

ON THREE NEW MACROCHELES FROM IRAN, AND DISCUSSION ON THE INFRAGENERIC SYSTEMATIC UNITS.

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MACROCHELIDAE,
IRAN,
SIBLING SPECIES,
SPECIES GROUP,
SUPERSPECIES.

SUMMARY: Three new species are described from Iran, *Macrocheles elongatum* n. sp., *M. kermani* sp. n. and *M. kamalii* sp. n. *M. kermani* and *M. kamalii* showed the characteristics of the *glaber*-group *sensu* Walter & Krantz. The adequacy of the *glaber*-group is discussed in regard to the definition by FILIPPONI & PEGAZZANO and to its current use in biology. The authors propose to substitute the term of superspecies for the existing species-groups, and to limit the *glaber*-group to the sibling species *M. glaber* and *perglaber*.

MACROCHELIDAE,
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RÉSUMÉ: Trois nouvelles espèces iraniennes de Macrochelidae sont décrites: *Macrocheles elongatum* n. sp., *M. kermani* n. sp. and *M. kamalii* n. sp. Les deux dernières font partie du groupe *glaber*. La validité de l'utilisation du species-group *sensu* Walter & Krantz est discutée, en fonction de l'utilisation originale par FILIPPONI & PEGAZZANO et de son usage courant en biologie. Il est proposé de considérer les groupes actuels comme des superspecies, et de limiter le groupe *glaber* aux espèces jumelles *glaber* et *perglaber*.

Three genera of Macrochelidae (*Glyptholaspis*, *Holostaspella*, *Macrocheles*) were reported from Iran, with nine species of *Macrocheles*: *glaber*, *insignitus*, *merdarius*, *montanus*, *muscaedomesticae*, *penicilliger*, *robustus* (syn: *robustulus*), *scutatus*, *subbadius* (KAMALI *et al.*, 2001). [Note: because of misidentification since BERLESE's works, the identities of *M. subbadius* and *scutatus* are doubtful: FILIPPONI & PEGAZZANO, 1962]. During the experimentation carried out by one of the authors (M. L.) the genera *Glyptholaspis*, *Holostaspella* (Macrochelidae) and the closely allied *Parholaspulus* (Parholaspidae) were collected. *M. glaber*, *insignitus*, *merdarius*, *muscaedomesticae*, *opacus*, *perglaber*, *robustulus*, *scutatus* and at least three new species were found. These new species are described in this article. Two of them were clearly

from the holartic native species-group “*glaber*” *sensu* WALTER & KRANTZ (1986).

The cosmopolite genus *Macrocheles* Latreille 1829, reassembles species with homogeneous morphology, though some of them were described in obsolete genera or subgenera (notably by BERLESE, 1905: subgenus *Coprholaspis*). Recent studies showed (HALLIDAY, 2000) that the genus *Macrocheles* colonises several microhabitats (fruit, rotting fungi, seaweed, guano), or are associated to fungus feeding beetles, or phoretic on both carrion beetles (Australia: HALLIDAY, 2000; Japan: TAKAKU *et al.*, 1994; Europe: BERTRAND & GLIDA, unpublished data) and dung beetles. Two main functional groups can be distinguished: the first with the species from leaf litter and soil habitats, and the second with species found in

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dung pads and phoretic on dung breeding insects (HYATT & EMBERSON, 1988; MANNING & HALLIDAY, 1994). The development of phoretic associations with insects is the evidence that some ancient HTU (HTU: hypothetical taxonomic unit: FARRIS, 1970) underwent an adaptive process. Some species were considered from the same species-group on the base of the morphology (WALTER & KRANTZ, 1986). The *glaber*-group with the sibling species *M. glaber* and *perglaber* (FILIPPONI & PEGAZZANO, 1962), was enriched with newly described species and was then divided in several complexes (WALTER & KRANTZ, 1986) on the base of morphology and geographic distribution. In a preliminary work attempt, KRANTZ (1998b) studied phylogenetic relationships among selected characters and species. However, the main uncertainty remains on the translation of our knowledge on these mites through the taxonomic units (genera, species-group, complexes). We can interrogate on the adequacy of the species-group to characterize the affinities of more than 30 species, with world-wide distribution. The partition of the genus in several groups of species might hide real systematic entities: a revision is needed, enlightened by the significance of supraspecific and infrageneric distinctions (GLIDA & BERTRAND, 2003).

