

***Stenochrus portoricensis*, *Zomus bagnallii* and a new genus of schizomids (Schizomida: Hubbardiidae) from a greenhouse in Frankfurt am Main, Germany**

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Abstract. A new genus of hubbardiid schizomid, *Bucinozomus* **gen. nov.** with the single species *B. hortuspalmarum* **spec. nov.**, is described on basis to two male specimens found in the “Palmengarten” greenhouse in Frankfurt am Main, Germany. It clearly differs from other known genera by having a long and conical abdominal segment IX, as well as the following combination of characters: anterodorsal margin of femur IV produced at less than a 90° angle, metapeltidium divided, and pedipalps with prominent spinose setae. It differs from *Trithyreus* Kraepelin, 1899 by having the pedipalp trochanter with a mesal spur, leg femur IV not slender and a pedipalp tarsus with a shorter claw (half of tarsus length). Living sympatric with this new taxon were female specimens of *Stenochrus portoricensis* Chamberlin, 1922 and *Zomus bagnallii* (Jackson, 1908).

Keywords: Europe, Hubbardiinae, short-tailed whipscorpions, taxonomy

Zusammenfassung. *Stenochrus portoricensis*, *Zomus bagnallii* und eine neue Zwerggeißelskorpion-Gattung (Schizomida: Hubbardiidae) aus einem Gewächshaus in Frankfurt am Main, Deutschland. Die neue Zwerggeißelskorpion-Gattung *Bucinozomus* **gen. nov.** (Schizomida: Hubbardiidae) mit der bisher einzigen bekannten Art *B. hortuspalmarum* **spec. nov.** wurde erstmalig anhand von zwei männlichen Individuen, welche in den Gewächshäusern des Palmengartens in Frankfurt am Main (Deutschland) gefunden wurden, beschrieben. Sie unterscheidet sich deutlich von allen anderen bisher bekannten Gattungen durch den Besitz eines langen, kegelförmigen Abdominalsegments IX, so wie durch eine Kombination folgender Merkmale: Der anterodorsale Rand des Femurs IV bildet einen Winkel unter 90° aus, das Metapeltidium ist geteilt und die Pedipalpen weisen auffällig stachelige Setae auf. Von der Gattung *Trithyreus* Kraepelin, 1899 lässt sich die neue Gattung anhand eines mesalen Sporns auf den Pedipalpen-Trochantern, einem insgesamt weniger schlanken Femur IV und kürzeren Klauen an den Pedipalpen-tarsen (Hälfte der Tarsuslänge) unterscheiden. Am Fundort kommt *B. hortuspalmarum* **spec. nov.** sympatrisch mit Weibchen von *Stenochrus portoricensis* Chamberlin, 1922 und *Zomus bagnallii* (Jackson, 1908) vor.

Schizomids are an understudied order of arachnids mainly distributed in tropical and subtropical areas, although three species have been accidentally introduced into Europe: *Stenochrus portoricensis* Chamberlin, 1922, *Schizomus crassicaudatus* (O. P.-Cambridge, 1872) and *Zomus bagnallii* (Jackson, 1908) (Reddell & Cokendolpher 1995, Harvey 2003, Korenko et al. 2009, Nedvěd et al. 2011, Christophoryová et al. 2013, Zawierucha et al., 2013) (Tab. 1). From German greenhouses, Cokendolpher et al. (2006) and Blick et al. (2006) recorded further undetermined schizomids from Frankfurt am Main.

As a result of several samplings during 2012–2014 in the wet tropical section of a greenhouse in Frankfurt am Main, the second author (SR) collected schizomid specimens belonging to three species, one

of which represents a new genus and species, which are herein described.

