**Descriptions of two new species of the genus *Paragus* Latreille (Diptera: Syrphidae), with a key to males of all South African species**

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**Abstract**

Two new species of the genus *Paragus* Latreille, 1804 are described from the Republic of South Africa: *Paragus longipilus* Tot, Vujić et Radenković **sp. n.**and *Paragus megacercus* Tot, Vujić et Radenković **sp. n.** These new species belong to the subgenus *Pandasyopthalmus* Stuckenberg, 1954a. *Paragus longipilus* **sp. n.** is a member of the *P. jozanus* group, whereas *Paragus megacercus* **sp. n.** belongs to the *P. tibialis* group. The taxonomic status of *Paragus chalybeatus* Hull, 1964 is revised and proposed as synonym of *Paragus punctatus* Hull, 1949. Additionally, an identification key to males of the South African species of *Paragus* is provided. Results of the present study confirm a significant level of endemism of *Paragus* in the Afrotropical Region (12 out of 29).

**Key words:** Afrotropical Region, *Paragus longipilus* **sp. n*.***, *Paragus megacercus* **sp. n.**, endemism, new synonym

**Introduction**

The genus *Paragus* Latreille, 1804 (Diptera: Syrphidae) is the only genus in the tribe Paragini, a member of the subfamily Syrphinae. *Paragus* consists of small-sized hoverflies with mainly black or largely reddish abdomen. From other hoverfly genera, it can be distinguished by the distinctive facial profile, well-developed first tergum, and the unsegmented aedeagus (Marcos-García & Rojo 1994). *Paragus* adults are found mainly in open areas and unimproved grasslands, flying low through ground vegetation (Speight 2018), and their larvae are aphid predators (Rotheray 1994). *Paragus* species are present in all regions except Antarctica and South America (Vujić *et al*. 2008).

Adult taxonomy of *Paragus* species is difficult due to the considerable intraspecific variability, mainly relating to colour characters that result in much misinterpretation and synonymy (Stuckenberg 1954a). Taxonomic confusion within this genus was resolved upon characterization of the structures of the male terminalia (Stuckenberg 1954a). Vujić *et al*. (2008) studied the phylogeny and systematics of the tribe Paragini using both morphological and molecular data and proposed a subdivision into four subgenera; apart from the two previously described subgenera, *Paragus* Latreille, 1804 and *Pandasyopthalmus* Stuckenberg, 1954a, two new subgenera *Afroparagus* Vujić et Radenković in Vujić *et al*. (2008) and *Serratoparagus* Vujić et Radenković in Vujić *et* *al*. (2008) were described. The subgeneric key published in Vujić *et al*. (2008) was re-edited by Ssymank & Mengual (2014) to include a newly described species from the Afrotropical Region, i.e. *Paragus caligneus* Ssymank et Mengual, 2014. To date, approximately 100 *Paragus* species have been recorded worldwide (Evenhuis & Pape 2019), of which 27 are present in the Afrotropical Region (two species of the subgenus *Afroparagus*, 20 of *Pandasyopthalmus*, one of *Paragus*, and four of *Serratoparagus*) (Whittington 2004; Ssymank & Mengual 2014).

Current knowledge of the genus *Paragus* in the Afrotropical Region is mainly derived from the revisions of Stuckenberg (1954a, b). Since then, a number of authors have contributed with descriptions of individual species (Kassebeer 1998, 1999a, b, 2000, 2001; Whittington 1998; Ssymank & Mengual 2014). Up to now 9 species of the genus *Paragus* have been recorded from the Republic of South Africa. Most of the South African species belong to the subgenus *Pandasyopthalmus* (7), followed by *Afroparagus* (1) and *Serratoparagus* (1) (Stuckenberg 1954a, b).

The aim of the present study is to improve the current knowledge of the genus *Paragus* from the Republic of South Africa (Afrotropical Region) by describing two new species, proposing a new synonym and providing a key to males of species found in this country.

**Material and methods**

The material the new species consist of was collected with sweep net during three separate field surveys carried out in the Republic of South Africa as part of the “Fly High” project of the EU Horizon 2020 RISE programme. The first two field surveys were carried out in 2016 (February and December), and the third was conducted in November 2017. The collected specimens were pinned, labelled and assigned with unique identification numbers.

