

## *Marthamea beraudi* (Navás) and its European congeners (Plecoptera : Perlidae)

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The west palaearctic species of *Marthamea* are reviewed. Adults are distinct from other European genera, but larvae and eggs are very similar to those of genus *Phasganophora*. *M. beraudi* (Navás) (Antilebanon Mts.) is re-instated as a species distinct from *M. vitripennis* (Burmeister). A lectotype of the latter is designated. Its range includes south-west, central and south-east Europe. Records from Syria are unconfirmed, those from Israel are erroneous. The species has in the past been confused with larvae of a *Phasganophora* species. *M. selysii* (Pictet) has brachypterous males and is known from Spain north to Meuse and Moselle rivers. Keys to adults and larvae are presented, but larval *M. selysii* and *M. vitripennis* can presently not be separated. The European *Marthamea* species are inhabitants of the potamon and are endangered ; they are presently already extinct in parts of their former ranges.

*Marthamea beraudi* (Navás) et ses congénères européens (Plecoptera : Perlidae).

L'auteur révisé les espèces paléarctiques occidentales de *Marthamea*. Les adultes sont distincts de ceux des autres genres européens de Perlidae mais les larves et les œufs ressemblent beaucoup à ceux du genre *Phasganophora*. *M. beraudi* (Navás), de l'Anti-Liban, est une bonne espèce distincte de *M. vitripennis* (Burmeister). Un lectotype de cette dernière est désigné. Son aire de répartition s'étend sur le sud-ouest, le centre et le sud-est de l'Europe. Sa présence en Syrie n'a pas été confirmée et, pour Israël, il s'agissait d'une erreur de détermination. A l'état larvaire, elle a été confondue auparavant avec une espèce de *Phasganophora*. Les mâles sont brachyptères chez *M. selysii* (Pictet), qui a été récoltée de l'Espagne à la Meuse et la Moselle. L'auteur présente une clef pour les adultes et les larves mais, pour ces dernières, on ne peut distinguer, à l'heure actuelle, *M. selysii* de *M. vitripennis*. Les espèces européennes de *Marthamea* font partie du potamon et sont menacées. Elles ont déjà disparu dans certaines parties de leurs aires de répartition originelles.

In 1909, L. Navás created the subgenus *Lerpa* (apparently of *Perla*, although this was not clearly stated) for a new species, *beraudi*, that he had received from Père Béraud. The actual collection site of the new species was not indicated but according to the title of the paper the specimens came from « Siria (Beyrouth) ». Beirut was a Turkish province (vilâjet) consisting of the city of Beirut and the area west of the Jordan valley to south of Nablus (E. Debes Handatlas, 1895).

Navás' figure shows male genitalia not clearly different from *Perla* (*Marthamea*) *selysii* (Pictet) and *vitripennis* (Burmeister) as shown by Klapálek

(1907). Navás indeed said *beraudi* was similar to these two species without indicating expressively in what it differed, as was his habit. Klapálek (1914) considered *Marthamea* generically distinct from *Perla*. A type species was not designated until 1923, when Klapálek chose *M. vitripennis* and included *Lerpa* Navás as a synonym of *Marthamea* Klapálek. In the same paper, he also translated an extract of the original Latin description of *beraudi* into German. However, the section on male genitalia was replaced by what is clearly Klapálek's interpretation of Navás' figure : that they were shaped exactly as in *M. vitripennis*. Klapálek believed *vitripennis* and *beraudi* to be the same species but he did not establish the synonymy formally. Navás (1929) insisted on the specific distinctness of *beraudi* (mentioning larger size, broader wings and, as a consequence of both, richer venation) but agreed with the transfer to *Marthamea*. As *Marthamea beraudi* the

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species was listed by Claassen (1940). Illies (1955) first described the distinctive penes of *M. selysii* and *M. vitripennis* and indicated that he had seen a male of the latter from Syria. In 1966, he mentioned Israeli material he had seen and accepted the synonymy between *beraudi* and *vitripennis* (that Klapálek had only tentatively suggested) as definitely established.

During study of some Plecoptera from the Near East, I have seen a small number of *Marthamea* specimens from the headwaters of the Litani and Jordan rivers in the Antilebanon Mts. which are neither *selysii* nor *vitripennis*. Although the type of *beraudi* is not available (Aubert 1956), I have no hesitation to assign these specimens to that species, which was described from the same area. *M. beraudi* is reinstated as a distinct species and is compared to the other two west palearctic species of *Marthamea* which are also redescribed. None of the Asian species assigned to *Marthamea* is considered. Whether any of them really belong to this genus is very questionable (Illies 1966). At least *M. producta* Klapálek has in the meantime been transferred to genus *Phasganophora* by Raušer (1968).

