

A redescription of *Philoponella congregabilis*, an Australian hackled orb weaver spider (Uloboridae) now found in Christchurch, New Zealand

Cor J Vink^{1,2,3} and Kate M Curtis^{1,3}

¹Canterbury Museum, Rolleston Avenue, Christchurch 8013, New Zealand

²Zoological Museum, Centre of Natural History, University of Hamburg, Martin-Luther-King-Platz 3, D-0146 Hamburg, Germany

³Department of Pest-management and Conservation, Lincoln University, Lincoln 7647, New Zealand

Email: cvink@canterburymuseum.com

Philoponella congregabilis (Rainbow, 1916), an Australian spider in the family Uloboridae, has recently established in Christchurch, New Zealand. The species is redescribed. It builds reduced, horizontal or sloping orb webs in low vegetation, on fences, under eaves and in outbuildings. The webs of different individuals can be interconnected. *Philoponella congregabilis* is found in eastern and southeastern Australia and its current New Zealand distribution is limited to the southern suburbs of Christchurch.

Keywords: invasive spider, taxonomy, uloborid

Introduction

The Uloboridae include small spiders that are unusual in that they do not have cheliceral venom glands. Instead of envenomating their prey, uloborids wrap their prey tightly with large amounts of silk, which breaks the cuticle (Eberhard et al. 2006). The spider then regurgitates digestive enzymes over its prey and feeds on the liquefied body (e.g. Weng et al. 2006). Most uloborids, including the genus *Philoponella* Mello-Leitão, 1917, construct small, reduced, cribellate orb webs and are commonly known as hackled orb weavers. Uloborids can be mistaken for small members of the orb weaving family Araneidae, but can be differentiated by their cribellum and calamistrum (Figs 1–4). These structures are used to produce cribellate (hackled) webbing.

Waitkera waitakerensis (Chamberlain, 1946), found only in the North Island (Opell 2006), used to be the only species in the family Uloboridae known from New Zealand. That changed sometime before October 2014, when the Australian species *Philoponella*

congregabilis (Rainbow, 1916) established itself in Christchurch and has now spread to a number of localities in southern Christchurch. Because the original and only description of *P. congregabilis* is not sufficient to identify specimens with certainty, we redescribe *P. congregabilis* here. We also plot its current distribution in New Zealand so that any further spread can be followed.

Methods

Specimens were collected from locations in the south of Christchurch. In some cases adults could not be found, so immature specimens were reared in the laboratory until they moulted as adults. Specimens were examined in 80% ethanol with a dissection microscope. Female internal genitalia were excised using a sharp entomological needle and cleared in lactic acid. All measurements are in millimetres (mm). Measurements of the redescribed specimens were made using

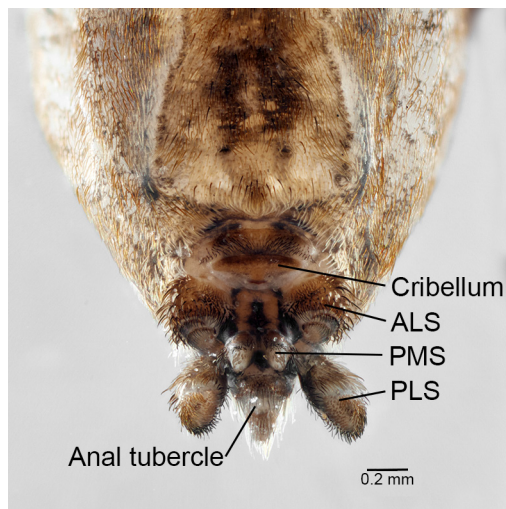


Figure 1. Ventral view of the anterior of a male *Philoponella congregabilis* (ZMH A0002084). Abbreviations: ALS, anterior lateral spinneret; PLS, posterior lateral spinneret; PMS, posterior median spinneret

