

Lestinogomphus silkeae, spec. nov., a new gomphid species from the northern Okavango Delta, Botswana (Odonata: Anisoptera).

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Lestinogomphus silkeae Kipping, spec. nov., from the northern Okavango Delta in Botswana is described and illustrated from a single male. The main distinguishing feature to other members of the genus is the shape of the appendages. The new species is compared with the widespread type species of the genus *Lestinogomphus angustus* Martin, 1912.

INTRODUCTION

The members of the genus *Lestinogomphus* Martin, 1912 are characterized by their small and slender body, the narrow base of the hindwing and especially the long cylindrical tenth abdominal segment, which without its appendages is more than half as long as the ninth. Body coloration is mainly green to yellow with indistinct brownish and blackish markings.

The genus was erected by Martin (1912) with the type species *L. angustus*. It is a small genus with currently five species. The genus is exclusively afrotropical, of which *L. angustus* is the most widespread member and occurs from Uganda (Clausnitzer 2001) southwards to KwaZulu-Natal (Tarboton 2002).

Despite the small number of species, the taxonomy of the genus is confused (Dijkstra 2003). This is due to the facts that six species names are available but only three species are based on well-diagnosed males, which are *L. congoensis* Cammaerts, 1969, *L. matilei* Legrand & Lachaise, 2001 and the only recently redescribed *L. angustus* Martin 1912 (*vide* Legrand & Lachaise, 2001). The most useful feature to distinguish the species is the shape of the male appendages. By contrast, the early descriptions of *L. angustus* Martin, 1912 and *L. africanus* (Fraser, 1926) mainly based on coloration, and type specimens are in a very bad stage (R. Cammaerts pers. comm.). The confusion has been exacerbated by the mix-up of *L. angustus* and *L. africanus* among one another or with other species (e.g. Pinhey 1961, plate 4), and the presence of some undescribed species (K.-D.B. Dijkstra pers. comm.). In his Mozambique checklist Pinhey (1981, p. 578, fig. 26) later gives a correct illustration of a male "*Lestinogomphus angustus* (Botswana)". Some authors have treated both species as synonyms or forms (Fraser 1949, Pinhey 1984). One more species was described from West Africa, *L. minutus* Gambles, 1968 from a single female specimen. Another species is *Lestinogomphus bivittatus* (Pinhey, 1961) from Angola, which also has been described only from a single female as *Microgomphus bivittatus*, but as the illustrations show it is clearly a *Lestinogomphus* female by the long tenth abdominal segment (K.-D.B. Dijkstra pers. comm.). The species described here is completely different by its anal appendages to other known members of the genus (K.-D.B. Dijkstra and R. Cammaerts pers. comm.).

This paper provides the description of a species from the northern Okavango Delta in Botswana. It is the result of a participation of the writer on the first Aqua-RAP Okavango Expedition of Conservation International to this region, which was carried out in June 2000 (*vide* Appleton et al. 2003).

MATERIAL & METHODS

The holotype and paratype males were collected on 9.vi.2000 by the author on the Okavango mainchannel riverbank at Xaro Lodge, approximately 15 km down stream of Shakawe, Ngamiland District, Botswana. This river section belongs to the Okavango Delta panhandle.

Abbreviations used in the text are: NMBZ = The Natural History Museum, Bulawayo, Zimbabwe; NMNW = Namibian National Insect Collection, National Museum of Namibia, Windhoek, Namibia; RMNH = Nationaal Natuurhistorisch Museum Naturalis, Leiden.

TYPE & ASSOCIATED MATERIAL: **Holotype**: male / BOTSWANA / Ngamiland District/ Okavango Delta/ Xaro Lodge/ 13 km SE Shakawe / 18°25'49"S, 21°55'38"E/ 9.vi.2000/ leg.: J. Kipping// deposited at NMNW; **Paratype**: male, same data as holotype, deposited at RMNH.

DESCRIPTION

General - Holotype male. Acetone dried. Fully mature, in good conditions. Fits to the characteristics of the genus. A small and slender gomphid species. The very narrow Fw and Hw of almost the same shape. Anal field of Hw reduced, an anal triangle is absent. Anal margin set with small spines. Abdominal segment 10 remarkably elongate, nearly as long as S8+S9. Coloration pale green to yellow with brown markings.

Head - (Figure 1) Labium pale yellow with golden hairs. Mandibles pale green, apically brown with black teeth. Labrum pale blue-green, the upper and lower edge broad and distinct dark brown, connected by a clear medial brown line. Anteclypeus uniformly pale blue-green. Anterior frons of the same color and a diffuse transverse brown band, a shallow smooth depression on both sides of the bulged middle section. A prominent crest without any spines. Upper frons uniformly pale blue-green. Vertex brownish with diffuse green markings between ocelli. Ocelli

with darker margins. Lateral ocelli slightly smaller than median ocellus. A small group of hairs behind the lateral ocelli. Antennae dark brown, last segments missing, first segments pale green.

