

LAKE EVOLUTION SINCE THE BRONZE AGE IN THE LOWER MINCIO RIVER VALLEY AND THE FORCELLO ETRUSCAN HARBOUR (CENTRAL PO PLAIN)

Cesare Ravazzi^{1*}, Mauro Marchetti², Marco Zanon¹, Renata Perego³, Lorenzo Castellano¹,
Massimiliano Deaddis¹, Mattia De Amicis⁴, Claudia Fredella⁵, Davide Margaritora¹,
Raffaele de Marinis⁵ & Tommaso Quirino⁵

¹ C.N.R., Istituto per la Dinamica dei Processi Ambientali - Milano, Italy

² Dip. Scienze della Terra, Università di Modena e Reggio Emilia – Modena, Italy

³ IPNA, Basel, Switzerland

⁴ DISAT, Università di Milano Bicocca, Italy

⁵ Dip. Scienze dell'Antichità, Università degli Studi di Milano, Italy

* Corresponding author: C. Ravazzi, cesare.ravazzi@idpa.cnr.it

ABSTRACT: C. Ravazzi et al. *Lake evolution since the Bronze Age in the Lower Mincio River valley and the Forcello Etruscan harbour (Central Po plain.)* (IT ISSN 0394-3356, 2011).

The Etruscan harbour of Forcello in lower valley of the Mincio River, N-Italy, was active between the VI to IV centuries BC. The stratigraphic investigations revealed that the settlement occupied a hill on the shore of a large lake, connected to the Mantua perfluvial lake system. The lake formed between the Late Bronze Age and the early Iron Age in the embanked floor of the Mincio Valley, and persisted till the late Middle Age. The diversion of the Po River at Guastalla during the Iron Age is considered responsible for damming the Mincio River at its confluence.

RIASSUNTO: C. Ravazzi et al. *Evoluzione lacustre della bassa Valle del Mincio a partire dall'Età del Bronzo e il porto fluviale etrusco del Forcello (Pianura Padana centrale)* (IT ISSN 0394-3356, 2011).

La città portuale del Forcello, situata nella bassa valle del fiume Mincio (N-Italia), fu attiva tra il VI e il IV secolo a.C. Nuove indagini stratigrafiche hanno stabilito che l'abitato sorgeva su un dosso alla riva di un lago esteso per almeno 5 km. Il lago si sviluppò a cavallo tra l'Età del Bronzo e l'età del Ferro e persistette sino alla bonifica del tardo Medioevo. Si avanza l'ipotesi che l'origine sia connessa con la diversione del Po a Guastalla nell'età del Ferro e il conseguente sbarramento del Mincio alla sua foce.

Key words: Bronze Age, Etruscan harbour, Forcello, Fluvial dynamics, forest history, plant goods trade

Parole chiave: Età del Bronzo, porto etrusco, Forcello, dinamica fluviale, storia forestale, commercio di merci vegetali

One of the most important Etruscan settlements in Northern Italy (Forcello, 16 m a.s.l., VI to IV century BC), was built in the valley of the Mincio River. The Forcello harbour allowed fluvial trades connecting the eastern Mediterranean Basin and continental Europe (DE MARINIS & RAPI, 2005). In 2008, a stratigraphic research was undertaken with the aim to look for plant goods trade and to reconstruct the landscape surrounding the site from charcoal and pollen assemblages preserved in the settlement and in the lowland sediments surrounding the site. A main question is attached to the reasons why Etruscans did settle the main trading post for the Padanian uplands well inside the Mincio valley, instead that along the Po River.

Stratigraphic evidence of the origin and evolution of the Bagnolo Lake. A transect of semi-disturbed drilling across the hill hosting the Etruscan settlement and slopes towards the Mincio valley floor allowed discovering a succession of open-water lake sediments formed by marly-silts and shell marly silts, overlapping palustrine and hydro-morphic soils. In turn, the palustrine organic accumulation rests over channeled sequences of lami-

nated, well sorted sand. We extended the coring campaign downstream, thus highlighting that the lake sequence increases in thickness. This proves that the lake occupied the Mincio embanked valley at least between Mantua and Bagnolo (Fig. 2a). A set of radiocarbon dating and LOI analysis on the master core (Fig. 1) shows that the pre-lacustrine phase of organic accumulation extends over part of the Bronze Age, while an age of 500-700 yr cal BC, close to the lake sequence base, set the origin of the Bagnolo lake between the late Bronze Age and the early Iron Age. The lake existed all along the Etruscan and the subsequent Roman and Middle Ages, in agreement with historical sources that a lake there was being dried up artificially late in the Middle Age (DE MARINIS, 1991). The above data show that the Forcello harbour flourished on the border of a low terrace bordering the shore of a large perfluvial lake, at least 5 km long, constrained into the deeply embanked Mincio valley. Downstream, the lake was connected to the Po River. Hence, assuming that the evolution of the Bagnolo lake is linked to the perfluvial lake system of Mantua (SESTINI, 1957), there were more than the existing three lakes, before human alterations (see Fig. 2b). The threshold supporting the lake

basin was located downstream of the Bagnolo town, thus the dam was unrelated to the change of channel direction near Mantua (Fig. 2), otherwise considered a river anomaly (BURRATO *et al.*, 2003).

