PECKHAMIA 273.1, 5 August 2022, 1—65
LSID urn:lsid:zoobank.org:pub:0DE6EA2A-8742-451F-91B4-512B5348F53B (registered 29 JUL 2022)
ISSN 2161—8526 (print)
ISSN 1944—8120 (online)

Maratus ammophilus, a new peacock spider in the *fimbriatus* group from Western Australia (Araneae: Salticidae: Euophryini)

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Abstract. *Maratus ammophilus*, a new species from the western coast of Australia, is described. Related species associated with the *fimbriatus* group of the genus *Maratus* are reviewed, and *M. licunxini* Baehr & Whyte 2016 is recognized as a synonym of *M. fimbriatus* Otto & Hill 2016. Male courtship display by members of this group is described.

Keywords. courtship, *Maratus fimbriatus*, *Maratus licunxini*, *Maratus speculifer*, *Maratus volpei*, new synonymy.

Four endemic Australian species have been placed in the *Maratus fimbriatus* group (Otto & Hill 2021). Members of this clade are distinguished from other members of the genus *Maratus* Karsch 1878 by the use of legs I in the courtship display of males, and by an embolus shaped like a wheel-rim. In this paper we describe one new member of this group, *M. ammophilus* n. sp., as we recognize the synonymy of *M. licunxini* Baehr & Whyte 2016 with *M. fimbriatus* Otto & Hill 2016. This leaves the total of described species in the group at four. We also recognize two more species in this group that we cannot formally describe and name, as type specimens are not yet available (Tables 1-2, Figures 1-2). These two species, each distinct from other members of the group, have been identified only as "carmel" and "flame" in the recent DNA study of *Maratus* (Girard et al. 2021), and here we refer to them as *Maratus* sp. A and *Maratus* sp. B, respectively. The eastern member of this group, *M. fimbriatus*, is quite different from the other species, with a prominently fringed fan; unlike the western species, male *M. fimbriatus* do not extend legs III during courtship display. As described below, distinct features of the new species, *M. ammophilus*, support the view that this species is most closely related to *M. speculifer* (Simon 1909).

Table 1. Members of the *Maratus fimbriatus* group.

map#	species	reference	type collectors	type locality
1	*M. ammophilus*	this paper (new species)	C. Bartell	30.23312°S, 115.01401°E
2	*M. fimbriatus*	Otto & Hill 2016	J. C. Otto	31.68110°S, 147.41246°E
3	*M. speculifer*	(Simon 1909)	W. Michaelsen, D. R. Hartmeyer	Stat. 115, North Fremantle
4	*M. volpei*	Schubert 2020	N. Volpe	31.23175°S, 136.40297°E
5	*M.* sp. A "carmel"	Girard et al. 2021	M. Girard	32.6382°S, 135.8784°E
6	*M.* sp. B "flame"	Girard et al. 2021	M. Girard	32.3222°S, 135.8875°E

Table 2. Phylogeny of the *Maratus fimbriatus* group, inferred through a comparison of DNA sequences (after Girard et al. 2021). *M. fimbriatus* and *M. licunxini* were not included in this study.

fimbriatus group	*M. speculifer*	
		M. sp. A "carmel"
		M. sp. B "flame"

Figure 1. Adult males representing species in the *fimbriatus* group of the genus *Maratus*. Photo credit: 4, © Nick Volpe, used with permission.

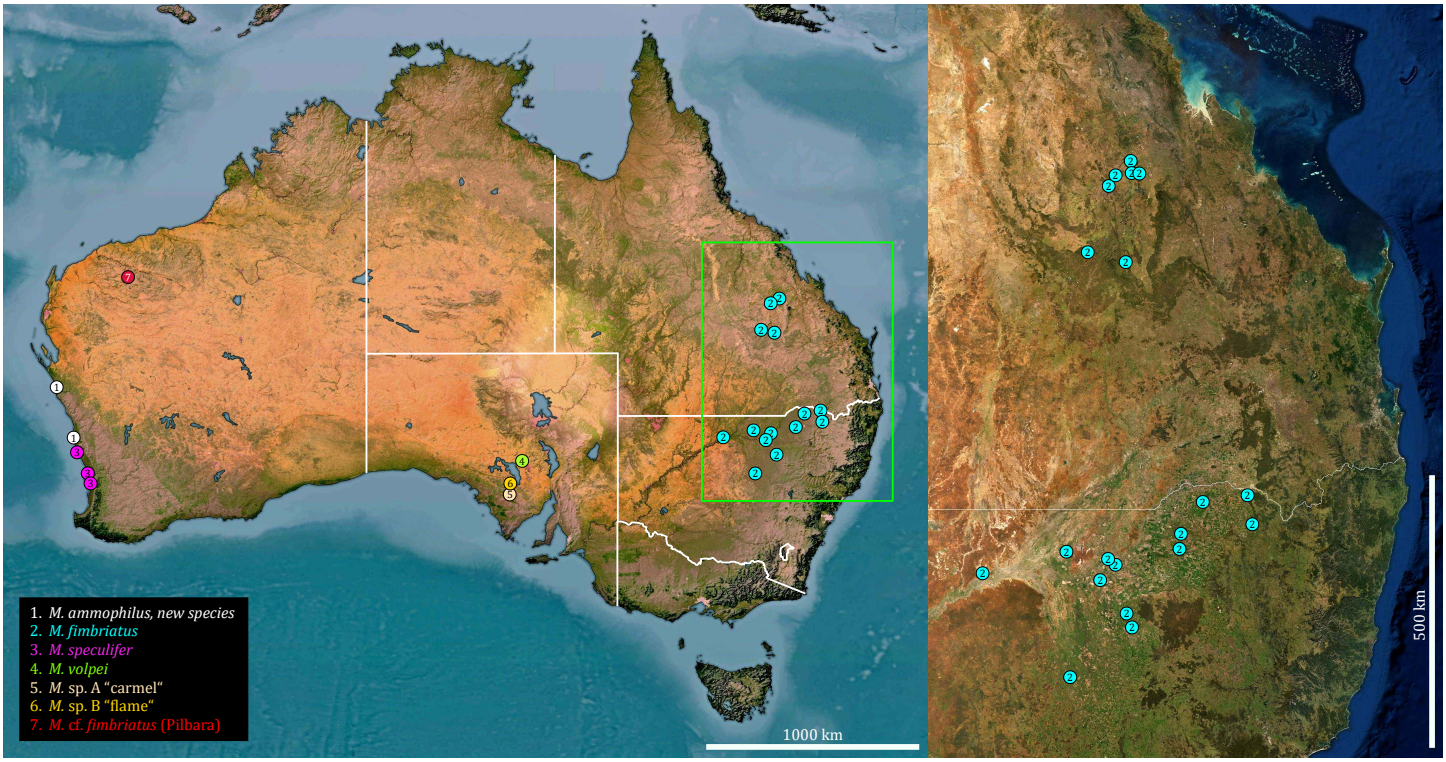


Figure 2. Known distribution of species in the *fimbriatus* group of the genus *Maratus*. *M. fimbriatus* was previously divided into two allopatric species groups, one in the interior of New South Wales (described as *M. fimbriatus*), and the second in the interior of Queensland (described as *M. licunxini*). New records of this species that have been posted and documented with reliable photographs in *iNaturalist* by Stuart Harris, Laurence Sanders and Wayne Winnington-Martin are included here. We have examined a specimen in the Australian Museum from the Pilbara (7) that has been identified as *M.* ?*fimbriatus* and recorded in the *Atlas of Living Australia*, and have determined that this represents a new, undescribed species with a much smaller fringe around the opisthosoma. In some cases more than one locality is marked by one circle. The known distribution of *M. ammophilus* is parapatric to the closely-related *M. speculifer*, with both species found on sands near the Indian Ocean coast of Western Australia. Other members of the group are known only from isolated sites in the interior of South Australia.

