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New report of fossil crabs (Decapoda, Brachyura) from the late Eocene of San Feliciano Hill (Orgiano, Monti Berici, Vicenza, NE Italy)

Nuevo reporte de cangrejos (Decapoda, Brachyura) fósiles del Eoceno tardío en San Feliciano Hill (Orgiano, Monte Bérico, Vicenza, NE de Italia)

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ABSTRACT

The rich decapod assemblage from the late Eocene of San Feliciano hill (Orgiano, Monti Berici, Vicenza, NE Italy) was partially recorded by De Angeli and Garassino (2002, 2014). Herein, two new crabs, *Bericirinia bretoni* n. gen., n. sp. (Epialtidae MacLeay, 1838) and *Orgianocarcinus bericus* n. gen., n. sp. (Dairidae Ng and Rodriguez, 1986) are reported from San Feliciano Hill, located in Monti Berici, Orgiano. Moreover, two well-preserved specimens assigned to *Actaeites lobatus* Müller and Collins, 1991 (*Xanthoidea* MacLeay, 1838, *incertae sedis*) allowed to add some morphological characters to the original description of the holotype, lacking the fronto-orbital margin.

Keywords: Crustacea, Decapoda, Brachyura, Epialtidae, Dairidae, Xanthoidea, taxonomy, late Eocene, Italy.

RESUMEN

El rico conjunto de decápodos del Eoceno tardío del cerro San Feliciano (Orgiano, Monte Bérico, Vicenza, NE Italia) fue registrado parcialmente por De Angeli y Garassino (2002, 2014). En esta zona hay dos nuevos cangrejos, *Bericirinia bretoni* n. gen., n. sp. (Epialtidae MacLeay, 1838) y *Orgianocarcinus bericus* n. gen., n. sp. (Dairidae Ng y Rodríguez, 1986) encontrados en el cerro San Feliciano, localizado en Orgiano del Monte Bérico. Además estos dos ejemplares están bien conservados y asignados para *Actaeites lobatus* Müller y Collins, 1991 (*Xanthoidea* MacLeay, 1838, *incertae sedis*) lo que permitió añadir algunos caracteres morfológicos a la descripción original del holotipo donde se carece del margen fronto-orbitario.

Palabras clave: Crustacea, Decapoda, Brachyura, Epialtidae, Dairidae, Xanthoidea, taxonomía, Eoceno tardío, Italia.

1. Introduction and geological setting

San Feliciano hill is located on the southwestern side of Monti Berici between Orgiano and Lonigo (Figure 1). The studied specimens are preserved within the limestones including coralline algae and corals from the late Eocene (Priabonian), located in San Feliciano hill (Orgiano, Monti Berici, Vicenza, NE Italy) (Figure 2). The stratigraphic unit is the so-called “Formazione di Priabona” (late Eocene, Priabonian). The microfossil analysis by nannofossils provided by Beccaro (2003) confirmed the Priabonian age for all layers present in the quarry. The lowest layers are represented by a well-stratified greyish marly-limestone formation including many algae, nummulites, bivalves, several echinoderms, and rare decapod crustaceans [*Palaeocarpilius macrocheilus* (Desmarest, 1822)]. White-yellowish calcarenites, 6-7 meters thick, overlap the lower layers. These calcarenites including coralline algae, corals, rare mollusc

casts, and decapod crustaceans (De Angeli, 2016; Quaggiotto and De Angeli, 2019). Finally, the upper part is represented by marly limestones including nummulites, bryozoans, bivalves, and echinoderms. Many decapod crustaceans collected within the calcarenites were described by several authors (Fabiani, 1911; De Angeli and Garassino, 2002, 2014, in press; De Angeli and Lovato, 2009; De Angeli *et al.*, 2010a; De Angeli, 2016). The studied specimens, subject of this note, were collected from this calcarenite level of the quarry.