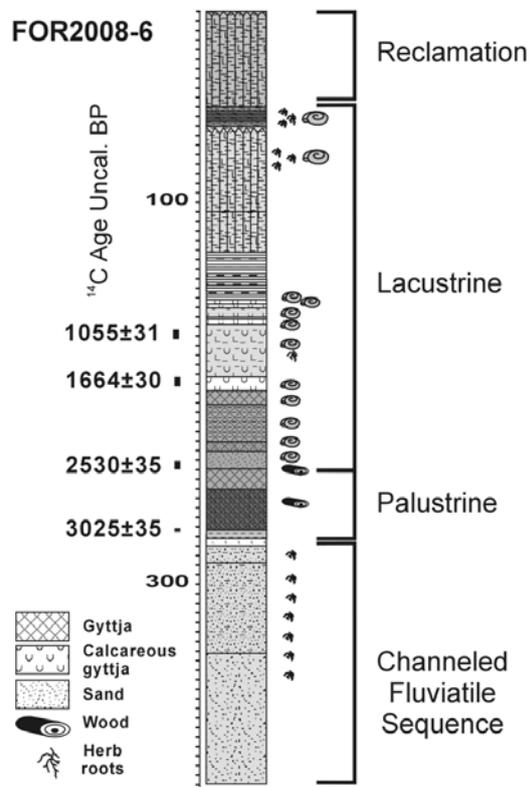


Fig. 1 - Log of the master core, drilled in the lowland, 100 m E of the Forcello hill border.
Log della carota principale, ottenuta nel fondovalle, 100 m ad E del margine del dosso del Forcello.

Iron Age avulsion of the Po River, origin of the Bagnolo Lake and Etruscan shipping. Figure 2b shows the reconstructed river network in the central Po plain after the diversion of the Po River at Guastalla and the abandonment of the Bondeno channel segment, the latter active throughout most of the Bronze Age. This event, dated back to the Iron Age (CASTALDINI, 1989), caused overflowing of a wide belt of the plain between Suzzara, Ostiglia and Mirandola. As a matter of fact, this belt lacks evidence of Bronze Age settlements, buried under the overbank cover. The new drainage pattern established at the Iron Age acknowledged a strong discharge increase of the Po River at the confluence with the Mincio R., due to contribution of two main Alpine rivers (Adda and Oglio) previously independent from the Po. We suggest that the displacement of these drainage axes in front of the Mincio valley mouth (Fig. 2b) reduced flow velocity, increased the sediment load (mainly of Ap-

ennine source rather than Alpine), caused damming and establishment of a permanent lake system in the terraced valley. In agreement with location and economical relevance of major Iron Age settlements in the lowermost Po plain (i.e. the town of Adria), we argue that the modification in the fluvial network promoted upstream shipping from the northern Adriatic till the Bagnolo perfluvial lake, where a main harbour was thus settled.

Plant good trades and forest history around the Forcello harbour. The Bagnolo Lake was kept until Middle Age reclaiming; hence lacustrine sediments registered the forest history and human activities since the time of the Etruscan settlement till XIV century AD.

The archaeobotanical investigation (pollen, charcoal, and other plant macroremains) carried out in the Forcello archaeological layers (phase F) is still in progress. Many useful plants (above all pulses) and weeds were identified, together with a smaller amount of wild plants of wet environments. Altogether they provided information on the diet of the Etruscans and on some supposed imported plants. Besides, an offsite palynological investigation from the lacustrine succession is being carried out. According to the radiocarbon dating, the record extends from the Late Bronze Age to the Late Middle Ages. The pollen record testifies the Roman forest clearings and shows unprecedented evidence of an early Middle Age phase of abandoning. Finally, an overall change in land use is dated at the X century AD. First occurrences of species important for the palaeoenvironmental history in Northern Italy, such as walnut and chestnut, are also documented here. Particularly walnut pollen already increases around VIII century BC, well before its appearance at the southern border of the Alps, testifying its older introduction in the lower Po Plain by the Etruscan people.

REFERENCES

- BURRATO P., CIUCCI F. & VALENSISE G. (2003) - *An inventory of river anomalies in the Po Plain, Northern Italy: evidence for active blind thrust faulting*. *Annals of Geophysics*, **46**, 865-881.
- CASTALDINI D. (1989) - *Evoluzione della rete idrografica centropadana in epoca protostorica e storica*. *Acc. Sc. Ferrara*, 115-134.
- DE MARINIS R.C. (1991) - *L'abitato Etrusco del Forcello: opere di difesa e di drenaggio e importanza delle vie di comunicazione fluviale*. In: M. Bergamini (a cura di) - *Gli Etruschi maestri di idraulica*. Perugia, 75-85.
- DE MARINIS R.C. & RAPI M. (2005) - *L'abitato etrusco del Forcello di Bagnolo S. Vito (Mantova). Le fasi di età arcaica*. Università degli Studi di Milano. Firenze. 311 pp.
- SESTINI A. (1957) - *L'Italia Fisica*. Touring Club Italiano, 320 pp.

