The "Giardino di Boboli", Florence, type-locality of many species mentioned in the present paper.

BERLESE'S PRIMITIVE ORIBATID MITES

by

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CONTENTS

I. INTRODUCTION

Among the works of acarologists of the past, Berlese's numerous writings take a particular place. Although they contain descriptions of an enormous number of new species, and notwithstanding the fact that they must be regarded as an important contribution to progress of systematics, the way of publishing is superficial to such a degree that Berlese appears to be the author that created the largest number of problems. As a rule his Latin descriptions are extremely short and consist of a few lines only. When exceptionally a figure is given, it represents at most some elementary characters. It even happens that reference is made to a species of which the diagnosis has never been published, whilst on the contrary it also occurs that a species is mentioned two times as new to science. Considering at the same time that it is difficult to recover the dates of publication of many papers, it is clear that reinvestigations are badly needed.

Several authors published excellent descriptions of some of Berlese's species, but a review of a group has never been given. Besides, a complete catalogue of the records [1]) and a definite bibliography are both still wanting.

Because studies of the type-species of genera, and monographs of some groups of primitive Oribatid mites are in course of preparation, a revision of Berlese's material appeared to be inevitable. Various factors enabled me to take up this subject.

The extensive introductory work, consisting in an analysis of Berlese's papers, was carried out mainly with the assistance of my wife; for this reason,

1) Lombardini (1936) published an alphabetic list of the species in the Berlese Collection; a large number (more than 40 %) of Berlese's species of primitive Oribatid mites are, however, omitted.

as well as because of her continuous help in Florence and during the preparation of the manuscript, she has had an important part in the realization of the present article.

Prof. A. Melis, director of the "Stazione di Entomologia Agraria", kindly permitted us to study the Berlese Collection, which is preserved in this institute; Dr. Fausta Pegazzano has taken much trouble to supply us with the necessary material [1]). I am also very grateful to Prof. G. Lombardini, who sent me the photograph of the "Giardino di Boboli".

In view of the plan of my future work, I restricted the revision to about 120 species, being the total number of primitive Oribatid mites mentioned in Berlese's papers. The primitive groups are together characterized by the absence or primitive condition of tracheal organs (that never start from acetabula or apodemata), by the length of the genu of the adult legs (which is not comparatively small), and by the absence of a dehiscence of the circumgastric type.

The species are arranged in a system that is based on Grandjean's 1954 essay and on his study of the Perlohmannoidea (1958); the sequence of the groups is, however, modified in the following way: 1. Palaeacaroidea; 2. Parhypochthonoidea; 3. Enarthronota; 4. Mesoplophoroidea; 5. Phthiracaroidea; 6. Perlohmannoidea; 7. Nothroidea. The families Parhypochthoniidae and Mesophoridae are placed here in separate superfamilies, although our knowledge of morphology and development of these groups is still insufficient.

The classification of the Parhypochthonoidea between the Palaeacaroidea and the Enarthronata does not point to an intermediate position; for the present the superfamily must be regarded as an isolated group. The position of the Mesoplophoroidea between Enarthronota and Phthiracaroidea appears logical. The superfamily Nothroidea contains the family Hermanniidae that has a somewhat separate position.

It is evident that a compromise must be found when the work has to be done in a limited space of time, without one's own instruments and methods. The greater part of the slides of the Berlese Collection are in a condition that does not allow of a detailed study; remounting takes much time and requires a carefulness that is not easily realized in a foreign institute. For this reason I restricted my work in such a way that the main purpose was to identify Berlese's species, to give them the correct place in the system, and to solve the problems concerning their synonymy.

The present paper is therefore composed in the following manner. First of

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1) My journey to Florence was made possible by a substantial grant from the "Jan-Joost-ter-Pelkwijkfonds".

all I prepared a bibliography of all those works of Berlese, which deal with Oribatid mites; it is partly founded on former bibliographies published by Paoli (1928) and Jacot (1929a), but additions and corrections are made, thanks to the fact that I could study some rare publications in the "Stazione di Entomologia Agraria" (Florence), in the Oudemans library (now property of the "Nederlandsche Entomologische Vereeniging"), and through the courtesy of the British Museum (Natural History).

In the systematic review the original description of a species is cited, together with a complete enumeration of Berlese's records; if possible I refer to a detailed redescription. For each superspecific unit a summary is given of the development of Berlese's views, and of the opinions of modern authors. Generally, no mention is made of species that, although they are present in the Collection, never were recorded by Berlese in literature.

At some of Berlese's type-localities ("Boboli", "Cascine", etc.) samples were taken that afterwards appeared to contain topotypic specimens of several important species. My collection of mites from New Guinea contains specimens that are identical with some of Berlese's tropical Oribatids. Detailed redescriptions of these species will, however, be published in separate series.

The present paper must also be regarded as an attempt to promote the use of a modern system [1]). For this reason I prepared moreover the following key to the seven groups, whilst keys to the families of Enarthronota, Phthiracaroidea, Perlohmannoidea, and Nothroidea are given in the chapters in question. I am very grateful to Prof. Grandjean for reading these keys.

KEY TO THE GROUPS OF PRIMITIVE ORIBATID MITES

1. The legs of the adults have 2 femora; in some or in all immature stages the legs are not monodactyle. Gnathosoma visible from above. Absence of notogaster and latero-abdominal gland . . . . . **Palaeacaroidea**

1) Woolley & Baker (1958) recently published a key to the superfamilies and families of Oribatei, which shortly afterwards was re-issued in the "Guide to the families of mites" by Baker, Camin, Cunliffe, Woolley, and Yunker (1958). The classification published by these authors is not satisfactory because several important families as well as some fundamental modern literature appear to be insufficiently known to them. I point to the fact that the Malaconothridae, Camisiidae, Lohmanniidae, and Hypochthoniidae (including Parhypochthoniidae, and apparently Trhypochthoniidae) are classified in a superfamily Camisioidea; the Nanhermanniidae, Epilohmanniidae, and Eulohmannidae in a superfamily Nanhermannioidea; and the Hermanniidae together with families of higher Oribatid mites in a superfamily Hermannielloidea. The key demonstrates the impossibility of the system: it starts with errors and it continues with the use of characters that are not comprehended (the superfamily Palaeacaroidea is said to be the only group in which the gnathosoma is visible from above, although this character is present in the Parhypochthoniidae and in some Enarthronota too; the diagastry of the Nanhermanniidae, the pseudodiagastry of the Eulohmanniidae, and the schizogastry of the Epilohmanniidae are used as one character; etc.).

— The legs of the adults have 1 femur, and are monodactyle in all immature stages. The notogaster is present 2
2. Notogaster divided by dorsal and superpleural "coupures". Gnathosoma visible or invisible from above. Absence of the latero-abdominal gland. One family (Protoplophoridae) is ptychoid . . . . . **Enarthronota**
— Notogaster divided in a different way, or undivided 3
3. Gnathosoma visible from above. Notogaster transversely divided, although ill-defined. Presence of latero-abdominal gland. Aptychoid . . . . . **Parhypochthonoidea**
— Gnathosoma not visible from above 4
4. Ptychoid 5
— Aptychoid 6
5. Genital and anal openings of the adults separated by a part of the ventral plate. Nymphs scleritized and ptychoid . . . . . **Mesoplophoroidea**
— Genital and anal openings of the adults not separated by a part of the ventral plate. Nymphs not scleritized . . . . . **Phthiracaroidea**
6. Protero-hysterosomatic articulation . . . . . **Perlohmannoidea**
— Absence of protero-hysterosomatic articulation . . . . . **Nothroidea**

II. BIBLIOGRAPHY [1])

BERLESE, A., 1881 (December). Indagini sulle metamorfosi di alcuni Acari insetticoli. Att. R. Ist. Ven. Sci. Lett. Art. (5), vol. 8, pp. 37-81 [2]).
——, 1882 (April). Note Acarologiche. Ibid. (5), vol. 8, pp. 619-647.
——, 1882-1903. Acari Myriopoda et Scorpiones hucusque in Italia reperta. Padova [3]). (Abbreviated in the following as A.M.S.).
——, 1883 (January 20). A.M.S., fasc. 3 (1-6).
——, 1883aa (February 20), A.M.S., fasc. 4 (Specierum novarum repertorium).
——, 1883a (April 20). A.M.S., fasc. 6 (1-5).
——, 1883b (December 20). A.M.S., fasc. 9 (1-4).

1) In the present bibliography all of Berlese's papers on primitive and higher Oribatei are listed, together with the articles that indirectly relate to these subjects.

2) No Oribatid mites are mentioned in this paper; it is recorded here because Berlese (1881) used the generic name *Notaspis* in the sense of *Uropoda*.

3) This work, which appeared in parts, never has been completed; it did not get a definite shape so that it strikes as being more or less improvised. In the course of about 20 years 101 "fasciculi" have been published, in 24 of which Oribatid mites are described (viz. the numbers 3, 6, 9, 15, 17, 20, 30, 33, 35, 36, 43, 49, 50, 57, 58, 61, 62, 63, 64, 67, 74, 77, 78, 79; cf. Berlese, 1883, 1883a, 1883b, 1884, 1885a, 1885b, 1886, 1886a, 1887, 1887a, 1887b, 1888, 1888a, 1889, 1890, 1892, 1892a, 1892b, 1892c, 1892d, 1895, 1895a, 1896, 1896a).

The fasciculi must be bound in 10 volumes. Originally they were provided with wrappers on which, apart from the dates of publication, further notes were printed, such as the series "Specierum novarum repertorium" (lists of short diagnosis of new species); it appears that generally these short diagnoses have been overlooked by later authors as well as by Berlese himself. I regret not to have succeeded in discovering a complete series of the wrappers. I remark, however, that Canestrini (1884) as well as Berlese (1888) mention that *Carabodes micronychus* Berlese was described on the wrapper of A.M.S., fasc. 4 (cf. 1833aa).

Dr. J. G. Sheals of the British Museum (Natural History) kindly informed me that only a part of the wrappers of their set has been preserved. He noted that the title on the front wrapper of vol. 1 is the Latin "Acari Myriopoda et Scorpiones hucusque in Italia reperta" and that no other title appears on this wrapper. On the wrapper of fasc. 15, however, the same Latin title is given, but below this the Italian "Acari, Miriapodi e

——, 1883c Escursione in Sicilia. Acarofauna Sicula. Ia Serie. Bull. Soc. Ent. Ital., vol. 15, pp. 212-220.
——, 1883d Sopra due nuovi generi di Acari italiani. Lettura fatta alla R. Accademia di Padova. Atti R. Acc. Pad., vol. 33, pp. 45-52, pl. 1.
——, 1884 (November 20). A.M.S., fasc. 15 (5-10).
——, 1884a Note relative agli Acari, Miriapodi e Scorpioni italiani (Note al Fascicolo XIII e XIV). Fascicolo I°. Padova [1]).
CANESTRINI, G. & A. BERLESE, 1884. Sopra alcune nuove specie di Acari italiani. Att. Soc. Ven. Trent. Sci. Nat. Res. Pad., vol. 9, pp. 175-182, pls. 3-5.
BERLESE, A., 1885 (January 20). Note relative agli Acari, Miriapodi e Scorpioni italiani. (Note al Fascicolo XV e XVI). Fascicolo II°. Padova.
——, 1885a (January 29). A.M.S., fasc. 17 (1-10).
——, 1885b (March 20). A.M.S., fasc. 20 (1-10).
——, 1885c (May). Note relative agli Acari, Miriapodi e Scorpioni italiani. (Note al Fascicolo XIII, XIV, XVII, XVIII, XX). Fascicolo III°. Padova [2]).

Scorpioni italiani" is given as well. This form then continues throughout the work, except in certain fasciculi by Canestrini (e.g. fasc. 19), which have "Chernetides italici" as a subtitle. Dr. Sheals was not able to say with certainty when the Italian subtitle first appeared.

In 1920 (in the journal "Redia") Berlese published an index that also contains the dates of publication of the fasciculi. Some of these dates are, however, incorrect because they do not conform to those on the wrappers (cf. Jacot, 1929a); the last-mentioned dates must be accepted as the valid ones. Because no scorpions are recorded in the work, Berlese (1920) altered the Latin title into "Acari Myriopoda et Pseudoscorpiones", etc.

Beside the fasciculi, some other parts appeared that must be regarded as belonging to the work. This concerns the following publications: 4 fasciculi with "Note relative agli Acari, Miriapodi e Scorpioni italiani" (italian title (!), cf. Berlese, 1884a, 1885, 1885c, 1886b); and introductory books, among which a volume on "Cryptostigmata II, Oribatidae" (not published at "Padova", but at "Portici" (!), cf. Berlese, 1896b). I do not know if title pages to the 10 volumes, and an index to volume 1 (present in Florence) were officialy published.

Because a complete set of the work is seldom found, a description is given here of an imaginary series that, from a bibliographical point of view, can be regarded as entirely correct. All fasciculi must have kept the original wrappers; they must be bound in 10 volumes, in the following way. Vol. 1 contains the fasc. 1 (1)-10 (10). Vol. 2: fasc. 11 (1)-20 (10). Vol. 3: fasc. 21 (1)-30 (10). Vol. 4: fasc. 31 (1)-40 (10). Vol. 5: fasc. 41 (1)-50 (10). Vol. 6: fasc. 51 (1)-60 (10). Vol. 7: fasc. 61 (1)-70 (15). Vol. 8: fasc. 71 (1)-80 (12). Vol. 9: fasc. 81 (1)-90 (12). Vol. 10: fasc. 91 (1)-101 (10). The "Note" and the introductory books must be added separately.

The complete set of the work present in the "Stazione di Entomologia Agraria" at Florence (Berlese's own set) has a different arrangement. Vol. 2 contains also "Note", fasc. 1-3 (but "Note", fasc. 4 is not added to vol. 3). Vol. 10 has an index fasc. 1-101, dated March, 1920; it is probably reprinted from Redia, vol. 14 (cf. Berlese, 1920). The introductory books are collected in the vols. 11 and 12. Vol. 11 contains: Cryptostigmata I, Cryptostigmata II, Mesostigmata, and Prostigmata. Vol. 12 contains: Pauropoda, Diplopoda, and moreover "Note", fasc. 1-4.

1) In this fasciculum no Oribatid mites are dealt with. It is mentioned here for the sake of completeness.

2) The reprint in the Oudemans library bears, in Oudemans's own handwriting, the indication "May". Viets (1955) records April 5, 1885 as date of publication, but this is the date given at the end of the paper.

The fasciculum contains also "Specierum novarum repertorium", ser. 8 (on p. 20), and a review of the same repertorium, ser. 4-8 (on p. 30).

——, 1885d (May 30). Acarorum systematis specimen. Bull. Soc. Ent. It., vol. 17, pp. 121-135.
——, 1885e. Di alcuni Acari del Museo di Firenze, colla descrizione di tre nuove specie appartenenti alla famiglia dei Trombididi. Ibid., vol. 17, pp. 136-144, pl. 1.
——, 1885f. Sopra alcuni Acari. Lettera del dott. Antonio Berlese al dott. G. Haller in Zurigo. Ibid., vol. 17, pp. 145-148.
CANESTRINI, G. & A. BERLESE, 1885. Nota intorno a due Acari poco conosciuti. Att. Soc. Ven. Tren. Sci. Nat. Res. Pad., vol. 9, pp. 206-208, pls. 6-7.
BERLESE, A., 1886 (May 15). A.M.S., fasc. 30 (1-4).
——, 1886a (October 10). A.M.S., fasc. 33 (4-10).
——, 1886b (October 20). Note relative agli Acari, Miriapodi e Scorpioni Italiani. (Note al Fascicolo XXI-XXX). Fascicolo IV. Padova.
——, 1886c. La Sottofamiglia dei Tarsonemidi. Bull. Soc. Ent. It., vol. 18, pp. 334-354, pl. 15 [1]).
——, 1886d. Acari dannosi alle piante coltivate. Padova.
——, 1887 (February 10). A.M.S., fasc. 35 (3-10).
——, 1887a (February 25). A.M.S., fasc. 36 (1-5).
——, 1887b (November 20). A.M.S., fasc. 43 (1-6).
——, 1888 (September 10). A.M.S., fasc. 49 (5, 7).
——, 1888a (November 10) [2]). A.M.S., fasc. 50 (1-2).
——, 1888b. (November 30). Acari Austro-Americani quos collegit Aloysius Balzan. Bull. Soc. Ent. It., vol. 20, pp. 171-222, pls. 5-13.
——, 1889 (December 15). A.M.S., fasc. 57 (5).
——, 1890 (January 15). A.M.S., fasc. 58 (9).
——, 1892 (January 15). A.M.S., fasc. 61 (8).
——, 1892a (January 15). A.M.S., fasc. 62 (8).
——, 1892b (February 10) [3]). A.M.S., fasc. 63 (1-3).
——, 1892c (February 10) [3]). A.M.S., fasc. 64 (1-2).
——, 1892d (April 15) [3]). A.M.S., fasc. 67 (5, 9, 10).
——, 1895 (October 24) [4]). A.M.S., fasc. 74 (1-7).
——, 1895a (November 20). A.M.S., fasc. 77 (2-10).
——, 1895 (December). Acari Myriopoda et Scorpiones hucusque in Italia reperta. Index specierum hucusque editarum, secundum ordinem alphabeticum dispositarum (Fasciculi 1-77). In: A. & A. N. Berlese, Scritti intorno alle cose naturale, Portici, pp. 13-35 [5]).
——, 1896 (March 20). A.M.S., fasc. 78 (1-3, 5-10).
——, 1896a (April 20). A.M.S., fasc. 79 (7-12).
——, 1896b. Acari Myriopoda et Scorpiones hucusque in Italia reperta. Ordo Cryptostigmata (Oribatidae). (Cryptostigmata II). Portici.
——, 1896c. Lettera al Chmo. Prof. Giovanni Canestrini intorno al alcune nuove specie di Acari italiani raccolte e descritte dal Dott. Gustavo Leonardi, con la diagnosi di due specie nuove raccolte dal Dott. Antonio Berlese. Att. Soc. Ven. Tren. Sci. Nat. Res. Pad. (2), vol. 2, pp. 314-320, figs. 1, 2.

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1) In this paper no Oribatid mites are mentioned; it is recorded here because Berlese (1886c) regarded the generic name *Murcia* as a synonym of *Claviceps*.

2) This is the date occurring on the wrapper; Berlese (1920) erroneously recorded December 10 as date of publication.

3) Berlese (1920) erroneously recorded January 15 as date of publication.

4) Berlese (1920) erroneously recorded May 20, 1894 as date of publication.

5) The reprint has an own pagination (pp. 1-25) and contains a special introduction (pp. 1, 2).

——, 1896d. Ricerche sugli organi e sulla funzione della digestione negli Acari. Riv. Pat. Veg., vol. 5, pp. 129-195, pls. 8, 9 (sep. pp. 1-42, 1 pl.) [1]).
——, 1897. Gli Acari agrarii. Ibid., vol. 6, pp. 1-65 [2]).
——, 1899. Gli Acari Agrarii (Cont.). Ibid., vol. 7, pp. 312-344.
——, 1900. Gli Acari Agrarii (Cont.). Ibid., vol. 8, pp. 227-297.
BERLESE, A., & G. LEONARDI, 1901 (December 16). Acari sud americani. Zool. Anz., vol. 25, pp. 12-18.
BERLESE, A., 1902 (October 13). Specie di Acari nuovi. Ibid., vol. 25, pp. 697-700.
——, 1903 (October 20). Diagnosi di alcune nuove specie di Acari italiani, mirmecofili e liberi. Ibid., vol. 27, pp. 12-28.
BERLESE, A., & G. LEONARDI, 1903 (April 30). Descripcion de Nuevos Acáridos descubiertos en Chile el Dr. F. Silvestri. Rev. Chil. Hist. Nat., vol. 7, pp. 108-110 [3]).
BERLESE, A., 1904. Acari nuovi. Manipulus Ius. Redia, vol. 1, pp. 235-252.
——, 1904a. Acari nuovi. Manipulus IIus. Ibid., vol. 1, pp. 258-280.
——, 1904b [4]). Acari nuovi. Manipulus III. Ibid., vol. 2, pp. 10-32, pls. 1, 2.
——, 1905 (March 20). Apparecchio per raccogliere presto ed in gran numero piccoli Arthropodi. Ibid., vol. 2, pp. 85-89, figs. 1, 2.
——, 1905a (August 25). Acari nuovi. Manipulus IV. (Acari di Giava). Ibid., vol. 2, pp. 154-176, pls. 15-17.
——, 1905b (September 15). Acari nuovi. Materiali pel "Manipulus V". Ibid., vol. 2, pp. 231-238.
——, 1908 (August 5). Elenco di generi e specie nuove di Acari. Ibid., vol. 5, pp. 1-15.
——, 1910 (February 9). Acari nuovi. Manipulus V, VI. Ibid., vol. 6, pp. 199-234, pls. 18-21.
——, 1910a (February 12). Liste di nuove specie e nuovi generi di Acari. Ibid., vol. 6, pp. 242-271.
——, 1910b (July 8). Brevi diagnosi di generi e specie nuovi di Acari. Ibid., vol. 6, pp. 346-388.
——, 1913 (August 10). Acari nuovi. Manipoli VII-VIII. Ibid., vol. 9, pp. 77-111, pls. 1-8 [5]).

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1) I have seen only a "reprint" of this paper, in which the number of pages is reduced to 42, the number of plates to one. Paoli (1928) records 1896-1897 as dates of publication. Apparently the paper has been published in two parts. Jacot (1929a) mentions July and October 1896 as dates. The reprint from the Oudemans Collection bears the date 1896, to which Oudemans added "October".

2) The complete paper consists of three parts (1897, 1899, 1900). The reprint present in the Oudemans Collection has a continuous pagination (pp. 1-168, figs. 1-112). In the present references the pagination of the separate parts is taken from Paoli (1928) and Jacot (1929a). I remark that Paoli records 1898, 1899, 1901 as dates of publication.

3) According to the Zoological Record this paper deals with the same material as Berlese & Leonardi, 1901. I remark that the descriptions of *Hoploderma variolosum* and *Neoliodes americanus* are, however, lacking.

4) Although vol. 2 of the journal Redia bears 1905 as date, Berlese later cites the article as from 1904. Because the pages that immediately follow the paper are apparently published in September 1904, I accept 1904 as date of publication.

I remark that an article in the journal Redia generally bears the date of publication of the reprinted copy. It is, however, difficult to establish whether the corresponding part of the journal was indeed published at the same date. In the present bibliography the dates of the reprints are accepted, unless there is evidence to the contrary.

5) In the explanation of pl. 8 some erroneous references occur; nearly all numbers with a, b, c, etc., need correction. In the following list the first-mentioned numbers are the wrong ones: 89a — c = 90a — c; 93a = 94a; 94a = 95a; 95a — c = 96a — c;

——, 1913a. Acarotheca italica. Fasc. Ius et IIus. Firenze[1]).
——, 1914 (December 31). Acari nuovi. Manipulus IX. Redia, vol. 10, pp. 113-150, pls. 10-13 (1-4).
——, 1916 (June 12). Centuria prima di Acari nuovi. Ibid., vol. 12, pp. 19-67.
——, 1916a (August 23). Centuria seconda di Acari nuovi. Ibid., vol. 12, pp. 125-177.
——, 1916b (December 31). Centuria terza di Acari nuovi. Ibid., vol. 12, pp. 289-338.
——, 1917. Acariens. Deuxième Expédition Antarctique Française (1908-1910), pp. 1-12, pl. 1.
——, 1918 (April 30). Centuria quarta di Acari nuovi. Redia, vol. 13, pp. 115-192.
——, 1920. Acari, Myriopoda et Pseudoscorpiones hucusque in Italia reperta. I. Indice sinonimico dei generi e delle specie illustrate nei fascicoli 1 a 101. II. Data di pubblicazione dei singoli fascicoli. Ibid., vol. 14, pp. 77-105.
——, 1920a[2]). Centuria quinta di Acari nuovi. Ibid., vol. 14, pp. 143-195.
——, 1921 (February 3). Mezzo per separare gli Artropodi raccolti col collettore Berlese dalla terra caduta con essi. Ibid., vol. 14, pp. 211-214, figs. 1, 2.
——, 1922. Acariens. Voyage de M. le Baron Maurice de Rothschild en Ethiopie et en Afrique orientale anglaise (1904-1905). Résultats scientifiques, Animaux articulés, 1er partie, pp. 91-107, pls. A6, A7.
——, 1923 (August 11). Centuria sesta di Acari nuovi. Redia, vol. 15, pp. 237-262.
——, 1923a. Acarina della Nuova-Caledonia e delle Isole Loyalty. in: F. Sarasin & J. Roux, Nova Caledonia, A, Zoologie, vol. 3 (1), pp. 115-124.

III. SYSTEMATIC REVIEW[3])

1. PALAEACAROIDEA

Palaeacariformes Trägårdh, 1932, p. 1.
Palaeacaroidea, Grandjean, 1954a, p. 179.

In a treatise on two species of primitive mites from Sweden and South Africa, Trägårdh (1932) expressed as his opinion that these must be regarded as representatives of an important new group of subordinal rank. He placed the group in the current Reuter system on foot of equality with Parasitiformes, Trombidiformes, and Sarcoptiformes, and consequently gave it the suffix "formes' 'resulting in the name Palaeacariformes.

A few months later Grandjean (1932a) pointed out that the Palaeacariformes belong to the Oribatid mites; in his monograph of the group (Grandjean, 1954a) he once more demonstrated this relationship. In the preliminary

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99a — b = 100a — b; 100a = 101a; 101a = 102a; 102a = 103a. I am in doubt as to fig. 97a showing the microsculpture of a tegument; probably this drawing indeed belongs to *Phtiracarus reticulatus*.

1) This is the explanatory text belonging to a collection of 100 slides that Berlese prepared for sale. The identifications are not always reliable.

2) This paper was finished on September 10, 1920, as is mentioned at the end of it. As date of publication the journal records also September 10, 1920. This is, however, not probable because the paper is placed between two articles that have been published on October 20 and October 25 respectively.

3) The species of the Berlese Collection are classified here according to the system explained in the Introduction. As a rule only those species are included, which have been mentioned by Berlese in literature.

system of the Oribatei, Grandjean (1954) classified the group as superfamily, and consequently emended the name Palaeacariformes into Palaeacaroidea.

Only one family of the group is represented in the Berlese Collection.

CTENACARIDAE Grandjean, 1954

The family Ctenacaridae was created by Grandjean (1954a) in his recent monograph; at the same time the family was divided into 3 subfamilies: Ctenacarinae, Adelphacarinae, and Aphelacarinae. The last-mentioned group contains one of Berlese's species; it is dealt with below.

