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## Research article

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# New species of *Monepidosis* Mamaev, 1966 and *Antipodosis* gen. nov., a closely related genus from New Zealand (Diptera, Cecidomyiidae)

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**Abstract.** Three new species of *Monepidosis* Mamaev, 1966, a Holarctic genus of Porricondylinae (Diptera, Cecidomyiidae), are described: *M. heterocera* sp. nov. from Sweden and Germany, *M. sceptoroides* sp. nov. from Sweden, and *M. shikokuensis* sp. nov. from Japan. A new porricondyline genus, *Antipodosis* gen. nov., is introduced for eight new species from New Zealand, named *A. australis* gen. et sp. nov., *A. elongata* gen. et sp. nov., *A. granvillensis* gen. et sp. nov., *A. pureora* gen. et sp. nov., *A. rakiura* gen. et sp. nov., *A. rotoiti* gen. et sp. nov., *A. rotoroa* gen. et sp. nov., and *A. waipapa* gen. et sp. nov. Male genitalic morphology indicates that *Monepidosis* and *Antipodosis* gen. nov. are closely related, together forming the *Monepidosis* group of genera, which stands out from the other Porricondylini. *Monepidosis spatulata* Spungis, 2006, a species originally described from Latvia and Lithuania, is for the first time reported to occur in Sweden.

**Key words.** Porricondylinae, Palearctic region, Australasian region, new genus, new species.

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## Introduction

A recent revision of the genus *Monepidosis* Mamaev, 1966 recognized 14 valid species, 13 in the Palearctic and one in the Nearctic region (Jaschhof & Jaschhof 2013; Gagné & Jaschhof 2014). Another species of *Monepidosis* was described from Sweden soon after (Jaschhof & Jaschhof 2015). Previous authors expected a considerable number of unnamed *Monepidosis* still to be found in the Holarctic realm (Spungis 2006; Jaschhof & Jaschhof 2013), an expectation validated here with the description of three new species from Sweden, Germany and Japan. *Monepidosis* are morphologically distinct from the other Porricondylini (Cecidomyiidae, Porricondylinae) in that male genitalic structures, such as gonostyli, gonocoxites, parameres, and ejaculatory apodeme, are heavily armed in a specific manner (Jaschhof & Jaschhof 2013). Most notably, parameres are present as two pairs of large, sclerotized tusks interlinked with each other, and the ejaculatory apodeme is developed into a long, sclerotized rod whose apex is variously modified (Jaschhof & Jaschhof 2013: fig. 88A). Genitalic structures similar to those in *Monepidosis* have now been found in eight different species of undescribed Porricondylinae from New Zealand, which are obviously closely related to each other and thus classified together in a discrete new genus, *Antipodosis* gen. nov. *Monepidosis* and *Antipodosis* gen. nov. appear to be, if not sister groups, members of a distinct natural subset of the tribe Porricondylini, called here the *Monepidosis* group.

In the present paper, the newly discovered taxa are described and named, so as to continue with the taxonomic inventory of Palearctic and especially Swedish Porricondylinae within the framework of ‘The Gall Midge Project’ (<http://www.stationlinne.se/sv/forskning/the-gall-midge-project>, accessed on 25 Nov. 2015), and to take a first step into the study of porricondyline biodiversity in Australasia. This study shows that porricondyline interrelationships are more revealing when studied globally.

## Material and methods

Specimens for this study, exclusively male adults, were either picked out from general insect samples obtained by Malaise traps or were collected by sweepnet and aspirator. Most of the specimens came from various different projects initiated by the author, specifically ‘The Gall Midge Project’, an ongoing venture to inventory the Cecidomyiidae of Sweden (2015–2017); the ‘Lestremiinae of Japan’ project (1998–2000; see Jaschhof 2000); and the ‘Lestremiinae of New Zealand’ project (2001–2003; see Jaschhof & Jaschhof 2003). Other specimens were provided by ‘The Swedish Malaise Trap Project’ (SMTP; see <http://www.stationlinne.se/sv/forskning/the-swedish-malaise-trap-project-smtp>, accessed on 25 Nov. 2015); were received on loan from the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (SDEI); or were donated by Dieter Doczkal, Zoologische Staatssammlung München, Germany.

Types and other voucher specimens of the species discussed here are available as microscopic preparations (Canada balsam inclusions) and shall be finally deposited in the following collections: Entomological Collection of Kyushu University, Fukuoka, Japan (KUEC); Naturhistoriska Riksmuseet Stockholm, Sweden (NHRS); New Zealand Arthropod Collection, Tamaki, Auckland, New Zealand (NZAC); and SDEI.

The procedures of specimen preparation and identification as well as the morphological terminology used in adult Porricondylinae were recently described by Jaschhof & Jaschhof (2013). Several morphological terms, some of which specific to the porricondylines treated here, are explained in Figs 2, 10 and 12 of the present paper, with the following abbreviations used:

ctr pr = central process  
d = dorsal  
ej ap = ejaculatory apodeme  
gcx ap = gonocoxal apodeme  
gcx em = gonocoxal emargination  
gcx pr = gonocoxal process  
par = paramere  
v = ventral

Since the male gonocoxites of almost all Porricondylinae, including *Monepidosis* and *Antipodosis* gen. nov., are largely merged into a single structure, they are described as a unit. Body length was measured from the head to the genitalia. Arrows (↓) are used to highlight important diagnostic characters in both the taxonomic descriptions and illustrations. The descriptive sections, titled here ‘Other characters’, mention only those characters that are not referred to in the diagnoses and differential diagnoses, respectively. Taxa are treated in alphabetical order.

## Results

Class Insecta Linnaeus, 1758  
Order Diptera Linnaeus, 1804  
Suborder Bibionomorpha Hennig, 1954  
Family Cecidomyiidae Newman, 1834  
Subfamily Porricondylinae Kieffer, 1913

Genus *Antipodosis* gen. nov.

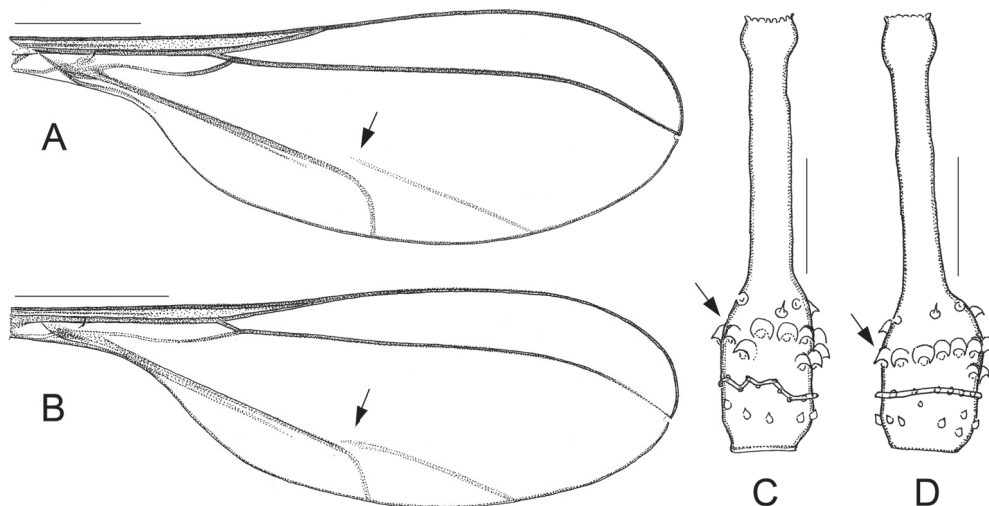
[urn:lsid:zoobank.org:act:B8BF652D-AFFF-418C-829E-608741C68503](https://doi.org/10.3897/zoobank.org/B8BF652D-AFFF-418C-829E-608741C68503)

### Type species

*Antipodosis australis* gen. et sp. nov., described below.

### Diagnosis

Larvae and females of *Antipodosis* gen. nov. are unknown, so this genus is based solely on characters of males. *Antipodosis* gen. nov. are small, inconspicuous Porricondylini, exhibiting the characters typical of that tribe and coming under the group of genera with 14 flagellomeres and without basitarsal spines (“group Aa” in Jaschhof & Jaschhof 2013). *Antipodosis* gen. nov. stands out from most other Porricondylini in that vein  $CuA_1$  runs parallel to  $CuA_2$  rather than approaching or joining it (Fig. 1A versus 1B), and the eye bridge is longer dorsally (5–10 versus 2–3 ommatidia). The structure of the genitalia is genus-specific. Most notably, the two gonocoxal apodemes, which in other Porricondylini are long bars separated from one another (Fig. 12), tend to merge into a single plate (Fig. 2); parameres are typically present as two pairs (a ventral and a dorsal pair) of strongly sclerotized tusks interlinked with each other (Fig. 2); and the ejaculatory apodeme, whose length exceeds that of the gonocoxites, is typically a strongly sclerotized rod with apical modifications.



**Fig. 1.** Male morphology of *Antipodosis* gen. nov. and *Monepidosis* Mamaev, 1966. **A.** Wing of *A. granvillensis* gen. et sp. nov., holotype, setae omitted. **B.** Wing of *M. shikokuensis* sp. nov., holotype, setae omitted. **C.** Fourth flagellomere of *A. rakiura* gen. et sp. nov., holotype, lateral. **D.** Fourth flagellomere of *M. sceptoroides* sp. nov., holotype, lateral. Scale lines: A–B = 0.50 mm, C–D = 0.05 mm.

### Differential diagnosis

The genus *Antipodosis* gen. nov. is similar to *Monepidosis* (Jaschhof & Jaschhof 2013), differing from it as follows: the eye bridge is longer; sensory hairs (= setae with hooded sockets) on the flagellomeres are dispersed rather than aligned to form a single whorl (Fig. 1C versus 1D); wings are wider (with length/width ratios usually < 3.0); CuA<sub>1</sub> does not approach but runs parallel to CuA<sub>2</sub> (Fig. 1A versus 1B); the gonostylar apex bears typically a pectinate tooth (Figs 2A, 7A), but never a large plate-like spine (Figs 10A–B, 11B); gonocoxites have a distinct ventral emargination (Fig. 2A) and have no central processes (Fig. 10A); and the anterior portions of the gonocoxal apodemes are either short and separated (Fig. 6A), or merged into a single, long plate (Fig. 2A).

