

OBSERVATIONS OF THE GENUS *PROTOGAMASELLUS* KARG
(ACARI : MESOSTIGMATA)
WITH A DESCRIPTION OF A NEW SPECIES

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TAXONOMY
PROTOGAMASELLUS
EUROPE
AFRICA

SUMMARY : This paper deals with three species of *Protogamasellus* (fam. Ascidae) collected at Carnsore Point, Co. Wexford, Ireland and discusses, with re-descriptions, the species of the genus described by ATHIAS-HENRIOT (1961) from Algeria.

Protogamasellus primitivus Karg, 1962, the type of the genus, is considered to be a junior synonym of *Protogamasellus mica* Athias, 1961.

Protogamasellus hibernicus sp. nov. is described from soil in a grassland/dune area at Carnsore Point, and the following new combinations are presented : *Protogamasellus minor* for *Gamasellodes minor* Athias, 1961 and *Protogamasellus minor singularis* for *Leioseius singularis* Karg, 1962.

The genus is considered to comprise two distinct groups of species which are characterised. A key is provided for the identification of females occurring in Europe and Africa.

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RÉSUMÉ : Cet article concerne trois espèces de *Protogamasellus* (fam. Ascidae) récoltées à Carnsore Point, Co. Wexford, Irlande et les discussions, avec redescriptions, des espèces de ce genre décrites d'Algérie par ATHIAS-HENRIOT (1961).

Protogamasellus primitivus Karg, 1962, le type du genre, est considéré comme un synonyme junior de *Protogamasellus mica* Athias, 1961.

Protogamasellus hibernicus sp. nov., extrait du sol d'une aire de prairie/dune à Carnsore Point, est décrit et les regroupements nouveaux suivants sont proposés : *Protogamasellus minor* pour *Gamasellodes minor* Athias, 1961 et *Protogamasellus minor singularis* pour *Leioseius singularis* Karg, 1962.

Le genre est considéré comme formé de deux groupes d'espèces dont on donne les caractères. Une clé est fournie pour l'identification des femelles que l'on rencontre en Europe et en Afrique.

The genus *Protogamasellus* was proposed by KARG (1962) for *Protogamasellus primitivus* Karg, a small predatory mesostigmatic mite found in soil of arable land (5-10 cm depth) in a number of localities in East Germany. KARG placed the genus in the family Aceosejidae (= Ascidae). LINDQUIST

& EVANS (1965) re-defined the genus and drew attention to descriptions of four species of "rhodacarid" mites by ATHIAS-HENRIOT (1961), namely, *Rhodacaropsis massula*, *R. cognatus*, *R. angustiventris* and *Rhodacarellus mica*, which they considered to be probably congeneric with

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P. primitivus. Subsequently, GENIS, LOOTS & RYKE (1967) have described two new subspecies of *P. primitivus* and four new species of the genus from the Ethiopian region and KARG (1977) has described a new species, *Protogamasellus bicirratulus*, from Chile.

Recently, three species of *Protogamasellus* have been extracted from soil samples at Carnsore Point, Co. Wexford, Ireland, one of which appears to be undescribed. All have the characteristic life-form of other euedaphic mesostigmatic mites such as *Rhodacarellus* and *Gamasellodes*. In addition to the description of the species, this work also includes a review of the new species of *Rhodacarellus* and *Rhodacaropsis* referred to above, based on a study of the type material.

Syntypes of the new species are deposited in the collections of the National Museum, Dublin and the British Museum (Nat. Hist.), London. The terminology used in this work follows EVANS & TILL (1979).

DESCRIPTION OF SPECIES

Protogamasellus hibernicus sp. nov.

■ **Female** : Podonotal shield 119-126 μm in length and 97-100 μm in breadth at level of *s3*; Opisthonotal shield 134 \times 86 μm . Podonotal region with 22 pairs of setae of which 17 pairs comprising *j1-j6*, *z1-z6*, *s1*, *s3-s6* are situated on the shield (Fig. 1). Setae *s2* and *r2-r5* on unsclerotized cuticle; deficient in *r1* and *r6*. Setae *j1*, *j2* and *z1* forming more or less a transverse row with *j1* about twice the length of *j2* and *z1*. "Pores" located near *z1*, *j4*, *s2* and *j6*. Posterior region of podonotal shield with a distinct transverse line passing through setae *z6* and marking the posterior boundary between the heavier anterior and the lighter posterior sclerotized regions of the shield.

