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The West Palaearctic species of the *Craspedolepta flavipennis* (Foerster) complex (Hemiptera, Psylloidea)

PAVEL LAUTERER[1] & DANIEL BURCKHARDT[2]

The Western Palaearctic complex of species centred around *Craspedolepta flavipennis* is revised. Five species are recognised: *C. flavipennis* and *sonchi*, in addition to *schaeferi* **sp. n.**, *crispati* **sp. n.** and *campestris* **sp. n.** which are described as new. Lectotypes are designated for *Aphalara flavipennis* and *A. sonchi*. The biology is discussed: *C. flavipennis* develops on *Leontodon hispidus*, other recorded Asteraceae remain unconfirmed; *C. sonchi* is associated with *Leontodon autumnalis* and *L. hispidus*; *C. crispati* and *C. campestris* are probably monophagous on *Senecio crispatus*, and *Senecio integrifolius* respectively; the hosts of *C. schaeferi* remain unknown. *Magnaphalara* and *Cerna*, objective synonyms with the type species *Aphalara flavipennis*, are considered subjective synonyms of *Craspedolepta*. *Craspedolepta numrehi* (Klimaszewski, 1982), **comb. n.** is recombined from *Cerna*, and *C. fuscipennis* (Patch), **stat. rev.**, is removed from synonymy with *C. sonchi*.

Key-words: Hemiptera, Psylloidea, *Craspedolepta*, Asteraceae, *Leontodon*, *Senecio*, taxonomy, West Palaearctic.

INTRODUCTION

The largest diversity of the sap-sucking jumping plant-lice or psylloids is found in tropical and South temperate latitudes. A notable exception constitutes the subfamily Aphalarinae (Psyllidae) that is almost exclusively restricted to the Holarctic biogeographic realm. The subfamily contains currently about 260 described species 145 of which are referred to *Craspedolepta* s. l. (103 Palaearctic species: Klimaszewski 1973; Gegechkori & Loginova 1990; and 42 Nearctic species: Hodkinson 1988). Most *Craspedolepta* species develop on Asteraceae but some are associated with Onagraceae (*C. alexei*, *nebulosa*, *schwarzi* and *subpunctata*), Apiaceae (*C. innoxia*), Ranunculaceae (*C. multipunctata*) or Polemoniaceae (*C. eas*).

The taxonomy of *Craspedolepta* is confused as a considerable number of species was described from insufficient material, often without host plant information, and was not diagnostically differentiated from close relatives. In addition, while sometimes the group is treated as a single genus (Hodkinson 1988; Gegechkori & Loginova 1990), some European authors split it into several ill-defined genera and subgenera not applicable to the world fauna, and without phylogenetic significance (Klimaszewski 1983; Ossiannilsson 1992; Conci et al. 1993).

A particularly confused history have *Craspedolepta flavipennis* (Foerster) and *C. sonchi* (Foerster). Foerster (1848) described *Aphalara flavipennis* from German specimens, which he had collected in abundance in humid meadows. He mentioned additional material from England and Ireland. In the same paper, Foerster, with some doubts about its validity, erected *Aphalara sonchi* for insects, which he received

[1] Moravian Museum, Department of Entomology, Hviezdoslavova 29a, CZ-62700 Brno-Slatina, Czech Republic. ento.laut@volny.cz
[2] Naturhistorisches Museum, Augustinergasse 2, CH-4001 Basel, Switzerland
daniel.burckhardt@unibas.ch

under this name from Ireland, and for specimens from Germany and Silesia. He separated the two species by differences in the forewing coloration, yellow in the former and pale with dark veins in the latter. Flor (1861) synonymised the two with *Aphalara picta* auct. nec Zetterstedt (1828) explaining observed differences as intraspecific variation. Meyer-Dür (1871), unaware of Flor's (1861) paper, treated *A. flavipennis* and *sonchi* as separate taxa and, using size and forewing coloration, added a third species, *A. alpigena*. This was later synonymised with *A. picta* auct. by Löw (1877) who followed Flor's concept. This view was accepted by subsequent authors (Aulmann 1913) until Ossiannilsson (1942), in revising Zetterstedt's type collection, showed that *picta* was misinterpreted and is synonymous with *Aphalara calthae* (L.), a fact already mentioned by Thomson (1877). Incidentally, *Aphalara picta* auct. is type species of the subgenus *Magnaphalara* Ramírez Gómez (1960), and *A. flavipennis* of the genus *Cerna* Klimaszewski in Klimaszewski *et al.*, (1974).

Klimaszewski (1961) noted differences in size, head shape, forewing coloration and male genital morphology between *Craspedolepta flavipennis* and *sonchi* which he removed from synonymy with the former. He did not examine relevant type material. Both are currently accepted species widely distributed in the Palaearctic (Klimaszewski 1973; Gegechkori & Loginova 1990) with several asteraceous genera reported as possible hosts (*Buphthalmum*, *Crepis*, *Leucanthemum*, *Hieracium*, *Hypochaeris*, *Leontodon*, *Senecio* and *Sonchus*). Kuwayama (1907) described *Aphalara flava* from Japan, which according to him is similar to *A. picta* auct. Following other species from the Eastern Palaearctics may also be related to *C. flavipennis*: *Craspedolepta baranuurti* Klimaszewski, 1971 (Mongolia), *C. bugijina* Klimaszewski, 1968 (Mongolia), *C. flavimaculata* Li, 1992 (China), *C. hiurai* Miyatake, 1964 (Japan) and *Cerna numrehi* Klimaszewski, 1982 (Mongolia, Siberia).

In their revision of the New World *Craspedolepta* species Journet & Vickery (1979) concluded, more on circumstantial evidence than based on examination of types, that the North American records of *Aphalara picta* concern *C. sonchi*, and they synonymised *A. fascipennis* Patch with *C. sonchi*. Hodkinson (1988) suggested that the current concept of *C. sonchi* is probably that of a species group.

In the literature there is very little original information on the biology of members of this group. Notable exceptions are Löw (1880) and Ossiannilsson (1992). The former reared *C. flavipennis* on *Leontodon hastilis*, the latter reported larvae of *C. sonchi* on *Leontodon autumnale* from Scandinavia. Lauterer (1965) observed many specimens of *C. sonchi* sucking on the peduncles of the inflorescence of *Leontodon autumnalis* and females attempting oviposition on and near the inflorescence, as well as many eggs on the inner side of the involucrum.

The aim of the present paper is to provide comparative morphological, biological and phenological evidence that *C. flavipennis* s. l. forms a complex of five closely related species in the West Palaearctic, and to provide means for their identification.

MATERIAL AND METHODS

Morphological terminology follows Ossiannilsson (1992). Measurements were taken from cleared and permanently slide mounted specimens. Drawings of the aedeagus and the female terminalia were made from permanent slide preparations, and those of the other structures from temporary mounts in glycerine. Gold coated specimens were used for producing the SEM photographs. Material was examined from following institutions:

MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts;
MHNG	Muséum d'histoire naturelle, Genève;
MMB	Moravian Museum, Brno;
MNHB	Museum für Naturkunde der Humboldt Universiät, Berlin;
MNHN	Muséum national d'histoire naturelle, Paris;
NHMB	Naturhistorisches Museum, Basel;
NHMV	Naturhistorisches Museum, Vienna;
ZMM	Zoological Museum, Moscow.

TAXONOMY

Diagnosis of the *Craspedolepta flavipennis* group. Adult large with wide, apically broadly rounded forewings. Male paramere elongate with club-shaped apical dilatation; antero-basally with large, irregularly subquadrangular lobe; antero-subapically with large thumb-like process, postero-apically with inward-directed tooth-like process, and between these processes with spoon-like excavate portion; both processes and apical margin of spoon-like portion dark and strongly sclerotised; inner surface with a few long setae antero-basally and along fore margin, postero-apically with sparse short setae, stalk bearing a few moderately long setae on both sides; in dorsal view usually with one or several short setae on thumb-like projection, and a row of setae along the rim of the spoon-like part. Distal portion of aedeagus with long slender stalk and relatively short apical dilatation with triangular or quadrangular lateral plates, bearing a small ventral subapical hook, and a small dorsal membranous base; sclerotised end tube of ductus ejaculatorius short, weakly curved. Female terminalia long, ventral margin of subgenital plate angular, flattened or weakly indented in apical half.

Egg oblong-oval, with ventral side relatively flattened and dorsal side slightly more curved; pedicel short or moderately long, arising at base and lying in the longitudinal egg axis or more inclined up to 20 ° to the ventral side at most; apical filament short to moderately long.

Larva. Younger instars semitransparent colourless to ochreous with large orange mycetome, last instar larva light ochreous in *C. flavipennis*, *C. crispati* and *C. campestris*. According to Ossiannilsson (1992) in *C. sonchi* first to third instar larva brownish yellow or greenish yellow, fourth instar pale brownish yellow or whitish green and fifth instar brownish yellow or pale green. Fifth instar with flattened head and body, covered in granular pointed or blunt microsculpture sometimes forming irregular transverse rows. Anterior margin of head with 4 lanceolate setae on either side of mid-line; ocular setae absent. Antenna (figs 62, 63) 3-segmented with 3 and 2 lanceolate setae on scape and pedicel respectively; flagellum with 4 lateral lanceolate setae and 6 rhinaria; rhinaria 1, 3 and 5 (from base) associated with lanceolate seta 1, 2 and 3 respectively, rhinarium 2 small, sometimes hardly visible. Forewing-pad large with well-developed humeral lobe, angular apically. Hind wing-pad pointed apically. Thorax and wing-pads lacking specialised dorsal or marginal setae. Caudal plate indistinctly angular or pointed apically, bearing 12–13 marginal lanceolate setae on either side. Circumanal rings moderately large, laterally weakly curved cephalad, consisting of a single row of pores.

Comments. According to White & Hodkinson (1982) the fifth instar larva of *C. sonchi* possesses 7-segmented antennae and circumanal rings with two pore rows.

This contradicts our and Ossiannilsson's (1992) observations according to which the antenna is 3-segmented, and the circumanal rings consist of a single row of pores. The material of White & Hodkinson (1982) comes, according to White (1980), probably from Norway and was collected on *Leontodon autumnalis* at the end of July, suggesting that there was a mix up of *C. sonchi* with other material.

Craspedolepta flavipennis (Foerster)

(Figs 1, 2, 11, 12, 25, 27, 28, 35, 40, 45, 50, 55, 59)

Aphalara flavipennis Foerster, 1848: 89. Lectotype ♂, Germany: Aachen (A. Foerster), det. *picta* Löw (NHMV), here designated (examined).
Aphalara alpigena Meyer-Dür, 1871: 402. Lectotype ♂, without locality label, ?Germany (MCZ), designated by Burckhardt, 1983: 47 (re-examined).
Aphalara picta auct. nec Zetterstedt, 1828, p. p.
Craspedolepta flavipennis; Wagner, 1948: 65.
Aphalara (*Magnaphalara*) *picta*; Ramírez Gómez, 1960: 64.
Cerna flavipennis; Klimaszewski in Klimaszewski et al., 1974: 242.

Material examined. Many adults from Austria, Czech Republic, France, Germany, Slovakia, Switzerland (MHNG, MMB, NHMB). **Czech Republic**: W Moravia, České Mezihoří Hills, Dolní Smržov, towards Rozhraní, 10.vi.1980, *Leontodon hispidus* (P. Lauterer), 1 fourth larval instar, 1 ♀ fifth instar larva MMB.