### Etymology

The name *Antipodosis* is composed of *Antipod-*, from the Latin *antipodes*, for ‘antipodes’, and the ending *-osis*, from *Monepidosis*, a closely related genus. Gender is feminine.

### Other characters

BODY LENGTH. 1.7–2.3 mm.

HEAD. Postfrons asetose. Antenna longer than body. Scape and pedicel usually yellowish, lighter than flagellum. Circumfila on flagellomeres 1 to 11–14, evenly ring-shaped or slightly sinuous, in *A. rotoiti* gen. et sp. nov. with short posterior extensions. Neck of fourth flagellomere longer than node; node apart from circumfilum with microtrichia, short setae forming a basal whorl, numerous long sensory hairs (Fig. 1C). Palpus as long as head height or longer, 4 subcylindrical segments.

THORAX. Scutum with a few lateral and dorsocentral setae. Both anepisternum and anepimeron setose.

WING (Fig. 1A). Longer than body. Length/width 2.5–2.9 (in *A. australis* gen. et sp. nov. exceptionally 3.1). Costal cell narrow, reinforced. Rs strongly oblique, in line with R<sub>5</sub>. M usually absent, in *A. waipapa* gen. et sp. nov. a remnant M present at wing margin.

LEGS. Densely covered with narrow scales. Claws crescent-shaped, with 1 large and 2–3 smaller teeth basally. Empodia rudimentary, as far as known.

ABDOMEN. Tergites 2–5(–6) varyingly strongly desclerotized at center, setae aligned in rows along margins; other tergites evenly sclerotized, setae aligned in 1 transverse row. Sternite 1 unsclerotized, asetose, other sternites evenly sclerotized, setae dispersed. Pleural membrane very sparsely setose.

GENITALIA (Figs 2–9). Ninth tergite either subtrapezoid or rounded posteriorly. Gonostylus either elongate, tapered towards apex, or flattened, with broadly rounded apex; typically a pectinate tooth apically, 1–2 bristles medially; basolateral apodeme large. Gonocoxites: ventral emargination approximately U-shaped, with glabrous, sclerotized rim; medial bridges sometimes with membranous outgrowths that occupy parts of the ventral emargination (Figs 7A, 8A, 9A). Ventral parameres usually bent laterally or dorsolaterally, occasionally interconnected mediobasally (Figs 3B, 9B); dorsal parameres usually bent dorsally (thus often hardly visible in ventral view); parameral apodemes usually large. Base of ejaculatory apodeme either widened (visible in ventral view, Fig. 5B) or flattened (visible in lateral view). Accessory gland ducts, or their merging points with ejaculatory apodeme, distinct. Both hypoproct and cerci present as two setose, medially merged lobes (omitted in illustrations); cerci longer than hypoproct.

### Distribution and phenology

The genus *Antipodosis* gen. nov. is to present knowledge endemic to New Zealand. Of eight species identified, two occur on the North Island and six on the South Island including Stewart Island. Almost

all the specimens known of *Antipodosis* gen. nov. were collected in native forest in austral summer (Nov.–Jan.).

### Phylogenetic remarks

The peculiarity of *Antipodosis* gen. nov. that gonocoxal apodemes tend to merge into a large plate is a derived character state not known in other Porricondyliini, thus an autapomorphy. From what is currently known of world Porricondyliini, it appears that *Antipodosis* gen. nov. is most closely related to *Monepidosis*. Compelling evidence of this relationship is provided by the parameres and the ejaculatory apodeme, whose basic structure is identical in the two genera. Both are therefore combined in what is here called the *Monepidosis* group. The relationships of this group to other Porricondyliini remain obscure for the time being. With respect to male morphology, *Antipodosis* gen. nov. has retained more ancestral traits than *Monepidosis*. For example, in *Antipodosis* gen. nov. the two gonocoxites are largely separated by the ventral emargination, whereas in *Monepidosis* they are lengthwise connected, with the connecting bridge even further modified to bear a pair of processes. Furthermore, in *Antipodosis* gen. nov. the gonostylar apex is equipped with a pectinate tooth of fine, separate spines, which is the structure found in many other Porricondylinae and Porricondyliini, whereas in *Monepidosis* the spines are merged into a large, plate-like tooth that encircles much of the gonostylus' distal half. Concurrent in *Antipodosis* gen. nov. and *Monepidosis*, the basic patterns of parameres and ejaculatory apodeme undergo various modifications, which may be so pronounced that the generic affiliations of the respective species are obscured (see *Antipodosis elongata* gen. et sp. nov., Fig. 3; *Monepidosis shikokuensis* sp. nov., Fig. 12). One may argue that such extreme variations are likely to evolve over long periods of time and both *Antipodosis* gen. nov. and *Monepidosis* might be phylogenetically old lineages.

### *Antipodosis australis* gen. et sp. nov.

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Fig. 2A–B

### Diagnosis

A combination of genitalic characters is specific to *A. australis* sp. nov., as follows (Fig. 2A–B). Of the gonocoxites (Fig. 2A), the processes are small but prominent (↓); the ventral emargination, whose shape is reminiscent of an inverted bell, has a broad glabrous rim that almost reaches the anterior gonocoxal margin (↓), and the apodemes are merged into a large subrectangular plate (↓). The ejaculatory apodeme has a distinct subapical extension (↓, Fig. 2B).

### Differential diagnosis

*Antipodosis australis* gen. et sp. nov. resembles *A. pureora* gen. et sp. nov. in having elongate, slender gonostyli; a long, plate-like gonocoxal apodeme; two pairs of unmodified parameral tusks, and a single-pointed, straight ejaculatory apodeme. Characters to differentiate between the two species are provided by the gonocoxal emargination, which in *A. australis* gen. et sp. nov. is bell-shaped (Fig. 2A) and in *A. pureora* gen. et sp. nov. U-shaped (Fig. 5A), and by the ejaculatory apodeme, whose base is flattened in *A. australis* gen. et sp. nov. (not visible in the ventral view depicted in Fig. 2B) and widened in *A. pureora* gen. et sp. nov. (Fig. 5B).

### Etymology

The name *australis* is a Latin adjective meaning ‘southern’, which refers to the distribution of this species in the two southern main islands of New Zealand.

## Type material

### Holotype

NEW ZEALAND: ♂, South Island, Buller, Lake Rotoroa, mixed podocarp / southern beech forest, 450 m, 15 Jan. 2001, Malaise trap “15”, Department of Conservation St. Arnaud (NZAC).

### Paratype

NEW ZEALAND: 1 ♂, Stewart Island, Christmas Village Hut, 46.74° S, 167.97° E, 18 Jan. 2000, Malaise trap, R.K. Didham (NZAC).

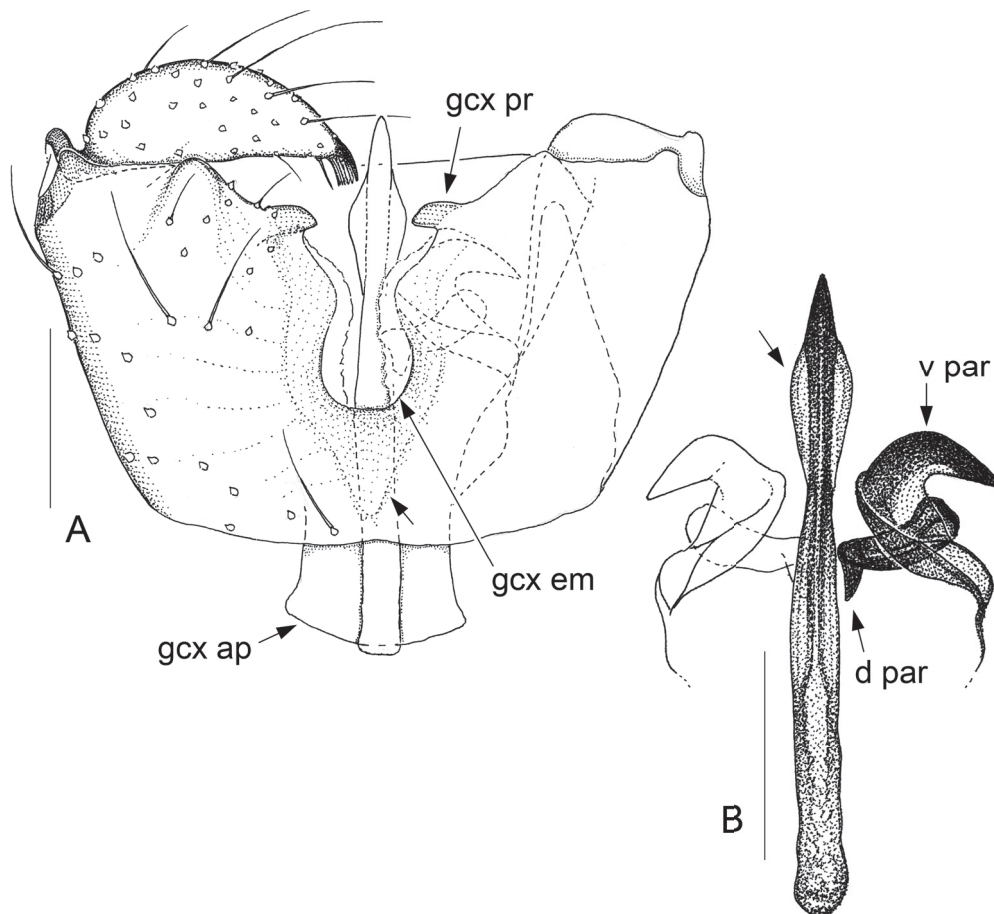
## Other characters

BODY LENGTH. 2.0 mm.

HEAD. Eye bridge 5–6 ommatidia long dorsally. Circumfila on flagellomeres 1 to 13–14. Neck of fourth flagellomere 1.8–1.9 times longer than node. Palpus as long as height of head.

WING. Length/width 3.0–3.1.

LEGS. Empodia rudimentary.