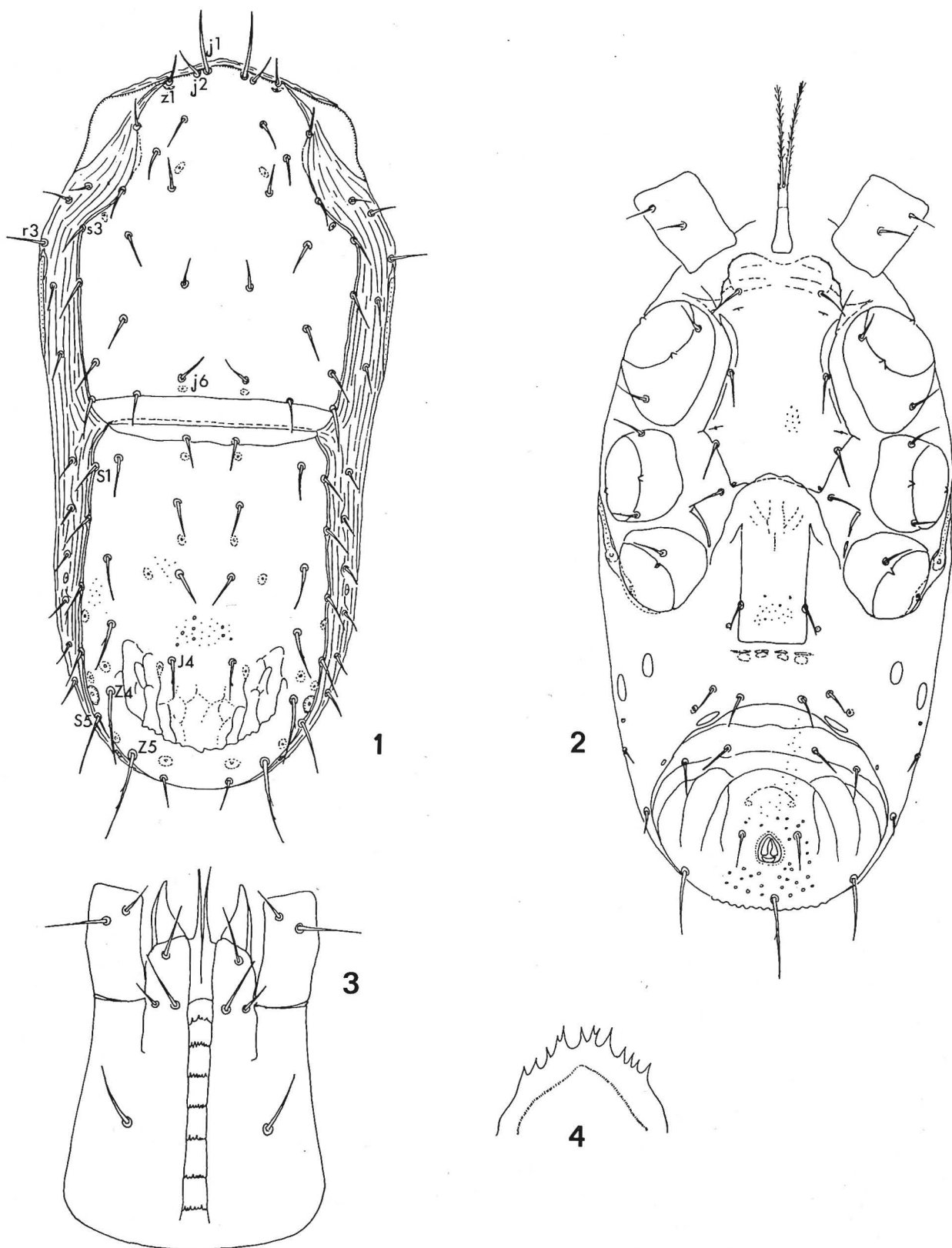
Opisthonotal region with 22 pairs of setae; *J1-J5*; *Z1-Z5* and *S1-S5* situated on opisthonotal shield and *R1-R6* and one pair of *UR* setae on the

lateral unsclerotized cuticle. Setae *Z5* (28-32 μm) longer than other opisthonotal setae and about twice the length of *J4* (14-15 μm) which is shorter in length than the distance between the bases of *J4* (17-20 μm). At least setae *J4*, *Z3-Z5* and *S5* minutely barbed. Porotaxy as in Figure 1. Posterior third of podonotal shield ornamented and both dorsal shields minutely punctate.

Ventrally, sternal shield, indistinct anteriorly, with three pairs of setae (*st1-st3*) and three pairs of pores; *st4* lying off shield on striated cuticle (Fig. 2). Tritosternum with slender base and long pilose laciniae. Genital shield wedge-shaped and with genital setae, anterior hyaline extension reaching posterior margin of sternal shield. Endopodal shield in region of coxae IV weak, often fragmented. Ornamented ventri-anal shield, length 83 μm , breadth 92 μm , with three pairs of ventral setae in addition to the adanal and post-anal setae. Chaetotaxy, porotaxy and sclerotization of remainder of opisthogaster as in Figure 2. Peritreme short, extending almost to the level of *r3*; peritrematic shield extending posterior to stigma and carrying post-stigmatic pore, shield poorly developed in the region of the peritreme and scarcely extending beyond the peritreme anteriorly. Anterior portion of peritrematic shield separated from posterior portion and weakly attached to podonotal shield in the region of *z1*.

Gnathosoma compact, hypognathal groove with 7 transverse rows of denticles, 5-7 denticles/row, (Fig. 3). Corniculi strongly grooved externally to accommodate salivary styli; hypostomatic processes simple. Gnathotectum with denticulate anterior margin (Fig. 4). Chaetotaxy of palptrochanter to palp genu (2-5-6) with stout seta *a1* of palpfemur chisel-like distally; apotele two-tined. Chelicera with movable digit bidentate, and fixed digit with 5/6 teeth and short pilus denticilis, resembling in form that of *P. m. singularis* (Fig. 8).

