

***Cephalcia masuttii* sp. n. (Hymenoptera: Pamphiliidae),
a new web-spinning sawfly living on spruce**

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Abstract. *Cephalcia masuttii* sp. n. is described from the SE Alps of Europe, based on morphological, biological, and genetic studies. The larvae feed gregariously on *Picea abies*. The species has been recorded also from Central Siberia and NE China, where the larvae feed on *Picea obovata* and *Picea koraiensis*, respectively. Indications exist that it may be more widely distributed in Europe and northern Asia. The strict gregariousness of larvae of this species is peculiar among spruce feeders of *Cephalcia*. Morphologically the adults are most similar to *Cephalcia alashanica*, with which they are compared. An allozyme analysis showed that the populations from Europe and China are quite similar and clearly different from the other species living on spruce. The karyotype of *C. masuttii* (n = 25) is also described.

INTRODUCTION

During a field survey in 1988 of the web-spinning sawflies of the genus *Cephalcia* Panzer living on Norway spruce (*Picea abies* Karst.) in the SE Alps of Europe, some unusually large silk nests filled with frass were found. They did not seem referable to any of the European species (Beneš, 1976; Beneš & Křístek, 1979; Viitasaari, 1982; van Achterberg & van Aartsen, 1986), including *C. alashanica* (Gussakovskij), whose nest had been obtained by Zanocco & Battisti (1995) after rearing adult females. No larvae were found inside the nests and efforts to dig them out from the soil under the nests were unsuccessful.

Four years later in 1992, similar nests with living larvae were collected by us on *Picea abies* in the SE Alps and on *Picea koraiensis* Nakai in NE China. A few individuals were also found within a large field sample of prepupae of *Cephalcia* spp. from an infested area in Germany. The study of both prepupae and adults obtained after rearings proved that all individuals belonged to the same species and differed from any other species known from Europe, Siberia (Verzhutskii, 1966, 1973), the Far East (Takeuchi, 1938; Shinohara, 1991; Shinohara et al., 1991; Xiao et al., 1992), and North America (Eidt, 1969). Only Kurentsov (1950, in Verzhutskii, 1973, p. 83), surveying the forest insects of Primor'e (Russian Far East), reported noticeable nests with larvae of *Cephalcia* sp. collected on young trees of *Picea koraiensis*. The little information provided by Kurentsov does not allow any comparison with our material, but the peculiar features of the nests and their geographical location suggest that the same species is involved. Still later, in 1996, a nest with living larvae was found in Central Siberia on *Picea obovata* Ledeb. Thus, the species possibly has a continuous distribution across Europe and northern Asia, living on various species of *Picea*.

All collection sites are listed in Table 1, together with the number of individuals recorded.

TABLE 1. Collection sites, with the number of nests and prepupae collected in the field and the adults obtained from them. The material obtained from subsequent rearings in Padova is not shown.

Country	Site	Longitude	Latitude	Elevation (m)	Nests	Prepupae	Adults	
							♂	♀
Italy	Julian Alps, Montasio Chiusaforte UD	13°26'52"E	46°24'41"N	1,550	5	35	9	10
Italy	Dolomites Bosconero, Forno di Zoldo BL	12°11'12"E	46°23'33"N	1,400	6	23	2	2
Italy	Venetian Prealps, Asiago, Cogollo del Cengio VI	11°26'44"E	45°52'18"N	1,220	–	3	1	1
Slovenia	Julian Alps, Vršič, Kranjska Gora	13°44'42"E	46°26'12"N	1,612	3	46	22	9
Germany	Böhmerwald, Bodenmais	13°04'01"E	49°04'05"N	700	–	3	–	–
P.R.China	Heilongjiang, Yichun- Dailing, Liangshui	128°53'20"E	47°10'50"N	300	2	24	1	–
Russia	W Sayan Mts.	93°26'43"E	52°33'16"N	935	1	11	–	–

Cephalcia masuttii sp. n.

