THE ORIBATID FAMILY PHTHIRACARIDAE. III. REDESCRIPTION OF *PHTHIRACARUS NITENS* (NICOLET)

BY

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In 1855 NICOLET published an interesting paper on the Oribatid mites of the surroundings of Paris, in which 56 species are dealt with. The descriptions and figures are of remarkable quality, especially when they are compared with the poor results obtained by C. L. KOCH not long before (1836-1841). Nevertheless, many of NICOLET's names are still not in use, partly because the descriptions do not allow of a specific identification unless the local fauna is known [1]. For this reason a series of collecting trips in the surroundings of Paris have been made by me in April, June, and September 1960, and in September [2] and November 1961.

Collecting is facilitated because NICOLET generally indicates the localities of his material. Fortunately most of these localities are still in existence, although the forests are nowadays considerably less extensive. Especially in the region south of Paris (Sceaux and neighbouring areas) a few remainders are left only. Important woods are, however, still present in the south-west.

Rather large series of samples have been collected by me at the following localities : Parc de Versailles (including the " Rû de Gally " in the western part of the park) ; Bois de Satory and Bois du Cerf Volant near Versailles ; Bois de Fausse Repose, between Ville d'Avray and Chaville ; Parc de St. Cloud ; woods near Viroflay ; Bois de Meudon, between Sèvres, Chaville, Vélizy-Villacoublay, and Meudon ; woods near Le Plessis-Robinson ; Parc de Sceaux ; Bois de Vincennes. I remark that the following woods mentioned by NICOLET are apparently no more in existence : Bois d'Aulnay near Fontenay-aux-Roses ; Bois de la Brèche near Versailles.

NICOLET described three species of Phthiracaroid mites, which are named

1. For a correct interpretation of an old description it is, moreover, necessary to apply the carbon block method of study described by GRANDJEAN (1949).

2. The collecting trip in September 1961 was made possible by a grant from the Netherlands Organization for Pure Research (Z.W.O.).

by him *Hoplophora magna*, *Hoplophora stricula* KOCH, and *Hoplophora nitens*. *H. magna* and *nitens* are characterized as common, respectively very common in all woods of the surroundings of Paris ; *stricula* is characterized as occurring rather rarely in the Bois de Satory.

Hoplophora magna is now classified with *Steganacarus* ; the identity is certain, although its relation to *S. anomalus* is a problem that must still be thoroughly studied. *Hoplophora stricula* sensu NICOLET is a *Rhysotritia* which is probably identical with *duplicata*, the commonest species near Paris of the genus ; I remark that this is mentioned already by GRANDJEAN (1953, p. 158) [1]. *Hoplophora nitens* is undoubtedly a *Phthiracarus* because of the smooth and shining notogaster ; its identity will be the subject of the present paper.

In order to identify *nitens* it is essential to know the Phthiracaroid fauna of the woods near Paris. As a result of my trips I collected the following material : 220 *Rhysotritia* (mostly *duplicata*, but also *ardua* and *minima*), 454 *Steganacarus* (mainly *magnus*), and 580 *Phthiracarus* (belonging to five species). In the following list the *Phthiracarus* species are enumerated with the total number of specimens and the frequency (i.e. the number of samples in which they have been collected). Anticipating the conclusions drawn below, the name *nitens* is given in this list to the commonest species. The name *P. globosus* (C. L. KOCH) is given to a characteristic, dark-coloured, and globular species of which the identity is certain since topotypic specimens have been collected by me in the surroundings of Regensburg (Bavaria, Germany). Because of the lack of sufficient descriptions, the remaining three species are named here *PA* *PB*, and *PC* respectively. I remark that *PA* is a small species related to *ferrugineus* sensu JACOT ; *PB* is a species with a falcate sensillus, related to *testudineus* sensu JACOT ; *PC* is a species with striklingly long notogastral setae, related to *crinitus* sensu JACOT. Consequently, the real *nitens* must be chosen out of the following species.

	number	frequency
Phthiracarus nitens	392	34
Phthiracarus globosus	42	2
Phhiracarus spec. *PA*	30	14
Phthiracarus spec. *PB*.....	110	6
Phthiracarus spec. *PC*	6	3

P. globosus does not correspond with NICOLET's description and figure of *nitens* because of its very dark colour, the nearly globular shape of the notogaster, and the long notogastral setae. *P.* spec. *PA* is at once excluded because of its small length ; *P.* spec. *PC* because of its strikingly long notogastral setae. The real *nitens* must finally be chosen from the remaining two species, those preliminarily named *nitens* and spec. *PB*. The first of these is the most common one that has

1. OUDEMANS (1915, p. 233) created the name *Phthiracarus undatus* for the nymph of *Hoplophora stricula* sensu NICOLET (1855, p. 399, pl. 2, fig. 2). The name could be a senior homonym of *Rhysotritia duplicata* if there is sufficient proof of the identity of this nymph ; for the moment this appears to be doubtful.

been found in all woods investigated by me. *P.* spec. *PB* is much more rare (only present in 6 samples) and has been found in damp places only ; the total number is flattered because 98 specimens of spec. *PB* have been collected in two samples from an alder marsh near a brooklet (Rû de Gally). I recall that NICOLET characterizes *nitens* as very common in all woods of the surroundings of Paris. Apart from this, P. spec. *PB* is only of medium length, whilst it has a long falcate sensillus, characters that do not exactly fit in with NICOLET's description and figure. In my opinion there is sufficient evidence to regard the common species indeed as the real *nitens*.

