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Three new species of *Oxyethira* Eaton, 1873 (Trichoptera: Hydroptilidae) from New Caledonia

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Abstract. *Oxyethira* Eaton, 1873 is one of the most diverse genera of Hydroptilidae, comprising over 240 species distributed in all biogeographical regions. Here three new species of *Oxyethira* (*Trichoglene*) Neboiss, 1977 are described and illustrated from male specimens collected in New Caledonia: *O. (Trichoglene) hamus* sp. nov., recognized by the hook-shaped apex of the long inferior appendages in lateral view and by the posterior margin of segment IX with a trilobed appearance in ventral view; *O. (Trichoglene) rectangulata* sp. nov., recognized by the rectangular shape of the inferior appendages, which are totally fused and with two pairs of small setae on the inner face; and *O. (Trichoglene) spiralis* sp. nov., recognized by the strongly curvilinear shape of the subgenital process in dorsal and lateral views and by the long process spiralling around the ejaculatory duct at the phallus apex.

Key words. Hydroptilidae, New Caledonia, microcaddisflies, *Oxyethira*, taxonomy.

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Introduction

The microcaddisfly genus *Oxyethira* Eaton, 1873 (Trichoptera: Hydroptilidae: Hydroptilinae) includes 247 extant and one fossil species (Morse *et al.* 2021). It has been recorded from all zoogeographic regions, and is especially diverse in the New World, with more than 100 species registered (Holzenthall & Calor 2017). *Oxyethira* species are currently grouped into 11 subgenera, but 29 species remain as incertae sedis (Kelley 1984, 1989; Oezdikmen 2007; Morse *et al.* 2021). The subgenus *Trichoglene* Neboiss, 1977 (26 species) has an Australasian distribution and occurs in Australia, New Caledonia and New Zealand (Wells & Johanson 2015; Morse *et al.* 2021).

A total of 26 species of *Oxyethira* are registered from New Caledonia belonging to 3 subgenera: *Dampfitrichia* Mosely, 1937 (one species), *Pacificotrichia* Kelley, 1989 (13 species) and *Trichoglene* Neboiss, 1977 (11 species). Another species, *O. macropennis* Wells & Johanson, 2015, remains unplaced to subgenus (Wells & Johanson 2015; Johanson & Wells 2019).

The diagnostic characteristics for the males in the subgenus *Trichoglene* are as follows: segment VIII without excision (considered as a plesiomorphic feature); short titillator (even absent in some species); phallus with a curved spine-shaped process in the sub-distal region; and subgenital processes widely separated and partially fused with the pleural region of segment IX (the two latter are considered apomorphic features) (Kelley 1984).

Three species groups are recognized among the New Caledonian members of the subgenus *Trichoglene*: the *spinifera*-group, with abdominal segment IX subquadrate; the *caledoniensis*-group, with venter of abdominal segment IX in ventral view produced anteriorly, proximally either rounded or tapered and somewhat triangular; and the *insularis*-group, with Y-shaped inferior appendages (Wells & Johanson 2015).

In this study, three new *Oxyethira* (*Trichoglene*) species are described, two belonging to the *caledoniensis*-group (*O. spiralis* sp. nov. and *O. hamus* sp. nov.) and one belonging to the *spinifera*-group (*O. rectangulata* sp. nov.).

Material and methods

The material was collected using Malaise traps (Gressitt & Gressitt 1952) and preserved in 80% ethanol. For examination of the male genital structures, the abdomen was removed and cleared in 10% KOH and mounted temporarily in glycerin or glycerin jelly on a slide for viewing and drawing. Pencil sketches were made using a drawing tube mounted on a Leitz Laborlux S light microscope, and then scanned and used as templates to produce vector graphics in Adobe Illustrator ver. CS6. The removed abdomens were then stored permanently with the rest of their respective bodies in microvials with 80% ethanol. The terminology used in the descriptions follows that of Kelley (1984).

Institutional abbreviations

MNHN = Muséum national d'histoire naturelle, Paris, France

NHRS = Swedish Museum of Natural History, Stockholm, Sweden

Abbreviations of genital structures

bp = bilobed process
ej = ejaculatory duct
ia = inferior appendages
sg = subgenital processes
VIII = segment VIII
IX = segment IX

Results

Class Insecta Linnaeus, 1758
Order Trichoptera Kirby, 1813
Family Hydroptilidae Stephens, 1836
Genus *Oxyethira* Eaton, 1873

Oxyethira (Trichoglene) hamus sp. nov.