All legs shorter than idiosoma in length and with ambulacra. Chaetotaxy typical for the genus with the characteristic combination: genu III, 2-2/1-2/0-1, genu IV 2-2/1-3/0-0 and tibia IV 2-1/1-3/1-1. Distal sensilla of tarsi I strongly developed.



FIGS. 1-4 : *Protogamasellus hibernicus* sp. nov., female.

1. — Dorsum of idiosoma. 2. — Venter of idiosoma. 3. — Venter of gnathosoma. 4. — Gnathotectum.

■ **Locality** : Females (syntypes) from soil sample (0.5 cm depth) taken from a sand-dune area at Carnsore Point, Co. Wexford, Ireland.

Protogamasellus mica (Athias)

Rhodacarellus mica ATHIAS-HENRIOT (1961) : *Acarologia* 3 (4) : 488 (Figs.).

Protogamasellus primitivus KARG (1962) : *Mitt. Zool. Mus. Berl.* 38 : 52 (Figs.). **Syn. Nov.**

■ **Female** : Podonotal shield 120-126 μm in length and 98-101 μm in width at level of setae *s3* ; opisthonotal shield 120-124 μm in length and 81-83 μm in width at level of *s1*. Podonotal shield with 17 pairs of setae, *j2* (8 μm) situated considerably posterior to *j1* (6-7 μm) ; distinct transverse suture posterior to *j4* and connecting lines commencing at *s3* and running through *z3* and *j2* (Fig. 5). Setae *s1* located on podonotal shield in all material examined. Pores external to *j2*, *j4* and *j5*, and between *z3* and *s2* ; reticulate area posterior to *j5* with a median and two lateral stripes more heavily sclerotized. Transverse line through *z6* conspicuous.

Opisthonotal shield with 15 pairs of setae, *J4* (14-19 μm) shorter or approximately equal in length to the distance between basis of *J4* (18-19 μm). Intraspecific variation in lengths of *J2*, *J4*, *Z3* and *Z5* apparent in specimens from the same sample as well as between specimens from different localities. Six pairs of *R* setae and two pairs of *UR*. Distinct line running from margin of the shield to *J1* on either side of the body, rarely continuous between *J1*. Porotaxy as in Fig. 5.

Genital shield wedge-shaped with slightly convex posterior margin, genital setae lying off the shield or, more rarely, one seta lying on margin of the shield (Fig. 6). Ventri-anal shield (92-95 μm in median length) with five pairs of ventral setae in addition to the three setae associated with the anus. Anterior margin of the shield incised usually to the level of *Jv1* but shape and extent of the incision variable, even within the

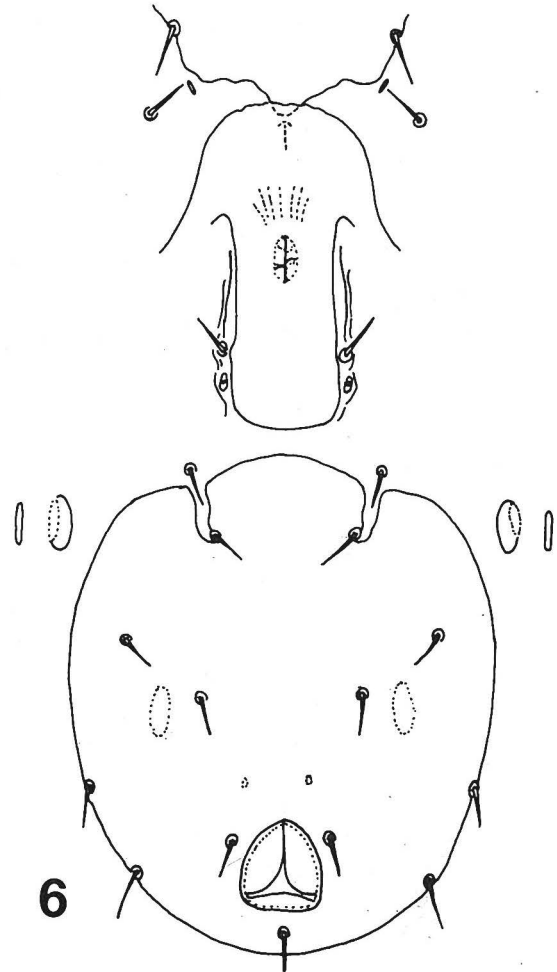
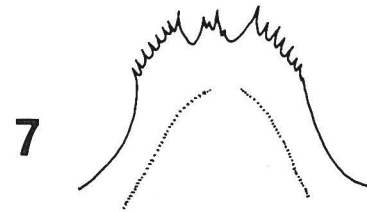
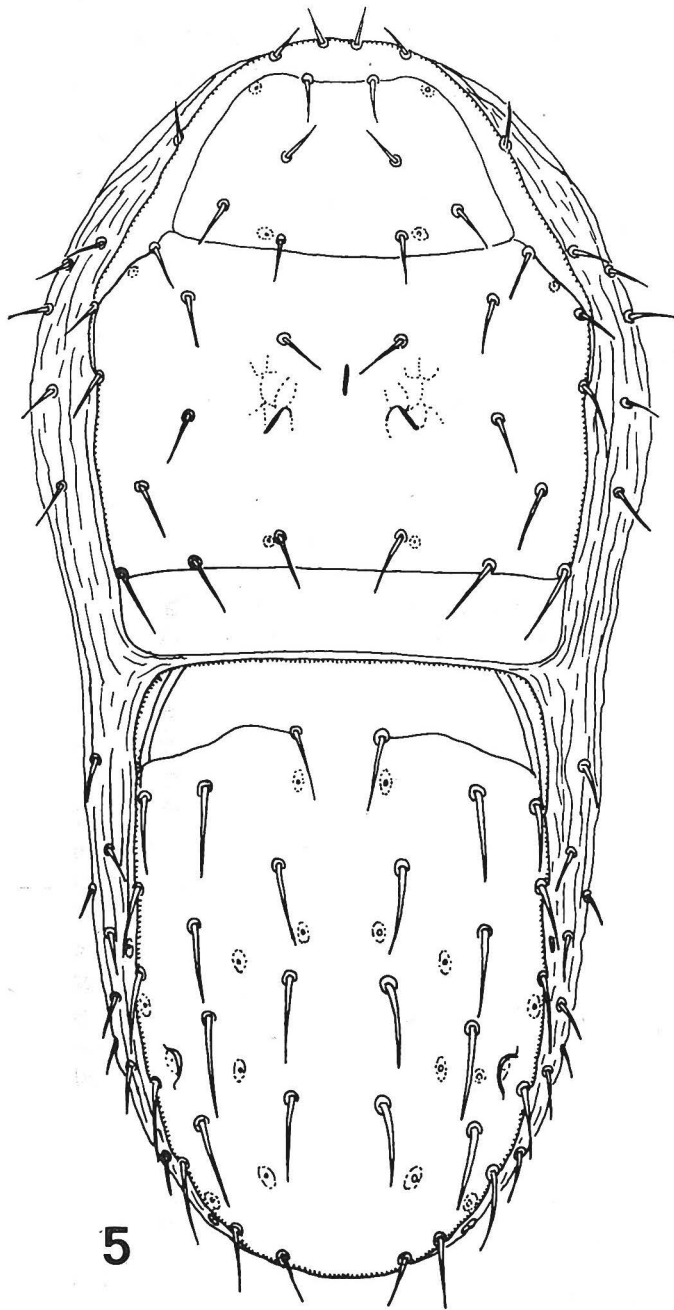
same specimen. Peritreme extending to the level of *r4*.

