

Four new species of *Adicella* MacLachlan (Trichoptera: Leptoceridae: Triaenodini) from Sabah, East Malaysia

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Four new species of *Adicella* MacLachlan, 1877, *A. anakpanah* spec. nov., *A. bavanga* spec. nov., *A. danumensis* spec. nov., and *A. gada* spec. nov., from Sabah (Borneo), East Malaysia, are described and figured.

Introduction

The genus *Adicella* MacLachlan, 1877, belongs to the tribe Triaenodini of the long-horned caddisfly family Leptoceridae. The genus is distributed in the West and East Palearctic biogeographic region, the Afrotropical region, and the Oriental region. To date more than 20 species have been described from the Oriental biogeographic region (Hagen, 1858, 1859; Kimmins, 1963; Malicky, 1979; Martynov, 1936; Mey, 1995; Oláh, 1993; Schmid, 1958, 1961, 1994a, b; Ulmer, 1906, 1930, 1951).

Although several studies on the Trichoptera fauna of South-East Asia have been published, particularly during the first half of this century, the Leptoceridae of Borneo have received little attention (see Kimmins, 1955; Ulmer, 1957), and no species of *Adicella* appears to be known from the Island. However, from Papua New Guinea and southeast Asia nine species of *Adicella* have been described (Table 1).

Table 1. Species of *Adicella* MacLachlan, 1877 described from Papua New Guinea and from southeast Asia, excluding Sri Lanka, India (except Andaman Island), and China.

Species	Reference	Distribution
<i>A. anakpanah</i> spec. nov.	this paper	Malaysia: Sabah
<i>A. bavanga</i> spec. nov.	this paper	Malaysia: Sabah
<i>A. dahsetuha</i>	Oláh, 1993: 98-99, fig. 5	Malaysia: Selangor
<i>A. danumensis</i> spec. nov.	this paper	Malaysia: Sabah
<i>A. gada</i> spec. nov.	this paper	Malaysia: Sabah
<i>A. longicercus</i> (as <i>Triaenodes</i>)	Kimmins, 1963: 265, figs 4-6	Myanmar (Burma): N E
<i>A. mangyana</i>	Mey, 1995: 207, figs 61, 62	Philippines: West-Mindoro
<i>A. nigropunctata</i>	Ulmer, 1930: 470-472, figs 139-141 Ulmer, 1951: 444-446, figs 684-686	Indonesia: Sumatra
<i>A. ordinaria</i>	Mey, 1995: 206, figs 59, 60	Philippines: West-Mindoro
<i>A. oviformis</i>	Ulmer, 1951: 446-447, figs 687-690	Indonesia: Java
<i>A. pulcherrima</i>	Ulmer, 1906: 43, figs 53-55; Ulmer, 1951: 443-444, figs 678-683	Indonesia: Java
<i>A. starmuehlneri</i>	Malicky, 1979: 101, fig. 3	India: Andaman Island
<i>A. trifida</i>	Kimmins, 1963: 270-272, figs 24-29	Myanmar (Burma): Kambaiti

The material treated here was collected by the senior author during several trips to Sabah, Sarawak and Brunei between 1986 and 1990. Habitats collected ranged from lowland to montane (50 - 3300 m a.s.l.) primary forest types.

Methods

The material was collected predominately with light traps and the specimens were preserved in 70% alcohol. Methods used in preparing, examining, and illustrating genitalia are those commonly used in the study of Trichoptera. The terminology is adopted from Schmid (1980). Measurements are reported as total lengths. If not obviously broken, antenna length is given as the longest measured. Measurements are given as ranges, followed by the mean when more than three measurements were taken.

Holotypes and paratypes of the species described below are deposited in the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands (RMNH); paratypes are also deposited in the University of Minnesota Insect Collection, St. Paul, Minnesota, USA (UMSP).

