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Two new water mite species of the genus *Hydrodroma* Koch, 1837 from New Caledonia (Acari, Hydrachnidia: Hydrodromidae)

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Original research

ABSTRACT

Two new water mite species of the genus *Hydrodroma* Koch (Acari: Hydrachnidia, Hydrodromidae) are reported from New Caledonia, i.e. *Hydrodroma novacaledonica* **sp. nov**. and *H. pacifica* **sp. nov.** An updated key for the Australasian species of *Hydrodroma* is provided.

Keywords Acari; new species; New Caledonia; taxonomy; Australia
Zoobank http://zoobank.org/505D641C-5C48-44A4-8B98-8FE2304A4090

Introduction

The family Hydrodromidae K. Viets, 1936 comprises of two genera, the widely distributed *Hydrodroma* Koch, 1837 and the doubtful *Oxopsis* Nordenskiöld, 1905, known from a single specimen collected in Sudan (see Cook 1974). The genus *Hydrodroma* has been found in all biogeographic regions except Antarctica. Species of this genus are often abundant in standing waters or pool areas of streams, but can be found also in stream riffles and cascades (Di Sabatino *et al.* 2010; Gerecke 2017). In general, adults have a uniform appearance, with idiosoma lacking muscle attachment sclerites, genital flaps bearing numerous small acetabula arranged in several rows along the medial edge, P-4 with a long and pointed dorsodistal extension reaching the tip of the slender and elongated P-5, and legs bearing swimming setae (Di Sabatino *et al.* 2010; Gerecke 2017).

More than 28 species of the family Hydrodromidae are known worldwide to date (Zhi-Qiang *et al.* 2010). Currently, six species have been described from the Australasian region (Australia and New Caledonia), i.e. *Hydrodroma kununurra* Pešić & Smit, 2007, *H. australis* Pešić & Smit, 2007, *H. kakadu* Pešić & Smit, 2007, *H. wilesi* Pešić & Smit, 2007, *H. cooki* Pešić & Smit, 2007 and *H. meridionalis* Pešić & Smit, 2007 (Pešić and Smit 2007a, b, 2011).

This paper gives the description of two new species of the genus *Hydrodroma* from New Caledonia.

Material and methods

Water mites were collected by hand netting, sorted live in the field, and immediately preserved in Koenike-fluid. In the lab, selected specimens were dissected, and slide mounted in Faure's medium. Holotypes and paratypes of the new species will be deposited in Muséum National

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d'Histoire Naturelle, Paris (MNHN), paratypes and non-type-material in Naturalis Biodiversity Center in Leiden (RMNH).

All measurements are in µm. The photographs of ejaculatory complexes were made using a camera on Samsung Galaxy smartphone. The following abbreviations are used: Ac = acetabula; Cx-I = first coxae; dL = dorsal length; H = height; I-L-4-6 = fourth-sixth segments of first leg; L = length; lL = lateral length; mL = medial length; NP = National Park; P-1-P-5 = palp segment 1-5; RMNH = Naturalis Biodiversity Center, Leiden; W = width.

Mentioning author(s) and year of publication in taxon names in this paper is for nomenclatural completeness only, and therefore no citation of the original papers is given in the references.

Systematics

Family Hydrodromidae K. Viets, 1936

Genus *Hydrodroma* Koch, 1837

Hydrodroma novacaledonica Pešić & Smit sp. nov.

Zoobank: C2A308F0-C3CB-4A75-AE55-D113163B5A91

Figs. 1A-C, E-G

Synonym — *Hydrodroma kakadu* Pešić & Smit 2007a: 38 [in part].

Material examined — Holotype ♂ (MNHN), New Caledonia, Creek des Japonais at crossing with road Thio-Boulouparis, 27 Sept. 2000, leg. Smit, dissected and slide mounted. Paratypes: 2♂, 3♀, same place and data as holotype, 1♀ dissected and slide mounted (MNHN, RMNH); 8♀, 1 deutonymph, New Caledonia, Hienghène Rivière, 19 km from mouth, 29 Sept. 2000, leg. Smit (RMNH).

