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New and rare species of hyporheic water mites from New Zealand (Acari: Hydrachnidia: Aturidae, Momoniidae), with the description of two new genera, one new subgenus and one new species

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Original research

ABSTRACT

Recently collected material as well as material collected in the 1960s of *Zelandopsis aturoides* Schwoerbel, 1984 shows that this species does not belong in *Zelandopsis*, but in a new genus described in this paper. Moreover, a new genus was found in recent material from New Zealand, i.e. *Acidoturus* n. gen., with the type species *A. parviscutatus* n. sp.. A new subgenus of *Momonium*, i.e. *Zelandomomonium*, is erected to accommodate *M. hopkinsi* Schwoerbel, 1984. Furthermore, a redescription is given for *Zelandopsis morimotoi* Imamura, 1977 and the first description is given of the female of *Notohygrobatas kathrynae* Cook, 1983.

Keywords new genera; new subgenera; new species; water mites; systematics; New Zealand

Zoobank <http://zoobank.org/1D4D62C4-A0C2-4B6C-99E5-E1F703FFC46A>

Introduction

New Zealand drifted away from the Gondwana continent some 85 million years ago. So it is not surprising that the water mite fauna of New Zealand is for a large part made up of endemic genera. However, this applies to lotic genera only. While none of the genera occurring in standing waters is endemic, the share of endemics in the 49 genera occurring in streams and hyporheic habitats is near 70%. Most rich in genera (22) are the Notoaturlinae Besch (Cook 1983, 1991, 1992, Pesic *et al.* 2010, Schwoerbel 1984, Smit 2015). The finding of material in the collection of the late Jürgen Schwoerbel, collected by K.H. Schminke, shed new light on one already published species. Moreover, material recently collected by the author contained included further interesting new or uncompletely documented taxa. The aim of this paper is to publish this new information, including the description of one new species and the proposal of two genera and one subgenus new to science.

Material and methods

The holotype of the new species described in this paper will be lodged in the Museum of New Zealand, Wellington (NMNZ). All non-type material will be lodged in Naturalis Biodiversity Center, Leiden (RMNH). The following abbreviations are used: asl = above sea level; Cx-IV – fourth coxae; dgl-2 – dorsoglandularia 2; P1-5 – palp segments 1-5; IV-leg-2 – second segment of fourth leg. All measurements are in µm, measurements of palp and leg segments are of the dorsal margins. Ventral length is measured from the tip of Cx-I till posterior idiosoma margin.

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Taxonomy

Family Hygrobatidae Koch, 1842

Genus *Notohygrobates* Cook, 1983

Notohygrobates kathrynae Cook, 1983

(Figure 1A-D)

Material examined — 1/0/0, Tributary of Urarima Stream, interstitial, north of Coromandel Town, North Island, New Zealand, 36°34.812' S 175°24.554' E, alt. 12 m asl, 21-1-2019, leg. H. Smit (RMNH); 0/1/0, Elliot Creek, interstitial, Aorere Valley, South Island, New Zealand, 40°49.897' S 172°28.309' E, alt. 110 m asl, 8-1-2019, leg. H. Smit (RMNH).

Description — Male: The male matches the description given by Cook (1983), and here only measurements are given: Ventral length 545, dorsal length 510, width 332.

Female: Idiosoma 680 long and 486 wide, ventrally 688 long. Lateral eyes absent. Integument papillate. Dorsum with a large anterior plate, with one pair of glandularia and the preocularia, two pairs of muscle attachments and seven pairs of glandularia, the posterolateral pair enlarged. Coxae as described by Cook (1983) for the male, with a large area of secondary sclerotization lateral to Cx-III and Cx-IV. Genital field with three pairs of glandularia, one of the anterior acetabula divided (probably an individual aberration); genital plates 106 long. Pre- and postgenital sclerites large. Length of P1-P5: 26, 78, 74, 82, 28; palp as in male. Length of I-leg-4-6: 116, 118, 102. Length of IV-leg-4-6: 159, 168, 142. Legs as in male, but I-leg-5 distally with a thin seta reaching to middle of I-leg-6. Excretory pore sclerotized, near posterior idiosoma margin.

Remarks — Thus far, one male only was known from North Island, New Zealand. This male was 486 long and thus smaller than the male of this study. A character not mentioned by Cook (1983) is the papillate integument. The female is described here for the first time. Apart from the genital field, it is similar to the male. Differences concern the pair of glandularia fused with the anterior dorsal plate (in the male free in the integument).