Many of these species have cryptic colouration, and close examination in the field may be required to distinguish them (Figure 3). This group may be diverse and widely-distributed in the interior of Australia, but access to sites in this vast area is often difficult. Over time we expect that many more species in this group will be described. One additional species in this group, discovered near Shark Bay, is shown in Figure 3:3-4.

Figure 3. Males representing two different species in the *Maratus fimbriatus* group, both living on sandy ground near the western coast of Australia. **1-2,** Male *M. ammophilus* at Lake Thetis, Jurien Bay (30.505942°S, 115.078376°E). In (1) a characteristic black bar across the front of each femur I can be seen. **3-4,** Undescribed male *Maratus* sp. at Denham Beach, Shark Bay. In this species the front of each femur I (3) resembles that of *Maratus* sp. B (Figure 1:5). Photo credits: 1-4, © Su Rammohan, used with permission.

Genus *Maratus* Karsch 1878

Type species *Maratus amabilis* Karsch 1878

Maratus ammophilus, new species

Type specimens. The holotype male (♂ #1), five paratype males (♂ #2-6), and two paratype females (♀ #1-2) were collected at Pumpkin Hollow on the coast north of Perth, Western Australia (30.233116°S, 115.014010°E, 7-18 FEB 2021, coll. Caleb Bartell). ♂ #1-4 and ♀ #2 were caught as juveniles and raised to adulthood, ♂ #5 and ♀ #1 were caught as adults, and ♂ #6 was raised from an egg deposited by ♀ #1. Three paratype males (♂ #7-9) and four paratype females (♀ #3-6) were collected at nearby South Bay, Green Head (30.073353°S, 114.978204°E, 7-18 FEB 2021, coll. Caleb Bartell). ♂ #9 was caught as an adult, ♂ #7-8 and ♀ #3-6 were collected as juveniles and raised to adulthood. All types will be deposited in the Western Australian Museum, Perth. *M. ammophilus* has also been observed at Lake Thetis in Cervantes (30.505942°S, 115.078376°E, JUL 2018; Su Rammohan, pers. comm.), and at the beach in Kalbarri (27.703654°S, 114.167276°E, JUN 2022; Michael Lun, pers. comm.).

Etymology. The species group name, *ammophilus* (Latin, adjective, m.), means *sand-loving*, a reference to the sandy beach habitat of these spiders.

Diagnosis. The distinctive wheel-rim shape of the embolus and the use of legs I in courtship clearly place the male *Maratus ammophilus* in the *fimbriatus* group of the genus *Maratus*. The male resembles *M. speculifer* with respect to the unusual shape and yellow-green colour of femora I, with a wider proximal *subsegment* separated from a narrower distal subsegment by a shelf on the anterior side. However, the overall colouration of the male *M. ammophilus* (Figure 1) is quite different, like the female almost entirely off-white. The setae of the dorsal opisthosoma of *M. ammophilus* are off-white and moderately iridescent, whereas the fan of the male *M. speculifer* bears a singular dark and glabrous, shiny scute, the basis for its species name. In addition the anterior femora I and II of *M. ammophilus* have a transverse black bar at the distal end of each subsegment, or at least at the end of each proximal subsegment, easily visible from the front during courtship display.

Description of male (Figures 4-7). Males (n=9) ranged from 3.2-3.8 mm in length. Almost the entire body, including the ventral opisthosoma, is covered with white to off-white or light-brown setae. The face is bright white, the chelicerae mostly glabrous and dark brown. An indistinct, middorsal thoracic tract of lighter setae may be present. The sides of the carapace have a distinct marginal band of white to off-white setae. The PME are closer to the PLE than to the ALE. The dorsal opisthosoma tends to be light brown rather than white, often with a moderate iridescence.

Legs I and II of similar length, shorter than legs III and IV, all with indistinct dark bands at the joints. Legs III are the longest. Sternum, labium and endites are dark brown to grey, almost glabrous except for longer white to off-white setae radiating from the posterior and lateral margins of the sternum. Cuticle of the prosoma and opisthosoma dark, that of the appendages almost lacking pigment. Ventral surface of each femur I and II translucent and almost glabrous, yellow-green. Each femur I and II is divided into a proximal *subsegment* of greater diameter, and a distal subsegment of lesser diameter, each subsegment (or at least the proximal subsegment) marked distally by a dark transverse band on the ventral surface; these subsegments are separated by a distinct, ventral shelf associated with the transverse band of the proximal subsegment (Figure 4:8,52). Pedipalps are light in colour, covered with long white setae. The retrolateral tibial apophysis (RTA) is unremarkable, similar to that of other *Maratus*. As is the case for other members of the *fimbriatus* group, the embolus resembles a wheel-rim, darker along the upper and lower margins of that rim, with a distally projecting terminus that bears the apical pore.

Figure 4 (continued on next page). Living male types for *Maratus ammophilus*. **8,** Note the division of the left femur I into proximal and distal subsegments, separated by a darkly-pigmented shelf on the ventral side. **9-10,** Courtship display, exposing the prominent features of legs I and II.

Figure 4 (continued from previous page, continued on next page). Living male types for *Maratus ammophilus*. **18-20,** Note the distinct but moderate iridescence of the dorsal opisthosoma of this individual.

Figure 4 (continued from previous page, continued on next page). Living male types for *Maratus ammophilus*. **30,** Note the dark brown, almost glabrous chelicerae.

Figure 4 (continued from previous page, continued on next page). Living male types for *Maratus ammophilus*. 40-42, Note the indistinct, lighter middorsal thoracic tract of this individual.

Figure 4 (continued from previous page). Living male types for *Maratus ammophilus*. **52-54,** Views of courtship display, with legs I and III extended. **55-58,** This male is not one of the designated types.

