In the aftermath of Permian-Triassic boundary mass-extinction: new ostracod (Crustacea) genus and species from South Tibet

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ABSTRACT
46 samples were processed for a taxonomic ostracod study from the Lower-Middle Triassic (Smithian to Anisian) of South Tibet. Forty four species belonging to 15 genera are recognized. One genus and seven species are described as new: *Bairdia jeancharlesi* Forel n. sp., *Bairdia letangae* Forel n. sp., *Bairdiacypris combeae* Forel n. sp., *Petasobairdia collini* Forel n. sp., *Hungarella tulongensis* Crasquin n. sp., *Triassicindivisia tibetinella* Crasquin n. gen., n. sp., *Liuzhinia larmae* Forel n. sp. The goal of this paper is to describe the new taxa as a preliminary step to palaeoenvironmental reconstruction.

KEY WORDS
Crustacea,
Ostracods,
Lower-Middle Triassic,
South Tibet,
new genus,
new species.

RÉSUMÉ
Après l'extinction en masse de la limite Permien-Trias : nouveau genre et nouvelles espèces d'ostracodes du sud Tibet.
Quarante-six échantillons ont été analysés pour l'étude des ostracodes du Trias inférieur et moyen (Smithien à Anisien) du sud Tibet. Quarante-quatre espèces appartenant à 15 genres ont été identifiées. Un genre et sept espèces sont nouveaux : *Bairdia jeancharlesi* Forel n. sp., *Bairdia letangae* Forel n. sp., *Bairdiacypris combeae* Forel n. sp., *Petasobairdia collini* Forel n. sp., *Hungarella tulongensis* Crasquin n. sp., *Triassicindivisia tibetinella* n. gen. n. sp., *Liuzhinia larmae* Forel n. sp. Le sujet de cet article est la description des nouveaux taxons en prélude à une reconstruction paléoenvironnementale.

MOTS CLÉS
Crustacea,
Ostracodes,
Trias inférieur et moyen,
sud Tibet,
genre nouveau,
espèces nouvelles.

INTRODUCTION

Geological setting

The Tulong section was located on the North Indian margin during the Early Triassic. It crops out near the village of Tulong (28°26'13''N, 86°08'09''E; 4430 m) on the road from Lhasa to Nyalam (Fig. 1). This section is well known for its Lower Triassic succession in South Tibet. It was described by Garzanti *et al.* (1998) and more recently by Shen *et al.* (2006). More recently, the Permian-Triassic interval in this area was restudied by a team from Zurich (Switzerland) and the stratigraphic succession obtained from other outcrops allow establishment of an almost complete succession from the Upper Permian up to the Lower Anisian (Brühwiler *et al.* 2009). The Tulong section corresponds to units III to VI of the Tulong Formation and is very well dated by ammonoids and conodonts (Brühwiler *et al.* 2009). It is beyond the scope of this paper to re-describe the section in detail. The following short presentation of the section (Fig. 2) is based on Brühwiler *et al.* (2009).

The unit III corresponds to 9 m of mostly grey limestone beds alternating with thin shale intervals. It is subdivided in four sub-units. The sub-unit IIIa is composed of 1.60 m of red-weathering dolomitized calcarenite and grey packstones and is Smithian in age (based on conodonts); this sub-unit was not sampled. The sub-unit IIIb consists of 20 m of thin-bedded, platy to nodular, grey to light red limestones alternating with shale interbeds and is Middle Smithian in age (conodonts). The sub-unit IIIc is 4 m thick and is composed of medium bedded grey limestone alternating with shales or very nodular marly limestone. The lower part of sub-unit IIIc contains middle Smithian ammonoids and the upper part late Smithian ammonoids. The sub-unit IIId consists of 1 m of massive very nodular marly limestone of latest Smithian age (ammonoids and conodonts).

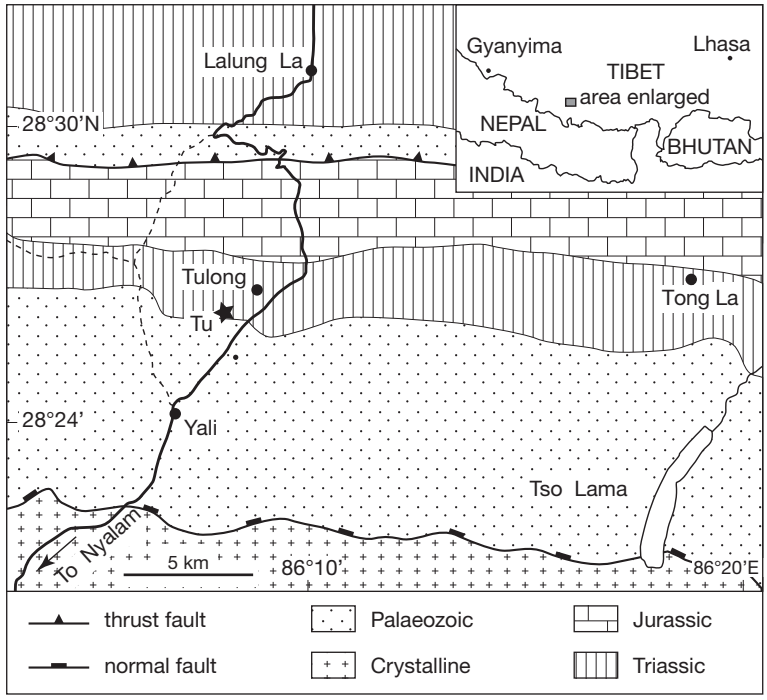


Fig. 1. — Location map of the Tulong section (★), South Tibet (after Brühwiler *et al*. 2009).