Hypognathal groove with 7 transverse rows of denticles, 6-10 denticles/row ; corniculi slender, sinuous and *hyp.* 1 strong, reminiscent of the form in *Proctolaelaps hypudaei* (Oudemans). Hypostomatic processes with externo-lateral spicules. Gnathotectum basically tripartite, multidentate (Fig. 7) ; supralabral process strongly sclerotized. Palpal chaetotaxy normal, apotele two-tined. Movable digit of chelicera with two strong teeth and a row of smaller closely-set teeth (6-7) in the proximal half of the digit and these oppose similar teeth on the fixed digit ; remainder of fixed digit with 5 teeth and a bidentate tip. Pilus dentilis short.

Leg chaetotaxy normal for the genus. Setae *pd* and *pl* on femur IV stubby, spine-like.

■ **Localities** : The type localities are given by ATHIAS-HENRIOT as : " Djelfa (Titteri) steppe d'alfa, racines d'*Euphorbia* sp. " and " Alger Ecole Nationale d'Agriculture, Station Botanique, Végétation négligée ". *P. primitivus* was reported from " Ackerboden, Vorwiegend in 5-10 cm. Tiefe, bei Berlin, Halle und Rheinsberg " (KARG, 1962) and from the U.S.S.R. by GHILAROV & BREGETOVA (1977). Females only have been found in association with *P. hibernicus* in soil samples (0.5 cm depth) taken from a grassland/dune area at Carnsore Point, Co. Wexford, Ireland.

■ **Notes** : Within the limited material of *P. mica* which I have examined including type material of both *P. mica* and *P. primitivus*, it is difficult to assess the status of the subspecies described by GENIS *et al.* (1967). The distinctive characters given by these authors refer, in the main, to the relative lengths of the dorsal setae and the nature of the incisions of the anterior margin of the ventri-anal shield in the female. It will be noted that both of these features show considerable intraspecific variability in the Carnsore material. *Protogamasellus dispar* Genis, Loots & Ryke is obviously closely related to *P. mica* and would appear to differ less from the typical form



FIGS. 5-7 : *Protogamasellus mica* (Athias), female.
5. — Dorsum of idiosoma. 6. — Genital and ventri-anal shields. 7. — Gnathotectum.

than *P. primitivus machadoi* Genis *et al.* The statement that setae *s1* are located on the lateral cuticle *P. dispar* is not in agreement with their illustration of the dorsum of the female in which these setae are located on the podonotal shield (cf. Fig. 17 in GENIS *et al.*, 1967).

Protogamasellus minor singularis (Karg)
comb. nov.

Gamasellodes minor ATHIAS-HENRIOT (1961) : *Acarologia* 3 (4).
Leioseus singularis KARG (1962) : *Mitt. Zool. Berl.* 38 : 5.