**Fig. 2.** *Antipodosis australis* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

TERMINALIA (Fig. 2A–B). Ninth tergite subtrapezoid, medially unsclerotized, asetose. Gonostylus strongly tapered towards apex, pectinate tooth narrow (Fig. 2A). Gonocoxites with small protuberances on ventroposterior margin; apodemes protrude clearly beyond ventroanterior margin (Fig. 2A). Ventral parameral tusks bent dorsolaterally, dorsal tusks bent dorsally (Fig. 2B).

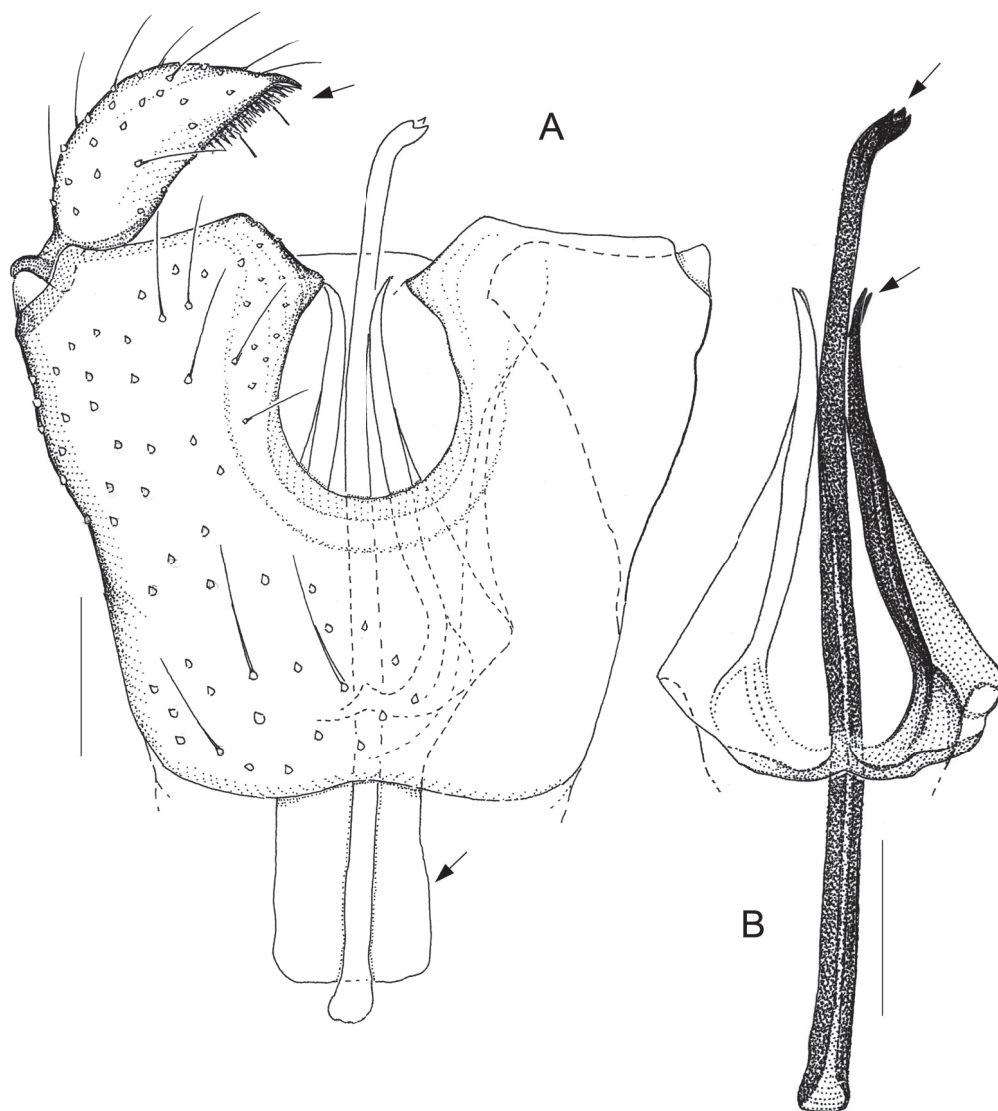
*Antipodosis elongata* gen. et sp. nov.

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Fig. 3A–B

### Diagnosis

Genitalic structures, such as gonocoxites, parameres and ejaculatory apodeme, are conspicuously elongated (Fig. 3A–B), making *A. elongata* gen. et sp. nov. the most deviant species of *Antipodosis* gen. nov. Adding to its exceptionality, ventral and dorsal parameres are largely merged with each other,



**Fig. 3.** *Antipodosis elongata* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

leaving only the extreme apices separated (↓, Fig. 3B). The ejaculatory apodeme is three-pointed apically (↓, Fig. 3B). The gonostylus, which is strongly flattened, has a fringe of short, thick microtrichia at the broadly rounded apex (↓, Fig. 3A).

### Etymology

The name *elongata*, a Latin adjective meaning ‘elongate’, refers to the genitalia of this species.

### Type material

#### Holotype

NEW ZEALAND: ♂, South Island, Buller, Lake Rotoiti, southern beech forest, 640 m, 31 Jan. 2001, Malaise trap “2”, Department of Conservation St. Arnaud (NZAC).

### Other characters

BODY LENGTH. 2.2 mm.

HEAD. Eye bridge 7–8 ommatidia long dorsally. Circumfila on flagellomeres 1–14. Neck of fourth flagellomere 1.5 times longer than node. Palpus 1.6 times longer than height of head.

WING. Length/width 2.9.

LEGS. Acropods missing, so length of empodia unknown.

TERMINALIA (Fig. 3A–B). Ninth tergite broadly rounded posteriorly. Gonocoxites (Fig. 3A): processes small, subtriangular; ventral emargination large, U-shaped, with glabrous rim basally; posterior portions extensively unsclerotized; apodemes merged anteriorly to form subrectangular plate that protrudes clearly beyond ventroanterior gonocoxal margin (↓). Apex of ejaculatory apodeme bent ventrally (Fig. 3B). Parameres directed posteriorly, only apices bent slightly dorsally; apodemes small (Fig. 3B).

*Antipodosis granvillensis* gen. et sp. nov.

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Figs 1A, 4A–C

### Diagnosis

*Antipodosis granvillensis* gen. et sp. nov. is distinguished from the congeneric species by two unique characters: the gonostylus bears apically a single, tooth-like spine (↓, Fig. 4A), and the dorsal parameral tusks are two-branched (↓, Fig. 4B).

### Etymology

The name *granvillensis*, an adjective, is derived from Granville State Forest in the West Coast region of South Island, which is the type locality of this species.

### Type material

#### Holotype

NEW ZEALAND: ♂, South Island, West Coast, Ahaura, Granville State Forest, hard beech forest, 170–250 m, Dec. 1994, Malaise trap “2 GUL 7K”, J. Hutcheson (NZAC).

#### Paratype

NEW ZEALAND: 1 ♂, South Island, Buller, Lake Rotoroa, mixed podocarp/southern beech forest, 450 m, 15 Jan. 2001, Malaise trap “15”, Department of Conservation St Arnaud (NZAC).



**Other characters**

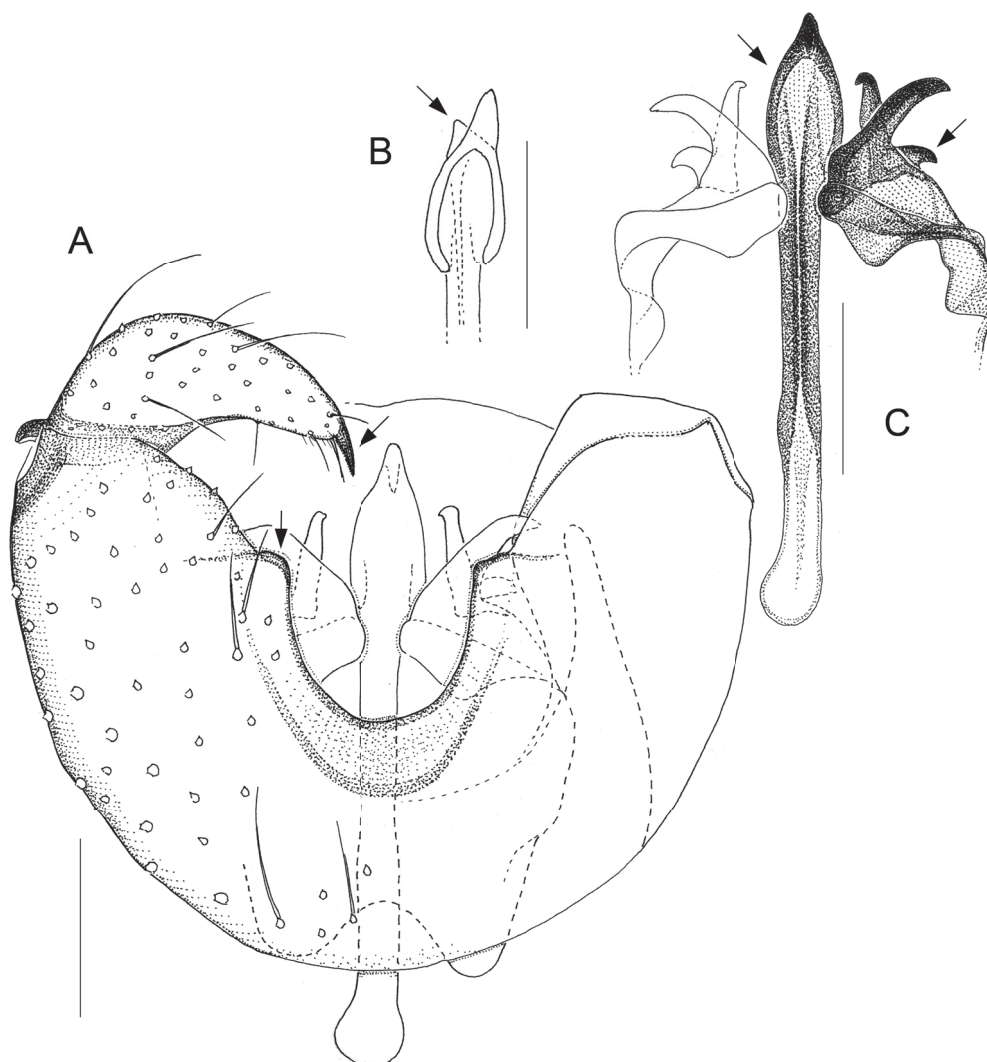
BODY LENGTH. 2.2 mm.

