POSTERS

MULTIDISCIPLINARY ANALYSIS OF THE SEDIMENTARY SUCCESSION AT SAN GIULIANO LAKE (MATERA, SOUTHERN ITALY): SEDIMENTOLOGICAL, BIOSTRATIGRAPHIC AND PALAEOECOLOGICAL RECONSTRUCTION

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A geological field mapping, and sedimentological, micropaleontological and palynological analyses were performed near Lago San Giuliano (Matera-Italy) to reconstruct the depositional environment of a fossil whale. The sedimentological analyses identify clay and silty clay. In the upper part of the succession silt and sandy silt with shell fragments samples were collected. Above clayey silty sediments still occur. The succession is Early Pleistocene in age for the presence, from the bottom, of nannoplankton species *Reticulofenestra asanoi* (CN 13b Biozone). The LO of *Helicosphaera selli* (1.2/1.1 Ma) and the LCO of *R. asanoi*, at ~0.91 Ma, in the medium and upper part respectively occur. The most common ostracod species are *Krithe compressa*, *Cytherella robusta* and *Henryhowella sarsi profunda*, occasionally with *Argilloecia acuminata*, *Pajenborchella malajensis cymbula*, *Bythocypris producta* and *Anchistrocheles interrupta*, as well as *Cytheropteron testudo*. The benthic foraminiferal species *Bolivina spathulata*, *Bulimina marginata*, *Cassidulina carinata*, *Melonis affinis*, *Uvigerina mediterranea* and *U. peregrina*, suggest high productivity, low oxygen, and high organic matter contents of bottom waters; events of lower productivity, relatively high oxygen and oligotrophic conditions are testified by *Cibicidoides subhaidingerii/Heterolepa dutemplei*, *Hyalinea balthica*, *Trifarina angulosa*, and *Cibicides pachyderma*. The planktonic foraminifera assemblages are dominated by *Globigerina bulloides* and *G. glutinata*, indicating an environment characterized by upwelling currents. Toward the top a marked increase of *Globigerinoides* species and the occurrence of *Neogloboquadrina pachyderma* dx and sx, *N. dutertrei* and of *Globorotalia inflata* take place. The fossil whale layers preserve pollen of *Abies*, *Carpinus*, *Alnus*, *Betula*, and *Quercus*, indicating a warm climate; the regionally extinct taxa *Cedrus*, *Picea*, *Carya*, and *Tsuga* suggest a mid-Calabrian age, consistent with nannoplankton data.

THEROPOD TRACKS FROM THE LAMA BADESSA ICHNOSITE (MIDDLE-UPPER CENOMANIAN, APULIA, SOUTHERN ITALY)

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More than thirty dinosaur tracks were recently discovered and preliminary investigated on the Upper Cretaceous surface from the Lama Badessa ichnosite, about 3 km south of Sannicandro di Bari in the Murge region (Apulia, southern Italy). The succession belongs to the top of the Calcari di Bari Fm, referred to the middle-upper Cenomanian (Spalluto & Caffau, 2010). The track-bearing area is about 1,600 m^2 wide and is characterised by the occurrence of only tridactyl footprints. Two bipedal trackways (constituted respectively by 11 and 8 tracks) and numerous isolated specimens were recognised. Their morphological features (i.e., outlines, phalangeal pad and claw traces) were evidenced *in situ* by using coloured chalks and replicated on acetate overlays for further analyses. The study was supported by close-range and aerial-based (i.e., drone) photogrammetry, with the aim of accurately digitise the whole ichnoassemblage. The tridactyl tracks are characterised by small to medium size (Footprint Length ≤ 20 cm), strong mesaxony and gracile morphologies. The anatomical details, identifiable in the best-preserved specimens (e.g., the presence of 2, 3 and 4 pads on digits II, III and IV respectively), as well as the high pace angulation, led to undoubtfully attribute the tridactyl tracks to theropod trackmakers.

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DISPARITY *VS* DIVERSITY WITHIN THE *HEMISYNTRACHELUS* LINEAGE (CETACEA, DELPHINIDAE): A REVIEW OF THE ITALIAN PLIOCENE RECORD

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The delphinids (Odontoceti: Delphinidae) comprise the most diverse extant cetacean family. Delphinids are mostly known as fossils from Pliocene deposits of the Emilia Romagna, Piedmont, and Tuscany regions of Italy. Many of the Italian delphinid remains belong to *Hemisyntrachelus*, an extinct genus that appears to be crucial for reconstructing the evolutionary history of this highly derived odontocete clade. *Hemisyntrachelus* is a delphinid whose size and shape are intermediate between those of the extant bottlenose dolphin (*Tursiops truncatus*) and killer whale (*Orcinus orca*). These morphological affinities are supported by recent phylogenetic analyses that suggest a basal position within the Orcininae for *Hemysintrachelus*. Although only two *Hemisyntrachelus* species – namely, *H. cortesii* (Fisher, 1829) and *H. pisanus* Bianucci, 1996 - are currently recognized from the Pliocene of Italy, an unexpectedly high intrageneric disparity is being revealed by our ongoing studies of the Italian *Hemisyntrachelus* fossil record. Indeed, the data we have collected in recent years seem to reevaluate the pioneering studies carried out in the second half of the 19th century, when a plethora of species and subspecies were described based on several specimens from Italy. Our integrated studies follow several approaches: 1) the analysis of the intraspecific skeletal morphological variability in extant delphinids using statistically significant samples in order to identify robust characters for diagnosis and phylogeny; 2) the implementation with new taxa and characters of a large matrix to obtain a better resolution of the delphinid phylogeny; 3) the acquisition of 3D skeleton models for geometric morphometrics analyses; and 4) the morphofunctional analyses of skull and postcranium for reconstructing trophic strategies and swimming styles. Our preliminary results suggest that *Hemisyntrachelus* is probably a paraphyletic genus that includes several species and constitutes an evolutionary grade towards the killer whale ecomorph.

IMPACT OF PLASTIC POLLUTION ON BENTHIC FORAMINIFERA

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Plastics are ubiquitous contaminants that currently affects worldwide oceans and marine biota, with about 5 billion tons of waste accumulated in the natural environment. The ubiquitous nature of microplastics means that marine biota can interact with them. While the fate of microplastics is well known, the biochemical effects of synthetic molecules especially on marine unicellular eukaryotic organisms is poorly investigated. To understand the fate of plastic in oceans and in marine organisms, we investigated the incorporation of (bio)polymers and microplastics in benthic foraminiferal species by applying FTIR (Fourier Transform Infrared) microscopy. Benthic foraminifera are an important component of marine communities, playing a key role in ecosystem functioning and biogeochemical cycling. Their sensibility and rapid response to environmental stress make them an efficient environmental proxy of past and present climate and environmental changes. We applied the infrared spectroscopy analysis to selected benthic foraminifera species: *Rosalina globularis* grew in laboratory experiments and to *Cibicidoides lobatulus*, *Rosalina bradyi* and *Textularia bocki* collected in a plastic remain found buried into sandy-silty sediment in the Mediterranean seabed. Foraminifera from laboratory experiments were also treated with bis-(2-ethylhexyl) phthalate (DEHP) molecule that incorporates in cytoplasm. The analyses reveal that: 1) microplastic debris can be found in the cytoplasm and inside the agglutinated test of *T. bocki*; 2) *C. lobatulus*, *R. bradyi* and *T. bocki*, grown on plastic remains, show signals of oxidative stress and protein aggregation; 3) DEHP can be incorporated in the cytoplasm of the commonly calcareous foraminifera *R. globularis*, thus entering biogeochemical cycles. This study confirmed that foraminifera are good proxy of on-going plastic pollution and the associated molecules can be found in their text.

ECCENTRICITY SIGNAL IN THE TIME-SERIES OF NANNOFOSSIL SPECIES AT MID-LATITUDE ACROSS THE MID - PLEISTOCENE TRANSITION (ODP SITE 1209, NORTHWESTERN PACIFIC OCEAN)

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The Mid-Pleistocene Transition (MPT; 1.25–0.6 million years ago, myr) is one of the most important and still debated climate reorganizations during which the glacial/interglacial cycles switched from a 41-thousand years (kyr) cycle (i.e., obliquity) to a quasi-periodic 100-kyr years cycle (associated with orbital eccentricity). Variations in the orbital geometry can affect the abundance and distribution of certain marine biota such as the coccolithophores, which represent a valid tool within the geological archives to inspect the influence of the main orbital cyclicities. Here, we apply for the first time various time series analytical techniques (including autocorrelation and cross correlation) to different nannofossil species of a dataset from mid-latitudinal ODP Site 1209 (Northwest Pacific Ocean) for the interval spanning the last 1.6 myr. The aim is to identify the main periodicities recorded by single nannofossil species during the MPT and to investigate further their response timings to those orbital drivers. In addition, we investigated how the recorded periodicities can improve understanding of the paleoecological preferences of particular species. The combination of multiple time series analyses allowed identification of the 100-kyr periodicity as the main cyclicity recorded in the most analyzed species confirming the predominance of the eccentricity-related signal at mid-latitudes and a reduced or absent influence of the obliquity response. Thus, our data highlight how orbital influence varies by latitude impacting the nannofossil species. This study documents a lag between eccentricity and species abundance fluctuations ranges between 20 and 40 kyr for the species *Calcidiscus leptoporus*, *Gephyrocapsa caribbeanica* small, and *Reticulofenestra* spp. This study corroborates the potential of nannofossils to deepen understanding of the dynamics and effects of variations in orbital geometry through time.