Cephalcia alashanica (Gussakovskij): van Achterberg & van Aartsen, 1986: 19 and Fig. 95 (in part); Xiao, 1963: 23 (in part); Xiao et al., 1992: 28 and Fig. 112 (in part).

Lyda klugii Hartig, 1837 (in part).*

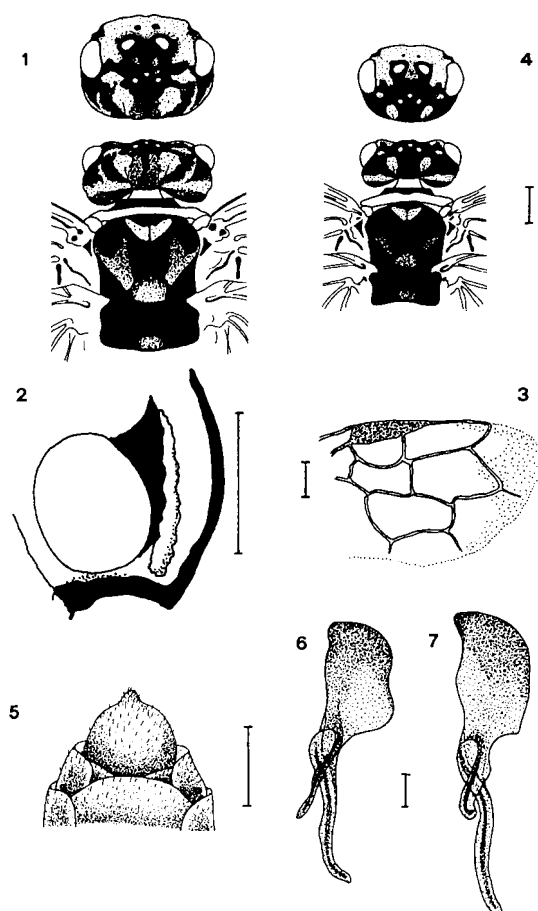
Cephalcia klugii (Hartig): Battisti & Sun (1996); Boato & Battisti (1996).*

Female (holotype)

Colour pattern: Head black with a reddish yellow pattern (Fig. 1), genae pale up to vertex. Spots on paraantennal fields connected with the big spots on clypeus. Malar space dark brown (Fig. 2). Mandibles brownish with a dark spot. Antennae reddish-yellow, scape with a brown longitudinal spot, apical part of flagellum dark. Thorax black, with anterior half of prescutum and meso- and metascutellum bright yellow (Fig. 1); pronotum, tegula, spots on scutum, and stripe on mesepisternum reddish yellow. Cenchri brownish yellow. Legs brownish with trochanters, coxae, and basal parts of femora mostly black. Wings slightly brown infuscated, with a darker area in the apical part of forewings (Fig. 3), venation and stigma brown. Abdomen brownish, with the following parts black: tergum I and basal parts of terga II and III, basal parts of sterna I–V, hypopygium and saw-sheath. Tip of abdomen light brown with yellowish cerci.

Measurements (in mm): Body length 12.5, head 2.61, eye 0.92×0.75 , POL:OOL (ratio of posterior ocellar line to ocellar-ocular line; see Beneš, 1976) 0.31:0.68, antenna 8.8, scape 0.65, pedicel 0.22, segment 3 1.08, segments 4+5 0.99, distance between antennal

* The material labelled as "types" of *Lyda klugii* Hartig consists of six specimens (Zoologische Staatssammlung, München, 2♂, 1♀; Museum für Naturkunde, Berlin, 3♂). One male and one female in München are conspecific with the presently described species. For this reason, Battisti & Sun (1996) and Boato & Battisti (1996) used the name *Cephalcia klugii* (Hartig). Recently, however, Blank et al. (in press) revised the type material and selected as lectotype the remaining male in München since only that specimen agrees with the original Hartig's description. This specimen belongs to *Cephalcia abietis* (L.). *Lyda klugii* Hartig was thus made a synonym of *Cephalcia abietis* (L.). The three males preserved in the Berlin Museum belong to *Cephalcia alpina* (Klug) (Blank et al., in press). The name *Lyda klugii* Schummel, 1836, revived by Beneš (1976) and van Achterberg & van Aartsen (1986), is a nomen nudum.