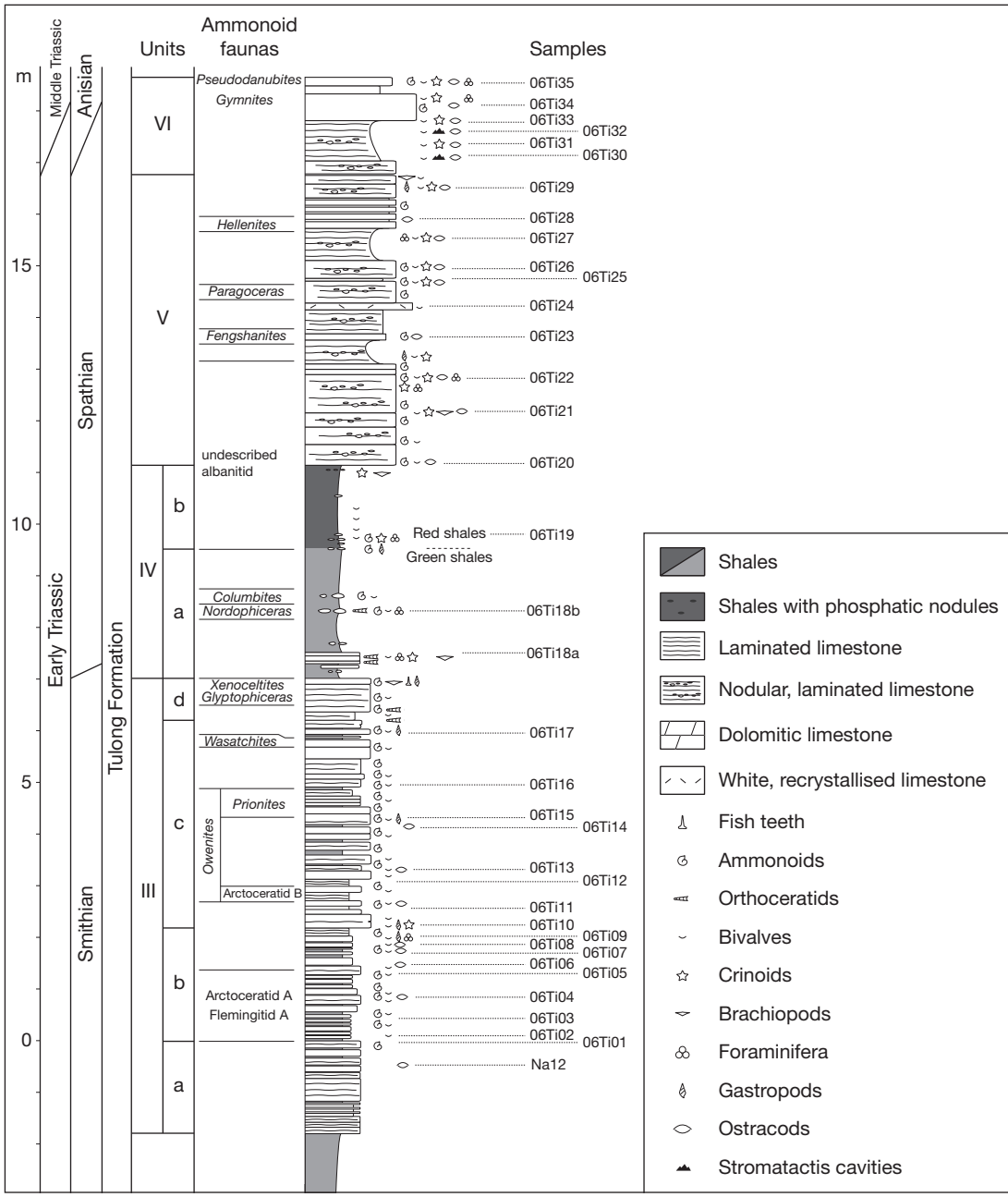


FIG. 2. — Log of the Tulong section, South Tibet, with the location of the studied samples (after Brühwiler *et al*. 2009).

The unit IV corresponds to 4 m of shales of early Spathian age (conodonts and ammonoids) subdivided into a lower green part and an upper red part.

The unit V is 6 m thick and consist of nodular, marly and bioturbated limestones of "ammonitico rosso" facies (Garzanti *et al.* 1998)

and is middle Spathian in age (ammonoids and conodonts).

The last unit, unit VI, consists of 1 m of thin-bedded yellowish nodular limestones overlain by less than 1 m of grey and yellowish limestone. The last beds contain early middle Anisian ammonoids.

MATERIAL AND METHOD

Forty six samples, distributed through a 21 m thick sequence (Fig. 2), were processed by hot acetolysis method (Lethiers & Crasquin-Soleau 1988; Crasquin-Soleau *et al.* 2005) which allows the extraction of calcareous shells contained in calcareous rocks. Twenty-nine samples gave ostracods; three of them yielded only indeterminable specimens.

Except for several specimens, in most of cases, the preservation of ostracods is poor and the number of specimens is low. Internal features were not observed.

Forty four species belonging to 15 genera are identified and figured (Figs 3-8). Seven species and one genus are new and described in detail in this paper. Other indicative species are also figured (Figs 3-8) and a complete list is available in Table 1.

All the specimens are deposited in the Université Pierre et Marie Curie, Paris (UPMC) collection (numbers: P6Mxx).

ABBREVIATIONS

AB	anterior border;
ADB	antero-dorsal border;
AVB	antero-ventral border;
DB	dorsal border;
H	height;
L	length;
LV	left valve;
PB	posterior border;
PDB	postero-dorsal border;
PVB	postero-ventral border;
RV	right valve;
VB	ventral border;
W	width.

SYSTEMATIC PALAEONTOLOGY

Class OSTRACODA Latreille, 1806
Subclass PODOCOPA Müller, 1894
Order PODOCOPIDA Müller, 1894
Suborder PODOCOPINA Sars, 1866
Superfamily BAIRDIOIDEA Sars, 1887
Family BAIRDIIDAE Sars, 1887

Genus *Bairdia* McCoy, 1844

TYPE SPECIES. — *Bairdia curta* McCoy, 1844.

Bairdia jeancharlesi Forel n. sp.
(Fig. 3I-L)

TYPE MATERIAL. — Holotype: one complete carapace (P6M2607; Fig. 3J); paratype: one complete carapace (P6M2603; Fig. 3I).

ETYMOLOGY. — Dedicated to Jean-Charles Forel, personal dedication.

MATERIAL EXAMINED. — 26 complete carapaces and 1 single valve.

DIMENSIONS. — L = 435 to 1120 µm; H = 260 to 680 µm. Holotype: L = 453 µm; H = 276 µm. Paratype: L = 895 µm; H = 535 µm.

TYPE HORIZON. — Sample 06Ti08, unit IIIb, Tulong Formation, Smithian, Lower Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

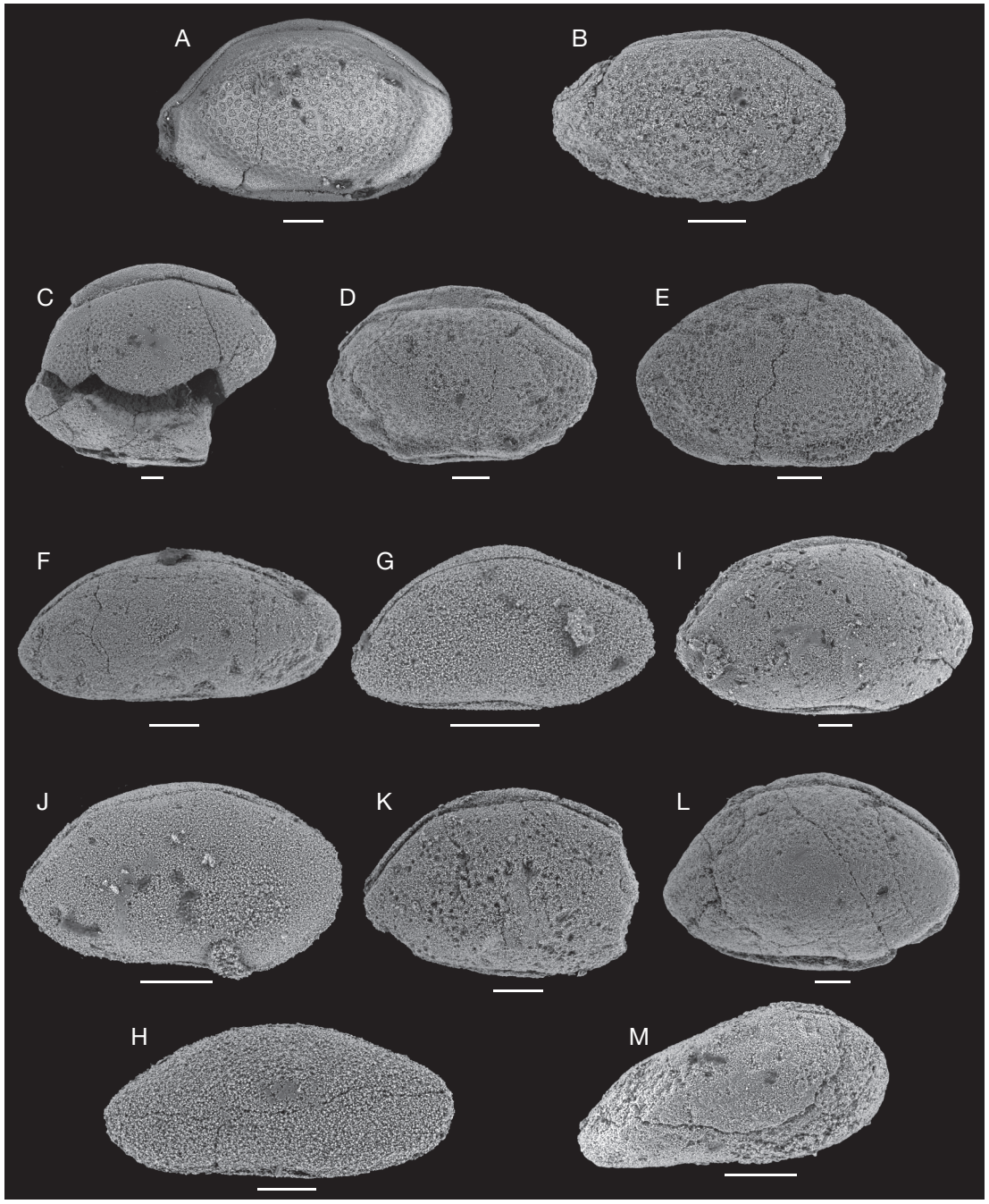
OCCURRENCE. — Tulong section, southern Tibet. Samples 06Ti04, 06Ti08, 06Ti21, 06Ti27-31, 06Ti35, Tulong Formation, units III, V and VI, Smithian to Anisian, Lower-Middle Triassic.

