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The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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**APOLOPHORA** – ORIENTAL GENUS OF MESOPLOPHOROIDEA (ACARI, ORIBATIDA) *

BY Wojciech NIEDBAŁA **

(Accepted February 2000)

**SUMMARY:** Analysis of morphological features of a relatively large number of individuals from the genus *Apoplophora* has proved that certain features show individual variation and thus are systematically and diagnostically of little use. These features are: ornamentation of body, number of cilia on sensilli, number of aggenital and anal setae. On the other hand, the features of great taxonomic importance, showing little or so far unnoticed individual variation, include: shape of sensillus, length of exobothridial setae and shape of setae c3. Analysis of these features has led to the synonymy of six species, and the description of two new species. Hence, the number of known Oriental species of *Apoplophora* is nine; four of which are endemic, two of wider distribution in the Orient, and three are more widely distributed species, introduced to the south and eastern Palearctic, north Australia and western Pacific islands. A key to the species of *Apoplophora* is given.

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* This study was supported by the State Committee for Scientific Research – Grant No 6 PO4C 080 10
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INTRODUCTION

BERLESE (1913) described two species: *Mesoplophora discreta* and *Mesoplophora pantotrema* from Samarang, Java.

GRANDJEAN (1933) considered *M. pantotrema* as a tritonymph of *M. discreta*.

HAMMEN (1959) noted that *M. pantotrema* was represented by deutonymph, and *M. discreta* by an adult specimen, and mentioned that both specimens were collected originate from the same locality.

HAMMER (1979) presented a short description and a drawing of *M. pantotrema* on the basis of the specimen found in Java, and she described a new species, *M. rostrorugosa*.

The genus *Apoplophora* was proposed in 1980 by AoKi, with *Apoplophora remota*, newly described from Japan, as the type species. The diagnostic features of the genus were presented as follows: genital aperture opening anteriorly, genital plate triangular, anal plate with 4 setae, genital and anal apertures separated from each other by the length, or more than the length of anal aperture, ventral plate with 7 pairs of setae, exobothridial seta moderately long, longer than half the length of interlamellar seta. AoKi (1980) did not accept the opinion of GRANDJEAN (1933) and HAMMEN (1959) that *M. discreta* and *M. pantotrema* were synonyms.

NIEDBALA (1984) analysed the morphology of adults and tritonymphs of *Apoplophora pantotrema* (Berlese) and proposed distinction of the family Apoplophoridae comprising two genera: *Dudichoplophora* Mahunka and *Apoplophora*. In the same paper, the author synonymised *M. rostrorugosa* Hammer and *A. remota* AoKi with *A. pantotrema* (Berlese), hence *Mesoplophora pantotrema* Berlese 1913 became the type-species of *Apoplophora*.

On the basis of a cladistic analysis of Hypochthonioidea (sensu lato), NORTON (1984) concluded that the most evolutionary developed lineage were the sister genera: *Mesoplophora* Berlese, with one progressive and three regressive synapomorphies, and *Apoplophora*, with three progressive and one regressive synapomorphy. However, this author did not take into account the genus *Dudichoplophora*.

The cladistic analysis carried out by HAUMANN (1991) led him to the conclusion that from within the family Mesoplophoridae, the genus *Apoplophora* had undergone the strongest progressive evolution and developed the greatest number of autapomorphous features, i.e. greater than the sister genus *Mesoplophora*.

NIEDBALA (1993), when redescrating the Mesoplophoroidea from the BERLESE’s collection, found that *M. pantotrema* was represented only by deutonymphs and at least one of the type specimens of *M. discreta* was also deutonymph.


NIEDBALA (1998) described *A. solomonensis* from the Solomon Islands.

Prior to the current analysis, 16 species names and 13 valid species of *Apoplophora* were known.

MATERIALS AND METHODS

The material on which the analysis presented in the article has been made, includes species determined by the author, from collections of different museums and institutions. The largest part of the material were found in new localities in the Oriental region, also in the bordering zone of Oriental region to the Pacific islands. Particular specimens selected from samples were subjected to microscopic morphological analysis, identified or, when new, thoroughly described.

Another part of the material studied was based on literature data – species described by other authors, principally by MAHUNKA (1985-1991).

All measurements are in micrometers. The number of founded specimens is given in parentheses.

ANALYSIS OF MORPHOLOGICAL FEATURES

A few morphological features used to differentiate recently described species of *Apoplophora* were found.
to show individual variation. One such feature is body ornamentation by longitudinal lines or striae. In a few samples from the Oriental region (in localities specified below under A. pantotrema), I found individuals without or with poorly marked or with well marked ornamentation, which indicates strong individual variation for this feature. Nine “species” have at least the dorsal surface of the prodorsum ornamented by longitudinal lines or striae; these are: A. remota, A. rostrorugosa, A. striata, A. lineata, A. ornatissima, A. indica, A. marcuardi, A. malaya and A. cristata. Other morphological features that supposedly distinguish these species also show individual variation, or there are no such differences — in particular between A. striata and A. lineata.