PALEOENVIRONMENTAL CONSIDERATIONS ON THE VAL SERIANA VALLEY (NORTH-WESTERN ITALY) DURING THE UPPER PLEISTOCENE. THE SMALL-MAMMAL FOSSILS FROM BÜS DI TRI FRADÈI CAVE (OLTRE IL COLLE, BG) AS PALAEOCLIMATIC PROXI DATA

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Büs di Tri Fradèi is a cave that opens at 1200 m a.s.l. in the municipality of Oltre il Colle (BG) in Northern Italy. The sedimentary deposit that fills the cave is divided in five main stratigraphic levels, of which only one fossiliferous. It is believed to have served as nursery for cave bears (*Ursus spelaeus*) as many remains of females and cubs were found inside, together with those of groundhogs, lacertids and anthropic traces such as flint or cervid antlers artifacts. Alongside these, of particular importance for this study, multiple remains of small mammals (Eulipotyphla, Rodentia and Chiroptera), naturally collected as prey by tawny owls (*Strix aluco*), barnowls (*Tito alba*) and small carnivores, were identified. These finds are fundamental for palaeoenviromental and palaeoclimatic reconstruction due to their rapid growth and evolution and the fact that they occupy strictly specific ecological niches linked to certain environments and climatic conditions. As the calibrated dating of the remains is around 32.000-34.000 years, the purpose of this study is to reconstruct the Upper Pleistocene environments in Val Seriana Valley (north-western Italy, Lombardy) using the small-mammal fossils remains from Büs di Tri Fradèi. The data gathered on the distribution of local taxa from this cave, suggest that the paleoenvironmental conditions were between temperate and cold-temperate (boreal). Data from Büs di Tri Fradèi are then compared with those from other caves of near areas to draw a more complete picture of the palaeoenvironment of the Lombardy PreAlps during the Upper Pleistocene.

BRACHIOPODS AND CONODONTS FROM THE UPPER MISSISSIPPIAN TONKA FORMATION OF CARLIN CANYON, NEVADA

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The area of north-eastern Nevada in USA is of great interest for studies in invertebrate palaeontology and biostratigraphy: the area includes the base-Kungurian GSSP candidate at Rockland, and possibly the Standard Auxiliary Boundary Stratotypes for the base-Sakmarian, base-Artinskian and base-Kungurian at Carlin Canyon, Elko. Located near Carlin, famous for its gold ores and for the Humboldt River route that pioneers followed in the 19th century (California Trail), the Carlin Canyon Carboniferous-Permian succession is known since the 19th century for the occurrence of a spectacular angular unconformity of Upper Pennsylvanian limestones on Mississippian to Mid-Pennsylvanian sedimentary rocks. A small assemblage of 53 brachiopod specimens was collected by L. Angiolini and C.M. Henderson during fieldwork in October 2022 in Carlin Canyon, Nevada, USA. The assemblage comes from steeply dipping yellowish bioclastic marlstone beds in the Serpukhovian (Upper Mississippian) Tonka Formation. The fauna is quite diverse with 15 species representing 13 genera and seven orders: Productida, Orthotetida, Orthida, Athyridida, Spiriferida, Spiriferinida, and Terebratulida. Most specimens are disarticulated, abraded and suffered bioerosion, thus the assemblage can be defined a neighbourhood assemblage. The identified brachiopod taxa record a wide spectrum of life strategies from pedicle-attached athyridides and spiriferides adapted to varied substrates to seminfaunal productides more typical of soft muddy substrates. The brachiopod fauna shares affinities with Chesterian (Serpukhovian) faunas in western United States such as the *Carlinia phillipsi* association and the *Rhipidomella nevadensis* Zone of the Great Basin of Utah and Nevada and of the Arco Hills Formation of Idaho, and the *Carlinia amsdeniana* Subzone of the Amsden Formation (Wyoming). A low diversity conodont assemblage has been recovered from the same beds. It is dominated by *Vogelgnathus campbelli*, but also includes indeterminate prioniodinid fragments. In addition, sarcopterygian dermal denticles and actinopterygian teeth were common in the residues. *Volgelgnathus campbelli* ranges from upper Visean to lower Serpukhovian.

ODONTOMETRIC CHARACTERISTICS OF THE EUROPEAN MIOCENE PRIMATES

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During the Miocene, primates in Europe were widely distributed and highly diverse. Since the early 19th century numerous species have been described. Due to their high potential for taphonomical conservation dental remains are among the fossil remains better used for the reconstruction of their ecology and phylogeny. The main aim of this study was to explore the differences among dental elements of Miocene primates using odontometrics. Odontometrics is a useful tool for investigating variation among primates and characterizing their possible dietary patterns. For such a purpose, dental elements belonging to a selection of Miocene primates from Europe were measured. The included taxa belong to fossil species of the families Hominidae (*Dryopithecus*, *Oreopithecus*), Pliopithecidae (*Pliopithecus*), and Cercopithecidae (*Mesopithecus*). Only unworn or nearly unworn teeth belonging to mature specimens were considered. According to previously established protocols, two measurements were taken on the crown, buccolingual width (B-L) and mesiodistal length (M-D). Although numerous species possessed specializations, they share traits like small incisors or narrow but long lower molars. The results also show differences that may be related to diverse diets among the studied taxa and to the different patterns of sexual dimorphism.

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EVIDENCE OF NOT-GENETICALLY CONTROLLED BIOMINERALIZATIONS IN CORALLIGENOUS BUILD-UPS (MARZAMEMI, SICILY, ITALY)

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Coralligenous build-ups form in open marine systems and their comparison with coeval bioconstructions of confined environments, like submarine caves, allow us depicting the complex interactions that develop between metazoans and microbial communities involved in the formations of recent bioconstructions in different settings of the Mediterranean Sea. In this study, two coralligenous build-ups were characterized in terms of the organisms and sediments involved in their formation. The main framework is made up by coralline algae and subordinate bryozoans and serpulids. Sponges affect bioconstruction development, both interacting with skeletonized organisms and through bio-erosive activity. The micrite (microcrystalline calcite) is a minor component of the build-ups and consists of autochthonous (*in situ*) and allochthonous (detrital) micrite. Fine autochthonous micrite mineralizes directly inside the framework cavities and shows aphanitic or peloidal fabric, produced by organomineralization processes of soft sponge tissues and microbial metabolic activity, respectively. The detrital micrite accumulates inside cavities and derives from external sources or is originated by erosion processes within bioconstruction itself. It is plausible that the abundance of sponges, competing with carbonatogenic bacteria for the same living cryptic spaces, prevented the development of conspicuous amount of microbialites in the coralligenous. A similar relationship between sponges and microbial communities was observed also in the biotic crusts of confined submarine caves, suggesting that this competition is not habitat specific. On the contrary, it may develop in a range of environmental settings, from open to cryptic systems, and could be used to clarify the role of metazoans *vs* microbialite in the paleoecological reconstruction of the fossil record.

MESOZOIC AND CENOZOIC CARBONATE PLATFORM BIOEVENTS FROM THE CARG GEOLOGICAL SHEET N. 377 "TRASACCO"

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The micropaleontology of the limestone units included into the geological sheet n. 377 "Trasacco" (CARG Project) has been studied to identify key bioevents and to discuss the relative stratigraphic implications. The recognized shallow-water biozones, event not fully calibrated, help to define the relative position of taxa through time, as well as to decipher lithostratigraphy in geological surveys. The analysed shallow-water succession covers great part of the Jurassic and Cretaceous 'Bahamian-type' facies, and Lower Miocene heterozoan carbonates. Through the Lower to Middle Jurassic, few foraminiferal associations are recorded restricted to the supratidal and near-emersion settings, along with crustacean coprolites (*Favreina*) and the cyanobacterial aggregation '*Rivularia*'. The Middle to Upper Jurassic succession records a recovery of the Pfenderinidae foraminifers, dasycladaceans green algae (species of *Clypeina*, *Salpingoporella* and *Selliporella*) and stromatoporoids. Larger agglutinated and porcelaneous foraminifera typify the Lower Cretaceous benthic association, among representative of the genera *Akcaya*, *Mesorbitolina*, *Praechrysalidina*, *Cribellopsis* and *Archaeoalveolina*, associated with green algae (including also species of *Heteroporella*, *Piriferella* and *Permocalculus*) and *Chondrodonta*. The Cenomanian records a foraminiferal diversity with *Cisalveolina*, *Sellialveolina*, *Rotorbinella*, and several soritids and nezzazatids, which become extinguished soon after at the Cenomanian-Turonian boundary (related to the Oceanic Anoxic Event 2). The Upper Cretaceous succession displays the diversification of some group of benthic foraminifera and rudist bivalves, whose evolution is likely related to those representatives that survived to the Cenomanian-Turonian boundary extinction. The Lower Miocene benthic coenosis was inhabited by foraminiferal genera still thriving in Recent seas.