Family Aturidae Thor, 1900

Subfamily Notoaturinae Besch, 1964

Acidoturus n. gen.

Zoobank: [1B48A517-17D6-427F-835C-A9EDF69379BA](https://zoobank.org/1B48A517-17D6-427F-835C-A9EDF69379BA)

Diagnosis — (Female only) Integument smooth. Dorsal shield small, covering only half of the dorsum, consisting of unpaired anteromedial and posteromedial plates and two pairs of lateral platelets. Anteromedial plate with a pair of postocularia, much larger than posteromedial plate, the latter with two pair of glandularia. Anterolateral platelets each with two pairs of glandularia, posterolateral platelets without glandularia. No “free” glandularia (= dgl-2) on the dorsal shield. Anterodorsal portion of ventral shield protruding into a rounded hood. All coxae pointed. Projections associated with insertion of fourth legs very large. A pair of glandularia medially to insertions of fourth legs. Gonopore terminal in position, genital plates somewhat bulging and extending onto dorsum. Palp rather stocky, especially P4. IV-leg-2 much larger than other segments, suture line separating IV-leg-2 from IV-leg-3 obliterated.

Type species — *Acidoturus parviscutatus* n. sp.

Etymology — Named for the pointed coxae.

Remarks — The remarkable small dorsal shield, much smaller than the dorsum, is not found in any other notoaturine genus. Moreover, an anteromedial dorsal plate much larger than the posteromedial plate, is also unique within the Notoaturinae. The configuration of the glandularia on the dorsal shield and the shape of the fourth leg are similar to those in

