A new Paoliella (Homoptera, Aphididae) from Africa, with keys to species of Paoliella Theobald, 1928

by

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Abstract. *Paoliella eastopi* spec. nov. from *Commiphora zimmermanni*, Kenya, is described. Keys to the apterae and alatae of the known *Paoliella* species are added. A possible division of *Paoliella* Theobald, 1928, into a main genus and a subgenus *Unipterus* Hall, 1932, pending the discovery of alate *Paoliella hystrix* Theobald, 1928 is discussed.

Paoliella eastopi spec. nov.

Apterous viviparous female

Colour in life not known. In mounted specimens head, especially on frontal part, dark, and the pro- and mesothoracic pleura dusky; rest of body colourless; middle and hind femora conspicuously black, fore femora much paler, like the basal antennal segments as dark as the head. Body about 0.095—1.35 mm long, rather slenderly oval. Dorsal processes colourless and spinulose, nearly all very markedly pedunculate so that near base many are $^5/_9$—$^2/_3$ times as wide as near the top, rounded; pleural processes only present in anterior row on mesonotum, absent on all other tergites; frontal processes nearly cylindrical, hardly waisted, about 0.026 mm long, the blunt hair on top 0.005 mm long; spinal processes on abdominal tergite III about 0.050 mm long, at the waist 0.025 mm across, in the knob 0.040 mm wide, the abruptly blunt hair on top about 0.003 mm long; processes caudad of siphunculi taller, to 0.065 mm and more slender, those on tergite VII near apex only 0.020—0.026 mm wide; spinal ones on tergite VIII quite short and conical; marginal processes similar to spinal ones, those on tergite VI suddenly much more slender, those on tergite VII very small, conical, or absent. Antennae about $^3/_5$ of length of body, pale, with basal segments and segment VI as dark as the head; segment III without rhinaria, with transverse rows of rather widely spaced spinules and 3—5 short, normal hairs of about 0.006 mm long; processus terminalis in measurements given from distal rim of accessory rhinaria. Eyes with many facets, the triommatidion more or less free from the compound eye. Rostrum reaching past middle coxae; last segment about 0.070 mm long, $^3/_4$ of second joint of hind tarsi, with 2 hairs besides the 3 subapical pairs. Fore coxae and femora conspicuously paler than middle and hind coxae and femora, but all trochanters quite pale; femora of all legs equally thick; femoral hairs like antennal hairs; tibiae without sensoria or pseudosensoria, pale with dusky apices; first tarsal joints with 7, 7, 7 long (to 0.039 mm) hairs ventrally and one hair of 0.013 mm dorsally; second joint also ventrally with long hairs, dorsally with short hairs, with a few spinules, not imbricated; empodial hairs extending beyond claws, in dorsal view setaceous with a tiny triangular tip. Siphunculi quite pale, more or less tapering, smooth, rimless, with a small, blunt hair on anterior surface.

Cauda dusky, from a broad (0.085 mm) base very strongly constricted to 0.018—0.022 mm, from there gradually widening to a knob of, e.g., 0.048 × 0.052 mm, i.e., slightly longer than wide, with 8 hairs. Anal plate bipartite with a curious dark sclerotic suture.

Measurements in mm.

No.	Length body	Ant.	Ant. segments III	IV	V	VI	Siph.	Cau.
1	1.23	0.69	0,21	0.12	0.12	0.09 + 0.05	0.03	0.10
2	1.05	0.64	0.19	0.10	0.12	0.10 + 0.04	0.03	0.09
3	1.32	0.75	0.23	0.13	0.12	0.11 + 0.05	0.03	0.10
4	1.31	0.75	0.23	0.13	0.12	0.09 + 0.06	0.03	0.11
5	1.12	0.68	0.19	0.11	0.12	0.11 + 0.06	0.03	0.12
6	1.13	0.69	0.20	0.13	0.11	0.09 + 0.06	0.03	0.11
7	1.13	0.78	0.24	0.14	0.13	0.11 + 0.05	0.03	0.11
8	1.15	0.74	0.23	0.13	0.11	0.11 + 0.06	0.03	0.10

(All from *Commiphora zimmermanni*, Nairobi, Kenya, leg. W. Bakker; 1—3, 26.I.1968, Bakker no. 13; 4, 29.V.1968, Bakker no. 21; 5—6, 22.VI.1968, Bakker no. 26; 7—8, 22.VIII.1968, Bakker no. 54.)

