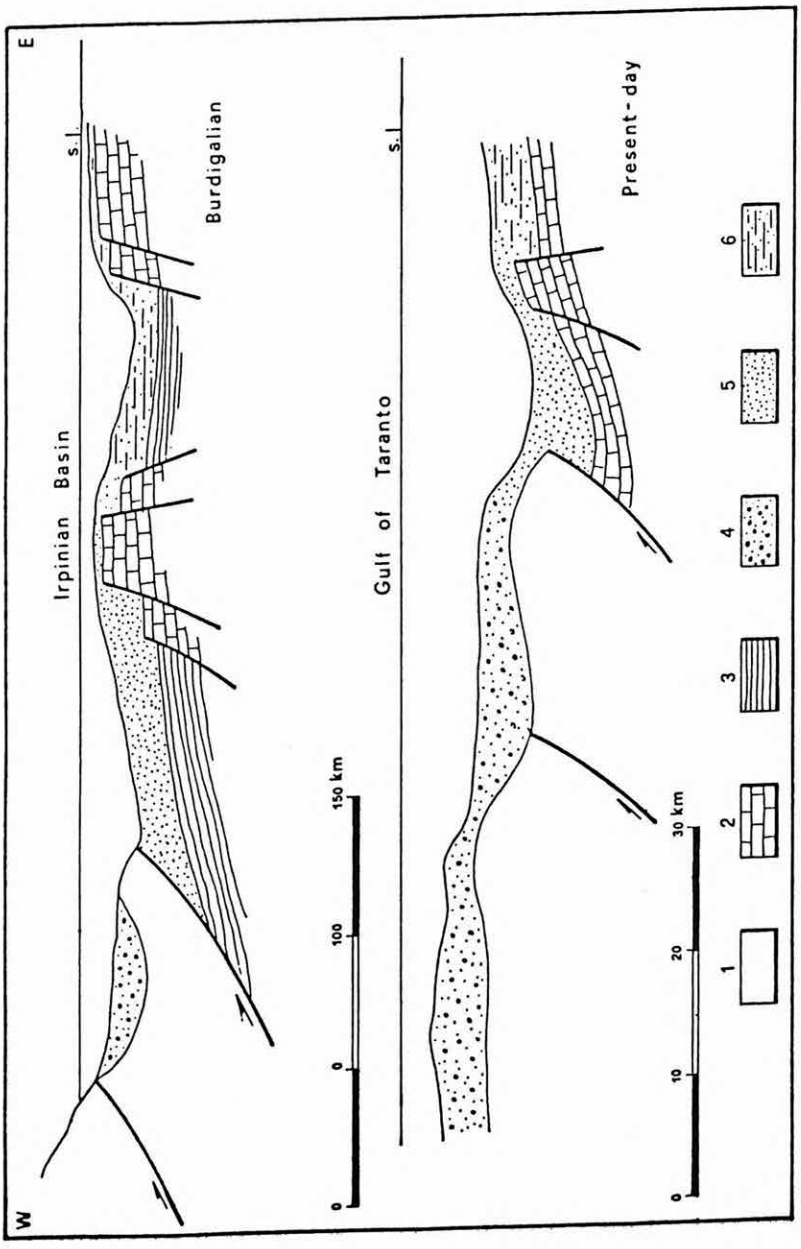

Fig. 4. Comparative sections across the gulf of Taranto (interpreted) and the Irpinian basin after the Burdigalian tectonic pulse (reconstructed)

1 Allochthonous thrust sheets, *2* neritic platforms, *3* pelagic basins, *4* piggyback basins, *5* foredeep, *6* foreland basins.
—The scale of length is greatly approximated for the Irpinian basin, hights are not in scale