Macrocheles kamalii n. sp.

Karaj, Niavaran, Charan (Iran). Description on holotype female from Karaj. Paratypes: Muséum national d'Histoire naturelle de Paris (France) and University of Tehran (Islamic Republic of Iran).

DESCRIPTION: *Dorsal shield*: Length, 750 μm , width 475 μm . Procurved line attenuated on the margins, dorsal shield reticulated posteriorly with large polygons, prodorsal shield reticulated. In central part of the shield, polygons elongated and less visible (FIG 1). Vertical setae (*j1*) longer than *z1* and *j2*, pilose for greater than the half of their length. *z1* shorter than *j1*, ($z1 < j2 < j3$) the triangle drawn by these three pairs enclosing the usual lyriform organ. Other anterior setae (*j4* to *j6*, *r2* to *r4*, *z2* to *z6*, *s2* to *s5*) longer, *j4* is the longest (50-60 μm). *j3*, *z5*, *j6*, *z6* simple. *Z1*, *J2*, *J3* are simple needle like setae.

Ventral shields: (FIG 2) sternal shield wider than long, large punctuated areas underline the antero-median subtriangular relief (*linea angulata*) with large but attenuated polygons in *areae punctatae*. Distance between median setae equal to the half of the width of the sternal shield at their level. Epigynial shield with sclerotization underlined by medium large punctuation. Metasternal sclerites oval. Ventrianal shield punctate reticulate 260 μm long. Lateral porous areae reaching the anterior end of the shield on each side. Postcoxal sclerite IV present.

Gnathosoma; chelicerae (FIG. 3) large (>100 μm) with movable digit 40 μm . Fixed digit with large lyriform organ; fixed digit with usual teeth and pilus dentilis and a recurrent blade. Dorsal seta short, arthrodial brush with the longest seta 3/4 of the movable digit long. Epistome similar to the *glaber* group, with smooth median process (FIG 4).

