A New Pentatomoid Bug from the Ypresian of Patagonia, Argentina

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Brief report

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A new pentatomoid bug from the Ypresian of Patagonia, Argentina

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A new pentatomoid heteropteran, *Chinchekoala qunita* gen. et sp. nov. is described from the lower Eocene of Laguna del Hunco, Patagonia, Argentina. The new genus is mainly characterised by cephalic characters such as the mandibular plates surpassing the clypeus and touching each other in dorsal view; head wider than long; and remarkable characters related to the eyes, which are surrounded antero-laterally and posteriorly by the anteocular processes and the pronotum, as well as they extend medially more than usual in the Pentatomoidea. This is the first pentatomoid from the Ypresian of Patagonia and the second from the Eocene in the region, being the unique two fossil pentatomoids in Argentina.

Introduction

Compared to ca. 7000 living species of Pentatomoidea (Cassis and Gross 2002; Rider 2006, 2011; Schuh and Slater 1995) only ca. 150 fossil species were described from the late Mesozoic onwards (Mitchell 2013; Popov and Pinto 2000; Yao et al. 2013). Fossils are mainly limited to Asia, Europe and North America, with only three species described from South America (Pinto and Ornellas 1974; Petrulevičius and Popov 2014; Petrulevičius and Coscarón in press).

In Argentina 311 living species of Pentatomoidea are recorded in the literature (Coscarón in press). In Patagonia their diversity is scarce with a total of 27 species (Coscarón in press), a number decreasing progressively southwards. There are 20 species south to the 42° parallel, and only 8 species in Santa Cruz and Tierra del Fuego. The previous known fossil from Patagonia, *Acanthocephalonotum martinsnetoi* Petrulevičius and Popov, 2014 (Petrulevičius and Popov 2014), comes from Río Pichileufú (Lutetian: 47.7 Ma), at paleolatitude ca. 46° (Wilf 2012; Wilf et al. 2005). Herein I study a second specimen of Pentatomoidea coming from the Ypresian locality of Laguna del Hunco (52.2 Ma; paleolatitude ca. 47°), Chubut province, Patagonia, Argentina. Laguna del Hunco is a well sampled locality from which diversified insects, mainly Odonata, were recovered (Fidalgo and Smith 1987; Petrulevičius 2005, 2008, 2013; Petrulevičius and Nel 2003, 2005, 2007, 2013; Petrulevičius et al. 2010).

Institutional abbreviations.—MPEF-PI, Museo Paleontológico Egidio Feruglio, Trelew, Chubut, Argentina.

Material and methods

The material was recovered from the caldera lake bed locality Laguna del Hunco, province of Chubut, Patagonia, Argentina (Wilf et al. 2003). It consists of a single specimen, holotype MPEF-PI 944a–b, with dorsal and ventral sides, collected from pyroclastic debris of the plant locality LH-25, latitude 42°30'S, longitude 70°W (Wilf 2012; Wilf et al. 2003, 2005). The locality was dated using 40Ar/39Ar by Wilf et al. (2005) and recalculated by Wilf (2012), giving an age of 52.22 ± 0.22 (analytical 2 σ), ± 0.29 (full 2 σ) Ma. The specimen was originally partly covered by sediment and was prepared with a pneumatic hammer. It was drawn with a camera lucida attached to a Wild M8 stereomicroscope and photographed with a Nikon SMZ800 with a DS-Vil camera. For female genitalia nomenclature I use valvifers VIII and IX sensu Tsai and Rédei (2014) instead of gonocoxites VIII and IX (Grazia et al 2008: fig. 32) because only valvifers IX are gonocoxites (Kukalová-Peck 2008: fig. 20: 5).

Systematic palaeontology

Heteroptera Latreille, 1810

Pentatomoidea Leach, 1815

Genus *Chinchekoala* nov.

Etymology: From Spanish *chinche*, bug (Heteroptera), and *koala*, Australian native name of *Phascolarctos cinereus*; referring to the resemblance of the specimen's head in ventral view with a koala head.

Type species: *Chinchekoala qunita* sp. nov. (by monotypy); see below.

Diagnosis.—As for the type species by monotypy.

Remarks.—Although the Pentatomoidea are widely considered monophyletic, the internal relationships of the group are not consensual and obscured due to high amount of homoplasy in the morphological signal at familial and subfamilial level (e.g., Gapud 1991; Grazia et al. 2008; Hassan and Kitching 1993; Kment and Garbelotto 2016; Yao et al. 2013). Awaiting finding new evidence, I refrain from assigning the new genus to any particular family, pending further study.

Chinchekoala qunita sp. nov.

Figs. 1–4.

Etymology: In reference to the kit *Qunita*, a great example of a public health policy in 2015 conducted to reduce the maternal and infant mortality in Argentina, especially promoting maternity care and the usage of a sophisticated baby box and of a turbulette. In memory of Tiago Ares, designer of Qunita, passed away on 27th October 2015.

Holotype: MPEF-PI 944a–b, dorsal and ventral sides of a female.

Type locality: Laguna del Hunco, province of Chubut, Patagonia, Argentina.

Type horizon: Ypresian (52 Ma), lower Eocene.

