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Research article

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A new species of *Ocyale* (Araneae, Lycosidae) from Madagascar, with first observations on the biology of a representative in the genus

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Abstract. A large white species of wolf spider, *Ocyale ghost* Jocque M. & Jocqué R. sp. nov., is described from a white sandy beach of an inland freshwater lake in the northwest of Madagascar. The first photos of a living specimen of the genus *Ocyale* are provided together with some observations on the biology of the newly described species. An updated and illustrated key to the Afrotropical species of *Ocyale* is included here.

Keywords. Beach, biology, phenology, white sand.

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Introduction

A pilot study in northwestern Madagascar (Fig. 1), evaluating the added value of including spiders in an ongoing biodiversity monitoring program, revealed the presence of an undescribed species of *Ocyale* Audouin, 1823 (Lycosidae). Wolf spiders of this genus are among the larger representatives of the family but, despite their size, little is known about their habitat and biology.

The genus *Ocyale* contains 12 nominal species, but only the five Afrotropical representatives have been revised (Alderweireldt 1996). The genus is present in Asia (reported from China by Yin & Peng 1997) but some of the descriptions from India-Ceylon leave doubt about the real identity of the specimens (Karsch 1879, 1892; Dyal 1935; Gajbe 2004). One species, *O. pilosa* Roewer, 1960, occurs both in Africa and Asia (Tikader & Malhotra 1980; Alderweireldt 1996). The only Neotropical species, *O. huachoi* (Mello-Leitão, 1942), is most probably misplaced. This is the first substantiated record of the genus from Madagascar, wherein we describe a new species of *Ocyale* and present observations on its biology.

Material and methods

Spiders were collected at night in July–August 2016 during an expedition of Operation Wallacea in northwestern Madagascar (Fig. 1). All material is preserved in 70% ethanol. Preserved specimens were observed and measured with a Leica M10 stereo microscope. Photographs were taken with a Leica MZ16 using Leica Application Suite; Leica Microsystems, 2011 automontage software. Specimens were



Fig. 1. Type locality of *Ocyale ghost* Jocque M. & Jocqué R. sp. nov.

immersed in K-Y brand jelly and then photographed to obtain a Z-stack of 15–25 images, which were subsequently merged into a single photomontage. A female epigyne was detached from the abdomen, digested using a tablet of Total Care Enzima product (protein removal system originally for cleaning contact lenses and containing Subtilisin A [0,4 mg/tablet]) and then immersed in 75% ethanol. For SEM photos, specimens were dried after immersion in absolute ethanol, gold coated then examined and photographed with a JEOL 6480 LV scanning electron microscope. All material is deposited in the Royal Museum for Central Africa, Tervuren, Belgium (MRAC) and the Zoologie et Biodiversité Animale (ZBA) laboratory at the University of Antananarivo, Madagascar.

Abbreviations

All measurements are in mm.

ALE	=	Anterior Lateral Eyes
ALS	=	Anterior Lateral Spinnerets
AME	=	Anterior Median Eyes
d	=	dorsal
dw	=	distal whorl
F	=	Femur
Mt	=	Metatarsus
MA	=	Median Apophysis
P	=	Patella
PEQ	=	Posterior Eye Quadrangle
pl	=	prolateral
PLE	=	Posterior Lateral Eyes
PLS	=	Posterior Lateral Spinnerets
PME	=	Posterior Median Eyes
PMS	=	Posterior Median Spinnerets
rl	=	retrolateral
T	=	Tibia
t	=	tarsus
TL	=	Total Length

Results

Class Arachnida Cuvier, 1812
 Order Araneae Clerck, 1757
 Family Lycosidae Sundevall, 1833

Ocyale Audouin, 1823

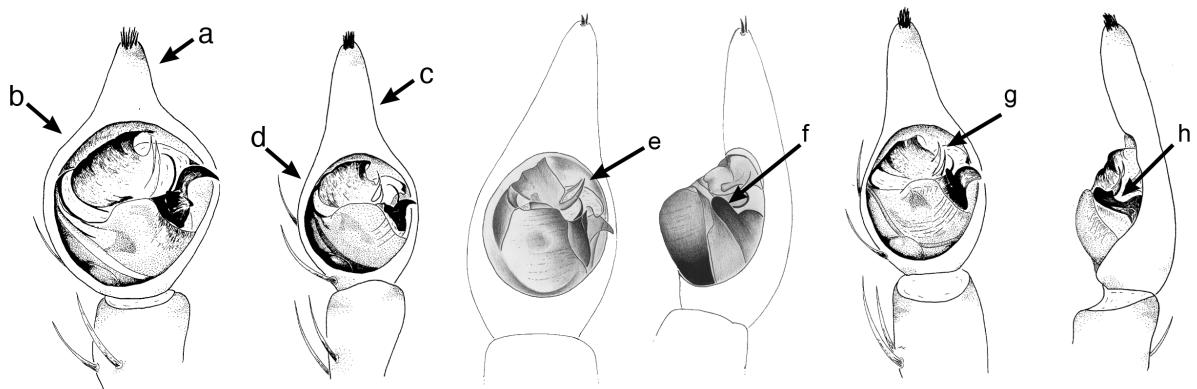
Key to the Afrotropical species of *Ocyale*

Letters refer to characters shown by arrows in key figures.