In literature the name *nitens* is sometimes mentioned as a synonym of other species. CLAPARÈDE (1868) lists it under *contractilis* PERTY, MICHAEL (1888, 1898) under *dasypus* DUGÈS, WILLMANN (1931) under *piger* SCOPOLI. It is probable that in recent times the common species has often been cited under the last-mentioned name. Notes by STRENZKE (1952, p. 154) on the identification of Swedish specimens as *P. piger* point in this direction ; it is, however, not certain that STRENZKE's German material belongs to *nitens* because he characterizes these specimens as dark-coloured.

I remark that SCOPOLI's original 1763 description of *Acarus piger* (a concise Latin diagnosis) is just sufficient to recognize the animal as a Phthiracaroid mite ; its recorded occurrence on lichen in Tirol definitively excludes the possibility that it is identical with *P. nitens*. *Oribates dasypus* DUGÈS (1834) [1] is a *Phthiracarus* from " Ardennes ", a department in the North of France, near the Belgian frontier ; the locality is imprecize so that a study of topotypic specimens will not be helpful to solve the problem of its identity. The important identity of *Phthiracarus contractilis* PERTY will be the subject of a following number of the present series.

My list of localities of *P. nitens* must be regarded as the first certain series of records since NICOLET's original description. In the redescription comparisons are made with *P. laevigatus* (cf. VAN DER HAMMEN, 1963), a closely related species with which *P. nitens* has probably been confounded.

I remark that similar difficulties as in *laevigatus* can be met with when the animal is heated with lactic acid. The use of diluted lactic acid (two parts of lactic acid and one part of distilled water) is preferable.

Phthiracarus nitens (NICOLET, 1855)

Hoplophora nitens NICOLET, 1855, p. 472, pl. 10 fig. 6.

Material. — The topotypic material from the surroundings of Paris (France) dealt with here, comprises the following specimens (localities arranged mainly from west to east.).

1. It is unknown whether this is the same species as represented by DUGÈS and EDWARDS (1848) as *Oribata decumana* ; the figures of the last-mentioned species have some resemblance to *P. nitens*.

Parc de Versailles, litter from woods near " Grand Canal ", June 15, 1960 : 25 specimens (sample 60 P 28). *Idem*, litter from " Petit Parc ", September 16, 1961 : 2 specimens (61 P 58). *Idem*, litter from large heap of leaf-mould in " Petit Parc ", September 16, 1961 : 7 specimens (61 P 59). *Idem*, moss, mainly collected in alder-marsh near Rû de Gally, November 22, 1961 : 12 specimens (61 P 74), 67 specimens (61 P 75), 4 specimens (61 P 76).

Bois de Satory, near Versailles, litter from dry part with scattered trees, September 12, 1961 : 2 specimens (61 P 52). *Idem*, moss from forest floor, September 16, 1961 : 35 specimens (61 P 60). *Idem*, litter from ravine, September 16, 1961 : 6 specimens (61 P 61). *Idem*, litter from higher part, November 21, 1961 : 2 specimens (61 P 71), 3 specimens (61 P 72), 1 specimen (61 P 73).

Bois du Cerf Volant [1], near Versailles, mainly litter, April 5, 1960 : 3 specimens (60 P 1), 6 specimens (60 P 2), 11 specimens (60 P 3), 5 specimens (60 P 4). *Idem*, litter, June 15, 1960 : 9 specimens (60 P 25), 16 specimens (60 P 27).

Bois de Fausse Repose, between Ville d'Avray and Chaville, litter, June 18, 1960 : 9 specimens (60 P 40).

Parc de St. Cloud, litter, June 18, 1960 : 22 specimens (60 P 35), 59 specimens (60 P 36).

Viroflay, litter from the woods, September 19, 1961 : 2 specimens (61 P 68).

Bois de Meudon, litter and moss from the northern part of the woods near Sèvres, June 14, 1960 : 1 specimen (60 P 24). *Idem*, litter from the western part of the woods near Chaville, June 14, 1960 : 9 specimens (60 P 21). *Idem*, moss from the same part of the woods, June 14, 1960 : 2 specimens (60 P 23). *Idem*, moss from the woods between Chaville and Vélizy-Villacoublay, September 17, 1961 : 2 specimens (61 P 62). *Idem*, litter from the south-eastern part near Meudon, September 23, 1960 : 9 specimens (60 P 41).

