

A new species of *Andricus* oak gallwasp from China (Hymenoptera: Cynipidae: Cynipini)

Yiping WANG¹, Rui GUO² & Xuexin CHEN³

¹College of Forest and Biotechnology, Zhejiang Agricultural and Forestry University, Lin'an 311300, China; e-mail: wyp@zafu.edu.cn

²Administration Bureau of Zhejiang Qingliangfeng National Nature Reserve, Lin'an 311300, China

³Institute of Insect Sciences, College of Agriculture and Biotechnology, Zhejiang University, Hangzhou 310029, China

Abstract: As part of a study on the cynipids (Hymenoptera: Cynipidae: Cynipinae) in the Chinese fauna, we report in the present paper two species of *Andricus* Hartig from the tribe Cynipini, including one new species, namely, *A. deqingis* sp. n. from that country. In addition to new species, we also provide illustrated keys to east Palaearctic and Oriental species of this genus. The type specimens are deposited in the Hymenoptera Collection, Zhejiang A & F University, Lin'an, China.

Key words: Hymenoptera; Cynipidae; *Andricus*; new species; China

Introduction

The oak gallwasps have a worldwide distribution, mostly from the Northern Hemisphere (Askew 1984; Pujade-villar et al. 2001; Ronquist 1999). There are around 1,000 species in 26 genera of tribe Cynipini, but oak gallwasps species from Eastern Palaearctic and Oriental region have yet been poorly described: only 49 valid species are recognised from the Eastern Palaearctic, mostly from Taiwan of China, Japan and the Russian Far East, respectively (Abe et al. 2007; Melika et al. 2010, 2011; Tang et al. 2009, 2011, 2012).

Andricus Hartig, 1840 is a large Holarctic genus with 243 species, including 140 Nearctic species and 103 Palaearctic species, and 5 species of them are reported from China (Azizkhani et al. 2006; Melika 2006; Tang et al. 2012; Tavakoli et al. 2008; Weld 1952).

In this paper, we report two species of *Andricus* in tribe Cynipini in China, including 1 new species with their host gall, namely, *A. deqingis* sp. n., and provide key to east Palaearctic and Oriental species of this genus.

Material and methods

All the specimens from China used in this study are from the Hymenoptera Collection, Zhejiang Agricultural and Forest University, Lin'an, China (ZJUH). For the identification of the tribe and genera of the family Cynipidae see Weld (1952) and Melika (2006), and for the morphological terminology of the gall wasps used in this paper see Ronquist and Nordlander (1989). Abbreviations for fore wing venation follow Melika (2006). Additional abbreviations used here include: F1–F12, 1st and subsequent flagellomeres; POL (post-ocellar distance), the distance between the inner margins of the

posterior ocelli; OOL (ocellar–ocular distance), the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye.

Descriptions and measurements were made under a Leica MZ 12.5 stereomicroscope (Wetzlar, Germany), and photos taken by a digital camera (Q-Imaging, Micropublisher 3.3 RTV) attached to a Leica MZ APO stereomicroscope (Wetzlar, Germany) using Synoptics Auto-Montage version 5.0 software.

All type specimens are deposited in the Hymenoptera Collection, Zhejiang Agricultural and Forest University, Lin'an, China.

Andricus Hartig, 1940

Andricus Hartig, 1840: 185. Type species: *Andricus nodule* Hartig, 1840 (= *A. trilineatus* Hartig, 1840) (type designated by Foerster, (1869)).

Aphilotrix Foerster, 1869: 331, 336. Type species: *Cynips corticis* Linnaeus, 1758, original designation (synonym in Mayr, 1881).

Manderstjernia Radoszkowski, 1866: 304. Type species: *Manderstjernia paradoxa* Tadoszkowski, 1866, original designation.

Oncaspis Dettmer, 1925: 123. Type species: *Oncaspis fli-granata* Dettmer, 1925, original designation (synonym in Weld, 1930).

Euschmitzia Dettmer, 1925: 122. Type species: *Euschmitzia rara* Dettmer, 1925, original designation (synonym in Weld, 1930).

Femuros Kinsey, 1937a: 65. Type species: *femuros repandae* Kinsey, 1937, original designation (synonym in Weld, 1952).