All the available South African *Paragus* material deposited in the collection of FSUNS was examined. Additionally, holotype of *Paragus chalybeatus* Hull, 1964 loaned from MZLU, and holotype of *Paragus punctatus* Hull, 1949 based on high-resolution photographs from NHM were studied. The following acronyms of museums and entomological collections containing examined material are used in the text:

FSUNS Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

NHM Natural History Museum, London, United Kingdom

MZLU Museum of Zoology, Lund, Sweden

The following references with keys, descriptions and illustrations were used for identification: Stuckenberg (1954a), Kassebeer (1998, 1999a, b, 2000, 2001), Hull (1964) and Whittington (1998). To study the male terminalia, dry specimens were relaxed in a humidity chamber for a day. The terminalia were extracted with a hook-tipped entomological pin and were then cleared by boiling in tubes of water-diluted KOH pellets for 5 minutes. This was followed by brief immersion in acetic acid to neutralize the KOH, and then by immersion in ethanol to remove the acid. Male terminalia were stored in plastic microvials of glycerine and were pinned with the source specimens.

To describe and diagnose species, characters of the male terminalia and external morphological features of adults were studied using a Nikon SMZ 745T (Nikon Corporation, Tokyo, Japan) stereomicroscope. Colour characters were described from dry mounted specimens. Photomicrography was conducted using Nikon Coolpix D7100 digital camera attached to a Nikon SMZ 745T stereomicroscope. Photos were processed using CombineZ5 (Hadley 2006) and Adobe Photoshop CS3 version 10.0 (Adobe Systems Incorporated, San Jose, California, USA, 2007). Figures 3, 4, 6 were made with a FSA 25 PE drawing tube attached to Leica MZ 16 (Leica Microsystems, Wetzlar, Germany) stereomicroscope, while Figures 8, 9, 10, 11 were drawn as a vectorial image on Genius MousePen i608X graphics tablet using Adobe Illustrator CS6 version 16.0.0. (Adobe Systems Incorporated, San Jose, California, USA, 2012). Body length was measured in lateral view in millimetres (mm) using an eyepiece micrometer from the tip of the tubercle excluding antenna to the apex of the abdomen. Wing length was measured from the insertion point on the thorax to the apex of the wing.

The terminology used in the descriptions and drawings follow Thompson (1999) except for the terms “paramereˮ, “pleuronˮ, “ommatidiaˮ and “sperm sacˮ that follow McAlpine (1981), while “lateral lobe of aedeagusˮ, “aedeagal complexˮ and terms referring to the wing veins follow Vujić *et al*. (2008).

The species distribution map (Fig. 1) was created in DIVA-GIS software, version 7.5 (Hijmans *et al*. 2012).

INSERT FIGUE 1 HERE

**Results**

**Descriptions of new *Paragus* species from the Republic of South Africa**

***Paragus* (*Pandasyopthalmus*) *longipilus* Tot, Vujić et Radenković** **sp. n.**

Figs 2, 3, 4, 7A

INSERT FIGURE 2 HERE

**Type material.** HOLOTYPE. **Republic of South Africa**, m#, pinned. Original label: “RSA, Western Cape Province, Ceres District, Gydo Pass, 33°13'22.1988"S, 19°19'11.1606"E, 1071 m a.s.l., 08.xii.2016, leg. Vujić (ZA3\_197, FSUNS)”. PARATYPE: **Republic of South Africa**: Eastern Cape Province, Naude's Neck Pass, m#, 30°44'54.2436"S, 28°13'1.308"E, 1899 m a.s.l., 30.xi.2017, leg. Vujić, Radenković, Veličković (ZA4\_131, FSUNS).

**Diagnosis.** Eyes uniformly pilose (typical of subgenus *Pandasyopthalmus*), covered with dense, white pile as long as pedicel, and narrowly separated by a length of about two ommatidia (Fig. 7A). Face with distinct tubercle. Spurious vein extending beyond the meeting point of vein M with the discal cross-vein (Fig. 2A). Medial longitudinal protuberance at the boundary between sterna 2 and 3 present (Figs 2C–D: pr); posterior margin of sternum 4 medially protruded, with two tufts of black pile medially (Figs 2C–D: t). Surstylus squared with apical protuberance and inner spine (marked with arrow on Fig. 3B); hypandrium as in Figs 3C–D; paramere broad basally and tapering towards the rounded apex, with a lateral spine (marked with arrow on Figs 3C–D).

