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Taxonomic studies on the Melaphinae, a group of palaearctic polydesmoid diplopoda¹⁾

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The polydesmoid genus *Melaphe* has long been recognized as an interesting discordant element in the Mediterranean diplopod fauna, since its closest relationships are obviously with genera of the Western Hemisphere. The suggestion has even been made (Verhoeff, 1932) that *Melaphe* is represented by a subgenus *Carakodesmus* in Venezuela, but this assumption is incorrect. In recent years several poorly-defined new species have been proposed in the genus, one of which is clearly not congeneric with the others. It is therefore apparent that *Melaphe* is one of the many diplopod genera that badly needs careful revisionary study. Because of a lack of sufficient study material, a good monograph can not be undertaken at the present, but many problems can be solved by examination of available specimens.

Thanks to the kindness of Dr. Wolfgang Engelhardt of the Zoologische Sammlung des Bayerischen Staates, München (designated by the letters ZSB), and of Dr. Gerhardt Pretzmann of the Naturhistorisches Museum Wien (NMW), I was recently able to study the types of *Melaphe* species described by K. W. Verhoeff and C. Attems. As a result, I can now settle the allocation of *Melaphe* with respect to its correct family, evaluate the species named by Verhoeff, and propose a new genus to include the isolated species *Melaphe albanica* Verhoeff. A treatment of the doubtful North African species *mauritanica* and *blainvillei* remains for a future investigation.

Material Examined

So far as I know, 12 names have been either proposed in the genus *Melaphe* or earlier based upon species which are probably referable to this genus. Of these names, I have been able to study the type specimens of six, which are indicated in the following list by an asterisk (*). The present location of the types of *blainvillei*, *vestitus*, and *mauritanicus* is unknown to me.

Polydesmus blainvillei Eydoux and Gervais, 1836

Polydesmus mauritanicus Lucas, 1844

Oxyurus vestitus Koch, 1847

Polydesmus (Oxyurus) cyprius Humbert and Saussure, 1869

Haploleptodesmus caramanicus Brolemann, 1910

Haploleptodesmus mauritanicus geniculatus Brolemann, 1910

* *Leptodesmus (Asiodesmus) vestitus thracicus* Verhoeff, 1926 (ZSB)

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- **Melaphe albanica* Verhoeff, 1932 (ZSB)
- **Melaphe wohlberedti* Verhoeff, 1940 (ZSB)
- **Melaphe arcuata* Verhoeff, 1941 (ZSB)
- **Melaphe vestita turcica* Verhoeff, 1941 (ZSB)
- **Melaphe corrupta* Attems, 1944 (NMW)

Systematic position

The distinctly „leptodesmoid“ characters of *Melaphe* have long been recognized. The species *vestita* and *cypria* were included in the old genus *Leptodesmus* by Attems (1899) and by Verhoeff (1926), and even since their isolation in a special genus *Melaphe*, this has been allocated to the „family“ *Leptodesmidae*.

This association is actually an unsatisfactory one, however, for two reasons. First, I have shown (1950, 1958) that the name *Leptodesmidae* is validly preoccupied by the older name *Chelodesmidae* of Cook. Second, and more important, the family *Leptodesmidae* in the sense of Attems and most other systematists is extremely heterogeneous. As treated in „Das Tierreich“, Lief. 69 (1938), the *Leptodesmidae* includes genera properly belonging to several very distinct families.

The definition of these families is still incomplete, since many genera — particularly of South America — remain to be studied. But it is now possible to characterize one family in some detail, and to separate it from the confused Neotropical groups. This is the family *Xystodesmidae*, originally proposed (1895) by O. F. Cook without any diagnosis except for the characters to be inferred from the included genera. Cook subsequently (1904) distinguished between his two families *Xystodesmidae* (chiefly North American in distribution) and *Chelodesmidae* (dominantly South American) by general body form and by the presence or absence of a spine on the second podomere of the legs. Both of these points are now known to be variable and unreliable as major criteria; indeed they were never accepted by Attems. But studies which I have recently made indicate the presence of numerous other characters heretofore completely overlooked. Some of these may be listed in the following table; a complete discussion of the subject will be published in full at a later time.