Only a small fraction of the material used in this study is in my own or the late J. Illies' collection at the Limnologische Flussstation Schlitz (LFS). Most was borrowed from several collections. Grateful thanks for help or information are extended to Dr. N. Alouf (Lebanese University, Beirut), Dr. E.G. Burmeister (Zoologische Staatssammlung, München; ZSM), Dr. A. Comte (Instituto Español de Entomología, Madrid, IEE), Dr. J. Dlabola (National Museum, Prague, NMP), Dr. M. González del Tánago and Dr. D. García de Jalon (Escuela Técnica Superior de Ingenieros de Montes, Madrid), Dr. K.K. Günther (Zoologisches Museum

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#### Genus *Marthamea* Klapálek

1907 *Perla* (*Marthamea*) Klapálek, Ceská Akad. Cis. Fr. Jos. I. (2) 16 (2): 17. Type species (design. Klapálek 1923): *Perla vitripennis* Burmeister.

1909 *Perla* (*Lerpa*) Navás, Brotéria, Ser. Zool. 8: 102. Type species (by monotypy): *Lerpa beraudi* Navás.

Among the genera of Perlidae in the western palearctic region, adult members of *Marthamea* can be recognised by the following combination of characters: Wings clear, veins brown except in costal space where veins and membrane are yellowish. No crossveins connecting anal veins in hindwing. Male abdominal tergite 5 with posterior extension; centre of tergites 6-8 variously adorned with patches of small spinules; tergite 9 simple; hemitergites 10 with deep anterior notch separating a lower finger-shaped process from the massive main part above and behind it; penis base transversely annulate, faintly sclerotised; eversible penis sac large to very large, with many fine spinules. Sternite 6 with setal brush, a smaller one also on sternite 7. Females without well projecting proper subgenital plate, edge of sternite 8 more or less sclerotised. Tergite 10 rather long, middle almost tongue shaped.

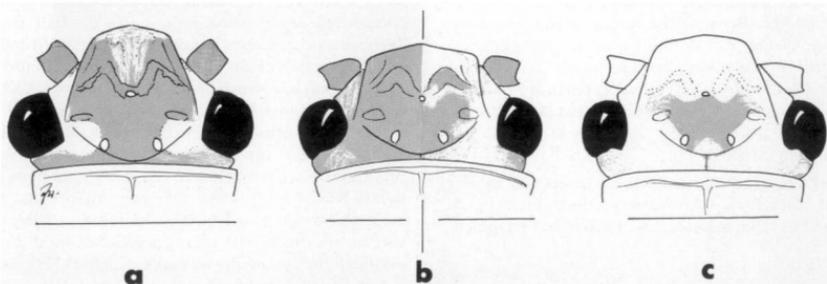


Fig. 1. Head pattern of adult *Marthamea* ssp.: a, *M. vitripennis*, ♂ from Kula Ljums; b, *M. selysii*, left ♂, right ♀ paralectotypes of var. *mosellae*, from Alf; c, *M. beraudi*, ♂ from Nahal Dan. Scale is 2 mm (two times 1 mm in b).

*Larvae.*

Submentum simple. Occipital setal fringe clearly divided into different sections behind the eyes: the long median section is formed by short club-shaped setae standing in a very regular line. At the sides, it curves a little anteriorad and meets the irregular postocular fringe of long setae at a distinct angle. At this meeting point, there is a single erect seta. No so-called swimming hairs on cerci; apical setae of distal cercus segments normal, short. Armature of proventriculus consists of numerous small spinules, no major sclerites.

*Eggs.*

Chorion completely smooth. The anchor has the shape of a huge biconcave disc, its short narrow stalk inserts on a small sclerotised nipple of the chorion.

Note that larvae and eggs of *Marthamea* are similar to those of genus *Phasganophora*, of which several west paleartic species exist. The only known European *Phasganophora* larva has in the past been confused with *M. vitripennis*, see there.

For a long time, species identification in *Marthamea* relied exclusively on colouration. Characters

