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Original article

Late Carnian (Tuvalian, *Tropites dilleri* zone) ostracods (Crustacea) from the Mufara Formation (Monte Scalpello, Central-Eastern Sicily, Italy)

Ostracodes (Crustacea) du Carnien supérieur (Tuvalian, zone à Tropites dilleri*) de la Formation Mufara (Monte Scalpello, Sicile centro-orientale, Italie)*

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ABSTRACT

Ostracod association from the Upper Triassic (*Tropites dilleri* zone of the Carnian stage) of the sedimentary succession (Mufara Formation) exposed along the east side of Monte Scalpello (Catenanuova, central eastern Sicily) has been studied for the first time. The specimens, silicified, are rare but well preserved and often consist of complete carapaces. They belong to eight families: Healdiidae, Cavellinidae, Bairdiidae, Acratiidae, Bythocyprididae, Pontocyprididae, Judahellidae, Glorianellidae. Twenty-three taxa have been listed; the family Bairdiidae is the most represented among all the others with fifteen species. Four species are new: *Bairdia scaliae* n. sp., *Acratia maugerii* n. sp., "*Anchistrocheles*" *gemmellaroi* n. sp. and *Judahella? montanarii* n. sp. Other species are left in open nomenclature because of the lack of specimens.

Mots clés :
Ostracodes: Trias supérieur
Néotéthys
Sicile centre-orientale
Mont Scalpello
Formation Mufara
Paléoenvironnement
Nouvelles espèces

RÉSUMÉ

L'association d'ostracodes de la succession sédimentaire du Trias supérieur (Carnien, zone à *Tropites dilleri* Formation Mufara) affleurant du côté oriental du Monte Scalpello (Catenanuova, Sicile centre-orientale) a été étudiée pour la première fois. Les spécimens, silicifiés, sont rares, mais bien conservés et se composent souvent de carapaces complètes. Les espèces appartiennent à huit familles : Healdiidae, Cavellinidae, Bairdiidae, Acratiidae, Bythocyprididae, Pontocyprididae, Judahellidae, Glorianellidae. La famille Bairdiidae est la plus représentée avec quinze espèces sur les vingt-trois répertoriées. Quatre espèces sont nouvelles : *Bairdia scaliai* n. sp., *Acratia maugerii* n. sp., "*Anchistrocheles*" *gemmellaroi* n. sp. et *Judahella ? montanarii* n. sp. D'autres espèces sont laissées en nomenclature ouverte.

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1. Introduction

After the first studies on Mesozoic sediments cropping out in the Monte Scalpello area carried out since the early 19th century (Calcara, 1840, 1845; Nelli, 1899a, b; Marinelli, 1899; Gemmellaro, 1860, 1904), the Upper Triassic fauna of "Clay-calcareous-arenaceous alternation" ("Flysch Carnico" *Auct.*), best referring to the "Mufara Formation" (Schmidt di Friedberg and Trovò, 1962) of the "Monte Judica Group" (Scalia, 1909) have been the subject of numerous palaeontological detailed studies on invertebrates: the molluscs have been studied by Scalia (1907a, 1909, 1910, 1912, 1914), the cnidaria by Maugeri Patanè (1934), the ammonites by Lentini (1974), the foraminifers, chaetetids, sphinctozoans and other organisms by Carrillat and Martini (2009).

So far, ostracods (Crustacea) coming from the Mufara Formation in the Monte Scalpello area never have been studied; the only references to these organisms are found in Lentini (1974) which refers about a high level of the Mufara Formation rich in *Bairdiidae* and in Carrillat and Martini (2009) which cites, only the presence of this organisms.

The present paper, therefore, wants to be a first contribution to the knowledge of the ostracod fauna of the Mufara Formation clays outcropping in the Monte Scalpello area. Furthermore, this analysis is an important step in the knowledge of the recovery of ostracod fauna after the Permian–Triassic massive extinction. The data on Middle and early Late Triassic are rare.

2. Materials and methods

Monte Scalpello is located (Fig. 1) in central eastern Sicily in the right side of Dittaino River to the south west of the town of Catenanuova (EN), 40 kilometers west of Catania (F 633 IV NO of the Carta d'Italia alla scala 1:25,000). It is inserted, as part of the "Monte Judica Units" (Lentini et al., 1987), along the northern margin of the Gela Foredeep, in the geodynamic context (Fig. 2) of the southern end of the Maghrebian–Sicilian-Southern Apennine nappes and as

Fig. 1. Geographical location of the sampling area.
Localisation géographique de la zone d'étude.

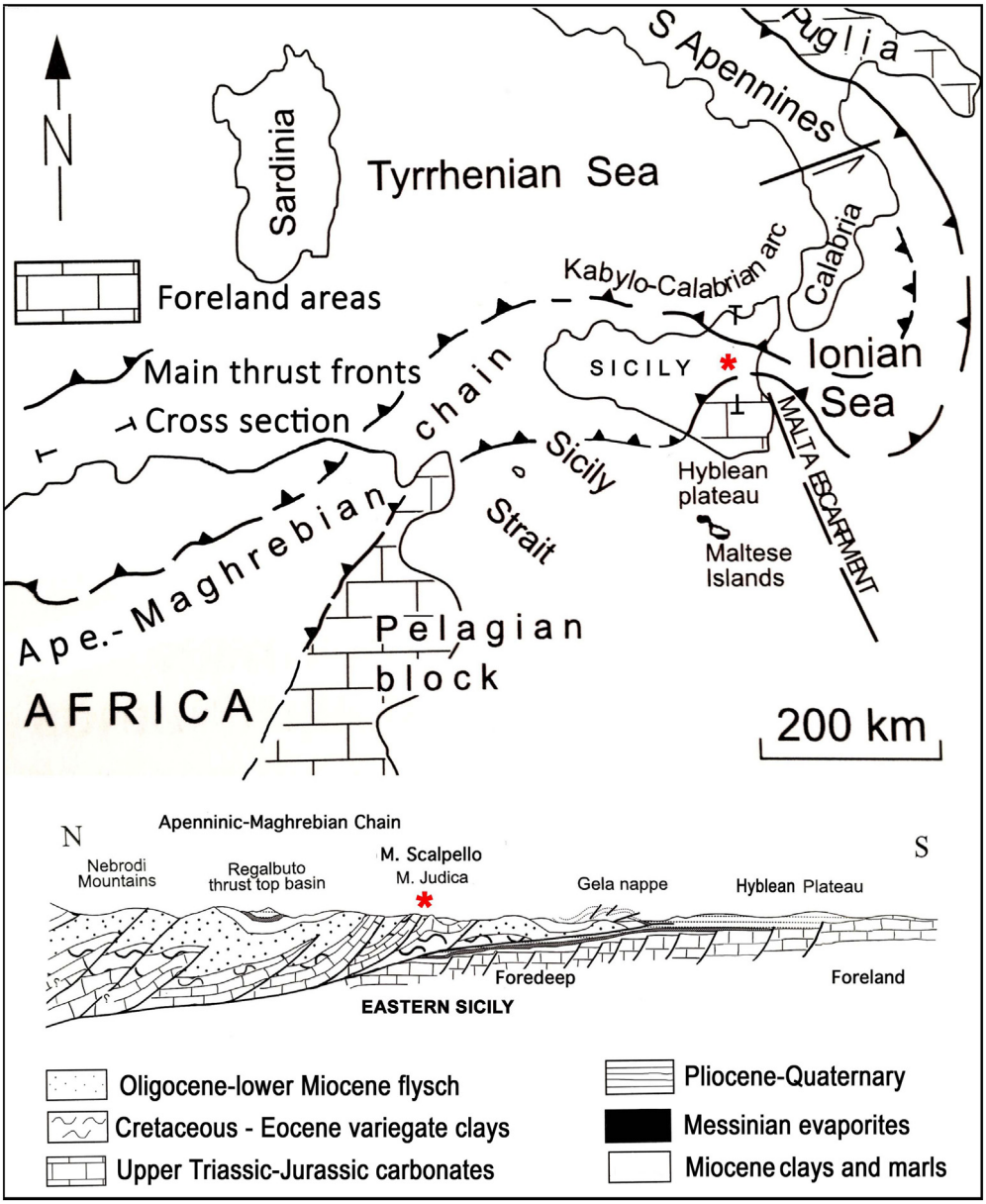

Fig. 2. Structural scheme of the central Mediterranean area with the location of the study area (after Grasso, 2001 modified).
Schéma structural de la Méditerranée centrale avec la localisation de la zone d'étude (d'après Grasso, 2001 modifié).

such, it would dwarf the mildly folded foreland (Hyblean Plateau) (Lentini et al., 1987; Grasso, 2001 inter alias).