2. Material

The material includes 10 specimens, housed in the Museo Civico “Domenico Dal Lago” of Valdagno (Vicenza, NE Italy) (MCV). The sizes are expressed in millimetres. Anatomical abbreviations – lcxp: carapace length; wcxp: carapace width; wof: orbitofrontal margin width; wf: frontal width.

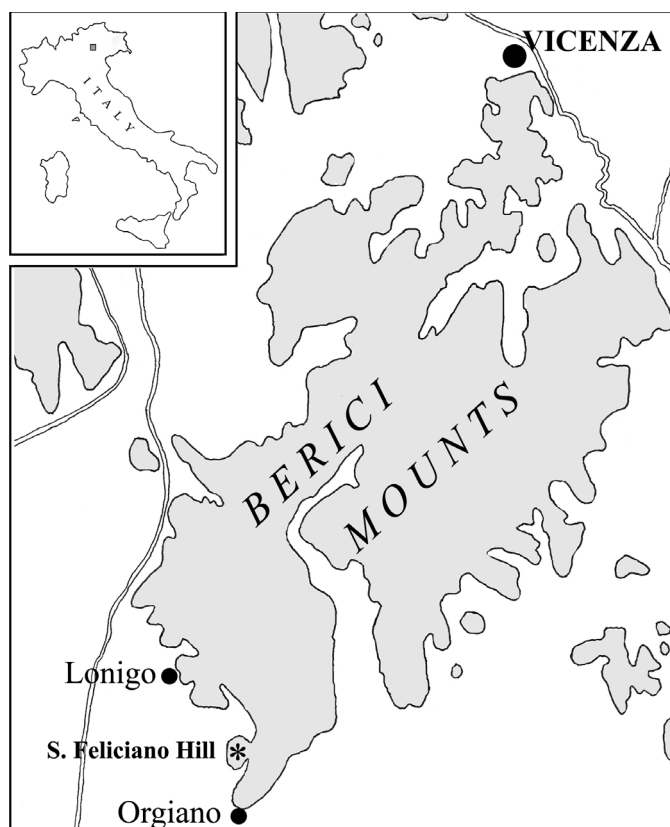


Figure 1 Map of Monti Berici with location (*) of San Feliciano hill (Orgiano, Monti Berici, Vicenza, NE Italy).



Figure 2 Close-up of the limestones including coralligenous algae and corals from the late Eocene (Priabonian) of San Feliciano hill.

3. Systematic paleontology

Order Decapoda Latreille, 1802
 Infraorder Brachyura Latreille, 1802
 Section Eubrachyura de Saint Laurent, 1980
 Subsection Heterotremata Guinot, 1977
 Superfamily Majoidea Samouelle, 1819
 Family Epialtidae MacLeay, 1838
 Subfamily Epialtinae MacLeay, 1838
 Genus *Bericirinia* n. gen.

Diagnosis: Triangular carapace, larger posteriorly, considerably wider than long, convex longitudinally; wide front; short, bifid rostrum, separated by U-shaped notch; preorbital angle blunt; orbits laterally directed; intercalated spine not present; divergent, smooth anterolateral margins; short posterolateral margins, strongly convergent; dorsal regions slightly raised and marked by weak grooves; frontal region with an axial depression running between epigastric lobes and protogastric regions; gastric, cardiac, and branchial regions with some tubercles and ovate swellings; dorsal surface with a scabrous-shaped small granules.

Etymology: from Monti Berici where the studied specimen was collected. Gender: feminine.

Type species: *Bericirinia bretoni* n. gen., n. sp., by monotypy.