Feron Kinsey, 1937a: 69. Type species: *Feron verutum* Kinsey, 1937, original designation (synonym in Weld, 1952).

Druon Kinsey, 1937a: 56. Type species: *Druon protagion* Kinsey, 1937, original designation (synonym in Weld, 1952).

Conobius Kinsey, 1938: 262. Type species: *Conobius strues* Kinsey, 1938, original designation (synonym in Weld, 1952).
Adleria Rohwer & Fagan, 1917: 359. Type species: *Cynips kollari* Hartig, 1843, original designation (synonym in Melika & Abrahamson, 2002).

Dros Kinsey, 1937a: 49. Type species: *Dros petasum* Kinsey, 1937, original designation (synonym in Melika & Abrahamson, 2002).

Erythres Kinsey, 1937b: 61. Type species: *Erythres hastate* Kinsey, 1937, original designation (synonym in Melika & Abrahamson, 2002).

Liodora Forster, 1869: 331, 334. *Liodora sulcata* Forster, 1869, original designation (synonym in Melika & Abrahamson, 2002).

Parandricus Kieffer, 1906: 102. Type species: *Parandricus mairei* Kieffer, 1906, original designation (synonym in Melika & Abrahamson, 2002).

Trichoteras Ashmead, 1897a: 67. Type species: *Trichoteras coquilletti* Ashmead, 1897, original designation (synonym in Melika & Abrahamson, 2002).

Diagnosis. The body length usually 1.2–3.0 mm; body from yellow, dark brown to black; antenna 13 or 15-segmented in female; mesoscutum reticulate or punctate but never transversely sculptured, often dense setae; mesopleuron smooth and shining; pronotum with dense setae laterally; tarsal claws with tooth (but in *A. mairei* (Kieffer, 1906) the claws simple and without tooth); ventral spine of hypopygium very long, needle-like, prominent part more than 4.0 times as long as its maximum width.

Distribution. Holarctic distribution.

Biology. Associated with oak hosts in the section *Quercus*.

Key to east Palaearctic and Oriental species of *Andricus*

- 1 The mesoscutum with weakly rugae or transversal striate 1
 - The mesoscutum smooth or alutaceous or coriaceous, and without rugae or transversal striate 3
- 2 Low face distinctly raised medially; antero-medial parallel lines of mesoscutum present; radial cell 3.0 times as long as its maximum width; length 1.2–1.6 mm (Russia Far East) *A. mesostegius* Kovalev, 1965
 - Low face hardly raised medially; antero-medial parallel lines of mesoscutum absent; radial cell 4.0 times as long as its maximum width; length 1.6–1.7 mm (Russia Far East) *Andricus marmoratus* Kovalev, 1965
- 3 The claws simple, and without tooth (West-southern China: Guizhou) *A. mairei* (Kieffer, 1906)
 - The claws with tooth 4
- 4 The female antennae with 13 segments 5
 - The female antennae with 14 segments 10
- 5 The body length equal or shorter than 1.1 mm ... 6
 - The body length longer than 1.1 mm 8
- 6 The vertex and face with weakly rugae; second metasomal tergite occupying entirely metasomal tergites