■ *Female* : Podonotal shield 120-124 μm in length and 103-108 μm in breadth at the level of *s3* (Fig. 8). Setae complement and distribution on the dorsum of the idiosoma as in *P. hibernicus*. Setae *j1*, *j2* and *z1* forming a transverse row with *j2* (14-16 μm) about two-thirds the length of *j1* (22-24 μm). Line connecting *z3* and *j4* on either side of the podonotum. "Pores" present in the region of *z1*, *j4* and *z3-s3*.

Opisthonotal shield (130-135 \times 97-99 μm) with setae *J4* (22-24 μm) considerably longer than the distance between their bases (14-16 μm); *Z4* and *Z5* are 29 μm and 36 μm , respectively. Porotaxy as in Fig. 8; surface of shield minutely punctate with depression posterior to *J4* and a crenulate ridge in the region of *Z4*. Setae *J4-J5*, *Z3-Z5* and *S5* barbed.

Chaetotaxy and sclerotization of the venter as in Fig. 9. Ventri-anal shield (78-82 \times 99-102 μm) with four pairs of ventral setae in addition to the adanal and postanal setae; ventral setae *Jv2* and *Zv2* forming more-or-less a transverse row. Anal opening normal in size. Peritreme short extending almost to the level of *r3*, peritrematic shield extending posterior to the stigma but poorly developed in the region of the peritreme. Anterior portion of peritrematic shield isolated and attachment to podonotal shield weak or lacking.

Gnathosoma with hypognathal groove provided with 7 transverse rows of denticles; hypostomatic processes simple; corniculi and hypostomatic setae as in *P. hibernicus*. Gnathotectum tridentate with median and lateral processes divided dis-

tally (Fig. 10). Movable digit of chelicera with 6 teeth and a bidentate lip, *pilus dentilis* short; fixed digit bidentate (Fig. 11). Seta *al* of palp-femur stout, chisel-like distally.

Chaetotaxy of legs normal for the genus. Setae *ad2*, *pd* and *p1* of femur IV subspinose.

Tubuli of Michael's organ (spermatheca) narrow and simple and extending from acetabula III to a median sacculus.

■ *Localities* : KARG (1962) collected *P. m. singularis* (females, males and nymphs) from arable and meadow soil (?) Kleinmachnow. E. Germany.

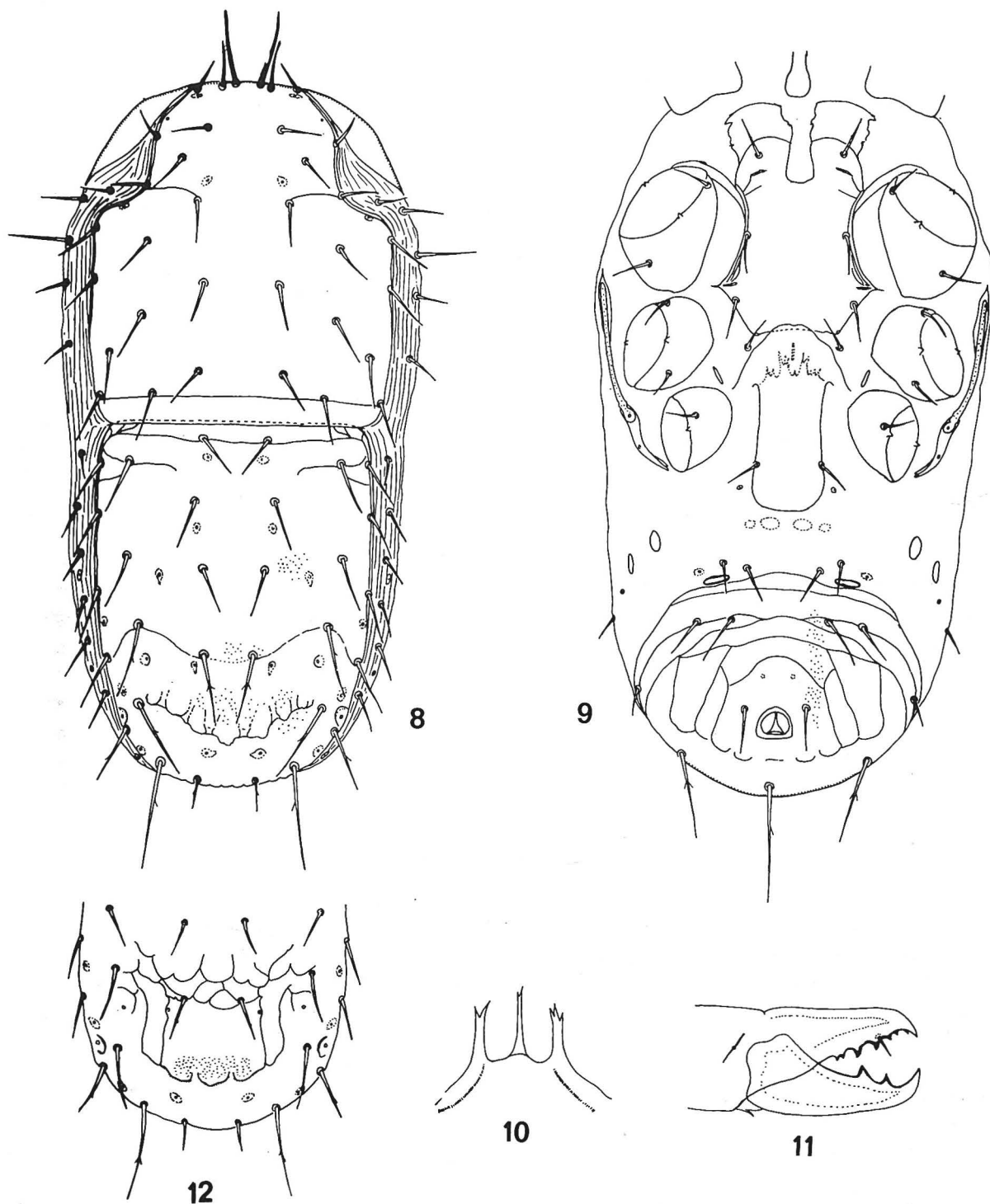
I have examined females from soil samples under gorse at Carnsore Point, Co. Wexford, Ireland and from pasture soil (ex-barley) on chalk at Berwick St. James, Wiltshire, England (Coll. W. WILKINSON, 1969).