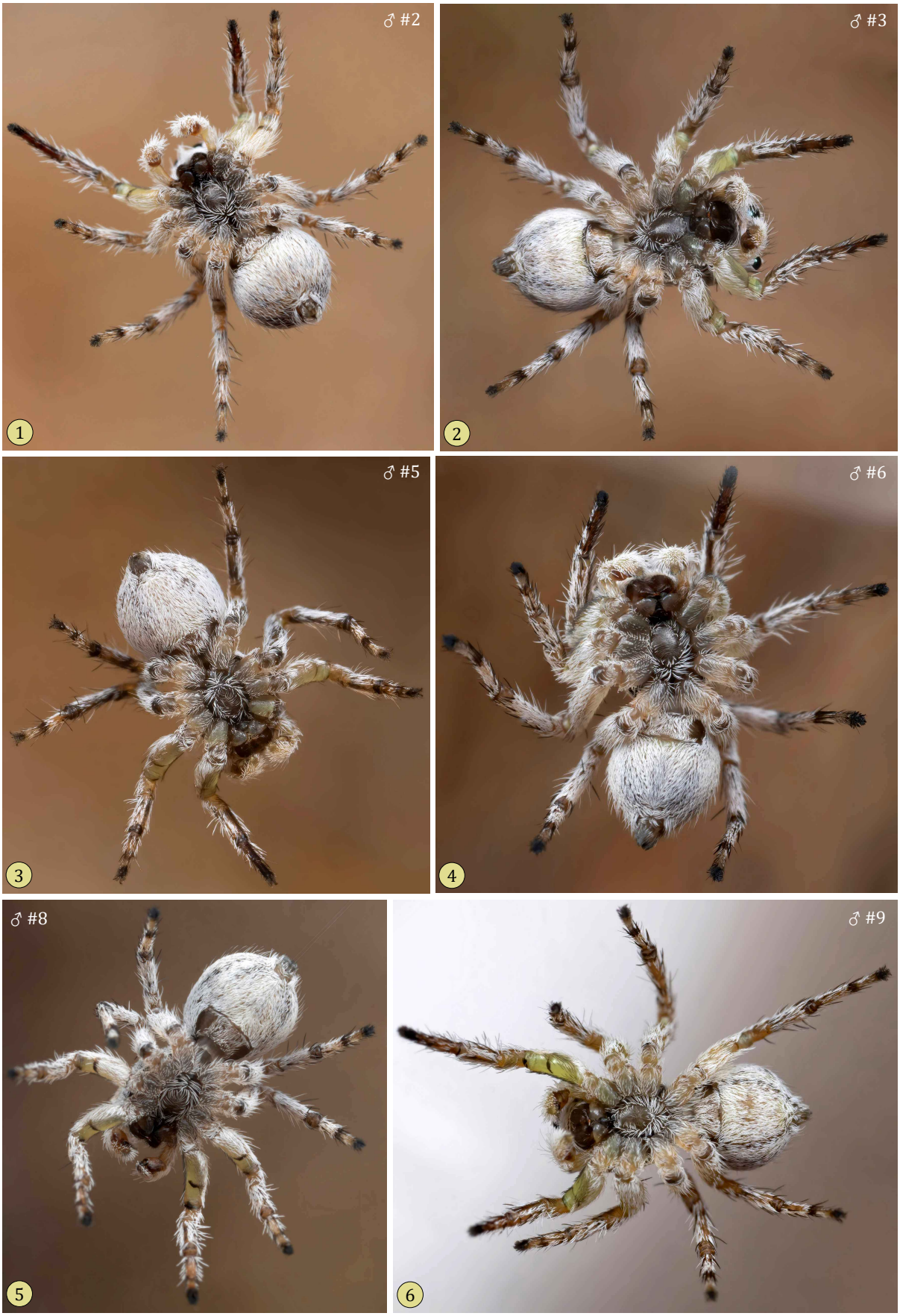


Figure 5. Ventral views of living male types for *Maratus ammophilus*.

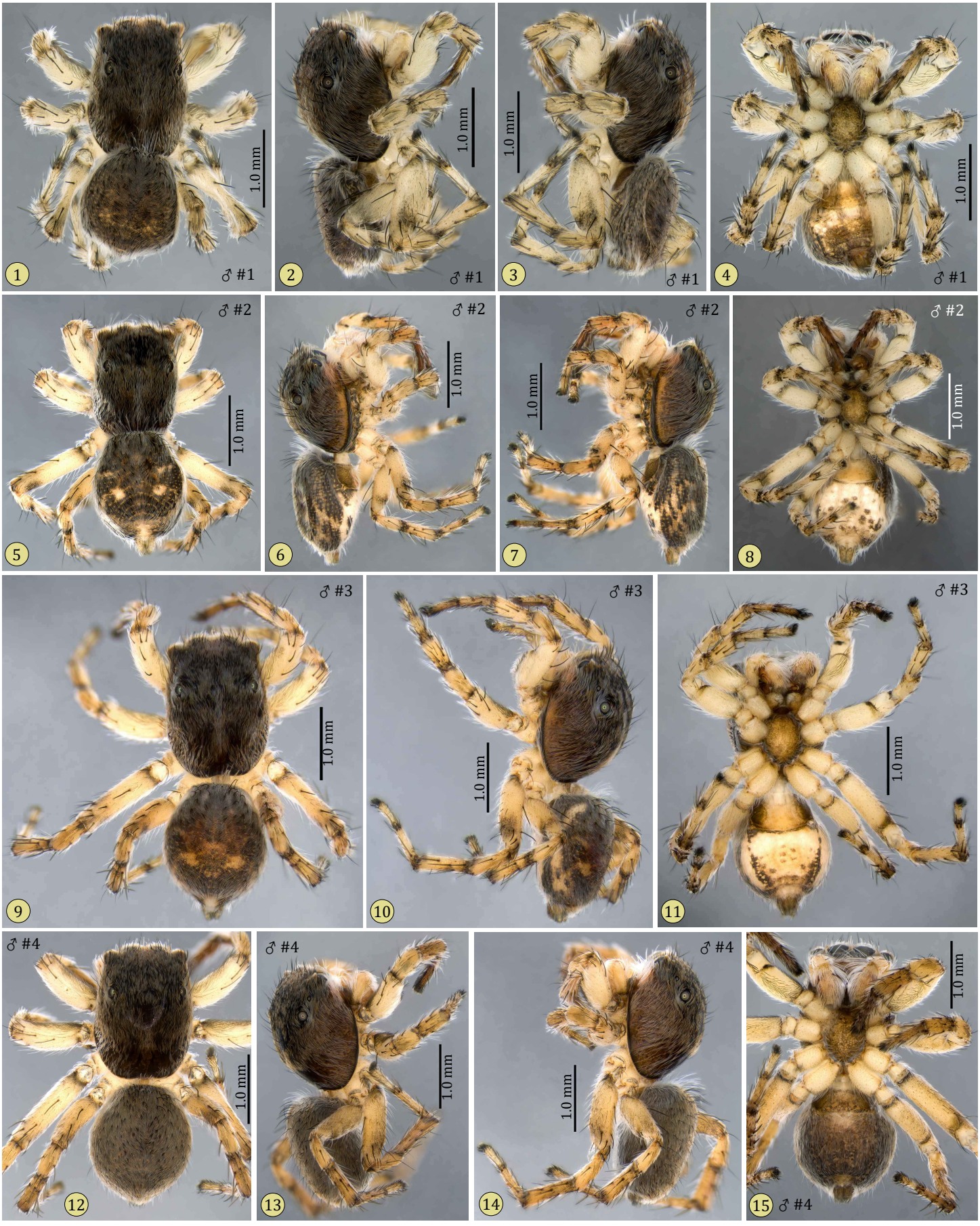


Figure 6 (continued on next page). Male types for *Maratus ammophilus*, in alcohol.