AGENTS OF CLIMATE CHANGE: A PALEONTOLOGICAL POINT OF VIEW

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Anthropogenic climate change is now a well-known threat to the environment at various local-to-global levels. However, most data concerning climate change studies are focused on present-day and historical observations, with some of the research considering longer time spans which are still inappropriately compared to the history of our home planet. Among the most important climate-altering components there are carbon dioxide (CO_2), carbon monoxide (CO), and methane (CH_4). They have specific isotopic fingerprints which help determine whether they are of anthropic or natural origin: anthropic sources are mostly related to the massive consumption of fossil fuels in modern-day society, while natural sources are related to several processes, such as underground microbial activity, volcanic eruptions, and tectonic activities. The combined use of measurements of CO_2, CO, and CH_4, and other agents of climate change in the atmosphere can provide important insights into the origins and temporal variations of these gases and their impacts on the Earth's climate. The geological and paleontological records offer relevant insights into how natural sources developed over Earth's history. In particular, the evolution of the organisms driven by extinction and radiation events may have influenced these climate-altering components. However, the type and amount of organic matter preserved in the fossil record can be related to the events mentioned above, and no detailed research on the possible source and rate of gaseous emissions from this component has been performed. This research is the first attempt in paleontological studies aimed at recording and distinguishing the source of gases in pilot areas and evaluating the production rate from possible fossil sources.

I RESTI DI COCCODRILLI TOMISTOMINI DELLA PIETRA LECCESE (MIOCENE, ITALIA MERIDIONALE)

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La presenza di coccodrilli nella calcarenite miocenica della Pietra leccese (Burdigaliano superiore-Messiniano inferiore) è conosciuta sin dalla metà del diciannovesimo secolo grazie ai lavori di Oronzo Gabriele Costa, Giovanni Capellini e Pasquale Aldinio che attribuirono i resti a *Crocodilus* sp., *Rhytisodon tuberculatus*, *Streptospondylus lyceensis*, *Steneosaurus lyciensis*, *Suchosaurus cultridens* e *Tomistoma lyceense*. I resti da loro descritti, e in alcuni casi figurati, sono al momento dispersi, con l'eccezione di un calco dell'olotipo di *Tomistoma lyceense* (# 2-4511) e tre denti isolati (# 8880-1 RE 43) conservati al Museo Geologico e Paleontologico Giovanni Capellini dell'Università di Bologna. Attualmente, nessuna delle identificazioni ottocentesche viene considerata corretta e *T. lyceense* viene considerato un nomen vanum o un nomen dubium. Tuttavia, un cranio parziale (MAUS 972/1) proveniente da Melpignano (LE) consente di rivalutare la morfologia e l'identificazione dei coccodrilli della Pietra Leccese. Questo reperto fa parte di una ricca collezione di resti fossili di vertebrati raccolta negli anni '80 da Angelo Varola e attualmente conservata presso il Museo dell'Ambiente dell'Università del Salento. I resti offrono informazioni sulla morfologia dei seguenti elementi scheletrici: dentale, lacrimale, mascellare, nasale, palatino, prefrontale, premascellare e spleniale. Sulla base di MAUS 972/1 non è possibile diagnosticare un nuovo taxon o confermare la validità di *T. lyceense*, ma l'inclusione dei caratteri morfologici rilevabili (47 su 244) in una matrice filogenetica aggiornata consente, grazie a una analisi di parsimonia, di confermare che MAUS 972/1 è un tomistomino collocato alla base del clade che comprende i taxa europei e l'unico tomistomino attuale, *Tomistoma schlegelii*.

THE CRETACEOUS FLORA OF SALENTO: PRELIMINARY DATA ON THE ASSEMBLAGE FROM SURBO (LECCE, ITALY)

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A Cretaceous flora recovered in the 1980s in a quarry near Surbo (Lecce, Italy) and yet unpublished, is reported. The fossils lie on about one hundred limestone slabs referred to the Cenomanian-Turonian Altamura Limestone Formation, belonging to the Apulia Carbonate Platform. The specimens are referred to the following taxa: *Brachyphyllum* sp., *Frenelopsis* sp., *Geinitzia?*, *Pagiophyllum* sp. and *Cupressinocladus?*. All these taxa are documented for the first time in this area. Further studies will be required to determine Conifer 1, Conifer 2 and Conifer 3. The specimens are preserved as impressions, but in some cases the conservation is not optimal due to taphonomic compression. Macrofloral remains are stored at the Museum of the Environment of the University of Salento (MAUS). The identified taxa fit well within the reconstructions of the Cretaceous Salento platform as characterized by a shallow water sea surrounded by continental areas under a hot, humid and seasonal climate. A multiproxy stratigraphic study has been started in the area surrounding the quarry in order to confirm the age of the floral assemblage and to extract additional palaeoenvironmental data. Once again, the genus *Frenelopsis*, with its xeromorphic features, demonstrates the importance of the Cheirolepidiaceae in this sector of Tethys Ocean during the Cretaceous. Palaeobotanical remains from Surbo share some similarities with those found in the *Fossil-Lagerstätte* of Pietraroja (Benevento, Italy), indicating a similar tropical/sub-tropical palaeoenvironment. The Surbo assemblage is noteworthy because it helps uncover information on the palaeoecology and palaeogeography of the little-known emerged lands comprised between the Tethys carbonate platforms in the early Upper Cretaceous.

LIVE AND DEAD BRYOZOANS IN THE CORALLIGENOUS BUILD-UPS OF MARZAMEMI (IONIAN SEA)

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Coralligenous is among the most biodiverse habitats of the Mediterranean Sea. It results from the active construction of skeletonized marine organisms, mainly crustose coralline algae and subordinately selected groups of invertebrates. In this context, bryozoans are relevant both for biodiversity and for the contribution they provide to the bioconstruction. Indeed, most have heavily mineralized colonies that, although usually small, can provide carbonate to the build-up whereas all species increase Coralligenous biodiversity. In the framework of the FISR project CRESCIBLUREEF "Grown in the blue: new technologies for knowledge and conservation of Mediterranean reefs", 8 samples were scraped from 4 columnar build-ups arising from a coarse biogenic bottom at a depth of 33.5-37.2 m off Marzamemi (SE Sicily, Ionian Sea). Living and dead bryozoans were identified and scored, distinguishing colonies settled on the canopy (mostly fleshy algae and erect bryozoans) from those forming the concretion. Communities include a total of 85 species (1337 colonies), while only 42 species (287 colonies) were identified in the thanatocoenoses. No species are shared by all build-ups but relevant differences in the total diversity and species composition of both communities and thanatocoenoses have been detected between build-ups confirming the high heterogeneity of this habitat both in the present-day and the recent past. These data, and still ongoing research on further build-ups including a deeper one, provide new information increasing previous knowledge about the role of bryozoans in the Coralligenous of the area and of the whole Mediterranean. Structural and/or compositional differences between live and dead bryozoan associations are being particularly addressed in order to detect possible (paleo)-environmental proxies.

NEW INSIGHTS ON MIDDLE TRIASSIC INVERTEBRATE ICHNOASSOCIATION FROM THE MONTI PISANI MEGAICHNOSITE (NORTHERN APENNINES)

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The "Verrucano" succession of the Monti Pisani (Northern Apennines, central Italy) has long been the subject of palaeontological research due to the abundance of fossil tetrapod tracks (including some of the oldest dinosauromorph footprints worldwide) that are found in the Middle Triassic Quarziti del Monte Serra Formation. Although much is known about the Monti Pisani tetrapod ichnoassociation, the associated invertebrate traces have received much less attention. Here, we provide a first report on the invertebrate fossil traces from the basal Scisti Verdi Member of the Quarziti del Monte Serra Formation. This stratal package consists of alternations of green-coloured quartzitic phyllites and light-coloured sandstone reaching a maximum total thickness of ~110–120 metres. The presence of imprints of gypsum crystals and ripple marks depicts a semi-protected, lagoonal palaeoenvironment. The following ichnotaxa have been preliminary identified from the Scisti Verdi Member: *Asteriacites* (both *A. lumbricalis* and *A. stelliformis*), cf. *Diplocraterion* isp., *Planolites* cf. *montanus*, and *Gyrochorte* vel *Cruziana*. The ichnotaxonomic composition of the studied assemblage resembles that of the Lower Triassic ichnosite of Mount Pallone (Carnic Alps, northern Italy), which was recently revealed to reflect stressed environmental conditions in a marginal-marine paleoenvironment. Similar considerations may apply to the Middle Triassic assemblage studied herein. Moreover, the dense aggregation of asterozoan traces, in addition to morphological evidence such as arm duplication, missing arm tips and vertical reaccommodation/superimposition, stresses the importance of a gregarious lifestyle for these ancient *Asteriacites* tracemakers.