There is also confusion about also the number of barbs on the sensilli. Their apparent number depends on the position of the specimen during the observation, the estimated number of barbs can be different when viewing the specimen in the dorsal aspect, from that seen in the lateral or ventral aspect. The estimation of barb number in holotype and paratypes of A. striata and A. cristata (MAHUNKA 1985, 1991 and Figs 17, 19, 21, 26, 28, 30, 34) is different. Probably the number of barbs of sensilli is variable.

The arrangement of “ventral” setae is also variable. One example is the different arrangement of these setae in the holotype and paratypes of A. jaccoidi (MAHUNKA 1991 Fig. 5) (Fig 35).

Another feature showing morphological variation is the number of aggenital setae: they can be either absent or occur as one or two pairs. In the same population of A. pantotrema from the sample collected in the Philippines I observed the presence of either 1 or 2 pairs of these setae; in A. heterotricha I noted one pair of genital setae in all 12 specimens from the sample collected in Meghalaya, India, and two pairs in all 10 specimens from the sample from West Bengal, India.

Probably in some figures of some authors the absence of genital setae is the result of omission (i.e. HAMMER 1979).

Individual variation was also observed in the number of anal setae. In the sample from Tawan, Sabah., 4 specimens had 4 pairs of anal setae and another 4 specimens had 3 pairs of anal setae. In the sample from Tawan, Sabah., 4 specimens had 4 pairs of anal setae and another 4 specimens had 3 pairs of anal setae.

Among the specimens of A. heterotricha I found: 4 pairs of anal setae in the specimen from Sabah, 3 pairs in the specimens from 4 samples collected in India (West Bengal and Meghalaya), 2 pairs of anal setae in the specimens from the sample from West Bengal, India, while in the same population from West Bengal, India (01.06.1979) half of the specimens have 2 pairs and the other half 3 pairs of anal setae.

The occasional observations I described above may be random variations. I am aware of the fact that assessment of the systematic worth of particular morphological features requires further study supported with statistical documentation and outgroup analysis.

The features of significant systematic and diagnostic worth seem to be: the shape of sensillus, the sensillus is barbed or not, the length of exobothrial setae, e.g. whether they are longer or shorter than interlamellar setae, the shape of c₁ setae, and whether they are smooth or barbed, the place of c₂ setae, anteriorly or posteriorly of the places of c₁ and c₂ setae, the shape of a₃ setae, whether they are smooth or rough, barbed, the place of a₃ setae, situated near antiaxial border of anal plate or not.

**DESCRIPTIONS AND DIAGNOSES OF SPECIES OF APOPLOPHORA**

*Apoplophora cristata* Mahunka, 1991

(Figs 1, 2)

**MATERIAL EXAMINED:** a paratype in alcohol labelled: “Apoplophora cristata sp. n. Malaisie 1977 i 74 leg T. JACCOUD det MAHUNKA” (courtesy Dr. S. MAHUNKA, Természettudományi Múzeum Allattára, Budapest).

**MEASUREMENTS OF PARATYPE:** prodorsum: length 238, width 164, height 116, sensillus 121, setae: interlamellar 48,1, lamellar 93,6, rostral 104, exobothri-
1. — prodorsum and anterior part of notogaster, lateral view. 2. — ventral aspect.

3. — prodorsum and anterior part of notogaster, lateral view. 4. — ventral aspect. 5. — specimen from India, prodorsum, dorsal view. 6. — specimen from India, ventral aspect.
dial 43.0; notogaster: length 296, width 243, height 210, seta c1 30.4; anal plate 70.8x37.9.

**Diagnosis.** Surface of prodorsum ornamented by longitudinal striae and lateral margin of notogaster serrate medially. Prodorsum with strong lateral carinae; sensilli with 33-40 comparatively long branches; setae covered with dense barbs, ro > le > in > ex. Notogaster with thick setae, densely ciliate, setae c2 more remote from anterior border than setae c1 and c3. Ventral region with 6 pairs of ventral setae; 6 pairs of genital setae; 2 pairs of smooth, long aggenital setae and 4 pairs barbed anal setae present.


**Distribution.** Malaysia, probably endemic species.

**Remark.** I am not fully convinced whether this species can be separated from *A. pantotrema*, as, apart from the presence of lateral carinae of prodorsum all the other morphological features of these two species are the same.

*Apoplophora heterotricha* Mahunka, 1987

(Figs 3-6)

**Material examined:** a paratype in alcohol labeled: "*Apoplophora heterotricha* sp. n. Sab-82/41 Borneo, Sabah leg. B. Hauser, det. S. Mahunka" (courtesy Dr. S. Mahunka, Természettudományi Múzeum Allattára, Budapest).

**Measurements of paratype:** prodorsum: length 220, width 147, height 93.6, sensillus 116, setae: interlamellar and exobothridial 60.7, lamellar 73.4, rostral 70.8; notogaster: length 281, width 215, height 169, seta c1 55.7; anal plate 65.8x35.4. Measurements of specimen from India (Meghalaya, Umran): prodorsum: length 263, width 156, height 116, sensillus 111, setae: interlamellar 75.9, lamellar 86.0, rostral 91.1, exobothridial 78.4; notogaster: length 358, width 288, height 268, setae c1 81.0, d1 and e6 86.0; genital plate 86x53.1, anal plate 86x43. Measurements of specimen from Nepal: prodorsum: length 278, width 212, height 151, sensillus 146, setae: interlamellar 85.9, lamellar 111, rostral 95.9, exobothridial 75.7; notogaster: length 409, width 308, height 288, setae: c1 93.6, c5 53.1, d2 116, genital plate 45.5x50.6, anal plate 83.5x45.5.