Other material — New Caledonia: Rivière Amoa tributary RG, 20°58′47.857 S, 165°09′32.126 E, 25 Oct. 2005 leg. Flouhr, 1♂, 1♀; Rivière Nodéla, 20°26′42.600 S, 165°19′52.345 E, 13 May 2005 leg. Flouhr, 1♀; Rivière Nodéla, 20°26′42.600 S, 165°19′52.345 E, 13 May 2005 leg. Flouhr, 1♀; Dothio Rivière at crossing with road Thio-Nakéty, 28.ix.2000, leg. Smit, 4♀; Oua Mendiou Rivière 30 km from mouth, 01 Oct. 2000, leg. Smit, 3♀; Thio Rivière at crossing with road to Kouaré, 27.Sept. 2000 leg. Smit, 1♂; Rivière Coulée, 22°10′24.327″ S, 166°37′18.119″ E, 21 Oct. 2005 leg. Smit, 1♂, 2♀; Rivière Coulée, 22°60′25.876″ S, 166°37′22.857″ E, 20 Sept. 2001 leg. Mary, 1♀ [damaged; gnathosoma and palps lacking]; Rivière Thio, 21°38′13.4736″ S, 166°11′56.935″ E, 29 Oct. 1997 leg. Mary, 1♀, dissected and slide mounted (RMNH); Thio 7, 02.viii.2000 leg. Mary, 2♀; Néaoua, 27 Oct. 1999, leg. Mary, 1♀; Thiiem, 02 Nov. 1999 leg. Mary, 5♀; Boghen 1, 30 Oct. 1999, leg. Mary, 1♀; Thio 7 (Dothio I), 12 Jan. 2000 leg. Mary, 2♀.

Diagnosis — Idiosoma and gnathosoma large in size (idiosoma L > 1000, genital plates L > 200, P-4 > 190 µm); integument papillae rounded. Genital plates with 47–51 pairs of Ac in at most 4 longitudinal rows. Leg setae numbers: II-L-posterior 3-4; III-L-4 posterior 9-14; III-L-5 posterior 7-11; IV-L-4 anterior 8-12, posterior 9-14; IV-L-5 anterior 0, posterior 6-8.

Description — Integument with reticulation in deeper layers (Fig. 4B). Cx-I+II medially separated by a fine membranous line, with a row of long fine setae at medial margins of Cx-I, and posterior margins of Cx-II, -III, and -IV. Genital flaps with rounded lateral and concave medial margins. Excretory pore sclerotized. Leg claws without claw blade, with a dorsal clawlet.

Male (holotype): Idiosoma L 1300, W 1050. Coxal field L 588; Cx-III W 659, L Cx-I+II 253, Cx-III+IV 322; coxal setae numbers: Cx-I, 17; Cx-II, 19; Cx-III, 13; Cx-IV 18. Genital plate L 208, on each plate Ac number 49, with 23-26 setae, all hollow. Ejaculatory complex L 194.

Gnathosoma vL 244; chelicera total L 277, L basal segment 211, claw 63, L ratio basal segment/claw 3.3. Palp (Fig. 1E) total L 452, dL/H, dL/H ratio: P-1, 56/37, 1.53; P-2, 77/56,