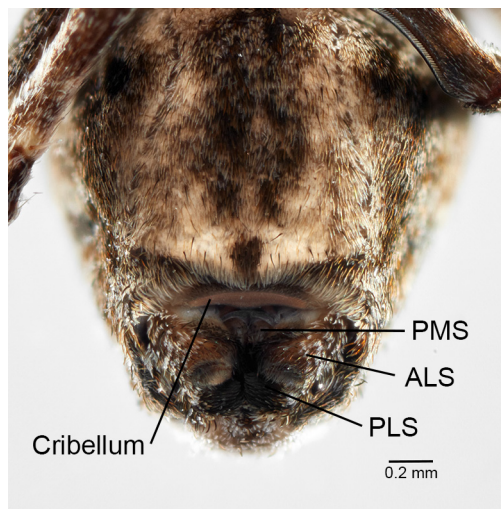


Figure 3. Ventral view of the anterior of a female *Philoponella congregabilis* (ZMH-A0002084). Abbreviations: ALS, anterior lateral spinneret; PLS, posterior lateral spinneret; PMS, posterior median spinneret



Figure 2. Hindleg IV of male *Philoponella congregabilis* (ZMH A0002084) showing the calamistrum on the dorsal surface of the metatarsus



Figure 4. Hindleg IV of female *Philoponella congregabilis* (ZMH A0002084) showing the calamistrum on the dorsal surface of the metatarsus

Nikon NIS Elements software and a Nikon DS-Ri1 camera attached to a Nikon AZ100M stereomicroscope. Carapace and body length measurements of multiple specimens were made with a micrometer ruler fitted to the eyepiece of a Leica MZ8 stereomicroscope. The colouration description is given from specimens preserved in 80% ethanol. High resolution images of specimens were produced by Nadine Dupérré at the Zoological Museum, Centre of Natural History, University of Hamburg, using a BK Plus Lab System (Dun, Inc.) with integrated Canon camera, macro lens (65 mm) and Zerene focus stacking software. Specimens were also illustrated by Nadine Dupérré who used digital photos to establish proportions

and microscope examination for detail and shading. Morphological nomenclature of the pedipalp and the epigynum follows Opell (1979).

Type specimens of *P. congregabilis* were loaned from the Australian Museum, Sydney, Australia, as the original illustrations by Rainbow (1916) were only lateral views of the entire male and female specimens, therefore identification could not be certain. High quality images of the types of the other two Australian *Philoponella* species that are held at the Zoological Museum, Centre of Natural History, University of Hamburg (ZMH), were compared to *P. congregabilis*; a syntype male and female of *P. variabilis* (Keyserling, 1887)

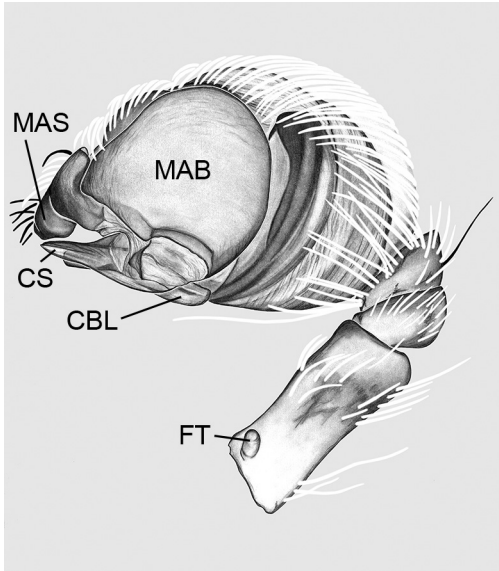


Figure 5. Left male pedipalp of *Philoponella congregabilis*, lateral view (ZMH A0002084). Abbreviations: CBL, conductor basal lobe; CS, conductor spike; FT, femoral tubercle; MAB, median apophysis bulb; MAS, median apophysis spur