Descriptions

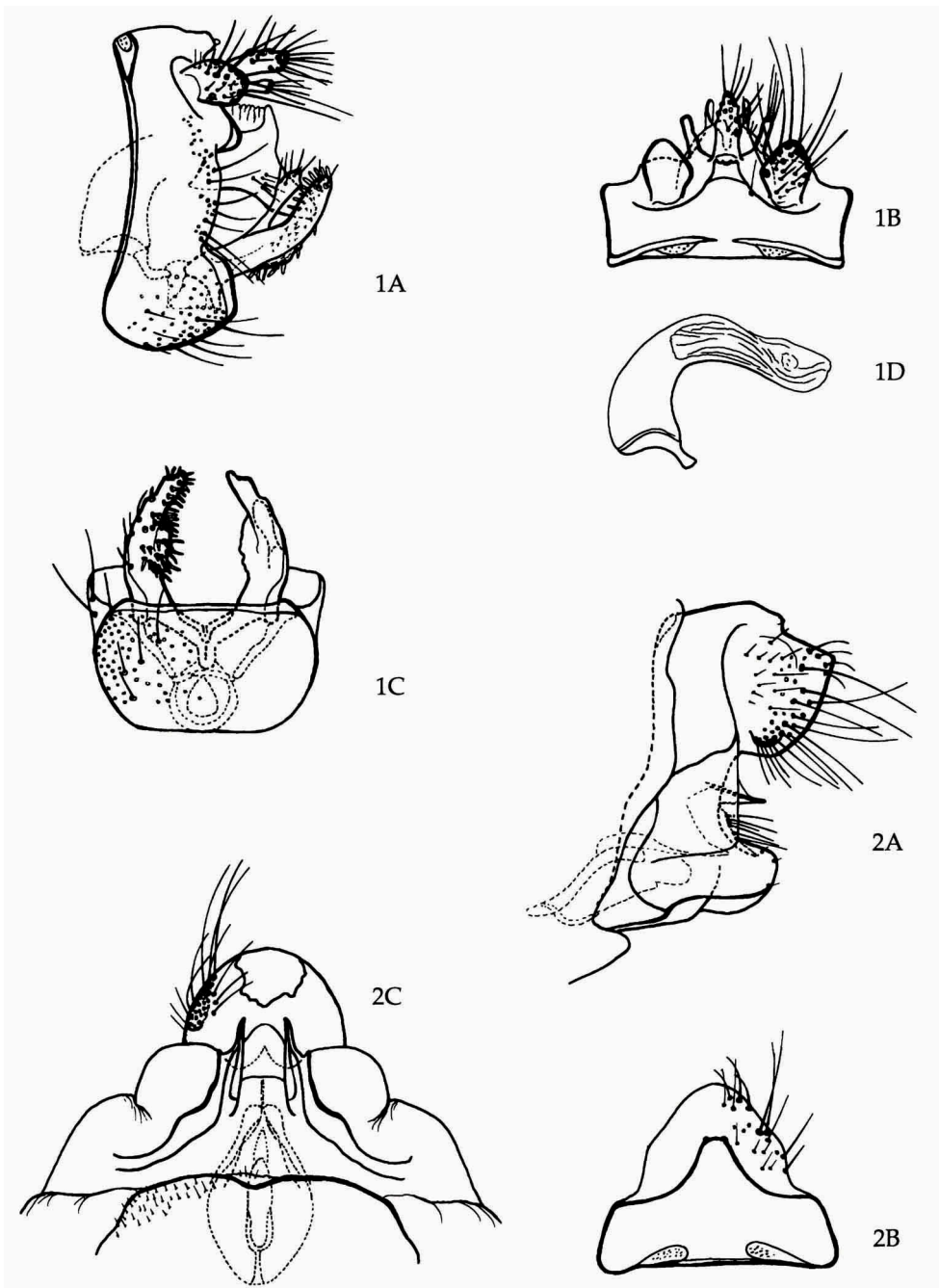
Adicella danumensis spec. nov.
(figs 1-2)

Material.— Holotype: ♂, Malaysia, Sabah, 60 km WSW of Lahad Datu, Danum Valley Field Cent., on bridge, 04°58'N 117°48'E, 23.iii.1987, 150 m a.s.l., at light, J. Huisman & J. van Tol (RMNH). Paratypes: ♀, same as holotype (RMNH); 1 ♂, 1 ♀, Sabah, Long Pa Sia area W of kampong, 25.xi-8.xii.1987, 1050 m a.s.l., Malaise trap 3, C. van Achterberg (UMSP); 2 ♀, Sabah, 60 km WSW Lahad Datu, km 68.5 on road Kg Silam - Danum Valley Field Centre, 04°58'N 117°48'E, 24.iii.1987, 150 m a.s.l., at light, J. Huisman (RMNH).