- (Japan) *Andricus quercicola* Shinji, 1940
 - The vertex and face alutaceous or coriaceous; second metasomal tergite hardly occupying entirely metasomal tergites (Japan) 7
- 7 The areolet of forewing absent; head and thorax blackish, metasoma yellowish and antennae with brownish yellow (Japan) *Andricus shirakashicola* Shinji, 1940
 - The areolet of forewing present; head, thorax and metasoma black and antennae with yellow (Japan). *Andricus kumugifoliae* Shinji, 1943
- 8 The medial line of mesoscutum long, and extending to 3/4 of entirely mesoscutum; parapsidal of mesoscutum wide and long (Japan, Russia and Korea) ... *Andricus hakonensis* (Ashmead, 1904)
 - The medial line of mesoscutum absent or quite short, and at most extending to 1/2 of entirely mesoscutum; parapsidal of mesoscutum narrow and short. 9
- 9 The vertex and face alutaceous; second metasomal tergite without antero-lateral setae, and occupying 1/3 of entirely metasomal tergites; areolet of forewing present (Japan) *Andricus shirakashii* Shinji, 1940
 - The vertex and face smooth; second metasomal tergite with antero-lateral setae, and occupying 1/2 of entirely metasomal tergites; areolet of forewing absent (Japan) .. *Andricus moriokae* Monzen, 1953
- 10 Head 2.6 times as broad as long from above view (Fig. 1B); parapsidal lines well-marked, narrow and reaching 1/4 of entirely length of mesosoma (Fig. 1G); mesopleuron with weakly delicate transversal striate medially (Fig. 1E) (Eastern China: Zhejiang) *A. deqingis* sp. n.
 - Head 2.0 times as broad as long from above view; parapsidal lines absent; mesopleuron smooth and shiny, without transversal striate 11
- 11 The malar area without striate; mesoscutum delicately alutaceous to smooth, especially in between notauli, possess a patch of dense white setae antero-laterally (Eastern China: Taiwan) *A. formosanus* Tang & Melika, 2009
 - The malar area with striate; mesoscutum coriaceous or alutaceous between notauli, hardly possess a patch dense white setae antero-laterally 12
- 12 Anterior half of mesoscutum distinctly sculptured, delicately coriaceous to alutaceous; ventral spine of hypopygium short, prominent part nearly as long as broad (Eastern China: Taiwan) *A. songshui* Tang & Melika, 2011
 - Mesoscutum alutaceous to smooth, glabrous, without distinct surface sculpture anteriorly; ventral spine of hypopygium long, prominent part at least 3.0 times longer than broad 13
- 13 F1 equal in length to F2 and only 1.7 times longer than pedicel; radial cell 4.2 times as long as its maximum width; the prominent part of the ventral spine of the hypopygium short, only 3.0 times longer than broad; host plant is *Q. griffithii* (West-south China: Yunnan) *A. xishuangbannaus* Melika & Tang, 2012

- F1 longer than F2 and 2.3 times longer than pedicel; radial cell 3.1–3.3 times as long as its maximum width; the prominent part of the ventral spine of the hypopygium long, 6.0 times longer than broad; host plant is *Q. serrata* (Eastern China: Taiwan)
 *A. pseudocurvator* Tang & Melika, 2011

Andricus deqingis sp. n. (Figs 1A–H)

Description. Sexual female: length of body 1.6 mm, fore wing 1.7 mm, and ovipositor sheath 0.1 mm.

Head (Figs 1A, B). Head rounded in front view, coriaceous, with white setae, more dense setation in lower face, 2.6 times broader than long from above view, 1.5 times broader than high and slightly narrower than mesosoma in anterior view. Gena delicately coriaceous, indistinctly broadened behind eye, invisible in front view behind eye. Malar space coriaceous, without irradiating striae, 0.3 times as long as height of eye. POL 2.1 times as long as OOL; OOL 1.4 times as long as diameter of lateral ocellus. Diameter of antennal toruli 1.3 times larger than distance between them, distance between torulus and inner margin of eye 1.1 times diameter of torulus; lower face coriaceous, with dense white setation; median elevated area of lower face coriaceous. Clypeus trapezoid, wider than high, emarginate, without median incision ventrally, alutaceous to glabrous, with small elevated rugose central area; anterior tentorial pit large, the epistomal sulcus and clypeo-pleurostomal line deep. Frons delicately coriaceous to reticulate, with white setae; interocellar area with weak rugae. Vertex and occiput uniformly coriaceous. Postocciput and postgena reticulate, shiny, impressed around occipital foramen, with setae; posterior tentorial pit large, ovate and deep; height of occipital foramen nearly equal to height of coriaceous postgenal bridge; hypostomal carina emarginate, continuing into postgenal sulcus, not united medially.

Antenna (Fig. 1D). Antenna with 14 segments, slightly longer than mesosoma; F1 1.8 times as long as F2, and 1.9 times as long as pedicel; F3 shorter than F4; relative lengths of antennal segments from scape to F12: 11: 8: 9: 8: 7: 7: 6: 5: 4: 4: 4: 9.