The Monte Scalpello area is lithologically characterized by a Mesozoic-Cainozoic sediments complex belonging to the so-called Imerese Succession (Lentini et al., 1987; Montanari, 1987; inter alias) or Imerese-Sicano Succession (Carrillat and Martini, 2009; Di Paolo et al., 2012). This sedimentary succession settled inside the pelagic Imerese Basin which had formed during the Meso-Cenozoic extensional phases and which was delimited by the Panormide Carbonate Platform to the west and the Trapanese Carbonate Platform to the east and to the south (Fig. 3) (Catalano and D'Argenio, 1982; Montanari, 1987; Speranza and Minelli, 2014).

The Imerese Basin, therefore, is represented by the transitional pelagic facies between the Panormide and Trapanese shelf facies, on the one hand, and the bathyal facies of the Neo-Tethys, on the other (Fig. 3).

The Imerese succession of Monte Scalpello (Fig. 4) starts with the "Carnian Flysh" (Auctorum) or, according to Schmidt di Friedberg and Trovò (1962), the Mufara Formation. This unit, outcropping in the southern slopes of the mount, is prevalently constituted by dark grey clays rich in ammonites with rare interbedded levels of fossiliferous calcarenites and fibrous calcite with *Halobia* spp. imprints.

The detailed stratigraphic attribution of Mufara Formation has been the subject of different opinions since the beginning of the twentieth century; Calcara (1840, 1845); Nelli (1899a, b); Gemmellaro (1904); Scalia (1907b, 1910, 1912, 1914); Maugeri Patanè (1934); Lentini (1974) and Dal Sasso et al. (2014) assigned these sediments to the Late Triassic (Carnian).

Lentini (1974), on the basis of the ammonites fauna found, attributes the lowest levels of Monte Scalpello section, to the *Trachyceras aonoides* ammonite zone of the Early Carnian; nevertheless the presence of *Tropitidae* among the specimens coming out from

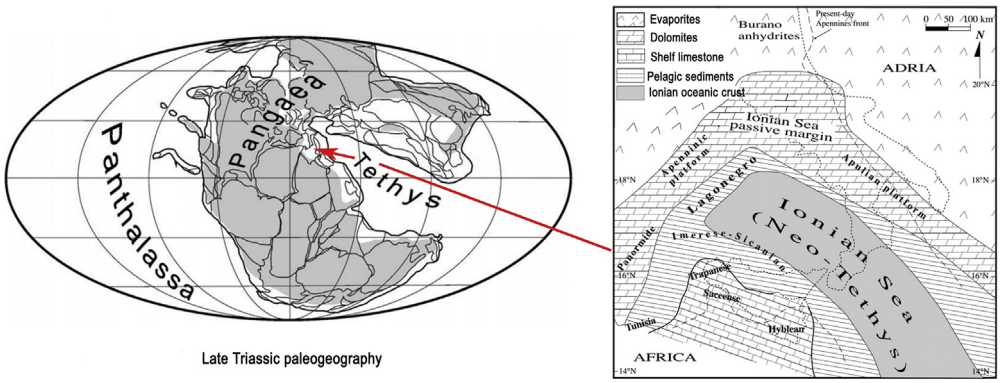

Fig. 3. Schematic palaeogeographic reconstruction of Pangaea and Neo-Tethys in Late Triassic times (after Speranza & Minelli (2014), Golonka, 2007 and Preto et al., 2010 modified).
Reconstruction paléogéographique schématique de la Pangée et de la Néo-Téthys à la fin du Trias (d'après Speranza & Minelli, 2014; Golonka, 2007 et Preto et al., 2010 modifié).

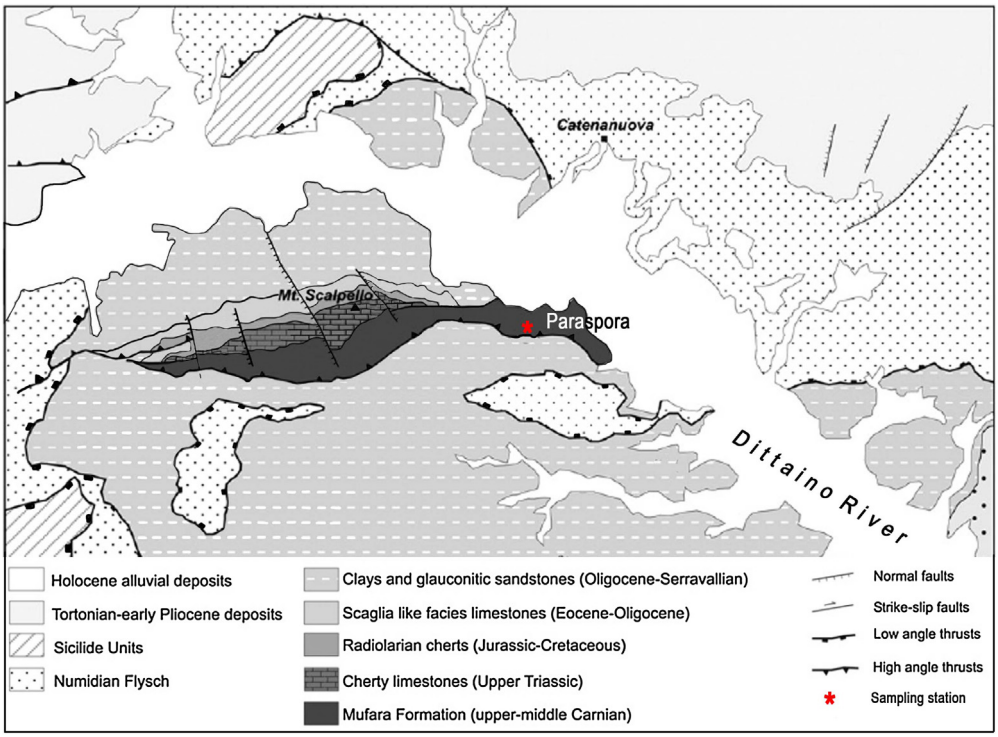

Fig. 4. Geological map of the Monte Scalpello area (after Lentini, 1974 and Di Paolo et al., 2012, modified).
Carte géologique de la région de Monte Scalpello (d'après Lentini, 1974 et Di Paolo et al., 2012, modifié).

this levels, excludes that this formation belongs to the Early Carnian (Lucas, 2010; Jenks et al., 2015).

The subsequent sedimentary layers are attributed, again by Lentini (1974), to the *Tropites subbullatus* zone; nevertheless the contemporary presence of specimens of *Trachyceratidae* (?*Neoprotrachyceras, Trachysagenites, Pamphagosirenites*) found by the authors of the present paper, and specimens of *Tropitidae*, suggests that both this fossiliferous horizons can be referred to the *Tropites dilleri zone* (Lucas, 2010; Jenks et al., 2015). A confirmation of this datum comes from Carrillat and Martini (2009) who, mostly on the basis of the foraminifers, refer the same clays of Mufara Formation outcropping at Monte Gambanera, nine kilometers to the south of the studied area, to the upper part of the Late Carnian (*Tropites subbullatus/Anatropites spinosus* zones). According to Jenks et al. (2015), the base of Tuvalian Substage (upper part of the Carnian Stage) is characterized by the appearance and radiation of the *Tropitidae*. Therefore, the presence of *Tropitidae* reported already by Gemmellaro (1904); Scalia (1909) and Lentini (1974) removes all doubts about the attribution of these sedimentary levels out cropping, to the Tuvalian substage (Late Carnian, *Tropites dilleri* zone) (Fig. 5).

Over the Mufara Formation follow conformably the Upper Triassic cherty limestone with *Halobia*, the Jurassic – Cretaceous radiolarian cherts and unconformably the Eocene – Oligocene limestone ("Scaglia"). The stratigraphic sequence is finally closed by Oligocene – Miocene clays and glauconitic sandstones.

