

A review of the genus *Artocella* van Achterberg (Hymenoptera: Braconidae: Rogadinae), with description of a new species from Spain

M.R. Shaw

Shaw, M.R. A review of the genus *Artocella* van Achterberg (Hymenoptera: Braconidae: Rogadinae), with description of a new species from Spain.

Zool. Med. Leiden 79-2 (9), 22.vii.2005: 179-193, figs 1-20.— ISSN 0024-0672.

Mark R. Shaw, National Museums of Scotland, Chambers Street, Edinburgh, EH1 1JF, U.K. (e-mail: M.Shaw@nms.ac.uk).

Key words: Hymenoptera; Braconidae; Rogadinae; *Artocella*; new species; Spain.

A new species of the genus *Artocella* van Achterberg is described from Spain. On the basis of its substantial sexual dimorphism, the differences between the two previously known species of this Turanian-Mediterranean genus, which had each been described from specimens of only one (and differing) sex, are reassessed.

Introduction

Van Achterberg (1980) erected the genus *Artocella* in the braconid subfamily Rogadinae to receive the new species *A. brevipalpis* van Achterberg, which he described from two female specimens from Tunisia. Later (van Achterberg, 1991) he classified the genus in the rogadine tribe Clinocentrini. Subsequently Belokobylskij (2001) described a further species, *A. vladimiri*, from a desert habitat in Turkmenia on the basis of a single male, and provided a key to separate the two species. Meanwhile, I had received two females and one male of a clearly distinct species of *Artocella* collected in 1999 in an arid part of Zaragoza province, Spain. From the latter series it was immediately obvious that this *Artocella* species is profoundly sexually dimorphic, and (presuming this trait is common to all *Artocella* species) that some at least of the characters given by Belokobylskij (2001) to separate his *A. vladimiri* (♂) from *A. brevipalpis* (♀) merely reflected sexual dimorphism.

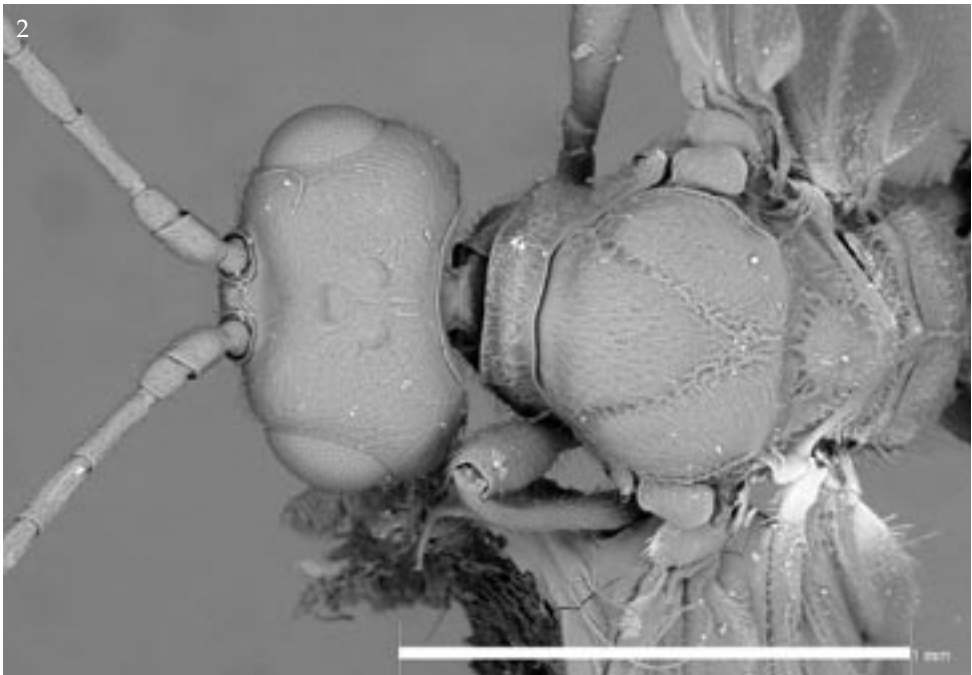
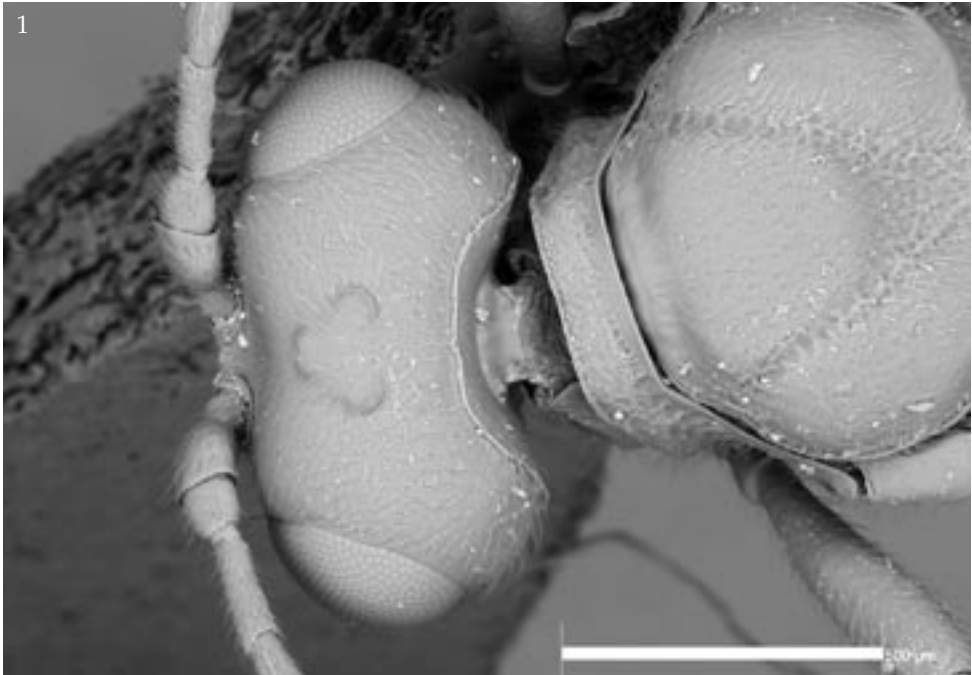
In this paper I describe the new species from Spain, characterise the sexual dimorphism seen in this species and, on that basis, review the probable status of *A. vladimiri* (holotype in Zoological Institute, Russian Academy of Sciences, St Petersburg: examined) with respect to *A. brevipalpis* (holotype and paratype in Nationaal Natuurhistorisch Museum, Leiden: paratype examined). Unfortunately there are no rearing records of *Artocella* but the interesting biogeography of the genus and the biotope of the new species are briefly discussed.

Terminology follows van Achterberg (1979, 1993) except that OOL is measured as the shortest distance between the lateral ocellus and the eye. The lengths of wing veins are measured from the mid points of vein junctions.

Descriptions

Genus *Artocella* van Achterberg, 1980

The new species conforms to van Achterberg's (1980) generic diagnosis except in the following respects: antennal segments 25 (♂), 27 and 28 (♀) [van Achterberg: 29-30];



Figs 1-2, *Artocella* species, head with mesonotum, dorsal aspect. 1, *A. askewi* ♀, holotype; 2, *A. askewi* ♂, paratype.

hypostomal carina joining occipital carina a little closer to mandibular base; propodeum (of male especially) with a more or less clear median carina in anterior half, and a rather vaguely indicated irregular areola, not open posteriorly; vein m-cu of fore wing sometimes less distinctly antefurcal; sculpture of third metasomal tergite weaker. Except as noted above it conforms to the re-expression of generic characters given by van Achterberg (1991), apart from the having only a very short and irregular pair of longitudinal carinae posteriorly on the propodeum.