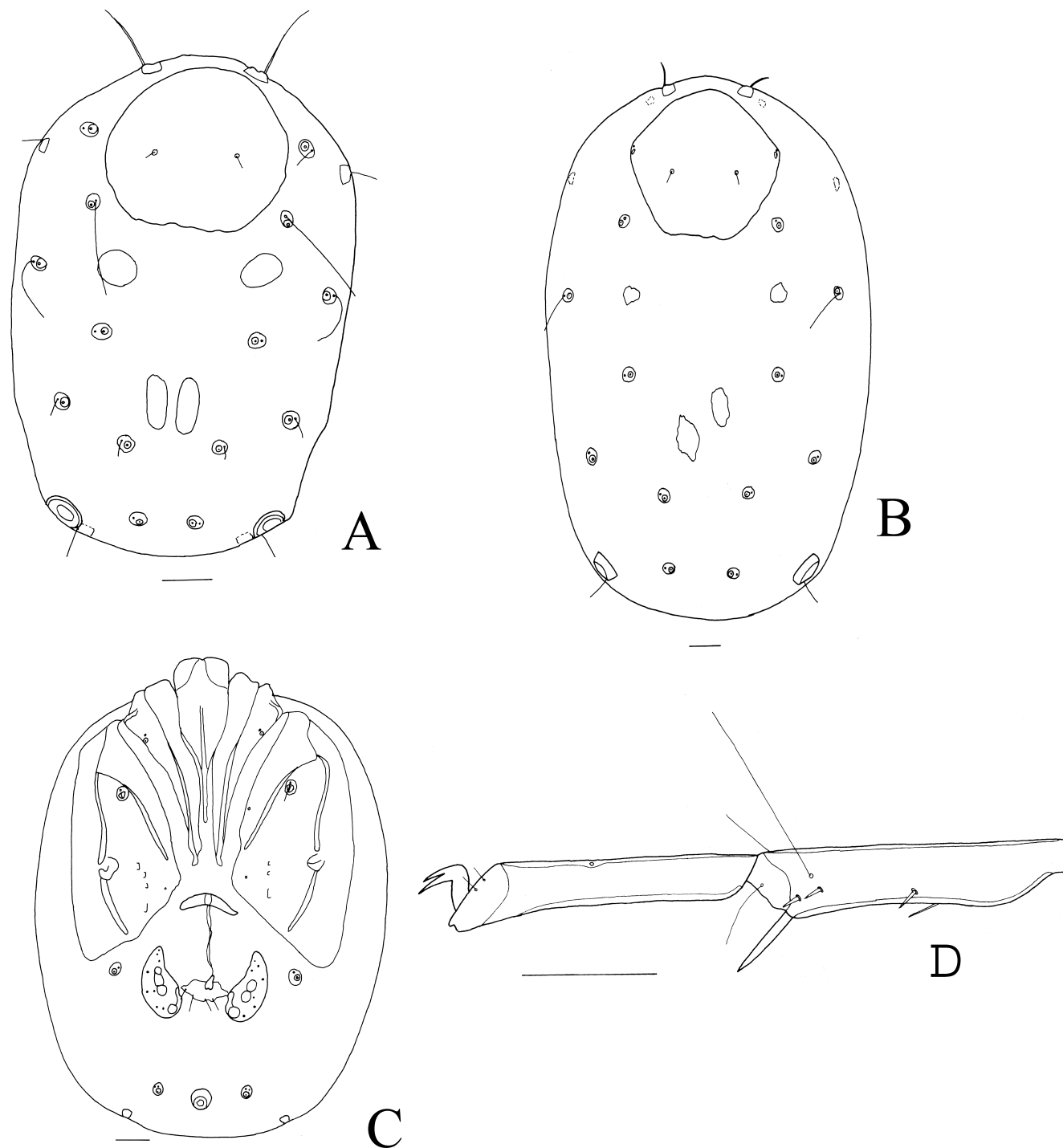


Figure 1 *Notohygrobatas kathrynae* Cook: A – male, dorsum; B – female, dorsum; C – female, venter; D – female, I-leg-5-6. Scale bars = 50 μm.

Planaturus Cook, but the latter genus has a much larger dorsal shield with the anteromedial and posteromedial dorsal plates about equal in size. Furthermore, in this genus the projections associated with the insertions of the fourth legs are much smaller. Large projections associated with the fourth legs are also found in *Abelaturus* Cook, but species of this genus have a different configuration of the dorsal glandularia. Moreover, *Abelaturus* species have the gnathosoma attached to a protrusible tube, which is not developed in *Acidoturus*. Finally, the very stocky leg segments are similar to those of *Taintaturus* Cook and *Hestaturus* Cook species, but these genera have different configurations of the dorsal glandularia.

***Acidoturus parviscutatus* n. sp.**

(Figure 2A-E)

Zoobank: [A686B0DB-F932-43D2-AB6C-B31FAF63B1FE](https://doi.org/10.5281/zenodo.3311111)

Material examined — Holotype female, Elliot Creek interstitial dig, Aorere Valley, South Island, New Zealand, 40°49.897' S 172°28.309' E, alt. 110 m, 8-1-2019, leg. H. Smit (NMNZ). Paratypes: one female, same data as holotype (RMNH); one female, Fifteen Mile Creek, interstitial dig, Aorere Valley, South Island, New Zealand, 40°48.443' S 172°31.378' E, alt. 69 m asl, 7-1-2019, leg. H. Smit (RMNH).

Diagnosis — As for genus, see above.

Description — Female: Idiosoma dorsally 405 (381–389) long (measured till tip of “hood”), ventrally 397 (366–377) long and 282 (267–284) wide. Dorsal shield 220 (214–230) long and 160 (156–168) wide, anteromedial dorsal plate 142 (140–150) long and 148 (130–150) wide, posteromedial plate 80 (76–80) long and 98 (82–94) wide. Integument anterodorsally with spine-like structures. Coxae pointed, suture lines indistinct or absent. Cx-I not extending beyond anterior margin of anterior “hood”. A suture line extending from base of Cx-III to lateral idiosoma margin. Gonopore terminal in position, 44 long. Genital field with numerous acetabula, extending onto dorsum. Length of P1-P5: 18, 36, 22, 38, 18. Palp stocky, especially P4; P3 with a relatively long dorsal seta, P4 with one short and one long ventral seta. Length of I-leg-4-6: 36, 40, 48 (till tip of segment). IV-leg-4 with a large ventral extension with a stout seta. Length of IV-leg-4-6: 25, 22, 40 (till tip of segment). IV-leg-2 larger than other segments, suture line of IV-leg-2 and -3 obliterated, IV-leg-4 with a ventral extension. Excretory pore dorsally.

Male: Unknown.

Etymology — Named for the small dorsal shield.