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Fig. 1A–D

Diagnosis

This new species belongs to the group of *Oxyethira caledoniensis*. It is similar to *O. houailou* Wells & Johanson, 2015 by the presence of strong sclerotized margins of the inferior appendages, each one bearing one seta in the mesal region as seen in ventral view; and by the general shape of the phallus apex, with a subdistal spine curved to the left in dorsal view. *Oxyethira (Trichoglene) hamus* sp. nov. is recognized by the hook-shaped apex of the long inferior appendages in lateral view (short and with pointed apex in *O. houailou*) and by the posterior margin of segment IX having a trilobed appearance in ventral view (forming a subtriangular projection in *O. houailou*).

Etymology

‘*Hamus*’, ‘hook’ in Latin, refers to the shape of the inferior appendages in lateral view.

Material examined

Holotype

NEW CALEDONIA • ♂; Province Sud Haute Yaté fauna reserve, 1760 m S of bridge Pont Perignon, 50 m upstream from bridge over stream; 22.14954° S, 166.701211° E; alt. 180 m; 14 Dec. 2003–13 Jan. 2004; K.A. Johanson leg.; Loc#081; Malaise trap; MNHN.

Paratypes

9 ♂♂; same collection data as for holotype; NHRS.

Description

BODY. Male antennae with 18 flagellomeres. Forewing length 1.4–1.8 mm (n = 10, mean 1.5 mm); tibial spurs 0, 3, 4; forewings with venation typical for subgenus. Abdominal sternite VII without mesoventral process.

MALE GENITALIA (Fig. 1A–D). Abdominal segment VIII almost cylindrical, with shallow incision at posterior margin in ventral view (Fig. 1C). Abdominal segment IX inserted within segment VIII; anterior margin forming three lobes in ventral view (Fig. 1C), surpassing anterior margin of segment VIII (Fig. 1A–B). Segment X not visible. Subgenital processes slightly curvilinear in dorsal view (Fig. 1B), each with pointed apex curved downward in lateral view and one bilobed process at base (Fig. 1A). Inferior appendages fused, with strongly sclerotized margins, bearing one pair of small mesal setae at posterior margin visible in dorsal (Fig. 1B) and ventral views (Fig. 1C), and one pair of small setae at inner margin visible in dorsal view (Fig. 1B); posterior margin slightly concave; in lateral view hook-shaped with apex curved backward and touching base of subgenital process (Fig. 1A). Setal lobes absent. Aedeagus elongate; in subdistal region, slender spine pointing left in dorsal view. Titillator absent (Fig. 1D).