XYSTODESMIDAE

Body form typically broad and robust, the width/length ratio usually more than 18%. Body almost always parallel-sided from 3rd to 16th segment. Paranota broad and usually overlapping.

Antennae moderate in length; the sensory cones set in a simple opening in the end of the 7th article, the distal margin of the latter not turned in mesially.

Gonopod aperture of males very large, extending forward on the 7th segment and reducing the prozonite to a mere narrow transverse band.

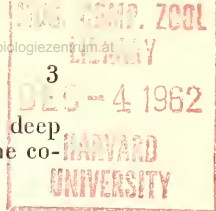
CHELODESMIDAE

(sensu latu)

Body form typically narrow, the width/length ratio less than 18% in most genera. Body almost always widest at segments 3—5, thence tapering gradually to the caudal end. Paranota smaller and not overlapping.

Antennae long, the sensory cones partially separated by mesially projecting lobes of the inturned distal edge of the 7th article.

Gonopod aperture of males smaller, only slightly extending onto the prozonite.



Socket of the solenite (the coxal flagellar remnant of the gonopod) completely separated from the margin of the coxal joint.

Solenite originating in a deep notch on the distal edge of the coxal joint.

As thus limited, the *Xystodesmidae* is found to consist of genera which occur dominantly in North America (south to Guatemala only in the high mountains) and in eastern Asia (China, Japan, Formosa, and the Riu Kin Islands). The *Chelodesmidae* and related family groups are restricted to South America for the most part. The emergence of these classical distributional patterns, I think, is very strong confirmatory evidence of the validity of the groups as defined by structural details!

A study of the species of *Melaphe* shows that in nearly every character cited, the genus is to be regarded as a member of the family *Xystodesmidae*, and that little close relationship is to be found with South American genera. This, too, is more meaningful from the standpoint of zoogeography, for numerous families of „myriapods“ are known to be discontinuously distributed in southern United States and in the eastern end of the Mediterranean region. Affinities of South American groups are almost without exception in the direction of Africa and Australasia.

The relationship of *Melaphe* to American xystodesmid genera is not entirely clear, but it is not close in any event. I think that subfamilial status may be desirable. Perhaps the genus comes closest to the American group of genera which centers around *Rhysodesmus*.

Family XYSTODESMIDAE Cook

Subfamily Melaphinae Brolemann

Melaphini (as tribe) Brolemann, 1916, Ann. soc. ent. France, vol. 34, p. 554.

Melaphinae Verhoeff, 1941, Arch. Naturg., N. F., vol. 10, p. 403.

Brolemann's tribe contained only the single type genus. The recent, very artificial „classification“ of the leptodesmoids published by Verhoeff included the Japanese genus *Profontaria* in the *Melaphinae*. This is a gross error in estimation, as there is little close affinity between *Melaphe* and *Profontaria*.

On the other hand, Verhoeff overlooked the fact that his species *M. albanica* differs in many ways from other members of the genus. It is indeed curious that he failed to isolate *albanica* in a genus of its own, which I think is amply justified and desirable. The chief characters of the genus are set forth in the following contrasting paragraphs:

- 1a Coxal margin of gonopod flared and elevated into a process between the edge and the socket of the solenite (fig. 3); the gonopods separated by a broad oval sternite; telopodite slender and simple, always curving away from the coxa *Melaphe* Cook
- 1b Coxal margin not produced into such a process; the gonopods separated by a long, narrow sternite; telopodite heavier and nearly straight, with a tarsal remnant, curving toward the coxa
 *Ochridaphe*, n. gen.

Genus *Melaphe* Cook

Oxyurus Koch, 1847, Krit. Rev. Insectenf. Deutschlands, vol. 3, p. 139.

Leptodesmus Attems, 1899, Denk. Akad. Wien, vol. 67, p. 394.

Melaphe Cook, 1904, Harriman Alaska Exped., vol. 3, p. 55. — Brolemann, 1916, Ann. soc. ent. France, vol. 34, p. 554. — Attems, 1931, Zoologica, vol. 30, Heft 79, p. 71; 1933, Das Tierreich, lief. 69, p. 187. — Verhoeff, 1940, Rev. Fac. Sci.

Univ. Istanbul, ser. B, vol. 5, p. 41.