Material and methods

This study was based on 12 specimens (two males; ten females) from a greenhouse in Frankfurt am

Tab.1: Schizomid species introduced into Europe

species	country and reference
<i>Bucinozomus hortuspalmarum</i>	Germany (this paper)
<i>Schizomus crassicaudatus</i>	France (Pickard-Cambridge 1872)
<i>Stenochrus portoricensis</i>	Czech Republic (Korenko et al. 2009), Germany (this paper), Great Britain (Reddell & Cokendolpher 1995), Poland (Zawierucha et al. 2013), Slovakia (Christophoryová et al. 2013), Spain (Canary Islands: Martín & Oromi 1984, Sevilla: Barranco et al. 2014)
<i>Zomus bagnallii</i>	Germany (this paper), Great Britain (Jackson 1908)

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Main, Germany. The specimens are deposited in the following institutions:

IES Instituto de Ecología y Sistemática, La Habana, Cuba.

MfN: Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science, Berlin, Germany.

SMF: Senckenberg Museum, Frankfurt am Main, Germany.

Nomenclature follows Reddell & Cokendolpher (1995). Notation for chaetotaxy of tergites I–VIII is that of Harvey (1992). For flagellar chaetotaxy we follow Harvey (1992), as modified by Reddell & Cokendolpher (1992) and Moreno-Gonzalez et al. (2014). The setal group numbering for the chelicerae follows Lawrence (1969); with notation of the formula as suggested by Moreno-Gonzalez & Villarreal (2012). Measurements are given in millimeters; total length excludes the flagellum; pedipalps and legs exclude the coxae.

Taxonomy

Family Hubbardiidae Cook, 1899

Subfamily Hubbardiinae Cook, 1899

Genus *Bucinozomus* **gen. nov.**

Type species: *Bucinozomus hortuspalmarum* **spec. nov.**

Diagnosis: The elongate and cylindrical abdominal segment IX of the adult male of *B. hortuspalmarum* **spec. nov.** (Figs 1–5), is unlike that of any other schizomid genus. Also, the following combination of characters differentiate this taxon from other Hubbardiidae: anterior process of propeltidium with 2+1 setal arrangement; pedipalps presumably sexually dimorphic; male pedipalps armed with spinose setae (Figs 9–11); anterodorsal margin of femur IV produced at less than a 90° angle (Fig. 12); metapeltidium divided (Fig. 6); and male abdominal segments IX–XII attenuated (Figs 1–5).

The only hubbardiid genera having the anterodorsal margin of femur IV produced at less than a 90° angle are *Clavizomus* Reddell & Cokendolpher, 1995 (Singapore, West Malaysia and Java), *Heterocubazomus* Teruel, 2007 (Cuba, West Indies), *Reddellzomus* Armas, 2002 (Cuba), *Tayos* Reddell & Cokendolpher, 1995 (Ecuador, South America), *Thrithyreus* Kraepelin, 1899 (Myanmar), and an undescribed genus from Guerrero State, Mexico, mentioned by Armas & Palacios-Vargas (2006). *Bucinozomus* closely resembles *Trithyreus* and *Clavizomus* by having spinose setae on the pedipalps, but it differs from

the former by having a trochanter with a mesal spur, leg femur IV not slender, and a pedipalp tarsus with shorter spurs and claw (half of tarsus length). On the other hand, the female of *T. grassii* (Thorell, 1889) lacks eye spots. *Clavizomus* is characterized by having clavate setae on the body and legs; a mesal spur on the pedipalp trochanter is also lacking. The New World genera *Heterocubazomus*, *Reddellzomus* and *Tayos* clearly differ from *Bucinozomus* by having pedipalps without spinose setae, an anterior process of the propeltidium with 1+1 setae, male pedipalps not sexually dimorphic (*Tayos*, *Reddellzomus*), and the metapeltidium entire (*Reddellzomus*).

Description: Anterior process of propeltidium with two setae followed by another one (2+1); corneate eyes absent; metapeltidium clearly divided (Fig. 6). Body without clavate setae. Pedipalps sexually dimorphic. Male pedipalps armed with strong mesal spur on trochanter and short, strong spiniform setae on ventroanterior surface of the femur (Figs 9–10). Movable cheliceral finger without accessory tooth (Fig. 13), with a guard tooth at end of serrula. Anterodorsal margin of femur IV produced at less than a 90° angle (Fig. 12). Male abdominal segments IX elongate and cylindrical (Figs 1–5). Abdominal tergite II with two posterior setae. Abdominal segment XII of males without dorsal process (Fig. 7).