Mesosoma (Figs 1C, E). Mesosoma strongly convex, with long white setae. Pronotum delicately coriaceous, with slightly elongated units along posterior end; propleuron delicately coriaceous to alutaceous, without lateral pronotal carina. Mesonotum coriaceous anteriorly, smooth and shiny posteriorly, with sparse long and white setae. Notauli complete, deep, distinctly impressed, slightly converging at posterior end; anterior parallel lines distinct, extending to 1/2 of entirely length of mesosoma; parapsidal lines well-marked, narrow and reaching 1/4 of entirely length of mesosoma; median mesoscutal line indistinct, extending to 1/7 of entirely length of mesosoma. Mesoscutellum quadrangular, broader in posterior 1/4, longer than broad, only very slightly overhanging metanotum, uniformly dull, rugose, with irregular strong rugae, areas between rugae smooth and shiny; scutellar foveae slightly ovate or

transverse, occupying 1/3 of length of mesoscutellum, separated by a broad median carina; Mesopleuron with weakly delicate transversal striae basally and smooth and shiny posteriorly, with sparse setae ventrally; acetabular carina delimiting very narrow area; dorsal axillar area narrow, coriaceous to rugose, with dense setae. Metapleural sulcus reaching mesopleuron in the upper 4/5 of mesopleuron height, area delimited by the inferior and superior parts of metapleural sulcus, with dense white setae; lateral propodeal carinae distinct, curved outwards in posterior third; lateral propodeal area rugose, with dense, long and white setae. Tarsal claws simple, without basal lobe.

Wing (Fig. 1G). Forewing longer than body, hyaline, with distinct, short and dense ciliation along margin, radial cell 2.7 times as long as its maximum width; vein R1 nearly straight, vein Rs not reaching wing margin and for a short distance following margin; areolet large, triangular and closed. Vein Rs+M absent.

Metasoma (Fig. 1F). Metasoma as long as head plus mesosoma or slightly shorter, slightly longer than its high in lateral view; 2nd metasomal tergite occupying to 3/5 of metasoma in dorsal view, with sparse setae laterally, all subsequent tergites without setae and punctured. Ventral spine of hypopygium very long, prominent part 9.0 times longer than broad, with some white subapical setae not extending beyond apex of spine, with dense long setae ventrally.

Color. Head reddish brown, but malar space and antennae light brown; mesosoma blackish brown, legs light brown. Metasoma with reddish brown.

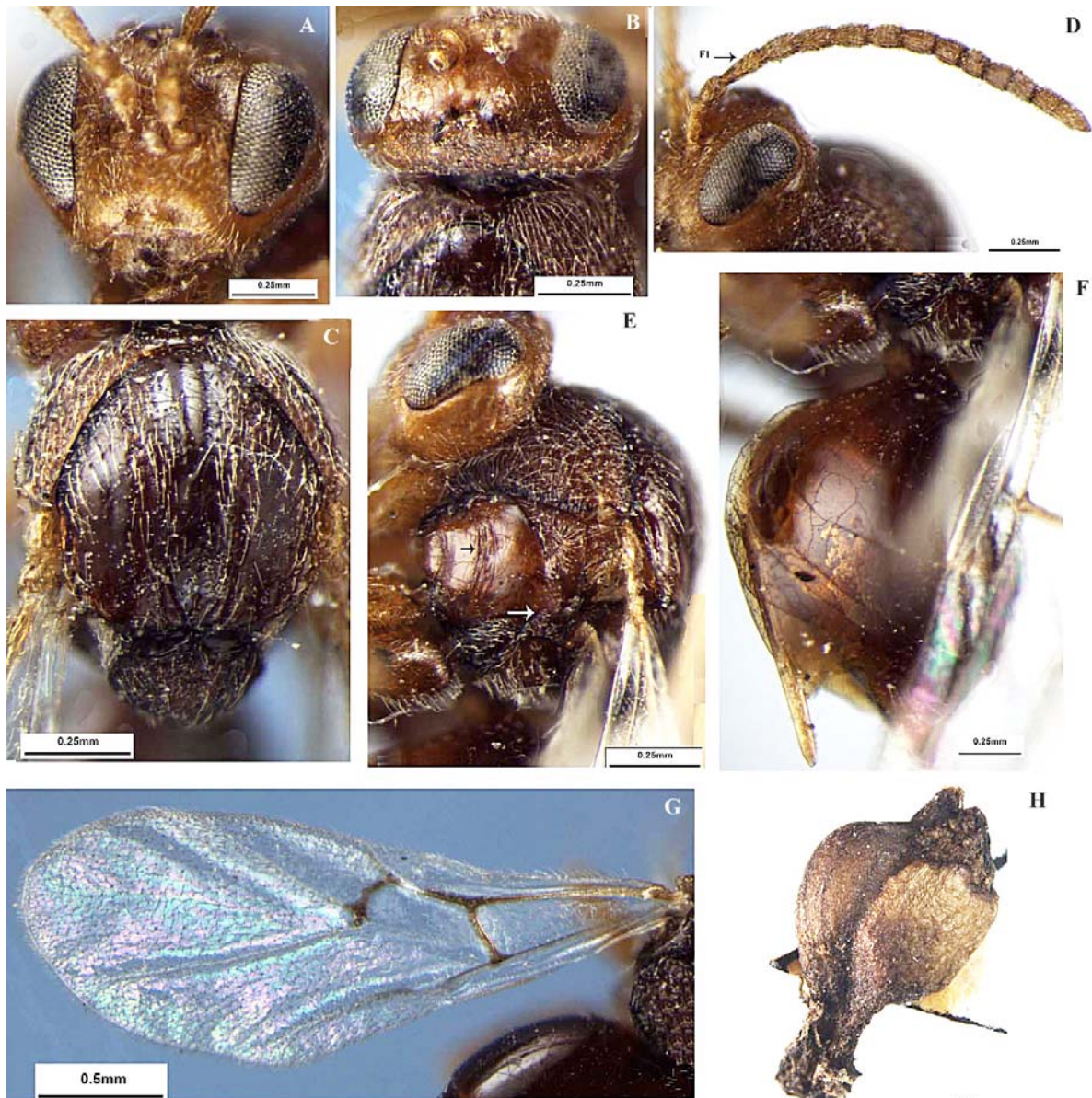
Male. Male is very similar to the female except for the relatively small body: length of body 1.5 mm, and fore wing 1.6 mm.

