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Cotesia acerbiae sp. nov. (Hymenoptera: Braconidae, Microgastrinae), a gregarious parasitoid of *Acerbia alpina* (Quensel, 1802) (Lepidoptera: Erebidae, Arctiinae) in Polar Ural, Russia

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Synopsis

Cotesia acerbiae Shaw & Vikberg sp. nov. is described from a single large brood reared from a cocoon of the circumpolar moth *Acerbia alpina* (Quensel, 1802) collected in Polar Ural (Tjumen oblast). The means to distinguish it from other western Palaearctic *Cotesia* species are given.

Key words: Hymenoptera, Braconidae, Microgastrinae, *Cotesia*, new species, description, taxonomy, host relations, distribution, Tjumen.

Introduction

The highly localised circumpolar moth *Acerbia alpina* (Quensel, 1802) (Erebidae: Arctiinae) is distributed, as various subspecies, in northern Fennoscandia, the Russian Arctic, some high mountain areas of Central Asia, Kamchatka and also in North America (see Stigenberg, Vikberg & Belokobylskij, 2011, for a summary of its occurrence and biology). The adult and larvae are rarely seen but, owing to its habit of forming its cocoon on rocks exposed to the sun, the cocoon stage of this prized insect is quite regularly collected during special expeditions by lepidopterists. Until recently the identity of its parasitoids, which tended to be discarded by lepidopterists, have been unclear (findings are summarised by Stigenberg, Vikberg & Belokobylskij, 2011), but in the last few years a gregarious species of Braconidae, *Meteorus acerbiavorus* Belokobylskij, Stigenberg & Vikberg, in the subfamily Meteorinae, has been collected, preserved and subsequently described from two localities in Enontekiö Lapland, Finland (Stigenberg, Vikberg & Belokobylskij, 2011) and more recently it has also been found in Sweden (Stigenberg & Shaw, 2012). The latter discovery followed a long period in which cocoons of the moth had been collected in the same small area of Sweden by a succession of entomologists without any evidence of parasitism having been noted (Claes Eliasson, pers. comm.).

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During an expedition to the Polar Ural (Tjumen oblast) of Russia, undertaken by Timo and Kari Nupponen in 1999, a cocoon of *A. alpina* (one of several found, all parasitised) was collected at Krasnyi Kamen (66°55′06″N 65°34′26″E). The collectors record (in litt., translated here) 'The locality is the highest ridge of Polar Ural along the railway from Labytnang to Vorkuta. It is arbitrary whether it is on the European or Asian side: the border between the two is variously interpreted. The purpose of the expedition was a faunistic study of butterflies, and local practicalities were arranged with the help of Vladimir Olschwang and colleagues. To reach the top of Krasnyi Kamen the first hurdle was to cross the fast-flowing river by inflatable rubber boat. Next came a 100 m climb through a mountain birch forest, and after that a further 700 m rise on a steep rocky slope to the upper plateau comprising montane tundra. The summer was late and the vegetation here was still dormant. The weather was cloudy and misty, and we walked probably for 10 hours with no insects flying. Some cocoons of *Acerbia alpina* were seen, all on the upper surface of small (less than 0.5 m diameter) flat stones. All cocoons were parasitised, and one was collected'.

The large brood of *Cotesia* that emerged from this single cocoon were sent to VV for determination. They are briefly mentioned by Stigenberg, Vikberg & Belokobylskij (2011), but the brood size given in that paper did not take account of a further two females found during the present work to have been trapped in the host cocoon. Because it appeared to VV to be an undescribed species, some were sent to MRS, who concurred. *Cotesia* is an exceptionally speciose genus and taxonomically rather difficult. We take the view that, for the best progress towards better knowledge of this genus to be made, the provision of new names to the species-level taxonomy should be exercised with restraint and as far as possible be based on reared material, because (except for the most distinctive species) morphological descriptions and the available keys are extremely difficult to interpret successfully. However, when good reared material of an apparently undescribed species is available it is of course appropriate to provide a name for it, and we do so here.

Description of new species

To facilitate integration with his work, terminology follows Nixon (1965; 1974) except that pterostigma is used in place of stigma and metasoma is used in place of gaster; see also Mason (1981) and Shaw (2007) who include notes on recognition of the genus. Further notation of wing venation and cells according to van Achterberg (1993) have been added in brackets. The distal end of the pterostigma is taken as the projection of its lower distal boundary to the wing margin; veins are measured to the midpoint of vein junctions; and the height of the discal cell is measured from the junction of the first and second abscissae of the discoideus. POL refers to the distance between the posterior ocelli and OOL to the distance between a posterior ocellus and the adjacent compound eye. Photographs were taken with Canon EOS 70D + Canon MP-E 65 mm f/2.8 1–5 × Macro Photo and Canon EOS 70D + Olympus SZX16 Microscope using Zerene Stacker program, except that Fig. 2 was taken on a Nikon D80 with Medical Nikkor 120 mm lens, and Fig. 11 was taken with a Canon Powershot S100. Images were handled with various versions of Adobe Photoshop.

