

NEW SPECIES OF CYNIPID GALL WASPS FROM IRAN
AND TURKEY (HYMENOPTERA: CYNIPIDAE: CYNIPINI)

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Two new species of cynipid gall wasps, *Andricus megalucidus* and *Aphelonyx persica* (Hymenoptera: Cynipidae) from Iran, Turkey and Greece are described. Only females and galls of the parthenogenetic generations are known for both species. Data on the diagnosis, distribution and biology of new species are given.

Key words: Cynipidae, gall wasp, *Andricus*, *Aphelonyx*, taxonomy, morphology, distribution, biology

INTRODUCTION

Andricus HARTIG, 1840 (Hymenoptera: Cynipidae: Cynipini) is a Holarctic genus of oak cynipid gall wasps with representatives in the Old World (Eurasia) and in North America. Approximately 80 species are known from the Western Palaearctic, particularly from Europe and Asia Minor. All of them induce galls on oaks. Asexual *Andricus* are easily distinguished from other genera of cynipid gall wasps by the long and slender ventral spine of the hypopygium, the prominent part of which is always more than 4.0 times as long as broad; the scutum is reticulate, punctate or coarsely rugose, but never transversely sculptured and often densely pubescent; the tarsal claw with a tooth; fully winged; propodeal carinae are parallel, subparallel or slightly curved.

Aphelonyx MAYR, 1881 (Hymenoptera: Cynipidae, Cynipini) is a Palaearctic genus of oak cynipid gall wasps with one known species from Western Palaearctic, *Aphelonyx cerricola* (GIRAUD, 1859). Only the asexual generation is known, which induces bud galls. The Western Palaearctic species, *Aphelonyx cerricola* is well known and widespread in Europe: being native to Austria, Italy, Montenegro, Bulgaria, Hungary and Romania, (DALLA TORRE & KIEFFER 1910, VASSILEVA-SAMNALIEVA 1974, IONESCU 1973), Israel (STERNLICHT 1968), Asia Minor (Turkey,

DALLA TORRE & KIEFFER 1910 after TROTTER 1903), Azerbaijan (MELIKA, unpubl. data), and Iran (CHODJAI 1980), and is an invading or introduced species in Britain (CRAWLEY 1997). This species is recorded almost entirely from oaks in the section *cerris*. In Europe and in Asia Minor this only known host is *Quercus cerris*. In Iran it has been recorded from *Q. persica*, *Q. infectoria* and *Q. libani* (CHODJAI 1980), although these records need to be confirmed. *Q. infectoria* is an unlikely host (it is a member of the oak section *Quercus*, not *cerris*), and in Iran the authors can confirm the presence of this species only on *Q. libani*. In Israel it was collected from *Quercus ithaburensis* (STERNLICHT 1968). We suggest that records of *A. cerricola* from *Q. persica* in Iran, and from *Q. ithaburensis* in Israel (CHODJAI 1980, STERNLICHT 1968) (see in PUJADE-VILLAR *et al.* 2003) are probably erroneous, and in fact represent the new species described in this paper.

Three further species of *Aphelonyx* (*A. crispulae* MATSUMURA, 1920, *A. glanduliferae* MATSUMURA, 1920, and *A. acutissimae* MONZEN, 1953 (MONZEN 1953)) have been described from Japan, although these must be revised (MELIKA & ABRAHAMSON 2002). The description of adult females of *A. acutissimae* given by MONZEN (1953) does not fit the genus *Aphelonyx*, and the location of the galls (on the underside of leaves) would be very unusual for this genus. We have no doubt that this species must belong to a genus other than *Aphelonyx*.