DIAGNOSIS. — A punctate species of *Bairdia* with faint overlap, AB and PB with quite small radius of curvature, PDB, BD and ADB straight at RV.

DESCRIPTION

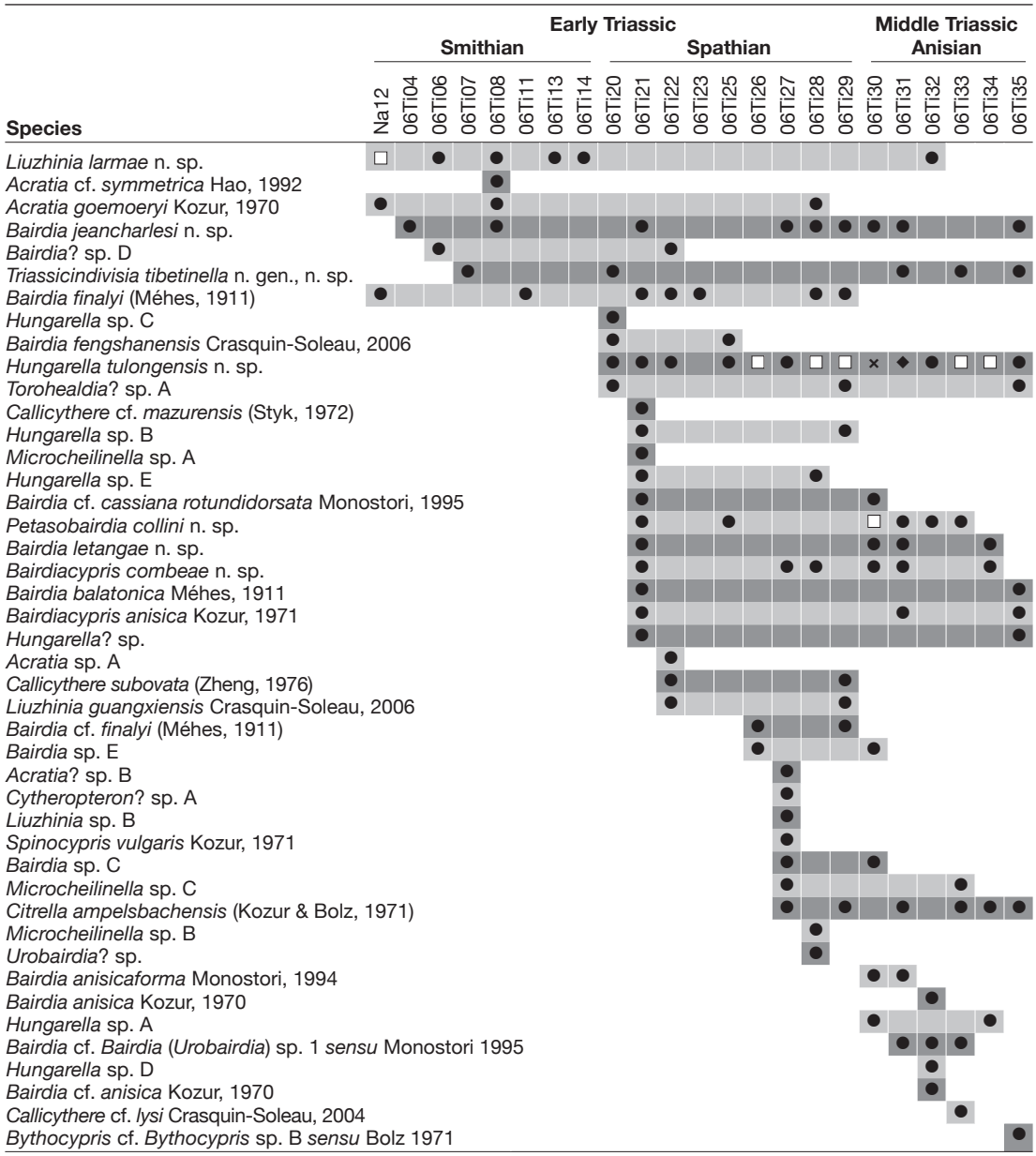
RV: PDB, DB and ADB straight; AB regularly arched with maximum of curvature located in its middle; AVB and PVB regularly convex; VB concave

FIG. 3. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**-**E**, *Bairdia letangae* Forel n. sp.; **A**, holotype (P6M2595), right lateral view of a complete carapace; **B**, paratype (P6M2596), right lateral view; **C**, right lateral view of a broken carapace (P6M2597); **D**, right lateral view of a broken carapace (P6M2598); **E**, left lateral view of a



complete carapace (P6M2599); **F**-**H**, *Bairdia finalyi* (Méhes, 1911); **F**, right lateral view of a complete carapace (P6M2601); **G**, right lateral view of a complete carapace (P6M2602); **H**, right lateral view of a complete carapace (P6M2606); **I**-**L**, *Bairdia jeancharlesi* Forel n. sp. ; **I**, paratype (P6M2603), right lateral view of a complete carapace; **J**, holotype (P6M2607), right lateral view of a complete carapace; **K**, right lateral view of a broken carapace (P6M2604); **L**, right lateral view of a complete carapace (P6M2605); **M**, *Spinocypris vulgaris* Kozur, 1971, right lateral view of a complete carapace (P6M2600). Scale bars: 100 µm.

TABLE 1. — Distribution chart and abundances of Lower and Middle Triassic ostracods in the Tulong section. The global extension of each species within the section is represented with grey parts. Abundances are indicated as follows: ●, between 1 and 5 specimens; □, between 5 and 10 specimens; ◆, between 10 and 20 specimens; ×, more than 20 specimens.



in its anterior part; PB with quite small radius of curvature but bairdoid beak poorly expressed. LV: PDB straight, DB regularly arched, ADB straight to gently arched, AB rounded with maximum of curvature in its middle; AVB, VB and PVB arched; PB with quite small radius of curvature. Carapace

ornamented by small punctations, flattened laterally in posterior and anterior parts; overlap is small with maximum in anterior part of DB; H/L = 0.61.

REMARKS

Bairdia jeancharlesi Forel n. sp. is close to *Bairdia cassiana rotundidorsata* Monostori, 1995 from the Anisian of Balaton area (Hungary; Monostori 1995). Here, the carapace is shorter, the overlap is weaker and the DB and PDB are more inclined posteriorly.

Bairdia letangae Forel n. sp.
(Fig. 3A-E)

TYPE MATERIAL. — Holotype: one complete carapace (P6M2596; Fig. 3A); paratype: one complete carapace (P6M2595; Fig. 3B).

ETYMOLOGY. — Dedicated to Béatrice Letang, personal dedication.

MATERIAL EXAMINED. — 7 complete carapaces and 2 single valves.

DIMENSIONS. — L = 540-785 µm; H = 320-500 µm. Holotype: L = 785 µm; H = 492 µm. Paratype: L = 540 µm; H = 320 µm.