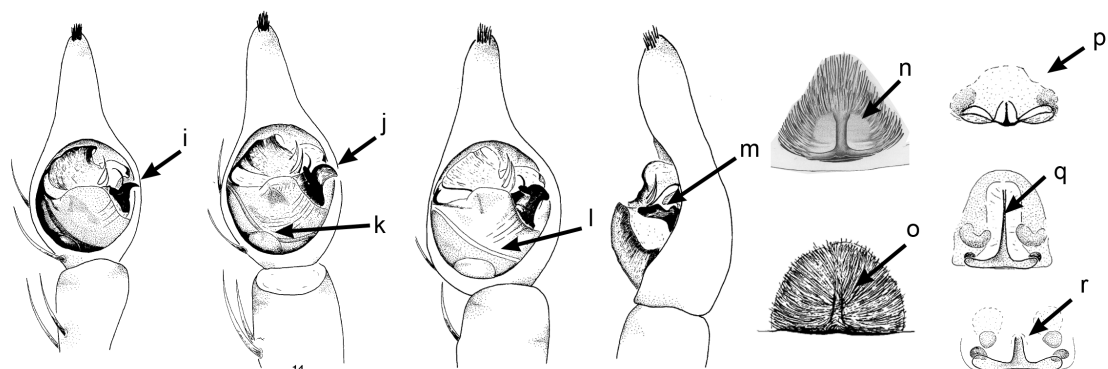
Species included:

- O. dewintera* Alderweireldt, 1996 ♂♀
- O. discrepans* Roewer, 1960 ♀
- O. ghost* Jocque M. & Jocqué R. sp. nov. ♂♀
- O. grandis* Alderweireldt, 1996 ♂♀
- O. guttata* Karsch, 1878 ♂♀
- O. pilosa* Roewer, 1960 ♂♀

1. Males 2
 - Females 6
2. Small species: TL 6–8 mm; distal part of cymbium shorter than bulbus (b) and bulbus clearly broadened (a) *O. dewinterae* Alderweireldt, 1996
 - Larger species, TL >16 mm; distal part of cymbium longer than bulbus (c) and bulbus clearly not broadened (d) 3
3. Distal prong of palea much narrower than proximal prong (e); ventral process of MA subrectangular with long parallel margins (f) *O. ghost* Jocque M. & Jocqué R. sp. nov.
 - Prongs of palea of similar size (g); long margin of ventral MA process with bulge (h) 4



4. Lateral process of MA slender, tapered to sharp tip (i); TL > 23 mm
 - *O. grandis* Alderweireldt, 1996
 - Lateral process of MA, shorter and broader, blunt (j); TL < 23 mm 5
5. Sperm duct near proximal margin of tegulum, partly hidden by subtegulum (k); long margin of ventral MA process with deep long incision before bulge *O. guttata* Karsch, 1878
 - Sperm duct further from proximal margin of tegulum, not hidden by subtegulum (l); long margin of ventral MA process with shallow, short incision before bulge (m) *O. pilosa* Roewer, 1960
6. Epigyne surrounded but not covered by white setae (n) *O. ghost* Jocque M. & Jocqué R. sp. nov.
 - Epigyne almost completely covered by white setae (o) 7
7. Large species, TL > 23 mm; epigyne with small and short septum (p).....
 - *O. grandis* Alderweireldt, 1996
 - Smaller species, TL < 23 mm; epigyne with well-developed inverted T-shaped septum (q, r) 8



8. Longitudinal part of inverted T longer than transverse part (q); colour pattern uniform
 *O. dewintera*e Alderweireldt, 1996
 – Longitudinal part of inverted T as long as or shorter than transverse part (r); brown to yellow carapace
 pattern (in ethanol) 9
9. Lateral epigyne margins along median septum swollen and shiny; longitudinal part of inverted T
 slender, longer than transverse part *O. guttata* Karsch, 1878, *O. discrepans* Roewer, 1960
 – Lateral epigyne margins along median septum not swollen and shiny; longitudinal part of inverted T
 broad, only half as long as transverse part (r) *O. pilosa* Roewer, 1960

Ocyale ghost Jocque M. & Jocqué R. sp. nov.

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Figs 1, 2, 3A–F, 4A–D, 5A–F, 6A–C, 7A–C

Diagnosis

Males of *O. ghost* sp. nov. can be recognized by details of the male palp: the tegulum is restricted to the prolateral side of the bulbus, the distal prong of the palea appendage is much narrower than the proximal one and the MA with the perpendicular prong is rectangular. Females are characterized by the epigyne in which the T-shaped posterior sclerite is fully exposed and not covered with setae as in other species in the genus.

Etymology

The species name ‘ghost’ refers to the fully white appearance of this spider. Additional reference is made to the large white direwolf ‘Ghost’ in *Game of Thrones*, the first book in the series of fantasy novels *A Song of Ice and Fire* by George R.R. Martin.