Material examined. Holotype – female, China: Zhejiang, Deqing, 1995-V-27, He Jun-hua, No. 965054; Paratypes. 20 ♀♀, 13 ♂♂: same labels as the holotype except for numbers, 965051-4, 965056, 965059, 965060-9, 965115, 964480-3, 954460-3, 954468, 954470-6, 954713, 954478, 957878, 957885, 957887, 957888, 957913, 965115.

Etymology. The new species is named after the location of type specimens.

Diagnosis. This species is similar to *A. formosanus* Tang & Melika, 2009, but can be separated from the latter by head 2.6 times as broad as its median long from above view, anterior parallel lines distinct, extending to 1/2 of entirely length of mesosoma, parapsidal lines well-marked, narrow and reaching 1/4 of entirely length of mesosoma, mesopleuron with weakly delicate transversal striae medially, and fore wing radial cell 2.7 times as long as its maximum broad.

Gall (Fig. 1H). Galls occur on both branches and twigs, 1.0–2.5 mm long. Galls located at the branches and twigs are usually yellowish and clusters, each contains single thin-walled larval chamber.



Figs 1 A–H. *Andricus deqingis* sp. n.: A – head, anterior view; B – head, dorsal view; C – mesosoma, dorsal view; D – antenna; E – mesosoma, lateral view; F – metasoma, lateral view; G – forewing; H – gall.

Biology. Only the sexual generation is known, inducing twigs galls on *Quercus* sp.

Distribution. China (Zhejiang).

A. xishuangbannaus Melika & Tang, 2012

A. xishuangbannaus Melika & Tang, 2012. J. Asia-Pacific Ent., 15: 602.

Material examined. 4 ♀♀, West Tianmu mountain, China, 2010–2010, Guo Rui.

Distribution. China (Zhejiang and Yunnan).

Biology. This species induce leaf gall on *Quercus serrata*, but host plant is *Q. giffithii* according to data (Tang et al. 2012). Galls are usually the underside of

Quercus serrata leaves. Galls exist on leaf vein, and it's formed from leaf vein rolling and inflate. An integral swelling leaf gall, locate at the base of the leaf midrib, irregularly shape, unilocular. Gall is small and diameter about 1.0 mm. Under the laboratory conditions, the adults emerge for 15 days.