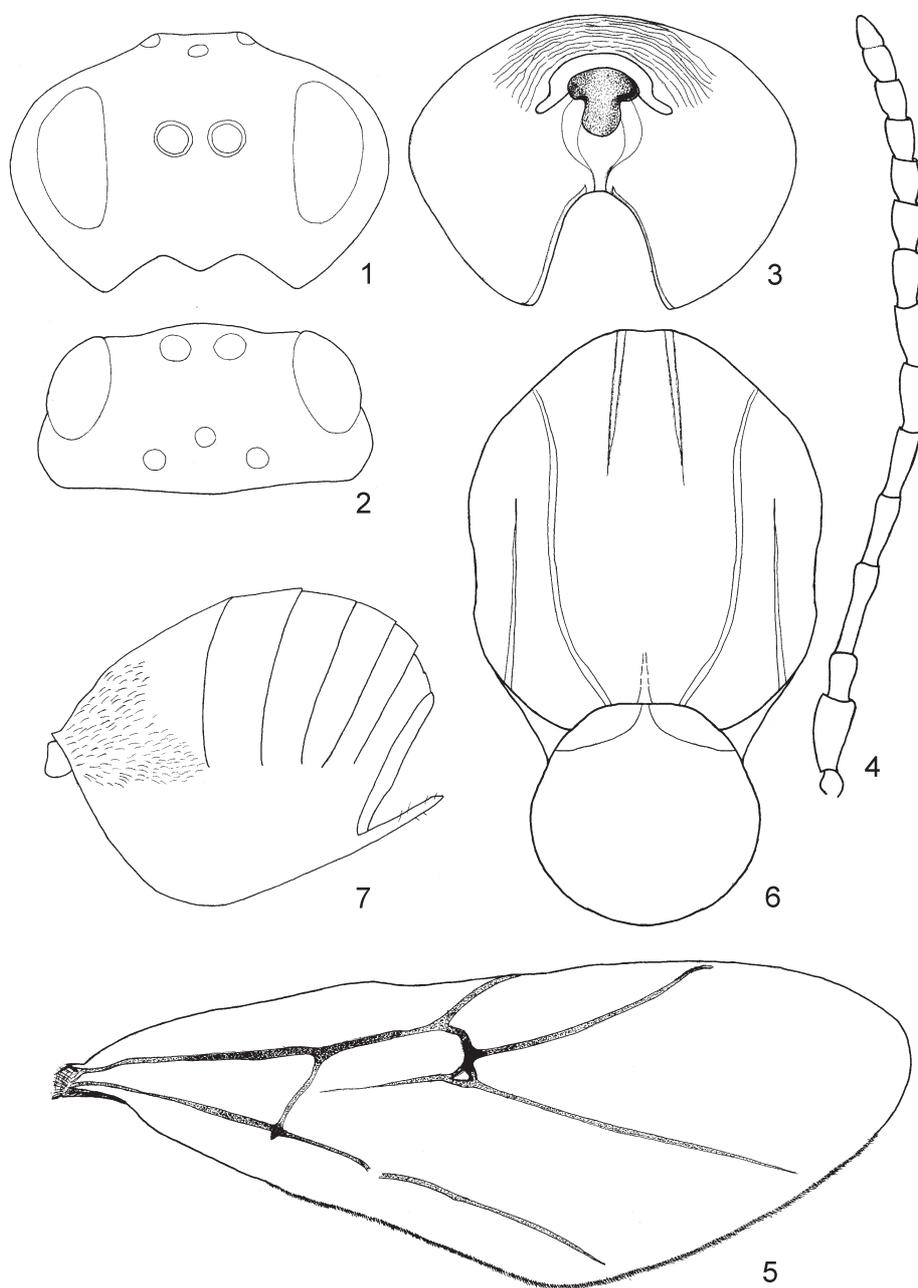
Aphelonyx very closely resembles the asexual generation insects of the genus *Andricus*, but differs in having antennae 2.0 times as long as head+mesosoma, notauli incomplete in the anterior 1/3, tarsal claws are simple, while in the asexual *Andricus* the notauli are usually complete, antennae are less than 2.0 times as long as head+mesosoma, and tarsal claws are toothed.

We follow the current terminology of morphological structures (GIBSON 1985, RONQUIST & NORDLANDER 1989, MENKE 1993, FERGUSSON 1995). Abbreviations for fore wing venation follow RONQUIST & NORDLANDER (1989). Measurements and abbreviations used here include: F1–F12, 1st and subsequent flagellomeres; POD (post-ocellar distance) is the distance between the inner margins of the posterior ocelli; OOD (ocellar-ocular distance) is the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; LOD, the distance between lateral and frontal ocellus. Width of radial cell measured along 2r. Pictures of some structures of adult wasps were made by digital camera, after that were worked up in Adobe Photoshop 6.0, printout and then linear drawings were made from them.

In this paper we describe two new species, *Andricus megalucidus* MELIKA, STONE, SADEGHI et PUJADE-VILLAR, asexual form, and *Aphelonyx persica* MELIKA, STONE, SADEGHI et PUJADE-VILLAR, asexual form, and give some data on the distribution and biology of these species.