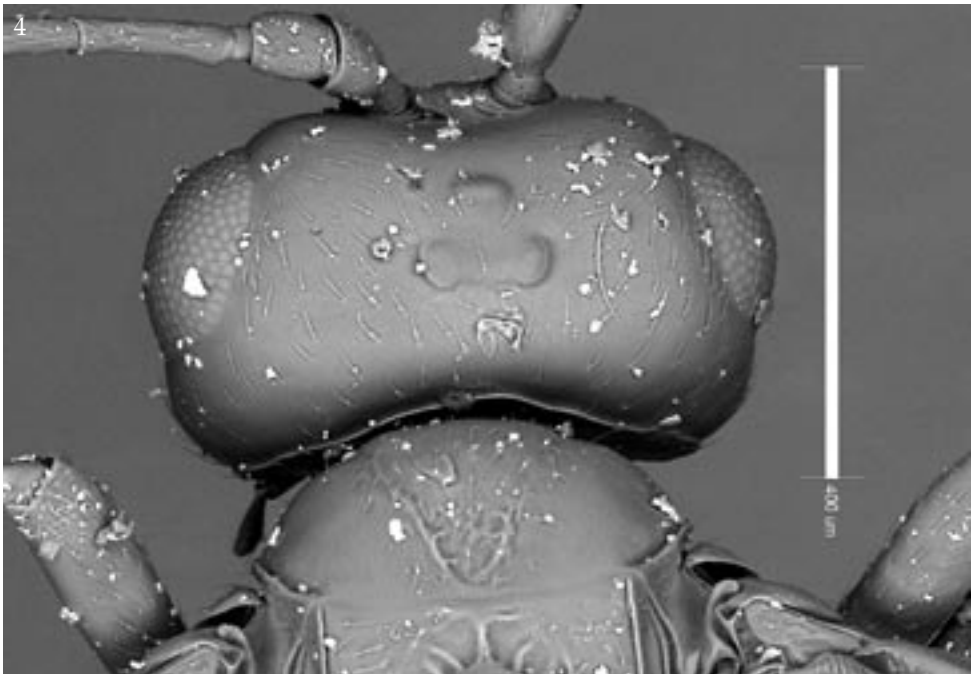
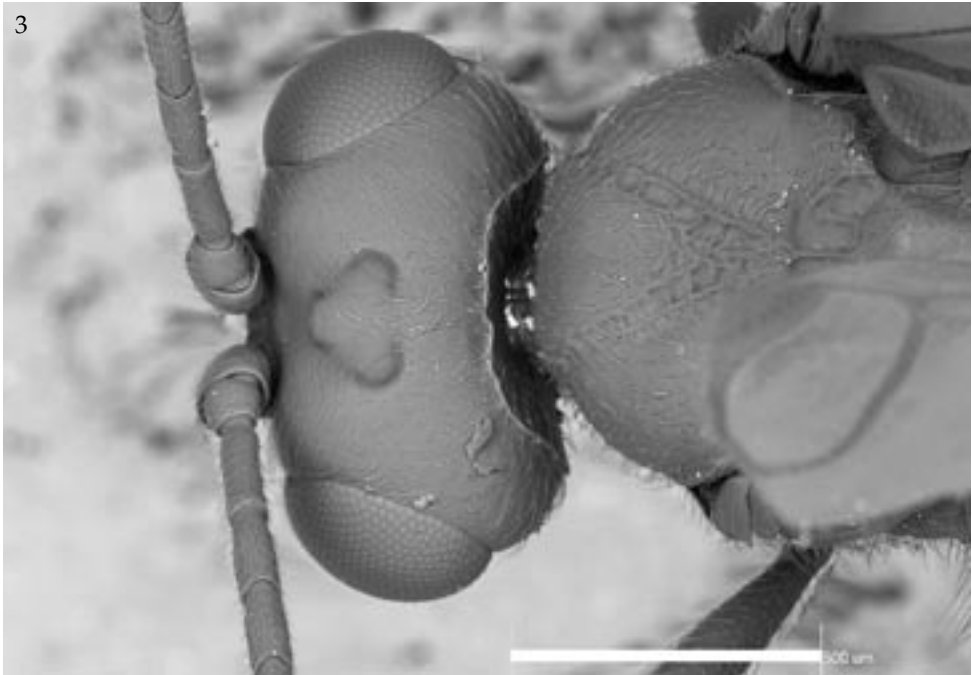
Artocella askewi spec. nov. (figs 1, 2, 5, 6, 9, 10, 13, 15-18)

Holotype (in National Museums of Scotland): ♀, "Spain: Zaragoza, Sierra de Alcubierre, Monegros, Pina de Ebro, ex *Ephedra nebrodensis*, swept 1.5.[19]99, J. Blasco-Zumeta"; paratypes (in National Museums of Scotland): 1 ♀, same data; 1 ♂, same data but 16.v.1999.

Female: length of body 3.7 mm; length of fore wing 3.4 mm.

Head (figs 1, 5).— Antenna about as long as body, with 27–28 segments, expanded part of scape 0.9 times as wide as long and apically obliquely truncate in dorsolateral view, length of third segment (including annellus) 1.2 times fourth (or 0.95 times, excluding annellus), third and fourth segments 3.3 and 2.6 times as long as wide respectively, penultimate segment 1.8 times as long as wide (fig. 17), apical segment weakly acuminate and lacking spine; palpi very short, length of maxillary palp about 0.4 times height of head, its apical segment 2.8 times as long as wide; eye glabrous, very weakly emarginate above antennal socket; head 1.9 times as wide as long and length of eye 2.0 times length of temple in dorsal view; POL:OD:OOL = 5:3:11; occipital carina entire, meeting hypostomal carina ca 0.3 times length of basal width of mandible from mandible; frons with a small central depression above the level of antennal sockets; clypeus well differentiated from face, 0.4 times as wide as face, centrally 0.3 times as high as wide in facial view, its apical margin strongly and rather sharply reflexed; cheek rather buccate; in lateral view width of eye 0.75 times its height and height of eye 0.57 times height of head (excluding mouthparts); malar space 1.1 times basal width of mandible; setosity rather even, moderately dense; surface mostly somewhat shiny and with only weak superficial sculpture.

Mesosoma (figs 5, 9).— Length of mesosoma 1.6 times its height; mesoscutum in dorsal view 1.2 times as wide as long; notauli pronounced, rugose, not quite converging to a point posteriorly and uniting in a broad area of strong rugosity occupying the central part of the posterior 0.3 of the mesoscutum; mesoscutum otherwise rather shiny, very superficially rugulose or (side lobes) punctulate, evenly but not very densely setose; scutellar sulcus rather large, centrally about a third as long as the rest of the scutellum, crenulate; sides of scutellum costate, the raised part rather flat, weakly differentiated, shiny, weakly punctulate, posteriorly polished; metanotum costate-rugose; propodeum rather evenly rounded, strongly rugose, lacking strong directional carinae except that an irregular anterior longitudinal carina and a posteriorly closed irregular areola are clearly indicated; prepectal carina complete and strong, not reaching anterior margin of mesopleuron; upper part of mesopleuron strongly rugose, otherwise nearly smooth with precoxal sulcus rather short, wide, very superficially rugose and remote from margins of mesopleuron; metapleuron rugulose.