Le Plessis-Robinson, litter from the woods north of the terrace, September 18, 1961 : 4 specimens (61 P 64).

Parc de Sceaux, litter, June 16, 1960 : 31 specimens (60 P 29), 2 specimens (60 P 30), 5 specimens (60 P 31), 2 specimens (60 P 32).

Bois de Vincennes, litter from the woods south-east of the castle, June 17, 1960 : 10 specimens (60 P 33), 7 specimens (60 P 34).

Total : 392 specimens from 34 samples.

Because the type-material of NICOLET's Oribatid mites is no more in existence, a specimen from sample 61 P 60 is designated here as neo-type of *Hoplophora nitens* NICOLET ; it is preserved in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden.

Occurrence. — In the surroundings of Paris the species is common in litter and moss in woods. It has apparently no special humidity preference because it is found in dry as well as in damp parts. It occurs in both the higher and the lower part of the woods.

1. I discovered this name on a local map. The woods are a continuation of the Bois de Satory.

Measurements. — 35 specimens from sample 61 R 60 have been measured. The results of males and females together are the following : length of prodorsum 0.300-0.435 mm ; length of notogaster 0.530-0.885 ; height of notogaster 0.390-0.620. When ovipositor and penis are not extended it is often difficult to establish the sex. The average length of the notogaster of the male is apparently between 0.550 and 0.620 mm, that of the female between 0.745 and 0.805.

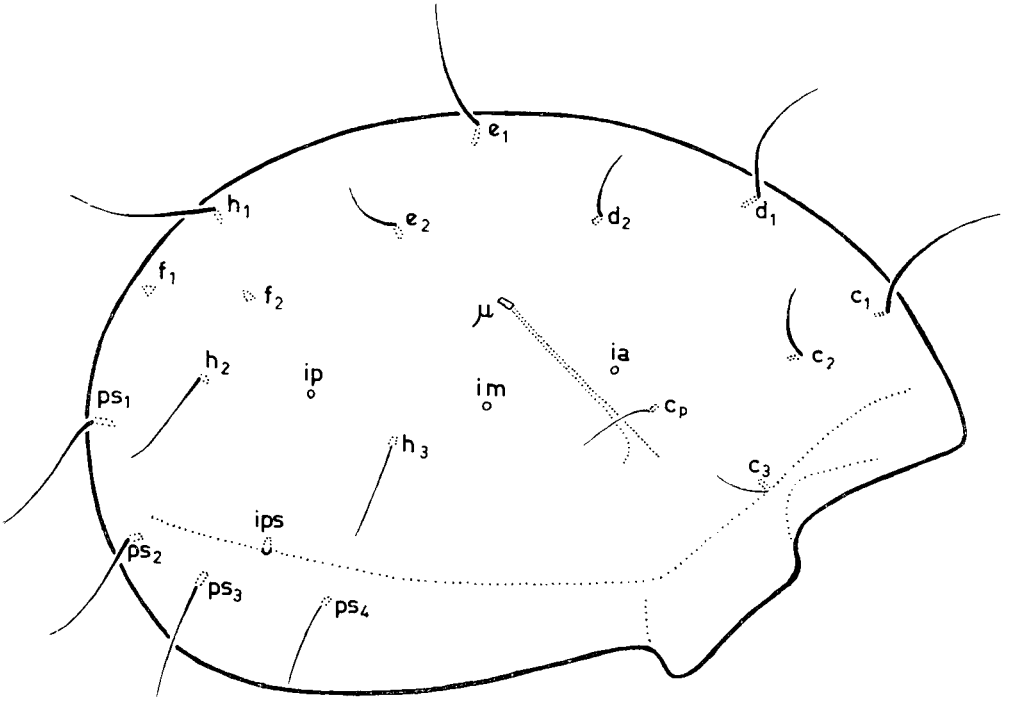

FIG. 1. — *Phthiracarus nitens* (NICOLET) ; lateral view of notogaster ; × 165.

Habitus and colour. — The species is a relatively large *Phthiracarus,* although somewhat smaller than *P. laevigatus.* In comparison with *laevigatus* the shape of the notogaster is more elongate, without sharp angle near c_1. The notogastral hairs are thin but distinct, and of medium length ; they are whitish and often broken. The cuticle is very shining ; on a carbon block only a vague irregular punctation can be discovered. The long solenidions φ of the tibiae are conspicuous, as drawn by NICOLET. The anterior apophysis of the genital valves is easily visible in a dry observation.

The colour is always more or less yellow, ochreous, or yellowish-brown ; recently moulted specimens are rather light, older specimens darker. The notogastral limb and the borders of anal and genital valves are generally distinctly darker than the remaining part of the idiosoma.

Cerotegument. — When the animal is studied on a carbon block, irregular granules of white cerotegument can be observed on the prodorsum (especially in the anterior region), on the notogastral limb, and in the ano-genital region. In older specimens small irregular masses of cerotegument can also be present on the sides of the notogaster.