***Andricus megalucidus* sp. n.**
(Figs 1–7, 13)

Description – Asexual (parthenogenetic) female: Head and mesosoma black; metasoma dorsally black, laterally brown; mandibles brown, antenna dark brown to black; fore legs uniformly brown, mid- and hind coxae, femur, tibiae dark brown to partially black, mid- and hind tarsus brown, fore legs entirely brown; ventral spine of hypopygium light brown. Head from above as broad as mesosoma or very slightly broader, 1.45–1.5 times as broad as high in front view (Fig. 1); POD 1.36 times as long as OOD; LOD 0.4 times as long as POD and 0.55 times as long as OOD (Fig. 2); transfacial distance 1.85–1.9 times as long as height of lower face (distance between antennal rim and tip of clypeus); distance between antennal rims 3.25 times as short as distance between antennal rim and inner margin of compound eye (Fig. 1); gena strongly broadened behind eye, equal or slightly broader than diameter of compound eye, measuring along transfacial line; malar space without sulcus, 2.2 times as short as height of compound eye; tintorial pits small, line between them slightly impressed and, thus distinctly separating the clypeus from lower face, which is shiny, finely uniformly coriaceous, slightly emarginated distally. Head uniformly dull rugose, malar space and lower face with irradiating strong rugae, reaching compound eyes and antennal sockets; occiput behind rounded, with strong rugae; entire head uniformly covered with dense long setae. Postocciput impressed, shiny, smooth; posterior tentorial pits shallow, shiny, smooth, elongated, reaching occipital foramen; gula 1.6 times as high as broad, lower part narrowed down to hypostomal carina, which is strong, emarginated (Fig. 3). Antenna 13-segmented, however in some specimens there is a very indistinct incomplete suture between F11 and F12, indicating that the antenna may be 14-segmented; ratio of scapus, pedicell and subsequent flagellomeres next: 1.05:0.53:1.0:0.82:0.75:0.70:0.67:0.62:0.55:0.50:0.44:0.44:0.76 (if one considers antenna to be 13-segmented, with an indistinct suture between F11 and F12, then F10:F11:F12 = 0.44:0.40:0.36) (Fig. 4). Mesosoma 1.2 times as long as high; with uniform dense white setae; pronotum, scutum, scutellum, and mesopleuron with uniform dull rugose sculpture; scutum+scutellum 1.56 times as long as broad in dorsal view. Scutum subequal, nearly as long as broad in dorsal view; notauli complete, deeply impressed and broad, reaching the pronotum; anterior parallel lines distinct and reach 1/3 length of scutum; parapsidal lines distinct and broad, starting from posterior margin and reaching 2/3 length of scutum; median scutellar line only weakly impressed, indistinct in between dull rugose sculpture of scutum (Fig. 6). Scutellum rounded, as broad as long in dorsal view, overhanging metanotum, with stronger rugae than sculpture of scutum; scutellar foveae large, ovate, with shiny smooth bottom, separated by a thin but distinct central carina (Fig. 6). Fore wing 1.25–1.45 times as long as body; hyaline, setae short, margin with very short indistinct cilia; veins distinct, dark brown, areolet present; radial cell open, 3.5 times as long as broad (Fig. 5). Legs with dense white setae, fore legs uniformly brown, mid- and hind coxae, femora, tibiae dark brown to partially black, mid- and hind tarsi brown. Propodeum with uniformly thick, nearly parallel lateral carinae, only very slightly bent outwards distally, central area shiny smooth, with a few interrupted transverse thin rugae distally, propodeum aside central area with uniform dense white setae; ventral impressed area of metanotum smooth, shiny, without rugae or carinae (Fig. 13). Metasoma black dorsally, dark brown laterally, with lateral patch of dense white setae on 1st tergite which is smooth and shiny, subsequent tergites finely minutely uniformly punctured; 1st tergite, measured dorsally 1.6–1.65 times shorter than scutum+scutellum; ventral spine of hypopygium slender, long, 6.8–8.0 times as long as broad, with few short white setae (Fig. 7). Length 4.2–5.1 mm.



Figs 1–7. *Andricus megalucidus*, asexual female: 1 = head, front view, 2 = head from above, 3 = head, posterior view, 4 = antenna, 5 = forewing, 6 = scutum and scutellum, dorsal view, 7 = metasoma, lateral view

Type material – Holotype female: Turkey, Tefenni, leg. G. N. Stone, 1998. 15 female paratypes: 5 with the same label as the holotype, 1 female labelled as “Turkey, Egirdir 4, c98, c99 9w, leg. G. N. Stone” and 9 females labelled as “Iran, Lorestan, Zagros Mnt., 1993–94, leg. E. Sadeghi; ex. *Q. infectoria*, bud gall (Code 34), em. 02.1993”.

Holotype, 2 female paratypes and galls in the Natural History Museum (British Museum) (NHML), 9 female paratypes in the cynipid collection of Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas (SPL), Kőszeg, Hungary, 2 female paratypes in the Hungarian Natural History Museum (HNHM), Budapest, Hungary and 2 female paratypes in the collection of the Research Institute of Forests and Rangelands, Tehran, Iran.