Figs 1-7. 1-6: *Cephalcia masuttii* sp. n. 1 - head and thorax of female, frontal and dorsal aspect; 2 - temporal groove of female; 3 - apical part of the female forewing; 4 - head and thorax of male, frontal and dorsal aspect; 5 - subgenital plate of male; 6 - penis valve. Fig. 7: *Cephalcia alashanica* (Gussakovskij), penis valve of a male from Venetian Prealps (Italy). Scale bar = 1 mm (Figs 1-5), 0.1 mm (Figs 6-7).

segment 4 longer than wide, tarsal claw with very small inner tooth. Wings with cells C densely and Sc1 sparsely pilose, stigma 4.5 times as long as wide, vein 1r just a little shorter than Rs, 2r-m distinctly behind 2r, 2m-cu distinctly curved (Fig. 3).

Abdomen densely alutaceous, hypopygium with broadly triangular impression, ventral part of abdomen and hypopygium with setae.

Male (allotype)

Colour pattern: Head black with a bright yellow pattern (Fig. 4). Gena mostly yellow, malar space black in the lower half; mandibles yellow, rufous apically; antenna yellow

sockets 0.37, distance between antennal socket and eye 0.51, hairs on vertex 0.15, thorax 3.17, wing 9.7, pterostigma 1.86×0.46 , hind tibia 3.08, hind tarsus 2.07, hind basitarsus 0.65, segments 2+3 0.69.

Head slightly contracted behind eyes; temporal groove feebly impressed, postgenal carina not distinct, malar space slightly wider than diameter of lateral ocellus; postocellar area almost flat, lateral sutures distinct, coronal suture indistinct; frons in lateral view rounded, frontal tubercle indistinct, frontal crest obtuse, paraantennal fields dorsally rounded. Ventral margin of clypeus thick medially and distinctly emarginate. Vertex slightly punctate and shining, frons and malar space rugose and dull, hairs on vertex 0.5-0.6 times diameter of lateral ocellus. Antenna with 29 segments; third segment 1.09 times segments 4+5, 6 times longer than apically wide; pedicel as long as apically wide; segment 10 about 2.2 times as long as wide.

Thorax dull, sutures of prescutum distinct, mesoscutellum with subparallel rows of punctures, parascutellar area rugose, metascutellum slightly coriaceous; cervical sclerites, meso- and metepisternum slightly transversely rugose with a distinct glabrous band in the sterno-pleural line. Hind basitarsus a little shorter than the following two segments together;

brownish, scape with a longitudinal dark spot, flagellum darker apically. Thorax black, with yellow apical half of prescutum and base of pronotum (Fig. 4). Reddish yellow are: apical halves of meso- and metascutellum, spots on scutum and small spots on mesepisternum. Cenchri dark yellow. Legs yellowish brown, coxae black basally. Wings as in female. Abdomen rufous, with the basal parts of terga and sterna black.

Measurements (in mm): Body length 11.5, head 2.61, eye 0.92×0.75 , POL:OOL 0.31:0.68, antenna 8.8, scape 0.65, pedicel 0.22, segment 3 1.08, segments 4+5 0.99, distance between antennal sockets 0.37, distance between antennal socket and eye 0.51, hairs on vertex 0.15, thorax 3.17, wing 9.7, pterostigma 1.86×0.46 , hind tibia 3.08, hind tarsus 2.07, hind basitarsus 0.65, segments 2+3 0.69.

