

GEOMORPHOLOGICAL EVOLUTION OF CAGLIARI COASTAL PLAIN-CONTINENTAL SHELF SYSTEM TO LATE PLEISTOCENE- HOLOCENE TRANSITION, CORRELATIONS WITH STABLE MEDITERRANEAN SITES

Paolo Orrù¹, Fabrizio Antonioli², Salvatore Carboni¹ & Luciano Lecca¹

1. Dipartimento di Scienze della Terra, Cagliari University, Italy

2. ENEA - National Agency for New Technologies, Energy and Environment, Rome, Italy

Corresponding author: P. Orrù <orru@unica.it >

ABSTRACT: Orrù P. *et al.*, *Geomorphological evolution of Cagliari coastal plain-continental shelf system to late Pleistocene-Holocene transition, correlations with stable Mediterranean sites.* (IT ISSN 0394-3356, 2011)

We report the evolutionary model of the coastal plain of Cagliari and the continental relatively late Pleistocene - Holocene, highlighting the strong linkages with similar coastal areas to its tectonic stability of the Mediterranean.

RIASSUNTO: Orrù P. *et al.*, *Evoluzione geomorfologica del sistema piana costiera-piattaforma continentale di Cagliari al passaggio Pleistocene superiore-Olocene, correlazioni con siti stabili Mediterranei.* (IT ISSN 0394-3356, 2011)

Viene presentato il modello evolutivo della piana costiera di Cagliari e della piattaforma continentale antistante relativamente alla finestra temporale Pleistocene superiore - Olocene; ponendo in rilievo le forti correlazioni con altre aree costiere a relativa stabilità tettonica del Mediterraneo.

Key words: Last Interglacial, Coastal plain, Continental shelf, Holocenic sea levels, Cagliari Gulf

Parole chiave: Ultimo interglaciale, Piana costiera, linee di riva oloceniche, Golfo di Cagliari

Two lagoons, closed by a system of beach ridges structured in two generations, characterize the Cagliari coastal plain similarly to other areas of the Mediterranean (FERRANTI *et al.*, 2006).

In particular, strong similarities in terms of geomorphological evolution and of depositional model are recognized, either in other coastal plains of Sardinia (Porto Pino lagoons in the Gulf of Palmas and Mistras-Cabras lagoon in the Gulf of Oristano) than in other Mediterranean coastal areas as the Plain of Fondi, in central Italy (ANTONIOLI *et al.*, 1988) and in the lagoon of Santa Pola, Alicante in southern Spain (ZAZO *et al.*, 2003).

The palaeo inner beach ridges of Sa Illetta and Is Arenas have been related to the Last Interglacial (MIS 5e) using: i the Senegalese fauna as *Strombus bubonius*; ii the U/Th analyses on *Cladocora* corals; iii the aminostratigraphy analyses (ULZEGA & HEARTY, 1986). The chronostratigraphic age of the paleo-beach of Is Arenas (Last Interglacial) has been recently confirmed using together ESR analyses (ORRÙ, *et al.* 2010), and the malacofauna fossils content which includes *Strombus bubonius* (Fig.1).

The excavation of the foundations diaphragms of the new Port Terminal of Cagliari allowed us to found continuity for the late-Quaternary succession through the system of double beach ridges of the western

lagoon system (Santa Gilla Lagoon); (Fig.2).

The continuity of the section allow us to follow a level containing *Strombus* sampled outcropping on the paleo-beach Sa Illetta, where the burrows in sandy cliffs are surmounted by a layer containing *Cladocora caespitosa* and calcareous algae (ULZEGA & HEARTY, 1986).

We describe some new sections of the same level, highlighted on a recent excavation performed at - 15 m. On the port access channel, the underwater survey has allowed more detailed facies and



Fig. 1 – Fig.1 – *Strombus bubonius* shell from deposits draged at – 8,5 m (unit 3 of Fig.2), few hundred meters far from the La Plaia coast line along the entrance channel to the Industrial harbour of Cagliari
Strombus bubonius provenienti dal livello dragato a – 8,5 m (unità 3 in Fig.2) in corrispondenza del canale di accesso al nuovo porto container, alcune centinaia di metri al largo del cordone litorale di La Plaia.