Discussion: Based upon Davie *et al.*, (2015) and Schweitzer *et al.*, (2020), *Bericirinia* n. gen.

shows the main morphological characters shared with many spider crabs, such as the triangular carapace, larger posteriorly; narrow frontal margin; and orbits laterally directed. Moreover, the short, bifid rostrum and the lacking of the intercalated spine allow to assign the new genus to the Epialtidae MacLeay, 1838. Schweitzer *et al.*, (2020) provided a new classification of the Majoidea and within the Epialtidae which includes five fossil genera (*Epialtus* H. Milne Edwards, 1834; *Bolcapisa* Beschin, Busulini and Tessier in Beschin *et al.*, 2016; *Eoinachoides* Van Straelen, 1933; *Nanomaja* Müller and Collins, 1991; *Panticarcinus* Collins and Saward, 2006) and one extant-fossil genus (*Pugettia* Dana, 1851), *Panticarcinus* from the early Eocene (Ypresian) of UK is the only genus which shows affinities with *Bericirinia* n. gen. Indeed, both genera share the triangular carapace, larger posteriorly; oblique, divergent anterolateral margins; and dorsal regions with swellings and tubercles. *Panticarcinus*, however, differs from the new genus in having the carapace longer than wider and elongate single rostrum.

Bericirinia bretoni n. gen., n. sp.

Figure 3

Diagnosis: as for the genus.

Etymology: the species is named in honour of Gérard Breton (1944-2020), in recognition of

his major contributions to the knowledge of the palaentology and invertebrate fossils.

Holotype: MCV.2021/003-I.G.21.23, by monotypy.

Type locality: San Feliciano hill (Orgiano, Monti Berici, Vicenza, NE Italy).

Geological age: late Eocene (Priabonian).

Material and measurements: one carapace in dorsal view (MCV.2021/003-I.G.21.23 – lcxp: 32.8 mm, wcxp: 34.2 mm, wof: 18 mm).

Description: Triangular carapace, convex longitudinally, larger posteriorly, slightly wider than long (lcxp/wcsp = 0.95), widest between angles of antero- and posterolateral margins; wide front; short, bifid rostrum, separated by

U-shaped notch; preorbital angle blunt; orbits laterally directed; divergent, elongate, and smooth anterolateral margins; short posterolateral margins, strongly convergent; relatively wide posterior margin, partially preserved; dorsal regions slightly raised and marked by shallow grooves; frontal region depressed axially; frontal axial depression running along epigastric and protogastric regions; epigastric lobes with two ovate swellings; raised protogastric regions with three swellings; relatively raised metagastric regions with two swellings; narrow, depressed urogastric region; cardiac region well marked by branchiocardiac grooves laterally, with two swellings; branchial region marked anteriorly by cervical groove with one strong