**Additional description.** Body chagrin, with irregular patterns within the cuticle.

Prodorsum with weak lateral carinae present. Sensilli covered with 15 or much more barbs, longer in distal part of sensilli than in proximal part. Setae strong covered with short barbs, ro and le > ex and in.

Notogaster with 8 pairs of setae strong, similar to prodorsal setae, except setae c3, smooth, thin and short located posteriorly of c1 and c2 setae.

Ventral region with 6 pairs of ventral setae covered with small barbs. 6 pairs of genital setae, 1 or 2 pairs of smooth aggenital setae. 2, 3 or 4 pairs of anal setae covered with thin barbs.

**Remark.** This species is easily distinguished from the congeneric species by the long exobothridial setae, longer than interlamellar setae, short and smooth c3 setae and smooth aggenital setae.

Localities in border zone of Oriental region and in Oriental region: North India, Uttar Pradesh, Kumaon, Mainitul Mallital (1940 m), in jungle litter, 15.IV.1979, leg. P.T. LEHTINEN — (1).


India, West Bengal, Darjeeling, Tiger Hill (2000 m), in litter of cloud forest, 29.IV.1979, leg. P.T. LEHTINEN — (5); West Bengal, Darjeeling, Tiger Hill, 2600 m, in litter of cloud forest, 29.IV.1979, leg. P.T. LEHTINEN — (1); India, Meghalaya, East Khasi Hills, Umran 1100 m, jungle litter, 4.V.1979, leg. P.T. LEHTINEN — (12); Meghalaya, East Khasi Hills, Shillong, Mawlai 1500 m, pine litter, 4.V.1979, leg. P.T. LEHTINEN — (4); Meghalaya, East Khasi Hills, Mawphlohg Law-Lyndoh, in jungle litter, 5.V.1979, leg. P.T. LEHTINEN — (4); India, West Bengal, Darjeeling, Bhanjan Road 4 km W Od Ghoom, at 2300 m, litter in cloud forest, 1.V.1979, leg. P.T. LEHTINEN — (3); West Bengal, Darjeeling 12 km NW of Sukhiapokri, at 2350 m, in cloud forest with stones, 1.V.1979, leg. P.T.

1. This is not a "notogaster" in the true sense, since it only represents segments C, D, E.
LEHTINEN – (10); West Bengal, Darjeeling, Bhanjan Road 4 km W od Ghoom, at 2300 m, litter in cloud forest, 1.V.1979, leg. P.T. LEHTINEN – (4).

Malaysia, Sabah -10 specimens from 2 localities (Mahunka 1987); Malaysia, Sabah, Tawau district, Bal Estate, Tiger Hill, jungle litter, 2.XI.1979, leg. P.T. LEHTINEN – (1).

Indonesia, Kalimantan, Timur, Samarinda district, Samarinda Ulu, Lac Bahu, rain forest, 27.X.1979, leg. P.T. LEHTINEN- (3).

DISTRIBUTION. Oriental species apparently introduced to the southern Palearctic.

_Apoplophora malaya_ Mahunka, 1991
(Figs 7-9)


MEASUREMENTS OF PARATYPE: prodorsum: length 338, width 227, height 141, sensillus 151, setae: interlamellar and rostral 116, lamellar 131, exobothridial 80,8; notogaster: length 454, width 358, height 308, seta c_1 _126; anal plate 101x50.5. Measurements of specimen from sample from Malaysia, Jahor: prodorsum: length 308, width 212, height 151, sensillus 136, setae: interlamellar and lamellar 106, rostral 90,9, exobothridial 70,7; notogaster: length 358, width 308, height 293, setae: c_1 , d_1 , c_1 , 90,9, c_1/c_1-d_1 = 0,75; genital plate 88,5x90,9, anal plate 81,0x48,1.

DIAGNOSIS. Surface of prodorsum ornamented by longitudinal striation, lateral part and surface of notogaster are smooth. Prodorsum with one pair of lateral carinae; sensilli covered with 11-13 barbs, setae covered with dense barbs, in = 1c > ro > ex. Notogaster with 8 pairs of setae, all setae, except smaller and smooth setae c_3 , long and with dense barbs. Ventral region with 6 pairs of barbed ventral setae; 6 pairs of genital setae and 2 pairs of aggenital setae present, anterior pair short and smooth, posterior pair longer and rough; 4 pairs of anal setae present, setae an_3 situated outside of row of anal setae, near antiaxial border of the plates.

REMARK. This species is distinguishable from _A. pantotrema_ by smooth setae c_3 of notogaster, smooth anterior aggenital setae and location of setae an_3 outside of row of anal setae, near the antiaxial border of anal plates.


DISTRIBUTION. Malaysia, probably endemic species.

