



**ISPRA**

Istituto Superiore per la Protezione e la Ricerca Ambientale

## **SERVIZIO GEOLOGICO D'ITALIA**

Organo Cartografico dello Stato (Legge n°68 del 2.2.1960)

NOTE ILLUSTRATIVE

della

CARTA GEOLOGICA D'ITALIA

alla scala 1:50.000

foglio 156

# **TORINO EST**

A cura di:

**A. Festa**<sup>1,2</sup>, **F. Dela Pierre**<sup>1,2</sup>, **A. Irace**<sup>1</sup> e **F. Piana**<sup>1</sup> (successione pre-pliocenica)  
**G. Fioraso**<sup>1</sup>, **S. Lucchesi**<sup>1</sup>, **P. Boano**<sup>1</sup> e **M.G. Forno**<sup>2</sup> (successione pliocenico-  
quaternaria)

con contributi di:

**E. Bicchi**<sup>1</sup> (biostratigrafia e paleoecologia della successione pre-pliocenica),  
**D. Violanti**<sup>1,2</sup> e **S. Trenkwalder**<sup>1</sup> (biostratigrafia e paleoecologia della successione  
pliocenica), **L. Ossella**<sup>1</sup> (idrogeologia), **G. Bellardone**<sup>3</sup> (eventi alluvionali),  
**S. Campus**<sup>3</sup> e **F. Tamberlani**<sup>3</sup> (banca dati geotecnica)

Coordinamento:

**R. Polino**<sup>1</sup>

<sup>1</sup> CNR - Istituto di Geoscienze e Georisorse - Unità operativa di Torino

<sup>2</sup> Dipartimento di Scienze della Terra - Università di Torino

<sup>3</sup> ARPA Piemonte - Centro Regionale per le Ricerche Territoriali e Geologiche

Ente realizzatore:



Centro Regionale per le Ricerche Territoriali e Geologiche

## IX - ABSTRACT

The “Foglio 156 Torino Est” of the Geological Map of Italy is located in Torino Hill and Monferrato areas, that correspond to the north-western sector of the Tertiary Piedmont Basin (TPB). The TPB consists of a sedimentary succession consisting of mainly terrigenous deposits that unconformably overlies Ligurian units or metamorphic units of the South-Alpine domain.

The stratigraphic succession of the “Foglio 156 Torino Est” spans in age since Late Cretaceous to Pliocene. The oldest sediments consist of Upper Cretaceous-Middle Eocene chaotic facies that are followed unconformably by Upper Eocene hemipelagic marls (M. Piano Fm.). In the overlying succession six regional unconformities (D1 to D6) are recognized that allow to subdivide the succession into six synthem.

The synthem I is introduced by shallow water coarse-grained sediments of the Cardona Fm. (Lower Oligocene) that are followed by slope fine-grained and silica-rich deposits of the Antognola Fm. and Marne a Pteropodi Fm. (Oligocene-Lower Burdigalian). The synthem II and III consists of shallower and coarser shelf deposits (Gruppo di Sciolze and Gruppo di Pino T.se) of Burdigalian to Langhian age. The synthem IV is made up of Serravallian to Lower Messinian hemipelagic sediments (Marne di Mincengo Fm. and Marne di S. Agata Fossili Fm.) that are abruptly followed by Messinian shallow water primary evaporites (Vena del Gesso Fm.). The synthem V consists of Upper Messinian chaotic sediments locally followed by brackish water marls correlatable to the Lago Mare facies of the Mediterranean region. The synthem six consists of Lower Pliocene outer shelf marine sediments (Argille Azzurre Fm.) followed by shallow water sands (Sabbie di Asti) and finally by delta and

alluvial plane sediments of Middle Pliocene age (Sabbie di Ferrere and Silt di S. Martino).

In the BTP a discontinuous cover of quaternary continental sediments develops, referred to lower Pleistocene - Holocene. This cover consists of fluvial sediments, connected with the ancient main rivers (northern palaeocollector and southern palaeocollector) and with the ancient tributary watercourses, and of aeolian sediments (loess and sand). The wide plane area is modelled in a continuous cover of fluvial sediments of Pleistocene to Holocene age, prevalently connected with the alpine watercourses (F. Dora Riparia, T. Stura and T. Orco).

The structural setting of the "Foglio 156 Torino Est" is characterized by several systems of steep faults and tight to open folds that induced a remarkable deformation of the Synthem I and II, minor deformation of synthem III and IV and very poor deformation of the synthem V and VI.