HEAD. Eye bridge 6–7 ommatidia long dorsally. Circumfila on flagellomeres 1–11. Neck of fourth flagellomere 1.4 times longer than node. Palpus 1.3 times longer than height of head.

WING (Fig. 1A). Length/width 2.7.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 4A–C). Ninth tergite subtrapezoid. Gonostylus elongate, slightly curved, strongly tapered towards apex (Fig. 4A). Gonocoxites (Fig. 4A) broadly rounded ventroanteriorly; processes inconspicuous, subrectangular (↓); ventral emargination evenly U-shaped, with broad glabrous rim basally; apodemes short, reaching just to ventral gonocoxal margin, slightly bilobed anteriorly.



**Fig. 4.** *Antipodosis granvillensis* gen. et sp. nov., ♂. **A.** Genitalia, ventral, holotype. **B.** Apex of ejaculatory apodeme, ventral, paratype. **C.** Parameres and ejaculatory apodeme, ventral, holotype. Scale lines: 0.05 mm.

Ejaculatory apodeme with ovoid apical extension, two-pointed, the ventral point slightly bent ventrally (↓, Fig. 4B–C), basal portion poorly sclerotized. Ventral parameral tusks bent dorsolaterally, dorsal tusks bent dorsoposteriorly; apodemes large (Fig. 4B).

*Antipodosis pureora* gen. et sp. nov.

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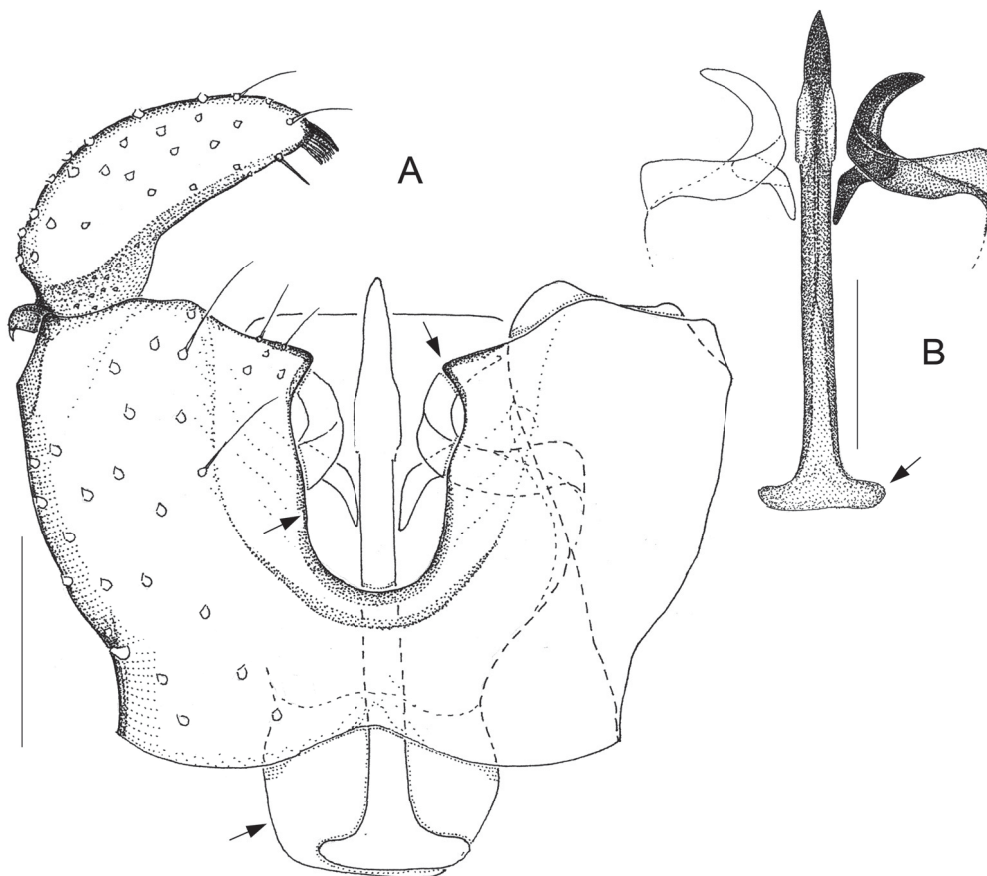
Fig. 5A–B

**Diagnosis**

A combination of genitalic characters is specific to *A. pureora* gen. et sp. nov., as follows (Fig. 5A–B). Of the gonocoxites (Fig. 5A), the processes are small and subtriangular (↓), the large ventral emargination is perfectly U-shaped (↓), and the apodemes are merged into a large plate with rounded margins (↓). The base of the ejaculatory apodeme is strongly widened (↓, Fig. 5B), which is unique in *Antipodosis* gen. nov.

**Differential diagnosis**

*Antipodosis pureora* gen. et sp. nov. is similar to both *A. australis* gen. et sp. nov. and *A. rotoroa* gen. et sp. nov. The three species differ from each other in the ejaculatory apodeme, which is strongly widened basally in *A. pureora* gen. et sp. nov. (Fig. 5B), markedly widened subapically in *A. australis* gen. et sp. nov. (Fig. 2B), and two-pointed apically in *A. rotoroa* gen. et sp. nov. (Fig. 8B). Other interspecific distinctions are described under each of the species.



**Fig. 5.** *Antipodosis pureora* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

### Etymology

The name *pureora* is from the Maori language, referring to Pureora Forest, one of the largest intact tracts of native podocarp forest in the North Island and collection site of this species.

### Type material

#### Holotype

NEW ZEALAND: ♂, North Island, Taupo, Pureora Forest, Waipapa Reserve, podocarp forest, 570 m, 8 Dec. 1983, Malaise trap, J. Hutcheson (NZAC).

### Other characters

BODY LENGTH. About 1.7 mm.

HEAD. Eye bridge 4–5 ommatidia long dorsally. Apices of antennae missing. Neck of fourth flagellomere 1.7 times longer than node. Palpus longer than height of head.

WING. Length/width 2.7.

LEGS. Acropods missing, so length of empodia unknown.

TERMINALIA (Fig. 5A–B). Ninth tergite subtrapezoid, medially unsclerotized, asetose. Gonostylus elongate, strongly tapered towards apex, pectinate tooth narrow (Fig. 5A). Gonocoxal emargination with glabrous rim basally; apodemes protrude beyond ventroanterior margin (Fig. 5A). Ejaculatory apodeme pointed apically, straight, slightly widened at merging points with accessory gland ducts (Fig. 5B). Ventral parameral tusks curved dorsolaterally, dorsal tusks directed dorsally (Fig. 5B).

#### *Antipodosis rakiura* gen. et sp. nov.

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Figs 1C, 6A–B

### Diagnosis

A character readily distinguishing *A. rakiura* gen. et sp. nov. from all other *Antipodosis* gen. nov. is that the dorsal portions of the parameres are merged into a rhomboid shaped plate (↓, Fig. 6B), with the result that only one pair of tusks remains ventrally. Other genitalic structures distinctive of this species are the gonostylus, which is swollen on the basal two thirds and flattened on the apical third (↓, Fig. 6A), and the gonocoxites, which have prominent, rectangular processes (↓).

### Etymology

The species epithet *rakiura* is identical with the Maori name commonly used for Stewart Island where this species was found.

### Type material

#### Holotype

NEW ZEALAND: ♂, Stewart Island, Murray Beach, 46.78° S, 168.00° E, 20 Jan. 2001, Malaise trap, R.K. Didham (NZAC).

### Other characters

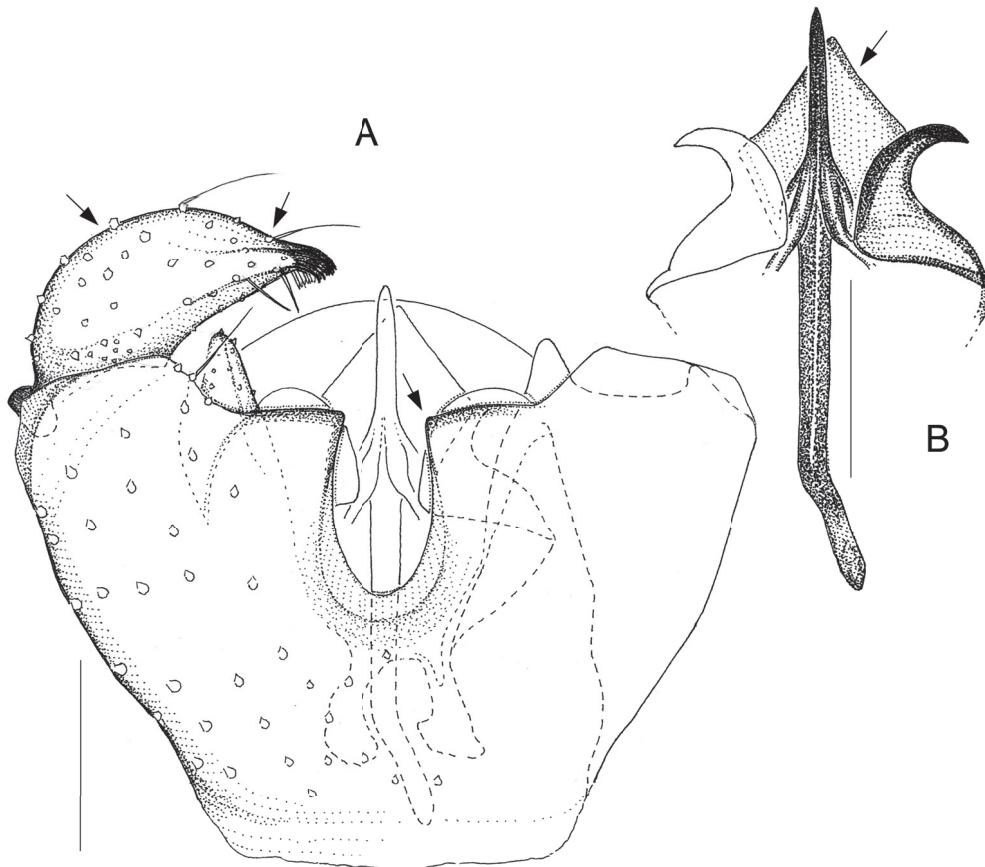
BODY LENGTH. 2.0 mm.