MICROFACIES AND BIOSEDIMENTARY PROCESSES OF LATE PLEISTOCENE (MIS 5.1) DEPOSITS (CAPO COLONNA, SOUTHERN ITALY)

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Interglacial MIS 5.1 mixed carbonate and siliciclastic deposits, cropping out along the marine terrace of Capo Colonna (Kr), were studied. Two main bio-sedimentary facies can be recognized: 1) Red algae-dominated decimeter- to meter-scale domal to stratiform bioconstructions (Coralligenous), rich of encrusting red algae, with less bryozoans, serpulids, and encrusting foraminifera; laterally, these are associated to medium to coarse mixed bioclastic grainstone/packstones that also fill most of the cavities of the skeletal framework; 2) Maerl facies, mainly composed of free branches and fragments of red algae immersed in mixed bioclastic medium to coarse grainstone/packstone. In mixed bioclastic sediments of both biofacies, micrite is ubiquitous and generally well preserved. Several typical microbialitc fabrics characterize most of the micrite: aphanitic, peloidal/dendritic, pseudo-thrombolitic and stromatolitic. Primary marine cements are commonly micritic isopachous rims, whereas vadose and botryoidal are rare. Late diagenesis affects all the deposits with dissolution, aragonite conversion into calcite, neomorphic recrystallization of calcite (e.g., micrite to microspar), and precipitation of meteoric dogtooth cements. The primary skeletal framework of the buildups is composed of encrusting red algae, foraminifera, bryozoans, and serpulids, while both primary micritic cement and early indurated microbialites contribute to bind skeletal and detrital components in both biofacies. Physical and biological destructive processes are commonly detected, producing erosional surfaces and dissolution cavities mainly due to endolithic sponges.

A FLAT-SNOUTED SPERM WHALE FROM THE LOWER MIOCENE OF THE SOUTHEASTERN PACIFIC (EAST PISCO BASIN, PERU) SUPPORTS AFFINITIES WITH THE SOUTHWESTERN ATLANTIC CETACEAN FAUNA

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Contrasting with the suction feeding of modern relatives in the families Kogiidae and Physeteridae, Miocene physeteroids display a broad range of feeding strategies. Despite the continuous improvements of the fossil record, the transition from the earliest sperm whales to suction feeding forms as well as the once prominent macroraptorial forms remains poorly understood. Here, we investigate a partial skull from Lower Miocene (Burdigalian) strata of the Chilcatay Formation of the East Pisco Basin (southern Peru). This specimen is recognised as belonging to an undescribed species of *Diaphorocetus*, a genus previously known only by the holotype of *Diaphorocetus poucheti*, from a roughly coeval unit in Patagonia (Argentina). Differing from the latter in its smaller cranial dimensions, higher tooth count, and minor differences in the position of facial foramina, the Peruvian fossil confirms the presence of a key character of *D. poucheti*, the marked dorsoventral flattening of the maxillary portion of the rostrum. Such cranial proportions suggest that, compared to other physeteroids, *Diaphorocetus* spp. were more efficient at performing fast lateral sweeps of their rostra to capture small- to medium-sized prey items with their proportionally small teeth. Recovered as stem physeteroids in our phylogenetic analysis, these forms contribute to the ecomorphological disparity of the Early Miocene sperm whales, but without displaying any of the cranial and dental changes occurring in later, macroraptorial and suction-feeding sperm whales. The discovery of a member of *Diaphorocetus* in southern Peru increases the similarities between the toothed whale faunas from the local Chilcatay Formation and the Gaiman and Monte Leon formations of Argentinian Patagonia, pointing not only to dispersal routes between the southeastern Pacific and southwestern Atlantic during the Burdigalian, but also to overall similar ecological settings along the coasts of Peru and Patagonia at that time.

NEW FOSSIL REMAINS AND HISTOLOGICAL STUDY OF *DIPLOCYNODON RATELII* (CROCODYLIA: DIPLOCYNODONTIDAE) FROM THE MIDDLE MIOCENE SITE OF ELS CASOTS (CATALONIA)

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Els Casots (Subirats, Catalonia) is one of the richest vertebrate localities in the Vallès-Penedès Basin and is considered a major reference site for the European early Middle Miocene (MN5, early Aragonian subzone Cb). The fossil remains of crocodilians are abundant, but only skulls and isolated elements, such as osteoderms and teeth, had been described so far and attributed to *Diplocynodon ratelii*. During the 2021 excavation campaign, a nearly complete skeleton was found in anatomical connection (IPS127899). A combination of cranial and postcranial features supports its assignment to *D. ratelii*, such as: 1) a distinct dorsoventral step on the frontal, 2) the slightly concavo-convex frontoparietal suture, and 3) keeled dorsal osteoderms and bipartite ventral osteoderms. Estimated total length of the individual is 1.38 m, the size of the smallest crocodylian species. Like extant small crocodilians (e.g., *Paleosuchus palpebrosus* and *Paleosuchus trigonatus*), *D. ratelii* was likely a generalist predator that preyed on small animals. To provide an initial insight into the paleobiology of the species, we also analysed the histology of an isolated femur of *D. ratelii* (IPS25075) found in a previous excavation. The primary bone tissue found in the thin sections studied (i.e., parallel-fibered bone) suggests similar growth rates to extant alligators. Future histological studies will focus on the analysis of vascular canals and lines of arrested growth to obtain more detailed information on the growth pattern of *D. ratelii*.

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ANALISI PALEOECOLOGICA DELL'ASSOCIAZIONE A *VENUS-OSTREA* DEL TORRENTE ARDA (PLEISTOCENE INFERIORE)

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La presenza dell'associazione a *Venus-Ostrea* nella successione pleistocenica del Torrente Arda (Emilia-Romagna) è stata segnalata in diversi studi, ma mai esaminata in modo approfondito. In questo lavoro è stata svolta un'analisi paleoecologica dell'associazione e, per le specie attualmente viventi, è stato effettuato un confronto con il loro ambiente di vita attuale, per osservare eventuali cambiamenti nelle loro distribuzioni dal Pleistocene a oggi. Il Pleistocene Inferiore è un intervallo di tempo caratterizzato da oscillazioni climatiche legate all'alternanza di cicli glaciali e interglaciali e da una generale tendenza al raffreddamento climatico.
L'analisi sistematica ha permesso di identificare 23 taxa di molluschi, evidenziando una compresenza tra organismi infaunali di substrati fangosi ed epifaunali di substrati duri, interpretata come conseguenza dell'apporto sedimentario periodico nel bacino. Durante i periodi di apporto di materiale fine si sono stanziati i taxa infaunali, mentre nei periodi quiescenti hanno potuto stanziarsi quelli epifaunali. Tra quest'ultimi è presente *Ostrea edulis* che ha sviluppato una strategia per adattarsi al substrato fangoso, aggregandosi in cluster di ridotte dimensioni per non sprofondare. Analizzando i range batimetrici attuali delle specie identificate, si osserva che molte di esse attualmente sono presenti dal piano infralitorale al circalitorale profondo; invece, durante il Pleistocene Inferiore, mostravano una distribuzione limitata tra 20 e 40 m. Questa differenza è attribuibile alle variazioni climatiche intercorse dal Pleistocene all'attuale che hanno influenzato la distribuzione dei molluschi. Alcune specie non sono state in grado di adattarsi al raffreddamento climatico del Pleistocene Inferiore e si sono estinte; altre non hanno subito variazione nella loro distribuzione; altre specie ancora, come *Venus nux*, dal Pleistocene Inferiore hanno subito un approfondimento del loro range batimetrico (75-100 m).