Based on its external morphological characters, *Paragus longipilus* **sp. n.** belongs to the subgenus *Pandasyopthalmus*. *Paragus longipilus* **sp. n.** differs from other described species of the genus by having much longer and denser body pile.Additionally, the medial longitudinal protuberance at the boundary between sterna 2 and 3 is present (Figs 2C–D: pr), as well as the posterior margin of sternum 4 medially protruded with two tufts of black pile medially (Figs 2C–D: t). The aedeagus complex (Figs 4A–C) is similar to that of the species *Paragus jozanus* Matsumura in Matsumura & Adachi 1916 (see Fig. 66 in Vujić *et al.* 2008).

**Description. MALE.** Body length 5.1 mm, wing length 3.7 mm. ***Head***(Figs 2A–B, 7A)*.* Eyes with dense, white, uniformly distributed pile, as long as pedicel, and narrowly separated by a length of about two ommatidia; antenna dark brown to blackish; basoflagellomere 1.75 times longer than wide, with rounded apex; arista dark brown; face yellow except black medial vitta extending from the oral margin to the tubercle, densely covered with long white pile and with distinct tubercle; frontal triangle yellow with yellow pile, except for a few black pile around the lunule; vertical triangle black, with golden sheen, covered with black pile anterior to anterior ocellus and yellow pile on the area posterior to the ocellar triangle; ocellar triangle equilateral, with black pile; occiput narrow, whitish pollinose, covered with dense yellow pile. ***Thorax***(Figs 2A–B)*.* Scutum black, with golden sheen, covered with yellow pile; pleuron black, whitish pollinose, except ventral part of katepisternum; anepisternum, anepimeron and dorsal part of katepisternum with patch of long white pile; calypter whitish; pedicel of halter dark brown, capitulum yellow; wing hyaline, covered with microtrichia except bare costal cell (C), basal part of subcostal cell (SC), first basal cell (R) and second basal cell (BM); spurious vein extending beyond the meeting point of vein M with discal cross-vein; stigma brownish-yellow; coxae and trochanters black; pro- and mesofemora black on basal 1/2, metafemur black on basal 3/4; tibiae and tarsi yellow; metatibia yellow with slightly darker ring in the submedial part (Fig. 2A); scutellum black with golden sheen, covered with yellow pile, as long as the length of scutellum. ***Abdomen***(Fig. 2). Terga black with golden sheen, with white erected pile on anterior half and black adpressed pile on posterior half; tergum 2 with long white pile on lateral margins (Fig. 2B); sterna 1 and 2 with long white pile, sterna 3–5 with short white pile, sterna 6–8 with black pile; boundary between sterna 2 and 3 with medial longitudinal protuberance (Figs 2C–D: pr); posterior margin of sternum 4 medially protruded, with two tufts of black pile medially (Figs 2C–D: t). ***Male terminalia***(Figs 3, 4)*.* Surstylus squared with apical protuberance and inner spine (Figs 3A–B: s); hypandrium as in Figs 3C−D, paramere broad at the base and tapering to the rounded apex, with lateral spine (marked with arrow on Figs 3C–D); posterior rim of hypandrium differentiated into a wide lingula (Fig. 3C: l); ejaculatory apodeme on Fig. 3E.

**FEMALE**. Unknown.

**Etymology.** The word ʻ*longipilus*ʼderives from the Latin adjective ʻ*longus*ʼ meaning long and ʻ*pilus*ʼ as nominative of the noun pile, referring to the long pile uniformly distributed on the eyes and other body parts.

**Distribution.** *Paragus longipilus* **sp. n.** is distributed in southern parts of the Republic of South Africa, in the Western and Eastern Cape Provinces (Fig. 1).

INSERT FIGURE 3 HERE

INSERT FIGURE 4 HERE

***Paragus* (*Pandasyopthalmus*) *megacercus* Tot, Vujić et Radenković** **sp. n.**

Figs 5, 6, 7B

INSERT FIGURE 5 HERE

**Type material.** HOLOTYPE: m#, pinned. Original label: “RSA, Kwazulu–Natal Province, Drakensberg Mountain, Gardens Castle, 29°44'51.039"S, 29°12'28.944"E, 1900 m a.s.l., 12.ii.2016, leg. Vujić (ZA2\_095, FSUNS)”.