Haploleptodesmus Brolmann, 1910, Arch. Zool. exper., ser. 5, vol. 5, p. 362. —

Attems, 1914, Arch. Naturg., vol. 30, A 4, p. 245.

Asiodesmus Verhoeff, 1926, Mitt. Bulgar. Ent. Ges., vol. 3, p. 201 (as subgenus of *Leptodesmus*).

Type species: *Oxyurus vestitus* Koch, by original designation.

Diagnosis: A xystodesmid genus of the Mediterranean region, characterized by the retention of a distinct sternite between the gonocoxae and by various details of the gonopods, such as the curious elevation which separates the solenite socket from the distal edge of the coxal joint. Coxae simple, without apophyses; telopodites long and slender, arcuately curved away from the coxae and without prefemoral or femoral processes.

Distribution: The known species are discontinuously distributed in three areas: (1) Algeria-Morocco, (2) Abyssinia, (3) Turkey and several adjoining islands, eastward as far as Syria. This range suggests that a previously much wider and more continuous range was occupied by the genus, and that perhaps climatic changes in the Tertiary have changed most of the previously moist forested region into deserts leaving *Melaphe* fragmented into three relict areas.

Species: One is known from Abyssinia, two from Asia Minor, and perhaps two from northwestern Africa. Most of the names proposed in the genus in recent years are clearly synonyms of *M. vestita*, as discussed below. Attems' synopsis of 1938 is a good treatment of the genus up to that time, but it fails to mention the species *M. albanica*, proposed by Verhoeff in 1932.

Melaphe vestita (Koch)

This attractive and frequently-collected species is known to occur widely in the coastal regions of Turkey, from the Bosphorus to Syria, and also on many of the coastal islands. On the basis of specimens which I have seen, two geographic races can be distinguished, the nominate subspecies in Asia Minor and the subspecies *thracia* in the European part of Turkey. The characters which separate these two populations are exactly those used by Attems in 1938: color pattern of the collum and small details of gonopod form. I give here the key characters as stated in Das Tierreich, Lief. 69, p. 188:

„Gonopoden auf der Hohlseite an der Grenze von Praefemur und Acropodite nicht oder nur schwach abgesetzt. Halsschild mit 2 gelben Flecken hintereinander. Der Zwischenraum zwischen den gelben Medianflecken und den Seitenflecken größer als die Flecken selbst. . .

. . . 1a *M. vestita vestita*

Gonopoden auf der Hohlseite an der Grenze von Praefemur und Acropodite plötzlich stark treppenartig abgesetzt. Beide gelbe Medianflecken des Halsschildes verschmelzen zu einer pilzförmigen Längsbinde. Raum zwischen dem halbkreisförmigen Medianfleck und den Seitenflecken so groß wie die Flecken. . . 1b *M. vestita thracia*“

Melaphe vestita vestita (Koch)

Figure 1

Oxyurus vestitus Koch, 1847 in Krit. Rev. Insectenf. Deutschl., vol. 3, p. 139, 1863,

Die Myriapoden, vol. 1, p. 9, fig. 9.

Oxyurus throax Attems, 1894, Sitz. Akad. Wien, vol. 103, pl. 1, fig. 18.

Leptodesmus vestitus Attems, 1899, Denk. Akad. Wien, vol. 67, p. 394, fig. 134.

- Melaphe vestita* Cook, 1904, Harriman Alaska Exped., vol. 8, p. 55.
Haploleptodesmus caramanicus Brolemann, 1910, Arch. Zool. exp., vol. 5, ser. 5, p. 363, pl. 7, figs. 62, 63. New synonymy!
Leptodesmus (Asiodesmus) vestitus Verhoeff, 1926, Mitt. Bulgar. Ent. Gesellsch., vol. 3, p. 201.
Melaphe vestita Attems, 1931, Zoologica, vol. 30, Heft 79, p. 71.
Melaphe vestitus Schubart, 1934, Zool. Anz., vol. 103, p. 186.
Melaphe vestita vestita Attems, 1938, Das Tierreich, Lief. 69, p. 133.
Melaphe wohlberedti Verhoeff, 1940, Rev. Fac. Sci. Univ. Istanbul, ser. B, vol. 5, p. 41, fig. 39. New synonymy!
Melaphe arcuata Verhoeff, 1941, Rev. Fac. Sci. Univ. Istanbul, ser. B, vol. 6, p. 294, fig. 19. New synonymy!
Melaphe vestita turcica Verhoeff, 1941, Rev. Fac. Sci. Univ. Istanbul, ser. B, vol. 6, p. 294, fig. 20. New synonymy!