Head slightly contracted behind the eyes; temporal groove feebly impressed, postgenal carina indistinct, malar space narrower than diameter of lateral ocellus; postocellar area as long as posteriorly wide, lateral sutures distinct, slightly divergent; frons in lateral view flat, frontal tubercle distinct and brownish, ocellar basin smaller than median ocellus, dorsal tentorial depressions as small but distinct tubercles, paraantennal fields shining, anterior margin of clypeus subtruncate. Vertex regularly punctate and shining, frons rugose and dull, hairs on vertex about as long as the diameter of lateral ocellus. Antenna with 27 segments, third segment 1.09 times longer than segments 4+5, 4.4 times as long as apically wide; pedicel as long as apically wide, segment 10 about 2 times as long as wide.

Thorax: Pronotum and prescutum shining, sutures of prescutum distinct, notum dull and wrinkled, with punctures. Mesoscutellum shining apically, metascutellum rugose. Cervical sclerites, meso- and metepisternum, meso- and metepimeron transversely rugose, with punctures. Mesobasisternum smooth and glabrous. Legs as in female. Wings with cells C and Sc1 pilose, Sc2 glabrous, stigma about 4 times as long as wide, vein 1r a little shorter than Rs, 2r-m distinctly behind 2r.

Abdomen densely alutaceous. Subgenital plate posteriorly produced into acute apex (Fig. 5), slightly shining, with alutaceous microsculpture and long setae, penis valve stout and apically broad, not pointed ventrally (Fig. 6).

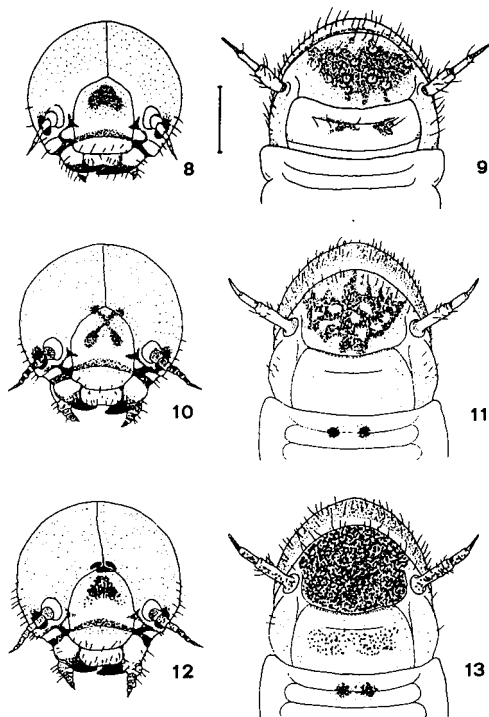
Holotype (♀) labelled "Italy, Julian Alps, Chiusaforte UD, Alt. Montasio, 1550 m, nest on *Picea abies* collected 24.vii.1992, emerg. Padova 23.iv.1993, leg. A. Battisti". Coll. Museo di Storia Naturale, Verona, Italy.

Allotype (♂): Same data as holotype, emerg. 19.iv.1993.

Paratypes: 7♀ and 7♂ from same locality as holotype and from Slovenia, Julian Alps, Vršič, Kranjska Gora, 1612 m, nests on *Picea abies* collected 24.vii.1992, emerg. Padova iv.1993, leg. A. Battisti. Coll. Istituto di Entomologia Agraria, Università di Padova, Italy.

Derivatio nominis: This species is dedicated to Professor Luigi Masutti, who led us in the study of forest insects.

Variability (based on specimens listed in Table 1): The general size of adults can vary strongly in both sexes, also within the offspring of a single female. The body length range is 9–12.5 mm for males and 9–14 mm for females. The head width varies from 2.1 to 2.8 mm for males and from 2.4 to 3.3 for females. The colour pattern shows little variability in Europe, except in the smallest males. The latter individuals may have an almost black mesoscutellum and the first segment of the antenna lacks a dark spot. However, these individuals are easily identified as *C. masuttii* by the bright spots on the vertex and by the shape of penis valve. The only male examined from China has a much darker colour pattern (mesoscutellum, vertex, and abdominal terga black). The colour pattern of the head of



Figs 8–13. Head (frontal aspect) and subanal sclerite of prepupae. 8, 9 – *Cephalcia masuttii* sp. n.; 10, 11 – *Cephalcia alashanica* (Gussakovskij) from Venetian Pre-alps (Italy); 12, 13 – *C. alashanica* from NE China. Scale bar = 1 mm.

the biggest females may be paler, especially around the spots on vertex. The number of antennal segments varies from 27 to 29 in both sexes.

