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Structural and systematic review of *Gephyraulus* Rübsaamen (Diptera, Cecidomyiidae, Oligotrophini) with description of *G. moricandiae* sp. n. from Tunisia

ABSTRACT — The genus *Gephyraulus* Rübsaamen, 1915, is here redescribed. In addition to the type species, *G. raphanistri* (Kieffer), two species have been assigned to this genus: *G. diplotaxis* (Solinas), here transferred from *Paragephyraulus* Solinas, 1982, and *G. moricandiae* sp. n. In particular, the genus is characterized by the shape of the female uromeres VII and VIII, together forming (in resting position) a conspicuous swelling containing most of the muscles for the regulation of the movements of the ovipositor. The three species constitute a distinct monophyletic group as indicated by obvious synapomorphies. All these species display a common behaviour as flower bud gall-makers on cruciferous plants.

Key words: Cecidomyiidae, *Gephyraulus*, functional anatomy, taxonomy, phylogeny.

CONTENTS

1. INTRODUCTION

RÜBSAAMEN (1915) established the genus *Gephyraulus* indicating as a peculiar feature: «die obere Lamelle der Legeröhre des ♀ kurz; das letzte Glied oberseits mit einer Chitinspange, die sich bis über die Mitte der Lamelle hinzieht». He

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erected this genus only for one species, originally described by kieffer (1886) under the name *Cecidomyia raphanistri*. Later Kieffer himself (1913) transferred this species to *Perrisia* Rondani (= jun. syn. of *Dasineura* Rondani) though indicating as exceptional the structure of the ovipositor tip: «l'appendice porte dorsalement une bande mediane chitineuse, élargie en arrière». Rübsaamen and Hedicke (1925-1939), in their system, placed *Gephyraulus* and *Dasineura* in different tribes. However, Möhn (1955), in a review of larval characters, brought *Gephyraulus, Dasineura* and some other genera together in a group that he called «die *Dasyneura* Gruppe».

SOLINAS (1982) erected the genus *Paragephyraulus* for a new species (*P. diplotaxis* Solinas, 1982) inticating, by the choice of this name, a position close to *Gephyraulus*. He found that *Paragephyraulus*, when compared with the original and successive descriptions of *Gephyraulus*, deviates with regard to the structure of the ovipositor tip (urotergite X). Furthermore he noticed that the last instar larva of *P. diplotaxis* displays a papillary pattern quite different from that reported for *Gephyraulus* (cf. MÖHN, 1955).

However, continued studies, fortunately made possible by recently obtained material suitable for comparative examinations, have revealed additional structural characters of the adults useful for a better definition of *Gephyraulus*. As a result of these studies three species have been here assigned to *Gephyraulus*, viz. *G. raphanistri* (Kieffer), *G. diplotaxis* (Solinas) (*Paragephyraulus* thus considered a syn. n. of *Gephyraulus*), and *G. moricandiae* sp. n.

The studies presented below deal with work done by E.S. and M.S. in close cooperation, except for section 3.3 that is based on investigations by M.S., and section 3.4 whose responsibility lies with E.S.

2. METHODS, SPECIMENS EXAMINED, EXPLANATION OF SYMBOLS

Adults were reared in the laboratory from larvae collected on respective host plants. All adults, pupal skins and larvae intended for examination were preserved in 70% alcohol. For observations of functional anatomy, specimens were fixed in Carnoy's fixative, dehydrated in ethanol and embedded through xylene in Canada balsam for whole mounts, and in paraffin wax for histological investigations. Sections were stained with Aurantia and Carazzi's haematoxylin. For observations of external morphology specimens were either mounted in Faure's chloral hydrate medium (pulverized gum arabic 30 g, chloral hydrate 200 g, glycerol 20 g, distilled water 50 ml) or fixed, cleared and mounted according to GISIN'S method (1960). In analysing the structures Zeiss microscopes equipped with interference and phase contrast optics were used.

Specimens examined

The specimens mentioned below were mounted in Faure'a chloralhydrate medium or (pupal skins of *G. diplotaxis*) according to GISIN'S method. All specimens are included in the cecidomyiid collection of the Swedish Museum of Natural History, Stockholm.

G. raphanistri (Kieffer). 4 adult females and 2 adult males, all reared from larvae collected on *Raphanus raphanistrum* in France, Sarthe, Thorée, 24.VIII.1952, *leg.* R. COUNTIN; 2 adult females, 1 adult male, 2 pupal skins, and 8 mature larvae; all collected in the larval stage on *R. raphanistrum*, Medeira, Funchal, Punta da Cruz, 9.XII.1984, *leg.* D. BORISCH.

G. diplotaxis (Solinas). 6 adult females, 6 adult males, 2 pupal skins, and 6 mature larvae, all collected in the larval stage on *Diplotaxis muralis* in Italy, Bari, most of them 21.IX.1971, *leg.* M. SOLINAS.

G. moricandiae sp. n. Holotype: Adult female reared from larva collected on *Moricandia arvensis* in Tunisia, Sousse, 22-XI-1984, *leg.* E. SYLVÉN, slide no 6287. Paratypes: 12 adult females, 5 adult males, 8 pupal skins, and 6 mature larvae; host plant, locality et cetera as above.

Explanation of symbols used in the figs.:

AA	apodemal arms
AE	aedeagus
ANP	anal papilla
AR	arculus
AVP	anterior ventral papilla
CS	cephalic seta
D	musculi dorsales
DI	diaphragm
GC	gonocoxite
GF	genital funnel
GS	gonostylus
H	hemolymph
IL	inferior lamella
L	musculi laterales
LB	labrum
LG	mediobasal lobe of gonocoxite
MS	macrospines
PH	prothoracic horn
R5	radial wing vein 5
SA	sternal apodeme
SL	superior lamella
SLB	sheath containing labrum
ST	sternite
TA	tergal apodeme
TG	tergite
V	musculi ventrales
VII-X	uromeres

TAB. 1 - Measurement data. - *Adults:* LW = arculus - wing apex distance. RW = arculus - R5 distal point distance. BW = breadth of wing as indicated by straight line perpendicular to and crossing centre of arculus - wing apex straight line. MB = maxillary bulbus length. NE/NO III, NE/NO V, NE/NO VII = neck length/node length of male flagellomere III, V, and VII respectively. OV = ovipositor (uromeres IX and X) length. - *Mature larva*: LL = flattened skin length. BL = flattened skin breadth. IPP = seta length on inner pleural papilla of metathorax. DP = seta length on dorsal papilla of uromere VIII.