For the present work, twenty kilograms of sediments were collected from one stratigraphic level of the Mufara Formation cropping out in contrada Paraspora, two hundred meters southwest of Masseria Mannino (37°32′56.86″N; 14°40′30.64″E) along the east side of Monte Scalpello, (Figs. 1, 4). Sediments were routinely washed, dried in oven and sieved. Then, ostracod specimens were picked out from the >63 μm fraction. The ostracod specimens were examined and measured under a stereomicroscope,

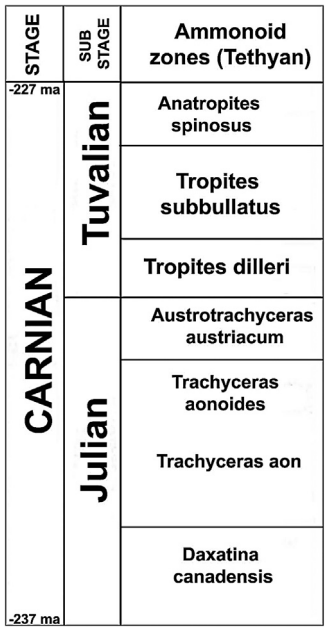

Fig. 5. Carnian Ammonoid zones (after Lucas, 2010 modified).
Zones à ammonoidés du Carnien (d'après Lucas, 2010, modifié).

then photographed under an LMU Tescan Vega II SEM. The material is housed in the Palaeontological Museum of the University of Catania. The repository number of the holotypes and the paratypes are given in the systematic descriptions.

3. Results

The sample taken results to be constituted mostly by pelitic sediments, indeed almost the entire sediment is passed over the 63 μm sieve. The poor washing residue (about 100 grams) provided in order of abundance, gastropods, brachiopods, bivalves and crinoids, echinoids skeletal fragments and small size ammonites. Microfauna is very poor in foraminifers represented prevalently by the genera *Glomospira* and *Hemidiscus*; ostracods, the majority of which is constituted by juvenile forms, are relatively abundant.

4. Systematic palaeontology

Ostracods from a sample of clay of the Mufara Formation taken at the base of Monte Scalpello are systematically listed. The specimens belong to the Order Metacopida Sylvester-Bradley, 1961 and Podocopida Sars, 1866 and eight families Healdiidae Harlton, 1933, Cavellinidae Egorov, 1950, Bairdiidae Sars, 1866, Acratiidae Gründel, 1962, Bythocyprididae Maddocks, 1969, Pontocyprididae Müller, 1894, Judahellidae Sohn, 1968, Glorianellidae Snejder, 1960.

Abbreviations. L: length; H: height; T: thickness; RV: right valve; LV: left valve; DB: dorsal border; VB: ventral border; AB: anterior border; PB: posterior border; PVB: postero-ventral border; AVB: antero-ventral border; PDB: postero-dorsal border; PVB: postero-ventral border.

Class Ostracoda Latreille, 1806
Order Metacopida Sylvester-Bradley, 1961
Suborder Metacopina Sylvester-Bradley, 1961
Superfamily Healdioidea Harlton, 1933
Family Healdiidae Harlton, 1933
Genus ***Ogmoconchella*** Gründel, 1964 emend Michelsen, 1975

Type species: *Healdia aspinifera* Drexler, 1958

Ogmoconchella felsooersensis **(Kozur, 1970)**

Fig. 6 A–B

1970 *Healdia (Healdia) felsooersensis* n. sp. – Kozur, p. 409, pl. 3, fig. 13, pl. 4, figs; 1–6
1995 "*Hungarella*" *felsooersensis* (Kozur, 1970) – Monostori, p. 40–41, pl. 1, figs. 2–4
1996 *Healdia (Healdia) felsoorensis* Kozur, 1970 – Crasquin-Soleau and Gradinaru, pl. 9, fig. 14
2013 *Healdia (Healdia) felsooersensis* Kozur, 1970 – Sebe et al., pl. 4, fig. 14
2013 *Hungarella problematica* (Méhes, 1911) – Monostori and Toth, p. 308, Pl. 4, Figs. 14–17
Material: 2 complete carapaces.
Dimensions (figured specimen): L = 790–810 μm; H = 580 μm; T = 380 μm.
Stratigraphic and geographic range: Early Anisian of Felsőörs, Balaton Highland, Hungary (Kozur, 1970, Monostori, 1995), Early Anisian of Dobrogea, Romania (Sebe et al., 2013), Late Carnian (*Tropites dilleri* zone), Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).
Remarks: A great confusion exists in the systematics of Late Permian – Triassic Healdiidae genera *Hungarella* – *Ogmoconcha* – *Ogmochonchella*.
Some authors consider *Hungarella* Méhes, 1911 (which has not type material–Monostori, 1995, p. 40) and *Ogmoconcha* Triebel, 1941 as synonyms (Moore, 1961; Anderson, 1964). Shaver (*in* Moore, 1961) and Sohn (1968) do not agree with this synonymy. In fact, the two genera are extremely close. The third genus *Ogmoconchella* was introduced by Gründel (1964) and emended later by Michelsen (1975) mainly on the presence of a spine at PVB. We use here this character to attribute the species *felsooersensis* to *Ogmoconchella*.

Genus ***Healdia*** Roundy, 1926
Type species *Healdia simplex* Roundy, 1926

Healdia? **sp.**
Fig. 6 C–D.

Material: 2 complete carapaces.
Dimensions: fig. 6C: L = 660 μm; H = 580 μm; fig. 6d: L= 680 μm, T = 310 μm.
Stratigraphic and geographic ranges: Late Carnian (*Tropites dilleri* zone), Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).
Remarks: In right lateral view, the carapace has all the characteristics of the genus *Healdia*. However, the dorsal view is very far from this genus. Indeed, here the carapace is biconvex with a maximum of thickness at mid-L (in *Healdia* genus the posterior part of the carapace is truncated) and here, there is only one spine at RV (in *Healdia* genus spines are present at PVB of both valves) As far as the muscle scars cannot be observed, the figured specimens are dubiously attributed to the genus *Healdia.*

Superfamily Cavellinoidea Egorov, 1950
Family Cavellinidae Egorov, 1950

Genus ***Bektasia*** Özdikmen, 2010
Type species. *Reubenella avnimelechi* Sohn, 1968

***Bektasia* sp.1**
Fig. 6 E

Material: 1 carapace.
Dimensions: L = 662 μm; H = 420 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Fm outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).
Remarks: this specimen could be compared to *Bektasia subcynlindrica* (Sandberg, 1866) *in* Kristan-Tollmann, 1973 from the Carnian of North Italy (Kristan-Tollmann, 1973) which has a similar lateral outline but has a shorter ADB and deeper sulci.

Order Podocopida Sars, 1866
Suborder Bairdiocopina Gründel, 1967
Superfamily Bairdioidea Sars, 1866
Family Bairdiidae Sars, 1866
Genus ***Hiatobairdia*** Kristan-Tollmann, 1970
Type species *Hiatobairdia subsymmetrica* Kristan-Tollmann, 1970
***Hiatobairdia subsymmetrica* Kristan-Tollmann, 1970**

Fig. 6 F–H

1970 *Hiatobairdia subsymmetrica* n. gen. n. sp. – Kristan-Tollmann, p. 268, pl. 35, figs. 1–3.
1976 *Hiatobairdia subsymmetrica* Kristan-Tollmann, 1970 – Tollmann, 1976, p. 276, pl. 163, fig. 14.
1978 *Hiatobairdia subsymmetrica deformis* n. sp. – Kristan-Tollmann, p. 83, pl. 4, figs. 1–7
1979 *Hiatobairdia subsymmetrica* Kristan-Tollmann, 1970 – Kristan-Tollmann et al., p. 147, pl. 6, fig. 4.
Material: 3 complete carapaces.
Dimensions (specimen figured in fig. 6 F): L = 1040 μm; H = 520 μm.
Stratigraphic and geographic range: Early Carnian of South Tirol, Italy (Tollmann, 1976; Kristan-Tollmann, 1978), Late Carnian (*Tropites dilleri* zone; this work), Rhaetian of Austrian Alps (Kristan-Tollmann, 1970) and Central Iran (Kristan-Tollmann et al., 1979).
Remarks: the Triassic genus *Hiatobairdia* Kristan-Tollmann, 1970 and the Permian genus *Kempfina* Crasquin, 2010 (in Crasquin et al., 2010) differ from other bairdiidae by the "acratian beak" at AVB and the two symmetric valves. The surface of the carapace is often punctuated.
Hiatobairdia subsymmetrica is characterized by its fine ridge underling the VB, a H/L = 0.53–0.56; the dorsal outline biconvex and the regularly punctuated carapace.