Cotesia acerbiae Shaw & Vikberg, sp. nov. (Figs 1–8)

This moderately large and heavily sculptured species (Fig. 1) will run in Nixon's (1974) key to couplet 4, there agreeing best with [*Cotesia*] *setebis* (Nixon) because [*Cotesia*] *callimone* (Nixon) has a much more sharply punctured mesoscutum and especially scutellum, the propodeum and metasomal tergites less strongly sculptured, and the legs more lightly coloured, although, like *C. acerbiae* sp. nov., it appears to be a parasitoid of Erebidae: Arctiinae (cf. Shaw, 2009). The types of both species have been examined. The new species differs from *C. setebis*, for which there are no host records, in having the first tergite more profoundly humped, the first three tergites more strongly sculptured and the third tergite matt over its whole surface (shining posteriorly at sides in *C. setebis*), the mesopleuron at front less shiny and lacking the clearly punctate element seen in *C. setebis*, vein *r* issuing more distally from a narrower pterostigma and the metacarp probably a bit longer (though this may vary), and there is also a small but distinct apical emargination of the hypopygium in *C. setebis* that is wholly absent in the new species. In Papp's (1986) key it will run in his *tibialis* sub-group to couplet 17, but then founders and does not belong to any of the subsequent species; and it remains unplaceable in Papp's (1987) revision of that part of his key. In the key by Kotenko & Tobias (1986, translated 1995) it will run to couplet 125 and then (depending on the interpretation of the length of the first tergite) either to 126 or 133, but it then does not agree with any of the treated species in either case. Therefore, and particularly because its host is known, we here describe it as new.

Despite all available material being from the same brood, it is unusually variable and the description below takes account of that. In general, terminology follows van Achterberg (1993) except that OOL refers to the minimum in-plane distance between a posterior ocellus and eye, and for wing venation we follow Nixon (1965; 1974) with van Achterberg's (1993) notation also given in parentheses. For a few terms not widely used except for Microgastrinae we also follow Nixon (1965, *et seq*.). The length of the first tergite is measured linearly as the shortest distance between base and apex (not as its total dorsal curvature).

Holotype ♀, '**Russia**: Polar Ural, Krasnyi Kamen 1000 m. Ex Acerbia alpina prepupa, 10.vii.1999 em vii.1999. 116 ♀ 74 ♂ T. & K. Nupponen leg.' (in National Museums of Scotland (NMS), Edinburgh).

Paratypes (95 ♀, 65 ♂), all same data as holotype (in NMS except as follows: 14 ♀, 4 ♂ in FMNH, Helsinki; 10 ♀, 10 ♂ in personal collection of V. Vikberg; 4 ♀, 2 ♂ in each of ZI, St. Petersburg, CNC, Ottawa and BMNH, London; 2 ♀, 1 ♂ in each of RMNH, Leiden; HNHM, Budapest; NHM, Wien and SMNH, Stockholm).

Description

Holotype ♀ (Fig. 2). Body length 2.9 mm (range 2.7–3.2). Fore wing length (from tegula) 3.1 mm (range 3.0–3.3). Head in dorsal view (Fig. 3) about 1.7 times as wide as long and widest across eyes (in some specimens only marginally so), temple about 0.9 times as long as eye and at first narrowing behind only gradually then roundly, ocelli in moderately low triangle with imaginary tangent to posterior pair more or less touching anterior ocellus, POL 2.5 and OOL 2.2 times diameter of posterior ocellus. Minimum width of face (Fig. 4) 1.35–1.45 and just below toruli 1.5–1.6 times as wide as high (toruli to supraclypeal groove), clypeus separated by a clear groove. Malar space 1.2–1.3 times basal width of mandible. Clypeus and face centrally and near eye weakly sculptured, matt (in some specimens somewhat shiny), below antenna rugulose with moderately large shallow punctures. Frons, stemmaticum and vertex matt with only weak sculpture (minute setiferous punctures at side of vertex). Antenna


1


2


3

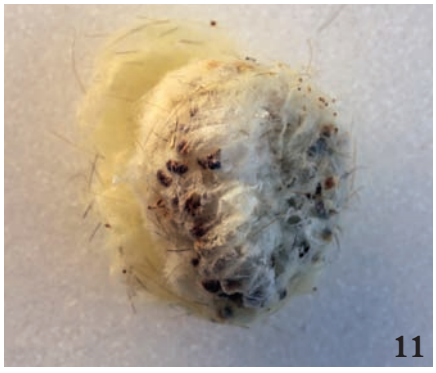

4


5


6


7

Figs 1–8. *Cotesia acerbiae* sp. nov. 1–7 ♀, 8 ♂. 1, 2, 8 habitus; 3, head in dorsal view; 4, face; 5, body in dorsal view; 6, wings; 7, hind leg. All paratypes except 2, holotype. Scale bar: 1 mm.