HEAD. Eye bridge 4–5 ommatidia long dorsally. Circumfila present on flagellomeres 1–12. Neck of fourth flagellomere 1.6 times longer than node. Palpus 1.2 times longer than height of head.

WING. Length/width 2.8.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 6A–B). Ninth tergite broadly rounded posteriorly, only medially sclerotized. Gonostylar apex broadly rounded, pectinate tooth wide (Fig. 6A). Gonocoxites (Fig. 6A): ventral emargination small, perfectly U-shaped, with glabrous rim basally; dorsal portions with subtriangular projections on posterior margin; apodemes short, bilobed anteriorly. Ejaculatory apodeme (Fig. 6B): apex pointed, straight; base flattened; accessory gland ducts unusually distinct. Parameral tusks curved dorsolaterally; parameral apodemes small (Fig. 6B).



**Fig. 6.** *Antipodosis rakiura* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

*Antipodosis rotoiti* gen. et sp. nov.

[urn:lsid:zoobank.org:act:9BA5DA6F-D8D5-4921-B55B-1CC4C739BE76](https://zoobank.org/act:9BA5DA6F-D8D5-4921-B55B-1CC4C739BE76)

Fig. 7A–B

**Diagnosis**

In this unusual *Antipodosis* gen. nov., the flattened gonostylus has a broadly rounded apex with wide pectinate tooth (↓, Fig. 7A); the ventral parameral tusks are clearly shorter than the dorsal (↓, Fig. 7B); and the elongate gonocoxites have practically no processes (Fig. 7A).

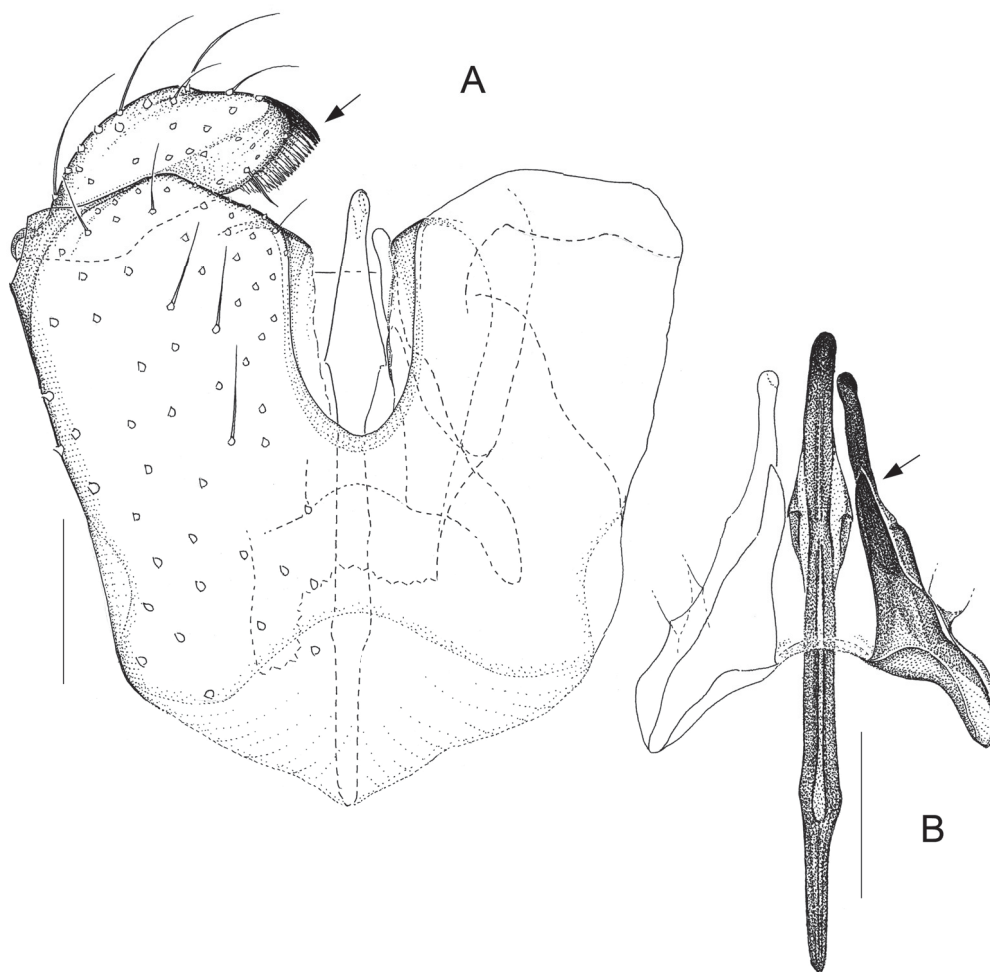
**Etymology**

The species epithet *rotoiti* is from the Maori language, meaning ‘the little lake’, with reference to Lake Rotoiti in northern South Island where this new porricondyline was collected.

**Type material**

**Holotype**

NEW ZEALAND: ♂, South Island, Buller, Lake Rotoiti, southern beech forest, 640 m, 20 Dec. 2000, Malaise trap “2”, Department of Conservation St Arnaud (NZAC).



**Fig. 7.** *Antipodosis rotoiti* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

### Other characters

BODY LENGTH. 2.1 mm.

HEAD. Eye bridge 4 ommatidia long dorsally. Circumfila on flagellomeres 1–14, often with short posterior extensions. Neck of fourth flagellomere 1.1 times longer than node. Palpus 1.5 times longer than height of head.

WING. Length/width 2.6.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 7A–B). Ninth tergite subtrapezoid. Gonocoxites with asetose, subtriangular portion ventroanteriorly; ventral emargination perfectly U-shaped, with narrow glabrous rim basally; medial bridges with membranous outgrowths that extend into the emargination; apices of apodemes missing, but probably merged to form a plate (Fig. 7A). Ejaculatory apodeme bent ventrally; widened subapically at merging point with accessory gland ducts; flattened basally (Fig. 7B). Ventral parameral tusks almost straight, directed posteriorly, dorsal tusks bent slightly dorsally (Fig. 7B).

*Antipodosis rotoroa* gen. et sp. nov.

[urn:lsid:zoobank.org:act:9C8C71A9-0BCF-4A69-BE42-8ADC45A015C7](https://doi.org/10.21203/rs.3.rs-1000000/v1)

Fig. 8A–B

### Diagnosis

The gonocoxal processes are more prominent in *A. rotoroa* gen. et sp. nov. (↓, Fig. 8A) than in any other *Antipodosis* gen. nov. The gonostylus is slightly curved, tapered towards the apex, and equipped with a long pectinate tooth (↓, Fig. 8A). The apex of the ejaculatory apodeme is two-pointed (↓, Fig. 8B). At the bases of the dorsal parameral tusks are small accessory processes, which are weakly sclerotized and blunt-ended (↓, Fig. 8B).

### Differential diagnosis

See *A. australis* gen. et sp. nov. (Fig. 2) and *A. pureora* gen. et sp. nov. (Fig. 5) for two species with genitalic structures superficially similar to that found in *A. rotoroa* gen. et sp. nov.

### Etymology

The name *rotorooa*, which means ‘the long lake’ in the Maori language, refers to Lake Rotorooa, whose vicinity provides the only habitat yet known of this porricondyline.

### Type material

#### Holotype

NEW ZEALAND: ♂, South Island, Buller, Lake Rotorooa, mixed podocarp/southern beech forest, 450 m, 15 Jan. 2001, Malaise trap “15”, Department of Conservation St Arnaud (NZAC).

#### Paratype

NEW ZEALAND: 1 ♂, same data as the holotype (NZAC).

### Other characters

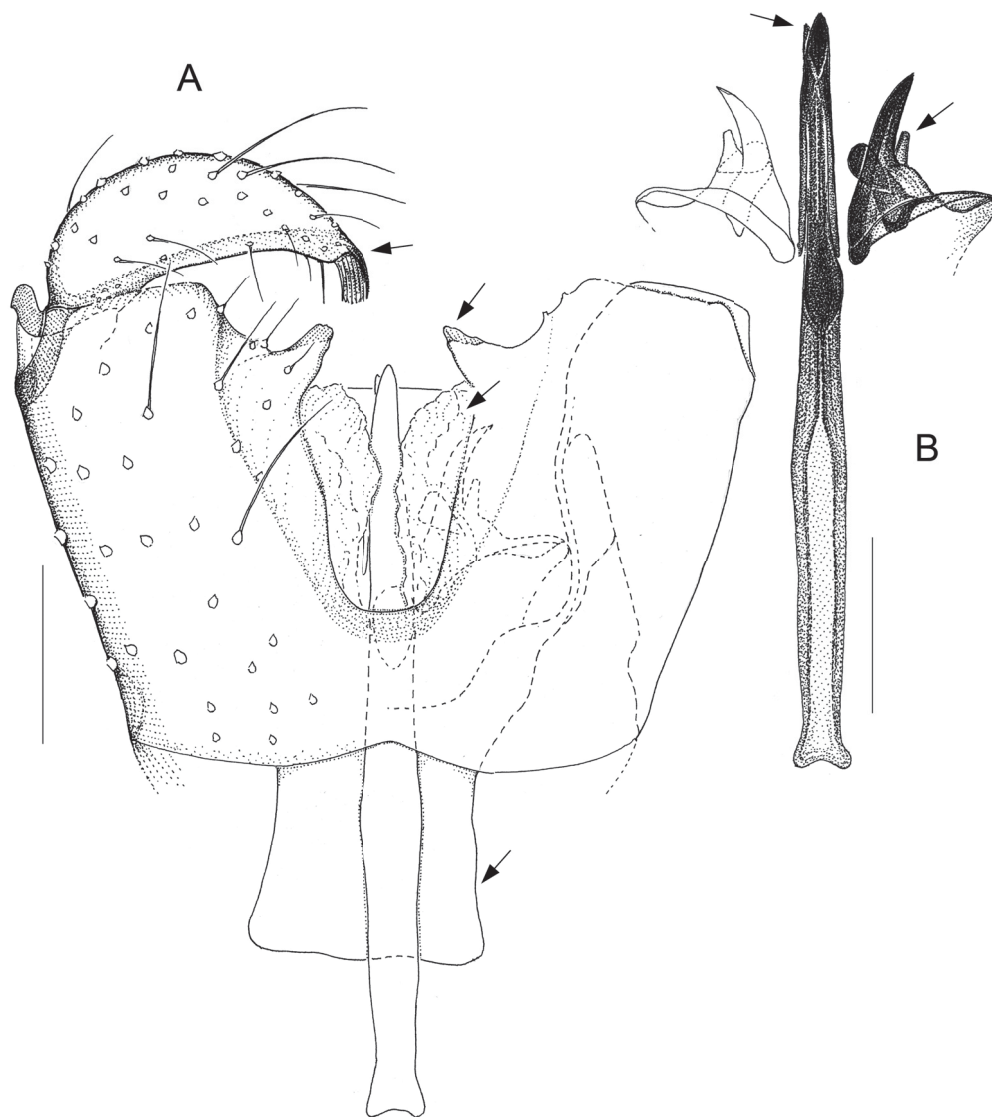
BODY LENGTH. 2.0 mm.