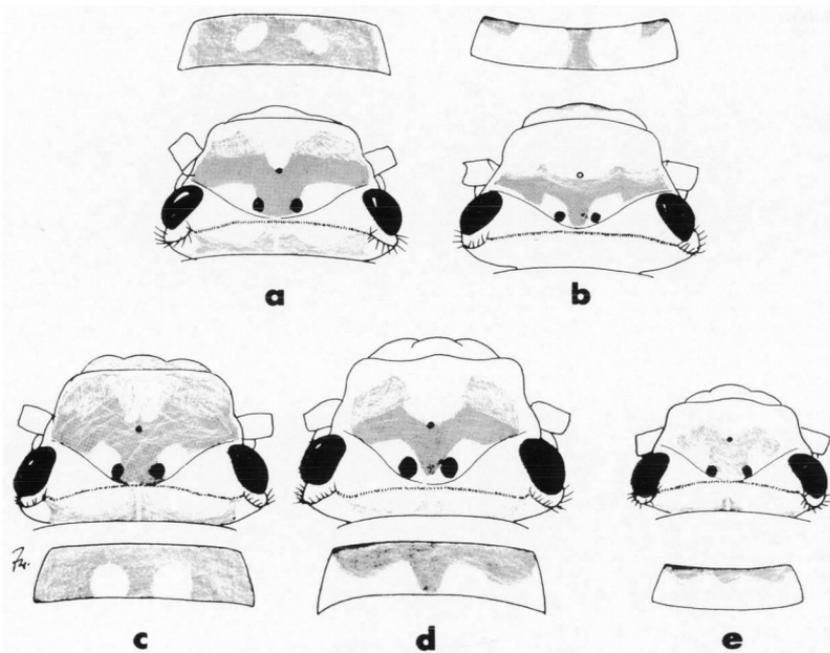


Fig. 2. Pattern on head and abdominal tergite 4 of larval *Marthamea* ssp.; a, *M. vitripennis* from the Maritza; b, *M. beraudi* from Banyas; c-e, *M. selysii* from Moselle, R. Lozoya and R. Jarama, respectively. Figures are not to scale.

of penes described by Illies (1955) appear to have not been used by subsequent authors. While structural identification of males poses no problems, females are best identified from eggs they contain. When eggs are not available, the head pattern must be used as an auxiliary character. Few larvae only have been available. Presently, only larval *M. beraudi* can be identified with certainty.

Only distinctive specific characters are described below. In the description of penes, the terms ventral and dorsal apply to the position in resting condition, inside the animal. The ventral side can be recognised by two small poorly expressed brownish basal sclerites. Figures are so orientated that these are on the lower side.

### *Marthamea vitripennis* (Burmeister)

1839 *Perla vitripennis* Burmeister, Handb. Entomol. 2 : 880.

1839 *Perla bicolor* Burmeister, Handb. Entomol. 2 : 880.

1852 *Perla terminalis* Walker, Cat. Neur. Ins. Brit. Mus. 1 : 155.

Material examined: ♀ lectotype of *P. vitripennis* (here designated): 2671/*vitripennis* Burm. Pict.\*/Halle, Erichson/*Marthamea vitripennis* Burmeister: Pictet (Mus. Berlin) ♀ lectotype, ♀ paralectotype of *Perla terminalis* Walker (des. Kimmins 1969): East Indies/49. *Perla terminalis* (BMNH). Spain: 1 penis on slide, Spain (coll. Illies); 1 ♀ with eggs, Sobradia (Zaragoza), 5. VI. 1933, (DEI; Navás det. *vitripennis*). France: 1 penis on slide, Toulouse, Aubert (coll. Illies). Germany: 1 penis on slide, Main (coll. Illies); 1 ♂, Dresden (Schiller; coll. Klapálek, NMP). Czechoslovakia: about 30 specimens including larval exuviae. Celakovic, May 1915, and Stvanice (coll. Klapálek, NMP); 2 ♂♂, 1 ♀, Slowakei, Dimburg (= Suchohrad) 5. VI. 1906 (F. Werner, NMW). Yugoslavia: 1 ♀, Petrina planina (E of Ohrid), 1 564 m (J. Thurner; LFS); 2 ♂♂, 1 ♀, Üsküb (= Skopje), 5. and 12. VI. 1918; 2 ♂♂, Orman, 14. VI. 1919; 1 ♂ without abdomen, Maced. centr. meridian., Drenovo bei Kavadar, 200-800 m, 1.9. VII. 1959 (F. Daniel) (all ZSM). Albania: 3 ♂♂, Kula Ljums, 7.-14. VI. 1918 (at confluence of Luma and White Drim, see Friese and Königsmann 1962) (NMW). Poland: 1 ♀ Deime (near Gdansk), 1.-15. IX. 1915 (W. Horn; Ulmer det. *vitripennis*; DEI). Bulgaria: 1 ♂, Kresnensko Defilé (Kressna Gorge of Struma r.), VI. 1935 (Dr. Táborský, LFS); 1 ♀, 4. VII. 1932, 2 ♂♂, 27. VI. 1935, 2 ♂♂, 27. VI. 1935, Kresna-Defilé, Sali Aga (Tuleschkow; Rauscher det. *vitripennis*); 1 ♀, Bulgaria (Ananian; all Mus. Sofia); 1 larva, Maritza river at village Ljubimez, 29. V. 1966 (from B. Russev, Sofia). Several additional males and females without adequate locality labels from the museums in London, Geneva and Vienna have also been examined.