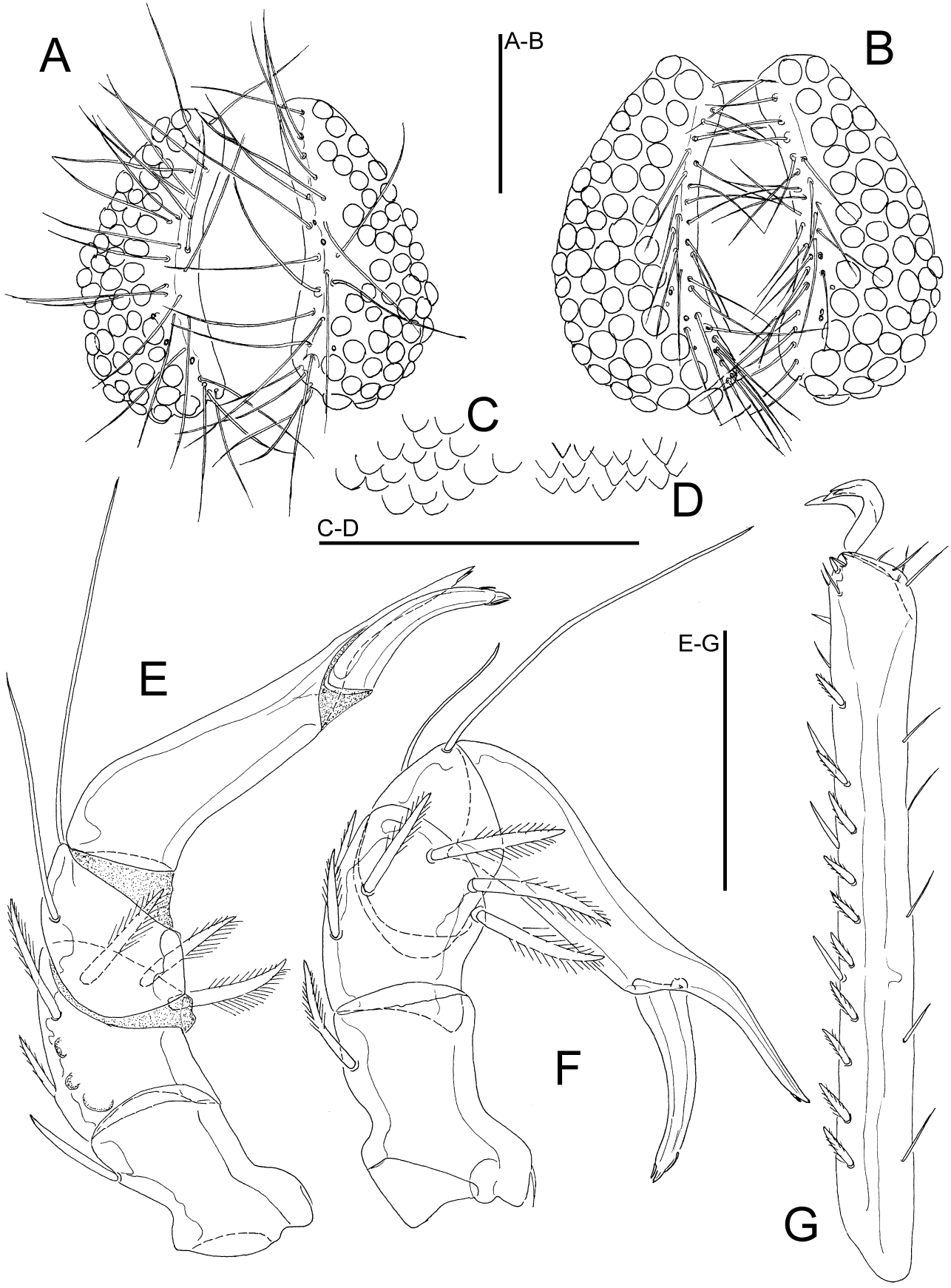

Figure 1 A-C, E-G: *Hydrodroma novacaledonica* **sp. nov**. (A, E, G holotype ♂, Creek des Japonais; B-C, ♀, Creek des Japonais; F, ♀, Rivière Thio): A-B – genital field; C – integument papillae; E – palp, lateral view; F – palp, medial view; G – IV-L-6. D: *H. kakadu*, ♀, Plunge Pool Edith Falls, Northern Territory: integument papillae. Scale bars = 100 µm.