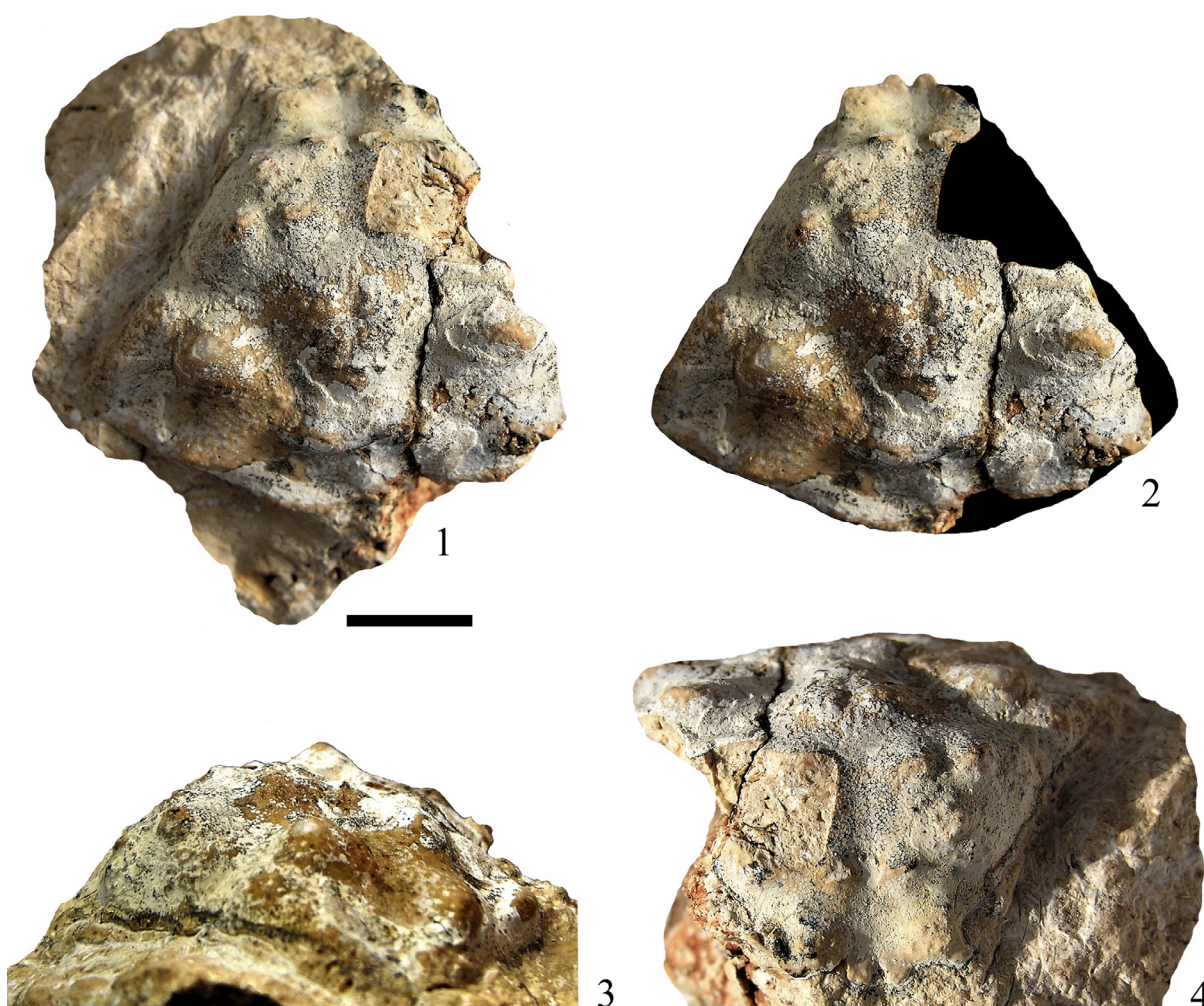


Figure 3 *Bericirinia bretoni* n. gen., n. sp., holotype, MCV.21/003-I.G.21.23; 1. dorsal view; 2. dorsal digital reconstruction; 3. lateral view; 4. frontal view. Scale bar equals 5 mm.

epibranchial swelling, one weakly raised transverse mesobranchial swelling, and one weakly transverse metabranchial swelling; dorsal surface with a scabrous-shaped small granules.

Superfamily Dairoidea Serène, 1965
Family Dairidae Ng and Rodriguez, 1986
Genus *Orgianocarcinus* nov.

Diagnosis: Obovate, convex carapace, wider than long; narrow front, slightly downturned and axially depressed; round orbits having supraorbital margin with two narrow fissures; convex anterolateral margin with 7 spines; short, concave posterolateral margin with 6-7 spines; straight posterior margin; well-distinct dorsal regions with large, obovate or rounded crater-shaped lobules, surrounded by smaller tubercles.

Type species: *Orgianocarcinus bericus* n. gen., n. sp., by monotypy.

Etymology: from San Feliciano hill Orgiano, where the studied specimens have been collected and *carcinus* = crab. Gender: masculine.

Discussion: The main morphological characters of the studied specimens fit those of the Dairidae Ng and Rodriguez, 1986. Indeed, the rounded shape of the orbits, with raised, tuberculate supraorbital margin; bilobate front, slightly downturned; and antero- and posterolateral margins with spines are shared with the extant and fossil *Daira* De Haan, 1833, well known from the Paleogene of Veneto with several species (De Angeli and Garassino, 2006; De Angeli *et al.*, 2019). *Orgianocarcinus* n. gen. differs, however, in having dorsal regions with some large obovate or rounded crater-shaped tubercles (vs. dorsal regions with many small mushroom-shaped lobules uniformly arranged in *Daira*). Although the studied specimen lacks the ventral parts, useful for its systematic assignment, the closer affinities are with the representatives of the Dairidae to which it is confidentially assigned.