TYPE HORIZON. — Sample 06Ti30, unit VI, Tulong Formation, Early Anisian, Middle Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti21, 06Ti30, 06Ti31 and 06Ti34, Tulong Formation, units V and VI, Spathian-Anisian, Early-Middle Triassic.

DIAGNOSIS. A massive species of ornamented *Bairdia* with AB and PB flattened, large reticulation on all the carapace except the dorsal margin.

DESCRIPTION

At RV, PDB straight, DB long and more or less horizontal, ADB straight to gently concave. At LV all dorsal parts form a regular arch. AB with quite small radius of curvature; AVB and PDB regularly arched; VB straight at LV, gently concave RV; PB with medium radius of curvature; maximum of curvature of PB and AB located at the same H; carapace strongly compressed along free margins and particularly in AB and PB; surface ornamented by a large reticulation, this reticulation is present on all the surface except for dorsal margins of both valves.

REMARKS

Bairdia letangae Forel n. sp. is similar to *Bairdia ortiseiensis* Crasquin, 2008 from the Late Permian of the Tesero section (Northern Italy; Crasquin *et al.* 2008). Here the DB is longer, the radius of curvature of AB is more important and the overlap is stronger. Compared to *Lobobairdia zapfei* Kozur, 1971 from the Anisian of Balaton area (Kozur 1971; Monostori 1995), *Bairdia letangae* Forel n. sp. has a straighter DB and reticulation present all over the carapace surface.

Genus *Petasobairdia* Chen, 1982

TYPE SPECIES. — *Petasobairdia bicornuta* Chen, 1982 (*in* Chen & Shi 1982).

Petasobairdia collini Forel n. sp.
(Fig. 4I-M)

TYPE MATERIAL. — Holotype: one complete carapace (P6M2615; Fig. 4M); paratype: one complete carapace (P6M2619; Fig. 4J).

ETYMOLOGY. — Dedicated to Dr Pierre-Yves Collin, Université Pierre et Marie Curie, Paris.

MATERIAL EXAMINED. — 18 complete carapaces and 20 isolated valves.

DIMENSIONS. — L = 630-1140 µm; H = 350-700 µm. Holotype: L = 1030 µm; H = 680 µm. Paratype: L = 848 µm; H = 546 µm.

TYPE HORIZON. — Sample 06Ti30, unit VI, Tulong Formation, Early Anisian, Middle Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti21, 06Ti25, 06Ti30, 06Ti32, 06Ti33, Tulong Formation, units V and VI, Spathian-Anisian, Early-Middle Triassic.

DIAGNOSIS. — A species of *Petasobairdia* with slight dorsal blade at LV, PB with very small radius of curvature and fingerprint ornamentation of fine ribs.

DESCRIPTION
RV: PDB, DB and ADB straight; DB quite horizontal compared with VB; AB with medium radius of curvature, maximum of curvature at mid-H; VB nearly straight to gently concave; PB with very small radius of curvature and maximum of curvature located at mid H;

LV: dorsal and ventral parts regularly arched; DB being more or less one third of length; presence of a dorsal blade.

Carapace laterally compressed at AB, AVB, PVB and PB; LV overlaps RV on dorsal and ventral margins with maximum on DB; carapace ornamented by a very fine reticulation organized in fingerprint of fine ribs parallel to margins.

REMARKS
Petasobairdia collini Forel n. sp. is close to two Late Permian species from South China. *Petasobairdia nantongensis* Chen, 1982 (*in* Chen & Shi 1982) has a shorter VB, overlap less important on ADB and PDB, AB and PB are smaller. *Petasobairdia subnantongensis* Chen, 1987 (*in* Shi & Chen 1987) has a longer DB particularly on LV and has a ventral "blade".

Genus *Bairdiacypris* Bradfield, 1935

TYPE SPECIES. — *Bairdiacypris deloi* Bradfield, 1935.

Bairdiacypris combeae Forel n. sp.
(Fig. 5F-H)

Fabalicypris reniformis. – Hao 1992: 41, 42, pl. 1, figs 10, 11.

TYPE MATERIAL. — Holotype: one complete carapace (P6M2624; Fig. 5F); paratype: one complete carapace (P6M2625; Fig. 5H).

ETYMOLOGY. — Dedicated to Simone Combe, personal dedication.

MATERIAL EXAMINED. — 9 complete carapaces.

DIMENSIONS. — L = 495-770 µm; H = 245-375 µm. Holotype: L = 529 µm; H = 245 µm. Paratype: L = 754 µm; H = 360 µm.

TYPE HORIZON. — Sample 06Ti30, Unit VI, Tulong Formation, Anisian, Middle Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti21, 06Ti27, 06Ti28, 06Ti30 and 06Ti34, units V and VI, Spathian-Anisian, Early-Middle Triassic.

DIAGNOSIS. — A species of *Bairdiacypris* with maximum of height located in posterior part of the carapace, AB with small radius of curvature and maximum of curvature located high.

DESCRIPTION
DB short and straight at both valves; ADB long and straight; AB with quite small radius of curvature with maximum convexity located high (just below mid-H); VB long, convex at LV and concave at RV; PB with small radius of curvature with maximum of convexity located low (below lower ⅓ of H); carapace long (H/L = 0.46); maximum of H located in posterior third of L.

REMARKS
Bairdiacypris combeae Forel n. sp. is close to *Bairdiacypris reniformis* (Chen, 1958) from the Early Permian of South China. In *B. combeae* Forel n. sp. the radius of curvature of AB and PB are smaller.