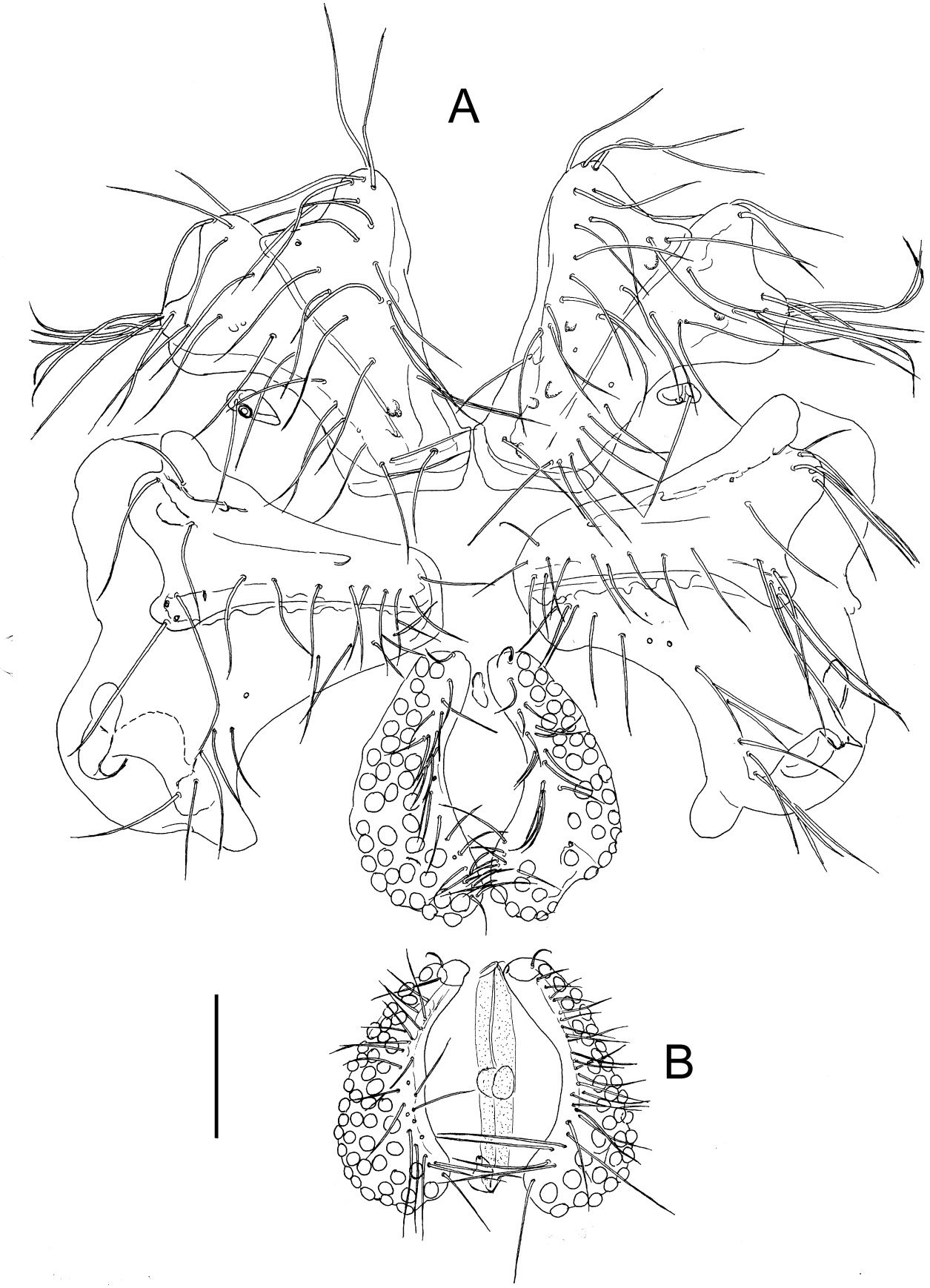

Figure 2 *Hydrodroma pacifica* **sp. nov**. (A holotype ♂, Rivière Ouénaoué; B ♀, La Coulée Rivière): A – coxal and genital field; B – genital field. Scale bar = 100 µm.

1.38; P-3, 50/58, 0.87; P-4, 191/45, 4.3; P-5, 78/19, 4.2; L ratio P-2/P-4, 0.4. dL IV-L: 94, 169, 191, 297, 313, 275.

Female (paratype from Creek des Japonais, n = 1; in parentheses some measurements of the specimen from Rivière Thio, n = 1): Idiosoma L 1420 (1350), W 1160. Coxal field L 623 (622); Cx-III W 669 (644); L Cx-I+II 291 (283), Cx-III+IV 363 (338); coxal setae numbers: Cx-I, 19 (16); Cx-II, 28 (19); Cx-III, 20 (15); Cx-IV 16 (17). Genital plate large, L 228 (219), on each plate Ac number 51 (47), with 26 (22) setae.

Gnathosoma vL 255 (259); chelicera total L 309 (305), L basal segment 242 (231), claw 66 (67), L ratio basal segment/claw 3.7 (3.5). Palp (Fig. 1F) total L 463 (464), dL/H, dL/H ratio: P-1, 56/39, 1.44 (60/42, 1.4); P-2, 77/62, 1.25 (83/63, 1.32); P-3, 52/59, 0.87 (48/55, 0.88); P-4, 198/47, 4.2 (195/45, 4.3); P-5, 80/19, 4.1 (78/20, 3.9); L ratio P-2/P-4, 0.39 (0.42). dL IV-L: 111 (113), 184 (172), 209 (198), 325 (316), 338 (347), 292 (291).

Etymology — Named after the island where the new species was collected.

Discussion — The new species from New Caledonia closely resembles *Hydrodroma kakadu* Pešić & Smit, 2007, a species similar in the presence of 3-4 swimming setae on II-L-5 and in the absence of swimming setae from anterior IV-L-5. It was originally described from Kakadu National Park, Australia, and reported also from New Caledonia (Pešić & Smit 2007a). The latter authors mentioned that specimens of *H. kakadu* from Australia differ from specimens from New Caledonia, in this study assigned to the new species *H. novacaledonica* **sp. nov**., in smaller dimensions of the idiosoma and gnathosoma (e.g., idiosoma L: < 800 in ♂, < 1000 in ♀; L genital plates < 180 in ♂, < 190 µm in ♀; in both sexes L gnathosoma < 190, chelicera < 250, P-4 < 150 µm) and in a reduced number of swimming setae on III/IV-L (less than 10 on both posterior III-L-4 and anterior IV-L-4) (Pešić & Smit 2007a). These differences are confirmed by the examination of new material from New Caledonia. Moreover, the new species from New Caledonia differs in the shape of integument papillae (rounded *vs*. pointed in specimens of *H. kakadu* from Australia; compare Fig. 1C and Fig. 1D).