Figs 9–11. 9, *Acerbia alpina* cocoon harbouring *Cotesia acerbiae*; 10, the opened host cocoon showing host remains lying on the communal silk covering the cocoons of *C. acerbiae*; 11, the cocoon mass of *C. acerbiae* with the covering removed (to rear). Scale bar: 1 mm.

as long as body, 2nd flagellar segment about 2.3 and penultimate segment about 1.7–2.0 times as long as wide (Figs 1, 2).

Mesoscutum (Fig. 5) dull, in front centrally with large but shallow punctures and coriaceous interspaces as wide, notaulic courses coarsely rugose-punctate and terminating in a broad sunken area posteriorly, lateral lobe centrally matt with only vague sculpture. Prescutellar sulcus deep, with about 9 fovea. Scutellum matt with a scattering of a few large but shallow punctures. Phragma of scutellum concealed by postscutellum. Propodeum strongly rugose, median keel sometimes irregular but always distinct. Mesopleuron in upper third extensively smooth and shiny, otherwise dull with rather weak rugulose sculpture, vague punctures poorly defined, well spaced and shallow, not evident anteriorly, precoxal area indented and with weak rugae. Most of the mesosoma has a satiny, almost greasy, sheen but mesosternum more shining, especially posteriorly. Metapleuron centrally smooth and shining. Fore wing (Fig. 6) with metacarp (1–R1) usually about as long as pterostigma and about 3.5 times as long as its distance to apex of radial cell (marginal cell), but highly variable and in some specimens as much as 5.3 times that distance, pterostigma also very variable, 3.1–3.6 times as long as wide, emitting radius (*r*) 0.6–0.7 distal to middle, 1st abscissa of radius about 0.9 times as long as width of pterostigma, as long as transverse cubitus (2–*SR*) and moderately strongly angled with it, 1st abscissa of discoideus (1–*CU*1) about 0.85 times as long as 2nd (2–*CU*1), discoidal cell (1st discal cell) about 1.3 times as wide as high, setae of median (basal) and submedian (subbasal) cells evenly distributed. Hind wing vannal lobe with hair fringe beyond its widest part present but weak. Front leg without subapical spine or emargination of last tarsal segment. Middle leg with inner tibial spur reaching to apex of basitarsus. Hind leg (Fig. 7) with outer face of coxa rugose (sculpture stronger than lower part of mesopleuron), femur 3.6–3.7 times as long as wide and weakly sculptured with a satiny or greasy appearance, tibial spurs subequal, the longest (inner) reaching to middle of basitarsus, outer side of hind tibia with long fine spines rather evenly distributed and not dense.

Metasoma (Fig. 5) with first tergite as wide as long, very strongly humped centrally, widening towards its rounded apex, heavily rugose. Second tergite 2.5 times as wide as long, basal field coextensive with tergite (but with coarsely crenulate lateral and posterior margins), as coarsely rugose as first tergite. Third tergite with rather evenly distributed (except anteromedially) moderately long though not dense setae, rugulose at base, otherwise coriaceous; in some specimens sculpture weakly extending almost to posterior margin but in any case this tergite entirely dull and strongly contrasting with the smooth and more shiny posterior tergites. Hypopygium (Fig. 2) robust, 0.7–0.8 times as long as hind tibia, acute in lateral view with no trace of truncation, angled about 60° at apex and projecting beyond apex of metasoma, ovipositor more or less concealed.

Colour black, with the following parts reddish brown in varying degree: mandible partly, palpi, front and middle legs (except coxae more nearly black), tegula and humeral plate. Hind leg with coxa almost black, trochanter and trochantellus deep brown, femur rather evenly blackish brown, tibia brown but sub-basally and apically paler (the same colour as tarsus), spurs slightly paler still. Wings with distinctly yellow-brown tinge, venation including pterostigma yellowish brown to brown.

Male (Fig. 8). Similar to female except for sexual characters. Antenna about 1.3 times as long as body.

Cocoon. Constructed in that of the host (Fig. 9), comprising a dense whitish cocoon mass in a more or less honeycomb arrangement in two tiers (Fig. 11) concealed beneath a loose layer of communal yellowish silk (Fig. 10).

Etymology. Named after the generic name of its only known host.

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