Adults.— (n = 1-2 ♂♂, 3-4 ♀♀). Forewing length 6.1 mm (♂), 5.2-5.5 mm (♀); hindwing length 4.9 mm (♂), 4.2-4.3 mm (♀). Eyes 0.36-0.39 mm wide (♂), 0.34-0.37, 0.36 mm (♀). Male antennae at least 19.5 mm long including 0.33-0.36 mm long antennal scape; female antennae at least 17.5 mm long including 0.34-0.37, 0.35 mm long antennal scape. Maxillary palp segment lengths (in mm): 0.37, 0.55, 0.54, 0.34, 0.60 (♂); 0.36-0.39, 0.37; 0.54-0.58, 0.57; 0.49-0.52, 0.51; 0.33-0.36, 0.34, 0.55-0.58 (♀). Colour in alcohol overall reddish brown.

Male genitalia (fig. 1A-D). Abdominal segment IX subrectangular with small, rounded lobe below preanal appendage. Preanal appendage short, bluntly rounded, setose. Upper part of tergum X with median, stout, setose projection and two weaker lateral projections, each with four setae apically. Lower part of tergum X with broad base, membranous dorsally, posteroventrally produced into rounded lobes, with few setae midlaterally; in dorsal view broadly rounded with apex of ventral lobes protruding caudad. Inferior appendage curving posterodorsad, apex rounded, with club-shaped, setose projection middorsally; in ventral view weakly curved mesad, with short, spinelike setae mesally. Phallus curved, tubular.

Female genitalia (fig. 2A-C). Abdominal segment IX subrectangular. Preanal appendage apparently fused with tergum X. Tergum X setose, with right angled dor-



Figs 1-2. *Adicella danumensis* spec. nov.: 1. male genitalia: 1A. lateral; 1B. dorsal; 1C. ventral; 1D. phal-
lus, lateral. 2. female genitalia: 2A. lateral; 2B. dorsal; 2C. ventral.

sal corner, slightly convex posterior margin, and rounded ventral corner; in ventral view broadly rounded, with outline of anal opening irregular. Valves subquadrangular with rounded corners, and single row of setae dorsomesally. Spermathecal sclerite elliptical.

Immatures.— Unknown.

Remarks.— The species groups with other *Adicella* species having inferior appendage with dorsal projection. Among these, the male of *A. danumensis* spec. nov. most closely resembles *A. dharasena* Schmid, 1961 by the bluntly rounded preanal appendage and by the shape of the lower part of tergum X, but differs particularly in the shape of the projections of the upper part of tergum X.

Etymology.— Named after Danum Valley Field Centre, using the Latin suffix *-ensis*, denoting place, locality or country of origin.

Adicella gada spec. nov.
(fig. 3)

Material.— Holotype ♂, Malaysia, Sabah, Kinabalu Park HQ, Sg. Liwagu crossing Silau-Silau trail, 06°00'N 116°33'E, 1470 m a.s.l., 15.xi.1986, J. Huisman (RMNH). Paratypes: 1 ♂, Sabah, Kinabalu Park HQ, on bridge to "Sg. Liwagu section I", 06°00'N 116°33'E, 1480 m a.s.l., 9.ii.1987, J. Huisman (RMNH); 1 ♂, Sabah, trail Long Pa Sia - Long Samado (2 km from Sarawak border), 04°20'N 115°41'E, 1520 m a.s.l., 22.x.1986, J. Huisman (UMSP).