Distribution — New Caledonia.

Hydrodroma pacifica Pešić & Smit sp. nov.

Zoobank: 7F836BF0-9B10-4686-B013-A469D331C630

Figs. 2, 3A-C, E-G

Material examined — Holotype ♂ (MNHN), New Caledonia, Rivière Ouénaoué at crossing with Mt Koghi road, 22°10.856 S, 166°29.532 E, 13 Nov. 2005 leg. Smit, dissected and slide mounted. Paratypes: 1♀, same place and data as the holotype, leg. Smit, dissected and slide mounted, (MNHN); 2♀, 1 deutonymph, La Coulée Rivière downstream of barrage, 22°10.404 S, 166°37.291 E, 16 Nov. 2005 leg. Smit, 1♀ dissected and slide mounted (RMNH).

Other material — New Caledonia: Rivière Voh, 20°56′13.241″ S, 164°43′29.427″ E, 6 Nov. 2001 leg. Mary, 1♂; Unnamed Creek E of Pont Pérignon, Parc de la Rivière Bleue, 24

Table 1 Number of swimming setae for *Hydrodroma novacaledonica* **sp. nov.**.

	Creek des Japonais		R. Hienghène		R. Dothio	R. Thio
	♂ holotype	♀ (n=2)	♂ (n=2)	♀ (n=4)	♀ (n=2)	♀ (n=1)
II-L-5 posterior	4	4-5	3–4	3–4	4	4
III-L-4 posterior	11	9-13	13–14	10–12	12-13	13
III-L-5 posterior	8	8	8–11	7–11	8-10	7
IV-L-4 anterior	9	12	11	10–11	12	11
IV-L-4 posterior	9	13	12–13	11–13	12-14	14
IV-L-5 anterior	0	0	0	0	0	0
IV-L-5 posterior	7-6	6-7	6–7	6–7	7-8	7

