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Exocelina kinibeli sp.n. from Papua New Guinea, a new species of the *E. ullrichi*-group (Coleoptera: Dytiscidae)

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Abstract

Exocelina kinibeli sp.n. (Coleoptera: Dytiscidae) is described from Papua New Guinea (Morobe Province) and placed into the *E. ullrichi*-group based on the structure of its male genitalia. An identification key to the three species of the group as well as new data on the distribution of *E. kainantuensis* (BALKE, 2001) and *E. ullrichi* (BALKE, 1998) are provided.

Key words: Coleoptera, Dytiscidae, *Exocelina*, new species, molecular phylogenetics, Papua New Guinea.

Introduction

A new species of the genus *Exocelina* BROUN, 1886 has been collected from the Morobe Province. This new species is morphologically similar to *E. ullrichi* (BALKE, 1998) and has two diagnostic characters of the *E. ullrichi*-group: parameres without long setae and median lobe of the aedeagus with a small apical notch ventrally. Therefore, it is considered to be the third member of this group. This is supported by molecular phylogenetic work grouping *E. ullrichi* and the new species together in one (rather isolated) clade (TOUSSAINT et al. 2014).

The *Exocelina ullrichi*-group was suggested by BALKE (1998) for two Papua New Guinea species: *E. ullrichi* and *E. kainantuensis* (BALKE, 2001). Recent fieldwork has revealed numerous specimens of *E. ullrichi* from new localities in the Eastern Highlands Province (EHP) of Papua New Guinea. So far, it has been known only from the type locality: Eastern Highlands Province, Kainantu area, Onerunka. Interestingly, this locality is the type locality of *E. kainantuensis* too, but since 1979, this species has never been found again there or recorded from other areas of the Eastern Highlands Province, despite the fact that the junior author has visited the type area many times.

Here, we describe the new species and provide an identification key to all three species of the *E. ullrichi*-group and a map of their distribution.

The highly diverse *Exocelina* fauna of New Guinea now consists of 65 described species (BALKE 1998, 1999, 2001; SHAVERDO et al. 2005, 2012, 2013).

Material and methods

Studied specimens are deposited in the following collections:

NARI	PNG National Insect Collection, Port Moresby, Papua New Guinea
NHMB	Naturhistorisches Museum Basel, Switzerland
NMW	Naturhistorisches Museum Wien, Vienna, Austria
ZSM	Zoologische Staatssammlung München, Munich, Germany

All specimen data were quoted as they appeared on the labels attached to the specimens. The label text was cited using quotation marks. Comments in square brackets are ours. We extracted DNA and obtained sequence data for some of the specimens, marked with individual DNA

extraction numbers (e.g., "DNA M.Balke 1379"). These data were used for molecular phylogenetic work published in TOUSSAINT et al. (2014).

Measurements were taken using a Leica M205C stereomicroscope. The following abbreviations were used: TL (total body length), TL-H (total body length without head), and MW (maximum body width). Drawings were made with the aid of a camera lucida attached to a Leica DM 2500 microscope. For detailed study and illustration, protarsi and genitalia were removed and mounted on glass slides with DMHF (dimethyl hydantoin formaldehyde) as temporary preparations. The drawings were scanned and edited, using the software Adobe Illustrator CS5.1.

The terminology to denote the orientation of the genitalia ("ventral" for median lobe and "external" for paramere) follows MILLER & NILSSON (2003). The terminology of the structure of the prosternum follows LARSON et al. (2000). Administrative divisions of Papua New Guinea follow information from Wikipedia (http://en.wikipedia.org/wiki/Administrative_divisions_of_Papua_New_Guinea).

Taxonomy

Exocelina kinibeli sp.n.

ZooBank registration and life science identifier: urn:lsid:zoobank.org:pub:4A4A7BBA-8ACC-4702-AC99-858BFC30DB57
Wiki species page: http://species-id.net/wiki/Exocelina_kinibeli

TYPE LOCALITY: Papua New Guinea: Morobe Province, Menyamya, Mt. Inji, close to 07°14.81'S 146°01.33'E (actual locality canopy covered and without satellite contact).