Alate viviparous female

Colour not known. In mounted specimens head and thorax black, the rest much as in apterae, but without great contrast in pigmentation between fore femora and other femora in the slightly teneral specimens. Processes on head as in apterae, but on front more slender, on vertex very much smaller and bluntly conical; marginal processes all absent; spinal processes on abdomen very different from those in apterae, short and mammiform on tergite I, more or less cylindrical or very faintly waisted on tergites II—VII, e.g., from 0.021 mm (width) × 0.033 mm (length), to 0.016 mm × 0.046 mm on tergite VII; tergite VIII with two very small conical processes of 0.012 mm long. Antennal segment III with 4—7 rather large, ciliate, slightly transversely oval, rhinaria in a row (average number 5.7 in 18 antennae). Wings with stigma not nearly extending to tip of wing; sector radii straight, rather long (0.50 mm); media once branched; basalis (Cu_2) bordered but not the other veins. First tarsal joints with 2 dorsal hairs instead of one. Other characters as in apterae viviparae.

Measurement in mm.

No.	Length body	Ant.	Ant. segments III	IV	V		Rhin. on III	Siph.	Cau.
1	1.28	0.78	0.25	0.14	0.13	0.11 + 0.05	4 & 4	0.03	0.10
2	1.29	0.86	0.28	0.15	0.14	0.12 + 0.06	6 & 7	0.03	0.11
3	1.13	0.79	0.26	0.13	0.13	0.11 + 0.06	4 & 6	0.03	0.08
4	1.16	0.82	0.25	0.15	0.14	0.11 + 0.06	5 & 5	0.03	0.09

(All on *Commiphora zimmermanni*, Nairobi, Kenya, leg. W. Bakker; 1—3, with apterae no. 1—3; 4, III.1968, Bakker no. 18.)