Diagnosis.—Tergite IX in females not visible dorsally (nor ven-

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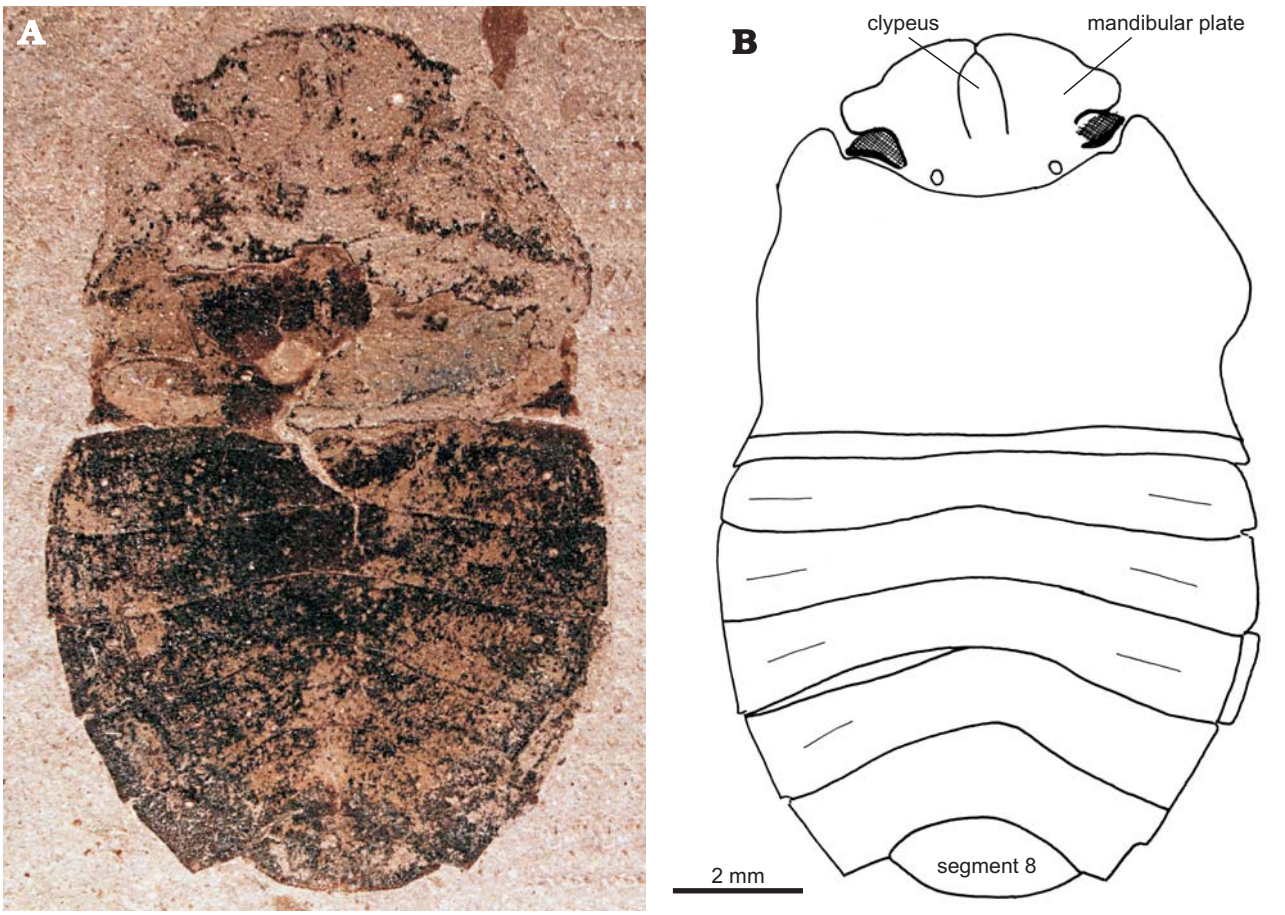

Fig. 1. Dorsal habitus of female of pentatomoid bug *Chinchekoala qunita* gen. et sp. nov., holotype MPEF-PI 944a from Laguna del Hunco (Chubut, Argentina); Ypresian, lower Eocene. Photograph (**A**), camera lucida drawing (**B**).

trally), covered by apically positioned tergite VIII; valvifers 9 fused, forming a single well-sclerotized piece; laterotergites 9 quite smaller than valvifers 8; head dorso-ventrally flattened and laterally carinate; mandibular plates (= juga) well developed, surpassing the clypeus and touching each other in dorsal view; head wider than long, anterior margin of head slightly convex; eyes reniform reaching both dorsal and ventral surface of head; interocular width greater than head length (1.7×); well-rounded and broad anteocular process completely embracing the anterior margin of the eye and perpendicular to the sagittal plane; postgenae (= temples) well surpassing the eye laterally; pronotum with broad and triangularly produced anterolateral angles parallel to the sagittal plane and reaching the anterior eye margin; slightly concave mesosternum; evaporatorium large and oval; spiracle long and slightly curved; peritreme long, spout-shaped and slightly falcate.

