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New *Mesocyclops* species (Copepoda, Cyclopidae) from Papua New Guinea*

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Abstract

Five species of the genus *Mesocyclops* are reported from Papua New Guinea; four of them are new to science: *M. pseudoannae* sp. n., *M. affinis sp. n., M. woutersi* sp. n. and *M. papuensis* sp. n.
Key-words: Taxonomy, Copepoda, *Mesocyclops,* new species, Papua New Guinea.

Résumé

Cinq espèces du genre *Mesocyclops* sont rapportées de la Papouasie Nouvelle Guinée; quatre espèces sont nouvelles pour la science: *M. pseudoannae* sp. n., *M. affinis sp. n., M. woutersi* sp. n. et *M. papuensis* sp. n.
Mots-clefs: Taxonomie, Copepoda, *Mesocyclops,* espèces nouvelles, Papouasie Nouvelle- Guinée.

Introduction

Few data are available on the freshwater copepod fauna of Papua New Guinea. To our knowledge only one paper is dealing with copepods from this area: DUSSART & FERNANDO (1985a).
In the present paper 5 species are described, 4 of them being new to science.
Most of the samples were collected by Dr. K. WOUTERS during an expedition of the Koninklijk Belgisch Instituut voor Natuurwetenschappen to Papua New Guinea in 1982; the samples of Wau and Mandy Passage were collected by Dr. P. GROOTAERT during the same expedition.
All material is deposited in the collections of the Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.

* Contribution n° 151, Léopold III Biological Station, Laing Island.

List of localities (Fig. 1)

MADANG PROVINCE

Talia Point:
3345: old coral gravel-pit; 8th June 1982
3346: old coral gravel-pit, t°=35°C; 8th June 1982.

Warawaranga:
3291, 3292: coral gravel-pit; 2nd June 1982
3359: small shallow pool; 11th June 1982.

Road between Mandy Passage and Damage Point:
3152: puddle in coconut plantation; 18th May 1982
1090: pool near the road; 26th May 1982.

Hansa Point:
3279, 3281, 3283: different swamps in depression; 31st May 1982
3287: bomb hole (D=10m) (from world war II); 2nd May 1982.

Nubia mission:
3172: pool with *Lemna* in bomb hole; 21st May 1982
3176: rivulet; 21st May 1982
3178: shallow ditch; 21st May 1982.

Nubia village:
3271: bomb hole (D=25m); 29th May 1982
3275: bomb hole (D=20m); 29 th May 1982.

Awar village:
3248: bomb hole; 28th May 1982
3251: bomb hole; 28th May 1982
3258: bomb hole, decaying leaves on the bottom; 28th May 1982.

Road between Awar and Awar airfield:
3196: bomb hole (D=20m) with green algae; 24th May 1982
3362: bomb hole (D=3m), decaying leaves on the bottom; 14th June 1982
3363: pit filled up with water, dug by the Papuans for the preparation of sago, t°=27°C; 14th June 1982.

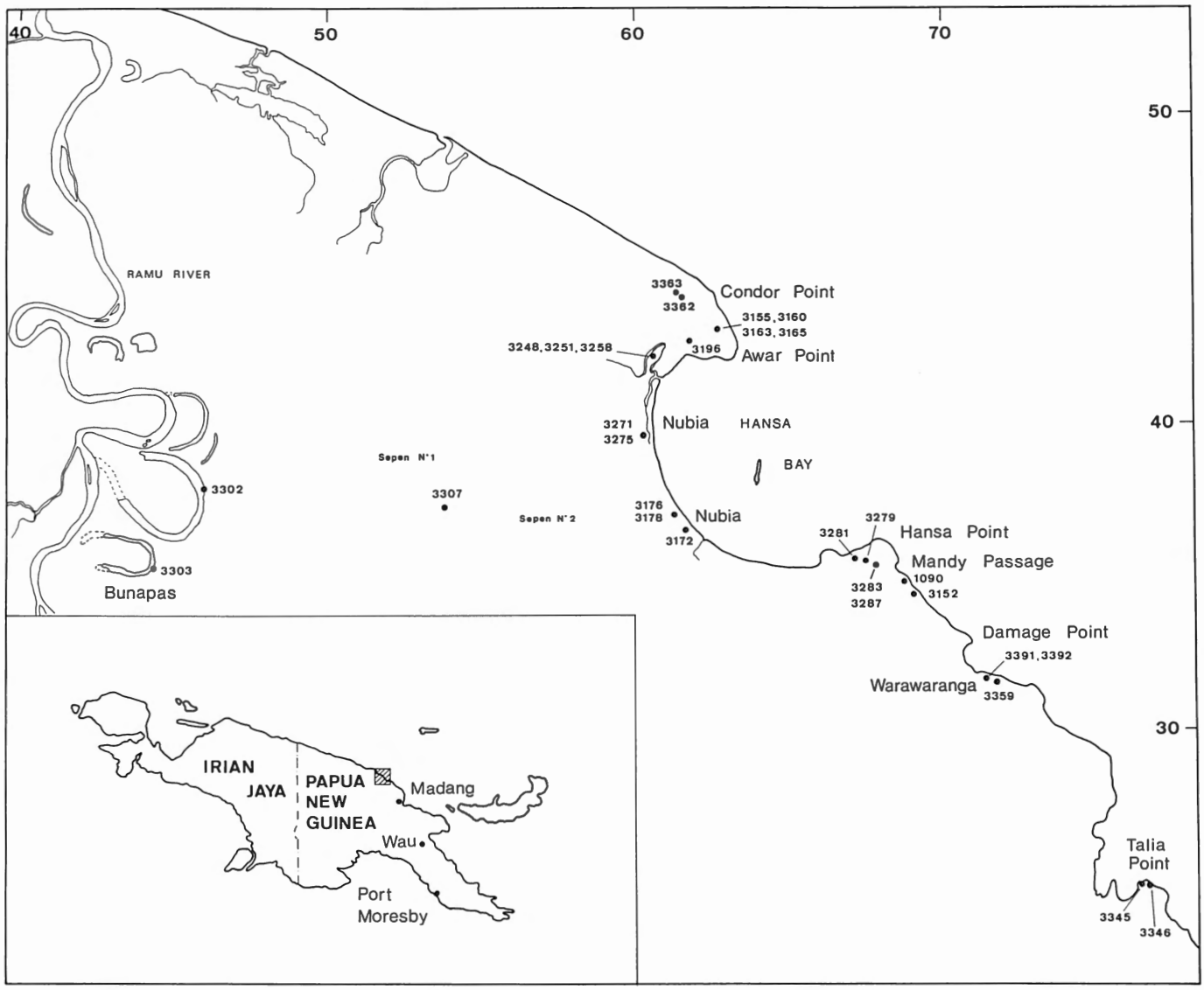


Fig. 1. *Map showing localities.*

Road between Awar Point and Condor Point:
3155: pool near the border of a rivulet; 19th May 1982
3160: shallow pool; 19th May 1982
3163: bomb hole (D=5m); 19th May 1982
3165: bomb hole (D=5m); 19th May 1982.

Between the villages Sepen 1 and Sepen 2:
3307: slow running rivulet with a dense vegetation; 3rd June 1982.

Bunapas:
3302: old riverbed of the river Ramu; 3rd June 1982
3303: ditch in connection with swamps of the old riverbed of the Ramu; 3rd June 1982.

MOROBE PROVINCE

Wau:
1114: pond in the Zoological Garden; 26th May 1982

Species descriptions

Mesocyclops pseudoannae sp. n.