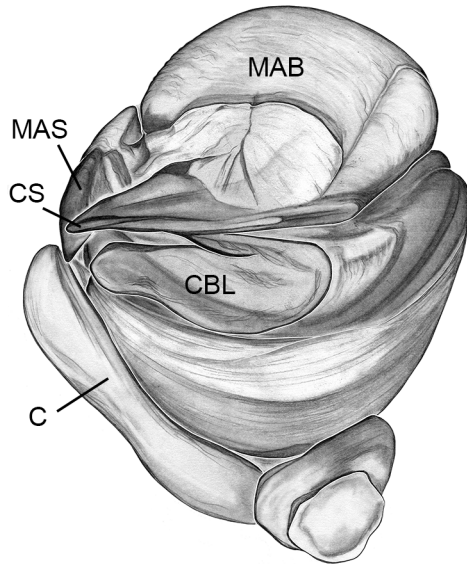


Figure 6. Left male pedipalp of *Philoponella congregabilis*, retrolateral view (ZMH A0002084). Abbreviations: C, cymbium; CBL, conductor basal lobe; CS, conductor spike; MAB, median apophysis bulb; MAS, median apophysis spur

(ZMH A0002113) and the possible type of *P. pantherina* (Keyserling, 1890) (ZMH A09184).

Specimens of *P. congregabilis* have been placed in the Canterbury Museum (CMNZ), Lincoln University Entomological Research Museum (LUNZ), Museum of New Zealand Te Papa Tongarewa (MONZ), New Zealand Arthropod Collection (NZAC) and ZMH.

Taxonomy

Philoponella congregabilis (Rainbow, 1916)

Figures 1–16

Uloborus congregabilis Rainbow 1916: 59, figs 1–2 (male and female).

Philoponella congregabilis (Rainbow); Lehtinen 1967: 258 (transferred from *Uloborus*).

Type specimens: Syntypes: 1 male and 3 females (AM KS6766), 2 males and 4 females (AM KS9272), examined. Australia: New South Wales: Parramatta, 11 Jan 1915, coll. A R McCulloch.

Other specimens examined: New Zealand: Christchurch: Hoon Hay, 43.5744°S, 172.6150°E, 18 Oct 2014, coll. M Provis, 1 male (CMNZ 2020.94.1). Cashmere, 43.5627°S, 172.6372°E, on fence, 7 Nov 2016, coll. K M Curtis, 2 males, 1 female (CMNZ 2020.94.2, 2020.94.3, 2020.94.8). Westmorland, 43.5825°S, 172.6057°E, outside greenhouse, 7 July 2019, coll. K M Curtis, collected as juveniles and reared in lab until adults, 1 male, 1 female (MONZ AS.004744); same data, 3 males, 2 females (NZAC 03029409). Westmorland, 43.5825°S, 172.6057°E, in greenhouse, 23 July 2019, coll. K M Curtis, collected as juveniles and reared in lab until adults, 2 males, 3 females (ZMH A0002084); same data, 1 male, 1 female (CMNZ 2020.94.4, 2020.94.5); same data, 1 male, 2 females (LUNZ 00012949). Somerfield, 43.56265°S, 172.62785°E, in web in garden, 4 Nov 2019, coll. C J Vink, 1 female (CMNZ 2020.94.6). Cashmere, 43.57547°S, 172.62914°E, in potting shed, 24 Nov 2019, coll. C J Vink & S J



Figure 7. Male *Philoponella congregabilis*, lateral view (ZMH A0002084)

Crampton, 1 female (CMNZ 2020.94.7); same data, 1 female and eggsac (CMNZ 2020.94.9). Huntsbury, 43.5643°S, 172.6508°E, under deck, 17 Nov 2019, coll. K M Curtis, 1 female and an eggsac (CMNZ 2020.94.10).

Diagnosis: *Philoponella congregabilis* can be separated from other species in the genus by the shape of the median apophysis bulb (Fig. 5) and the well-developed conductor basal lobe (Fig. 6). The large dorsal projection on the anterior half of the abdomen (Figs 7 and 8) separates *P. congregabilis* from the other two Australian *Philoponella* species, *P. variabilis* and *P. pantherina*. The gonopores of *P. congregabilis* (Fig. 8) are more anterior than those of *P. variabilis* and *P. pantherina*. The median apophysis bulb is much smaller in *P. congregabilis* than it is in *P. variabilis*. *Philoponella congregabilis* can be separated from *Waitkera waitakerensis*, which is the only

other uloborid found in New Zealand, by the large dorsal projection on the anterior half of the abdomen in the former species (Figs 7 and 8) and by the very different form of the male pedipalp (Figs 5 and 6) and female epigyne (Figs 9 and 10).