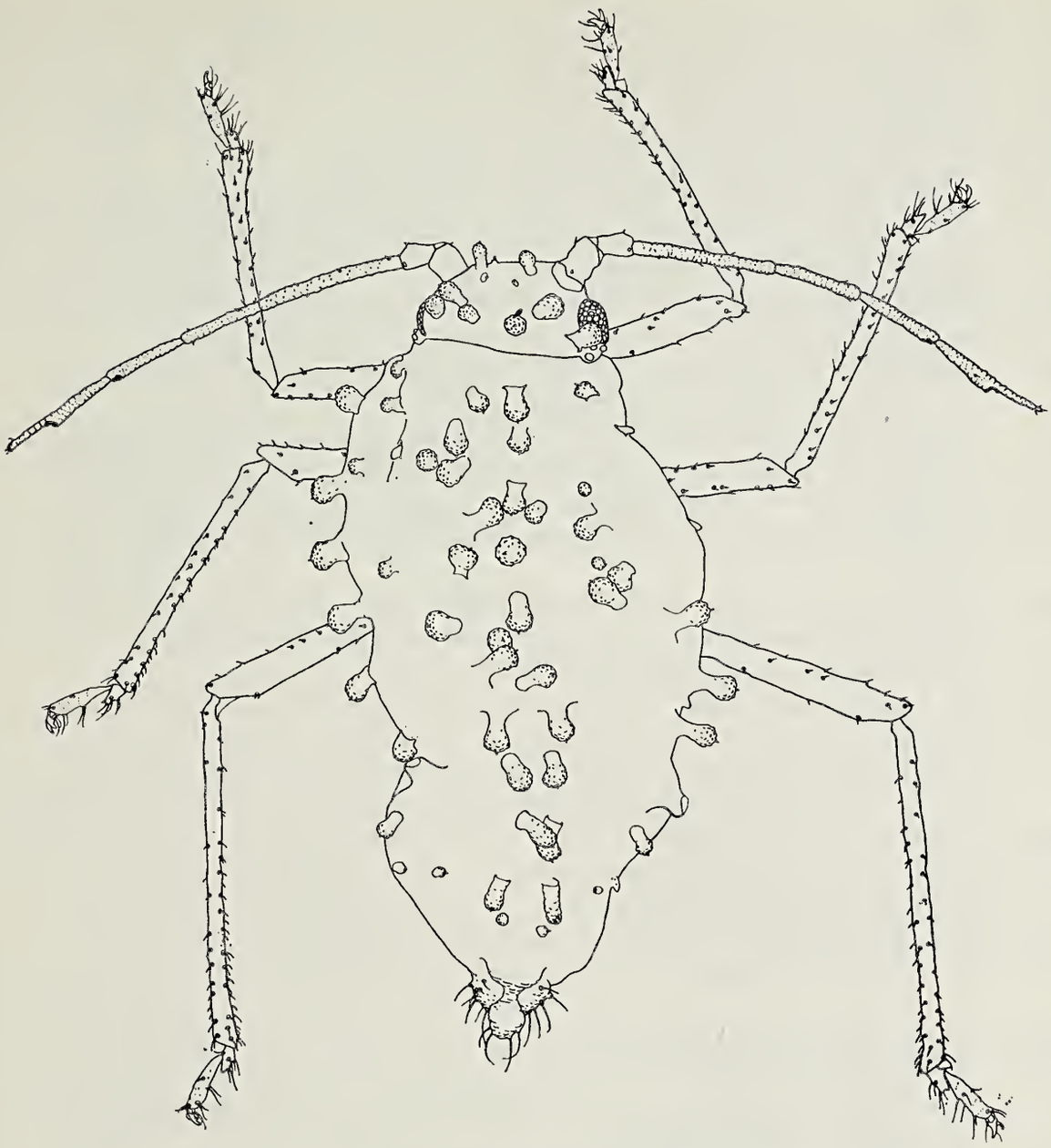

Fig. 1. *Paoliella eastopi* spec. nov., apt. viv fem.; × 71.5

Discussion. Dr. W. BAKKER found this species in large numbers, together with *Paoliella commiphorae* Doncaster, on the typical host for the latter species, and provided me with four very good samples. Those collected in January, March and May contained alatae.

Apterae can easily be recognized by their waisted dorsal processes, but alatae are more difficult. Since EASTOP's (1961) and ILHARCO's (1971) key to *Paoliella* Theob. and its subgenus *Unipterus* Hall, 1932, a few more species have been described. These key as follows:

Apterae viviparae.

1(4) Dorsal processes with broadly rounded apices, $1^1/_{10}$—$1^1/_3$ times as long as their basal width, at most $1^1/_3$ times as long as ant. segment IV or V.

2(3) Dorsal processes more or less evenly tapering from base, absent on the front. Fore tibiae on distal half usually with some sensoria. All femora pale brown. *Commiphora africana, C. dulcis.* Eritrea, N. Nigeria, South and S.W. Africa . . . . . *P. delottoi* (H.R.L).

3(2) Dorsal processes very conspicuously constricted near base, with much wider apical knob. Frontal processes slender, hardly waisted, at least half as long as ant. segment I. Middle and hind femora blackish, but fore femora much paler. *Commiphora zimmermanni.* Kenya . . . . . *P. eastopi* spec. nov.

4(1) Dorsal abd. processes slender, many times as long as their basal width, sometimes expanding towards apex but not with a rounded knob.

5(6) Dorsal abd. processes on top with a lanceolate, very acute, serrated, structure 0.013—0.022 mm long, surpassing up to twice the apical hair of the processes. *Terminalia arjuna.* South India . . . . *P. nirmalae* (David & Narayanan)

6(5) Dorsal abd. processes with blunt apex, with a terminal hair or a semiglobular, smooth, structure on top as long as the apical hair. African species.