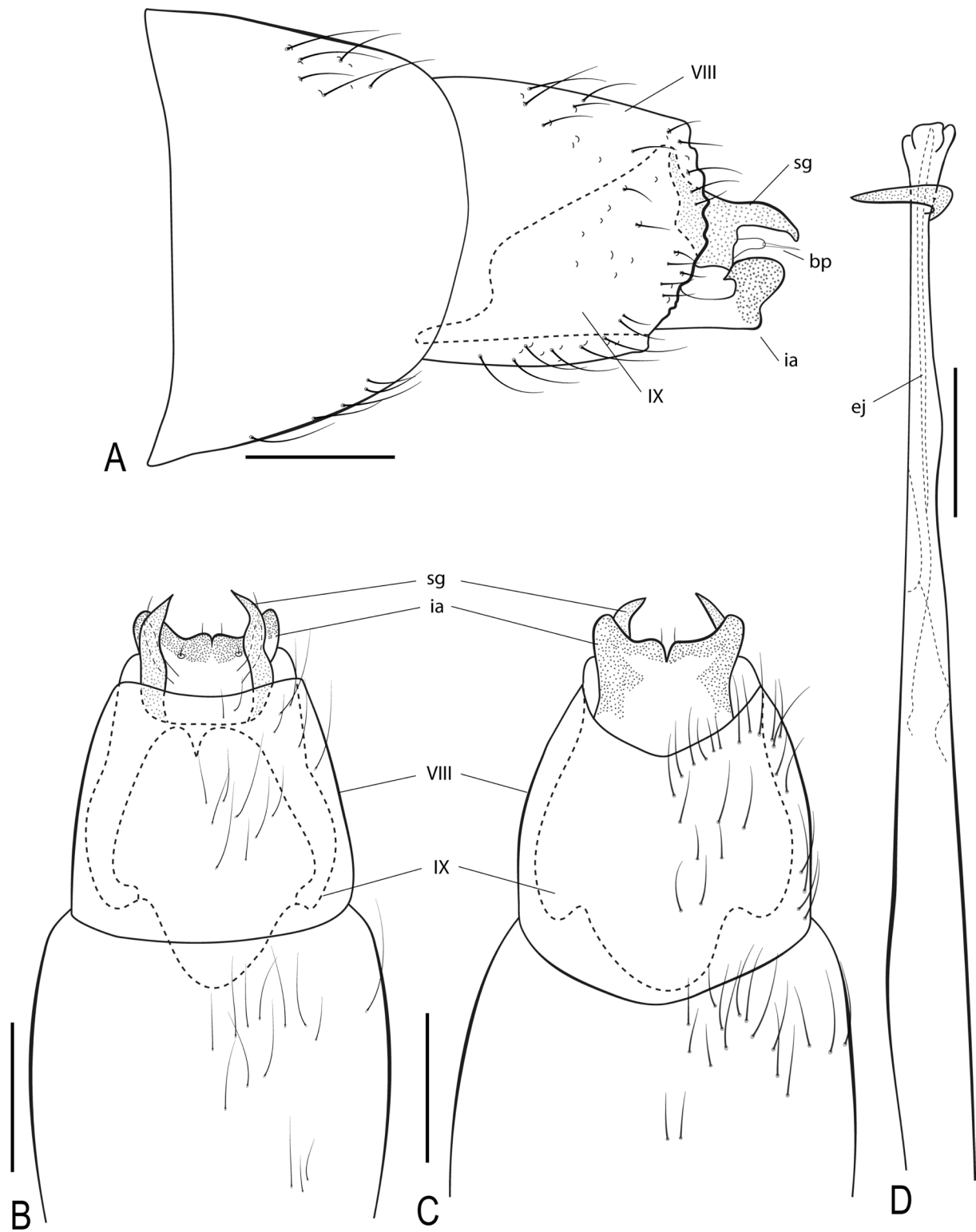


Fig. 1. *Oxyethira (Trichoglene) hamus* sp. nov., male genitalia. **A.** Lateral. **B.** Dorsal. **C.** Ventral. **D.** Aedeagus, dorsal. Abbreviations: See Material and methods. Scale bars = 0.1 mm.

Oxyethira (Trichoglene) rectangulata sp. nov.

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Fig. 2A–D

Diagnosis

Oxyethira (Trichoglene) rectangulata sp. nov. belongs to the group of *Oxyethira spinifera*. It is similar to *O. tiwaka* Wells & Johanson, 2015 by the quadrangular shape of segment IX in ventral view, and in lateral view by the inferior appendages being divided into a dorsal part forming a hump and a ventral part forming a pointed projection. This species can be recognized by the rectangular shape of the inferior appendages in dorsal and ventral views, which are totally fused, bearing two pairs of small setae on the inner face (in *O. tiwaka* these appendages are much smaller and the ventral part forms a quadrate-shaped sclerotized projection in ventral view); by the shape of the subgenital process in lateral view, which is thinner and almost straight in *O. rectangulata* sp. nov., and thicker, C-shaped in *O. tiwaka*.

Etymology

‘*Rectangulata*’, from Latin, ‘rectangular’, refers to the shape of the inferior appendages in dorsal and ventral view.

Material examined

Holotype

NEW CALEDONIA • ♂; Province Sud, Haute Yaté fauna reserve, 1760 m S of bridge Pont Perignon, 50 m upstream from bridge over stream; 22.14954° S, 166.701211° E; alt. 180 m; 14 Dec. 2003–13 Jan. 2004; K.A. Johanson leg.; Loc#081; Malaise trap; MNHN.

Paratypes

2 ♂♂; same collection data as for holotype; NHRS.

Description

BODY. Male antennae with 20 flagellomeres. Forewing length 1.7–1.8 mm (n = 3); tibial spurs 0, 3, 4; forewings with venation typical for subgenus. Abdominal sternite VII with a small, pointed mesoventral process.

MALE GENITALIA (Fig. 2A–D). Abdominal segment VIII cylindrical with wide, V-shaped incision in ventral view (Fig. 2C). Abdominal segment IX inserted within segment VIII; anterior margin slightly concave, not surpassing anterior margin of segment VIII (Fig. 2B–C). Segment X not visible. Subgenital processes almost straight in dorsal (Fig. 2B) and ventral views (Fig. 2C), each bearing one bilobed process at base. Inferior appendages fused, rectangular in dorsal (Fig. 2B) and ventral views (Fig. 2C), bearing two pairs of small mesal setae at inner margin visible in dorsal view (Fig. 2B); divided into two parts in lateral view (Fig. 2A): dorsal part forming a truncate hump, ventral part forming pointed projection. Setal lobes absent. Aedeagus elongate, with slender apical spine curved left in dorsal view. Ejaculatory duct extending freely at apex. Titillator absent (Fig. 2D).



