QUANTITATIVE ANALYSES OF LATEST QUATERNARY STRATIGRAPHY FROM CORES USING MODERN MEIO AND MACROBENTHIC INVERTEBRATES: A PRACTICAL APPROACH TO FACIES INTERPRETATION

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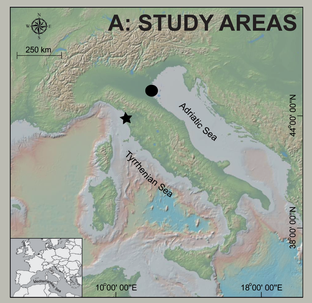
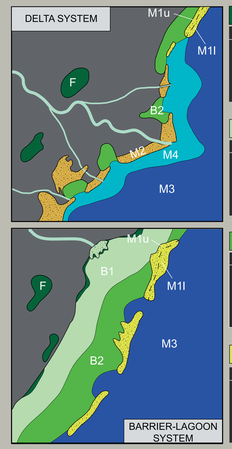
A: STUDY AREAS



Late Quaternary sedimentary successions of Italy have been investigated in recent years in a series of paleoclimatic, sequence stratigraphic, geochronological, and paleontological studies (e.g., Scarponi and Kowalewsky, 2004; Scarponi et al., 2013). These studies demonstrated that the late Quaternary coastal record of Italy (**A**) represents an ideal venue for developing integrative studies of stratigraphic, ecological and environmental processes.
This report summarizes how benthic ostracod and mollusk analyses performed on a network of cores enabled a detailed facies characterization of the Late Pleistocene-Holocene successions buried beneath the modern Po (●) and Arno (★) coastal plains (Italy; **A**).
Mollusks and ostracods represent important components of the coastal benthos and are commonly considered excellent paleoenvironmental indicators that may complement each other and compensate for each other's weaknesses.
These faunal groups share the following key strengths: high abundance and preservation potential within the fossil record; wide ecological distribution;high ecological sensitivity to relevant environmental parameters (e.g., salinity; organic content; grain size); availability of literature data about modern assemblages.
Here, key mollusk and ostracod taxa commonly retrieved from both present day coastal environments (**B**) and from late Quaternary cored deposits (**C**) are illustrated and discussed as fundamental facies discriminators. Where evaluation of individual facies is difficult, the joint consideration of ostracods and mollusks may contribute important information about depositional environments (**C**).
In addition, through the application of detrended correspondence analysis (DCA) to the mollusk part of the dataset (**D**), an interpretable paleobiological pattern emerges despite taphonomic and sedimentological overprints: salinity (**D1**) represents the most prominent factor controlling the composition of mollusk associations in back-barries paleoenvironments; whereas water depth (**D2**) appears to be the main driver or the macrofaunal turnover in marine coastal paleoenvironments. The procedure outlined above yielded useful insight into a better understanding of stratigraphic and paleobiological processes across single cores (**D**) and across entire depositional profile of an active sedimentary basin (e.g., Arno Plain; **E**) during natural, cyclic climate oscillations.

B: MODERN MOLLUSK-OSTRACOD ASSOCIATIONS OF THE ITALIAN COASTAL AREAS



Seven major ostracod-mollusk associations retrieved along Italy and their spatial distribution patterns across a variety of environments and sub-environments characterizing both present-day delta and back-barrier systems.
Data from a series of modern datasets from coastal and shallow marine settings. For references see Vatova (1949), Peres and Picard (1964), Colalongo (1969), Bonaduce (1975), Breman (1975), Bonaduce et al. (1977), Montenegro and Pugliese (1996), Pieri et al. (2009).

SWAMP

	OSTRACODS	MOLLUSKS
F	oligotypic assemblage. Key species: *P. albicans*, *Ilyocypris* spp.	relatively high diversity, thin shelled assemblage. Key species: *P. planorbis*, *V. piscinalis*

INNER LAGOON

	OSTRACODS	MOLLUSKS
B1	oligotypic assemblage, dominated by euryhaline species: *C. torosa*, *L. elliptica*	low diversity assemblage, dominated by hydrobiids. Key species: *E. ventrosa*, *A. segmentum*

OUTER LAGOON

	OSTRACODS	MOLLUSKS
B2	high diversity assemblage, dominated by euryhaline and brackish-marine species: *C. torosa*, *L. ramosa*	low diversity assemblage, dominated by euryhaline taxa. Key species: *L. lucinalis*, *C. glaucum*