***Schwoerbelaturus* n. gen.**

Zoobank: [EDB43336-E6DE-4FFD-A6E9-86D92EFFFFB65](https://doi.org/10.5281/zenodo.3311111)

Diagnosis — Male: Lateral eyes absent. Dorsum with large unpaired anteromedial and posteromedial plates; anteromedial plate with the postocularia, posteromedial plate with two pairs of glandularia. Posterior margin of posteromedial plate not visible in dorsal view. Two pairs of lateral platelets, each with a gland. No “free” dorsoglandularia (= dgl-2) present. Cx-I projecting far anteriorly beyond frontal idiosoma margin. Suture lines of coxae obliterated, those of Cx-IV completely absent. A pair of glandularia near suture line Cx-III/Cx-IV, two pairs of glandularia between insertion of fourth legs and genital field. Genital field terminal in position, with several pairs of acetabula, some pairs shifted to the dorsum. Gonopore relatively wide. Palp slender, especially P4 and P5; P4 bulging ventrally, with a long ventral seta. Legs without swimming setae, segments slender and not modified.

Female: Unknown.

Type species — *Zelandopsis aturoides* Schwoerbel, 1984

Etymology — The new genus name is a combination of the name Schwoerbel and the genus name *Aturus*.

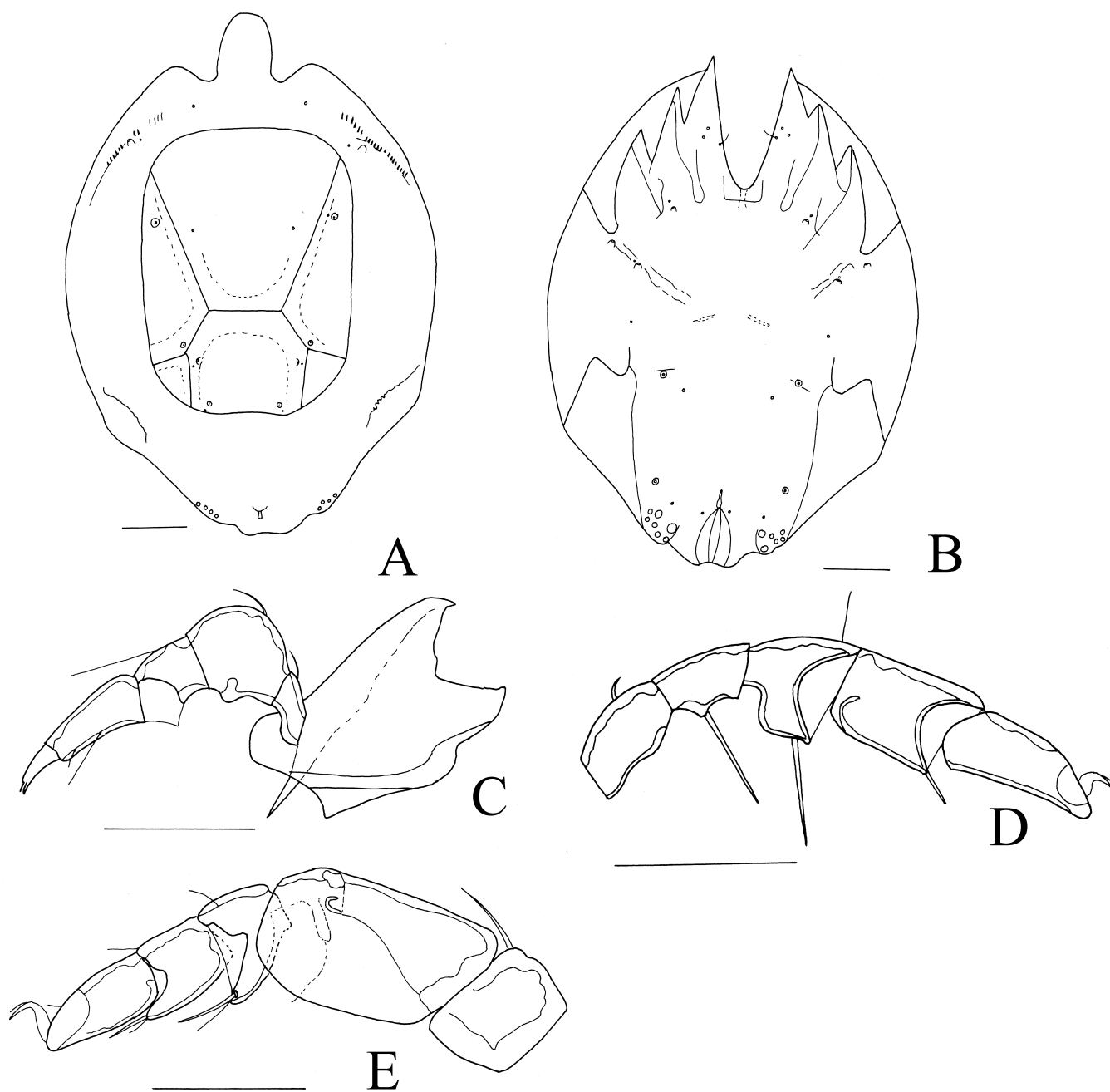


Figure 2 *Acidoturus parviscutatus* n. sp., holotype female: A – dorsum; B – venter; C – gnathosoma + palp; D – I-leg-2-6; E – IV-leg-1-6. Scale bars = 50 µm.

Remarks — Schwoerbel (1984) was not certain about the assignment of *Zelandopsis atuioides*. Now that more material is available, also of *Zelandopsis* Imamura, it is clear that Schwoerbel's species does not belong to the latter genus. The following differences can be found between *Schwoerbelaturus* n. gen. and *Zelandopsis* (in brackets): Dorsal shield without a free pair of glandularia (with a free pair), anteromedial dorsal plate very narrow (of normal width), Cx-I far projecting over frontal margin (not far projecting), P2 and P3 without denticles (with denticles), posterolateral platelet with glandularia (without glandularia), two pairs of glandularia between fourth legs insertion and genital field (one pair), one pair of glandularia near suture line Cx-III/Cx-IV (two pairs). Apart from *Evidaturus*, no other genus has a similar configuration of dorsal glandularia and plates. Besides a very rugose integument (smooth in the new genus), *Evidaturus* differs in much smaller projections associated with the insertion of the fourth coxae.

***Schwoerbelaturus atuioides* (Schwoerbel, 1984)**

(Figure 3A-D)