Male.— (n = 2-3). Forewing length 6.9-7.2 mm; hindwing length 5.1-5.4 mm. Eyes 0.36-0.39 mm wide. Antennae at least 20.8 mm long including 0.43-0.46 mm long antennal scape. Maxillary palp segment lengths (in mm): 0.34-0.37, 0.51-0.58, 0.54-0.55, 0.28-0.31, 0.48-0.64. Colour in alcohol overall reddish brown.

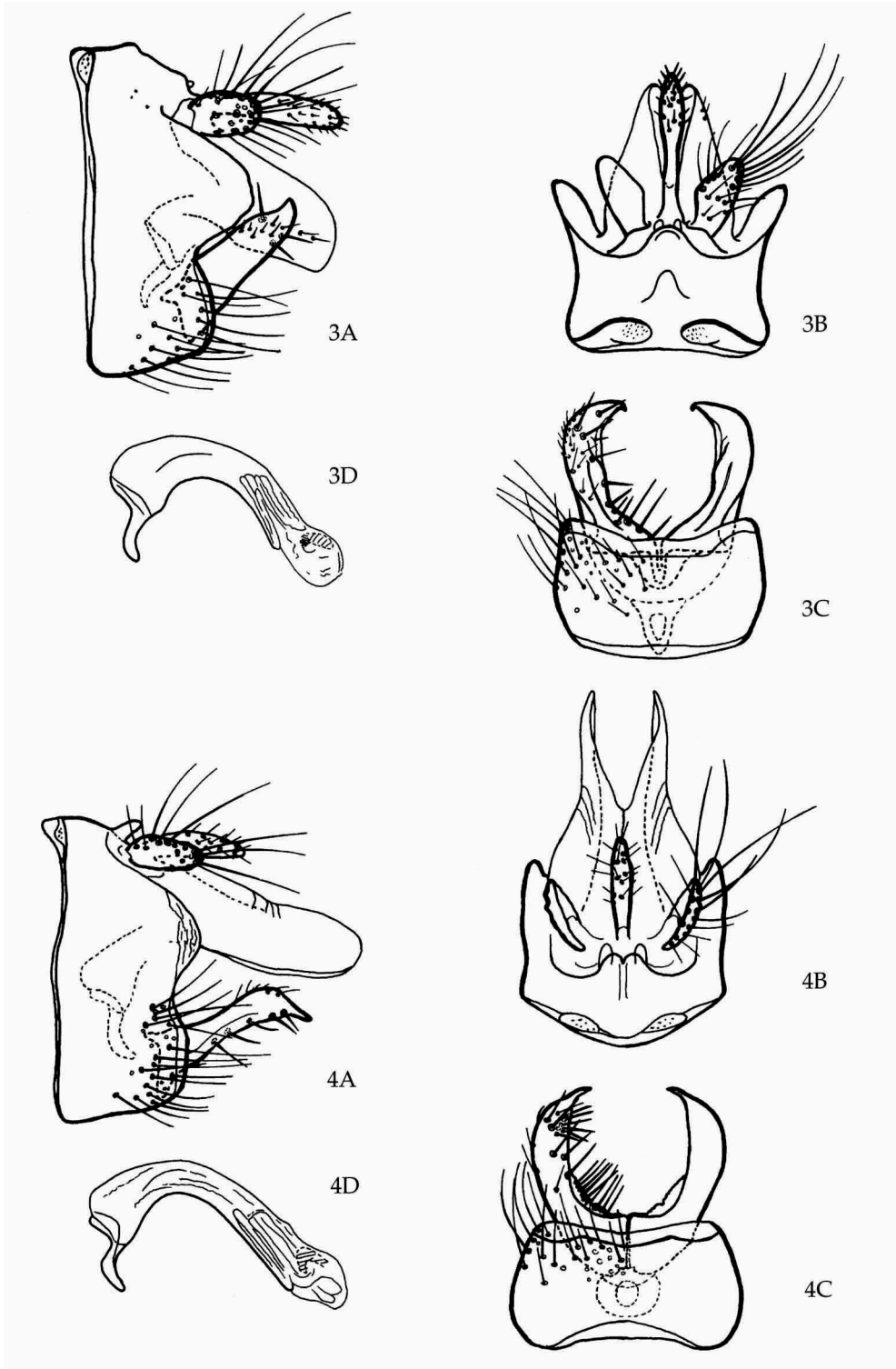
Male genitalia (fig. 3A-D). Abdominal segment IX subrectangular with pleura large, rounded, projecting posterolaterad. Preanal appendage small, ovate, setose. Upper part of tergum X with median club-shaped projection, with distal third setose. Lower part of tergum X subrectangular with broadly rounded corner posterodorsally, with few setae laterally near apex; in dorsal view triangular, deeply cleft apically. Inferior appendage stout, projecting posterodorsad, with broadly pointed apex; in ventral view curved mesad with hooked, pointed apex, with scattered, strong setae ventromesally. Phallus curved, tubular, with rounded, membranous apex.