Figs 3-4, *Artocella* species, head with mesonotum, dorsal aspect. 3, *A. brevipalpis* ♀, paratype; 4, *A. vladimiri* ♂, holotype.

Wings (fig. 15).— Fore wing: first discal cell petiolate anteriorly; parastigma narrow; 1-SR+M sinuate; SR1 curving rather evenly to wing margin, and perceptibly slightly incassate; 2-R1 practically absent; r-m slightly antefurcal, ie. joining 2-SR rather than 3-SR so that the second submarginal cell is minutely petiolate (holotype), or interstitial (paratype); 2-SR:r-m:2-M = 13:8:10; r-m and 2-SR+M unpigmented; 2-SR+M variable, ca 0.2 – 0.4 times 2-M; 3-M weakly indicated nearly to wing margin; r:SR1:1-R1:length of pterostigma = 7:32:23:33; 1-R1 1.8 times width of marginal cell; length of marginal cell 2.8 times its width; cu-a postfurcal, nearly perpendicular and straight; 1-CU1:2-CU1 = 5:23; first subdiscal cell closed but the short CU1b posteriorly unpigmented; CU1a tubular only in about proximal third but distinct nearly to wing margin. Hind wing: 1-1A and cu-a forming a continuous curve; m-cu indicated; M+CU:1-M = 15:11; 1r-m essentially interstitial, in a continuous line with SC+R1, so that 2-SC+R is not represented (except that the crossing of veins is not perpendicular); SR almost straight, unpigmented; marginal cell parallel-sided.

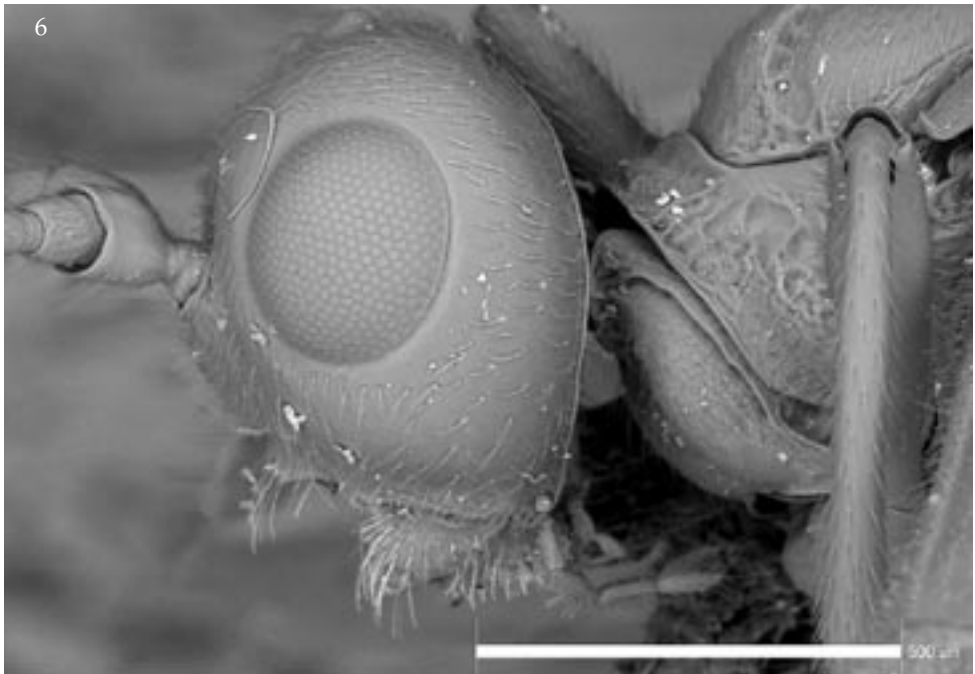
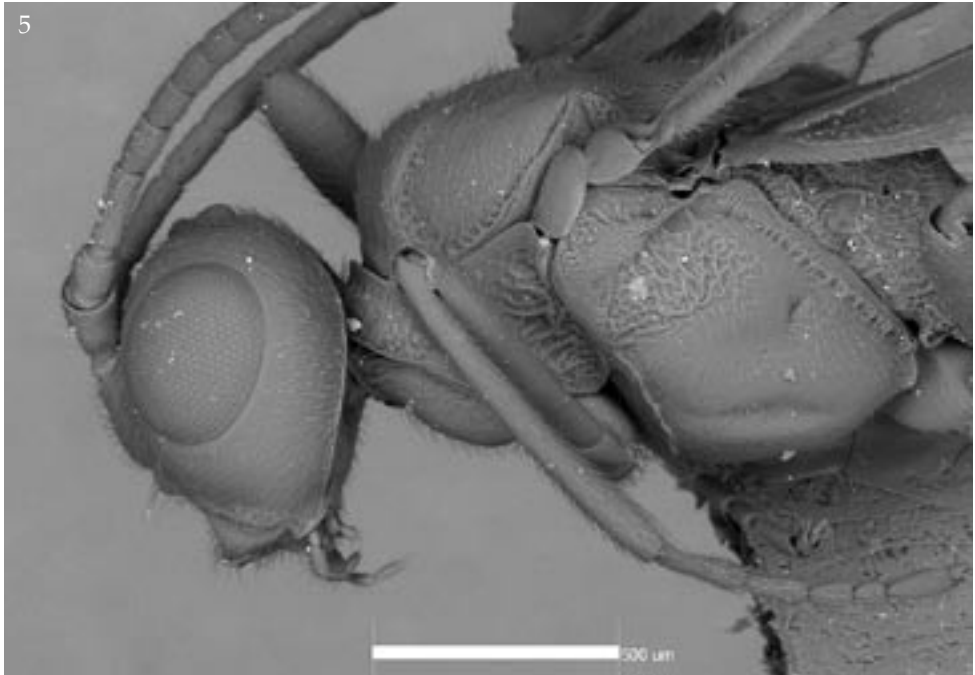
Legs.— Hind coxa rugulose; length of femur and tibia of hind leg 4.6 and 9.4 times their widths, respectively; length of femur:tibia:tarsus (excluding claw) of hind leg = 43:66:56; hind tibial spurs small, slender, weakly curved, setose, 0.23 (inner) and 0.18 (outer) times length of hind basitarsus; apex of hind tibia with setal comb rather inconspicuous.

Metasoma (figs 9, 13).— Apical width of first tergite 1.0 (holotype) to 0.9 (paratype) times its length; first tergite strongly down-curved in anterior third and there rugose, but posteriorly gently convex and longitudinally rugulose-striate, anteriorly dorsal carinae very weak, short, not uniting, dorsope small and shallow; second tergite with fine, rather weak, confused and largely curved strigose and somewhat granulate sculpture, in central anterior part the striate element mostly transverse but elsewhere largely longitudinal and diverging posteriorly, and the extreme sides becoming unsculptured, shiny; third tergite centrally with similar but weaker transverse sculpture anteriorly and centrally, the rest becoming smoother; subsequent tergites largely smooth; spiracles of second and third tergites near edge of notum; second and subsequent tergites rather flat, sparsely setose, setae more numerous in apical and lateral parts of tergites; ovipositor sheath about 1.2 times as long as hind basitarsus, with upstanding setae along its length apically about as long as its width; hypopygium rather large, acuminate (ca 60°).