_Apoplophora marcuardi_ Mahunka, 1991
_Apoplophora triseta_ Mahunka, 1991 syn. nov.
(Figs 10-12)


MEASUREMENTS OF PARATYPE of _A. triseta_: prodorsum: length 212, width 146, height 101, sensillus 101, setae: interlamellar 55,7, lamellar 68,3, rostral 70,8; notogaster: length 278, width 222, height 172, seta c_1 55,6; anal plate 65,8x37,9.

DIAGNOSIS. Surface of body striated or serrate. Prodorsum with sensilli covered with 33-40 short barbs; setae, except exobothridial setae finer than others, strong, thick, densely barbed. Surface of notogaster covered with spines, setae densely barbed, setae c_2 more remote from anterior margin than setae c_1 and c_3 . Ventral region with 6 pairs of ventral setae densely barbed; 6 pairs of genital setae, 2 pairs of aggenital setae, anterior pair is smooth and posterior pair is rough or barbed; 4 pairs of densely barbed anal setae present.


REMARKS. _A. triseta_ seems to be a synonym of _A. marcuardi_ because it differs from the latter only by

Fig. 10: *Apoplophora marcuardi* Mahunka, 1991 — lateral aspect of body, (after Mahunka 1991).

11. — prodorsum and anterior part of notogaster, lateral view. 12. — ventral aspect.
Figs. 13–16: *Apoplophora ornata* sp. nov., holotype.

17. – prodorsum and anterior part of notogaster, lateral view. 18. – ventral aspect.
features subject to individual variation, i.e. a smooth surface of body and the presence of 3 pairs of anal setae.

I question whether to synonymize this species with *A. pantotrema*. The only important morphological feature distinguishing these two species is the presence of the barbed posterior aggenital setae.

**Aplophora ornata** sp. nov. (Figs 13-16)

**Measurements of Holotype:** prodorsum: length 253, width 190, height 111, sensillus 68,3, setae: interlamellar 35,4, lamellar 32,9, rostral 30,4, exobothridial 7,5; notogaster: length 353, width 154, height 230, seta c1 43,0; genital plate 58,2x60,7, anal plate 91,1x37,9.

**Description.** Colour yellow, prodorsum chagrin, covered by irregular patterns, surface of notogaster and ventral region reticulate.

Prodorsum with sensilli covered with short barbs. Setae short, smooth, in > le > ro > ex, exobothridial setae smaller than diameter of bothridia.

Notogaster with short, pectinate setae, setae of row c remote from anterior border, setae c2-3 more than setae c1.

Ventral region with 6 pairs short, pectinate setae. 6 pairs of genital setae. One pair of pectinate anal setae. 4 pairs of pectinate anal setae present.


**Etymology.** The name of new species *ornata* is Latin for “ornament” and alludes to the reticulated ornamentation of surface of notogaster and ventral region.

**Remark.** The new species is similar to *A. spinosa* Mahunka, 1987 from Sabah, and is distinguishable by the smooth prodorsal setae, one pair of pectinate aggenital setae and reticulate surface of notogaster and ventral region.

**Distribution.** Borneo, perhaps endemic species.

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*Apoplophora pantotrema* (Berlese, 1913) (Figs 17-35)


**Material Examined:** the paratypes in alcohol labelled: “*Mesoplophora indica* sp. n. Ind.72/18 leg C. BESUCHET and I. LÖBL det MAHUNKA”, “*Mesoplophora striata* sp. n. Ind 72/18 leg C. BESUCHET and I. LÖBL det.MAHUNKA”, “*Aplophora lineata* sp. n. Sab-82/15 Borneo, Sabah leg. B. HAUSER det. S. MAHUNKA”, “*Aplophora ornatissima* sp. n. Pal83/8 Borneo, Sabah, leg.B. HAUSER det. S. MAHUNKA”, “*Aplophora jaccoudi* sp. n. Malaisie 1977 i 74 leg. T. JACCoud det. MAHUNKA” (courtesy Dr. S. MAHUNKA, Természettudományi Múzeum Allattara, Budapest).

**Measurements:** A paratype of *M. indica*: prodorsum: length 227, width 162, height 101, sensillus 124, setae: interlamellar 181, lamellar 98,7, exobothridial 86,0; notogaster: length 328, width 237, height 197, seta c1 75,9; anal plate 75,7x40,4. A paratype of *M. striata*: prodorsum: length 343, width 252, height 177, sensillus 137, setae: interlamellar 126, lamellar 134, rostral 121, exobothridial 75,9; notogaster: length 470, width 353, height 308, seta c1 96,1; anal plate 116x60,6. A paratype of *A. lineata*: prodorsum: length: 378, width 283, height 182, sensillus 121, setae: interlamellar 147, lamellar 134, rostral 121, exobothridial 88,5; notogaster: length 505, width 404, height 399, seta c1 131; anal plate 151x70,7. A paratype of *A. ornatissima*: prodorsum: length 328, width 232, height 278, sensillus 157, setae: interlamellar 96,1, lamellar 106, rostral 75,9, exobothridial 55,7; notogaster: length 404, width 333, height 303, seta c1 50,6; anal plate 101x53. A paratype of *A. jaccoudi*: prodorsum: length 252, width 182, height 116, sensillus 126, setae: interlamellar 81,0, lamellar
19. — prodorsum and anterior part of notogaster, lateral view. 20. — ventral aspect.