**Diagnosis.** Eyes uniformly pilose (typical of subgenus *Pandasyopthalmus*), covered with dense white pile as long as diameter of posterior ocellus and narrowly separated by a length of three ommatidia (Fig. 7B). Face with less pronounced tubercle. Spurious vein ends before the meeting point of vein M and the discal cross-vein (Fig. 5B). Tarsi dorsally black, except for yellow meso- and metabasotarsomere, ventrally yellow except for fifth tarsomere (Fig. 5A). Abdomen elongated, about 3 times longer than wide. Tergum 2 with long white pile at lateral margins. Sterna shiny black, covered with long white wavy-tipped pile. In male terminalia, the cerci are enlarged, 5.9 times longer than the narrowest medial part of the epandrium in dorsal view, covered with a short dense and yellow pubescence and very long wavy-tipped yellow pile (Figs 6A–B). Surstylus small, tapering towards the apex (Fig. 6A). Paramere relatively small, dorsal and ventral margins sub-parallel (Fig. 6D). Ejaculatory apodeme large, umbrella-like (Fig. 6E). Based on the shape of its hypandrium, *Paragus megacercus* **sp.n.** is most similar to *Paragus haemorrhous* Meigen, 1822 (Figs 10K–L). The enlarged cerci distinguish this species from all other known members of the genus.

**Description. MALE.** Body length 6.1 mm, wing length 4.4 mm. ***Head*** (Figs 5A–B, 7B)*.* Eyes covered with white, uniformly distributed pile, as long as diameter of posterior ocellus; eyes narrowly separated by a length of about three ommatidia (Fig. 7B); antenna black; basoflagellomere 2.8 times longer than wide, with rounded apex; arista bare, dark brown; face yellow except black medial vitta extending from the oral margin to the tubercle, densely covered with yellow pile; frontal triangle yellow with yellow pile except for some black pile at the base of lunule; vertical triangle mostly shiny black, but yellowish pollinose anterior to anterior ocellus, covered with predominantly black pile, except yellow pile on the area posterior to ocellar triangle; ocellar triangle equilateral with black pile; occiput narrow, whitish pollinose, covered with yellow pile. ***Thorax***(Fig. 5)*.* Scutum black, covered with yellow pile; pile just behind the postpronotum yellow, wavy-tipped and longer than pile on the other parts of scutum; scutellum covered with yellow pile; pleuron black, whitish pollinose except ventral part of katepisternum; anepisternum and dorsal part of katepisternum with patch of long, dense, white pile; anepimeron with some yellow wavy-tipped pile; wing hyaline, covered with microtrichia, except for some bare areas in cells C, SC, R, BM, CuP and alula; stigma dark brown; spurious vein ending before the meeting point of vein M with discal cross-vein; calypter whitish; pedicel of halter brown, capitulum yellow; coxae and trochanters black; femora predominantly yellow, pro- and mesofemora black in basal 1/4; pro- and mesotibiae yellow, metatibia with dark medial ring; tarsi dorsally black, except yellow meso- and metabasotarsomere, ventrally yellow except fifth tarsomere. ***Abdomen***(Fig. 5)*.* Shiny black, elongated, about 3 times longer than wide; terga black, with white pile on the anterior 1/4 and black adpressed pile on the posterior 3/4; tergum 2 with long white pile on lateral margins; terga 3 and 4 with a pair of poorly visible silver pollinose maculae; sterna shiny black, covered with long white wavy-tipped pile. ***Male terminalia***(Fig. 6). Cerci extraordinarily large, covered with short yellow pubescence and long dense, yellow, wavy-tipped pile (Figs 6A–B); surstylus small, tapering to the apex (Fig. 6A); hypandrium on Figs 6C–D; paramere relatively small with sub-parallel dorsal and ventral margins (Fig. 6D); ejaculatory apodeme distally with large umbrella-like cap (Fig. 6E).

**FEMALE.** Unknown.

**Etymology.** The name ʻ*megacercus*ʼ(mega is derived from the ancient Greek word ʻ*megas*ʼ meaning ʻlargeʼ) refers to the extraordinarily large cerci of the male terminalia.

