

New records of stilt bugs (Insecta, Heteroptera, Berytidae) from the Afrotropical region, with distributional and ecological notes*

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Abstract

Additional information on the distribution of eleven species of stilt bugs (Heteroptera, Berytidae) from the Afrotropical region is reported and discussed with respect to the major biomes of Africa. For some species, remarks on ecology, identification and taxonomy are included. New country records are indicated for *Gampsocantha pumilio*, *Gampsocoris africanus cornutus*, *Micrometacanthus trichoferus*, *Cametanthus madagascariensis*, *Metacanthus microphthalmus*, *M. mollis*, *M. nitidus*, *Neostusakia picticornis* and *Yemma gracilis*.

Keywords: Heteroptera, Berytidae, Afrotropical Region, distribution, ecology

Kurzfassung

Neue Nachweise von Stelzenwanzen (Insecta, Heteroptera, Berytidae) aus dem tropischen Afrika mit Anmerkungen zu Verbreitung und Ökologie

Für elf Arten afrotropischer Stelzenwanzen (Heteroptera: Berytidae) wird die aktuell bekannte Verbreitung unter Berücksichtigung neuer Funddaten dargestellt. Für neun Arten werden Erstinachweise aus insgesamt acht Staaten gemeldet. Soweit vorliegend, werden Angaben zur Ökologie der Arten gemacht, in einigen Fällen werden ergänzend Hinweise zur Bestimmungsproblematik gegeben.

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Introduction

Stilt bugs (Berytidae) are a small group within the pentatomomorphan Heteroptera, with less than 200 species described so far (CAI & BU 2011, CAI et al. 2011, 2013a, b, DELLAPE & CARPINTERO 2007, HENRY 2007, HENRY & FROESCHNER 1998, 2000). The Berytidae are widely distributed in all zoogeographic regions, with 39 species reported from the Afrotropical Region (HENRY & FROESCHNER 1998). Distributional data on Afrotropical Berytidae are available only from few publications which are concomitant covering descriptions of new species in many cases. A review of stilt bug material from different sources is presented and discussed in this paper, adding new information to the distribution of several African species.

Material and Methods

Afrotropical stilt bug specimens were reviewed from – and are deposited in – the following collections: CMCB: CARSTEN MORKEL private collection, Beverungen, Germany; DHJS: D. H. JACOBS private collection, Pretoria, South Africa; MZLU: Museum of Zoology, Lund, Sweden; NHMM: Naturhistorisches Museum Mainz, Germany (collection H. GÜNTHER); SANCO: National Collection of Insects, Pretoria, South Africa.

Identification up to the generic level was performed using the revision of HENRY (1997). Species identification was done using the original and subsequent descriptions in various papers (JOSIFOV & ŠTUSÁK 1987, LINDBERG 1958, LINNAVUORI 1974, PÉRICART 1984 and ŠTUSÁK 1963, 1964, 1965a, 1965b, 1966, 1967c, 1976, 1987). The geographic coordinates of localities are given from the labels or on request from the collectors. Those not available were estimated as precisely as possible using GoogleEarth, Natural Earth, U.S. Geographical Survey and Exploring Africa, and are given in square brackets (tab. 1). Published distributional data were taken from DUARTE

* We are pleased to dedicate this paper to Dr. CHRISTIAN RIEGER, honoring his 70th birthday as well as his significant contributions and impact on Heteropteran research.

RODRIGUES (1977), JOSIFOV & ŠTUSÁK (1987), LINDBERG (1958), LINNAVUORI (1973, 1974, 1986, 1988, 1989), LINNAVUORI & VAN HARTEN (1997), STÅL (1855, 1865) and ŠTUSÁK (1963, 1964, 1965a, 1965b, 1966, 1967a, 1967b, 1967c, 1968, 1977). Distributional maps were drawn utilizing geographical, physical and political data provided by Natural Earth and United States Geographical Survey, mapping of vegetation was generalized from Exploring Africa.

Results

We provide information derived from 548 specimens (tab. 1) belonging to eleven species, which are listed in systematic order following the classification proposed by HENRY (1997).

Subfamily Gampsocorinae

Gampsoacantha pumilio JOSIFOV & ŠTUSÁK, 1987

The species is recorded for the first time from The Gambia (1 ♀) and South Africa (73 specimens from Gauteng, Limpopo and Mpumalanga province) (tab. 1).

The specimens from South Africa are provisionally identified as *Gampsoacantha pumilio* but differ somewhat from the original description. They resemble *G. pumilio* in the hairs present on the head and pronotum, in the size of the base of the median spine of the collar, in the coloration of the legs, and the length of the hemelytra but the size, height and coloration of the lateral posterior pronotal spines appear more like the description of *G. beroni*. The comparative lengths of the anterior and posterior pronotal lobes are intermediate. [*Gampsoacantha beroni* is only known from its type series from Mozambique, which is, according to JOSIFOV & ŠTUSÁK (1987), "collected in moist habitats on halophilous grasses which grow on flat shores of salt lakes, not too far from the coast".]

Gampsoacantha pumilio seems fairly common but often overlooked because of its small size. The species is widespread in the savanna and grassland biomes in South Africa and seems to be associated with grasses. Several specimens have been collected in urban areas of Pretoria and it is likely that the species lives and breeds on some of the grasses that are cultivated as lawns. In the urban areas, all specimens were collected from swimming pools in which they have fallen, whereas they have been collected by sweeping and vacuuming in other areas.

Based on our records, the known distribution area of *G. pumilio* encompasses the savanna

vegetational belt from the Atlantic Coast in West Africa to the Indian Ocean in South Africa, including different savanna types ranging from humid to dry (fig. 1).

Gampsocoris africanus cornutus ŠTUSÁK, 1966

We report 78 (43 ♂ / 35 ♀) specimens from West Africa (The Gambia, Senegal, Sierra Leone; tab. 1). The species is recorded for the first time from The Gambia and Sierra Leone.

Although we report *Gampsocoris africanus cornutus*, based on the postocular part of the head being constantly rusty yellow in our material, we question the validity of this subspecies. The series from Gambia and Senegal show large variation in the length of the anterolateral pronotal spines, ranging from equal to twice the interocular distance. Also, the first antennal segment is regularly covered with brown faded spots, while the femoral spots show a large variation in size and color between black and brown. ŠTUSÁK (1968) already mentions an "intermediate" male specimen between *G. africanus africanus* and *G. africanus cornutus* from Ghana, but published it as the subspecies *africanus*.

Based on the known records, the distribution area of *G. africanus* is limited to the humid savanna ecozone, extending from the Atlantic Coast in West Africa to Central Africa (fig. 1).

Micrometacanthus trichoferus LINDBERG, 1958

The species is recorded for the first time from Botswana and South Africa (tab. 1).

So far, only the two type specimens from the Cape Verdes were known (fig. 2). Our material comprises 181 specimens from various localities in Gauteng, Mpumalanga and the Limpopo province in South Africa as well as from Botswana. *Micrometacanthus trichoferus* seems also to be a fairly common species that is overlooked because of its small size.