Type Specimen: Present location unknown. The type of *H. caramanicus* Brolemann is in the Museum National de Histoire Naturelle de Paris; types of the species named by Verhoeff are all in the Zoologische Sammlung in München.

Synonymy: Brolemann's species *caramanicus* was based upon a specimen from the coast of Karamania in Asia Minor. The original description consists only of a drawing of the gonopod, which does not seem to differ in any respect from that of *M. vestita*. Attems (1938) has already suggested the identity of these two names.

Melaphe wohlberedti was described from specimens taken on the island of Rhodos. The differences cited by Verhoeff are imaginary: I have seen the type slide and note that the gonopod is merely mounted in a different aspect from that of the other *Melaphe* specimens. The drawing made from such a preparation naturally will have a distinctive appearance!

The type material of *M. arcuata* and *M. vestita turcica* now consists only of slide preparations of the gonopods. I studied them very carefully and could find no convincing differences, even when one slide was placed directly over the other for the closest comparison! Since these two entities appear to be identical, and since apparently only one recognizable form of *Melaphe* occurs in Turkey, I hereby consider both of these names as synonyms of each other and of *Melaphe vestita vestita*. *M. arcuata* was described from Aydin, *vestita turcica* from Izmir (= Smyrna).

Koch gives only „Kleinasien“ as locality for his species *Oxyurus vestitus*, but the very good colored illustration of the type specimen, published in 1863, shows clearly the color characteristics typical of the nominate subspecies as here understood.

Melaphe vestita thracia (Verhoeff)

Figures 2, 3

- Leptodesmus (Asiodesmus) vestitus thracicus* Verhoeff, 1926, Mitt. Bulg. Ent. Ges. vol. 3, p. 200, pl. 6, fig. 4.
Melaphe vestita thracia Attems, 1938, Das Tierreich, Lief. 69, p. 139.

Type specimen: This form was described from Kuru Dag, Keschian, and Badoma, all localities in Thrace. The Verhoeff Collection at München now contains only two slides of gonopods, labeled Kuru Dag and Ketsan. The first of these is marked on the label with a red „X“ which was Verhoeff's symbol for a type specimen, and I hereby designate this slide as Lectotype. The restricted type locality Kuru