DIFFERENTIAL DIAGNOSIS

M. pseudoannae sp. n. is closely related to *M. annae* KIEFER, 1930 and *M. splendidus* LINDBERG, 1943. It is distinguished from its congeners by the combination of the following characters: presence of a spine on basipodite P_1, spine pattern on basipodite A_2, well developed prominences on the connecting plate P_4, last thoracic segment laterally without hairs, structure of the receptaculum seminis.
M. pseudoannae differs from *M. annae* in having a group of setules on the caudal side of basipodite P_4 and in the structure of the receptaculum seminis. In *M. annae* the posterior margin of the proximal part is strongly curved, in *M. pseudoannae* the anterior

and posterior margin of the lateral arms are parallel. Futhermore in *M. annae* the posterior margin of the lateral arms forms a "jointed" canal in front of the copulatory-pore. In *M. pseudoannae* there is no such canal.
The present species differs from *M. splendidus* in having large prominences on the connecting plate of P_4 and in the structure of the receptaculum seminis as far as comparison is possible with LINDBERGS' drawing (1943). The drawing is probably insufficient or incorrect because the copulatory-pore never is connected with the anterior margin of the proximal part but with the posterior margin.

TYPE LOCALITY

Papua New Guinea, Madang Province, Hansa Point, loc. n° 3283; swamp; leg.: K. WOUTERS, 31st May 1982.

TYPE MATERIAL

Holotype: 1 female, dissected in glycerine and mounted on two slides; the first slide contains A_1-P_4, the second P_5-abdomen; n° 26.528/B 3283.
Allotype: 1 male, dissected in glycerine and mounted on one slide; n° 26.528/E 3283.
Paratypes: 2 females, dissected and mounted on two slides; n° 26.528/D 3283 and 26.528/A 3283; one tube n° 26.528/3283 containing 2 undissected females and one undissected male.

Additional material examined: loc. 3303 (1 female).

Etymology: due to its affinities with the *M. splendidus - annae* group the species is named *M. pseudoannae.*

DESCRIPTION OF THE FEMALE HOLOTYPE

Total body length (furcal setae not included): 915 µm (variability: 915 - 1,028 µm).
Antennule: hyaline membrane of segment 17 with several deep notches (Fig. 6).
Basipodite of antenna: because the spine pattern on the basipodite of *M. splendidus* LINDBERG and *M. annae* KIEFER is unknown, no comparison can be made. The spine pattern of *M. pseudoannae* is very similar to the one found in the species group *M. rarus - paludosus - tenuisaccus* (VAN DE VELDE, 1984). The presence of a row of spines proximal to the exopodite seta is very characteristic (Fig. 3: ♂).
Maxillulary palp: not provided with a row of spines (Fig. 5).
Thoracopods P_1-P_4: connecting plates not provided with setules; spine present on the inner distal margin of basipodite P_1 (fig. 4: ♂); prominences on distal margin of connecting plate P_4 well developed, two times as long as wide (Fig. 8); inner part of caudal side of basipodite P_4 distally with a group of setules (Fig. 8: ♂).
P_5 & P_6: of the usual structure (Fig. 14).
Last thoracic segment: no setules on the lateral sides nor on the dorsal or ventral side (Figs. 9, 14).
Receptaculum seminis (Fig. 9): anterior part of proximal part with a medial depression; lateral arms slender, curved backwards, anterior and posterior margin parallel (for terminology of the receptaculum seminis see VAN DE VELDE, 1984).
Abdominal segments: margin of last segment dorsally provided with minute spines and ventrally with well developed spines (Figs. 12, 13).
Furca: rami short; L:W ratio: 2.10 (variability: 2.10 - 2.35); no setules on the inner margin of the rami; lateral and external furcal setae without spinules at their implantation (Figs. 12, 13).

DESCRIPTION OF THE MALE ALLOTYPE

Total body length: 692 µm. Spine pattern on basipodite of antenna, structure of P_1-P_4 and armature of last thoracic segment as in the female. Structure of P_5 and P_6 as shown in Fig. 10. Furcal rami 1.9 times as long as wide. Besides the usual sexual dimorphism the following differences are noted with the female: spinules at implantation of lateral and external furcal setae, distal margin of last abdominal segment dorsally as well as ventrally with well developed spines.

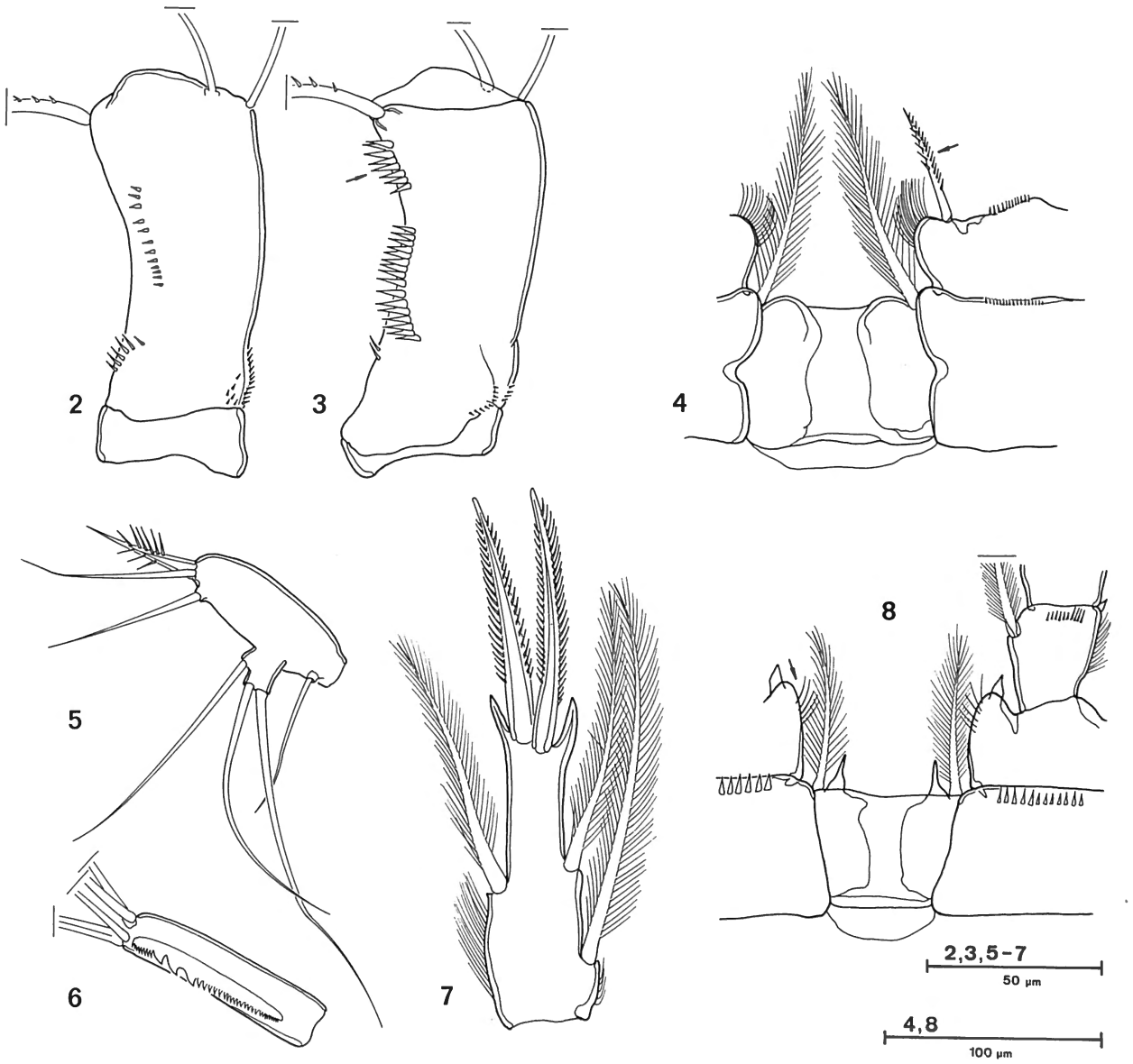
REMARKS

In 1943 LINDBERG described *M. splendidus* from India, but KIEFER (1981) considered it a synonym of *M. annae* KIEFER, 1930 from Madagascar.
DUSSART and FERNANDO (1985b), rejecting the synonymy with *M. annae,* reported *M. splendidus* from Sri Lanka. The same authors (1986) found *M. annae* in Australia and Sri Lanka (no figures).
The present species cannot be identified with *M. splendidus* from Sri Lanka. It has longer prominences on the connecting plate of P_4 and the structure of the receptaculum seminis is different. *M. splendidus* has a jointed canal in front of the copulatory-pore, as in *M. annae.* This canal is absent in *M. pseudoannae.*

Mesocyclops affinis sp. n.