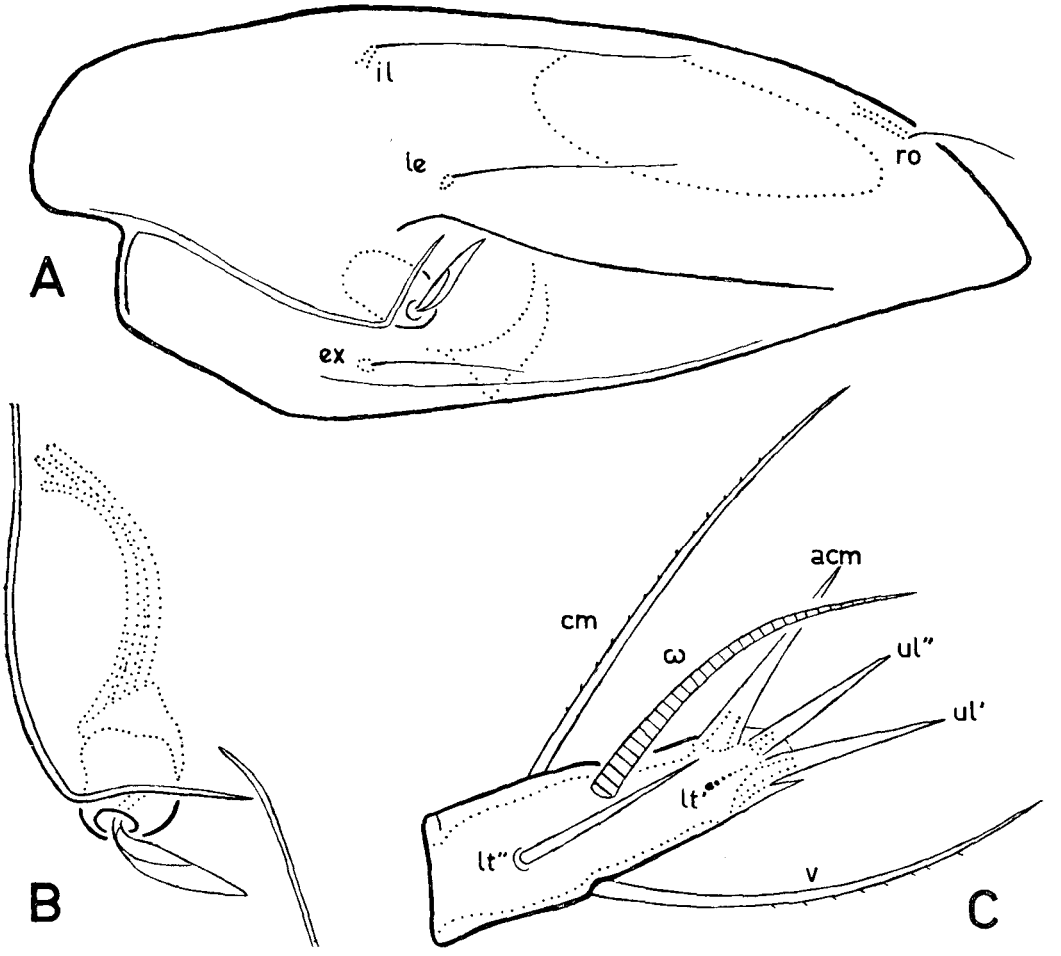

FIG. 2. — *Phthiracarus nitens* (NICOLET) ; A, lateral view of aspis ; B, sensillus and bothridium ; C, lateral (antiaxial) view of right palpal tarsus ; A, × 360 ; B, × 555 ; C, × 1095.

Cuticle. — In transparent light the cuticle appears to be finely and densely punctate. The punctation of the lateral border of the prodorsum and of the border of the notogastral limb can be less distinct. In some of my specimens heating with lactic acid caused a nearly complete separation of epiostracum and ectostracum in the region of the opisthosoma.

Prodorsum (fig. 2 A). — The aspis presents the usual pair of anterior concavities. The lateral ridge is rather thin ; it is slightly curved above the bothridium. Bothri-

dium and sensillus are represented in fig. 2 B ; the sensillus resembles that of *Phthiracarus laevigatus*. The prodorsal setae are very thin ; they are lying close to the surface of the aspis. The interlamellar setae (*il*) are markedly longer than the lamellar setae (*le*). The rostral setae have a long canal.