Both sexes macropterous, wings 12.5-21.0 mm long. Body brown with yellow marks. Head pattern as in Fig. 1a, note clear yellow pigment laterally from ocelli in front of occipital suture. In females,

yellow is more extended and the pattern less contrastive. Rugae of pronotum, soft parts of thorax, prescuta, tibiae (except near base), lower side of femora, abdomen, and base of cerci yellowish to yellowish brown.

#### Male.

A distinctly bilobed spinulose extension of tergite 5 covers the membranous anterior half of tergite 6 which has a well developed entire antecosta. Tergite 7 similar to 6 except a semicircular median brown mark which carries many small spinules in its centre. Antecosta of tergite 8 divided, triangular median brown mark with very few spinules. Depressed centre of tergite 9 sclerotised, rhomboid, simple. In side view, posterior contour of hemitergite 10 strongly, almost rectangularly, bent (Fig. 3).

Penis relatively small, when everted shorter than width of abdomen and shorter than last three tergites together. Short ventral face of everted sac straight, longer dorsal side convex. Among the numerous small spinules there is a group of slender spicules dorsally, at the highest point of the everted sac; larger triangular spinules form a distinct oblique subterminal ring.

#### Female.

Subgenital plate not distinctive. Dark marks on head less extended than in male, especially occiput light. Pale in front of occipital suture between tentorial callus and posterior ocellus, dark between posterior ocelli.

#### Eggs.

Ca. 0.38 mm long, greatest diameter near middle, oval. Anchor pole somewhat flattened, with very small apical nipple for anchor attachment (Fig. 6a).

#### Larva.

Paraprocts with profusely branched gills. Head pattern and abdominal markings as shown in Fig. 2a, similar to *M. selysii*; distinction is presently not possible. Previous descriptions of presumed larvae of *M. vitripennis* were based on misidentified material, see Notes below.

#### Notes.

The status of the *vitripennis* syntype is confirmed by old catalogue notes of the Museum in Berlin (Dr. Günther, in a letter). The specimen is without abdomen, but the well expressed head pattern leaves no doubt about its identity. Rediscovery of this syntype

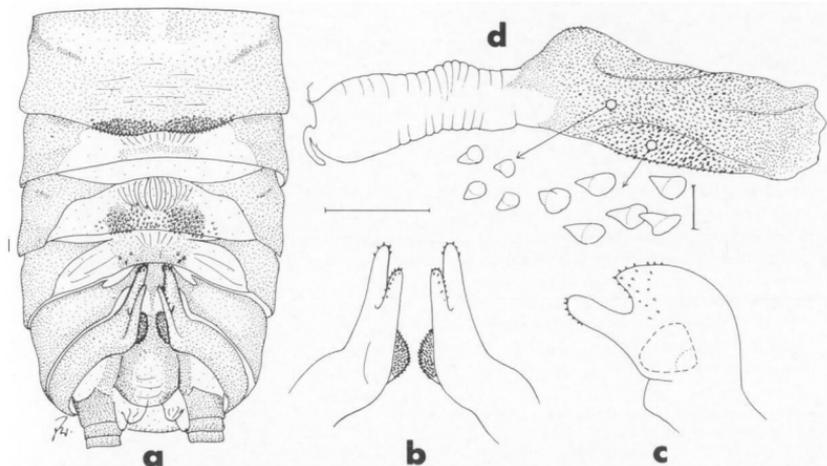


Fig. 4.- *Marthamea selysii* ; a, abdominal tip of male ; b, c, male hermitergites IO in dorsal and lateral views, respectively ; d, everted penis. Scale is 1 mm for a, 0,5 mm for b, c ; scale for details in d is 0,02 mm.

confirms the conspecificity of *vitripennis* (females) and *bicolor* (males ; lectotype designated by Zwick, 1972). Pictet (1841) had seen syntypes of both but was not sure of their identity. Schneider (1848) had established the conspecificity from fresh material he had from Silesia, but only from the description, without having seen syntypes.