Diagnosis. Adult. Forewing (figs 1, 2) intensively yellowish to dark brownish ochreous, slightly darker apically mottled with faint light brownish dots apically in all cells of wing; veins slightly lighter or concolorous with membrane, never with contrasting darker dots; wings very variable in colour, young specimens and specimens emerging in July–August with slightly lighter membrane, similar to young specimens of *C. sonchi*. Body dark-ochreous to brownish, darker than in the other related species, in very young specimens lower part of thorax and abdomen greenish-ochreous.

Head (fig 25), in dorsal view, with anterior margin relatively strongly indented in the middle, forming a pointed tubercle on either half of vertex, part from tubercle to mid-line of vertex more or less straight; antero-lateral margin of vertex dorsad of antennal insertion distinctly concave. Surface spinules on forewing membrane (figs 11, 12) larger and coarser than in the other West Palaearctic species; arranged in undulating rows which produce rounded cells of one row of spinules at the base of cell m_2 as well as cells r_2 and cu_2. Paramere (figs 27, 28, 35) long and slender, antero-basal lobe large and slightly up-turned anteriorly; thumb-like antero-subapical process, in profile, short, in dorsal aspect close to spoon-like portion leaving only narrow gap; dorsal sclerotised margin of spoon-like portion, which is moderately high, in profile, unevenly rounded; inner margin of spoon-like part, in dorsal view, only very weakly convex, postero-apical tooth long and slender. Distal portion of aedeagus (figs 40, 45) with relatively massive apical dilatation which has a small membranous dorsal base. Female terminalia (fig 50) with strongly up-turned apex of proctiger and with strongly angular ventral margin of subgenital plate. Measurements and ratios see tab. 1.

Egg (fig 55). Elongate, narrowly rounded at base and tapering apically. Apical filament longer than in other West Palaearctic species.

Fifth instar larva (fig 59). Humeral lobe large, reaching beyond middle of the lateral eye margin. Ventral surface of the abdomen level with the circumanal ring near margin with relatively strongly pointed microsculpture.

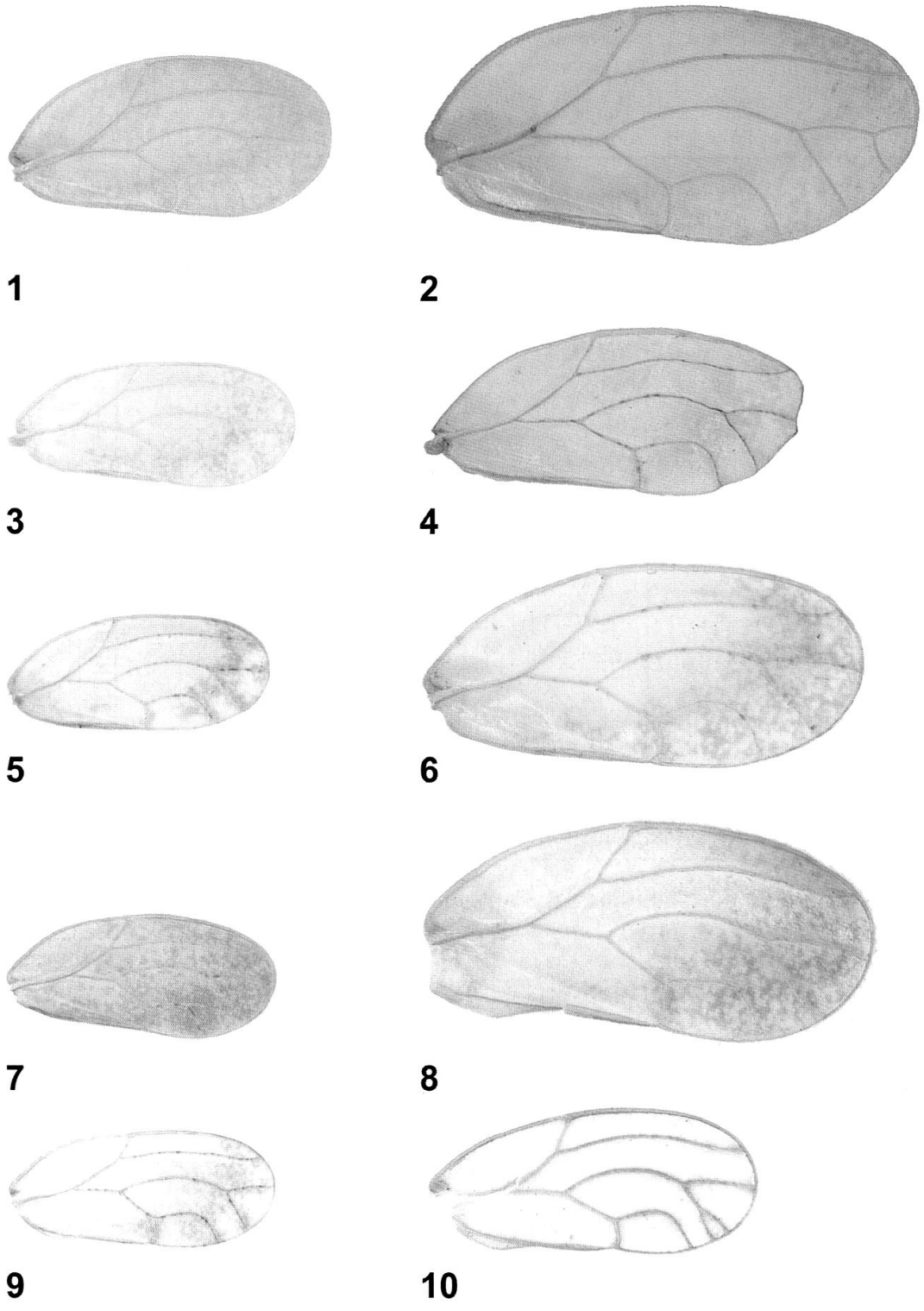
Table 1. Measurements (in mm) and ratios. Abbreviations: n = number of specimens; HW = Head width; AL = antenna length; WL = forewing length; MP = male proctiger length; PL = paramere length; AEL = length of distal segment of aedeagus; FP = female proctiger length; ALHW = AL/HW; L3/4 = length antennal segment 3/ length of antennal segment 4; TLHW metatibia length /HW; WLHW = WL/HW; WLW = WL/ forewing width; a/b = m, cell value; c/d = μ, cell value; MPHW = MP/HW; FPHW = FP/HW; FPC = FP/ circumanal ring length; FPS = FP/female subgenital plate length.

	C. flavipennis	*C. schaeferi*	*C. crispati*	*C. campestris*	*C. sonchi*
n	9 ♂, 11 ♀	4 ♂, 3 ♀	3 ♂, 4 ♀	3 ♂, 3 ♀	7 ♂, 6 ♀
HW	0.82–0.93	0.81–0.94	0.81–0.95	0.86–0.97	0.81–0.95
AL	1.04–1.52	1.07–1.27	1.02–1.14	1.02–1.23	1.10–1.23
WL	3.16–3.92	3.12–3.79	2.77–3.84	2.90–3.81	2.70–3.50
MP	0.27–0.33	0.28–0.31	0.29–0.35	0.32–0.34	0.31–0.34
PL	0.38–0.40	0.36–0.39	0.36–0.39	0.38–0.39	0.34–0.40
AEL	0.38–0.39	0.34–0.37	0.34–0.36	0.34–0.36	0.34–0.37
FP	1.07–1.19	1.02–1.08	0.90–0.99	0.96–1.01	1.02–1.09
ALHW	1.27–1.65	1.17–1.40	1.09–1.35	1.12–1.31	1.22–1.45
L3/4	1.67–2.15	1.69–2.02	1.53–1.81	1.58–2.01	1.65–1.96
TLHW	0.94–1.09	0.84–0.88	0.75–0.85	0.76–0.81	0.83–0.89
WLHW	3.67–4.34	3.40–3.99	3.41–4.06	3.32–3.96	3.35–3.92
WLW	1.96–2.26	2.08–2.19	2.03–2.20	2.00–2.15	2.07–2.37
a/b	1.12–1.46	1.23–1.59	1.09–1.57	1.20–1.41	1.05–1.30
c/d	2.09–3.05	2.22–2.51	2.42–3.02	2.13–2.58	2.07–2.82
MPHW	0.33–0.38	0.31–0.34	0.33–0.44	0.36–0.37	0.36–0.41
FPHW	1.22–1.33	1.11–1.15	0.97–1.08	0.99–1.06	1.14–1.17
FPC	3.44–4.05	3.46–3.68	2.84–3.37	3.02–3.27	3.07–3.70
FPS	1.23–1.33	1.39–1.46	1.26–1.43	1.18–1.31	1.31–1.44

Comments. For stabilising the nomenclature in the *C. flavipennis* complex a lectotype of *Aphalara flavipennis* is designated here. The lectotype corresponds to the interpretation of Klimaszewski (1961), a concept currently used in the literature. The lectotype of *Aphalara alpigena* (MCZ) was re-examined, and the synonymy with *C. flavipennis* is confirmed. The lectotype of *Aphalara alpigena* corresponds to Meyer-Dür's (1871) description with an almost colourless transparent forewing membrane and light ochreous veins. The membrane is exceptionally light which may be an artefact of conservation. The lectotype does not bear a locality label, and there is no locality mentioned in the original description. As Meyer-Dür received the specimens from Foerster it is possible that it comes from Germany.