Aphelacarus Grandjean, 1932

Aphelacarus Grandjean, 1932a, p. 412.

Grandjean, who created the genus *Aphelacarus,* designated *Parhypochthonius acarinus* as the type. According to the classification recently proposed by him (Grandjean, 1954a) the genus is the single representative of the subfamily Aphelacarinae.

Aphelacarus acarinus (Berlese, 1910)

Parypochthonius acarinus Berlese, 1910, p. 219, pl. 19 fig. 42.
Parhypochthonius acarinus, Lombardini, 1936, p. 46.
Aphelacarus acarinus, Grandjean, 1932a, p. 412, figs. 1-4; 1954a, p. 226, figs. 11-21.

In the Berlese Collection 12 slides are present that bear the label *Parhypochthonius acarinus.* On 7 of these labels the word "tipico" occurs [1]); this concerns the slides nos. 80/11, 12, 17, 21, 22, 23, and 83/4, containing specimens from Palermo, Sicily; they correspond with the original description. Another slide from Palermo (no. 142/24), which is not designated as type, is also identical with *P. acarinus.*

On the contrary, the slides nos. 140/27, 157/28, 160/41, 42 with specimens from Florence, Sardinia, and Italian Somaliland respectively (never mentioned in literature), which Berlese identified with *P. acarinus,* appear to belong to a different species, viz. *Ctenacarus araneola* (Grandjean, 1932a), a representative of the related subfamily Ctenacarinae. Up to now *Ctenacarus araneola* was known from North Africa and South America only; the species is recorded here for the first time from Europe.

A. acarinus is one of the very primitive Oribated mites that now form part of the superfamily Palaeacaroidea. Berlese contributed the species to *Parhypochthonius* (in 1910 he erroneously wrote *Parypochthonius*), a genus that

1) As a rule I have not selected a holotype out of type-material, because nothing can be said about the tenability of the slides.

shows also primitive characters, but of which the systematic position is uncertain.

Willmann (1931, p. 98) recorded that Sellnick had found the species in an ants' nest in East Prussia. Grandjean (1932a, 1954a) published detailed descriptions and figures of the species, which fit in with Berlese's specimens. The sensillus of the types appears to be slightly more slender than in Grandjean's figures. Berlese described the notogastral hairs as black; these are, however, brown.

2. PARHYPOCHTHONOIDEA nov. superfam.

PARHYPOCHTHONIIDAE Grandjean, 1932

Originally the genus *Parhypochthonius* has been classified with the Hypochthoniidae (Berlese, 1910, 1913a; Willmann, 1931). Grandjean (1932a) created, however, a separate family Parhypochthoniidae that, on account of numerous primitive characters, was incorporated in the "Palaeacariformes". Because other important characters are contrary to this relation, Grandjean (1954, p. 429) considered the Parhypochthoniidae an isolated family; it is here placed between the Palaeacaroidea and the Enarthronota, although it has certainly no intermediate position.

Parhypochthonius Berlese, 1904

Parhypochthonius Berlese, 1904b, p. 25; 1910, p. 218; 1913a, p. 7 [1]).

Berlese published the diagnosis of *Parhypochthonius* together with the description of the type-species (*P. aphidinus*). In 1910 (p. 219) he added two species to the genus, of which in my opinion one (*urticinus*) indeed belongs to it, whilst the other (*acarinus*) has become the type of the genus *Aphelacarus* (Palaeacaroidea) [2]).

Parhypochthonius aphidinus Berlese, 1904

Parypochthonius aphidinus Berlese, 1904b, p. 25, pl. 2 fig. 42.
Parhypochthonius aphidinus, Lombardini, 1936, p. 46.

The original description of *P. aphidinus*, which is accompanied by an elementary drawing, gives a rough impression of the species. Berlese failed to observe two pairs of notogastral hairs (probably c_3 and d_1); c_p appears to be

1) In the original diagnosis, the generic name is spelt as *Parhypochthonius*, but on the same page the type-species is named *Parypochthonius aphidinus*. The same difference in spelling is found in Berlese's 1910 paper; here the spelling *Parhypochthonius* is found in the key, *Parypochthonius* in the description of two species.

2) Schweizer (1956, pp. 219-221, figs. 126-130) described five "new" species as representatives of *Parhypochthonius*; these are, however, nymphs and larvae of higher Oribatid mites (*Trichoribates, Ceratozetes, Scheloribates, Sphaerozetes* or *Chamobates*).

of medium length; the sensilli are figured as symmetrical. The measurements of the mite are said to be 0.450 × 0.200 mm.

In the Berlese Collection several slides of the species are present, mainly with specimens from Florence; preparation no. 80/19 from Florence is designated as type. Only one preparation, viz. no. 214/35 (Florence, Cascine) shows dissymmetry of the sensilli. All specimens originate from decaying chestnut-wood.

Willmann (1931, p. 98, fig. 18) described a var. *germanicus* of the species; differential characters are not precisely mentioned, but I think that the variety is founded on the remarkable dissymmetry of the sensillus: the 8 pectinations of the left sensillus are directed backwards, those of the right forwards. The measurements mentioned by Willmann are 0.470 × 0.225 mm.

Grandjean (1932a, p. 425) mentions that he collected *Parhypochthonius aphidinus* in France; his specimens are smaller (length 0.350-0.385 mm) than those described by Berlese. In 1934b (p. 423, figs. 1-4) he dealt with material from the same locality (medium length 0.380 mm), and observed also a dissymmetry of the sensillus; because of the smaller length he now named the specimens *Parhypochthonius* sp.

I suppose that the specimens described by Berlese, Willmann, and Grandjean belong to one species, but that there is variation in measurements as well as in position of the right sensillus (especially in slides).

Matters stand slightly different in *Parhypochthonius aphidinus octofilamentis* Jacot (1938, p. 647, fig. 1). Although the distinguishing characters mentioned by this author are of minor importance, his fig. 1 shows that a_3 (= c_p) is distinctly longer than in *P. aphidinus*; I remark that the same character is found in *P. urticinus*.

Parhypochthonius urticinus Berlese, 1910

Parypochthonius urticinus Berlese, 1910, p. 219, pl. 19 fig. 43.
Parhypochthonius urticinus, Lombardini, 1936, p. 46.

The following characters are mentioned in the original description of the species. The colour is hyaline whitish. The posterior border of the notogaster bears 8 long, remarkably shaped hairs that gradually enlarge in the basal part, but end in a long sharp point; the other notogastral hairs are simple. The sensillus is long, provided with 8 pectinations. The claws resemble those of *P. aphidinus*; the median claw is considerably smaller than the laterals. The measurements are 0.380 × 0.180 mm. Berlese did not observe the tube-shaped orifice of the latero-abdominal gland, which is a striking character of *P. aphidinus*.

The figure shows that c_p is notably long. Berlese omitted a number of noto-

gastral hairs, among which f_2 that in *P. aphidinus* is inserted on the thickened border of the orifice of the latero-abdominal gland; I think that h_3, ps_2 and ps_3 also escaped his notice. Consequently, the remarkably shaped hairs probably are f_1, h_2, h_1, and ps_1. In Berlese's fig. 43 the hairs are drawn as gradually thickened in the basal part, whilst they end in a long sharp point.

In the Berlese Collection one slide (no. 80/24) is present; it contains the type, originating from Lake City, Florida. The preparation is suited for the observation of the following supplementary details. In the left sensillus the pectinations are directed backwards, whilst these are turned upwards in the other one. The notogaster is slightly damaged, but at the right side the thickened orifice of the latero-abdominal gland is distinctly visible; when seen from above the orifice does, however, not extend beyond the lateral border of the body. Because of some deposits in the slide it was impossible to study the shape of the posterior notogastral hairs.

3. ENARTHRONOTA

Enarthronota Grandjean, 1947.

The name Enarthronota Grandjean (1947) is used for a group of Oribatid mites that are recognizable by the fact that the notogaster is divided in a special way. The group consists of the families Hypochthoniidae, Eniochthoniidae, Brachychthoniidae, Haplochthoniidae, Cosmochthoniidae, Heterochthoniidae, Atopochthoniidae, Pterochthoniidae, Sphaerochthoniidae, and Protoplophoridae; with the exception of Haplochthoniidae and Atopochthoniidae, all families are represented in the Berlese Collection.

Probably the Enarthronota are to be considered of higher rank than superfamily; according to the "Règles" it is indeed not allowed to use the name for a superfamily, because names of the family-group (subfamily, family, and superfamily) must be founded on generic names. In my opinion the group possibly must be regarded as a section in which superfamilies still must be distinguished; I point for instance to the special relationship between Sphaerochthoniidae and Protoplophoridae.

Berlese's species have been classified by him (Berlese, 1913a, pp. 7, 8) with Hoplophoridae, Hypochthoniidae, Nothridae and Malaconothridae

KEY TO THE FAMILIES OF ENARTHRONOTA

1. The notogaster is divided by only one "coupure", although faint transverse ridges on the pygidium, or an incomplete separatory band on the notaspis can be present . 2
— Notogaster divided by more than one "coupure" 5
2. The single "coupure" is situated between the rows *c* and *d*; faint transverse ridges are present on the pygidium 3
— The single "coupure" contains *e* (often virtual), or it is situated closely behind this row 4

3. Ptychoid . . . . . **Protoplophoridae**
— Aptychoid . . . . . **Sphaerochthoniidae**
4. The row *e* (the hairs are often virtual) is situated on an intercalary sclerite . . . . . **Hypochthoniidae**
— Row *e* on a limbus . . . . . **Eniochthoniidae**
5. "Coupures" without intercalary sclerites 6
— One or more "coupures" with intercalary sclerites that bear hairs 8
6. Two "coupures", between *d* and *e*, and between *e* and *f* respectively **Brachychthoniidae**
— Three "coupures", between *c* and *d*, *d* and *e*, and *e* and *f* respectively 7
7. Hairs simple, no peranal segment . . . . . **Haplochthoniidae** fam. nov. [1])
— Hairs foliate, peranal segment present . . . . . **Pterochthoniidae**
8. Three eyes distinctly present, a median one and a pair of posterior laterals . . . . . **Heterochthoniidae**
— No eyes 9
9. Only f_1 and f_2 erectile, and situated on intercalary sclerites. Segment D is not sclerotized; *d* is absent . . . . . **Atopochthoniidae** [2])
— Rows *e* and *f* erectile, and situated on intercalary sclerites. D is present . . . . . **Cosmochthoniidae**

HYPOCHTHONIIDAE Berlese, 1910

In his early publications Berlese (1896a, 1896b) regarded the genus *Hypochthonius* as part of the family Nothridae in which it had a separate position because of the divided notogaster. The genus consisted of species that are now regarded as representatives of separate families, although (with one exception) these still belong to a single group (Enarthronota). Due to the erroneous observation of a subdivision of the notogaster, Berlese (1896) described also a strongly different species as a *Hypochthonius* (*H. tectorum*); this species (afterwards the type of the genus *Trhypochthonius*) shows, however, little relationship with the Enarthronota.

In 1910 (p. 218) Berlese created a family Hypoctonidae (sic!) [3]; he divided the genus *Hypochthonius*, and added other genera so that the family in his opinion consisted of *Parhypochthonius, Trhypochthonius, Trizetes, Sphaerochthonius, Cosmochthonius, Hypochthonius* (with subgenus *Hypochthoniella*), and *Brachychthonius*. Some years after, he gave the same classification (Berlese, 1913a, p. 7). According to moderns views the first-mentioned 2 genera are now classified in groups that are widely remote of the Hypochthoniidae, whilst *Trizetes* even does not belong to the primitive Oribatid mites. The other ones are all reckoned among the Enarthronota.

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1) This new family consists of the genera *Haplochthonius* Willmann, *Amnemochthonius* Grandjean, and possibly of the genus *Tetrachthonius* Hammer. The family is not represented in the Berlese Collection.

2) This family is not represented in the Berlese Collection.

3) In the same paper the name is, however, also spelt as Hypochthonidae.

Nowadays the genera *Hypochthonius, Eohypochthonius,* and *Malacoangelia* only are considered representatives of the family Hypochthoniidae [1]).

Hypochthonius C. L. Koch, 1836

Hypochthonius C. L. Koch, 1836, fasc. 3 (19, 20); 1842, vol. 3, p. 109.
Hypocthonius, Berlese, 1896a, fasc. 79 (11); 1896b, pp. 24, 25.
Hypochthonius, Berlese, 1910, p. 217; 1913a, p. 36.

In the above the development is explained of Berlese's conception of the genus *Hypochthonius.* Berlese (1913a) finally regarded the following species as representatives: *rufulus* C. L. Koch (the type of the genus), *ventricosus* Canestrini (a species of uncertain relationship, possibly *Archegozetes*), *pallidulus* (non C. L. Koch; now *Eniochthonius* fam. Eniochthoniidae), *crosbyi* Ewing (recently redescribed, although insufficiently, by Woolley, 1956, p. 290, figs. 3, 4; the species certainly does not belong to the Hypochthoniidae or the Eniochthoniidae), and *asiaticus* Berlese (now *Eohypochthonius*).

Berlese dated the genus *Hypochthonius* at first as 1842, and later as 1835; in fact the correct date is 1836. I remark that for some time Berlese spelt the generic name as *Hypocthonius.*

Hypochthonius rufulus C. L. Koch, 1836

Hypochthonius rufulus C. L. Koch, 1836, fasc. 3 (19).
Hypocthonius rufulus, Berlese, 1896, fasc. 78 (6); 1896b, p. 25.
Hypochthonius rufulus, Berlese, 1913a, p. 57, textfig., prep. I-15 [2]); Lombardini, 1936, p. 42.

This is a common species in Europe and North America. According to Berlese (1896) it occurs throughout Italy. In the Collection many specimens are present, but I studied only the slide from the "Acarotheca italica" and one slide from the Berlese Collection (no. 213/22, Florence, park "delle Cascine"); both identifications are correct.

Eohypochthonius Jacot, 1938

Eohypochthonius Jacot, 1938b, p. 133.

Jacot founded the present genus on *Hypochthonius gracilis,* a species

1) Recently Schweizer (1956, pp. 234-244, figs. 151-159) described a new genus *Alphypochthonius* with 9 new species, which he classified with the *Hypochthoniidae.* All species are, however, nymphs and larvae of higher Oribatei, probably *Melanozetes, Fuscozetes, Trichoribates, Sphaerozetes,* etc. The type of the genus *Alphypochthonius* is *A. alpinus*; description and figures of this species strongly resemble *Melanozetes* nymphs, probably *M. mollicomus* (cf. Van der Hammen, 1952, p. 97, fig. 8d). *Alphypochthonius* must therefore be placed in the synonymy of *Melanozetes.* I remark that the differences in measurements, which Schweizer regards as differences between males and females, are of course due to the presence of different nymphal stages.

2) The preparations are those of the "Acarotheca italica", prepared by Berlese for sale.

described by him in 1936c (p. 251, pl. 20 fig. 9) from North Carolina (U.S.A.). The genus distinctly belongs to the Hypochthoniidae but differs from *Hypochthonius* among others by the transversely divided genital covers.

Judging from Jacot's description, *E. gracilis* is much smaller and slenderer than *Hypochthonius rufulus*; the notogastral hairs are longer (c_2 is nearly as long as c_1); according to the figure e_1 and e_2 are virtual [1]).

In my opinion the following species must be added to the genus.

Eohypochthonius asiaticus (Berlese, 1910)

Hypochthonius asiaticus Berlese, 1910b, p. 380; Lombardini, 1936, p. 42.

Judging from the original, very short description, the species has a superficial resemblance to "*Hypochthoniella pallidula*", although it is slightly more elongate; the notogaster has only one "coupure"; the notogastral hairs are long; the measurements are 0.330 × 0.160 mm. The species was described from "Tjompea", Java; I remark that undoubtedly "Tjompea" is a lapsus for Tjampea (near Bogor, West Java). According to the catalogue 4 slides must be present in the collection [1]); slide no. 199/22 is, however, missing. No. 103/14 bears the label "Tjompea, Giava, tipico". The nos. 141/31, 32 bear the indications "Samarang, Giava", and "Giava" respectively. The last-mentioned slide is the single one that in its present state is more or less suitable for a superficial examination. I observed that the genital covers are divided, and that the notogastral hairs are long, with the exception of e_1 and e_2 that are probably virtual (the bad condition of the slide did not allow of a definite observation). From this I conclude that the species belongs to the genus *Eohypochthonius*.

Malacoangelia Berlese, 1913

Malacoangelia Berlese, 1913, p. 101; 1913a, p. 8; Ewing, 1917, p. 124; Grandjean, 1935, p. 237; 1947, p. 223; 1954, p. 429.

Originally, Berlese described *Malacoangelia* as having the characters and the habitus of the genus *Malaconothrus* with the exception of the differently shaped sensillus and bothridium. In a survey of the system of the Acari, Berlese (1913a) classified *Malacoangelia* together with *Lohmannia, Malaconothrus,* etc. in the tribe "Michaeliini", a subdivision of the family Nothridae. Shortly after (Berlese 1916a, p. 176), he created a new tribe "Lohmannini"

1) Grandjean characterizes a hair as "virtuel" when the place of insertion only is present.

2) The Catalogue of the Berlese Collection consists of several hand-written volumes, in which the generic names occur in alphabetic order. Berlese ornamented the initial letters with coloured pictures of the mites in question; reduced reproductions of two of these letters are given by Melis (1950).

(a subdivision of the Malaconothridae) containing the genera *Lohmannia, Perlohmannia, Epilohmannia, Malacoangelia,* and *Eulohmannia.* The conformity of *Malacoangelia* with *Malaconothrus* or *Lohmannia,* which Berlese erroneously supposed, is inconceivable to us. Ewing (1917) already, relying on the original description only, correctly placed the genus in the family Hypochthoniidae. Grandjean (1935) again demonstrated the close relationship with *Hypochthonius*; the same opinion is found in his later classification of the Enarthronota (1947, 1954).

Malacoangelia remigera is the type and single representative of the genus.

Malacoangelia remigera Berlese, 1913

Malacoangelia remigera Berlese, 1913, p. 101, pl. 7 figs. 86, 86a, pl. 8 fig. 88; Grandjean, 1935, p. 237, figs. 1, 2.

The species is no more present in the Berlese Collection, nor does the name occur in the Catalogue. The original description is, however, accompanied by three drawings, by which the identity of the species is certain. The redescription by Grandjean contains many important characters that Berlese did not observe.

Up to now the species is known from Java and Panama only.

ENIOCHTHONIIDAE Grandjean, 1947

In his preliminary classification of the Enarthronota, Grandjean (1947, p. 223) created a subfamily Eniochthoniinae that later (Grandjean, 1954, p. 429) was raised to family rank (Eniochthoniidae).

Although the generic name *Hypochthoniella* Berlese (1910) has priority against *Eniochthonius* Grandjean (1947), the family name Eniochthoniidae is valid.

Eniochthonius Grandjean, 1933

Hypochthoniella Berlese, 1910, p. 218.
Eniochthonius Grandjean, 1933, p. 32.

Some misunderstanding has arisen about the validity of the generic name *Hypochthoniella.* In a discussion of the classification of the family Hypochthoniidae, Berlese (1910, p. 218) wrote the following in a foot-note "L' *H. pallidulus K.* avendo l'addome diviso in tre parti potrebbe formare sottogenere (*Hypocthoniella*) [1]) nel gen. *Hypocthonius* di cui e tipo l' *H. rufulus* K.". This subgenus is sufficiently characterized, not only because of the cited

1) This manner of writing certainly is a lapsus; Berlese 1910, p. 218) spells the Greek word χθόνιος in three ways: *ctonius, cthonius,* and *chthonius.* I prefer the correct orthography *chthonius* that is in common use.

description, but also by the fact that it is distinctly founded on the species that since Michael is known by the name *pallidulus* C. L. Koch.

The subgenus was raised to generic rank and later authors generally cited the species as *Hypochthoniella pallidula,* till Grandjean (1933, p. 32) drew attention to the fact that *Hypochthonius pallidulus* C. L. Koch undoubtedly must be regarded as the nymph of *H. rufulus* C. L. Koch, and therefore distinctly differs from *H. pallidulus* sensu Michael. At the same time Grandjean placed the generic name *Hypochthoniella* in the synonymy of *Hypochthonius,* and created a new genus *Eniochthonius* with *H. pallidulus* sensu Michael as the type [1]).

Considering that Berlese's conception of the genus *Hypochthoniella* is unmistakable, and because the material in his collection precludes any doubt, it appears to be correct to use the name *Hypochthoniella.* Because the family name Eniochthoniidae is already in use, I prefer, however, to conserve also the name *Eniochthonius.* Below I demonstrate that *Eniochthonius minutissimus* is the correct name of the type.

Eniochthonius minutissimus (Berlese, 1904) (= *pallidulus* auct.)

Hypocthonius pallidulus, Berlese, 1896b, p. 25.
Hypochthonius minutissimus Berlese, 1904, p. 252.
Hypochthonius (*Hypochthoniella*) *pallidulus,* Berlese, 1910, p. 218.

The original description of *H. minutissimus* appears to have escaped the notice of later authors; it is, besides, a remarkable fact that afterwards Berlese never recorded the species again. The diagnosis, as usually much too short, gives no decisive answer as to specific identity, but nevertheless reminds of the genus *Hypochthoniella.*

In the hand-written catalogue of the Berlese Collection the name *H. minutissimus* does not occur. Among the material booked as *H. pallidulus* I found, however, the slides of three types; these bear on the labels the name *H. minutissimus* that in pencil, in Berlese's own handwriting, is corrected into *pallidulus.* It concerns the slides nos. 19/8, 20/2, and 20/3 that are still labelled as "tipico"; the specimens have been collected at Florence in the "Giardino di Boboli", as was recorded in the original description. A further study of the type specimens shows that they are indeed identical with *pallidulus* sensu Michael; the same conclusion applies to the remaining material of *pallidulus.*

It is a proof of inaccuracy that Berlese never published his correction; in this manner he has been the cause that the name *minutissimus* was not in-

1) *Arthrochthonius* Ewing (1917) has also *H. pallidulus* as type, so that it is a synonym of *Hypochthoniella*; Ewing apparently contributed also some Brachychthoniidae and other Enarthronota to it. After its publication, the name *Arthrochthonius* has not been in use.

troduced before. Grandjean (1933), who discovered the real identity of *H. pallidulus* C. L. Koch, supposed that it is possible to preserve the name *pallidulus* in the genus *Eniochthonius*; consequently he cites the species afterwards as *Eniochthonius pallidulus* (Michael). Because this is contrary to the international rules of nomenclature I created (Van der Hammen, 1952) the name *Eniochthonius grandjeani*. It is evident now that both names must be placed in the synonymy of *E. minutissimus*.

BRACHYCHTHONIIDAE Grandjean, 1947

Although the Enarthronota mainly consist of relics or isolated genera, the Brachychthoniidae still represent a branch rich in species. The group was separated as a special family from the Hypochthoniidae by Grandjean (1947). The following genera (mentioned in chronological order) are to be distinguished: *Brachychthonius* Berlese, 1910 (= *Brachychochthonius* Jacot, 1938); *Eobrachychthonius* Jacot, 1936; *Synchthonius* Van der Hammen, 1952; and *Liochthonius* nov. gen. (= *Brachychthonius* auct. non Berlese). In the Berlese Collection three of these are represented by one or more species. With some hesitation I have created here a new name for the genus *Brachychthonius* auct. non Berlese; many authors already pointed out that *Brachychthonius* Berlese and *Brachychochthonius* Jacot are synonyms, but up to now nobody has renamed *Brachychthonius* auct.

Forsslund (1957) published a revision of some of Berlese's Brachychthoniidae, so that in the following I have made only a few notes about these species.

Eobrachychthonius Jacot, 1936

Eobrachychthonius Jacot, 1936b, p. 24.

Jacot created the genus *Eobrachychthonius* in 1936, and designated *E. sexnotatus* as the type. According to Forsslund (1957) the type-species is identical with *Brachychthonius latior* Berlese (1910).

Eobrachychthonius latior (Berlese, 1910)

Brachychthonius latior Berlese, 1910, p. 220, pl. 19 fig. 38; Lombardini, 1936, p. 38.
Eobrachychthonius sexnotatus Jacot, 1936b, p. 24, pl. 1 figs. 3, 4.
Eobrachychthonius latior, Forsslund, 1957, p. 584, figs. 1-3.

As mentioned above, Forsslund placed *E. sexnotatus* in the synonymy of *E. latior*; a list of further synonyms is also given by him. I remark that Jacot (1936b, p. 25) erroneously cites Berlese's species as *Eobrachychthonius latus* (*latus* being a lapsus for *latior*); of course, *B. latus* Jacot (1936c, p. 248) is a different species.

E. latior was described after specimens from Lake City, Florida; it is now also known from Europe and other parts of North America.

Liochthonius [1]) nov. gen. (= *Brachychthonius* auct.)

Because the genus *Brachychthonius* Berlese is used here in the correct sense of *Brachychochthonius* Jacot, a new genus must be created for *Brachychthonius* auct. I introduce the name *Liochthonius* for the genus with the same characters as *Brachychthonius* auct., and I designate *Brachychthonius perpusillis* Berlese (redescription by Forsslund, 1942, p. 4, fig. 4) as the type.

Liochthonius perpusillus (Berlese, 1910)

Brachychthonius perpusillus Berlese, 1910, p. 220, pl. 19 fig. 41; Lombardini, 1936, p. 38; Forsslund, 1942, p. 4, fig. 4; 1957, p. 590, fig. 12.

Forsslund (1957) recently established the identity of the present species; the holotype conforms to the Swedish specimens described by him as *Brachychthonius perpusillus* in 1942. I do not know if *Hypochthonius brevis* Michael is identical with *B. perpusillus*; it is at least a closely related species that belongs to the genus *Liochthonius* (cf. Evans, 1952, p. 227).

B. perpusillus occurs in Europe and North America; Berlese collected a heterogenous collection of specimens in Tuscany and North Italy; Forsslund (1957) designated slide no. 72/41 as holotype.

Liochthonius laetepictus (Berlese, 1910)

Brachychthonius laetepictus Berlese, 1910b, p. 380; Lombardini, 1936, p. 38; Forsslund, 1957, p. 591, fig. 14.

According to Forsslund (1957) *B. laetepictus* is probably identical with *B. sellnicki* sensu Evans (1952), non Sig Thor; a redescription and a figure are published by him. The type-locality of the species is Chianti in Tuscany (Italy).

I recall that *B. laetepictus* sensu Oudemans and Willmann appeared to be a different species (*Eobrachychthonius oudemansi* Van der Hammen, 1952).

Brachychthonius Berlese, 1910

Brachychthonius Berlese, 1910, pp. 218, 219.
Brachychochthonius Jacot, 1938b, p. 130.