BEACH RIDGE

	OSTRACODS	MOLLUSKS
M1u	shell fragments or absent	low diversity assemblage, dominated by infaunal taxa. Key species: *D. semistriatus*, *A. tornatilis*, *C. gallina*
M1l	low diversity assemblage, dominated by: *P. turbida*, *C. whitei*	

DELTA FRONT

	OSTRACODS	MOLLUSKS
M2	shell fragments or absent	low diversity assemblage, dominated by infaunal taxa. Key species: *L. mediterraneum*, *D. semistriatus*

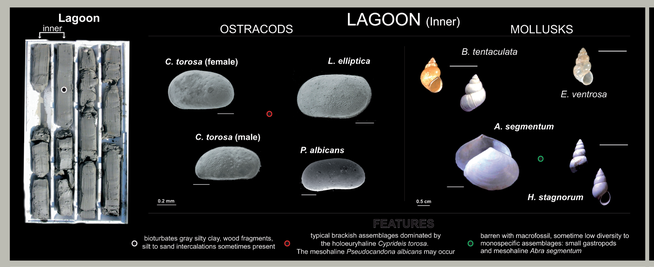
OFFSHORE TRANSITION

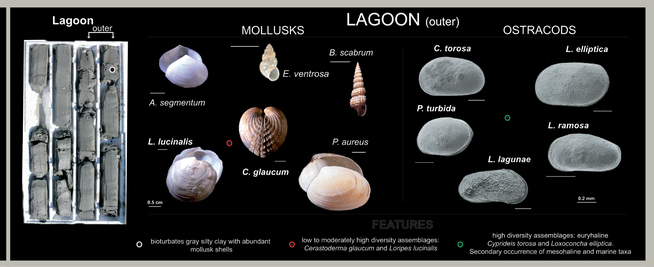
	OSTRACODS	MOLLUSKS
M3	high diversity assemblage, dominated by shallow marine species: *S. incongruens*, *C. neapolitana*	high diversity assemblage. Key species: *D. lupinus*, *T. distorta*

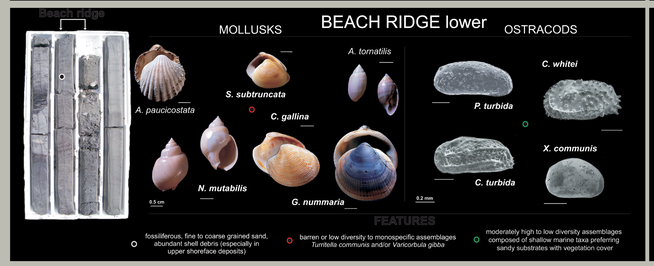
PRODELTA

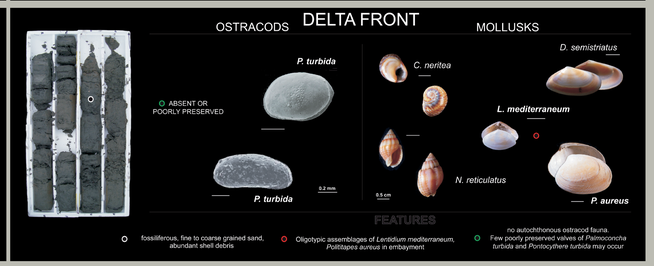
	OSTRACODS	MOLLUSKS
M4	low diversity assemblage, dominated by opportunistic species: *P. turbida*, *L. ramosa*	low diversity assemblage, dominated by opportunistic taxa. Key species: *T. communis*, *V. gibba*