REVISING THE EARLY EUROPEAN RECORD OF THE DIRK-TOOTHED CAT *MEGANTEREON*

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Megantereon was a leopard-sized cat recorded during the Pliocene and Pleistocene of the Old World. Its fragmentary record prompted a hot debate during the last decades between scholars advocating for a single species and others who identified several forms and dispersal events. Here we revise the earliest records of *Megantereon* in Europe including the sites of Serrat d'en Vaquer (France, ca. 4 Ma), Les Etouaires (France, ca. 2.8 Ma), Saint Vallier (France, ca. 2.5 Ma) and Senèze (France, ca. 2.2 Ma), further describing two unpublished partial skeletons from the Upper Valdarno (Italy; ca. 1.8 Ma) and Pardines (France; ca. 2.6 Ma) including one cranium and several postcranial bones. The focus of the present contribution is to categorize the early *Megantereon* forms and to clarify if their evolution and/or derivation of characters in Europe is stable or continuous through time. Their intraspecific variability and sexual dimorphism are also tested. First, the present revision shows that the earliest European records of *Megantereon* correspond to the latest Pliocene of Les Etouaires furthermore better considering the specimens of Serrat d'en Vaquer and Odessa Catacombs as belonging to the genus *Dinofelis*. Our results also highlight a high intraspecific variability among these forms and an undetected sexual dimorphism, somewhat partially masking the derivation of characters in more advanced forms putatively present after (or coeval to) the Olduvai magnetostratigraphic subchron.

PALEOCLIMATIC AND PALEOCEANOGRAPHIC CHANGES AND THEIR IMPACT ON PLANKTIC FORAMINIFERA IN THE TYRRHENIAN SEA DURING THE LAST 32 KA

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The marine sediment core NDT_22_2016 was recovered offshore of La Spezia Gulf at 436 m depth in 2016 during an oceanographic survey by the National Research Council (CNR), as part of the NextData project. Within the 320 cm-long core, only one stratigraphic level (at 150 cm) was dated at 15.912 ±111 cal kyrs BP by means of AMS^{14}C on planktonic foraminifera *Globigerina bulloides*. So, considering a constant sedimentation rate, we can estimate a possible age of ca. 32 kyr BP for the bottom of the core. The main aim of this research is to investigate the paleoenvironmental and paleoceanographic changes that took place in the northern sector of the Tyrrhenian Sea over the past 32000 years, as revealed by planktic foraminifera (PF). The preliminary quantitative analyses, performed on >125 μm size fraction, identify that in the first 80 cm (cmbsf), the thanatocoenosis is composed of a rather wide PF biodiversity, mainly composed of *Globigerinoides elongatus*, *G. ruber*, *Globoconella inflata*, *Globorotalia truncatulinoides*, *Globigerina bulloides*, *G. falconensis* and *Neogloboquadrina incompta*. Below 80 cm, the planktonic foraminiferal assemblage exhibits a drastic reduction in biodiversity, as the 70% of the association is commonly composed by cold species such as *G. bulloides*, *Turborotalita quinqueloba*, and *Globorotalia scitula*, while *Neogloboquadrina pachyderma* is absent. Since this variation occurs in a stratigraphic level younger than 15.912 ±111cal kyr BP, we believe that this faunal change reflects the transition from warmer conditions, occurring during the Holocene, to colder conditions, which were established during the Younger Dryas event. Work is in progress to increase the sample resolution to achieve a century-scale resolution and identify paleoceanographic oscillations both during the warm (interglacial) and cold (glacial) configurations.

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TECHNOLOGICAL INNOVATION FOR THE REMOTE 3D STUDY OF MARINE BIOCONSTRUCTIONS: A PROJECT PROPOSAL

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Marine bioconstructions are biodiversity-rich systems built by bioconstructor organisms, topographically distinct with respect to the surrounding marine landscape and characterized by good resistance to the action of destructive agents. The main bioconstructions in the Mediterranean Sea are represented by coralligenous build-ups, vermetid reefs, deep-sea coral build-ups, sabellarid build-ups, and polychaeta/bryozoans bioconstructions. They form in a wide range of marine settings, from shallow to deep sea and from open to confined sectors. Despite of their importance, Mediterranean bioconstructions have not received the same attention that tropical coral reefs, and their knowledge in term of distribution and biological, ecological and geobiological processes are still fragmentary. Traditionally, underwater habitat mapping has been carried out coupling acoustic remote sensing techniques with RGB images, videos, and bottom sampling. During the last decade, the implementation of hyperspectral devices has become a viable alternative to regular photography. In contrast to ordinary cameras (that acquire three color bands), hyperspectral cameras record the full spectrum of reflected light, in each pixel of the acquired image. Recently, different instrument carriers for the underwater hyperspectral imager have been used in underwater field applications, such as *Remotely Operated underwater Vehicle* (ROV). ROVs play an important role in several application fields like marine science and underwater archeology in both shallow and deep water. The current project proposal aims to suggest a new protocol for the study of the Mediterranean marine bioconstructions based on the implementation of high-resolution 3D mapping and reconstruction models starting from the data remotely acquired through ROVs equipped with specific optical-stereo and hyperspectral cameras. The protocol could represent a highly innovative tool, in the scientific and environmental fields, useful for monitoring and enhancing of these delicate habitats, which are protected by EU.

THE PLEISTOCENE MALACOLOGICAL COLLECTION OF CATALLARGA (SICILY) IN THE MUSEUM OF PALEONTOLOGY (UNIVERSITY OF CATANIA)

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A rich fossiliferous sandy level is well exposed along the western side of the Catallarga hill, near the Grammichele village in the north-western margin of the Hyblaean Plateau (Southern Sicily). It belongs to the Pleistocene clayey-sandy succession that fills the Gela-Catania Foredeep and consists of white-to-yellowish organogenic calcarenites and coarse sands lower Pleistocene in age. The fossiliferous outcrop of Catallarga, discovered at the end of the 19th century by Travaglia and later studied by Malatesta (1960-63), was more extensively investigated during the 1980s by Di Geronimo and collaborators (University of Catania). Numerous sampling surveys allowed us to gather a large amount of material, mainly mollusc shells, presently stored in the Palaeontological Museum of the Department of Biological, Geological, and Environmental Sciences. Based on this large collection of about 300 species, including Bivalves, Gastropods, Scaphopods, and Polyplacophors, the present study deals with bivalves, revising and updating taxonomy, and implementing previous literature. From a palaeoecological point of view, infaunal soft bottom-dwelling species, typical of infralittoral and circalittoral biocenoses, largely dominate. Among them, several species (among which *Laevicardium crassum, Callista chione,* and *Glycymeris glycymeris*) indicative of the SGCF Biocenosis are dominant. The co-occurrence of species of cold climatic affinity, such as the Boreal Guests *Arctica islandica, Macoma obliqua, Polititapes rhomboides,* and thermophilic species, such as *Varicorbula revoluta, Chama placentina, Plicatula mytilina*, deserves in deep investigation. The malacological Catallarga deposit is highly informative for its relevant palaeobiodiversity and the excellent preservation state of most shell remains.

DIGITAL INVESTIGATION OF LAMNIFORM SHARK VERTEBRAE FROM THE SCAGLIA CINEREA – BISCIARO BOUNDARY (MIOCENE, UMBRIA-MARCHE BASIN)

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During the sampling of a stratigraphic section along the shore of the Fiastra Lake (Carg Project - sheet 313 Camerino of the Geological Map of Italy 1:50000), a rock boulder with partially exposed skeletal materials has been discovered at the base of a small cliff at the northern termination of the Sibillini Mts. Ridge. In this area the Umbria-Marche Basin stratigraphic succession is extensively exposed. The Oligo-Miocene portion of the succession is well-exposed is the examined section, represented by the ~200 m-thick Scaglia Cinerea Formation passing upwards to the ~100 m-thick Bisciaro Formation. The studied specimen was found erratic in close proximity to the boundary between the two formations, in a stratigraphic interval attributable to the Aquitanian *p.p.* To better investigate the nature of the exposed skeletal structures, the block has been examined using a CT scan. From the acquired digital data, the elements appeared to be articulated fish vertebrae affected by a certain degree of lithostatic compression. Through computed tomography investigations, the vertebrae have been digitally isolated and extracted from the block, and the digital model has been 3D printed. Thanks to the identification of diagnostic characters, the vertebral material has been attributed to a lamniform shark (order Lamniformes). The vertebrae were also digitally retro-deformed, and a body length estimate has been proposed, suggesting in an individual not shorter than four meters of total length. The effectiveness of these non-invasive methods has been demonstrated for the intended purpose. The obtained data also allowed a taxonomic identification of the specimen and to report the first occurrence of a large vertebrate remains discovered to date at the Scaglia Cinerea – Bisciaro boundary.