## LEGEND GEOLOGICA MAP

### QUATERNARY UNITS

#### *UNDIFFERENTIATED UNITS ACCORDING TO PERTAINING DRAINAGE BASIN*

##### **Ubiquitous units under deposition**

Clayey silts located along valley sides and developed at expense of weathered fluvial deposits (colluvial deposits) (**UID<sub>b2</sub>**). Heterometric deposits with silty-sandy and sandy-clayey matrix, sometimes containing large portions of bedrock (landslide deposits) (**UID<sub>a1</sub>**). Waste disposal (**UID<sub>h</sub>**). *UPPER PLEISTOCENE - PRESENT*

##### **Fully-developed ubiquitous units**

Nonstratified homogeneous sandy silts, 3-5 m thick, slightly weathered (10YR) and located in the upper part of hilly reliefs (loess); homogeneous fine sands, few metres thick and slightly weathered (10YR), locally with poor developed cross-stratification, located along the southern slope of the hilly reliefs (eolian sands) (**UIN<sub>d</sub>**). *UPPER PLEISTOCENE - HOLOCENE*

#### PALAZZOLO SYNTHEM

##### **Ghiaia Grande Subsynthem**

Gravelly and sandy-gravelly deposits, unweathered or slightly weathered (2.5Y - 10YR), with sandy intercalations, blanketed by unweathered (2.5Y) decimetric to metric thick sandy and silty-sandy cover. Along tributary valley floors unweathered (2.5Y) silty and silty-sandy deposits with gravelly intercalations (fluvial deposits) (**CSN<sub>3b</sub>**). *HOLOCENE - PRESENT*

### **Crescentino Subsynthem**

Gravelly and gravelly-sandy deposits, slightly weathered (7.5-10YR), locally with sandy intercalations with planar or cross-stratification; gravels are blanketed by unweathered or slightly weathered (2.5Y - 10YR) decimetric to metric sandy and silty-sandy cover with cross-stratification; lens containing abundant organic matter and flooded tree trunks are locally presents. They form terraces suspended few metres above the stream courses. Along tributary valley floors silty and silty-sandy nonstratified deposits slightly weathered (7.5-10YR) (fluvial deposits) (**CSN<sub>2b</sub>**). *UPPER PLEISTOCENE - HOLOCENE*

## ***DIFFERENTIATED UNITS ACCORDING TO PERTAINING DRAINAGE BASIN***

### **Dora Riparia Basin**

#### **FRASSINERE SYNTHEM**

### **Col Giansesco Subsynthem**

Coarse sandy gravels slightly weathered (10-7.5YR) with heterometric clasts of quartzites, serpentinites, gneiss and subordinate prasinites, calcschists and grey marbles. Gravels are covered by a thin blanket of sandy silts and loess l.s. They form terraces suspended 10 m above the stream courses (glaciofluvial deposits) (**AFR<sub>2b</sub>**). *LATE UPPER PLEISTOCENE*

### **Cresta Grande Subsynthem**

Coarse sandy gravels slightly weathered (7.5YR) covered by a decimetric thick blanket of sandy silts and loess l.s. They form terraces suspended 15 m above the stream courses (glaciofluvial deposits) (**AFR<sub>1b</sub>**). *EARLY UPPER PLEISTOCENE*

### **Stura di Lanzo Basin**

#### **REGIA MANDRIA SYNTHEM**

### **Leinì Subsynthem**

Coarse sandy glavels with heterometric clasts of serpentinites, gneiss and quartzites; gravels are covered with a slightly weathered (10YR) blancket 0.5-1.5 m thick of sandy silt. They form terraces suspended 10 m above the stream courses (fluvial deposits) (**RGM<sub>2b</sub>**). *UPPER PLEISTOCENE*

### **Venaria Reale Subsynthem**

Homogeneous gravels with scanty coarse sands with intermediate weathering (7.5YR); clasts consist of serpentinites, peridotites and gneiss; gravels are blancketed by sandy silt few metres thick. They form terraces suspended 10-15 m above the Stura di Lanzo stream course (fluvial deposits) (**RGM<sub>1b</sub>**). *EARLY UPPER PLEISTOCENE*

## Dora Baltea Basin

### BORGO REVEL SYNTHEM

Gravels and sandy gravels, weakly weathered (7.5YR) and with sandy intercalations, covered by a decimetric thick blanket of sandy silts. They form terraces suspended 10-15 m above the Dora Baltea stream course (fluvial deposits) (**BRR<sub>b</sub>**). *UPPER PLEISTOCENE*