FIGS. 21-25: *Apoplophora pantotrema* (Berlese, 1913), specimen from Sumatra.
and rostral 93,6, exobothridial 58,2; notogaster: length 374, width 273, height 252, seta c1 81,0; anal plate 85,8x40,4. One specimen approaching to a “form” of “striata” from Sumatra: prodorsum: length 252, width 182, height 111, sensillus 152, setae: in 93,6, le and ro 101, ex 63,2; notogaster: length 338, width 263, height 217, setae c1,1, c1/c1-d1 = 0,97, d1 83,5, c1 126; genital plate 53,1x40,5, anal plate 78,4x43. One specimen approaching to a “form” of “ornatissima” from Sabah: prodorsum: length 454, width 323, height 202, sensillus192, setae: interlamellar 197, lamellar and rostral 187, exobothridial 126; notogaster: length 602, width 488, height 406, setae c1,1 192, d2 227. One specimen approaching to a “form” of “ornatissima” from Jahor (Malaysia): prodorsum: length 243, width 177, height 104, sensillus 104, setae: interlamellar 70,8, lamellar 68,3, rostral 75,9, exobothridial 45,5; notogaster: length 308, width 273, height 202, setae: c1 65,8, d1 68,3, e1 75,9, c1/c1-d1 =0,79; genital plates 50,6x53,1, anal plates 65,8x35,4.

**Figs. 26-27:** *Apoplophora lineata* Mahunka, 1987, paratype - synonym of *Apoplophora pantotrema* (Berlese, 1913).
26. — prodorsum and anterior part of notogaster; lateral view. 27. - ventral aspect.

**Figs. 28-29:** *Apoplophora ornatissima* Mahunka, 1988, paratype - synonym of *Apoplophora pantotrema* (Berlese, 1913).
28. — prodorsum and anterior part of notogaster; lateral view. 29. - ventral aspect.
Figs. 30-33: *Apophlophora pantotrema* (Berlese, 1913), specimen from Borneo.
30. — prodorsum, lateral view. 31. — prodorsum, dorsal view. 32. — notogaster, lateral view. 33. — genital plate.

Figs. 34-35: *Apophlophora jaccoudi* Mahunka, 1991, paratype — synonym of *Apophlophora pantotrema* (Berlese, 1913),
34. — prodorsum and anterior part of notogaster, lateral view. 35. — ventral aspect.
DIAGNOSIS. All setae of body except genital and aggenital setae are long end densely covered with small setae. Prodorsum with sensilli longer than setae, densely covered with small setae; exobothridial setae long, several times longer than diameter of bothridia. Notogaster with setae 

sub M. indica: India, Kerala — (33) (MAHUNKA 1985).


sub A. ornatissima: Sabah — (15) (MAHUNKA 1986).

sub A. pantotrema: Indonesia, Bali -4 specimens from 3 localities (HAMMER 1982).

Philippines -7 specimens from 7 localities (CORPUZ-RAROS 1979).

India — (2) (NIEDBALA 1984).

Java — (1) (NIEDBALA 1984).


sub A. remota: Japan — (5) (Aoki 1980).

Thailand — (24) (Aoki 1965),

sub M. rostrorugosa and M. pantotrema: Indonesia, Java -26 specimens from 3 localities (Hammer 1979).
sub A. striata: India, Kerala — (26) (Mahunka 1985).

New localities in Oriental region:

India, Nandi Hills, ca 400 km N from Bangalore, mixed, thick, moist deciduous litter, at 1400 m, 2.VIII.1986, leg. V. Behan — (17); Nandi Hills, ca 400 km N from Bangalore, mixed moss from tree trunks, at 1400 m, 2.VIII.1986, leg. V. Behan — (1); Nandi Hills, ca 400 km N from Bangalore, Liverworts, lichens and mosses on bank, at 1400 m, 2.VIII.1986, leg. V. Behan — (8); Nandi Hills, ca 400 km N from Bangalore, Ficus litter, at.

India, Mt. Hagen, near Ketanga village, litter of mixed moss above Ambunti (NIEDBALA 1984).

Sulawesi, Tarn Dao Nat. Park, tropical forest, 400 km N from Bangalore, mixed moss from tree, at.

Vietnam, Tarn Dao Nat. Park, tropical forest, alt.

Thailand, Chiangmai Pr., Doi Suthep, jungle, 14.XI.1976, leg. P.H. LEHTINEN — (2); Thailand, Malaya Peninsula, Sungai, Buloh Selangor soil from forest floor, 15.III.1962, leg. NANDCHOTRAM — (1).

Vietnam, Dalat, 320 km N from HoChiMinh, moist mixed litter in old tropical forest, at 1500 m, 11.XI.1985, Leg. M. ZACHARDA — (3); Dalat, 320 km N from HoChiMinh, moist mixed litter in old tropical forest, at 1500 m, 11.XI.1985, Leg. M. ZACHARDA — (3); Vietnam, Tam Dao Nat. Park, tropical forest, 11 X 1996, leg. W. JĘDRYCKOWSKI — (3); Tam Dao Nat. Park, tropical forest, alt. 900 m, 2 X 1996, leg. W. JĘDRYCKOWSKI — (1).