Material examined — Holotype male, Urarima stream, [North Island, New Zealand], 1-6-1967, leg. Schminke (SMF, labelled “L42, *Tryssaturus* “sp. A’(identatus?), *Uralbia* sp. male”). Other material: one male (SMF), two males (RMNH), Stream at crossing with road to Port Charles, Coromandel Peninsula, North Island, New Zealand, 23-1-1967, leg. Schminke.

Description — Male: Idiosoma smooth, weakly sclerotized, lateral eyes absent. Idiosoma dorsally. Measurements (in brackets holotype): 222–244 long (220), ventrally 300–318 long (280) and 172–204 wide (168). Anteromedial dorsal plate 78–92 long (82) and 120–138 wide (126), posteromedial plate 120–136 wide (120), length not measurable.

Remarks — According to Schwoerbel, the holotype should have pigmented lateral eyes. However, lateral eyes are not visible in either the holotype or in the additional three specimens. The slide with the holotype was not labelled properly, with neither *Zelandopsis atuioides* nor holotype written on it. However, as Schwoerbel (1984) had only one specimen at his disposal, and the specimen matches the description, we can assume that the specimen on this slide is the holotype.

***Zelandopsis* Imamura, 1977**

The genus *Zelandopsis* was described by Imamura (1977) based on one male only, collected from the Twin Forks Creek, Paturau, South Island, New Zealand. According to Imamura, this male should have no acetabula. I visited this area in December 2018 but was unable to find the stream itself and an unnamed stream in this area was without water mites. However, in the Marlborough Sounds area I was able to collect several males and females of *Zelandopsis morimotoi* Imamura, which makes it possible to redescribe this species, including the first description of the female.

Revised diagnosis. Lateral eye pigment absent in males, but in one female specimen eyes with red pigment, lying beneath integument. Idiosoma dome-shaped in lateral view, posteriorly tapering. Dorsum with anterior plate much narrower than wide, with the postocularia. Posterior dorsal plate unpaired, with two pairs of glandularia. Two pairs of lateral dorsal platelets present, the anterior ones with a pair of glandularia, the posterior ones without glandularia. Dorsum with one pair of “free” glandularia, located between the pair of lateral platelets and the posteromedial plate. Coxae extending slightly beyond frontal idiosoma margin. Suture lines of coxae indistinct, lateral to Cx-III a short ridge. Gonopore in male away from posterior margin, in female near posterior idiosoma margin. Acetabula in male posterior to gonopore in two irregular rows, in female in two groups flanking the gonopore. P2 ventrally with small denticles. I-III-leg-2 longer than other segments. Legs without swimming setae. Excretory pore located dorsally.