Type material

Holotype

MADAGASCAR: ♂, Mahajanga Prov., Matsedroy, Lake 2, 15°29'33.9" S, 046°39'04.1" E, 5 Jul. 2016, 19:55–20:45, hand collected on sandy beach (Fig. 2), S. Wellens leg. (MRAC 245337).

Paratypes

MADAGASCAR: 1 ♀, 2 juvs, same data as holotype (MRAC 245338); 2 ♀♀, 2 juvs, same data as preceding (MRAC 245340); 2 ♀♀, 2 juvs, as preceding (MRAC 245341); 2 ♀♀, 2 juvs, as preceding (MRAC 245342); 1 ♀, as preceding (MRAC 245347); 1 ♂, 6 juvs, as preceding (MRAC 245348); 1 ♂, 3 juvs, as preceding (MRAC 245361); 2 ♀♀, 2 juvs, as preceding (MRAC 245350); 1 ♀, 5 juvs, as preceding except 12 Jul. 2016 (MRAC 245339); 1 ♀, 5 juvs, as preceding except 22 Jul. 2016 (MRAC 245351); 1 ♀, 4 juvs, as preceding except 24 Jun. 2016 (ZBA); 1 ♂, 4 ♀♀, as preceding (ZBA); 1 ♂, 2 ♀♀, 1 juv., as preceding (ZBA).

Description

Male (holotype)

MEASUREMENTS. Total length 15.35; carapace 8.77 long, 2.27 high, 6.58 wide, narrowed to 3.95 in eye region; labium 1.14 wide, 0.79 long; sternum 3.68 long, 3.07 wide.

COLOUR. Alive (Fig. 3A–E): almost entirely white with slightly contrasting darker spots as in ethanol specimens; eyes surrounded by yellow rings; cheliceral condyle reddish brown. In ethanol (Fig. 4A–B): fairly different from colouration of live specimens; carapace brownish cream with interrupted black radiating striae, black fovea, two pairs of spots in front of fovea and dispersed irregular spots along

margins; PEQ covered with white setae, tegument dark in its anterior half; chelicerae brown with dark setae as seen in frontal view, dark brown with black setae in ventral view; labium dark brown with cream crescent shape along anterior concave margin; sternum with strongly sinuous lateral margins, ending in long, tapered point; with dispersed short dark setae; legs formula IV-III-I-II; uniform cream with dispersed short, dark setae and dark spines; pedipalp: femur, patella and tibia cream, cymbium and bulbus contrasting dark brown; abdomen: dorsum cream with dispersed small dark spots, two reddish apodemes in anterior half and dispersed dark setae, sides and venter uniform cream; spinnerets: ALS dark, PLS and PMS pale on dorsal side, dark on ventral side.

EYES. AME: 0.35; ALE: 0.15; PME: 0.67; PLE: 0.61; eye rows: ALE: 1.51, PME: 1.51, PLE: 2.18.

CHELICERAE. With three teeth on retromargin, one small proximal tooth and one larger distal tooth on promargin.

LEGS. Spination of leg I (identical on both sides): femur pl4, d3, rl2; patella pl1, rl1; tibia pl2, d2, rl2, v2-2-2; metatarsus pl2, rl2, v2-2, dw5. Leg measurements: see Table 1.

PALP (Figs 5A–D, 6A–C, 7A–B). Tegulum ribbed, developed on prolateral basal part of bulbus; palea with two prongs, proximal one broad and slightly curved, distal one thin and strongly curved; embolus originating on retrolateral part of palea and curved ventrally around it; MA large, with prolateral part a short hook, ventral part subrectangular, perpendicular to the former.



Fig. 2. Habitat on type locality of *Ocyale ghost* Jocque M. & Jocqué R. sp. nov. (photo by MJ, July 2012).