Thailand, Chiangmai Pr., Doi Suthep, jungle, 14.XI.1976, leg. P.H. LEHTINEN — (2); Thailand, Malaya Peninsula, Sungai, Buloh Selangor soil from forest floor, 15.III.1962, leg. NANDCHOTRAM — (1).

Vietnam, Dalat, 320 km N from HoChiMinh, moist mixed litter in old tropical forest, at 1500 m, 11.XI.1985, Leg. M. ZACHARDA — (3); Dalat, 320 km N from HoChiMinh, moist mixed litter in old tropical forest, at 1500 m, 11.XI.1985, Leg. M. ZACHARDA — (3); Vietnam, Tam Dao Nat. Park, tropical forest, 11 X 1996, leg. W. JĘDRYCKOWSKI — (3); Tam Dao Nat. Park, tropical forest, alt. 900 m, 2 X 1996, leg. W. JĘDRYCKOWSKI — (1).


Indonesia, Sumatra, Utara Simalungun, Simarpalatuk Bangun Dolok, 1500 m, jungle litter, 23.IX.1978, leg. P.T. LEHTINEN — (1); Indonesia, Sumatra, Barat Dist., Padangpanjang 4 km SE, jungle slope, 26.IX.1978, leg. P.T. LEHTINEN — (13); Sumatra Barat Dist., Padangpanjang, Gunung Singgalang, 2500 m, cloud forest (TF), 27.IX.1978, leg. P.T. LEHTINEN — (2); Indonesia, Sumatra 655 — (2); Indonesia, Borneo, Roy Soc. N. Borneo exped. 1964, leg. G.P. ASKev B124 — (2); Indonesia, Sarawak. Mulu, Lowl rain forest path, 3.X.1977, leg. B. BOLTON — (1); Sabah Mt. Kinabalu N.P., below Layang Layang, at 2590 m, 1.V.1987, leg. A. SMETANA — (18); Indonesia, Kalimantan, Timur, Samarinda district, Sanga Sanga, Muara, jungle litter, 29.X.1979, leg. P.T. LEHTINEN — (4); Indonesia, Cibodas, volcano, 2000 m, tropical forest, 23.VIII.1979, leg. J. BLOSZYK — (1); Indonesia, Java, Timur Fudjon Cuban Rondo, 28.X.1984, leg. P.T. LEHTINEN — (14); Java, Barat, Bongor district Campos Gunung Cipodas, dry grassy mountain slope, 7.X.1979, leg. P.T. LEHTINEN — (1); Java, Timur, Gubuh Klakah, litter of mountain forest, 29.X.1984, leg. P.T. LEHTINEN — (3); Java, Mt. Pangrango Gunung, alt. 2000 m, litter in tropical forest, 23.VIII.1979, leg. J. BLOSZYK and J. MICHEJDA — (1); Indonesia, Sulawesi, Utara, Minahassa, Tonsea district Airmadidi, in garden, 22.X.1979, leg. P.T. LEHTINEN — (2); Sulawesi, Utara, Minahassa, Tonsea district Gunung Klubat, at 1000 m, jungle litter, 21.X.1979, leg. P.T. LEHTINEN — (10); Sulawesi 1954, Celebes Klubat, leg. A.H.G. ALSKON — (1); Sulawesi Forest Ternate, 5.VIII.1954, leg. A.H.G. ALSKON — (2); Sulawesi, Tomohon, 5.VIII.1954, leg. A.H.G. ALSKON — (9).