Material examined – 13 asexual females in the collection of University of Barcelona, labelled as “Greece-Corfu, Umg. Barbati, em. data, leg. E. Kwast”, “coll. 8.10.1997”, “emerged 21.02 – 09.03.1998”, “*Andricus* nr. *lucidus* (Hartig, 1843) J. P-V 2001 det”.

Etymology — The species name *megalucidus* reflects the close similarity of the adult and asexual generation gall of this species to *Andricus lucidus*, and the larger size of the gall.

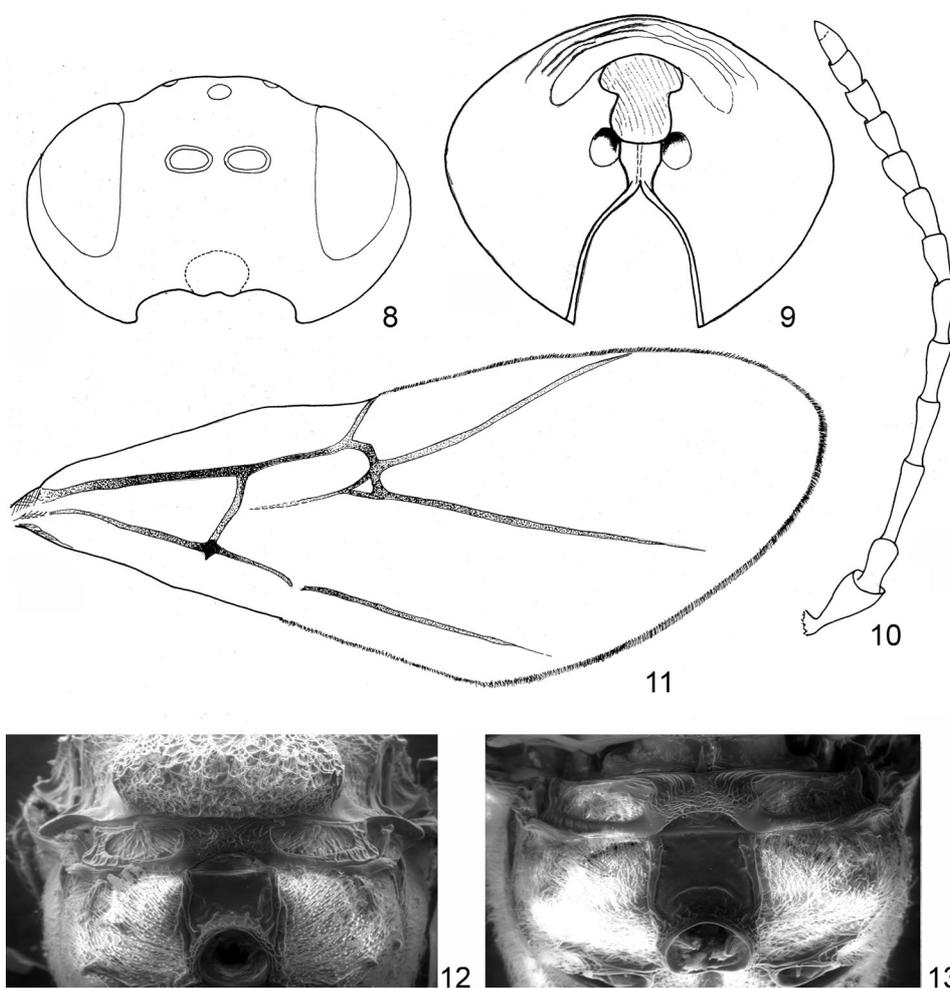
Diagnosis – *Andricus megalucidus* sp. n. is very closely related to *A. lucidus* (HARTIG, 1843) (Figs 8–12), which is a very common and widespread oak gall-wasp species in Europe (DALLA TORRE & KIEFFER 1910, MELIKA *et al.* 2000). The gall was mentioned recently in PUJADE-VILLAR *et al.* (2002) as *Andricus* nr. *lucidus*.

Andricus megalucidus occiput behind is rounded, with strong rugae; the post-occiput is impressed, shiny, smooth; posterior tentorial pits of the head are shallow, shiny, smooth, elongated, reaching the occipital foramen; the gula 1.6 times as high as broad, its lower part narrowed down to the hypostomal carina, which is strong and emarginated (Fig. 3); the pedicel is longer (Fig. 4); the fore wing margin with shorter cilia, the radial cell 3.5 times as long as broad (Fig. 5); the ventral impressed area of the metanotum is smooth, shiny, without rugae or carinae (Fig. 13); the 1st tergite, measured dorsally 1.6–1.65 times shorter than the scutum+scutellum combined (Fig. 7).