For the requested suppression of an older unused name by Fabricius for the present species and the history of the use of the name *vitripennis* see ICZN (1981). The female lecto- and paralectotype of *Perla terminalis* Walker (1852) have been compared. Synonymy with *M. vitripennis* had been suggested by Klapálek (1923) and is here confirmed. However, I doubt the correctness of the locality label of the *terminalis*-types (East Indies). Records from the Near East are unconfirmed. The Syrian male mentioned by Illies (1955) is not available. The Israeli material recorded by Illies (1966) has been examined and is *beraudi*. The easternmost specimens of *vitripennis* I have seen are from Bulgaria. I am

convinced that records from Romania (Kis 1974), Lithuania (Kazlauskas 1962), in fact most records of adults from the middle and eastern part of central Europe are correct. This is also likely for records from Paris (e.g., Pictet 1841). It is unfortunate that the accurate origin of a specimen from the Main river in coll. Illies is not known. This comes from a suggested gap between disjunct eastern and western populations of *M. vitripennis* which would have been separated by glacial events (Illies 1953). However, in view of the dramatic decline of the species practically everywhere in central Europe I am wondering whether the lack of records from part of central Europe may not be due to early pollution of the potamon of rivers of which *M. vitripennis* was an inhabitant. Records from France (e.g., Despax 1951) and Spain (Aubert 1957) require checking. *M. vitripennis* occurs there but has at least sometimes been confused with *M. selysii*, see there.

Schoenemund (1925) described larvae as those of *M. vitripennis* which have a transverse dark band

across the head, in front of the M-line. An essentially T-shaped pattern results, instead of the Y-shaped pattern present in true *M. vitripennis*. Illies (1955) used some of Schoenemund's material from the Plane for a similar description. Although Schoenemund said the larva to be easy to keep in aquaria (1925) and to be common in the Plane (1927), he appears to have never actually reared an adult. A few specimens from his collections before me include mature female larvae with eggs. They have been compared to adults and larvae (also including eggs) of *Phasganophora senilis* (Klapálek) identified and collected by Kittel (1976) and obtained through his courtesy. They are clearly the same species, and not *Marthamea vitripennis*. A note on the true identity of the species in question is under preparation.

### *Marthamea selysii* (Pictet)

1841 *Perla* (*Perla*) *selysii* F.J. Pictet, Hist. nat. gén. part. Inst. Névr. : 208, pl. 17, fig. 5.

1885 *Perla selysii* var. *mosellae* McLachlan, Ent. Mon. Mag. (1885).

Material examined: Spain: 1 ♀, *Perla selysii* Env. Madrid (specimen reported by E. Pictet 1865; Mus. Geneva); 3 ♂♂, Paracuellas, Jarama, VI. 1936 (D. Pelayez; Aubert det. 1954 : *vitripennis*) (coll. Inst. Espan. Entomol., Madrid); Talamanca, R. Jarama, 1 ♀, 28. V. 1983, 2 larvae, 5. V. 1983; Piedras, R. Jarama, 3 larvae, 1. V. and 17. VI. 1969 (all coll. G. del Tánago); 1 larva (mature ♀ with eggs), env. of Madrid, R. Lozoya, 1979 (coll. G. de Jalón); 1 ♀, Andalusia (coll. Hiendlmayr, DEI). Belgium: 1 ♂, Dinant Loyon; Belgium, coll. Camille van Voixem (coll. McLachlan, BMNH). Germany: 1 ♂, 1 ♀ paralectotypes of *M. selysii* var. *mosellae*, Alf. Moselle, 1894 (coll. McLachlan, BMNH); 3 ♂♂, 2 ♀♀, 1 exuvia, Alf (le Roi, in coll. Illies, Schlitz): 1 ♂, 1 ♀, 3 exuviae, 3 larvae, IX. 1958, Mosel, km 21.8, km 37.8, km 65.7 (coll. Illies).

Female macropterous, wings 18-21 mm long. Males brachypterous, wings cover about half of the abdomen and do not extend to the tips of the metafemora. Colour varies from more or less uniform dark brown to yellowish brown with a head pattern as in Fig. 1b, right side. In the last case, the dark mark tends to be ill defined postero-laterally.

### Male.

Spinulose extension of tergite 5 wide, shallowly bilobed (Fig. 4). Tergite 6 medially soft, except shi-

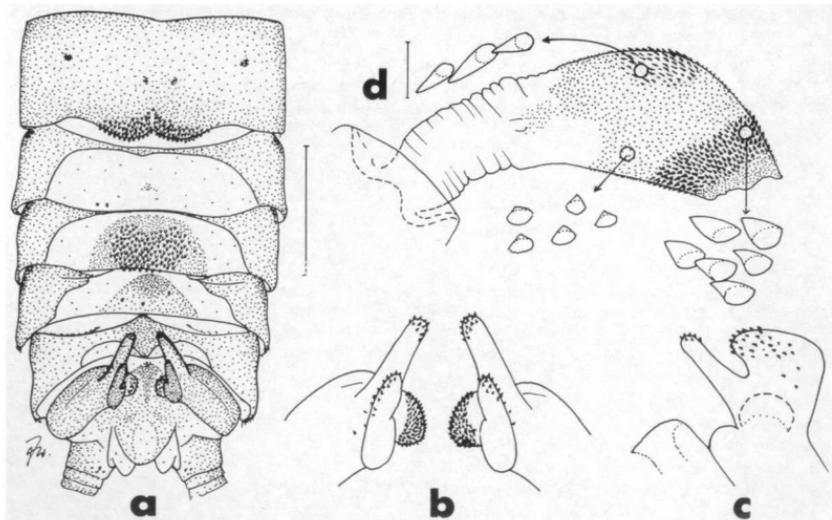


Fig. 3. *Marthamea vitripennis*, male genitalia. Details and scales as in Fig. 4.