Etymology: The generic name is derived from the Latin noun *bucina* (trumpet), relating to the very attenuate last abdominal segments of the male, and the name *Zomus* Reddell & Cokendolpher, 1995. It is masculine in gender.

Remarks: Although this new genus is known only from male specimens, the diagnostic characters are sufficient for its correct identification.

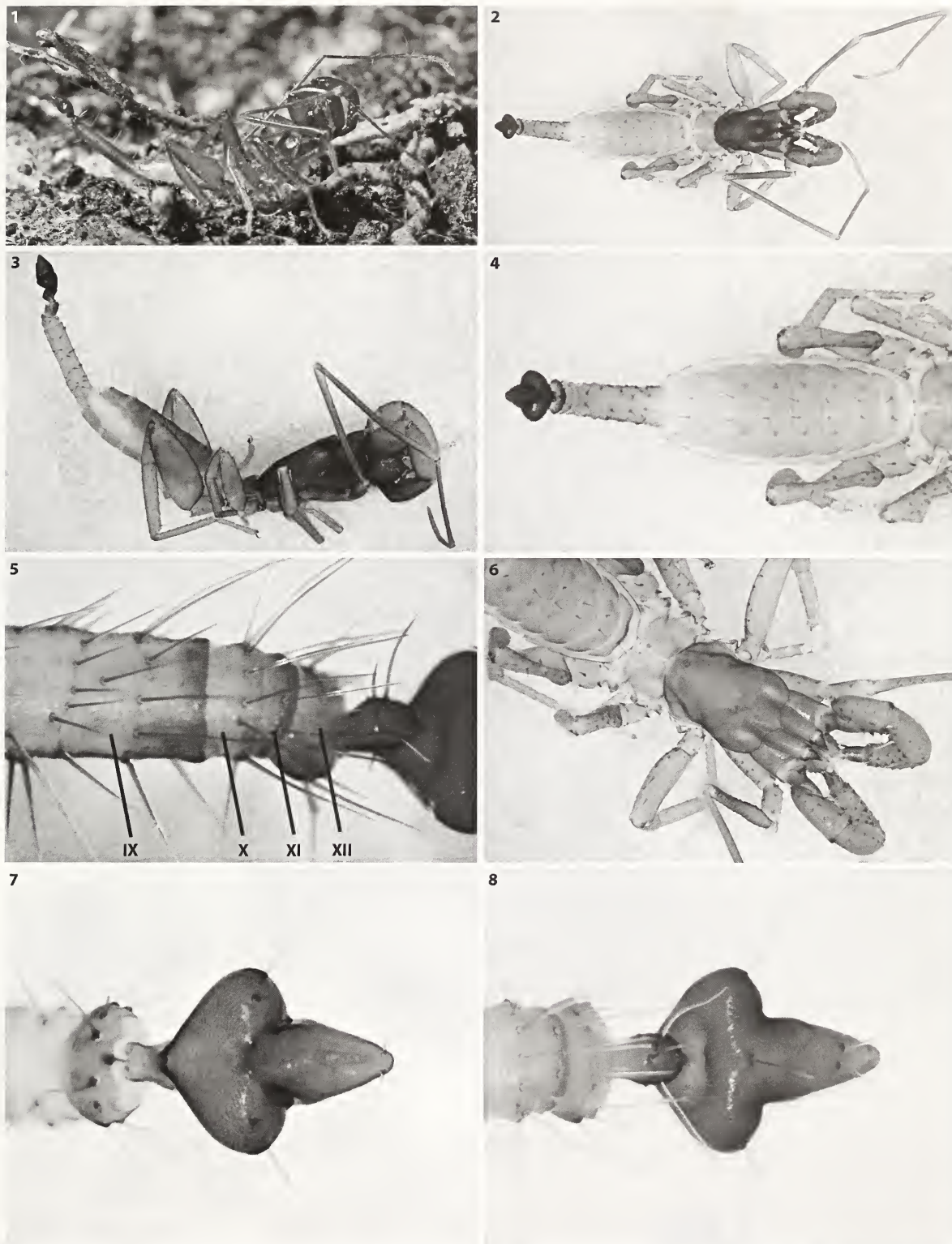
Bucinozomus hortuspalmarum **spec. nov.**

