

JOURNAL OF LIMNOLOGY

DOI: 10.4081/jlimnol.2026.2271

SUPPLEMENTARY MATERIAL

New records of ostracods (Crustacea, Ostracoda) from groundwater habitats in Italy, with faunistic and biogeographical notes

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Key words: groundwater biodiversity; subterranean ecosystems; stygofauna; endemism; range extension.

Tab. S1. Details of the sampling sites. The cadastral numbers refer to the National Cadastre of Caves of Italy (<https://speleo.it/catastogrotte/wish>) or regional cadastres.

Code and name	Region	Province	Municipality	Coordinates WGS84	Cadastral number	Description
01 Grotta Cava di Papipano	Friuli Venezia Giulia	Udine	Faedis	46.162098 N 13.357085 E	FVG408-Fr296	The cave is developed as a sub-horizontal gallery extending for approximately 70 meters, traversed by a small perennial watercourse originating from a siphon located in the innermost sector of the cavity (Stoch, 1988; Cucchi and Martinuzzi, 1996; Gasparo, 1997).
02 Grotta Grava X	Campania	Salerno	Valle dell'Angelo	40.297307 N 15.402714 E	CP1404	The cave lies in the Monte Cervati karst district in the Cilento area, with the presence of Triassic-Miocene platform carbonates (Patacca and Scandone, 2007).
03 Grotta Pertosa	Campania	Salerno	Pertosa	40.536340 N 15.455270 E	CP1	The Pertosa-Auletta Cave is a phreatic system characterized by a basal cavity with predominantly horizontal development, extending for approximately 3 km in planimetric length. It lies within the Alburni Massif, a vast carbonate complex that constitutes one of the most significant karst areas of southern Italy, where about 250 caves are present (Pastore, 2016).
04 Grotta Grave Grubbo	Calabria	Crotone	Verzino	39.261538 N 16.862963 E	Cb 258	The cave occurs in a region dominated by Messinian evaporitic deposits. Gypsum crops out as massive beds, 80–140 m thick. Cave waters show notably high sulfur concentrations and can be classified as sulfate–calcitic waters (Latella et al., 1999; Iovine et al., 2010). The cave is part of a single karst system known as the “Complesso Le Grave”, currently the longest gypsum cave in Calabria and the second longest in Italy among caves developed in gypsum.
05 Grotta Palummaro	Calabria	Crotone	Caccuri	39.236070 N 16.836131 E	Cb 265	The cave opens within the Caccuri Formation, which includes rudite-dominated geological units. In its lower sector, intraformational breccias occur, composed of angular clasts ranging from decimetric to metric size, variably flattened and deformed. These clasts consist of sandstone and gypsum–calcareous pelites embedded in a dark lutitic matrix that is locally rich in organic sapropel. The cave ranks among the largest Italian gypsum caves in terms of both passage

						development (624 m) and depth (~70 m). It comprises four sections that, because of the very low ceiling, become completely flooded during high-flow periods by water entering from the upper entrance, forming temporary sumps (Moretti and Vincenzi, 2016).
06 Grotta Abisso del Gatto	Sicily	Palermo	Cefalù	37.993611 N 14.048333 E	245SI-PA	The cave is located on the western slope of Cozzo Carzarello at an elevation of 380 m, within the boundaries of the "Parco delle Madonie". It developed within a limestone platform outcropping in the Madonie Mountains and, together with the "Abisso del Vento", represents one of the most developed cave systems in Sicily (Biancone, 1994; Macaluso et al., 1994). With a total depth of 327 m, it is the deepest cave in Sicily. The system extends for approximately 1,100 m and consists of narrow, meandering galleries connected by a series of shafts up to 60 m deep, which are affected by water flow only during periods of prolonged rainfall (Di Maggio et al., 2012).
07 Grotta Conza	Sicily	Palermo	Palermo	38.187194 N 13.278944 E	60SI-PA	The cave develops within Upper Triassic limestone, opens at 175 m a.s.l., and extends for ~100 m. The passage slopes upward by ~30°, with an overall vertical relief of ~30 m, and the rock cover above the cave is relatively thin (~14 m). Although the cave is karstic, its morphology has been shaped by argillite within the Numidian Flysch underlying the carbonate succession, as well as by fractures and faults. These discontinuities increased the permeability of the soluble rocks, enhancing infiltration and dissolution. In contrast, the impermeable argillite acted as a barrier, locally retaining water within the carbonate levels and further promoting karstification. Because of its small size, the cave is strongly influenced by external thermal excursions (Mannino et al., 1986; Spena, 2007). No surface streams occur in the area; recharge is exclusively from rainfall percolation. Rainwater and percolation water produce a few temporary puddles near the entrance, while dripping water feeds rimstone pools inside the cave. These pools