Diagnosis: *C. masuttii* shares the highest number of morphological characters with *C. alashanica* as defined by Beneš (1976), Viitasaari (1982), van Achterberg & van Aartsen (1986), and Xiao et al. (1992). However, *C. masuttii* can be separated from *C. alashanica* on the basis of the following characters. The adult male has bright yellow spots on head vertex and mesoscutellum, a dark longitudinal spot on the scape, the penis valve shorter and broader distally, with a less pronounced tip (compare Fig. 7); the male from China can be separated from Chinese male of *C. alashanica* by the penis valve, the dark stripe on the scape, and the spot on the clypeus connected with spots on the paraantennal fields. The adult female has the yellow spots on the paraantennal fields connected with the spot on the clypeus (in *C. alashanica* there is always a black stripe)*, a temporal groove less impressed and more distant from the eye, antenna with 27–29 seg-

ments and with segment 3 longer than 4+5, head slightly contracted behind the eyes, postocellar area flat. Both sexes can be separated from *C. alashanica* also by having the apical part of forewing less infuscated.

Egg

Cylindrical with rounded ends, 2 mm long and 0.7 mm in diameter when laid, olive green and heavily coated with a dark sticky substance. It is partially inserted into the spruce needle, with a knob-like process on the ventral side. The egg swells gradually to about 1.5 times its original size before hatching and becomes greyish green. The chorion sculpture has a characteristic irregular mesh well developed on the dorsal side of the egg.

* On the basis of this character, two specimens collected in the Netherlands and in China and included in *C. alashanica* by van Achterberg & van Aartsen (1986, Fig. 95) and by Xiao et al. (1992, Fig. 112), respectively, should belong to the new species here described.

Prepupa (eonymph and pronymph)

Colour pattern: The body of living prepupae is mostly light green, corresponding to the Pantone® standards (Color Selector 1000/Coated) 370 to 392, with 378 the highest frequency for females and 377 for males. Light brown to brown are: head capsule, sclerites on prothorax, spots on thorax and legs, sclerites on tergum and sternum of segment X. The pronymph differs morphologically from eonymph only by the presence of the large, dark pupal eyes visible through the cuticle. The body colour usually changes to yellow after preservation in 70% alcohol.

Head (Fig. 8): 1.7 to 2.1 mm wide in males, 2.1 to 2.6 mm wide in females. Epicranial suture originates at right of median line and reaches median line where it joins frontal suture. Frons with 2 shallow depressions in the middle and with a dark spot-like area around them, rarely extending above frontal sutures. Antenna 7-segmented, ocellus prominent. Mandibles short, stout, heavily sclerotized, each with two teeth and a secondary cusp. Maxillae and labium with 4-segmented and 3-segmented palpi respectively.

Thorax: Prothorax with a medially divided sclerite, mesothorax and metathorax each with 4 annulets dorsally. Annulets 2 and 3 with a single row of setae, without sclerotization at the base. Legs setaceous, with divided trochanter and setiform claw.

Abdomen: terga and sterna of segments I to IX with 4 annulets, pleura of segment VIII modified as a secondary locomotion organ. Segment X rounded distally, with dorsal margin of anal slit sclerotized, with a variable number of setae. Tergum with 2 longitudinal ridges, converging to the suranal hook and bounding two large pigmented sclerites laterally. Sternum with a large sclerite pigmented in the basal part (Fig. 9). Subanal appendages 3-segmented, with 7 setae on segment 1 and 1–2 setae on segment 2; only the apical half of segment 3 is sclerotized and pigmented.