Description.—This description is based on a single specimen, the holotype MPEF-PI 944a–b, presenting a dorsal (Figs. 1, 3) and a ventral view (Figs. 2, 4) of a mainly complete body lacking antennae, legs, scutellum and wings.

Body: 14.5 mm long and 7.7 mm wide at pronotum. Head broader than long with numerous punctures (Figs. 3A, 4A); anterior margin of head somewhat convex; head 4.5 mm wide, 2.6 mm long (dorsal view); eyes reaching both dorsal and ventral surface of head; eyes well developed with ≈ 130 ommatidia either in dorsal (Fig. 2A) and ventral (Fig. 4A) sides; eyes, 0.35 mm wide in dorsal view, 0.3 mm wide in ventral view, 1 mm long in dorsal view, 0.9 mm long in ventral view; ommatidia showing juxtaposed crystalline cones hexagonally packed in the anterior portion of the eye (Fig. 4B); postgenae (= temples) well surpassing the eye laterally; anteocular length 1.5 mm; inter-ocular width 2.8 mm; inter-ocular width/head length ratio 0.6; ocelli situated posteromedially to eyes near anterior pronotal margin; distance between ocelli 1.6 mm; distance between eyes and ocellus 0.4 mm; mandibular plates superimposed (left one under right one) before clypeus for a short distance in dorsal view, separated in ventral view; apex of mandibular plates contiguous in dorsal view about 0.35 mm; lateral margins of mandibular plates deeply concave; clypeus bullet shaped; anteocular process completely embracing the anterior margin of the eye and perpendicular to the sagittal plane, round shaped, 0.7 mm long, with its anterior and posterior margins symmetrical; eyes almost enclosed anteriorly by the anteocular processes and posterolaterally by the expanded anterolateral angles of pronotum; labrum narrow; origin of the labium at the same height than anterior side of anteocular process, distinctly anterior to antennal sockets and anterior margins of eyes.

Pronotum: transverse with numerous punctures, 7.7 mm wide, 3.9 mm long; anteriorly strongly concave to receive head;