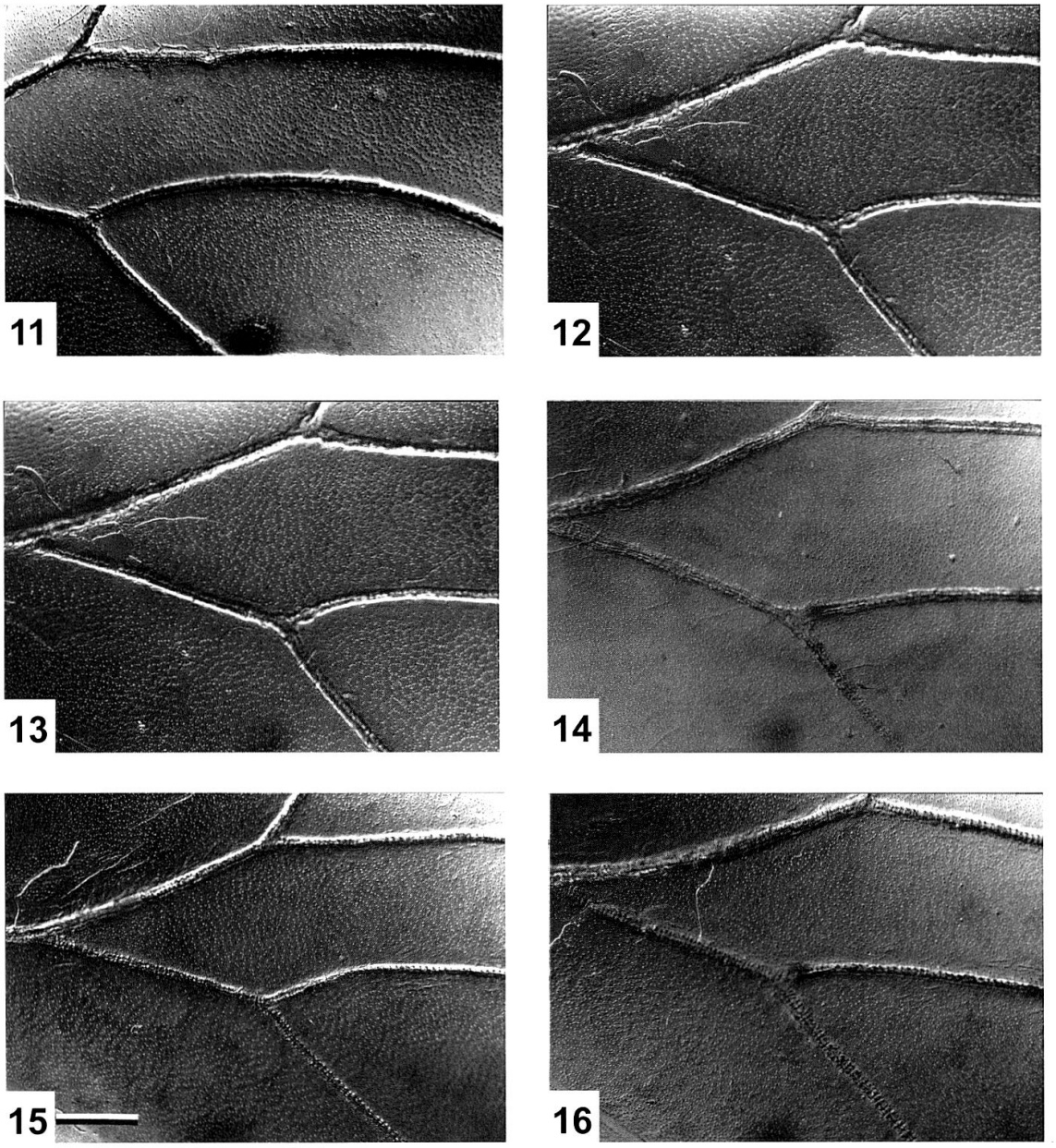
Table 2. Measurements (in mm) of fifth instar larva. Abbreviations: n = number of specimens; BL = body length; BW = body width; HW = head width; AW = abdominal width.

	C. flavipennis	*C. crispati*		*C. campestris*
n	1 ♀ larva	1 ♂ larva	2 ♀ larva	1 ♀ exuvia
BL	2.75	2.48	2.93–3.14	2.79
BW	2.19	1.80	2.25–2.30	1.80
HW	0.90	0.84	0.99	0.83
AW	1.35	1.20	1.48–1.55	1.23



Figs 1–10: *Craspedolepta* spp., forewing. – 1, 2, *C. flavipennis*; 3, 4, *C. schaeferi*; 5, 6, *C. crispati*; 7, 8, *C. campestris*; 9, 10, *C. sonchi*. – 1, 3, 5, 7, 9, male; 2, 4, 6, 8, 10, female.

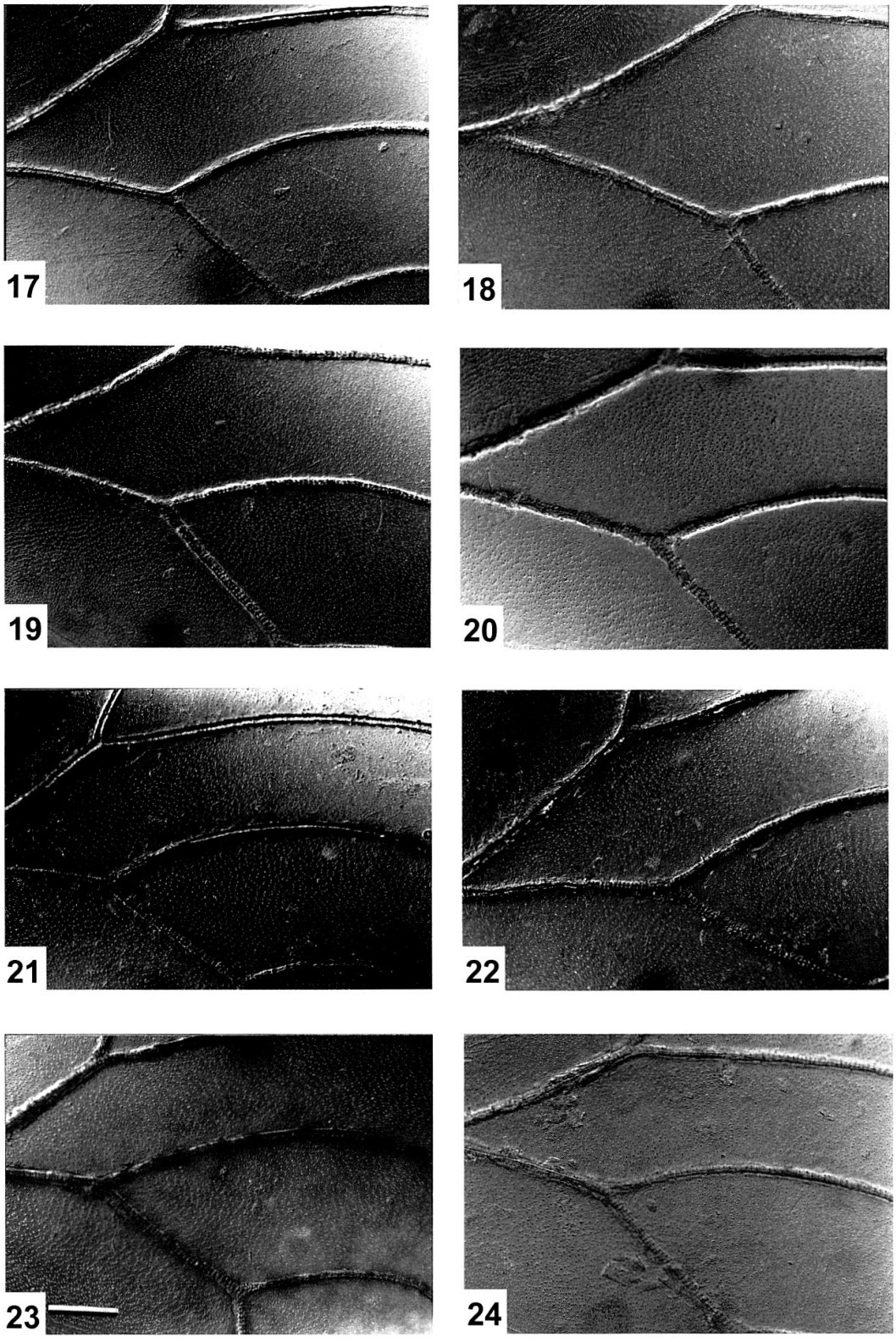
Bionomics. Many host plants are named in the literature; e. g. Vondráček (1957) lists *Crepis biennis*, *Chrysanthemum leucanthemum*, *Hypochaeris radicata* and *Leontodon hispidus*, however, only the last one is confirmed (Loew 1877, 1880; P. Lauterer and I. Malenovský, observations in the Czech Republic; D. Burckhardt,



Figs 11–16: *Craspedolepta* spp., distribution of surface spinules on right forewing (scale bar = 0.2 mm). – 11, 12, *C. flavipennis*, Czech Republic; 13, 14, *C. schaeferi*, Switzerland; 15, 16, *C. schaeferi*, France; 11, 13, 15, male; 12, 14, 16, female.

observations in Switzerland). We never could observe *C. flavipennis* sucking or laying eggs on other plants growing together with *L. hispidus*. In contrast to its close relatives, *C. flavipennis* is less specialised ecologically and occurs in xerothermic, mesic and wet places. Adults emerge over a long period of time, and teneral specimens can be found from the end of May to the middle of August. The species has also a wide altitudinal range, from the lowlands to alpine elevations (in the Czech Republic and Slovakia ranging from 150–1950 m a. s. l.).

Comments. *C. flavipennis* is more variable in colour, morphology and ecology than its close relatives.



Figs 17–24: *Craspedolepta* spp., distribution of surface spinules on right forewing (scale bar = 0.2 mm). – 17, 18, *C. crispati*, Czech Republic; 19, 20, *C. campestris*, Czech Republic; 21, 22, *C. sonchi*, Czech Republic; 23, 24, *C. sonchi*, Ural. – 17, 19, 21, 23, Male; 18, 20, 22, 24, female.

Craspedolepta schaeferi sp. n.

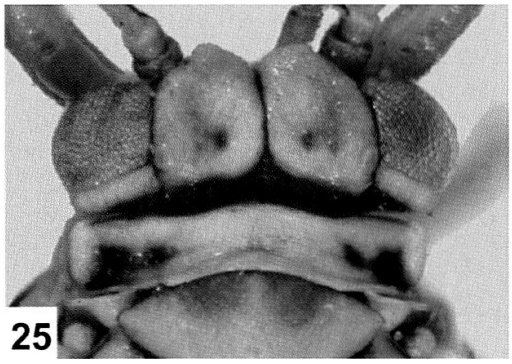
(Figs 3, 4, 13–16, 29, 30, 36, 41, 46, 51)

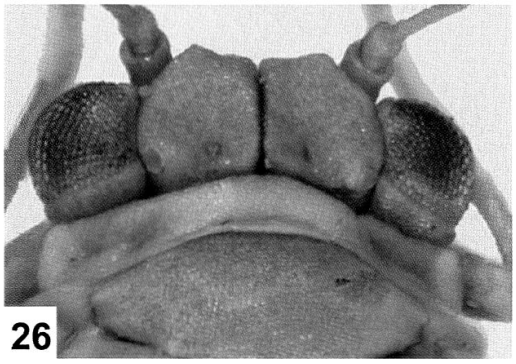
Type material. Holotype ♂ MHNG, Switzerland: JU, Saignelégier, 23.vi. 1977, *Senecio helenitis* (M. Jacquart).

Paratypes. Switzerland: same data as holotype, 15 ♂, 12 ♀ NHMB, 2 ♂, 2 ♀ MHNG, 3 ♂, 5 ♀ MMB; GR, Lenzerheide, Danis, 2400 m, collected 6.viii.1992, emerged from flower heads of *Aster alpinus*, 15.viii.1992 (B. Merz), 3 ♂, 1 ♀ NHMB; GR, Alp Flix, 1940 m, 769/155, 27.viii.1978 (D. Burckhardt), 1 ♀ NHMB. – France: Haut-Rhin, 68, Le Markstein, 1150 m, 26.v.l993 (W. della Giustina), 4 ♂, 3 ♀ NHMB, 10 ♂, 3 ♀ MMB; Haut-Rhin, Vosges, Ballon d' Alsace, 1250 m, 10.vi.1994 (I. Malenovsky), 3 ♂, 2 ♀ (MMB); Hautes-Pyrenées: Gèdre, 20.viii. 1923 (H. Ribaut), 1 ♂, 1 ♀ MNHN; Pyrenées-Orientales, Les Angles, 18.viii.1936 (H. Ribaut), 4 ♂, 5 ♀ MNHN, 3 ♂ NHMB.

Material not included in type series: Switzerland: GR, Disentis, 21.vii.1945 (H. A. Schaefer), 1 ♀ NHMB.