Description: Male. Total length 2.95, carapace length 1.54, sternum length 0.92, abdomen length 1.91, carapace width 1.46, sternum width 0.69, and abdomen width 1.21. Leg I total length 7.41, length of articles: femur 2.28, patella 0.64, tibia 1.79, metatarsus 1.74, tarsus 0.96; leg II 3.77 (1.27, 0.47, 0.65, 0.86, 0.52); leg III 2.73 (0.85, 0.30, 0.45, 0.67, 0.46); leg IV 4.69 (1.36, 0.53, 0.97, 1.12, 0.71). Chelicerae length 0.35 and chelicerae width 0.21. Carapace black-brown with sparse yellow-brown pubescence and a longitudinal median strip of whitish setae (Fig. 11). Chelicerae, endites, labium a dusky red with blackish tones, sternum



Figure 8. Female *Philoponella congregabilis*, lateral view (ZMH A0002084). Abbreviation: PER, posterior epigynal rim

black-brown with cream setae (Fig. 12). Sternum brown with mostly white setae and some pale orange-brown setae (Fig. 12). Legs pale orange-brown distally to black-brown proximally. Legs with dark brown bands both ventrally and dorsally; many segments with light proximal bands and dark distal bands. Calamistrum on dorsal surface of metatarsus IV (Fig. 2). Abdomen pale yellow-cream with a large dorsal projection with six small dark tufts; black-brown dorsal square patch on the posterior end of the abdomen with white dots on the median edges of the square (Fig. 11). Venter of abdomen two longitudinal brown lines in a faint hourglass shape (Fig. 12). Anal tubercle and spinnerets dusky brown with specks of cream and cribellum present (Fig. 1). Male pedipalp with long pale yellow-cream setae that extend from the cymbium over the bulb (Figs 5 and 12) and finger-like femoral tubercle (Fig. 5). Median apophysis spur blunt

and conductor spike with pointed tip (Fig. 5). Conductor blade well-developed (Fig. 6).

Female. Total length 4.90, carapace length 1.50, sternum length 1.02, abdomen length 3.81, carapace width 1.27, sternum width 0.72, and abdomen width 2.03. Leg I total length 6.14, length of articles: femur 1.97, patella 0.59, tibia 1.49, metatarsus 1.34, tarsus 0.75; leg II 3.27 (1.03, 0.46, 0.53, 0.71, 0.54); leg III 2.7 (0.84, 0.38, 0.40, 0.64, 0.44); leg IV 4.67 (1.38, 0.55, 0.99, 1.08, 0.67). Chelicerae length 0.46 and chelicerae width 0.24. Carapace brown with white and orange pubescence and longer setae forming two white longitudinal lines (Fig. 13). Chelicerae, endites, and labium pale orange with blackish tones (Fig. 14). Sternum brown with mostly white setae and some orange setae (Fig. 14). Legs brown with the metatarsus and tarsus light orange in legs I and II and the tarsus orange in legs III and IV. Calamistrum on dorsal surface of metatarsus

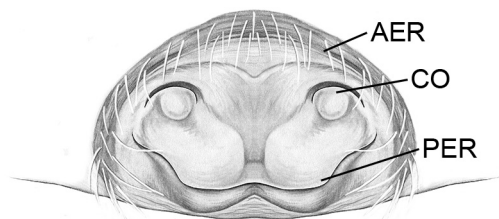


Figure 9. Epigynum of *Philoponella congregabilis*, ventral view (ZMH A0002084). Abbreviations: AER, anterior epigynal rim; CO, copulatory opening; PER, posterior epigynal rim