Berlese (1910) designated *Hypochthonius brevis* Michael as the type of the genus *Brachychthonius*. The generic diagnosis is, however, accompanied by a figure of the type species, which unmistakably defines it as strongly

1) From λεῖος (smooth) and ὀθόνιος.

different from *Hypochthonius brevis* Michael; for this reason Willmann (1928a, p. 160, fig. 11) correctly created a new specific name (*B. berlesei*) for *B. brevis* Berlese (non Michael). Most authors still mentioned, however, *Hypochthonius brevis* Michael as type of the genus; Jacot (1938b, p. 130) even created a separate genus *Brachychochthonius* (type: B. *jugatus* Jagot, 1938b), which included *B. berlesei.* Recently, however, some authors expressed as their opinion that properly *Brachychochthonius* is to be considered a synonym of *Brachychthonius.* In the present paper I use indeed the name *Brachychthonius* in this correct sense.

Brachychthonius berlesei Willmann, 1928

Brachychthonius brevis, Berlese, 1910, p. 220, pl. 19 fig. 39; Lombardini, 1936, p. 38.
Brachychthonius berlesei Willmann, 1928a, p. 160 fig. 11.

As mentioned above, Berlese's 1910 record of *B. brevis* refers to *B. berlesei* Willmann. This species is known from several countries in Europe; there are many preparations of it in the Berlese Collection.

I remark that Berlese (1896b, p. 25), in an introduction to the classification of Oribatid mites, also mentioned *Hypochthonius brevis* (among the representatives of the Hypochthoniidae); because reference is made to Michael's specimens only, this record certainly relates to the real *B. brevis* Michael.

Brachychthonius italicus Berlese, 1910

Brachychthonius brevis var. *italicus* Berlese, 1910, p. 220, pl. 19 fig. 40.

B. italicus was described as a variety of *B. brevis* Berlese (non Michael). Modern authors correctly regard it as a separate species. Jacot (1938, p. 131) classified *B. italicus* in *Brachychochthonius,* which generic name here is considered a synonym of *Brachychthonius.* The species is known from several countries in Europe; the type-locality is Florence.

Brachychthonius italicus spiciger Berlese, 1910

Brachychthonius brevis var. *spiciger* Berlese, 1910, p. 220.
Brachychthonius italicus spiciger, Jacot, 1936c, p. 349, fig. 7.
Brachychochthonius italicus spiciger, Jacot, 1938b, p. 132.

Berlese described this american form as a variety of *B. brevis* Berlese (non Michael). I studied slide no 83/10 from Lake City, Florida, which probably is the type. This specimen is only slightly different from *B. italicus* and I agree with Jacot that it must be considered a subspecies of *B. italicus*; Forsslund (in litt.) kindly informed me that he is of the same opinion.

Brachychthonius expolitus Berlese, 1910

Brachychthonius brevis var. *expolitus,* Berlese, 1910, p. 220.

According to Berlese the present species differs from *B. berlesei* in having a smooth (unsculptured?) dorsal surface, and short, strongly thickened sensilli. The slides of the species are, however, in such a bad condition that it is impossible to study the material. In the original description Berlese records several localities in Italy; perhaps the type material consists of more than one species. For the present *B. expolitus* must be considered of uncertain identity, possibly even belonging to the genus *Liochthonius.*

COSMOCHTHONIIDAE Grandjean, 1947

In Grandjean's original (1947) conception of the Cosmochthoniidae, the family consisted of the genera *Haplochthonius, Cosmochthonius,* and *Heterochthonius*; shortly afterwards (Grandjean, 1948a) he added *Amnemochthonius,* whilst in a later, more definite classification (Grandjean, 1954) the genus *Heterochthonius* was placed in a separate family. *Haplochthonius* and *Amnemochthonius* are regarded here as representatives of a separate family, as is mentioned above in the key [1]).

Cosmochthonius Berlese, 1910

Cosmochthonius Berlese, 1910, pp. 218, 221.

Berlese (1910) mentions diagnostic characters of the genus *Cosmochthonius* in a key (p. 218) as well as in a concise description (p. 221). One of the striking facts is that he characterizes the genus as monodactyle; it is the first character mentioned in the key, and it is repeated in the diagnosis. Probably Berlese accepted this upon authority of Michael, without further examination. In fact neither the type of the genus (*C. lanatus* Michael) nor one of the other species appear to be monodactyle [2]).

Cosmochthonius lanatus (Michael, 1885)

Hypochthonius lanatus Michael, 1885, p. 396, pl. 7 fig. 11; 1888, p. 541, pl. 49 figs. 15-22.
Hypocthonius lanatus, Berlese, 1896b, p. 25.
Cosmochthonius lanatus, Berlese, 1910, p. 221; Lombardini, 1936, p. 39.
Cosmochthonius domesticus Grandjean, 1948, p. 354; 1950, p. 80.

In the present species tarsus I is bidactyle, whilst tarsi II, III, and IV have three claws. Some years ago (Van der Hammen, 1952) I noted already that

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1) *Tetrachthonius* Hammer, 1958, p. 23 (type: *T. clavatus* Hammer, 1958, p. 23, pl. 4 figs. 19, 19a) appears to be related to *Haplochthonius* and *Amnemochthonius*; it is, however, insufficiently characterized, and not classified or compared with other genera.

2) *Cosmochthonius pulcherrimus* Hammer, 1958, p. 22, pl. 3 figs. 17, 17a-c, is described as having one claw. The species is, however, probably no *Cosmochthonius* at all.

according to Evans (in litt.) Michael erroneously described the type specimens as monodactylous. Consequently, the name *C. domesticus* Grandjean, created for a species similar to the original description of *C. lanatus* but with bi- and tridactylous legs, is no more necessary.

In the Berlese Collection numerous specimens of the species are present. The greater part of the slides are in a bad condition so that I looked at a few specimens only. I have not established if some of the slides also contain specimens of a closely related species, *C. reticulatus* Grandjean (1948, p. 354), different from *C. lanatus* by the greater total length and by the shape of the dorsal alveoli; certainly *C. reticulatus* will prove to occur in Italy.

Cosmochthonius plumatus Berlese, 1910

Cosmochthonius plumatus Berlese, 1910, p. 221, pl. 20 fig. 48; Lombardini, 1936, p. 39; Grandjean, 1950, p. 78, fig. 2.

C. plumatus is bidactylous at I and tridactylous at II, III, and IV, just as *C. lanatus*. The microsculpture of the dorsal surface is different from *lanatus* because it is not reticulate but consists of small irregular points.

The localities recorded by Berlese are: M. Giovi, Mugello (Tuscany), and Palermo (Sicilia). In the Collection I found indeed a slide (no. 80/7) that bears the indication "Monte Giovi, muschio, tipico". Further there are 4 slides (nos. 80/4, 5, 6, 8) with specimens from Palermo. On slide no. 22/30 from Florence, Berlese wrote with a question-mark the names *lanatus* as well as *plumatus* (the preparation is recorded in the catalogue under both names); the extremely bad condition does, however, not allow of a definite conclusion.

C. plumatus appears to be a rare species. The notes given by Grandjean (1950) are founded on one of Berlese's specimens. In the Oudemans Collection (present in the Leiden Museum) I found a preparation of a nymph from Salatiga (Java), which Oudemans identified with *plumatus* (cf. Oudemans, 1916a, p. 266; Buitendijk, 1945, p. 374); although this nymph generally reminds of the adults of *plumatus*, genuine nymphs are required to arrive at a positive proof [1]).

Cosmochthonius emmae Berlese, 1910

Cosmochthonius emmae Berlese, 1910, p. 222, pl. 20 fig. 49; Lombardini, 1936, p. 39; Grandjean, 1950, p. 80.

This is the single species of the genus, known to be bidactylous at I, II,

1) Hammer (1958, p. 23, pl. 4 fig. 18) describes a "variety" of the species, collected in South America (*Cosmochthonius plumatus* var. *suramericanus*). The single specimen is rather small (0.22 mm) so that it is perhaps a nymph. The number of claws is not mentioned.

and III, and tridactylous (exceptionally bidactylous) at IV. It is easily recognizable by the peculiar, leaf-shaped hairs.

According to the Catalogue two slides must be present in the Berlese Collection, viz. the nos. 69/19, and 69/20; the last-mentioned preparation is, however, lost. Slide no. 69/19 is designated as type; the locality is "S. Vincenzo, Pisa, humus della macchia".

The species is apparenty rare. Grandjean (1950) records the capture of a very small number of specimens in Algeria. Franz (1954) mentions that the species was collected in the environs of Vienna (Austria) by Dr. E. Piffl; the last-mentioned kindly informed me that in the course of five years he found only one specimen of it.

HETEROCHTHONIIDAE Grandjean, 1954

In his first notes on the Enarthronota, Grandjean (1947) classified *Heterochthonius* among the Cosmochthoniidae; he pointed out that the genera *Cosmochthonius* and *Heterochthonius* show some analogy in habitus, but are thoroughly different in many important characters. In 1954 he created a separate family Heterochthoniidae, characterized among others by the possession of eyes (which is a unique character) and by the lack of genital tracheae (the presence of which is a special character of the Cosmochthoniidae).

Heterochthonius Berlese, 1910

Heterochthonius Berlese, 1910, pp. 221, 222.

Berlese (1910) created *Heterochthonius* as a subgenus of *Cosmochthonius*; he mentioned the simple dorsal hairs and the long tarsi as differential characters. Ewing (1917, p. 125) already regarded *Heterochthonius* as a separate genus, which opinion was established by Grandjean (1928) in his detailed description of *H. gibbus*, the type species.

Heterochthonius gibbus Berlese, 1910

Cosmochthonius (*Heterochthonius*) *gibbus* Berlese, 1910, p. 222, pl. 20 fig. 50 [1]).
Heterochthonius gibbus, Grandjean, 1928, p. 235, figs. 1-4.

The original description of the species is founded on specimens from the "Monte Falterona", a mountain in Tucany. In the Berlese Collection I found indeed two preparations (viz. the nos. 80/9 and 80/10) from this locality; they are designated as type. There is further one slide (no. 146/28) on which "Vallombrosa" (also in the mountains of Tuscany) is recorded as locality.

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1) In the explanation of the plate, Berlese spells the subgeneric name as *Heterocthonius*.

In their present state, two slides (nos. 80/9 and 146/28) are not suited for study. No. 80/10 is, however, in a satisfactory condition; it fits in with the description of specimens from the Vosges (Grandjean, 1928). I draw attention to the fact that eyes are distinctly visible in this type-specimen, so that it is certain that Berlese (who did not mention it) overlooked this unique character.

PTEROCHTHONIIDAE Grandjean, 1950

Among the Enarthronota *Pterochthonius angelus* is remarkable by its exceptional habitus, whilst many of its characters must be regarded as unique and primitive. It is impossible to classify the species in one of the above-mentioned families, so that Grandjean (1950) created a separate family Pterochthoniidae.

Pterochthonius Berlese, 1913

Pterochthonius Berlese, 1913, p. 104.

Berlese created *Pterochthonius* as a subgenus of *Cosmochthonius,* but the resemblance of the two is superficial and holds good in the number of dorsal "coupures" only. As mentioned above, *Pterochthonius* must be regarded as an isolated genus. *P. angelus* is the type and single representative of it.

Pterochthonius angelus (Berlese, 1916)

Cosmochthonius angelus Berlese, 1910b, p. 388.
Cosmochthonius (*Pterochthonius*) *angelus,* Berlese, 1913, p. 104, pl. 8 fig. 93; 1916b, p. 336; Lombardini, 1936, p. 39.
Pterochthonius angelus, Grandjean, 1948, p. 338, fig. 4; 1950b, p. 85, figs. 1-7.

Berlese (1910b) described the present species in a foot-note, apparently added in haste to his series of "Brevi diagnosi"; the only characters mentioned in this diagnosis are the remarkable shape of the dorsal hairs, the number of "coupures", and the total length, whilst Vallombrosa (in the mountains of Tuscany) is recorded as type-locality. In 1913 he created the subgenus *Pterochthonius,* the description of which is accompanied by an elementary drawing of *Cosmochthonius* (*Pterochthonius*) *angelus.* Finally (Berlese, 1916b) he recorded the species from Columbia (North America) [1]), Vallom-

1) According to Jacot (1937, p. 238) Berlese's "Columbia" material originates from Columbia, Missouri. His notes are interesting enough to be cited here: "Professor Cyrus R. Crosby has told me that in 1904 to 1906 while at the University of Missouri he ran a Berlese trap with leaf mould from along Hinkson Creek (which runs through the University campus). Some of the mites thus secured he sent to Pavesi in exchange for phalangids. Soon after, Pavesi died, and Berlese obtained the material. Interim Crosby gave the rest of the material to Ewing when he was a graduate student at Cornell University. Thus Ewing's and Berlese's Columbia, Missouri species are topotypic even in a restricted sense".

brosa, and S. Vincenzo (near Pisa). After that, *Pterochthonius angelus* was mentioned by Grandjean only, who published a detailed redescription after specimens from France and Mexico.

In the Berlese Collection the following slides are present: nos. 122/24, 27, 29, 30 from Vallombrosa (designated as type), and no. 122/32 from S. Vincenzo; they are identical with the specimens described by Grandjean.

SPHAEROCHTHONIIDAE Grandjean, 1947

In his 1932 ad 1934 papers, Grandjean still classified the genus *Sphaerochthonius* with the Hypochthoniidae, although he stated a relationship with the Protoplophoridae. Later (Grandjean, 1947) he created a separate family Sphaerochthoniidae, consisting of the genus *Sphaerochthonius* only; the same conception is found in his 1954 classification.

Sphaerochthonius Berlese, 1910

Sphaerochthonius Berlese, 1910, pp. 218, 223.

In the original diagnosis of *Sphaerochthonius* (as well as in the accompanying key to the genera of Hypochthoniidae), Berlese (1910) mentions monodactyly of the legs as one of the main characters. An examination of the type species *(S. splendidus)* demonstrates, however, that his observation is incorrect. *Sphaerochthonius* is tridactylous, although the lateral claws appear to be very thin and are easily overlooked. The claw segment has a characteristic shape that reminds of *Cryptoplophora* (Protoplophoridae).

Sphaerochthonius splendidus (Berlese, 1904)

Hypochthonius splendidus Berlese, 1904b, p. 26, pl. 2 fig. 37.
Sphaerochthonius splendidus, Berlese, 1910, p. 223; Lombardini, 1936, p. 49.

Berlese (1904b) published a concise description of the species, which is accompanied by a superficial figure. In combining the data of description and figure, one arrives at the conclusion that *S. splendidus* is a gray mite, measuring 0.310 × 0.200 mm, with a notogaster that is considerably convex, with 1 dorsal "coupure", thick cylindrical notogastral hairs (!), a microsculpture of polygonal areolae, and monodactylous legs (!). The sensillus is described as cultriform, anteriorly with hairs, posteriorly granulate; in the figure of a specimen in dorsal view, the sensillus is, however, drawn as cylindrical, on all sides beset with hairs. Berlese further mentions the occurrence of granules on the dorsal hairs, which later (Berlese, 1910) he regarded as sticking dirt. The species was described after specimens from the "Giardino di Boboli" in Florence.

In the Berlese Collection 3 slides of the species are present, viz. the nos.

58/6, 58/7, and 24/18; the first-mentioned two have been designated as type. The nos. 58/7 and 24/18 originate from the "Giardino di Boboli"; 58/6 was collected in the "Giardino Giapponica", earlier a part of the above-mentioned garden, but nowadays belonging to the "Stazione di Entomologia agraria". The slides, although in a rather bad condition, are suited for observation of some important structures. Because I collected a number of specimens at the type-locality, an extensive redescription will be published separately. For the moment it suffices to mention the following characters, overlooked or incorrectly interpreted by Berlese.

The animal is covered with a coarsely granulate cerotegument that is also present on the cultriform sensillus and the dorsal hairs; probably owing to this Berlese overlooked the remarkable T-shape of the last-mentioned hairs. The notogaster has one "coupure"; the pygidium shows two rather faint transverse ridges that form part of the dorsal sculpture, but that are no "coupures". The pleuraspides consist of two parts; a small triangular, and a larger piece (lateral and inguino-scapular according to Oudemans's 1917a terminology). The legs are tridactyle; they resemble those described by Grandjean (1932) after a *Sphaerochthonius* spec. from Algeria; Grandjean characterized this species as similar to *S. splendidus* but different by the tridactyle legs. Because *S. splendidus* appears to be also tridactyle, I suppose that the Algerian specimens indeed belong to the present species.

Sphaerochthonius gemma (Oudemans, 1909)

Hypochthonius gemma Oudemans, 1909, pp. 319, 320.
Sphaerochthonius elegans Berlese, 1910a, p. 266; 1916b, p. 337.
Cosmochthonius gemma Oudemans 1917, p. 343; 1917a, p. 25, figs. 51, 52.

For the present I place the name *Sphaerochthonius elegans* in the synonymy of *S. gemma,* although it is impossible to give certainty about this supposition without remounting of the type-specimen of the first-mentioned species.

The types of *S. elegans* and *S. gemma* originate from Java; in both cases they have been collected by Jacobson. Oudemans as well as Berlese have been under the impression that their specimens belonged to the adult stage; they regarded the presence of three dorsal "coupures" as an important specific character. For this reason Oudemans (1917) even classified the species in the genus *Cosmochthonius.*

To our knowledge, only juvenile specimens of *Sphaerochthonius* have 3 dorsal "coupures". The fact that in this genus the notogaster of the juveniles is already partly scleritized, easily leads to the erroneous conclusion that nymphs are adults; this happened indeed in the present case.

In 1910 Berlese characterized *S. elegans* as a species from Java, strongly

different from *S. splendidus* by the presence of T-shaped dorsal hairs (!) and 3 dorsal "coupures". Evidently Berlese later no more remembered this description because in 1916 he described *S. elegans* again as a new species, by this time not only from Java but also from Italian Somaliland. In this second description the species is characterized as closely resembling (!) *S. splendidus* but different by the division of the notogaster into 4 segments.

In the Berlese Collection 3 slides are present: no. 129/50 from Java (designated as type) and nos. 160/43, 44 from former Italian Somaliland.

All specimens distinctly have 3 dorsal "coupures" and monodactyle legs. I compared the preparations with the type of *S. gemma* (Oudemans) and observed a distinct similarity in habitus.

Oudemans (1909) described *S. gemma* as a *Hypochthonius*. He stated a close relationship with *Hypochthonius splendidus* (later *Sphaerochthonius*), but observed the presence of 3 dorsal "coupures", although in his opinion 2 of these might be caused by pressure of the cover-glass. In 1917 he attached more value to the number of "coupures" and thought that an alteration of the generic diagnosis of *Cosmochthonius* should allow to include *H. gemma* into this genus; a detailed description followed shortly afterwards (Oudemans, 1917a). Oudemans regarded the type-specimen as adult, and this impression is also suggested by the description, especially because Oudemans figures the reticulate microsculpture as rather heavy. Grandjean (1932, p. 34) already supposed that *gemma* probably is a *Sphaerochthonius*; he expressed as his opinion that the posterior two "coupures" would appear to be nothing but dorsal ridges.

After remounting the single slide of *S. gemma,* the type specimen appeared to be in a condition sufficient to establish the following characters in addition to Oudemans's description. The animal is nearly colourless, and the reticulate microsculpture is faint. The notogaster distinctly shows 3 dorsal "coupures". The legs are monodactyle but for the rest the claw-segment has nearly the same remarkable structure as in the adults of *S. splendidus*. The strip of soft skin, laterally of the "unguinal" pieces, is much larger than in Oudemans's figure, the surface of this part is striated. The genital opening is small, and each of the covers bears only 3 hairs; there are only one pair of genital suckers. Consequently, it is unmistakable that the type is a juvenile specimen. Because in some Enarthronota the development of the number of genital suckers differs from the normal scheme, it is not certain to which stage the specimen belongs, but judging from facts known in related species, it most likely is a deutonymph.

In summarizing the above-mentioned facts, I arrive at the conclusion that *S. gemma* and *S. elegans* possibly are synonymous, that both have been des-

cribed after juvenile specimens, but that the adults of the species are unknown.

PROTOPLOPHORIDAE Ewing, 1917

Although Jacot is generally mentioned as author of the present family, the group was in fact created by Ewing (1917, p. 119) as subfamily of the "Hoplodermatidae". Jacot (1923) mentions the group as subdivision of the Ginglymosoma (= Ptyctima). At that time it consisted of 4 species that all had been described by Berlese (*Protoplophora palpalis, Arthrhoplophora paradoxa, Prototritia armadillo,* and *Prototritia vulpes*).

In 1932 Grandjean published a paper on the family; he described two new genera (*Cryptoplophora, Aedoplophora*), contributed with some doubt two species to the genus *Protoplophora,* and pointed to the relationship of *Cryptoplophora* and *Aedoplophora* with *Sphaerochthonius.* In the 4th series of notes on the Enarthronota (Grandjean, 1954b) he redescribed *Cryptoplophora* and *Aedoplophora*; at the same time he mentioned that useful fragments of his two "*Protoplophora*" species are no more present in his collection.

Berlese's Protoplophoridae represent a collection of insufficiently described ptychoid Oribatid mites. For the moment it is difficult to establish further details, because the material in the Collection is in a bad condition and one type is no more present. Nevertheless, I think that the original descriptions of *Arthrhoplophora* and *Prototritia* will be sufficient to recognize the species when new specimens are collected.

I remark that Jacot (1938a, p. 112) classified the genus *Phtiracarulus* Berlese with the Protoplophoridae [1]). I discovered, however, that *Phtiracarulus perexiguus* Berlese, the type of the genus *Phtiracarulus,* is a juvenile *Mesoplophora michaeliana* Berlese, so that *Phtiracarulus* must be placed in the synonymy of *Mesoplophora.* The genus *Phtiracarulus* sensu Jacot, founded on adults as well as nymphs, appears to be strongly different from *Protoplophora,* but related to *Mesoplophora*; it is dealt with here in the chapter on the Mesoplophoridae.

Protoplophora Berlese, 1910

Protoplophora Berlese, 1910, p. 217.

Berlese (1910) placed the genus at the base of the Hoplophoridae (the family in which at that time all ptychoid Oribatid mites had been classified), but nevertheless pointed to a relationship with the Hypochthoniidae. In the

1) Jacot (1938a) regarded the group as a subfamily (Protoplorinae), which he divided into two tribes: Protoplophorini and Phtiracarulini.

diagnosis he characterizes the notogaster as divided into several parts; he distinctly figures several "coupures" and telescoping tergites. The long palp is remarkable, but Berlese leaves us in doubt as to the structure of rostrum and mandibles. The genus is founded on one species (*P. palpalis*) from Palermo, Sicily.

Protoplophora palpalis Berlese, 1910

Protoplophora palpalis Berlese, 1910, p. 217, pl. 20 figs. 53, 53a.
Prothoplophora palpalis, Lombardini, 1936, p. 47.

The present species was described in less than three lines, accompanied by two schematic drawings; the characters given are not suited for specific identification.

In the Berlese Collection one slide of *P. palpalis* is present, viz. no. 81/41, designated as type, locality Palermo (Sicily). In its present state the preparation is completely unsuited for study, and remounting of the very small specimens appeared too risky. For this reason it has been impossible to establish if the types are adults or juveniles. The number of dorsal "coupures" and the telescoping tergites point to the nymphal stage.

It is uncertain if the single specimen collected by Grandjean (1932, p. 24) in Spain, and identified by him with *P. palpalis,* indeed belongs to the species. The adult specimen is smaller than *Protoplophora palpalis,* it has only one dorsal "coupure", and the sensillus is differently shaped.

Grandjean (1932, p. 26) described another related species as belonging to the genus *Protoplophora* (*P. bivaginata*), although he thought that the different structure of the ventral surface pointed to a separate genus. Because Berlese does not mention characters of the ventral surface, it is, in my opinion, impossible to decide if any of the two species indeed belongs to the genus *Protoplophora.*

Arthrhoplophora Berlese, 1910

Arthrhoplophora[1]) Berlese, 1910, p. 219; 1910a, p. 267.

The present genus (with *A. paradoxa* as type and single representative) is remarkable to such a degree that it appears doubtful whether it indeed belongs to the Protoplophoridae. Further investigations are, however, needed to arrive at a more definite conclusion.

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1) This is the original spelling of the generic name; afterwards Berlese and other authors omitted the initial *h* of *"hoplophora"*.

Arthrhoplophora paradoxa Berlese, 1910

Arthrhoplophora paradoxa Berlese, 1910a, p. 267; Lombardini, 1936, p. 38.
Arthroplophora paradoxa, Berlese, 1913, p. 102, pl. 8 figs. 96, 96a, 96b, 96c[1]).

In the Berlese Collection 4 slides of the species are present, viz. the nos. 132/7, 8, 9, 10 with specimens from Java; they are all designated as type. None of them is suited for a supplementary description. Berlese (1913) published, however, four drawings that reveal some remarkable characters. I point for instance to the unique neotrichy of the notogaster, the special structure of the claw segment, and the long terminal hairs of the palp. These characters will certainly be sufficient for identification.

Prototritia Berlese, 1916

Prototritia Berlese, 1916, p. 65.

Berlese (1916) described *Prototritia* as a subgenus of *Arthroplophora* (*"hoplophora"* is spelt here without initial *h*); he mentioned tridactyly of the legs as the single differential character. The type of *Prototritia* is *Arthroplophora* (*Prototritia*) *armadillo* that is described together with a second species, *A.* (*P.*) *vulpes.* The subgenus is raised here to generic rank.

Grandjean (1932, p. 29) pointed to the fact that the description of *Prototritia,* and in particular that of *A.* (*P.*) *armadillo* reminds in some respects of *Aedoplophora,* but that identity is precluded because of the number of "coupures" and the structure of the claw segment.

Prototritia armadillo Berlese (1916)

Arthroplophora (*Prototritia*) *armadillo* Berlese, 1916, p. 66.

There is only one slide of the species present in the Berlese Collection, viz. no. 160/22 from Italian Somaliland; the preparation is designated as type. The slide is in such a bad condition that only a few characters are visible. The sensillus is filiform. I established that the species is distinctly different from *Aedoplophora.*

Prototritia vulpes Berlese, 1916

Arthroplophora (*Prototritia*) *vulpes* Berlese, 1916, p. 66.
Arthroplophora vulpes, Lombardini, 1936, p. 38.

Preparations of the species are no more present in the Berlese Collection. The description of *P. vulpes* reminds of *Arthrhoplophora,* and makes the impression that at least the ventral surface is characterized by neotrichy.

P. vulpes was collected in Italian Somaliland, just as *P. armadillo.*

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1) In the explanation of pl. 8 Berlese erroneously refers to figs. 95a, b, c.