New localities in Australian region: Papua New Guinea, 35 km NE of Port Moresby, litter under trees of plantation of rubber trees, dry place, 1 IX 1979, leg. J. BLOSZYK and J. MICHEJDA — (2); 40 km NE of Port Moresby, litter in mixed forest above stream, 1 IX 1979, leg. J. BLOSZYK — (8); Hummock above Ambunti City, litter under pineapples, 22 IX 1979, leg. J. BLOSZYK — (2); Mt. Hagen, near Kedanga village, litter under Notophagus sp., 16 IX 1979, leg. J. BLOSZYK and J. MICHEJDA — (2); W of Tagoba, at 2400 m, litter in mountain forest, 3 IX 1979, leg. J. BLOSZYK — (2); W of Tagoba, at 2100 m, litter in mountain forest, 3 IX 1979, leg. J. BLOSZYK — (1); Mt. Hagen, at upper limit of forest, at 3100 m, litter, 5 IX 1979, leg. J. MICHEJDA — (1); 30 km E of Port Moresby, at 400 m, at the start of the “Kokoda Trail”, bushes above river, litter among herbs and ferns, 1 IX 1979, leg. J. BLOSZYK — (2); Hummock above Ambunti City, under bamboos, 22 IX 1979, leg. J. BLOSZYK — (4); Mt. Wilhelm, at 2930 m, dry litter in leafy forest, 10 IX 1979, leg. J. BLOSZYK — (1) (NIEHBALE 1984).
Australia, Cairns, litter of bushes above stream, 28 VIII 1979, leg. J. BLOSYJK – (2); Cairns, litter among herbs near road, very dry place, 28 VIII 1979, leg. J. BLOSYJK – (1) (NIEDBAŁA 1984); Cairns, S of ville, in forest, 28 VIII 1979, leg. J. BLOSYJK – (2); QLD W of Mc Namee CK, 600 m, 17° 40′ S, 145° 48′ E, rainforest, 6 VII 1971, leg. R.W. TAYLOR, Feehan – (24); QLD Seymour Range, 50 m, 17° 26′ S, 146° 00′ E, rainforest, 6 VII 1971, leg. R.W. TAYLOR, Feehan – (27); QLD 6 km W of Paluma, 19° 00′ S 146° 12′ E, at 950 m, rainforest, 4 XI 1970, leg. R.W. TAYLOR, Feehan – (5); QLD Crawford’s Lookout, 320 m, 17° 37′ S, 145° 48′ E, rainforest, 5 VII 1971, leg. R.W. TAYLOR, Feehan – (27); QLD, Eachan Nat. Park, 17° 18′ S, 145° 37′ E, rainforest, at 760 m, 6 VII 1971, leg. R.W. TAYLOR – (8); QLD Me Namee CK, 300 m, 17° 31′ S, 145° 37′ E, rainforest, 6 VII 1971, leg. R.W. TAYLOR, Feehan – (2); QLD Mc Namee CK, 600 m, 17° 40′ S, 145° 48′ E, rainforest, 6 VII 1971, leg. R.W. TAYLOR, Feehan – (6); QLD W of Mc Namee CK, 600 m, 17° 40′ S, 145° 48′ E, rainforest, 6 VII 1971, leg. R.W. TAYLOR, Feehan – (11); Queensland, southern part of Cape Tribulation, N. Cairns, rain forest, soil and litter, July 1992, leg. R. SCHUSTER – (9); ca 200 m far from Cape tribulation, the same forest and date – (2); Queensland, near Ellis Beach, N. Cairns, forest with high humidity, transitional zone to the rain forest, soil and litter, July 1992, leg. R. SCHUSTER — (30).

DISTRIBUTION. Oriental species introduced to Palearctic (Japan), Australian (Papua-New Guinea and Queensland) and the west Pacific islands (Solomon and Fiji) regions.

REMARKS. A. pantotrema is probably currently undergoing strong speciation, mainly in the Oriental region. This is supported by the fact of recent descriptions of many species by MAHUNKA, which either did not show morphological differences from A. pantotrema, differed from the latter by certain morphological features subject to individual variation, or showed significant differences from A. pantotrema but only in single features. Only the latter group can be considered as different species, the other can be only forms within the species A. pantotrema.

As noted in the Introduction, the following ‘species’: A. remota, A. rostrorugosa, A. ornatissima, A. indica, and similarly A. striata, A. lineata are characterised by the dorsal surface of the prodorsum ornamented by longitudinal lines or striae; there are no other morphological differences among them.

A. jaccoudi differs from A. pantotrema only by the presence of 2 pairs of aggenital setae, which is a feature subject to individual variation.

In a specimens of A. ornatissima from Sabah, notable feature is that anterior pair of ventral setae is situated near genital plates. However, the specimens found in Borneo and Jahor did not have the pair of setae shifted as much anteriorly. Moreover, M. indica and A. jaccoudi did not differ from A. pantotrema by any morphological features other than the presence of 2 pairs of aggenital setae, which is a feature subject to individual variation.

Aplophora phalerata sp. nov.

(Figs 36-42)

MEASUREMENTS OF HOLOTYPE: prodorsum: length 379, width 247, height 156, sensillus 142, setae: interlamellar 114, lamellar 147, rostral 157, exobothridial 134; notogaster: length 495, width 384, height 338, setae: c_1 121, e_1 157, anal plate 111x55.7. Measurements of specimen from Sumatra: prodorsum: length 348, width 247, height 151, sensillus 157, setae: interlamellar 114, lamellar 147, rostral 157, exobothridial 96.1; notogaster: length 470, width 394, height 298, setae c_1 121, d_1 147, e_1 172, c_1/c_1-d_1 = 1.0; anal plate 111x58.2.

DESCRIPTION. Colour brown, surface of body granulate.

Prodorsum with pointed rostrum, better developed in specimens from Sumatra. Sensilli covered with 15 (holotype) or 23 (specimen from Sumatra) barbs. Setae thick, rostral setae the thickest and the longest, all setae densely barbed, le > in >ex.

Notogaster with long setae densely covered with barbs, setae c_2 more remote from anterior margin than setae c_1 and c_3.
FIGS. 36-42: Apoplophora phalerata sp. nov.

Ventral region with 6 pairs of densely barbed ventral setae, 6 pairs of genital setae, 2 pairs of aggenital setae long and barbed, more so in holotype than in specimen from Sumatra. 4 pairs of barbed anal setae present.

HOLOTYPE (in Department of Animal Taxonomy and Ecology): India, Tamil Nadu Nilgiri Poddabeta, 2700 m, on bush, 22.IV.1979, leg. P.T. LEHTINEN.