ning longitudinal little folds in the anterior half. Similar longer folds present anteriorly on tergite 7. Behind these are two medially confluent patches of spinules. Antecosta 8 divided, vague indications of longitudinal folds anteriorly, a few spinules posteriorly on the soft centre of tergite. Tergite 9 similar to *M. vitripennis*. In side view, the posterior contour line of hemitergite 10 forms a regular, approximately semicircular line.

Penis large, when everted as long as width of abdomen and as long as last four segments. Everted sac long, wide, tubular, with dorso-basal hump. Armature consists of very many stout triangular spinules. Ventromedian spinules larger than others, but no clear pattern results from these size differences.

#### Female.

Genitalia not distinctive (compare Notes 1). In pale specimens, the area between the ocelli is clearly darker than the rest, but this tends to be also infuscate, instead of clear yellow, no contrastive pattern.

#### Eggs.

Ca. 0.38 mm long, spheroid, more or less acuminate towards small nipple forming anchor attachment. Demarcation or flattening of polar area hardly recognisable. The chorion is distinctly thicker near the greatest diameter of the egg than at the poles (Fig. 6b, c).

#### Larva.

Paraprocts with profusely branched gills. Head pattern similar to *M. vitripennis*, although sometimes more extended. The abdominal pattern appears to be quite variable, see Fig. 2 c-e. It should be noted that the extensively pigmented specimen from the Moselle is generally quite pale, perhaps faded in alcohol. Distinction from *M. vitripennis* presently not possible.

#### Notes.

The female type of *M. selysii* from near Liège was no longer in Pictet's collection in 1865 (A.E. Pictet 1865) and has not been retrieved (Zwick 1972). The uniformly dark body suggests that it was of the present species. Illies' (1955) illustration of the penis is strongly schematic, existing slide preparations in coll. Illies agree with the present figure and description. C. Berthélemy has kindly drawn my attention to the fact that the figure of female genitalia in the same paper appears to be a combination of dorsal

and ventral views presented in Despax (1951). Illies was right in treating the var. *mosellae* as identical with the nominate form.

*M. selysii* had been recorded from the rivers Meuse (Dinant, Maastricht, Liège), Moselle (Alf, Waserliesch, and other places) and the middle section of the Rhine (e.g., Klapálek 1923, Schöenemund 1925). Records from Spain by A.E. Pictet (1865) and others were doubted by Klapálek (1923), his view was shared by Illies (1966). However, occurrence in Spain is now confirmed. Records from Hungary (Pongracz 1914) are unconfirmed and probably erroneous. The Romanian male illustrated by Vasiliu and Costea (1942) is clearly *M. vitripennis*. *M. selysii* appears to be restricted to west Europe (Fig. 7).

The species is extremely endangered: specimens from the Moselle listed above appear to be the last that have been taken in the northern part of the species' range. Spanish populations are also strongly threatened by extinction (M. González del Tánago, in a letter).

Illies (1953) believed that *M. selysii* was a thermophilous inhabitant of Central European lowland rivers before the Pleistocene and belonged to the « glaziale Mischfauna » of that area. Northward and southward progression of glaciers would have eliminated this fauna from its original area and would have pushed it east or westward, where some survived in eastern or western refugia, or in both. *M. selysii* would be the only example of a species surviving only in a western refugium, the Meuse-Moselle river systems. However, as *M. selysii* in fact occurs also in Spain, beyond the Pyrenees and far from the influence of Central European glaciation, this assumption is not too likely.

#### *Marthamea beraudi* (Navás), spec. propr.

1909 *Lerpa beraudi* Navás, Brotéria, Ser. Zool., 8: 102, figs.