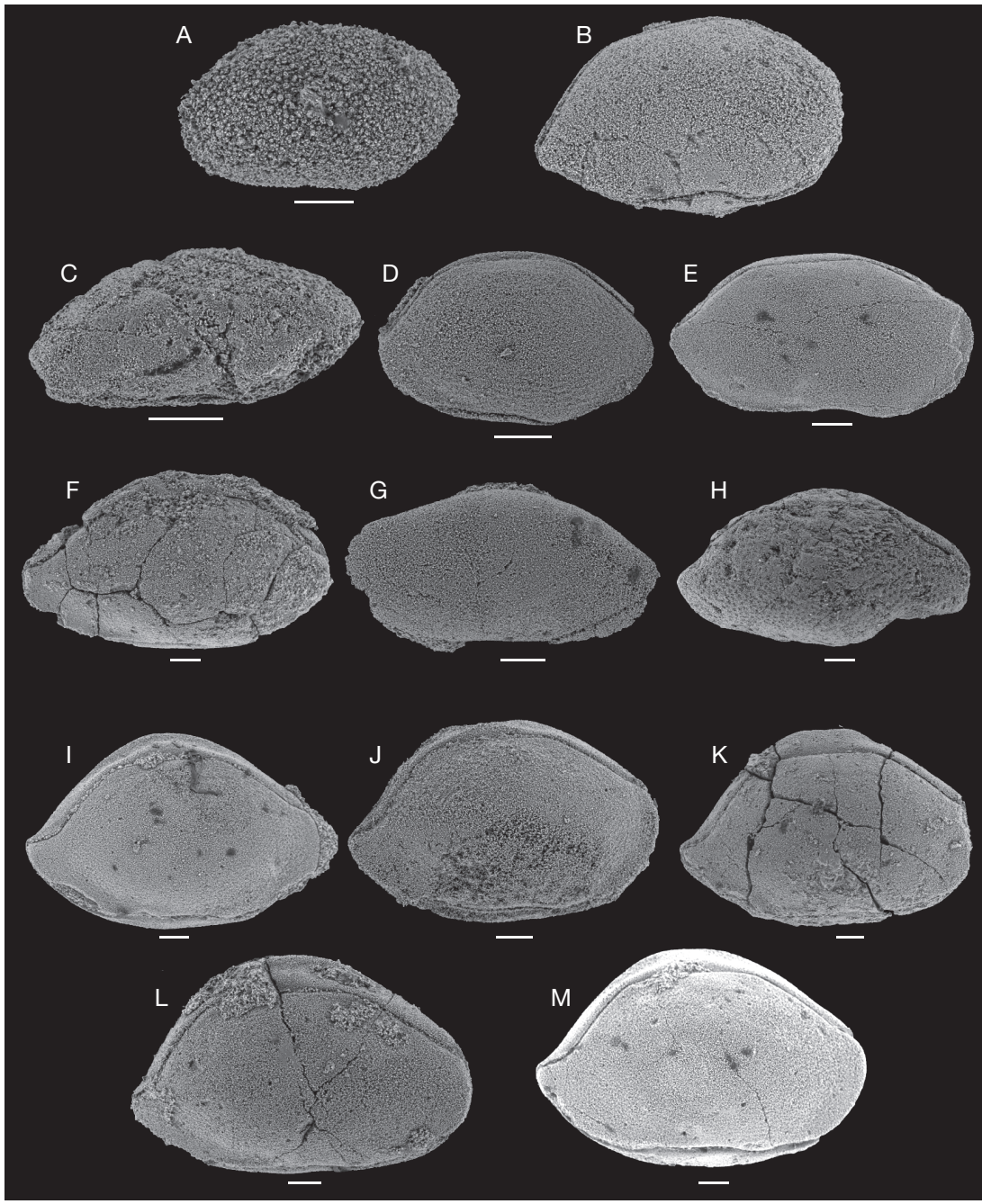
Genus *Liuzhinia* Zheng, 1976

TYPE SPECIES. — *Liuzhinia subovata* Zheng, 1976.

Liuzhinia larmae Forel n. sp.
(Fig. 6C-G)

TYPE MATERIAL. — Holotype: one complete carapace (P6M2638; Fig. 6C); paratype: one complete carapace (P6M2639; Fig. 6D).

FIG. 4. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**, *Bairdia fengshanensis* Crasquin-Soleau, 2006, right lateral view of a complete carapace (P6M2608); **B**, *Bairdia* sp. C, right lateral view of a complete carapace (P6M2609); **C**, *Acratia*? sp. B, right lateral view of a complete carapace (P6M2610); **D**, *Bairdia anisicaforma* Monostori, 1994, right lateral view of a complete carapace (P6M2611); **E**, *Bairdia* sp. F, right lateral view of a complete carapace (P6M2612);



F, *Bairdia anisica* Kozur, 1970, right lateral view of a complete carapace (P6M2613); **G**, *Bairdia*? sp. D, left lateral view of a complete carapace (P6M2614); **H**, *Bairdia* cf. *finalyi* (Méhes, 1911), right lateral view of a broken carapace (P6M2620); **I**-**M**, *Petasobairdia collini* Forel n. sp.; **I**, right lateral view of a complete carapace (P6M2617); **J**, paratype (P6M2619), right lateral view of a nearly complete carapace (dorsal part of left valve is missing); **K**, right lateral view of a nearly complete carapace (P6M2613); **L**, right lateral view of a complete carapace (P6M2618); **M**, holotype (P6M2615), right lateral view of a complete carapace. Scale bars: 100 µm.

ETYMOLOGY. — Dedicated to Kriemhilde Larm, personal dedication.

MATERIAL EXAMINED. — 32 complete carapaces and 1 isolated valve.

DIMENSIONS. — L = 350-570 µm; H = 175-290 µm. Holotype: L = 406 µm; H = 200 µm. Paratype: L = 388 µm; H = 206 µm.

TYPE HORIZON. — Sample 06Ti08, Unit IIIb, Tulong Formation, Smithian, Lower Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti06, 06Ti08, 06Ti13, 06Ti14 and 06Ti32, units III to VI, Smithian-Anisian, Early-Middle Triassic.

DIAGNOSIS. — A *Liuzhinia* species with long and straight dorsal border; AB and PB with small radius of curvature.

DESCRIPTION

DB long and straight; AB with relatively small radius of curvature; VB long and gently convex on both valves; PB with small radius of curvature; AB and PB gently compressed laterally at the extremities of the carapace; maximum of H located in front of L anterior third; H/L = 0.51

REMARKS

Liuzhinia larmae Forel n. sp. is very close from *Liuzhinia antalyaensis* Crasquin-Soleau, 2004 from the early Induan of the Western Taurus (Turkey, Crasquin-Soleau *et al.* 2004), Guangxi, South China (Crasquin-Soleau *et al.* 2006) and Southern Alps, Italy (Crasquin *et al.* 2008). Here, the radius of curvature of AB is smaller, the DB is shorter, the H/L ratio is smaller and the thickness is less important in posterior part of the carapace.

NB: in Crasquin-Soleau *et al.* (2004: 286), there is a printing mistake in the diagnosis of *Liuzhinia antalyaensis*. It should be as follows:

DIAGNOSIS. — Species of *Liuzhinia* with long straight dorsal border and maximum of height located in the anterior third.

Suborder METACOPINA Sylvester-Bradley, 1961
Superfamily HEALDIOIDEA Harlton, 1933
Family HEALDIIDAE Harlton, 1933

Genus *Hungarella* Méhes, 1911

TYPE SPECIES. — *Hungarella problematica* Méhes, 1911.

Hungarella tulongensis Crasquin n. sp. (Fig. 8A-F)

TYPE MATERIAL. — Holotype (P6M2662): one complete carapace (Fig. 8A); paratype (P6M2666): one complete carapace (Fig. 8D).

ETYMOLOGY. — From the Tulong section, type locality.

MATERIAL EXAMINED. — 230 complete carapaces and 18 isolated valves.

DIMENSIONS. — L = 380-570 µm; H = 240-350 µm. Holotype: L = 506 µm; H = 316 µm. Paratype: L = 514 µm; H = 308 µm.

TYPE HORIZON. — Unit V, Tulong Formation, Spathian, lower Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

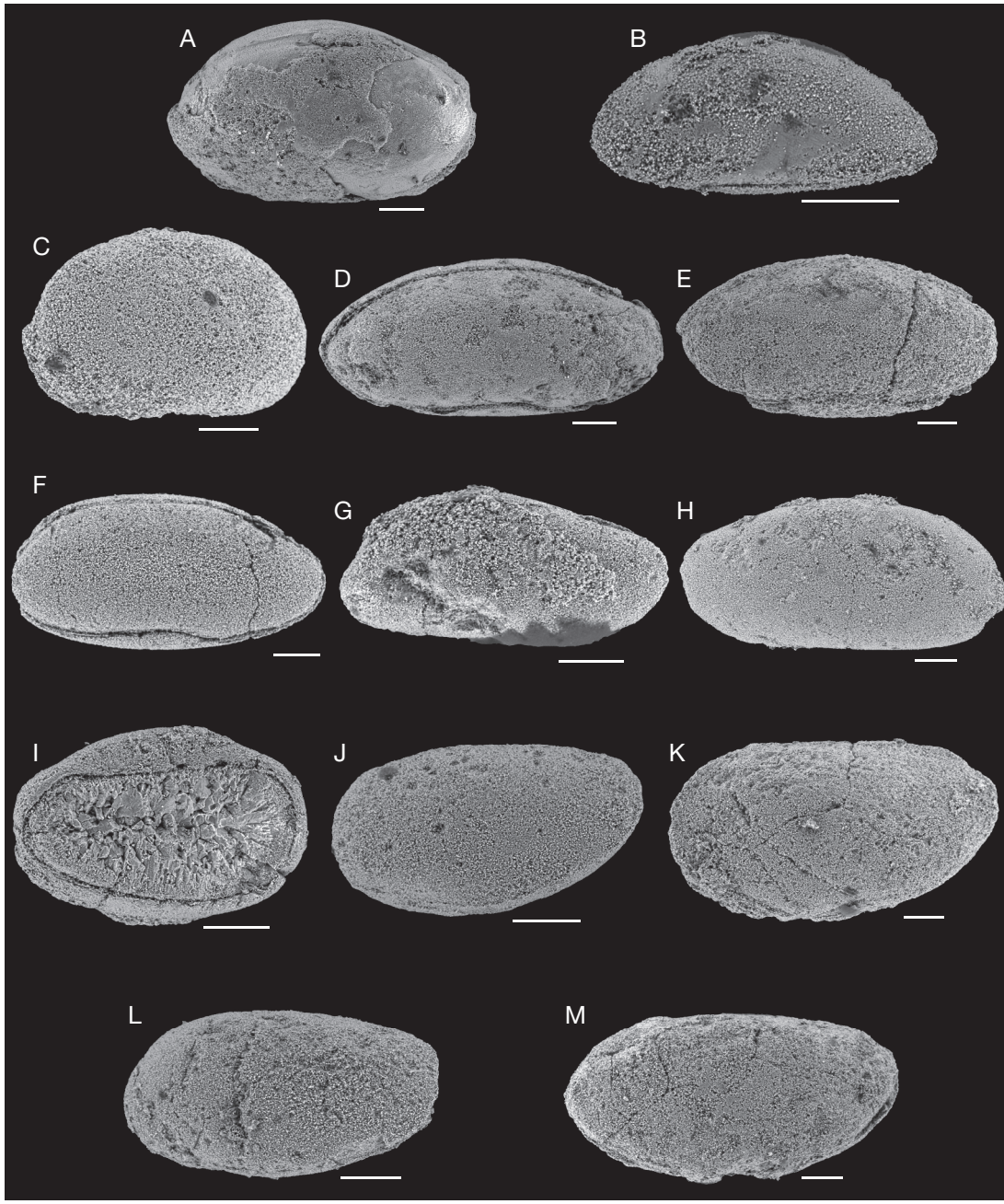
OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti20, 06Ti25, 06Ti26, 06Ti28-32 and 06Ti34, units V and VI, Spathian-Anisian, Early-Middle Triassic.