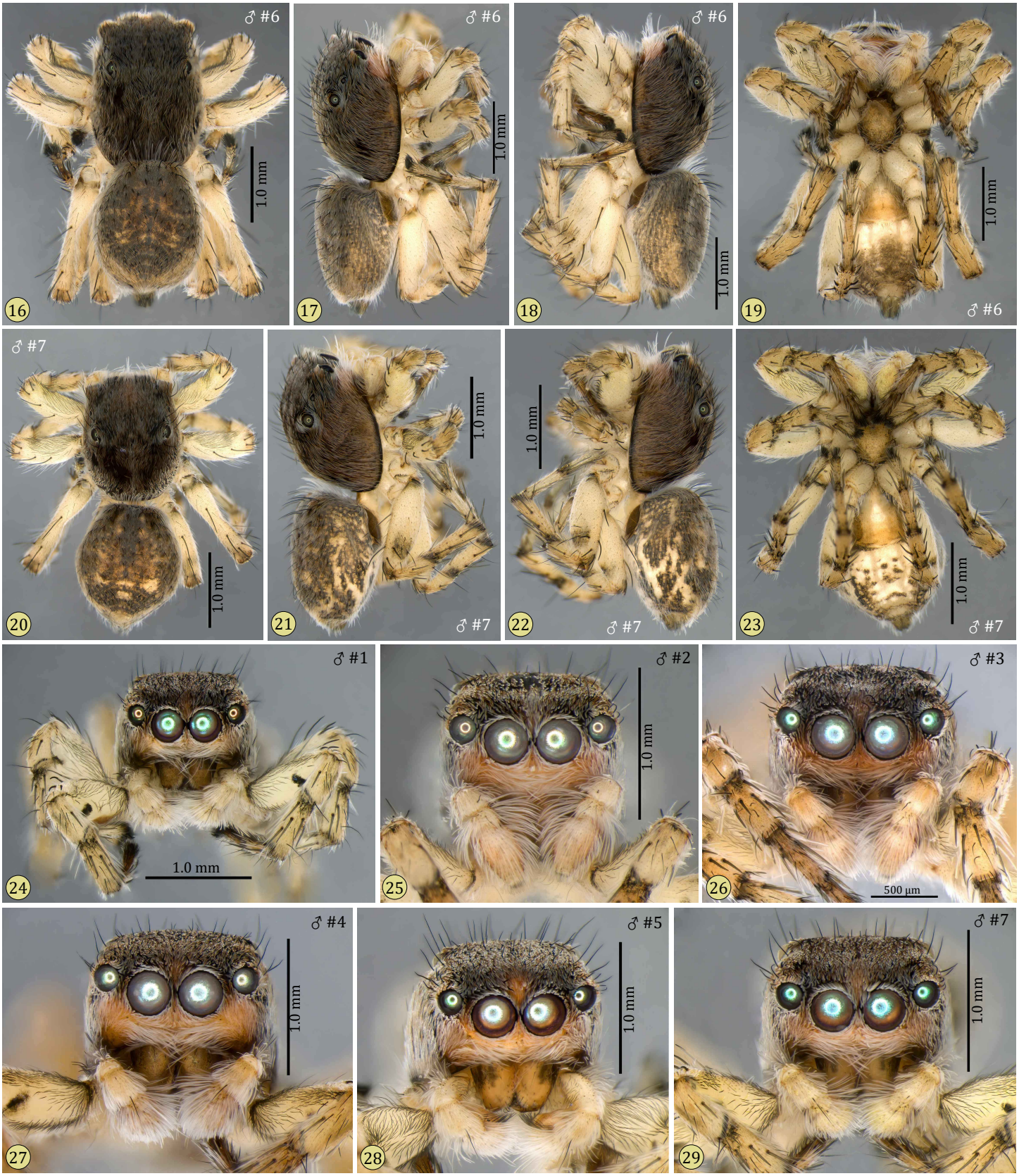


Figure 6 (continued from previous page). Male types for *Maratus ammophilus*, in alcohol.