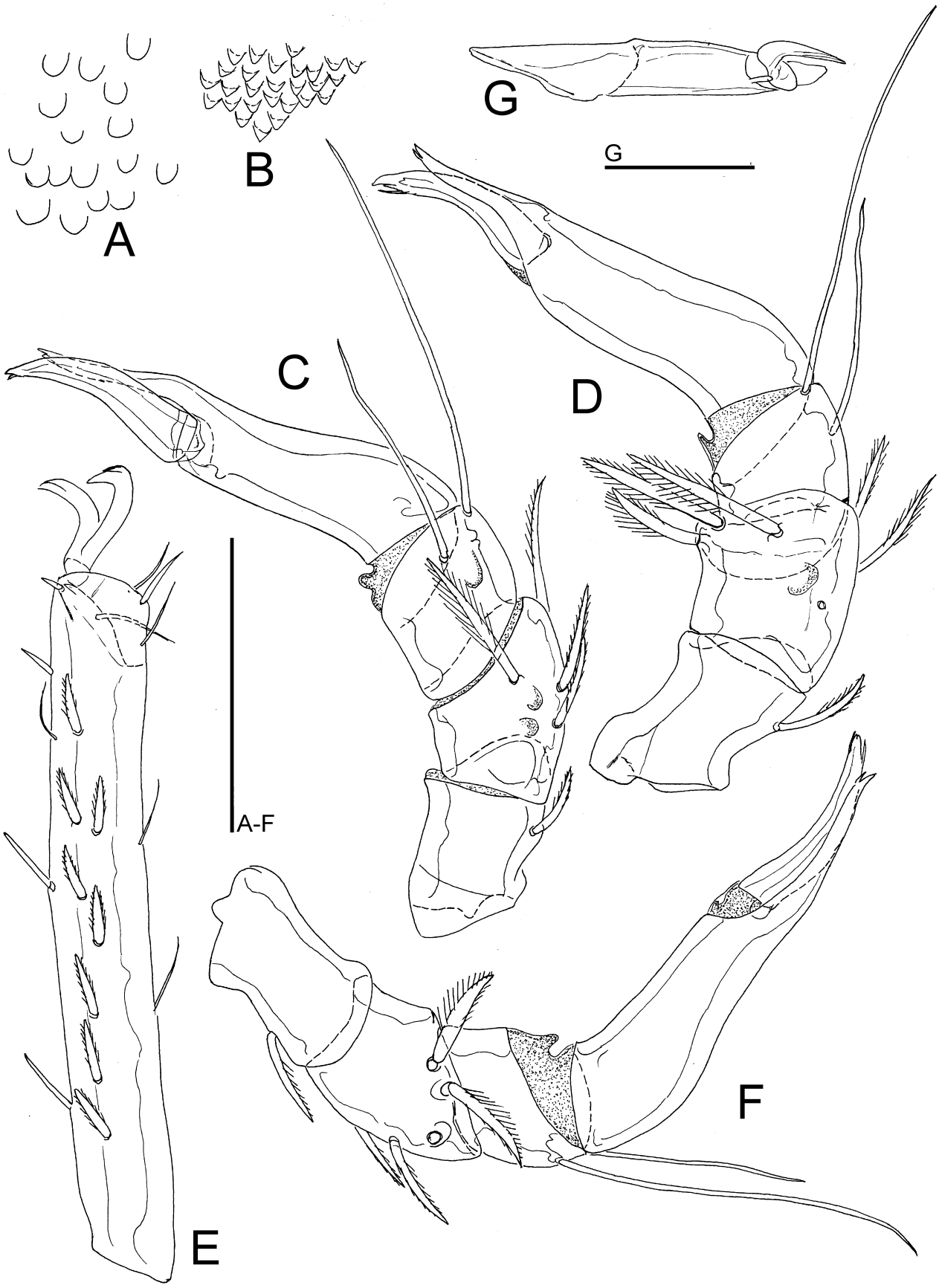

Figure 3 A-C, E-G: *Hydrodroma pacifica* **sp. nov**. (A, C-E holotype ♂, Rivière Ouénaoué; F-G ♀, La Coulée Rivière): A – integument papillae; C – palp, lateral view; D, F – palp, medial view; E – IV-L-6; G – chelicera. B: *H. cooki*, ♀, Caranbirini Waterhole, Northern Territory: integument papillae. Scale bars = 100 µm.