LINDBERG (1958) reported the species to be collected at the ground among dry grass and herb vegetation. In South Africa most of the specimens were collected in urban areas from swimming pools in which they have fallen (140 specimens at the second author's home in Menlo Park, Pretoria), often together with *G. pumilio*. It is likewise likely that they can live and breed on some of the grasses that are cultivated as lawns. In other areas they were mainly collected by sweeping grass and shrubs.

Due to the known records we expect *M. trichoferus* showing a distributional pattern similar to

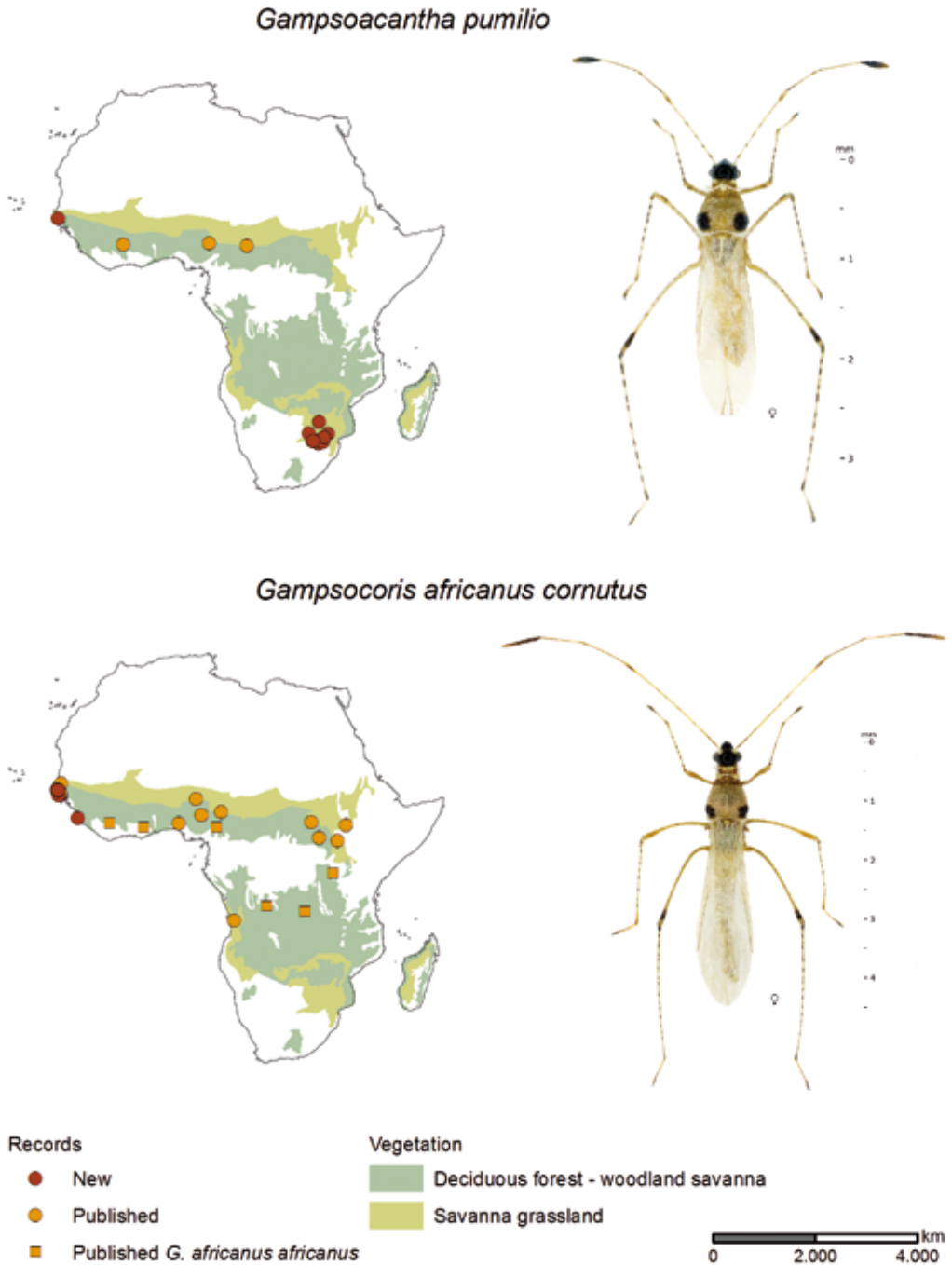


Figure 1. Distribution of *Gampsocantha pumilio* and *Gampsocoris africanus cornutus*. Fotos: G. STRAUSS.

Gampsoacantha pumilio, ranging from West to South Africa and including at least different types of savanna and grassland.

Subfamily Metacanthinae

Cametanthus madagascariensis ŠTUSÁK, 1967

The species is recorded for the first time from South Africa. We report four specimens (2 ♂ / 2 ♀) from four different provinces in South Africa, namely KwaZulu-Natal, Limpopo, Mpumalanga and North West (tab. 1).

Our specimens fit the original description very well, but differ in having the antennae little shorter (10-11.2 mm versus 13.2 mm; 1.84-2.15 versus 2.2-2.35 times as long as body) and having the dark brown spot on the pronotum not well defined. We do not consider these differences as being of specific value.

The specimens were collected at light and by vacuuming grass and shrubs. We have also seen four specimens of an yet undescribed *Cametanthus* species that were collected by tree-beating in a forest. It is thus possible that the genus is not associated with grass but rather with trees or shrubs.

Cametanthus madagascariensis was described from Madagascar (ŠTUSÁK 1967c) and subsequently reported from Nigeria (ŠTUSÁK 1977). Our records extend the species' known distributional range to southern Africa. (fig. 2).

Capyella malacaipa (STÅL, 1855)

We report six specimens (1 ♂ / 5 ♀) from South Africa, namely from the North-West, Gauteng, Mpumalanga and KwaZulu-Natal provinces (tab. 1).

Some of our specimens of *Capyella malacaipa* slightly differ from the characters given by ŠTUSÁK (1965a) in having the clavate apex of antennal segment 1 (and/or apices of segments 2 and 3) black or dark brown instead of rusty brown. Based on our material, we consider the differences in coloration of the antennal joints to be variable. Also the size, shape and direction of the frontal process are varying in our specimens, according to those examined by ŠTUSÁK (1965a). Therefore, we judge the characters mentioned beforehand not to be of systematic value.

The specimens from Mariepskop were collected in "indigenous forest against mountain" where they were "plentiful". The second author collected a specimen near Komatipoort by beating trees in a riverine thicket. It is possible that this species is arboreal and not associated with grasses.

Representatives of *C. malacaipa* were already known from South Africa ["Ad Portum Natalensem" (STÅL, 1855) and "Caffraria" (STÅL 1865) – Port Natal is now Durban in KwaZulu-Natal and Caffraria is part of the Eastern Cape province], Angola and Democratic Republic of the Congo (ŠTUSÁK 1964, 1965a, 1967b) (fig. 2).