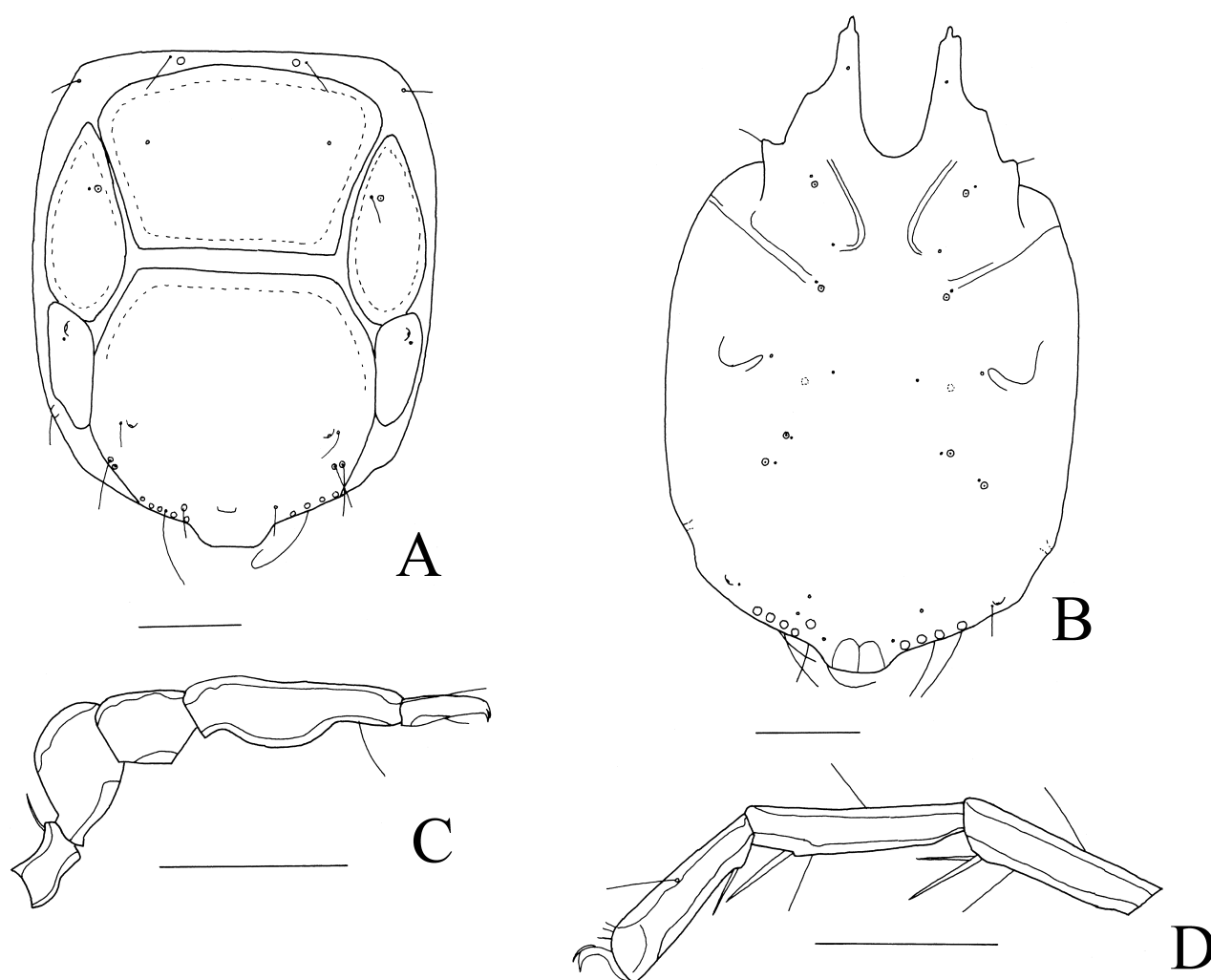


Figure 3 *Schwoerbelaturus aturoides* (Schwoerbel), male from Stream at crossing with road to Port Charles: A – dorsum; B – venter; *Schwoerbelaturus aturoides* (Schwoerbel), holotype male: C – palp; D – IV-leg-4-6. Scale bars = 50 μ m.