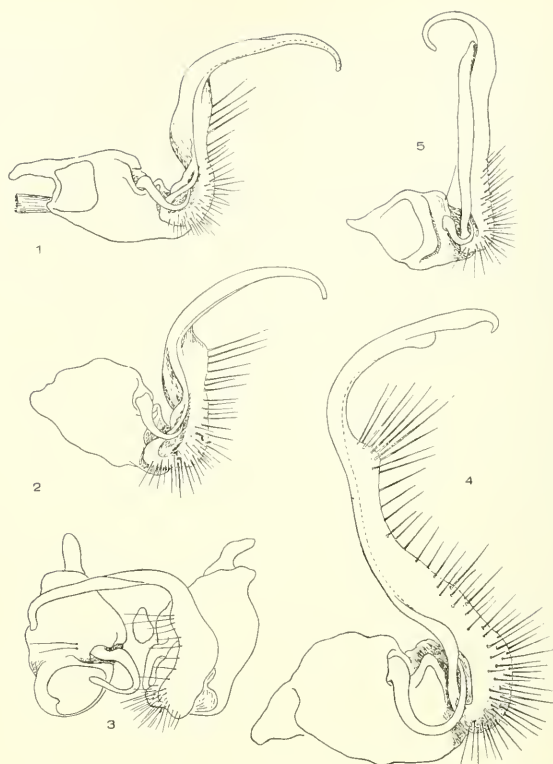


Fig. 1: *Melaphe vestita vestita* (Koch), left gonopod of specimen from Aydin, Turkey, mesial aspect (type specimen of *Melaphe arcuata* Verh.).
 Fig. 2: *Melaphe vestita thracia* (Verhoeff), left gonopod of lectotype specimen from Kuru Dag, Thrace, mesial aspect.
 Fig. 3: *M. v. thracia*, both gonopods (right telopodite removed) of specimen from Kesan, Thrace, a ventrolateral aspect to show details of coxal structure.
 Fig. 4: *Melaphe corrupta* Aittens, left gonopod of holotype, mesial aspect.
 Fig. 5: *Ochridaphe albanica* (Verh.), left gonopod of lectotype, mesial aspect.
 All figures drawn to same scale.



Fig. 6: *Ochridaphe albanica* (Verh.), male gonopods of paratype, ventral aspect (in situ), showing tibial remnant.
 Fig. 7: *O. albanica*, base of 2nd legs and genitalia of female paratype, caudal aspect, the left cyphopod removed to show coxosternal details.

Dagh, is a mountain range north of the base of the Gallipoli Peninsula, located about 27° E, and 40°50' N.

Notes: The locality Keschan is now spelled Kezan, Kešan, and Keshan on different maps. It is located about 20 km. to the northwest of Kuru Dag.

Melaphe corrupta Attems

Figure 4

Melaphe corrupta Attems, 1944, Zool. Anz., vol. 144, p. 229, fig. 8.

Type specimen: Male holotype (NMW), collected by Mali in 1897. The type locality is cited by Attems as „Harrar, Ig-Iga, Abyssinia“. I presume that this refers to the two places (or somewhere between them) now spelled Harar and Jijiga, in the eastern highlands of Ethiopia, located about 9° N, 42° E.

I have restudied the microscope preparation of the type gonopods and find that the species is unquestionably congeneric with *vestita*. *M. corrupta* is somewhat larger in size, as particularly regards the dimensions of the gonopods. Figures 1—4 are all drawn to the same scale!

The original drawing shows the subterminal lobe of the gonopod tibiotarsus to be on the outer side of the distal arc, in contrast to the present illustration where it is shown to be on the inner side. This discrepancy may be due to distortion caused by gradual drying of the mounting medium and pressure of the coverslip. When I studied the slide in July, 1960, the terminal fourth of the telopodite had become detached from the main part. Under such circumstances, Attems' original figure must be considered as correct.

The occurrence of this species in Abyssinia is very singular, almost certainly the result of long isolation in a relict status. The original range of *Melaphe* must predate the Tertiary climatic changes which created the Sahara and Arabian desert regions. It will be interesting to await the discovery of other such millipeds in the high mountains in Abyssinia.

Ochridaphe, new genus

Type species: *Melaphe albanica* Verhoeff, 1932.

Diagnosis: A genus similar to *Melaphe* in external structural features, but differing in the formation of the gonopods, as indicated in the preceding key. The coxal margin is not produced into an elevated flange between the edge and the solenite, and there is a large, distinct, tibial remnant present on the telopodite.

Distribution: Albania; probably also Yugoslavia.

Species: Only one is so far known, this is

Ochridaphe albanica (Verhoeff), new combination

Figures 5—7

Melaphe vestita Attems, 1929, Zool. Jahrb., Abt. Syst., vol. 56, p. 318; 1931, Zoologica, vol. 30, Heft 79, p. 74.

Melaphe albanica Verhoeff, 1932, Zool. Jahrb., Abt. Syst., vol. 62, p. 472, pl. 4, figs. 1, 2; 1940, Rev. Fac. Sci. Univ. Istanbul, ser. B, vol. 5, p. 41.

Type specimens: Four male and eight female cotypes (ZSB) in a bottle labeled only „Albania“. The species was originally described from the Jablanica and Korab mountains of Albania (Storkan, leg.), but now it is impossible to know the exact provenance of the existing specimens. A male has been separated from the others and labeled as „Lectotype“. In the collection are two slides, each with gonopods, one labeled Jablanica, the other Korab, these were used by Verhoeff in making his drawings of the species.

Redescription of the species: Body form small, males 22–25 mm. in length and 4.0–4.5 mm. in width; females 25–30 mm. in length and 4.0–5.2 mm. in width. Body parallel-sided from segment 3 to 18 in males, or increasing gradually in width back to segment 16 or 17 in females.