Metacanthus microphthalmus ŠTUSÁK, 1965

We report 65 specimens (31 ♂ / 33 ♀), indicating the species for the first time from The Gambia, Namibia and Botswana. Additional records from South Africa are from the Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga and Northern Cape provinces (tab. 1). Previously, *Metacanthus microphthalmus* was reported from Angola, Kenya (ŠTUSÁK 1964, 1965b), South Africa and Tanzania (ŠTUSÁK 1976). For the latter two countries, ŠTUSÁK (1976) does not provide any detailed locality information. However, the material from ZMLU included two specimens from Pretoria identified by ŠTUSÁK (tab. 1).

Identification of the species bears some difficulties, especially with regard to the eye-size which shows large variation within specimens taken from the same locality and *M. microphthalmus* is probably conspecific with *M. mollis*. Further sampling and detailed examination of the material will be necessary to establish such synonymy.

Most specimens from the veld in southern Africa were collected by sweepnetting, beating and vacuuming shrubs and grass, whereas specimens in urban areas have been collected from swimming pools.

So far, *M. microphthalmus* is recorded only occasionally within Afrotropical Africa, with a distributional gap in the central and western part of Africa (fig. 3). Due to the known records and the likelihood that they may be conspecific we expect *M. microphthalmus* to have a distributional pattern similar to *M. mollis* (fig. 3).

Metacanthus mollis ŠTUSÁK, 1964

We report 71 specimens (45 ♂ / 26 ♀) from The Gambia, Senegal, Namibia, Botswana, South Africa and Swaziland (tab. 1). *Metacanthus mollis* is reported for the first time from Botswana, The Gambia, Namibia and Swaziland.

The species can be found in biotopes including savanna grassland as well as in steppe and semidesert, LINNAVUORI (1986) collected two specimens "under *Salsola*". The specimens from southern Africa were collected by the same methods as *M. microphthalmus*.

Micrometacanthus trichoferus



Cametanthus madagascariensis



Capyella malacaipa



Metacanthus transvaalensis



Records

- New
- Published

Vegetation

- Deciduous forest - woodland savanna
- Savanna grassland

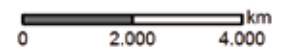


Figure 2. Distribution of *Micrometacanthus trichoferus*, *Cametanthus madagascariensis*, *Capyella malacaipa* and *Metacanthus transvaalensis*.

M. mollis is widely known from Afrotropical Africa, the records from the Arabian peninsula extending the species' range into the Palaearctic region (fig. 3). In southern Africa, about 50 specimens were collected from more than 20 localities by the second author, indicating that *M. mollis* is probably the most widespread and common berytid species in the area.

Metacanthus nitidus ŠTUSÁK, 1964

We report 35 specimens (16 ♂ / 19 ♀) from Senegal, The Gambia, Mali, Tanzania and South Africa (tab. 1). *Metacanthus nitidus* is recorded for the first time from The Gambia, Mali and South Africa.

Although records of the species are frequent, the only reported host plant known so far is *Fleuria aestuans*, indicated by ŠTUSÁK (1968). So far, no additional information on the ecology of the species is available.

Metacanthus nitidus widely occurs throughout Afrotropical Africa, it's distributional pattern resembling that of *M. mollis* (fig. 3). Together with the latter, *M. nitidus* currently appears to be one of the most widespread Afrotropical stilt bugs and to be abundant in central and west Africa.

Metacanthus transvaalensis ŠTUSÁK, 1963

We report one male of *Metacanthus transvaalensis* from South Africa, Mpumalanga province (tab. 1).

Our specimen from SANC fits well in the original description derived from the only known series from Johannesburg (ŠTUSÁK 1963), but slightly differs in coloration (no lateral black stripe behind eyes) and relation of rostral segment length'. However, these differences are probably not of systematic value.

So far, no information on the ecology of the species is available.

The only known records of *M. transvaalensis* currently available are those from South Africa (fig. 2).

Neostusakia picticornis (NOUALHIER, 1898)

We report 24 specimens (12 ♂ / 12 ♀) from Senegal, The Gambia, Botswana and South Africa (tab. 1). The species is recorded for the first time from The Gambia, Botswana and South Africa.

Previously published records of *Neostusaki picticornis* namely include, among others, the synonym *Neometacanthus congoensis* and the homonym *Neometacanthus picticornis* (see ŠTUSÁK 1966, KMENT et al. 2009).

All the specimens examined by us have the top of the head rugose, a characteristic not mentioned in any of the descriptions. However, HENRY (in litt.) confirmed that the specimens of *N. picticornis* in his collection also exhibit this trait.

The specimens from South Africa and Botswana were collected by sweeping or hand collecting on an unidentified shrub. This species occurs in savanna as well as steppe and semidesert biomes, but is probably not associated with grasses.

Our records fit well into the species' known distribution area, which covers most of sub-Saharan Africa (fig. 4).

Yemma gracilis LINNAVUORI, 1974

The species is recorded for the first time from Tanzania (6 ♀) and South Africa (4 ♂ / 2 ♀) (tab. 1).

The specimen from Tanzania deposited in ZMLU was identified and labeled "*Metacanthus (Yemma) spicilis* LINNAV." by ŠTUSÁK in 1973, the specific epithet obviously being an erroneous spelling. The specimens we examined compare well with the original description, although the dark rings on the legs and antennae are less prominent, the wings are nearly transparent and the head is about 1.7 times longer than wide (1.45 times in description).

Yemma gracilis occurs in savannah biomes as well as in steppe and semi-desert. No further information on the ecology or collecting methods of the species is available.

Compared to the previously reported specimens from Sudan, Chad and Ethiopia, the species known distribution range is extended far to the southern tip of Africa (fig. 3).

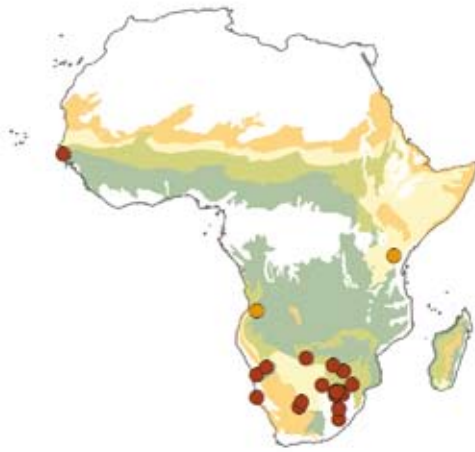
Discussion

Stilt bug specimens are underrepresented in most collections, which might be a result of their comparatively cryptic body shape resembling husks in many cases. Additionally, stilt bugs are usually not the primary target of extensive collecting, especially not throughout Africa.

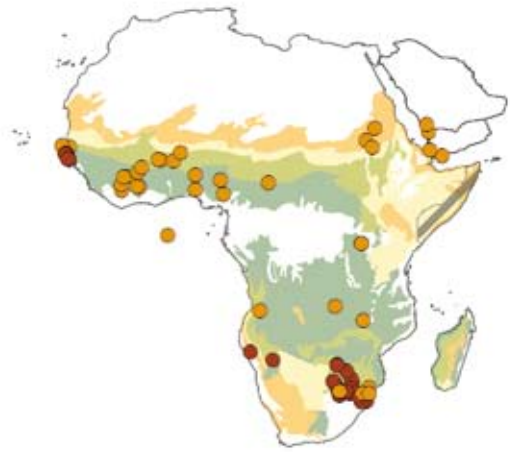
According to ŠTUSÁK (1967b), "most African Berytidae are known only from the type localities but many are certainly widely distributed. Some of the species known so far only from East and West Africa might occur also in South Africa".