Genus ***Bairdia*** McCoy, 1844
Type species *Bairdia curta* McCoy, 1844
***Bairdia* cf. *humilis* Monostori, 1995**
Fig. 6 I–J

Material: 2 complete carapaces.
Dimensions: specimen figured in fig. 6 I: L = 1280 μm; H = 580 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara formation outcropping in the east side of Monte Scalpello (Lat. 37°32′56.86″N; Long. 14°40′30.64″E), Sicily, Italy (this work).
Remarks: The present specimens differ from *Bairdia humilis* Monostori, 1995 from Late Anisian of Balaton Highland, Hungary, only by a radius of curvature of AB a little larger here.

***Bairdia* cf. deformata Kollmann, 1963**

Fig. 6 K–L

Material: 2 carapaces.
Dimensions: specimen figured in fig. 6K: L = 910 μm; H = 622 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).
Remarks: the specimens are very close to *Bairdia deformata* Kollmann, 1963 from the Rhaetian of Austria in general outline with a stocky carapace and short DB. The only interrogation is the presence here of a ridge on DB of LV, which is not mentioned in Kollmann's description (1963).

***Bairdia cassiana* (Reuss, 1869)**
Fig. 6M
1869 *Cythere cassiana* n. sp.–Reuss, p. 108
1869 *Bairdia cassiana* (Reuss)–Gümbel, p. 180, pl. 5, figs. 18–19
1970 *Bairdia cassiana* (Reuss)–Ulrichs, p. 705–706, pl. 1, figs. 1–2
1978 *Bairdia cassiana* (Reuss)–Kristan-Tollmann, p. 81, fig. 4, pl. 6, fig. 6
1995 *Bairdia cassiana rotundidorsata* Monostori, p. 42, pl. 2, figs. 4–5
1996 *Bairdia (Rectobairdia) garciai* n. sp. - Crasquin-Soleau and Gradinaru, p. 77–78, pl. 2, figs. 5–8
2013 *Bairdia cassiana* (Reuss, 1868)–Monostori and Tóth, p. 310, pl. 2, figs. 7–8, 10
Material: 1 carapace.
Dimensions: L = 900 μm; H = 490 μm.
Stratigraphic and geographicrange: Early Anisian of Dobrogea, Romania (Crasquin-Soleau and Gradinaru, 1996); Late Anisian of Balaton Highland, Hungary (Monostori, 1995), Ladinian of Balaton Highland (Monostori and Tóth, 2013), Early Carnian of Southern Alps, Italy (Reuss, 1868, Gümbel, 1869, Ulrichs, 1970; Kristan-Tollmann, 1978), Late Carnian (*Tropites dilleri* zone); Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

***Bairdia* sp. 1**
Fig. 6 N–O

Material: 2 carapaces.
Dimensions: L = 830 μm; H = 480 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone), Mufara Formation of east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

***Bairdia balatonica* Méhes, 1911**
Fig. 6 P
1911 *Bairdia balatonica* n. sp. – Méhes, p. 13–14, pl. 1, figs. 8–11
1911 *Bairdia badayi* n. sp. – Méhes, p. 17–18, pl. 1, figs. 29–30
?1965 *Bairdia balatonica* Méhes var. 1911–Széles, p. 414, fig. 4
1965 *Bairdia dadayi* Méhes, 1911 – Széles, p. 412–413, fig. 1

1978 *Bairdia* cf. *balatonica* Méhes – Kristan-Tollmann, p. 81, pl. 1, figs. 1–3

1995 *Bairdia balatonica* Méhes, 1911–Monostori, p. 42, pl. 2, fig. 1 (non figs. 2 and 3)

2011 *Bairdia balatonica* Méhes, 1911 – Forel and Crasquin, p. 252, fig. 5 A

2013 *Bairdia balatonica* Méhes, 1911 – Monostori and Tóth, p. 309, figs. 1–5

Material: 1 carapace.

Dimensions: L = 860 μm; H = 545 μm.

Stratigraphic and geographic range: Spathian–Anisian of South Tibet (Forel and Crasquin, 2011), Anisian (Monostori, 1995), Ladinian (Monostori and Tóth, 2013) and Early Carnian (Méhes, 1911; Széles, 1965) of Hungary, Early Carnian of Southern Alps, Italy (Kristan-Tollmann, 1978), Late Carnian (*Tropites dilleri* zone). Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

***Bairdia scaliai* n. sp.**

Fig. 6 Q–R

Etymology: The species is named in memory of Salvatore Scalia (1874-1923), palaeontologist at Catania University, for his scientific engagement in the Mesozoic fauna of Monte Scalpello.

Material: four complete carapaces.

Holotype: complete carapace figured in Fig. 6 R (PMC. O 17 H 11/4/2017), dimensions: L = 740 μm; H = 445 μm.

Paratype: complete carapace figured in Fig. 5 Q (PMC. O 65-67 P 10/4/2017).

Type locality: East side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Catenanuova, Sicily, Italy.

Type horizon: Late Carnian (*Tropites dilleri* zone) in the dark grey clays of the Mufara Formation.

Diagnosis: A species of *Bairdia* with compact carapace AB with large radius of curvature, PB short, with small radius of curvature and maximum of curvature located high, all dorsal parts regularly arched, strong overlap at DB.

Description: Carapace compact (H/L = 0.57–0.58); DB regularly arched with PDB, DB and ADB in a regular arc of a circle at LV, ADB slightly concave at RV; AB with large radius of curvature with maximum of curvature located a little below mid - H, a very fine ridge underlines the AB; VB quite horizontal to very slightly concave; PB short, with very small radius of curvature and maximum of curvature located around lower 1/3 of H, presence of the very thin ridge along the PB; bairdiid beak poorly expressed but present; strong overlap of LV on RV along all the dorsal margin with maximum at DB; overlap weak on all other parts of the carapace; surface smooth.

Remarks: This species is quite different from all the other species recognized in the Triassic. It could be compared to *Bairdia jeancharlesi* Forel, 2011 from the Smithian–Anisian of Tibet (Forel and Crasquin, 2011) but here the PB is shorter and the AB has a larger radius of curvature. *Bairdiacypris triassica* Kozur, 1971 from Late Anisian of Hungary (Kozur, 1971) has the same radius of curvature at PB and AB but L is really greater.

Stratigraphic and geographic range: Late Carnian of Sicily, Italy.

***Bairdia* cf. *finalyi* (Méhes, 1911)**

Fig. 6 S

Material: 2 carapaces.

Dimensions: figured specimen L = 858 μm; H = 570 μm.

Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Formation in the east side of Monte Scalpello; (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

Remarks: The present specimens are very close to *Bairdia finalyi* (Méhes, 1911) from the Smithian–Ladinian of Balaton Highland, Hungary (Méhes, 1911; Kozur, 1971; Monostori, 1995), West Carpathians (Salag and Jendrejakova, 1984), Guangxi, South China (Crasquin-Soleau et al., 2006), Tibet (Forel and Crasquin, 2011). They differ only by a larger radius of curvature of AB here.

***Bairdia?* sp. 2**

Fig. 6 T

Material: 1 carapace.

Dimensions: L = 843 μm; H = 357 μm.

Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

Remark: this specimen has a remarkable and characteristic AB truncated in ventral part but there is not enough material to go further in the description.

***Bairdia* sp. 3**

Fig. 6 U

Material: 2 carapaces.

Dimensions: figured specimen L = 800 μm; H = 440 μm.

Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone. Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

Remarks: these specimens are very close to the specimens presented by Mette and Mohat-Aghai (1999; Pl. 4; fig. 4–5) as *Bairdia* sp. 7 from the Rhaetian of Tyrol in Austria. All these specimens could belong to a new species. The generic attribution is just at the limit between the two genera *Bairdia* and *Urobairdia*. As the ventral "blade" from AB to PB, characteristic of *Urobairdia*, is not clearly shown, we chose to let it in genus *Bairdia* (Fig. 6).