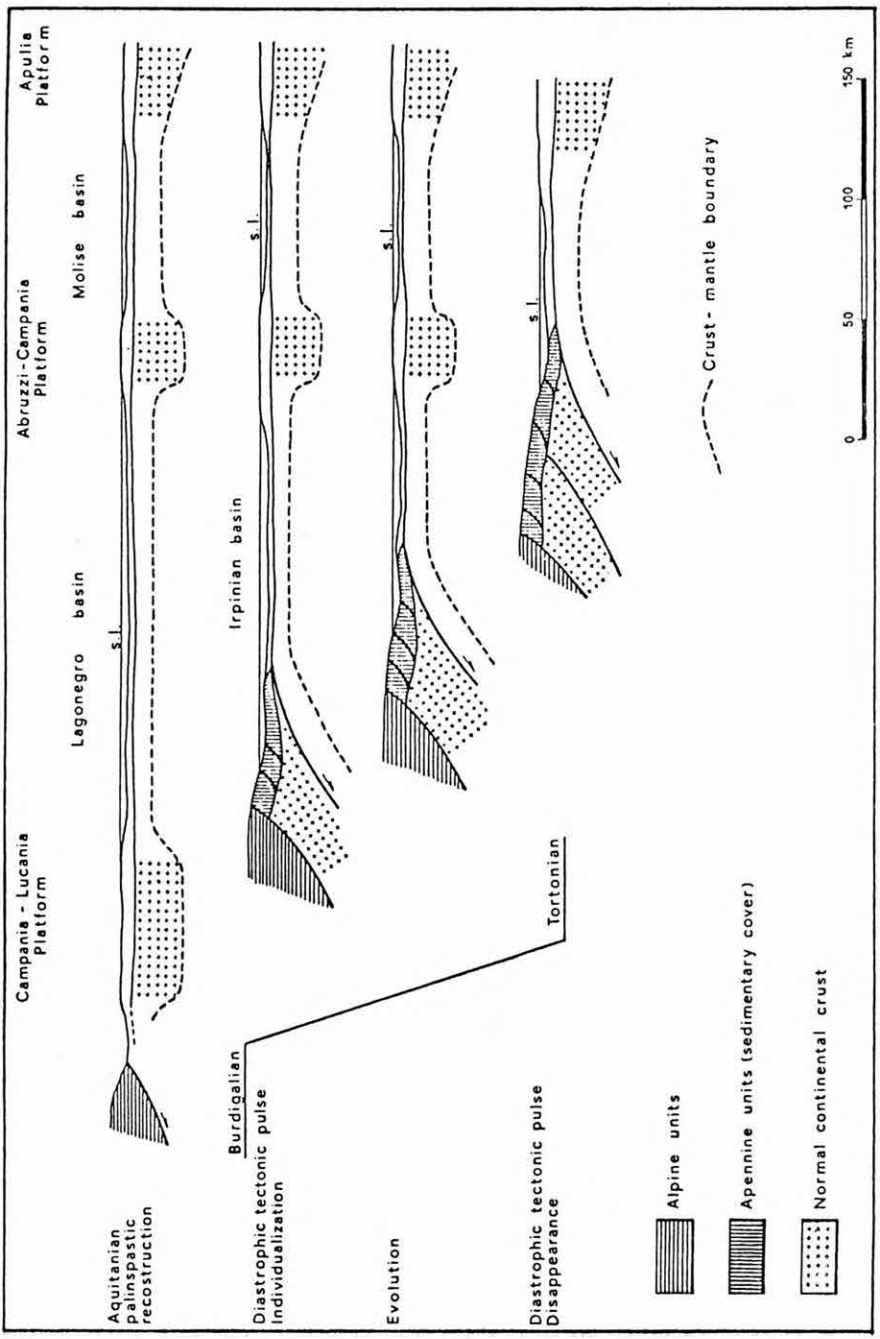

Fig. 5. The evolution of the Irpinian basin

The evolution of the Irpinian basin spanned a period of ca. 10 m. y., from the Burdigalian to the Tortonian. Contrarily, for the Taranto gulf, only 2 m. y. are taken into consideration.

The width dimensions of the Irpinian basin can be estimated as being by a factor of two or three greater as compared to the Taranto gulf, while there are no references for a definition of the length of the basins.

During the compressive stage, the evolution of the Irpinian basin should have been influenced by the structures acquired in the previous crustal stretching (Fig. 5).

It would seem possible to conclude that:

I The discontinuities of the crustal thickness along the margin of the Adria plate, linked to the tensile regime of the Mesozoic, controlled the development of the flysch-like basins during the compressive regime. The flysch-like basins seem to be localized in areas with a thinned crust.