	Expressed	*G. raphanistri*			*G. diplotaxis*			*G. moricandiae*		
	in	n	Range	Mean	n	Range	Mean	n	Range	Mean
LW, ♂	mm	3	1.5-1.6	1.5	6	1.3-1.5	1.5	3	1.6-1.8	1.7
LW, ♀	mm	6	1.2-1.6	1.4	6	1.3-1.5	1.4	10	1.3-1.7	1.5
RW/LW, ♂ + ♀	%	9	91-94	93	12	92-94	93	13	93-95	94
BW/LW, ♂ + ♀	%	9	42-46	44	11	41-44	42	13	40-43	42
MB/LW, ♂ [1]	‰	3	11-21	15	6	6-9	7	3	12-15	14
MB/LW, ♀ [1]	‰	6	14-19	16	6	7-11	9	10	10-18	13
NE/NO III	%	3	70-79	76	6	68-102	75	5	78-90	83
NE/NO V	%	3	91-93	92	6	77-96	89	5	87-98	92
NE/NO VII	%	3	100-111	106	6	93-100	96	5	94-108	99
OV/LW	%	6	22-26	24	6	32-36	32	9	20-24	21
LL	mm	8	2.1-3.0	2.5	6	2.0-2.4	2.2	6	2.8-3.2	3.0
BL/LL	%	8	31-44	37	6	33-36	35	6	31-33	32
IPP/LL	‰	6	7-9	8	6	5-10	8	6	7-9	8
DP/LL	‰	6	9-10	10	6	8-11	9	6	9-10	10

[1] For ♂ + ♀ the means and their 99% confidence limits referring to 1000 MB/LW are as follows:

3. RESULTS AND DISCUSSION

3.1 - Descriptive survey

3.1.1 - Redescription of *Gephyraulus* Rübsaamen, 1915

Adult. - Eye bridge 3-5 facets broad. Antenna ususally with 13-14 and 12-13 flagellomeres in male and female, respectively. Flagellomeres I and II fused. Circumphila appressed in both sexes, not reticulate. Necks of flagellomeres long in male (Table I), very short (< 0.1 node length) in female. Palpus 4-segmented, furnished with both setae and scales; segment I shortest, segment IV longest. Maxillary bulbus (= term here proposed for a swelling closely at the rear of segment I of palpus) well-defined. Labial lobes and labrum (Fig. 1) prolonged compared with corresponding structures in *Dasineura sisymbrii* (Schrank) (Fig. 1, d) and most other *Dasineura* species. Claws toothed. Empodium about as long as or somewhat longer than claws. Wing (Fig. 2): R_5 straight, joining C anterior to apex. C with a break just beyond insertion of R_5. For length of arculus to wing apex, arculus to distal point of R_5, and breadth of wing see Table 1. Male abdomen: each of tergites I-VI with unbroken caudal row of setae. Sclerotized portion of tergite VII about or almost as broad as that of tergite VI, without caudal row of setae but with a group of irregularly placed setae on each longitudinal half. Tergites II-VI densely covered with narrow scales (Fig. 6, c). Pleurae I-VI with elongate, setiform scales. Sternites II-VIII each with two transverse bands of setae (few if any scales). Terminalia (Fig. 7) with superior lamella bilobed, inferior lamella either not incised or bilobed at the tip. Gonocoxite with conspicuous mediobasal lobe sheathing aedeagus. Gonostylus in dorsal and ventral aspect bent with distal half tapering. Almost entire gonostylus covered with microtrichia. Gonostylus length about half or somewhat less than gonocoxite length. Female abdomen: uromeres I-VI as described above for male. Uromeres VII-VIII highly specialized, intimately connected, together forming (in resting position) a dorsoventrally flattened, otherwise spindle-shaped body (Figs. 3 and 10). Of the two tergites included in this body, the posterior one (tergite VIII) with a pair of strong apodemal arms projecting forwards. For further information (internal structure and function) of the said body (for which the term «preovipositor functional unit» is here proposed) see below (section 3.3). Ovipositor (Fig. 5), i.e. uromeres IX and X, short (Table 1), protrusible. Superior lamella quite sclerotized and having dorsally near the tip a structure obviously reported for no other Oligoytrophini members, viz. a well-defined, oval, somewhat depressed area furnisched with several sensory setae.

Pupa (Fig. 7, d). - Face without protuberances. Base of antennal sheath with a minute tooth. One pair of cephalic setae, each seta about as long as or somewhat

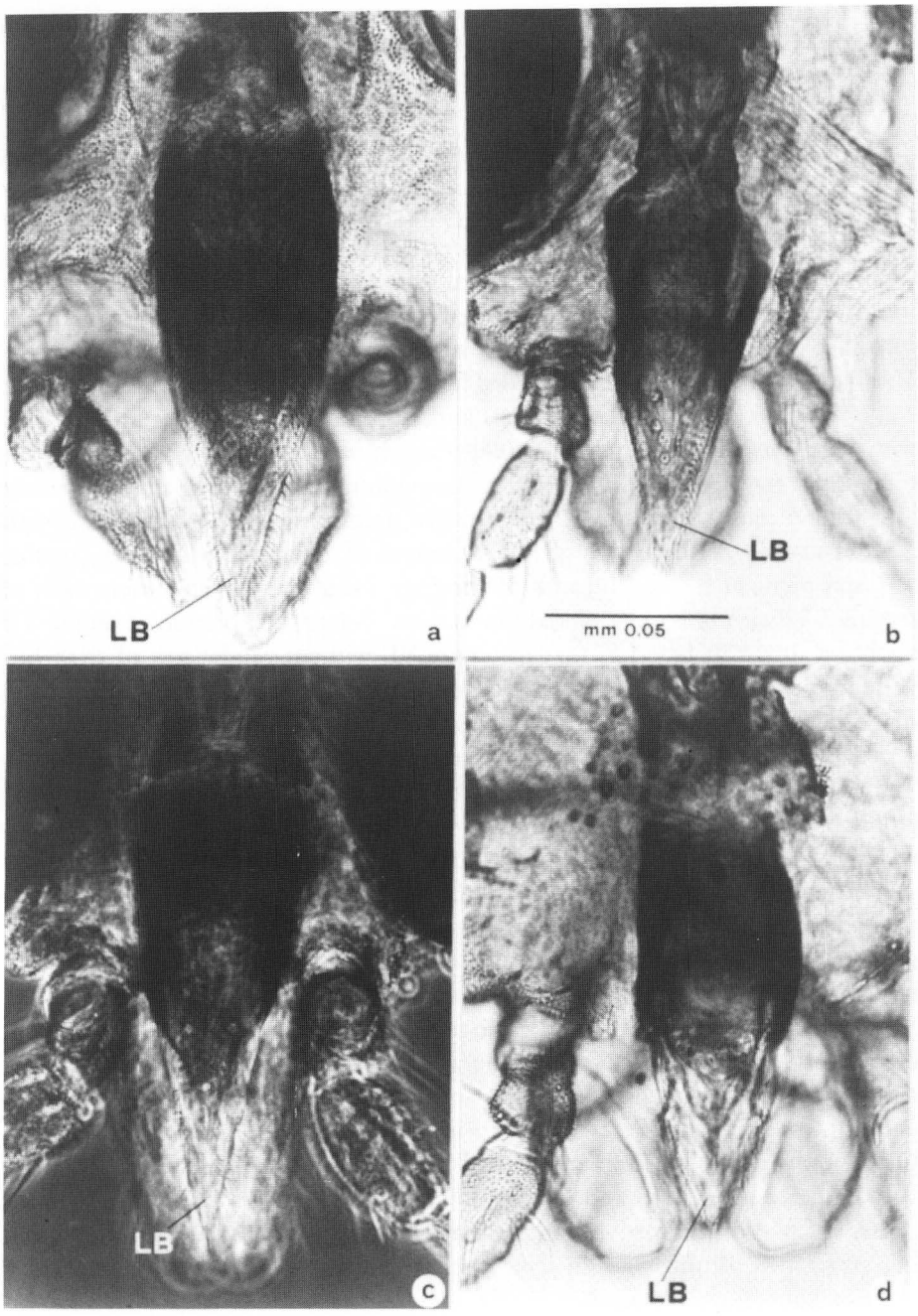

Fig. 1 - Cephalic aspect of female mouth parts of: a) *G. raphanistri*; b) *G. diplotaxis*; c) *G. moricandiae*; d) *Dasineura sisymbrii*. (All at same magnification).