HEAD. Eye bridge 7–8 ommatidia long dorsally. Circumfila on flagellomeres 1–12. Neck of fourth flagellomere 1.5 times longer than node. Palpus 1.3 times longer than height of head.

WING. Length/width 2.6.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 8A–B). Ninth tergite subtrapezoid. Gonocoxites (Fig. 8A): processes subtriangular (↓); ventral emargination large, extends beyond midlength of gonocoxites, largely occupied by membranous outgrowths of medial bridges (↓), with glabrous rim basally; apodemes merged into large, subrectangular plate that protrudes far beyond anterior gonocoxal margin (↓). Apex of ejaculatory apodeme bent ventrally (Fig. 8B). Ventral parameral tusks only slightly bent, dorsal tusks directed posteriorly (Fig. 8B).



**Fig. 8.** *Antipodosis rotoroa* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

*Antipodosis waipapa* gen. et sp. nov.

[urn:lsid:zoobank.org:act:53252B20-F0CE-4F56-B7DF-182BBFC599FA](https://doi.org/10.3897/ejt.192.53252B20-F0CE-4F56-B7DF-182BBFC599FA)

Fig. 9A–B

**Diagnosis**

This is the only species of *Antipodosis* gen. nov., whose gonostyli have no apical structure, such as a pectinate or solid tooth (↓, Fig. 9A). As another peculiarity, the apical portion of the ejaculatory apodeme is conspicuously enlarged and spoon-shaped (↓, Fig. 9B).

**Etymology**

The name *waipapa*, from the Maori language, refers to Waipapa Reserve in Pureora Forest where the type specimens of this species were collected.

**Type material**

**Holotype**

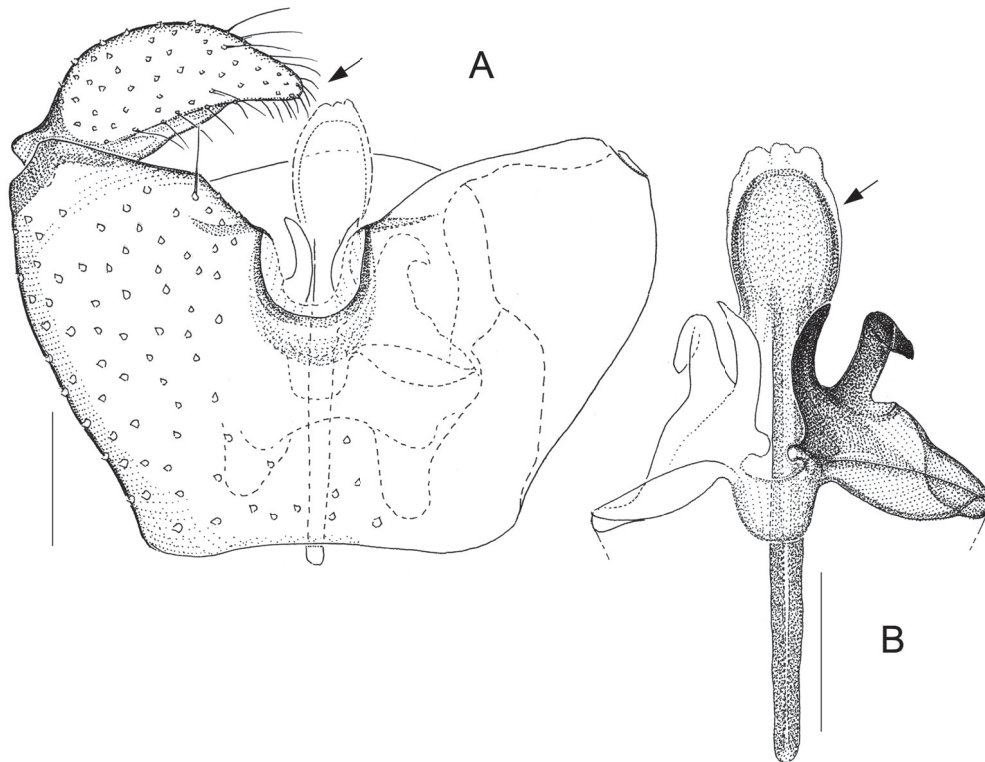
NEW ZEALAND: ♂, North Island, Taupo, Pureora Forest, Waipapa Reserve, shrubland, 570 m, 29 Mar. 1984, Malaise trap, J. Hutcheson (NZAC).

**Paratypes**

NEW ZEALAND: 2 ♂♂, same data as the holotype, but podocarp forest, 17 Nov. 1983 (NZAC).

**Other characters (male)**

BODY LENGTH. 2.3 mm.



**Fig. 9.** *Antipodosis waipapa* gen. et sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.



**HEAD.** Eye bridge 9–10 ommatidia long dorsally. Scape and pedicel concolorous with flagellum. Neck of fourth flagellomere 1.8 times longer than node. Apices of antennae missing. Palpus 1.6 times longer than height of head.

**WING.** Length/width 2.5. A short M present at wing margin.

**LEGS.** Acropods missing, so length of empodia unknown.

**TERMINALIA** (Fig. 9A–B). Ninth tergite rounded posteriorly. Gonostylus flattened, rounded apically (Fig. 9A). Gonocoxites (Fig. 9A): true processes missing, medial bridges with membranous outgrowths that extend into the ventral emargination; emargination small, perfectly U-shaped, with glabrous rim basally; apodemes short, bilobed anteriorly. Ventral parameral tusks smaller and less strongly bent than dorsal tusks; parameral apodemes large, connected ventrally by weakly sclerotized bridge (Fig. 9B). Base of ejaculatory apodeme flattened; apical extension covered by membranous cap (Fig. 9B).

#### Genus *Monepidosis* Mamaev, 1966

A bibliography including the synonymy of the genus *Monepidosis* was given in the revision of Porricondyliinae by Jaschhof & Jaschhof (2013). Species of *Monepidosis* can be distinguished from each other using characters of the male gonocoxites, or more specifically, the processes at the ventroposterior gonocoxal margin, which vary in size, shape and position. There are two kinds of processes: the gonocoxal processes, which are outgrowths of the medial bridges, and the central processes, which are outgrowths of the ventral bridge (Jaschhof & Jaschhof 2013; this paper, Fig. 10A). Apart from genitalic structures, the morphology of male *Monepidosis* is extremely uniform. Females and larvae of most *Monepidosis* species, including the species treated here, are unknown.

#### *Monepidosis heterocera* sp. nov.

[urn:lsid:zoobank.org:act:A0B02B2E-6CB1-488A-8C19-DDB27BC9D43B](https://zoobank.org/act:A0B02B2E-6CB1-488A-8C19-DDB27BC9D43B)

Fig. 10A–C

#### **Diagnosis**

A typical *Monepidosis* (Jaschhof & Jaschhof 2013: 185), distinguished by the following genitalic characters in combination (Fig. 10A–B). The gonocoxal processes, which arise from a concave, asetose area of varying size (↓, Fig. 10A–B), are nearly as large and prominent (↓) as the central processes. Their apices are typically rounded (Fig. 10A), rarely more pointed (Fig. 10B), and membranous rather than sclerotized. The central processes, separated medially by a V-shaped space, are parallel-sided, unicolored, and end in small, strongly sclerotized hooks (↓, Fig. 10A). The bases of both gonocoxal and central processes are occasionally interconnected by a sclerotized rim, which is very pronounced in the specimen depicted in Fig. 10B (↓).

#### **Remarks on intraspecific variability**

Most of the specimens studied have rounded gonocoxal processes that arise from small depressions (Fig. 10C), so show a combination of the character states figured in A and B. The specimens depicted in A and B were initially suspected to belong to different species, until it became obvious that they represent the extreme ends of the range of variation described above. I believe that most of this variation is artificial, i.e. dependent on how a specimen is positioned in the balsam drop.