Diagnosis. Adult. Forewing colour highly variable (figs 3, 4); distinctly transparent with irregular, relatively widely spaced light brown dots in apical quarter,

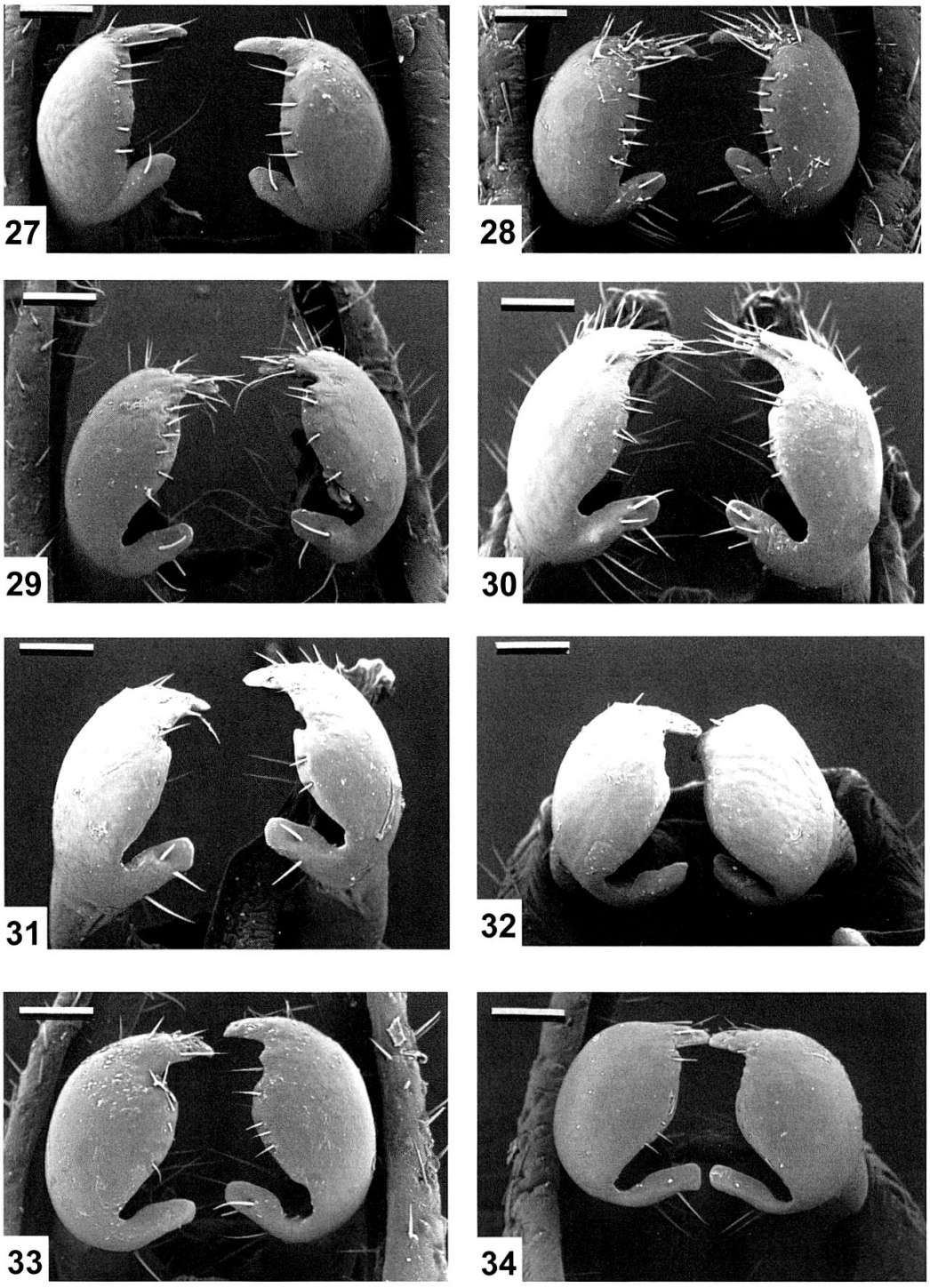




Figs 25, 26: *Craspedolepta* spp., head, dorsal view. – 25, *C. flavipennis* ♂; 26, *C. crispati* ♀.

semitransparent, whitish or imperceptibly yellowish with more or less extended irregular sparsely spaced light brown or ochreous dots which can be confluent; some specimens with densely spaced small brown dots covering the whole wing surface; veins light, only indistinctly contrasting with membrane, often with dark dots. Body ochreous sometimes with brownish tinge.

Head similar to that of *C. crispati*, in dorsal view, with anterior margin relatively weakly indented in the middle, not forming distinct tubercle on either half of vertex; antero-lateral margin of vertex dorsad of antennal insertion more or less straight. Surface spinules on forewing membrane (figs 13–16) relatively fine, arranged in straight lines near veins and undulating lines in the middle of cells; in cells m_2 and cu_2, and rarely also in r_2 producing roundish or elongate cells; cellular pattern less distinct than in *C. flavipennis* but better developed than in other species where it is almost completely absent. Paramere (figs 29, 30, 36) long and slender, antero-basal lobe large and slightly up-turned anteriorly, similar to *C. flavipennis* but slightly smaller; thumb-like antero-subapical process, in profile, long, in dorsal aspect, curved away from spoon-like portion leaving wide gap; dorsal sclerotised



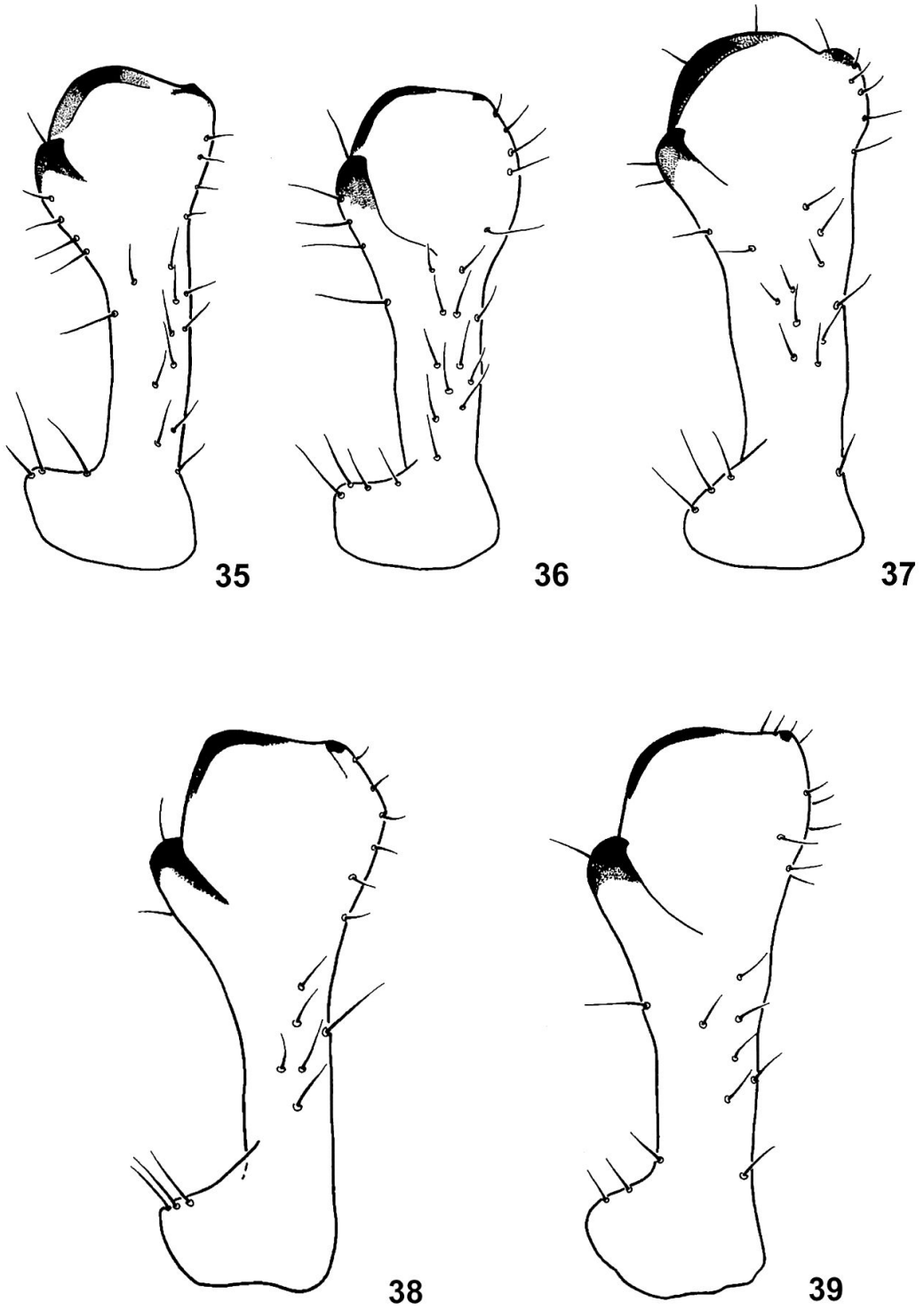
Figs 27–34: *Craspedolepta* spp., parameres, dorsal view (scale bar = 0.05 mm). – 27, 28, *C. flavipennis*, Czech Republic; 29, *C. schaeferi*, Switzerland; 30, *C. schaeferi*, France; 31, *C. crispati*, Czech Republic; 32, *C. campestris*, Czech Republic; 33, *C. sonchi*, Czech Republic; 34, *C. sonchi*, Ural.

margin of spoon-like portion, which is moderately high, in profile, unevenly rounded; inner margin of spoon-like part, in dorsal view, distinctly convex, postero-apical tooth shorter and more robust than that in *C. flavipennis*. Distal portion of aedeagus (figs 41, 46) with moderately large apical dilatation which has a large membranous dorsal base. Female terminalia (fig 51) with weakly up-turned apex of proctiger