Our results show and indicate that, in many cases, the geographic ranges of Afrotropical stilt bugs are more extended than documented so far, and we are additionally aware of several undescribed taxa from South Africa, including one un-

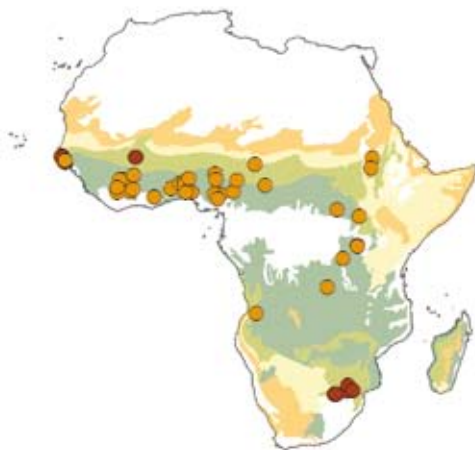
Metacanthus microphthalmus



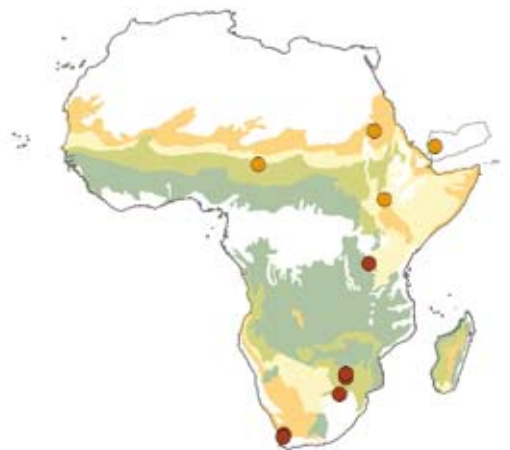
Metacanthus mollis



Metacanthus nitidus



Yemma gracilis



Records

- New
- Published
- Country record *

Vegetation

- Deciduous forest - woodland savanna
- Savanna grassland
- Steppe (gras, brush, thicket)
- Semidesert

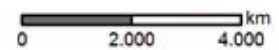


Figure 3. Distribution of *Metacanthus microphthalmus*, *M. mollis*, *M. nitidus* and *Yemma gracilis*. * = Species occurrence indicated for specific country, but no detailed data available to the authors.

described genus and species, and undescribed species belonging to *Paraberytus*, *Cametanthus*, and *Gampsocoris*, which will be treated in subsequent works.

Obviously, species like *Metacanthus microphthalmus*, *M. mollis*, *M. nitidus* and *Neostusakia picticornis* are widely distributed, occurring over most of sub-Saharan Africa. It is evident that other species may also eventually be found to occur over the entire sub-Saharan Africa: *Cametanthus madagascariensis* is present in Madagascar, South Africa and western Africa, *Capyella malacaipa* is known from Democratic Republic of the Congo, Angola and South Africa, and *Yemma gracilis*, formerly known from north-eastern Africa, also occurs in southern Africa. *Gampsoacantha pumilio* and *Micrometacanthus trichoferus* have been recorded in South Africa as well as more than 5000 km away at localities in western Africa. They may also be found to occur elsewhere in sub-Saharan Africa. Yet it is not clear how stilt bugs manage to spread effectively. Recordings from light indicate, among other observations (MORKEL 2007), that they are frequent flyers, and we assume that, due to their small size and weight, air-borne migration over the long distance may also occur.

With respect to vegetation, records of *Gampsoacantha pumilio*, *Gampsocoris africanus*, *Micrometacanthus trichoferus*, *Cametanthus madagascariensis* and *Capyella malacaipa* are limited to savanna biomes, while *Metacanthus microphthalmus*, *M. mollis*, *M. nitidus*, *Neostusakia picticornis* and *Yemma gracilis* are also reported from areas mainly covered by steppe and semi-desert.

However, the role of stilt bugs in Afrotropical ecosystems is almost completely obscure. Hypothetical hosts of Afrotropical Berytidae are so far only indicated by habitat statements like 'halophilous grasses', 'tussock of grass' (*Gampsoacantha*; JOSIFOV & ŠTUSÁK 1987), 'on underground in mountain forests', 'in gardens and savannah forests' (*Gampsocoris africanus*; LINNAVUORI 1988). Berytids' feeding habits include predaceous, phytophagous and mixophagous specification (e.g. PÉRICART 1984, MORKEL 2007, OSSES et al. 2007, WHEELER & SCHAEFER 1982), but the hosts of most species remain unknown. Recently, WHEELER & HENRY (2006) reported an African grass introduced to North America being adapted as a host for two neotropical species, prompting the need for verification of other bug/host relationships.

It may not be excluded that, as known for Neotropical species, Afrotropical Berytidae may ser-

ve as antagonists of pests (HENRY 2000), and therefore (potentially) being also of agro-economical importance. Careful field investigations and the proper use of new analysis methods like digestion analysis by genetic markers may help to elucidate that unknown section of stilt bug's ecology. Prospectively, with more ecological and distributional data available, the suggested matching of species' distribution may help to identify key factors determining the distribution of Afrotropical stilt bugs.

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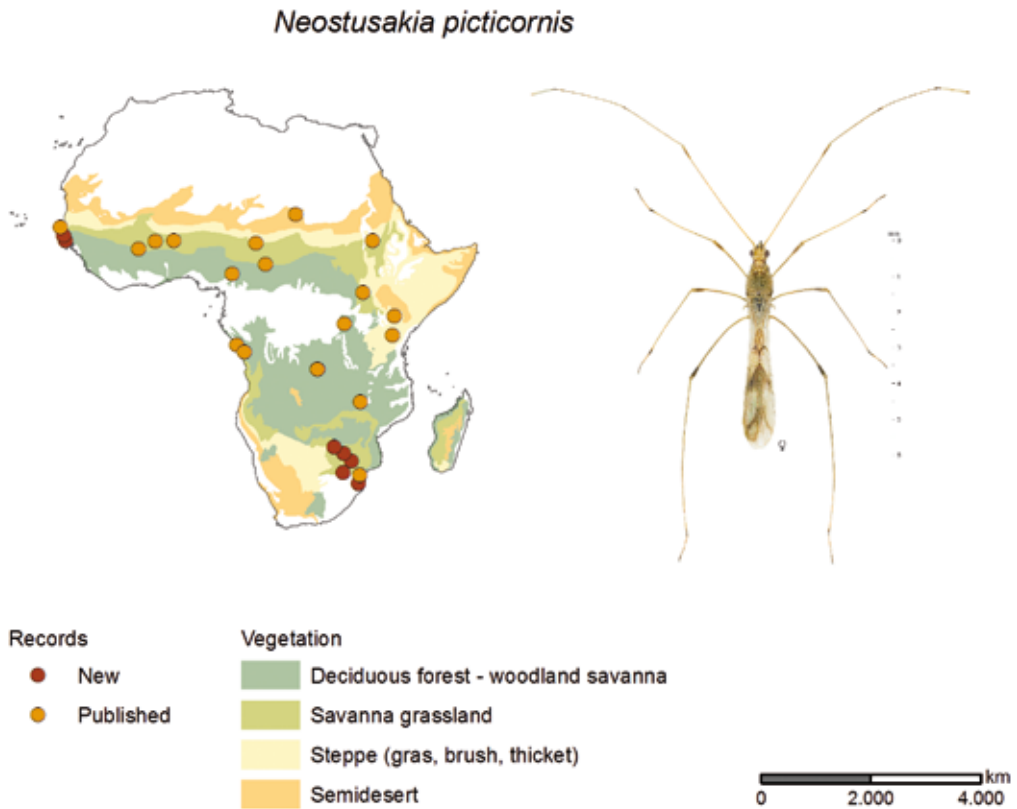