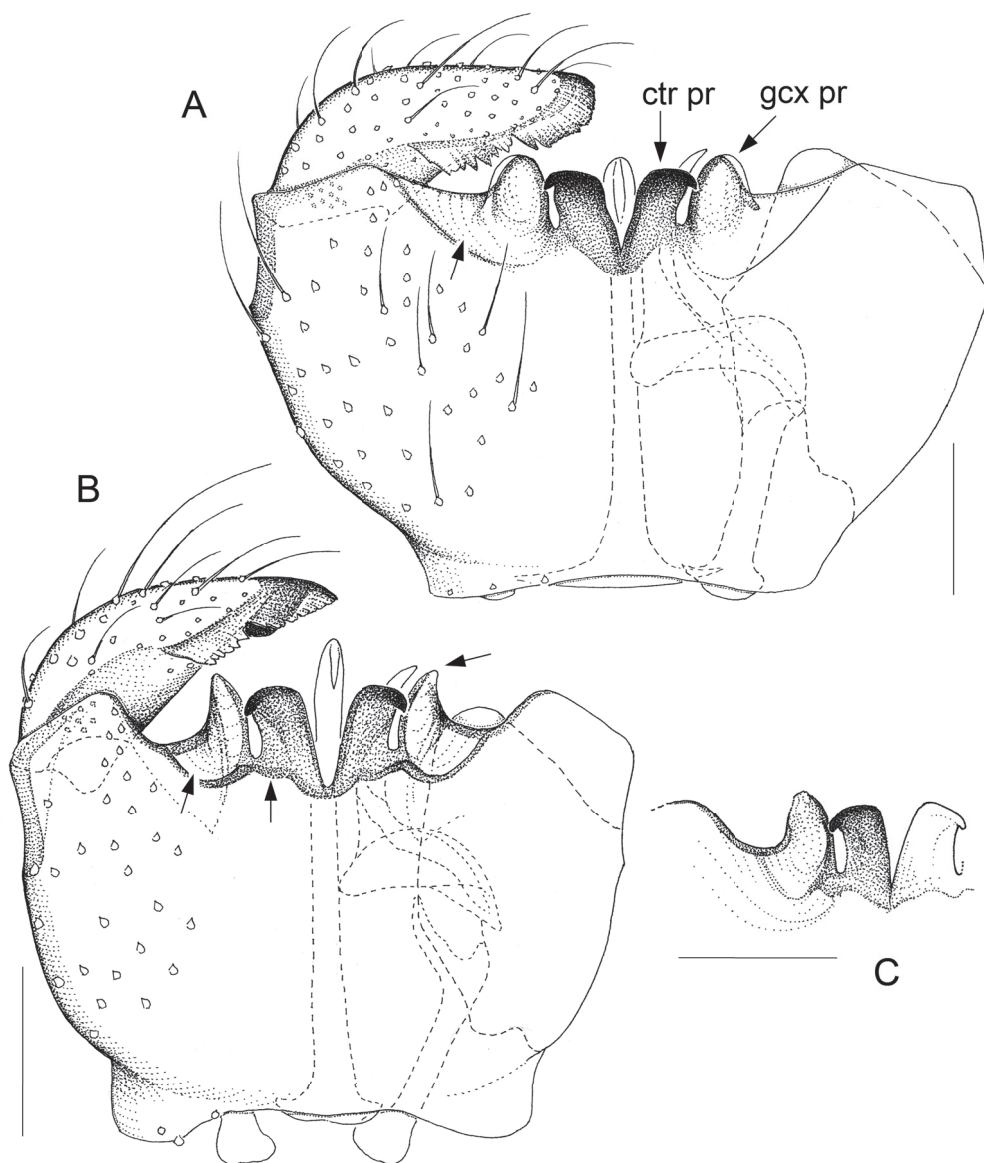
#### **Differential diagnosis**

*Monepidosis heterocera* sp. nov. and *M. pectinatoides* Jaschhof, 2013 resemble each other in having moderately sized, prominent gonocoxal processes and wide, parallel-sided central processes. The two

species differ in minute details concerning those processes. As characteristics of *M. pectinatoides*, the gonocoxal processes are sharply pointed and sclerotized apically, and the central processes are bicolored, black laterally, white medially (Jaschhof & Jaschhof 2013: fig. 89B). Further, the apical portion of the ejaculatory apodeme is more strongly bent ventrally in *M. pectinatoides* than in any other *Monepidosis*, including *M. heterocera* sp. nov.

### Etymology

The name *heterocera* is derived from the Greek words *heteros*, for ‘different’, and *keras*, for ‘horn’, meaning ‘with different horns’, which refers to the gonocoxal processes that distinguish this species from its closest relatives.



**Fig. 10.** *Monepidosis heterocera* sp. nov., ♂. **A.** Genitalia, ventral, holotype. **B.** Genitalia, ventral (paratype). **C.** Processes at ventroposterior gonocoxal margin, ventral, paratype. Scale lines: 0.05 mm.

## Type material

### Holotype

SWEDEN: ♂, Öland, Mörbylånga, Skogsby, Station Linné, 56.61° N, 16.49° E, near compost pile, 1–31 Jul. 2014, Malaise trap, M. & C. Jaschhof (NHRS CEC96).

### Paratypes

SWEDEN: 1 ♂, Öland, Gamla Skogsby (Kalkstad), 56.61° N, 16.50° E, mixed deciduous forest, 1–27 May 2014, Malaise trap, M. & C. Jaschhof (NHRS CEC97); 3 ♂♂, same locality, 13 May–8 Jun. 2015, Malaise trap, M. & C. Jaschhof (NHRS CEC109–110, SDEI CEC111).

### Other material examined

SWEDEN: 2 ♂♂, Öland, Gamla Skogsby (Kalkstad), 56.61° N, 16.50° E, mixed deciduous forest, 1–27 May 2014, Malaise trap, M. & C. Jaschhof (NHRS ZFMK-TIS2537355–2537356).

GERMANY: 1 ♂, Brandenburg, Schorfheide-Chorin Biosphere Reserve, Barnim, Klein Ziethen, Kernberge near Serwester See, edge of pine forest, 22 Apr. 2009, Malaise trap, leg. SDEI (SDEI A7625); 1 ♂, Baden-Württemberg, Malsch, Glaser gravel plant, edge of pine forest, 19 Mar.–21 Apr. 2010, Malaise trap, D. Doczkal (SDEI A7624).

## Other characters

BODY LENGTH. 1.7–1.9 mm.

HEAD. Eye bridge 3–4 ommatidia long dorsally. Circumfila on flagellomeres 1–10. Neck of fourth flagellomere 1.5 times longer than node. Palpus 1.3–1.5 times longer than height of head.

WING. Length/width 2.8–3.0. A remnant M present at wing margin.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 10A–C). Gonostylus flattened, with plate-like, irregularly serrated spine around apex (Fig. 10A–B). Parameres present as 2 pairs of large, strongly sclerotized, dorsally curved tusks, similar to those found in many other *Monepidosis* (Jaschhof & Jaschhof 2013: fig. 88A). Apex of ejaculatory apodeme flattened, bent ventrally; base widened, sclerotized (Fig. 10A–B).

## Distribution and phenology

Sweden (Öland), Germany (Brandenburg, Baden-Württemberg). Adults collected in and near deciduous and coniferous forest from March/April (southwest Germany) to July (southeast Sweden). Possibly a thermophilic species, given that all collection sites are favoured by a warm climate.

*Monepidosis sceptoroides* sp. nov.

[urn:lsid:zoobank.org:act:60EE7BD9-7842-4026-BA78-050F926D770B](https://doi.org/10.3896/BI.2019.60EE7BD9-7842-4026-BA78-050F926D770B)

Figs 1D, 11A–C

## Diagnosis

*Monepidosis sceptoroides* sp. nov. is the only *Monepidosis* with only one pair of parameral tusks (↓, Fig. 11C). Of the gonocoxites (Fig. 11A), the wide, shallow ventral emargination has a glabrous rim basally (↓); the central processes, which are situated posterior to that rim, form a widely open, unevenly sclerotized V-shape (↓); and gonocoxal processes are missing.

### Differential diagnosis

*Monepidosis scepteroides* sp. nov. is similar to *M. scepteri* Spungis, 2006, especially with respect to the central processes. In *M. scepteroides* sp. nov., as distinct from *M. scepteri*, the gonocoxites are wider than long instead of the reverse, and the plate-like gonostylar spine is a single piece rather than consisting of two clearly separated portions (Spungis 2006: fig. 4B). Like all *Monepidosis* but *M. scepteroides* sp. nov., *M. scepteri* has two pairs of parameral tusks (Spungis 2006: fig. 4A).

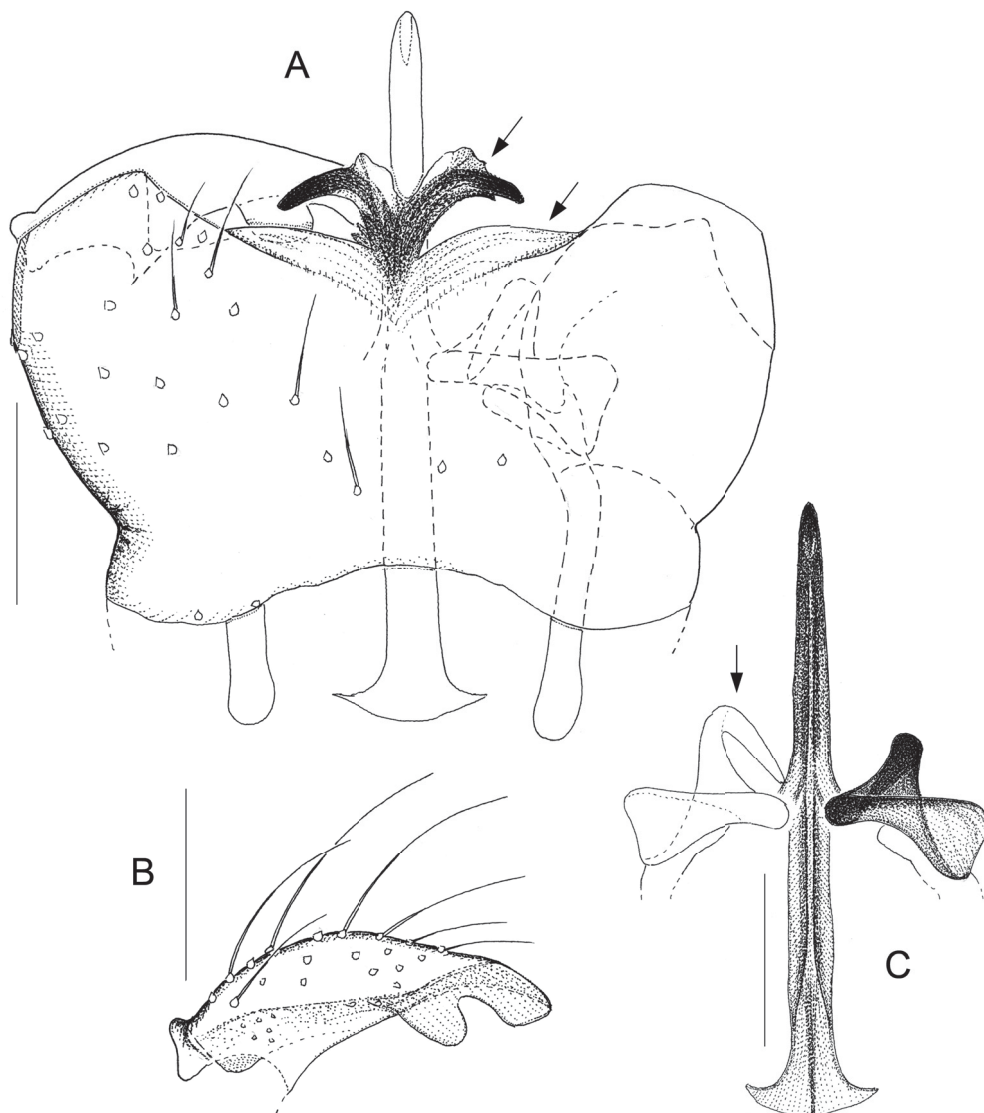
### Etymology

The name *scepteroides*, an adjective, refers to the similarity of this species to *M. scepteri*.