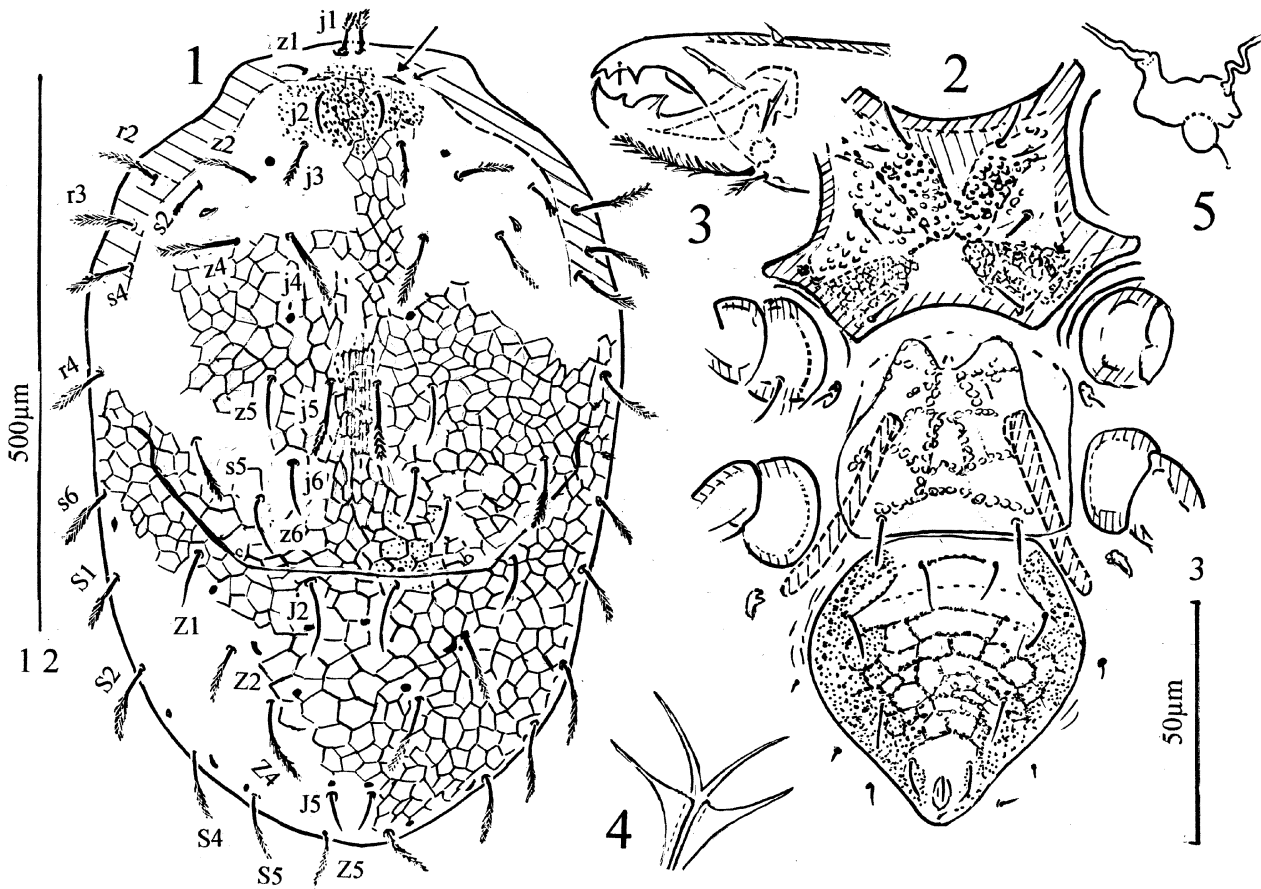
Sacculus foemineus: sacculi subquadrangular, subsphaerical *cornu* with short spermatheca's ductus (FIG. 5). Genu IV with 6 setae.

Macrocheles kermani n. sp.

LOCUS TYPICUS: Karaj (Iran). Description on holotype female from Karaj. Paratypes: Muséum national d'Histoire naturelle de Paris (France) and University of Tehran (Islamic Republic of Iran).

DESCRIPTION: *Dorsal shield*: 800-850 μm long, 465 μm wide, reticulate, polygons finely punctuated, with well developed procurved line (FIG. 6). Alveoli larger in the central part of the shield, axially orientated in the median zone. The anterior lyriform organ behind *z1*. The setae *j1* are directed forward, not contiguous. Distance *z1-j2* is very short. Setae *j3* and *z5* finely ciliated distally. *z4*, *s2*, *r2*, *r3*, *s4*, *s5* plumose.

Ventral shields (FIG. 7): Sternal shield longer than wide. Only *linea media transversa* well visible, concave, similar to *M. scutatus* (Berlese, 1904). *Linea arcuata* weaker. *Linea angulata* disturbed by ornamentation. *Areae punctatae posteriores* underlined by large punctuation as on the posterior margin of the shield. Distance between first pair of setae less than 100 μm . The second and third pairs draw a trapezoidal shape with largest base forward. Epigy-



FIGS 1-5: *Macrocheles kamalii* n. sp. Female. 1. — Dorsal shield. 2. — Ventral view. 3. — Chelicera, distal end, lateral view. 4. — Epistome. 5. — Sacculus foemineus.

nial shield as broad as long, subquadrangular with reticulate punctated pattern. Metasternal shields with needle like setae. Ventrianal shield as long as sternal shield, reticulate punctated with polygonal ornamentation laterally orientated. *Areae porosae* reaching the second pair of setae.

Gnathosoma: Epistome similar to *M. glaber*. Chelicerae (FIG. 8) 100 µm long with short lyriform organs, movable digit as in *glaber* group, arthrodial brush not longer than the half length of the movable digit.