longer than face. Sheath containing labrum elongate (reflecting prolonged labrum in the adult, cf. above). Prothoracic horns slender, more or less bent, tapering from base to tip, length about half that of face. Abdomen largely covered with

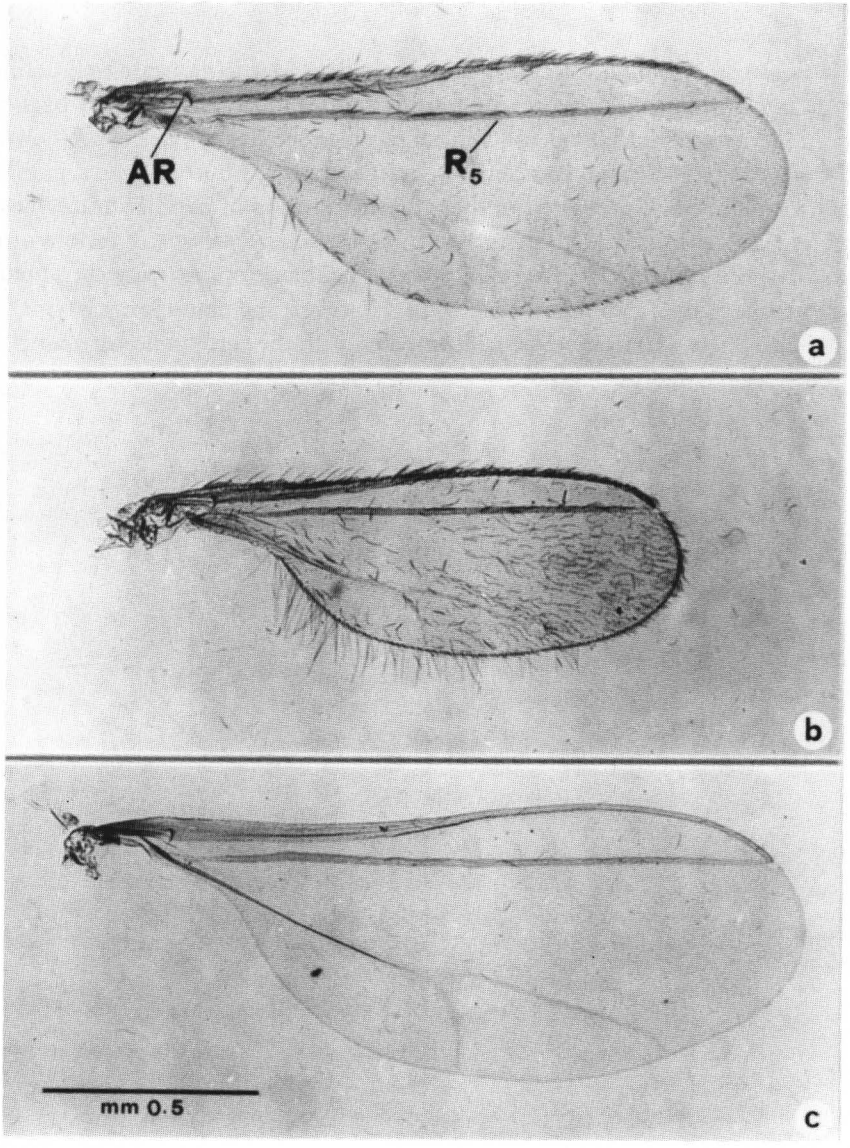

Fig. 2 - Female wing of: a) *G. raphanistri*, b) *G. diplotaxis*, c) *G. moricandiae*, (All at same magnification).

two types of spines: microspines, macrospines (Fig. 7). Macrospines exclusively on urotergites II-VIII and only in three or four cross rows on the anterior half of each uromere. Urotergite VII bearing 6 papillae with seta and several papillae without seta. For length of flattened skin (in *G. moricandiae*) see below (section 3.1.2).

Mature larva. - Ground colour white. Spatula (Fig. 8) with elongate well-defined shaft but with small, usually broadly rounded lobes in front, separated by weak incision. For number of lateral and ventral papillae see below (sections 3.1.2 and 3.1.3). Number of terminal papillae 6-8, each with seta, number of anal papillae 2-4, all without seta. Otherwise number and distribution of papillae and setae on thorax and abdomen basically the same as in *Dasineura sisymbrii* and various other *Dasineura* species (cf. Fig. 5 in SYLVÉN, 1975). The mamelons carrying the anterior ventral papillae salient, spherical (Fig. 9, a). However, the mamelons carrying the anal papillae (Fig. 9, b) relatively small compared with the corresponding mamelons

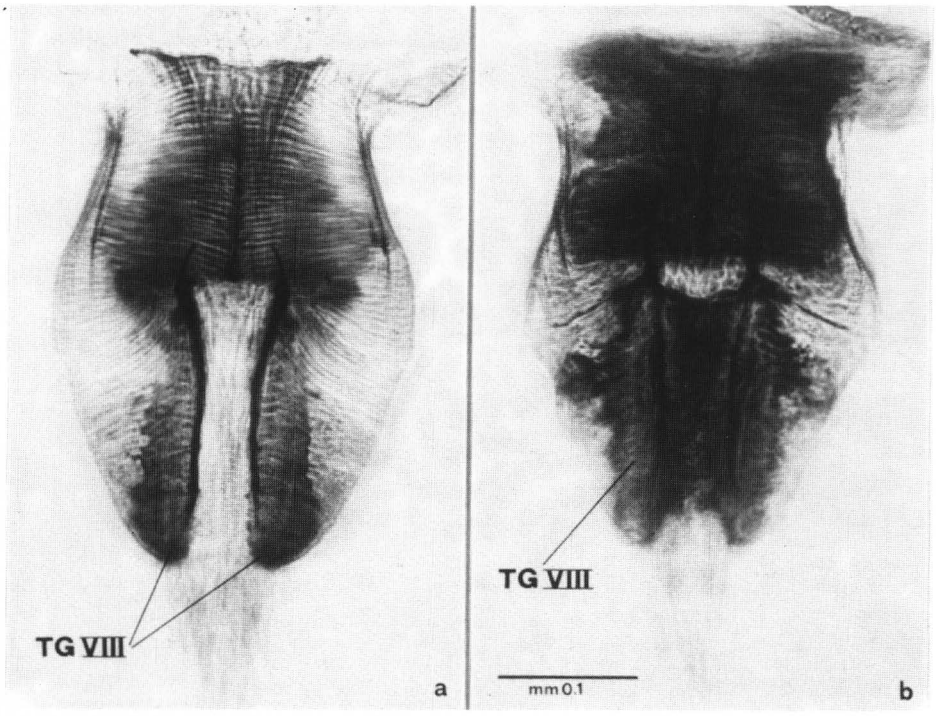

Fig. 3 - Dorsal aspect of «preovipositor functional unit» of: a) *G. raphanistri*; b) *G. moricandae*. (Both at same magnification).

in many *Dasineura* species. Otherwise most of skin shagreened, the cuticular pattern including transverse rows of elliptical, pointed verrucae on the anterior part of each of the urosternites I-VII (Fig. 9, a). For length and breadth of flattened skin, and length of certain setae see Table 1.