Colour.— Brownish yellow; tip of mandible, flagellum (except annellus), stemmaticum, most of dorsal part of mesosoma posterior to mesoscutum (except raised part of scutellum), first tergite of metasoma, ovipositor sheath and at least partly propleuron, upper part of mesopleuron and metapleuron black; scape, pedicel, annellus, palpi, raised part of scutellum, second tergite partly, posterior edge of more apical tergites, most of legs (except front and mid coxae) darker than ground colour but to variable extents in the two female specimens to hand; posterior (rugose) part of mesonotum and frons darkened only in holotype, and leg colour as well as the extent of dark colouration in the upper part of the side of the mesosoma varies substantially. Wing membrane hyaline, venation brownish, pterostigma faintly paler centrally.

Male: length of body 3.0 mm, length of fore wing 2.9 mm.

Head (figs 2, 6).— Antenna 1.05 times as long as body, with 25 segments, expanded



Figs 5-6, *Artocella* species, head with anterior part of mesosoma, lateral aspect. 5, *A. askewi* ♀, paratype; 6, *A. askewi* ♂, paratype.

part of scape 0.7 times as wide as long, length of third segment 1.1 times fourth, third and fourth segments 3.7 and 3.3 times as long as wide, penultimate segment 2.4 times as long as wide (fig. 18); eye completely lacking emargination; head 1.6 times as wide as long and length of eye 1.5 times length of temple in dorsal view (very sensitive to exact angle of view and could easily be measured as low as 1.0 times), temple rounded behind; POL:OD:OOL = 4:2.5:13; frons more widely excavate above level of antennal sockets; face 2.9 times as wide as high, not so noticeably convex centrally; clypeus 0.36 as wide as face; cheek more buccate; in lateral view width of eye 0.87 times its height and height of eye 0.47 times height of head (excluding mouthparts); malar space 1.4 times basal width of mandible; face weakly rugulose.

Mesosoma (fig. 10).— Mainly differing from female in having more posteriorly convergent notauli, weaker sculpture to the sides and anterior of the scutellum, and a clearer median carina (owing to reduced surrounding sculpture) on the anterior half of the propodeum.

Wings (fig. 16).— Fore wing: apart from its pale brownish wing membrane, differs from female mainly in the venation of the marginal cell and second submarginal cell: SR1 strongly incrassate (most other veins also thicker than in female); r-m very slightly post-furcal, so second submarginal cell not petiolate (but remaining essentially triangular); second submarginal cell smaller, 2-SR:r-m:2-M = 8:6:8; 2-SR + M relatively longer, ca 0.7 times 2-M; r:SR1:1-R1: length of pterostigma = 7:26:12:28; marginal cell smaller and almost parallel-sided, 1-R1 1.7 times and its length 3.4 times its width; 1-CU1:1-CU2 = 3:18; subdiscal cell a little more widened distally. Hind wing similar to female, but m-cu indicated more proximally.

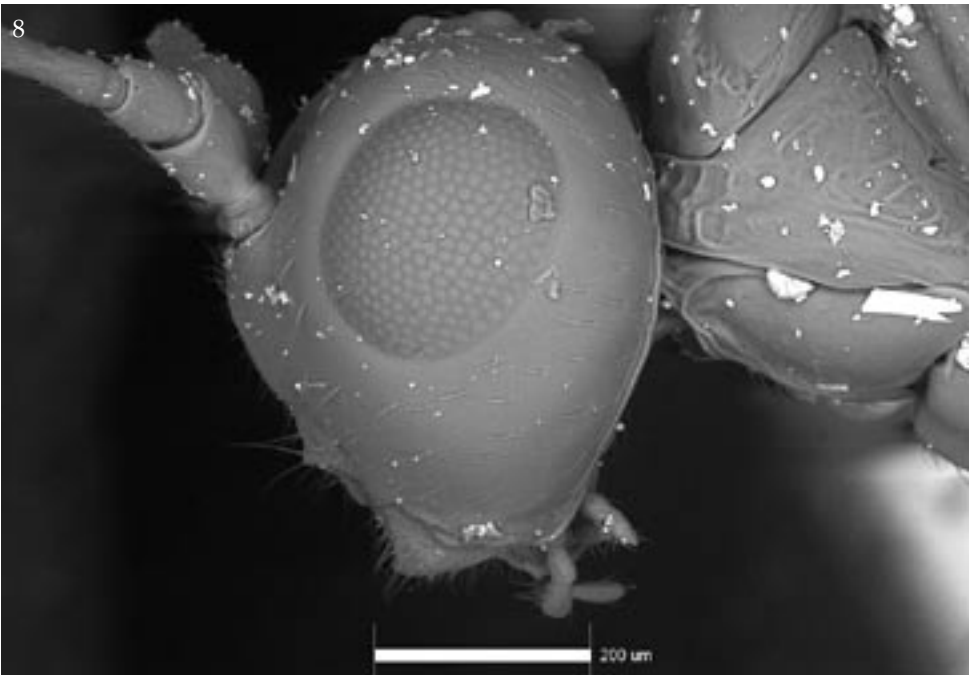
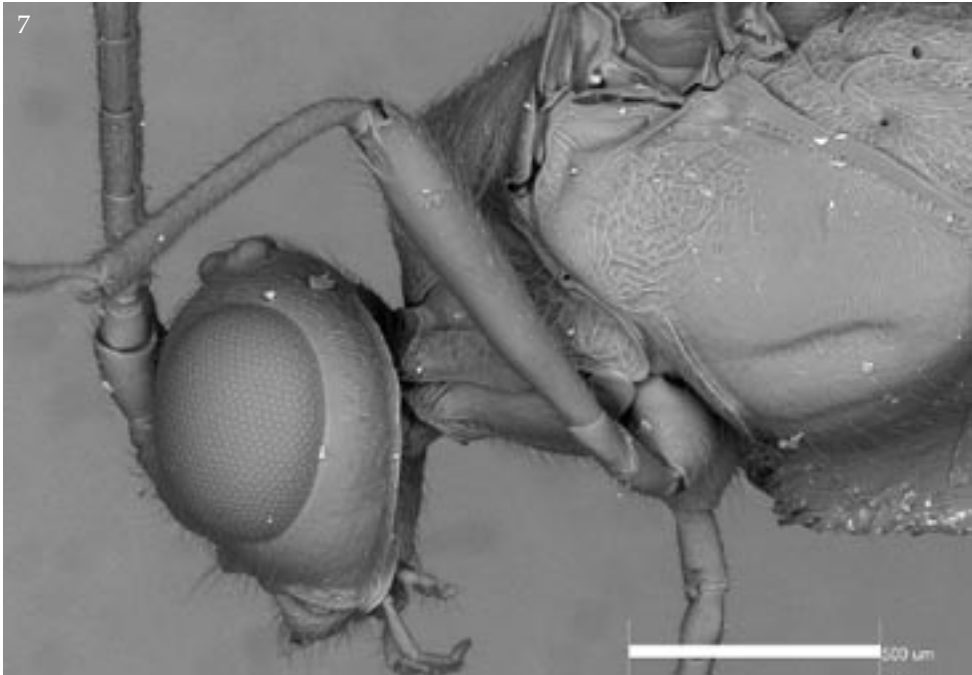
Legs.— Length of femur and tibia of hind leg 4.5 and 8.7 times their widths, respectively; length of hind tibial spurs longer, 0.30 and 0.24 times length of basitarsus.