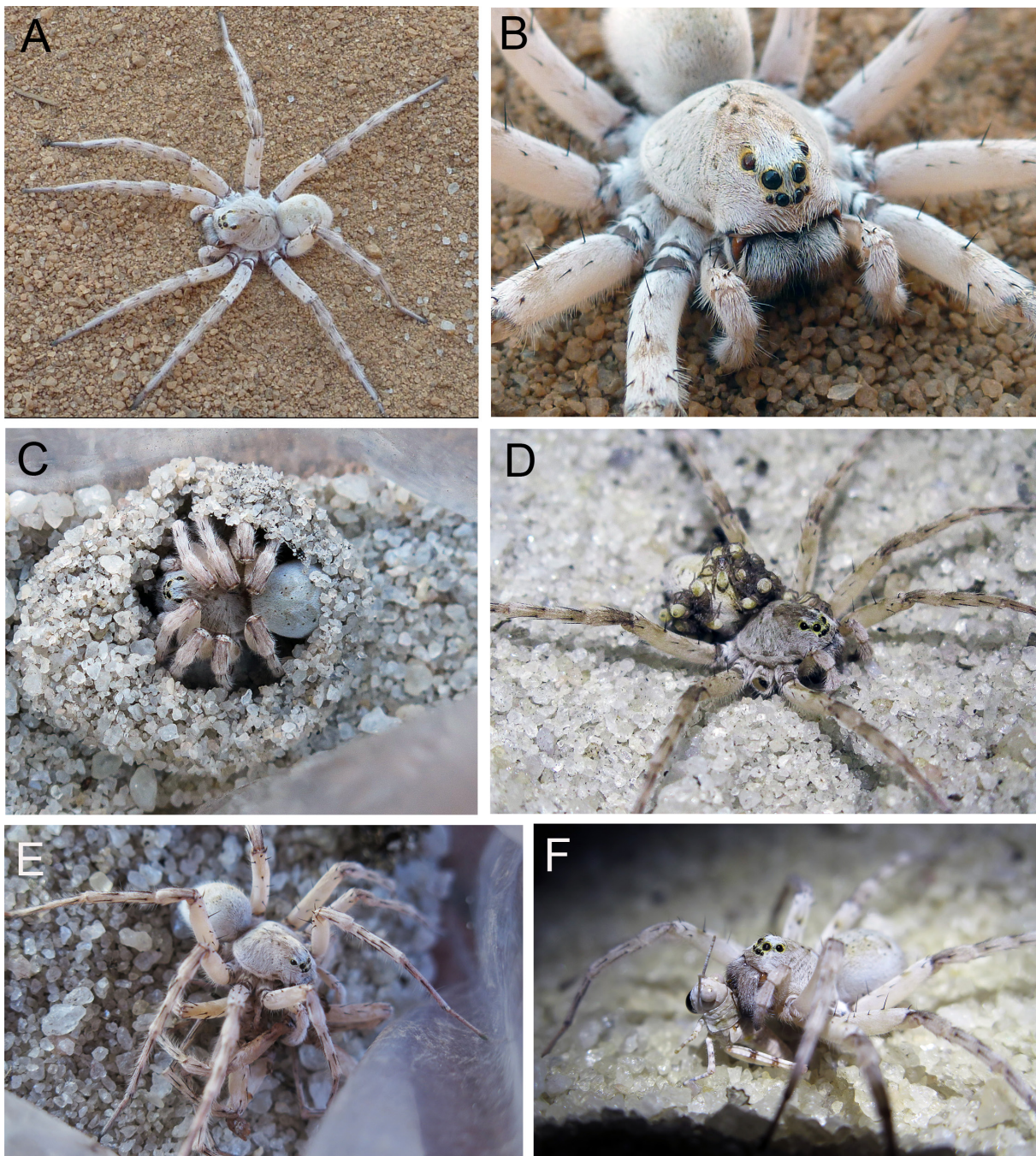


Fig. 3. *Ocyale ghost* Jocque M. & Jocqué R. sp. nov. photographed at type locality. **A.** Female habitus. **B.** Same, detail. **C.** Female in sand retreat. **D.** Female with spiderlings on abdomen. **E.** Two males, one being eaten by the other. **F.** Female with white grasshopper prey. Photos A–B: MJ (2012), C–F: SW (2016).