The ornamentation with large obovate or rounded crater-shaped lobules, resembling the coral look, could be a perfect camouflage system for *Orgianocarcinus* n. gen. which lived within the corals.

Orgianocarcinus bericus n. gen., n. sp.

Figure 4

Diagnosis: as for the genus.

Etymology: The trivial name alludes to Monti Berici where the studied specimens have been discovered.

Holotype: MCV.21/008-I.G.21.28.

Paratypes: MCV.21/004-I.G.21.24; MCV.21/005-I.G.21.25; MCV.21/006-I.G.21.26; MCV.21/007-I.G.21.27; MCV.21/009-I.G.21.29; MCV.21/010-I.G.21.30.

Geological age: late Eocene (Priabonian).

Type locality: San Feliciano hill (Orgiano, Monti Berici, Vicenza, NE Italy).

Material and measurements: seven specimens with well-preserved carapace (MCV.21/004-I.G.21.24 – lcxp: 8.2; wcxp: 11.4; wof: 6; wf: 4.2; MCV.21/005-I.G.21.25 – lcxp: 8.4; wcxp: 11.8; MCV.21/006-I.G.21.26 – lcxp: 7.7; wcxp: 10.8; wof: 5.8; MCV.21/007-I.G.21.27 – lcxp: 4.9; wcxp: 6.9; MCV.21/008-I.G.21.28 – wcxp: 9.4; MCV.21/009-I.G.21.29 – wcxp: 8; MCV.21/010-I.G.21.30 – lcxp: 5; wcxp: 7).

Description: Obovate carapace, convex in both sections, above all longitudinally, wider than long (lcxp/wc xp = 0.71); wide orbitofrontal margin half of maximum carapace width; front weakly protruded beyond orbits, slightly downturned and axially depressed; round orbits; raised supraorbital margin with two narrow fissures; preorbital angle with one tubercle; medial orbital tooth with one tubercle; subtriangular extraorbital tooth; convex anterolateral margin with 7 spines; short, slightly concave posterolateral margin with 6-7 spines; straight posterior margin, as wide as front; dorsal regions well marked by grooves; frontal region with medial longitudinal depression; epigastric lobes with two ovate swellings; slightly raised protogastric regions with tubercles; subtriangular, elongate mesogastric region with one longitudinal, ovate lobe; well-distinct metagastric region with one large ovate lobe; subpentagonal cardiac region with two lobes anteriorly and one lobe posteriorly; depressed intestinal region with a