Genus ***Ptychobairdia*** Kollmann, 1960

Type species *Ptychobairdia kuepperi* Kollmann, 1960

***Ptychobairdia kristanae* Kollmann, 1960**

Fig. 7 A

1960 *Ptychobairdia kristanae* n. g. n. sp. – Kollmann, p. 99–100, pl. 25, figs. 6–9.

1960 *Ptychobairdia medwenitschi* n. g. n. sp. – Kollmann, p. 101–102, pl. 26, figs. 1–11.

1963 *Ptychobairdia kristanae* Kollmann – Kollmann, p. 181

Material: 1 carapace.

Dimensions: L = 1180 μm; H = 763 μm.

Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E) (this work), Rhaetian – Early Jurassic of Austria (Kollmann, 1960; 1963).

Remarks: The types figured by Kollmann (1960, Pl. 25, figs 6–9) have a ventral bulge more pronounced than here but intraspecific variations are very common in bairdiids

Genus ***Bairdiacypris*** Bradfield, 1935

Type species *Bairdiacypris deloi* Bradfield, 1935

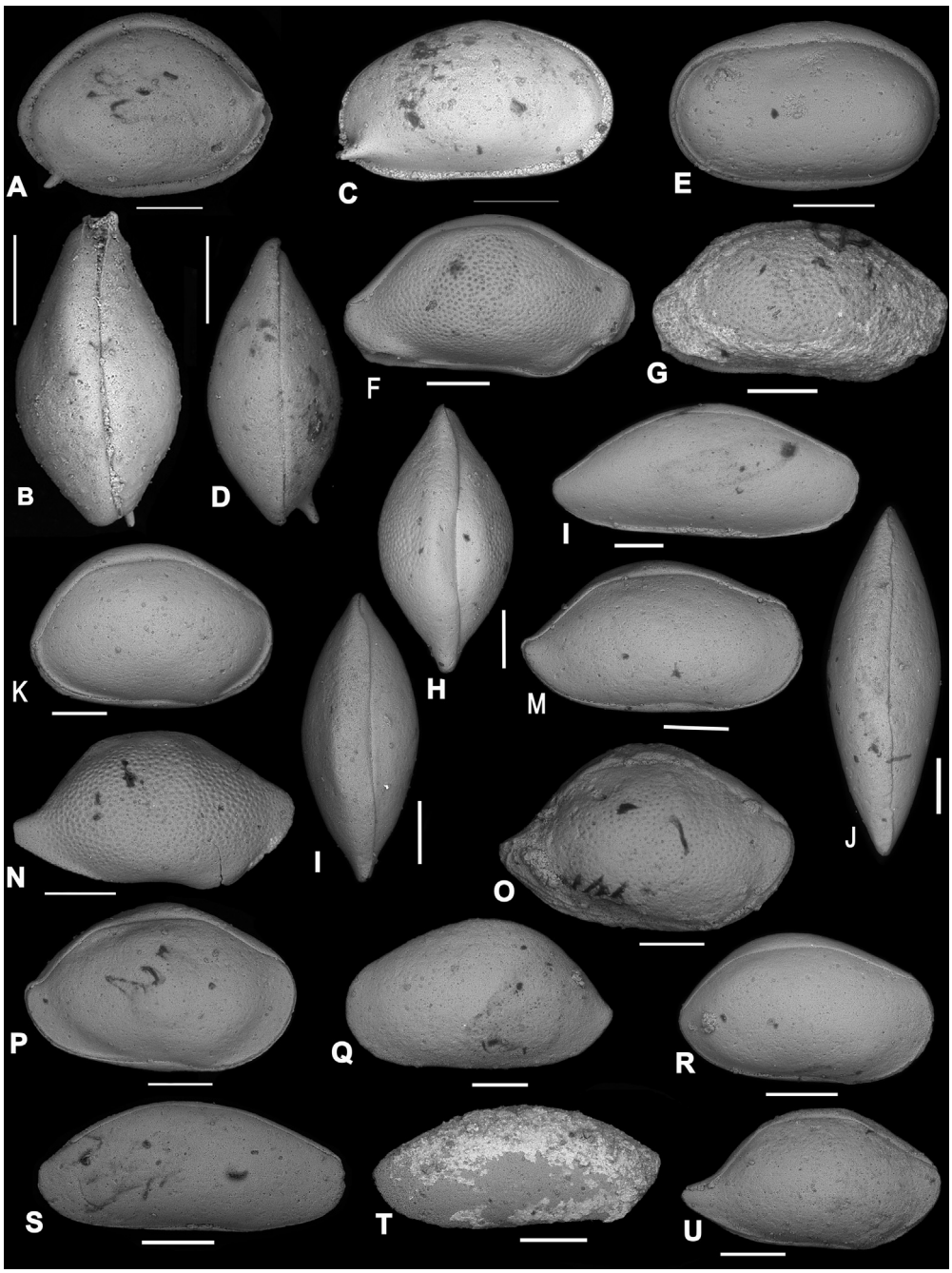

Fig. 6. Carnian ostracods from Monte Scalpello. Scale bar 200 μm. A–B. *Ogmoconchella felsooersensis* (Kozur, 1970). **A**. Complete carapace, right external lateral view. **B**. Complete carapace, dorsal view. C –D. *Healdia* sp. **C**. Complete carapace, right external lateral view. **D**. Complete carapace, dorsal view. **E**. *Bektasia* sp. 1. Complete carapace, left external lateral view. F–H. *Hiatobairdia subsymmetrica* Kristan-Tollmann, 1970. **F**. Complete carapace, right external lateral view. **G**. Complete carapace, right external lateral view. **H**. Complete carapace, dorsal view. I–J. *Bairdia* cf. *humilis* Monostori, 1995. **I**. Complete carapace, right external lateral view. **J**. Complete carapace, dorsal view. K–L. *Bairdia* cf. *deformata* Kollmann, 1963. **K**. Complete carapace, right external lateral view. **L**. Complete carapace, dorsal view. **M**. *Bairdia cassiana* (Reuss, 1869), complete carapace, right external lateral view. **N, O**. *Bairdia* sp. 1. Complete carapace, right external lateral view. **P**. *Bairdia balatonica* Méhes, 1911. Complete carapace, right external lateral view. Q–R. *Bairdia scaliai* n. sp. **Q**. Paratype, complete carapace, left external lateral view. **R**. Holotype, complete carapace, right external lateral view. **S**. *Bairdia* cf. *finalyi* (Méhes, 1911). Complete carapace, right external lateral view. **T**. *Bairdia?* sp. 2. Complete carapace, right external lateral view. **U**. *Bairdia* sp. 3. Complete carapace, right external lateral view.

Ostracodes du Carnien du Monte Scalpello. Barre d'échelle 200 μm. A–B. Ogmoconchella felsooersensis *(Kozur, 1970).* **A**. *entier carapace vue latérale externe droite.* **B**. *Carapace complète, vue dorsale. C–D.* Healdia *sp.* **C**. *Carapace complète, vue latérale externe droite.* **D**. *Carapace complète, vue dorsale.* **E**. *Carapace complète, vue latérale externe gauche. F–H.* Hiatobairdia subsymmetrica *Kristan-Tollmann, 1970.* **F**. *Carapace complète, vue latérale externe droite.* **G**. *Carapace complète, vue latérale externe droite.* **H**. *Carapace complète, vue dorsale. I–J.* Bairdia *cf.* humilis *Monostori, 1995.* **I**. *Carapace complète, vue latérale externe droite.* **J**. *Carapace complète, vue dorsale. K - L.* Bairdia *cf.* deformata *Kollmann, 1963.* **K**. *Carapace complète, vue latérale externe droite.* **L**. *Carapace complète, vue dorsale.* **M**. Bairdia cassiana *(Reuss, 1869). carapace complète, vue latérale externe droite.* **N, O**. Bairdia *sp. 1. Carapace complète, vue latérale externe droite.* **P**. Bairdia balatonica *Méhes, 1911. Carapace complète, vue latérale externe droite. Q–R.* Bairdia scaliai *n. sp.* **Q**. *Paratype, carapace complète, vue latérale externe gauche.* **R**. *Holotype, carapace complète, vue latérale externe droite.* **S**. Bairdia *cf.* finalyi *(Méhes, 1911). Carapace complète, vue latérale externe droite.* **T**. Bairdia? *sp. 2. Carapace complete, vue latérale externe droite.* **U**. Bairdia *sp. 3. Carapace complete, vue latérale externe droit.*

Bairdiacypris cf. aequisymmetrica Mette, Honigstein and Crasquin, 2014

Fig. 7 B

Material: 1incomplete carapace.
Dimensions: L = 905 μm; H = 390 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).
Remarks: the specimen discovered here is quite close to *Bairdiacypris aequisymmetrica* Mette et al., 2014 from the Middle Anisian of Austria (Mette et al., 2014) by the general outline of the carapace. Unfortunately, the PB is broken here and the doubt stays.