7(10) Longest spinal process on abd. tergites I—IV not or very little longer than ant. segment III if 6 antennal segments are present.

8(9) Processes on tergites I—IV evenly tapering to the bluntish apex, elongated conical. *Commiphora pilosa.* Ngong Hills, Kenya. Abnormal *P. echinata* of Eastop (1958).

9(8) Processes only on basal half tapering, towards apex expanding, with rounded tip. *Combretum apiculatum, C. gueinzii.* Tanganyika, Kenya, Rhodesia, South Africa, Angola . . . . . *P. papillata* (Hall)

10(7) Longest spinal process on abd. tergites I—IV very much longer than ant. segment III if 6 antennal segments are present, much longer than $^3/_5$ of ant. segment III if only 5 segments are present.

11(12) Knob of cauda considerably longer than its largest width, oval. First tarsal joints mostly with 5 ventral hairs, the longest of which is 0.039 mm, not with dorsal hairs. Most dorsal processes markedly expanded towards apex, topped by a semiglobular membrane. *Combretum gueinzii.* South Africa . *P. wettsteini* Quednau

12(11) Knob of cauda not longer than its largest width, acorn-shaped. First tarsal joints with 2, 3, 6 or 7 ventral hairs, with or without dorsal hair. Processes tapering to apex, or expanding near apex.

13(14) First tarsal joints with 2 or 3 ventral hairs. Processes more or less expanded at top or with the apical part cylindrical. *Combretum gueinzii.* South Africa . . . . . *P. browni* Quednau

14(13) First tarsal joints with 5—7 ventral hairs.

15(16) Dorsal processes not incrassate at apices, rather evenly tapering from base to apex, or cylindrical on distal part to the often oblique tip, apparently without apical hair. *Commiphora savojae.* Somalia . . . . . *P. hystrix* Theob.

16(15) At least some dorsal processes more or less expanded toward apex.

17(18) Abd. spinal and marginal processes at apex very abruptly expanded to fully twice their smallest width. Pleural processes on abdomen short and quite pale. Longest processes up to just more than $^2/_3$ antennal length. *Commiphora pedunculata, Commiphora* spp. Tanganyika, N. Nigeria; South Africa? . . . *P. ayari* (Eastop)

18(17) Some abdominal dorsal processes only little expanded at apex, the longest about as long as antennae. *Commiphora pilosa.* Tanganyika, with perhaps subspecies in Kenya, vide couplet 8(9) . . . . . *P. echinata* Eastop

Alate viviparous females.

1(2) Rhinaria present on ant. segments III and IV, sometimes also on V. Abdomen not only with spinal and marginal processes, but also with pleural ones in normal alatae. *Terminalia arjuna.* South India . . . . *P. nirmalae* (David & Narayanan)

2(1) Rhinaria usually only on ant. segment III. Abdomen only in apteriform alatae with pleural processes, but then normally without secondary rhinaria. African species.

3(8) Head without processes. Fore tibiae sometimes with sensoria on distal half, abdomen sometimes without processes. Fore femora not or hardly thicker than middle femora.

4(5) Fore tibiae with some sensoria on distal half. Proc. terminalis much shorter than base of segment VI. Abdomen with spinal and marginal processes. *Commiphora africana, C. dulcis.* Eritrea, N. Nigeria, S. and S.W. Africa . *P. delottoi* (H.R.L.)

5(4) Fore tibiae without sensoria.

6(7) Abdomen without processes. *Terminalia sericea.* Kenya, Rhodesia, S. Africa . . . . . *P. terminaliae* (Hall)

7(6) Abdomen with rather small, pale spinal and marginal processes. *Terminalia sericea.* Angola . . . . . *P. harteni* Ilharco

8(3) Head with processes. Fore tibiae without sensoria. Abdomen with processes. Fore femora incrassate or not.