DIAGNOSIS. — A species of *Hungarella* with dorsal parts straight and carapace laterally compressed at AB.

DESCRIPTION

PD and AD parts long and straight on RV, straight to gently convex on LV; the two parts are at a 140-150° angle; AB regularly arched with a clear lateral flattening, maximum of convexity located around mid-H; VB regularly convex on both valves; PB with quite large radius of curvature, maximum of curvature located a little below mid-H; carapace subtriangular with maximum of H at mid-L or a little in front of; H/L = 0.62;

FIG. 5. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**, *Bairdia balatonica* Méhes, 1911, right lateral view of a complete carapace (P6M2621); **B**, *Acratia* sp. A., right lateral view of a complete carapace (P6M2622); **C**, *Hungarella*? sp., right lateral view of right valve (P6M2623); **D**, **E**, *Bairdiacypris anisica* Kozur, 1971; **D**, right



lateral view of a complete carapace (P6M2627); **E**, right lateral view of a broken carapace (P6M2628); **F**-**H**, *Bairdiacypris combeae* Forel n. sp.; **F**, holotype (P6M2626), right lateral view of a right valve; **G**, left lateral view of a complete carapace (P6M2625); **H**, paratype (P6M2624), left lateral view of left valve; **I**, *Microcheilinella* sp. A, right lateral view of left valve (P6M2629); **J**-**M**, *Triassicindivisia tibetinella* Crasquin n. gen., n. sp.; **J**, holotype (P6M2631), left lateral view of a complete carapace; **K**, paratype (P6M2632), left lateral view of a complete carapace; **L**, left lateral view of a complete carapace (P6M2636); **M**, left lateral view of a complete carapace (P6M2637). Scale bars: 100 µm.

LV overlap of LV on RV very weak all around the margins; surface smooth.

REMARKS

Hungarella tulongensis Crasquin n. sp. differs from the Upper Anisian species "*Hungarella*" *reniformis* Méhes, 1911 from Lake Balaton (Hungary; Méhes 1911; Monostori 1995) by H/L smaller and a maximum of convexity of BP located lower. *Hungarella elongata* (Blake, 1876) from the Late Triassic (Rhaetian) of Great Britain (Anderson 1964) has the same anterior structure but the dorsal outline is less angular and H/L is smaller. *Hungarella ovata* Zheng, 1976 from the Rhaetian of South China (Zheng 1976) is also relatively close to the new species but has a concave VB on RV and a PB with smaller radius of curvature (*Hungarella* genus needs re-collection and re-description).

Order PALAEOCOPIDA Henningsmoen, 1953
Superfamily indet.
Family indet.

Genus *Triassicindivisia* Crasquin n. gen.

TYPE SPECIES. — *Triassicindivisia tibetinella* Crasquin n. sp. (Fig. 5J-M).

ETYMOLOGY. — From the similarity with the Devonian genus *Indivisia* Zaspelova, 1954 (*in* Egorov 1954).

TYPE HORIZON. — Tulong section, Southern Tibet. Sample 06Ti35, unit VI, Anisian, Middle Triassic.

DISTRIBUTION. — Middle Smithian to Early Anisian, Tulong section, Southern Tibet.

DIAGNOSIS. — A new Triassic palaeocopid genus with free margins laterally compressed, without observable sulcus, all surface smooth.

REMARKS

Triassicindivisia n. gen. is close to the Devonian *Indivisia*.

Triassicindivisia tibetinella Crasquin n. sp. (Fig. 5J-M)

TYPE MATERIAL. — Holotype: one complete carapace (P6M2631; Fig. 5J); paratype: one complete carapace (P6M2632; Fig. 5K).

ETYMOLOGY. — From Tibet, type locality.

MATERIAL EXAMINED. — 8 complete carapaces.

DIMENSIONS. — L = 460-825 µm; H = 250-420 µm. Holotype: L = 460 µm; H = 253 µm. Paratype: L = 714 µm; H = 385 µm.

TYPE HORIZON. — Sample 06Ti35, Unit VI, Tulong Formation, Anisian, Middle Triassic.

TYPE LOCALITY. — Tulong section, Southern Tibet.

OCCURRENCE. — Tulong section, Southern Tibet. Samples 06Ti07, 06Ti20, 06Ti31, 06Ti33 and 06Ti35, units III to VI, Smithian-Anisian, Early-Middle Triassic.

DIAGNOSIS. — A species of *Triassicindivisia* n. gen. with elongated carapace (H/L = 0.52), AB and PB have small radius of curvature.