ETYMOLOGY. The specific epithet phalerata is Latin for “adorned” and alludes to the appearance of body setae.

REMARK. The new species is easily distinguishable from A. pantotrema and other congeneric species by the presence of 2 pairs of long and barbed aggenital setae and the thick and the long rostral setae between the prodorsal setae.


DIAGNOSIS. Small, grey-yellow species. Sensilli covered with dense barbs; setae short and barbed, exobothridial setae smallest, slightly longer than diameter of bothridia. Notogaster with 8 pairs of short (c1/c2-d1), pectinate setae, setae of row c remote from anterior border, setae c1 more than setae c1-2. Ventral region with 6 pairs of short and pectinate ventral setae; 6 pairs of genital setae, 2 pairs of minute, smooth aggenital setae and 4 pairs of barbed anal setae present.

Localities in Oriental region: Malaysia, Sabah, Sepilok — (3) (Mahunka 1987); Sabah, Tawau district, Bal Estate, Tiger Hill, 2.XI.1979, leg. P.T. LEHTINEN – (1); Indonesia, Borneo, Roy Soc. N. Borneo expd. 1964, leg. G.P. ASKEV B124 – (3).

DIAGNOSIS. Oriental species.

Apoplophora spinosa Mahunka, 1987
(Figs 47, 48)


MEASUREMENTS OF PARATYPE: prodorsum: length 217, width 167, height 98.7, sensillus 83.5, setae: interlamellar and lamellar 32.9, rostral 40.5, exobothridial 15.2; notogaster: length 281, width 271, height 177, seta c1 35.4; anal plate 70.8 x 31.6. Measurements of specimen from sample from Sabah (Tawau district): prodorsum: length 197, height 96.1, sensillus 83.5, setae: interlamellar, lamellar and rostral 20.2, exobothridial 7.6; notogaster: length 255, height 169, seta c1 35.4, d1 37.9, e1 45.5.

DIAGNOSIS. Small, grey-yellow species. Sensilli covered with dense barbs; setae short and barbed, exobothridial setae smallest, slightly longer than diameter of bothridia. Notogaster with 8 pairs of short (c1/c2-d1), pectinate setae, setae of row c remote from anterior border, setae c1 more than setae c1-2. Ventral region with 6 pairs of short and pectinate ventral setae; 6 pairs of genital setae, 2 pairs of minute, smooth aggenital setae and 4 pairs of barbed anal setae present.


DIAGNOSIS. Oriental species.

DISTRIBUTION OF SPECIES OF APOPLOPHORA

Apoplophora is a typical Oriental genus with species reported from India, Sri Lanka, Thailand, Vietnam, Malaysia, Indonesia and Philippines. Four species are endemic (A. cristata, A. malaya, A.
43. — prodorsum, lateral view. 44. — prodorsum, dorsal view. 45. — notogaster, lateral view. 46. — ventral aspect.

Figs. 47-48: *Apoplophora spinosa* Mahunka, 1987, paratype,
47. — prodorsum and anterior part of notogaster, lateral view. 48. — ventral aspect.
Two species are of wider Oriental distribution (A. phalerata, A. spinosa). Only a few species spread towards the Australian region (Papua-New Guinea and Queensland), Pacific islands (Solomon and Fiji) and the bordering zone of the Palearctic (North India, Nepal, Japan). A. heterotricha spread towards the southern Palearctic, A. solomonensis to the Pacific islands, and the most mobile species — A. pantotrema, to all the above bordering zones of the Oriental region. None of the Apoplophora species reaches the Ethiopian region.

**KEY TO SPECIES OF Apoplophora**

1. Surface of notogaster and ventral region reticulate .............................................. ornata
2. Surface of body not reticulate ........................................................................... 2
3. Lateral carinae of prodorsum present ................................................................. 3
4. Lateral carinae of prodorsum absent .................................................................. 4
5. Setae with short barbs with length about the width of setae, setae ag shorter than half the length of ag2, .............................................................. malaya
6. Setae with long barbs, longer than the width of setae, setae ag, almost the same length as ag2, setae ................................................................. cristata
7. Setae short, distance between prodorsal setae always greater than the length of setae ................. spinosa
8. Setae long, distance between prodorsal setae smaller than the length of setae .......... ... 5
9. Rostral prodorsal setae of the same width ................................................................ 6
10. Setae c3 fine, smooth and shorter than other setae ............................................. phalerata
11. Setae c3, covered with barbs and not shorter than other setae ......................... heterotricha
12. Setae ag2 covered with barbs and not shorter than other setae ......................... 8
13. Setae ag2 covered with barbs, ................................................................. marcuardi
14. Setae ag2 smooth, ........................................................................ pantotrema

(MAHUNKA (S.), 1987) in the key for determination included M. leviesa Hammer, 1979 in genus Apoplophora. In reality this species belongs to another genus — Mesoplophora (Palpiophora).

**ACKNOWLEDGEMENTS**

I am grateful to Dr. V. BEHAN-PELLETIER and Dr. R.A. NORTON for their constructive comments and linguistic correction. I wish to express my thanks to investigators who have helped me to obtain the material of Apoplophora from different localities.