Metasoma (fig. 10).— First tergite 0.85 times as wide apically as long, more coarsely rugose-striate; second and third tergites with strigose element weaker, largely granulate.

Colour.— Like the paler (paratype) female, but wing membrane markedly yellow-brownish, especially in the apical quarter of the fore wing.

Sexual dimorphism.— As well as exhibiting the usual sexual differences, the two sexes differ strongly in the venation of the fore wings (figs 15, 16) as well as the colouration of the wing membrane; in the shape of the head and size of the eye (figs 1, 2, 5, 6), and hence the more buccate cheeks and larger malar space of the male; and the complete lack of emargination of the eye in the male. Less extreme but still considerable differences are the colouration of the fore wing membrane (apically); and the extent of sculpture surrounding the raised part of the scutellum, the propodeum, and the basal tergites of the mesosoma (figs 9, 10). The two sexes are broadly similar in the extent and density of the setosity of the head and mesosoma (figs 1, 2, 5, 6).

Comparison with other species.— *A. askewi* (♀) differs from *A. brevivalpis* (♀) (figs 3, 7, 11, 19) most obviously in having the head more rounded, with smaller eyes, a longer temple (eye ca 2.6 times temple in *A. brevivalpis* in the view shown) and a longer malar space (0.9 times width of mandibular base in *A. brevivalpis*); the first metasomal tergite with more longitudinally organised sculpture; the second tergite with lighter but strigose sculpture; and in several details of wing venation, the most striking of which is the absence of vein 2-SC+R in the hind wing. (Under the light microscope the anterior longitudinal carina of the propodeum is rather indistinct in



Figs 7-8, *Artocella* species, head with anterior part of mesosoma, lateral aspect. 7, *A. brevipalpis* ♀, paratype; 8, *A. vladimiri* ♂, holotype.

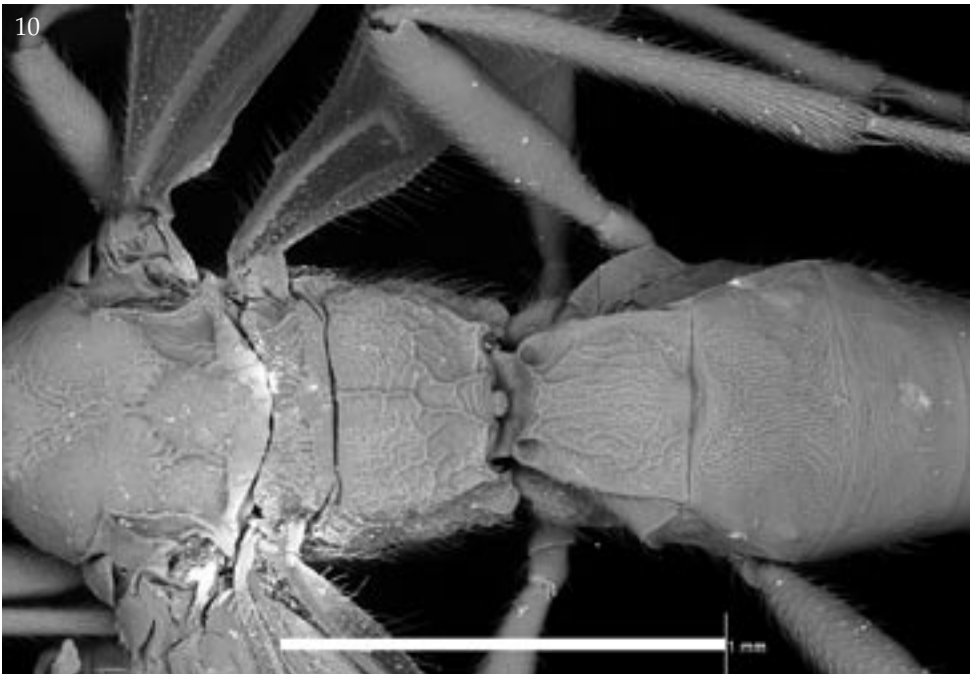
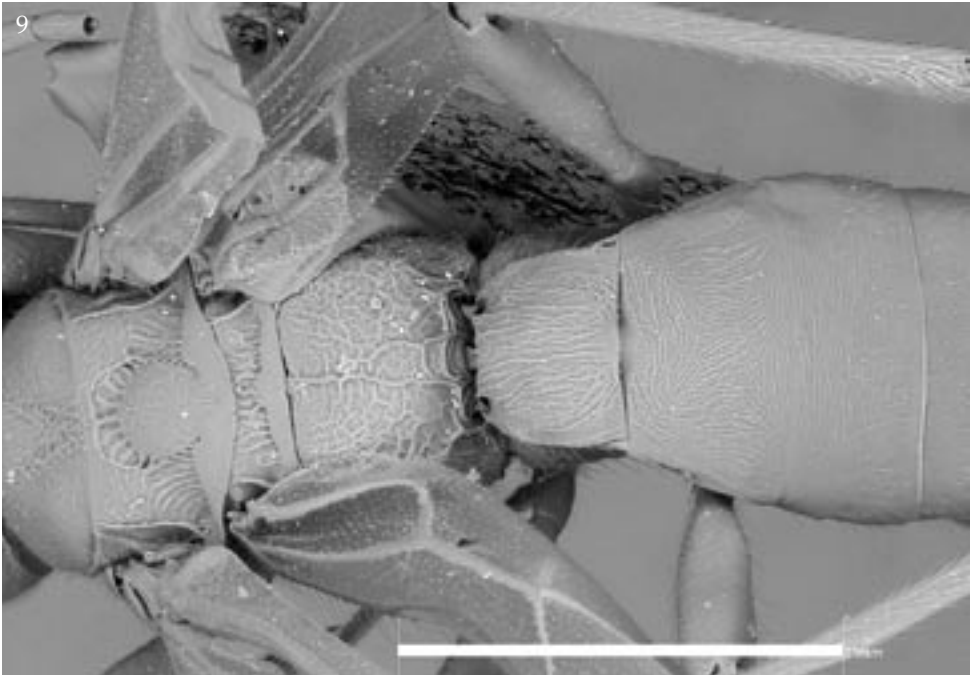
the females of both species (cf. van Achterberg's (1980) generic diagnosis), but this feature shows up well in SEMs (figs 9, 11) although it is somewhat irregular). *A. askewi* (♂) differs from *A. vladimiri* (♂) (figs 4, 8, 12, 14, 20) most obviously in having a much more pubescent body; a broader mesonotum relative to the width of the head; much more contrast between the sculpture of the first and second metasomal tergites; a rounder head, with smaller eyes and slightly longer malar space (1.3 times basal width of mandible in *A. vladimiri*); the absence of 2-SC+R in the hind wing; and the longer 1-CU1 in the fore wing.

It is a pleasure to name this species after Dick Askew (Dr R.R. Askew), whose immense contribution to entomology includes substantial work on the biology and taxonomy of the highly endemic parasitic wasp fauna in the Monegros region of Zaragoza province, in collaboration with Javier Blasco-Zumeta.

The status of *Artocella vladimiri*

Note.—Belokobylskij (2001) described *Artocella vladimiri* from a single male specimen; the appearance of the sex symbol ♀ in one part of his paper is a *lapsus*.