Material examined: headwaters of the Jordan river: Banyas (= Banias, spring sources of Nahal Banyas = N. Hermon): 3 ♀♀, 4. VI. 1943 (Bytinski-Salz); 3 ♂♂, 16. V. 1968; 2 larvae, 31. VII. 1970; Nahal Hazbani (N. Senir): 1 larva, 15. V. 1967; 1 ♀, 1 larva, 16. V. 1968; 2 larvae, 16. I. 1970; 3 larvae, 31. I. 1970; 1 ♂, 9. V. 1972 (Kugler); 1 larva, VII. 1974 (Freidberg); Tel Dan (spring sources of Nahal Dan) and Nahal Dan: 1 ♀, 7. VII. 1954; 1 ♂, 15. V. 1968 (Nitzan); 1 larva, 2. I. 1973 (Freidberg) (all in coll. Kugler, Tel Aviv). Headwaters of the Litani river, riv. Jahfufah, 1 000-1 200 m, on railroad Beirut-Damascus, 1 ♂, 1 ♀, 16. VI. 1978 (N. Alouf), my coll.

Both sexes macropterous, wings 16-26 mm long. Yellowish brown species, only a small central mark on the head (Fig. 1c) and some rugae of the pronotum brownish. Outer edges of femora and tibiae also brownish.

*Male.*

Tergite 5 with broad entire or indistinctly divided spinulose extension. Tergite 6 with variable, narrow

or extended spinule patch in soft pale centre of segment. Tergite 7 with brown anterior patch and posterior spinules in centre. A brownish central mark on tergite 8; tergite 9 narrow, normal. Hemitergites 10 with posterior contour line bent at a blunt angle. Penis as large as in *M. selysii*, everted sac huge, distally widened, with many fine uniform spinules except a fairly distinct subterminal band of larger spinules (Fig. 5).

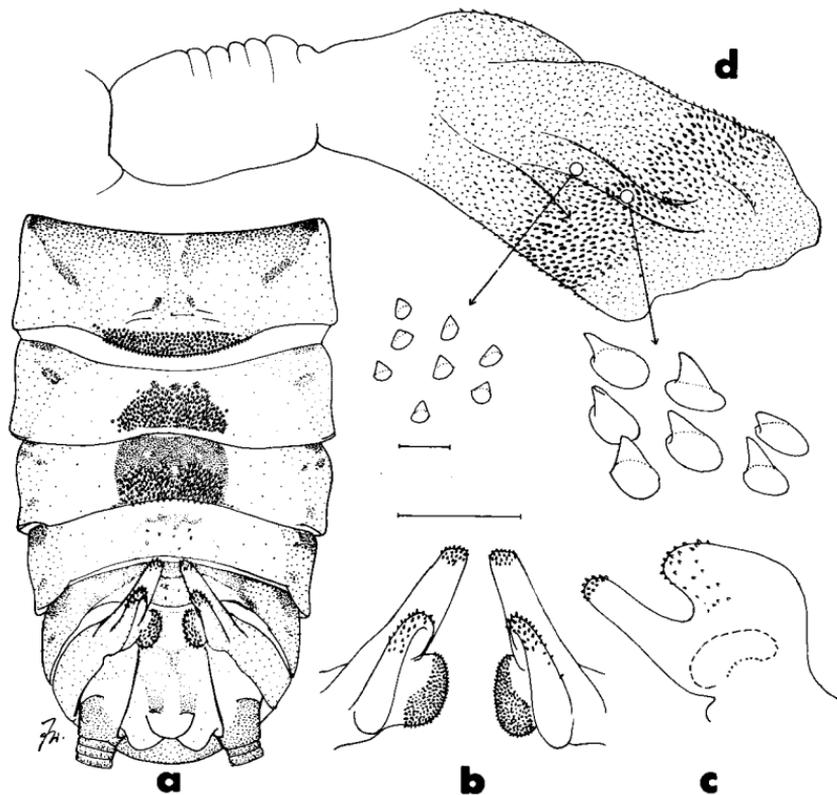


Fig. 5. *Marthamea beraudi*, male genitalia. Details and scales as in Fig. 3.

*Female and eggs.*

Genitalia not distinctive. Egg oval, 0.47 mm long. Lid conical, greatest diameter a little displaced towards anchor pole. A raised circular fold delimits the relatively flat anchor pole which has a flat wide nipple for anchor attachment (Fig. 6d).

*Larva.*

Paraprocts without gills. In specimens before me, dark pigment is very reduced (Fig. 2c) but information from N. Alouf suggests that the abdomen may be dark with a pair of pale patches on every segment.

*Notes.*

Origin and affinities of *M. beraudi* are not easily interpreted. Similarities with *M. selysii* (large penis with poorly differentiated armature) as well as with *vitripennis* (macropterous males) are in primitive traits permitting no conclusion on close affinities. Paraproct gills shared by *M. selysii* and *M. vitripennis* are another example of such symplesiomorphies. Clearly derived characters are exhibited by only one of the three species (*vitripennis*: differentiated penis armature; *selysii*: male brachypterism; *beraudi*: reduced paraproct gills). The phylogenetic relationships of the three west palearctic species of *Marthamea* remain therefore unknown.