### Northern paleobasin (paleo-Dora, paleo-Stura e paleo-Orco)

### MONTE DEI CAPPUCCHINI SYNTHEM

Slightly weathered sands, silts and subordinately gravels (10YR 5/6), 1-5 m thick, preserved on terraced surface relics in the Collina di Torino northern slope, suspended from 110 to 30 m above present flood plain (fluvial deposits) (**ONT<sub>b</sub>**). *LATE PLEISTOCENE*

### CAVORETTO SYNTHEM

Weathered sands and silts (7.5YR 4/4), 1-5 m thick, preserved on terraced surface relics in the Collina di Torino northern slope, suspended from 170 to 110 m above the present flood plain (fluvial deposits) (**ORE<sub>b</sub>**). *LATE PLEISTOCENE*

### S. VITO SYNTHEM

Strongly weathered sands, silts and subordinately gravels (5YR 4/4), 1-5 m thick, preserved on terraced surface relics in the Collina di Torino northern slope, suspended from 300 to 175 m above the present flood plain (fluvial deposits) (**SVT<sub>b</sub>**). *MIDDLE PLEISTOCENE*

### Southern paleobasin (paleo-Po)

### S. GIOVANNI SYNTHEM

Weakly weathered unbedded sandy silts, 5-15 m thick, distributed on the Altopiano di Poirino (fluvial deposits) (**GVN<sub>b</sub>**). *UPPER PLEISTOCENE*

### ZANCO SYNTHEM

Weathered unbedded clayey silts (5YR 4/4), 3-10 m thick, with clasts of serpentinites, prasinites, gabbros, greenschists, blueschists and quartzites, filling wide meander relics; gravelly bodies locally are presents at the base (fluvial deposits) (**PLT<sub>b</sub>**). *MIDDLE PLEISTOCENE*

### BUTTIGLIERA SYNTHEM

Strongly weathered (7.5YR 4/8) unbedded clayey silts, with sands levels, 10-20 m thick, discontinuously preserved on the hilly ridges and on the Altopiano di Poirino (fluvial deposits) (**BUI<sub>b</sub>**). *LOWER PLEISTOCENE*

### MORIALDO SYNTHEM

Slightly weathered sandy gravels (10YR 5/6) with fine grained gravels and sands, 5-10 m thick, discontinuously preserved on the hilly ridges and on the Altopiano di Poirino; clasts of quartzites, serpentinites, prasinites, gneiss, micaschists, dolomites and gabbros (fluvial deposits) (**SMD<sub>b</sub>**). *LOWER PLEISTOCENE*

## SUCCESSIONE PALEOGENICO-NEOGENICA

### **Silt di San Martino** (Villafranchiano *Auct.*)

Alternating grey silts, clayey silts and fine grained sands, with lenticular bodies of coarse grained sands. The fossil remains are gasteropods, continental bivalves and plant remains (**SSM**). Chaotic sediments connected with gravity-induced syndepositionary events are locally preserved (**SSM<sub>a</sub>**). *MIDDLE PLIOCENE*

### **Sabbie di Ferrere** (Villafranchiano *Auct.*)

Trough cross-bedded brown (7.5YR 4/6) medium to coarse grained sand, with canalized gravel bodies and levels of plain planar laminated brown silt. The fossil remains are gasteropods, bivalves, brachiopods, echinoids, scaphopods and floated plant remains (**SFR**). *MIDDLE PLIOCENE*

### **Sabbie di Asti**

Sandy member (**AST<sub>2</sub>**): yellow homogeneous sand and silt, compacted and locally cemented, slightly planar-parallel bedded: locally planar-parallel bedded and with ripple structures silty levels occur. *PLIOCENE INFERIORE*

### **Argille azzurre**

Silty-clayey member (**FAA<sub>9</sub>**): brown silt and fine-grained sand, locally planar parallel bedded. Yellow medium to coarse grained sandstone levels, up to 5 m thick, that fills channels (**FAA<sub>9a</sub>**). The fossil remains are gasteropods, bivalves, brachiopods, echinoids, scaphopods, burrows remains and locally plant fragments and leaves imprints. *PLIOCENE INFERIORE*