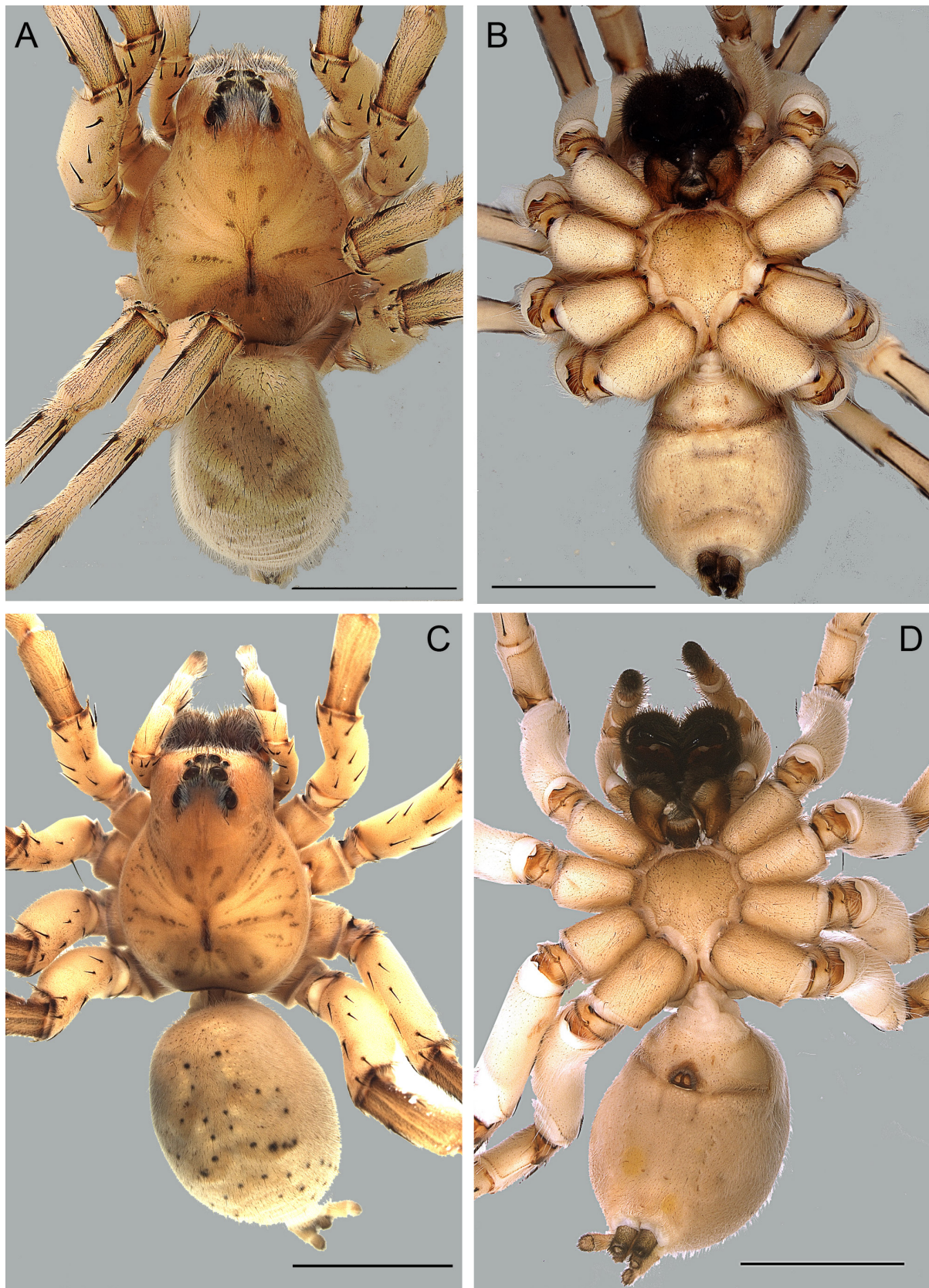


Fig. 4. *Ocyale ghost* Jocque M. & Jocqué R. sp. nov. **A–B.** Holotype, ♂. **A.** Dorsal habitus. **B.** Ventral habitus. **C–D.** Paratype, ♀ (MRAC 245338). **C.** Dorsal habitus. **D.** Ventral habitus. Scale bars = 0.5 mm.

Table 1. Leg measurements of male holotype and female paratype (MRAC 245338).

Male holotype (MRAC 245337)	Fe	P	Ti	Mt	t	Total
I	6.82	3.83	6.25	5.68	4.83	27.41
II	6.82	3.41	5.96	6.39	4.54	27.12
III	7.24	3.12	5.96	7.67	4.97	28.97
IV	8.52	3.12	7.53	9.09	5.25	33.51
Female paratype (MRAC 245338)						
I	7.24	4.12	5.40	5.82	3.98	26.55
II	6.67	3.41	4.97	5.40	3.69	24.14
III	7.81	3.83	5.40	6.53	4.69	28.26
IV	7.81	4.54	6.67	7.67	5.68	32.38