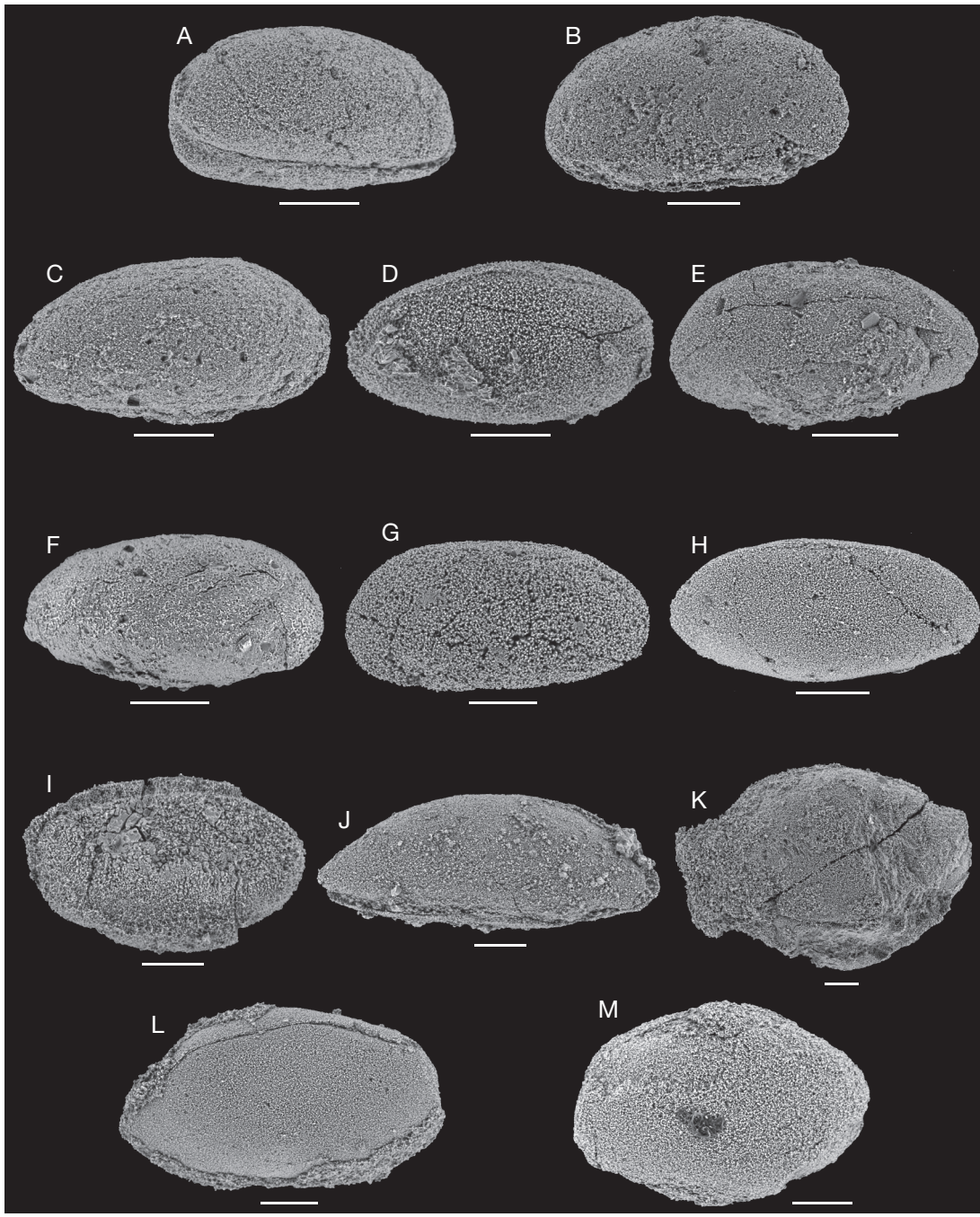
DESCRIPTION

Carapace with long straight to gently convex DB; cardinal angles clearly expressed, equivalent and very obtuse (≈ 145 to 150°); AB with small radius of curvature, maximum of convexity located at mid-H or a little below; VB regularly curved with maximum of convexity (H maximum) in front of mid-L; BP with small radius of curvature, maximum located high at upper ⅓ of H; free margins compressed laterally; RV overlaps LV all along free margins; surface smooth, no primary nor secondary ornamentation; H/L = 0.52.

REMARKS

This new genus and the type species are reminiscent of Paraparchitoidea by the absence of primary and secondary ornamentation. Internal characters, e.g., muscle scars, were not observed so the superfamily is uncertain for the time being.

FIG. 6. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**, *Microcheilinella* sp. C, right lateral view of a complete carapace (P6M2635); **B**, *Liuzhinia* sp. B, right lateral view of a complete carapace (P6M2634); **C**-**G**, *Liuzhinia larmae* Forel n. sp.; **C**, holotype (P6M2638), right lateral view of a complete carapace; **D**, paratype (P6M2639), right lateral view of a complete carapace; **E**, left lateral view of a complete carapace (P6M2640); **F**, right lateral view of a complete carapace (P6M2641); **G**, left lateral view of a complete carapace (P6M2642); **H**, *Acratia* cf. *symmetrica* Hao, 1992, right lateral view



of a complete carapace (P6M2643); **I**, *Microcheilinella* sp. B., right lateral view of a broken carapace (P6M2630); **J**, *Acratia goemoeryi* Kozur, 1970, right lateral view of a complete carapace (P6M2644); **K**, *Urobairdia*? sp., right lateral view of a broken carapace (P6M2645); **L**, *Bairdia* cf. *cassiana rotundidorsata* Monostori, 1995, right lateral view of a complete carapace (P6M2646); **M**, *Bairdia* sp. E, right lateral view of a complete carapace (P6M2647). Scale bars: 100 µm.

DISCUSSION

Crasquin *et al.* (2007) described an early late Griesbachian age fauna from southwestern Tibet (Gyanyima section, Burang area) from which 14 species were recognized. The ostracod fauna presented in this paper is the first described from late Early-Middle Triassic age sediments of Tibet. In Tulong no ostracods were found before the Smithian. The Smithian-Anisian ostracods from Tulong have no species in common with the Griesbachian of Gyanyima. The distribution of the Tulong species is given: Table 1. Only seven species are recognized in the Smithian. The base of the Spathian is characterized by the first appearance of 15 species (samples 06Ti20 and 21). The discovery of this Lower-Middle Triassic ostracod fauna is very important for understanding the general recovery processes after the upper Permian mass extinction. The ostracod recovery is analysed in another paper (Forel *et al.* in press).

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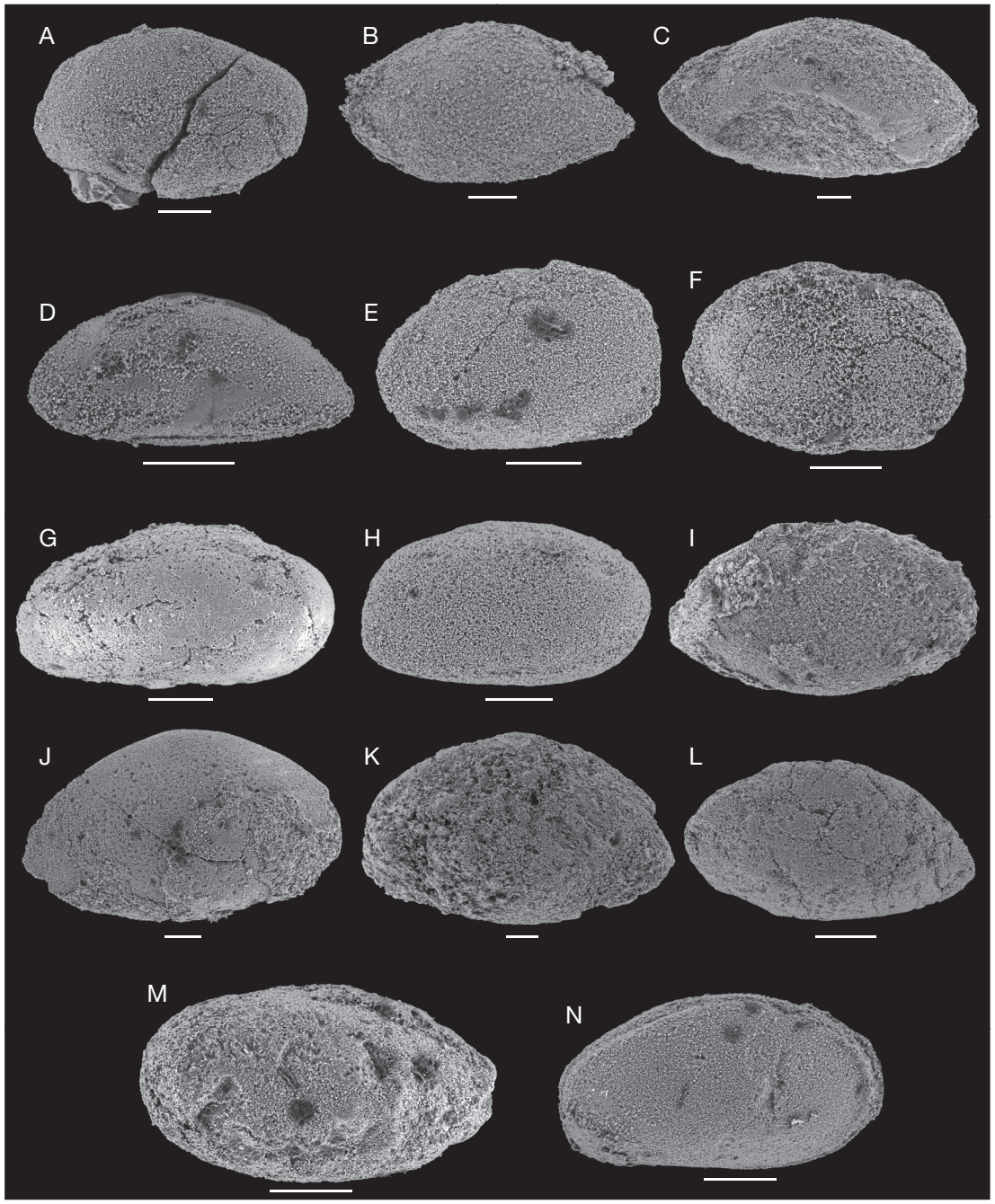
FIG. 7. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**, *Bairdia* sp. E, right lateral view of a broken carapace (P6M2651); **B**, **C**, *Bairdia* cf. *Bairdia* (*Urobairdia*) sp.1 *sensu* Monostori, 1995; **B**, left lateral view of a left valve (P6M2648); **C**, left lateral view of a left valve (P6M2649); **D**, *Acratia* sp. A, right lateral view of a complete carapace (P6M2650); **E**, *Callicythere subovata* (Zheng, 1976), right lateral view of a right valve (P6M2652); **F**, *Callicythere* cf. *mazurensis* (Styk, 1972), right lateral view of a right valve (P6M2653); **G**, *Callicythere* cf. *lysi* Crasquin-Soleau, 2004, right lateral view of a