4. MESOPLOPHOROIDEA nov. superfam.

MESOPLOPHORIDAE Ewing, 1917

The genus *Mesoplophora* Berlese (1904b) was compared by Berlese with *"Hoploderma"*, and later (Berlese, 1913a, p. 7) indeed classified with the "Hoplophoridae". Ewing (1917, p. 119) created a subfamily Mesoplophorinae (part of the "Hoplodermatidae"), which was later raised to family rank. Jacot (1923, p. 161) classified the Mesoplophoridae with the Ginglymosoma (= Ptyctima), a classification that has been adopted by Sellnick (1928) and Willmann (1931).

Grandjean (1933a, p. 308; 1934a, p. 356) reckoned the Mesoplophoridae also among the Ptyctima, although he pointed to the possibility of a different phylogeny. In 1954 he classified the Mesoplophoridae, however, as an isolated family of uncertain relationship. I remark that a study of the interesting genus *Archoplophora* [1]) nov. gen. (mentioned below) certainly will enlarge our knowledge of the isolated family.

Mesoplophora Berlese, 1904

Mesoplophora Berlese, 1904b, p. 23.
Phtiracarulus Berlese, 1920a, p. 149.
Meshoplophora, Lombardini, 1936, p. 44.

Berlese characterized the genus *Mesoplophora* as similar to *"Hoploderma"*, but with genital and anal openings remote from each other. Under four names he described two species of the genus; the type is *Mesoplophora michaeliana.*

In 1920 Berlese described *Phtiracarulus,* a supposed subgenus of *Phthiracarus,* but a study of the type-species and single representative (*P. perexiguus*) demonstrates that this is a juvenile *M. michaeliana*; further commentary is given below [2]).

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1) From ἀρχή (origin) and *hoplophora.*

2) Willmann (1930, p. 245, figs. 8, 9) described a ptychoid mite from Guatamala, which he classified in *Phtiracarulus* (*P. rostralis*); he considered the differences with *Phthiracarus* sufficient to raise the subgenus to generic rank. Jacot (1938a, p. 112, pl. 9 figs. 1-5) described a closely related species (*P. laevis*) from the U.S.A. It is difficult to separate *laevis* and *rostralis,* because the differential characters mentioned by Jacot (number and length of the notogastral hairs) are not evident; it is, indeed, not impossible that in the mountains of Guatamala (the type-material of *rostralis* was collected at an altitude of 2500 feet) the same species occurs as in N. America.

Apparently, Willman still considered *P. rostralis* a representative of the family Phthiracaridae. Jacot regarded the two species (*laevis* and *rostralis*) as highly developed Protoplophoridae (tribe Phtiracarulini Jacot, 1938a). Up to the present, nobody observed, however, the relationship with the Mesoplophoridae; in fact, *rostralis* and *laevis* remind of the scleritized nymphs of *Mesoplophora,* although they are certainly adults. Apart from females with eggs, Jacot also described remarkable, scleritized nymphs. A reinvestigation

Mesoplophora michaeliana Berlese, 1904

Mesoplophora Michaeliana Berlese, 1904b, p. 23, pl. 2 fig. 51.
Phtiracarus (Phtiracarulus) perexiguus Berlese, 1920a, p. 149.
Meshoplophora michaeliana, Lombardini, 1936, p. 44.

Until recently, *M. michaeliana* (the type-species of the genus) had never been found again. Although the original description is sufficient for identification, new material of the type-species was indispensable in order to give a detailed definition of the genus.

In the Berlese Collection several specimens of the species are present. By means of the catalogue I found the following preparations: 26/36, 209/16, 214/2 (all from the garden of the "Stazione di Entomologia Agraria" at Florence); 70/6, 7, 8, 9 (from the Boboli Gardens, Florence); 214/1 (Cascine, Florence); 209/14, 15 (Florence). None of them is designated as type, for which reason I select no. 26/36 as such; consequently the garden of the "Stazione di Entomologia Agraria" (Florence) must be considered the type-locality. In this small garden I collected indeed a number of topotypic specimens, the detailed redescription of which will be published in a monograph on the Mesoplophoridae.

Apart from adults of *M. michaeliana,* slide no. 70/7 contains some small ptychoid specimens that Berlese identified with *Phtiracarus minimus* (now *Pseudotritia minima*); the preparation did not permit of a definite conclusion.

I found also two slides (nos. 209/19, 20, from the garden of the "Stazione di Entomologia Agraria", Florence) with the types of *Phtiracarus (Phtiracarulus) perexiguus.* Because these specimens appear to be juveniles of *Mesoplophora michaeliana,* the subgenus *Phtiracarulus* (of which *perexiguus* is the type) becomes a synonym of *Mesoplophora,* whilst the species must be placed in the synonymy of *M. michaeliana.* In slide no. 209/20 I distinctly recognized a deutonymph. The specimen described by Berlese as a hexapod nymph is of course a larva. I remark that the juveniles of *Mesoplophora* are scleritized; they remind of adult ptychoids.

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of the large material collected by Jacot will certainly enlarge our knowledge of the systematic position of the Mesoplophoridae. I remark that in *Phtiracarulus* (sensu Willmann and Jacot) genital and anal plates are separated by a plate that possibly must be considered a fusion of adanals and prae-anal.

Because *Phtiracarulus* Berlese is a synonym of *Mesoplophora,* a new genus must be created for *Phtiracarulus* sensu Willmann and Jacot. I name this genus **Archoplophora** nov. gen., but for the moment I refer to the diagnosis given by Jacot (1938a, p. 112, pl. 9 figs. 1-5). I designate *Phtiracarulus laevis* Jacot (1938a) as type of the genus *Archo plophora.*

Mesoplophora pantotrema Berlese, 1913

Mesoplophora pantotrema Berlese, 1913, p. 101, pl. 8 figs. 94, 94a[1]).
Mesoplophora discreta Berlese, 1913, p. 101, pl. 8 figs. 95, 95a[1]).
Meshoplophora discreta, Meshoplophora pantotrema, Lombardini, 1936, p. 44.

Grandjean (1933a, p. 308) pointed out that *M. pantotrema* is the nymph of *M. discreta.* The original figure of *pantotrema* is indeed drawn after a juvenile, while the considerable range of the measurements, as mentioned in the description, points to the presence of several stages among the type-material. *M. discreta* represents the adult stage. Both *pantotrema* and *discreta* originate from the same locality ("Samarang, Giava"), so that it is obvious that adults and nymphs belong to the same species. Because *pantotrema* is the first-mentioned of the two, *discreta* must be considered a synonym of *pantotrema.*

In the Berlese Collection 5 slides of *"M. pantotrema"* are present, viz. the nos. 137/24 (type), 25, 26, 27, 28; with the exception of no. 137/27 (locality: "Giava", without further details), all specimens bear the label "Samarang, Giava". Slide no. 137/26 contains a deutonymph.

"M. discreta" is represented by 4 slides, viz. the nos. 137/20, 21, 22, 23; on the labels the locality is indicated as "Samarang, Giava" (nos. 137/20, 23), or simply as "Giava" (137/21, 22). The type-slide (no. 137/23) is the single preparation that in its present state is suited for observation; it contains indeed an adult specimen.

5. PHTHIRACAROIDEA

Phthiracaroidea Grandjean, 1954, p. 430.

The species classified here with the Phthiracaroidea have been regarded as members of a genus (*Hoplophora* C. L. Koch), a subfamily (Hoplophorinae, Phthiracarinae), or a family (Hoplophoridae, Hoplodermatidae, Phthiracaridae). Grandjean (1954) raised the family Phthiracaridae (this name has priority) to superfamily rank, and subdivided the group in three families: Oribotritiidae, Pseudotritiidae and Phthiracaridae; the name Pseudotritiidae is replaced here by Euphthiracaridae.

The relationship of the Phthiracaroidea to other ptychoid groups (Protoplophoridae, Mesoplophoridae) is uncertain.

The present superfamily is an extremely difficult group. The representatives are poor in characters, and the existing descriptions are for the greater part insufficient. Berlese mentioned no less than 38 species and varieties in his papers, among which he described 31 as new. His descriptions are incom-

1) In the explanation of pl. 8 Berlese erroneously refers to figs. 93a and 94a, instead of 94a and 95a respectively.

plete, whilst the type-material is often not suited for study, and sometimes even heterogeneous. Several times Berlese changed his opinion on the conception of the genera, without giving any explication. For these reasons it is not easy to deal with his Phthiracaroid mites.

In the following an attempt is, however, made to classify his species and to give some supplementary details.

KEY TO THE FAMILIES OF PHTHIRACAROIDEA

1. The ventral surface of the opisthosoma between the borders of the notogaster (the ano-genital region) is long and narrow 2
— The ano-genital region is rather broad . . . . . **Phthiracaridae**
2. Genital and anal plates are separated from aggenital and adanal plates. Palp with 5 segments . . . . . **Oribotritiidae**
— Genital and aggenital plates fused; anal and adanal plates fused in the posterior part only. Palp with 3 segments . . . . . **Euphthiracaridae**

ORIBOTRITIIDAE Grandjean, 1954

The family Oribotritiidae is different from the Euphthiracaridae (from which it was separated by Grandjean in 1954) by the characteristic structure of the ano-genital region, and by the structure of the palp that has 5 joints.

Beside *Oribotritia* Jacot (1924) (which was mentioned by Grandjean (1954) as single representative of the family) two other genera possibly belong to the family: *Indotritia* Jacot (1929) and *Protoribotritia* Jacot (1938a).

I have contributed Berlese's species to *Oribotritia*.

Oribotritia Jacot, 1924

Oribotritia Jacot, 1924, p. 83.
Tritia Berlese, 1883a, fasc. 6 (1); (p.p.) 1896b, p. 20.
Phtiracarus (p.p.), Berlese, 1913a, p. 55.

Berlese (1883a) created the genus *Tritia*, with *Hoplophora decumana* C. L. Koch as type; he used the generic name later on for species of the families Oribotritiidae and Euphthiracaridae. Michael (1898) placed *Tritia* in the synonymy of *Phthiracarus* Perty, and Berlese adopted this opinion between 1904 and 1913, when he contributed species of the above-mentioned two families to *Phtiracarus*. Berlese (1913a) published a diagnosis of *"Phtiracarus"* and designated *P. berlesei* (= *Oribotritia decumana*) as type of the genus, although *Phthiracarus* is monotypical (type: *P. contractilis*). In his 1916 and 1923 papers Berlese returned, however, to the use of *Tritia*.

Jacot (1924) discovered that *Tritia* is preoccupied. For this reason he created the new name *Oribotritia*. *Hoplophora decumana* is of course also the type of *Oribotritia*.

Three species of the genus are dealt with in Berlese's papers.

Oribotritia decumana (C. L. Koch, 1836)

Hoplophora decumana C. L. Koch, 1836, fasc. 2 (9).
Tritia decumana, Berlese, 1883a, fasc. 6 (2); 1896b, p. 20; Sellnick, 1925, p. 305, figs. 5-7.
Phthiracarus berlesei Michael, 1898, p. 81.
Phtiracarus berlesei, Berlese, 1913a, p. 56, textfig., prep. I-14.
Oribotritia decumana, Sellnick, 1928, p. 39, figs. 89, 90; Willmann, 1931, p. 193, figs. 356, 357.

Jacot (1936) did not collect specimens of *Hoplophora decumana* in Regensburg (the type-locality); nevertheless the identity of the species seems quite certain. Redescriptions are given by Sellnick (1925, 1928) and Willmann (1931).

Michael (1898) considered *Tritia decumana* Berlese (1883) different from *Hoplophora decumana* C. L. Koch (1836), and consequently gave it a new name (*berlesei*); this name was later on also used by Berlese (1913a).

The species is not mentioned by Lombardini; a specimen is, however, present in the Acarotheca italica.

Oribotritia nuda (Berlese, 1887)

Tritia nuda Berlese, 1887, fasc. 35 (9); 1896b, p. 20; Sellnick, 1923, p. 17, figs. 6, 17, 29; Lombardini, 1936, p. 50.

The type-specimens from Padua are no more present, but 4 slides from Florence (nos. 215/29-32) are identified by Berlese with the species; I remark that the specimen in slide no. 215/30 was collected under bamboo in the garden of the "Stazione di Entomologia Agraria".

Sellnick (1923) prepared a redescription of the species after specimens from Florence, which were sent to him by Berlese.

Oribotritia breviseta (Berlese, 1923)

Tritia berlesei var. *breviseta* Berlese, 1923, p. 261.

The type-specimen of *breviseta* (slide no. 216/27) from East Africa is still present in the Collection. Berlese described it as a variety of *Tritia berlesei* (= *Oribotritia decumana*); I consider the "variety" a separate species because of its very short notogastral hairs.

EUPHTHIRACARIDAE Jacot, 1930

In 1923 Jacot created a subfamily Tritiinae; because the name *Tritia* is preoccupied, and because Jacot later considered the group a tribe, he replaced the name in 1930 (p. 214) by Euphthiracarini.

Grandjean (1954) distinguished the families Oribotriidae and Pseudotritiidae; the last-mentioned family also contains the genus *Euphthiracarus,* so that the name Pseudotritiidae must be replaced by Euphthiracaridae.

Pseudotritia Willmann, 1919

Pseudotritia Willmann, 1919, p. 552; Jacot, 1930, p. 242.

Willmann (1919) created *Pseudotritia* as a subgenus of *Tritia,* with *T. (P.) monodactyla* Willmann (1919) as type; according to him the subgenus is characterized by the presence of only one claw at the legs. Sellnick (1923) pointed already to the fact that the structure of the genital region and the chaetotaxy of the notogaster of *Pseudotritia* resemble those of some other *Tritia* species. Jacot (e.g. 1930) used indeed the structure of the ano-genital region as main character of *Pseudotritia.* Later authors followed him in this modified conception of the genus.

Seven of Berlese's species are listed here with the genus *Pseudotritia;* originally they have been described by him as representatives of *Tritia* (1887a, 1916b, 1923) and *Phtiracarus* (1904b, 1913), and one time (1913) erroneously as a *Hoploderma.* Three species (*punctulata, reticulata,* and *vestita*) are probably related to *Euphthiracarus.*

Pseudotritia monodactyla Willmann, 1919

Tritia (Pseudotritia) monodactyla Willmann, 1919, p. 552, fig. 1; Sellnick, 1923, p. 20, figs. 9, 20, 32.
?*Tritia aequipunctata* Berlese, 1923, p. 260.
Pseudotritia monodactyla, Sellnick, 1928, p. 39; Willmann, 1931, p. 195, figs. 362, 363; Märkel, 1958, p. 488, fig. 7.

I have placed *Tritia aequipunctata* with some doubt in the synonymy of *Pseudotritia monodactyla;* Märkel's 1958 redescription of *monodactyla* suits, however, to the notes that I made in 1956.

In the Berlese Collection the type is present (slide no. 216/15; locality: Florence, Cascine), together with slide no. 225/36, a cotype (read: paratype) from Florence ("cotype" is written in pencil, an earlier designation as "tipico" is cancelled). The structure of the tegument of these specimens, the shape of the sensillus, the notogastral hairs, and the monodactylous legs resemble those of *monodactyla.*

Pseudotritia ardua (C. L. Koch, 1841)

Hoplophora ardua C. L. Koch, 1841, fasc. 32 (15).
Tritia lentula, Berlese, 1887a, fasc. 36 (3); 1896b, p. 20.
Phthiracarus canestrinii Michael, 1898, p. 81.
Phtiracarus canestrinii, Berlese, 1913a, p. 55.
Tritia ardua, Sellnick, 1923, p. 12, figs. 1, 12, 23, 24.
Oribotritia ardua, Sellnick, 1928, p. 39.
Pseudotritia ardua, Jacot, 1930, p. 243, pl. 38 figs. 44-51; Märkel, 1958, p. 486, fig. 5.
Oribotritia loricata, Willmann, 1931, p. 194, fig. 358.

Berlese's figure of *Tritia lentula* (non *lentula* C. L. Koch) demonstrates

that the species has one lateral ridge on the aspis, and a slightly thickened sensillus; it is therefore identical with *Pseudotritia ardua* (C. L. Koch), and different from the related species *P. duplicata Grandjean* (cf. Märkel, 1958). In the Berlese Collection I studied two slides (nos. 215/41, 42) with specimens from Torino that are *ardua* indeed.

I remark that Michael's *arduus* is *duplicata,* whilst he gave the name *canestrinii* to our *ardua.* Berlese (1913a) apparently accepted this opinion, for at that time he mentioned *arduus* as well as *canestrinii.* Probably both species are present in the Collection, because Lombardini (1936, p. 50) mentioned both *Tritia ardua* and *Tritia lentula* (Michael's *canestrinii*) in his Catalogue.

Pseudotritia minima (Berlese, 1904)

Phtiracarus minimus Berlese, 1904b, p. 22.
Tritia (*Pseudotritia*) *minuta* Willmann, 1919, p. 552, fig. 2.
Tritia (*Pseudotritia*) *minima,* Sellnick, 1923, p. 21, figs. 11, 12, 34[1]).
Pseudotritia minima, Sellnick, 1928, p. 39; Willmann, 1931, p. 195, fig. 364; Märkel, 1958, p. 488, figs. 3d, 8.
Tritia minima, Lombardini, 1936, p. 50.

The species was described after specimens from Florence. I have indeed studied material from this locality, viz. the slides nos. 216/36, 41 (Florence, Cascine), and 216/37-40 (Florence, Boboli); none of these is designated as type. According to the label, slide no. 70/7 (Florence, Boboli) contains *Mesoplophora michaeliana* and "*Phtiracarus minimus*"; this preparation may have been part of the type-material; at the time of my visit its condition did, however, not permit of a definite identification.

The species was redescribed by Sellnick after specimens from Florence, sent to him by Berlese. It is sufficiently characterized by the above-mentioned descriptions.

Pseudotritia punctulata (Berlese, 1913)

Phtiracarus punctulatus Berlese, 1913, p. 102, pl. 8 fig. 97[2]).
Tritia punctulata, Lombardini, 1936, p. 50.

In 1913 Berlese used "*Phtiracarus*" instead of *Tritia*; Berlese (1913a, p. 55) lists *punctulatus* indeed as a "*Phtiracarus*" with other Oribotritiidae and Euphthiracaridae. The present species apparently belongs to the last-mentioned family. I have contributed it to the genus *Pseudotritia,* although there is no certainty about this relationship.

The species was mentioned by Lombardini, but I have seen no slide in the

1) In the text (p. 21) an erroneous reference is made to fig. 33.
2) Although fig. 97a, representing the microsculpture of a tegument, is placed close to fig. 97, it appears to belongs to fig. 98 (*Pseudotritia reticulata*).

Berlese Collection. Judging from the original description and figure the species mainly differs from *P. reticulata* by the microsculpture of the tegument. The type-locality is "Cansiglio".

Pseudotritia reticulata (Berlese, 1913)

Phtiracarus reticulatus Berlese, 1913, p. 102, pl. 8 figs., 98, 97a.
Tritia reticulata, Lombardini, 1936, p. 50.

In the Berlese Collection I have seen two slides with specimens from the type-locality (Tiarno): nos. 31/22 and 216/28; the first-mentioned slide contains also other species.

The microsculpture of the tegument of the present species is reticulate; the hairs of notogaster and prodorsum are long, strong, and pointed. The sensillus is S-shaped.

Phtiracarus reticulatus is related to *Pseudotritia punctulata.* It is classified here with the genus *Pseudotritia,* although the structure of the tegument resembles that of *Euphthiracarus.*

Pseudotritia vestita (Berlese, 1913)

Hoploderma vestitum Berlese, 1913, p. 103, pl. 8 figs. 103, 103a[1]).

Although the species is not mentioned by Lombardini (1936), two cotypes (nos. 141/17, 21) are still present in the Collection; they originate from the type-locality Semarang (Java), but one slide has only Java as locality.

I could study the animal in lateral view only. This study as well as Berlese's drawing (the lateral view of the aspis for instance) point to the Euphthiracaridae (Berlese erroneously classified the species with *Hoploderma*!). I have classified the species with *Pseudotritia* because of the absence of a ridge on the aspis.

Pseudotritia hyeroglyphica (Berlese, 1916)

Tritia lentula var. *hyeroglyphica* Berlese, 1916b, p. 337.

I have not seen the type-specimen of the present species, which was collected in Italian Somaliland. Slide no. 216/9 from Portici (Italy) contains, according to the label, also the "variety" *hyeroglyphica,* together with the species; I think that in this case the "variety" is possibly an old specimen of *P. ardua.*

Nothing can therefore be said about the type of *hyeroglyphica.* I have listed it here as a *Pseudotritia* species, the identity of which is uncertain.

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1) In the explanation of pl. 8 an erroneous reference is made to fig. 102a.

Euphthiracarus Ewing, 1917

Euphthiracarus Ewing, 1917, pp. 125, 132; Jacot, 1924a, p. 90; 1930, p. 248; 1938, p. 120; Märkel, 1958, p. 486.

Ewing (1917) designated *Phthiracarus flavus* Ewing (1908, p. 450, fig. 1) as type of the present genus. Jacot contributed several North American species to it. Up to now *E. cribrarius* is the only species of the genus known from Europe. *Pseudotritia punctulata* [1]), *reticulata,* and *vestita* (the first-mentioned two from Italy) are possibly related to *Euphthiracarus.*

Euphthiracarus cribrarius (Berlese, 1904)

Phtiracarus cribrarius Berlese, 1904b, p. 23.
Phtiracarus cribarius [2]), Berlese, 1913a, p. 55.
Tritia cribraria, Sellnick, 1923, p. 13, figs. 2, 13, 25.
Oribotritia cribraria, Sellnick, 1928, p. 39.
Oribotritia cribaria, Willmann, 1931, p. 194, figs. 360, 361.
Euphthiracarus cribarius, Märkel, 1958, p. 486, figs. 3b, 4.

The species is no more present in the Berlese Collection. In the concise original diagnosis some important characters are, however, mentioned (measurements, structure of the tegument, shape of sensillus), which are useful for identification. The species has been redescribed by Sellnick, Willmann, and Märkel; the figures prepared by the last-mentioned author are very good.

PHTHIRACARIDAE Perty, 1841

Perty (1841) created the Phthiracarea, a group consisting of one genus ("Sippe") with one species (*Phthiracarus contractilis*). Oudemans (1896, pp. 53, 62) rediscovered the name and used it instead of Hoplophoridae (Hoplophorinae Berlese, 1885d; Hoplophoridae Berlese, 1896b).

Although Oudemans (1896) used *Phthiracarus* in the sense of *Tritia* Berlese (followed by Michael, 1898), he later (Oudemans, 1915, p. 212) discovered the correct conception of the genus. I remark that Berlese apparently followed Oudemans in his varying use of *Phthiracarus.*

Michael (1898) emended the name Phthiracarea into Phthiracarinae, whilst Oudemans later wrote Phthiracaridae. At that time the conception of the family corresponded with our superfamily Phthiracaroidea. Jacot (1930, p. 214) created two tribes, Phthiracarini and Euphthiracarini, of which the first-mentioned (in Jacot's restricted sense) is now considered a separate family Phthiracaridae.

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1) Jacot (1930, p. 250, pl. 40 figs. 60-65) describes *Euphthiracarus punctulatum* Jacot, a different species, from the U.S.A..

2) *cribarius* is a lapsus for *cribrarius* (from *cribrum,* sieve).

Berlese s Phthiracarid species are classified here with five genera: *Tropacarus, Steganacarus, Hoplophorella, Hoplophthiracarus,* and *Phthiracarus.*

Tropacarus Ewing, 1917

Tropacarus Ewing, 1917, p. 130.
Calhoplophora Berlese, 1923, p. 257.

Calhoplophora Berlese (1923) has the same type (*Hoplophora carinata* C. L. Koch) as *Tropacarus* Ewing (1917); for this reason it must be placed in the synonymy of the last-mentioned genus. Ewing did not know *Tropacarus carinatus,* but founded his generic diagnosis on the descriptions of the species. Ewing and Berlese mentioned no other representatives of the genus; I added *Hoplophora pulcherrima* Berlese, and *Phthiracarus* (*Trachyhoplophora*) *brevipilus* Berlese.

Tropacarus carinatus (C. L. Koch, 1841)

Hoplophora carinata C. L. Koch, 1841, fasc. 32 (9); Berlese, 1887a, fasc. 36 (1); 1896b, p. 19.
Tropacarus carinatus, Sellnick, 1928, p. 39; Willmann, 1931, p. 189, fig. 343; Jacot, 1936, p. 183; Strenzke, 1952, p. 132.

The identity of this characteristic species is certain. Berlese (1887a) recorded it from North Italy; in the Collection I studied only a specimen from Vallombrosa (no. 39/20).

According to Jacot (1936) and Strenzke (1952) the species mainly occurs in litter and moss in coniferous forests.

Tropacarus pulcherrimus (Berlese, 1884?)

Hoplophora pulcherrima Berlese, 1884 (?), Spec. Nov. Rep., ser. 5 [1]); 1885c, p. 30.
Hoplophora carinata var. *pulcherrima,* Berlese, 1887, fasc. 35 (10).
Hoploderma pulcherrimum, Berlese, 1913a, p. 154, textfig., prep. II-11.
Phthiracarus pulcherrimus, Lombardini, 1936, p. 47.

According to Berlese (1887) the type-specimens of the present species were collected in the Colli Euganei (Padua); later (Berlese, 1913a) the species was recorded from North and Central Italy. In the Berlese Collection I studied a specimen from Tiarno (in slide no. 31/29); the species is also present in the Acarotheca italica. I remark that Berlese (1896b) listed the species as a variety, but did not include it in the key.

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1) Berlese (1885c) mentioned that *Hoplophora pulcherrima* was described in the series "Specierum novarum repertorium" (this series is printed on the wrappers of the fasciculi of A.M.S.); ser. 5 is probably to be found in one of the fasc. 13-16.

Tropacarus brevipilus (Berlese, 1923)

Phthiracarus (*Trachyhoplophora*) *brevipilus* Berlese, 1923, p. 257.
Tropacarus curtipilus, Strenzke, 1952, p. 152.

I classify the present species as a *Tropacarus,* although Berlese included it in *Trachyhoplophora* (a synonym of *Steganacarus*); I remark that *Trachyhoplophora* was created in the same paper together with *Calhoplophora* (a synonym of *Tropacarus*). The species reminds indeed of a *Steganacarus,* because its special *Tropacarus*-characters are not striking (the dorsal ridge e.g. is only partly present); the species has very long claws.

The types are still present in the Collection, together with other specimens: 94/24, type, garden of the "Stazione di Entomologia Agraria", Florence; 94/25, cotype (read: paratype), same locality; 94/26, Boboli Gardens, Florence; 94/27, as 94/25; 94/28, Cascine, Florence.