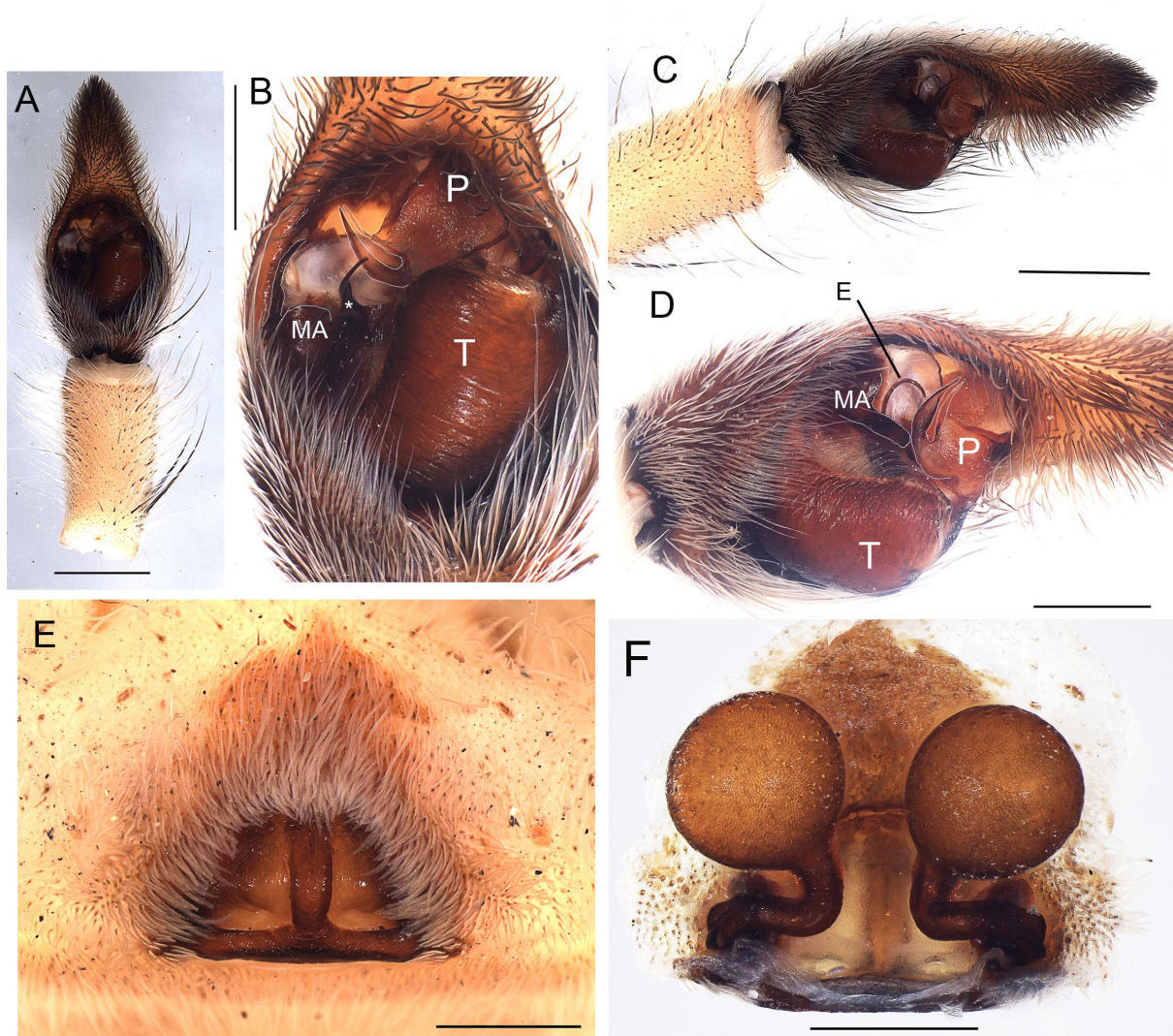


Fig. 5. *Ocyale ghost* Jocque M. & Jocqué R. sp. nov. **A–D.** Palp, ♂, holotype. **A.** Ventral view. **B.** Same, detail. **C.** Lateral view. **D.** Same, detail. **E–F.** Epigyne, ♀, paratype (MRAC 245338). **E.** Ventral view. **F.** Digested, dorsal view. Abbreviations: MA = median apophysis; P = palea; T = tegulum; E, * = embolus. Scale bars = 0.5 mm.

Female (paratype MRAC 245338)

MEASUREMENTS. TL 16.24; carapace 7.95 long, 3.69 high, 6.31 wide, narrowed to 3.69 in eye region; labium 0.92 long, 1.08 wide; sternum 3.33 long, 2.83 wide.

COLOUR. In ethanol (Fig. 4C–D): dorsal surface of abdomen more uniform cream than in male but with similar dark spots and apodemes; pedipalp as in the male except for unmodified tarsus with dark tip.

EYES. AME: 0.42; ALE: 0.21; PME: 0.67; PLE: 0.60; eye rows: ALE: 1.44, PME: 1.44, PLE: 2.14.

LEGS. Spination of leg I, right (left): femur pl2(5), d3(4), rl3(3); patella pl1(1), rl1(1); tibia pl2(2), d1(1), rl2(2), v2-2-2 (3-2-2); metatarsus pl2(2), rl2(2), v2-2-2(2-2-2), dw5(5). Leg measurements: see Table 1.

EPIGYNE (Figs 5E–F, 7C). Roughly triangular area surrounded by dense mat of white setae; large and broad inverted T-shaped sclerite, 1.6 times wider than long; spermathecae large, globular; entrance ducts Z-shaped with basal portion slightly sinuous.

Variation

Males: TL 16.76–19.45 (n = 5); females: TL 16.47–22.01 (n = 19).