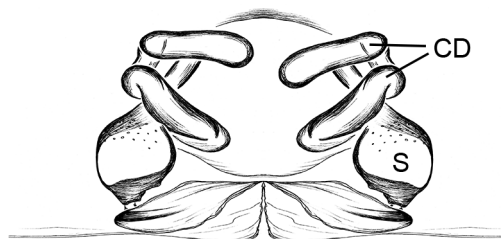


Figure 10. Internal genitalia of *Philoponella congregabilis*, dorsal view (ZMH A0002084). Abbreviations: CD, copulatory duct; S, spermatheca

IV (Fig. 4). Abdomen grey-brown with cream speckles and a thick longitudinal black-brown strip with a white outline (Fig. 13). Venter of abdomen is dark brown around the edge with the middle grey-brown with cream setae. Anal tubercle and spinnerets dark brown with white bands and cribellum present (Fig. 3). Epigynum with copulatory openings toward the anterior epigynal rim and a wide posterior epigynal rim (Fig. 9). Posterior epigynal rim with lobes that extend ventrally (Fig. 8). Internal genitalia with copulatory ducts that twist and initially extend anteriorly and then posteriorly to round spermathecae (Fig. 10).

Variation: Male body length 3.7–5.0, \bar{x} 4.5, $n = 7$. Female body length 3.8–5.4, \bar{x} 4.7, $n = 10$. Male carapace length 1.5–2.1, \bar{x} 1.7, $n = 12$. Female carapace length 1.5–2.1, \bar{x} 1.8, $n = 17$. Overall colouration varies between pale cream, dark orange and brown.

Notes: In all but one male of the syntypes, the opisthosoma had detached from the prosoma and many of the legs had also detached. There were four eggsacs and a broken opisthosoma with some of the syntypes (AM KS9272) and many of the legs had been caught up in the silk around the eggsacs. There were also three small Diptera wrapped in silk.

Natural history: *Philoponella congregabilis* construct untidy looking horizontal or sloping orbwebs. Webs are built in low vegetation and in human modified areas they are built on fences,

under eaves or in outbuildings (e.g. sheds and garages). The webs of different individuals can be interconnected with several spiders in the one web complex. There is often debris in the web, which helps to camouflage the spiders and their eggsacs. Eggsacs (Fig. 15) are elongated (9.2–11.6 mm long, $n = 6$) with various protuberances and contain about 20 eggs.

Distribution: Eastern and southeastern Australia: southern Queensland, New South Wales, Victoria, South Australia (S Sato & S Derkarabetian pers. comm.) and Tasmania. New Zealand: southern suburbs of Christchurch (Fig. 16).

Discussion

It is unknown how and when *Philoponella congregabilis* came to New Zealand. Due to its small size, it may have gone unnoticed for some time, however, arachnologists living in the south of Christchurch (CJV, KMC and Simon Pollard) noticed it as soon as their webs appeared in the properties where they lived. Given that this species is found in and around buildings, fences and gardens both in Christchurch and in Sydney, it is likely to spread to other parts of New Zealand, especially to warmer areas north of Christchurch. It is unlikely to compete with New Zealand's single endemic species *Waitkera waitakerensis*, as that species is only found in forests in the North Island (Opell 2006). It is also unlikely to be a specific threat to endemic insects as their



Figure 11. Male *Philoponella congregabilis*, dorsal view (ZMH A0002084)



Figure 12. Male *Philoponella congregabilis*, ventral view (ZMH A0002084)



Figure 13. Female *Philoponella congregabilis*, dorsal view (ZMH A0002084)



Figure 14. Female *Philoponella congregabilis*, ventral view (ZMH A0002084)

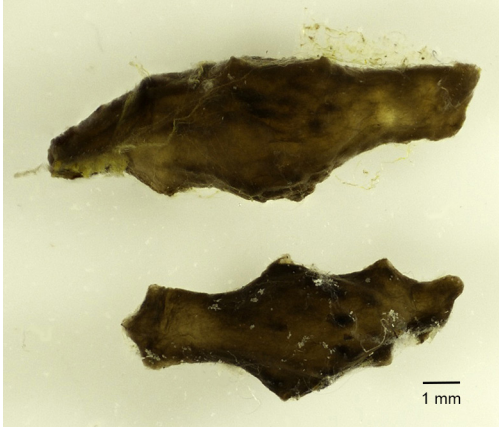


Figure 15. Eggsacs of *Philoponella congregabilis* (top CMNZ 2020.94.9, bottom CMNZ 2020.94.10)

web is used for general prey capture.