Fig. 2. *Oxyethira (Trichoglene) rectangulata* sp. nov., male genitalia. A. Lateral. B. Dorsal. C. Ventral. D. Aedeagus, dorsal. Scale bars = 0.1 mm.

Oxyethira (Trichoglene) spiralis sp. nov.

[urn:lsid:zoobank.org:act:5027693E-FC66-4256-B619-34C77CA3E6FF](https://doi.org/10.21203/rs.3.rs-10000000/v1)

Fig. 3A–D

Diagnosis

Based on general similarities, *Oxyethira (Trichoglene) spiralis* sp. nov. is tentatively placed in the group of *Oxyethira caledoniensis*. It is similar to *O. caledoniensis* Kelley, 1989 by the shape of segment IX in ventral and lateral views, with the anterior margin only slightly produced anteriorly and by the shape of the apparently fused inferior appendages. In *O. caledoniensis* the inferior appendages are widely separated and form bilobed sclerotized structures that are absent in *O. spiralis* sp. nov. The new species can be recognized in lateral view by the subquadrate shape of the inferior appendages, by the strongly curvilinear shape of the subgenital process in dorsal and lateral views, and by the long process spiralling around the ejaculatory duct at the phallus apex.

Etymology

'*Spiralis*', from Latin, 'spiral', referring to the shape of the long process present around the ejaculatory duct in this species.

Material examined

Holotype

NEW CALEDONIA • ♂; Province Nord, Western slope of Kugüö Mt, Xwé Wida Di Stream, 2 km E of Koh; 21°35.474' S, 165°50.776' E; alt. 154 m; 20 Nov.–12 Dec. 2003; K.A. Johanson leg.; Loc#036; Malaise trap; MNHN.

Description

BODY. Male antennae with 22 flagellomeres. Forewing length 1.7 mm (n = 1); tibial spurs 0, 2, 4; forewings with venation typical for subgenus. Abdominal sternite VII with a small, pointed mesoventral process.

MALE GENITALIA (Fig. 3A–D). Abdominal segment VIII cylindrical without excisions. Abdominal segment IX inserted in segment VIII; anterior margin slightly produced anteriorly (Fig. 3A–B). Segment X not visible. Subgenital processes with strongly sigmoid shape in dorsal (Fig. 3B) and ventral views (Fig. 3C), each bearing one bilobed process at base. Inferior appendages fused and almost quadrate in lateral view (Fig. 3A). Setal lobes absent. Aedeagus elongate, long process spiralling around ejaculatory duct; ejaculatory duct extending freely in middle of two weakly sclerotized projections at phallus apex. Titillator absent (Fig. 3D).

Discussion

Despite the great morphological variation present in the genitalia of *Oxyethira*, all species described here present characteristics unique for the subgenus *Trichoglene* (Kelley 1984): segment VIII without modification; and widely separated subgenital processes that are partially fused with the pleural region of segment IX.

There are different distribution patterns for *Oxyethira* species in New Caledonia ranging from wide to localised, or even disjunct (north-south extremes) (Wells & Johanson 2015). *Oxyethira (Trichoglene) hamus* sp. nov. and *O. (Trichoglene) rectangulata* sp. nov. have their distribution restricted to the type locality in the southern region of New Caledonia (Province Sud). Other species previously described have a similar distribution pattern on the island: *Oxyethira (Trichoglene) amieu* Wells & Johanson, 2015, *O. (Trichoglene) insularis* Kelley, 1989, *O. (Trichoglene) parinsularis* Wells & Johanson, 2015

and *O. (Trichoglene) perignonica* Wells & Johanson, 2015. These species can be well localized or widely distributed in the Sud Province but are never found in the northern region (Province Nord) (Wells & Johanson 2015). *Oxyethira (Trichoglene) spiralis* sp. nov. is only known from its type locality in the Province Nord.