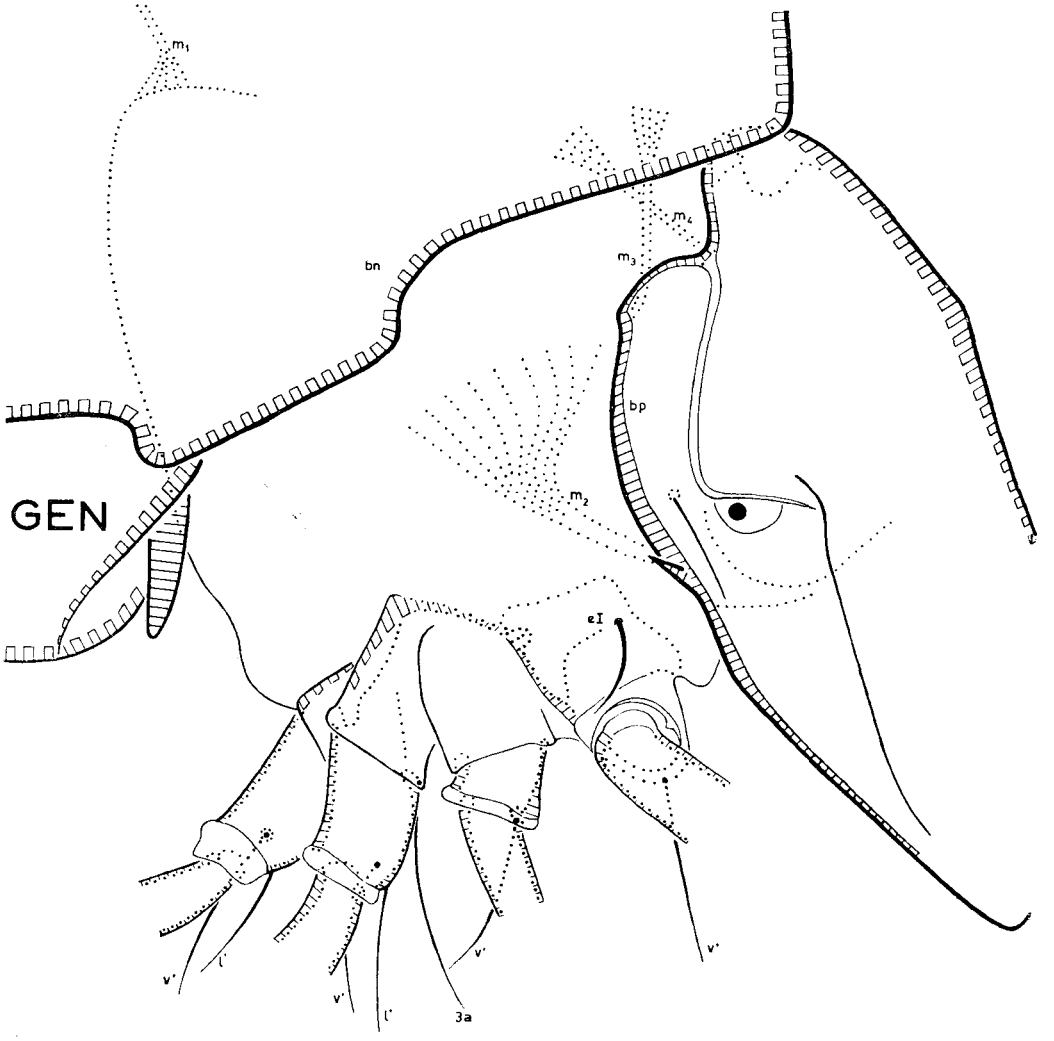

FIG. 3. — *Phthiracarus nitens* (NICOLET), lateral view of podosoma with parts of aspis and notogaster ; × 295.

Notogaster (fig. 1). — The notogaster is rather elongate and much less arched than in *P. laevigatus* ; the outline presents no pronounced angle near c_1. The notogastral setae are of medium length, distinctly longer than in *P. laevigatus*. The disposition of the setae is shown in fig. 1. There are four pairs of lyrifissures (*ia, im, ip, ips*), two pairs of vestiges of setae (f_1, f_2) and the usual mark μ of a muscle (this muscle is indicated on fig. 5 as m_1).

Lateral region of the podosoma. — In fig. 3 I have represented a lateral view of the podosoma of a specimen that is not completely opened ; parts of aspis, notogaster, and genital valve are also drawn. The main muscles that serve for opening and closing are indicated with $m_{1\text{-}4}$. Muscle m_1, is attached at the lateral mark μ on the inside of the notogaster (cf. fig. 1) ; m_2 is a large muscle attached at a rein-