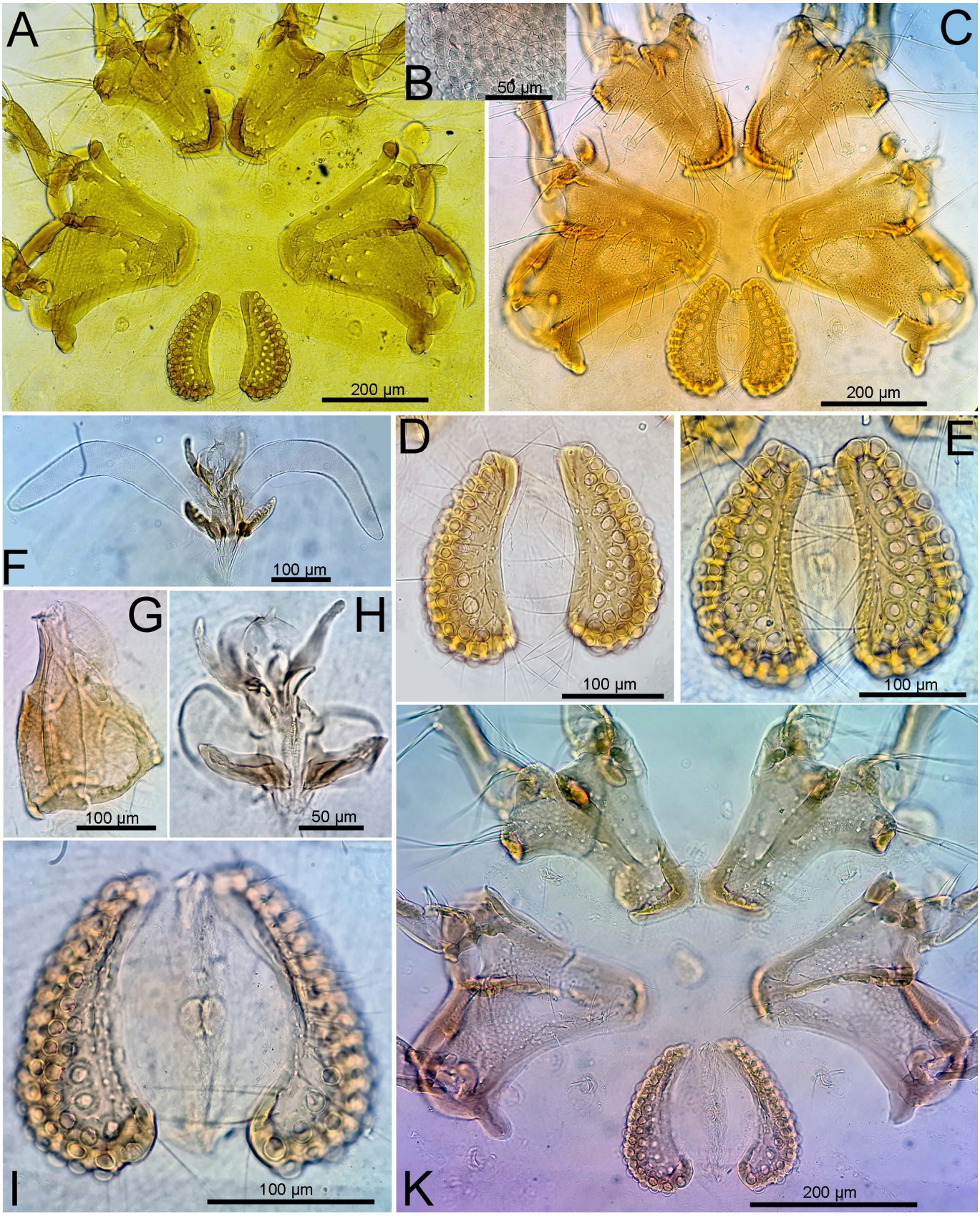

Figure 4 Photographs of selected parts. A-G: *Hydrodroma novacaledonica* **sp. nov**. (A, D, F, holotype ♂, Creek des Japonais; B-C, E, G, ♀, Creek des Japonais): A, C – coxal and genital field; B – dorsal integument papillae; D-E – genital field; F = ejaculatory complex; G – gnathosoma, lateral view; H-K: *Hydrodroma pacifica* **sp. nov**. (H holotype ♂, Rivière Ouénaoué; K-I ♀, La Coulée Rivière): H – ejaculatory complex; I – genital field; K – coxal and genital field. Scale bars = 100 µm.

Sept. 2000 Smit, 1 ♀ (partly damaged); Coco amont, 5 Oct. 2000 leg. Mary; Rivière Confiance, leg. Mary, 1♂.

Diagnosis — Integument papillae rounded. Genital plates with 38–43 pairs of Ac in at most 3 longitudinal rows. Leg setae numbers: II-L-posterior 1 (short); III-L-4 posterior 4-6; III-L-5 posterior 3-6; IV-L-4 anterior 4, posterior 7; IV-L-5 anterior 0, posterior 3-4.

Description — *General features* —Integument with reticulation in deeper layers. Cx-I+II medially separated by a fine membranous line, with a row of long fine setae at medial margins of Cx-I, and posterior margins of Cx-II, -III, and -IV. Genital flaps with rounded lateral and strongly concave medial margins. Excretory pore sclerotized. Legs claws without claw blade, with a dorsal clawlet.

Males (holotype): Idiosoma L 910. Coxal field L 464; Cx-III W 456; L Cx-I+II 219, Cx-III+IV 256; coxal setae numbers: Cx-I, 22; Cx-II, 25; Cx-III, 19; Cx-IV 16. Genital plate slender, L 197, on each plate Ac number 38, with 23 setae, all hollow. Ejaculatory complex L 156.

Gnathosoma vL 194; chelicera total L 266, L basal segment 205, claw 63, L ratio basal segment/claw 3.3. Palp (Figs. 3C-D) total L 376, dL/H, dL/H ratio: P-1, 44/34, 1.27; P-2, 66/55, 1.2; P-3, 41/47, 0.87; P-4, 158/39, 4.0; P-5, 67/17, 3.9; L ratio P-2/P-4, 0.42. dL IV-L: 84, 141, 166, 250, 266, 244.

Female (paratype from Rivière Ouénaoué, n =1; in parentheses specimen from La Coulée Rivière, n =1): Idiosoma L 1050, W 1000. Coxal field L 484 (450); Cx-III W (516); L Cx-I+II 209 (216), Cx-III+IV 247 (256); coxal setae numbers: Cx-I, 19 (20); Cx-II, 23 (26); Cx-III, 24 (20); Cx-IV, 17 (15). Genital plate L 181 (183), on each plate Ac number 43 (44), with 21 (31) setae. Egg maximum diameter (n =2) 116-122.

Gnathosoma vL 197; chelicera total L 266 (256), L basal segment 198 (203), claw 65 (61), L ratio basal segment/claw 3.1 (3.3). Palp (Fig. 3F) total L 375 (382), dL/H, dL/H ratio: P-1, 47/35, 1.35 (47/32, 1.47); P-2, 63/56, 1.12 (66/48, 1.37); P-3, 38/50, 0.75 (39/47, 0.83); P-4, 158/39, 4.0 (163/38, 4.27); P-5, 69/17, 4.1 (67/15, 4.5); L ratio P-2/P-4, 0.40 (0.41). dL IV-L: 86 (100), 147 (150), 166 (172), 256 (263), 275 (272), 238 (241).