Sellnick (1931, pp. 695, 721) recorded *Hoploderma curtipilus* Berlese and described a *Hoploderma curtipilus* var. *perfecta* from the Ionian islands: *curtipilus* is, however, certainly a lapsus for *brevipilus.* Strenzke (1952, p. 152) mentioned a *T. curtipilus* from Germany, and cited Sellnick (l.c.) only; Strenzke's short description indeed exactly fits in with *T. brevipilus.*

Steganacarus Ewing, 1917

Hoplophora, Berlese, 1892d, fasc. 67 (5).
Steganacarus Ewing, 1917, pp. 125, 130.
Atropacarus Ewing, 1917, pp. 125, 130.
Trachyhoplophora Berlese, 1923, p. 257.

Species of the present genus have been listed with the genera *Hoplophora* C. L. Koch, *Hoploderma* Michael, *Steganacarus* Ewing, *Atropacarus* Ewing, and *Trachyhoplophora* Berlese.

C. L. Koch used the name *Hoplophora* in 1836 when he described two species: *Hoplophora decumana* (now *Oribotritia*) and *Hoplophora stricula* (now *Steganacarus*). In 1842 C. L. Koch published a diagnosis of the genus, and designated *Hoplophora laevigata* C. L. Koch (1841) as type.

Because the name *Hoplophora* appeared to be preocupied (*Hoplophora* Perty, Orthoptera), Michael (1898) gave the new name *Hoploderma* to the genus. In the present case it is of no importance that Michael regarded *laevigata* as a possible synonym of *"Phthiracarus" nudus,* so that we can follow the general use that *laevigata* is also the type of *Hoploderma.*

Opinion 204 of the "Opinions and declarations rendered by the International Commission on Zoological Nomenclature" deals with Koch's designation of types. In the present case (type-species described in 1841, two other species in 1836) it will be necessary to submit an application to the Commis-

sion for the use of the Plenary Powers, because adoption of the rules (i.e. to place *Oribotritia* in the synonymy of *Hoploderma*) would lead to instability and confusion; the possibility of this use is mentioned in the opinion in question.

Because *Hoploderma* Michael (1898) has *laevigata* as type, it must be placed in the synonymy of *Phthiracarus* Perty (1839) of which, according to Jacot (1930, p. 211), the type (*P. contractilis* Perty, 1841) is a synonym of *laevigata*. Further notes on the genus *Phthiracarus* are given below.

Although the name *Hoploderma* has been in use for some time for the present genus, most authors followed Jacot (1930) in accepting the correct name *Steganacarus* Ewing, 1917 (type: *Hoplophora anomala* Berlese). Ewing (1917) also described the genus *Atropacarus* (type: *Hoplophora stricula* C. L. Koch); this genus is not yet sufficiently characterized. In 1923 Berlese created *Trachyhoplophora*, a subgenus of *Phthiracarus* (!), with *Hoplophora magna* Nicolet as type; because *magna* is related to *anomala*, *Trachyhoplophora* becomes a synonym of *Steganacarus*.

Berlese's species can be arranged in some groups that are based on the general habitus: *anomalus, magnus, applicatus* (*Steganacarus* s.str.); *phyllophorus* (related to *Hoplophorella*, but different in the arrangement of the anal hairs); *clavigerus, vitrinum, remigerus, somalicus* (? *Atropacarus*); *pardinus* and *rapax* (which have a superficial resemblance to *anomalus* and *magnus*, but are different in several characters).

Steganacarus anomalus (Berlese, 1883)

Hoplophora anomala Berlese, 1883a, fasc. 6 (5); 1896b, p. 19.

According to the original description, the species has been collected "in agri Romani (Frosino)" (probably Frosinone), and "in agri Patavini (Monselice)" (by G. Canestrini). These types are no more present in the Collection, but I found the slides nos. 147/37 (garden of the "Stazione di Entomologia agraria", Florence), and 141/38 (Boboli gardens, Florence); I collected indeed specimens of the species at the last-mentioned locality.

Oudemans (1915, p. 219) described a *Phthiracarus magna* forma *anomaloides* that in his opinion is not distinctly different from "*Phthiracarus anomala* Berlese"; on p. 214 he mentions, however, several diagnostic characters of *anomala*. I remark that according to Oudemans (l.c., p. 214) the original description of *anomala* was prepared by Berlese and Canestrini.

Steganacarus magnus (Nicolet, 1855)

Hoplophora magna Nicolet, 1855, p. 472, pl. 10 fig. 4; Berlese, 1892d, fasc. 67 (9); 1896b, p. 19.

Hoploderma magnum, Sellnick, 1928, p. 140; Willmann, 1931, p. 191, figs. 347, 348.

This common European species was recorded by Berlese from Vallombrosa. I have seen no specimen in the Berlese Collection.

Steganacarus applicatus (Sellnick, 1920)

Phthiracarus applicatus Sellnick, 1920, p. 36.
Hoplophora stricula, Berlese, 1896, fasc. 78 (3); 1896b, p. 19.
Phthiracarus berlesei Oudemans, 1915, p. 214; Lombardini, 1936, p. 47.
Hoploderma applicata, Sellnick, 1928, p. 40.
Hoploderma applictum, Willmann, 1931, p. 191, fig. 349.

The species described by Berlese (1896) as *Hoplophora stricula* is certainly not identical with *Hoplophora stricula* C. L. Koch (1836). For this reason Oudemans (1915) gave the new name *berlesei* to *stricula* Berlese (non Koch); he overlooked, however, that Michael (1898) already used the name *Phthiracarus berlesei* for *Tritia decumana* sensu Berlese (1883), so that *P. berlesei* Oudemans is a primary homonym.

In the Collection I did not see the specimens from Vallombrosa on which Berlese's 1896 description was based, but slide no. 31/23 from Tiarno bears the label "*Phtiracarus Berlesei* Oudemans"; it contains *Steganacarus applicatus.* Two cotypes of *S. applicatus* Sellnick from Lötzen are also present in the Collection; on the label Berlese added the name "*Berlesei* Michael" (certainly a lapsus for "*Berlesei* Oudemans"!) as a synonym.

For these reasons I place Berlese's 1896 record of *Hoplophora stricula* in the synonymy of *S. applicatus*; the figure is, however, certainly inaccurate because the two posterior pairs of dorsal hairs are not drawn as strikingly erect.

Steganacarus phyllophorus (Berlese, 1904)

Hoploderma phyllophorum Berlese, 1904a, p. 275; 1913, p. 103, pl. 8 figs. 102, 102a [1]).
Phthiracarus phyllophorus, Lombardini, 1936, p. 47.
Steganacarus phyllophorus, Schuster, 1957, p. 97, figs. 1-3.

The type of the species (no. 57/46, from Florence is still present in the Berlese Collection, together with another slide (no. 141/2) from the same locality.

Schuster (1957) recently collected the species in Austria, and prepared a detailed redescription. I collected several specimens of the species in the "Gardino di Boboli" in Florence (the type-locality).

I remark that Berlese apparently regarded the species as a representative of *Hoplophorella,* because according to Schuster (1957) his material is labelled as "*Phthiracarus* (*Hoplophorella*) *phyllophora*" and "*Phthiracarus*

1) In the explanation of pl. 8 an erroneous reference is made to fig. 101a.

(*Hoplodermella*) *phyllophora*"; I remark that *Hoplodermella* certainly is a lapsus for *Hoplophorella*. *S. phyllophorus* is indeed related to *Hoplophorella*, but differs e.g. by the fact that 4 anal hairs are inserted near the median border.

Steganacarus clavigerus (Berlese, 1904)

Hoploderma clavigerum Berlese, 1904a, p. 275: 1913, p. 104, pl. 8 fig. 104.
Phthiracarus clavigerus, Lombardini, 1936, p. 47.

In the Berlese Collection the following slides are present: 141/5, 8 from the "Gardino di Boboli", Florence; and 141/9 from Pisa. The last-mentioned specimen is designated as type, although Berlese (1904a) mentioned "Boboli" as type-locality; I collected indeed topotypes in the "Gardino".

I do not know if Sellnick's (1928, p. 40) description of *Hoploderma clavigera* indeed represents the species; the same applies to *Phthiracarus lutulentus* Sellnick (1920, p. 37).

Steganacarus vitrinum (Berlese, 1913)

Hoploderma vitrinum[1]) Berlese, 1913, p. 103, pl. 8 figs. 100, 100a, 100b[2]).

The present species was not mentioned by Lombardini; I do not know if the type-material is indeed no more present because the species was omitted from my private catalogue when I visited Florence. The figure shows a Phthiracarid mite with convex anal covers, which points to *Steganacarus*; the structure of the tegument (although vague), the pale colour, and the shape of the notogastral hairs point to the *striculus*-group.

Steganacarus pardinus (Berlese, 1916)

Hoploderma pardinum Berlese, 1916b, p. 337.

The present species was described after a specimen from East Africa; the type (no. 183/47) is still present in the Collection.

Berlese compares the species with *magnus* and *anomalus* and in general shape it reminds indeed of these species. The notogastral hairs are, however, very small, hardly visible, slightly pointing backwards, and irregularly curved. The type-specimen is closed (as Berlese mentioned already); the colour is dark-brown.

Steganacarus rapax (Berlese, 1916)

Hoploderma rapax Berlese, 1916b, p. 338.

S. rapax has some resemblance to *S. magnus*, but differs in several striking

1) I do not know if *vitrinum* (from *vitrum*) is an adjective.
2) In the explanation of pl. 8 erroneous reference is made to figs. 99a, 99b.

characters that are enumerated by Berlese; the claws are very long. Two slides are present in the Collection (nos. 183/48, 49); probably they are the original preparations. The type-locality is East Africa.

Steganacarus remigerus (Berlese, 1923)

Phthiracarus (*Trachyhoplophora*) *remigerus* Berlese, 1923, p. 258.

The present species is related to *Steganacarus striculum*. The notogaster shows similar pits. The notogastral hairs are thickened towards the end, although the top is rounded or somewhat pointed. The sensillus is curved, slightly thickened towards the end.

The original slides are still present in the Berlese Collection, viz. the nos. 208/15 (type), 208/16-18; the specimens originate from "Somalia italiana, Foci del Giuba".

Steganacarus somalicus (Berlese, 1923)

Phthiracarus (*Trachyhoplophora*) *somalicus* Berlese, 1923, p. 258.

Berlese described the present species as closely related to *S. striculus*, possibly even a variety. In the Berlese Collection the original material (nos. 208/9-14, no type-selection) from "Somalia italiana, Foci del Giuba" is labelled as "*Phthiracarus echidninus* Berl. var. *somalicus*"; apparently *echidninus* is an unpublished synonym of *striculus*. As mentioned by Berlese, the species differs from *striculus* by the rather short sensillus that is thickened towards the end. The notogastral hairs appear to be slightly longer than in *striculus*; they are stiff and coarse at the end.

Hoplophorella Berlese, 1923

Hoplophorella Berlese, 1923, p. 260.

Berlese created *Hoplophorella* as a subgenus of "*Phthiracarus* Perty (= *Hoplophora* C. L. Koch)". He designated *Hoplophora cucullatum* Ewing as type, but mentioned no diagnostic characters. At the same time he described a "variety" of the species, but added no other species to the subgenus.

Jacot (1933, p. 247, textfig. 2d) published a diagnosis of *Hoplophorella* (now considered a genus). He mentioned as single distinguishing character the position of the anal hairs, of which only three are inserted near the median border. I do not know if this character is of much value, or if the presence of a large hood at the anterior border of the notogaster is of more importance; in the last-mentioned case it should be possible to include *Steganacarus phyllophorus* Berlese in the present genus.

Hoplophorella cucullata (Ewing, 1909)

Hoploderma cucullatum Ewing, 1909, p. 133, pl. 6 fig. 35.
Hoploderma licnophorum Berlese, 1913, p. 102, pl. 8 fig. 99.
Hoplophorella cucullata, Jacot, 1953, p. 249.

The type-specimens of *H. cucullatum* Ewing and *H. licnophorum* Berlese both have been collected by Crosby at the same locality: Columbia, Missouri. The original descriptions point to the same species, and Jacot (1933) regarded *cucullatum* and *licnophorum* already as synonyms. Apparently Berlese himself also discovered this fact, because in 1923 he described a variety of *"Phthiracarus (Hoplophorella) cucullatus"*, of which the type-material is still labelled as *"Phthiracarus (Hoplophorella) licnophora* var. *obsoletior"*.

The type-slide (no. 142/5) of the species is still present in the Berlese Collection. There is no doubt about its identity with *cucullata.*

Hoplophorella obsoletior Berlese, 1923

Phthiracarus (Hoplophorella) cucullatus var. *obsoletior* Berlese, 1923, p. 260.

The original specimens (slides nos. 48/42, 43, of which the last-mentioned is the type) are still present in the Berlese Collection; they were collected in former Italian Somaliland. As mentioned above, the slides are labelled as *Phthiracarus (Hoplophorella) licnophora* var. *obsoletior.*

In my opinion we must regard the "variety" as a separate species, because nothing is known about the variability or even about the occurrence of *cucullata* outside the U.S.A. *Hoplophorella obsoletior* is characterized by the fact that the hood at the anterior border of the notogaster is obsolete.

Hoplophthiracarus Jacot, 1933

Hoplophthiracarus Jacot, 1933, p. 239.

According to Jacot (1933, p. 239) *Hoplophthiracarus* is recognizable by the following characters. The anal covers are not convex as in *Steganacarus* and *Hoplophorella,* but flattened and often retracted as in *Phthiracarus.* It differs from the last-mentioned genus by the prominent and erect interlamellar hairs.

Some species of the genus, among which *Hoploderma histricinum* (the type), strongly remind of *Steganacarus* because of the structure of the tegument. Possibly *Hoplophthiracarus* is only an artificial unit; in the present paper *Hoplophora variolosa* Berlese is also contributed to it.

Hoplophthiracarus histricinus (Berlese, 1908)

Hoploderma histricinum [1]) Berlese, 1908, p. 12; 1910, p. 217, pl. 20 fig. 54.
Hoplophthiracarus histricinum, Jacot, 1933, p. 240, pl. 20 figs. 14, 15.
Phthiracarus histricinus, Lombardini, 1936, p. 47.

1) Probably a lapsus for *hystricinum.*

Because Berlese (1908) mentioned "America boreale" as type-locality, Jacot (l.c., p. 241) supposed that the species had been collected at several localities. In the Berlese Collection two slides are present: 72/40 (type) and 208/28; both originate from Washington, which according to Jacot is Washington, D.C.

The specimens conform to the redescription by Jacot; they closely resemble species of *Steganacarus,* but the anal covers are retracted.

Hoplophthiracarus histricinus var. **nitidior** (Berlese, 1923)

Phthiracarus (*Trachyhoplophora*) *histricinus* var. *nitidior* Berlese, 1923, p. 258.

The original specimens of the variety are still present in the Berlese Collection, viz. the nos. 208/26, 27 (type), 29, 30; they originate from Lake City, Florida.

The variety differs from the species in structure of tegument, colour, and size. In Florida the variety is, according to Jacot (1933, p. 242), more common than the typical species.

Hoplophthiracarus variolosus (Berlese, 1888)

Hoplophora variolosa Berlese, 1888b, p. 218 (sep. p. 48), pl. 13 fig. 6.
Hoploderma variolosum, Berlese, in: Berlese & Leonardi, 1901, p. 12.
Phthiracarus variolosus, Lombardini, 1936, p. 47.

Two preparations of the species are present in the Berlese Collection: 31/28 (type, Matto-grosso, Brazil) and 21/13 (S. Vinzenzo, Chile). The specimen recorded in 1901 from Buenos Aires is apparently no more present; it is, however, also possible that slide no. 21/13 bears a wrong label, because *H. variolosus* is not mentioned in the list of mites from Chile (Berlese & Leonardi, 1903).

The structure of the tegument of the species reminds of *Steganacarus,* but the flattened, retracted anal covers and the erect interlamellar hairs point to *Hoplophthiracarus.*

The sensillus is thickened towards the end, but the top is blunt. In the original Latin description the organ is described as "runcata"; Oudemans (1915a, p. 234) translated it as smooth, but probably "runcata" is a misprint for "truncata".

Phthiracarus Perty, 1839

Phthiracarus Perty, 1839, column 847; 1841, p. 874.

The genus *Phthiracarus* was created by Perty in 1839, although no type-species was mentioned; I remark that this publication has generally been overlooked. In 1841 Perty redescribed the genus and mentioned one species.

According to Jacot (1930, pp. 209, 211) the third volume of Perty's "All-

gemeine Naturgeschichte" appeared in 1843; this is, however, 1841 (cf. Engelmann, 1846, p. 116; Sherborn, 1929, p. 4928; Neave, 1940, p. 735).

Phthiracarus is monotypical. *P. contractilis,* the type, is figured by Claparède (1868, pl. 36 figs. 15-19) after unpublished drawings by Perty. According to Jacot (1930, p. 211) *P. contractilis* is a synonym of *Hoplophora laevigata* C. L. Koch, 1841, fasc. 38 (16); the last-mentioned species was redescribed by Jacot (1936, p. 167, figs. 1-6).

It will be useful to establish the exact date of publication of Perty's work, and to investigate the supposed synonymy. A detailed redescription of the type-species will be highly important.

Berlese classified *Phthiracarus* species with the genera *Hoplophora* (1883a), *Hoploderma* (1913, 1913a), and *Phthiracarus* (1920a, 1923) respectively. In 1923 Berlese used the generic name *Phthiracarus* in the sense of our Phthiracaridae; he distinguished a number of subgenera, among which *Phthiracarus* s.str. corresponds with the present conception of the genus. I remark that from 1904 up to and including 1913 Berlese used *Phtiracarus* for species that are nowadays classified with Oribotritiidae and Euphthiracaridae.

Phthiracarus spec.

Hoplophora globosa, Berlese, 1883a, fasc. 6 (3); 1883c, p. 220 (sep. p. 11).
Hoploderma globosum, Berlese, 1913a, p. 54, textfig., prep. I-13.
Phthiracarus globosus, Lombardini, 1936, p. 47.

The identity of *Hoplophora globosa* C. L. Koch (1841) is not yet certain. Although the species has been recorded from many localities in Europe, I do not think that these records concern one species. Anyhow, the species mentioned from Western Europe as *Phthiracarus globosus* is certainly different from Berlese's species. I remark that Berlese's slide no. 207/48 (locality: Palermo; apparently one of his 1883 specimens) is different from *P. globosus* sensu Willmann because only the anterior three pairs of dorsal hairs are rather long, whilst the fourth pair is smaller and curved backward; the position of the anal hairs resembles that of Willmann's *globosus.* Because Berlese's A.M.S. figure strongly differs from the Palermo specimen (notogastral and anal hairs!), the drawing is apparently a synthetic one, prepared after more than one species (Berlese mentions the species from Sicily and North Italy). The figure in the text of the Acarotheca italica (1913a) is a copy of the 1883a figure. I regard the above-mentioned records therefore as uncertain.

Phthiracarus italicus (Oudemans, 1900)

Hoploderma italicum Oudemans, 1900b, p. 170.
Hoplophora dasypus, Berlese, 1883a, fasc. 6 (4).
Hoploderma italicum Oudemans, 1915, p. 216.

Berlese considered material from North Italy identical with *Oribates dasypus* Dugès (1834), a species of uncertain identity. Oudemans placed *dasypus* in the synonymy of *Acarus piger* Scopoli (1763), a species of which even the relation to a family is unknown. Because Berlese's *dasypus* is not identical with the species that Oudemans identified as "*piger* (= *dasypus*)", Oudemans gave the name *italicus* to *dasypus* sensu Berlese.

In a previous paper (Van der Hammen, 1952) I noted already that Oudemans's own *italicus* material is heterogeneous. One of his specimens possibly represents the same species as mentioned by Willmann (1931, p. 193) sub *P. italicus*; it may be *testudineus* (C. L. Koch, 1841) sensu Jacot (1936, p. 170, figs. 7-12).

Berlese's *dasypus* resembles *testudineus* indeed, but the recorded length (1 mm) does not fit in with this species.

I have seen one slide (no. 31/22) in the Berlese Collection, which according to the label contains *Tritia reticulata, Phtiracarus magnus,* and *Phtiracarus dasypus* (locality: Tiarno). Apart from *Pseudotritia reticulata* the slides appeared to contain two species that are probably *Phthiracarus laevigatus* (C. L. Koch) and *Steganacarus applicatus* (Sellnick); I do not know which of these two species was identified by Berlese as *dasypus* but at any rate they do not represent the figured specimen.

It will be useful to designate a specimen of *testudineus* or a related species from the type-locality as neotype of *P. italicus*; in this way *italicus* becomes either a synonym or the name of a good species.

Phthiracarus pavidus (Berlese, 1913)

Hoploderma pavidum Berlese, 1913, p. 103, pl. 8 figs. 101, 101a[1]).
Phthiracarus pavidus, Sellnick, 1928, p. 40; Willmann, 1931, p. 191, fig. 350; Lombardini, 1936, p. 47.

The original specimens from Tiarno (slides nos. 142/8-11, of which 142/10 is the type) are still present in the Collection. The identity of this remarkable species is certain.

I classify *pavidus* with the genus *Phthiracarus*, although the species has erect interlamellar hairs as in *Hoplophthiracarus*; the shining tegument gives it, however, the apparence of a species of the first-mentioned genus. Berlese figured the specimen as having 22 pairs of notogastral hairs; it will be interesting to establish the real number. The notogastral hairs are curved in a striking way. It is not impossible that the species represents a separate genus.

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1) In the explanation of pl. 8 an erroneous reference is made to fig. 100a.

Phthiracarus nigerrimus Berlese, 1920

Phtiracarus nigerrimus Berlese, 1920a, p. 149; Lombardini, 1936, p. 47.

The type-specimen (slide no. 202/34) from La Plata (The Argentine) is still present in the Collection. It has some resemblance to *P. globosus* sensu Willmann, but it is larger, the dorsal notogastral hairs are curved to the front, and the anterior anal hair is not curved backwards as in *globosus,* but erect.

Phthiracarus roubali Berlese, 1923

Phthiracarus roubali Berlese, 1923, p. 259.

Although I have seen a type (no. 207/34) and a "cotype" (no. 207/33) of the present species, collected in "Boemia" (Brady) at altitudes of 870 and 800 m respectively, little can be said about the identity. The types resemble dark specimens of *piger* sensu Willmann, but the dorsal hairs are rather long and strong.

I remark that Berlese recorded the species from "Boemia, Gallia, Italia septentr." I have seen no specimens from the last-mentioned two countries.

Phthiracarus subglobosus Berlese, 1923

Phthiracarus subglobosus Berlese, 1923, p. 259.

The type of *P. subglobosus* (slide no. 207/1) is still present in the Berlese Collection, together with another slide (no. 207/3) that possibly contains a different species. The specimens in both slides originate from Vallombrosa. Berlese recorded the species from "Italia, Germania, Norvegia". Sellnick (1931, p. 695) mentions the species in his list of mites from the Ionian islands.

P. subglobosus is a species of remarkable length, which Berlese compares with *nitens* Nicolet and *meridionalis* (author unknown). Possibly the measurements and the few other details mentioned by Berlese are sufficient to recognize the species. I remark that "Germania" and "Norvegia" are uncertain records.

Phthiracarus rotundus Berlese, 1923

Phthiracarus rotundus Berlese, 1923, p. 259.

The present species, mentioned by Berlese from South and Central Italy, is represented in the Collection by two slides: no. 147/5 (type, from Citta di Castello) and no. 147/6 (from Monte della Verna, Tuscany). The type-slide is in a bad condition, and I do not know if the specimens are conspecific. Nothing can therefore be added to Berlese's original diagnosis.

Phthiracarus curtulus Berlese, 1923

Phthiracarus curtulus Berlese, 1923, p. 259.

The original material from "Etruria" and Florida, referred to by Berlese, is still present in the Collection. Slides nos. 207/41, 42 from Florence represent one species, slide no. 207/45 (the type) from Florida another; Florida is therefore the type-locality.

Jacot (1933, p. 247) remarked already that the original description is not suited for identification, and probably even erroneous as to the sensillus. I have noted that the species is a *Phthiracarus* with very thin hairs of moderate length.

Phthiracarus pudicus Berlese, 1923

Phthiracarus pudicus Berlese, 1923, p. 260.

Slides nos. 208/1 (type) and 208/2 ("cotype", read: paratype) are still present in the Collection. The type-locality is Cape of Good Hope. The species appears to be a *Phthiracarus* indeed. I have paid no attention to specific characters.

6. PERLOHMANNOIDEA

Perlohmannoidea Grandjean, 1958.

Grandjean (1958) thoroughly studied the systematic position of Perlohmanniidae, Epilohmanniidae, Eulohmanniidae, and Lohmanniidae. He created a superfamily Perlohmannoidea for these families, which must be considered a collection of relics. The group has characters in common with the Nothroidea, but especially with the Phthiracaroidea. A diagnosis is given by Grandjean (1958, p. 116). The history of the conception of the present group is mainly dealt with in the chapter on the family Lohmanniidae.

KEY TO THE FAMILIES OF PERLOHMANNOIDEA

1. Pseudodiagastric (i.e. ventrally the notogaster advances from each side in the direction of the plane of symmetry, without, however, reaching it; a "plicature" band passes between anal and adanal opening, which is the border of the notogaster; it continues anteriorly to the shoulder of the hysterosoma). Large plethotrichic epimeres . . . . . **Eulohmanniidae**
— Not pseudodiagastric 2
2. Schizogastric[1]) (i.e. there are two ventral plates, separated by a transverse band). Latero-abdominal gland present . . . . . **Epilohmanniidae**
— Not schizogastric 3

1) Schizogastry is a new word, created in order to indicate a special condition of the ventral plate. I remark that Oudemans (1917a) classified the Epilohmanniidae in a "superphalanx" Digastropeltae (an artificial unit); this would result in a corresponding adjective "digastropeltate" that is, however, too long to be of some use.

3. Habitus very characteristic: dorsal surface convex, base of prodorsum about just as wide as the anterior border of the notogaster, outline more or less elliptic. Elements of the ano-genital region not widely separated. The coxisternal region of the metapodosoma (III-IV) consists of one shield. Latero-abdominal gland absent . . . . . **Lohmanniidae**

— Habitus different: dorsal surface not strikingly convex, base of prodorsum narrower than the anterior border of the notogaster. The ano-genital region consists of a number of rather widely separated shields. The coxisternal shield of the metapodosoma consists of two parts that are longitudinally separated by a sternal band. Latero-abdominal gland present . . . . . **Perlohmanniidae**

PERLOHMANNIIDAE Grandjean, 1954

Berlese (1916a) reckoned *Perlohmannia* among the representatives of the tribe Lohmannini, but Grandjean (1931) separated the genus from this tribe and thought that it were possible to include it in a new tribe Trhypochthonini. This opinion has been corrected by him in 1954 when the family Perlohmanniidae was created, and in 1958 when the family was placed in a superfamily Perlohmannoidea.