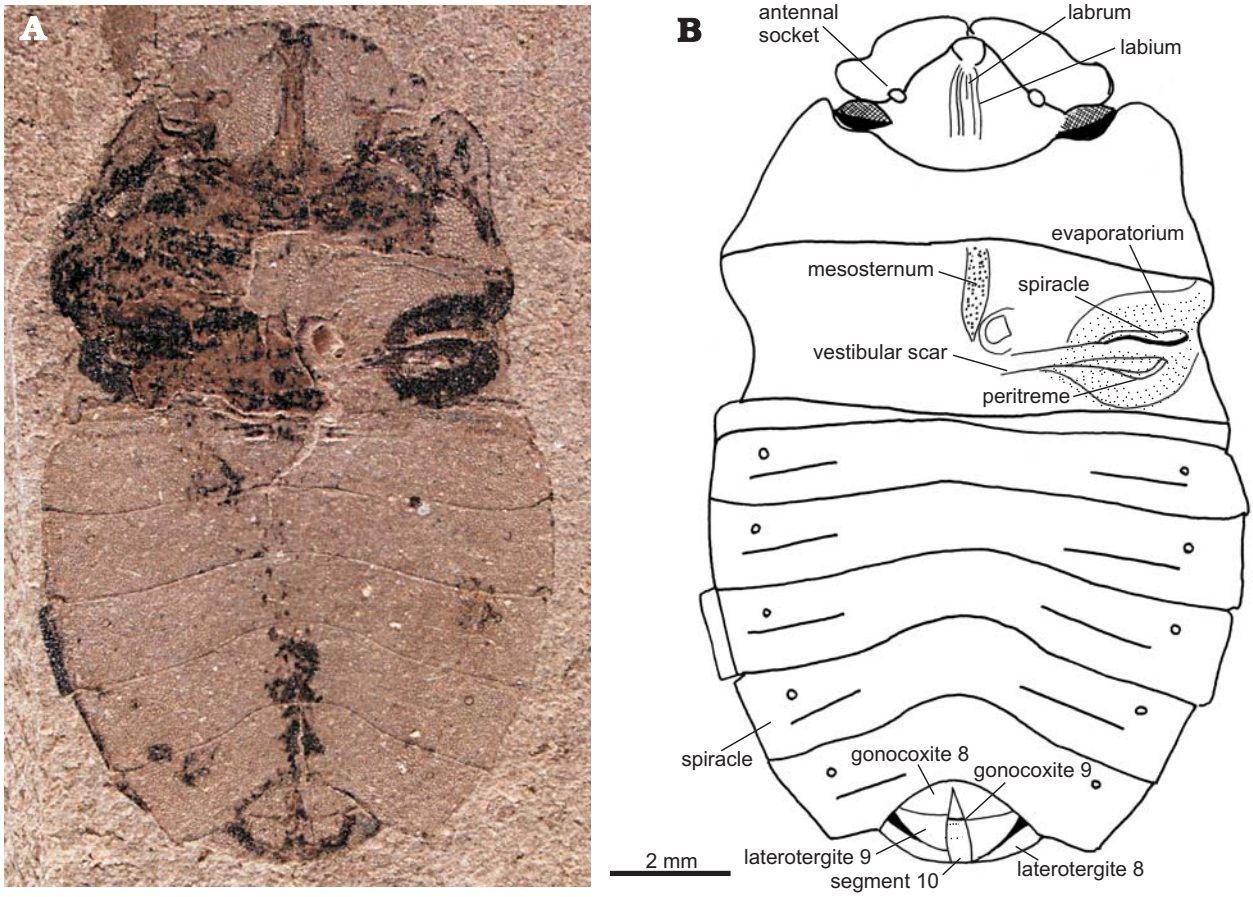

Fig. 2. Ventral habitus of female of pentatomoid bug *Chinchekoala qunita* gen. et sp. nov., holotype MPEF-PI 944b from Laguna del Hunco (Chubut, Argentina); Ypresian, lower Eocene. Photograph (**A**), camera lucida drawing (**B**).

anterolateral angles broad and triangular, parallel to the sagittal plane and produced anteriad, reaching reaching the anterior margin of eyes; humeral angles rounded.

Thoracic venter: punctated, with slightly concave and punctated mesosternum narrowing anteriad and posteriad (Fig. 4B); surface of pleura uneven; evaporatorium large with preserved dark oval area covering the mesepimeron and metepimeron; vestibular scar leading from ostiole inwards; spiracle developed, wide and long and slightly curved (posteriorly); peritreme long, spout-shaped, slightly falcate, apically curved anteriad, with peritremal surface oriented posteroventrally (Fig. 4B).

Abdomen in dorsal view: Tergites II to VIII visible because of the lack of preserved scutellum and wings, 8.6 mm wide at segment IV, 7.6 mm long; abdomen laterally arcuate, lateral margins of segments ca. straight, without projections; abdominal tergite VIII elongated ellipsoidal and not reaching the lateral margins of segment VII, covering the IX (Fig. 3C); laterotergites parallelogram shaped and narrow (only V preserved).

Abdomen in ventral view: with pregenital segments II to VII visible; spiracles placed on flat tubercles from segment III to segment VII; ventrites III to VII have laterally well visible transverse lateral muscle scars (= pseudosutures) posterior to spiracle (Fig. 2A).

Female external genitalia (Figs. 2B, 4C): Valvifers VIII subtriangular and separating each other forming a triangular shape widening distally; between the valvifers XIII, the valvifers IX fused (?); laterotergites IX well separated and between them the segment X; laterotergites IX smaller than valvifers VIII; laterotergites VIII thin and not well preserved.

Discussion.—The specimen is considered a Pentatomoidea because of the presence of several characters: (i) pronotum with the humeral and anterolateral angles developed, (ii) head dorso-ventrally flattened, (iii) mandibular plates well developed, reaching or surpassing the clypeus, (iv) fusion of abdominal sterna II–VII, (v) tergite IX in females not visible dorsally (and ventrally), covered by apically positioned tergite VIII. Character (i) is considered a synapomorphy of Pentatomoidea (excluding Urostylididae) by Grazia et al. (2008) but it is present also in some Coreoidea (Pavel Štys personal communication to Petrulevičius and Popov 2014). Characters (iv–v) are considered synapomorphies of Pentatomoidea by Yao et al. (2012) and Grazia et al. (2008), respectively.

The specimen has also the laterotergites IX separate, with segment X between them. This feature is present within pentatomoids in some Acanthosomatidae, Cydnidae, Thaumastellidae, Phloeidae, Scutelleridae, Aphylinae, and Pentatomidae except the Ochlerini (Grazia et al. 2008). The Acanthosomatidae have the valvifers VIII contiguous and some genera have also Pendergrast's organs in the abdomen unlike our specimen (Grazia et al. 2008). The studied specimen shares with the