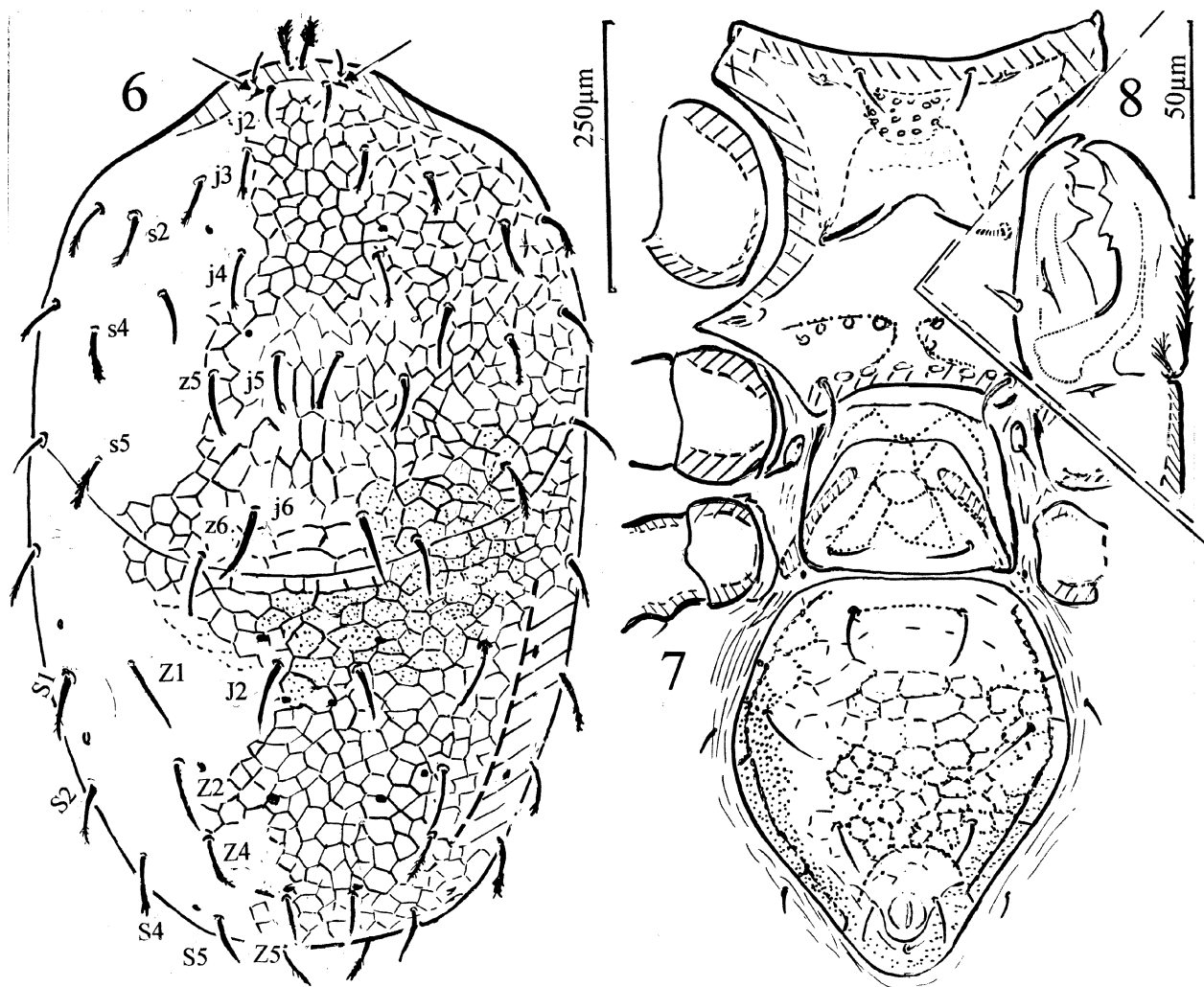
Genu IV with 6 setae.

Macrocheles elongatum n. sp.

LOCUS TYPICUS: Sahrabad (Iran). Description on holotype female from Sahrabad. Paratypes:

University of Tehran (Islamic Republic of Iran). Only few specimens collected but morphology of this species differs from the known species and can be considered as a good species.