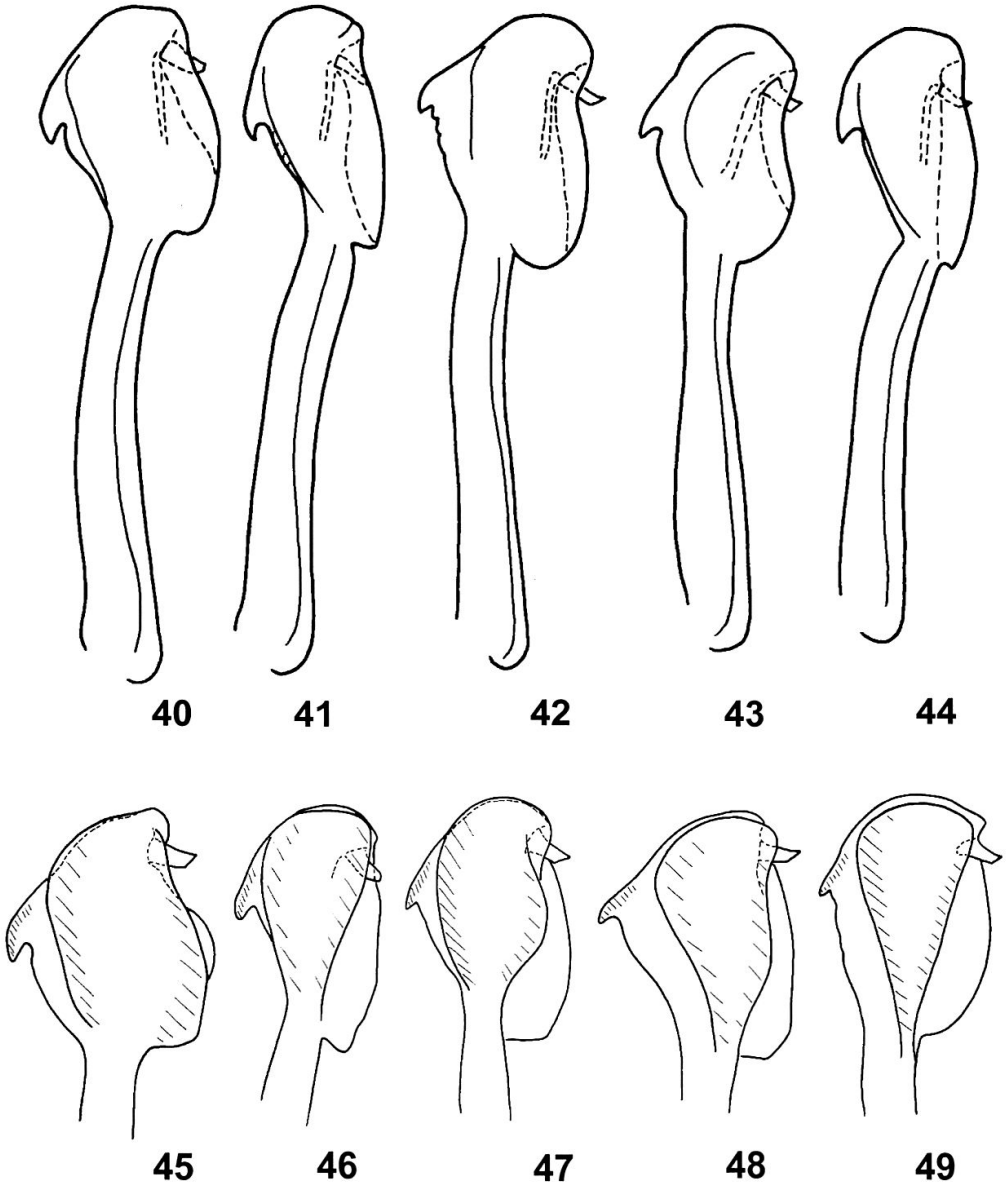
and with weakly angular ventral margin of subgenital plate. Measurements and ratios see tab. 1.

Egg and fifth instar larva unknown.

Bionomics. Adults were collected on *Senecio helenitis*, and reared from flower heads of *Aster alpina*. The species occurs from the upper montane to the alpine zone, i. e. from 1000–2400 m a. s. l.



Figs 35–39: *Craspedolepta* spp., paramere, inner face, in profile. – 35, *C. flavipennis*; 36, *C. schaeferi*, France; 37, *C. crispati*; 38, *C. campestris*; 39, *C. sonchi*.



Figs 40–49: *Craspedolepta* spp., aedeagus. – 40, 45, *C. flavipennis*; 41, 46, *C. schaeferi*; 42, 47, *C. crispati*; 43, 48, *C. campestris*; 44, 49, *C. sonchi*; 40–44, distal protion; 45–49, apical dilatation of distal portion.

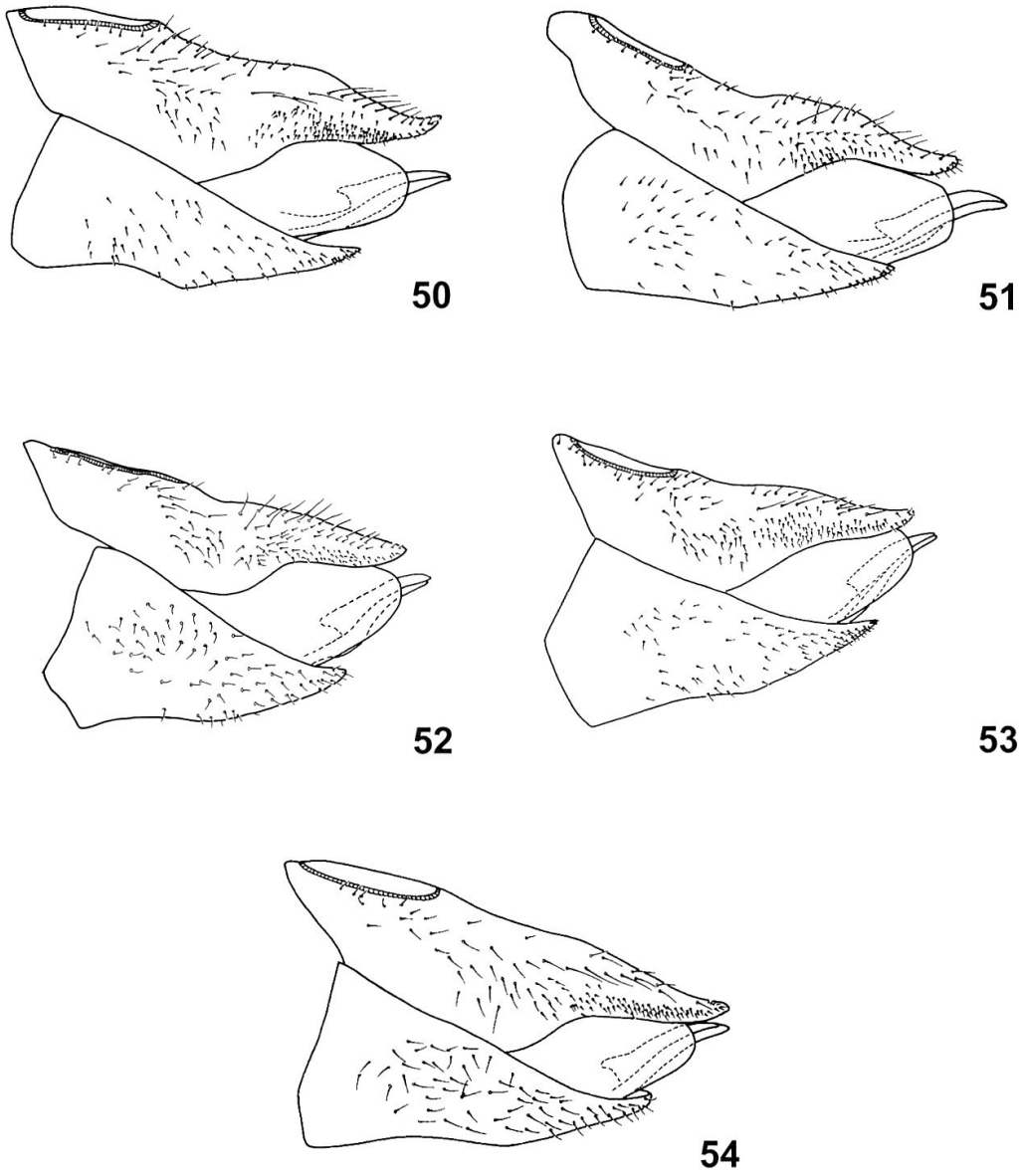
Craspedolepta crispati sp. n.

(Figs 5, 6, 17, 18, 26, 31, 37, 42, 47, 52, 56, 60, 62)

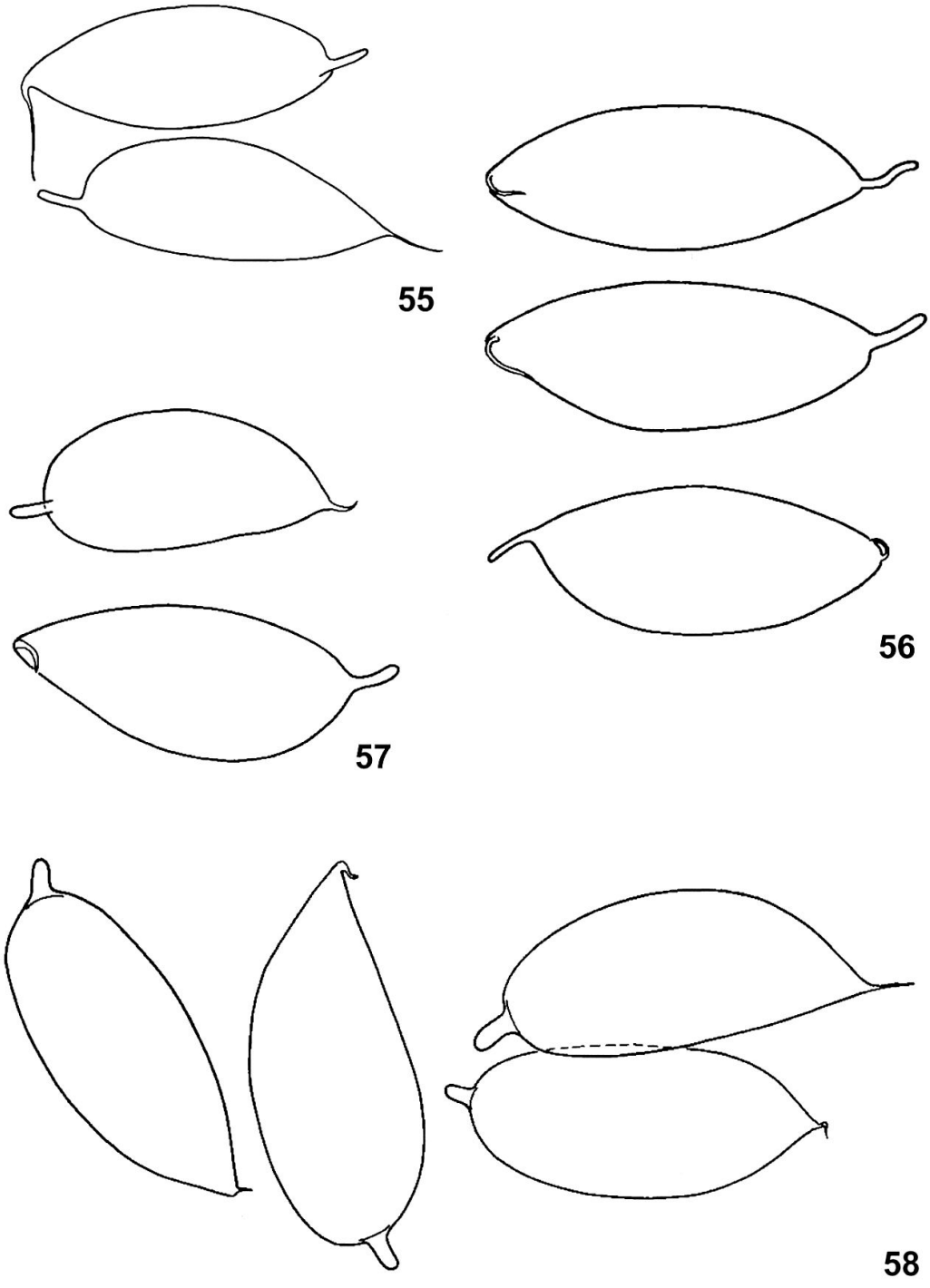
Type material. Holotype ♂ MMB: Czech Republic: E Bohemia, Česko-moravská vrchovina hilly country, Žďárské vrchy hills, Svratka, 630 m, 6.vi.1982, sphagnetum meadow NW of village, *Senecio crispatus* (V. Novotný).