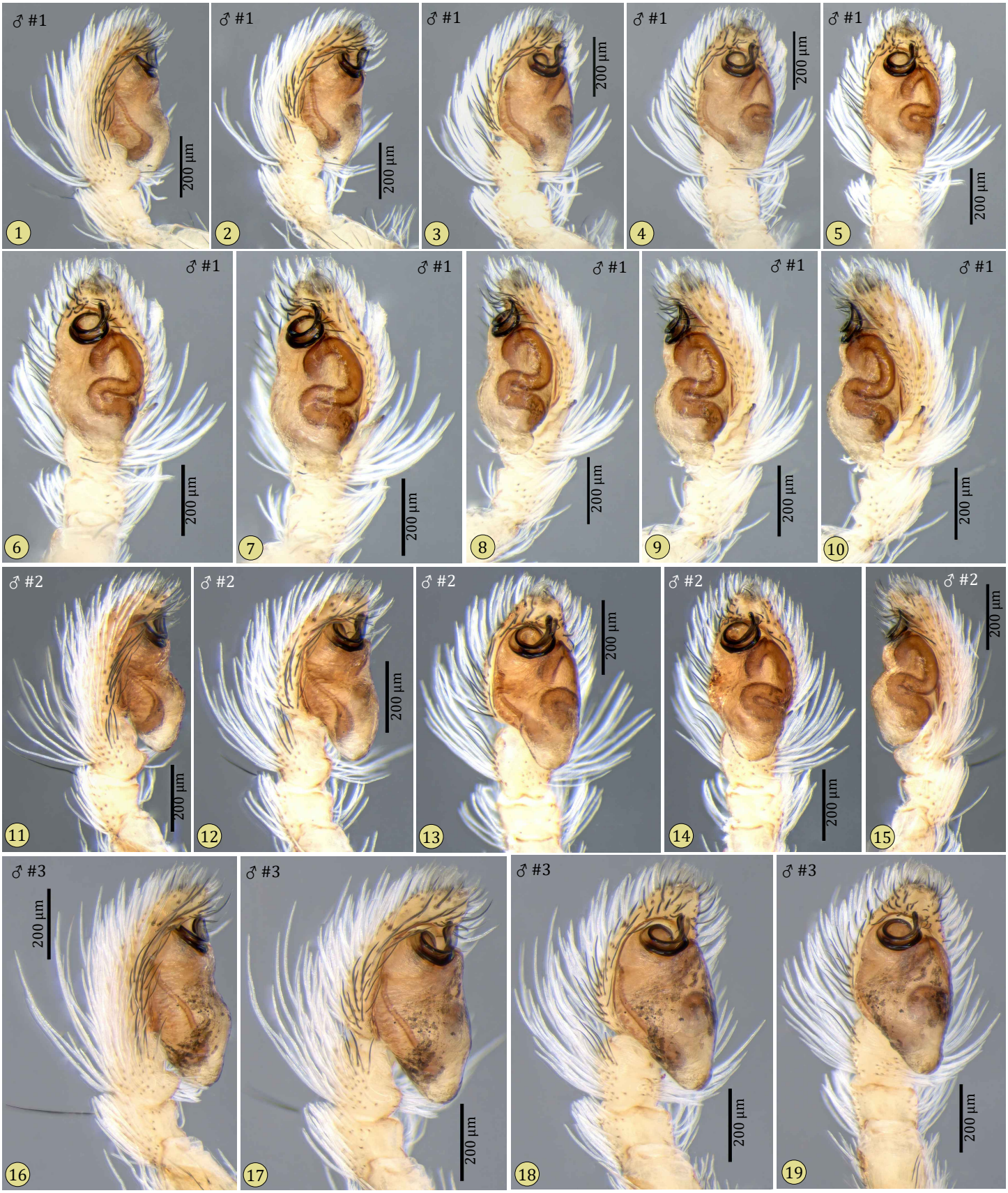


Figure 7 (continued on next page). Medial to lateral views of the left pedipalp of male types for *Maratus ammophilus*, in alcohol.

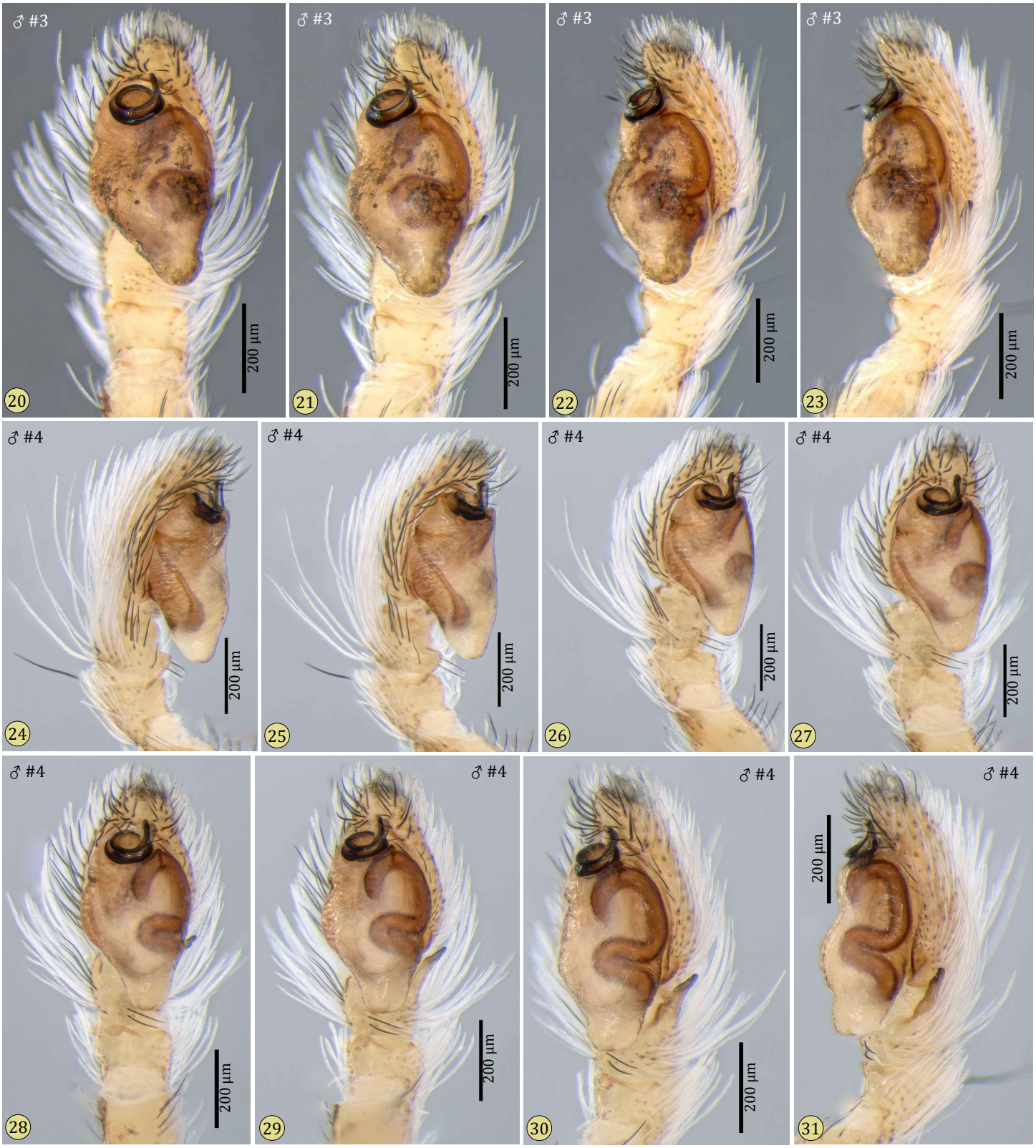


Figure 7 (continued from previous page, continued on next page). Medial to lateral views of the left pedipalp of male types for *Maratus ammophilus*, in alcohol.