Collohmannia Sellnick (1922) certainly does not belong to the Perlohmanniidae, so that for the moment the family consists of only one genus.

Perlohmannia Berlese, 1916

Perlohmannia Berlese, 1916a, p. 176.

The genus *Perlohmannia,* which was created by Berlese in 1916, has *Lohmannia insignis* Berlese (1904) as type; Berlese did not give a generic diagnosis. Two representatives only have been described [1]). The second species, *P. dissimilis* (Hewitt, 1908), was thoroughly studied by Grandjean (1958); it was also mentioned in the Catalogue by Lombardini (1936, p. 47).

Perlohmannia insignis (Berlese, 1904)

Lohmannia insignis Berlese, 1904b, p. 23, pl. 2 fig. 41; Carpenter, 1905, p. 294, pls. 25, 26A; 1905a, p. 249, pl. 7; Lombardini, 1936, p. 47.

The type of the species is no more present in the Berlese Collection. The type-specimens were sent to Berlese from Ireland by Halbert; consequently cotypes may still exist somewhere as part of the Halbert Collection, although until now they have not been discovered.

The species was redescribed by Carpenter, who collected his specimens also in Ireland. Hewitt, who in 1908 described *Lohmannia insignis* var. *dissi-*

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1) *Perlohmannia eximia* is a nomen nudum mentioned by Berlese (1916a, p. 176). Apparently Berlese was not aware of the fact that the diagnosis had never been published by him. A slide bearing this name is present in the Collection; it is mentioned by Lombardini, 1936, p. 47.

milis (now *Perlohmannia dissimilis*), has compared his "variety" with the type of *insignis* Berlese, so that it was still present at that date.

In the Michael Collection, property of the British Museum (Natural History), there is a slide of "*Lohmannia insignis*", which was apparently sent to Michael by Berlese. A description of this material will be interesting; Mr. D. Macfarlane (in litt.) kindly informed me that the prodorsal hairs are arranged as in *dissimilis*; the identity is therefore uncertain.

EPILOHMANNIIDAE Oudemans, 1923

The name Epilohmanniidae was introduced by Oudemans in 1923 in order to replace the name Lesseriidae (Oudemans, 1917), the generic name *Lesseria* Oudemans (1917) being preoccupied by *Epilohmannia* Berlese (1916). Just as the other Perlohmannoidea, the Epilohmanniidae must be considered an isolated family.

Jacot (1936a, p. 546) created a genus *Epilohmannoides* (type: *E. terrae* Jacot, l.c.), characterized e.g. by the fact that genital and anal openings are separated from each other by "a very narrow bar of the ventral plate" only; the diagnosis is, however, insufficient to draw definite conclusions as to the systematic position of the genus.

Epilohmannia Berlese, 1916

Epilohmannia Berlese, 1916a, p. 176.
Lesseria Oudemans, 1917a, p. 78.

Epilohmannia Berlese (1916) has priority against *Lesseria* Oudemans (1917a). Both genera have the same species (*cylindrica* Berlese) as type, although Oudemans gave the name *Lesseria szanislói* (Oudemans, 1915a) to his 1917a specimens. (The name *szanislói* is not in use, and below I note that it is indeed incorrect to do so). Berlese did not give a generic diagnosis: he designated the type and added three new species.

Berlese described seven representatives of the genus: two from Florence (also known by redescriptions), one from East Africa, one from South America, and three from North America (the type of one of these is lost) [1]). The specimens must be remounted in order to enable sufficient comparisons (the characters mentioned in Berlese's diagnoses are still visible). The following is therefore little more than a catalogue.

Epilohmannia cylindrica (Berlese, 1905)

Lohomannia cylindrica Berlese, 1904, p. 23, pl. 2 fig. 40.
Lesseria szanislói, Oudemans, 1917a, p. 78, figs. 127-139.
Epilohmannia cylindrica, Lombardini, 1936, p. 40.

1 Jacot (1934) described a species from Hawaii.

In the Berlese Collection the following slides are present: 24/28 (type material), and 24/29. The specimens have been collected in Florence; they are identical with those from Hungary, described by Oudemans as *Lesseria szanislói*. The larva of the species was partially described and figured by Grandjean (1946, p. 63, figs. 1, 2).

Oudemans (1915a, p. 232) gives the name *Phthiracarus szanislói* to *Hoplophora arctata* Szanisló, 1880 (non Riley, 1874); later, he described a species from Hungary (identical with *Epilohmannia cylindrica*) as *Lesseria szanislói*. I remark that Riley (1874) described a Phthiracaroid mite of uncertain identity from America, whilst Szanisló (1880) described two different species, a Phthiracaroid and a Perlohmannoid mite, both of uncertain identity, from Hungary. *Phthiracarus szanislói* Oudemans (1915a) must therefore be regarded as a nomen dubium, *Lesseria szanislói* (Oudemans, 1917a) as a synonym of *Epilohmannia cylindrica*.

Epilohmannia ovalis Berlese, 1916

Epilohmannia ovalis Berlese, 1916a, p. 176; Lombardini, 1936, p. 40.

Slides nos. 160/23, 24, 32 are present in the Collection; the specimens originate from La Plata (The Argentine), and are designated as types. Berlese enumerated a few distinguishing characters, which are indeed correct.

Epilohmannia puella Berlese, 1916

Epilohmannia puella Berlese, 1916a, p. 176; Lombardini, 1936, p. 40.

Specimens of this species are no more present in the Collection. The original diagnosis of *E. puella* was founded on one or more specimens from Lake City, Florida (U.S.A.).

Epilohmannia amygdaliformis Berlese, 1916

Epilohmannia amygdaliformis Berlese, 1916a, p. 177.

The type of *E. amygdaliformis* is still present (slide no. 175/7); it originates from East Africa. The species was not mentioned in Lombardini's Catalogue.

Epilohmannia gigantea Berlese, 1916

Epilohmannia gigantea Berlese, 1916b, p. 335; Sellnick, 1931, p. 707, figs. 11-13; Lombardini, 1936, p. 40.

Sellnick (1931) published an excellent redescription of the species, founded on specimens from the Ionian Islands. This description exactly fits in with the specimens in the Berlese Collection, viz. the nos. 175/8 (Giardino di Boboli, Florence; designated as type), 212/47 (Garden of the "Stazione di

Entomologia Agraria", Florence), and 220/46, 47 (Spalato, nowadays Split, Yugoslavia).

Epilohmannia praetritia Berlese, 1916

Epilohmannia praetritia Berlese, 1916b, p. 336; Lombardini, 1936, p. 40.

There are three slides in the Collection, viz. the nos. 175/11, 12, 13, of which the first two are designated as type. The specimens originate from Columbia, Missouri (U.S.A.).

Epilohmannia minuta Berlese, 1920

Epilohmannia minuta Berlese, 1920a, p. 149; Lombardini, 1936, p. 40.

The species is no more present in the Berlese Collection. In the concise description Berlese mentions that *E. minuta* was collected at "Columbia" (Missouri, U.S.A.).

EULOHMANNIIDAE Grandjean, 1931

Grandjean (1931, p. 144) created a separate family Eulohmanniidae with the genus *Eulohmannia* as single representative. A few months later Willmann (1931, p. 95) introduced the same family name; he united the Eulohmanniidae and the Nanhermanniidae into a subcohors Diagastres. Grandjean (1956) demonstrated, however ,that in fact *Eulohmannia* is not diagastric; he gives the name pseudodiagastry to the special condition of the notogaster.

Originally Berlese considered *Eulohmannia* a subgenus of *Lohmannia,* but afterwards he classified it as separate genus in the tribes Michaelini (Berlese, 1913a) and Lohmannini (Berlese, 1916a) respectively.

Eulohmannia Berlese, 1910

Eulohmannia Berlese, 1910, p. 223.

Berlese (1910) mentions the bidactylous legs of *Eulohmannia* as the single character in which the subgenus differs from *Lohmannia* s.str. He points to a conformity with *"L. cilindrica"* (later the type of the genus *Epilohmannia*), a species that is nowadays regarded as a representative of a different family.

The type of *Eulohmannia* is *E. ribagai* Berlese; up to now it is the single representative of the family; it must be considered a relic.

Eulohmannia ribagai Berlese(1910)

Lohmannia (Eulohmannia) ribagai Berlese, 1910, p. 223, pl. 20 fig. 51; 1916, p. 67.
Arthronothrus biungiculatus Trägårdh, 1910, p. 554, figs. 342-346.
Eulohmannia ribagai, Willmann, 1931, p. 95, figs. 10, 11; Lombardini, 1936, p. 40; Grandjean, 1939, p. 111, figs. 2, 3A-B; 1939a, p. 300, figs. A-G; 1956, p. 282, fig. 1A.

The original description, accompanied by an elementary drawing, is sufficient to recognize the species. Berlese (1916) pointed to the fact that *Arthronothrus biungiculatus* Trägårdh (June 30, 1910) is a synonym of *L. (E) ribagai* Berlese (February 9, 1910). Supplementary descriptions have been given by Willmann (1931) and Grandjean (1939, 1939a, 1956). The types from Tiarno, North Italy (nos. 66/1, 70/33) are still present in the Berlese Collection, together with a side (no. 125/1) from Filettino (in the mountains of Central Italy).

LOHMANNIIDAE Berlese, 1916

The history of the conception of the present family is, more than in many other groups, a history of misunderstanding. The first-known species was described in 1884 by Haller as *Michaelia paradoxa*; the description is accompanied by rather detailed figures that represent a large mite of exceptional habitus. Because *Michaelia* had already been in use for a mite of a different group, Michael (1898) altered the generic name into *Lohmannia* [1]).

Canestrini (1891) and Banks (1895) regarded the type of the genus as belonging to the nymphal stage; some years after, the former (Canestrini, 1897, 1898) nevertheless described a related species as a *Hermannia* (*Hermannia rubescens*). Berlese (1896) described another related species as *Angelia murcioides* (*Angelia* is a synonym of *Nothrus*). In the same year Berlese (1896b) thought that it was possible to classify *M. paradoxa* in the genus *Angelia,* between *Angelia murcioides* and *A. monodactyla* (now *Malaconothrus*), unless it would prove to be a larva (!); I remark that in the same note Berlese erroneously regarded the type of *Michaelia paradoxa* as originating from America.

As mentioned above Michael (1898) altered the name *Michaelia* into *Lohmannia*; he added *Angelia murcioides* to the genus. In 1904 Berlese followed Michael's conception, but for unknown reason he spelt the generic name with an additional *o* (*Lohomannia,* Berlese, 1904b); he added several new species of which nowadays *L. murcioides* var. *aciculata* only belong to the Lohmanniidae.

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1) The generic name *Michaelia* has been created within two months by three authors, viz.

1. *Michaelia* Troussart (November, 1884; type: *Dermalichus heteropus* Michael, 1881);
2. *Michaelia* Haller (December 18, 1884; now *Lohmannia* Michael, 1898; type: *Michaelia paradoxa* Haller, 1884);
3. *Michaelia* Berlese (December 29, 1884; now *Bimichaelia* Sig Thor, 1902; type: *Michaelia augustana* Berlese, 1884).

Radford (1952, pp. 64, 165, 176) correctly regards *Michaelia* Haller, and *Michaelia* Berlese as preoccupied, but mentions *Michaelia* Trouessart (1884) as a synonym of *Michaelichus* (Trouessart & Megnin, 1885!).

In an outline of the system of the Acari, Berlese (1913a, p. 8) created a tribe Michaeliini (subdivision of the Nothridae), a heterogeneous collection of genera among which he mentions *Lohmannia* as well as *Michaelia* (!) [1].

In 1916 Berlese created, however, a new tribe Lohmannini (Berlese, 1916a, p. 176), as subdivision of the Malaconothridae; this time the tribe consisted of the genera *Lohmannia, Perlohmannia, Epilohmannia, Malacoangelia,* and *Eulohmannia.*

Oudemans (1917) created a separate family for the genus *Lesseria* Oudemans (a synonym of *Epilohmannia*), whilst Grandjean (1931, p. 144) further restricted the Lohmanniidae to the single genus *Lohmannia*; many new genera and species are since distinguished and added to the family.

Those of Berlese's "*Lohmannia*" species that indeed belong to the Lohmanniidae are insufficiently described, several types are no more present, so that the following representatives of the family are only preliminarily classified.

Lohmannia Michael, 1898

Michaelia Haller, 1884, p. 234.
Lohmannia Michael, 1898, p. 75; Berlese, 1916a, p. 176.

New material of the type-species of the genus (*M. paradoxa*) has never been collected [2]; Grandjean (1950a) studied the characters of *Lohmannia* with the help of a related species that he regarded as an auxiliary type (*Lohmannia lanceolata*). Some of the generic characters mentioned by him as especially important are, however, not dealt with in the original description of the three following species (*murcioides, regalis,* and *parallela*), so that their classification in the genus *Lohmannia* remains doubtful; *L. aciculata,* although certainly belonging to a separate genus, is still classified here with *Lohmannia* too.

Lohmannia murcioides Berlese, 1896

Angelia murcioides Berlese, 1896, fasc. 78 (7).
Lohmannia murcioides, Berlese, 1916a, p. 176.

The type of the species is no more present in the Berlesce Collection. The original description and the coloured plate, although incomplete and incorrect in many details, can probably be identified when the species is collected at

1) The complete list of the genera in question is: *Lohmannia, Eulohmannia, Michaelia, Malaconothrus, Malacoangelia, Archeonothrus.* I remark that the name Michaeliini would result in a family-name Michaeliidae that certainly must be suppressed for purposes of synonymy.

2) Grandjean (1950a, p. 97) remarks that he collected Haller's species possibly in Spain. The Spanish specimens recorded by Mihelčič (1956, p. 13, fig. 7) as *Lohmannia (Michaelia) paradoxa*? (this combination of generic names is incomprehensible) differ, however, from Haller's original description by the shape of the hairs; Mihelčič draws the genital plates as undivided, which is probably an error.

the type-locality (Vallombrosa). Description and figure lead to the conclusion that the species has the habitus of a *Lohmannia,* but that several important characters do not agree with the generic diagnosis. The genital covers, for instance, are figured as entire, whilst these are transversely divided in the genus *Lohmannia*; it is plausible to suppose, that Berlese overlooked the transverse line, but this has still to be proved. There are two pairs of anal hairs inserted on separate anal covers, just as in *Lohmannia*; Berlese figures, however, 6 pairs of adanal hairs, of which two probably do not belong to the adanal segment but to the notogaster.

Lohmannia regalis Berlese, 1923

Lohmannia regalis Berlese, 1923, p. 261.

Two slides of the species are present in the Berlese Collection, viz. the nos. 222/11 (designated as type) and 222/12 (designated as "cotype", read: paratype). Both preparations, which are in a good condition, originate from "Spalato", nowadays Split, Yugoslavia.

L. regalis is characterized by transversely divided genital plates, a covering prae-anal, and separate anal plates; in consequence of this it reminds of species of the genus *Lohmannia.* The ventral lamellae of the femora, however, point to *Thamnacarus,* from which genus it strongly differs by the abscence of neotrichy and by the shape of the sensillus. For the moment I prefer to classify the species with the genus *Lohmannia.*

Sellnick (1931, p. 703, figs. 9, 10) published a detailed description of a variety (*L. regalis* var. *reticulata*) that was found in Levkas, one of the Ionian Islands; on p. 694 of the same paper he records that no less than 80 specimens have been collected. A summary of the differential characters of the variety is not given, but the name *reticulata* points to the reticulate structure of the tegument as main difference. This structure is indeed absent or invisible in Berlese's types. It is, however, not easy to establish further differences; both Yugoslavian specimens are only slightly more slender than the specimen figured by Sellnick. Because a reticulate structure is sometimes difficult to observe, I doubt whether Sellnick's specimens really differ from the typical *regalis.*

Lohmannia parallela Berlese, 1916

Lohmannia parallela Berlese, 1916a, pp. 176, 177.

The type of the species is no more present in the Berlese Collection, and the original description is not suited for identification. The few characters known are the pale colour, the resemblance to *L. murcioides,* the parallel

borders of the notogaster, the long hairs, and the small measurements (0.450 × 0.210 mm). The sensillus was described in an indistinct manner; it has 17 "branches", but it is difficult to decide whether the structure is barbate or pectinate.

For the moment it is impossible to interpret Berlese's description; because of the similarity to *L. murcioides,* the species is classified here with the genus *Lohmannia.* The types was collected in Italian Somaliland.

Lohmannia aciculata Berlese, 1904

Lohmannia murcioides var. *aciculata* Berlese, 1904b, p. 24, pl. 2 fig. 39.
Lohmannia aciculata, Berlese, 1916a, p. 176.

The present species has a combination of characters, which does not fit in with any of the genera now known. Grandjean (1950a, p. 159) mentions the occurrence of the same combination in a specimen that he regarded as possibly identical with *L. aciculata.* The species is characterized by divided genital plates, a covered prae-anal plate, separate anals, and the presence of ventral femoral lamellae. (Recently a new genus *Papillacarus,* with *aciculata* as type, was created by Kunst, 1959).

Although the type of the species is no more present (Berlese mentions the Boboli Gardens at Florence as type locality), there is another preparation in the Berlese Collection, viz. no. 201/29 from San Vincenzo near Pisa. Apart from the above-mentioned characters, I point to the faint neotrichy; the secondary hairs in the posterior part of the notogaster are comparatively small. Without remounting of the single slide, it appeared impossible to correctly describe the remarkable structure of the tegument.

Mr. D. Macfarlane kindly sent to me a slide of the species from the Michael Collection, property of the British Museum (Natural History); the label bears in Berlese's own handwriting the name "*Lohmannia aciculata* Berl." and the locality "Firenze". The identification of the specimens is correct. Because they can be regarded as cotypes, a redescription will be important; remounting is, however, necessary.

Meristacarus Grandjean, 1934

Meristacarus Grandjean, 1934, p. 35, figs. 7-10.

The genus *Meristacarus* is similar to *Lohmannia* in many characters, but differs by the unidivided genital plates and the hairless anals; the lateral borders of the hysterosoma are, moreover, much less parallel than in other genera of the family.

The type of the genus is *M. porcula* Grandjean (1934), a species from Martinique and Panama.

Meristacarus rubescens (Canestrini, 1897)

Hermannia rubescens Canestrini, 1897, pp. 461, 467; 1898, p. 393 (sep. p. 9), pl. 24 fig. 4.
?Lohmannia rubescens, Berlese, 1916a, p. 176.

The type-material of *Hermannia rubescens* Canestrini originates from Seleo (Berlin Harbor, Territory of New Guinea); I do not know if it is still in existence. Canestrini published two descriptions of the species, which are nearly exactly similar; the second description is accompanied by a superficial figure of the ventral surface, which strongly reminds of a *Meristacarus.* The outline of the body is elliptic. The prae-anal plate is distinct. The genital plates are not divided; Canestrini probably overlooked the separate anals. The data mentioned about the structure of the mandible agree with those known in other Lohmanniidae, with the exception of the fact that Canestrini did not observe the fourth (paraxial) tooth of the fixed finger. The sensillus is described as filiform, but Canestrini probably overlooked the pinnate structure. The exorbitant measurements (2.20 × 1.00 mm) are exactly two times as large as in the type-species of the genus *Meristacarus*; it is not impossible that Canestrini made a mistake in his calculation.

I myself repeatedly collected a *Meristacarus* species in New Guinea, which is closely related to *M. porcula.* When studied in air, in reflected light, at a faint enlargement, the ventral surface of this species shows a distinct similarity to Canestrini's figure 4.

As mentioned above Canestrini described *rubescens* as a *Hermannia,* without any explication; Berlese (1916a) added the species to the genus *Lohmannia.* In the Berlese Collection several preparations labelled as *L. rubescens* are present; none of these originates from New Guinea, and I do not know if Berlese indeed compared his specimens with the type. I studied slide no. 137/14 from Semarang, Java; this preparation strongly reminds of *M. porcula,* but the barbules of the notogastral hairs are distinctly longer. A study of the variability of my own *Meristacarus* specimens will certainly be helpful in solving this problem.

7. NOTHROIDEA

Nothroidea Grandjean, 1954, p. 431.

The superfamily Nothroidea was created by Grandjean (1954); according to him it consists of the families Hermanniidae, Nothridae, Camisiidae, Nanhermanniidae, Trhypochthoniidae, and Malaconothridae.

Knülle (1957, p. 154) united Malaconothridae, Trhypochthoniidae, and a new family Trhypochthoniellidae in a new superfamily Trhypochthonoidea. The distinguishing characters mentioned by him are, however, not convincing, mainly because they do not fit in with the genera *Allonothrus* Van der

Hammen and *Archegozetes* Grandjean; the same applies to the family Trhypochthoniellidae.

I have followed Grandjean's conception, but I arranged the families in a different way; the Hermanniidae are placed at the end of the group, because they have already some resemblance to the higher Oribatei.

KEY TO THE FAMILIES OF NOTHROIDEA

1. Genital and anal openings are situated in a large ventral plate . . **Hermanniidae**
— No special ventral plate 2
2. Diagastric (i.e. the scleritization of the notogaster continues between anal and genital openings) . . . . . **Nanhermanniidae**
— Not diagastric 3
3. The cerotegument belongs to a special type: it is birefringent and porose, and distinctly consists of shields . . . . . **Malaconothridae**
— Cerotegument of a different type 4
4. Neotrichy of the epimeres. No aggenital hairs. Only part of the genital hairs have a (less distinct) marginal position (no neotrichy of the genital plates). Adults holotrichous . . . . . **Nothridae**
— No neotrichy of the epimeres. The genital hairs have a distinct marginal position (often neotrichy). As a rule the adults are unideficient 5
5. Two pairs of aggenital hairs. The last joint of the palp has 8 hairs (ω included), the ventral pair is lacking. Notogaster flattened or slightly concave . . **Camisiidae**
— No aggenital hairs. The last joint of the palp has 10 hairs (ω included). Notogaster slightly convex . . . . . **Trhypochthoniidae**

NOTHRIDAE Berlese, 1885

Grandjean (1954) separated the genus *Nothrus* from the Camisiidae, and consequently created a family Nothridae. This family is distinctly different from the Camisiidae by the following characters: the notogastral hair f_1 is present in all stages; there is neotrichy of the epimeres; there are only 2 pairs of adoral hairs; there is no genital neotrichy; the aggenital hairs appear to be absent. Sellnick and Forsslund (1955) still classified the genus *Nothrus* with the Camisiidae.

Some misunderstanding has arisen about the names of the two families. The name Nothridae was originally created by Berlese (1885c, p. 5; 1885d, p. 126); Oudemans (1900a) emended it into Camisiidae. Berlese (1896b) enumerated the following heterogeneous collection of genera as representatives of the Nothridae: *Ameronothrus, Hermannia, Neoliodes, Angelia, Nothrus,* and *Hypochthonius.* Although Berlese (1885a) used the name *Angelia* in the sense of the modern *Nothrus* conception, and *Nothrus* in the sense of *Camisia,* Berlese must be considered the author of the name Nothridae. Below, the nomenclatorial reasons for the present use of the name *Nothrus* are dealt with.

Nothrus C. L. Koch, 1836

Nothrus C. L. Koch, 1836, fasc. 2 (17, 18); 1842, vol. 3, p. 110.
Angelia Berlese, 1885a, fasc. 17 (6); 1885c, p. 9; 1885d, p. 127; 1896a, fasc. 79 (8); 1896b, pp. 24, 26; 1913a, p. 58.

C. L. Koch used the generic name *Nothrus* for the first time in 1836, when he described two species that are nowadays considered representatives of the genus *Camisia* von Heyden (1826). In 1842 Koch designated, however, *Nothrus palustris* (a species described by him in 1839) as type of the genus; this conception is generally accepted.

Opinion 204 of the "Opinions and declarations rendered by the International Commission on Zoological Nomenclature" deals with Koch's designation of types. In the present case it will be necessary to submit an application to the Commission for the use of the Plenary Powers, because adoption of the rules would lead to instability and confusion; the possibility of this use is mentioned in the opinion in question.

Berlese (1885a) divided the genus *Camisia* into two subgenera: *Angelia* Berlese, and *Nothrus* C. L. Koch; he designated *Angelia anauniensis* as type of the first-mentioned subgenus, so that the identity with *Nothrus* (sensu C. L. Koch, 1842) is evident (*Nothrus* sensu Berlese is a synonym of *Camisia*). Berlese (1896a) considered *Angelia* a separate genus and mentioned *Angelia palustris* and *A. sylvestris* as types. Berlese (1913a) mentioned *Nothrus palustris* as type of *Angelia,* whilst he enumerated the following species: *palustris* C. L. Koch, *anauniensis* Canestrini & Fanzago, plus var., *sylvestris* Nicolet, *quadripila* Ewing (at the same time mentioned as representative of *Nothrus* (= *Camisia*) [1]), *glabra* Michael, and *pulchella* Berlese. With the exception of *glabra,* these species still belong to one genus.

Nothrus palustris C. L. Koch, 1839

Nothrus palustris C. L. Koch, 1839, fasc. 29 (13); Berlese, 1886, fasc. 30 (4); Sellnick & Forsslund, 1955, p. 498, figs. 39-41.
Angelia palustris, Berlese, 1896b, p. 26; 1913a, p. 59, textfig., prep. I-16.

There is no doubt about the identity of the present species. Because *Nothrus* sensu Berlese is a synonym of *Camisia,* Berlese's 1886 classification is not consequent. In 1896 Berlese indeed mentioned *palustris* as a representative of *Angelia.*

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1) A redescription of *quadripila* was given by Woolley (1955). In this study a comparison is made with other representatives of the genus; a related species (*Nothrus borussicus* Sellnick) was, however, omitted.

Nothrus silvestris Nicolet, 1855

Nothrus silvestris Nicolet, 1855, p. 458, pl. 7 fig. 4.
Nothrus anauniensis, Berlese, 1885a, fasc. 17 (7).
Angelia sylvestris, Berlese, 1896b, pp. 26, 29; 1913a, p. 158, textfig., prep. II-14.
Angelia anauniensis, Lombardini, 1936, p. 38.