Life habits. - The respective host plants (see below) of the three species here assigned to *Gephyraulus* all belong to Cruciferae. The larvae of each species feed gregariously in flower buds which remain closed and become swollen. Pupation occurs in the soil. There is more than one generation a year.

Type species (by original designation) *Cecidomyia raphanistri* Kieffer, 1886.

3.1.2 - Description of *Gephyraulus moricandiae* sp. n.

Adult. - Distal half or more of male inferior lamella consisting of a pair of narrow lobes (Fig. 7, b). Sclerotized portion of female urosternite VII (Fig. 4, c, c')

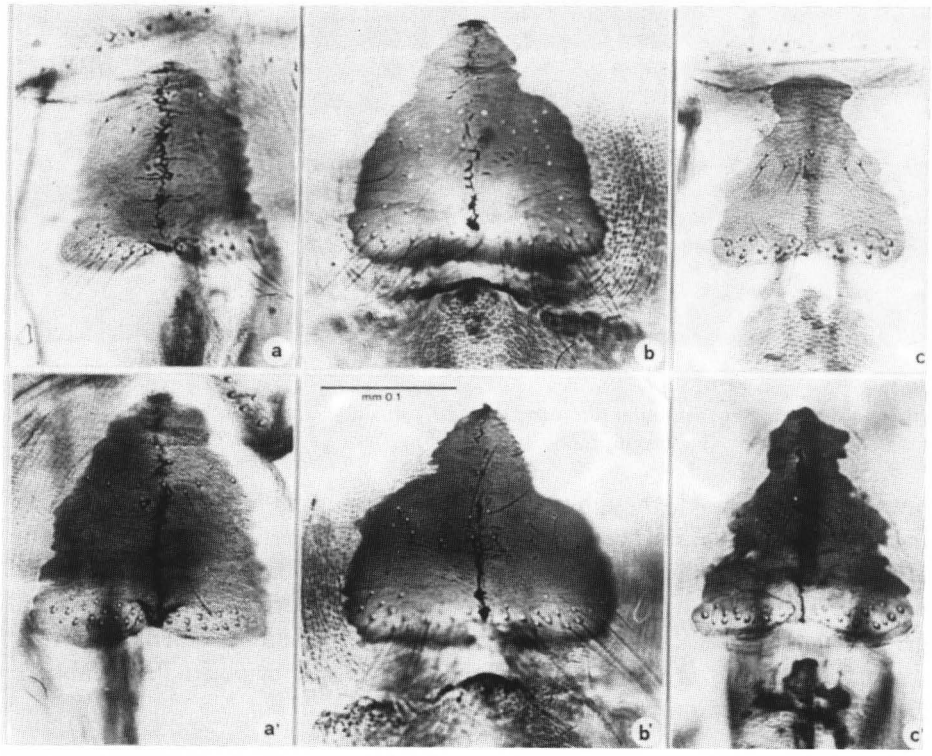

Fig. 4 - Urosternite VII in females of: a, a') *G. raphanistri*; b, b') *G. diplotaxis*; c,c') *G. moricandiae*; (All at same magnification).

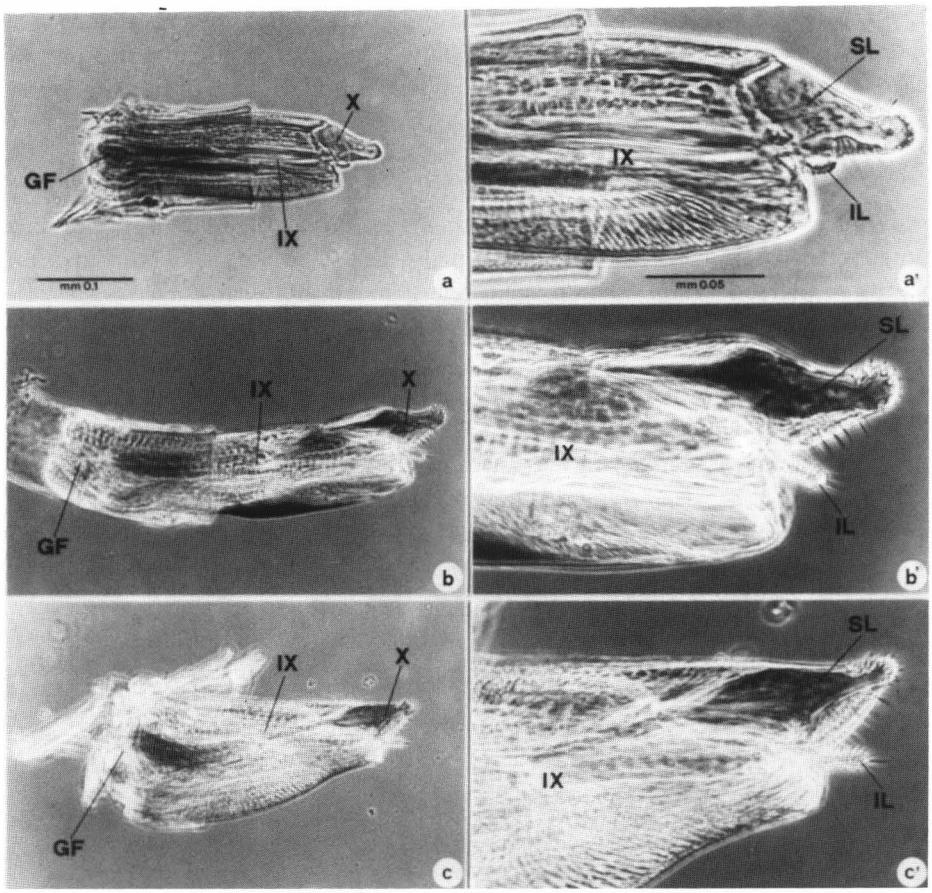

Fig. 5 - Lateral aspect of ovipositor (uromeres IX and X) of: a,a') *G. raphanistri*; b,b') *G. diplotaxis*; c,c') *G. moricandiae*; (b,c magnification as a; b', c' as a').

reversed heart-shaped, though (in available specimens at least) somewhat wider in front than just behind. Female urotergite VIII almost entirely sclerotized (Fig. 3, b). Ovipositor in lateral aspect tapering (Fig. 5, c). For shape of labrum and wing see Figs. 1, c and 2, c respectively. For shape of scales on urotergites and general appearance of male terminalia see Fig. 7. For measurements of certain distances referring to wing, male flagellomeres, and ovipositor see Table 1. Otherwise see text above (section 3.1.1).