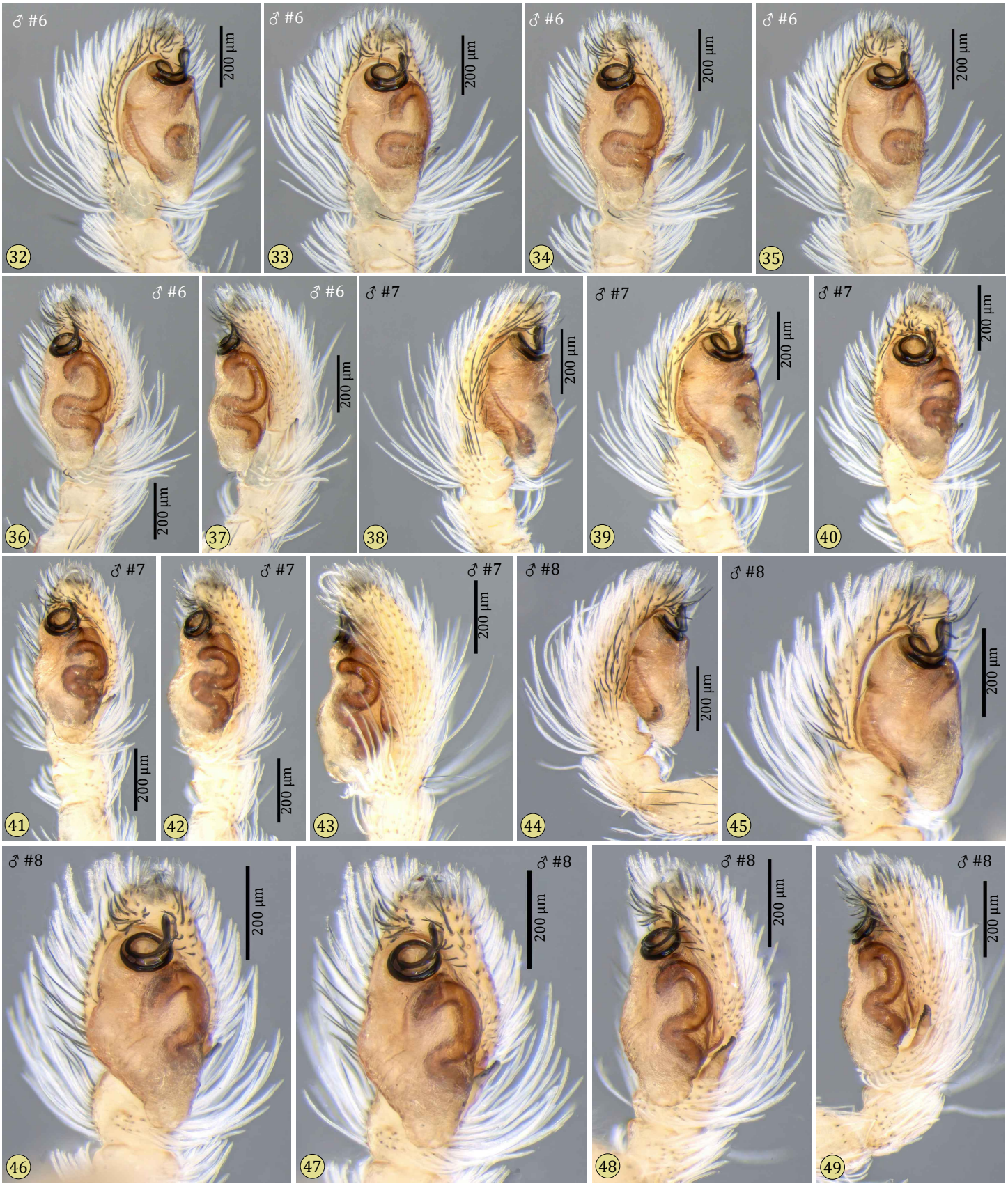


Figure 7 (continued from previous page). Medial to lateral views of the left pedipalp of male types for *Maratus ammophilus*, in alcohol.

Description of female (figures 8-10). Females (n=5) ranged from 4.0-4.9 mm in length. Colour very much like the male, although the yellow-green colouration beneath femora I and II may be subdued and obscured by long white setae.

Figure 8 (continued on next page). Living female types for *Maratus ammophilus*.

Figure 8 (continued from previous page, continued on next page). Living female types for *Maratus ammophilus*.

Figure 8 (continued from previous page). Living female types for *Maratus ammophilus*.

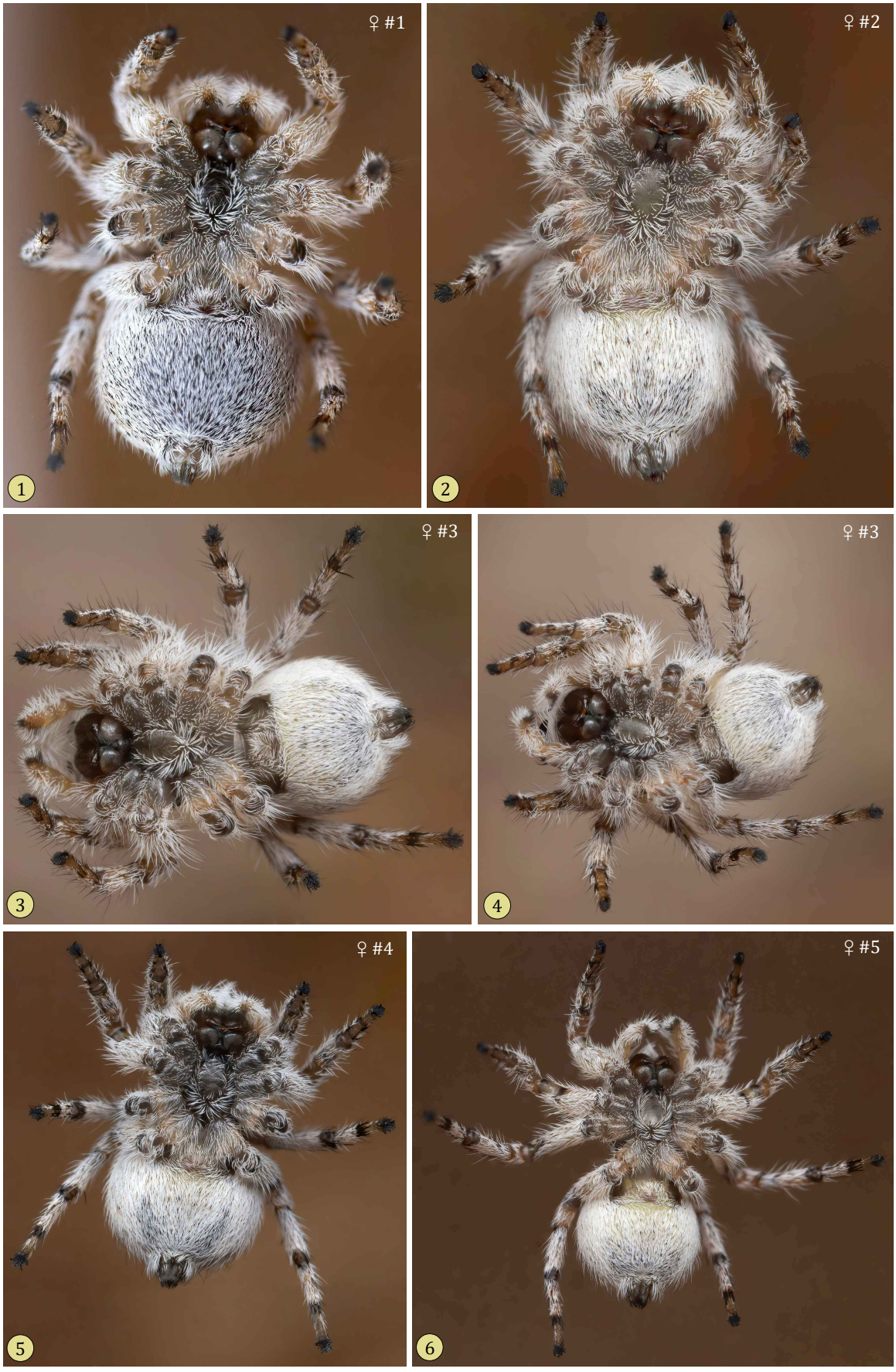


Figure 9. Ventral views of living female types for *Maratus ammophilus*.