DESCRIPTION. *Dorsal shield*: (FIG 9) Length: 220-250 µm width: 120-125 µm, elongated, entire, convex anteriorly with marked angles, reticular ornamentation, with polygons weaker on the medial part, with usual simple setae. *Ventral shields*: (FIG. 10) Sternal shield with simple setae, (maximal width = 4/3 median length). Epigynal shield trilobate anteriorly, with two simple setae. Ventrianal shield elongated with long simple setae, convex. *Gnathosoma*: Chelicerae slender 65 µm long (FIG. 11). Fixed digit with recurrent blade, with *pilus dentilis* inserted anteriorly. Movable digit regularly convex with three median



FIGS 6-8: *Macrocheles kermani* n. sp. Female. 6. — Dorsal shield. 7. — Ventral view. 8. — Chelicera, distal end, lateral view.

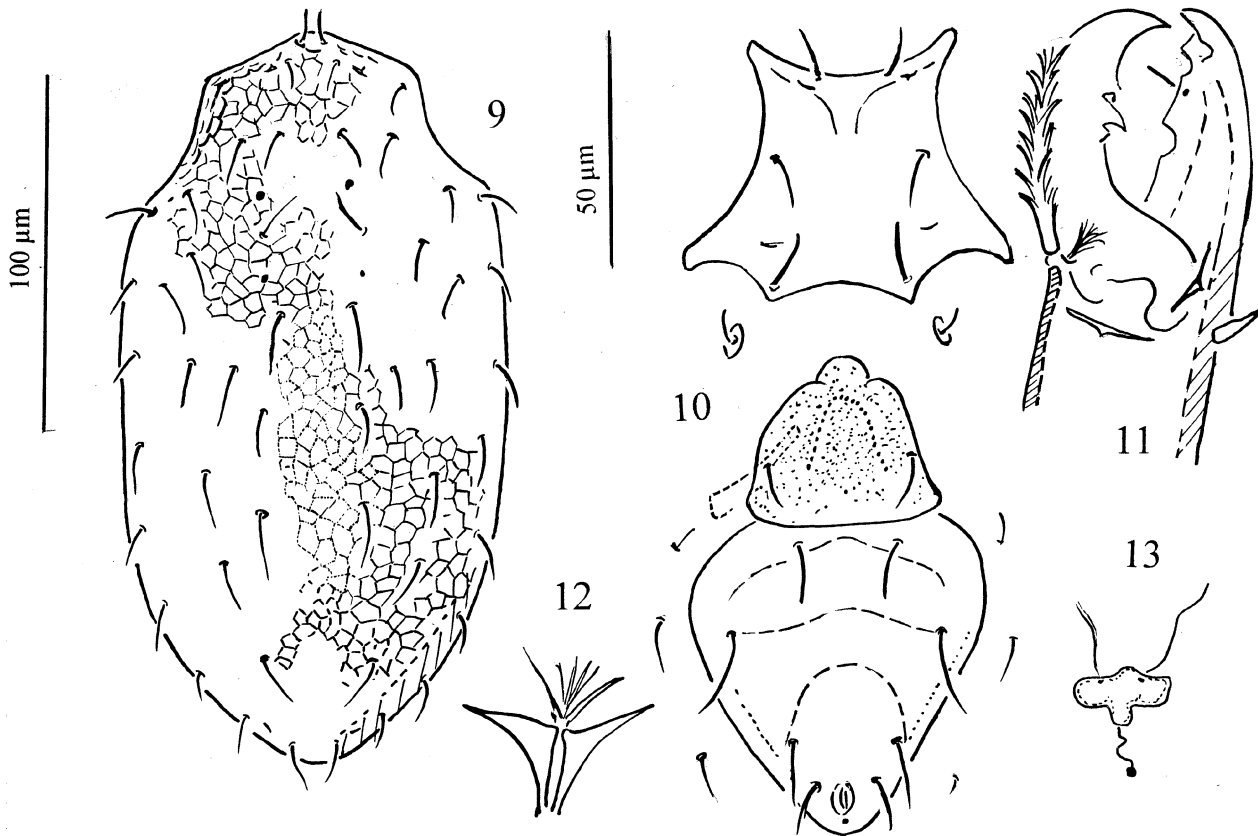
teeth, Arthrodial brush with minute setae, large setae as long as 3/4 of movable digit. Lyriform organ well developed. Epistome with a median brush (FIG. 12) *Sacculus foemineus* (FIG. 13): well visible, *glaber*-like. Legs with usual chaetotaxy. Male unknown.