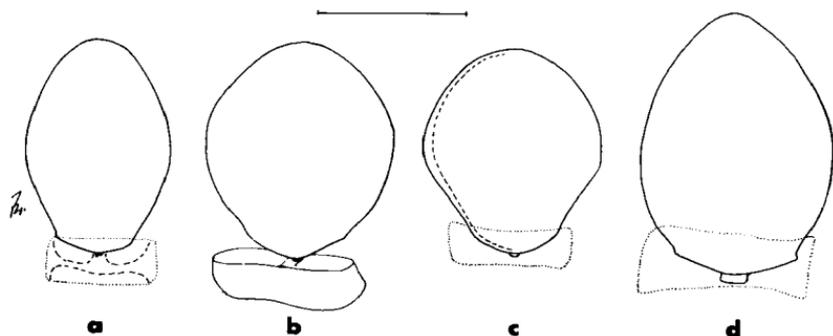


Fig. 6. Eggs of *Marthamea* spp.; a, *M. vitripennis*; b, c, *M. selysii* from R. Lozoya and Moselle, respectively; d, *M. beraudi*. Scale is 0,25 mm.

**Key**

- Males* :
- 1 Macropterous specimens ..... 2
  - Brachypterous specimens : posterior edge of hemitergite semicircularly curved. Tergite 7 with distinct longitudinal folds in front. Penis very large, armature rather uniform (Fig. 4d) ..... *M. selysii*
  - 2 Head largely dark, compare Fig. 1a ; posterior edge of hemitergite rectangularly bent. Tergite 5 distinctly bilobed, 6 practically unarmed. Penis small, with complex armature (Fig. 3d) ..... *M. vitripennis*
  - Dark patch on head small (Fig. 1c). Process of tergite 5 entire or almost so. Tergite 6 with distinct spinule patch. Contour of hemitergite curved. Penis very large, with poorly expressed subterminal ring of larger spinules (Fig. 5d) ..... *M. beraudi*
- Females with eggs* :
- 1 Contrastive head pattern, area between ocelli and eyes clear yellow; eggs oval ..... 2
  - Uniformly dark head, or at least light areas between ocelli and eyes somewhat infuscate, not clear yellow; eggs spheroid, anchor pole rather pointed (Fig. 6b, c) ..... *M. selysii*
  - 2 Large pale species (wings 19-26 mm), head pattern as in Fig. 1c. Egg with relatively narrow apex and fairly wide flat anchor pole, large, 0.47 mm long (Fig. 6d) ..... *M. beraudi*

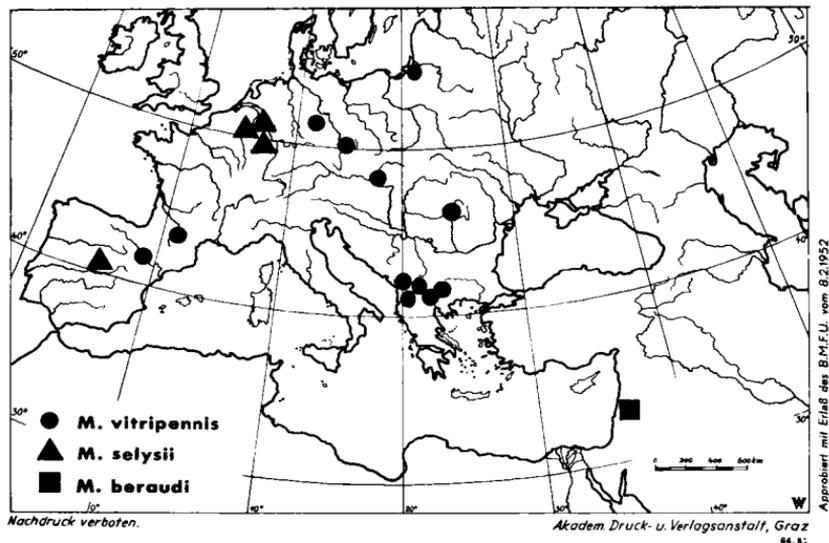


Fig. 7. Distribution map of *Marthamea* ssp. based only on material used in this study, and on illustration of Romanian ♂ (Vasiliu and Costea, 1942).

- Small (wings 18-21 mm) species, dark head pattern more extended, resembling Fig. 1a. Oval eggs 0.38 mm long, widest near middle, both poles rather similar (Fig. 6a) ..... *M. vitripennis*

**Larvae:**

- 1 Gills on paraprocts present: *M. vitripennis* and *M. selysii*.
- Paraprocts without gills ..... *M. beraudi*

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