Because *Artocella* species are now seen to be highly sexually dimorphic, many of the apparently clear differences recorded by Belokobylskij (2001) between *A. bevipalpis* and his new species *A. vladimiri* have to be discounted. An examination of the holotype of *A. vladimiri* and the paratype of *A. bevipalpis*, in conjunction with the mixed-sex series of what is undoubtedly all *A. askewi*, suggests that the two previously described nominal species are rather close. In particular, the apparently enormous difference in the size of the eyes and the shape of the temple behind them, as well as the cheek, might conceivably be merely sexual (some of these differences are slightly exaggerated in the key given by Belokobylskij (2001) owing to different methods of measurement in the two original descriptions). Differences in the wing venation and in the sculpture of the propodeum seem to be little more than those seen between the sexes of *A. askewi*, especially in view of the intraspecific variation seen (even between the two fore wings of a single specimen) in the available material. In comparison with *A. askewi*, the relatively stronger sculpture of the third tergite of the metasoma, the comparatively long vein 2-SC+R in the hind wing, and the smaller extent of rugulose sculpture around the union of the notauli seem to be similar in the two species. The much smaller size of the male specimen of *A. vladimiri* may not be meaningful either, especially if the genus was correctly classified in the tribe Clinocentrini by van Achterberg (1991). The developmental biology might then be expected to be similar to that of at least some species of *Clinocentrus* (Shaw, 1981; 1983), in which the parasitoid causes the host to die and mummify in whichever instar it is attacked, leading to a large variation in the size of adults to develop in a given host species (males usually resulting from the smaller hosts). The difference in the number of antennal segments associated with this phenomenon is considerable, and could easily explain the difference between the male holotype of *A. vladimiri* (21 segments) and the female type of *A. bevipalpis* (29-30 segments); in *Clinocentrus cunctator* (Haldan) (= *C. gracilipes* (Thomson)) males resulting from second instar larvae of the choreutid moth *Anthophila fabriciana* (Linnaeus) have ca 22 antennal segments while females from fourth (final) instar larvae of the same host have ca 30 (M.R. Shaw, un-



Figs 9-10, *Artocella* species, part of mesosoma and basal tergites of metasoma, dorsal aspect. 9, *A. askewi* ♀, paratype; 10, *A. askewi* ♂, paratype.

published). The antenna of the male of *A. vladimiri* is slenderer than that of the female of *A. brevivalpis* to about the same degree as separates the two sexes of *A. askewi* (figs 17-20).

However, the very much sparser setosity of the head and mesonotum in *A. vladimiri* (figs 4, 8) than in *A. brevivalpis* (figs 3, 7) is not reflected between the sexes of *A. askewi* (figs 1, 2, 5, 6), and this character strongly suggests that the two previously described nominal species are in fact distinct – although, if indeed the holotype of *A. vladimiri* were to be an abnormally small specimen of its species, even this character may prove to be unreliable. Because most of the differences between *A. brevivalpis* and *A. vladimiri* echo the sexual differences seen in *A. askewi*, the specific validity of *A. vladimiri* will remain in doubt until either females from Turkmenia are collected, or the male of *A. brevivalpis* is known.

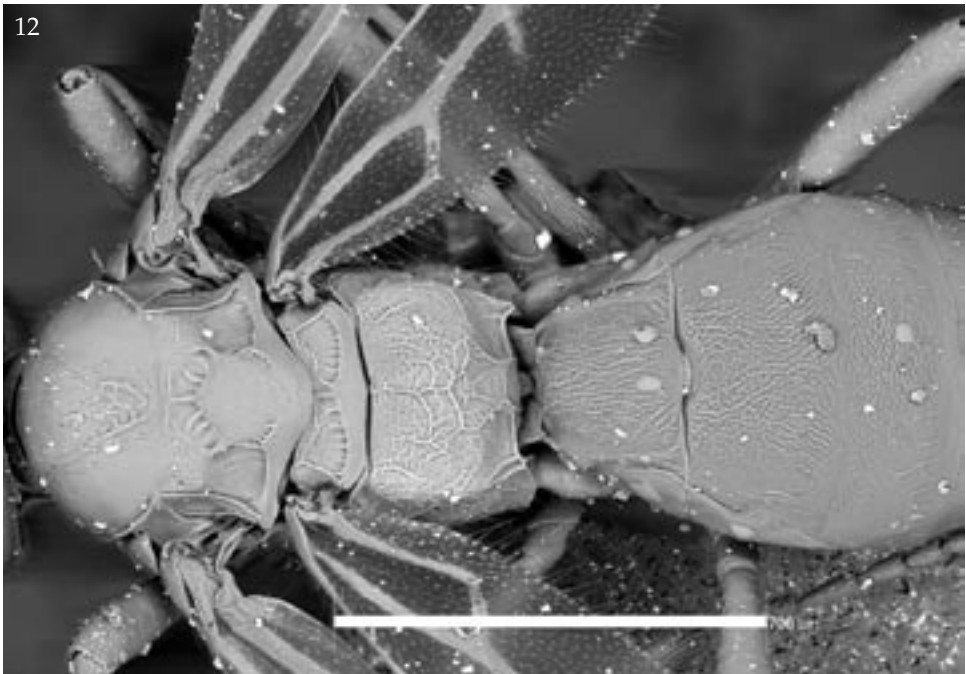
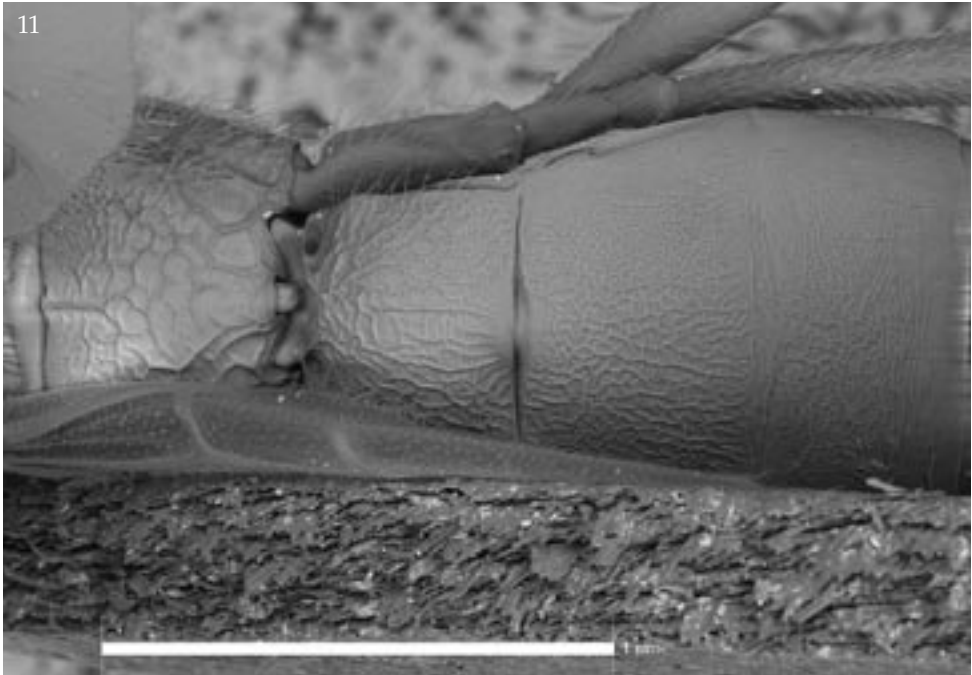
Tentative key to species of the genus *Artocella* van Achterberg
(male of *A. brevivalpis* and female of *A. vladimiri* are unknown)