DISCUSSION

(1) Affinities of *M. kamalii* and *M. kermani* with *M. glaber* and the *glaber* group.

The *glaber*-group is characterized notably by the setation of the dorsal shield with 28 setae (4 to 10

pilose), the procurved line of dorsal shield, the typical ornamentation of sternal shield, the bidentate fixed digit of chelicera (with proximal major tooth and distal minor one), the characteristic tripartite epistome, the two-lobed sacculus foemimeus. FILIPPONI & PEGAZZANO (1962) gave a definition of the *glaber* group founded on the pattern of the sternal shield and the character distally pilose of the setae (*j1*), (*j4*) & (*z4*) and (*J5*). *M. kamalii* and *M. kermani*. The both new species here described corresponded to the characters of the *glaber* group *sensu* WALTER & KRANTZ, 1986. Affinities of *M. kermani* can be discussed: (*j4*) are not pilose but bear few small hairs at the distal



FIGS 9-13: *Macrocheles elongatum* n. sp. Female. 9. — Dorsal shield. 10. — Ventral view. 11. — Chelicera, distal end, lateral view. 12. — Epistome. 13. — Sacculus foemineus.

end, (z4) are simple. These characters were observed from the African species of the *glaber*-group *M. eurygaster* KRANTZ, 1981.

The *glaber* group,
sensu FILIPPONI & PEGAZZANO (1962)
or sensu KRANTZ & WALTER (1986)

The species-group: a useful tool: The group of species was of frequent use, and often relevant to a temporary systematic. The SPECIES-GROUP is a “natural group” stated for grouping species at a lower degree than the infrageneric level (CAIN, 1954). The species belonging to one species-group share more apomorphic characters than with the others, and the species-group is monophyletic.

The species being the only element with a true biological status which reached “the point of non

retour” (MAYR, 1982), the monophyletic species-group can be considered as an Operational Taxonomic Unit (OTU) or an Evolutionary Unit (EU) of the first supraspecific degree (DARLU & TASSY, 1993; SNEATH & SOKAL, 1973).

The group of species was often stated for few species which were previously confused, and newly identified (*i. e.* the snails *Cepea nemoralis* and *C. hortensis* or in Diptera *Drosophila pseudoscura* and *D. persimilis*) (BOCQUET *et al.*, 1976; MAYR 1974, 1981, 1982). The “species-group” identifies the few sibling species from the others belonging to the same genus or subgenus. It was used to state a phylogenetically consistent systematic (division in groups, subgroups, or complexes of species).

The superspecies and the interspecies: The SUPERSPECIES (=Artenkreis) is a monophyletic group of species which are allopatric, but can be morphologically differentiated (MAYR, 1942). The INTERSPECIES is a

group of species, less or more sympatric but genetically isolated (RIPLEY, 1945). The species group and the interspecies have quite the same definition (VUILLEUMIER, 1976).

The glaber group: Historically, FILIPPONI & PEGAZZANO (1962) defined the *glaber*-group when meticulous studies on *glaber* and *perglaber* made the evidence that the well known species *M. glaber* and the sympatric and newly described species *perglaber* were genetically isolated: the hypothesis of the subspecies was rejected. Newly described species were added besides, new groups were proposed but without strict respect of the primal characters or with extended criteria: geographic distribution (sympatry) or morphology (females similar to the *glaber*'s females). For instance, the sibling species *glaber* and *perglaber* became sunk among more than 30 species clearly identified on the base of morphological characters. The first significance of the group was lost, the heterogeneity became greater, and a new definition was needed: complexes were defined (WALTER & KRANTZ 1986). Five complexes were proposed: *glaber sensu stricto* (cosmopolite, but Holarctic native), *friggi* (Ethiopian), *limue* (Paleotropical), *capensis* (Ethiopian) and *kraepelini* (Australian) (WALTER & KRANTZ 1986).