DIFFERENTIAL DIAGNOSIS

M. affinis sp. n. differs from its congeners by the combination of the following characters: spine pattern on basipodite of antenna, structure P_4, structure of



Figs. 2-8. Mesocyclops pseudoannae *sp. n. holotype:*
2. basipodite A_2, caudal side; 3. basipodite A_2, frontal side; 4. connecting plate and inner portion of coxo- and basipodite P_1; 5. maxillulary palp; 6. antennular segment 17; 5. enp_3P_4; 8. connecting plate and inner portion of coxo- and basipodite P_4.

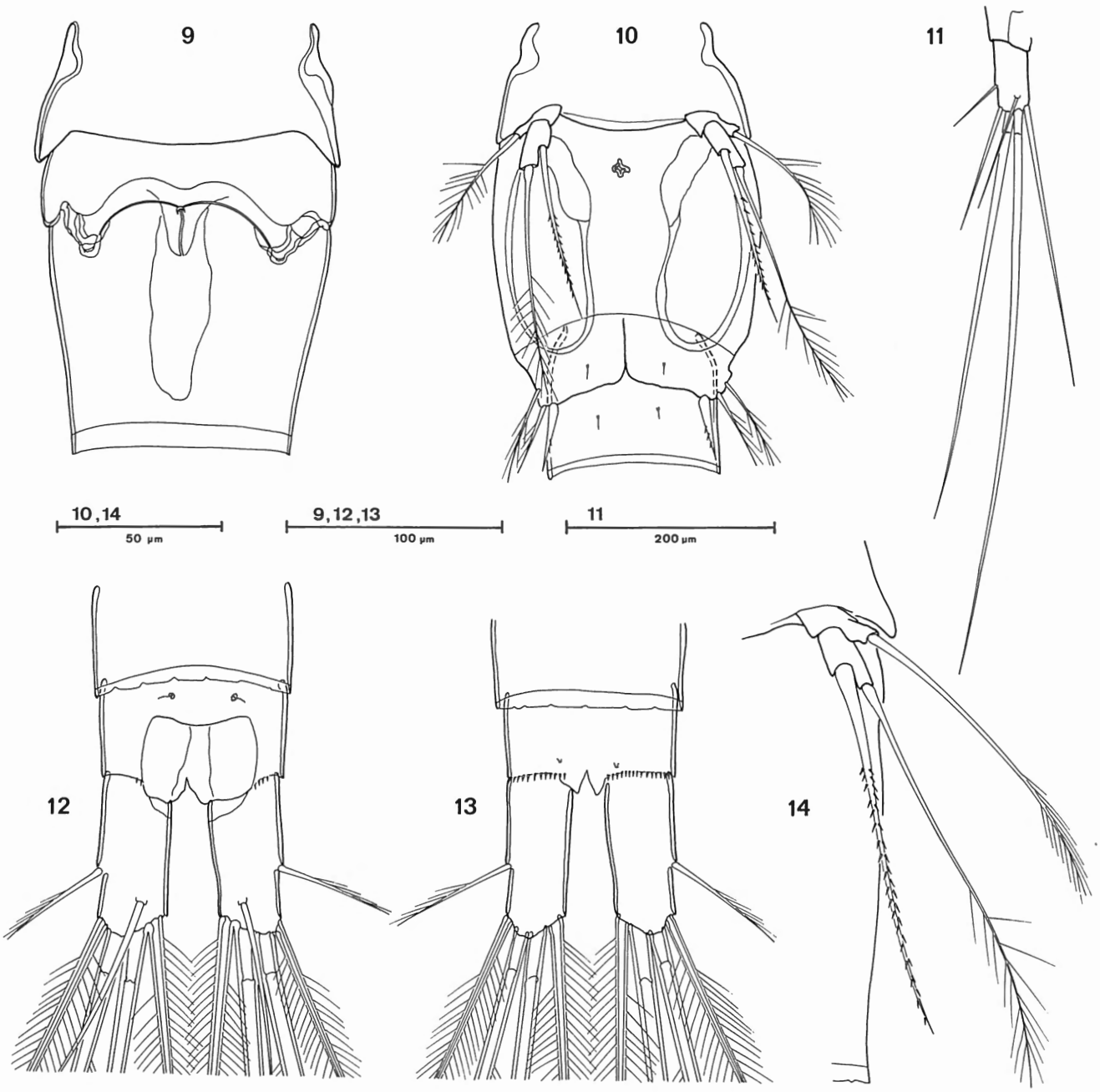
the receptaculum seminis and last thoracic segment laterally with a group of setules (only in females).
It is closely related to *M. thermocyclopoides* HARADA but differs from it by slight differences in the structure of the receptaculum seminis, by the spine pattern on the basipodite of the antenna and by the short furcal rami.

TYPE LOCALITY

Papua New Guinea, Madang Province, road between Awar and Awar airfield; large bomb hole with green algae (D=20m); leg.: K. WOUTERS, 24th May 1982.

TYPE MATERIAL

Holotype: 1 female, dissected in glycerine and mounted on two slides; the first slide contains A_1-P_4, the second P_5-abdomen; n° 26.528/A 3196.
Allotype: 1 male, dissected in glycerine and mounted on one slide; n° 26.528/E 3196.
Paratypes: 3 females, dissected and mounted on slides, respectively labelled n° 26.528/B3196, n° 26.528/C 3196 and n° 26.528/D 3196: one tube n° 26.528/3196 containing 14 undissected females.
Additional material examined: localities n° 3152, 3165, 3363, 3176, 3302, 3303, 3307, 3155, 3272, 3362, 3281, 3271, 3287, 3275, 3279.