Acknowledgements

We thank G. Melika (Hungary, Budapest), Dr. J. Pujade-Villar (Spain, Barcelona) and Y. Abe (Japan, Fukuoka) for their generous help with literatures. The project was supported by a research grant from National Natural Science Foundation of China (31071970), a scholarship from the Postdoctoral Science Foundation of China (20080441251), a scholarship under the Zhejiang Association for International Exchange of Personnel.

References

- Abe Y., Melika G. & Stone G.N. 2007. The diversity and phylogeography of cynipid gall-wasps (Hymenoptera, Cynipidae) of the Oriental and Eastern Palaearctic regions, and their associated communities. *Oriental Insects* **41**: 169–212. DOI: 10.1080/00305316.2007.10417504
- Askew R.R. 1984. The biology of gall wasps, pp. 223–271. In: Ananthakrishnan T.N. (ed.), *Biology of Gall Insects*, IBH Publishing Co., New Delhi, 362 pp. ISBN: 0713129069 9780713129069
- Azizkhani E., Rasouljan G.R., Kharazi-Pardel A., Tavakoli M., Sadeghi S.E., Melika G., Stone G.N. & Atkinson R. 2006. New species of oak gall wasps from Zagross Mountains of Iran (Hymenoptera: Cynipidae: Cynipini). *Folia Entomol. Hung.* **67**: 161–197.
- Kieffer J.J. 1906. Description d'un genre nouveau et de neuf especes nouvelles de Cynipides exotiques. *Marcellia* **5**: 101–110.
- Melika G. 2006. Gall Wasps of Ukraine. Cynipidae. *Vestnik Zool.*, Suppl. 21, 644 pp.
- Melika G., Pujade-Villar J. & Abe Y. 2010. Palaearctic oak gallwasps galling oaks (*Quercus*) in the section *Cerris*: reappraisal of generic limits, with descriptions of new genera and species (Hymenoptera: Cynipidae: Cynipini). *Zootaxa* **2470**: 1–79. ISBN: 978-1-86977-505-6
- Pujade-Villar J. & Ros-Farré P. 2001. Review of the uncertain *Neuroterus* species described by Hartig (Hymenoptera: Cynipidae). *Ztschr. Entomol.* **22** (20): 405–412.
- Ronquist F. 1999. Phylogeny of the Hymenoptera (Insecta): The state of the art. *Zool. Scr.* **28** (1–2): 3–11. DOI: <http://onlinelibrary.wiley.com/doi/10.1046/j.1463-6409.1999.00019.x/pdf>
- Ronquist F. & Nordlander G. 1989. Skeletal morphology of an archaic cynipoid, *Ibalia rufipes* (Hymenoptera: Ibalidae). *Entomol. Scand. Suppl.* **33**: 1–60.
- Tang C.T., Melika G., Yang M.M., Nicholls J.A., Còska G. & Stone G.N. 2009. First record of an *Andricus* oak gallwasp from the Oriental Region: a new species from Taiwan (Hymenoptera: Cynipidae: Cynipini). *Zootaxa* **2175**: 57–65.
- Tang C.T., Melika G., Yang M.M., Nicholls J.A. & Stone G. 2011. New species of oak gallwasps from Taiwan (Hymenoptera: Cynipidae: Cynipini). *Zootaxa* **2865**: 37–52.
- Tang C.T., Sinclair F., Yang M.M. & Melika G. 2012. A new *Andricus* Hartig oak gallwasp species from China (Hymenoptera: Cynipidae: Cynipini). *Journal of Asia-Pacific Entomol.* **15**: 601–605. DOI: <http://dx.doi.org/10.1016/j.aspen.2012.07.005>
- Tavakoli M., Melika G., Sadeghi S.E., Péntzes Z., Assareh M.A., Atkinson R., Bechtold M., Mikó I., Zargaran M.R., Aligolizade D., Barimani H., Bihari P., Pirozi F., Fülöp D., Somogyi K., Challis R., Preuss S., Nicholls J. & Stone G.N. 2008. New species of oak gallwasps from Iran (Hymenoptera: Cynipidae: Cynipini). *Zootaxa* **1699**: 1–64.
- Weld L.H. 1952. Cynipoidea (Hymenoptera) 1905–1950. Privately printed [L. H. Weld], Ann Arbor, MI, 351 pp.

Received September 24, 2012

Accepted February 25, 2013