TYPE MATERIAL: **Holotype** ♂: "Papua New Guinea: Morobe, Menyamya, Mt Inji, 1900m, 14.XI.2006, nr 07.14.813S 146.01.330E, Balke & Kinibel, (PNG 97)" [printed], "DNA M.Balke 1379" [green, printed], "Holotype *Exocelina kinibeli* sp.n. des. H.Shaverdo & M.Balke, 2014" [red, printed] (ZSM).

DIAGNOSIS: Beetle medium-sized, dorsally dark brown, with coarse dense punctation, matt; pronotum with lateral bead; male antennomere 2 larger than other antennomeres, triangular, with rounded externodistal angle; male pro- and mesotarsomeres 1–3 dilated, protarsomere 4 relatively broad, symmetrical, its anterior angle not expanded, with large, thick, strongly curved anterolateral hook-like seta; in lateral view, median lobe curved and strongly protruding apically, with tip small and sharply turned upwards forming ventral notch, as well as with dorsomedian setae; paramere without notch on dorsal side, with very short, sparse, thin setae. The species is similar to *E. ullrichi*, except for its smaller size, coarser and denser dorsal punctation, less enlarged male antennomere 2, protarsomere 4 symmetrical, its anterior angle not expanded, prosternal process distinctly convex, and more protruding apex of median lobe.

DESCRIPTION: Size and shape: Beetle medium-sized (TL-H 4.35 mm, TL 4.9 mm, MW 2.25 mm), with elongate habitus, broadest at elytral middle.

Coloration (Fig. 1): Head dark brown, slightly paler on clypeus and piceous behind eyes, with piceous V-shaped spot between eyes; pronotum dark brown, piceous along punctate anterior row and on disc; elytra dark brown, with some areas darker; head appendages yellowish red, legs darker, especially distally; the holotype slightly teneral, and coloration may be darker in general.

Surface sculpture (Fig. 1): Head with very dense, coarse, punctation (spaces between punctures 1–2 times size of punctures), only slightly finer and sparser anteriorly, between eyes forming two small areas of partly merging punctures; diameter of most of punctures equal to diameter of cells of microreticulation. Pronotum and elytra with slightly finer and more evenly distributed punctation than on head. Pronotum rugose posteriorly, left and right of medial line. Head, pronotum, and elytra with strongly impressed microreticulation. Dorsal surface matt due to

strong punctation and microreticulation. Metaventrite and metacoxa distinctly microreticulate, metacoxal plates with longitudinal strioles and transverse wrinkles. Abdominal ventrites with distinct microreticulation, numerous strioles, and fine sparse punctation, coarser and denser on two last abdominal ventrites.

Structures. Pronotum with lateral bead. Base of prosternum and neck of prosternal process with distinct ridge, with anterolateral extensions. Blade of prosternal process lanceolate, relatively narrow, convex, with distinct bead and few setae; neck and blade of prosternal process evenly jointed. Abdominal ventrite 6 with 24–26 lateral striae on each side, slightly truncate apically. Antennomere 2 larger than other antennomeres, triangular, with rounded but not strongly protruding externodistal angle (Fig. 1). Pro- and mesotarsomeres 1–3 dilated. Protarsomere 4 relatively broad and symmetrical, its anterior angle not expanded, with one large, thick, strongly curved anterolateral hook-like seta. Protarsomere 5 simple, ventrally with anterior row of more than 40 long and posterior row of six shorter setae (Fig. 2). In lateral view, median lobe of aedeagus curved and strongly protruding apically, with tip small and sharply turned upwards forming ventral notch, as well as with dorsomedian setae (Figs. 4–5). Paramere without notch on dorsal side, with very short, sparse, thin setae (Fig. 3).

Female: Unknown.

HABITAT: The new species was collected from tiny water holes on red clay at the edge of a montane forest creek. The forest remnants along a summit ridge are surrounded by man-made grassland on very steep slopes. The new species was found associated with two species of the *E. ekari*-group (SHAVERDO et al. 2014, submitted).

DISTRIBUTION: Papua New Guinea: Morobe Province. The species is known only from the type locality (Fig. 6).

ETYMOLOGY: The species is named for Andrew Kinibel (Madang, Papua New Guinea), who collected the holotype together with the second author. The species name is a proper noun in the genitive case.