Etymology — Named after the Pacific region.

Discussion — The new species resembles *Hydrodroma cooki* Pešić & Smit, 2007, a species widely distributed in lentic waters in Australia (Pešić & Smit, 2007b). It shares the presence of only one short swimming setae on II-L-5 and the absence of swimming setae from anterior IV-L-5. From the new species, *H. cooki* is distinguished by an increased number of genital acetabula (on each plate 63–161 Ac in 5–9 longitudinal rows) and swimming setae on III/IV-L (more than 10 on both posterior III-L-4 and anterior IV-L-4), legs with a relatively small-sized claw and by the shape of the integument papillae (pointed *vs*. rounded in *H. pacifica* **sp. nov.**). *Hydrodroma wilesi* Pešić & Smit, 2007, reported from a helocrene spring and stream in the Northern Territory, Australia (Pešić & Smit, 2007b), is similar in legs with a relatively large-sized claw and genital plate with < 60 Ac in 4–5 rows. It differs from the new species in a reduced number of swimming setae on III/IV-L (III-L-4 posterior 1–2, III-L-5 posterior 1–3 rather short, IV-L-4 anterior 2–3, posterior 2–4, IV-L-5 posterior 1).

Distribution — New Caledonia.

Key to the Australasian species of *Hydrodroma* Koch, 1837

1. II-L-5 with more than four swimming setae 2
— II-L-5 with one or without swimming setae 5

2. IV-L-5 anteriorly without swimming setae 3
— IV-L-5 anteriorly with 2–5 swimming setae 4

3. Idiosoma and gnathosoma small in size (idiosoma L: < 800 in ♂, < 1000 in ♀; L genital plates < 180 in ♂, < 190 µm in ♀; in both sexes L gnathosoma < 190, chelicera < 250, P-4 <

150 µm); III-L-4 at most with ten swimming setae, IV-L-5 anteriorly with 7-9 swimming setae; integument papillae distally pointed ..... *Hydrodroma kakadu* Pešić & Smit, 2007 (Australia)
— Idiosoma and gnathosoma large in size (Idiosoma L > 1000; L genital plates > 200, L gnathosoma > 200, chelicera > 270, P-4 > 180 µm); III-L-4 with more than ten swimming setae, IV-L-5 anteriorly with 9-14 swimming setae; integument papillae distally rounded ..... *Hydrodroma novacaledonica* Pešić & Smit, **sp. nov**. (New Caledonia)

4. Genital plate with less than 50 pairs of acetabula in 3–4 rows ..... *Hydrodroma australis* Pešić & Smit, 2007 (Australia)
— Genital plate with more than 70 pairs of acetabula in 5–6 rows ..... *Hydrodroma kununurra* Pešić & Smit, 2007 (Australia)

5. IV-L-5 anteriorly with 2–4 swimming setae (usually with 2, occasionally with 1) ..... *Hydrodroma meridionalis* Pešić & Smit, 2011
— IV-L-5 anteriorly without swimming setae 6

6. Genital plate with fewer than 60 pairs of acetabula in 4–5 rows; legs with a relatively large-sized claw 7
— Genital plate with more than 60 pairs of acetabula in 5–9 rows; legs with a relatively small-sized claw ..... *Hydrodroma cooki* Pešić & Smit, 2007

7. III-L-4 with 1-2 swimming setae, III-L-5 with 1-2 rather short swimming setae, IV-L-5 posteriorly with one swimming seta ..... *Hydrodroma wilesi* Pešić & Smit, 2007 (Australia)
— III-L-4 with 4-6 swimming setae, III-L-5 with 3-4 long swimming setae, IV-L-5 posteriorly with 3-4 swimming setae ..... *Hydrodroma pacifica* Pešić & Smit, **sp. nov**. (New Caledonia)

Table 2 Number of swimming setae for *Hydrodroma pacifica* **sp. nov.**.

	Holotype ♂	R. Ouénaoué, ♀, n =2	R. Voh, ♂, n = 1
II-L-5 posterior	1	1	1
III-L-4 posterior	5	6	4
III-L-5 posterior	4	4	3
IV-L-4 anterior	5	5-6	3
IV-L-4 posterior	6-7	6-7	4
IV-L-5 anterior	0	0	0
IV-L-5 posterior	3-4	3	3

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