II During a continuous compressive regime, the margin of collision evolves in a discontinuous manner according to the crustal thickness of the colliding blocks: normal crust collision gives rise to distrophic pulses; normal crust—thinned crust collision gives rise to flysch-like basins.

If an analogous model could be applied to the Taranto gulf, we ought to retain that the gulf is in its final stage, i.e. when the front of the thrust sheets has reached the margin of the Apulia platform with normal crust. The proceeding stage would have been characterized by A-type subduction of thinned crust existing below the Molise basin, to the west of the Apulia platform.

REFERENCES

AGIP 1977: Temperature sotterranee. — (ed. by BRUGORA), Segrate Milano.:1390.

BELFIORE A., BONADUCE G., GARAVELLI G., MASCELLARO P., MASOLI M., MIRABILE L., MONCHARMONT M., MORETTI M., NUOVO G., PENNETTA M., PESCATORE T., PLACELLA B., PUGLIESE N., RUSSO B., SENATORE M. R., SGARRELLA F., SANSONE E., SPEZIE G., THOREZ J., TRAMUTOLI M., VULTAGGIO M. 1981: La sedimentazione recente del Golfo di Taranto (Alto Ionio, Italia). I.U.N. Napoli. — Ann. Fac. Sc. Nautiche, app. 3.:49—50, 1—96.

CELLO G., TORTORICI L., TURCO E. and GUERRA I. 1981: Profili profondi in Calabria Settentrionale. — Boll. Soc. Geol. It. 100.:423—431.

COCCO E., CRAVERO E., ORTOLANI F., PESCATORE T., RUSSO M., SGROSSO I. and TORRE M. 1972 Les facies sedimentaires du Basin Irpinien (Italie Meridionale). — Atti Acc. Pontaniana, Napoli. 21.:1—13.

FINETTI I. 1976: Mediterranean ridge: a young submerged chain associated with the Hellenic. — Arc. Boll. Geof. Teor. e Appl. 13. (69):1—31.

IPPOLITO F., D'ARGENIO B., PESCATORE T. and SCANDONE P. 1975: Structural—stratigraphic units and tectonic framework of Southern Apennines. — In Geology of Italy (ed. by C. SQUYRES), Earth Science Soc., Lybian Arabic Republic:317—328.

MOUGENOT D., BOILLOT G. and REHAULT J. P. 1983: Prograding shelf-break types on passive continental margins: some European examples. — SEPM, Special Publication 33.:61—77.

OGNIBEN L. 1969: Schema introduttivo alla geologia del confine calabro—lucano. — Mem. Soc. Geol. It. 8.: 453—763.

ORI G. G. and FRIEND P. F. 1984: Sedimentary basins formed and carried piggyback on active thrust sheets. — Geology, 12.:475—478.

PESCATORE T. 1978: Evoluzione tettonica del Bacino Irpino (Italia Meridionale) durante il Miocene. — Boll. Soc. Geol. It. 97.:783—805.

— 1985: Evolution of the flysch basins and continental collision: Irpinian basin (Southern Italy). — Acta Geologica. 28. (1—2): 101—108.

ROSSI S., AUROUX C. and MASCLE J. 1983: The Gulf of Taranto (Southern Italy): seismic stratigraphy and shallow structure. — Mar. Geol. 51.:327—346.

SELLI R. and ROSSI S. 1975: The main geologic features of Ionian Sea. — Rapp. Comm. Int. Mer. Medit. 23. (4a):115—116.

SENATORE M. R., DIPLOMATICO G., MIRABILE L., PESCATORE T. and TRAMUTOLI M. 1982: Franamenti sulla scarpata continentale pugliese del Golfo di Taranto (Alto Ionio — Italia). — Geologica Romana 21.:497—510.

TRAMUTOLI M., PESCATORE T., SENATORE M. R. and MIRABILE L. 1984: Interpretation of reflection high resolution seismic profiles through the Gulf of Taranto (Ionian Sea, Eastern Mediterranean). The structure of Apennine and Apulia deposits. — Boll. Oceanol. Teor. e Appl. 2. (1):33—52.

TULLIO PESCATORE and **MARIA ROSARIA SENATORE**
Dipartimento di Scienze delle Terra
Universita di Napoli
Largo S. Marcellino, 10
80138 NAPOLI
Italy