Pupa. - Length of flattened skin 2.0-2.3 mm (n = 5). Otherwise see Fig. 7 and section 3.1.1.

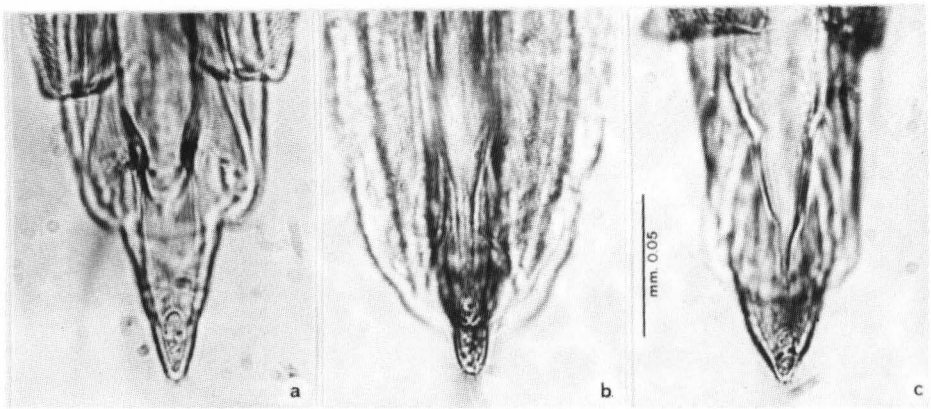

Fig. 6 - Ovipositor posterior portion dorsal aspect (subapical depressed area in focus) of: a) *G. raphanistri*; b) *G. diplotaxis*; c) *G. moricandiae*. (All at same magnification).

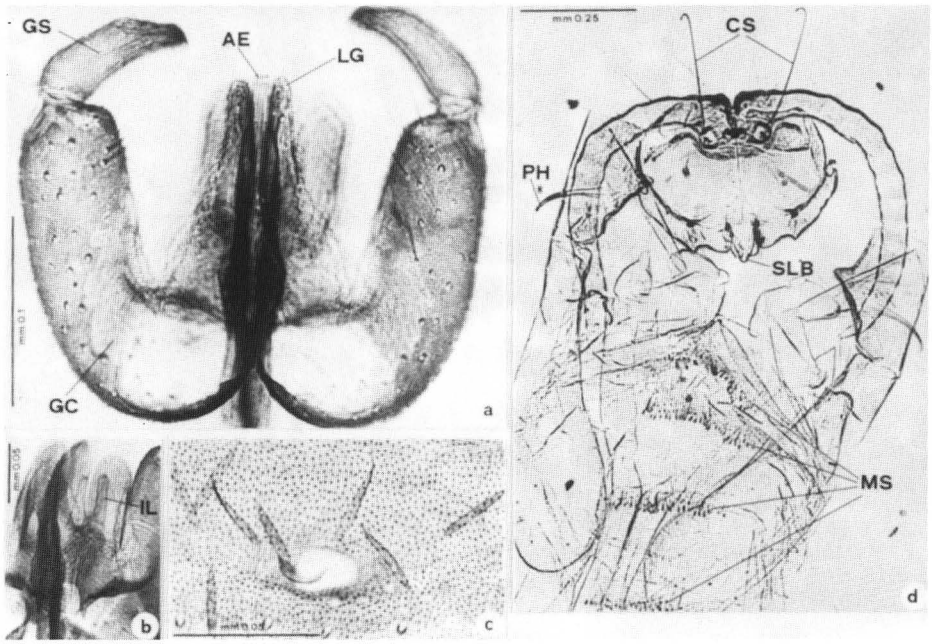

Fig. 7 - *G. moricandiae* sp. n.: a) ventral aspect of male terminalia; b) optical section of ditto showing inferior lamella; c) scales on a female urotergite; d) pupal skin.

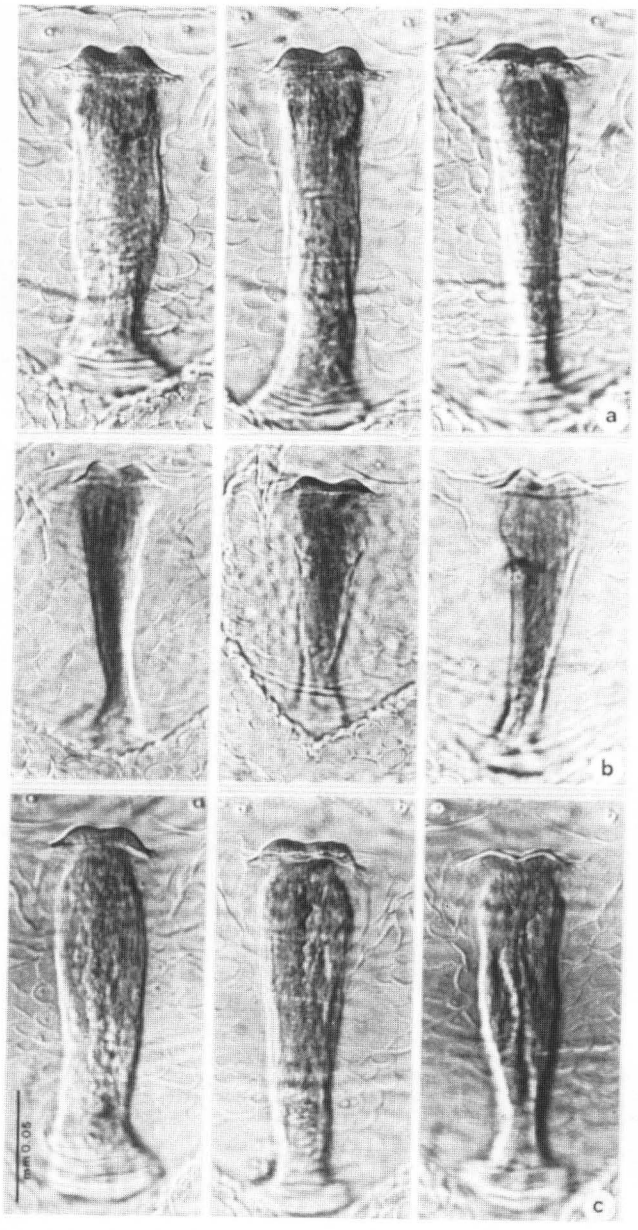

Fig. 8 - Spatula of last instar larva in specimens of: a) *G. raphanistri*; b) *G. diplotaxis*; c) *G. moricandiae* (All at same magnification).

Mature larva. - For shape of spatula see Fig. 8, c. Number of lateral papillae normally not reduced, i.e. either longitudinal half of each thoracic segment with three inner and three outer later papillae, in each group two papillae with minute seta, one papilla without seta. uromeres I-VII each with four anterior ventral papillae without seta and situated separately on well-defined mamelons (Fig. 9, a). Uromere VIII with four ventral papillae, all with seta. Uromere IX with 6-8 terminal papillae. Uromere X with 2-4 anal papillae situated on more or less irregularly shaped, usually elongate mamelons (Fig. 9, b). For cuticular pattern on anterior part of urosternite VII see Fig. 9, a. Otherwise see above (section 3.1.1).