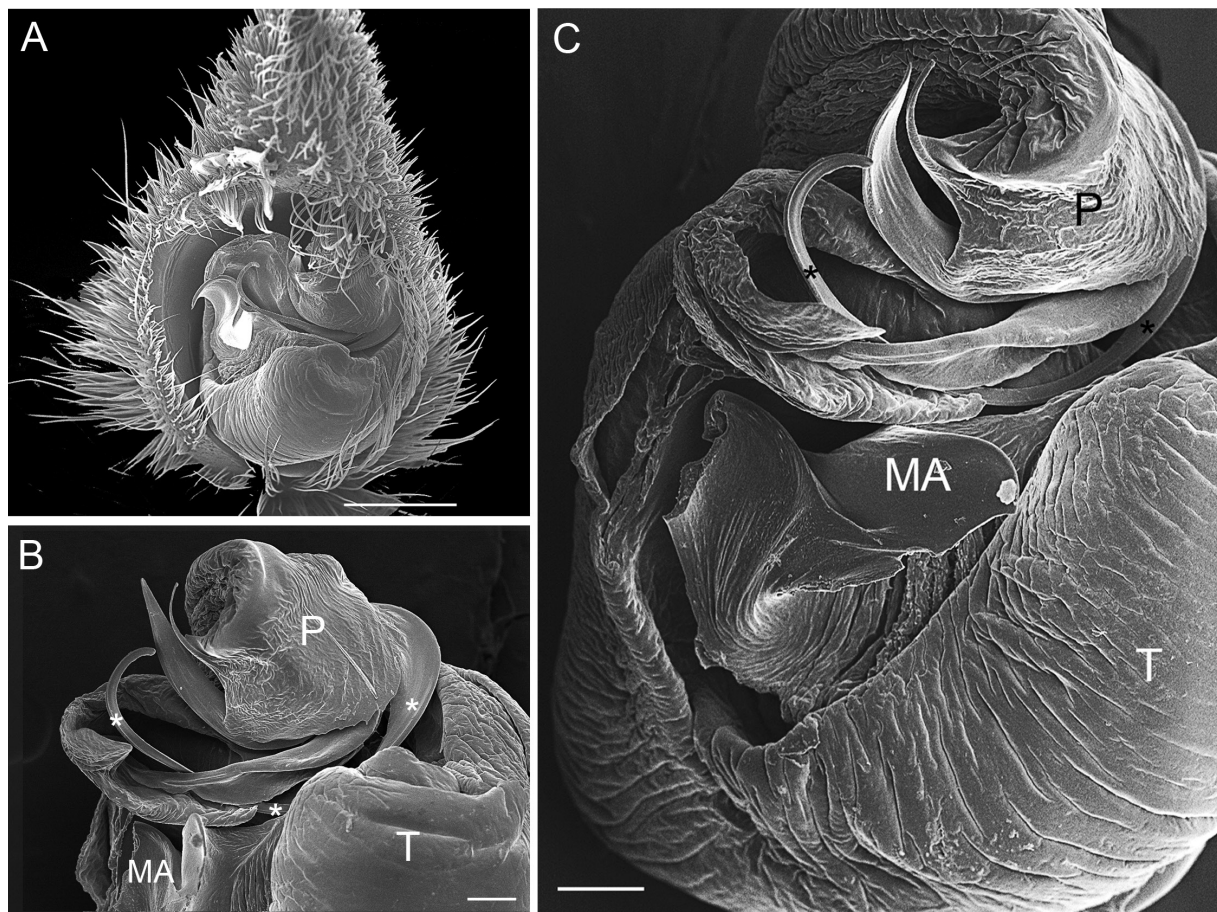


Fig. 6. *Ocyale ghost* Jocque M. & Jocqué R. sp. nov., palp, ♂, paratype (MRAC 245361), scanning electron micrographs. **A.** Right palp, ventral view. **B.** Distal end of bulbus, ventral view. **C.** Main part of bulbus ventro-prolateral view. Abbreviations: MA = median apophysis; P = palea; T = tegulum; * = embolus. Scale bars: A = 0.5 mm; B–C = 0.1 mm.

Distribution

Known only from the type locality (Fig. 1).

Affinities

We placed this species in the genus *Ocyale* based on the presence of the two elongate curved prongs on the palea (Figs 4B, 5B–C, 6B), the epigyne surrounded with white hairs and with a wide inverted T-shaped sclerite (Figs 5E, 7C), the large globular spermathecae (Fig. 5F) and the conformation of the copulatory ducts (Alderweireldt 1996: fig. 27). The specimen illustrated by Siyam *et al.* (2015: figs 13–15) from Sudan is probably not an *Ocyale*, at least not *O. pilosa* because the palp does not fit the illustrations of Alderweireldt (1996: figs 12–13). The colour pattern described for the genus in both these papers may be inaccurate based on the observed differences between specimens in ethanol and photos of the living spiders for this new species. This indicates the value of including images of living animals in descriptions of new species. It is not clear to which species the representative of Madagascar is most closely related to.

Biology

Ocyale ghost sp. nov. was only found on the white sandy beaches (Fig. 3A–B) of an inland lake in the study region. The surveys also included grassland and dry forest, but the species seems restricted to a