***Bairdiacypris* cf. *mirautaae* Crasquin-Soleau and Gradinaru, 1996**
(Fig. 7C)

Material: 1 carapace.
Dimensions: L = 730 μm; H = 350 μm.
Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone). Mufara Fm. outcropping in the east side of Monte Scalpello (37°32′56.86″N, 14°40′30.64″E) Sicily, Italy (this work).
Remarks: the specimen discovered here is quite close in general outline to *Bairdiacypris mirautaae* Crasquin-Soleau and Gradinaru, 1996 from the Early Anisian of Dobrogea (Romania; Crasquin-Soleau and Gradinaru, 1996) and Ladinian of Hungary (Monostori and Tóth, 2013). Here, the carapace is shorter and the PB is less tapering.

Genus ***Anchistrocheles*** Brady and Norman, 1889
Type species *Anchistrocheles fumata* Brady, 1890

***"Anchistrocheles" gemmellaroi* n. sp.**

Fig. 7 D–F

Etymology: The species is named in memory of the palaeontologist Gaetano Giorgio Gemmellaro (1832–1904).
Material: Seven complete carapaces (three adults and four juveniles).
Holotype: A complete carapace (fig. 7 E), PMC. O 18 H 10/4/2017 (L = 742 μm; H = 440 μm).
Paratypes: Two complete carapaces (fig. 7 D: L = 690 μm; H = 420 μm and fig. 7 F: L = 800 μm; H = 490) and other not figured (PMC. O 68-73 P 10/4/2017).
Type locality: East side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy.
Type level: Late Carnian (*Tropites dilleri* zone) in the dark grey clays of the Mufara Formation.
Diagnosis: A species attributed to "*Anchistrocheles*", with bairdioid carapace sub trapezoidal, with rows of spines at AB, PVB and PB, flanks parallel in dorsal view.
Description: Bairdioid carapace sub trapezoidal in lateral view, with DB, PDB and ADB straights at both valves; AB with large radius of curvature; ventral margin concave at both valves; PB short and with a small radius of curvature; AB, PVB and PB strongly compressed laterally, without reticulation and ornamented with marginal spines at both valves; LV overlaps RV all around the carapace with maximum at dorsal parts; In dorsal view, flanks parallel (like in *Orthobairdia* genus), extremities strongly compressed laterally, a small sulcus is observable in front of mid-L; surface reticulated and small tubercles are observed on the surface in ADP and DP.
Remarks: This species is attributed to the genus "*Anchistrocheles*". It is clear that is not this genus which is a recent one and for which the specific determinations are made on soft parts. This generic attribution with "?" was used in the past, particularly for Triassic – Jurassic specimens exhibiting row of spines along AB and PB (Carnian, Late Triassic of Turkey (Forelet al., 2017); Rhaetian, Late Triassic of Austria (Bolz, 1971), Sinemurian, Early Jurassic of Germany and Switzerland (Beher et al., 2001; Beher, 2004), Bathonian, Early Jurassic of France (Sheppard, 1981 PhD MS). A revision of all these species and of the definition of a new genus is in preparation (Crasquin and Forel, work in progress).
"Anchistrocheles" gemmellaroi n. sp. could be compared to *Bairdia marginosulcata* Bolz, 1971 from the Late Norian–Rhaetian of Austria (Bolz, 1971) which presents a biconvex carapace in dorsal view and a smaller radius of curvature at AB. The new species is very close from *Anchistrocheles? spinosa* from the Bathonian, Middle Jurassic of North-Western France with the flanks parallel and compressed extremities in dorsal view, with spines along AB and PVB and PB. This species was described and illustrated in the PhD thesis of Sheppard (1981). It seems that this species was never published and is considered here as unvalid. *"Anchistrocheles" gemmellaroi* n. sp. has a AB with larger radius of curvature and dorsal parts straighter.

Genus ***Nodobairdia*** Kollmann, 1963.
Type species *Nodobairdia mammillata* Kollmann, 1963

***Nodobairdia mammillata* Kollmann, 1963**

Fig. 7G

1963 *Nodobairdia mammillata* n. g. n. sp. - Kollmann, p. 174, pl. 7, figs. 6–15
1971 *Nodobairdia mammillata* Kollmann, 1963 – Kristan-Tollmann, p. 63, pl. 1, fig. 1
1971 *Triebelina (Nodobairdia) triassica* n. sp. – Bolz, 1971, p. 216, pl. 16, figs. 229–232
1978 *Nodobairdia mammillata* Kollmann, 1963 – Kristan-Tollmann, p. 84, pl. 8, figs. 1–6
Stratigraphic and geographic range: Late Ladinian of Alps, Austria (Kollmann, 1963; Kristan-Tollmann, 1971), Late Carnian of Alps, Austria (Kristan-Tollmann, 1978). *Tropites dilleri* zone of the Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E) Sicily, Italy (this work); Norian–Rhaetian of Alps, Austria (Bolz, 1971).

Family Acratiidae Gründel, 1962
Genus ***Acratia*** Delo, 1930
Type species– *Acratia typica* Delo, 1930

***Acratia maugerii* n. sp.**

Fig. 7 H–J

1991 *Acratia* sp. – Kristan-Tollmann, p. 196, pl. 1, fig. 1
2013 *Acratia goemoeryi* (Kozur, 1970) – Monostori and Tóth, p. 6–7, pl. 4, only fig. 2

Etymology: The species is named in memory of Giuseppe Maugeri-Patanè *palaeontologist in Catania University* for his scientific engagement in Mesozoic palaeontology.

Material: Three complete carapaces.

Holotype: One complete carapace (fig. 7H, J), PMC. O 19 H 10/4/2017 (L = 1110 μm; H = 490 μm).

Paratypes: Two complete carapaces, one figured PMC. O 74 P 10/4/2017 (fig. 7I: L = 805 μm, H = 380 μm).

Type locality: East side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy.

Type level: Late Carnian (*Tropites dilleri* zone), Mufara Formation.

Diagnosis: A new species of *Acratia* with short carapace (H/L = 0.45–0.46 for the measured specimens), quite semicircular valves, straight VB and PB a little slender for the genus; acratian beak clearly expressed.

Description: Carapace short (H/L = 0.45–0.46 for the measured specimens), quite semicircular in lateral view with PB more acute and slightly longer than AB. Ventral margin almost straight, anteriorly ending with a pronounced acratian beak. Caudal process acute. Left valve wider than the right. Strong overlap especially in centro-ventral and antero-dorsal margin. Outer surface smooth. Carapace biconvex in dorsal view.

Stratigraphic and geographic range: Late Ladinian of NE Iran (Kristan-Tollmann, 1991) and Balaton Highland, Hungary (Monostori and Tóth, 2013) – Late Carnian (*Tropites dilleri* zone), Murfa Formation, Sicily, Italy (this work).

Remarks: the figured specimens are put in synonymy with *Acratia* sp., from the Late Ladinian from NE Iran (Kristan-Tollmann, 1991) and one specimen figured by Monostori and Tóth (2013) from Ladinian of Balaton Highland, Hungary. *Acratia triassica* Kozur, 1970 (figs. 2–5 only, not fig. 1) is very close from the new species. However, here the carapace is more rounded in dorsal part with a PB less acuminate.

Family Bythocyprididae Maddocks, 1969
Genus ***Bythocypris*** Brady, 1880
Type species *Bythocypris reniformis* Brady, 1880

***Bythocypris?* sp. 1**
Fig. 7K

Material: 1 carapace.