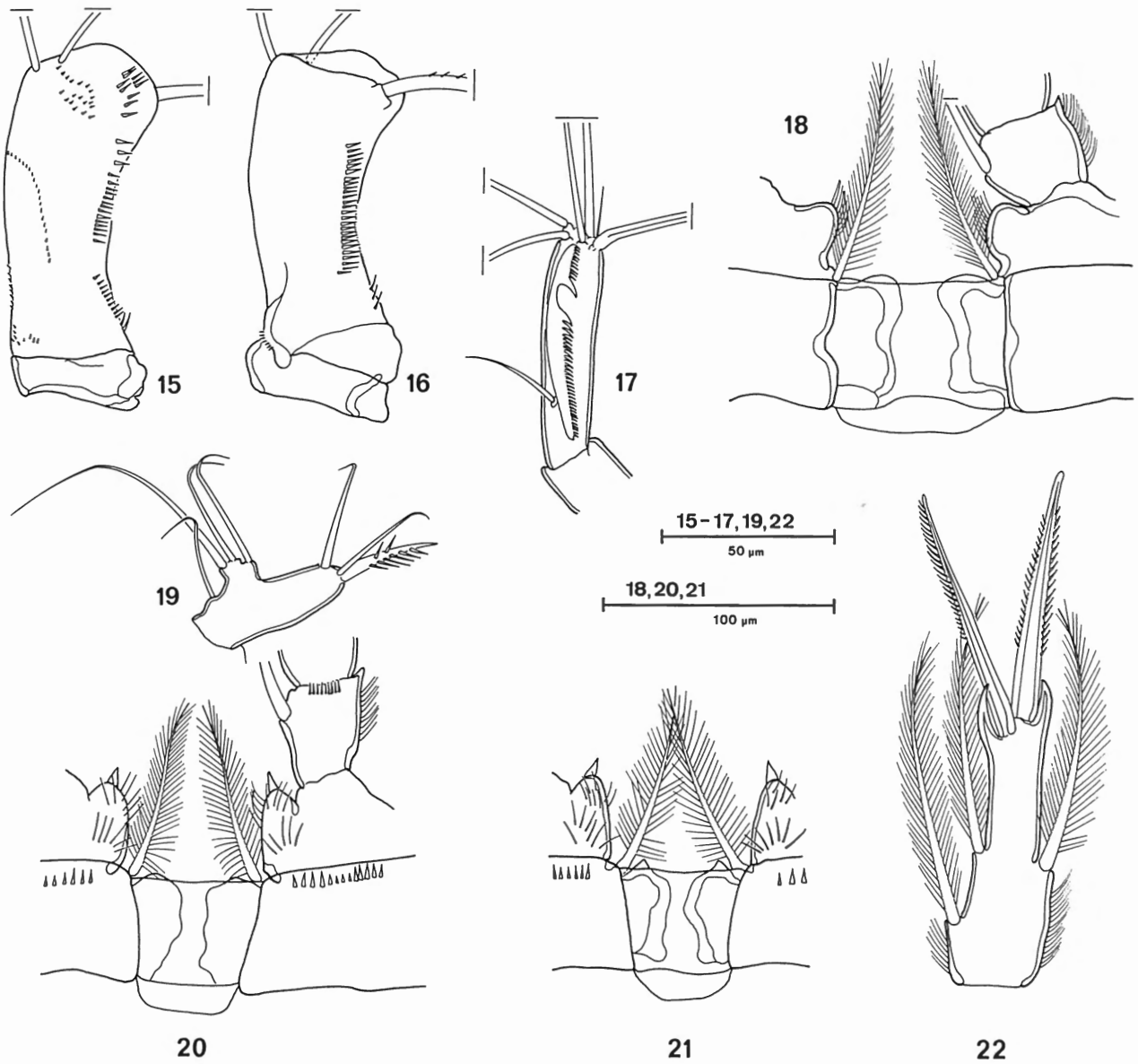


Figs. 9-14. Mesocyclops pseudoannae *sp. n. holotype:*
9. last thoracic segment and genital segment; 10. genital segment of male allotype; 11. furca; 12. last abdominal segment and furcal rami, dorsal view; 13. last abdominal segment and furcal rami, ventral view; 14. P_5.

Etymology: the species belongs to the *M. thermocyclopoides* — complex and is therefore named *M. affinis.*

DESCRIPTION OF THE FEMALE HOLOTYPE

Total body length (furcal setae not included): 1,132 µm.
Antennule: hyaline membrane of segment 17 with one deep notch (Fig. 17).
Basipodite of antenna: in addition to the basic pattern common to all *Mesocyclops* species (see VAN DE VELDE, 1984), a row of minute spinules present on medial caudal side. A group of spines at the level of exopodite seta and, a patch of minute spinules on caudal side at the level of inner apical setae (Fig. 15).
Maxillule: basis of maxillulary palp not provided with spines (Fig. 19).
Thoracopods: connecting plates P_1-P_4 without setules on caudal side; inner distal margin of basipodite P_1 not armed with a spine (Fig. 18); prominences on

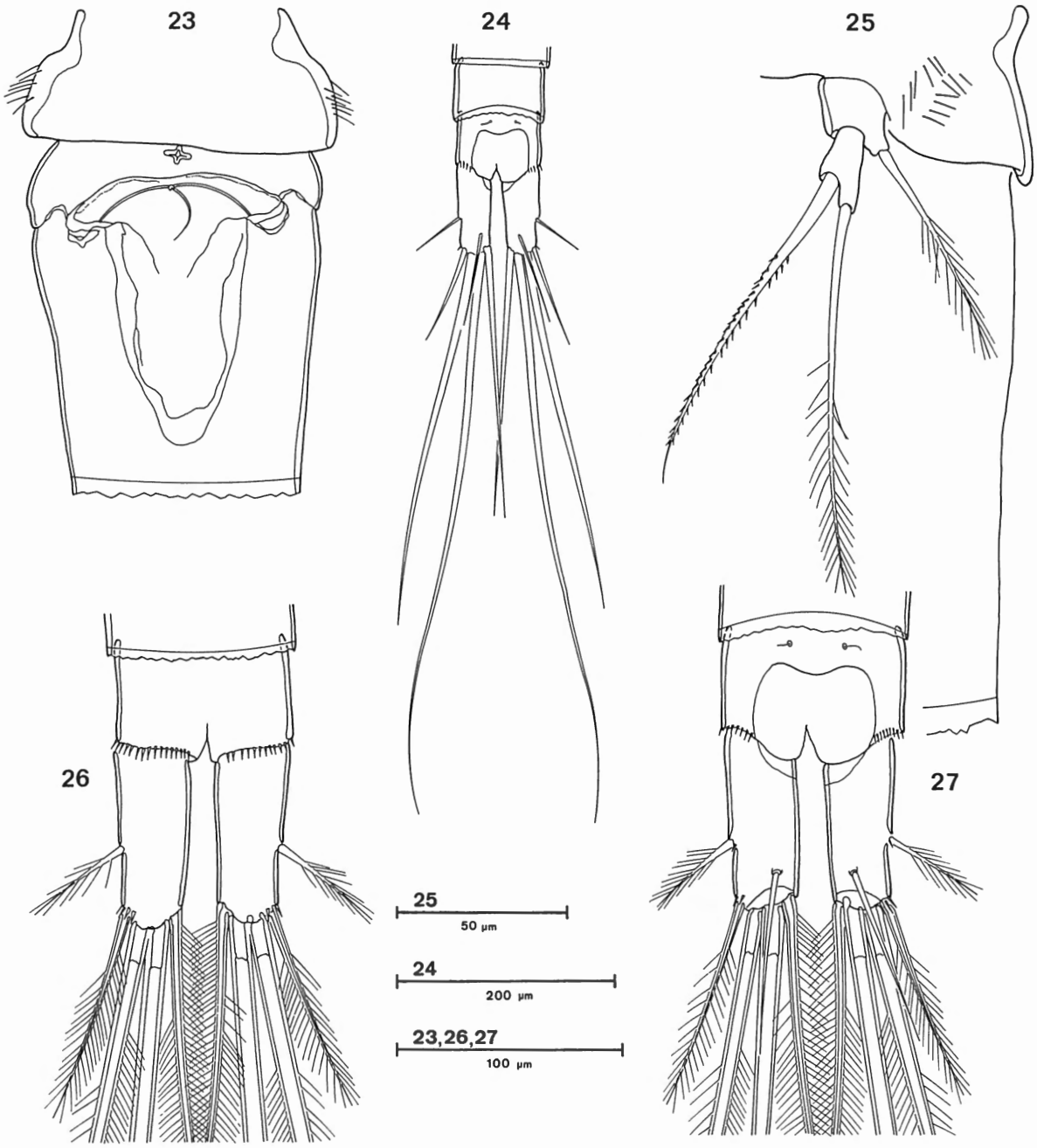


Figs. 15-22. Mesocyclops affinis *sp. n. holotype:*
15. basipodite A_2, caudal side; 16. basipodite A_2, frontal side; 17. antennular segment 17; 18. connecting plate and inner portion of coxo- and basipodite P_1; 19. maxillulary palp; 20. connecting plate and inner portion of coxo- and basipodite P_4; 21. connecting plate and inner portion of coxo- and basipodite P_4, other specimen; 22. enp_3P_4.