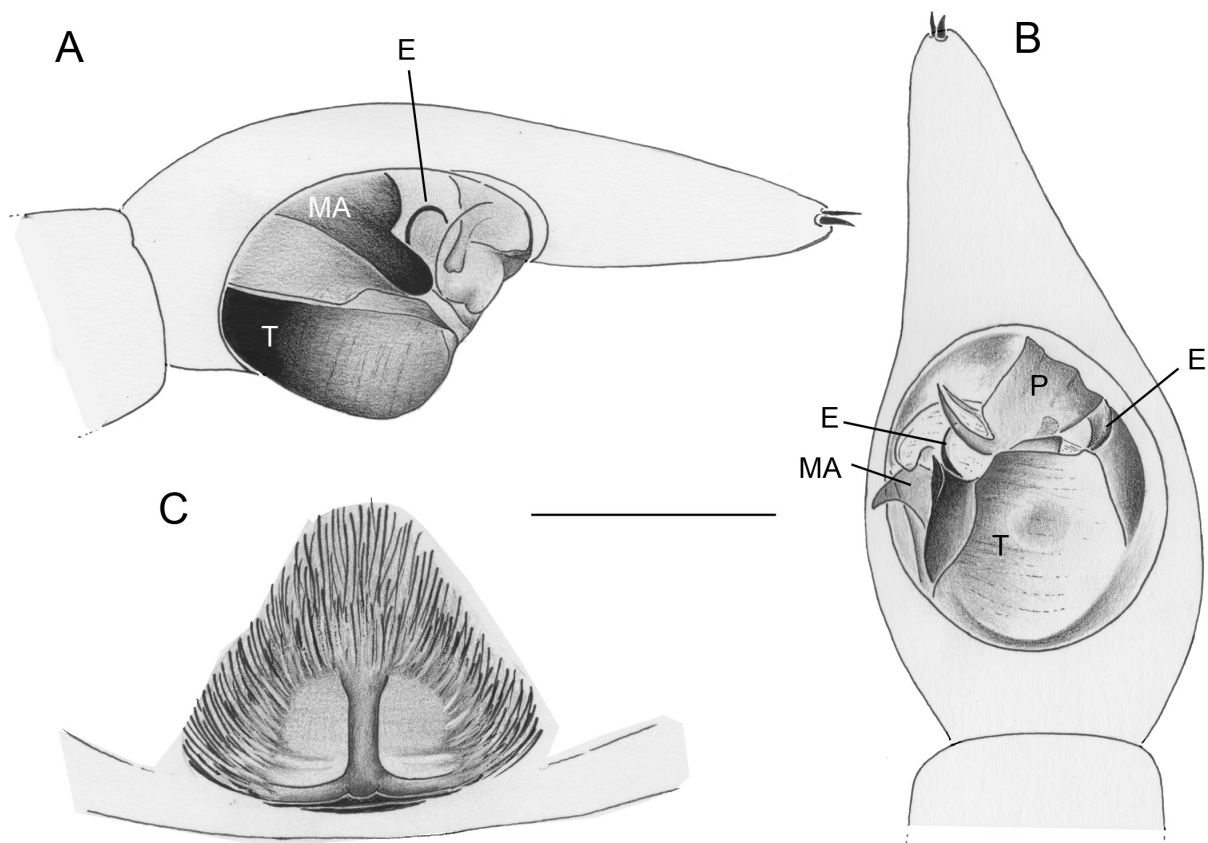


Fig. 7. *Ocyale ghost* Jocque M. & Jocqué R. sp. nov. **A–B.** Palp (holotype, ♂). **A.** Retrolateral view. **B.** Ventral view. **C.** Epigyne (paratype, ♀, MRAC 245338), ventral view. Scale bar = 1mm. Abbreviations: MA = median apophysis; P = palea; T = tegulum; * = embolus.

white-sand habitat, as reflected in its habitus. *Ocyale ghost* sp. nov. is active at night and all specimens were caught with headlamps after sunset. Captured animals that were kept alive in large ziplock bags overnight constructed retreats in the sand, lined with silk (Fig. 3C). Possible prey include large insects such as grasshoppers (Fig. 3F) that also exhibit camouflage colours as an adaptation to the white beach they live on. Intraspecific predation is also likely to occur (Fig. 3E), a phenomenon which is not unusual among lycosids (Edgar 1969; Hallander 1970). We observed copulation and females with spiderlings (Fig. 3D) in the midst of the dry season (June–July). Juveniles of a complete range of size, from very small ones (6 mm TL) to subadults, were observed, indicating that this species might reproduce year-round. The permanent presence of water in its habitat might explain why this species is also active in the dry season when spider activity is on average very low.

Discussion

Species of *Ocyale* are among the larger and, as far as their colour is concerned, the most remarkable wolf spiders. Despite these features, virtually nothing is known about their biology. Our study is the first that provides photos of the animals in the field, showing striking differences between preserved and living specimens that stress the importance of documenting live patterns and colours in species descriptions. It is known that colours can fade when animals are fixed in ethanol, this phenomenon has been documented for other spiders. In *Subasteron daviesi* Baehr & Jocqué, 2001, for instance, bright red and yellow abdominal spots become clear white in ethanol (Baehr & Jocqué 2001). Another striking example is that of the male of *Donacosa merlini* Alderweireldt & Jocqué, 1991, in which the striking pink hairs of the living male completely fade in alcohol (Alderweireldt & Jocqué 1991). More remarkable is that in *Ocyale ghost* sp. nov., the chelicerae, which are white in live specimens, turn dark in preserved spiders.

The specimens of the type series of *O. dewintera* Alderweireldt, 1996, were collected by RJ on white sandy beaches of Lake Malawi, showing a similar habitat occupancy as for *Ocyale ghost* sp. nov. Concerning ecology, the only other observations reported are from Dyal (1935) who described *Ocyale kumari*, a species from Pakistan, based on a single female specimen. The species was attributed to the genus *Ocyale* but the description does not provide many details and the illustration of the epigyne does not appear diagnostic for the genus. This species was found on a river bank in a fairly deep burrow (4 cm) and produces a sheet-web. Even these observations are not in accordance with the few records that relate the behaviour of *Ocyale* and rather point in the direction of *Hippasa* Simon, 1885.

In the survey on Madagascar, apart from *Ocyale*, only one other unidentified lycosid was found in very low numbers. The general paucity of wolf spiders encountered during field collections for this study reinforces the observation of Jocqué *et al.* (2011) that Lycosidae are uncommon on Madagascar. This strongly contrasts with the situation on mainland Africa, where Lycosidae are among the most abundant spiders (Jocqué & Alderweireldt 2006).

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