1. Vein 2-SC+R of hind wing absent, i.e. veins 1r-m and SC+R1 appearing as a continuous line crossing the almost continuous veins 1-SC+R and SR (figs 15, 16); preapical antennal segments more robust (figs 17 (♀) and 18 (♂)); sculpture of metasomal tergite 2 rather weak, granulate-strigose, contrasting with the stronger sculpture of tergite 1 (figs 9, 10) *A. askewi* spec. nov.
- Vein 2-SC+R of hind wing clearly present (fig. 14, and van Achterberg 1980: fig. 3); preapical antennal segments more elongate (cf. figs 19, 20); sculpture of metasomal tergite 2 stronger, less contrasting with that of tergite 1 (cf. figs 11, 12) 2
2. Head and mesonotum with setae moderately dense and even (cf. figs 3, 7) *A. brevivalpis* van Achterberg (♀)
- Head more sparsely setose (cf. figs 4, 8) and side lobes of mesonotum largely glabrous (cf. figs 4, 12) *A. vladimiri* Belokobylskij (♂)

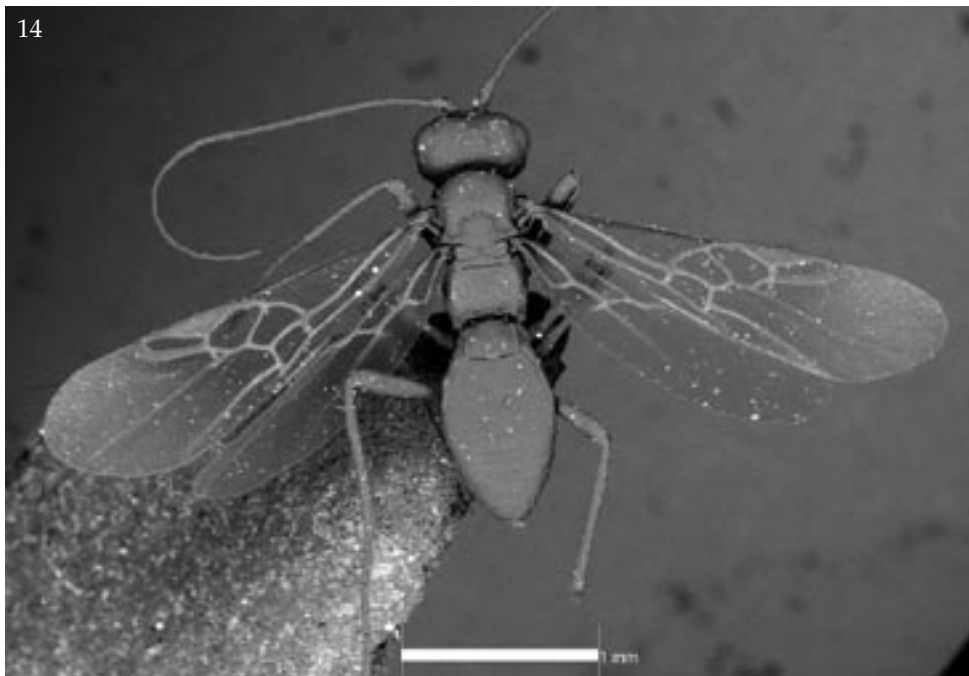
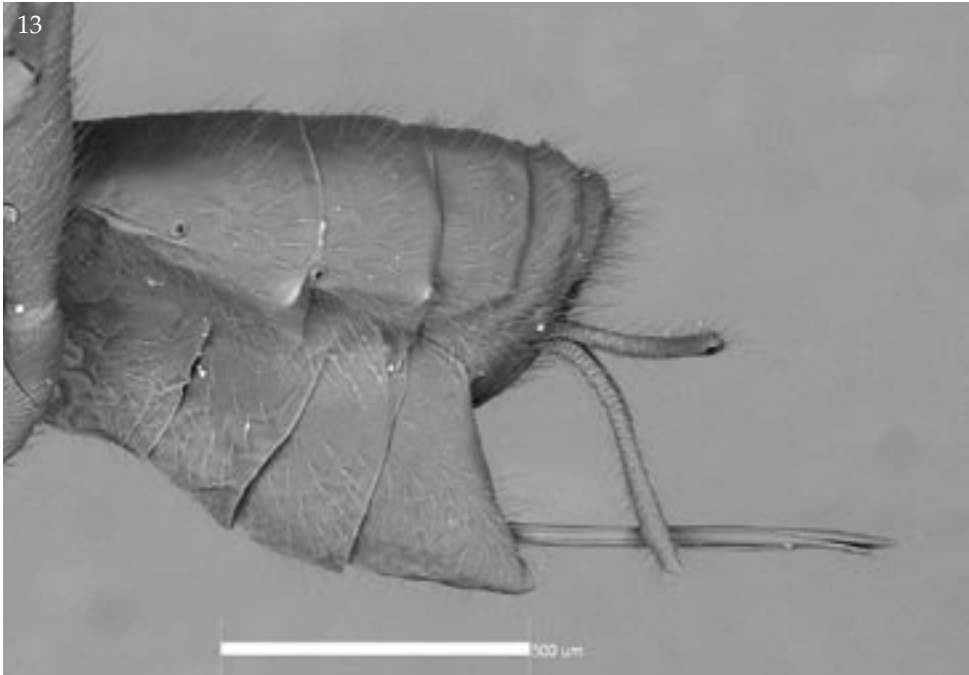
Biogeography of *Artocella* and biotope of *A. askewi*

As Belokobylskij (2001) remarks, the deserts of Turkmenia are biogeographically part of the “ancient Mediterranean” (the Turanico-Mediterraneo as depicted by Taglianti et al, 1992: fig. 9). This area of Central Asia shares many taxa not only with North Africa but also, most interestingly, with the arid area in the central Ebro valley (N. E. Spain) known as Los Monegros, where the new species was collected (e.g. Blasco-Zumeta, 1996; Ribera & Blasco-Zumeta, 1998 and cf. Melic & Blasco-Zumeta, 1999). The known distribution of the genus *Artocella* is an absolutely classical fit, with one species so far discovered in each of these now isolated and harshly arid areas. The only exact habitat information available is for *A. askewi*, all three specimens of which were swept from joint-pine, *Ephedra nebrodensis* Tineo ex Guss. (Ephedraceae) in a forest steppe dominated by *Juniperus thurifera* Linnaeus and *Pinus halepensis* Miller. The characteristics of this area, known locally as Sierra de Alcubierre, are its harsh climate of extreme temperatures, desiccating winds and low rainfall (Ochoa, 1982), and its resulting characteristic and species-deficient flora (Braun-Blanquet & Bolós, 1957).