Thorax - Prothorax mainly concealed by head, pale green. Synthorax green with dark brown markings, becoming yellowish ventrally. Mesepisternum with a prominent median carina. A narrow green stripe along the carina only in the anterior third. The green antehumeral stripe is completely bordered by brown markings. A broad outer green antehumeral stripe is present. Mesepimeron and metepisternum green, a diffuse brown stripe along the humeral suture. Another diffuse brownish stripe along the mesometapleural suture is broken in the middle. Metepimeron yellow without markings.

Legs - Leg pairs similar. Coxae pale green, trochanters green-yellow, on inner side with dark spines. Femora yellow becoming dark brown in the distal third, on interior two ridges set with short blackish spines. Tibiae dark brown, slightly paler exterior, set with two rows of long black spines on inner and two rows of short black denticles on outer side. Tarsi and tarsal claws dark brown.

Wings - Venation blackish. Wings clear. Shape of Fw and Hw very similar. Pt membrane pale brown, slightly darker in the middle with thick black margins. Node in Fw at about 62 % of distance between base and Pt, in Hw at about 58 %. Discoidal cells uncrossed. Discoidal field starts with two cells to nodal level in Fw, with three cells in Hw. In Fw 11 and 13 Ax, in Hw 9 and 10 (distal Ax complete), in Fw 8 and 9 Px, in Hw 7 and 8. Arculus at second Ax in all wings. Pt reaches over 3.5 cells in Fw and Hw. Membranule and anal triangle absent. Anal margin with six small spines and one larger at distal end.

Abdomen - S1 pale green. S2 green with pale brown markings and prominent auricles. S1-2 slightly swollen. S3-6 very long and slender, S7 becoming wider distally. S3-7 greenish with a narrow brown band in the middle and a broad band distally. S8-9 shorter and wider, brownish, ventrally yellow. S10 1.84 times longer than S9, laterally compressed, pale brown with darker markings and a yellow stripe ventrally. At distal end with some black denticles. Anal appendages very short, reddish-brown, paraproct yellow-brown. Superior appendage down curved with a rounded tip and a swollen lateral process. This process with a distinct granular surface, the knob-like end backward directed. Inferior appendage shorter than superiors with a prominent forward directed pointed tooth (Figure 2-4).

Accessory genitalia - Generally similar to *L. angustus* (Figure 6). Lamina small with short hairs. Anterior hamules broad at base, apically with a tuft of long hairs. More robust and stout as in *L. angustus*. Posterior hamules in lateral view broad, longer than genital lobe, posterior and outer ridge slightly concave. Color is brownish. Genital lobe in lateral view with a distinct sharp bend (Figure 5).

Measurements - (in mm): total length 39.5, abdomen length 29.4, Fw length 21.7, Hw length 20.31, Hw width 5.6, head width 5.52, Fw-Pt 2.67.

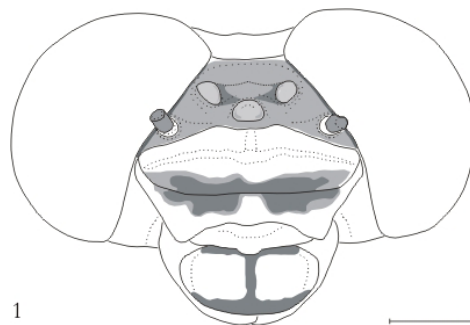
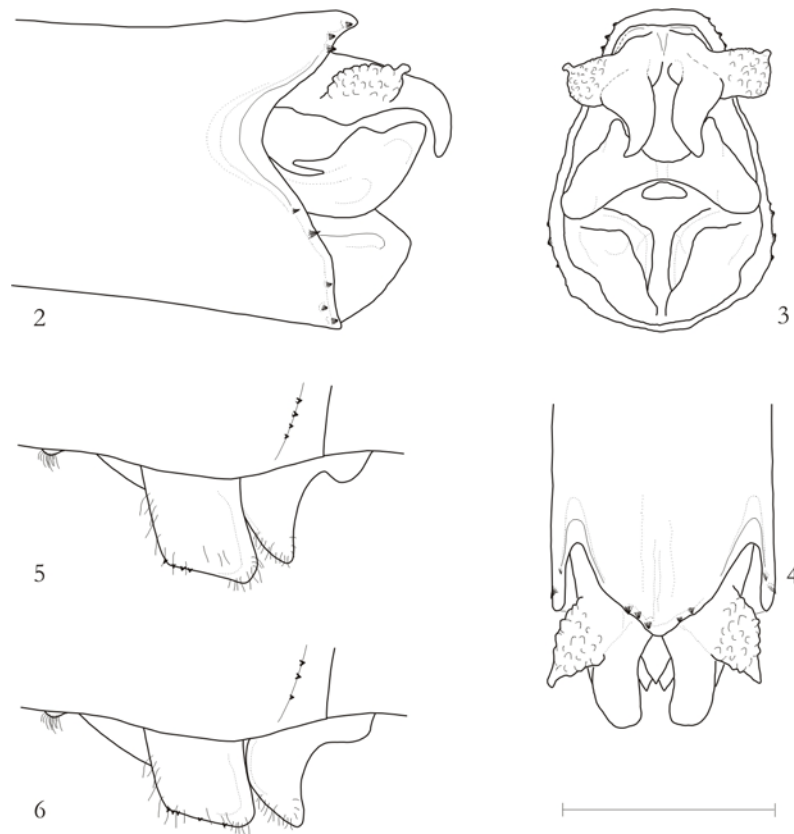