Most of the type females have a fairly uniform but variable cover of off-white to light brown setae on the dorsum, but one (♀ #2, Figure 8:4-12) is much more patterned or contrasty on the dorsum, with many areas bearing darker brown setae. Variable pigmentation of the cuticle is more evident in alcohol (Figure 10:1-20). All females have long, bright white setae on the face, projecting anteromedially over the top of the dark brown, glabrous chelicerae. Setae covering the lower sides of the carapace are also bright white. PME closer to the PLE than to the ALE. Legs I and II are shorter and of similar length, legs III and IV longer and also of similar length. The epigynum (Figure 10: 25-28) is unremarkable and similar to that of other *Maratus*, with large fossae and posterior spermathecae of similar size.

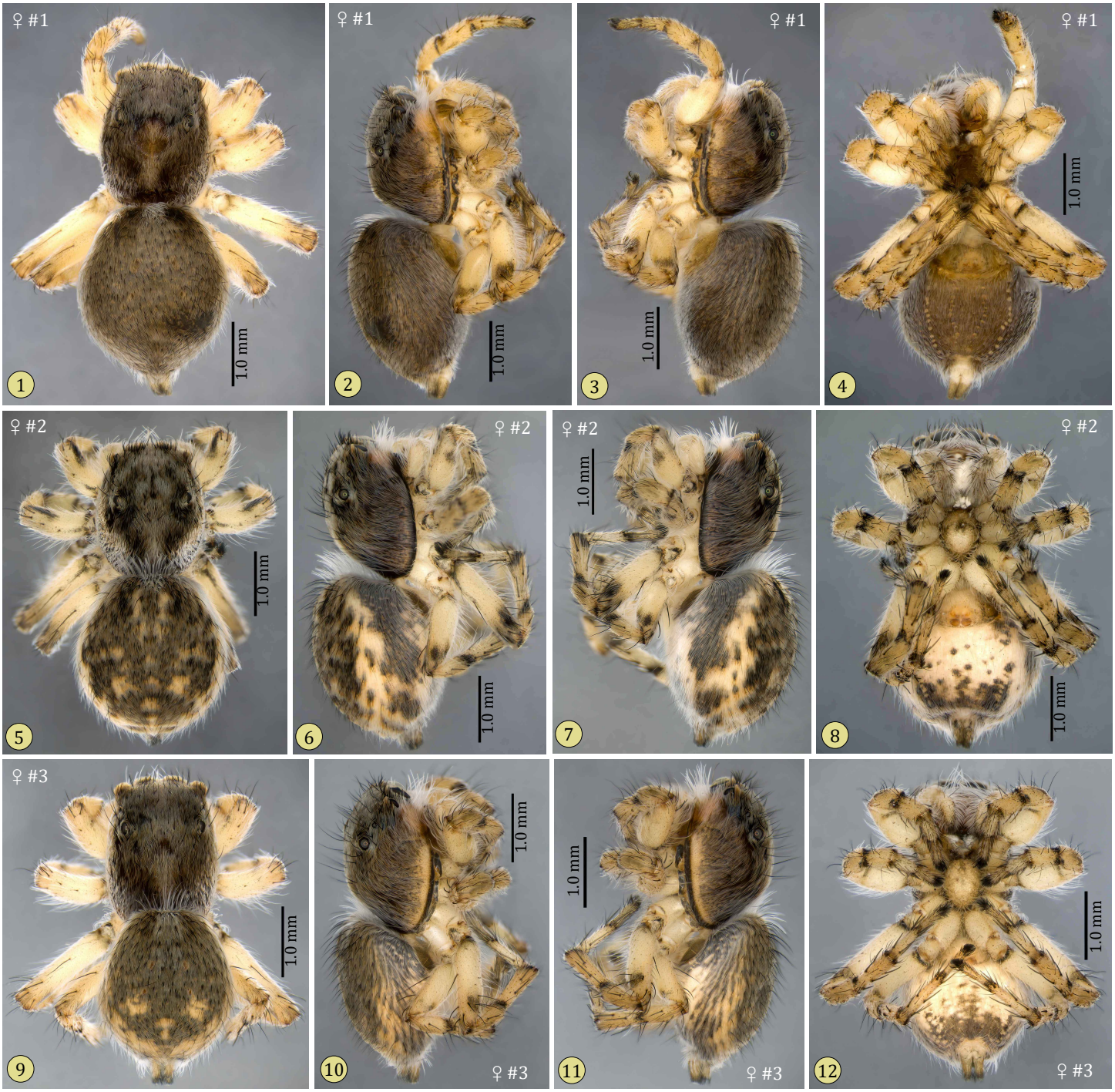


Figure 10 (continued on next page). Female types for *Maratus ammophilus*, in alcohol.