Key to species of the *Exocelina ullrichi*-group

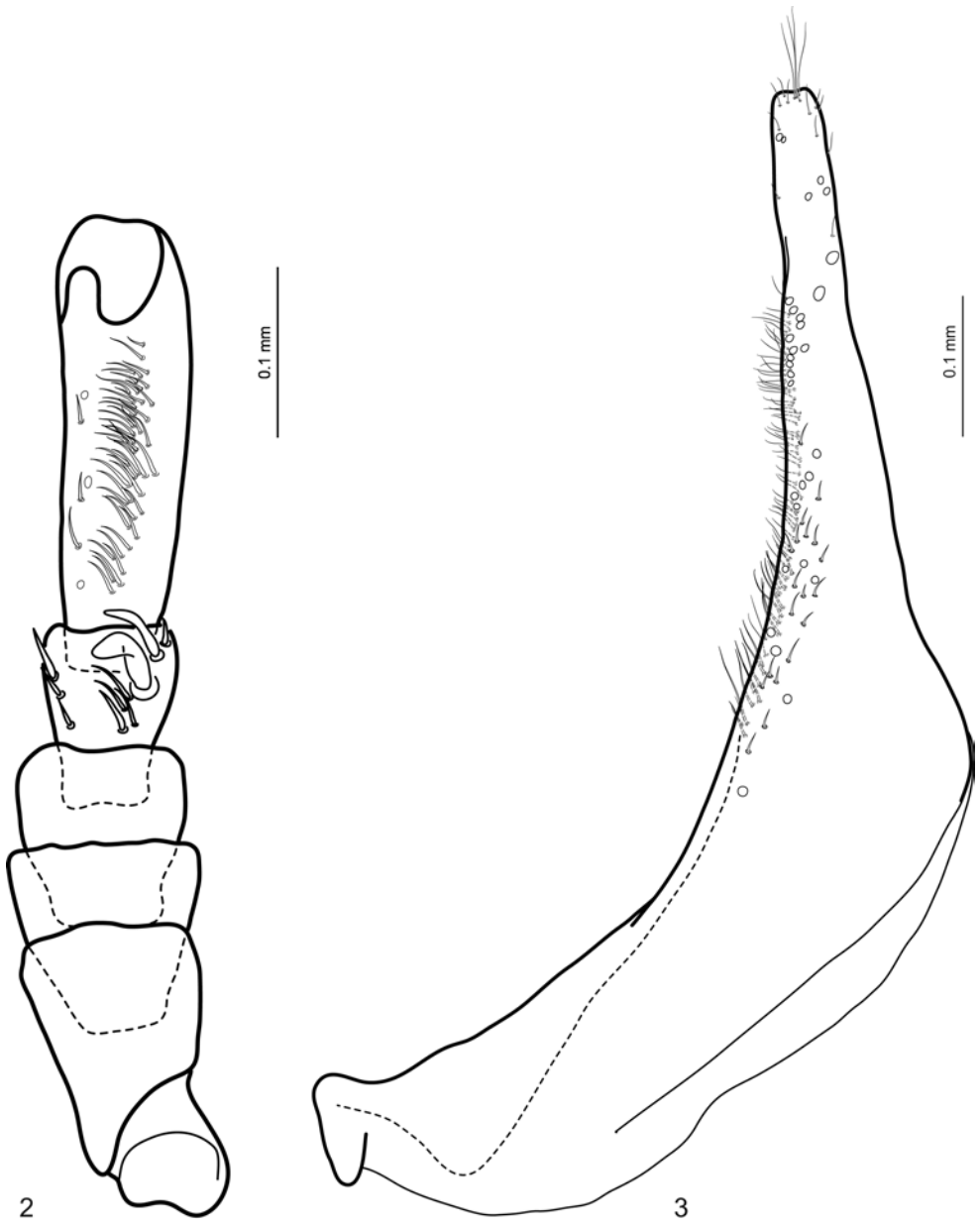
This key is based mostly on the male characters. In many cases females cannot be assigned to species due to similarity of their external and internal structures (for female genitalia, see SHAVERDO et al. (2005: Figs. 17a–b) and SHAVERDO et al. (2013: Fig. 7C).

Females of *E. ullrichi* can be distinguished by the slightly enlarged antennomere 2 from the species, which are approximately the same size (e.g., *E. kainantuensis* and *E. knoepfchen* (SHAVERDO, HENDRICH & BALKE, 2012)) and by larger size and stronger dorsal punctation from *E. miriae* (BALKE, 1998), which occurs often together with *E. ullrichi* and also has a slightly enlarged antennomere 2.