Variability: Prepupae can show a difference in pigmentation. In lighter individuals the dark spot in the middle of the frons may be limited to the 2 depressions and the subanal sclerite shows only a series of small spots, almost without pigmentation. In the darker individuals the frontal spot may extend above the frontal sutures and the subanal sclerite is strongly pigmented, but the pigmentation never reaches the apical border. No geographic variation was evident between populations from Europe and China.

Diagnosis: Compared with *C. alashanica* from Europe (Zanocco & Battisti, 1995) (Figs. 10, 11) and China (Battisti & Sun, 1996) (Figs. 12, 13), the prepupa of *C. masuttii* is smaller, more slender and has a less conspicuous dark spot on the frons, and never cross shaped; the pigmentation on the subanal sclerite is always weaker. Prepupae of *C. masuttii* were always collected in the field from the soil under big, compact nests. In sympatric conditions, both in Europe (Venetian Prealps) and China, prepupae of *C. alashanica* were found only under nests close to, and not distinguishable from, those of *C. abietis* (L.)*.

Life history

The life history has been studied from rearings carried out in Padova, under natural outdoor conditions, following the technique described in Battisti (1994). Rearings started with nests collected in the field in 1992–94 (Table 1). Adults from these were then used

* The nest of *C. alashanica* described by Xiao (1980) and Xiao et al. (1992) is very similar to that of *C. masuttii*. However, the description of the prepupa (Xiao et al., 1992) seems to correspond to that of *C. alashanica* according to Zanocco & Battisti (1995) and Battisti & Sun (1996). It is possible that some Chinese findings attributed to *C. alashanica* actually refer to the new species described herein.



Figs 14–16. *Cephalcia masuttii* sp. n. 14 – mating; 15 – group of eggs ready to hatch; 16 – middle size nest at the end of larval development.

for new rearings, 7 of which were successful in 1993 and 8 in 1994.

Emergence was observed from 6–24 April, preceding by a few days the emergence of adults of *C. arvensis* Panzer reared under the same conditions. Maximum emergence of males occurred 7 days before that of females (protandry). Life span of adults is very variable, with a maximum of 27 days observed for a female from Bosconero in 1994. The sex-ratio at emergence of adults originating from a single female is also variable, from 8 to 80% of females. Mating was observed 13 times out of 21 mating experiments with different individuals (Fig. 14). The male usually approaches the female immediately which in most cases takes aggressive evasive action. The mating position is strophandrous and mating lasts up to 8 minutes. The mated female resists all further mating attempts by the male. Egg laying begins 2–5 days after emergence for both mated and virgin females. The eggs are laid always in groups (14.4 ± 9.6 eggs/group, $n = 18$) (Fig. 15) and they are frequently attended by the female, which stays near the eggs until death, showing an aggressive behaviour if disturbed. Long-lived females can survive till egg hatching. A female can lay up to 53 eggs (fecundity: 27.2 ± 14.7 , $n = 11$) in 1 or 2 groups. The eggs are usually laid in the basal part of 2–8 needles in the inner part and in the lower side of the branches, and they are very difficult to detect. The needles and the eggs are covered with a dark, sticky substance secreted by the female after laying each egg. The incubation period lasts from 12 to 15 days with average temperature 17.6°C .

After hatching, the larvae assemble and begin to spin a small nest of silk very close to the egg site. They cut the needles near the base and eat them from the base. The frass is accumulated inside the nest. The larvae move in a tube of silk covered by faeces. At the end of development, the inner wall of the tube is coated with a brown substance. The nest is progressively enlarged and the final shape is almost spherical, with a diameter of 4–8 cm. Larvae moult inside the nest and the exuviae are incorporated into the nest. The number of instars has been determined taking the basal width of the frons (BWF) as an index (Martinek, 1980). Males usually have 4 instars and females 5 (Fig. 17). However, an additional instar commonly occurs in both sexes. For this reason, in the mature larvae the largest males can be externally confused with the smallest females, and dissection to determine the sexual reproductive system is needed. The larval development lasts about 30 days at an average temperature of 21.3°C . After entering the soil and constructing an earth-walled cell, the larva changes immediately into a pronymph and overwinters in this stage. All individuals emerge in the next spring.