Female and immatures.— Unknown.

Remarks.— *A. gada* spec. nov. resembles *A. bavanga* spec. nov., but can be easily separated by the large, rounded pleura of segment IX projecting posterolaterad, by the long, club-shaped median projection of tergum X, and by the stout inferior appendage. Both species show similarities to *A. aglae* Schmid, 1994 and *A. maculata* Kimmins, 1963, in the shape of tergum X, but both differ particularly in the shape of the inferior appendage, being pointed and curved mesad in ventral view.

Etymology.— Malay - *gada* - club for fighting, referring to the shape of the median projection of tergum X.

Fig. 3. *Adicella gada* spec. nov., male genitalia: 3A. lateral; 3B. dorsal; 3C. ventral; 3D. phallus, lateral.
Fig. 4. *Adicella bavanga* spec. nov., male genitalia: 4A. lateral; 4B. dorsal; 4C. ventral; 4D. phallus, lateral.



Adicella bavanga spec. nov.
(fig. 4)

Material.— Holotype: ♂, Malaysia, Sabah, 60 km WSW of Lahad Datu, Danum Valley Field Cent., on bridge, 04°58'N 117°48'E, 16.iii.1987, 150 m a.s.l, at light, J. Huisman & J. van Tol (RMNH). Paratypes: 1 ♂, Sabah, 60 km WSW Lahad Datu, km 68.5 on road Kg Silam - Danum Valley Field Centre, 04°58'N 117°48'E, 24.iii.1987, 150 m a.s.l, at light, J. Huisman (RMNH); 1 ♂, Sabah, 2 km SW Long Pa Sia, Long Rurun (Sg. Ritan) 04°23'N 115°42'E, 5.xii.1987, 1040 m a.s.l., at light, J. Huisman & C. van Achterberg (UMSP).

Male.— (n= 3). Forewing length 5.8-6.7 mm, hindwing length 4.1-4.8 mm. Eyes 0.34-0.36 mm wide. Antennae at least 19.9 mm long including 0.36-0.45 mm long scape. Maxillary palp segment lengths (in mm): 0.31-0.34, 0.37-0.42, 0.40-0.49, 0.22-0.26, 0.37-0.43. Colour in alcohol overall reddish brown.

Male genitalia (fig. 4A-D). Abdominal segment IX with tergum narrow; pleura broad, with rounded, posterior lobe; sternum subquadrangular. Preanal appendage small, oblong, setose. Upper part of tergum X with short, median, rod-shaped projection, setose in distal two thirds. Lower part of tergum X broadly digitate, projecting caudad; in dorsal view bottle-neck shaped, deeply cleft apically. Inferior appendage weakly sinusoid, with pointing apex; in ventral view curved mesad, with single row of strong setae on mesal ridge subbasally, on mesal cushion subapically, and with few, scattered strong setae ventromesally. Phallus curved, tubular.

Female and immatures.— Unknown.

Remarks.— See remarks for *A. gada* spec. nov.

Etymology.— Malay - *bavang* - rod, referring to the rod-shaped projection of tergum X.