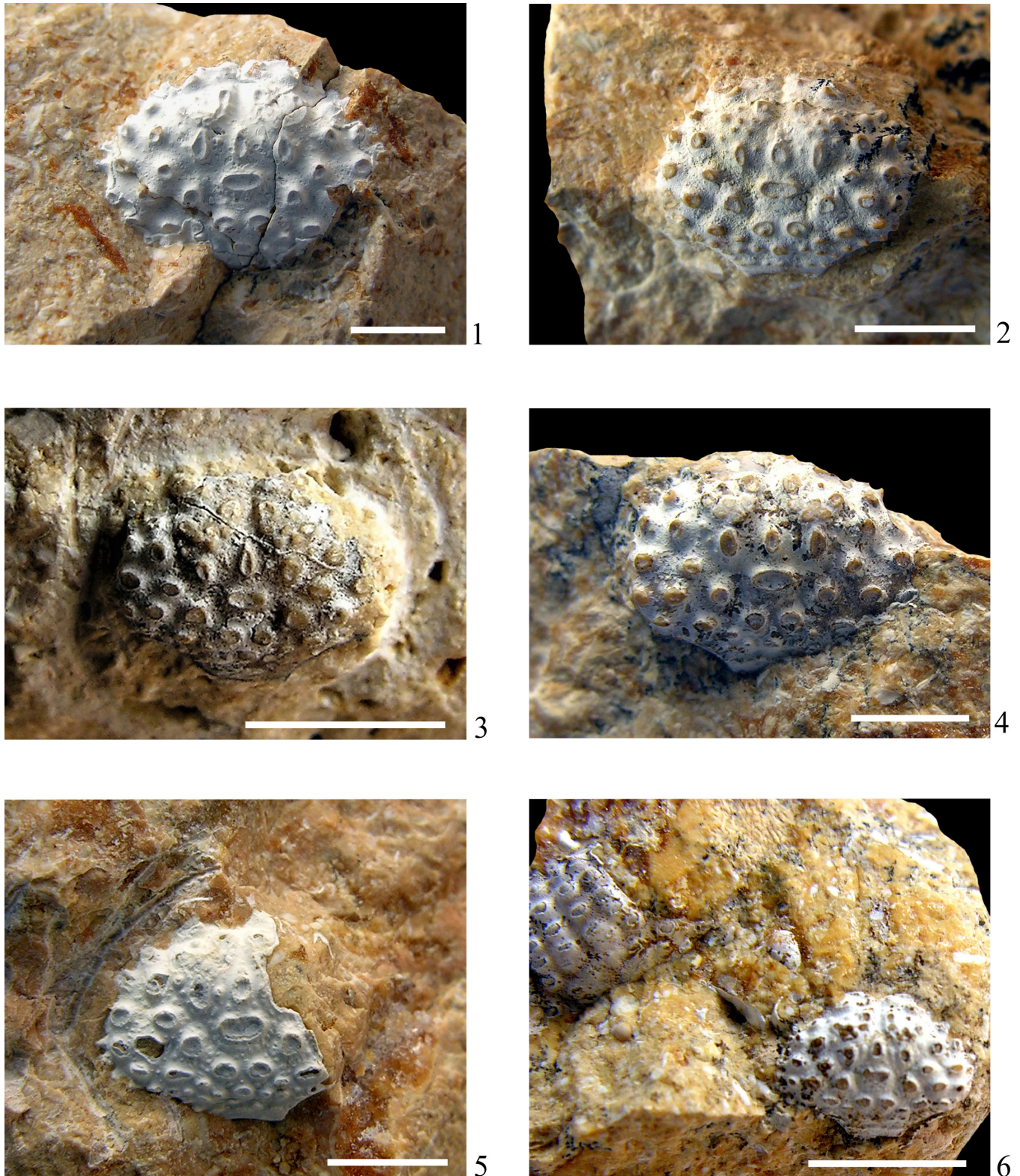


Figure 4 *Orgianocarcinus bericus* n. gen., n. sp., 1. holotype, MCV.21/008-I.G.21.28, dorsal view; 2. paratype, MCV.21/004-I.G.21.24, dorsal view; 3. paratype, MCV.21/010-I.G.21.30, dorsal view; 4. paratype, MCV.21/006-I.G.21.26, dorsal view; 5. paratype, MCV.21/009-I.G.21.29, dorsal view; 6. paratype, MCV.21/007-I.G.21.27, dorsal view. Scale bar equals 5 mm.

transverse row of 6-7 tubercles; triangular hepatic regions well marked by cervical groove with three lobes; branchial regions with 4 epibranchial lobes, 4 mesobranchial lobes, and three smaller meta-branchial lobes.

Cephalic and thoracic appendages and ventral parts not preserved.

Superfamily Xanthoidea MacLeay, 1838 (*incertae sedis*)

Genus *Actaeites* Müller and Collins, 1991

Type species: *Actaeites lobatus* Müller and Collins, 1991, by monotypy.

Fossil species: *Actaeites lobatus* Müller and Collins, 1991.

Actaeites lobatus Müller and Collins, 1991

Figure 5

Actaeites lobatus Müller and Collins, 1991: 70, fig. 4c, Pl. 4, figs. 9, 10.