***Zelandopsis morimotoi* Imamura, 1977**

(Figure 4A-F)

Material examined — New Zealand (all leg. H. Smit): 1/1/0, Bob's Peak Creek, interstitial dig, western slope, Taipare Bay, Marlborough Sounds, South Island, 41°00.394' S 173°45.248' E, alt. 96 m asl, 2-1-2019; 0/1/0, Bob's Peak Creek, western slope, Taipare Bay, Marlborough Sounds, South Island, 41°00.394' S 173°45.248' E, alt. 96 m asl, 2-1-2019; 0/1/0, Unnamed stream, tributary of Bob's Peak Creek, Taipare Bay, South Island, 41°00.499' S 173°44.825' E, alt. 124 m asl, 2-1-2019; 1/0/0, Upper course of Old Homestead Creek, interstitial dig, Taipare Bay, South Island, 41°01.119' S 173°42.807' E, alt. 179 m asl, 2-1-2019.

Description — As given for genus. Frontal idiosoma margin concave. Anterior part of dorsum with spine-like structures.

Male: Idiosoma 364–373 long ventrally, 356–365 long dorsally and 254–288 wide.

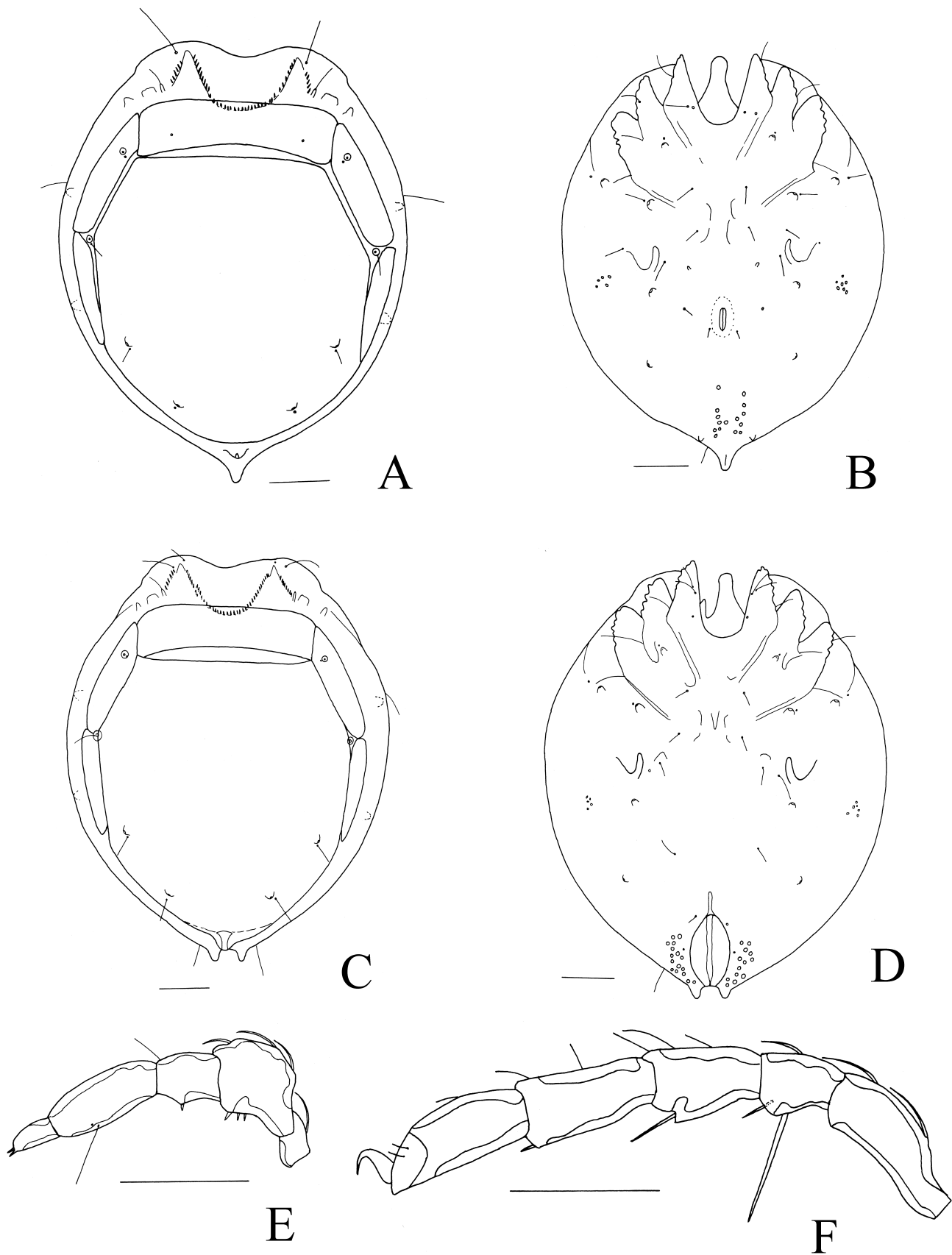


Figure 4 *Zelandopsis morimotoi* Imamura: A – male, dorsum; B – male, venter; C – female, dorsum; D – female, venter; E – male, palp; F – male, I-leg-2-6. Scale bars = 50 μ m.

Venter posteriorly with a short, apically rounded extension. Gonopore narrow, 24 long; an area surrounding the gonopore without idiosoma pores. Acetabula in the posteroventral sclerotization far posterior to gonopore, 7–8 pairs in irregular rows. Length of P1–P5: 18, 42, 26, 48, 22 (till tip of segment). P2 ventrally with three denticles, P3 ventrally with one denticle. Length of I-leg-4-6: 40, 44, 56 (till tip of segment). IV-leg-2 longer than other segments. Length of IV-leg-4 46, 52, 26.

Female: Idiosoma 389–413 long ventrally, 381–405 long dorsally and 300–328 wide. Venter posteriorly with a pair of short, apically rounded extensions. Gonopore 64 long. Number of acetabula difficult to ascertain, but very likely around 20 pairs. Lengths of P1–P5: 18, 46, 26, 52, 24 (till tip). P2 ventrally with 2–5 denticles, P3 with one denticle. Length of I-leg-4-6: 43, 50, 56 (till tip of segment). Length of IV-leg-4-6: 49, 54, 50.