Figure 1. *Lestinogomphus silkeae* sp. nov., head with labrum and frons coloration (front aspect), scale bar: 1 mm.



Figures 2-5. *Lestinogomphus silkeae* sp. nov., 2, male anal appendages (lateral aspect from left); 3, same (posterior aspect); 4, same (dorsal aspect); 5, male accessory genitalia (lateral aspect from left); Figure 6. *Lestinogomphus angustus* Martin, 1912, male accessory genitalia (lateral aspect from left); scale bar: 1 mm.

ETYMOLOGY

The new species is named in honour of my wife Silke (1968-2003), who always encouraged me in my studies of African Odonata.

DIAGNOSIS

Comparison to *Lestinogomphus angustus* Martin, 1912.

The main distinguishing feature is the shape of the male inferior appendages. In *Lestinogomphus silkeae* the thorn on the lower appendage is more slender, pressed down and forward directed, whereas in *L. angustus* the thorn has a massive base and is clearly upright. The tenth abdominal segment is shorter and more robust in *L. silkeae*, the ratio between length and height is 1 : 0.57, whereas in *L. angustus* it is 1 : 0.49 (n=5 [M]).

The male accessory genitalia differs in some features. The anterior hamule is more stout in *L. silkeae*. Posterior hamule is olivaceous in *L. angustus* but brownish in *L. silkeae*. In lateral view it is longer than the genital lobe in *L. silkeae* but in *L. angustus* both are of the same length. In *L. silkeae* the genital lobe show a very distinct sharp bend in lateral view. In contrast in *L. angustus* the genital lobe is regular rounded.

In general the body coloration of both species is very similar. *L. silkeae* is slightly darker and shows minor differences (*vide* Table 1). Here the clearest difference is along the middorsal carina. Green extends broadly on both sides and the whole length of the carina in *L. angustus*, but not in *L. silkeae*. The legs in *L. angustus* are much more pale as in *L. silkeae*.

Size measurements do not differ in both species.

Lestinogomphus angustus Martin, 1912.

EXAMINED MATERIAL: 1 male, BOTSWANA, Kasane, Chobe Safari Lodge, 21.iii.2002, leg. J. Kipping; 1 male, ZIMBABWE, Victoria Falls National Park, Zambezi River, 24.v.2000, riverine forest, leg. J. Kipping; 1 male, BOTSWANA, Kasane, Chobe River rapids, 20.iii.2005, leg. J. Kipping; 2 males, BOTSWANA, Kasane, Kubu Lodge, Chobe River, 16.iii.2005, leg. J. Kipping. All in private collection of the author.

Table 1: Distinguishing features of *L. silkeae* spec. nov. and *L. angustus* Martin, 1912

	<i>L. silkeae</i> spec. nov. (n=1 [M])	<i>L. angustus</i> (n=5 [M])
inferior male appendages	the small and slender thorn is pressed down and forward directed	with a clearly upright thorn in the middle
tenth abdominal segment, ratio of length and height	1 : 0.57	1 : 0.49
male accessory genitalia	posterior hamules longer than genital lobe, genital lobe with a sharp bend in lateral view	posterior hamules of equal length with genital lobe, genital lobe rounded in lateral view
labrum coloration	upper and lower margin broad and clear brown, a clear central brown line from upper to the lower margin	reduced brown markings, in the middle only a small dot instead a line
middorsal carina	green along the carina reduced	green extends broadly along the whole length of the carina
femora coloration	yellow, dark brown in the distal third	very pale, only a brown tinge distally
tibiae	dark brown, only a pale tinge exterior	very pale, only dark stripes along the the interior rows of spines
ptero stigma*	reaches over 3.5 cells in all wings	reaches over 5 to 6 cells in all wings
head width [mm]	5.6	5.66 (mean)
total length [mm]	39.5	41.07 (mean)
Hw length [mm]	20.31	20.87 (mean)
Fw-pt [mm]	2.67	2.87 (mean)

* here no difference in the RMNH specimen (K.-D.B. Dijkstra, pers. comm.).