						are isolated, and their morphology and position prevent them from being filled, even accidentally, by water accumulating elsewhere in the cave (Bruno et al., 2018).
08 Grotta Entella	Sicily	Palermo	Contessa Entellina	37.779208 N 13.113036 E	310SI-PA	The cave ranks among the largest caves in Sicily and is developed within the Rocca di Entella outcrop, composed of 2–3 m thick gypsum evaporitic layers deposited during the Messinian (Catalano, 1986).
09 Grotta Totino	Sicily	Agrigento	Cattolica Eraclea	37.445721 N 13.378778 E	Unregistered	The cave is a gypsum-hosted cavity affected by sulfur-related processes, likely a hypogenic cave of hydrothermal origin, with active discharge of $\sim 10 \text{ L s}^{-1}$. Samples were collected from dripwater-fed gours, where the substrate consisted of very fine clays.
10 Grotta Monte Conca	Sicily	Caltanissetta	Campofranco	37.488806 N 13.712917 E	3000SI-CL	The Monte Conca sinkhole is an active cave system developed within Messinian evaporites in central-western Sicily (Italy), inside the “Monte Conca” Strict Nature Reserve. It represents the longest and deepest gypsum karst system in Sicily, reaching a depth of 130 m and extending for more than 2.5 km (Madonia and Vattano, 2011). From the bottom of the fourth shaft, a 450 m-long gallery leads to the innermost sector, where a sulfidic pool is fed by groundwater seeping from the bedrock. Geochemical and microbiological investigations revealed intense bacterial activity, documented by floating filamentous microbial mats and sulfuric acid-rich biofilms (snottites) coating walls and ceilings (Messina et al., 2015). This pattern suggests the presence of a significant chemoautotrophic support by the microbial communities to the local food web, especially during the dry season when the organic input from the surface is minimal (Nicolosi et al., 2022). The cave floor mainly consists of exposed bedrock, locally covered by the stream, with clay, mud, gravel, and iron- and gypsum-rich deposits accumulating in the lower gallery. Seasonal hydrology strongly influences cave conditions. During the wet season (January-May), recharge from a tributary of the Gallodoro stream floods the

						system, often preventing access and transporting large amounts of allochthonous sediments and organic matter into the inner passages (Madonia and Vattano, 2011). In contrast, during the dry season (July-August), water flow ceases, leaving only isolated pools and promoting sulfur-oxidizing microbial communities (Davis et al., 2020).
11 Miniera di Streppenosa	Sicily	Ragusa	Modica	36.849419 N 14.708614 E	6043SI-RG	An underground asphalt mine with an entrance located in a trench cut into the mountainside and a total gallery development of 1,600 m. The tunnels were excavated to form a roughly orthogonal layout, with roofs supported by generally irregular pillars of variable cross-section. The workings extend on a single level, and the galleries are rather irregular in both length and orientation. In some sectors, to facilitate extraction of the mineralized rock, the tunnel alignment was inclined downward relative to the general elevation of the mine, creating local depressions where infiltration water accumulates. The southwestern sector is in fact almost entirely occupied by water, which in places reaches depths of up to 3 m.
12 Grotta Sette Calzette	Sicily	Ragusa	Ragusa	36.934111 N 14.725083 E	6027SI-RG	The cave is located within the San Leonardo quarry and has two entrances. The lower entrance opens into a large, water-filled chamber with a cistern on the right-hand side in complete darkness, where a small trickle flows. The upper entrance, located above the first, was dry at the time of the survey. The cave extends for approximately 30 m and consists of a simple, horizontal passage. It opens at 435 m a.s.l. within limestones and marly limestones of the Ragusa Formation (Upper Oligocene). The cave is a permanent resurgence and is characterized by persistent water accumulation.
13 Grotta Bremi	Sicily	Ragusa	Modica	36.887232 N 14.875619 E	6025SI-RG	It is the longest cave in the Province of Ragusa, with a total surveyed development of 500 m. It opens in calcarenites and marly limestones of the Ragusa Formation (Lower Miocene). The entrance is extremely small (50 cm wide and 40 cm high) and lies at 340 m a.s.l. Passage morphology varies

						markedly, reflecting the alternation of fractures and bedding planes: where water erosion and dissolution were focused along fractures, passages are relatively high but narrow, whereas where water flowed and dissolved preferentially along bedding planes, they are wider and characterized by a flat ceiling. In some sectors the rock cover above the cave is only ~10–15 m thick, allowing rapid percolation of irrigation water. The overlying land is used for crops that require daily irrigation during certain periods of the year, which can lead to flooding of some cave sections. At present, the cave ends beyond the last sump at a collapse.
14 Grotta Burritta	Sicily	Siracusa	Noto	36.972010 N 15.002073 E	7139SI-SR	The cave is approximately 60 m long, predominantly horizontal, meandering, and developed in limestone.
15 Grotta Monte Santa Venera	Sicily	Siracusa	Buccheri	37.151735 N 14.918658 E	Unregistered	The cave has a narrow entrance about 1 m high. Between the entrance and the first chamber, a corridor contains a small stream whose bed is composed of pelites with a few coarse clasts. Proceeding inward, the first chamber hosts small pools ~10 cm deep; one of them contains densely intertwined root systems forming a compact mat.
16 Grotta Villasmundo	Sicily	Siracusa	Melilli	37.221444 N 15.106194 E	7032SI-SR	The cave opens at the base of a carbonate cliff and extends for approximately 2,140 m, with a vertical range of 65 m. It develops within the upper part of the Monti Climiti Formation (Lower-Middle Miocene, 25-12 Ma), composed of detritic-organogenic calcarenites to calcirudites (Amore, 1998). Located at an elevation of 130 m along the banks of the Cugno di Rio stream, the cave represents the longest known karst system in the Hyblean district, with a total extension of about 2.5 km. It hosts a complex and still active hydrological network, including two perennial streams and a seasonal watercourse. These flow through passages mainly formed under vadose conditions and eventually converge in the innermost sector, where they feed the Lago Terminale. This terminal lake reaches a depth of 56 m and covers an area of approximately 400 m ² (Abbate, 2003).

17 Teatro greco-romano	Sicily	Catania	Catania	37.502670 N 15.083528 E	Unregistered	In the western parodos of the theatre, there is a late-built drainage channel made of reused materials. It was designed to carry away water that flooded the orchestra, entering through a small rectangular opening. Even today, when the groundwater table rises, water still gushes from this lower western side of the theatre, continuing to flood the orchestra (Nicoletti, 2015).
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