Figs 1–15, Tabs 1–2

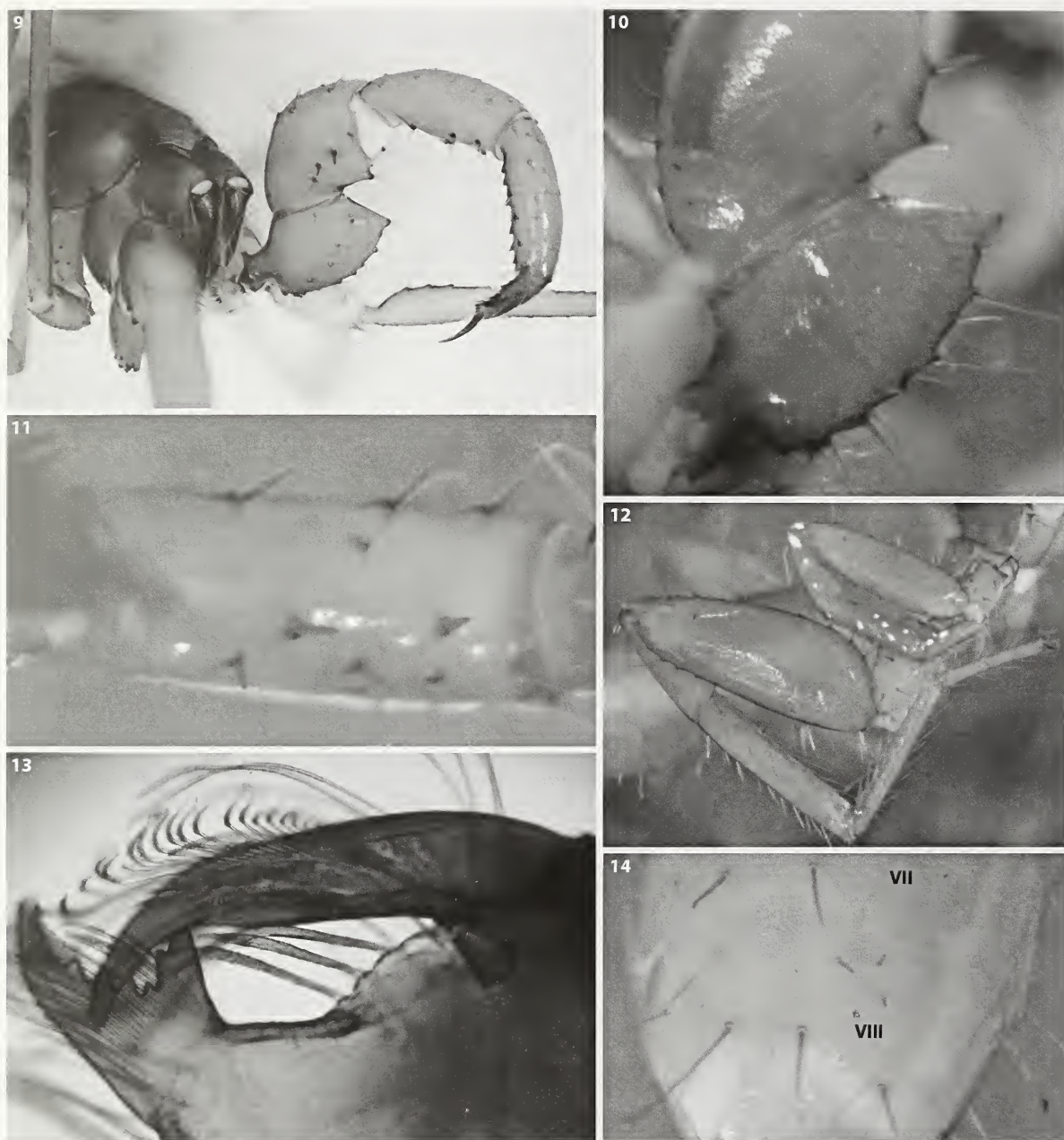
Type data: Holotype ♂ (SMF), GERMANY: Frankfurt am Main: Palmengarten; Tropicarium (N 50°07'27.28" – E08°39'23.89", approximately 112 m a.s.l.), 22 February, 2012; leg. Stefan Rehfeldt (in greenhouse; section: coastal and mangrove forests; under a stone; near an allotment of rice). Paratype: ♂ (MfN), 26 March, 2013; other data same as the holotype.