Berlese (1885a) described the bidactylous form as *Nothrus anauniensis* Canestrini & Fanzago; at present this form is generally recognized as a variety of N. *silvestris.* Sellnick & Forsslund (1955) described the species *silvestris* as well as the variety *anauniensis.*

I remark that Canestrini & Fanzago described *Nothrus anauniensis* in 1876 (p. 99), and afterwards in 1877 (p. 92, pl. 2 fig. 2; sep. p. 24, pl. 1 fig. 2). Sellnick & Forsslund erroneously cited the last-mentioned description as the original one. In the 1876 description *anauniensis* is described as bidactyle, but afterwards (1877) it is figured as monodactyle; Canestrini & Fanzago record that the length is about 1 mm, in which h_2 is probably included.

Later, Canestrini (1884, p. 1426; sep. p. 30) placed *anauniensis* in the synonymy of *Nothrus palustris,* but Berlese (1885c, pp. 10, 31) demonstrated that *anauniensis* and *palustris* are diferent species, although he placed *anauniensis* with *silvestris* in the synonymy of *biciliatus* C. L. Koch.

Berlese (1896b) placed *Nothrus anauniensis* also in the synonymy of *Angelia sylvestris* (Berlese spelt the name *sylvestris* with *y,* whilst Nicolet used *i,* as well as *y*; the spelling with *i* is now in common use). The species was described as having 1 or 2 claws. In Berlese's 1913a figure, *Angelia sylvestris* is, however, tridactyle; the figure reminds nevertheless of *Nothrus silvestris.*

Some of Berlese's *sylvestris* and *anauniensis* specimens were studied by me; it appeared that they do not belong to one species. Slides nos. 27/43 and 39/6 for instance (labelled as *Angelia sylvestris* from Vallombrosa) contain *Nothrus silvestris* var. *anauniensis.* Slides nos. 11/39 and 122/1 (labelled as *anauniensis*) contain, however, tridactylous specimens from Florence (length 0.800, broadth 0.370-0.385 mm) that are probably identical with *Nothrus biciliatus* C. L. Koch.

Nothrus longipilus (Berlese, 1910)

Angelia anauniensis var. *longipila* Berlese, 1910b, p. 381.

Berlese described the present species as a variety of *Angelia anauniensis.* In the short diagnosis Berlese mentions that the measurements are hardly greater (0.980 × 0.460 mm, posterior hairs probably included) than in *anauniensis,* but that the posterior notogastral hairs are twice as long and slender, although less than in *sylvestris.* Because Berlese (1896) already placed *anauniensis* in the synonymy of *silvestris,* this diagnosis appears incomprehensible.

In the Berlese Collection two slides are present: nos. 122/5, 6 from Mugello (Italy), both designated as type. The two specimens are tridactylous so that they do not belong to the *silvestris* group. The measurements are the following: length 0.860-0.910; breadth 0.445-0.455; h_2 0.125; ps_1 0.110 mm. The species is apparently related to *Nothrus borussicus* Sellnick, but the posterior hairs are relatively shorter. Because specimens in the Berlese Collection, which are labelled as *anauniensis* and *sylvestris*, represent *silvestris* and *biciliatus* respectively, it appears not logical that Berlese described the species as a variety of *anauniensis*.

Nothrus monodactylus (Berlese, 1910) (non Michael, 1888)

Angelia anauniensis var. *monodactyla* Berlese, 1910b, p. 381.
Nothrus monodactylus, Jacot, 1937a, p. 354.

In the original diagnosis of the "variety" the monodactylous legs and the measurements (0.820 × 0.420 mm, posterior notogastral hairs probably included) are mentioned only. Jacot gave the present combination of names to the species and supposed (without having seen the species) that it is closely related to, or even synonymous with *Nothrus terminalis carolinae* Jacot (1937a, p. 354). The name *A. anauniensis* var. *monodactylus* points, however, to *Nothrus silvestris*.

In the Berlese Collection three types are present (nos. 121/36, 37, 38); they originate from Columbia, Missouri (U.S.A.). The material is damaged; h_2 is lacking in all specimens. The length is 0.770-0.785, the breadth 0.400 mm; the length of the notogastral hairs ps_1 is only 0.065 mm. The species apears indeed to be related to *Nothrus silvestris*, although the bad condition of the specimens does not allow of a definite conclusion. I remark that *Nothrus monodactylus* (Berlese) and *Malaconothrus monodactylus* (Michael) are secondary homonyms.

Nothrus pulchellus (Berlese, 1910)

Angelia pulchella Berlese, 1910b, p. 381; 1913, p. 100, pl. 8 figs. 90, 90 a-d [1]); Lombardini, 1936, p. 38.

The type-slides (nos. 121/26, 27) of the present species are still present in the Collection; the specimens originate from the Boboli Gardens in Florence.

Nothrus pulchellus resembles *N. biciliatus* but it has monodactylous legs; the measurements are 0.660 × 0.355 mm.

Nothrus crinitus (Berlese, 1916)

Angelia pulchella var. *crinita* Berlese, 1916b, p. 335.

1) In the explanation of pl. 8 an erroneous reference is made to figs. 89 a-d.

The type of the species, although in a bad condition and damaged, is still present in the Collection; it originates from East Africa. Judging from Berlese's diagnosis it represents a separate species. According to my data the measurements of the species are 0.800 × 0.385 mm; the legs are monodactyle.

CAMISIIDAE Oudemans, 1900

Oudemans (1900a) replaced the name Nothridae Berlese by Camisiidae because he considered *Nothrus* a synonym of *Camisia*. Both family-names are in use since Grandjean (1954) placed the two genera in different families.

It is obvious that Oudemans (1900a) is the author of the family-name Camisiidae and not Sellnick (1928) as was erroneously mentioned in literature (cf. Radford, 1950, p. 180; Sellnick & Forsslund, 1955; p. 475).

Camisia Von Heyden, 1826

Camisia Von Heyden, 1826, p. 612.
Nothrus, Berlese, 1885a, fasc. 17 (6); 1885c, pp. 3, 49; 1885d, p. 127; 1896b, pp. 24, 28; 1913a, p. 60.

Von Heyden (1826) created the genus *Camisia* and designated *Notaspis segnis* Hermann as the type. Berlese did not know the name *Camisia* and used *Nothrus* instead of it. The name *Nothrus* is now used for a different genus as was mentioned above in the chapter on the family Nothridae.

Berlese (1885a) published a generic diagnosis and mentioned *N. bicarinatus* (correct name: *C. segnis*) as type of the genus. In the same year (Berlese, 1885c) he mentioned the following species in a key: *spinifer, bicarinatus* (= *segnis*), *segnis* (= *biurus*), *angulatus* (= *horrida*), *horridus* (= *biverrucata*); in another paper (Berlese, 1885d) he gave a short diagnosis only.

Berlese (1896b) mentioned a number of species, whilst later (1913a) he gave a long list, among which are species that now belong to the genera *Heminothrus, Acronothrus,* and *Nothrus* (*N. quadripilus* is listed in the same paper with *Angelia* as well as with *Nothrus*).

Berlese made a number of errors in the nomenclature of the species, which are dealt with below.

I remark that in 1913 Berlese created a subgenus *Uronothrus* with *segnis* (read: *biurus*) as type. In the Berlese Collection *biurus* is indeed labelled as *Nothrus* (*Uronothrus*) *segnis*. On the other hand, the real *segnis* and *horrida* are labelled as representatives of a subgenus *Eunothrus* that has never been published. The creation of a subgenus *Uronothrus* appears superfluous.

Camisia segnis (Hermann, 1804)

Notaspis segnis Hermann, 1804, p. 94, pl. 4 fig. 8, pl. 9 figs. X, Y.
Nothrus bicarinatus, Berlese, 1885a, fasc. 17 (4); 1885c, p. 9; 1896b, p. 28; 1899, p. 336, fig. 47.
Camisia segnis, Grandjean, 1936, p. 38, figs. 1, 2; Sellnick & Forsslund, 1955, p. 491.

The identity of the present species is certain since Grandjean (1936) studied Hermann's Oribatid mites. I refer to the above-mentioned descriptions; some years ago I prepared a list of synonyms (Van der Hammen, 1952, p. 31).

I studied two slides in the Berlese Collection (nos. 214/23, 24, with specimens from Florence, Boboli), which are labelled as *Nothrus* (*Eunothrus*) *bicarinatus*; the specimens are indeed *segnis*.

Camisia biverrucata (C. L. Koch, 1839)

Nothrus biverrucatus C. L. Koch, 1839, fasc. 29 (15).
Nothrus horridus, Nicolet, 1855, pl. 7 fig. 1; Berlese, 1885a, fasc. 17 (1); 1885c, pp. 6, 9.
Camisia biverrucata, Sellnick & Forsslund, 1955, p. 482, fig. 10.

Berlese apparently drew his specimen partly after Nicolet; both authors figure 2 pairs of the notogastral hairs ps_1 (= PN_1) instead of one. For this reason Oudemans (1900) gave new names to *horridus* Nicolet (*Camisia nicoleti*) and *horridus* Berlese (*C. berlesei*); later (1901) he placed *berlesei* in the synonymy of *nicoleti*. In fact both are synonyms of *biverrucata*, just as *C. fischeri* Oudemans (1900).

Lombardini (1936, p. 45, sub *Nothrus*) records *biverrucatus* as well as *horridus* in his Catalogue of the Berlese Collection. Sellnick & Forsslund (1955) remark that they studied a *biverrucata*-slide in Florence indeed. I have paid no attention to the species, because the identity of Berlese's records appears certain.

Camisia biurus (C. L. Koch, 1839)

Nothrus biurus C. L. Koch, 1839, fasc. 30 (2).
Nothrus segnis, C. L. Koch, 1839, fasc. 30 (1); Berlese, 1885a, fasc. 17 (2); 1885c, p. 9; Lombardini, 1936, p. 45; Michael, 1888, p. 517, pl. 48 figs. 1-6.
Camisia segnis, Sellnick, 1928, p. 20, fig. 43; Willmann, 1931, p. 110, fig. 63.
Camisia exuvialis Grandjean, 1939a, p. 305; Van der Hammen, 1952, p. 32.
Uronothrus segnis, Willmann, 1939, p. 432.
Uronothrus kochi Willmann, 1943, p. 226.
Camisia biurus, Balogh, 1943, pp. 27, 113, pl. 5 fig. 4; Sellnick & Forsslund, 1955, p. 479, fig. 9.

Because there has been confusion in the nomenclature of the present species, I prepared a list of synonyms that is given above; the use of the name *biurus* is explained by Sellnick & Forsslund (1955). Berlese's 1885 figure of *"segnis"* was certainly prepared after the present species. Slide no. 178/15, labelled *Nothrus* (*Uronothrus*) *segnis*, from Tiarno, is indeed *biurus*.

Camisia spinifer (C. L. Koch, 1836)

Nothrus spinifer C. L. Koch, 1836, fasc. 2 (18); Berlese, 1885a, fasc. 17 (3).
Nothrus spiniger, Berlese, 1913a, p. 62, textfig., prep. I-17.
Camisia spinifer, Sellnick & Forsslund, 1955, p. 493, fig. 16.

C. spinifer was not mentioned by Lombardini, but there is a specimen in the Acarotheca italica; the identity of Berlese's records is certain.

Camisia horrida (Hermann, 1804)

Notaspis horridus Hermann, 1804, p. 90, pl. 6 fig. 3.
Nothrus angulatus, Berlese, 1885a, fasc. 17 (5); 1885c, pp. 7, 9.
Camisia horridus, Grandjean, 1936, p. 51, fig. 3.
Camisia horrida, Sellnick & Forsslund, 1955, p. 486, fig. 12.

Berlese's description of *"angulatus"* probably refers to *horridus.* I remark that some preparations in the Berlese Collection, labelled as *Nothrus (Eunothrus) horridus,* are indeed *horridus*; these are apparently not the specimens described in A.M.S. as *horridus,* but those recorded by Lombardini (1936, p. 45) as *Nothrus horridus.*

Camisia flagellata (Berlese, 1888)

Nothrus flagellatus Berlese, 1888b, p. 216 (sep. p. 46), pl. 13 fig. 5[1]).

The species is no more present in the Collection, and was indeed not mentioned by Lombardini; according to Berlese one specimen was collected at Rio-Apa (Buenos Aires), under the bark of a tree. The concise diagnosis is accompanied by a superficial drawing that shows the characters of the genus *Camisia.* The species has two times been listed among the representatives of the genus *Nothrus* (Berlese, 1896b, p. 29; 1913a, p. 61) .

Camisia superba (Berlese, 1910)

Nothrus superbus Berlese, 1910a, p. 266.

The species was not mentioned in Lombardini's Catalogue, and I have indeed seen no specimen of it. Berlese compares *superbus* with *Camisia spinifer,* although it is larger (1.400 × 0.600 mm); a few distinguishing characters are given in the original concise diagnosis; the type-locality is Palermo (Sicily).

Acronothrus Berlese, 1916

Acronothrus Berlese, 1916, p. 65.

Berlese created *Acronothrus* (as subgenus of *Nothrus*) in 1916, with *Nothrus cophinarius* Michael, 1908 (from New Zealand) as type. I do not know if Berlese studied the type-specimen; he did not give a generic diagnosis, but only mentioned *Neoliodes americanus* Berlese, 1901 (from South America) as other representative of the genus. Later (Berlese, 1916a) he added *A.*

1) In the text Berlese erroneously refers to fig. 4.

alluaudi Berlese (East Africa) and *A. rothschildi* Berlese (Ethiopia). Although Berlese (1916) did not mention *Nothrus camelus* Berlese (1910b), this species from Nouméa certainly belongs to the genus. *Nothrus unguifera* Michael, 1908 (from New Zealand), described as closely related to *N. cophinarius,* is possibly only the other sex of the last-mentioned species. The genus is best known by the description of *Acronothrus nukuhivae* (with var. *hivaoae*) Jacot (1935, p. 218, fig. 1c-g), a species from the Marquesas islands. According to Jacot, this species resembles *unguifera*; it appears that the genus *Acronothrus* is related to *Camisia.*

Oudemans (1937, p. 2560, fig. 1097bis) discovered an interesting publication by Cambridge (1875), which escaped the notice of most authors. It appears that Cambridge described a new species of mite (*Westwoodia obtecta*) as a harvestman (new family: Crotonoides); because the name *Westwoodia* had already been used for different animals, Thorell (1876, p. 454) altered the generic name into *Crotonia.* As Willmann wrote to Oudemans (l.c.), *Crotonia obtecta* (Cambridge) is related to *Nothrus cophinarius,* and especially to *N. unguifera.*

I do not know whether the type of *obtecta* is still in existence, but probably *Acronothrus* Berlese (1916) and *Crotonia* Thorell (1876) are synonyms, just as the family names Camisiidae Oudemans (1900) and Crotoniidae Cambridge (1875). It will, however, be better to have the names *Crotonia* and Crotoniidae suppressed for purposes of synonymy.

As far as known the genus *Acronothrus* has a remarkable distribution: New Zealand, Nouméa, Marquesas islands, East Africa, and South America [1]).

Acronothrus americanus (Berlese, 1901)

Neoliodes americanus Berlese, in Berlese & Leonardi, 1901, p. 12.

The species was described from Buenos Aires. Two slides (34/50 and 21/16) are present in the Collection, one from the type-locality and another from Chile. I paid no attention to specific characters.

Acronothrus camelus (Berlese, 1910)

Nothrus camelus Berlese, 1910b, p. 381; 1913a, p. 60.

A. camelus is no more present in the Collection, but judging from the diagnosis it is indeed an *Acronothrus,* related to *cophinarius.* The species is recorded from Nouméa (New Caledonia).

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1) Womersley (1957, p. 22, fig. 1) recently described *Acronothrus ramus,* a fossil species from Australian resin (probably Upper Tertiary); it is related to *A. cophinarius* Michael.

Acronothrus alluaudi Berlese, 1916

Nothrus (Acronothrus) alluaudi Berlese, 1916a, p. 174.

The type (slide no. 165/48) is still present in the Collection; it originates from East Africa. The differences from *rothschildi* are given in the original description.

Acronothrus rothschildi Berlese, 1916

Nothrus (Acronothrus) rothschildi Berlese, 1916a, p. 175.
Nothrus rothschildi, Berlese, 1922, p. 91, pl. A 6 fig. 2; Lombardini, 1936, p. 45.

The type of the present species is also still present, viz. no. 165/47 from "Ethiopia meridionale". The species resembles *A. alluaudi.*

Heminothrus Berlese, 1913

Heminothrus Berlese, 1913, p. 98.

Heminothrus was described as a subgenus of *Nothrus* (i.e. *Camisia*). Berlese gave a concise diagnosis, and designated *Nothrus Targionii* Berlese (1885a) as type. It is remarkable that no diagnosis was given of the genus *Platynothrus* (same paper, p. 99!), although the two genera are closely related. In fact it is difficult to give diagnostic characters of *Heminothrus* and *Platynothrus.* Sellnick & Forsslund (1955) separated the genera on account of the presence of sacculae attached to the bothridium; the use of this character results in a genus *Platynothrus* that contains a heterogeneous collection of species.

I have contributed the species with distinct dorsal ridges, which have a rather similar habitus, to the genus *Platynothrus.* The remaining species are listed with *Heminothrus*; this genus certainly must be divided into a number of genera. I remark that *H. capillatus* has faint dorsal ridges in the anterior part of the notogaster (and short sensilli); *H. thori* is different because of the completely scleritized coxisternal region. For a future subdivision it will be useful to pay attention to position and length of the notogastral hairs; further to cerotegument, secretion, and adhering dirt.

Heminothrus targionii (Berlese, 1885)

Nothrus Targionii Berlese, 1885a, fasc. 17 (8): 1885c, p. 12.
Heminothrus targionii, Lombardini, 1936, p. 42; Sellnick & Forsslund, 1955, p. 507, figs. 26, 27.

The species, originally described as a *Nothrus,* was in 1913 (p. 99) designated as type of the subgenus *Heminothrus.* In the Berlese Collection the following slides of the species are present: no. 149/38 (locality: "Alta Italia"), and no. 149/47 (locality: "Veneto"). I do not know if these are the type-

specimens from Rua (Padua). The original description is, however, sufficient to recognize the species. I remark that Berlese mentioned 0.800 mm as length, whilst the specimens in the Collection measure 0.860; according to Willmann (1931), and Sellnick & Forsslund (1955) the length is 0.900, and 0. 936-0.972 mm respectively.

H. targionii is known from many localities in Europe.

Heminothrus thori (Berlese, 1904)

Angelia Thori Berlese, 1904a, p. 275.
Nothrus (Heminothrus) thori, Berlese, 1913, p. 99, pl. 7 fig. 83.
Heminothrus thori, Lombardini, 1936, p. 42.
Platynothrus thori, Sellnick & Forsslund, 1955, p. 521, figs. 23-25.

The present species has a separate position because the coxisternal region is completely scleritized. Sellnick & Forsslund (1955) classified *thori* with *Platynothrus*; for the moment I prefer to list the species as a *Heminothrus.*

The type of *H. thori* is still present in the Berlese Collection (slide no. 16/38). Berlese recorded a length of 1.000 mm; according to Sellnick & Forsslund it is 0.954-1.000 mm .

Heminothrus ornatissimus (Berlese, 1910)

Angelia ornatissima Berlese, 1910, p. 224, pl. 20 fig. 61.

The types of *Angelia ornatissima* (viz. the nos. 81/9, 15 from Lake City, Florida) are still present in the collection. The species certainly belongs to the genus *Heminothrus*; the figure will probably be sufficient for purposes of identification. The length is 0.585-0.600, and the breadth 0.290 mm; according to Berlese the measurements are 0.650 × 0.330 mm, in which the hairs are possibly included.

I remark that Berlese (1913) did not mention the species as a representative of the subgenus *Heminothrus.*

Heminothrus paolianus Berlese (1913)

Nothrus (Heminothrus) paolianus Berlese, 1913, p. 99, pl. 8 fig. 89.

The type-material of the species has been collected by Paoli in moss at Lago Palù, Sondrio [1]), in the mountains of North Italy, at an altitude of 1300 m; it is not present in the Berlese Collection.

Willmann (1925, p. 9) described the "variety" *longisetosus* that is also described by Sellnick & Forsslund (1955, p. 509, figs. 28, 29). As long as

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1) Lago Palù and Sondrio are apparently two localities, although Berlese's record makes the impression that Lago Palù is situated in the province of Sondrio.

topotypic specimens of *paolianus* are not discovered and described, the identity of the species, and its relation to the "variety" remain, however, uncertain.

Heminothrus capillatus (Berlese, 1914)

Angelia capillata Berlese, 1914, p. 132, pl. 11 (2) fig. 25.

Two type-specimens from Bergamo (slide no. 184/4) are still present in the Collection. The length is about 1 mm. The differences from the subspecies *septentrionalis* Sellnick in Hammer, 1944 (recently redescribed by Sellnick & Forsslund, 1955, p. 519, figs. 21-22) are of minor importance. The species has faint dorsal ridges in the anterior part of the notogaster, which appear to be absent in the subspecies.

Heminothrus princeps (Berlese, 1916)

Nothrus (Heminothrus) princeps Berlese, 1916b, p. 334.

The type of the species is still present in tube no. 1385. It is probably indeed a *Heminothrus*. Berlese recorded that the locality is Columbia, North America; as mentioned above, this is Columbia, Missouri.

Platynothrus Berlese, 1913

Platynothrus Berlese, 1913, p. 99.

Berlese created the genus in 1913; he published no diagnosis, but mentioned "*Nothrus palliatus* (= *N. bistriatus* K.)" as type of the genus, and added *Nothrus punctatus* L. Koch and *N. peltifer* C. L. Koch. As Sellnick & Forsslund (1955) already mentioned, *palliatus* is the nymph of *peltifer* (syn. *bistriata* sensu Nicolet) so that the correct name of the type-species is now *Platynothrus peltifer*. I have added one species (*robustior*), which Berlese described as a *Heminothrus*. As mentioned above I restricted *Platynothrus* to species of which the notogaster shows distinct dorsal ridges.

Platynothrus peltifer (C. L. Koch, 1839)

Nothrus peltifer C. L. Koch, 1839, fasc. 29 (9).
Nothrus palliatus C. L. Koch, 1839, fasc. 30 (4).
Nothrus bistriatus, Berlese, 1885a, fasc. 17 (9); 1885c, p. 12.
Angelia palliata, Berlese, 1896b, pp. 26, 30, 32.
Heminothrus bistriatus, Lombardini, 1936, p. 42.
Platynothrus palliatus, Lombardini, 1936, p. 47.
Platynothrus peltifer, Sellnick & Forsslund, 1955, p. 515, figs. 17, 18.

Berlese described the species in A.M.S. as "*Nothrus bistratus* Nic. non K." ("*Nothrus bistriatus* K." on the plate!). He refers to the species that Nicolet (1855, p. 454, pl. 7 fig. 7) described as a juvenile of *Nothrus palustris* and

which the last-mentioned author (l.c. p. 397) considered identical with *Nothrus bistriatus* C. L. Koch. (Nicolet's references to *N. silvestris, N. palustris,* and *N. bistriatus* are extremely confused). In fact the identity of *Nothrus bistriatus* C. L. Koch is uncertain; it resembles a *Camisia.*

Berlese (1896b) classified the species (as *palliata* C. L. Koch) with the genus *Angelia*; on p. 30 he mentions *N. peltifer* C. L. Koch as a synonym, and on p. 32 *Hermannia bistriata* Mich. *Nothrus cirrosus* Canestrini & Fanzago (1876, p. 100), mentioned by Berlese (1896b, p. 29) as a synonym of *Angelia palliata,* is of uncertain identity.

Platynothrus peltifer is the correct name of the present species; it is found in Europe, Greenland, and Canada. A detailed description was given by Sellnick & Forsslund, 1955, p. 515, figs. 17, 18.

According to Lombardini (1936) the specimens in the Berlese Collection are identified as *Heminothrus bistriatus* and *Platynothrus palliatus.* I have paid, however, no attention to the preparations of this common species.

Platynothrus robustior (Berlese, 1916)

Heminothrus robustior Berlese, 1916a, p. 175.

Berlese described the present species as a *Heminothrus* and compared it with *H. palliatus* (i.e. the species that he designated in 1913 as type of the genus *Platynothrus*!); *robustior* resembles indeed some representatives of *Platynothrus,* although the legs are tridactyle. I remark that Hammer (1958) described also two tridactyle species from South America. For the present I classify therefore the species with the genus *Platynothrus. P. robustior* was collected in La Plata (The Argentine). The measurements of the type-specimens (slides nos. 160/18-20 in the Berlese Collection) are: length 0.955-0.985 mm, breadth 0.525 mm.

TRHYPOCHTHONIIDAE Willmann, 1931

At first (Berlese, 1896b) *Hypochthonius tectorum* Berlese (1896) was classified with the Nothridae, later (Berlese, 1910) is was considered one of the representatives of the family Hypochthoniidae. Willmann (1931) created the Trhypochthoniinae, a subfamily of the Hypochthoniidae, which afterwards has been regarded as a separate family; it is related to the Malaconothridae.

Berlese's species are classified here with the genera *Trhypochthonius* Berlese. *Trhypochthoniellus* Willmann, and *Allonothrus* Van der Hammen [1]).

1) Knülle (1957, p. 150) created a separate family Trhypochthoniellidae, because the genus *Trhypochthoniellus* differs from *Trhypochthonius* as well as from the Malacono-

Trhypochthonius Berlese, 1904

Trhypochthonius Berlese, 1904b, p. 27; 1913a, p. 154.
Tripochthonius Berlese, 1910, p. 218.

Berlese created the genus *Trhypochthonius* in 1904 with *Hypocthonius tectorum* as type; at the same time he described *T. longisetus* as a new species of the genus. In 1905 he described another species (*T. badius*) but he now spelt the generic name as *Tripochtonius*. Five years later Berlese (1910) published a key to the genera of the Hypochthoniidae, among which *Tripochthonius* (sic!) is mentioned; he mentions four representatives: *tectorum* (Berlese), *badius* Berlese, *longisetus* Berlese, and *americanus* (Ewing). Recently (Van der Hammen, 1956), I published a preliminary revision of the genus, in which *longisetus* and *badius* are referred to *Trhypochthoniellus*.

Trhypochthonius tectorum (Berlese, 1896)

Hypocthonius tectorum Berlese, 1896, fasc. 78 (8).
Trhypochthonius tectorum, Lombardini, 1936, p. 50.

T. tectorum was described as a *Hypochthonius* because of the observation of a transverse groove that later appeared to be an artefact. Berlese mentions that he collected many specimens, especially in moss on roofs in Venice, Florence, Naples, etc. I collected indeed specimens on a roof in Florence; they can be regarded as topotypes. The identity of the common species is certain.

Trhypochthoniellus Willmann, 1928

Trhypochthoniellus Willmann, 1928, p. 3; 1931, p. 104; Grandjean, 1939a, p. 306.