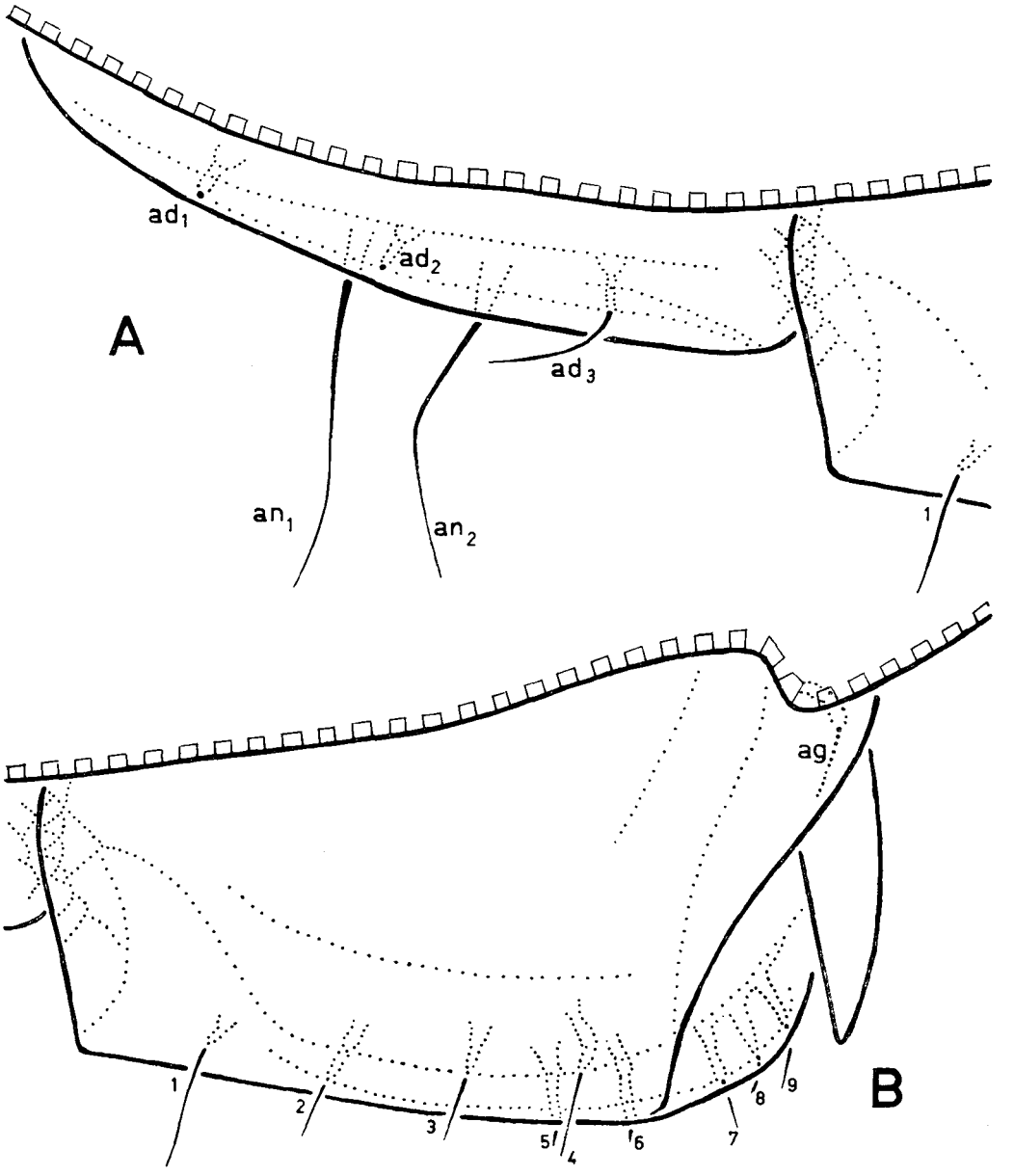

FIG. 4. — *Phthiracarus nitens* (NICOLET), lateral view of ano-genital region ; A, anal valve ; B, genital valve ; A, B, × 590.

forced point of the lateral border of the aspis ; m_3 and m_4 are attached in the posterior part of the aspis.

The coxal regions are slightly scleritized, but the lateral part of the podosoma mainly consists of weak skin. The supracoxal seta *e*I is relatively long and easily visible ; I remark that I did not notice it in *P. laevigatus* (although present). The setae of the trochanteres, and the epimeral seta 3 *a*, easily visible in lateral view, are also represented in fig. 3.