Host plant. - *Moricandia arvensis* (L.) DC.

Life habits. - See above (section 3.1.1).

Holotype and paratypes. See above (section 2).

3.1.3 - Distinguishing characters on species level

1. - Ovipositor (uromeres IX and X) length about 1/3 of wing distance from arculus to apex (Table 1). Female uromere IX roughly cylindrical (Fig. 5, b). Female urosternite IX strongly sclerotized (Fig. 5, b). Female urotergite VIII partially membranaceous along medial longitudinal line (Fig. 10, a). Female urosternite VII with posterior margin straight or almost straight (Fig. 4, b, b'). Male inferior lamella distally without emargination or weakly bilobed, in latter case each lobe much less than half as long as the entire lamella (cf. Fig. 10 in SOLINAS, 1982). Mature larva with number of lateral papillae reduced (on either longitudinal half of each thoracic segment three outer lateral papillae, two with minute seta and one without, and only one inner lateral papilla, without seta and irregularly missing), also with number of ventral papillae reduced (anterior ventral papillae only two on each of uromeres I-VII; ventral papillae only two on uromere VIII) ..... *G. diplotaxis*

— Ovipositor length about 1/5 or 1/4 of wing distance arculus to apex (Table I). Female urosternite IX moderately sclerotized (Fig. 5, a, c). Female urosternite VII with posterior margin medially emarginate (Fig. 4, a, a', c, c'). Male inferior lamella bilobed, with each lobe narrow, at least half as long as the entire lamella (Fig. 7, b). Mature larva normally with number of lateral papillae not reduced (cf. above, section 3.1.2), nor with number of ventral papillae reduced, thus with four anterior ventral papillae on each of uromeres I-VII, and four ventral papillae on uromere VIII .....
..... 2

2. Female uromere IX roughly cylindrical (Fig. 5, a). Female urotergite VIII completely menbranaceous along medial longitudinal line (Fig. 3, a). Female superior lamella connected to uromere IX by a well-defined suture (Fig. 5, a') ..... *G. raphanistri*

— Female uromere IX in lateral aspect tapering (Fig. 5, c). Female urotergite VIII almost entirely sclerotized (Fig. 3, b). No well-defined suture connecting female superior lamella to uromere IX (Fig. 5, c') .... *G. moricandiae*

Note: Possibly the above-mentioned difference in the shape of the male inferior lamella between *G. diplotaxis* and the remaining two species will not be consistent when more specimens are examined. However, another feature, not mentioned in the above survey, might be of interest for identifying the adult males. Thus, the maxillary bulbus shows a tendency to be relatively smaller, in both sexes, in *G. diplotaxis* than in *G. raphanistri* and *G. moricandiae* (Table 1).

No characters separating the pupae of the three species have been detected thus far, but available material is not sufficient for a more thorough examination. Nor have structural characters been observed, clearly separating adult males and mature larvae of *G. moricandiae* from corresponding stages of *G. raphanistri*. Regarding mature larvae, many of the verrucae along the anal slit appear to be pointed in *G. moricandiae*, a feature not noticed in *G. raphanistri*. Whether there is a consistent difference of this kind between the two species remains to be investigated.

The ratios RW/LW and BW/LW, explained and discussed in Table 1, constitute useful tools for the separation of various oligotrophine species. However, in the present case these ratios show no differences between the species.

3.2 - Host plants and geographical distribution

For *G. raphanistri* the type host plant is *Raphanus raphanistrum* L. Host plant according to KIEFFER (1890) is also *R. sativus* L. Literature records (cf. BARNES, 1946; BUHR, 1964-1965) about other crucifers belonging to *Brassica, Sinapis*, and *Diplotaxis*, used by this midge as host plants, need verification.

For *G. diplotaxis* and *G. moricandiae*, so far, only *Diplotaxis muralis* DC and *Moricandia arvensis* (L.) DC respectively are known as host plants.

For *G. raphanistri* the type locality is Bitche in France. As shown above (section 2), specimens of this midge from another locality in France, as well as from Madeira, were examined in connection with the present study. In addition, occurrence of this midge on *R. raphanistrum* in several other European countries has been reported (cf. TAVARES 1905, 1921; HOUARD, 1908). Some of these records at least,