**Distribution.** Republic of South Africa, Drakensberg Mountains (Fig. 1).

INSERT FIGURE 6 HERE

INSERT FIGURE 7 HERE

**Taxonomic status ofother South African species of *Paragus***

***Paragus punctatus* Hull, 1949: 732**

*Paragus* *chalybeatus* Hull, 1964: 451 **syn. n.**

**Type material studied.** The holotype of *Paragus chalybeatus* was examined (MZLU). This holotype is labelled: “Holotypus (red label)/*Paragus chalybeatus* Hull (handwritten) det. F. M. Hull/Zool. Mus. Lund Sweden Type No. 300411 Syrphidae (handwritten)/S. Afr. Cape. Prov. Cape Peninsula. Hout Bay. Skoorsteenkop. 2.ii.1951. No. 166 (white label)/ Swedish South Africa Expedition 1950–1951, Brinck-Rudebeck (white label)/Insect trap Alt ft (white label)”. The holotype of *Paragus punctatus* was also examined on the basis of high resolution photos of the head and thorax (dorsal and lateral views) (NHM). The holotype of *Paragus punctatus* is in very poor condition, lacking the abdomen and left wing, and is labelled as follows: “Holotype *Paragus punctatus* Hull (red label) (handwritten)/Cape Prov., Swellendam. Nov. 1933. (white label)/S. Africa. R. E. Turner. Brit. Mus. 1933–646. (white label)/NHMUK010369583 (white label)”.

**Comments.**Hull (1949) described *Paragus punctatus* based on a single female, collected in Swellendam (Cape Province, South Africa) in November 1933. Stuckenberg (1954a) found in the collections of the British Museum a male, labelled the same as holotype of *Paragus punctatus*. He designated this male as allotype of *Paragus punctatus*. Hull (1964) described a new species, *Paragus chalybeatus*, from Hout Bay, Skoorsteenkop, South Africa*.* He stated that this new species shares very similar morphological characters with the allotype of *Paragus punctatus* designated by Stuckenberg (1954a), but also indicated the existence of differences between them.

Examining the holotype of *Paragus chalybeatus* we conclude that the type specimen shares the same morphological characters with the allotype of *Paragus punctatus* found in Stuckenberg (1954a) and with the examined males of *Paragus punctatus* deposited in FSUNS. We designate here *Paragus chalybeatus* as synonym of *Paragus punctatus*. Based on diagnostic characters defined by Vujić *et al*. (2008) (small ejaculatory apodeme with simple apical part, lateral lobe of aedeagus protruded anteriorly more than paramere, and hypandrium without characteristic lateral protuberances) (Figs 10I–J) *Paragus punctatus* belongs to the *P. jozanus* group.

**Key to males of South African species of the genus *Paragus***

**1**. Eyes with 2 or 3 vertical vittae of pile … **2**

- Eyes with uniformly distributed pile (subgenus *Pandasyopthalmus*) … **3**

**2**. Posterior margin of scutellum without teeth; abdomen broad, terga laterally fused (subgenus *Afroparagus*); terminalia as in Figs 9E–G: lingula absent (Fig. 9F) … ***Paragus* *borbonicus* Macquart, 1842**

- Posterior margin of scutellum with distinct teeth (subgenus *Serratoparagus*); terminalia (Figs 9A–D): epandrium (Figs 9A–B) with bulge next to the cercus in lateral view (Fig. 9B marked with arrow); hypandrium with developed lingula (Fig. 9C) ... ***Paragus capricorni* Stuckenberg, 1954b**

**3**. Abdomen petiolate (Fig. 8A) … **4**

- Abdomen parallel sided, never distinctly petiolate (Fig. 8B) … **7**

**4**. Terminalia: paramere boomerang-shaped (Figs 10E: p, 10G: p) … **5**

- Terminalia: paramere broad in the base, tapering towards the apex (Figs 10A: p, 10C: p) ... **6**

**5**. Terminalia: surstylus rhomboid-shape apically (Fig. 10G: s), paramere with slender apex (Fig. 10G: p); ejaculatory apodeme as in Fig. 10H … ***Paragus longiventris* Loew, 1858**

- Terminalia: surstylus trapezoid-shape apically (Fig. 10E: s), paramere with rounded apex (Fig. 10E: p); ejaculatory apodeme as in Fig. 10F … ***Paragus minutus* Hull, 1938**

**6**. Basoflagellomere shorter (two times longer than scape and pedicel together) (Fig. 11A); terminalia: paramere broader, with pointed apex (Fig. 10A: p) ... ***Paragus marshalli* Bezzi, 1915**

- Basoflagellomere more elongated (three times longer than scape and pedicel together) (Fig. 11B); terminalia (Figs 10C–D): paramere narrower, with rounded apex (Fig. 10C: p) … ***Paragus dolichocerus* Bezzi, 1915**