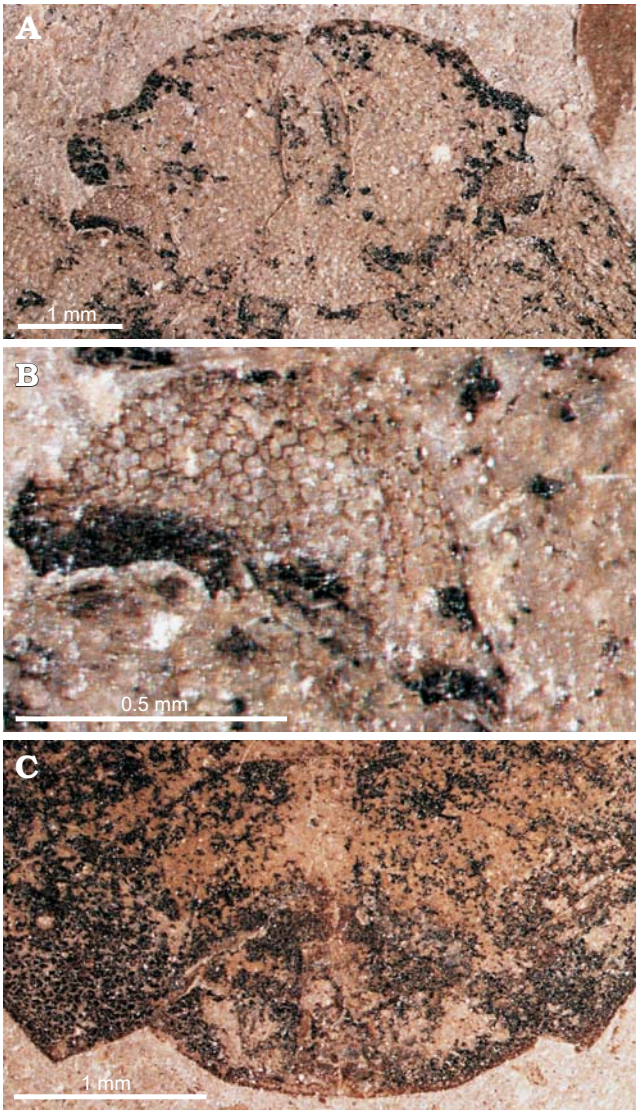

Fig. 3. Details of dorsal habitus of female of pentatomoid bug *Chinchekoala qunita* gen. et sp. nov., holotype MPEF-PI 944a from Laguna del Hunco (Chubut, Argentina); Ypresian, lower Eocene. Head (**A**), eye (**B**), last tergites (**C**).

Phloeidae the compound eyes with well-developed dorsal and ventral surfaces, but these latter differ by the presence of body foliations and by having the abdominal tergite VIII splitting on the midline (see Grazia et al. 2008: fig. 11a). The Cydnidae (partim), Scutelleridae and Aphylinae have the antenniferous tubercles ventral on the head but partially obscured by the mandibular plates (Grazia et al. 2008), unlike the studied specimen which has the antenniferous tubercles completely covered by the enlarged mandibular plates. However, among the Scutelleridae, the genus *Morbora* Distant, 1899 also has the antenniferous tubercles completely covered (see Cassis and Vanags 2006). The specimen seems to have the valvifers IX fused which is a character of Pentatomidae excluding Cyrtocorinae (Grazia et al. 2008), Tessarotomidae and some Scutelleridae (e.g., Ahmad et al. 1988: fig. 8). However, this character is quite obscured and difficult to be confirmed in the specimen. The Tessarotomidae have no synapomorphies after Grazia et al. (2008) but have many differences with our specimen like the small and narrow head with respect to the body and the tergite IX dorsally visible. The placement of the fossil in Tessaratomidae sensu stricto (i.e., Tessaratominae + Natalicolinae) could also be excluded because it has a small ostiole and spout-shaped peritreme, and not the large ostiolar groove accompanied by two peritremal lobes as in Tessaratomidae sensu stricto (see Kment and Vilímová 2010b: figs. 1, 2). The specimen has the valvifers VIII subtriangular and separated from each other by a triangle with its base caudad. This character is shared with some Scutelleridae like *Deroplax* Mayr, 1864 (Ahmad et al. 1988) and Pentatomidae like *Anoano* Cachan, 1952 (Kment 2012). Our specimen shares with the female of Acanthosomatidae (except Blaudini and Lanopini), Cydnidae (except Amnestinae), Phloeidae (including Serbaninae), Thaumastellidae, Scutelleridae: Tectocorinae and Scutellerini, Aphylidae, and Pentatomidae (except Ochlerini) the laterotergites IX smaller than valvifers VIII and the segment X visible between the valvifers IX (Grazia et al. 2008).

The specimen is one of the few Pentatomoidea with a broad head and the mandibular plates touching each other in front of the clypeus. Other genera having these characters are found within the Discocephalinae (Campos and Grazia 2006; Rolston 1981, 1990), the Pentatominae: Sciocorini, Myrocheini, Caystrini, and Triplatygini (Kment and Garbelotto 2016) and the Phyllocephalinae (Kamaluddin and Ahmad 1988). The genera of Sciocorini, Myrocheini, and Castrini having broad heads possess the margins of head, pronotum and corium sharp, without lobes and the humeri of pronotum rounded (Kment and Garbelotto 2016), unlike the specimen studied here. We could exclude the genera of Triplatygini, which have spiny (when present) preocular lobes and anterolateral pronotal angles truncate with thin and pointed lobes (Kment 2008, 2012, 2015; Kment and Baena 2015). The genera of Discocephalinae could also be excluded by having the origin of the labium caudad to the anterior limit of the eyes and the peritreme not reaching the middle of the metapleuron (Gapud 1991; Rolston 1981; Rolston and McDonald 1979).

It is interesting to remark the similarities of the specimen with an Australian genus of Scutelleridae, *Morbora*. They share the broad head, anteocular process reaching the lateral eye margin, the anterolateral angles of pronotum reaching the anterior eye margin, and the eyes reaching far mediad, dorsally and ventrally. In *Morbora* the mandibular plates are not touching each other in front of the clypeus and it has other special generic characters like the valvifers VIII tripartite (Cassis and Vanags 2006) and the scutellum wide and covering the entire abdomen, like all Scutelleridae. The similarities of both genera are remarkable but the absence of a preserved scutellum in our specimen precludes deciding about any relationship with the Scutelleridae.