Paratypes. Czech Republic: same data as holotype, 39 ♂, 40 ♀ NHMB, 1 ♂, 1 ♀ MHNG, 100 ♂, 193 ♀ MMB; same but 3.vi.1982 (V. Novotný) 45 ♂, 53 ♀ MMB; same but 22.v.2001, *Senecio crispatus*, 110 ♂, 87 ♀, MMB; Turovka at Horní Cerekev, 630 m, 14.v.1957, (J. Dlabola), 41 ♂, 29 ♀. W Moravia: Žďárské vrchy hills, Nové Město na Moravě, part Ochoza, 670 m, 16.v.1966, water logged meadow, *Senecio crispatus*, 1 ♂, 3 ♀ NHMB, 47 ♂, 30 ♀ MMB; same but sur-

roundings Ski hotel, 595 m, *Senecio crispatus*, 22.v.1982, 4 ♂, 2 ♀, MMB; W Moravia, Žďárské vrchy hills, Budeč, part Kopeček, 570 m, 16.v.1966, sphagnetum, *Senecio crispatus*, 1 ♂ NHMB, 70 ♂, 65 ♀ MMB; Budeč, Matějovský rybník pond, 560 m, sphagnetum, 3.vi.1977, 1 ♂, 1 ♀ MMB; Žďár nad Sázavou, up to Velká Strana pond, 590 m, 21.v.2001, *Senecio crispatus*, 124 ♂, 92 ♂, MMB; same but downhill of Velká Strana pond, 585 m, 21.v.2001, *Senecio crispatus*, 234 ♂, 211 ♀, MMB; Maršovice, towards Pohledec, Rokytno, 655 m, 23.v.1982, *Senecio crispatus*, 25 ♂, 25 ♀ NHMB, 16 ♂, 37 ♀ MMB; Vlachovice, towards Rokytno, 685 m, 23.v.1982, *Senecio crispatus*, 5 ♂, 3 ♀ MMB; Zubří, 660–680 m, 23.v.1982, *Senecio crispatus*, 6 ♂, 3 ♀ MMB; W Moravia, Jihlavské vrchy hills, Doupě, towards Vanůvek and Řídelov, peat bog Bažantka, 595 m, 7.vi.1966, 1 ♀ MMB; same but 19.vi.1978, 1 ♂ MMB; Doupě, Panský rybník pond, 590 m, sphagnetum, 7.vi.1966, 1 ♀ MMB; Doupě, towards Třeštice, 585 m, *Senecio crispatus*,

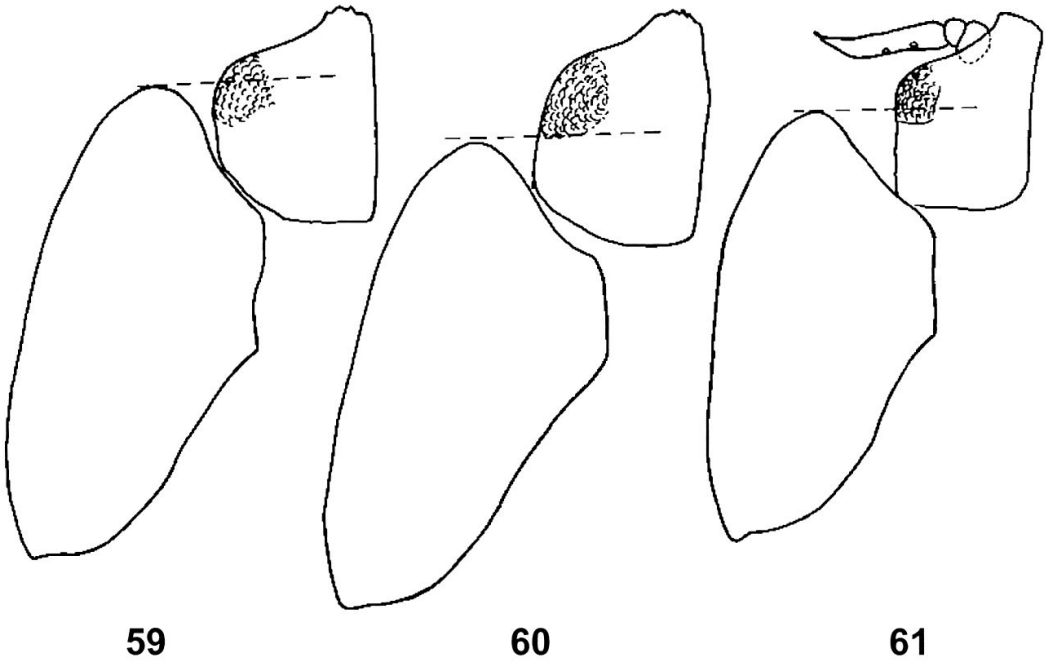


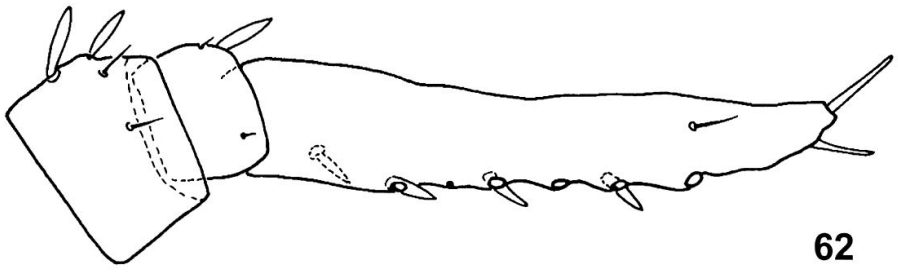
Figs 50–53: *Craspedolepta* spp., female terminalia, in profile. – 50, *C. flavipennis*; 51, *C. schaeferi*; 52, *C. crispati*; 53, *C. campestris*; 54, *C. sonchi*.

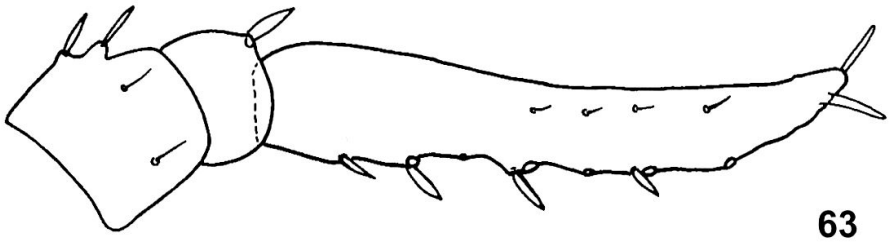


Figs 55–58: *Craspedolepta* spp., eggs. – 55, *C. flavipennis*; 56, *C. crispati*; 57, *C. campestris*; 58, *C. sonchi*.

19.vi.1978, 4 ♂ MMB; Horní Bolíkov, 630 m, peat bog, 8.vi.1966, 4 ♀ MMB; Lipolec, peatbog Pařezné Louky, 535 m, 4.v.1966, 5 ♂ MMB; Jihlávka, towards Kaliště, 645 m, peat bog, 4.v.1966, 1 ♀, MMB; Mysletice, 530 m, peaty meadow, 3.v.1966, 4 ♂, 4 ♀ MMB; Olší, Zdénkova louka peaty meadow, 585 m, 3.v.1966, 1 ♀ MMB; same but *Senecio crispatus*, 3.v.1966, 5 ♂, 2 ♀ MMB; Řídelov, up to the Pilný pond, sphagnetum, 635 m, 19.vi.1978, 10 ♂, 16 ♀ MMB; Vílanec, part Loučky, 585 m, peaty meadow, 16.vi.1966, 1 ♂, 1 ♀ MMB; Volfířov, 510 m, peaty







Figs 59–63: *Craspedolepta* spp., fifth instar larva. – 59, *C. flavipennis*; 60, 62, *C. crispati*; 61, 63, *C. campestris*; 59–61, head and forewing pad, left side, dorsal aspect (stippeled line which is perpendicular to longitudinal body axis, indicating length of humeral lobe relative to eye); 62, 63, right antenna, ventral view.

meadow, 4.v.1966, 7 ♂, 4 ♀ MMB. W Moravia, Českomoravská vrchovina hills, Olšany, towards Ořechov, 610 m, peaty meadow at Pilka pond, 7.vi.1966, 1 ♂, 1 ♀ MMB; same 3.v.1966, *Senecio crispatus*, 1 ♂ MMB.

Material not included in type series. Czech Republic: W Moravia, Žďárské vrchy hills, Budeč, Babin rybník pond surroundings, 11.v.1980, roots of *Senecio crispatus* , 1 ♀ fifth instar larva NHMB, 1 ♂ and 1 ♀ fifth instar larvae MMB; Vla-

Table 3. Morphological characters for separating the West Palaearctic species of the *Craspedolepta flavipennis* group.

	C. flavipennis	*C. schaeferi*	*C. crispati*	*C. campestris*	*C. sonchi*
Anterior margin of vertex	strongly indented in the middle, with two distinct anterior tubercles	weakly indented in the middle, lacking distinct anterior tubercles	relatively weakly indented in the middle, with two indistinct anterior tubercles	relatively weakly indented in the middle, with two indistinct anterior tubercles	relatively weakly indented in the middle, sometimes with two indistinct anterior tubercles
Antero-lateral margin of vertex dorsad of antennal insertion	distinctly concave	more or less straight	more or less straight	more or less straight	more or less straight
Coloration of forewing membrane	yellowish ochreous to dark brownish ochreous	variable	semitransparent to whitish, with yellowish tinge and brownish dots in apical third, agreggated near veins leaving lighter areas in the middle of cells r_2, m_1, m_2 and cu_{1+2} along outer wing margin	cream-coloured to yellowish with yellowish ochreous or brownish ochreous tinge along outer wing margin	semitransparent to whitish, sometimes with light brownish spots or brownish tinge apically
Coloration of forewing veins	same colour as membrane or slightly lighter, never with contrasting darker spots	more or less concolorous with membrane, sometimes with dark dots	concolorous with membrane or weakly brown, sometimes with dark dots in apical half	concolorous with membrane or slightly lighter, sometimes with dark dots in apical half	dark brown, sometimes with darker contrasting dots
Surface spinules on forewing membrane	large and coarse	relatively fine	fine and dense	moderately sized	finer than in *C. flavipennis* but coarser than in other species
Arrangement of surface spinules at the base of cell cu_2	in distinct, rounded cells	in indistinct, elongate cells	in straight or undulating rows	in irregularly undulating rows, less regularly spaced than in *C. crispati*	in undulating rows, shorter than in *C. crispati* and sparser than in *C. schaeferi*
Paramere, in profile	long and slender	long and slender	wide and robust	wide and robust, slightly less than in *C. crispati*	smaller than in other species, with relatively slender stalk
Antero-basal lobe of paramere	large and slightly up-turned anteriorly	moderately large and slightly up-turned anteriorly	small and triangular	small and triangular	moderately small, triangular
Thumb-like antero-subapical process, in profile	short, relatively close to paramere apex	long, relatively close to paramere apex	short, relatively close to paramere apex	long and thick, relatively removed paramere apex	short and slender, relatively removed paramere apex

Table 3. Continued. Morphological characters for separating the West Palaearctic species of the *Craspedolepta flavipennis* group.