Berlese's point of view: In the first attempts to state a natural classification, BERLESE (1918) created four subgenera (*Geholaspis*, *Coprholaspis*, *Nothrolaspis* and *Macrocheles*). *M. glaber* (= *H. glabra*, Müller, = *M. (C.) glabro*: BERLESE 1918) was included in the subgenus *Coprholaspis*, with the following definition: "*Sternum non reticulo dermate altiori et crassiori confecto ornementum, sed sulco transverso inter poros repugnatorios secundos (ad angulos sterni medios), vel reticulo sulcis exilibus confecto, vel nitidum Plerea-que fimicolae et sapius insectis copophilis adfixae.*" BERLESE divided the subgenus *Coprholaspis* creating "phalanx" (i. e. with *M. merdarius*). The diagnostic characters of the fifth phalanx (including *M. glaber*) were: "*Adsunt bene conspicue linea media transversa et obliquae posteriores; aliquando etiam saltem vestigium lineae arcuatae (areae punctatae nullae vel obsoletissime)*". Some species now included in the *glaber* group (as *kraepelini* Berlese 1905) were excluded "*Adsunt lineae (transversa media semper conspicua, caeterae plus minusve obsoletae vel bene incisae) nec*

non areae punctatae saltem posteriores aliaeque punctiformes passim dissitae" but this opinion was revised by BERLESE in unpublished notes (WALTER & KRANTZ, 1986) ("deeply punctate linea arcuata forking linea oblique posteriores and acinous areae punctatae posteriores characteristics of the *glaber* group": WALTER & KRANTZ, *op. cit.*). *M. subbadius* was placed by BERLESE in a distinct "phalanx" by "*sternum non lineis integris sed lineis punctulis, serriatis tantum significatae, vel punctulis passim dissitis sculptum*". This taxonomy was based essentially on the ornamentation of the sternal shield.

A new definition of the glaber group: The *glaber*-group with more than 30 species became less and less in adequacy with the previous definition. Because the *glaber*-group was first created for grouping sympatric but isolated species, and because the *glaber*-group includes allopatric species which might have undergone a distinct speciation, it seems suitable to get the systematic clearer. We propose (1) that the *glaber*-group characterizes solely the couple of sibling species [*glaber*-*perglaber*] according to FILIPPONI & PEGAZZANO (1962), (2) to reconsider the *glaber*-group *sensu* WALTER & KRANTZ. The term of superspecies seems the most in adequacy and the coprophilous species of the genus *Macrocheles* can be subdivided into several superspecies (*glaber*, including the *glaber*-group and some species as *scutatus sensu* FILIPPONI & Pegazzano, 1962, *limue*, *kraepelini*, *friggi*, *capensis*...). Secondary adaptive radiation in isolated territories and continents may be the cause of these infrageneric divisions (HALLIDAY, 2000). The grouping of the species into superspecies of different geographic distributions, stated on selected characters, informs on the possible origins of regional faunas. According to these paradigms, the *glaber*-group (the sibling species *glaber* and *perglaber*), the *glaber*-like species as *scutatus* or *falsiglaber* (Glida & Bertrand, 2003), and the Iranian species *M. kamalii* and *kermani* must be included in the superspecies *glaber*.

Remarks on the Iranian Macrochelids : The Iranian Macrochelids are diversified and coprophilous species are very similar to the Mediterranean fauna. The Iranian species of the superspecies *glaber* showed affinities with both European and African macrochelids (*M. eurygaster*). Two hypothesis can be advan-

ced: either this region has to be considered in future as an extension of the Mediterranean Region (and an hypothetical “hot spot” of the superspecies *glaber*), or the Iranian fauna reflects the geographic position at the junction of Asian, European and African faunas.

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