The specimen could be differentiated from the other fossil genus of Pentatomidae present in the Eocene of Patagonia, *Acanthocephalonotum* by the presence, in this latter, of pointed and triangular anteocular processes and the pronotum with a broad spine-like anterolateral process, stout and sharp (Petrulevičius and Popov 2014).

The specimen has also a character in the thoracic scent efferent system i.e., the vestibular scar leading from ostiole inwards

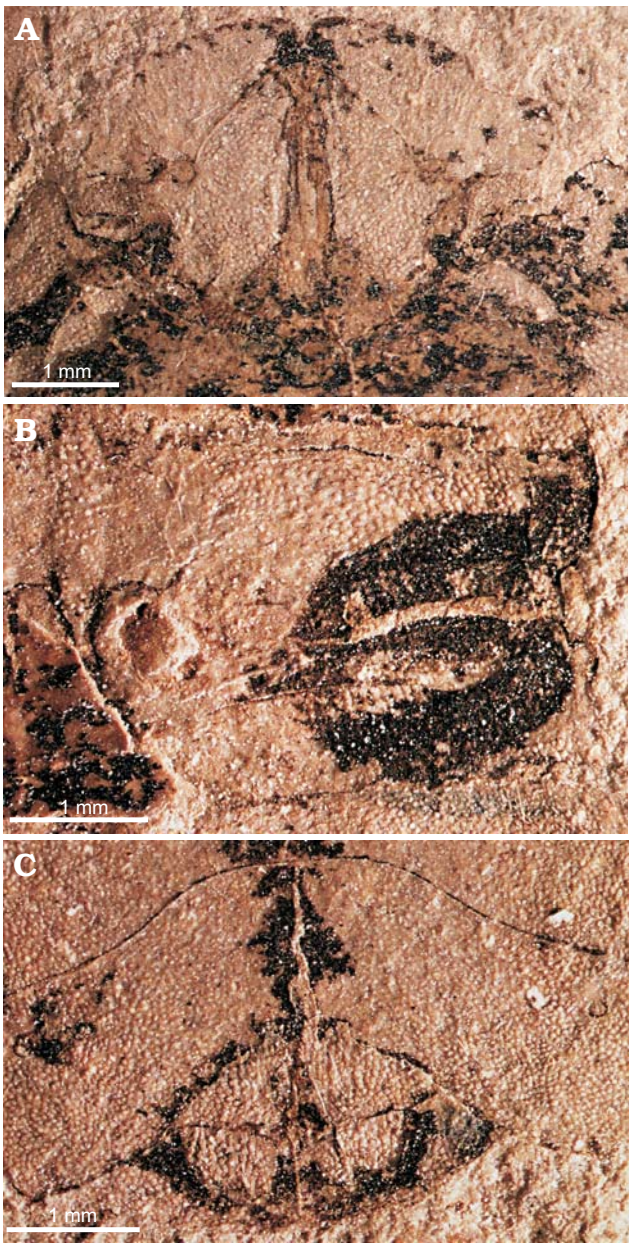

Fig. 4. Details of ventral habitus of female of pentatomoid bug *Chinchekoala qunita* gen. et sp. nov., holotype MPEF-PI 944b from Laguna del Hunco (Chubut, Argentina); Ypresian, lower Eocene. Head (**A**), thoracic scent efferent system (**B**), genitalia (**C**).

(Fig. 4B; Petr Kment personal communication 2016). This character is only present sensu Kment and Vilímová (2010a) in Thaumastellidae, Cydnidae, Thyreocoridae, Parastrachiidae, Phloeidae: Phloeinae, Plataspidae, and Dinidoridae (partim). All these taxa except the Cydnidae had been excluded by other previously cited characters. Some cydnids have a broad head and the mandibular plates touching each other in front of the clypeus (see Lis and Heyna 2001: fig. 49), but there are no genera with anteocular processes. Unfortunately, the specimen does not preserve the legs, and thus it is unknown if they were spiny, like in Cydnidae (Petr Kment personal communication 2016), which precludes its attribution to this family awaiting a specimen with preserved legs.

Concluding remarks

The specimen studied here has unique characters and a combination of features allowing the erection of a new genus. The presence of these characters allows including it in Pentatomoidea awaiting new material to decide its familial affinities.

The most surprising characters are related to the eyes, which are surrounded antero-laterally and posteriorly by the anteocular processes and the pronotum, as well as they extend medially more than it is usual in the Pentatomoidea (Petr Kment personal communication 2016). The nice preservation of crystalline cones in *Chinchekoala* gen. nov. allows counting the number of facets, concluding a similar number in both dorsal and ventral surfaces. Either in the dorsal and ventral views of the specimen, the anterior and lateral eye margins are surrounded by the processes of the head and pronotum, leaving a strait "window" of lateral vision (Figs. 1B, 2B). In any case, the main vision of the specimen is directed upwards and downwards.