Distribution: Only known from the type locality (Fig. 15).

Diagnosis: Propeltidium with three pairs of dorsal setae. Male flagellum with the bulb fleur-de-luce-



Figs 1-8: *Bucinozomus hortuspalmarum*. Male holotype. 1, alive in the Frankfurt greenhouse. 2-3, habitus dorsal (2) and lateral (3). 4, opisthosoma, dorsal. 5, Abdominal segments IX-XII, ventral aspect. 6, prosoma and first tergites, dorsal. 7-8, last abdominal segments and flagellum, dorsal (7) and ventral (8)



Figs 9-14. *Bucinozomus hortuspalmarum*. Male holotype. 9-11, pedipalp: mesal view (9), trochanter and femur, external aspect (10), patella, ventral aspect (11). 12, Legs III-IV. 13, chelicera, fixed and movable finger. 14, tergites VII-VIII.

shaped in dorsal and ventral aspect, without dorso-median prominences (Fig. 8).

Male: Yellowish-brown, with propeltidium, chelicerae, pedipalp coxae and flagellum darker. Propeltidium with three pairs of dorsal setae; ocular spots irregular in form, sub ovate. Metapeltidium clearly divided (Fig. 6). Anterior sternum with 11+2 setae.

Cheliceral fixed finger with four accessory teeth (Fig. 13); serrula on the movable finger with 25 hyaline teeth. Chaetotaxy: setal group formula: 3-2-2-3-19-1; G1 (setae group 1) with three spatulate setae, having each the basal part smooth, and the rest with minute spiniform spicules. Pedipalps (Figs 9-11): trochanter apically pronounced, sharp-pointed, with



Figs 15-17. General view of the Frankfurt greenhouses (15). Living females of *Stenochrus portoricensis* (16) and *Zomus bagnallii* (17), both from the Frankfurt greenhouses

a mesal spur; femur 1.7 times longer than high, with two stout ventroanterior setae, the basal one on a large tubercle; patella 1.1 times longer than femur and 3.0 times longer than high; claw 0.6 times as long as the dorsal length of the tarsus. Chaetotaxy of tergites I-VIII: 2+4 (microsetae diagonal): 2+4 (microsetae in column):2:2:2:2:2:5+4 (Figs 4, 6, 14). Segment IX with more than 10 dorsal setae (Figs 3-5); X and XI very short; X with a pair of large dorsolateral setae and six pairs of ventral setae; XI with six pairs of ventral setae; XII without dorsal median eminence, with four dorsal setae, a pair of lateral setae and six ventral setae. Flagellum resembles, at grosso modo, an *Iris* flower (Figs 7-8); bulb 1.3 times longer than wide, without dorsomedian eminences; chaetotaxy: 15 setae (7 dorsal, 8 ventral), dm1 on the bulb base,

dl1 basal to vm1 level, dl2 almost at the same level than vl1, vm1 basal to vm2, vm5 in middle of the bulb, dl3 near to the apex, clearly shorter than vl2; laterally and basal to dl2 there are two pairs of microsetae; dm5 and vm4 are lacking. Measurements (see Tab. 2).