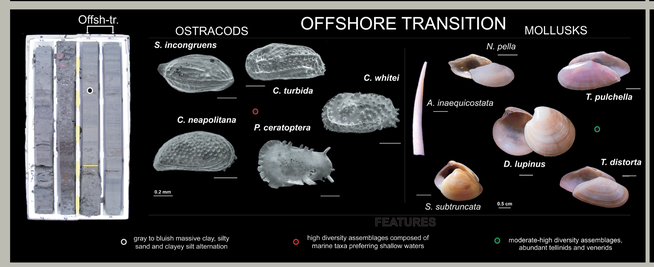
C: HIGH-RESOLUTION FACIES CHARACTERIZATION: THE MOLLUSK-OSTRACOD CONTRIBUTION

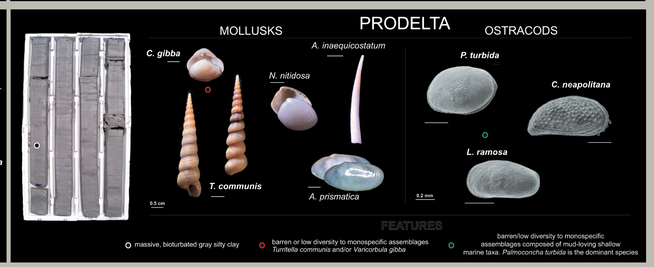








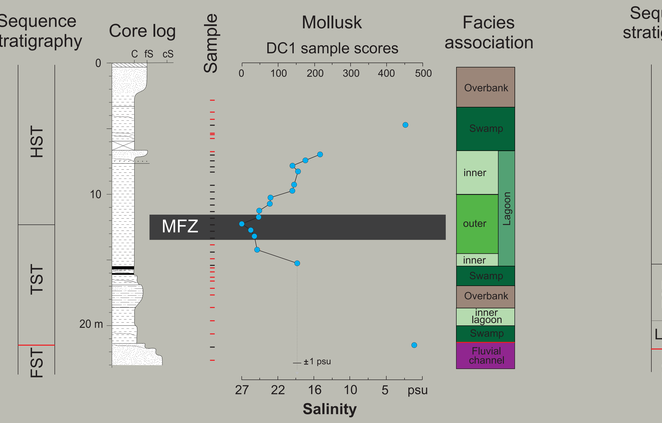




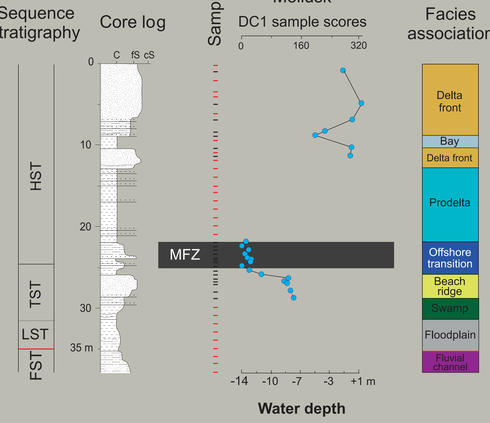
Iconography and diagnostic features of several late Quaternary facies associations. Here, the taxa-environment relationships represent the cornerstone for high-resolution paleoenvironmental reconstructions.

D: STRATIGRAPHIC VARIATIONS IN THE FAUNAL CONTENT AND CONTROLLING FACTORS

D1: Back-barrier succession (core M3)



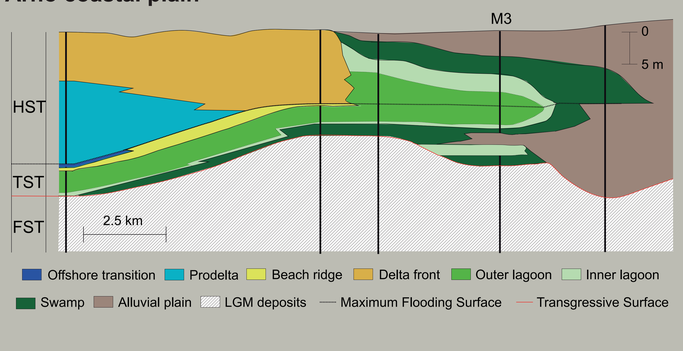
D2: Marine succession



Detrended Correspondence Analysis (DCA) of mollusk samples, calibrated using present day ecological data of extant genera and/or species recovered in the studied sedimentary successions. These paleobiological proxies provide reliable quantitative estimates of salinity (back-barrier succession) and bathymetry (coastal marine succession).

E: SEQUENCE STRATIGRAPHICAL ARCHITECTURE

Arno coastal plain



CONCLUSIONS

- The integrated meio-macrofossil approach is a fruitful strategy for resolving stratigraphical architecture of late Quaternary cored successions.
- DCA on the mollusk dataset proved to be highly successful in reconstructing the main palaeoenvironmental gradients that shaped the composition of mollusk assemblages.
- The main gradients controlling stratigraphic distribution of mollusks seems to be salinity in back-barrier deposits and water depth in coastal marine deposits.

REFERENCES

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