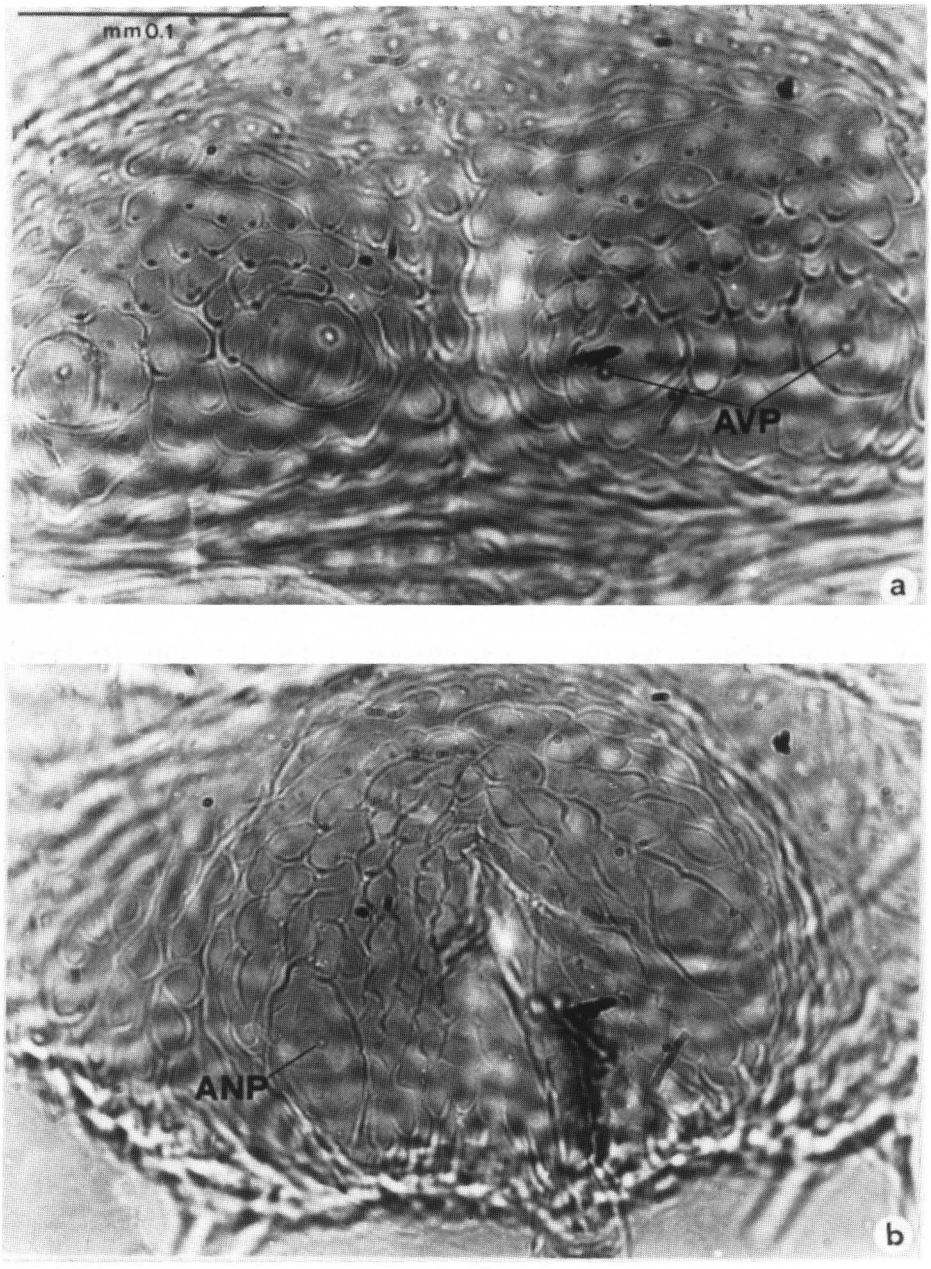

Fig. 9 - Last instar larva of *G. moricandiae*: a) detail of urosternite VII showing anterior ventral papillae and, in front of them, elliptical pointed verrucae; b) ventral aspect of hind part of body showing anal slit and papillae (Both at same magnification).

need verification. For instance, confusion with another gall midge, *Contarinia nasturtii* (Kieffer), might have been involved in several cases.

So far *G. diplotaxis* and *G. moricandiae* are only known from the type localities, viz. Bari in Italy and Sousse in Tunisia respectively.

3.3 - Preovipositor functional unit

In *Gephyraulus* the preovipositor functional unit referred to above and previously roughly described by SOLINAS (1982) for *G. diplotaxis* shows a remarkable shape, quite unusual in other Oligotrophini. Thus far in particular *Cystiphora* Kieffer we know exhibits something similar (especially as for function), even if a closer examination reveals clear differences also in this case. Moreover, the shape of the ovipositor in *Gephyraulus* is completely different from that in *Cystiphora*.

The preovipositor functional unit, i.e. uromeres VII and VIII connected to form (in resting position) a swollen body in *Gephyraulus*, is adapted for regulation of the movements of the ovipositor (uromeres IX and X). As below indicated by anatomical studies on *G. diplotaxis*, this unit contains in *Gephyraulus* a peculiar musculature, as follows (terminology according to SNODGRASS, 1935).

Musculi dorsales (Figs. 10, c; 11). In uromere VII they are scantly developed; they originate on the anterior margin of urotergite VII, and insert on the apodemal arms (Fig. 10, c) of urotergite VIII. In uromere VIII. on the other hand, they are well developed; here they originate on the above-mentioned apodemal arms (Figs. 10, c; 11, c), and insert on the ovipositor (uromere IX) as directional retractors of the same (Fig. 10, e, f).

Musculi ventrales (Figs. 10, d; 11). In uromere VII they are scantly developed; they originate on the anterior margin of urosternite VII, and most of them insert on the anterior margin of urosternite VIII (Fig. 10, d), whereas some attach to the ovipositor. In uromere VIII, they are well developed (Figs. 10, d; 11 e, f); they originate on the anterior margin of urosternite VIII, and partially on the posterior margin of urosternite VII (fig. 10, e); all of them insert ventrally on the oviopositor as directional retractors of the same (Fig. 10, f).

Musculi laterales (Figs. 10, 11). In both uromere VII and VIII they exhibit a showy development. Most of them are tergosternal and tergopleural in the anterior end of uromere VII (Fig. 11, a), and tergopleural, sternopleural and tergosternal in the rest of uromere VII (Fig. 11, b, c) and anterior end of uromere VIII (Fig. 11, d), thus all acting as compressors, whereas in most of uromere VIII (Fig. 11, e, f), these muscles laterally attach to pleurae and sternite, and medially to diaphragm (Fig. 11, DI), thus here acting as dilators. In other words, the said muscle arrangement makes the «preovipositor functional unit» work as a peristaltic pump whereby hemolymph fills preovipositor first, and then it is squeezed into

ovipositor with the pressure required for this to be protruded and introduced into the very tightly closed flower buds of the host plant.

3.4 - Phylogenetic aspects

The three species here assigned to *Gephyraulus* form a monophyletic group distinctly differing from all other known oligotrophine groups. The peculiar

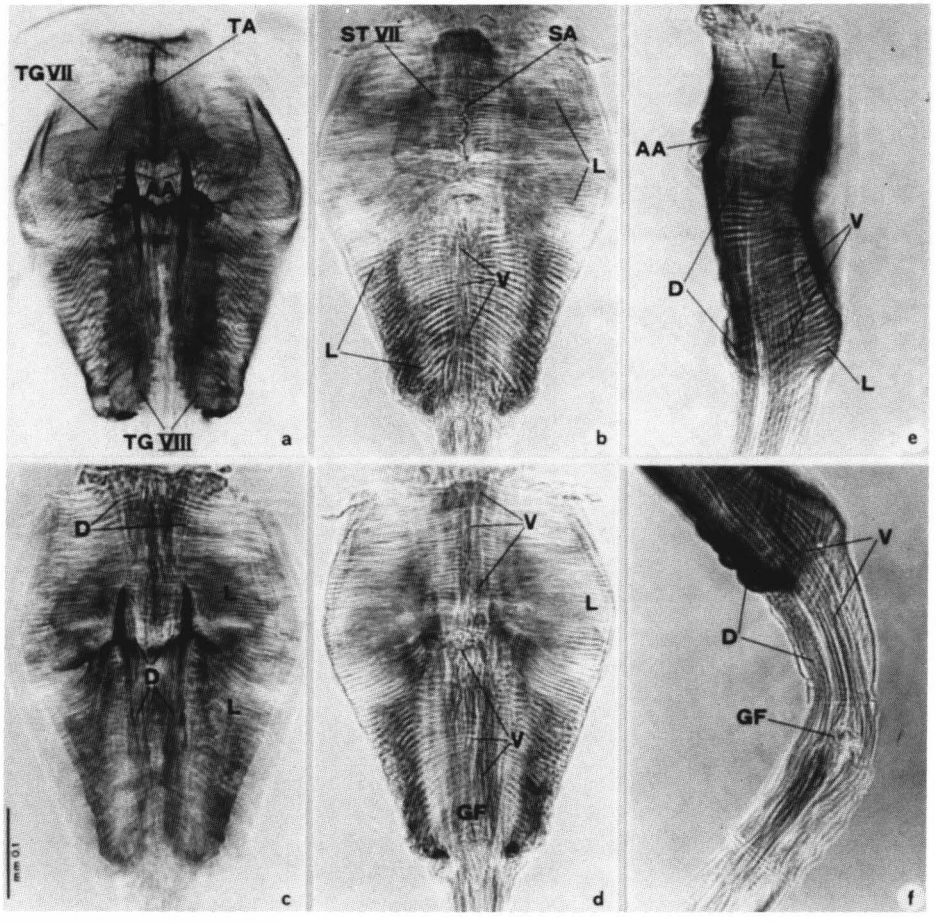

Fig. 10 - Preovipositor functional unit of *G. diplotaxis*: a) dorsal view; b) ventral view; c) optical frontal section showing musculi dorsales in focus; d) optical section with musculi ventrales in focus; e) optical sagittal section at the right dorsal apodemal arm level; f) ditto distal part (All at same magnification).

structure of the ovipositor and the highly specialized preovipositor functional unit constitute conclusive synapomorphous features. Moreover, there are other structural characters shared by the three species, not unique to the genus *Gephyraulus* but nevertheless of rare occurrence in other Oligotrophini. The prolonged labrum in the adults of both sexes costitutes such a character, as well as the uniform shape of the spatula with weak, usually broadly rounded lobes in the mature larvae. In addition, the above conclusions are supported by the habits of the three species, all of them causing flower bud galls, exclusively on cruciferous plants.