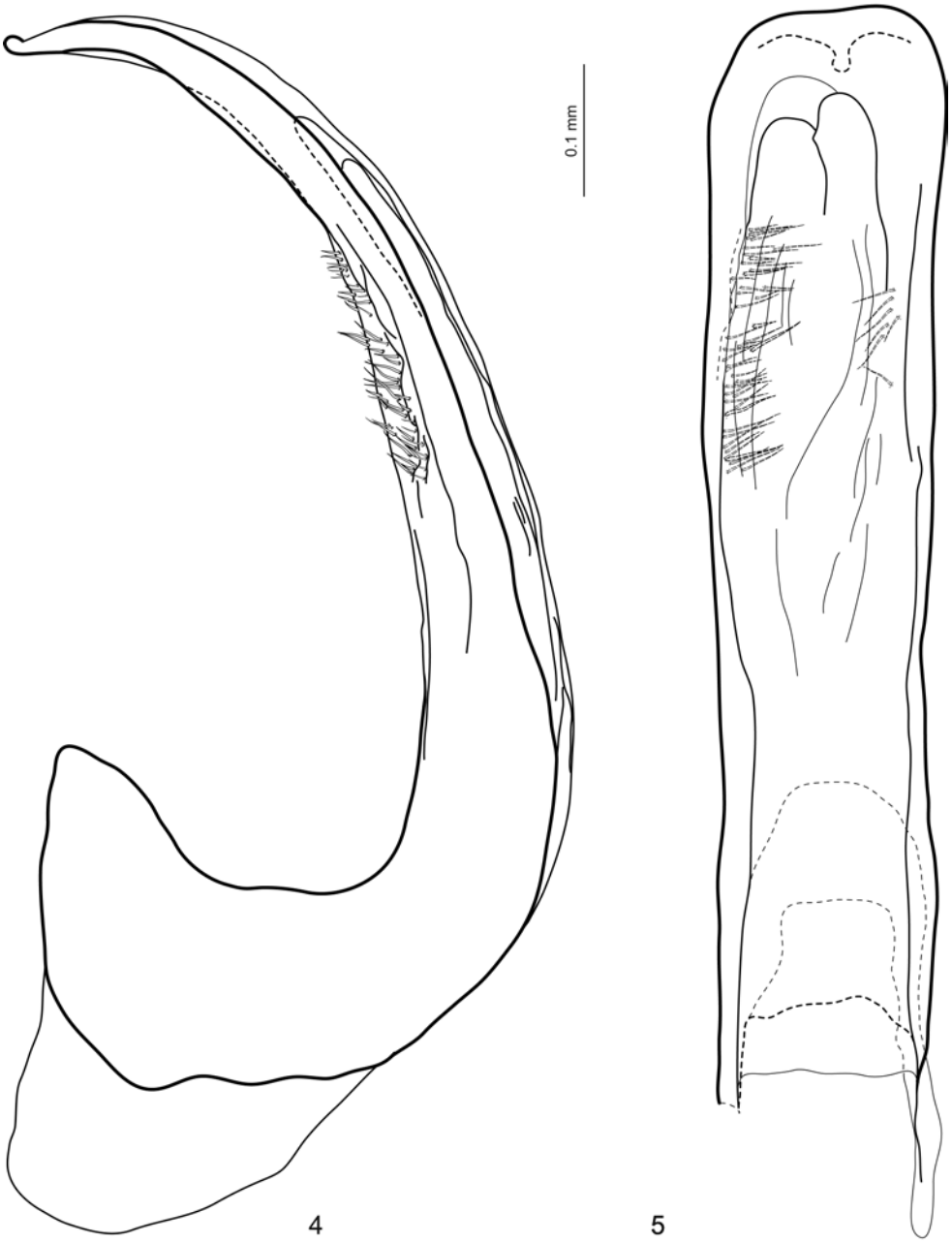
1 Male antennomeres 2–4 very strongly enlarged: antennomere 2 almost quadrangular, antennomeres 3–4 more rounded and distinctly smaller than antennomere 2 (BALKE 1998: fig. 12). Prosternum with very sharp ridge, blade of prosternal process broadly lanceolate, distinctly concave (BALKE 1998: fig. 23). Median lobe and paramere as in BALKE (1998: figs. 36, 43, 60) ..... ***kainantuensis*** (BALKE, 2001)

– Only male antennomere 2 modified: enlarged, triangular, with rounded externodistal angle (BALKE 1998: Fig. 13). Prosternum with distinct ridge, blade of prosternal process flat to convex (BALKE 1998: Fig. 23) 2

Fig. 1: Habitus of *Exocelina kinibeli* sp.n., holotype.