New Zealand is estimated to have a spider fauna of 2,000 species (Paquin et al. 2010) and 50 of the 73 introduced spider species established in New Zealand are Australian (CJV unpublished). Australian species continue to be found in New Zealand (e.g.

Forster 1982; Smith et al. 2012; Vink and Thorpe 2013) and our nearest neighbour is likely to carry on drip-feeding its spider fauna to Aotearoa New Zealand.

Acknowledgements

We thank Marcus Provis for bringing the first New Zealand specimen to our attention and Volker Framenau (Murdoch University) for alerting CJV to the possibility of it being an Australian uloborid. Graham Milledge (AM) organised the loan of the type specimens and Helen Smith provided us with information on their webs and biology in New South Wales. Simon Pollard graciously allowed us to collect specimens from his property. We are especially grateful to Nadine Dupérré (ZMH) for the excellent photos she took, for her wonderful illustrations and providing images of the types of *P. variabilis* and *P. pantherina*. Shoyo Sato (Giribet Lab, Harvard University) kindly provided feedback on the structures of the pedipalp and epigyne and he and Shahan Derkarabetian (Giribet Lab, Harvard University) informed us of the presence



Figure 16. Locality records of *Philoponella congregabilis* in Christchurch, New Zealand. Yellow location markers are examined specimens, red location markers are specimens photographed and reported on iNaturalistNZ (<https://inaturalist.nz/taxa/521225-Philoponella-congregabilis> [cited 14 July 2020]). Satellite imagery copyright TerraMetrics, Inc. www.terrametrics.com

of *Philoponella congregabilis* in South Australia. Thanks to Brent Opell and Volker Framenau for their helpful reviews.

References

- Eberhard WG, Barrantes G, Weng J-L. 2006. Tie them up tight: wrapping by *Philoponella vicina* spiders breaks, compresses and sometimes kills their prey. *Naturwissenschaften* 93: 251–254.
- Forster LM. 1982. The Australian redback spider - an unwelcome immigrant to New Zealand. *The Weta* 5: 35.
- Lehtinen PT. 1967. Classification of the cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. *Annales Zoologica Fennici* 4: 199–468.
- Opell BD. 1979. Revision of the genera and tropical American species of the spider family Uloboridae. *Bulletin of the Museum of Comparative Zoology* 148: 443–549.
- Opell BD. 2006. Molecular phylogenetic evidence for the parallel evolution of rock ecomorphs in the New Zealand orb-weaving spider *Waitkera waitakerensis* (Family Uloboridae). *Journal of Arachnology* 34: 467–475.
- Paquin P, Vink CJ, Dupérré N. 2010. *Spiders of New Zealand: Annotated Family Key & Species List*. Lincoln: Manaaki Whenua Press.
- Rainbow WJ. 1916. Some new Araneidae from the County of Cumberland. *Australian Zoologist* 1: 58–61.
- Smith HM, Vink CJ, Fitzgerald BM, Sirvid PJ. 2012. Redescription and generic placement of the spider *Cryptachaea gigantipes* (Keyserling, 1890) (Araneae: Theridiidae) and notes on related synanthropic species in Australasia. *Zootaxa* 3507: 38–56.
- Vink CJ, Thorpe S. 2013. A new record of the Australian wolf spider *Artoriopsis expolita* (L. Koch, 1877) (Araneae: Lycosidae) in New Zealand. *The Weta* 45: 38–41.
- Weng JL, Barrantes G, Eberhard WG. 2006. Feeding by *Philoponella vicina* (Araneae, Uloboridae) and how uloborid spiders lost their venom glands. *Canadian Journal of Zoology* 84: 1752–1762.