Additional information on the life history has been obtained from field observations. Adult emergence occurs in the first half of May at warmer sites (Venetian Prealps, Dolomites) and in the second half of May-beginning of June at colder sites (Julian Alps, China). The mature larvae drop to the ground at the end of July (Dolomites) and in the first half of August (Julian Alps). The nest (Fig. 16) is very compact and can remain on the tree for up to 3 years after evacuation by the larvae. The mature larvae burrow to a depth of 5 to 20 cm. Soil samples taken in Europe and China under empty nests of the previous year revealed that most individuals (92%, $n = 37$) enter prolonged diapause as an eonymph.

Natural enemies

The larvae from nests collected in the Julian Alps (Europe) were frequently parasitized by *Sinophorus crassifemur* (Thomson), a polyphagous species of Ichneumonidae

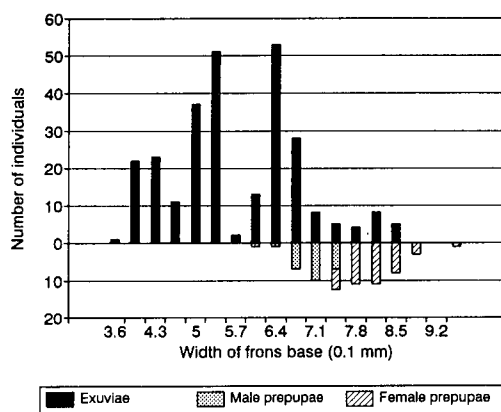


Fig. 17. *Cephalcia masuttii* sp. n. Variation of the width of frons base in exuviae collected from the nests and in prepupae.

the egg. Only eggs ($n = 6$) laid by unmated females ($n = 2$) from the Slovenia population gave usable results. Air-drying technique was employed according to Dixon & Flavell (1986). Colchicine treatment was made directly on tissues simultaneously with hypotonic choc. The haploid chromosome number is $n = 25$. The chromosome arm number, calculated on 10 karyotypes according to Imai & Crozier (1980), is AN (haploid arm number) = 37. The karyotype (Fig. 18) is composed by 12 M ($m+sm+st$) and 13 A ($a+t$) chromosomes. The M chromosomes decrease rather gradually in size. The A chromosomes can be divided into 2 groups characterized by a different size of chromosomes, the first including 10 rather large chromosomes, the second 3 micro chromosomes.

For allozyme analysis, living prepupae were homogenized in 0.01 M Tris-HCl pH 8 and processed with standard horizontal starch gel electrophoresis (Selander et al., 1971; Harris & Hopkinson, 1976). A total of 28 loci were studied referable to the following 22 enzymatic proteins: G3P (1.1.1.8), LDH (1.1.1.27), HBDH (1.1.1.30), MDH (1.1.1.37, 2 loci), ME (1.1.1.40, 2 loci), IDH (1.1.1.42), PGD (1.1.1.43), ODH (1.1.1.73), XDH (1.1.1.204), GAPDH (1.2.1.12), SOD (1.15.1.1, 2 loci), AAT (2.6.1.1, 2 loci), PK (2.7.1.40), APK (2.7.3.3), EST (3.1.1.1, 3 loci), LAP (3.4.11.1), PEP (3.4.11–13, 3 enzymes with gly-leu, leu-leu-leu and phe-pro as substrate), ALD (4.1.2.13), GPI (5.3.1.9), PGM (5.4.2.2). Staining methods were those of Shaw & Prasad (1970), Harris & Hopkinson (1976) with slight quantitative modifications. A total of 46 prepupae coming from all sites (China: 17, Germany: 3, Italy Montasio: 8, Italy Bosconero: 3, Italy Venetian Prealps: 3, Slovenia: 12) were examined and compared with samples of syntopic populations belonging to the following species: *C. abietis*, *C. alashanica*, *C. arvensis* s.l., *C. erythrogaster* (Hartig), *C. alpina* (Klug) [= *fallenii* (Dalman); see Blank et al., in press] (Boato & Battisti, 1996). The results showed all the populations of *C. masuttii* to be very similar one to another, but one locus (PEP phe-pro) showed alternative fixed alleles between all the European and the Chinese populations. Diagnostic loci with no common alleles (Ayala & Powell, 1972) were found in all pairwise comparisons of *C. masuttii* with the other species, in the