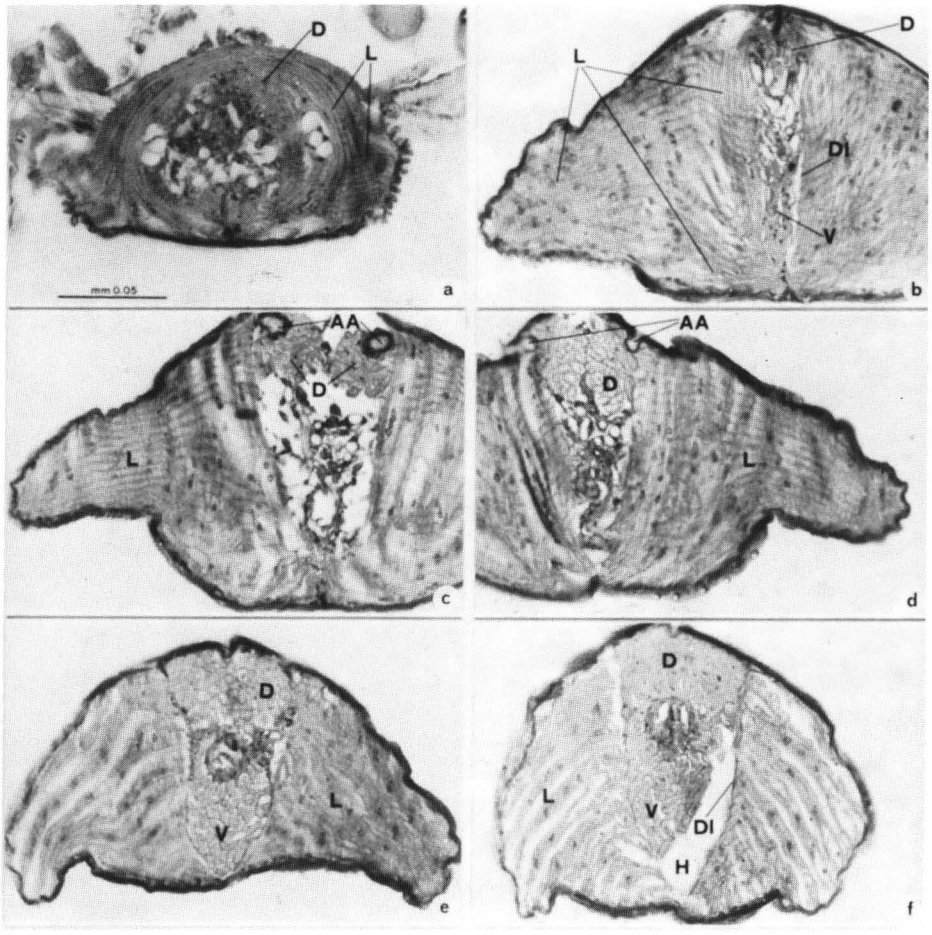

Fig. 11 - Cross-sections of preovipositor functional unit of *G. diplotaxis* through: a) uromere VII close to its anterior end; b) ditto at about half length level; c) ditto close to its posterior end; d) uromere VIII at base of dorsal apodemal arms level; e) ditto at about half length level; f) ditto close to its posterior end (All at same magnification).

It is of special interest to note that the lateral and ventral papillae of the mature larva show a reduced pattern in *G. diplotaxis*, obviously an apomorphous condition compared with the unreduced pattern in the two remaining species. Now, despite complete sets of these papillae constitute the norm in most genera among Cecidomyiinae, a reduced pattern is not a particularly rare phenomenon, occurring, for example, in members of several oligotrophine genera (cf. SYLVÉN, 1975, p. 76). Obviously, reductions of this kind have appeared many times within Oligotrophini, and such a homoplasy naturally delimits their applicability for phylogenetic considerations. In the present case it might be assumed that a reduction happened after the establishment of the *Gephyraulus* ancestor species. However, whether a reduction evolved as a first or later step in the development of the hierarchy of the genus is not clear from available data.

In the cecidomyiid system proposed by RÜBSAAMEN and HEDICKE (1925-1939), some genera, among them *Gephyraulus*, were assigned to Poomyni, other genera, among them *Dasineura*, to Dasyneurini. However, this division, as it is only based on a difference in the extent of pubescence (microtrichia) on the gonostylus, can not be considered to be sufficiently substantiated. As indicated by recent studies (SYLVÉN, unpublished), in *Dasineura*, for example, there is a more or less gradual change from species (e.g. *D. plicatrix* (H. Loew)) with the gonostylus pubescent only at the base to species (e.g. *D. hygrophila* Mik) with almost the entire gonostylus covered by pubescence.

Regarding many key characters (e.g. shape of flagellomeres, number of palpal segments, design of wing veins and pretarsal claws, shape of male terminalia) *Gephyraulus, Dasineura* and the remaining genera in the *Dasineura* group (sensu MÖHN, 1955, cf. above, section 1) show a high degree of conformity. However, how these genera, from a phylogenetic point of view, are related among themselves and to various other oligotrophine genera still remains to be evaluated.

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RIASSUNTO

REVISIONE STRUTTURALE E SISTEMATICA DEL GENERE *Gephyraulus* RÜBSAAMEN (Diptera, Cecidoymiidae, Oligotrophini) CON DESCRIZIONE DI *G. moricandiae* SP. N. DELLA TUNISIA.

Viene ridescritto il gen. *Gephyraulus* RÜBSAAMEN, 1915, con aggiunta alla specie tipo, *G. raphanistri* (Kieffer), di altre due specie: *G. diplotaxis* (Solinas), qui trasferita da *Paragephyraulus* Solinas, 1982, e *G. moricandiae* sp. n. In particolare, il genere risulta caratterizzato dal vistoso ingrossamento degli uromeri VII e VIII che insieme formano un «preovopositore» peculiarmente adattato a far muovere l'ovopositore nel modo appropriato e con la forza richiesta per violare i bocci fiorali serrati ed effettuare l'ovideposizione. Alcuni caratteri chiaramente sinapomorfici indicano che le tre specie costituiscono un gruppo monofiletico distinto. Tutte e tre le specie trasformano in galle i bocci fiorali di crucifere.

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