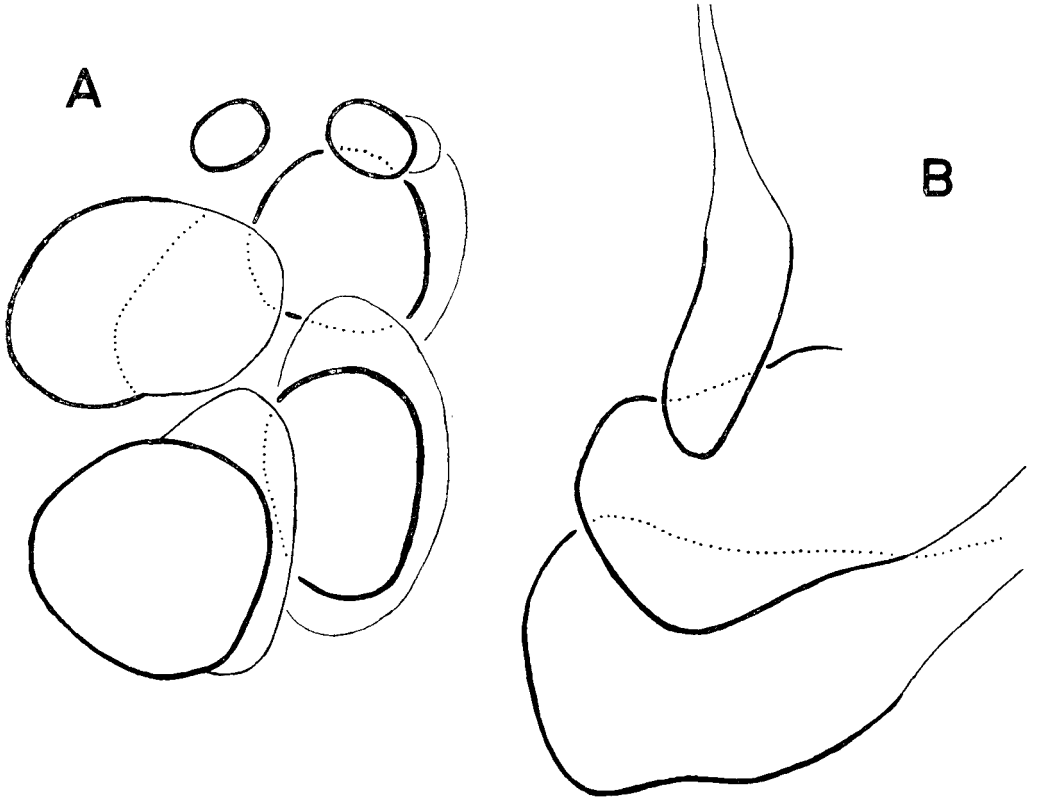

FIG. 5. — *Phthiracarus nitens* (NICOLET), genital papillae ; A, ventral view ; B, lateral view ; A, B, × 555.

Ano-genital region (fig. 4 A, B). — The genital valves present a distinct anterior apophysis as in *P. laevigatus*. There are 4 + 5 genital setae and 1 aggenital, the usual numbers for Phthiracaridae.

The anterior anal lock is right-fitting (cf. VAN DER HAMMEN, 1963, p. 712). The adanal setae ad_1 and ad_2 are vestigial ; ad_3 is curved backward. Among 35 specimens from sample 61 P 60 investigated by me, I discovered two vertitions : in one case ad_1 appeared to be present as a normal seta at the left side ; in another case ad_1 as well as ad_2 appeared to be present at both sides.

I have found no specimens with extended ovipositor. I succeeded, however, in establishing the number of genital papillae (cf. fig. 5 A, B). There are three

pairs, of which the anterior pair is reduced. I do not know if this number is present in all cases. The anterior pair is difficult to observe ; in order to study it with certainty, it is necessary to separate the papillae from the opisthosoma. My figures have been prepared after a removed set ; they clearly show the relation in size between the papillae.