Remarks — The specimens collected in this study match the description given by Imamura (1977). Imamura was not able to find the acetabula in his only male specimen. As the male was collected during a zoological expedition, and not by Imamura himself, it is likely that it was fixed in ethanol. This makes specimens dark and some structures, like the indistinct acetabula, are difficult to see. Imamura illustrated some indistinct structures posterior to the male gonopore, apparently not aware that these were the acetabula. Another feature not mentioned by Imamura is the long second segments of legs I–III, which are longer than the other segments of these legs. Habitat. Interstitial, but occasionally collected in superficial waters.

Family Momoniidae K. Viets, 1926

Genus *Momonía* Halbert, 1906

Subgenus *Zelandomonía* n. subg.

Zoobank: [7B4F9F55-4F3A-4A63-BFE3-D5F4C9C5AAF2](https://zoobank.org/7B4F9F55-4F3A-4A63-BFE3-D5F4C9C5AAF2)

Diagnosis — Lateral eyes present. Dorsum with one pair of platelets and three large unpaired plates. Venter soft, Cx-I+II separated from Cx-III+IV. Cx-IV long, with a slightly concave posteromedial margin, forming a genital bay; Cx-IV without a group of long setae near posterolateral margin, but three moderate large setae posterior to insertion of fourth legs. Insertions of fourth legs far distanced from lateral idiosoma margin. Genital field with three pairs of acetabula on a pair of genital plates in female, but in the gonopore field in male. Gonopore field of female much longer than genital plates, pregenital sclerite very small, postgenital sclerite moderately long and somewhat curved. P4 ventrally with one stout and one hair-like seta, P5 not tapering distally, with two stout claws. Legs without swimming setae. I-leg-5 elongated, I-leg-6 stocky, with an elongated claw.

Type species — *Momonía hopkinsi* Schwoerbel, 1984

Habitat — Interstitial.

Distribution — One species known from New Zealand.

Remarks — Due to the absence of swimming setae, the presence of large dorsal platelets and the atypical palp the species from New Zealand cannot be assigned to *Kondia* as proposed by Schwoerbel (1984). Previously, four subspecies were known of the genus *Momonía*, i.e. *Momonía* s.s., *Kondia* Sokolow, 1926, *Paramomonía* Yi & Jin, 2012 and *Orientmomonia* Pešić, 2014. However, none of these subgenera match the description given above, and therefore, I propose to erect a new subgenus to accommodate *M. hopkinsi*.

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was part of the collection of the late Jürgen Schwoerbel. Ulrike Mückenheim (Groß-Gerau) prepared most of the slides. Johannes Postma (Ann Arbor) reviewed the English.

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