**7**. Cercus enlarged (5.9 times longer than the narrowest part of epandrium in dorsal view) (Figs 6A–B) … ***Paragus megacercus* sp. n.**

- Cercus not enlarged … **8**

**8**. Posterior margin of sternum 4 medially protruded with two tufts of black pile medially (Figs 2C–D: t), boundary between sterna 2 and 3 with medial longitudinal protuberance (Figs 2C–D: pr); terminalia as in Fig. 3 … ***Paragus longipilus* sp. n.**

- Posterior margin of sternum 4 simple, boundary between sterna 2 and 3 without medial longitudinal protuberance … **9**

**9**. Terminalia (Figs 10I–J): surstylus narrow in the base, expanding medially, tapering towards the apex (Fig. 10I: s); abdomen completely black, terga with white erect pile on anterior half and with black adpressed pile on posterior half … ***Paragus punctatus* Hull, 1949**

- Terminalia (Figs 10K–L): surstylus same width along its length (Fig. 10K: s); abdomen black with orange markings on terga, terga only with white pile … ***Paragus haemorrhous* Meigen, 1822**

INSERT FIGURE 8 HERE

INSERT FIGURE 9 HERE

INSERT FIGURE 10 HERE

INSERT FIGURE 11 HERE

**Discussion**

Studies on hoverflies (including the genus *Paragus*) in the Afrotropical region are scarce and mostly related to East Africa, but also South Africa is rather well known in terms of them (Smith & Vockeroth 1980; De Meyer *et al*. 1990, 1995, 1997; Whittington 1994, 1998). To date, 27 *Paragus* species have been recorded in the Afrotropical Region (Whittington 2004; Ssymank & Mengual 2014), which represent approximately a third of known *Paragus* species worldwide. *Paragus longipilus* **sp. n.** and *Paragus megacercus* **sp. n.**, described herein, increase the total number of known *Paragus* species to 29 in this region. By harbouring 10 *Paragus* species (Stuckenberg 1954a, b), including the two newly described species, the Republic of South Africa represents the most intensely studied part of Africa, followed by Cameroon (Ssymank 2012) with eight, Kenya (Stuckenberg 1954a, b) with five, Zimbabwe (Stuckenberg 1954b; Whittington 1998) and the Ivory Coast (Kassebeer 1998, 1999b) with three species each.

The taxa described in this paper are presumably endemic to the Republic of South Africa. *Paragus longipilus* **sp. n.** was detected in the Eastern and Western Cape Provinces, whereas *Paragus megacercus* **sp. n.** was sampled from the Drakensberg Mountains in KwaZulu–Natal Province. Apart from these newly described species, a significant number of other *Paragus* species are endemic to different parts of the Afrotropical region (*Paragus boyesi* Kassebeer, 1999 and *Paragus tsimbazazensis* Kassebeer, 1999 in Madagascar; *Paragus punctatus* in South Africa; *Paragus paulyi* Kassebeer, 2000 in Cameroon; *Paragus basilewskyi* Doesburg, 1955 in Burundi; *Paragus cooksoni* Whittington, 1998 in Zimbabwe; *Paragus manensis* Kassebeer, 1999 and *Paragus tonkouiensis* Kassebeer, 1999 in Ivory Coast; *Paragus nigrocoeruleus* Hull, 1949 in Namibia; and *Paragus zuqualensis* Kassebeer, 2001 in Ethiopia). Compared to other regions (Palaearctic Region with 11 species, Oriental Region with 10 species, Australian Region with 2 species (Evenhuis & Pape 2019), and Nearctic Region with 1 species (Vockeroth 1986)), the Afrotropical Region is characterized by having the largest diversity of species of the subgenus *Pandasyopthalmus* (20) (Evenhuis & Pape 2019).