Figure 4. Distribution of *Neostusakia picticornis*. Foto: G. STRAUSS.

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 Exploring Africa: <http://exploringafrica.matrix.msu.edu>

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Table 1. Detailed records of Afrotropical Berytidae. [] = Latitude / Longitude estimated from locality description. Abbreviations: CED. = CEDERHOLM, DAN. = DANIELSSON, HAM. = HAMMARSTEDT, HED. = HEDQVIST, LAR. = LARSSON, MDTP = Maloti Drakensberg Transfrontier Programme, MIR. = MIRESTRÖM, NOR. = NORLING, SAM. = SAMUELSSON

Country	Locality	Latitude / Longitude
Gampsocorinae		
<i>Gampsocantha pumilio</i> JOSIFOV & ŠTUSÁK, 1987		
South Africa	Gauteng prov., Ezemvelo Nat. Res. nr. Bronkhorstspuit	25,663 °S / 28,958 °E
	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Menlo Park, Pretoria	25,7634 °S / 28,2521 °E
	Gauteng prov., Rietfontein, Pretoria	25,7293 °S / 28,2134 °E
	Limpopo prov., Farm Duikerspan, nr. Thabazimbi	24,39 °S / 27,497 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,427 °S / 29,348 °E
	Mpumalanga prov., Everest Mine, nr. Lydenburg	25,145 °S / 30,129 °E
	Mpumalanga prov., Farm Booyensdal 43JT, nr. Lydenburg	25,1091 °S / 30,1231 °E
	Mpumalanga prov., Farm Grootpan, 27 km NW. Carolina	25,902 °S / 29,923 °E
	Mpumalanga prov., Farm Klipfontein, 24 km NW Carolina	25,952 °S / 29,915 °E
	Mpumalanga prov., Farm Leeuwpan, 27 km WNW Carolina	25,973 °S / 29,878 °E
	Mpumalanga prov., Steenkoolspruit on farm Diepspruit, nr. Kriel	26,152 °S / 29,249 °E
	Mpumalanga prov., Top of Mariepskop, nr. Kampersrus	24,543 °S / 30,866 °E
The Gambia	Bakau, Cape St. Mary at Sun Wing Hotel	[13,487411 °N / 16,667366 °W]
<i>Gampsocoris africanus africanus</i> ŠTUSÁK, 1966		
Senegal	Brin, 3 km SSE, 11 km SW Ziguinchor	[12,515684 °N / 16,344829 °W]
	Djibelor, 1 km NE in forest, ~7,5 km SW Ziguinchor	[12,520841 °N / 16,290364 °W]
	Mpak, 11 km S Ziguinchor	[12,460937 °N / 16,234236 °W]
	Parc Nationale Basse Cassamance	[12,389819 °N / 16,570193 °W]
	Ziguinchor, 2.5 km ESE, in cultivated area	[12,56047 °N / 16,235218 °W]
Sierra Leone	Freetown, S of, Crossing to Guma Dam	[8,428649 °N / 13,202863 °W]
The Gambia	Abuko Nature Reserve, Bambo pool	[13,389343 °N / 16,653777 °W]
	Abuko Nature Reserve, outside at water works at Lamin stream	[13,385335 °N / 16,646835 °W]
	Abuko Nature Reserve, outside at water works at Lamin stream	[13,385335 °N / 16,646835 °W]
	Bakau, about 3 km SW, Kotu stream	[13,450356 °N / 16,71617 °W]
	Bakau, at Tropic Bungalow at the beach	[13,449563 °N / 16,721921 °W]
	Bakau, Cape St. Mary at Sun Wing Hotel	[13,487411 °N / 16,667366 °W]
	Bamba Forest about 4 km NNW Brikama Road Junction	[13,296624 °N / 16,67486 °W]
	Kartung, 6 km N	[13,132874 °N / 16,763352 °W]
	Kitty, 2 km S, 7 km SSW Brikama Road Junction	[13,212087 °N / 16,675812 °W]

Date	Individuals (♂/♀)	leg.	det.	coll.
	74			
4.2.2004	1	JACOBS, STILLER, VOIGT	JACOBS	DHJS
6./7./8./9.1999	2 / 5 / 2 / 1	JACOBS	JACOBS,	CMCB,
5./7./9./11.2000	2 / 9 / 2 / 1		MORKEL	DHJS
8.2002	1			
6./7./8.1990	3 (3/0) / 24 / 1	JACOBS	JACOBS,	CMCB,
			MORKEL	DHJS
8.1988	1	JACOBS	JACOBS	DHJS
7.-11.2.1986	1	JACOBS	JACOBS	DHJS
13./17.2.2010	1	JACOBS, STILLER	JACOBS	DHJS
27.1.2011	5	JACOBS	JACOBS,	CMCB,
			MORKEL	DHJS
18.-20.3.2013	2	JACOBS	JACOBS	DHJS
11.-14.2.2012 / 11.4.2012	3 / 1	JACOBS	JACOBS	DHJS
14.2.2012	2	JACOBS	JACOBS	DHJS
13.2.2012	1	JACOBS	JACOBS	DHJS
20.12.2006	1	JACOBS, STILLER	JACOBS	DHJS
19.-20.2.2010	1	JACOBS, STILLER	JACOBS	DHJS
5.11.1977	1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
9.11.1977	15 (6/9)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
9.11.1977	14 (7/7)	CED., DAN., HAM., HED., SAM.	MORKEL	CMCB, MZLU
8.11.1977	21 (16/5)	CED., DAN., HAM., HED., SAM.	MORKEL	CMCB, MZLU
11.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
11.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
20.11.1977	2 (0/2)	CED., L., DAN., R., HALL, R.	MORKEL	CMCB, MZLU
18.11.1977	1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
26.2.1977	2 (1/1)	CED., DAN., LAR., NOR., SAM.	MORKEL	MZLU
4.11.1977 / 18.11.1977	12 (6/6) / 1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	CMCB, MZLU
19.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
4.11.1977 / 16.-18.11.1977	1 (0/1) / 1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
5.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
24.2.1977	1 (1/0)	CED., DAN., LAR., MIR., NOR., SAM.	MORKEL	MZLU
20.11.1977	2 (1/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
27.2.1977	1 (0/1)	CED., DAN., LAR., MIR., NOR., SAM.	MORKEL	MZLU