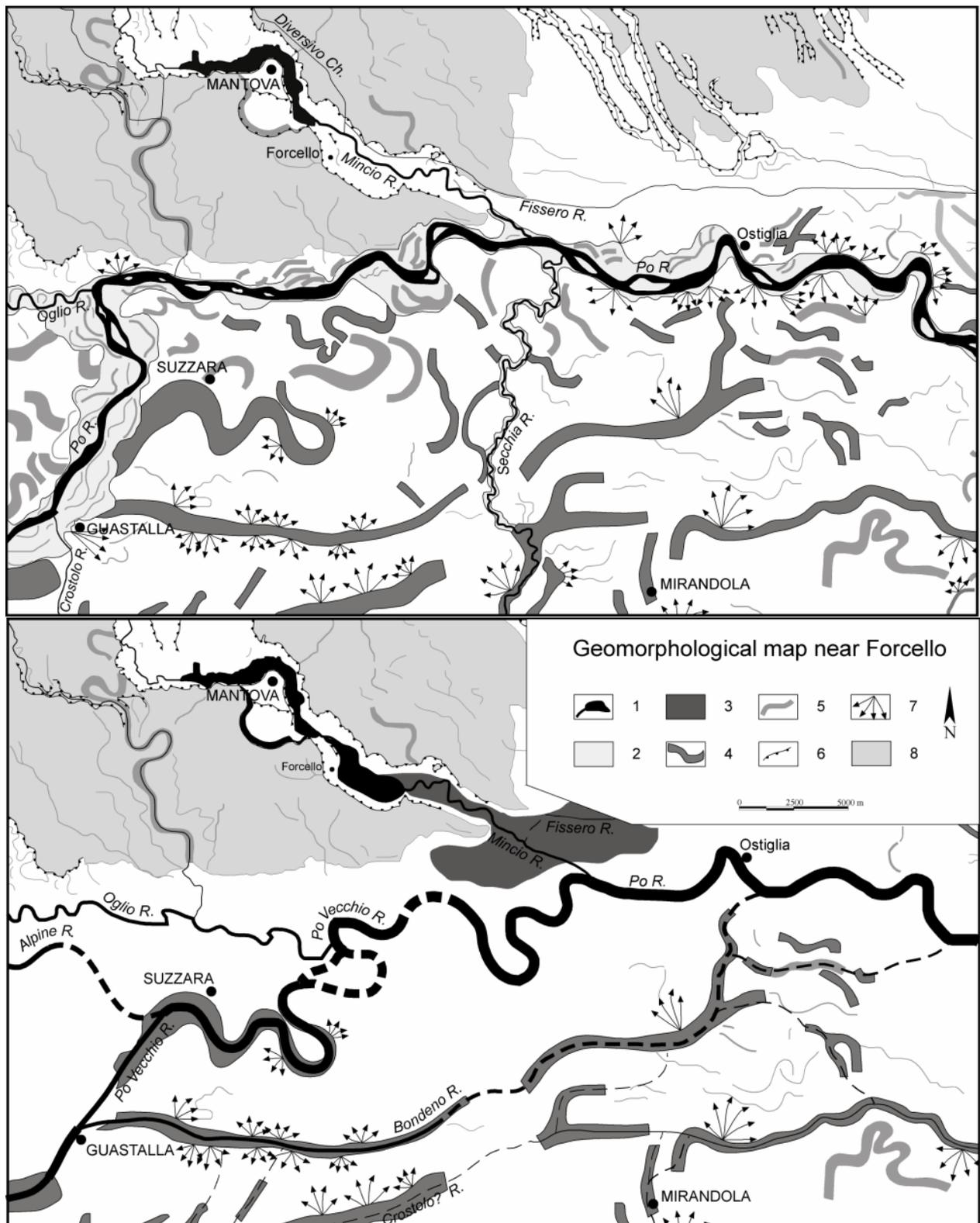


Fig. 2 – Geomorphological maps near Forcello 2a) Modern setting; 2b) V Century B.C.

Legend: 1) Rivers and lakes (dashed lines depict presumed fluvial tracks), 2) High water fluvial bed, mostly between main levees, 3) Poorly drained lowlands, 4) Alluvial ridge, 5) Abandoned fluvial course, 6) Main fluvial scarp, 7) Crevasse splay area, 8) Main Plain Level (surface marking the last aggradation phases, before the beginning of deglaciation).

Carta geomorfologica dei dintorni del Forcello. 2a) assetto attuale; 2b) V secolo a.C.

Legenda: 1) Fiumi e laghi (il tratteggio indica i tracciati fluviali presunti); 2) Aree golenali, principalmente tra gli argini maestri; 3) Aree depresse mal drenate; 4) Dossi fluviali; 5) Letto fluviale abbandonato; 6) Scarpata fluviale principale; 7) Ventaglio di rotta; 8) Livello "fondamentale" della pianura (superficie limite dell'aggradazione dei conoidi durante l'Ultimo Massimo Glaciale, prima della deglaciazione)