distal margin of connecting plate P_4 small, rounded (Fig. 20) or pointed (Fig. 21); inner part of basipodite P_4 distally and proximally with a group of setules on caudal side (Figs. 20, 21); lateral inner part of caudal side of coxopodite P_4 not provided with setules (Figs. 20, 21).
P_5 & P_6: of the usual structure (Fig. 25).
Last thoracic segment: beset only laterally with a group of setules (Figs. 23, 25).
Receptaculum seminis: as in Fig. 23; very similar to that of *M. thermocyclopoides* HARADA (KIEFER, 1981: Fig. 5). Differences with *M. thermocyclopoides* are: lateral arms narrower, posterior margin of proximal part longer and copulatory-pore situated more closely to the anterior margin of the proximal part.
Abdominal segments: dorsal and ventral distal margin of last segment fringed with a row of well developed spines (Figs. 26, 27).
Furca: furcal rami short, 2.55 times as long as wide, no setules on inner margin; dorsal furcal seta shorter than external furcal seta; implantation of lateral furcal seta with one minute spine, implantation of external furcal seta with several spines (Figs. 26, 27).

DESCRIPTION OF THE MALE ALLOTYPE

Total body length: 656 µm. Spine pattern on basipodite of antenna, structure of P_1-P_4 as in the female. Besides the usual sexual dimorphism the following

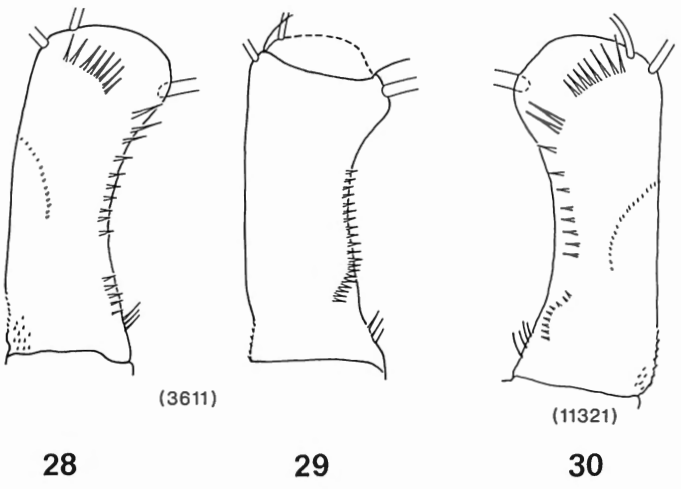


Figs. 23-27. Mesocyclops affinis *sp. n. holotype:*
23. last thoracic segment and genital segment; 24. last abdominal segments and furca; 25. P_5; 26. last abdominal segment and furcal rami, ventral view; 27. last abdominal segment and furcal rami, dorsal view;

differences are noted with the female: last thoracic segment laterally without hairs, implantation of lateral as well as external furcal seta with well developed spines, dorsal furcal seta longer than external furcal seta. Furcal index: 2.23.

REMARKS

M. affinis belongs to the *M. thermocyclopoides* - complex.
M. thermocyclopoides HARADA, 1941, originally described from Taiwan, was redescribed by KIEFER (1981). According to this author *M. thermocyclopoides* is widely distributed, from Africa to Taiwan. Its presence in Africa however was rejected (VAN DE VELDE, 1984) and it was shown that two related species are present in Africa: *M. ogunnus* ONABAMIRO and *M. dussarti* VAN DE VELDE.
The species described by me in the same paper as *M. thermocyclopoides* HARADA was erroneously named so and represents a species closely related to *M. thermocyclopoides*. It was found later that *M. thermocyclopoides* represents a complex of related species,



Figs. 28-30. Mesocyclops thermocyclopoides *HARADA, type specimens, Lake Candidius, original drawings of KIEFER: 28. basipodite A_2, caudal side; 29. basipodite A_2, frontal side; 30. basipodite A_2, caudal side, other specimen.*

each with a more restricted geographical range than the species-complex itself. This view was confirmed by KIEFER (in litt.*) and he stated that the real *M. thermocyclopoides* is probably found only in Southern China, Burma and Vietnam.
Because the spine pattern on the basipodite of the antenna was not yet described, Prof. KIEFER sent us drawings of HARADA's type specimens from Lake Candidius (Figs. 28-30).
Considering the spine pattern on the basipodite of the antenna, the record of *M. cf. thermocyclopoides* from Malaysia by LIM & FERNANDO (1985) probably refers to HARADA's *M. thermocyclopoides.*

Mesocyclops woutersi sp. n.

DIFFERENTIAL DIAGNOSIS

The present species belongs to the *M. thermocyclopoides*-complex and is related to *M. affinis*. *M. woutersi* differs from *M. affinis* by the spine pattern on the basipodite of the antenna and the structure of the receptaculum seminis. It differs from *M. thermocyclopoides* by the spine pattern on the basipodite of the antenna, a slight difference in the structure of the receptaculum seminis and the short furcal rami.

TYPE LOCALITY

Papua New Guinea, Madang Province, Warawaranga; loc. n° 3291; coral gravel-pit; leg.: K. WOUTERS, 2nd June 1982.

* Prof. F. KIEFER died in 1985.