Actaeites lobatus — Karasawa and Schweitzer, 2006: 50. — Beschin *et al.*, 2007: 56, Pl. 9, figs. 2a-b, 3, 4. — De Angeli and Beschin, 2008: 32, fig. 10, Pl. 4, fig. 4. — De Angeli *et al.*, 2010b: 167, fig. 13.

— Schweitzer *et al.*, 2010: 129. — Beschin *et al.*, 2015: 93, Pl. 7, fig. 4. — Beschin *et al.*, 2016: 137, Pl. 17, fig. 8. — Beschin *et al.*, 2018: 196, fig. 128a, b. — De Angeli *et al.*, 2019: 37.

Geological age: late Eocene (Priabonian).

Locality: San Feliciano hill (Orgiano, Monti Berici, NE Italy).

Material and measurements: two specimens with well-preserved carapace (MCV.21/001-I.G.21.21 – lcxp: 10; wcxp: 12; MCV.21/002-I.G.21.22 – lcxp: 15.1, wcxp: 29; wo-f: 14.8; wof: 8).

Emended diagnosis: Convex carapace, wider than long; bilobate front, depressed axially, with small marginal spines; orbits moderately wide, separated from the front by a deep groove; supraorbital margins with two fissures; convex anterolateral margins with three spines (excluding the extraorbital spine); dorsal regions of the carapace covered by small tubercles uniformly arranged, marked by smooth grooves.

Discussion: *Actaeites lobatus* was described based upon the morphological characters of the holotype (MAFI EF-22.1 [M.91-153]) from the Priabonian of Budapest (Müller and Collins, 1991). The orbitofrontal margin poorly preserved and the lacking of ventral parts did not allow a right systematic assignment of this species (Kara-

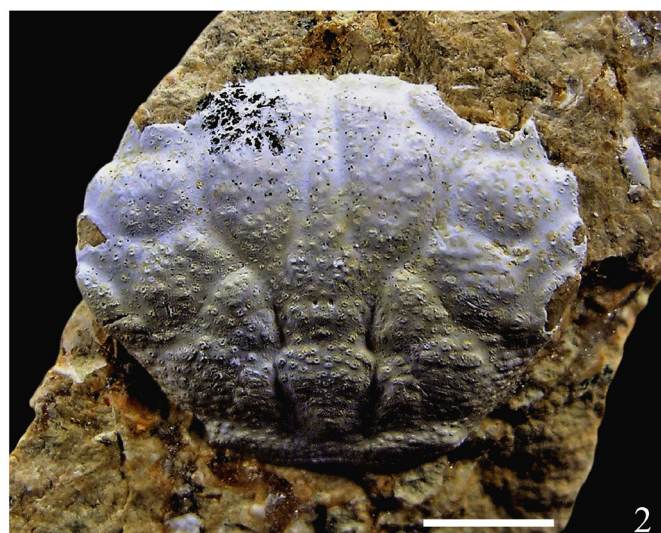
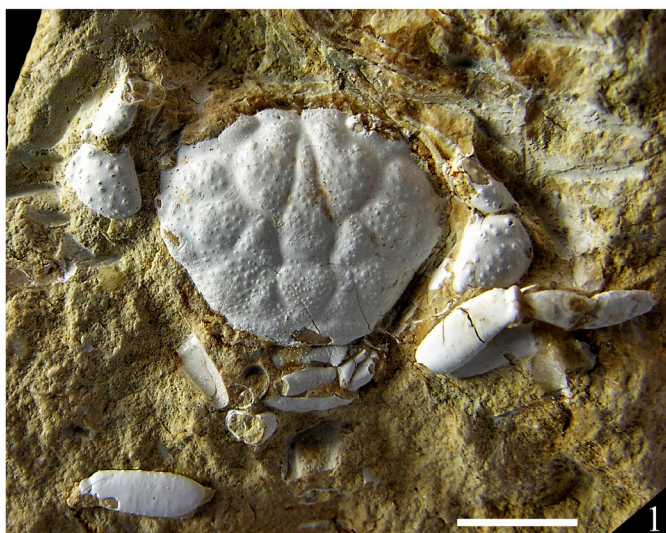