*Discontinuity surface (D6)*

## **GRUPPO DELLA GESSOSO-SOLFIFERA**

### **Complesso caotico della Valle Versa**

Chaotic complex consisting of blocks of different composition and size (from decimetres up to some metres) floating in a fine-grained clayey matrix (**CTV**). The blocks are composed of: selenitic gypsum and gypsumrudites (**gs**); dolostones and vuggy dolomitic limestones (“evaporitic carbonates”, **ce**); micritic limestones with remains of *Lucina* sp. (Bardella, Schierano, Pino d’Asti), polygenic carbonate breccias and grey micritic limestones with planktonic foraminifers (**cl**). The matrix in which the blocks are enclosed, generally poorly outcropping, consists of mud breccias with millimetre to centimetre-sized non cemented clasts of marls, arenites and mudstones. Rare reworked planktonic foraminifers (*Orbulina universa*, *O. suturalis*, *Neogloboquadrina acostaensis*). Grey to blue marls and clayey marls containing ostracods and brackish waters mollusks (*Dreissena* sp., *Limnocardium* sp., *Melanopsis* sp. and *Melanoides* sp.) have been observed at the top of the chaotic complex in the Moncucco quarry. *UPPER MESSINIAN*

*Discontinuity surface (D5)*

### Formazione della Vena del Gesso

Alternation of decimetre-thick black laminated mudstone beds with abundant plant remains, and selenitic gypsum tabular bodies, 10-30 m thick (Moncucco T.se quarry) (**GES**). *MESSINIAN*

### Marne di S. Agata Fossili

Burrowed grey to azure clays and marly clays, with abundant planktonic foraminifers. In the upper part black laminated mudstone beds are present. In the lower part of the Formation (Montaldo T.se and Moncucco T.se, Marentino and Cappella del Rocciamelone) a coarse-grained body, composed of medium to coarse sands with intercalations of conglomerates and with a maximum thickness of 300 m, has been observed (**SAF<sub>a</sub>**). Planktonic foraminifer assemblage characterized by *Neogloboquadrina acostaensis*, *Globigerinoides obliquus obliquus*, *Orbulina* sp. and *Globigerina multiloba*. *TORTONIAN-LOWER MESSINIAN*

*Discontinuity surface (D4)*

### Marne di Mincengo

Whitish calcareous marls with abundant planktonic foraminifers (*Orbulina suturalis*, *O. universa*, *Globorotalia menardi*, *Paragloborotalia mayeri*) (**MIN**). In the sector of S. Giorgio a Vergnano an arenaceous to conglomeratic body, mainly composed of clasts of serpentinites and quartzites, is present. It shows a maximum thickness of about 200 m and a lateral extent of some kilometres (**MIN<sub>a</sub>**). To the south of S. Giorgio a Vergnano and S. Giuseppe, decimetre-thick beds of medium to coarse-grained litoarenites, mainly composed of clasts of serpentinites and containing skeletal fragments of bivalves and gasteropodes, are present (**MIN<sub>b</sub>**). *SERRAVALLIAN*

### GRUPPO DI PINO TORINESE

#### Areniti di Tonengo

Terrigenous member (**CTO<sub>1</sub>**): ibrid arenites with planktonic foraminifers, glaucony and terrigenous grains with intercalations of graded, metre-thick sandstone beds containing abundant plant remains. *LANGHIAN*

#### Formazione di Baldissero

Burrowed marls and ibrid arenites containing planktonic foraminifers, glaucony and terrigenous grains, with intercalations of thin sandstone beds. Planktonic foraminifer assemblage characterized by *Praeorbulina glomerosa sicana*, *P. glomerosa glomerosa*, *Dentoglobigerina langhiana*, *Globoquadrina dehiscens* (**BAD**). In the medium and upper part, thin silicified beds are present. At various stratigraphic levels, thick arenaceous-conglomeratic bodies, composed of clasts of ophiolites, ortogneiss and quartzites, have been observed (**BAD<sub>a</sub>**). Their lateral extent is of some kilometres whereas their thickness range from 50 m (to the North of Mistrassi) up to 350 m (SW of Torrazza, Bric del Vai, Bric Martina, Pino T.se, Colle della Maddalena). *LANGHIAN*

*Discontinuity surface (D3)*

## GRUPPO DI SCIOLZE

### Arenarie di Moransengo

Alternations of yellowish sandstones and calcareous marls (**AMA**). *BURDIGALIAN P.P.*  
- *LANGHIAN P.P.*

### Formazione di Termofourà

- Marly siliceous member (**TFO<sub>2</sub>**): burrowed whitish calcareous marls with intercalations of decimetre-thick beds of silicified marls. Langhian p.p.