	C. flavipennis	*C. schaeferi*	*C. crispati*	*C. campestris*	*C. sonchi*
Thumb-like antero-subapical process of paramere of paramere, in dorsal view	close to spoon-like portion, leaving only narrow gap	curved away from spoon-like portion, leaving wide gap	curved away from spoon-like portion, leaving wide gap, intermediate between *C. flavipennis* and *C. sonchi*	curved away from spoon-like portion, leaving wide gap, slighthly less than in *C. crispati*	strongly curved away from spoon-like portion, leaving wide gap
Spoon-like part of paramere, in profile	moderately high	moderately high	low	very high	very high
Dorsal sclerotised margin of spoon-like part of paramere, in profile	unevenly rounded	unevenly rounded	broadly rounded	indistinctly angular	distinctly angular
Dorsal sclerotised margin of spoon-like part of paramere, in dorsal view	very weakly convex	moderately convex	moderately convex	moderately to strongly convex	strongly convex
Postero-apical tooth of paramere, in dorsal view	long and slender	relatively short and robust	short and robust	short and robust	short and robust
Distal portion of aedeagus	with relatively massive apical dilatation	with moderately large apical dilatation	with moderately large apical dilatation	with moderately large apical dilatation	with moderately large apical dilatation
Apical dilatation of distal aedeagal portion	with small membranous dorsal base	with large membranous dorsal base	with large membranous dorsal base	with large membranous dorsal base	with small membranous dorsal base
Ventral margin of female subgenital plate	strongly angular	weakly angular	weakly angular	weakly angular	weakly angular

chovice, towards Rokytno, 685 m, peatbog, 23.v.1982, roots of *Senecio crispatus*, 2 fifth instar larvae, MMB. Slovakia: Liptovská Huta, Minčol Mt., 20.vi.1965, (L.Pospíšilová), 3 ♂ MMB. Finland: Pargas (Reuter) 1 ♀ MMB. If not stated otherwise the material was collected by P. Lauterer.

Diagnosis. Adult. Forewing (figs 5, 6) whitish, semitransparent with light yellowish tinge, often with light brown confluent dots in apical third; brown dots often aggregated near veins and then leaving lighter areas in the middle of cells r_2, m_1, m_2 and cu_{1+2} along outer wing margin; veins concolorous or weakly brownish, sometimes with darker contrasting dots in apical half. Body light ochreous, more greenish in young specimens.

Head (fig 26), in dorsal view, with anterior margin relatively weakly indented in the middle, forming sometimes a small, indistinct tubercle on either half of vertex; antero-lateral margin of vertex dorsad of antennal insertion more or less straight. Surface spinules on forewing membrane (figs 17–18) finer and denser spaced than in the other species; arranged in straight or widely undulating rows, in apical portions of cells r_2 and m_2 evenly spaced. Paramere (figs 31, 37) wider and

more robust than in other West Palaearctic species, antero-basal lobe relatively small and triangular; thumb-like antero-subapical process, in profile, short, intermediate between *C. flavipennis* and *C. sonchi*, in dorsal aspect, curved away from spoon-like portion leaving wide gap which is intermediate between that of *C. flavipennis* and *C. sonchi*; dorsal sclerotised margin of spoon-like portion, which is low, in profile, broadly rounded; inner margin of spoon-like part, in dorsal view, distinctly convex, poster-apical tooth short and robust. Distal portion of aedeagus (figs 42, 47) with moderately large apical dilatation which has a large membranous dorsal base. Female terminalia (fig 52) with weakly up-turned apex of proctiger and with weakly angular ventral margin of subgenital plate. Measurements and ratios see tab. 1.

Egg (fig 56). Elongate, base and apex tapering. Apical filament moderately long.

Fifth instar larva (figs 60, 62). Humeral lobe relatively short, anterior margin not reaching middle of the lateral eye margin. Ventral surface of abdomen level with the circumanal ring near margin with relatively blunt microsculpture.

Bionomics. Monophagous on *Senecio crispatus* growing in mires, swamps and on the edges of ponds in spring. Adults occur during a short period of time when the host plant is flowering (3.v.-19.vi.). The oviposition is restricted to the flower involucrum. The species is stenotopic and ranges in the Czech from 510–685 m a.s.l.

Comments. *C. crispati* is morphologically closest to *C. campestris*, from which it differs in the forewing coloration and spinulation and details of the paramere. In contrast to *C. campestris* which is xerothermophilous, *C. crispati* is psychrophilous and hygrophilous.

Craspedolepta campestris sp. n.

(Figs 7, 8, 19, 20, 32, 38, 43, 48, 53, 57, 61, 63)

Type material. Holotype ♂ MMB: Czech Republic: S Moravia, Pavlovské vrchy hills, Horní Věstonice, Kotelná hill, 320–380 m, 19.v.1983, *Senecio integrifolius* (P. Lauterer).

Paratypes. Czech Republic: same data as holotype, 137 ♂, 123 ♀ MMB, 1 ♂, 1 ♀ NHMB; same but between Perná and Horní Věstonice, W slopes of Kotelná hill, 330–480 m, 20.v.1982, *Senecio integrifolius* (P.Lauterer), 1 ♂, 2 ♀ NHMB, 26 ♂, 10 ♀ MMB; same but 26.v.1982, 1♂, 2 ♀ MMB; same but Horni Věstonice cadastre, W slopes of Kotelná hill, 320–380 m, 26.v.1982, *Senecio integrifolius* (P. Lauterer), 6 ♂, 4 ♀ NHMB, 60 ♂, 43 ♀ MMB; same but breedings until 20.vi.1982, 21♂, 16 ♀ MMB; same but Horní Věstonice, W slopes of the Kotelná hill, 370–400 m, game reserve surroundings, 17.v.1994, *Senecio integrifolius* (P. Lauterer), 17 ♂, 17 ♀ NHMB, 16 ♂, 16 ♀ MMB, 3 ♂, 3 ♀ MHNG; same locality, Horní Věstonice, Soutěska canyon, 300–480 m, 19.v.1983, *Senecio integrifolius* (P. Lauterer), 26 ♂, 23 ♀ MMB; same but Horní Věstonice, W slopes of Kotelná hill, 370–400 m, 14.v.2001, *Senecio integrifolius* (P. Lauterer), 15 ♂, 17 ♀ MMB.

Material not included in type series. Czech Republic: S Moravia, Pavlovské vrchy Hills, Horní Věstonice, Kotelná hill, W slopes, 320–380 m, 19.v.1983, on roots of *Senecio integrifolius*, 3 exuviae of ♀ fifth instar; same but Horní Věstonice, W slopes of Kotelná hill, 14.v.2001, on underside of *Senecio integrifolius* plants, 8 exuviae of fifth instar. – Germany: Bad Freienwalde, Umgebung Schiffmühle, 17.vii.1969 (U. Göllner), 1 ♀ NHMB. – Macedonia: Popova Sapka, 25.vi. 1966 (Königsmann), 1 ♀ NHMB.

Diagnosis. Adult. Forewing (figs 7, 8) semitransparent, lighter or darker cream-coloured to yellowish, with light ochreous to ochreous brown tinge along outer wing margin; in apical half, very rarely also in proximal half, with relatively widely spaced irregular light brown dots; yellowish tinge stronger developed than in the other species with the exception of *C. flavipennis*; veins concolorous with or seemingly lighter than membrane with few contrasting darker dots. Body light ochreous, slightly greenish in young specimens.

Head similar to that of *C. crispati*, in dorsal view, with anterior margin relatively weakly indented in the middle, sometimes forming an indistinct tubercle on either half of vertex; antero-lateral margin of vertex dorsad of antennal insertion more or less straight. Surface spinules on forewing membrane (figs 19–20) moderately sized, arranged in more or less irregularly undulating rows, never as regularly spaced as in *C. crispati*; this is particularly well-developed in basal part of cell m_2 where rarely cells are formed which are constituted by a single row of spinules; rows of spinules in cell cu_2 rather straight. Paramere (figs 32, 38) wide and robust, antero-basal lobe relatively small and triangular; thumb-like antero-subapical process, in profile, long and thick, slightly further away from paramere apex than in the preceeding three species, in dorsal aspect, slightly less strongly curved away from spoon-like portion than in *C. crispati* leaving wide gap; dorsal sclerotised margin of spoon-like portion, which is very high, in profile, indistinctly angular; inner margin of spoon-like part, in dorsal view, distinctly convex, postero-apical tooth short and robust. Distal portion of aedeagus (figs 43, 48) with moderately large apical dilatation which has a large membranous dorsal base. Female terminalia (fig 53) with weakly up-turned apex of proctiger and with weakly angular ventral margin of subgenital plate. Measurements and ratios see tab. 1.

Egg (fig 57). Shorter than in *C. flavipennis*, rounded basally and tapering apically. Apical filament short.

Fifth instar larva (figs 61, 63). Humeral lobe relatively short, anterior margin not reaching middle of the lateral eye margin. Ventral surface of the abdomen level with the circumanal ring near margins with relatively blunt microsculpture.

Bionomics. Monophagous on *Senecio integrifolius* on xerothermic loamy slopes on limestone rocks. The larvae live on the roots, oviposition takes place on inner side in the flower involucrum. The development of eggs is fast as the flowers mature and dessicate in a short period of time. The adult life span is short. Adults were observed from the 14.v.–20.vi. Occurs in low altitudes from 300–480 m a.s.l.

Craspedolepta sonchi (Foerster)

(Figs 9, 10, 21–24, 33, 34, 39, 44, 49, 54, 58)

Aphalara sonchi Foerster, 1848: 96. Lectotype ♀, Ireland: (leg. Haliday?), det. *picta* Löw (NHMV), here designated (examined).
Aphalara picta auct. nec Zetterstedt, 1828, p. p.

Material examined. Adults were examined from Belgium, Czech Republic, Finland, France, Germany, Ireland, Poland, Russia (Ural), Switzerland (MHNG, MMB; MNHB, NHMB, NHMV, ZMM).

Diagnosis. Adult. Forewing (figs 9, 10) whitish transparent, rarely with a few minute, hardly visible light brownish spots or brownish tinge apically; veins dark brown, sometimes with very narrow dark band on adjacent areas of membrane, sometimes with contrasting darker dots particularly apically. Some specimens from

Switzerland and Germany collected in first half of August (MHNG), and from North Ural (MMB) collected in second half of July, have pronounced brown spots in apical half of the forewings the brown colour of the veins being less prominent. Body ochreous slightly darker in old specimens, greenish in young specimens.

Head similar to that of *C. crispati*, in dorsal view, with anterior margin relatively weakly indented in the middle, sometimes forming small, indistinct tubercle on either half of vertex; antero-lateral margin of vertex dorsad of antennal insertion more or less straight. Surface spinules on forewing membrane (figs 21–24) finer than those of *C. flavipennis*, but coarser than those of the other species; spinules forming short undulating rows, shorter than those of *C. crispati* and sparser than those of *C. schaeferi*. Paramere (figs 33, 34, 39) smaller than in other West palaearctic species, with relatively slender stalk, antero-basal lobe moderately small and triangular; thumb-like antero-subapical process, in profile, short and slender, slightly further away from paramere apex than in *C. campestris* and much more than in other species, in dorsal aspect, strongly curved away from spoon-like portion leaving wide gap; dorsal sclerotised margin of spoon-like portion, which is very high, in profile, indistinctly angular; inner margin of spoon-like part, in dorsal view, strongly convex, postero-apical tooth short and robust. Distal portion of aedeagus (figs 44–49) with moderately large apical dilatation which has a small membranous dorsal base. Female terminalia (fig 54) with weakly up-turned apex of proctiger and with weakly angular ventral margin of subgenital plate. Measurements and ratios see tab. 1.

Egg (fig 58). Moderately elongate, narrowly rounded basally, strongly tapering apically. Apical filament short.

Fifth instar larva see Ossiannilsson (1992).