Female: Unknown.

Etymology: The specific name is derived from the Latin words *hortus* (garden) and *palmarum* (genitive plural of palm), because the schizomid specimens were found in a greenhouse of the Palm Garden in Frankfurt.

Natural history: The only available specimens (two males) were found under stones in the palm garden (Palmengarten) of the Frankfurt greenhouse, sympatric with *S. portoricensis*.

Tab. 2: Measurements (mm) of *Bucinozomus hortuspalmarum*. H, height; L, length; W, width.

characters	♂ holotype
Total body L	6.20
Propeltidium, L/W	1.55/0.98
Flagellum, L/W/H	0.83/0.52/0.33
Pedipalp, L	4.04
Trochanter, L/H	0.88/0.41
Femur, L/H	0.93/0.52
Patella, L/H	1.01/0.33
Tibia, L/H	0.83/0.28
Tarsus, L	0.39
Claw, L	0.23
Leg I, L	8.90
Femur, L	2.10
Leg IV, L	5.90
Femur, L/H	1.69/0.60

Comments: On May 2014, SR again visited the greenhouse in Frankfurt, but unfortunately only one specimen of *Z. bagnallii* was found, no other schizomids. The plants near the location were watered very intensively and this could have been the reason for the schizomids scarcity during this visit.

Stenochrus portoricensis Chamberlin, 1922

Fig. 16, Tab. 1

First record for GERMANY: Frankfurt am Main: Palmengarten; Tropicarium (N50°7'27.28 – E8°39'23.89, approximately 112 m a.s.l.): 5 ♀♀ (IES), 22 February, 2012; leg. Stefan Rehfeldt (greenhouse; section: coastal and mangrove forests; under a stone; near an allotment of rice).

Comments: Korenko et al. (2009) wrote that “*Stenochrus portoricensis* [...] has been accidentally introduced into many countries [...] and even in Europe: [...] Great Britain and Germany (Blick 2006, Cokendolpher et al. 2006).” On the other hand, according to Nedvěd et al. (2011), “Blick (2010) recorded *S. portoricensis* from Germany”, but they wrongly cited this 2006-online-source. Also, Theo Blick (e-mail to SR on August 2014) wrote that the records of *S. portoricensis* in Germany have not been published with this species name so far.

Zomus bagnallii (Jackson, 1908)

Fig. 17, Tab. 1

First record for GERMANY: Frankfurt am Main: Palmengarten; Tropicarium (N 50°7'27.28 – E8°39'23.89, approximately 112 m a.s.l.): 2♀♀

(SMF), 22 February, 2012; 2♀♀ (SMF), 29 March, 2013; 1♀ (SMF), 17 May, 2014; leg. Stefan Rehfeldt (in greenhouse; sections: coastal and mangrove forests; monsoon and trade wind forests; and the bromeliad house; under stones and under flower pots).

Discussion

Three schizomid species are now known to occur in German greenhouses. There is evidence that at least one of them reproduces in this habitat (Blick et al. 2006). *Stenochrus portoricensis* and *Z. bagnallii* are relatively widespread in the Frankfurt am Main greenhouse, where they became established more than ten years ago (Blick et al. 2006, Cokendolpher et al. 2006). But this is not the case for *B. hortuspalmarum*, only known from two male specimens collected in the Palmengarten.

Stenochrus portoricensis naturally occurs in several countries of the New World (Reddell & Cokendolpher 1995), from which it has been introduced into the Canary Islands and several European countries (Tab. 1). *Zomus bagnallii* was imported to France from Sri Lanka. But the bizarre *B. hortuspalmarum* was inadvertently introduced into the German greenhouse from an unknown country, although some of its morphological characters clearly resemble those of certain south-eastern Asian genera (such as *Clavizomus* and *Trithyreus*), perhaps the area in which it naturally occurs.

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