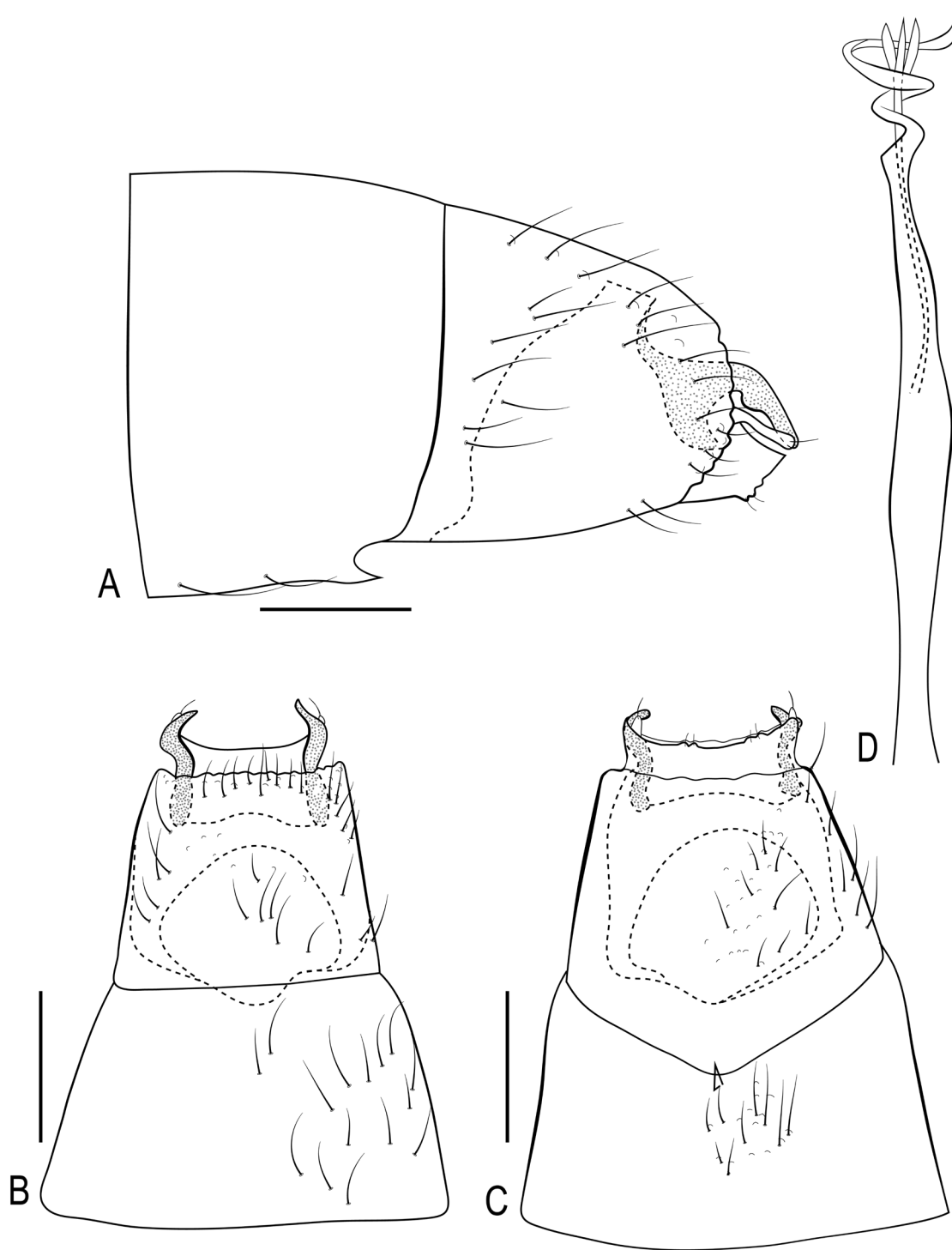


Fig. 3. *Oxyethira (Trichoglene) spiralis* sp. nov., male genitalia. **A.** Lateral. **B.** Dorsal. **C.** Ventral. **D.** Aedeagus, dorsal. Scale bars = 0.1 mm.

Wells & Johanson (2015) reviewed the New Caledonian *Oxyethira* species and described 17 new species, bringing the total number of species for the island to 26. Of these, 11 species belong to *Trichoglène*. Together with the herein described species the diversity of *Oxyethira* on New Caledonia is increased by about 10%, and of those in *Trichoglène* by almost 30%.

The three new species were found among several thousand New Caledonian Hydroptilidae stored in ethanol and collected at the end of 2003 and beginning of 2004. This means that new species can still be found in material from well-studied areas that have given rise to descriptions of dozens of new species in the family Hydroptilidae (Wells & Johanson 2012, 2014, 2015; Wells, Johanson & Mary-Sasal 2013). This shows the potential for finding new Hydroptilidae in New Caledonia and that undescribed species are still available in collections or likely not yet collected.

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