PRELIMINARY STUDY OF TWO CAVE BEAR CUBS FROM THE LATE PLEISTOCENE VERTEBRATE ASSEMBLAGE OF THE "TECCHIA" OF EQUI CAVE (EQUI TERME, MASSA-CARRARA PROVINCE, ITALY)

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Taking its place in the northern portion of the Apuan Alps, the "Tecchia" of Equi cave (Equi Terme, Massa-Carrara Province, Italy) represents a cave of great palaeontological and archaeological relevance. Here, abundant faunal remains have been collected, mostly Late Pleistocene (MIS3) mammals such as the cave bear (*Ursus spelaeus* Rosenmuller, 1794). In 2014, two extremely small skeletons of this species were collected from a single stratigraphic horizon at the "Tecchia". Both specimens (hereinafter, Cub 1 and Cub 2) exhibit an excellent state of preservation. Cub 1 includes the skull, which preserves an undeformed three-dimensional morphology and is still connected to the cervical vertebrae. The cervical and thoracic vertebrae and the ribs are fully articulated. The 23-mm-long scapulae, a 33-mm-long humerus and a tibia are also preserved. Cub 2 features the thoracic cage and part of the vertebral column. Preserved elements of the forelimbs consist of both the 31-mm-long humeri, ulnae and radii, plus a 25-mm-long scapula. Many anatomical traits of Cub 1 and Cub 2 reveal a very young age at death, including vertebrae that are not fully ossified and the lack of epiphyses of the long bones. Cub 1 is edentulous, and its cranium displays open fontanelles and unfused sutures. By comparing the measurements of the scapulae and long bones of both cubs to the values reported in literature for early juvenile conspecific individuals from other sites of central Europe, an age at death of less than a week was estimated. These cave bear cubs may have died from malnutrition a few days after their birth, similar to what happens to many modern bear cubs, due to the oftencritical nutritional conditions of their mothers during hibernation.

A LEATHERY MEAL: MEGATOOTHED SHARK BITE MARK ON A *PSEPHOPHORUS* CARAPACE FROM THE PIETRA LECCESE FORMATION (MIOCENE, SOUTHERN ITALY) AND ITS PALAEOECOLOGICAL IMPLICATIONS

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Ancient prey-predator interactions are sometimes preserved in the vertebrate fossil record in the form of traces such as bite marks and gnaw marks. Here, we report on a probable shark bite mark affecting a partial carapace belonging to the extinct leatherback turtle *Psephophorus polygonus* (Chelonioidea: Dermochelyidae) from the Pietra Leccese Formation (Miocene, southern Apulia). This specimen is kept at the Museo dell'Ambiente dell'Università del Salento (MAUS) with accession number MAUS 1008/1. In order to characterise the observed mark, we acquired a digital model of the carapace via photogrammetry and performed an elevation analysis of the injury. The latter appears as a furrow-like incision that cut through the turtle's dermal ossicles. It is narrow (maximum width 11 mm) and elongated (total length 55 mm). The trace is slightly asymmetrical as its deepest point (as deep as 18 mm) is eccentric, and damaged areas occur at both ends of the mark. The long margins of the injury are characterized by a downward bending of the ossicles, which appears to be fairly more abrupt on one side than on the other. Based on the size and morphology of the studied trace, it likely represents the mark left by the impact of a large-sized shark tooth. This interpretation is supported by actualistic observations that have provided evidence that macropredatory sharks such as *Carcharodon carcharias* feed upon the extant leatherback turtle (*Dermochelys coriacea*). Furthermore, the chelonian fossil record preserves several examples of shark bite marks on turtle shell elements. Among the many selachian genera whose remains have been collected from the Pietra Leccese Formation, the extinct genus *Carcharocles* (Lamniformes: Otodontidae) represents the most probable producer of the trace observed on MAUS 1008/1. Despite its fragmentary nature, this find contributes to reconstruct the structure of the central Mediterranean trophic chain during the Miocene.

THE WOLFERODE QUARRY: AN AMAZING MIDDLE TO LATE PERMIAN TRACKSITE IN CENTRAL GERMANY

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The sediments of the middle to late Permian Hornburg Formation (Fm) (Saxony-Anhalt, Germany) reveal a rarely preserved fan- and playa-system in central Europe. The successions represent an exceptional window into the continental environments and biotas of the Euramerican Permian Pangean palaeoequatorial northern trade wind zone. In September 2022, an international excavation (ca. 60 m^2) in the NE corner of the abandoned "Quarry Held", Wolferode (Upper Hornburg Fm), unearthed a variety of well-preserved trace fossils (40 excavation boxes) including tetrapod trackways, tetrapod scratch marks (probably swimming traces), insect trackways, insect body imprints, jellyfish imprints and microbially induced sedimentary structures. It was the first excavation of its size in the Upper Hornburg Fm strata. The fossil-bearing strata is approximately 6 m thick and includes laminated silt and clay stones; intercalated sandstone channels show internal cross bedding structures, and on the bottom desiccation crack fillings, ice crystal casts, flute casts and/or load casts. The trace fossil content of these dry evaporitic red beds is exceptional on a worldwide scale and of great interest for Permian biostratigraphy and ichnology. It will also add to the interpretation of ancient food chains and environments. The excavation will be continued in 2023 and is open for volunteers.

MOLETO: A NEW LATEST MIDDLE-EARLIEST LATE PLEISTOCENE VERTEBRATE SITE IN NORTHERN ITALY

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The palaeontological site of Moleto (Ottiglio, AL, Piedmont, Italy) was discovered in the 1990s in an abandoned quarry carved into a Burdigalian-Langhian (Lower-Middle Miocene) carbonate succession called Pietra da Cantoni. Sediment collection in three closely spaced fissured provided a rich vertebrate association whose age can be constrained to the latest Middle-earliest Late Pleistocene on the basis of the presence of the rodent *Arvicola mosbachensis* and its enamel characteristics (enamel differentiation quotient [SDQ] values ranging from 100 to 130). The very similar faunal content, particularly with respect to the common presence of *A. mosbachensis* and its similar SDQ values, suggests a geologically coeval deposition of the fillings of the three fissures. The vertebrate assemblage is represented by amphibians (*Salamandra salamandra*, *Bufo* gr. *B. bufo*, *Rana* sp.), reptiles (*Anguis* gr. *A. fragilis*, Lacertidae indet., *Hierophis* sp., *Natrix* sp., *Vipera* gr. *V. aspis*), birds (Passeriformes indet.), and mammals (*Erinaceus europaeus*, *Talpa europaea*, *Sorex* sp., *Arvicola mosbachensis*, *Microtus* cf. *M. agrestis*, *Microtus* cf. *M. arvalis*, *Apodemus* gr. *A. sylvaticus-flavicollis*, *Sciurus* sp., *Glis glis*, *Muscardinus avellanarius*, *Clethrionomys glareolus*, Lagomorpha indet., *Mustela putorius*, Carnivora indet., *Stephanorhinus* sp., *Sus* cf. *S. scrofa*, *Dama* cf. *D. dama*, *Cervus elaphus*, *Capreolus capreolus*, Bovidae indet.). Interestingly, a diverse fish assemblage including squalomorph and galeomorph sharks, batoids, and percomorph bony fishes reworked from the embedding sediments of the Miocene Pietra da Cantoni, and indicative of shallow to deep shelf marine biotopes, has been found in the fissure fillings. The habitat weighting method and a bioclimatic model applied to the small-mammal assemblage of Moleto reveals a landscape dominated by woodland habitats with presence of open humid meadows, under temperate and moist climatic conditions.

NUOVE EVIDENZE DI DEPOSITI PLIO-PLEISTOCENICI A CONCHIGLIE E VEGETALI FOSSILI NELL'ALVEO DEL TORRENTE CERVO: RASSEGNA PRELIMINARE

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Il Torrente Cervo in piena eccezionale nell'ottobre 2020 ha sfondato la briglia di Castelletto Cervo nel Biellese, causando l'erosione di alcuni affioramenti testimoniata da sopralluoghi i cui risultati sono qui riportati. Sono stati esposti ingenti spessori di sabbie mal classate a stratificazione incrociata e allineamenti ciottolosi al di sopra di un noto deposito a conchiglie presso Candelo. Nel sito "Castellengo" sono riemersi nuovi fossili quali colonie di Thoracica e Bryozoa, Bivalvia (Pectinidae, *Panopea*, *Ostrea*, tronchi carbonificati scavati da Teredinidae), Gastropoda (Muricidae, *Xenophora*, *Bufonaria marginata*), Echinoidea (*Schizaster*) e pigne fossili. A valle della diga di Cossato sono esposte sabbie grossolane che comprendono un noto strato a frutti fossili e un fitto intreccio di Domichnia (*Thalassinoides*, *Ophiomorpha*). Alla confluenza del Cervo con lo Strona presso Cossato, uno strato a impronte di foglie già studiato in passato affiora a 5 metri dal fondo alveo. Un nuovo deposito con impronte di Bivalvia, correlato con uno ciottoloso più a monte, indica disomogeneità laterale del paleoambiente secondo l'antica linea di costa. A valle del guado di Castelletto Cervo i resti fluitati di tronchi, frutti e semi (*Juglans*, *Styrax*, *Fagus*) sono associati a una foresta fossile i cui ceppi in posizione di crescita hanno scorze compatibili con quelle di *Alnus* attuali. La distruzione della briglia di Castelletto Cervo ha rivelato depositi ricchi in resti carpologici (*Stewartia*, *Fagus*, *Styrax*), rizomi di monocotiledoni e Domichnia (*Thalassinoides*). Il corpo sabbioso grossolano denominato "Castelletto Cervo II" (Gelasiano) ha restituito nuove pigne e rami fogliosi di *Picea,* oltre a semi di *Magnolia*, ecc. Più in alto sono risaltate, meglio che in passato, le ghiaie alla base dello strato di lignite di Garella di Fondo e la successione che le comprende. I dati in studio registrano circa due milioni di anni di cambiamenti paleoambientali ai piedi delle Alpi Occidentali.