9(10) Tip of fore wing with a large dark spot, ventrad bordered by the media. Proc. terminalis more than 2½ times base of VI. *Combretum apiculatum, Combretum* sp. Tanganyika, Angola . . . . . *P. nachensis* (Eastop)

10(9) Tip of fore wing without dark spot, but such a spot often present at apex of Cu_2. Proc. terminalis at most 2½ times base of VI.

11(16) Proc. terminalis 1½—2½ times base of VI.

12(13) Oblique wing veins not bordered with black. Hind femora black at base, in middle and at apex, paler in between. Trapped. Tanganyika . . . *P. sawa* (Eastop)

13(12) Cu_2 bordered with black over most of its length. Femora pale or only with base paler.

14(15) Cu_2 bordered over its whole length, and also other veins distally bordered. Processes on abdomen pale. *Commiphora* . . . . *P. commiphorae* Doncaster s.l.
a. Ant. segment III usually shorter than IV. Spinal processes absent on most posterior abd. tergites, or indicated on VIII. *Commiphora zimmermanni.* Kenya . . . . . *P. commiphorae* sensu stricto
b. Ant. segment III always longer than IV. Spinal processes mostly present on tergites I—VIII. *Commiphora fischeri.* Tanganyika . . . . . *P. commiphorae persimilis* (Eastop)

15(14) Cu_2 bordered with black except at its apex, proximad of apex with large blackish blotch. Other veins pale, not bordered. Processes on anterior abd. tergites black with the very apex often pale. *Combretum ?psidioides, C. angolense.* Angola, S. Africa . . . . . *P. chiangae* van Harten & Ilharco

16(11) Proc. terminalis less than 1½ times base of VI.

17(26) Fore femora 1½—2 times as thick as middle femora, and base of fore tibiae slightly enlarged.

18(21) Siphunculi black, or placed on a black sclerite. Cu_2 bordered except at its very apex, and proximad of apex with a very large blackish blotch.

19(20) Fore femora pale, brownish. Dorsal processes on anterior abd. tergites placed on black sclerotic bars, only at the base black, remainder pale. Proc. terminalis mostly shorter than base of VI. *Combretum apiculatum, C. gueinzii, C. ?psidioides.* N. Nigeria, Kenya, Tanganyika, Rhodesia, Angola, S. Africa . *P. papillata* (Hall)

20(19) Fore femora black, as dark as mesonotum. Dorsal processes black with the very apex often pale. Proc. terminalis about 1½ times base of VI. *Combretum ?psidioides, C. angolense.* Angola, S. Africa . . . *P. chiangae* van Harten & Ilharco

21(18) Siphunculi pale.

22(23) Forewings with Cu_2 bordered, but not at apex, and proximad of the apex with a large black blotch. Ant. segment III with 2—5 rhinaria. Processes on mesonotum all pale. *Combretum gueinzii.* S. Africa . . . . . *P. wettsteini* Quednau

23(22) Fore wings with Cu_2 bordered or not to the apex, but not with a large blotch proximad of apex. Posterior processes on mesonotum pale or dark.

24(25) Both pairs of mesonotal processes inconspicuously pale. Cu_2 not bordered with brown. Trapped. Tanganyika . . . . . *P. ufuasi* (Eastop)

25(24) Posterior pair of mesonotal processes large, thick and dark brown. Cu_2 in fore wings bordered with brown. *Commiphora pedunculata, C.* sp. Tanganyika, N. Nigeria, (S. Africa?) . . . . . *P. ayari* (Eastop)

26(17) Fore femora not or hardly thicker than middle femora, and fore tibiae not enlarged at base.

27(28) First joints of hind tarsi ventrally with 2—3 hairs, dorsally mostly without hairs. Basal vein (Cu_2) of fore wings usually reaching posterior edge of wing, with a brown border that from its base increases in width, and that (at apex) is extended towards the base of the wing. Abd. tergite VIII with its two spinal hairs on a common tubercle or perhaps sometimes two mutually touching processes. Antennae 5-segmented. Larvae brownish. On *Combretum ?psidioides*. Angola . . . . . *P. monotuberculata* v. Harten & Ilharco

28(27) First tarsal joints of hind tarsi ventrally normally with 4—5 hairs and also dorsally with 2 hairs. Basal vein (Cu_2) of fore wings not reaching posterior edge of wings, the bordering not widening from base, and not extending past the end of the vein. Abd. tergite VIII with the two spinal hairs rather far apart, on small processes or not. Antennae 6-segmented.