(Hymenoptera). The parasitization percentage, observed for 3 nests at emergence of both host and parasitoid, was 0, 7.7% ($n = 1$), and 58.6% ($n = 17$). Prepupae collected from the soil in both Europe and China were parasitized by Ichneumonidae and Tachinidae (Diptera), but no emergence of adult parasitoids was observed.

Karyology and allozymes

The karyological analysis was performed on somatic mitosis of embryos (Naito, 1982). Embryos were processed 3–6 days after egg laying, when the colour of the chorion changes from light green to green-grey and it is possible to perceive an increase in size of



Fig. 18. *Cephalcia masuttii* sp. n. Karyotype and two mitotic metaphases from a male embryo ($\times 2,500$).

following decreasing number: *C. erythrogaster* 10, *C. alashanica* 6, *C. alpina* 4, *C. abietis* 3, *C. arvensis* s.l. 2.

DISCUSSION

C. masuttii seems to be well separated from all the other related species living on spruce by a number of biological, morphological and genetic characters. First of all, it is a strictly gregarious species, whereas all the other species living in nests on spruce should be considered as primitively gregarious sensu Eidt (1969). The large size and the compactness of the nest allow in most cases a field identification, even if the larvae have already left the nest. The species is well characterized also by the emergence period, being the second to emerge, after *C. alpina* and before all the other species living on spruce.

The great variability in the dimensions of both prepupae and adults may be due to the frequent occurrence of one additional instar in larvae of both sexes. To our knowledge,

this phenomenon otherwise occurs only very rarely in *C. abietis* females (Martinek, 1980), and thus represents a peculiar and enigmatic feature.

The allozyme analysis shows that the populations from Europe and China are quite similar, and this is surprising if the differences in climate and ecology (including the host plant) between the two regions are considered. The allozyme analysis also indicated that the closest group to *C. masuttii* is the *C. arvensis* complex, whereas *C. alashanica* appears to be more distantly related. Morphology thus seems at variance with allozymes in revealing the relationships between species; however, this disagreement may emerge only from a partial and not objective consideration of the morphological features, due to the need of finding diagnostic characters for species identification. As in other cases, a thorough and global analysis of morphological features may solve the contrast (Boato, 1991). In our opinion, cytogenetics promises to be very informative with respect to both the modes of speciation and the phylogeny within the genus *Cephalcia*. Unfortunately, no cytogenetic investigations have yet been accomplished on other members of this genus. The chromosome number observed in *C. masuttii* seems to be higher than those already observed in lower Hymenoptera, as for example in the well investigated family Tenthredinidae where $n = 5-22$ (Naito, 1982).

The data so far collected on this new species are insufficient to define exactly the ecological requirements and a possible eventual tendency to develop outbreaks. The characteristic nests are relatively common on isolated trees at the timberline in Italy and Slovenia, but the severe climatic conditions and the activity of natural enemies seem to keep the populations at low level. Moreover, this species seems to have a rather fragmented distribution, despite its extensive range. This may be related also to the tendency of the female to lay its eggs in one or two groups close to one another, and consequently to colonize the same tree for many generations.

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