Head moderately convex, rather flat in front, smooth and polished. Vertex with about ten setae of various length on each side, also a pair in the interantennal isthmus, and another pair just below, two frontal setae on each side. Clypeal setae about 12–12, extending laterad to the genal notch, labral setae 10–10. No marginal genal setae. Genae not convex, their surface continuous with frons, but with a distinct shallow median depression. Median tooth of labrum distinct, the lateral teeth scarcely indicated. Interantennal isthmus broad, subequal to length of 2nd antennal article. Antennae long and slender, reaching caudal margin of 4th segment, articles 2–6 similar in size and shape, each very slightly clavate and becoming increasingly setose distally. 7th article longer than broad, cylindrical, its distal edge not inturned between the four large elongate sensory cones.

Collum as broad as width of head across mandibles and as broad as 2nd tergite, the ends broadly rounded, caudal edge evenly arcuate along its length, surface of collum smooth and polished, with two submarginal setiferous tubercles on each side in front.

Second segment similar in size and shape to collum, not as long, with four small setiferous tubercles across the middorsum of the metatergite, and another such tubercle on the base of each paranotum. Segments 3 and 4 similar, without marginal paranotal thickenings. Following body segments with marginal paranotal scapulae, poriferous segments with enlarged peritremata, pores opening laterad, on caudal half of the edge. Posterior margin of metatergites straight across dorsum, that of paranota distinctly convex near the base, with two submarginal setiferous tubercles. Prozonites a little shorter than metazonites, with the same surface texture; interzonal furrow broad and flat, well-defined but not with sharp edges, its surface very finely costulate across dorsum. Posterior to segment 10, caudal margin of paranota becomes increasingly concave and very slightly margined, the posterior-lateral angle becoming increasingly acute to the 19th segment.

On the caudal segments the ozopores become gradually more dorsal in their position. Epiproct and paraprocts of normal polydesmoid form; hypoproct large, flat, smooth, with a large median apex but without projecting paramedian tubercles.

Legs set on abruptly elevated podosterna, these glabrous, smooth, and without cruciform impressions of subcoxal spines. Stigmata small, oval, even with surface of body, similar in size and shape and position with respect to coxal sockets. No distinct supracoxal condyles. Sides of body flat, glabrous, without peculiarities.

Legs of normal size and shape, the length of podomeres in decreasing order: 3—6—2—5—4—1, the 2nd podomere longer than usual in the family, and the 3rd distinctly more clavate, the basal two-thirds of its length normal and parallel-sided, the distal third abruptly larger. Ventral surfaces of all podomeres setiferous, as is also dorsal side of tarsus. No spines or pads present. Pretarsus long, slender, and somewhat curved, but not distinctly carinate on the dorsal surface.

Seminal process of second legs of males long and cylindrical, distally oblique; pregonopodal sterna without any modifications, increasing in width from segment 4 to segment 6.

Gonopod aperture rather large, oval, extending into prozonite which it reduces to a thin strip at midventral region. Gonopods large, projecting cephalad, coxae and sternum visible in situ (figures 5, 6). Coxae rather short, the distal edge not elevated into a distinct ridge separating base of solenite from base of telopodite. Prefemur and femur together straight, without any trace of suture or other separation; near end of femur a distinct tibial remnant projecting distad, but not set off by a basal groove or suture. Tarsus slender, simple, curved back toward the coxa in more than a half-circle, and functioning as the solenomerite.

Females with the interzonal furrow less distinct, the podosterna less well-defined and much broader than in males, legs much longer and more slender. No special epigynal structure except a low median projection. Coxae of 2nd pair of legs (figure 7) produced into a small apical cone bearing a long macroseta. Cyphopods normal in shape for the family, like those of most American genera except that the receptacle is strongly reduced in size and perhaps serves only for attachment of the retractor muscles.

Remarks: Known only from southeastern Albania, this species almost certainly occurs at least locally in Yugoslavia as well. The references to a female *Melaphe* from Munela, Albania, by Attems (1929, 1931) almost certainly apply to this species, as *M. vestita* is not known to extend north of Thrace, in the European part of Turkey.

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