Country	Locality	Latitude / Longitude
<i>Micrometacanthus trichoferus</i> LINDBERG, 1958		
Botswana	Selkirk Mine, nr. Francistown	21,3268 °S / 27,7061 °E
South Africa	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Menlo Park, Pretoria	25,7634 °S / 28,2521 °E
	Gauteng prov., nr. Cullinan	25,687 °S / 28,52 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,427 °S / 29,348 °E
	Limpopo prov., Venetia Nat. Res., 85 km W. Messina	22,301 °S / 29,206 °E
	Mpumalanga prov., Farm Klipfontein, 24 km NW Carolina	25,952 °S / 29,915 °E
	Mpumalanga prov., Farm Leeuwpán, 27 km WNW Carolina	25,971 °S / 29,872 °E
	Mpumalanga prov., Farm Leeuwpán, 27 km WNW Carolina	25,973 °S / 29,878 °E
	Mpumalanga prov., Farm Nootgedacht, 28 km WNW Carolina	25,962 °S / 29,857 °E
Metacanthinae		
<i>Cametanthus madagascariensis</i> ŠTUSÁK, 1967		
South Africa	KwaZulu-Natal prov., Vryheid Hill Nat Res, nr. Vryheid	27,7534 °S / 30,7906 °E
	Limpopo prov., nr. Makapansgat RSA 20 km ENE Mokopane nr. Research house	24,139 °S / 29,199 °E
	Mpumalanga prov., Farm Sterkfontein 52JT, nr. Lydenburg	25,158 °S / 30,116 °E
	North West prov., Trident Kloof, nr. Wolhuterskop	25,771 °S / 27,657 °E
<i>Capyella malacaipa</i> STÅL, 1855		
South Africa	KwaZulu-Natal prov., Kosi Bay	26,966 °S / 32,805 °E
	KwaZulu-Natal prov., Shaka's rock, SE 2931 Ca I Kusbos	29,517825 °S / 31,22758 °E
	KwaZulu-Natal prov., Tambotie Ridge B & B, nr. Pongola	27,375 °S / 31,806 °E
	Mpumalanga prov., Mariepskop	24,569 °S / 30,863 °E
	North West prov., nr. Zeerust	25,3766 °S / 26,2312 °E
<i>Metacanthus microphthalmus</i> ŠTUSÁK, 1965		
Botswana	30 km S Maun	20,186 °S / 23,237 °E
	Gaborone SE district, at roadsides in town	[24,65411 °S / 25,908739 °E]
	Selkirk Mine, nr. Francistown	21,3222 °S / 27,7062 °E
Namibia	Central Namib Desert, 61 km E. Walvis Bay	22,947 °S / 15,106 °E
	Lüderitz	[26,645833 °S / 15,153889 °E]
	Toggekrv 250 (Ornatako), Otjozondjupa Dist.	21,729806 °S / 16,729806 °E
South Africa	Eastern Cape prov., Qachas Nek	30,1671 °S / 28,5976 °E
	Free State prov., Golden Gate	28,5107 °S / 28,6219 °E
	Gauteng prov., Ezemvelo Nat. Res. nr. Bronkhorstspuit	25,664 °S / 28,959 °E
	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Kliprivier, nr. Johannesburg	26,312 °S / 28,053 °E
	Gauteng prov., Krokodilspruit, nr. Pretoria	25,597 °S / 28,437 °E

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Date	Individuals (♂/♀)	leg.	det.	coll.
	181			
6.4-22.7.2008	1	JACOBS	JACOBS	DHJS
5./6./8.1999	1 / 2 / 3	JACOBS	JACOBS,	CMCB,
4./5./12.2000	5 / 6 / 1		MORKEL	DHJS
5.2001	1			
4.2002	1			
5.2003	1			
5./6./7./8.1990	67 / 18 / 53 / 2	JACOBS	JACOBS, MORKEL	CMCB, DHJS
29.5.2001	1	JACOBS	JACOBS	DHJS
13./17.2.2010	4	JACOBS, STILLER	JACOBS	DHJS
19.2.2011	3	JACOBS	JACOBS	DHJS
14.2.2012 / 11.4.2012	3 / 1	JACOBS, STILLER, LYLE	JACOBS	DHJS
12.4.2012	1	JACOBS	JACOBS	DHJS
13.2.2012	2	JACOBS	JACOBS	DHJS
2.12.2012	4	JACOBS	JACOBS	DHJS
	4 (2/2)			
30.1.-2.2.2007	1 (1/0)	JACOBS, STILLER, GROBBELAAR	JACOBS	DHJS
14.1.2010	1 (0/1)	JACOBS, STILLER, BROWN	MORKEL	CMCB
1.-4.2.2012	1 (1/0)	JACOBS, STILLER, LYLE	JACOBS	DHJS
8.12.1991	1 (0/1)	STILLER	JACOBS	SANC
	6 (1/5)			
9.2.1990	1 (0/1)	MILLAR	JACOBS	SANC
15.1.1989	1 (0/1)	STALS	MORKEL	CMCB
6.-10.5.2004	1 (0/1)	JACOBS	JACOBS	DHJS
20.-21.2.1988	1 (1/1)	STALS	JACOBS, MORKEL	CMCB, DHJS
20.-22.2.2009	1 (0/1)	MOHALE	JACOBS	DHJS
	63 (31/32)			
19.1.1978	1 (1/0)	HOLM, JACOBS, KIRSTEN, SCHOLTZ	JACOBS	DHJS
9.1.1982	4 (2/2)	NOR.	MORKEL	CMCB, MZLU
29.2.-4.3.2008	3 (0/3)	JACOBS	JACOBS	DHJS
6.-14.2.2013	2 (1/1)	JACOBS, DESCHODT, WEBB	JACOBS	DHJS
8.3.2008	7 (4/3)	GÜNTHER	MORKEL	NHMM
9.3.2003	9 (5/4+) + 2	FRISCH	MORKEL	CMCB
29.11.2005	1 (0/1)	MDTP	JACOBS	DHJS
22.10.2005	1 (1/1)	MDTP	MORKEL	CMCB
16.-18.11.2005	1 (0/1)	JACOBS	JACOBS	DHJS
6.1999	1 (0/1)	JACOBS	JACOBS	DHJS
11.2000	1 (1/0)			
26.8.2004	2 (2/0)	JACOBS, PAULSEN	JACOBS	DHJS
5.1987	1 (0/1)	JACOBS	JACOBS	DHJS