■ *Notes* : The subspecific status attributed to *P. m. singularis* must be considered provisional pending the examination of a range of material from N. Africa and Europe. In the original description of *Protogamasellus minor minor* (Athias) comb. nov. no mention was made of the transverse lines at the level of *z6* and *J1* although the characteristic lines connecting *z3* and *j4* were illustrated. The main difference between the typical form and *P. m. singularis* lies in the relative lengths of some of the opisthonotal setae, particularly, *J4*, and the nature of the ornamentation of the depressed area posterior to the latter setae (Fig. 12). In *P. minor minor* setae *J4* are shorter (18 μm) than the distance between their bases (23 μm). Further, the lateral tines of gnathotectum are relatively shorter and are each divided into four processes.

Protogamasellus massula (Athias)

Rhodacaropsis massula ATHIAS-HENRIOT (1961) : *Acarologia* 3 (4) : 495 (Figs.).

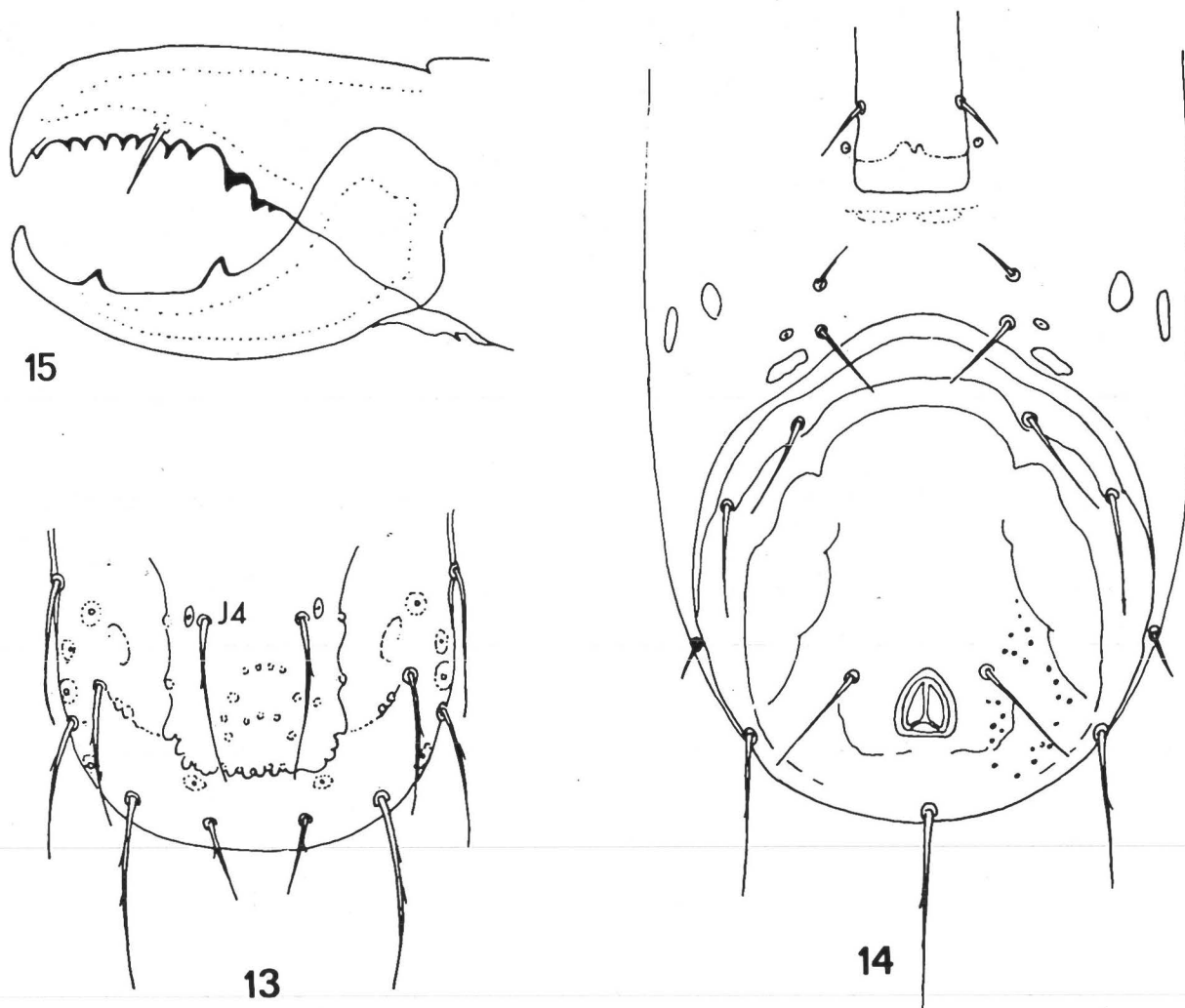
■ *Female* : Dorsal idiosomatic chaetotaxy typical for the genus and with one pair of *UR* setae. Podonotal shield (length 140 μm) with setae *j1*