REIMAGINING *VELOCIRAPTOR* 100 YEARS AFTER ITS DISCOVERY

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This year marks the 100th anniversary of the discovery of *Velociraptor*. In this contribution, our aim is to trace the history of the discoveries related to this fascinating non-avian theropod and to examine how it has been depicted by palaeoartists over the past century. The first *Velociraptor* fossil was discovered on August 11th, 1923 by the staff of the American Museum of Natural History during an expedition in the Gobi Desert. The name *Velociraptor* is derived from Latin and means "swift thief", reflecting the perceived nature of this taxon as a fast-moving predator. This animal is characterized by using only two toes to walk with the inner digit possessing a raised sickle-shaped ungual phalanx. This peculiar adaptation was discovered only in the 70's, with the description of *Deinonychus*, by John Ostrom. Among the many other specimens recovered over the past fifty years, utterly fascinating is the finding of the "fighting dinosaurs", recovered in 1971. Over the years, *Velociraptor* has been reconstructed by many palaeoartists, with varying degrees of accuracy. Early depictions by illustrators like Giovanni Caselli and Zdenek Burian, did not include the sickle-claw or had inaccurate head proportions. More accurate reconstructions were proposed in the 1980's, by palaeoartists such as Mark Hallett and Gregory Paul, that envisioned *Velociraptor* as entirely feathered for the first time, an inference supported by the discovery of fully feathered dromaeosaurids in the 21st century from the Early Cretaceous of China. *Velociraptor* got most of its fame in pop culture with the "Jurassic Park" novel by Michael Crichton in 1990 and the homonymous film directed in 1993 by Stephen Spielberg, which depicted the theropod as a bloodthirsty killer hunting in packs. These fictitious reconstructions were highly inaccurate, being two times bigger than they would have been and lacking any plumage coverage. Nonetheless, popular imagination often sees this animal as depicted in cinematography. Within this context, our aim here is to provide an updated, accurate and original *in-vivo* reconstruction of this small, feathered theropod.

THE ACHILLE TELLINI HISTORICAL COLLECTION (MUSEO UNIVERSITARIO DI SCIENZE DELLA TERRA, SAPIENZA UNIVERSITÀ DI ROMA)

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During the renovation work of the MUST (Museo Universitario di Scienze della Terra, Sapienza Università di Roma), it was necessary to reorganise all the collections in order to move them to the new repository. As part of this project, several historical collections were selected as tests for a standardised approach to digitisation, cataloguing, and valorisation from a scientific and historical point of view. Among these collections, the Tellini collection stands out. Achille Tellini was one of Portis′ most promising assistants. He was a student of Portis in Turin and followed him in Rome, after his graduation in 1888. Here at La Sapienza University, Tellini started his research career, which initially focused on palaeontology. Between 1888 and 1892, he enriched the museum with a large collection of invertebrate fossils and mainly foraminifera. The collection consists of over 6,000 specimens including many types of specimens. Within the entire collection, it is possible to identify two main sub-collections in terms of both number of pieces and scientific value: one dating from 1889-1890, and the other from 1888. The work done on the Tellini collection led to the production of the complete inventory and mapping of the collection held at MUST. Moreover, it was possible to carry out a systematic revision on some taxa established by Tellini (1888), namely *Nummulites bormiensis, N. rosai*, and *N. saccoi*. Lastly, the catalogue standard cards BN-P-ICCD (Beni Naturalistici – Paleontologica – Istituto Centrale per il Catalogo e la Documentazione) were reviewed and then applied to the whole collection.

Tellini A. (1888). Le Nummulitidee terziarie dell'Alta Italia Occidentale. *Bollettino della Societá Geologica Italiana*, 7: 169-230.

BIODIVERSITY AND DISTRIBUTION PATTERN OF SERPULIDS FROM MEDITERRANEAN HOLOCENE CORALLIGENOUS BUILD-UPS

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Coralligenous is a priority habitat of the Mediterranean Sea, also known in the fossil record being composed of skeletonised organisms (calcareous algae and invertebrates) but its nature and associated biodiversity are still not adequately known. In the framework of the FISR project CRESCIBLUREEF – "Grown in the blue: new technologies for knowledge and conservation of Mediterranean reefs", serpulid associations (communities and thanatocoenoses) from four Holocene coralligenous build-ups (25 to 40cm high) collected in August 2021 from 33.5 to 37.2 m depth off Marzamemi (SE Sicily) were examined. Besides calcareous algae that constitute the primary framework, serpulids and other skeletonized invertebrates secondarily contribute to the build-up growth. Living serpulid associations consist of 22 species (including 984 specimens), while a total of 31 serpulid species (including 1153 specimens) were identified in the thanatocoenoses. The most widely distributed and abundant species are overall *Placostegus* cfr. *crystallinus*, *Josephella marenzelleri*, *Metavermilia multicristata* and *Semivermilia crenata*. All species detected on the examined build-ups are already known from the Mediterranean, but 11 species are reported for the first time from the Coralligenous, among which *Vermiliopsis infundibulum*, *Filogranula annulata* and *Spirorbis cuneatus*. These new data remarkably increase the serpulid biodiversity known for the Coralligenous, highlighting the need of further research on this habitat.

The still ongoing research is aimed at clarifying: 1) which serpulid species form/inhabit the coralligenous build-ups in the studied region, 2) any structural/compositional differences of species associations between live and dead serpulid associations and their possible paleo-ecological meaning, as well as between the studied four build-ups and 3) any difference in the degree and pattern of colonisation between top and bottom halves of each build-up and between sheltered and exposed parts.

MIS 5.5 SST ESTIMATION FROM A MACROFOSSIL ASSEMBLAGE: A MULTI-PROXY RECONSTRUCTION

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This contribute presents a multi-proxy palaeoclimatic study performed on a macrofauna coming from a MIS 5.5 calcarenite, exposed along the coastline of the Mar Piccolo of Taranto (MP). Three bulk samples returned 120 mollusc species, including four of the tropical "Senegalese Fauna". Mollusc species with a southern or warm affinity are present in a double percentage in respect to today, whereas the northern or cold affinity species are equally represented, indicating warmer, but not tropical, SST during MIS 5.5. This is supported by the most recurring preferred SST ranges of the assemblage, that indicate 20 °C in average. For further SST estimations, trace elements (Mg/Ca and Sr/Ca), and oxygen stable isotope ($\delta^{18}O$) analyses, were performed on well preserved specimens of *Thetystrombus latus, Spondylus gaederopus, Venus verrucosa, Pinna nobilis*, and corallites of *Cladocora caespitosa*. Only some SST estimations, derived from equations available in literature, are realistic and converge on similar mean annual SST, on average of 20.8 ± 0.9 °C. As the modern annual mean SST of the study area ranges from 18 °C to 18.8 °C in the semi-closed MP basin and in the facing open sea Gulf of Taranto (GT) respectively, the final estimate of the MIS 5.5 SST falls in the range 1.2 - 2.0 °C for the GT, and 2.0 - 2.8 °C for the MP. Albeit warmer than today, this is not a firmly warmer tropical-like SST setting as it would be derived from the mean annual SST requirement of the Senegalese *T. latus*, that would suggest at least +2.7 °C in respect to modern GT, and +3.5 °C in respect to modern MP. To conclude, the approximations and assumptions made for obtaining SST values with any single proxy-based method return a wide uncertainty, strongly suggesting the need of a multi-proxy approach to infer the most reliable SST estimation.