The discovery of the second genus and species of Pentatomoidea from the Eocene of Patagonia is noteworthy not only for the knowledge of the diversity but also for the ubiquity of the group, being preserved in two different localities in Patagonia with 7 Ma of difference and 150 km distant from each other (Petrulevičius 2008; Petrulevičius and Popov 2014). This diversity could be highlighted considering that only 26 species from 21 genera of Pentatomidae and Acanthosomatidae are living nowadays in Patagonia (Coscarón in press). In any case, the incipient fossil diversity of these bugs is not unexpected since much more than one hundred plant species are recorded in the locality, supported by a warm and humid climate (Wilf 2012).

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References

Ahmad, I., Moizuddin, M., and Mushtaq, S. 1988. A revision of the genus *Deroplax* (Hemiptera: Scuttelleridae) from Oriental region with description of two new species from Pakistan and Bangladesh. *Oriental Insects* 22: 259–266.

Campos, L.A. and Grazia, J. 2006. Análise cladística e biogeografia de Ochlerini (Heteroptera, Pentatomidae, Discocephalinae). *Iheringia (Série Zoologia)* 96: 147–163.

Cassis, G. and Gross, G.F. 2002. Hemiptera: Heteroptera (Pentatomomorpha). *In*: W.W.K. Houston and G.V. Maynard (eds.), *Zoological Catalogue of Australia 27.3B*. 732 pp. CSIRO Publishing, Melbourne.

Cassis, G. and Vanags, L. 2006. Jewel bugs of Australia (Insecta, Heteroptera, Scutelleridae). *Denisia* 19: 275–398.

Coscarón, M.C. (in press). A catalogue of the Heteroptera or true bugs of Argentina. *Zootaxa*.

Fidalgo, A.P. and Smith, D.R. 1987. A fossil Siricidae (Hymenoptera) from Argentina. *Entomological News* 98: 63–66.

Gapud, V. 1991. A generic revision of the subfamily Asopinae with consideration of its phylogenetic position in the family Pentatomidae and superfamily Pentatomoidea (Hemiptera–Heteroptera). *Philippine Entomology* 8: 865–961.

Grazia, J., Schuh, R.T., and Wheeler, W.C. 2008. Phylogenetic relationships of family groups in Pentatomoidea based on morphology and DNA sequences (Insecta: Heteroptera). *Cladistics* 24: 932–976.

Hassan, S.A. and Kitching, I.J. 1993. A cladistic analysis of the tribes of Pentatomidae (Heteroptera). *Japan Journal of Entomology* 61: 651–669.

Kamaluddin, S. and Ahmad, I. 1988. A revision of the tribe Phyllocephalini (Hemiptera: Pentatomidae, Phyllocephalinae) from Indo-Pakistan subcontinent with description of five new species. *Oriental Insects* 22: 185–240.

Kment, P. 2008. A revision of the endemic Madagascan genus *Triplatyx* (Hemiptera: Heteroptera: Pentatomidae). *Acta Entomologica Musei Nationalis Pragae* 48: 543–582.

Kment, P. 2012. Redescription of the Madagascan endemic genus *Anoano* with a new synonymy (Hemiptera: Heteroptera: Pentatomidae). *Acta Entomologica Musei Nationalis Pragae* 52: 371–382.

Kment, P. 2015. Two new genera of Madagascan Pentatominae (Hemiptera: Heteroptera: Pentatomidae). *Acta Entomologica Musei Nationalis Pragae* 55: 591–624.

Kment, P. and Baena, M. 2015. A redescription of the endemic Madagascan genus *Tricompastes* (Hemiptera: Heteroptera: Pentatomidae). *Zootaxa* 4044: 65–78.

Kment, P. and Garbelotto, T.A. 2016. *Discimita linnavuorii*, a new genus and species of Afrotropical Pentatominae resembling Neotropical Discocephalinae (Hemiptera: Heteroptera: Pentatomidae). *Entomologica Americana* 122: 199–211.

Kment, P. and Vilímová, J. 2010a. Thoracic scent efferent system of Pentatomoidea (Hemiptera: Heteroptera): a review of terminology. *Zootaxa* 2706: 1–77.

Kment, P. and Vilímová, J. 2010b. Thoracic scent efferent system of the Tessaratomidae sensu lato (Hemiptera: Heteroptera: Pentatomoidea) with implication to the phylogeny of the family. *Zootaxa* 2363: 1–59.

Kukalová-Peck, J. 2008. Phylogeny of higher taxa in Insecta: finding synapomorphies in the extant fauna and separating them from homoplasies. *Evolutionary Biology* 35: 4–51.

Lis, J.A. and Heyna, J. 2001. Revision of the Australian genus Blaena (Heteroptera: Cydnidae). *European Journal of Entomology* 98: 321–350.

Mitchell, T. 2013. *EDNA*. http://edna.palass-hosting.org/search.php

Petrulevičius, J.F. 2005. Avances en el conocimiento de la diversidad de insectos de Laguna del Hunco, Eoceno inferior de Chubut, Patagonia, Argentina. *Ameghiniana* 42: 40R.

Petrulevičius, J.F. 2008. Primer registro de Discocephalinae (Insecta: Pentatomidae) fósiles; un nuevo género del Eoceno de Río Pichileufú, Patagonia, Argentina. *Ameghiniana* 45: 32R.