TYPE MATERIAL

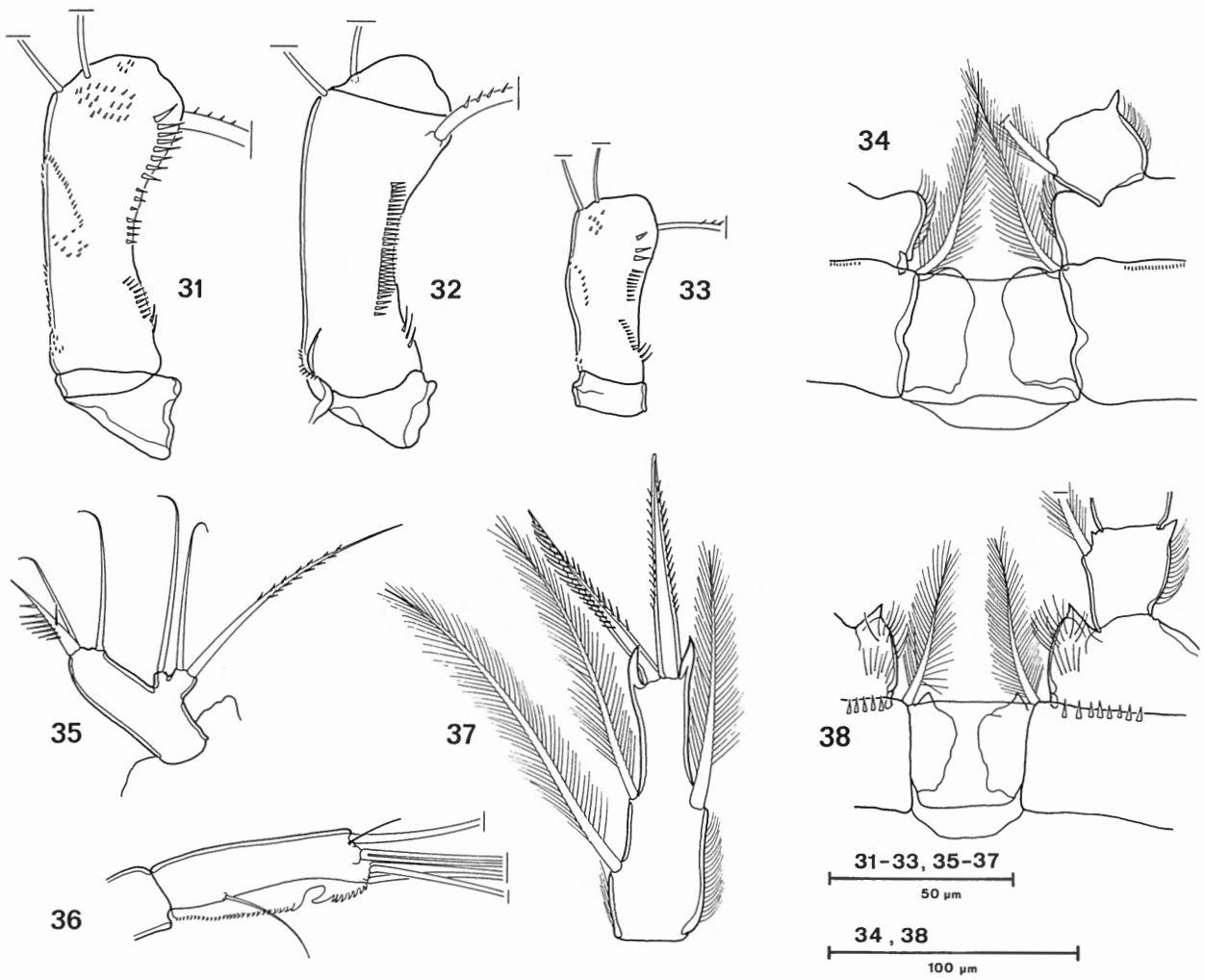
Holotype: 1 female, dissected in glycerine and mounted on two slides, n° 26. 528/A 3291.
Allotype: 1 male, dissected and mounted on one slide, n° 26.528/D 3291.
Paratypes: 2 females and 1 male, dissected and mounted on slides, n° 26.528/B 3291, 26.528/C 3291 and 26.528/D 3291; one tube containing 22 females and 3 males undissected, n° 26.528/3291.

Additional material examined: localities n° 3152, 3165, 3365, 3366, 3248, 3249, 3172, 3359, 3345, 3155, 3346, 3163, 3362, 3292.

Etymology: the species is named after Dr. K. WOUTERS (K.B.I.N.), who collected the samples.

DESCRIPTION OF THE FEMALE HOLOTYPE

Total body length (furcal setae not included): 1,016 µm.
Antennule: hyaline membrane of segment 17 with one deep notch (Fig. 36).
Basipodite of antenna: spine pattern very similar to that of a *Mesocyclops* species from Calcutta erroneously named *M. thermocyclopoides* (VAN DE VELDE, 1984). A difference however is that in *M. woutersi* there are no minute spinules on the caudal side between the longitudinal row of spines and the row of spines proximal to that row (Fig. 31: ♂).
Maxillule: basis of maxillulary palp not provided with spines (Fig. 35).
Thoracopods: connecting plate of P_1-P_4 without setules on the caudal side; inner distal margin of basipodite P_1 not armed with a spine (Fig. 34). Prominences on distal margin of connecting plate P_4 small, pointed or rounded; inner part of basipodite P_4 distally and proximally with a group of setules on caudal side; lateral inner part of caudal side of coxopodite P_4 without setules (Fig. 38).
P_5 & P_6: of the usual structure (Fig. 39).
Last thoracic segment: beset only laterally with setules (Figs. 39, 41).
Receptaculum seminis: as in Fig. 41; very similar to *M. thermocyclopoides* HARADA from Taiwan and *M. dussarti* VAN DE VELDE from Africa. A difference is that in *M. woutersi* a jointed canal in front of the copulatory-pore is present (Fig. 42: ♂).
Abdominal segments: distal margin of last abdominal segment ventrally with a row of well developed spines and dorsally with 3-4 minute spines (Figs. 43, 44).
Furca: furcal rami short, 2.52 times as long as wide, not pilose on inner margin; dorsal furcal seta shorter than external furcal seta; implantation of lateral and external furcal setae not provided with spines (Figs. 43, 44).



Figs. 31-38. Mesocyclops woutersi *sp. n. holotype:*
31. basipodite A_2, caudal side; 32. basipodite A_2, frontal side; 33. basipodite A_2, caudal side, male allotype; 34. connecting plate and inner portion of coxo- and basipodite P_1; 35. maxillulary palp; 36. antennular segment 17; 37. enp_3P_4; 38. connecting plate and inner portion of coxo- and basipodite P_4.

DESCRIPTION OF THE MALE ALLOTYPE

Total body length: 620 µm. Spine pattern on basipodite of antenna (Fig. 33), structure of P_1-P_4 and ornamentation of last thoracic segment as in the female. Besides the usual sexual dimorphism the following differences are noted with the female: implantation of lateral and external furcal setae with spines and dorsal furcal seta as long as external furcal one; furcal index: 2.30.

REMARKS

See *M. affinis*.

Mesocyclops papuensis sp. n.