29(30) Ant. segment III with 4—7 rhinaria in a row. Processes on vertex constricted at base, balloon-shaped; spinal ones on abd. tergite III to 0.035 mm long, hardly or not longer than siphunculi. *Commiphora zimmermanni*. Kenya . *P. eastopi* spec. nov.

30(29) Ant. segment III with 18—32 rhinaria, scattered along one side of the segment. Processes on vertex conical to tapering and blunt; spinal ones on abd. tergite III to about 0.090 mm, much longer than siphunculi. *Commiphora pilosa*. Tanganyika, with perhaps a subspecies in Kenya; South Africa (?alatae of *Paoliella browni* Quednau, 1961) . . . . . *P. echinata* Eastop

With the above keys the position of *P. eastopi* spec. nov. will be sufficiently clear.

It will be evident from the key to alatae that in some species the alate's fore femora are incrassate, i.e., much thicker, e.g., up to twice as thick, as the middle femora. Such species show also a modified base to the fore tibiae and many of them are known to jump when disturbed.

Eastop (1958) discussed the modifications for leaping in his Saltusaphidini, in which in groups that can leap not only the fore legs, but also the middle legs are adapted to leaping. Eastop, in contrast to Quednau (1953, 1954) suggests that the entire group originally had leaping habits and adaptations, but that the ability to leap was lost in various genera independently.

This hypothesis can also be applied in *Neuquenaphis* Blanchard, 1939, and in *Paoliella* Theob. One could subdivide *Paoliella* Theob. into two subgenera, one holding species, the alatae of which leap, with enlarged fore femora, the other holding non-leaping species with normal fore femora. Unfortunately no alatae are known of the type-species of *Paoliella*, *P. hystrix* Theob. In the type-species of *Unipterus* Hall, *U. terminaliae* Hall, the fore femora are normal. Therefore, if a subgeneric division on the basis of the structure of the fore legs is accepted, the name *Unipterus* Hall is available as a subgenus holding the species with normal fore legs.

Eastop (1961) used *Unipterus* as a subgenus of *Paoliella* and placed those species in it which are only known as alatae, or have no apterous viviparous females. Quednau (1962) maintained *Unipterus* as a genus, but later (1964), followed by Ilharco (1971), considered *Unipterus* a synonym of *Paoliella*, because the absence or rarity of apterous females is, rightly, not considered a basis for separating the two.

Consequently, the known species of *Paoliella* could be divided in two clearly separated groups on the basis of the shape of the fore femora; *Unipterus* Hall is

available as a subgeneric name for the species in which the fore femora are not enlarged; but it may be a synonym of *Paoliella* Theob. if it is found that alatae of the type-species of *Paoliella* also has normal fore femora. In the latter case a new subgeneric name for species with in the alatae incrassate fore femora may be needed.

Now that some good material of larvae and adults of the South American genus *Neolizerius* Blanchard, 1939, is available, it appears that this genus is extremely similar to *Paoliella*. The genera agree in larvae and apterae having 3-facetted eyes; the siphunculi, absent in first instar larvae, bearing one hair; in antennae having only one or two accessory rhinaria on the last segment, closely adpressed to the primary rhinarium; in having ciliate secondary rhinaria; in the head in alatae having marked frontal ridges or sutures internally; in tibiae having no differentiated apical spines; and in the first tarsal joints having 2—8 hairs in apterae, 6—7 ventrally and 1—2 dorsally in alatae.