Dimensions: L = 568 μm; H = 300 μm.

Stratigraphic and geographic range: Late Carnian (*Tropites dilleri* zone), of the Mufara Formation outcropping in the east side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy (this work).

Remarks: a specimen attributed with doubt (this genus is a Recent one defined on soft parts) to the genus *Bythocypris*. It is quite close to *Bythocypris* sp. B *in* Bolz, 1971 from the Norian – Rhaetian of Austria which has a very similar outline except here a VB more convex. We have no enough material to go further in determination.

Superfamily Cypridoidea Baird, 1845
Family Pontocyprididae Müller, 1894
Genus ***Pontocypris*** Sars, 1866
Type species *Cypris serrulata* Sars, 1863

***Pontocypris rara* Méhes, 1911**

Fig. 7 L

1911. *Pontocypris rara* n. sp.– Méhes, 1911, p. 13, pl. 1, fig. 5

Material: 1 carapace.

Dimensions: L = 662 μm; H = 288 μm.

Stratigraphic and geographic range: Late Carnian of Balaton Highland, Hungary (Méhes, 1911) and Monte Scalpello (*Tropites dilleri* zone), (37°32′56.86″N, 14°40′30.64″E) Sicily, Italy (this work).

Family Judahellidae Sohn, 1968
Genus ***Judahella*** Sohn, 1968
Type species *Judahella tsorfatia* Sohn, 1968

Judahella? montanarii **n. sp.**

Fig. 7 M–N

Etymology: The species. is named in memory of Loris Montanari *geologist in Catania University*. **Material**: Two complete carapaces.

Holotype: A complete carapace figured in Fig. 7M (PMC O 20 H 10/4/2017) (L = 450 μm; H = 200 μm).

Paratype: A complete carapace figured in Fig. 7N (PMC O 76 P 10/4/2017).

Type locality: East side of Monte Scalpello (37°32′56.86″N; 14°40′30.64″E), Sicily, Italy.

Type level: Late Carnian (*Tropites dilleri* zone) in the dark grey clays of the Mufara Formation.

Diagnosis: *Judahella? montanarii* n. sp. is characterized by subrectangular elongate carapace with a long straight DB ended by a caudal process, presence of lateral ridges and tubercles on valve surface.

Description: Lateral view: small carapace elongate subrectangular (Fig. 7M, N); long straight DB ended by a short caudal process. Upper part of AB straight with an angle of 110° with DB; maximum of convexity of AB located below mid-H; VB slightly convex, surface of valves are ornamented by large ridges and nodes reticulated; dorsal ridges overpass hinge line; the largest and strong ridge is arched and shows variable thickness through its length; it begins in the antero-dorsal margin, moves downwards until reaching the centre of the ventral margin and back again towards the postero-dorsal margin initially curved and then straight and facing forward. Another thinner ridge is present along the outer edge of the anterior margin of the valves. Two stubby nodes are present in the posterior dorsal and in the central anterior area.

Dorsal view: hinge line long and straight; caudal process strongly compressed laterally; ridges and nodes very prominent by absence of ventro-lateral swollen process

Remarks: The new species is attributed to *Judahella*? The doubt comes from the presence of the posterior caudal process never described in the genus. The present specimens could be compared to *Judahella tsorfatia* Sohn, 1968 from the Ladinian of Eastern France (Sohn, 1968) by their similar subrectangular lateral outline. But here, the nodes are gathered in ridges and there is a caudal process. *Judahella tuberculifera* (Gümbel, 1869) from Carnian of Italian Alps (Gümbel, 1869; Lieberman, 1979), Anisian–Ladinian of Poland (Styk, 1958), Ladinian of France (Sohn, 1968), Anisian of Germany (Knupfer and Kozur, 1968), Ladinian of Spain (Kozur et al., 1974) and Anisian of South China (Kristan-Tollmann, 1983) has a general dorsal outline which can evoke the new species.

Family Glorianellidae Snejder, 1960 emend. Kozur, 1970
Genus ***Mockella*** Bunza and Kozur, 1971

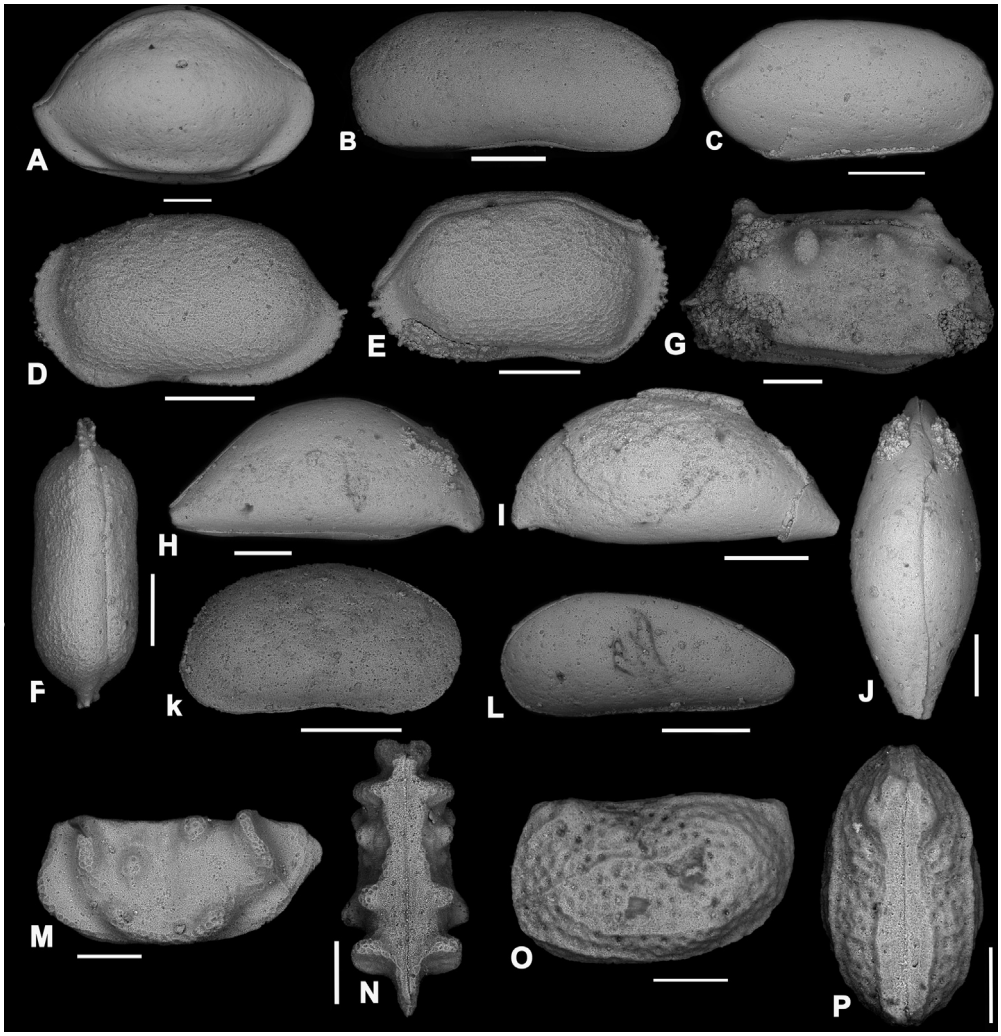

Fig. 7. Carnian ostracods from Monte Scalpello. Scale bar = 200 μm (A–L); 100 μm (M–P). **A**. *Ptychobairdia kristinae* Kollmann, 1960. Complete carapace, right external lateral view. **B**. *Bairdiacypris* cf. *aequisymmetrica* Mette et al., 2014. Complete carapace, right external lateral view. **C**. *Bairdiacypris* cf *mirautaae* Crasquin-Soleau and Gradinaru, 1996. Complete carapace, right external lateral view. D–F. *"Anchistrocheles"gemmellaroi* sp. nov. **D**. Paratype, complete carapace, left external lateral view. Paratype, carapace complète, vue latérale externe gauche. **E**. *"Anchistrocheles"gemmellaroi* sp. nov. Holotype, complete carapace, right external lateral view. **F**. Paratype, complete carapace, dorsal view. **G**. *Nodobairdia mammillata* Kollmann, 1963. Complete carapace, right external lateral view. H–J. *Acratia maugerii* n. sp. **H**. Holotype, complete carapace, right external lateral view. **I**. Paratype, complete carapace, left external lateral view. **J**. Paratype, complete carapace, dorsal view. Complete carapace, right external lateral view. **K**. *Bythocypris?* sp. 1. Complet carapace, right external lateral view. **L**. *Pontocypris rara* Méhes, 1911. Complete carapace, left external lateral view. **M–N**. *Judahella? montanarii* n. sp. **M**. Holotype, left valve, external lateral view. **N**. Paratype, complete carapace, dorsal view. O–P. *Mocklella muelleri* Bunza and Kozur, 1971. **O**. Complete carapace, left external lateral view. **P**. Complete carapace, dorsal view.