Andricus lucidus (Figs 8–12) occiput behind is less rounded, with indistinct carinae, the postocciput is much less impressed, posterior tentorial pits are deep, rounded, shiny, smooth; the gula only very slightly higher than broad, subequal, much less narrowed towards the hypostomal carina (Fig. 9); the pedicel is shorter (Fig. 10); the fore wing margin with longer cilia, the radial cell 4.3 times as long as broad (Fig. 11); the ventral impressed area of the metanotum with 2–3 thin transverse carinae, in front of which the surface with short distinct rugae (Fig. 12); the 1st tergite, measured dorsally 1.2–1.4 times shorter than scutum+scutellum combined.

All specimens of *A. megalucidus* we have examined are more robust, the body is 4.2–5.1 mm long while females of *A. lucidus* are usually smaller (3.5–4.5 mm).

Gall structure and location – The gall is induced on lateral or terminal shoot buds (Fig. 14). The gall of the closely related *Andricus lucidus* is occasionally also induced on acorns, and the same may be true for *A. megalucidus*. The gall when mature reaches 50–60 mm in diameter, and is covered with a close coating of flattened and curved spines up to 10 mm long (Fig. 14). The gall of *Andricus lucidus* is smaller reaching up to 30 mm in diameter, with straight spines up to 6 mm long that are not flattened, and end in a small knob. The gall of *A. megalucidus* is multi-locular, with a single gall so far yielding 50 individuals.



Figs 8–13. 8–12 = *Andricus lucidus*, asexual female: 8 = head, front view, 9 = head, posterior view, 10 = antenna, 11 = fore wing, 12 = metanotum and propodeum, dorsal view. 13 = *A. megalucidus*, asexual female, metanotum and propodeum, dorsal view

Biology – Only the parthenogenetic females of *Andricus megalucidus* are known. It is probable that, like *Andricus lucidus*, this species has a cryptic sexual generation (ATKINSON *et al.* 2002), probably on *cerris*-group oaks. The asexual generation gall has been collected from *Quercus infectoria* in Turkey and Iran, and from *Q. pubescens* in Greece. Adult wasps emerged in February from galls collected in Iran the previous October, and in late February – beginning of March from galls collected in Greece.

Comments – CHODJAI (1980) in his faunistic review of oak gallwasps of Iran mentioned *Andricus lucidus* as a common widespread species. It is probable that part of his data refer to *Andricus megalucidus*. Both *A. lucidus* and *A. megalucidus* can coexist in the same locations, as for example, in Greece (Corfu, Barbati) (PUJADE-VILLAR *et al.* 2002), and at sites in Turkey and Iran.

Distribution – Currently known from Turkey (regions north of Antalya east to Tarsus), Iran (northern Zagros mountains, Kordestan; Lorestan; West Azerbaijan, Piran Shahr and Sardesht), and Greece (Corfu, PUJADE-VILLAR *et al.* 2002), although further sampling in similar habitats is required to establish its true distribution.