Figure 5 *Actaeites lobatus* Müller and Collins, 1991, 1. MCV.21/001-I.G.21.21, dorsal view; 2. MCV.21/002-I.G.21.22, dorsal view. Scale bar equals 5 mm.

sawa and Schweitzer, 2006). Fortunately the studied specimens preserved the anterior part of the carapace, lacking in the holotype, allowing to amend the original diagnosis. Moreover, one studied specimen (MCV.21/001-I.G.21.21) preserves incomplete chelipeds, walking legs, and three male pleonal somites. The chelipeds have carpus and propodus covered by small tubercles. The dorsal regions of the carapace are covered by small tubercles uniformly arranged, marked by smooth grooves.

Except the Priabonian of Hungary, this species has been recorded from the early Eocene (Ypresian) of Geccholina di Monte di Malo (Vicenza), Vestenanova and Zovo di Bolca (Verona); from the late Eocene (Priabonian) of Campolongo di Val Lione and San Feliciano Hill (Vicenza); and from the early Oligocene of Soghe and Bernuffi di Montecchio Maggiore (Vicenza) (Beschin *et al.*, 2007, 2015, 2016, 2018; De Angeli and Beschin, 2008; De Angeli *et al.*, 2010b).

4. Conclusions

The previous reports of decapod crustaceans from the late Eocene of San Feliciano hill include anomurans [*Galathea berica* De Angeli and Garassino, 2002, *Acanthogalathea parva* Müller and Collins, 1991, *A. feldmanni* De Angeli and Garassino, 2002, *Palaeomunida defecta* Lörentz, 1901, *P. multicristata* De Angeli and Garassino, 2002, *Sadayoshia pentacantha* (Müller and Collins, 1991), *Beripetrolisthes mulleri* De Angeli and Garassino, 2002, *Eopetrolisthes striatissimus* (Müller and Collins, 1991), *Lobipetrolisthes blowi* De Angeli and Garassino, 2002, *Longoporcellana lobata* De Angeli and Garassino, 2002, *Petrolisthes bittneri* De Angeli and Garassino, 2002, *Pisidia dorsosinuosa* De Angeli and Garassino, 2002, *Spathagalathea minuta* De Angeli and Garassino, 2002], brachyurans (*Eogarthambrus guinotae* De Angeli, Garassino and Alberti, 2010a, *Phlyctenodes dalpiazzi* Fabiani, 1911, *Spathanomus felicianensis* De Angeli, 2016; *Caporiondulus bericus* De Angeli, 2016), achelata (*Palinurellus bericus* De Angeli and

Garassino, 2014), and isopods (*Sphaeroma gasparellai* De Angeli and Lovato, 2009) (Fabiani, 1911; De Angeli and Garassino, 2002, 2014; De Angeli and Lovato, 2009; De Angeli *et al.*, 2010a; De Angeli, 2016). Moreover, a carapace of *Lobipetrolisthes blowi* with isopod (bopyrid) infestation was recorded by Ceccon and De Angeli (2013).

Three new brachyurans *Bericirinia bretoni* n. gen., n. sp., *Orgianocarcinus bericus* n. gen., n. sp. and *Actaeites lobatus* Müller and Collins, 1991) increase the knowledge of the decapod assemblage of San Feliciano hill. The fossiliferous level which preserves the decapod crustaceans is rich of coralline algae, corals, rare molluscs, pointing out the presence of a coral reef during the late Eocene on the southeastern side of Monti Berici (De Angeli and Beschin, 2004; Beschin *et al.*, 2018). Some species recorded in the decapod assemblage of San Feliciano hill were previously reported from the late Eocene of Hungary by Müller and Collins (1991).

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