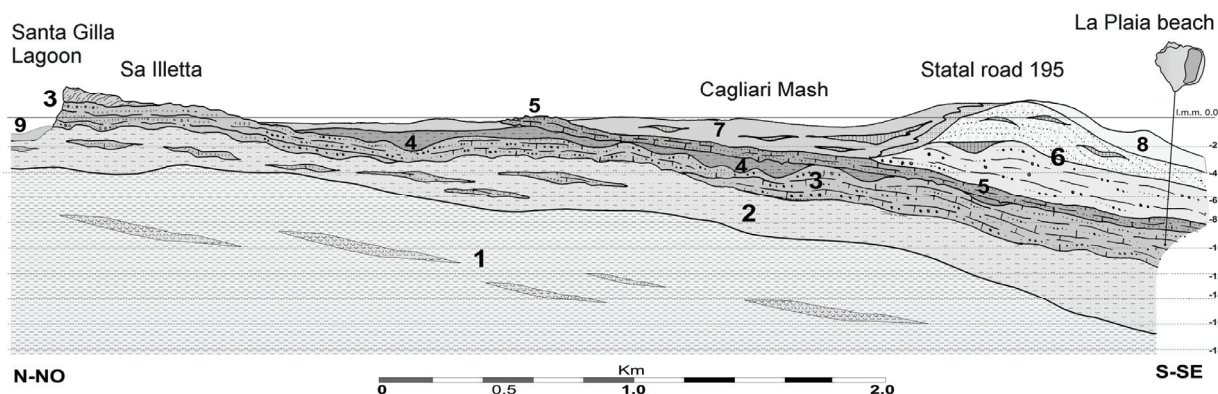


Fig. 2, Geologic profile of the Lagoon of Saint Gilla - 1) grey-greenish sandy silt (Middle Pleistocene); 2) sandstones and conglomerates with burrows (Upper Pleistocene - MIS 5); 3) littoral arenites containing coastal containing *Strombus bubonius* and *Cladocora coespitosa* (Late Pleistocene - MIS 5e); 4) gray silt quartz in fluvial-deltaic peat (Late Pleistocene-Holocene); 5) littoral sandstone containing *Cerastoderma* and seabka beach rock - Holocenic transgression (Holocene); 6) littoral sandy gravel with *Posidonia* peat (Late Holocene - Present); 7) blackish silt and sandy silt of the present lagoon; 8) present sandy beach.

*Profilo geologico della Laguna di Santa Gilla. 1) limi argillosi e argille limose deltizie a ostrie (Pleistocene medio); 2) limi sabbiosi ocra a burrows con lenti calcarenitiche (Pleistocene superiore - MIS 5); 3) arenarie e conglomerati litorali fossiliferi a *Strombus bubonius* e *Cladocora coespitosa* (Pleistocene superiore - MIS 5e); 4) limi quarzosi grigi fluvio-deltizi e torbe (Pleistocene superiore-Olocene); 5) arenarie litorali a *cardium* e beach-rock di seabka perilagunari (Olocene); 6) ghiaie e ghiaie sabbiose di spiaggia con livelli torbosi a *Posidonia oceanica* (Olocene-Attuale); 7) limi e limi sabbiosi nerastri lagunari (Olocene-Attuale); 8) sabbie di spiaggia (Olocene-Attuale)*

sedimentary structures.

The transition to Holocene marine deposits is marked by deep incisions founded in both coastal plain and continental shelf, these palaeo-valley began their evolution after the Last Interglacial highstand while the highest incision was carved during the MIS 2 low stand. Chrono-stratigraphic study of sediments, ^{14}C analyses of peaty, silty and sandy coastal lagoon sediments at the mouth of the lagoon of Santa Gilla, has enabled us to reconstruct the sea level rise during the Holocene (ORRÙ *et al.*, 2004). Geophysical surveys (seismic profile Orrù *et al.*, 2004; LECCA *et al.*, 2005) allowed to follow the palaeo-valleys (mostly buried) carved during low stand along the continental shelf the main heads of the Canyons of the board. (FANUCCI *et al.*, 1976)

The lgm lowstand allowed also in other coastal plains the incision of palaeovalley along the continental shelf as in the Fondi fossil palaeovalley (ANTONIOLI *et al.* 1988).

The Holocene sea level rise has been detected studying and dating (^{14}C analyses): seven orders shelf of beach-rock outcropping on the continental shelf (ULZEGA *et al.*, 1986) the deepest of lay at -45 m (ORRÙ *et al.*, 2004), relict beach bordered the palaeo-lagoon (-39 m), and in the inner band (-35 m) have recently been identified and sampled the submerged back-shore sand dunes overlayed on a large fluvial fan characterized by to medium and large polygenic gravels.

A buried Punic age (2500 BP) paleo-sea level at -2 m is preserved in the bottom-area Santa Gilla

lagoon (SOLINAS & ORRÙ., 2006; ANTONIOLI *et al.*, 2007).

Comparing data from the different markers studied: fossiliferous sediments from boreholes, beach-rocks, geoarchaeological markers, appear a good correspondence with the predicted sea level curve (LAMBECK *et al.*, 2010) which indicates a relatively tectonic stability for the coastal area of Cagliari during the Holocene.

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