Willmann (1928) created *Trhypochthoniellus* as a subgenus of *Trhypochthonius* (type: *T.* (*T.*) *setosus* Willmann, 1928); he thought that the absence of the sensillus pointed to the Malaconothridae, but that other characters justified the relationship with *Trhypochthonius*. In 1931 Willmann raised *Trhypochthoniellus* to generic rank.

In fact the trichobothridial regression of the ascendant type is a common character of the Nothroidea; bothridium and sensillus generally appear at one of the nymphal stages. In the Malaconothridae and in some *Trhypochthoniellus* species, the sensillus is also absent in the adult stage, but this is only a gradual difference. The chaetotaxy of *Trhypochthoniellus* is a more important character; I refer to Grandjean (1939a, 1954) and to my 1956 paper.

Trhypochthoniellus longisetus (Berlese, 1904)

Trhypochthonius longisetus Berlese, 1904b, p. 27, pl. 2 fig. 44.

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thridae. Recently (Van der Hammen, 1955, 1955a), while dealing with the genera *Archegozetes* and *Allonothrus,* I demonstrated, however, that it is difficult to divide the family *Trhypochthoniidae.*

I have placed the present species in the genus *Trhypochthoniellus* because the notogastral hairs are described as long and smooth, and the structure of the notogaster as shining. The type is, however, no more present in the Berlese Collection. Because the species was collected in hothouses in Florence, it was perhaps introduced from a tropical country. The identity of *T. longisetus* remains therefore uncertain.

Trhypochthoniellus badius (Berlese, 1905)

Tripochtonius badius Berlese, 1905b, p. 237.
Trhypochthonius badius, Berlese, 1913a, p. 155, textfig., prep. II-12; Lombardini, 1936, p. 50.

The type of *T. badius* is no more present in the Collection. There is a slide (no. 217/31) from Florence (Cascine), and a specimen in the Acarotheca italica; in the Oudemans Collection there is also an "Acarotheca" slide. The original specimens were collected in moss in a flowerpot in Florence; this moss was possibly Sphagnum, for afterwards the species has been recorded from bogs.

The specimens studied by me are damaged; the dorsal hairs are different from those in *Trhypochthonius.* The species has a characteristic chestnut-brown colour.

Allonothrus Van der Hammen, 1953

Allonothrus Van der Hammen, 1953, p. 244.

The present genus was created in 1953 with *A. schuilingi* as type and single representative. Later (Van der Hammen, 1955a) I studied the development of the type-species and classified it with the Trhypochthoniidae.

Angelia pyriformis Berlese does not belong to the Nothridae (the notogaster is unideficient; $\varphi_1 + d$ of tibia I is long, etc.), but it appears to be related to *Allonothrus schuilingi,* so that it is preliminary regarded here as a representative of this genus.

Allonothrus pyriformis (Berlese, 1913)

Angelia pyriformis Berlese, 1913, p. 99, pl. 8 fig. 91; Lombardini, 1936, p. 38.

The specimens in the Berlese Collection are in a bad condition. There are six slides (nos. 135/20-25) that bear different labels: 21 and 22 are juveniles; 20, 23, and 25 are designated as type; on 21 and 22 the locality is indicated as Java only; 21, 23, 24, and 25 are from Semarang, Java; nevertheless, it is evident that the six slides represent the type-material. Of this material no. 135/22 is the single one that is suited for study; the specimen is identical with Berlese's description and figure. Because the identity of the remaining speci-

mens is not completely certain, I designate the specimen in slide no. 135/22 as lectotype.

I noted the following striking differences from *A. schuilingi.* The present species is larger (length according to Berlese 0.600 mm, according to my own data 0.690; in *schuilingi* 0.435). The general shape of the body reminds of *Trimalaconothrus.* The sensillus is only very slightly thickened towards the end. The dorsal hairs are generally longer and slimmer; ps_2 is an ordinary hair, not fan-shaped. The structure of the notogaster is different; in *schuilingi* the central area of the notogaster is elevated and at each side bordered by a groove, whilst the reticulations are absent or indistinct in the anterior lateral part and in small areas around the hairs.

MALACONOTHRIDAE Berlese, 1916

Berlese (1896b, pp. 26-27) classified *Nothrus monodactylus* Michael (1888, p. 528, pl. 45 figs. 10-14) as *Angelia monodactyla* with the Nothridae [1]). Afterwards (Berlese, 1913a) the genus *Malaconothrus* Berlese, 1904 (to which *monodactylus* belongs) was classified in a tribe (Michaeliini) of this family. Finally, Berlese (1916a, pp. 175, 176) created a separate family Malaconothridae, consisting of the tribes Malaconothrini and Lohmannini. At present the genera *Malaconothrus* Berlese (1904) and *Trimalaconothrus* Berlese (1916) are the only representatives of the family; *Mucronothrus* Trägårdh (1931) is according to Hammer (1958, p. 25) related to *Trhypochthoniellus.*

Malaconothrus Berlese, 1904

Malaconothrus Berlese, 1904b, p. 24.

In the description of *Lohmannia (Malaconothrus) egregia,* Berlese compares this species with *Nothrus monodactylus* Michael. He thought it justified to create a subgenus *Malaconothrus* which later he considered a separate genus. *N. monodactylus* is generally regarded as the type of *Malaconothrus;* Radford (1950, p. 180) even mentions that Berlese himself designated it as the type [2]). It is, however, evident that the genus is monotypical, so that *Lohmannia (Malaconothrus) egregius* must be considered the type; the identity of this species is certain. *M. egregius* is the single representative of the genus, which is described in Berlese's papers [3]).

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1) Berlese (1896b) records *A. monodactyla* from England only; possibly he had not seen the species.

2) Knülle (1957, p. 155) records that Baker and Wharton (1952) designated *M. monodactylus* as type of the genus. A list of species of the genus is given by Knülle (l.c., p. 156).

3) I have made no study of two species from Java in the Collection, of which the diagnosis has not been published.

Malaconothrus egregius Berlese, 1904

Lohomannia (Malaconothrus) egregia Berlese, 1904b, p. 24, pl. 2 fig. 38.
Malaconothrus egregius, Lombardini, 1936, p. 44.

In the Berlese Collection slide no. 213/48 is present, with a specimen from the garden of the "Stazione di Entomologia Agraria" at Florence; it is not designated as type. The measurements of the specimen are 0.490 × 0.205 mm, whilst, according to Berlese, the type measures 0.450 × 0.210 mm (the drawing is exactly two times as long as broad!).

Because I collected specimens in the Boboli Gardens in Florence, the identity of the species is certain. It resembles *Malaconothrus gracilis* Van der Hammen (1952, p. 27, fig. 2c, d., g, k, l) because of the parallel-sided hysterosoma, the long notogastral hairs, and the structure of the cerotegument. The length of the anal covers appears to be equal to that of the genitals.

Willmann (1931, p. 108) describes a species from damp places as *Malaconothrus egregius,* although he doubts if it is *M. crinitus* Berlese. I remark that *crinitus* is a *Trimalaconothrus,* whilst the real *egregius* has much longer notogastral hairs than Willmann's specimens, and a completely different habitat (just as *M. gracilis*); the measurements recorded by Willmann are 0.400 × 0.180, the length of *gracilis* is 0.405-0.455 mm.

An extensive redescription of *M. egregius* will be published in a separate series.

Trimalaconothrus Berlese, 1916

Trimalaconothrus Berlese, 1916b, p. 336.

In 1916 Berlese created a subgenus *Trimalaconothrus,* and separated it from *Malaconothrus* on account of the tridactylous legs; later authors considered *Trimalaconothrus* a genus. Berlese designated *Malaconothrus (Trimalaconothrus) indusiatus* Berlese (1916b) as type, and added *Nothrus tardus* Michael (1888), *Malaconothrus major* Berlese (1910), and *Malaconothrus optatus* Berlese (1908). In this list *Malaconothrus crinitus* Berlese (1908) was erroneously omitted [1]).

Trimalaconothrus indusiatus Berlese, 1916

Malaconothrus (Trimalaconothrus) indusiatus Berlese, 1916b, p. 336.

The types of the present species (slides nos. 177/29, 30) are still present in the Collection; the specimens originate from "Bosco della Sila, Cosenza"

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1) A list of species of the genus *Trimalaconothrus* was given by Knülle (1957, p. 159). This author uses *T. novus* Sellnick (1921) as auxiliary type, and designates it at the same time as type of a new subgenus (*Tyrphonothrus*).

(South Italy). The measurements of a clean specimen are 0.640 × 0.375 mm (0.650 × 0.370 according to Berlese). The species resembles *T. grandis* Van der Hammen (1952, p. 28, fig. 3a, b), but the notogastral hairs (especially e_2 and h_2) and the interlamellar hairs appear to be shorter; the S-shaped ridges on the prodorsum are less distinct.

Trimalaconothrus tardus (Michael, 1888)

Nothrus tardus Michael, 1888, p. 526, pl. 47 fig. 14.
Angelia tarda, Berlese, 1896, fasc. 78 (5).

Berlese prepared his 1896 figure after a specimen sent to him by Michael; he does not mention whether the description is based on the same specimen. The difference between the length mentioned by Michael (0.360 mm) and that mentioned by Berlese (0.550 mm) is, however, considerable [1]).

Because no specimen of the species is present in the Berlese Collection, the 1896 record (in moss, Padua) remains doubtful; there is, moreover, an important difference in habitat (Michael collected his type-specimen on lichen growing on the granite rocks, Land's End, Cornwall).

Trimalaconothrus optatus (Berlese, 1908)

Malaconothrus optatus Berlese, 1908, p. 12; 1910, p. 223, pl. 19 fig. 46.

Berlese described (1908) and figured (1910) *M. optatus* as having two claws at each leg; probably the smaller median claw had been overlooked, for afterwards (Berlese, 1916b, p. 336) the species was added to *Trimalaconothrus,* characterized by tridactylous legs.

The description is, however, insufficient and no specimens are present in the Berlese Collection, so that the identity of *T. optatus* is uncertain. The indication of the type locality ("Italia") is of no value.

Trimalaconothrus crinitus (Berlese, 1908)

Malaconothrus crinitus Berlese, 1908, p. 12; 1910, p. 223, pl. 19 fig. 44.

Although the present species is not described or figured as tridactyle, nor enumerated in Berlese's 1916 list of *Trimalaconothrus* species, it is recorded in the Catalogue as *M. (T.) crinitus* [2]).

The type (from Columbia, Missouri) is no more present, but there is a slide (no. 209/18) from Lake City (Florida) with a specimen that Berlese

1) According to Knülle (1957, pp. 165, 166, figs. 40, 41), who studied two of Michael's "*tardus*" specimens (the real types?), the measurements are 0.482 × 0.228 mm. Knülle describes and figures a pair of small ridges on the notogaster, which run from h_1, to h_2-h_3; these are probably the same ridges as in Berlese's drawing.

2) Knülle (1957, p. 159) lists *crinitus* with the species of *Malaconothrus.*

labelled as *crinitus*; it is indeed a *Trimalaconothrus*. The measurements recorded by Berlese are 0.380 × 0.200 mm. The original description is, however, not sufficient to prove the identity of the last- mentioned specimen.

Trimalaconothrus maior (Berlese, 1910)

Malaconothrus maior Berlese, 1910, p. 223, pl. 19, figs. 45, 45a.

The type of *T. maior* (from Lake City, Florida) is no more present in the Collection, and the description is too short to enable a thorough comparison with other species. The identity remains therefore uncertain. I remark that in a later list, Berlese (1916b, p. 336) spelt the name as *major*.

NANHERMANNIIDAE Sellnick, 1928

Berlese classified *Nothrus nanus* Nicolet with the family Nothridae. At first he regarded it as a *Hermannia*, but in 1913 he created the genus *Nanhermannia* with *nanus* as type. Sellnick (1928) placed this genus in a separate family Nanhermanniidae. Willmann (1931) united the Nanhermanniidae and the Eulohmanniidae in a subcohors Diagastres; as Willmann already supposed, this classification is artificial. Grandjean (1954) considered the Nanhermanniidae a family of the Nothroidea, and this classification is used in the present paper.

Two genera of the family are known: *Nanhermannia* and *Masthermannia*.

Nanhermannia Berlese, 1913

Nanhermannia Berlese, 1913, p. 100.

Berlese created the genus *Nanhermannia* in 1913 and designated "*Hermannia nana* Nic." (i.e. *Nothrus nanus* Nicolet) as type. He described two species (*elegantula, coronata*) and later added a fourth (*comitalis*).

There has been a considerable confusion in the nomenclature of the *Nanhermannia* species. Because the following corrections are rather radical, a new monograph of the genus and the family is badly needed; I hope to publish it as soon as possible.

Nanhermannia nanus (Nicolet, 1855) (= *elegantula* auct.)

Nothrus nanus[1]) Nicolet, 1855, p. 458, pl. 7 fig. 5.
Hermannia nana, Berlese, 1885c, p. 10; 1892b, fasc. 63 (1)[2]); 1896b, p. 31.
Nanhermannia elegantula, Sellnick, 1928, p. 17; Willmann, 1931, p. 96, fig. 15; Strenzke, 1953, p. 72, fig. 3.
Nanhermannia nana, Lombardini, 1936, p. 45.

1) As Michael (1888, p. 455) already remarked, *nanus* is a noun; it appears to be incorrect to use the word as an adjective.

2) In the explanatory text the name of the genus is spelt as *Hermanna*.

The identity of the present species is important because Berlese designated it as the type of the genus *Nanhermannia*. In the following I demonstrate that this type has generally been misinterpreted. Although the original description and figure appear at first sight to be insufficient, the locality (forest near Paris) justifies the supposition that *nanus* is probably not identical with *nana* sensu Willmann; the last-mentioned species prefers bogs, moist meadows, alder-marshes, etc.

According to verbal information kindly provided by Grandjean, and as appears from material collected by him in the forests near Paris, two species only are found in the environs investigated by Nicolet.

According to the nomenclature used in the 1953 monograph by Strenzke, these two species should be named *elegantula* and *areolata*. The first-mentioned species is common near Paris, the second much more rare. On account of this we could choose "*elegantula*" already as the real *nanus*; there are, however, still better arguments.

When the species are studied in air, in reflected light, at a small enlargement, the observation is comparable with that made a century ago by Nicolet. In the case of "*areolata*" we state that the median part of the prodorsum looks like a longitudinal ridge, whilst the portion between the bothridia is not strikingly convex. In "*elegantula*" the median part is broader and not like a ridge, whilst the prodorsum is distinctly embossed between the bothridia; this elevated part is posteriorly divided by a median furrow.

It is evident that the prodorsal structure as figured by Nicolet has a striking resemblance to that of our "*elegantula*", so that the identity of *nanus* is certain. I point further to the triangular, deepened portion, drawn by Nicolet in the posterior part of the prodorsum, which is certainly the space between the two conical projections (this space is absent in *nana* sensu Willmann). I remark that Nicolet did not see the part of the projections, which overlaps the notogaster; the length recorded by him (0.400 mm) is inaccurate.

From the above it is apparent that *Nothrus nanus* Nicolet is the same species that later authors (except Berlese and Grandjean) named "*elegantula*". Below I demonstrate that the real *N. elegantula* Berlese (1913) is identical with the species that Strenzke (1953) described as *N. areolata*.

To avoid future misunderstanding I selected a neotype from one of the topotypical specimens of *nanus*; this neotype is preserved in the Collection of the "Rijksmuseum van Natuurlijke Historie", Leiden.

It appears that Berlese (probably by chance, because it was the first *Nanhermannia* species he collected) correctly identified *nanus*. Although he enumerated the species among the representatives of *Hermannia* in "Note", fasc. 3 (1885c), the description followed much later (1892b). The original speci-

mens (from the Colli Euganei) are no more present, but two other preparations from North Italy (nos. 214/9, 10 from Belluno Pedavena and Castions di Strada respectively) are indeed *nanus*. Berlese's drawing (1892b) points moreover to this species.

I remark that Berlese (1892b) recorded a length of 0.400 mm (apparently taken from Nicolet), whilst later (1896b) he recorded a length of 0.510 mm (probably cited from Michael's description of a *Hermannia nana* that is a different species). The measurements of *N. nanus* are those mentioned by me in 1952 (sub *elegantula*) : length 0.550-0.600; breadth 0.250-270 [1]).

Nanhermannia elegantula Berlese, 1913 (non auct.)

Nanhermannia elegantula Berlese, 1913, p. 100, pl. 7 fig. 84; Lombardini, 1936, p. 45.
Nanhermannia areolata Strenzke, 1953, p. 69, fig. 1.

The type-slides of the species, viz. the nos. 28/41, 42 with specimens from Tiarno (Trentino), are still present in the Collection. They are conform to the description of *N. areolata* Strenzke, so that the last-mentioned name must be placed in the synonymy of *N. elegantula*. As mentioned above, the "*elegantula*" of most authors is a synonym of *N. nanus*.

Jacot (1937, p. 238) erroneously considers *elegantula* a subspecies of *N. dorsalis* (Banks). I remark that Jacot knew the identity of the real *elegantula* because in September 1936 Grandjean sent topotypes of *nanus* to him, together with *elegantula* from the environs of Paris. Nevertheless one of Jacot's slides [2]) studied by me (no. 34 F 4.3-40, also bearing no. 142, labelled as *Nanhermannia dorsalis elegantula*, locality not indicated, but certainly U.S.A.), contains specimens that are different from *elegantula* in the structure of the prodorsum (see also Jacot's fig. 6). For this reason Jacot's "*N. dorsalis elegantula*" cannot be regarded as a synonym of *N. elegantula*.

Nanhermannia coronata Berlese, 1913

Nanhermannia coronata Berlese, 1913, p. 100, pl. 7 fig. 85; Lombardini, 1936, p. 45.

The type of the present species (slide no. 145/3, specimen from Lake City, Florida) has a strong resemblance to *N. nana* sensu Willmann. According to Jacot (1937, p. 238) it is identical with *Carabodes dorsalis* Banks (1896, p. 77), of which the type-specimens were collected on "the surface of a large boulder, in the woods" near Sea Cliff, Long Island, N.Y. (U.S.A.). Speci-

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1) *Nanhermannia elegantissima* Hammer (1958, p. 14, fig. 1), a species from South America, appears to be closely related to *N. nanus* (Nicolet); the differential characters are not obvious.

2) Three of Jacot's slides with *Nanhermannia* species were kindly presented to me by Grandjean.

mens from Jacot's "*dorsalis*"-slide no. 34 F. 3.2 P-3 (also bearing no. 70) are, however, different; they resemble *N. komáreki* Kunst (1956).

For the moment I prefer to give no name to *N. nana* sensu Willmann; a study of the variability of this species (based on European and American [1]) material), and detailed redescriptions of *coronata, dorsalis* (Banks), and *dorsalis* sensu Jacot are badly needed before anything can be said about their synonymy.

Nanhermannia comitalis Berlese, 1916

Nanhermannia comitalis Berlese, 1916b, p. 335; Sellnick, 1928, p. 17; Willmann, 1931, p. 96, fig. 13; Lombardini, 1936, p. 45.

The single type-specimen of *N. comitalis* is preserved in glass tube no. 1881; it originates from Logny (France). The species is easily recognizable by the structure of the prodorsum, and the *Hermannia*-like shape.

Masthermannia Berlese, 1913

Masthermannia Berlese, 1913, p. 100.
Posthermannia Grandjean, 1954c, p. 298.

The original diagnosis of the genus is insufficient, and Berlese's description and figure of the type-species (*Angelia mammillaris*) are partly incorrect. Owing to this Grandjean (1954c) created a genus *Posthermannia* that is in fact a synonym of *Masthermannia,* because *Posthermannia nematophora* (the type-species of the genus) appears to be identical with *M. mammillaris.*

Two species of the genus are known: *Masthermannia mammillaris* (Berlese) (= *Posthermannia nematophora* Grandjean), and *Masthermannia hirsuta* (Hartmann, 1949); the differences between them are given by Grandjean (1956a, p. 456).

Masthermannia mammillaris (Berlese, 1904)

Angelia mammillaris Berlese, 1904a, p. 275.
Masthermannia mammillaris, Berlese, 1913, p. 100, pl. 8 fig. 92; Lombardini, 1936, p. 44.
Posthermannia nematophora Grandjean, 1954c, p. 298, figs. 1-3.

The type of the species (slide no. 21/7) from Florence (Cascine) is still present in the Collection. The measurements are 0.480 × 0.210 mm, although Berlese recorded 0.400 × 0.200. The specimen is covered with dirt, but I could establish that the apparent differences between *P. nematophora* and the figure of *M. mammillaris* are due to erroneous observations by Berlese. *P. nematophora* must therefore be placed in the synonymy of the last-mentioned species; it was described and figured in detail by Grandjean.

1) Strenzke (1953. p. 74) records *nana* sensu Willmann from the U.S.A.

Apart from the type-specimen, there is a slide (no. 24/6) with a juvenile specimen from the Boboli Gardens in Florence, which Berlese labelled as *mammillaris*; in its present state the identity of the specimen appeared to be uncertain.

Further there are 9 slides (nos. 135/13-19, 140/1, 2) with specimens from Semarang, Java, regarded by Berlese as *M. mammillaris*; although these show characters of the genus, they are too damaged to be identified with certainty. Nevertheless this record adds to our scarce knowledge of the distribution of the species of *Masthermannia*.

HERMANNIIDAE Sellnick, 1928

Originally, Michael as well as Berlese classified the genus *Hermannia* Nicolet (1855) with the Nothridae s.lat. Sellnick (1928) created, however, a separate family Hermanniidae that he placed between Nanhermanniidae and Malaconothridae. Willmann (1931) united the family with the Neoliodidae and created a subphalanx Immarginatae, part of the Macropylina, an artificial classification that is based on the structure of the ventral surface.

Willmann's system remained the current classification till Grandjean (1954) created a superfamily Nothroidea in which he incorporated the present family, although several characters of the Hermanniidae point to a separate position (no trichobothridial regression, absence of the anal fissure, exoskeleton resembling that of the higher Oribatei, etc.).

Two genera are mentioned as representatives of the family: *Hermannia* and *Phyllhermannia*. The systematic position of the last-mentioned genus appears, however, uncertain.

Hermannia Nicolet, 1855

Hermannia Nicolet, 1855, pp. 418, 421, 468; Berlese, 1892d, fasc. 67 (10); 1896b, p. 31; 1913a, p. 156.

Nicolet (1855, p. 418) designated *Nothrus piceus* as the type of *Hermannia*, but on p. 421 he names the type-species *Hermannia crassipes* and mentions *Nothrus piceus* as a synonym [1]). In fact *Hermannia crassipes* is a synonym of *Nothrus gibbus* C. L. Koch. There is, however, no doubt about the identity of the type-species. The other species that Nicolet contributed to the genus *Hermannia* (*granulata* and *arrecta*) now belong to a different group (genus *Hermanniella*, fam. Hermanniellidae).

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1) Radford (1950, p. 181) remarks that the type of *Hermannia* was designated by Sig Thor (1931) in "Die Tierwelt Deutschlands" vol. 22, p. 113). The genus is indeed dealt with in this volume, but Willmann is the author of pp. 79-200. Radford overlooked, however, that Nicolet himself designated the type.

At first Berlese contributed also a number of species to the genus, which are now regarded as representatives of the genera *Hermanniella, Nanhermannia,* and *Platynothrus.* The present conception of *Hermannia* is, however, already found in Berlese's later work (cf. Berlese, 1913a, p. 157). In my opinion the genus must be subdivided into a *gibba*-group (*Hermannia* s.str., species: *gibba, convexa*) and a *scabra*-group (new genus to be defined; species: *scabra, subglabra, reticulata*). A monograph of the family is, however, in course of preparation. For the moment Berlese's species are still classified with the genus *Hermannia.*

Hermannia gibba (C. L. Koch, 1839)

Nothrus gibbus C. L. Koch, 1839, fasc. 29 (4).
Angelia piceus, Berlese, 1885c, pp. 9, 10.
Nothrus piceus, Berlese, 1886a, fasc. 33 (6).
Hermannia picea, Berlese, 1896b, p. 31; 1913a, p. 157, prep. II-13.

Berlese contributed the species to the genera *Angelia, Nothrus,* and *Hermannia* successively. In the "Acari Myriapoda et Scorpiones" (1886a) he mentioned *Nothrus convexus* C. L. Koch and *Hermannia crassipes* Nicolet as synonyms. In fact *Nothrus piceus* C. L. Koch, and *Nothrus convexus* C. L. Koch are different species, whilst Berlese overlooked that the species described by him is identical with *Nothrus gibbus* C. L. Koch.

H. gibba is present in the Acarotheca italica, but appears to be absent from the Berlese Collection.

I remark that little has been published on the morphology of this common species, although it appears highly interesting; I refer to my future monograph.

Hermannia grandis Berlese, 1910

Hermannia grandis Berlese, 1910a, p. 380; Lombardini, 1936, p. 42.

Berlese described *H. grandis* after a nymph from Filettino (near Rome). According to the diagnosis the length of the specimen is 1.000 mm and the breadth 0.640. The type-slide (no. 103/13) is still present in the Collection, but it is in a bad condition and completely dark. The nymph is probably related to the nymph of *Hermannia convexa* (C. L. Koch, 1839).

Hermannia subglabra Berlese, 1910

Hermannia subglabra Berlese, 1910a, p. 381; Lombardini, 1936, p. 42; Forsslund, 1957, p. 592, fig. 4.
Hermannia pulchella Willmann, 1952, p. 172.

Forsslund (1957) stated already that *H. pulchella* Willmann (1952, p. 172) is a synonym of *H. subglabra*; Willmann (1952) created the name *pulchella*

because two species had been confounded under the name *H. scabra* (L. Koch).

The type of *subglabra* is still present in the Collection (no. 117/6); it originates from Kuhaarden (Germany).

Phyllhermannia Berlese, 1916

Phyllhermannia Berlese, 1916, p. 65.

Berlese created *Phyllhermannia* as a subgenus of *Hermannia,* with *Hermannia phyllophora* (Michael, 1908, p. 140, pl. XX figs. 17-23) from New Zealand as type. He did not give a diagnosis and probably he had not seen the type-species.

In the Michael Collection in the British Museum (Natural History) I found a specimen labelled as *Hermannia palmifer,* which is certainly the one described by Michael as *H. phyllophora*; it originates from the same locality (Ruahine Range, New Zealand). The slide is not suited for a detailed study, but I could observe that there are lanceolate hairs on the notogaster, which Michael overlooked. The specimen must, however, be remounted for further study. For the moment the systematic position of *Phyllhermannia phyllophora* remains therefore doubtful; it has a superficial resemblance to *Hermannia,* but in other characters it reminds of the higher Oribatei.

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