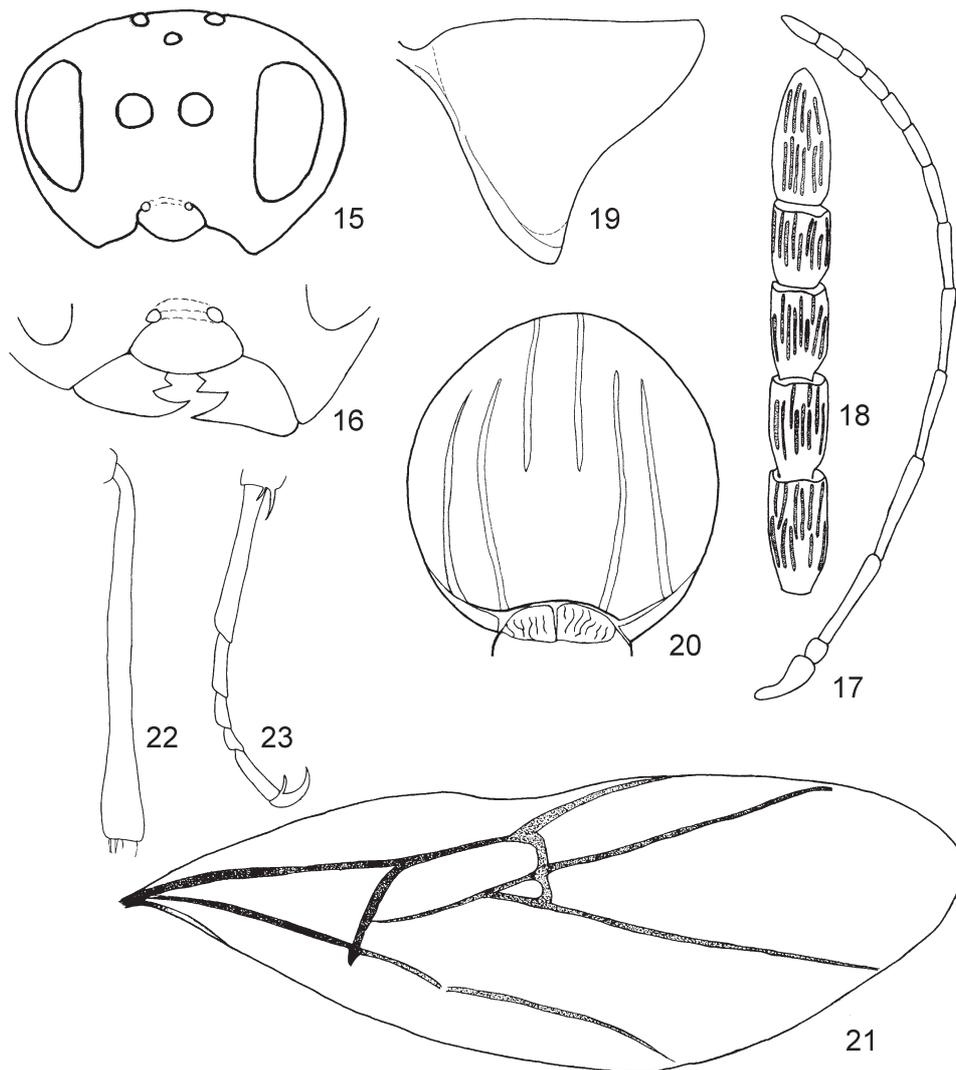
Fig. 14. Asexual generation gall of *Andricus megalucidus* collected at Kordestan, Piran Shahr, Iran, developing on buds of *Quercus infectoria* (photo by G. STONE)

Aphelonyx persica sp. n.
(Figs 15–23, 31)

Description – Asexual (parthenogenetic) female: Head, mesosoma, metasoma, and legs uniformly light-brown; only tips of mandibles black; in one specimen very narrow and short black marked stripes are visible along the middle part of the notauli. Head from above as broad as mesosoma or very slightly narrower, 1.4–1.5 times as high in front view (Fig. 15); POD nearly equal OOD; LOD 0.5 times as long as OOD, and nearly 0.5 times as long as POD; head with depression in front of frontal ocellus; transfacial distance 1.6–1.7 times as long as height of lower face (distance between antennal rim and tip of clypeus); distance between antennal rims nearly equal to distance between antennal rim and inner margin of compound eye. Gena strongly broadened behind eye, slightly broader than diameter of compound eye, measured along the transfacial line; malar space without sulcus, 0.3 times the height of the compound eye; tentorial pits large and deep, line between them impressed and, thus distinctly separates the clypeus from the lower face (Fig. 16); clypeus coriaceous with some punctures, distinctly separated from face, emarginated distally and slightly overhanging mandibles (Fig. 16). Head uniformly coriaceous, with short striae irradiating from the clypeus to area between antennal foramina and frontal ocellus, which dull rugose; occiput behind rounded; entire head coated with white setae, especially long and dense on distal part of clypeus. Antenna 14-segmented; ratio of scapus, pedicell and subsequent flagellomeres next: 0.5:0.2:1.0:1.0:0.86:0.8:0.6:0.57:0.4:0.37:0.3:0.27:0.25:0.4; light brown as is the entire body (Fig. 17), location of placoid sensilla on F8–F12 – Fig. 18. Mesosoma 1.5 times as long as high; with uniform dense coat of white setae, except for the central portion of mesopleuron and shiny smooth propodeum. Pronotum laterally triangular, uniformly delicately rugose, distally very strongly emarginated (Fig. 19). Scutum uniformly rugose and pustulate, nearly as long as broad in dorsal view, notauli distinct and impressed in posterior 2/3, anterior parallel lines distinct and reach half length of scutum; parapsidal lines distinct and wide, starting from posterior margin of scutum and as long as notauli; median scutellar line absent; mesopleuron uniformly coriaceous, densely pubescent (Fig. 20). Scutellum as long as broad in dorsal view, rounded, strongly overhanging metanotum, with strong rugae, central area impressed; area between disk of scutellum and transscutal articulation impressed, shiny with strong rugae and with distinct strong central longitudinal carina, dividing this depression into two parts (Fig. 20). Fore wing 1.25 times as long as body length, hyaline, setae short, margin with very short cilia; veins distinct, dark brown, areolet present; radial cell open, 4.5 times as long as broad (Fig. 21). Legs uniformly light brown, with dense white setae; ratio of fore tarsomeres I–V: 1.0:0.36:0.24:0.15:0.51; hind tibia broadened to apex; ratio of hind tarsomeres I–V: 1.0:0.37:0.21:0.17:0.45 (Figs 22–23). Propodeum shiny, smooth, without carinae or very weakly impressed; median propodeal area shining without setae, lateral sculptured and pubescent. Metasoma laterally compressed, slightly higher than long in lateral view, densely pubescent; ventral spine of hypopygium long, needle like, nearly 4.5–5.0 times as long as broad, with sparse short white setae. Length 4.7–5.2 mm.