Adicella anakpanah spec. nov.
(fig. 5)

Material.— Holotype: ♂, Malaysia, Sabah, Long Pa Sia, riverbank near airstrip, 04°25'N 115°34'E, 21.x.1986, 1000 m a.s.l, J. Huisman (RMNH). Paratype: 1 ♂, Sabah, J. Huisman (RMNH).

Male.— (n = 2). Forewing length 5.9-6.1 mm, hindwing length 4.8-4.9 mm. Eyes 0.37-0.40 mm wide. Antennae broken, scape 0.40-0.42 mm long. Maxillary palp segment lengths (in mm): 0.28-0.34, 0.39-0.40, 0.37-0.40, 0.22, 0.45-0.49. Colour in alcohol overall reddish brown.

Male genitalia (fig. 5A-D). Abdominal segment IX subrectangular, with sternum weakly produced posteriorly. Preanal appendage short, triangular, setose. Upper part of tergum X with median projection constricted medially and with broadly triangular, setose apex. Lower part of tergum X broadly rounded; laterally with pronounced, triangular, vertical ridge, and few setae; in dorsal view shallowly cleft apically. Inferior appendage long, projecting dorsad, with rounded apex curving posteromesad; setose posteromesally, a few hooked setae along posterior margin subbasally. Phallus curved, with basal half broad.

Female and immatures.— Unknown.

Remarks.— The male of this species is distinctive because of the long inferior

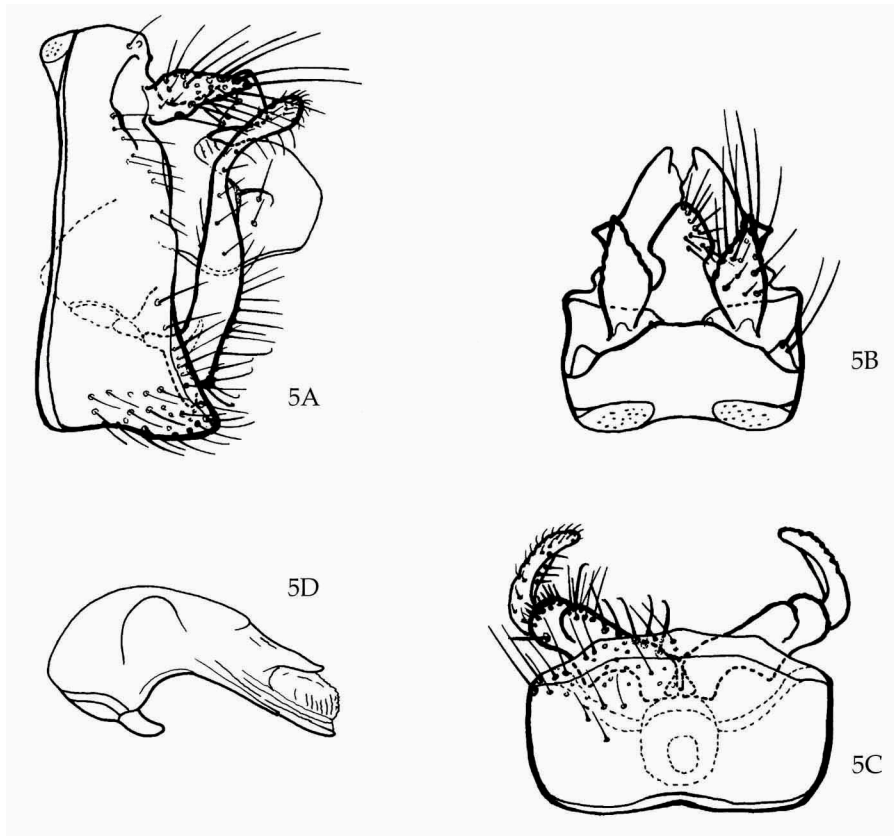


Fig. 5. *Adicella anakpanah* spec. nov., male genitalia: 5A. lateral; 5B. dorsal; 5C. ventral; 5D. phallus, lateral.

appendage and the shape of the median projection of tergum X.

Etymology.— Malay - *anak-panah* - arrowhead, referring to the shape of the median projection of tergum X.

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