Figs. 2–3: *Exocelina kinibeli* sp.n. 2) protarsomere, ventral view, 3) paramere, external view.



Figs. 4–5: *Exocelina kinibeli* sp.n. 4) median lobe, lateral view, 5) median lobe, ventral view.

2 Beetle larger, TL-H: 5.3–5.9 mm. Male antennomere 2 strongly enlarged, triangular, with distinctly protruding externodistal angle (BALKE 1998: fig. 13). Protarsomere 4 asymmetrical, its anterior angle expanded (BALKE 1998: fig. 29; SHAVERDO et al. 2013: fig. 2C). Blade of prosternal process flat to slightly convex. Median lobe and paramere as in BALKE (1998: figs. 36, 44, 61)..... ***ullrichi*** (BALKE, 1998)

– Beetle smaller, TL-H: 4.35 mm. Male antennomere 2 less enlarged, with less protruding externodistal angle (Fig. 1). Protarsomere 4 symmetrical, its anterior angle not expanded (Fig. 2). Blade of prosternal process distinctly convex. Median lobe and paramere as in Figs. 3–5 ..... ***kinibeli* sp.n.**

Faunistic notes

Exocelina kainantuensis (BALKE, 2001)

Copelatus (*Papuadytes*) *formosus* BALKE 1998: 320 (junior primary homonym of *Copelatus formosus* WOLLASTON, 1867 and *Copelatus formosus* RÉGIMBART, 1889). – NILSSON 2001: 76 (cat.).
Copelatus (*Papuadytes*) *kainantuensis* (BALKE 2001): 361 (replacement name for *Copelatus* (*Papuadytes*) *formosus* BALKE, 1998). – NILSSON 2004: 167 (cat.).
Exocelina kainantuensis: NILSSON 2007: 34.

TYPE MATERIAL STUDIED: **Paratypes**: 1 ♂: "14 V 79 PNG/EHProv. Umg. Kainantu Onerunka", "Paratypus Copelatus formosus sp.n. Balke des. 1997" [red, printed], "Paratypus *Copelatus (Papuadytes) kainantuensis* BALKE, 2001 replacement name" [red, printed] (NMW). 1 ♂: "VI 79 PNG/EHProv. Umg. Kainantu Onerunka", "Paratypus Copelatus formosus sp.n. Balke des. 1997" [red, printed], "Paratypus *Copelatus (Papuadytes) kainantuensis* BALKE, 2001 replacement name" [red, printed] (NMW).

ADDITIONAL MATERIAL EXAMINED:
PAPUA NEW GUINEA: 21 exs. "PAPUA N: GUINEA, Onerunka VIII. 79, nr Kainantu, W. G. Ullrich", "Coll. HENDRICH Berlin", "Copelatus kainantuensis, Hendrich det. 2005" (NHMB, NMW, ZSM).

The species is known only from its type locality: Onerunka, Kainantu area, Eastern Highlands Province of Papua New Guinea.

Exocelina ullrichi (BALKE, 1998)

Copelatus (*Papuadytes*) *ullrichi* BALKE 1998: 320. – NILSSON 2001: 77 (cat.).
Papuadytes ullrichi: NILSSON & FERY 2006: 56.
Exocelina ullrichi: NILSSON 2007: 34.

TYPE MATERIAL STUDIED: **Paratypes**: 1 ♂, 1 ♀: "VI 79 PNG/EHProv. Umg. Kainantu Onerunka", "Paratypus Copelatus ullrichi sp.n. Balke des. 1997" [red, printed] (NMW). 1 ♂ "14 V 79 PNG/EHProv. Umg. Kainantu Onerunka", "Paratypus Copelatus ullrichi sp.n. Balke des. 1997" [red, printed] (NMW).