Type material – Holotype female: Iran, Tatineh (33°48'60''N, 47°56'51''E), north of Kermanshah, 2002.X.26, ex *Quercus brantii*, leg. G. N. STONE; 11 female paratypes: 2 with the same label as the holotype; 6 females labelled as “Iran, ex *Quercus persica*, coll. E. Sadeghi”; 1 female with label white, handwritten “Dachté Arjen, X.1967. *Q. persica*”, “UNV-BCN, J. Pujade-Villar, Barbotin col.”; 1 female with the following labels: “W Khoramabad, X.1967, *Quercus persica*” / “UNV-BCN, J. Pujade-Villar, Barbotin col.”; and 1 with the following labels: “IRAN, *Aphelonyx cerricola*” / “UNV-BCN, J. Pujade-Villar, Barbotin col.”

Holotype, one female paratype and galls are deposited in the Natural History Museum (British Museum) (NHML), 5 female paratypes in the cynipid collection of Systematic Parasitoid Laboratory (SPL), Kőszeg, Hungary, 3 female paratypes in Barcelona University, 1 female paratype in the Hungarian Natural History Museum (HNHM), Budapest, Hungary and 1 female paratype in the collection of the Research Institute of Forests and Rangelands, Tehran, Iran.

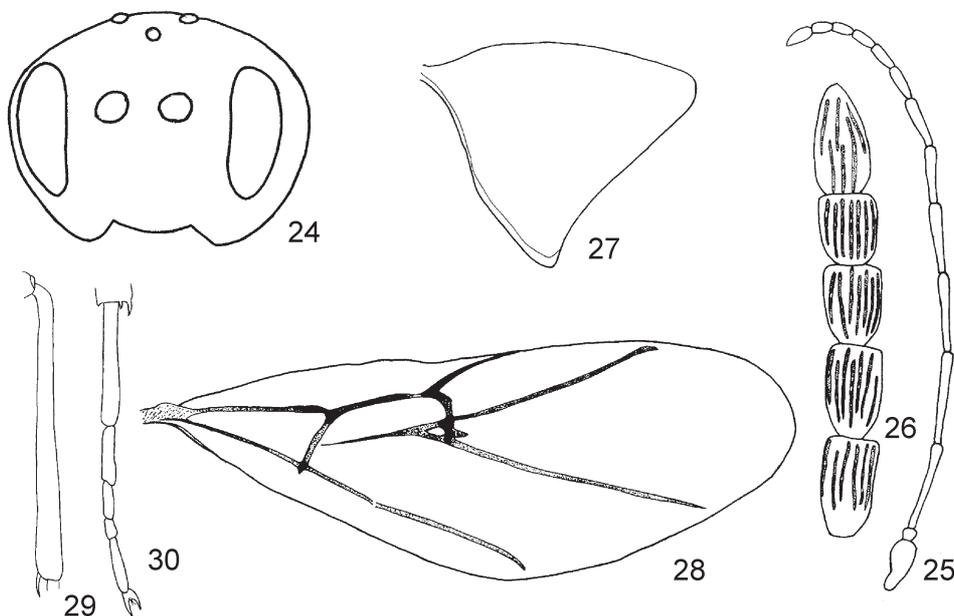


Figs 15–23. *Aphelonyx persica*, asexual female: 15 = head in front view, 16 = lower face and clypeus in front view, 17 = antenna, 18 = F8–F12, 19 = pronotum in lateral view, 20 = scutum in dorsal view, 21 = fore wing, 22 = hind tibia, 23 = hind tarsus

Etymology — The specific name *persica* refers to the Persian region where this species is native, centred on the *Quercus persica* forests of the Zagros Mountains.