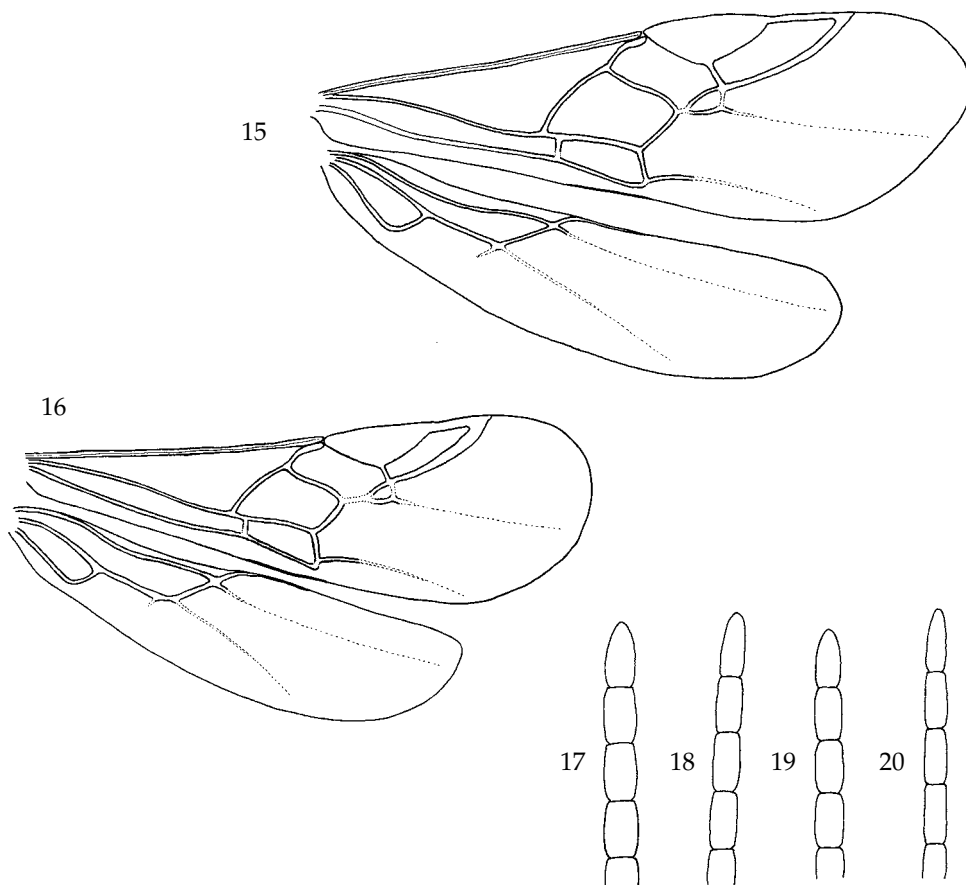
The hosts of *Artocella* are presumed to be weakly concealed “microlepidoptera”



Figs 11-12, *Artocella* species, part of mesosoma and basal tergites of metasoma, dorsal aspect. 11, *A. brevipalpis* ♀, paratype; 12, *A. vladimiri* ♂, holotype.



Figs 13-14, *Artocella* species. 13, *A. askewi* ♀, paratype, posterior part of metasoma, lateral aspect; 14, *A. vladimiri* ♂, holotype, dorsal aspect.



Figs 15-20, *Artocella* species. 15-16, wings; 18-20, apical segments of antenna. 15, 17, *A. askewi* ♀; 16, 18, *A. askewi* ♂; 19, *A. brevipalpis* ♀; 20, *A. vladimiri* ♂.

larvae (though this is no more than a hunch), but attempts to rear *A. askewi* from Lepidoptera larvae collected in May from *Ephedra* in the general area have so far been unsuccessful (J. Blasco-Zumeta, pers. comm.). A further point of interest is that the three specimens of *A. askewi* were collected in about the first half of May, close to the time of collection (April) of the single specimen of *A. vladimiri*, while the two specimens of *A. brevipalpis* were collected in September (although, of course, univoltinism has not been established for any of the species).

Acknowledgements

I am very grateful to Javier Blasco-Zumeta for donating to the National Museums of Scotland the Braconidae collected during his entomological survey of Retuerta de Pina and for much useful information including comment on the manuscript, to Sergey Belokobylskij for lending the holotype of *A. vladimiri*, to Dmitri Kasparyan for trans-

lating Belokobylskij's 2001 paper (before its publication in English in Entomological Review), to Diane Mitchell and Bill Crighton for much help with image capture, and to Kees van Achterberg for access to the paratype of *A. brevipalpis* and for comments on the manuscript.

References

- Achterberg, C. van, 1979. A revision of the subfamily Zelinae auctt. (Hymenoptera, Braconidae).— Tijdschrift voor Entomologie 122: 241-429.
- Achterberg, C. van, 1980. Three new Palaearctic genera of Braconidae (Hymenoptera).— Entomologische Berichten, Amsterdam 40: 72-80.
- Achterberg, C. van, 1991. Revision of the genera of the Afrotropical and W. Palaearctic Rogadinae Foerster (Hymenoptera: Braconidae).— Zoologische Verhandlungen Leiden 273: 1-102.
- Achterberg, C. van, 1993. Illustrated key to the subfamilies of the Braconidae (Hymenoptera: Ichneumonoidea).— Zoologische Verhandlungen Leiden 283: 1-189.
- Belokobylskij, S.A., 2001. New taxa of the braconid subfamilies Doryctinae and Exothecinae (Hymenoptera, Braconidae) from the western Palaearctic region.— Entomologicheskoe Obozrenie 80: 451-471 (in Russian). English translation: Entomological Review 81: 749-766.
- Blasco-Zumeta, J., 1996. Notes on the invertebrate fauna associated with gypsiferous soils in the Central Ebro Valley. In: Herrero, J. (ed.). Biocenoses and agriculture in a semi-arid and gypseous environment of the Central Ebro Valley, Spain: 6-17.— Universitat de Lleida, Lleida.
- Braun-Blanquet, J. & Bolós, O., 1957. Les groupements végétaux du bassin moyen de l'Ebre et leur dynamisme.— Anales de la Estación Experimental de Aula Dei 5 (1-4): 1-266.
- Melic, A. & Blasco-Zumeta, J. (Eds). 1999. Manifiesto científico por los Monegros.— Boletín Sociedad Entomológica Aragonesa 24 (1998): 1-266.
- Ochoa, M.J., 1982. Relaciones entre el medio y comunidades vegetales del sabinar continental árido en el Valle del Ebro. Ministerio de Agricultura, Pesca, y Alimentación.— Comunicaciones I.N.I.A Serie Recursos Naturales, Madrid 14: 1-52.
- Ribera, I. & Blasco-Zumeta, J., 1998. Biogeographical links between steppe insects in the Monegros region (Aragón, N. E. Spain), the eastern Mediterranean and central Asia.— Journal of Biogeography 25: 969-986.
- Shaw, M.R., 1981. Delayed inhibition of host development by the nonparalysing venoms of parasitic wasps.— Journal of Invertebrate Pathology 37: 215-221.
- Shaw, M.R., 1983. On[e] evolution of endoparasitism: the biology of some genera of Rogadinae (Braconidae). In: Gupta, V. K. (ed.), Studies on the Hymenoptera. Contributions of the American Entomological Institute 20: 307-328.
- Taglianti, A.V., Audisio, P.O., Belfiore, C., Biondi, M., Bologna, M.A., Carpaneto, G.M., de Viase, A., de Felice, S., Piattella, E., Racheli, T., Zapparoli, M. & Zoia, S., 1992. Riflessioni di gruppo sui corotipi fondamentali della fauna W-paleartica ed in particolare italiana.— Biogeographia 16: 159-179.

Received: 9.xii.2004

Accepted: 18.iii.2005

Edited: C. van Achterberg