FIGS. 8-11 : *Protogamasellus minor singularis* (Karg), female.

8. — Dorsum of idiosoma. 9. — Venter of idiosoma. 10. — Gnathotectum. 11. — Cheliceral digits.

FIG. 12 : Posterior region of opisthonotal shield of *Protogamasellus minor minor* (Athias), female.



FIGS. 13-15 : *Protogamasellus massula* (Athias), female.
13. — Posterior region of opisthonotal shield. 14. — Opisthogaster. 15. — Cheliceral digits.

and *j2* approximate and forming a transverse row with *z1*; setae *j2* about two-thirds the length of *j1*. No ornamentation in the region of *j5-j6*. Opisthonotal shield (length about 140 μm) with 15 pairs of setae. *J4* (27-29 μm) considerably longer than the distance between the bases of *J4* (18-19 μm); at least setae *J4*, *Z4*, *Z5* and *S5* with one or two barbs (Figs. 13).

Genital shield with pair of setae; ventri-anal shield with three pairs of ventral setae in addition to the three setae associated with the anus (Fig. 14), setae *Jv1* considerably posterior to *Zv1*.

Hypognathal groove with 7 transverse rows of denticles; proximal three rows multidentate but

remaining rows apparently with single median denticle. Gnathotectum subtriangular with denticulate margin. Movable digit of chelicera bidentate, teeth widely separated, dentition of fixed digit and form of *pilus dentilis* as in Figure 15.

Leg chaetotaxy normal for the genus; setae *ad2*, *p1* and *a1* of femur IV short, spinose.

■ **Locality** : The type locality is "La Réghaia, route de Ménerville, forêt de *Quercus suber*", Algeria. I have also examined material from litter and soil under pines (*Pinus halepensis*), Kadons (Hydra), Algeria (ATHIAS collection).

The specimens at my disposal were unfortuna-

tely distorted and it is not possible to give a comprehensive re-description of the species. The chaetotaxy and ornamentation of the opisthonotal shield and the shape and chaetotaxy of the ventri-anal shield are diagnostic.

Protogamasellus angustiventris (Athias)

Rhodacaropsis angustiventris ATHIAS-HENRIOT (1961) : *Acarologia* 3 (4) : 493 Figs.

The holotype and only known specimen of this species is badly distorted and it is not possible to make a detailed description of the species.

The dorsal chaetotaxy is typical for the genus with *s1* on the podonotal shield and one pair of *UR* setae. Seta *j1* (30 μ m) is approximately twice the length of *j2*. A feature of the species is the extremely narrow opisthonotal shield (155 \times 59 μ m) which has a U-shaped depression posterior to *J4*. Setae *Z4* and *Z5* are, respectively, 15 and 42 μ m in length while setae *J4* are 14 μ m and the distance between their base 11 μ m. Three pairs of ventral setae occur on the ventri-anal shield.

The hypognathal groove has 7 transverse rows of denticles and the gnathotectum is subtriangular in shape with its margins multidenticulate. Chelicerae with bipartite movable digit; fixed digit with 3 large proximal teeth and 5 smaller teeth between them and the bifid tip. The leg chaetotaxy is normal for the genus.

■ *Locality* : A single female from soil under *Laurus nobilis*, " Vallée de l'Oued Bouzaréah, Alger ".

Protogamasellus cognatus (Athias)

Rhodacaropsis cognatus ATHIAS-HENRIOT (1961) : *Acarologia* 3 (4) : 495, Figs.

This species is also only represented by the holotype. The dorsal complement of setae is typical for the genus but *s1* are situated on striated cuticle flanking the podonotal shield. Setae *j6* are

14 μ m in length. The opisthonotal shield has a U-shaped depression posterior to *J4* which are 20 μ m in length and 18 μ m between their bases; *Z5* are 45 μ m long.

The ventri-anal shield is distinctly attenuated in its anterior two-thirds and bears only two pairs of ventral setae (cf. Fig. 299 in ATHIAS 1961).

The leg chaetotaxy is typical for the genus.

■ *Locality* : Known only from the type locality : " Jardin d'agrément, compost végétal ", Maison Carrée, Algeria.