DIFFERENTIAL DIAGNOSIS

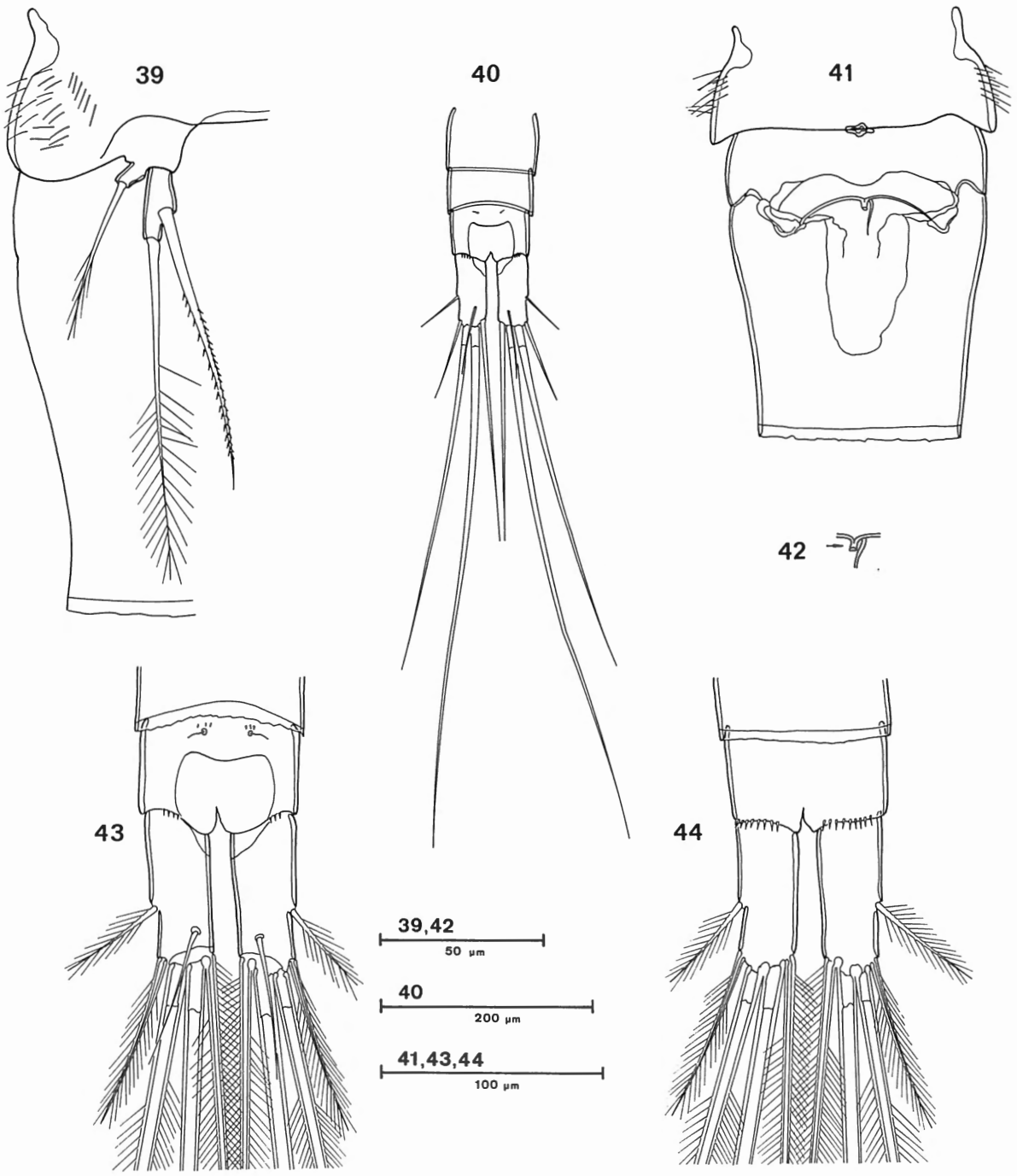
M. papuensis sp. n. differs from its congeners by the combination of the following characters: spine pattern on the basipodite of the antenna, structure of P_4, structure of the receptaculum seminis and last thoracic segment devoid of setules laterally.

TYPE LOCALITY

Papua New Guinea, Madang Province, Hansa Point; loc. n° 3279; swamp; leg.: K. WOUTERS, 31st May 1982.

TYPE MATERIAL

Holotype: 1 female, dissected in glycerine and mounted on two slides; the first slide contains A_1-P_4, the second P_5-abdomen; n° 26.528/A 3279.
Allotype: 1 male, dissected and mounted on one slide, n° 26.528/B 3279.
Paratypes: 1 female, dissected on two slides, n° 26.528/C 3279; one tube containing 10 undissected females, n° 26.528/3279.



Figs. 39-44. Mesocyclops woutersi *sp. n. holotype:*
39. P_5; 40. last abdominal segments and furca; 41. last thoracic segment and genital segment; 42. detail of copulatory-pore area; 43. last abdominal segment and furcal rami, dorsal view; 44. last abdominal segment and furcal rami, ventral view.

Additional material examined: localities n° 3365, 3366, 3258, 3178, 3172, 3307, 3303, 3155, 3272, 3362, 3281, 3271.

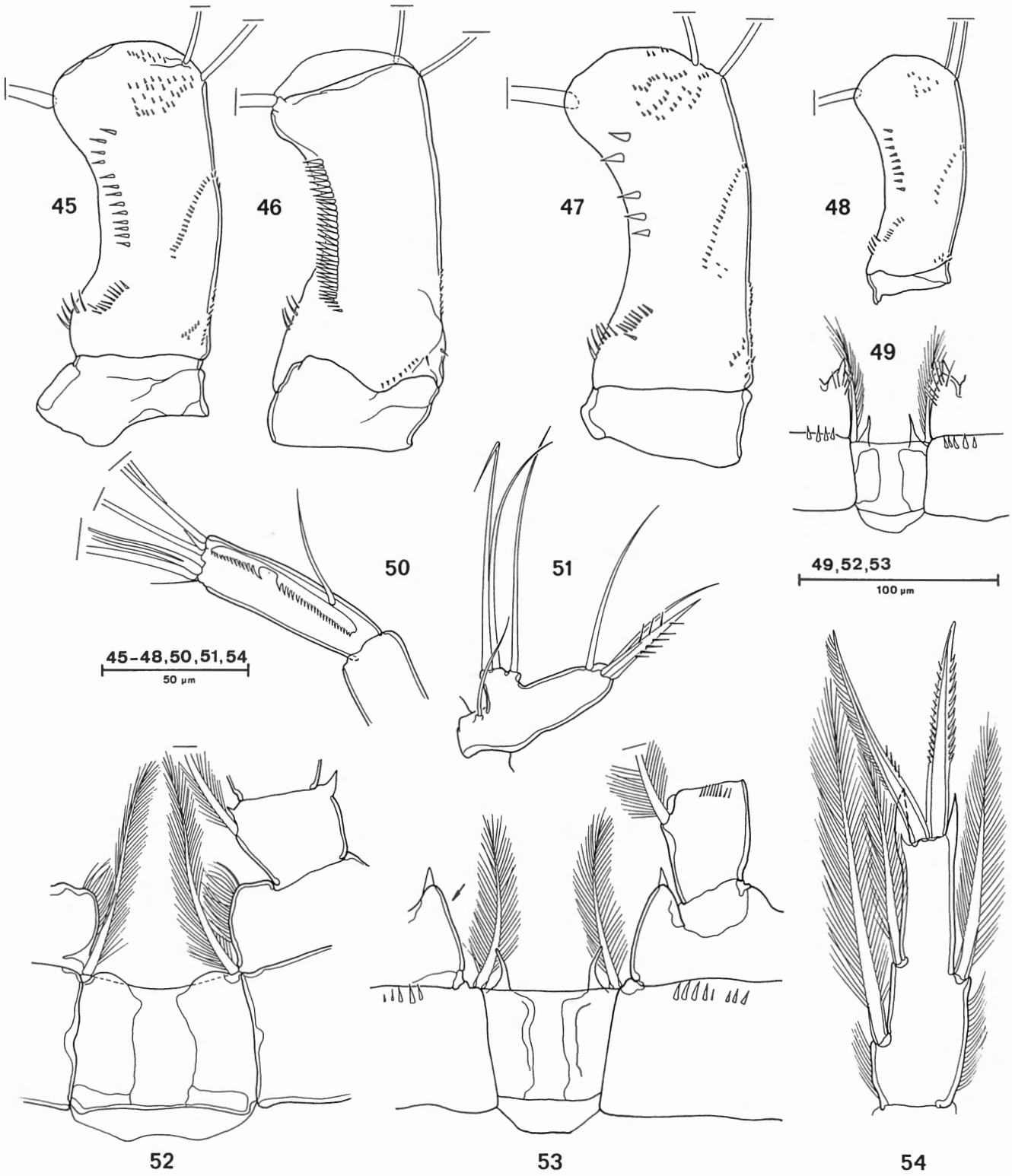
Etymology: named for Papua New Guinea.

DESCRIPTION OF THE FEMALE HOLOTYPE

Total body length (furcal setae not included): 1,496 µm.

Antennule: hyaline membrane of segment 17 with one deep notch (Fig. 50).