Based on the eye pilosity being evenly distributed, the two new species described in the present study belong to the subgenus *Pandasyopthalmus*. Both of these new taxa have very clear and remarkable morphological features, especially regarding the shape of the male terminalia. *Paragus longipilus* **sp. n.** has long pile on the eyes, a medial longitudinal protuberance on the boundary between sterna 2 and 3, and two tufts of black pile medially on the posterior margin of sternum 4, which together differentiate it from all other described species of the genus. The very large cerci observed in *Paragus megacercus* **sp. n.** have not been reported previously for other *Paragus* species. Diagnostic characters of the male terminalia (small ejaculatory apodeme with simple apical part, lateral lobe of aedeagus anteriorly protruded more than paramere, aedeagal apodeme without well developed lateral arms but with strong beak-like prolongation) serve to identify *Paragus longipilus* **sp. n.** as belonging to the *P. jozanus* group (as per Vujić *et al*. 2008), whereas those of *Paragus megacercus* **sp. n**. fit to the diagnostic characters of the *P. tibialis* group (large umbrella-like ejaculatory apodeme, reduced lateral lobe of aedeagus, and hypadrium with characteristic lateral protuberances). Further analysis of molecular characters will help to define the systematic position of these two new taxa within the subgenus *Pandasyopthalmus.* Accordingly, diagnostic characters of the *P.* *jozanus* and *P. tibialis* groups may need to be redefined.

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LEGENDS OF FIGURES

**FIGURE 1.** Map of sampling localities of the new species: *Paragus longipilus* **sp. n.** (black triangle) and *Paragus megacercus* **sp. n.** (black circle).

**FIGURE 2.** *Paragus longipilus***sp. n.**, male, holotype. **A** lateral view, **B** dorsal view, **C** abdomen, lateral view, **D** abdomen ventro-lateral view. **pr**–medial longitudinal protuberance, **t**–tufts of black pile. Scale bar, 1 mm.

**FIGURE 3.** *Paragus longipilus***sp. n.**, holotype, male terminalia. **A, B** epandrium, **C, D** hypandrium, **E** ejaculatory apodeme. A, D lateral view, B, E dorsal view, C ventral view. **aa**–aedeagal apodeme, **ae**–aedeagus, **ce**–cercus, **l**–lingula, **la**–lateral lobe of aedeagus, **p**–paramere, **s**–surstylus. B arrow marked inner spine of surstylus. C, D arrow marked lateral spine of paramere. Scale bar, 0.25 mm.

**FIGURE 4.** *Paragus longipilus* **sp.n.** aedeagus complex. **A** ventral view, **B** dorsal view, **C** lateral view. **ae**–aedeagus, **la**–lateral lobe of aedeagus, **aa**–aedeagal apodeme. Scale bar, 0.25 mm.

**FIGURE 5.** *Paragus megacercus***sp. n.**, male, holotype. **A** lateral view, **B** dorsal view. Scale bar, 1 mm.

**FIGURE 6.** *Paragus megacercus* **sp. n.**, holotype, male terminalia. **A, B** epandrium, **C, D** hypandrium, **E** ejaculatory apodeme. A, D lateral view, B, E dorsal view, C ventral view. **aa**–aedeagal apodeme, **ae**–aedeagus, **ce**–cercus, **l**–lingula, **la**–lateral lobe of aedeagus, **p**–paramere, **s**–surstylus, **ss**–sperm sac. Scale bar, 0.25 mm.

**FIGURE 7.** Head of male, holotype, frontal view. **A** *Paragus longipilus* **sp. n.**, **B** *Paragus megacercus* **sp. n.** Scale bar, 1 mm.

**FIGURE 8**. Male abdomen. **A** *Paragus longiventris*, **B** *Paragus punctatus*. Scale bar, 1 mm.

**FIGURE 9.** Male terminalia. **A, B, C, D** *Paragus capricorni*, **E, F, G** *Paragus borbonicus*. A, B, E, epandrium, C, F hypandrium, D, G ejaculatory apodeme. A, E, D, G dorsal view, B, C, F, lateral view. **s**−surstylus, **ce**−cercus, **l**−lingula.. Scale bar, 0.5 mm.

**FIGURE 10.** Male terminalia, lateral view. **A, B** *Paragus marshalli*, **C, D** *Paragus* *dolichocerus*, **E, F** *Paragus minutus*, **G, H** *Paragus longiventris*, **I, J** *Paragus punctatus*, **K, L** *Paragus haemorrhous*. A, C, E, G, I, K epandrium and hypandrium. B, D, F, H, K, L ejaculatory apodeme. **p**−paramera, **l**−lingula, **s**−surstylus, **ce**−cercus.Scale bar, 0.5 mm.

**FIGURE 11.** Male head, lateral view. **A** *Paragus marshalli*, **B** *Paragus dolichocerus.* Scale bar, 1.5 mm.