DISCUSSION

The morphological features of the species examined in the course of the present study agree with those given in the definition of the genus by LINDQUIST & EVANS (1965). The females of *Protogamasellus* appear to fall into two distinct groups which may be distinguished by the following contrasting characters :

<i>mica</i> -gr	<i>hibernicus</i> -gr
1. Setae <i>j1</i> and <i>z1</i> subequal in length.	Setae <i>j1</i> outstandingly longer than <i>z1</i> .
2. Transverse line in anterior region of opisthonotal shield interrupted between the bases of setae <i>J1</i> .	Transverse line continuous between setae <i>J1</i> .
3. Opisthonotal shield without a depressed, ornamented area posterior to setae <i>J4</i> .	Opisthonotal shield usually with a depressed, ornamented area posterior to setae <i>J4</i> .
4. Anal opening conspicuously enlarged.	Anal opening normal in size.

The *mica*-gr contains *P. mica* s. lat. (including *P. dispar*) and *Protogamasellus bifurcalis* Genis, Loots & Ryke while the remainder of the described species belong to the *hibernicus*-gr. I do not consider it necessary in the present state of our

knowledge of the genus to propose subgeneric taxa for these groups.

The transverse lines in the posterior region of the podonotal shield and in the anterior region of the opisthonotal shield define an area of weakly sclerotized cuticle bordering the prosomatic/opisthosomatic juncture. This area, together with the transverse suture in the anterior region of the podonotal shield of *P. mica* s. lat. increase the flexibility of the idiosoma and are undoubtedly adaptations for movement in the confined spaces of the deeper layers of the soil as in the case of certain species of *Rhodacarus*. The occurrence of a suture posterior to *j4* in some euedaphic Gamasina would indicate flexibility in the region of legs II and III, and this condition compares with the flexibility of the prosomatic region at the sejugal furrow in euedaphic Lower Cryptostigmata.

Females of the European and African species of *Protogamasellus* are distinguished in the following key. No attempt is made to separate the subspecies of *P. mica*. I do not consider *P. bicirratu*s to be congeneric with *Protogamasellus* sensu LINDQUIST & EVANS (1965) on the basis of spurred legs II in the male, the absence of a line at the level of setae *z6* and the presence of an anal shield in the female.

KEY TO FEMALES OF *Protogamasellus* KARG

1. Setae *j1* and *z1* subequal in length; anal opening conspicuously enlarged; transverse line in anterior region of opisthonotal shield typically interrupted between setae *J1* (*mica*-gr)..... 2
— Setae *j1* considerably longer than *z1*; anal opening normal in size; transverse line anterior region of opisthonotal shield continuous between *J1* (*hibernicus*-gr) 3
2. Podonotal shield with transverse suture posterior to *j4* (Fig. 5); ventri-anal shield with 5 pairs of ventral setae (excluding adanals) and anterior margin with a pair of incisions to about the level of *Jv2* (Fig. 6). Corniculi entire distally. Europe & Africa *P. mica* Athias s. lat. (including *P. dispar* Genis et al).
— Podonotal shield without such transverse suture; ventri-anal shield with 6 pairs of ventral setae and lacking anterior incisions; corniculi forked distally. S. Africa *P. bifurcalis* Genis, Loots & Ryke.

3. Opisthonotal shield considerably narrower than the width of the podonotal shield at its posterior margins and at least $2.0 \times$ as long as wide..... 4
— Opisthonotal shield about as wide as the posterior margin of the podonotal shield less than $1.5 \times$ as long as broad 5
4. Setae *J4* on opisthonotal shield scarcely longer than the distance between their bases ($14 : 11 \mu\text{m}$); movable digit with two teeth and bidentate tip; pair of circular platelets between setae *Jv2*. Algeria.....
P. angustiventris (Athias)
— Setae *J4* at least $1.8 \times$ as long as the distance between their bases; movable digit of chelicera with four teeth and bidentate tip; without platelets between *Jv2*. S. Africa.....
P. scuticalis Genis, Loots & Ryke.
5. Gnathotectum basically three-pronged, lateral prongs denticulate (Fig. 10)..... 6
— Gnathotectum rounded or subtriangular and multi-denticulate (Fig. 4)..... 7
6. Podonotal shield with distinct line connecting *z3* and *j4* (Fig. 8); ventri-anal shield with 4 pairs of ventral setae (excluding adanals). Europe, N. Africa..... *P. minor* (Athias) s. lat.
— Podonotal shield without such line; ventri-anal shield with 3 pairs of ventral setae (excluding adanals). S. Africa.....
P. brevicornis Genis, Loots & Ryke.
7. Ventri-anal shield strongly attenuated in its anterior two-thirds and with 2 pairs of ventral setae (excluding adanals); setae *s1* lying on unsclerotized cuticle. N. Africa..... *P. cognatus* (Athias).
— Ventri-anal shield not or weakly attenuated in anterior two-thirds and with 3 pairs of ventral setae (excluding adanals); setae *s1* on margin of podonotal shield 8
8. Opisthonotal setae *J4* considerably longer than the distance between their bases; teeth of movable digit of chelicera widely spaced, distance between them greater than the width of the digit at the level of the distal tooth. (Fig. 15). N. Africa.....
P. massula (Athias).
— Opisthonotal setae *J4* shorter than distance between their bases (Fig. 1); teeth of movable digit more closely set, distance between them not exceeding width of digit at level of distal tooth, Europe (Britain and Ireland) *P. hibernicus* sp. nov.

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