Petrulevičius, J.F. and Coscarón, M.C. (in press). Fossil Heteroptera. *In*: M.C. Coscarón (ed.), A Catalogue of the Heteroptera or True Bugs of Argentina. *Zootaxa*.

Petrulevičius, J.F. and Nel, A. 2003. Frenguelliidae, a new family of dragonflies from the earliest Eocene of Argentina (Insecta: Odonata). Phylogenetic relationships within Odonata. *Journal of Natural History* 37: 2909–2918.

Petrulevičius, J.F. and Nel, A. 2005. Austroperilestidae, a new family of damselflies from the earliest Eocene of Argentina (Insecta: Odonata). Phylogenetic relationships within Odonata. *Journal of Paleontology* 79: 658–662.

Petrulevičius, J.F. and Nel, A. 2007. Enigmatic and little known Odonata (Insecta) from the Paleogene of Patagonia and northwest Argentina. *Annales de la Société entomologique de France (N.S.)* 43: 341–347.

Petrulevičius, J.F. and Nel, A. 2013. A new Frenguelliidae (Insecta: Odonata) from the early Eocene of Laguna del Hunco, Patagonia, Argentina. *Zootaxa* 3616: 597–600.

Petrulevičius, J.F. and Popov, Y.A. 2014. First fossil record of Discocephalinae (Insecta, Pentatomidae): a new genus from the middle Eocene of Río Pichileufú, Patagonia, Argentina. *ZooKeys* 422: 23–33.

Petrulevičius, J.F., Nel, A. and Voisin, J.-F. 2010. Discovery of a new genus and species of darner dragonfly (Aeshnidae: Odonata) from the lower Eocene of Laguna del Hunco, Patagonia, Argentina. *In*: A. Nel, D. Azar, and J.F. Petrulevičius (eds.), Fossil Insects, Systematics, Phylogeny, and Palaeoecology. *Annales de la Société Entomologique de France (n. s.)* 46 (Special Issue): 271–275.

Pinto, I.D. and Ornellas, L. 1974. New Cretaceous Hemiptera (Insecta) from Codó Formation, Northern Brazil. *Anais do 28 Congresso Brasiliero de Geologia*: 289–304.

Popov, Y.A. and Pinto, I.D. 2000. On some Mesozoic burrower bugs (Heteroptera: Cydnidae). *Paleontological Journal* 34: S.298–S.302.

Rider, D.A. 2006. Family Pentatomidae. *In*: B. Aukema and C. Rieger (eds.), *Catalogue of the Heteroptera of the Palaearctic Region 5*, 233–402. The Netherlands Entomological Society, Amsterdam.

Rider, D.A. 2011. *Number of Genera and Species of Pentatomidae*. North Dakota State University web page http://www.ndsu.nodak.edu/faculty/rider/Pentatomoidea/Classification/Genus_Species_Numbers.htm

Rolston, L.H. 1981. Ochlerini, a new tribe in Discocephalinae (Pentatomidae). *Journal of the New York Entomological Society* 89: 40–42.

Rolston, L.H. 1990. Key and diagnoses for the genera of broadheaded Discocephalines (Pentatomidae). *Journal of the New York Entomological Society* 98: 14–31.

Rolston, L.H. and McDonald, F.J.D. 1979. Keys and diagnosis for the families of Western Hemisphere Pentatomoidea, subfamilies of Pentatomidae and tribes of Pentatominae (Hemiptera). *Journal of the New York Entomological Society* 87: 189–207.

Schuh, R.T. and Slater, J.A. 1995. *True Bugs of the World (Hemiptera: Heteroptera): Classification and Natural History*. 336 pp. Cornell University, Ithaca.

Tsai, J.-F. and Rédei, D. 2014. A revision of the genus *Amblycara* (Hemiptera: Heteroptera: Pentatomidae). *Acta Entomologica Musei Nationalis Pragae* 54: 133–155.

Wilf, P. 2012. Rainforest conifers of Eocene Patagonia: attached cones and foliage of the extant southeast-Asian and Australasian genus *Dacrycarpus* (Podocarpaceae). *American Journal of Botany* 99: 562–584.

Wilf, P., Cúneo, N.R., Johnson, K.R., Hicks, J.F., Wing, S.L., and Obradovich, J.D. 2003. High plant diversity in Eocene South America: evidence from Patagonia. *Science* 300: 122–125.

Wilf, P., Johnson, K.R., Cúneo, N.R., Smith, M.E., Singer, B.S., and Gandolfo, M.A. 2005. Eocene plant diversity at Laguna del Hunco and Río Pichileufú, Patagonia, Argentina. *The American Naturalist* 165: 634–650.

Wilf, P., Little, S.A., Iglesias, A., Zamaloa, M.C., Gandolfo, M.A., Cúneo, N.R., and Johnson, K.R. 2009. *Papuacedrus* (Cupressaceae) in Eocene Patagonia, a new fossil link to Australasian rainforests. *American Journal of Botany* 96: 2031–2047.

Yao, Y., Ren, D., Rider, D.A., and Cai, W. 2013. Phylogeny of the infraorder Pentatomomorpha based on fossil and extant morphology, with description of a new fossil family from China. *PLos ONE* 7: e37289.

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