Gall structure and location — The gall when mature is up to 15 mm in diameter, greyish-brown in colour with a velvety, pubescent and slightly irregular surface (Fig. 31). The gall is hollow, with a tough woody wall being 1.5–3.0 mm thick. The interior space contains a single larval chamber, which in the mature gall is unattached to the gall wall, and free-rolling. The larval chamber is ovoid, up to 6 mm in length, and has a tough but thin wall. Galls may be found singly or in groups, developing most commonly on lateral buds on young shoots. Solitary galls are almost spherical, while closely clustered galls may be deformed. Old galls are persistent on the host tree. The galls of *A. cerricola* differ in that (i) the gall surface is pubescent when young, but usually smooth and often with a varnished texture when mature, and the larval chamber is not free-rolling within the gall. Such free-rolling inner cells are known for some American oak cynipid galls, and are thought to represent an adaptation to provide protection against attack by parasitoid wasps (STONE *et al.* 2002).

Diagnosis — *Aphelonyx persica* is uniformly light brown, compound eyes are grey; the head is 1.4–1.5 times as broad as high in front view (Fig. 15); the pronotum emarginated distally (Fig. 19); the fore wing is 1.25 times as long as body length, the radial cell is 4.5 times as long as broad (Fig. 21); the hind tibia broadened to the apex; the ratio of hind tarsomeres I–V: 1.0:0.37:0.21:0.17:0.45 (Figs



Figs 24–30. *Aphelonyx cerricola*, asexual female: 24 = head in front view, 25 = antenna, 26 = F8–F12, 27 = pronotum in lateral view, 28 = fore wing view, 29 = hind tibia, 30 = hind tarsus

22–23). The propodeum is without carinae or very weakly impressed; the central propodeal area is shining without pilosity, while the lateral area is sculptured and pubescent.

In *Aphelonyx cerricola* the body is dark brown, the head between frontal ocellus and antennal foramens with a black spot; compound eyes black; the scutum with elongated notauli and anterior parallel lines with broad black stripes, the mesopleuron is entirely or partially black, the propodeum dark brown to black; the metasoma dorsally black. The head only 1.3 times as broad as high in front view (Fig. 24); the pronotum only slightly emarginated distally, almost straight (Fig. 27); the fore wing is 1.4 times as long as body length, the radial cell is 4.25 times as long as broad (Fig. 28); the hind tibia only slightly broadened to the apex, the ratio of hind tarsomeres I–V: 1.0:0.45:0.24:0.15:0.34 (Figs 29–30). The propodeum with lateral carinae curved and with some carinae in the central propodeal area.

All specimens of *A. persica* we examined are more robust, the body is 4.7–5.2 mm long, while females of *A. cerricola* are smaller (3.7–4.8 mm); also the

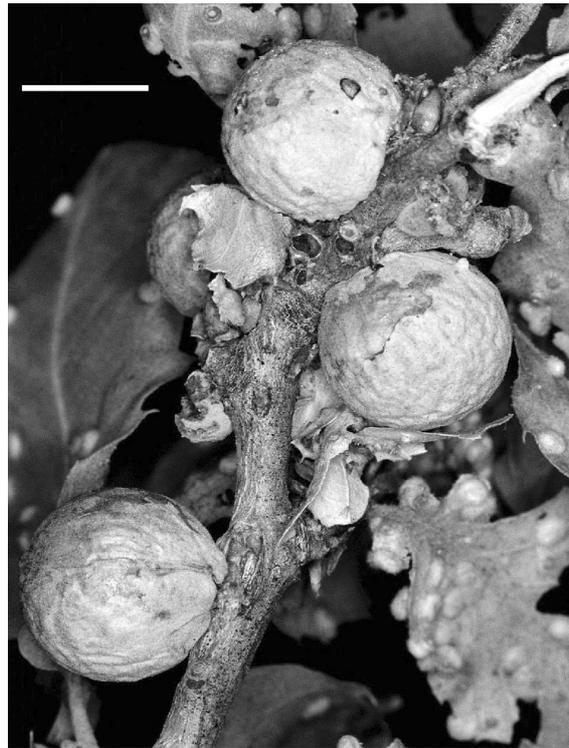


Fig. 31. *Aphelonyx persica* galls on *Q. brantii*. The white scale bar is 10 mm long (photo by G. STONE)

location and number of placoid sensilla on F8–F12 of female antenna in the two species are different (Figs 18, 26).

Biology – Only the parthenogenetic females of *Aphelonyx persica* are known, as for *A. cerricola*. It was collected on *Quercus brantii* Lindl. (= *Q. persica*), *Q. libani* and *Q. castaneifolia*. Galls were mature when collected on 26th October 2002, and the adults emerged in an outdoor insectory between 3 and 18 March 2003.

Distribution – Currently only known from Iran, from the type location, from Golestan (33°32'76" N, 48°04'34"E) in Lorestan; Guilan, East and West Azerbaijan, Phars Provinces.

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