NOTES ON ECOLOGY, BEHAVIOUR AND DISTRIBUTION

Currently known from the type locality, Xaro Lodge, right Okavango River bank, 13 km SE Shakawe in the northern panhandle of the Okavango Delta, Ngamiland District, Botswana. A second locality is Victoria Falls of the Zambezi River, where a male specimen was collected by E.C.G. Pinhey in May 1961 and is deposited in NMBZ (originally labelled Victoria Falls, Rhodesia). This museum also possesses a possible but poorly preserved male from Musengezi River, Mzarabani, Zimbabwe, collected by the Natural History Museum expedition on 5 April 1990 (K.-D.B. Dijkstra pers. comm.).

The males of this species were caught in dense riverine forest and garden-like habitats lining the Okavango main channel. These and others (also females) were seen sun basking on broad leaves in small clearings. In contrast all individuals of *L. angustus* I have seen so far used as resting places the lower stratum of *Acacia* sp. or similar thorn shrubs. Despite of intense search there are no records from the type locality and adjacent areas in February 2002, March 2005 and February 2006.

DISCUSSION

The species described here is only the fourth within the genus *Lestinogomphus*, which is described by clear morphological features of a male type specimen. The genus is in urgent need of revision (*vide supra*). Two species were described only from a single female specimen, *L. minutus* Gambles, 1968 and *L. bivittatus* (Pinhey, 1961). The latter might occur in the region, but the type specimen deposited in the Dundo Museum, Angola could not be proofed due to political circumstances in Angola during the recent years. It was described as *Microgomphus bivittatus* Pinhey, 1961, collected at Dundo, Angola (19.ix.1957), leg. E. Luna de Carvalho. I am aware of the possibility that both belong to the same species and this example shows very clear the disadvantage of describing species by single females. But the type locality of *L. bivittatus* belongs to the Congo River basin, from the ecological point of view to the freshwater ecoregion of Moist Forest Rivers – Kasai, whereas that of *L. silkeae* belongs to the Okavango Floodplains (*vide* Thieme *et al.* 2005). As indicated by new findings of other gomphid species, for example *Neurogomphus cocytius* Cammaerts, 2004 or *Paragomphus cataractae* Pinhey, 1963 there is a stronger similarity between the Okavango River catchment and the Zambezi River catchment (Kipping 2006, Suhling *et al.* 2006) and I expect other undescribed species to occur in northern Angola or even in the upper Okavango basin (*vide* Kipping & Suhling 2006).

So far at least two species of the genus occur in southern Africa, of the widespread *L. angustus* and the species described here liable records exist. There is a strong possibility that other undescribed species are hidden behind old

published records of *L. angustus* and *L. africanus* or in museum collections. For example Pinhey (1951, plate 11b) gives a rather bad illustration of a male from Victoria Falls, Zimbabwe, labelled as *L. africanus*, which could be either the new species described here or even another undescribed species. Unfortunately the type specimen of *Lestinigomphus africanus* (Fraser, 1926) cannot be proofed since the last part of the abdomen is missing, now even the type specimen is missing and so no description of the anal appendages exist (V. Clausnitzer pers. comm.). So it is unclear what Pinhey (1951) means with *L. africanus*.

It is remarkable that during a short time period and at a well accessible river section two new gomphid species have been found (*vide* Suhling & Marais 2006). This makes likely that, especially in remote areas of the Zambezi or upper Okavango River systems, other undescribed species of the genus exist. Gomphids are generally hard to find in their adult stage, they are better recorded as larva or exuvia. Here the genus *Lestinigomphus* makes an exception, at least males are often sitting in the lower stratum of shrubs close to the rivers and are easy to spot. This raises the question why the new species has only been found once despite the intense search for it. One explanation I have is the different phenology of *L. angustus* and *L. silkeae*. The only available and liable records of *L. silkeae* are from May 1961 and June 2000 (*vide supra*), all records of *L. angustus* from the region (northern Namibia and Botswana, altogether 52 datasets in Odonata database) are from mid August to early April. During several visits at the type locality in February and March only two *L. angustus* were found exactly at the same river course. Unfortunately the location has never been visited later in the year since 2000. At the Chobe River near Kasane, where *L. angustus* is rather common, dozens of males were netted during the last years without a new record of *L. silkeae*, but all the visits to this river were carried out only in March. Pinhey (1967) recorded *L. angustus* in February 1967 from Sepopa, which is situated about 50 km southeast of the type locality. This all indicates a difference in the flying period of both species. Two corrections in earlier papers of the author have to be done. The record of *Lestinigomphus angustus* in Kipping (2003 a, b) from Xaro Lodge is in fact the new species *L. silkeae*.

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