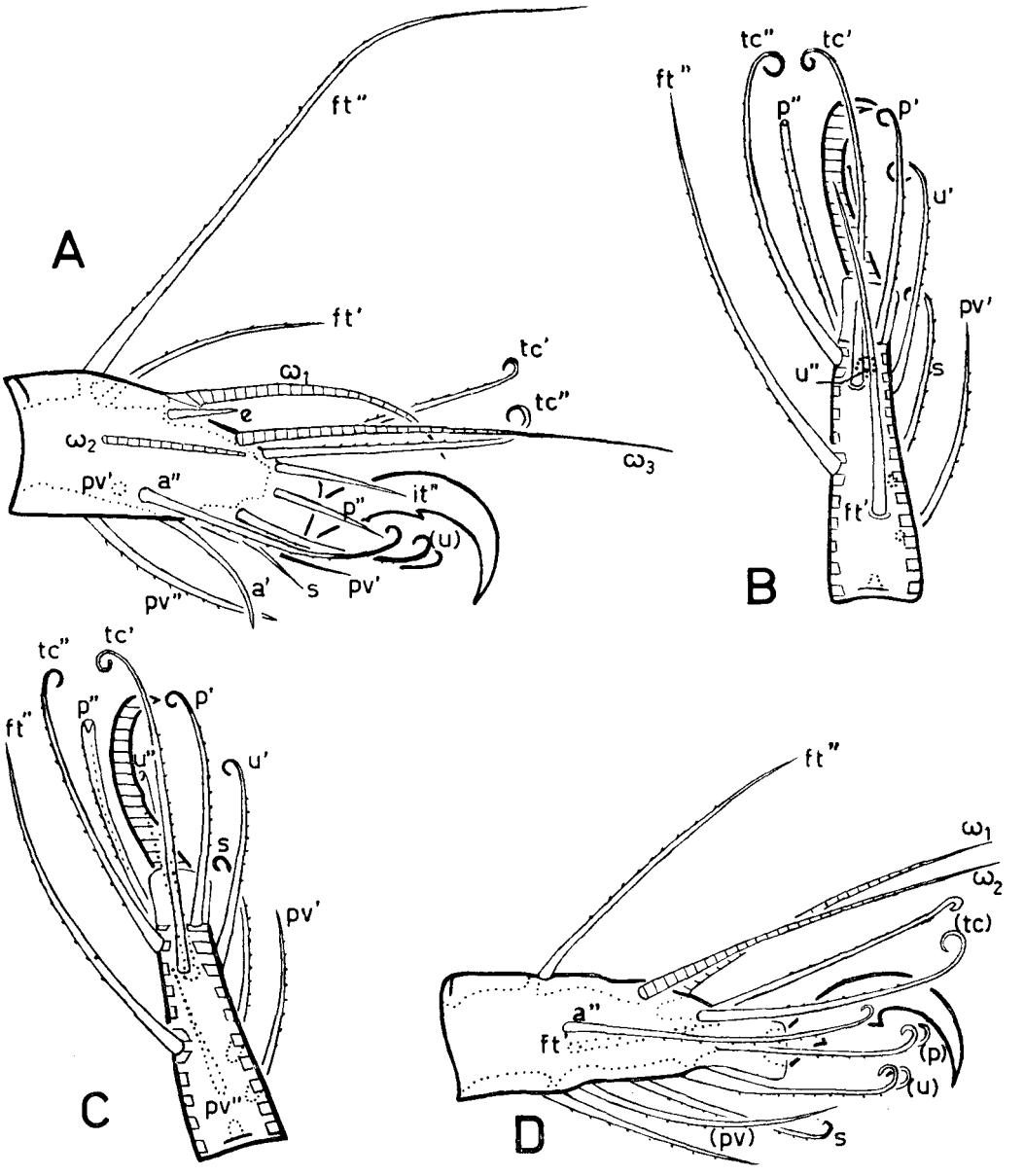

FIG. 6. — *Phthiracarus nitens* (NICOLET) ; A, lateral (antiaxial) view of right tarsus I ; B, dorsal view of left tarsus III ; C, dorsal view of left tarsus IV ; D, lateral (antiaxial) view of right tarsus II ; A-D, × 555.

Palp (fig. 2 C). — The palp closely resembles that of *P. laevigatus*. The formula is 2-2-7. The solenidion ω is free. The tarsus has three distinct eupathidia (*acm*, *ul''*, and *ul'*). I have figured the tarsus because the position of the tooth at the base of *ul'* suggests that this is indeed the remainder of the subultimal seta (*su*) which has joined *ul'*.

Legs. — The numbers of setae on the legs correspond with those of *P. laevigatus* ; *d* of tibiae I-IV, and *l'* of genu I (which are associated with solenidions) are strongly reduced. The formulae are the following.

Setae : I (1-4-2-5-16-1) ; II (1-3-2-3-12-1) ; III (2-2-1-2-10-1) ; IV (2-1-1-2-10-1).

Solenidions : I (2-1-3) ; II (1-1-2) ; III (1-1-0) ; IV (0-1-0).

I have now definitively solved the problem of the notation of the tarsal setae. We start from the fact that (*tc*), (*p*), (*u*), *s*, and (*a*) are curled in the terminal part, unless they are eupathidia (on tarsus I (*it*), (*p*), (*u*), *s*, and *a'* are eupathidia), whilst (*ft*) and (*pv*) are straight. It now appears that tarsi I and II both have two fastigials (*ft*) and two primiventrals (*pv*). On tarsus II the fastigial seta *ft'* has a rather lateral position ; *a'* II is absent. In my figure of tarsus II of *P. laevigatus* (VAN DER HAMMEN, 1963, fig. 5 D) the notation *a'* must consequently be corrected into *pv'*.

The setae on tarsi III and IV have developed positions that rather strongly deviate from the original paired ones. I have prepared figures of dorsal views of these tarsi in order to clarify the homology ; they can be studied in addition to my figures of lateral views of tarsi III and IV of *P. laevigatus* (cf. VAN DER HAMMEN, 1963, fig. 6 C, D). It appears that on tarsi III and IV *tc'* is inserted obliquely behind *tc''*. Most setae have slightly moved according to a direction that is upward on the antiaxial side, inward on the upperside, downward on the paraxial side, and outward on the ventral side. Tarsus III has a pair of fastigials (*ft*) and one primiventral (*pv'*), whilst tarsus IV has one fastigial (*ft''*) and a pair of primiventrals (*pv*) ; on both tarsi the antelaterals (*a*) are absent. In my figures of tarsi III and IV of *P. laevigatus* (cf. VAN DER HAMMEN, 1963, fig. 6 C, D), the notation *a'* must consequently be corrected into *pv'*.

It appears that especially the antelareral setae (*a*) are reduced in *P. nitens* and *P. laevigatus*. On tarsus I (*a*) is present, but *a'* is an eupathidium with a ventral position (if this ventral eupathidium is *a'* indeed). On tarsus II *a''* only is present ; *a'* as well as *a''* are absent on tarsi III and IV.

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