Country	Locality	Latitude / Longitude
	Gauteng prov., Menlo Park, Pretoria	25,7634 °S / 28,2521 °E
	Gauteng prov., Middelwater Farm nr. Pretoria	25,68 °S / 27,993 °E
	Gauteng prov., Pretoria, Lynnwood	25,764251 °S / 28,26728 °E
	Gauteng prov., Rietfontein, Pretoria	25,7293 °S / 28,2134 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,267 °S / 29,33 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,323 °S / 29,357 °E
	Mpumalanga prov., Farm Grootpan, 27 km NW. Carolina	25,903 °S / 28,924 °E
	Mpumalanga prov., Steenkoolspruit on farm Diepspruit, nr. Kriel	26,152 °S / 29,249 °E
	Mpumalanga prov., Top of Mariepskop, nr. Kampersrus	24,543 °S / 30,866 °E
	Northern Cape prov., Olifantshoek	28,229 °S / 22,144 °E
	Northern Cape prov., Tswalu Game Res., nr. Hotazel	27,312 °S / 22,469 °E
The Gambia	Abuko Nature Reserve, outside at water works at Lamin stream	[13,385335 °N / 16,646835 °W]
<i>Metacanthus mollis</i> ŠTUSÁK, 1964		
Botswana	Selkirk Mine, nr. Francistown	21,3222 °S / 27,7358 °E
Namibia	Waterberg	[20,516667 °S / 17,233333 °E]
	Zesfontein	19,125 °S / 13,617 °E
Senegal	Brin, 3 km SSE, 11 SW km Zinguinchor	[12,515684 °N / 16,344829 °W]
	Mpak, 11 km S Zinguinchor	[12,460937 °N / 16,234236 °W]
South Africa	Gauteng prov., Farm Hartbeesfontein, nr. Pretoria	25,42 °S / 28,4 °E
	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Leondale, nr. Alberton	26,305 °S / 28,174 °E
	Gauteng prov., Menlo Park, Pretoria	25,7634 °S / 28,2521 °E
	Gauteng prov., Middelwater Farm nr. Pretoria	25,68 °S / 27,993 °E
	Gauteng prov., Rietfontein, Pretoria	25,7293 °S / 28,2134 °E
	KwaZulu-Natal prov., Sibaya Lake	27,301 °S / 32,664 °E
	KwaZulu-Natal prov., Tambotie Ridge B & B, nr. Pongola	27,375 °S / 31,806 °E
	Limpopo prov., Balloon Forest, nr. Trichardsdal	24,197 °S / 30,341 °E
	Limpopo prov., Farm Duikerspan, nr. Thabazimbi	24,39 °S / 27,497 °E
	Limpopo prov., Grootpan farm, nr. Thabazimbi	24,033 °S / 27,1 °E
	Limpopo prov., nr. Mokeetzi	23,58 °S / 30,143 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,267 °S / 29,33 °E

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Date	Individuals (♂/♀)	leg.	det.	coll.
5./6./7./9.1990	3 (1/2) / 3 (2/1) / 4 (1/3) / 1 (1/0)	JACOBS	JACOBS, MORKEL	CMCB, DHJS
18.4.2003	4 (2/3)	JACOBS, STILLER	JACOBS, MORKEL	CMCB, DHJS
30.11.1994	2 (1/1)	DAN.	MORKEL	MZLU
7.1988	1 (0/1)	JACOBS	JACOBS	DHJS
17.-22.2.2011	?	JACOBS	JACOBS	DHJS
13.10.2010	1 (1/0)	JACOBS	JACOBS	DHJS
11.4.2012	1 (1/0)	JACOBS	JACOBS	DHJS
1.-4.12.2006	1 (0/1)	JACOBS	MORKEL	CMCB
19.-20.2.2010	1 (0/1)	JACOBS, STILLER	JACOBS	DHJS
2.10.1979	1 (1/0)	HOLM, SCHOLTZ	JACOBS	DHJS
5.-11.12.2004	2 (0/2)	JACOBS, McFADYEN	JACOBS	DHJS
25.-26.2.1977	1 (1/0)	CED., DAN., LAR., MIR., NOR., SAM.	MORKEL	MZLU
	71 (45/26)			
29.2.-4.3.2008 / 28.3.-5.4.2008	2 (0/2) / 1 (1/0)	JACOBS	JACOBS	DHJS
18.3.2008	1 (0/1)	GÜNTHER	MORKEL	NHMM
2.1925	1 (0/1)	Mus. Exped.	JACOBS	DHJS
9.11.1977	14 (12/2)	CED., DAN., HAM., HED., SAM.	MORKEL	CMCB, MZLU
8.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
16.10.2004	1 (1/0)	JACOBS	JACOBS	DHJS
1981	1 (1/0)	JACOBS	JACOBS	DHJS
24.6./1990	1 (0/1)	JACOBS	JACOBS	DHJS
5./6./7./8.1999	1 (1/0) / 3 (2/1) / 1 (0/1)			
1.2000	2 (2/0) 1 (1/0)			
23.2.2005	1 (0/1)	JACOBS	JACOBS	DHJS
13.4.2005	1 (0/1)			
5./6./7.1990	1 (0/1) 5 (1/4) 1 (1/0)	JACOBS	JACOBS	DHJS
18.4.2003	1 (1/0)	JACOBS, STILLER	JACOBS	DHJS
8.1984	1 (0/1)	JACOBS	MORKEL,	CMCB,
8.1985	2 (1/1)		JACOBS	DHJS
7.1988	1 (1/0)			
4.-10.7.1983	1 (0/1)	DE 6LLIERS	JACOBS	DHJS
8.-10.5.2004	1 (1/0)	JACOBS, STILLER	JACOBS	DHJS
5.-8.4.1984	2 (1/1)	JACOBS	JACOBS	DHJS
7.-11.2.1986	1 (1/0)	JACOBS	JACOBS	DHJS
20.2.1988	1 (1/0)	STALS	JACOBS	DHJS
16.2.1990	1 (1/0)			
28.5.1999	1 (1/0)	JACOBS	JACOBS	DHJS
12.-18.2.2010	1 (1/0)	JACOBS	JACOBS	DHJS