Basipodite of antenna: in addition to the basic pattern common to all *Mesocyclops* species a row of minute spinules is present on the medial caudal side. At the level of inner apical setae a patch of minute spinules on caudal side (Fig. 45). Spine pattern very similar to that of *M. woutersi* except for the spines of the longitudinal row on the caudal side becoming larger towards the distal end of the basipodite in *M. woutersi.*



Figs. 45-54. Mesocyclops papuensis *sp. n. holotype:*
45. basipodite A_2, caudal side; 46. basipodite A_2, frontal side; 47. basipodite A_2, caudal side, other specimen; 48. basipodite A_2, caudal side, male allotype; 49. connecting plate and inner portion of coxo- and basipodite P_4, male allotype; 50. antennular segment 17; 51. maxillulary palp; 52. connecting plate and inner portion of coxo- and basipodite P_1; 53. connecting plate and inner portion of coxo- and basipodite P_4; 54. enp_3P_4.

In *M. papuensis* these spines are of equal size.
Maxillule: basis of maxillulary palp not provided with spines (Fig. 51).
Thoracopods: connecting plates of P_1-P_4 without setules on the caudal side; inner distal margin of basipodite P_1 without a spine (Fig. 52); prominences on distal margin of connecting plate P_4 pointed, curved and well developed; inner part of basipodite P_4 without setules (Fig. 53:♂); lateral inner part of caudal side of coxopodite P_4 without setules.
P_5 & P_6: of the usual structure (Fig. 55).
Last thoracic segment: completely devoid of setules (Figs. 55, 57).
Receptaculum seminis: as in Fig. 57; lateral arms broad, slightly curved backwards; anterior and posterior margin of lateral arms parallel; copulatory-pore horse-shoe-shaped.
Abdominal segments: dorsal and ventral distal margin of last segment with a row of well developed spines (Figs. 58, 59).
Furca: furcal rami 3.1 times as long as wide; no setules on inner margin; dorsal furcal seta slightly shorter than external furcal seta; implantation of lateral and external furcal setae provided with spines (Figs. 58, 59).

DESCRIPTION OF THE MALE ALLOTYPE

Total body length: 944 µm. Spine pattern on basipodite of antenna (Fig. 48), last thoracic segment devoid of lateral setules and structures of P_1-P_3 as in the female. Connecting plate P_4 with long prominences; in contrast with the female inner part of basipodite P_4 with a distal group of setules. Furcal rami 2.65 times as long as wide; dorsal furcal seta slightly longer than external one.

REMARKS

M. papuensis is morphologically closely related to *M. pehpeiensis* HU, 1943 as described by LIM & FERNANDO (1985), and *M. ruttneri* KIEFER, 1981, *M. pehpeiensis* is known from China, Australia, Java, Burma, Sri Lanka and Malaysia (*vide* LIM & FERNANDO, *op. cit.*). *M. ruttneri* was described from a greenhouse in Austria and originated from tropical plant material. According to LIM & FERNANDO (*op. cit.*) *M. ruttneri* is a synonym of *M. pehpeiensis*.
Similarities with *M. ruttneri* and *M. pehpeiensis* are in the well developed prominences on the connecting plate P_4, the general morphology of the receptaculum seminis, the last thoracic segment devoid of lateral setules and in the spine pattern of the basipodite of the antenna (only known in *M. pehpeiensis*).
M. papuensis differs from *M. ruttneri* in the structure of the receptaculum seminis: the posterior margin of the proximal part is not strongly curved at the level of the copulatory-pore.
It differs from *M. pehpeiensis* by the seta of basal segment of P_5 set with setules and the inner part of basipodite P_4 without distal setules.

Mesocyclops aspericornis (DADAY, 1906) has a circumtropical-subtropical distribution. It was found in localities n° 3160, 3258, 3178 and 3359.

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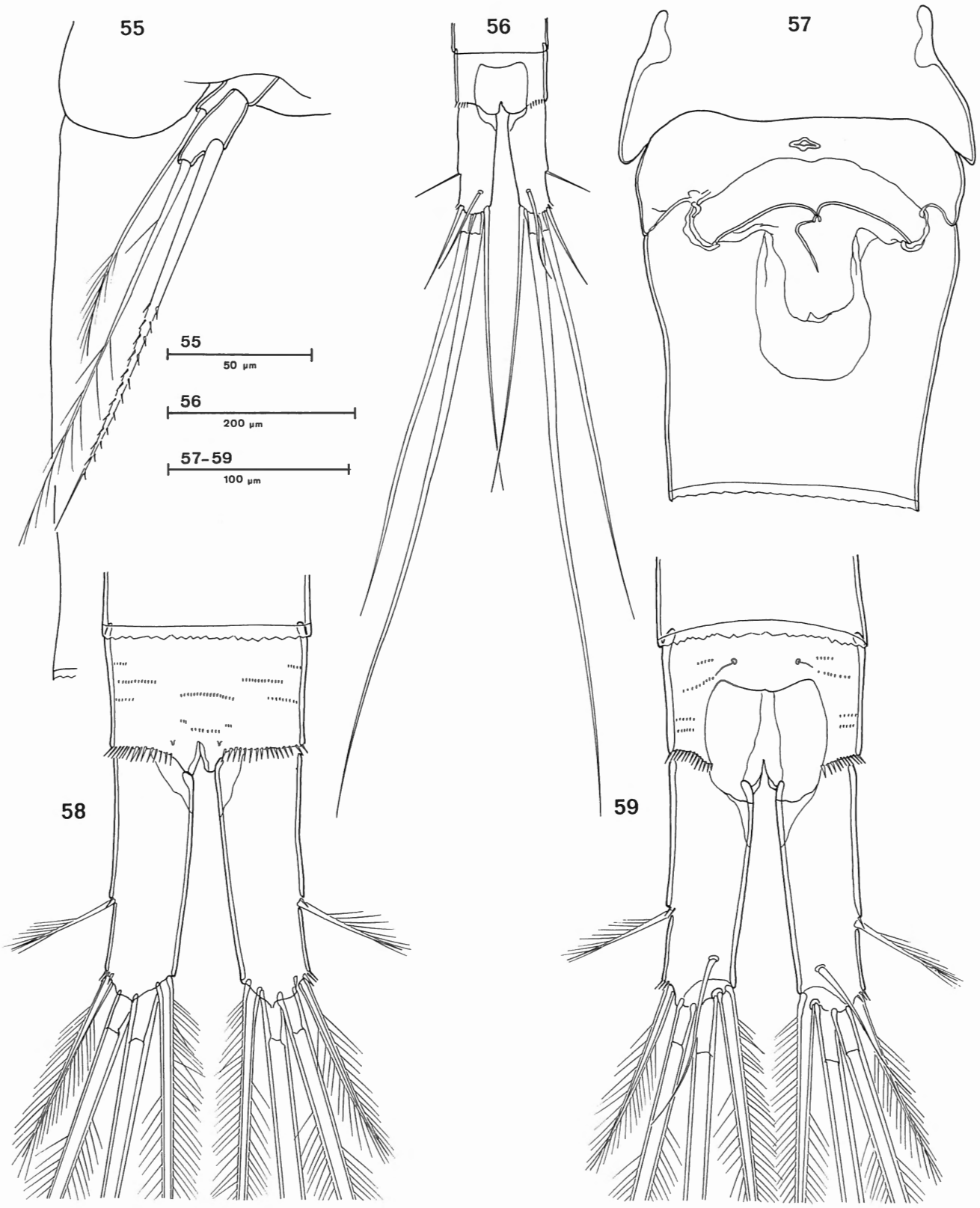

Figs. 55-59. Mesocyclops papuensis *sp. n. holotype:*
55. P_5; 56. last abdominal segment and furca; 57. last thoracic segment and genital segment; 58. last abdominal segment and furcal rami, ventral view; 59. last abdominal segment and furcal rami, dorsal view.

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