Ostracodes du Carnien du Monte Scalpello. Barre d'échelle 200 μm (A–L), 100 μm (M–P). **A**. Ptychobairdia kristinae *Kollmann, 1960. Carapace complète, vue latérale externe droite.* **B**. Bairdiacypris *cf.* aequisymmetrica *Mette et al., 2014. Carapace complète, vue latérale externe droite.* **C**. Bairdiacypris *cf* mirautaae *Crasquin-Soleau and Gradinaru, 1996. Carapace complète, vue latérale externe droite. D–F.* "Anchistrocheles" gemmellaroi *sp. nov.* **D**. *Paratype, carapace complète, vue latérale externe gauche.* **E**. "Anchistrocheles" gemmellaroi *sp. nov. Holotype, carapace complète, vue latérale externe droite.* **F**. *Paratype, carapace complète, vue dorsale.* **G**. Nodobairdia mammillata *Kollmann, 1963. Carapace complète, vue latérale externe droite. H–J.* Acratia maugerii *n. sp.* **H**. *Holotype, carapace complète, vue latérale externe droite.* **I**. *Paratype, carapace complète, vue latérale externe gauche.* **J**. *Paratype, carapace complète, vue dorsale.* **K**. Bythocypris? *sp. 1. Carapace complète, vue latérale externe droite.* **L**. Pontocypris rara *Méhes, 1911. Carapace complète, vue latérale externe gauche. M–N.* Judahella? montanarii *n. sp.* **M**. *Holotype, valve gauche, vue latérale externe.* **N**. *Paratype, carapace complète, vue dorsale. O–P.* Mocklella muelleri *Bunza and Kozur, 1971.* **O**. *Carapace complète, vue latérale externe gauche.* **P**. *Carapace complète, vue dorsale.*

Type species *Mockella marinae* (Kozur, 1970)

***Mockella muelleri* Bunza and Kozur, 1971**

Fig. 7 O–P

1971 *Mockella muelleri* n. sp. – Bunza and Kozur, p. 8–9, pl. 1, fig. 12

Material: 2 carapaces, 1 figured.

Dimensions: L = 390 μm; H = 235 μm (figured specimen).

Stratigraphic and geographic range: Late Carnian of Tyrol, Austria (Bunza and Kozur, 1971), Carnian of Monte Cammarata, Sicily (Cafiero and De Capoa Bonardi, 1982) and east side of Monte Scalpello (37°32′56.86″N, 14°40′30.64″E) Sicily, Italy (this work) (Fig. 7).

5. Conclusion

Carnian Ostracods are known worldwide, from Alaska (Sohn, 1968), Alps (Kristan-Tollmann, 1969, 1978; Kollmann, 1963), Austria (Kristan-Tollmann, 1971, 1973, 1988; Bunza and Kozur, 1971), British Columbia (Arias and Lord, 2000), Germany (Gründel, 1965; Bunza and Kozur, 1971), Hungary (Kristan-Tollmann, 1991; Kozur, 1971, 1972; Bunza and Kozur, 1971), Indonesia (Kristan-Tollmann and Hasibuan, 1990), Israel (Sohn, 1968; Gerry et al., 1988; Bunza and Kozur, 1971); Italy (Kristan-Tollmann, 1971, 1973, 1982, 1983; Lieberman, 1979), Slovenia (Kolar-Jurkovsek, 1990) and Turkey (Forel et al., 2017). The turn-over between Palaeozoic and Mesozoic ostracod fauna is long, at least 14 My, began in the early

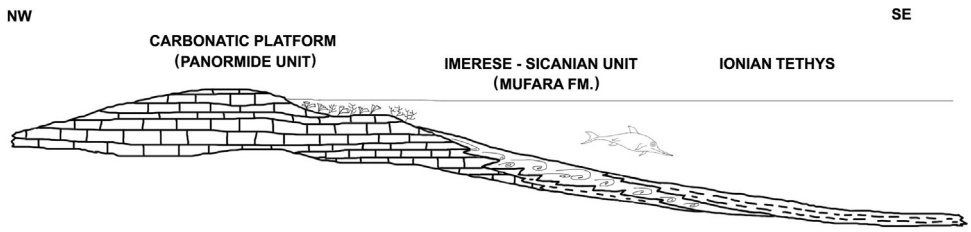

Fig. 8. Schematic palaeoenvironmental model for the Late Carnian Mufara Formation (see also Fig. 3)
Modèle paléoenvironnemental schématique de la Formation Mufara du Carnien supérieur (voir également Fig. 3)

Late Permian (in the Early Wuchiapingian) and is considered to be ended in the Anisian (Crasquin and Forel, 2013). However, some Palaeozoic genera are still present in the Carnian: three Kirkbyidae (*Carinaknightina, Kirkbya, Tubulikirkbyia?*) in Turkey deep environment (Forel et al., 2017) and *Acratia*, discovered as well in Turkey (Forel et al., 2017) whose presence are confirmed here.

The paleoecological interpretation of the Carnian ostracods association of Monte Scalpello is not easy. It is necessary to consider both the structure, composition and taphonomic characteristics of the association found, as well as the sedimentological characteristics of the sedimentary Unit and its position in the palaeogeographic context at that time.

First of all, the strong shelled forms and absence of typical deep water species it would seem to indicate a not deep waters association. From the taphonomic point of view, it is very interesting to note that the ostracods specimens are predominantly represented by integer carapaces and rare valves. This could suggest a rapid burial *in situ* in a high sedimentation rates environment, since the valves, after the death of the specimens, tend to open in a few hours (Guernet and Lethiers, 1989). Similar taphonomic characteristics were also found by Pokorny (1964) and Oertli (1971) for pelitic layer associations deposited in extremely rapid distal sedimentation basins.

Another important datum concerns the size of all the found skeletal remains. Gastropods, bivalves, crinoids and brachiopods remains are all of the same little size; also the ostracod thanatocoenosis structure is characterized by abundance of juveniles and rare adults; according to van Harten (1986), all that would suggest strong phenomena of dimensional selection and, therefore, displaced of faunas and sediments.

From the sedimentological point of view, the study area is characterized by the extreme abundance of pelitic sediments with interbedded sandy levels sometimes rich in oolites. Sometimes, these sediments shown in the outcrop, particular sedimentary structures as parallel lamination, wavy lamination and vortices structures, all features that make one think of a high-energy sedimentation environment.

From a palaeogeographic point of view, the Mufara Formation outcropping in the studied area, is located inside the pelagic Imerese Basin that is delimited by the carbonate platforms of Complesso Panormide to the west and the Complesso Trapanese to the east and to the south (Fig. 3) (Catalano and D'Argenio, 1982; Montanari, 1987; Speranza and Minelli, 2014). All the materials produced by the erosion of the carbonate platforms were conveyed in this basin (Carrillat and Martini, 2009).

On the basis of all these data, it is possible to hypothesize for the ostracods association an environment characterized by high sedimentation rates and high depositional energy, features that controls strongly, today as in the past, the colonization of the bottom as well as the composition and structure of the populations (cf. Di Geronimo and Robba, 1989; Sciuto, 2014). According to Carrillat and Martini (2009), the Monte Scalpello area, it could be a probably, distal turbiditic sedimentary environment not necessarily very deep (Fig. 8). The collection of further faunistic and sedimentological data (whose finding and observation is made extremely difficult by the intense agricultural activity) can lead to more detailed information on the Triassic palaeo-environment of the Monte Scalpello area (Fig. 8).

Disclosure of interest

The authors declare that they have no competing interest.

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