### Type material

#### Holotype

SWEDEN: ♂, Mörbylånga, Gamla Skogsby (Kalkstad), 56.61° N, 16.50° E, mixed deciduous forest, 8 Aug. 2014, aspirator, M. Jaschhof (NHRS CEC94).



**Fig. 11.** *Monepidosis scepteroides* sp. nov., ♂, holotype. **A.** Genitalia, ventral. **B.** Gonostylus, ventral (paratype). **C.** Parameres and ejaculatory apodeme, ventral. Scale lines: 0.05 mm.

### Other characters

BODY LENGTH. 1.7 mm.

HEAD. Eye bridge 3–4 ommatidia long dorsally. Apices of antennae missing, circumfila on flagellomeres 1–10 at least. Neck of fourth flagellomere 1.9 times longer than node (Fig. 1D). Palpus 1.3 times longer than height of head.

WING. Length/width 3.1.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 11A–C). Gonostylus (Fig. 11B) strongly flattened, with long, deeply incised plate-like spine apically and apicoventrally. Apex of ejaculatory apodeme pointed, flattened, bent ventrally; base weakly sclerotized, widened (Fig. 11C). Parameral tusks strongly curved, directed dorsally (↓, Fig. 11C).

### Distribution and phenology

Sweden (Öland). Known from a single specimen collected in deciduous forest in August.

*Monepidosis shikokuensis* sp. nov.

[urn:lsid:zoobank.org:act:7F6FEC96-9091-44F0-849C-3342D230A34F](https://zoobank.org/act:7F6FEC96-9091-44F0-849C-3342D230A34F)

Figs 1B, 12A–B

### Diagnosis

Parameres and ejaculatory apodeme of this highly unusual *Monepidosis* are merged into a single complex structure (Fig. 12A). The portions of parameral origin, which encircle the ejaculatory apodeme, include vestigial tusks that are curved dorsally (↓). The ejaculatory apodeme is forked into 4 long prongs (↓), of which the laterals have finely serrate apices. The structure of gonostyli and gonocoxites is also exceptional in *M. shikokuensis* sp. nov. (see section ‘Other characters’, Fig. 12B).

### Etymology

The name *shikokuensis*, an adjective, is derived from Shikoku, one of the main islands of Japan, where this species was found.

### Type material

#### Holotype

JAPAN: ♂, Shikoku, Kochi, Asakura, 33.55° N, 133.47° E, secondary growth of mixed evergreen deciduous / coniferous forest, 4–11 Nov. 1998, Malaise trap, M. & C. Jaschhof (KUEC).

### Other characters

BODY LENGTH. 1.6 mm.

HEAD. Eye bridge 5–6 ommatidia long dorsally. Circumfila on flagellomeres 1–12. Neck of fourth flagellomere 2.1 times longer than node. Palpus 1.3 times longer than height of head.

WING (Fig. 1B). Length/width 3.2.

LEGS. Empodia rudimentary.

TERMINALIA (Fig. 12A–B). Gonostylus flattened, slightly curved, tapered towards apex, without apical spine (↓, Fig. 12B). Gonocoxites (Fig. 12B): processes missing; ventral emargination unusually large,

with broad, medially raised microtrichose rim basally (↓); apodemes approach each other. Base of ejaculatory apodeme sclerotized, widened (Fig. 12A).

### Distribution and phenology

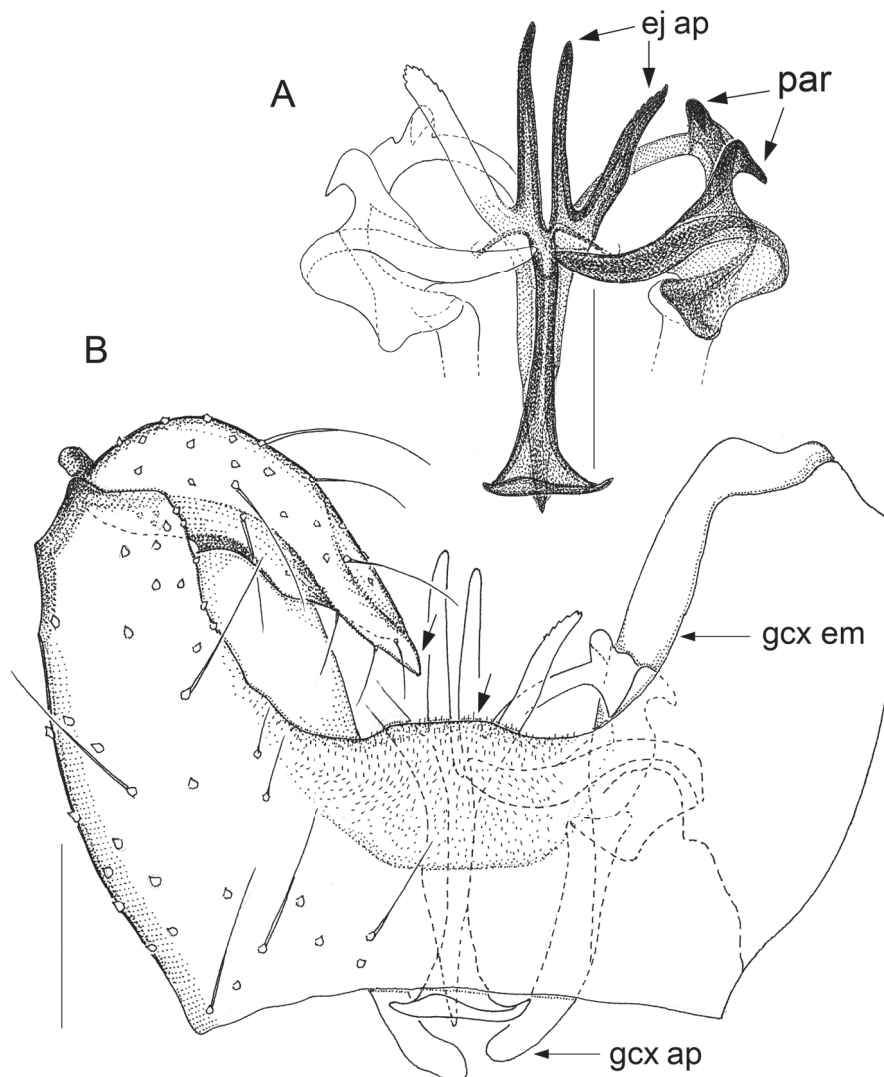
Japan (Shikoku). Known from a single specimen collected in evergreen secondary growth in November.

### *Monepidosis spatulata* Spungis, 2006

*Monepidosis spatulata* Spungis, 2006: 27.

### Remark

*Monepidosis spatulata*, a species described on the basis of specimens found in Latvia and Lithuania (Spungis 2006), is here reported for the first time from Gotland, Sweden.



**Fig. 12.** *Monepidosis shikokuensis* sp. nov., ♂, holotype. A. Parameres and ejaculatory apodeme, ventral. B. Genitalia, ventral. Scale lines: 0.05 mm.

### Material examined

SWEDEN: 1 ♂ (no. CEC98), Gotland, Eksta socken, Stora Karlsö, 8–29 Aug. 2014, Malaise trap, Hymenoptera Inventory Group 2014 (NHRS).

### Discussion

The example of *Monepidosis* is ideally suited to demonstrate how little we know of the biodiversity of Porricondylinae in Europe, the continent regarded quite rightly as the best-investigated for this and the other subfamilies of fungivorous Cecidomyiidae. *Monepidosis* is also exemplary for the fact that many Porricondylinae must be regarded as rare in the sense that specimens are seldom found despite great efforts to collect them. This scarcity, which cannot be explained due to the lack of autecological information, makes species inventories fruitful but time-consuming ventures. For example, a nationwide Porricondylinae inventory running in Sweden since 2009 (see Jaschhof & Jaschhof 2013) found nine different species of *Monepidosis* to date, of which five were new to science (a tenth species, also new, is known to me from two specimens that are too poorly preserved for description). Some of the morphologically most unusual *Monepidosis*, such as *M. shikokuensis* sp. nov., came to be known not from Europe but from Japan, where Porricondylinae have never been surveyed on a systematic basis, meaning that random findings contribute significantly to the overall picture we have of this genus. *Antipodosis* gen. nov. must be regarded as a similarly random discovery. The 13 specimens I had available to describe *Antipodosis* gen. nov. and its eight species were accumulated at the time of the ‘Lestremiinae of New Zealand’ project for curiosity’s sake rather than for taxonomy. Another 60 specimens from the same ‘by-catch’ of New Zealand Porricondylinae belong to 41 different species of 9 genera (Jaschhof, unpublished data), whereas only one porricondyline, *Yukawaepidosis aliculata* (Yukawa, 1964), was named from the New Zealand region in the past (Gagné 1989; Gagné & Jaschhof 2014). Finally, the discovery that *Antipodosis* gen. nov. and *Monepidosis* are closely related to each other does not necessarily indicate straight affinities between New Zealand and Holarctic Porricondylinae. It remains unknown for the time being whether the *Monepidosis* group has representatives in southeast Asia, New Guinea, New Caledonia, or Australia, since all these regions are practically unstudied for Porricondylinae.

### Acknowledgements

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