- Silty-conglomeratic member (**TFO<sub>1</sub>**). Planktonic foraminifer-rich silty marls and siltstones, with intercalations of litoarenites, mainly composed of serpentinite grains, and of lenticular bodies of conglomerates (**TFO<sub>1a</sub>**) composed of ophiolitic clasts. Locally (Tetti Civera) a rich fossil assemblage of mollusks, corals and macroforaminifers is present in the conglomeratic beds. The planktonic foraminifer assemblage is characterized by *Catapsydrax dissimilis* and *Globigerinoides bisphericus*. *UPPER BURDIGALIAN*

### Pietra da Cantoni

White to yellowish marls and calcareous marls with intercalations of silicified beds (Rivalba, Candione, Bric Natta and Gassino T.se). To the south of Gassino, decimetre to metre-thick arenaceous beds are present. Planktonic foraminifer assemblage characterized by *Globigerinoides* spp. and *Globorotalia* spp. (**PDC**). *UPPER BURDIGALIAN*

*Discontinuity surface (D2)*

### Marne a Pteropodi Inferiori

- Diatomitic member (**MPI<sub>2</sub>**): Diatomitic marls and whitish diatomites with brown chert nodules. In the lower part, rare arenaceous beds are present. Burdigalian p.p.

- Marly siliceous member (**MPI<sub>1</sub>**): alternation of planktonic foraminifer-rich silty marls and silicified marls showing brown weathered surfaces and containing sponge spicula, radiolarians, rare planktonic foraminifers and pteropods. Planktonic foraminifer assemblage characterized by *Catapsydrax dissimilis*, *C. unicavus*, *Globoquadrina predehiscens*. *BURDIGALIAN P.P.*

### Formazione di Antognola

- Arenaceous-conglomeratic member (**ANT<sub>7</sub>**): burrowed yellowish sandstones with intercalations of conglomeratic sandstones and paraconglomerates. Aquitanian.

- Silty-marly member (**ANT<sub>1</sub>**): brown to gray burrowed silty marls with intercalations of graded and laminated beds of yellowish sandstones, 10-100 cm thick (Rivodora). Planktonic foraminifer assemblage characterized by *Catapsydrax dissimilis*, *Paragloborotalia opima opima*, *P. kugleri*, *Globigerinoides primordius*. In the Torino Hill, (SW of Rivodora), three lenticular bodies consisting of paraconglomerates with mainly serpentinitic clasts and of graded and laminated beds of macroforaminifer-rich microconglomerates, locally (M. Aman) containing blocks of Mesozoic micritic limestones, are present (**ANT<sub>1a</sub>**). Their maximum thickness is in the sector of Superga. At Bric Palouch, a ten of metres - thick conglomeratic body, composed of an arenaceous



matix and centimetre-sized clasts of serpentinites, metagabbros, radiolarites and marbles, is present (**ANT<sub>1b</sub>**). *UPPER OLIGOCENE-AQUITANIAN*

### **Formazione di Cardona**

Heterometric conglomerates (**CAD<sub>a</sub>**) composed of an arenaceous matrix and of clasts of ophiolitic rocks (serpentinites, prasinites, metagabbros), ophiolitic covers (marbles, calschistes), granitoids, quartzites and sedimentary rocks (radiolarites, micritic limestones, marly limestones with *Chondrites*). Coarse-grained yellowish sandstones and strongly burrowed, rhythmic alternation of mudstones and sandstones. The planktonic foraminifer assemblage is scarce; it is characterized by *Catapsydrax dissimilis*, *Pseudohastigerina* spp., *Chiloguembelina cubensis* (**CAD**). *OLIGOCENE P.P.*

*Discontinuity surface (D1)*

### **Marne di Monte Piano**

Badly stratified mudstones and grey to green calcareous marls containing abundant planktonic foraminifers (*Acarinina bullbrooki*, *Globigerinatheka mexicana*, *Turborotalia cerroazulensis cerroazulensis*, *T. cerroazulensis pomeroli*) (**MMP**). To the NE of Pareglio and to the S of Rio Bramo (Lauriano) decimetre-thick beds of yellowish cemented sandstones are present. Close to Colle Battaina, decimetre-thick beds of intraclasts and bioclasts (coralline algae, macroforaminifers, fragments of corals, bivalves and echinoids) - bearing calcirudites are present ("Calcere di Gassino" *Auct.*). *UPPER EOCENE*

*Tectonic contact*

## **LIGURIAN UNITS**

### **Complesso caotico di La Pietra**

Varicolored shales (**CCP**) enclosing decimetre to metre-sized blocks of whitish marly and micritic limestones with *Chondrites*, white to greyish micritic limestones comparable to the Maiolica, litoarenites with carbonate cement and rounded grains of both siliciclastic (quartz, feldspars, fragments of magmatic and metamorphic rocks) and carbonatic origin, grey marly limestones with radiolarians and sponge spicula. *UPPER CRETACEOUS - MIDDLE EOCENE*