Country	Locality	Latitude / Longitude
	Mpumalanga prov., Farm Booyendal 43JT, nr. Lydenburg	25,1091 °S / 30,1231 °E
	Mpumalanga prov., Farm Klipfontein, 24 km NW Carolina	25,952 °S / 29,915 °E
	Mpumalanga prov., Farm Leeuwan, 27 km WNW Carolina	25,971 °S / 29,871 °E
	Mpumalanga prov., Farm Nooitgedacht, 28 km WNW Carolina	25,962 °S / 29,857 °E
	Mpumalanga prov., Groenvaly Farm, nr. Barberton	25,893 °S / 30,803 °E
	Mpumalanga prov., Loskop, nr Witbank	25,575 °S / 29,152 °E
Swaziland	Loyengo, 2 km N	[26,522503 °S / 31,465866 °E]
The Gambia	Abuko Nature Reserve, outside at water works at Lamin stream	[13,385335 °N / 16,646835 °W]
	Bakau, about 3 km SW, Kotu stream	[13,450356 °N / 16,71617 °W]
	Bakau, at Tropic Bungalow at the beach	[13,449563 °N / 16,721921 °W]
	Bakau, Cape St. Mary at Sun Wing Hotel	[13,487411 °N / 16,667366 °W]
	Brufut, 3 km NW, River Tanji	[13,370707 °N / 16,7905 °W]
	Tanji, 1 km N Tanji R4er Bridge	[13,362189 °N / 16,79499 °W]
	<i>Metacanthus nitidus</i> ŠTUSÁK, 1964	
Mali	Ségou, Tominian	[13,290689 °N / 4,594232 °W]
Senegal	Brin, 3 km SSE, 11 km SW Ziguinchor	[12,515684 °N / 16,344829 °W]
	Mpak, 11 km S Ziguinchor	[12,460937 °N / 16,234236 °W]
South Africa	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Gauteng prov., Rietfontein, Pretoria	25,7293 °S / 28,2134 °E
	Gauteng prov., vissershoeck Farm, Magaliesberg summit, nr. Pretoria	25,688 °S / 27,986 °E
	Gauteng prov., Wonderboom Nat. Res., Pretoria	25,688 °S / 28,191 °E
	Limpopo prov., Lekgalameetse Nat. Reserve	24,167 °S / 30,241 °E
	Mpumalanga prov., Farm Sterkfontein 52JT, nr. Lydenburg	25,158 °S / 30,116 °E
	Mpumalanga prov., Hazzyview, nr. Nelspruit	25,033 °S / 31,057 °E
Tanzania	Bukoba, Nyaishozi	[1,322312 °S / 31,807989 °E]
The Gambia	Bakau, about 3 km SW, Kotu stream	[13,450356 °N / 16,71617 °W]
	Tanji, 1 km N Tanji River Bridge	[13,362189 °N / 16,79499 °W]
	<i>Metacanthus transvaalensis</i> Štusák, 1963	
South Africa	Mpumalanga prov., Blyfstaanhoogte transmitter tower, Mauchsberg Pass, Sterkspruit NR	25,1486 °S / 30,6178 °E
	<i>Neostusakia picticornis</i> (NOUALHIER, 1898)	
Botswana	Selkirk Mine, nr. Francistown	21,3222 °S / 27,7358 °E
Senegal	Djibelor, 1 km NE in forest, ~7,5 km SW Ziguinchor	[12,520841 °N / 16,290364 °W]
South Africa	KwaZulu-Natal prov., Tambotie Ridge B & B, nr. Pongola	27,375 °S / 31,806 °E
	Limpopo prov., Eiland Resort, nr Tzaneen	23,65 °S / 30,666667 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,427 °S / 29,348 °E
	Mpumalanga prov., Die Hel, Loskopdam, nr. Middelburg	25,542 °S / 29,285 °E
The Gambia	Abuko Nature Reserve, Bambo pool [III 1977 Exped.]	[13,389343 °N / 16,653777 °W]

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Date	Individuals (♂/♀)	leg.	det.	coll.
18.-20.3.2013	3 (3/0)	JACOBS	MORKEL, JACOBS	CMCB, DHJS
14.2.2012	1 (1/0)	JACOBS	JACOBS	DHJS
11.-14.2.2012	1 (1/0)	JACOBS	JACOBS	DHJS
12.2.2012	1 (1/0)	JACOBS	JACOBS	DHJS
1.-8.4.2001	1 (0/1)	JACOBS	JACOBS	DHJS
15.11.2004	2 (1/1)	JACOBS	JACOBS	DHJS
25.10.1994	1 (0/1)	DAN.	MORKEL	MZLU
18.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
19.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
18.11.1977	1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
5.11.1977	1 (1/0)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
28.2.1977	1 (1/0)	CED., DAN., LAR., MIR., NOR., SAM.	MORKEL	MZLU
19.11.1977	2 (0/2)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
	35 (16/19)			
11./16./17./25.10.1998	2 (1/1) / 4 (2/2) / 1 (0/1) / 4 (1/3)	MORKEL	MORKEL	CMCB
9.11.1977	9 (5/4)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
8.11.1977	2 (1/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
7.1999	1 (1/0)	JACOBS	JACOBS	DHJS
8.1984	1 (0/1)	JACOBS	MORKEL	CMCB
31.1.2010	1 (0/1)	JACOBS, STILLER	MORKEL	CMCB
11.4.2003	1 (1/0)	JACOBS	JACOBS	DHJS
13.-17.2.1989	4 (2/2)	VERHEIJEN	MORKEL, JACOBS	SANC
9.-13.11.2011	1 (1/0)	JACOBS, LYLE, DESCHODT	JACOBS	DHJS
30.8.1991	1 (1/0)	ERICHSEN	JACOBS	SANC
2.7.1951	1 (0/1)	BACKLUND	ŠTUSÁK	MZLU
19.11.1977	1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
19.11.1977	1 (0/1)	CED., DAN., HAM., HED., SAM.	MORKEL	MZLU
	1 (1/0)			
6.-8.3.2003	1 (1/0)	STILLER	MORKEL	SANC
	24 (12/12)			
29.2.-4.3.2008	4 (2/2)	JACOBS	JACOBS	DHJS
8.11.1977	5 (3/2)	CED., DAN., HAM., HED., SAM.	MORKEL	CMCB, MZLU
8.-10.5.2004	3 (1/2)	JACOBS, STILLER	MORKEL, JACOBS	CMCB, DHJS
3.6.1990	8 (4/4)	JACOBS	MORKEL, JACOBS	CMCB, DHJS
13.&17.2.2010	1 (1/0)	JACOBS, STILLER	JACOBS	DHJS
30.4.-1.5.1993	1 (0/1)	STILLER	JACOBS	SANC
11.3.1977	2 (1/1)	CED., DAN., LAR., MIR., NOR., SAM.	MORKEL	MZLU

Country	Locality	Latitude / Longitude
<i>Yemma gracilis</i> LINNAVUORI, 1974		
South Africa	Gauteng prov., Kameeldrift, nr. Pretoria	25,6327 °S / 28,2973 °E
	Limpopo prov., Bergpan, Farm Zoutpan, nr. Vivo	22,971 °S / 29,332 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,267 °S / 29,33 °E
	Limpopo prov., Venetia Nat. Res., 80 km W. Messina	22,267 °S / 29,33 °E
	Western Cape prov., Cedarberg, Algier, near Forest Station	[32,334139 °S / 19,117241 °E]
	Western Cape prov., Piekenierskloof, 15 km S Citrusdal	[32,724584 °S / 19,07218 °E]
Tanzania	Nzega Mayo	[4,218102 °S / 33,18214 °E]

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Date	Individuals (♂/♀)	leg.	det.	coll.
	8 (5/3)			
12.1999	1 (1/0)	JACOBS	MORKEL	CMCB, DHJS
13.-15.12.2010	2 (2/0)	JACOBS, PAULSEN, MARAIS	JACOBS	DHJS
12.-18.2.2010	1 (1/0)	JACOBS, STILLER	JACOBS	DHJS
17.-22.2.2011	1 (0/1)	JACOBS	MORKEL	CMCB
6.10.1994	1 (0/1)	DAN.	MORKEL	MZLU
4.10.1994	1 (1/0)	DAN.	MORKEL	MZLU
19.8.1951	1 (0/1)	BACKLUND	ŠTUSÁK	MZLU