ADDITIONAL MATERIAL EXAMINED:
PAPUA NEW GUINEA: 1 ♂, 1 ♀: "Papua New Guinea: Eastern Highlands, Aiyura, 1670 m, 5.iv.2006, 06.21.131S 145.54.398E, Balke & Sagata (PNG 32)" (ZSM); 3 ♂♂, 1 ♀: "Papua New Guinea: Eastern Highlands, Aiyura, creek, 1670 m, 20.v.2006, 06.21.131S 145.54.398E, John & Balke (PNG 70)" (NMW, ZSM); 1 ♂: "Papua New Guinea: EHL, Aiyura, ii.2003, Sagata, DNA M Balke: MB 389" (ZSM); 1 ♀: "Papua New Guinea: Eastern Highlands, Aiyura, ditch in forest, 1670 m, 20.v.1994, 06.21.131S 145.54.398E, John & Balke (PNG 69)" (ZSM); 1 ♂, 6 ♀♀: "Papua New Guinea: Eastern Highlands, Onerunka, small creek, red soil /rock, 1700 m, 21.v.2006, 06.20.936S 145.46.874E, John & Balke (PNG 71)" (NMW, ZSM); 89 ♂♂, 49 ♀♀: "Papua New Guinea: Eastern Highlands, Kainantu, Yoginofi, 1900 m, 9.v.1994, 06.21.799S 145.45.463E, Balke & Sagata (PNG 55)" (NARI, NMW, ZSM); 9 ♂♂: "Papua New Guinea: Eastern Highlands, Hogu, 1 km E Mt. Barola, 1900 m, 9.v.1994, 06.17.556S 145.45.036E, Balke & Sagata (PNG 56)" (NARI, NMW, ZSM); 4 ♂♂, 1 ♀: "Papua New Guinea: Eastern Highlands, Goroka, below Mt. Otto, 2000 m, 11.v.2006, 06.01.687S 145.26.493E, Balke (PNG 57)" (NMW, ZSM); 2 ♂♂, 4 ♀♀: "Papua New Guinea: Eastern Highlands, Akameku - Brahmin, Bismarck Range, 2200 m, 23.xi.2006, 05.56.801S 145.22.238E, Balke & Kinibel (PNG 106)" (NMW, ZSM); 1 ♂, 3 ♀♀: "Papua New Guinea: Eastern Highlands, Kimiagomo vill, north Okapa stn, 1900, 30.iv.2006,

06.25.407S 145.34.480E, Sagata (PNG 80)" (NMW, ZSM); 7 ♂♂, 11 ♀♀: "Papua New Guinea: Aiyura, 1787m, 15.i.2003, 06.21.411S 145.54.340E, K. Sagata, (WB5)" (NARI, NMW, ZSM); 10 ♂♂: "Papua New Guinea: Eastern Highlands, Yuyulio, Kimiagomo-Okapa, 2100 m, 13.iv.2003, 06 25.255S 145 34.233E, K. Sagata (WB7)" (NMW, ZSM); 3 ♀♀: "Papua New Guinea: Eastern Highlands, Wapi Creek, Kimiagomo, Okapa, 1900 m, 9.viii.2005, 6 25.407S 145 34.480E, K.Sagata (WB122)" (ZSM); 1 ♂: "Papua New Guinea: EHP, Okapa, Kimiagomo, Wapi Creek, 6.25.407 / 145.34.480, 1900 m, 9.viii.2005, Sagata, DNA MB1253" (ZSM).

The species is widely distributed in the Eastern Highlands Province. It was very often found to be associated with *E. knoepfchen*, *E. miriae*, and one new species of the *E. ekari*-group (SHAVERDO et al. 2014, submitted).

Fig. 6: Map of Papua New Guinea showing distribution of *Exocelina kinibeli* sp.n. (red), *E. ullrichi* (blue), and *E. kainantuensis* (yellow).

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Zusammenfassung

Exocelina kinibeli sp.n., eine neue Art aus Morobe, Papua Neu Guinea wird beschrieben. Auf Grund der Struktur des Aedeagus wird die Art der *E. ullrichi*-Gruppe zugeordnet. Ein Bestimmungsschlüssel für die drei Arten der Gruppe sowie neue Daten zur Verbreitung von *E. ullrichi* (BALKE, 1998) und *E. kainantuensis* (BALKE, 2001) werden hier bereitgestellt.

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