COLLEZIONI MUSEALI E VALORIZZAZIONE DEL PATRIMONIO PALEONTOLOGICO. MAPPARE PER COSTRUIRE RETI: IL CASO STUDIO DELLA VAL D'ALPONE

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Nel panorama dei siti paleontologici nazionali e internazionali la Val d'Alpone, situata nella porzione estrema dei Monti Lessini orientali Veronesi, rappresenta un fortunato esempio per il gran numero di giacimenti conosciuti. Lungo circa i 30 chilometri di sviluppo della valle, tre sono le località fossilifere dell'Eocene storicamente note: Roncà, San Giovanni Ilarione e Bolca. Il loro eccezionale patrimonio paleontologico ha favorito una proficua ricerca scientifica che prosegue tutt'ora con importanti collaborazioni fra i musei del territorio, il Museo di Storia Naturale di Verona e università italiane ed estere. Accanto ad una notevole produzione bibliografica, l'interesse nei confronti di queste tre località è testimoniato anche da un diffuso fenomeno collezionistico che, in tempi storici, ha dato origine a raccolte confluite, in molti casi, all'interno di musei italiani e stranieri. Il collezionismo dei secoli scorsi ha contribuito ad accrescere la notorietà dei giacimenti, amplificandola dal contesto locale a quello internazionale. Attualmente, tali raccolte svolgono un importante ruolo nella conservazione dei beni paleontologici, base necessaria per consentirne la valorizzazione e promuovere la ricerca. Per questo motivo, è stato avviato un progetto di censimento e verifica della consistenza del patrimonio paleontologico della Val d'Alpone presso le collezioni di musei e università nazionali e internazionali. Aggiornando lo stato delle conoscenze sulle collezioni paleontologiche storiche della Val d'Alpone sparse nel mondo, questa mappatura punta a sostenere la tutela dei beni paleontologici e dei siti in esame, nonché ad agevolare la crescita di reti che possano facilitare lo scambio di informazioni, la cooperazione scientifica e la promozione di iniziative per la divulgazione al grande pubblico. Ciò favorirà l'accesso e la diffusione del sapere, secondo uno degli obiettivi prefissati dall'Unesco, per cui la Val d'Alpone si candida a divenire patrimonio.

A DENDROLITE/THROMBOLITE CARBONATE BUILD-UP FROM THE MESSINIAN TERMINAL CARBONATE COMPLEX OF THE SALENTO PENINSULA (SOUTHERN ITALY)

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A late Messinian shallow-water succession composed of bioclastic/microbialitic carbonate deposits has been described in the Salento Peninsula and has been considered as a central Mediterranean equivalent of the Terminal Carbonate Complex (TCC), up to now mainly known from the Western Mediterranean. The changes forced by the Messinian Salinity Crisis on the Mediterranean marine environments, particularly on shallow-water carbonate factories, allowed the development of microbial communities, driving metabolic induced microbialite deposition, mostly under shallow-water and normal marine salinity conditions during warm climatic phases. Here we present a micromorphological and biogeochemical approach integrating optical and electron microscopy analyses with UV-Epifluorescence observations, EDS microanalyses and Raman Spectroscopy, in order to investigate the processes involved in the deposition of massive dendrolite/thrombolite facies. Two different wave-resistant fabric have been recognized at meso- and microscale observations: a) dendritic mesofabric made of short, digitate ramifications; b) thrombolitic growth forms made of larger, upward oriented branches. Data of UV-Epifluorescence and Raman spectroscopy indicate the presence of organic matter remains trapped among the fine crystals of the microbialite textures, suggesting biomediated processes involved in their precipitation. Dendrolites and thrombolites show very rare traces of abrasion and bioperforation and biotic crusts of metazoans. Both microbialite textures are interspersed by small sediment pockets: a grainstone/packstone with abundant remains of gastropods and bivalves, pellets and fragmented oolites. These features suggest the development of the build-up under high-energy conditions and relatively fast accumulation of sediment, that was trapped among the dense microbial structures.

SOME CONSIDERATIONS ABOUT MIS3 MARMOTS (*MARMOTA MARMOTA*) OF NORTH-WESTERN ITALY WITH PARTICULAR REGARDS TO THOSE FROM CAVERNA GENEROSA (CENTROVALLE INTELVI, COMO)

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This work focuses on fossil bones of the alpine marmot *Marmota marmota* (Rodentia, Sciuridae), a poorly-studied topic in previous palaeontological works. In northern Italy the alpine marmot seems to be absent during the Lower Pleistocene and very poorly present in the Middle Pleistocene. Only during the Upper Pleistocene, this rodent spread. The fossil remains studied herein come from Upper Pleistocene deposits of Caverna Generosa (Centro Valle Intelvi, CO; 1450 m a.s.l.), Buco del Frate (Prevalle, BS; 253 m a.s.l.) and Büs di Tri Fradei (Oltre il Colle, BG; 1200 m a.s.l.). Furthermore, remains of the extant alpine marmot were analysed for comparison. The morphometric study revealed that the sexual dimorphism is negligible and that fossil and extant specimens are dimensionally similar, although most the extant marmots seem to be slightly larger than the fossil ones. The Caverna Generosa fossil specimens were divided into classes of dental eruption and wear, associated to different ontogenetic stages. This allowed to highlight a peak of mortality for the juvenile specimens. Furthermore, the Caverna Generosa sample was compared with those from Grotte di Pradis (Friuli Venezia Giulia, Italy) and Grotte Colomb (France) where human exploitation on marmot is attested. This comparison confirmed that the pattern of mortality at Caverna Generosa is not related to human exploitation. Dating of two alpine marmot bones from two different levels of two different areas of Caverna Generosa returned ages of 35616-34378 BC cal and 32537-32031 BC cal, respectively. These results testified that the frequentation of the cave by *M. marmota* is more or less contemporary to that of *Ursus spelaeus* and other Upper Pleistocene species found in the site.

RE-ANIMATION OF A FOSSIL: BRINGING BACK TO LIFE THE SPECIMENS FROM MUSTE (MUSEO DI SCIENZE DELLA TERRA) OF UNIVERSITY OF BARI WITH DIGITAL TECHNOLOGIES

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Advanced 3D technologies, such as terrestrial laser scanner points clouds, structured light scanner image, and photogrammetry are becoming a standard methodology for obtaining detailed 3D digital models of fossils through a non-invasive process. These technologies allow digital palaeontology to move through countless possibilities in research and science communication. The combination of museums and the virtual world is increasingly seen internationally as an excellent tool for spreading knowledge and reaching an ever wider and more aware public. The MuSTe (Museo di Scienze della Terra, University of Bari), in collaboration with CETMA (European Research Centre for Design Technologies and Materials), is carrying out a project supported by the Apulia Region (POC Puglia FESR FSE 2014-2020-action 10.4), that concerns digitisation process of the museum collection not only for scientific and conservation purposes, but also to improve the accessibility of the scientific museums and to involve a wider and heterogeneous audience through digital media. The project envisages the use of the above-mentioned technologies to obtain digital models of some of the fossil remains of Quaternary vertebrates found in Apulia and preserved at the MuSTe. The digital models of the skeletons will be processed through 3D software to reproduce the soft tissues of the animals and their appearance in life, and then breathe life into them through digital animation techniques and recreate their movements within digital dioramas ('animation' in its original meaning means 'to give life'). The resulting digital products will be part of the permanent exhibition of MuSTe. Digital reconstructions are also easily accessible to the public and highly attractive, therefore they are today the best way to convey information immediately to visitors and students.

A NEW PROBOSCIDEAN TRACKSITE IN THE PLEISTOCENE OF SOUTH-WESTERN SARDINIA (ITALY)

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The western coast of Sardinia contains extensive outcrops of Quaternary shallow marine and alluvial-aeolian deposits where numerous vertebrate ichnosites have been identified (Pillola et al., 2020; Zoboli & Pillola, 2018). A new Pleistocene vertebrate ichnosite is reported from the locality of S'Enna 'e S'Arca (Arbus, along the SW coast of Sardinia). The Pleistocene succession at S'Enna 'e S'Arca discontinuously covers the Paleozoic basement and consists of aeolian sandstones, beach sandstones and conglomerates. The footprints are referable to megacerine deer and small proboscideans and are visible both in bedding plane and cross-section. Previously, small proboscidean footprints have been reported exclusively in the site of Funtana Morimenta near Gonnesa (late Middle Pleistocene) (Pillola & Zoboli, 2017). The proboscidean footprints preserved in cross-section from both localities are very similar in shape and dimensions and are likely attributable to the dwarf mammoth *Mammuthus lamarmorai*. The age of the Pleistocene coastal deposits of Sardinia mainly spans from the late Middle Pleistocene to the Late Pleistocene. Two main generations of aeolian deposits are recognised. Considering the chronological framework based on luminescence (OSL) and U/Th data, the oldest of them is assigned to the Middle Pleistocene (MIS7/6) while the most recent to the Late Pleistocene (MIS5/4). To date, the only proboscidean taxon reported in the Quaternary of Sardinia is the poorly known dwarf mammoth *Mammuthus lamarmorai*. However, the possible presence of other small proboscidean taxa cannot be excluded. Proboscidean remains and footprints are reported only in the Middle Pleistocene deposits of Sardinia and a persistence of these mammals during the post- MIS5 is not supported by unequivocal data. Radiometric and/or OSL dating in the S'Enna 'e S'Arca ichnosite could provide a useful contribution to improve our knowledge about the temporal distribution of proboscideans of Sardinia.

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