Neolizerius in alatae of the known species has no dorsal processes. Its apterae have a very large number of irregularly placed dorsal processes, but of these apparently only 2—8 per abdominal segment bear an apical hair. The wing venation is highly similar in both genera, but in the South American aphids the stigma is prolonged to the tip of the fore wings, and Cu_1 of the forewings is as strong as the media. In *Paoliella* the stigma is sometimes elongated, but shorter, and Cu_1 is rarely as thick as the media, in several species indistinct, and in many specimens of *P. commiphorae* almost completely obsolete. Apterae of *Neolizerius* differ from those of *Paoliella* by having very large nodules, sometimes looking like secondary processes, at the base of all, or the larger, marginal, processes. The processus terminalis is very short in the known *Neolizerius* spp.

Summarizing, the two genera are very closely related and in the alatae extremely similar.

In an earlier paper (Hille Ris Lambers, 1968) I pointed out the interrelation between the genera *Neuquenaphis* Blanchard, 1939 from South America; *Paoliella* Theobald from Africa and South India; and *Sensoriaphis* from Australia, Tasmania, New Zealand, and New Guinea. The extremely close relationship of *Paoliella* and *Neolizerius* may perhaps be considered further evidence for the former existence of Gondwanaland.

Types. Holotype: apterous viviparous female (measurements no. 1), from *Commiphora zimmermanni*, Nairobi, Kenya, 26.I.1968, leg. W. Bakker no. 13. Paratypes; apterae and alate viviparae from the same host, locality and collector, collected on same day as the holotype; and on III.1968, Bakker no. 18; 29.V. 1968, Bakker no. 21; 22.VI.1968, Bakker no. 26; and 22.VIII.1968, Bakker no. 34.

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Personalia

Op 7 november jl. promoveerde ons lid Drs. C. DAVIDS aan de Universiteit van Amsterdam tot Doctor in de Wiskunde en de Natuurwetenschappen op een proefschrift dat getiteld was: „The water mite Hydrachna conjecta Koenike, 1895 (Acari, Hydrachnellae), bionomics and relation to species of Corixidae (Hemiptera)".

Promotor was Prof. Dr. G. BARENDRECHT.

De redactie wenst de jonge doctor van harte geluk met de succesvolle afsluiting van zijn universitaire studie.

Griffiths, G. C. D., 1972, The phylogenetic classification of Diptera Cyclorrhapha, with special reference to the structure of the male postabdomen. Volume 8 of the Series Entomologica. pp 340, figs 154, pls 2, ca 260 refs, systematic index 9 kolommen, subject index 2 kolommen. Dr. W. Junk N.V., Uig., Den Haag. Prijs (gebonden) *f* 70,— (excl. B.T.W.).

De uitgeverij Junk heeft in dit tijdschrift al vaker prijzende zinnen toegevoegd gekregen wegens haar Series Entomologica. Ditmaal is daar eens te meer alle reden voor, doordat Junk erin slaagde een opmerkelijk werk zeer goed verzorgd uit te geven. Het opmerkelijke is in tweeën samen te vatten: de zeer methodische, op een expliciet geformuleerde geloofsbelijdenis t.a.v. de op fylogenetische theorie gebaseerde aanpak, en de grote nauwgezetheid en werkkracht van de auteur. GRIFFITHS is een goed pleitbezorger van de Phylogenetic Systematics van HENNIG, en dit boek is wellicht het meest omvangrijke werkstuk waar genoemde theorie aan de hand van recent materiaal wordt toegepast. Het is niet mijn competentie om te beoordelen in hoeverre dit heeft geleid tot een bevredigende indeling; ongetwijfeld is het werk van GRIFFITHS een van de meest veelomvattende op dit gebied, en ook gebaseerd op een zo groot mogelijk pakket van kenmerken. Want hoewel de titel anders suggereert, wordt bij de indeling van de Cyclorrhapha door de auteur lang niet uitsluitend gebruik gemaakt van kenmerken van het mannelijk genitaalkapsel. Een waardevol aanhangsel van het boek is een tabel tot de families gebaseerd op zeer fundamentele kenmerken — geen makkelijke tabel, maar wel een die ontworpen is om tot een resultaat te leiden waar eenvoudiger criteria niet toereikend bleken. — W. N. ELLIS.