Comments. For stabilising the nomenclature in the *C. flavipennis* complex a lectotype of *Aphalara sonchi* is designated here. The lectotype corresponds to the interpretation of Klimaszewski (1961), a concept currently used in the literature.

Bionomics. Recorded from several asteraceous hosts but confirmed only from *Leontodon autumnale* and *L. hispidus*. Lives on mesic meadows and edges of fields which may be more xeric. The host plants flower during a relatively long period of time, in July–August, and adults were collected between the end of June until the middle of September. The typical wing colour occurs in older specimens, in August–September, insects from the beginning of July have a more ochreous wing colour and not very dark veins. In Czech and Slovak Republics the species lives mostly in submontane biotopes, but was collected from 260 to 1850 m a. s. l. In Switzerland it goes up to the upper subalpine zone at around 2000 m a. s. l.

BIOLOGY

All the members of the *C. flavipennis* group are univoltine. Soon after emergence, which usually takes place on the lower portions of the host plants (leaves or stems), the adults migrate up the plant to the stem near the flower buds or flowers. There, the adults aggregate, and copulation takes place. The first adults appear when the first flower buds start opening; they never oviposit in flower buds and the peak of adult frequency is reached when most flowers are open. Eggs are laid on the leaf surface inside the flower involucrum, alone or in groups of 2–4. They are positioned perpendicularly or weakly inclined on the concave surface of the involucrum. In *C. crispati* and *C campestris*, the egg maturation in the ovaries is completed in a relatively short period (see table 4). This may be the result of short availability of living involucral leaves, which die off with seed maturation. The hatching must always

Table 4. Phenological observations and altitudinal range of four *Craspedolepta* spp. in the Czech Republic.

	C. flavipennis	*C. crispati*	*C. campestris*	*C. sonchi*
First hibernated larva	10.vi.–9. vii.	11.v.	14.v.	?
first imago	16.v.–17.v.	3.v.	14.v.	(28.iv.?) 14.vii.
first copulation	6.vi.	4.v.	14.v.	26.vii.
first eggs in ovaries	17.v. unripe 2.vi.ripe	16.v.	14.v.	23.vii. unripe 9.viii. ripe
first oviposition	?vi.	v.	v.	viii.
last imago	31.viii.? 30.ix.	19.vi.	20.vi.	10.ix.
first instar larva occurrence	? (2.x.-L1–L4)	9.vi.	8.vi.	?
population maximum	25.v.–15.viii.	3.v.–19.vi.	14.v.–20.vi.	22.vii.–10.ix.
altitudinal range m a.s.l.	150–1950	510–685	300–480	260–1850

take place before the appearence of ripe seeds on the host plant. The hatching of larvae of *C. campestris* and *C. crispati* were observed on 8–9.vi.1982. First instar larvae walked on the involucrum, a few on the outer and many on inner surface, where they were sucking in addition to young soft seeds. Second instar larvae were there only rarely, they evidently migrate to the leave and plant base. Some second instar larvae were found under the leaf sheath suggesting a positive tigmotactic behaviour. Probably the third or fourth instar larva overwinters on the hypocotyle or on roots. On 10 July we found fourth and fifth instar larvae of *C. flavipennis* on roots of *Leontodon hispidus*. The fifth instar larva lives on roots and later on the lower leaves and moves up the plant stem only shorty before adult emergence. On 14 and 19 May we found 13 exuvia of fourth and fifth instar larvae of *C. campestris*, and on 11 and 23 May fifth instar larvae of *C. crispati*.

The phenology of four species was studied in detail in the Czech Republic (table 4). Adults of *C. flavipennis* occur from the second half of May to August; the

period of adult emergence stretches over a very long period, probably reflecting the association of the species with very different biotopes. The host plant, *L. hispidus*, is flowering during a long period of time. The appearance of the first adults of *C. flavipennis* in low elevations coincides with that of *C. crispati* in high elevations, whose adults occur very early in the year, i. e. in the first half of May. *C. campestris* is similar to the latter with adult occurence in the second half of May and June. Adults of *C. sonchi* live mostly in the second half of July to August but also in the first half of September, when those of the other species have already died off.

A number of asteraceous plants has been mentioned in the literature as host plants of both *C. flavipennis* and *sonchi*, however, confirmed records are scarce. Löw (1880) bred *C. flavipennis* on *Leontodon hispidus* L. spp. *hastilis* (L.) Rchb. Our larval material of this species comes only from *Leontodon hispidus* (numerous observations and breedings by us and I. Malenovský). Adult *C. schaeferi* were collected on *Senecio helenitis* (L.) Sch. & Th. and flower heads of *Aster alpinus* L. but no larvae have been found. *C. crispati* and *C. campestris* are probably restricted on *Senecio crispatus* DC. and *Senecio integrifolius* (L.) Clairv. (= *S. campester* (Retz.) DC.) which are both confirmed by larval material. Larval *C. sonchi* finally were collected in Scandinavia exclusively on *Leontodon autumnalis* L. (Ossiannilsson, 1992) which is confirmed by our observations. In the Czech Republic we observed adults of *C. sonchi* sucking and ovipositing also on *L. hispidus*. *C. crispati* and *C. campestris* seem to be restricted to *Senecio crispatus* and *Senecio integrifolius* respectively. *C. flavipennis* occurs in a wide range of biotopes and is most probably monophagous on *Leontodon hispidus*. The host of *C. schaeferi* is so far unknown.

The habitat preference of the species studied agrees with those of their host plants. *C. flavipennis* is a species with little habitat specialisation ranging from steppic to montane meadows, xero-thermophilous to mesophilous occuring from low to high elevations (in Slovakia from 100–1800 m a.s.l.). In the Czech Republic *C. crispati* is associated with water logged meadows, mostly Sphagnetum, around ponds and springs in montane elevations of 400–700 m a. s. l. The species is hygrophilous or psychrophilous. *C. campestris* lives in Southern Moravia on relatively deep loess soils adjacent to limestone rocks in extremely xero-thermophilous biotopes at 300–480 m a. s. l. *C. sonchi* occurs in mesophilous or psychrophilous meadows, in Central Europe in colline to submontane elevations, in Northern Europe also in the lowlands.

TAXONOMIC AND PHYLOGENETIC CONSIDERATIONS

Within the large Holarctic genus *Craspedolepta*, the *C. flavipennis* group is defined here on the basis of the large body size, the broadly rounded forewings, the presence of a large antero-basal lobe in the paramere, the relatively compact apical dilatation of the distal segment of the aedeagus, bearing a very or moderately small membranous dorsal base, and the angular ventral margin of the female subgenital plate. The group is probably monophyletic and some of the characters mentioned above may constitute autapomorphies. In addition to the five West Palaearctic species whose adults can be identified with table 3, the group contains several East Palaearctic (*Craspedolepta baranuurti* Klimaszewski, 1971, and *Crasp. bugijina* Klimaszewski, 1968 from Mongolia, *Cerna numrehi* Klimaszewski, 1982, from Mongolia and Siberia, *Crasp. flavimaculata* Li, 1992 from China, as well as *Crasp. flava* Kuwayama, 1907, and *Crasp. hiurai* Miyatake, 1964, from Japan) and Nearc-

tic (*Craspedolepta fuscipennis* (Patch)) species. The taxonomic state of the East Palaearctic species is difficult to assess, as the examined material is far too incomplete. We have seen type material only of *Craspedolepta numrehi* (Klimaszewski, 1982), comb. nov. (from *Cerna*) which differs in the paramere shape from the West Palaearctic species. There is currently a single species, *C. fuscipennis* (Patch), stat. rev., described from the Nearctic region, but material in the MHNG suggests that there are at least two. *C. fuscipennis* differs in the forewing pattern and male paramere strongly from *C. sonchi*, with which it has been synonymised by Journet & Vickery (1979).

Based on adult morphology and anatomy *Craspedolepta* s. l. is split by some European authors (Klimaszewski 1983; Ossiannilsson 1992; Conci et al. 1993) into several genera. Also egg and larval characters vary within the genus, however, little is known about the significance of these characters. Loginova (1979) classified the eggs into several types, those of *Craspedolepta* corresponding to type II, subtype 2. This classification is based on a typological concept and is, therefore, of little phylogenetic significance. Whereas the monophyly of *Craspedolepta* s.l. is probable, that of the proposed subdivisions is not, obviously excepting monotypic taxa. Introducing monotypic genera and subgenera, however, renders the rest paraphyletic. For this reason, *Tetrafollicula* and *Neocraspedolepta* are rejected. Slightly more complicated is the situation of *Magnaphalara* which was erected by Ramírez Gómez (1960) for *Aphalara picta* auct. nec Zetterstedt, 1828. In accordance with article 70.3.2 of the Code (ICZN, 1999), the taxonomic species involved in the misidentification is chosen here as type species, i. e. *Aphalara flavipennis* Foerster, 1848. The latter is also type species of *Cerna* Klimaszewski which becomes a junior objective synonym of *Magnaphalara*. This fact has been pointed out by Burckhardt (1983). As indicated above it is probable that the *C. flavipennis* group is monophyletic. The closest relatives of the group may be the *C. nervosa* group, the *C. subpunctata* group or another group rather than the remainder of *Craspedolepta* s. l. together. Removing the *C. flavipennis* group into *Magnaphalara* would thus render the rest artificial. Ossiannilsson (1992) included *C. nervosa*, *sonchi* and *nebulosa* in *Craspedolepta* (*Magnaphalara*) but assigned *C. subpunctata* to *Neocraspedolepta*. There are no convincing synapomorphies supporting this classification either for which reason it is rejected.

MATING EXPERIMENTS

Mating experiments were made between the 30.v.1982 and 18.vi.1982. On 6.–8.vi. eight males of *C. campestris* and 20 females of *C. flavipennis*, as well as 40 males of *C. flavipennis* and 20 females of *C. campestris* were bred together on *Senecio integrifolius* and *S. crispatus* respectively. On 15.–18.vi. the breedings were repeated with about 100 specimens of both sexes of *C. flavipennis*, 5 males and 16 females of *C. campestris* and around 10 males and 10 females of *C. crispati*. *C. flavipennis* all died on these plants within 3 days. There were no matings between *C. flavipennis* and the other two species but many interspecific matings of all three species could be observed.

Another experiment was made on 30.v.1982: 20 ♂ of *C. campestris* and 20 ♀ of *C. crispati* were put together on *S. integrifolius* and an identical experiment with inversed sex of both species. Intraspecific matings were observed only during a very short time: during the first and second day of the experiment only 3 matings of male *C. campestris* with female *C. crispati* and one mating vice versa could be observed.

In the control where males and females of the same species were put together, much more specimens were in copula than were alone. There were many attempting copulation with other males.

On 9.vi.1982 of intraspecific mating of *C. campestris* and *C. crispati*, with around 10 specimens of each species and sex in both combinations were tested. Short after installing the experiment one copula of a *C. crispati* male with a *C. campestris* female was observed; a second copula a *C. campestris* male with a *C. crispati female* take place on 11.vi.1982. At the same time interspecific copulations in control were numerous. Both species can survive several days on the host plant species of other species.

Copulation between *C. crispati* and *C. campestris* is therefore exceptionally possible, but it is unlikely that they can produce hybrid offsprings, as adults generally copulate many times. Neither of the two species cross with *C. flavipennis*. Experiments with *C. sonchi* were not possible as this species occur much later in the year than the other ones.

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