right valve (P6M2651); **H**, *Bythocypris* cf. *Bythocypris* sp. B *sensu* Bolz, 1971, right lateral view of a right valve (P6M2655); **I-L**, *Citrella ampelsbachensis* (Kozur & Bolz, 1971); **I**, right lateral view of a complete carapace (P6M2656); **J**, right lateral view of a complete carapace (P6M2657); **K**, left lateral view of a complete carapace (P6M2658); **L**, left lateral view of a complete carapace (P6M2659); **M**, *Cytheropteron*? sp. A, left lateral view of a complete carapace (P6M2660); **N**, *Hungarella* sp. C, right lateral view of a complete carapace (P6M2669). Scale bars: 100 µm.

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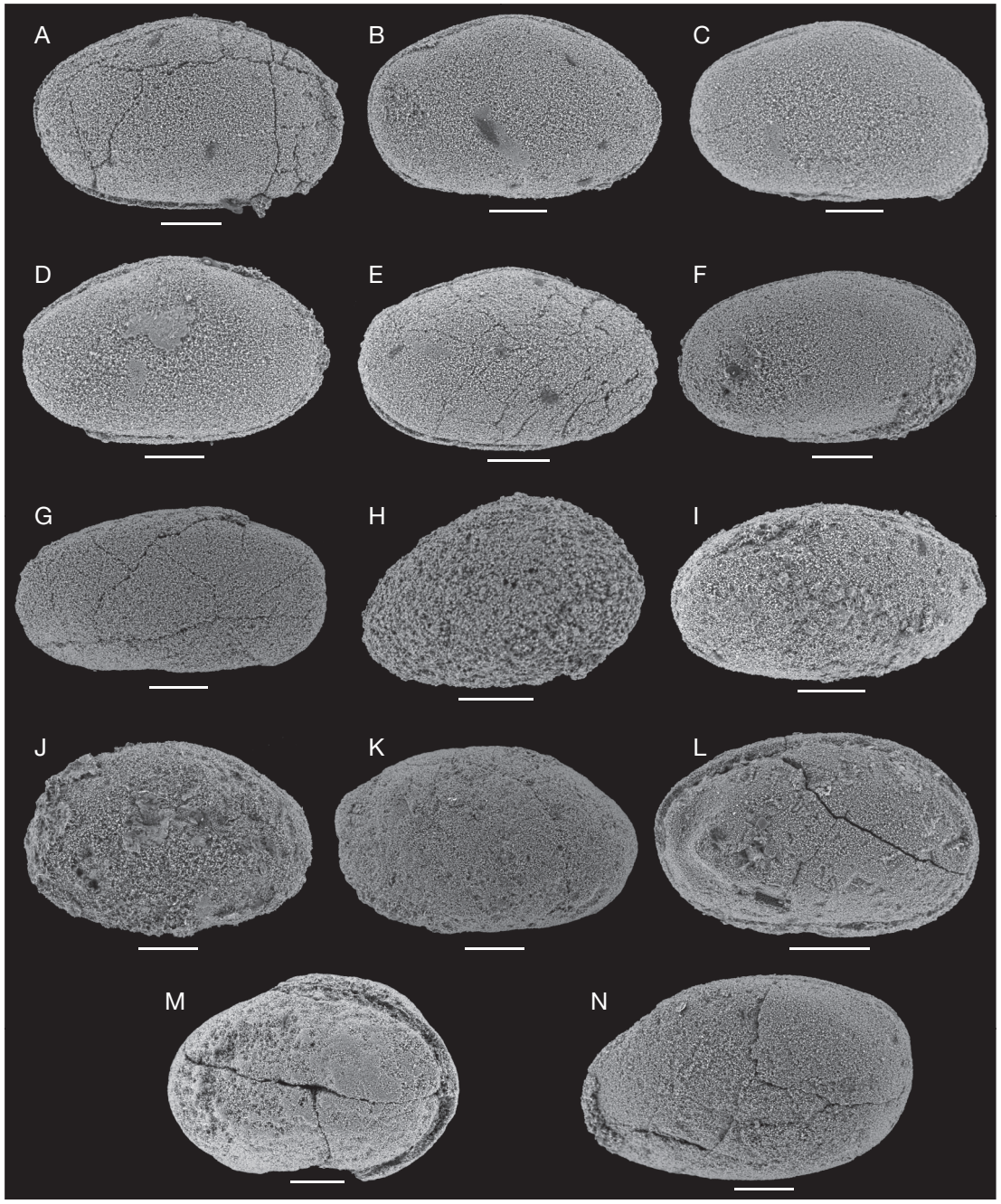
FIG. 8. — Specimens from Tulong section (Tibet), stored at the Pierre et Marie Curie University Collections (Paris, France): **A**-**F**, *Hungarella tulongensis* Crasquin n. sp.; **A**, holotype (P6M2662), right lateral view of a complete carapace; **B**, right lateral view of a complete carapace (P6M2663); **C**, right lateral view of a complete carapace (P6M2665); **D**, paratype (P6M2666), right lateral view of a complete carapace; **E**, right lateral view of a complete carapace (P6M2667); **F**, right lateral view of a complete carapace (P6M2661); **G**, *Hun-*



garella sp. B, right lateral view of a complete carapace (P6M2668); **H**, *Liuzhinia guangxiensis* Crasquin-Soleau, 2006, right lateral view of a complete carapace (P6M2672); **I**, *Hungarella* sp. D, right lateral view of a complete carapace (P6M2670); **J**, *Hungarella* sp. E, right lateral view of a complete carapace (P6M2671); **K**-**M**, *Torohealdia*? sp. A; **K**, left lateral view of a left valve (P6M2675); **L**, right lateral view of a complete carapace (P6M2673); **M**, right lateral view of a broken carapace (P6M2674); **N**, *Hungarella* sp. A, right lateral view of a complete carapace (P6M2664). Scale bars:100 µm.