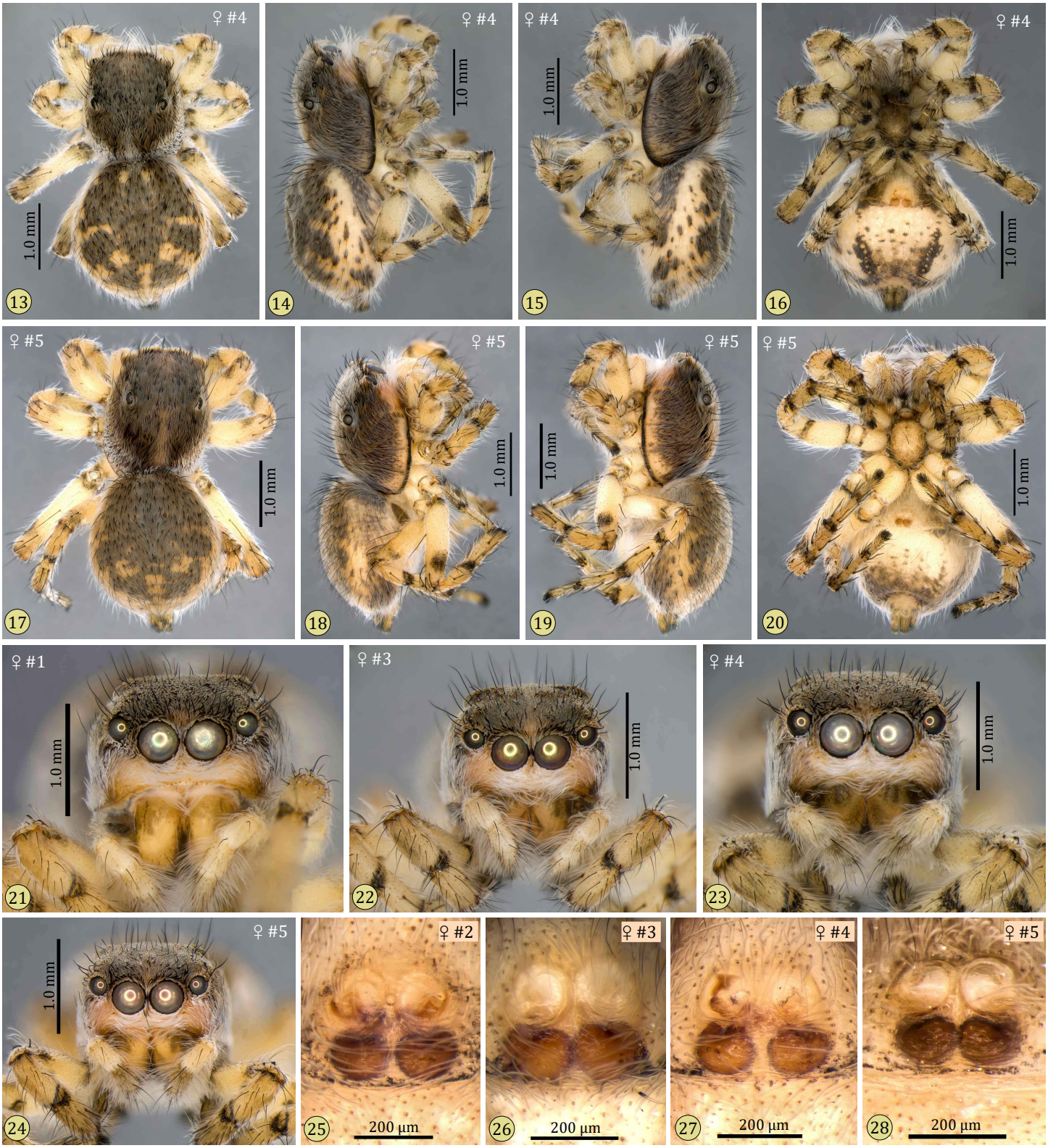


Figure 10 (continued from previous page). Female types for *Maratus ammophilus*, in alcohol. **25-28,** Ventral views of epigynum, anterior toward the top of the page.

Immatures (Figure 11). Immature *Maratus ammophilus*, even in the first emergent (free-living) instar (II), have a colouration similar to that of adults.

Figure 11. Immature *Maratus ammophilus*. Numbers (#) correspond to the identification numbers assigned to adults.

Courtship (Figures 12-16). Courtship display in *Maratus ammophilus*, as observed under natural conditions in the laboratory, is relatively simple, with the male moving intermittently (discontinuously) from side to side in front of the female, holding each new position with legs I extended and elevated to display the prominent markings on the underside of the femora, as legs III are extended to the sides. In this position, the ornamentation under legs II is also visible to the front. During this display the white pedipalps are held in place in front of the dark and glabrous chelicerae. As shown in Figure 12, the male tends to keep legs II in place when moving the elevated and extended legs I and III to one side or the other, and may even keep legs II and IV in place during this movement without any stepping at all. This fixed placement or stance of legs II keeps them in a position where the ventral femora II, like the ventral femora I, are readily visible from the front. When legs III are widely extended this side-to-side rocking movement also has a *see-saw* effect.

The extent to which the opisthosoma is raised (never to a vertical position), or legs III are extended, varies. In addition, detailed placement of legs II and IV during each stance varies according to the surface on which the male is displaying. All aspects of this display are similar to those seen in other members of the *fimbriatus* group, although one species, *Maratus fimbriatus*, does not extend legs III, but also rotates the fan with each side-to-side movement.

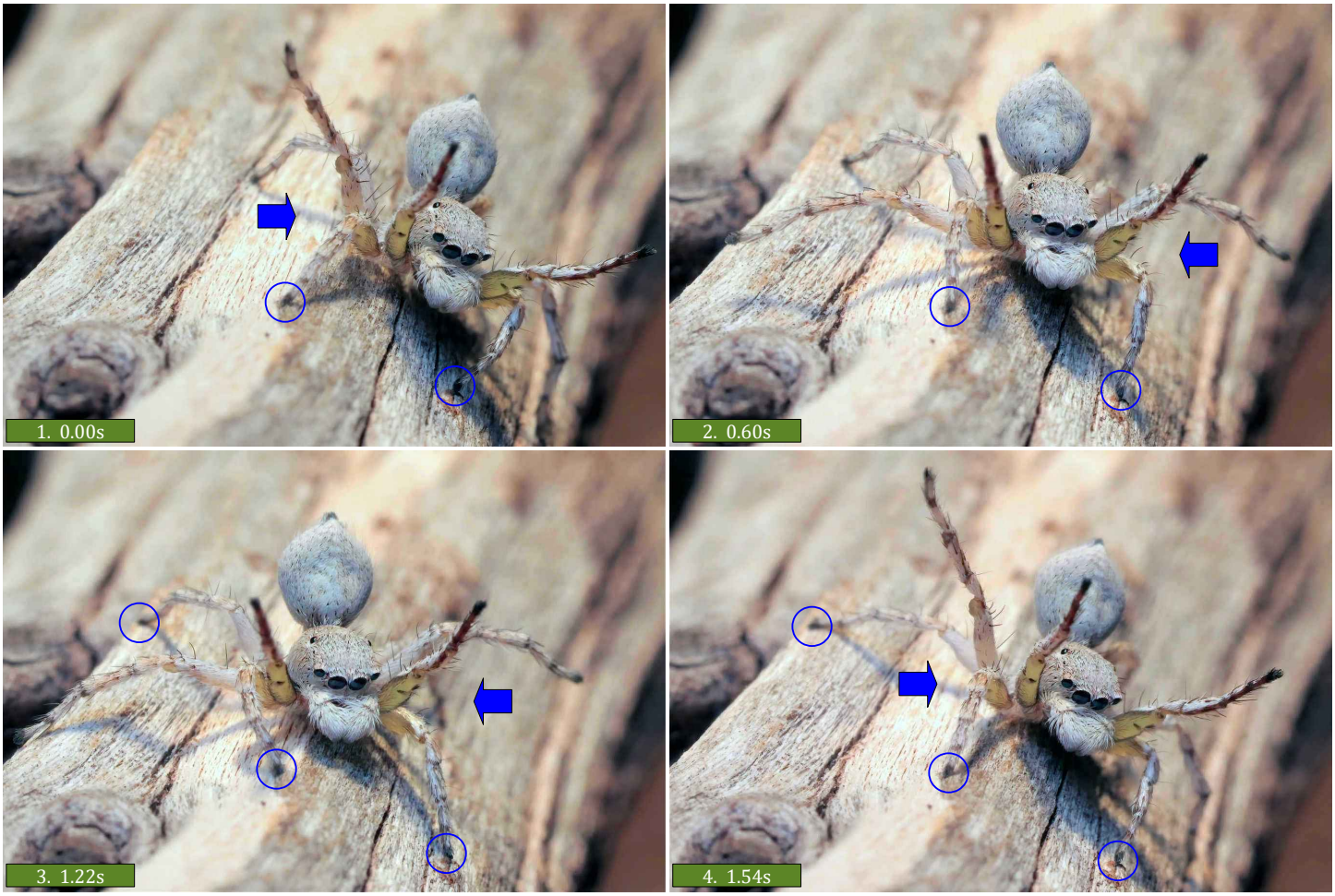


Figure 12. Frames from a 50 fps video of courtship by a male *Maratus ammophilus*, showing four sequential positions held during display. The direction of movement from the previous frame is indicated with a blue arrow. Circles identify stationary legs on which this male pivoted. Throughout this sequence, the male held legs II in position. From 3-4 the male also held legs IV in position while rocking to the side.

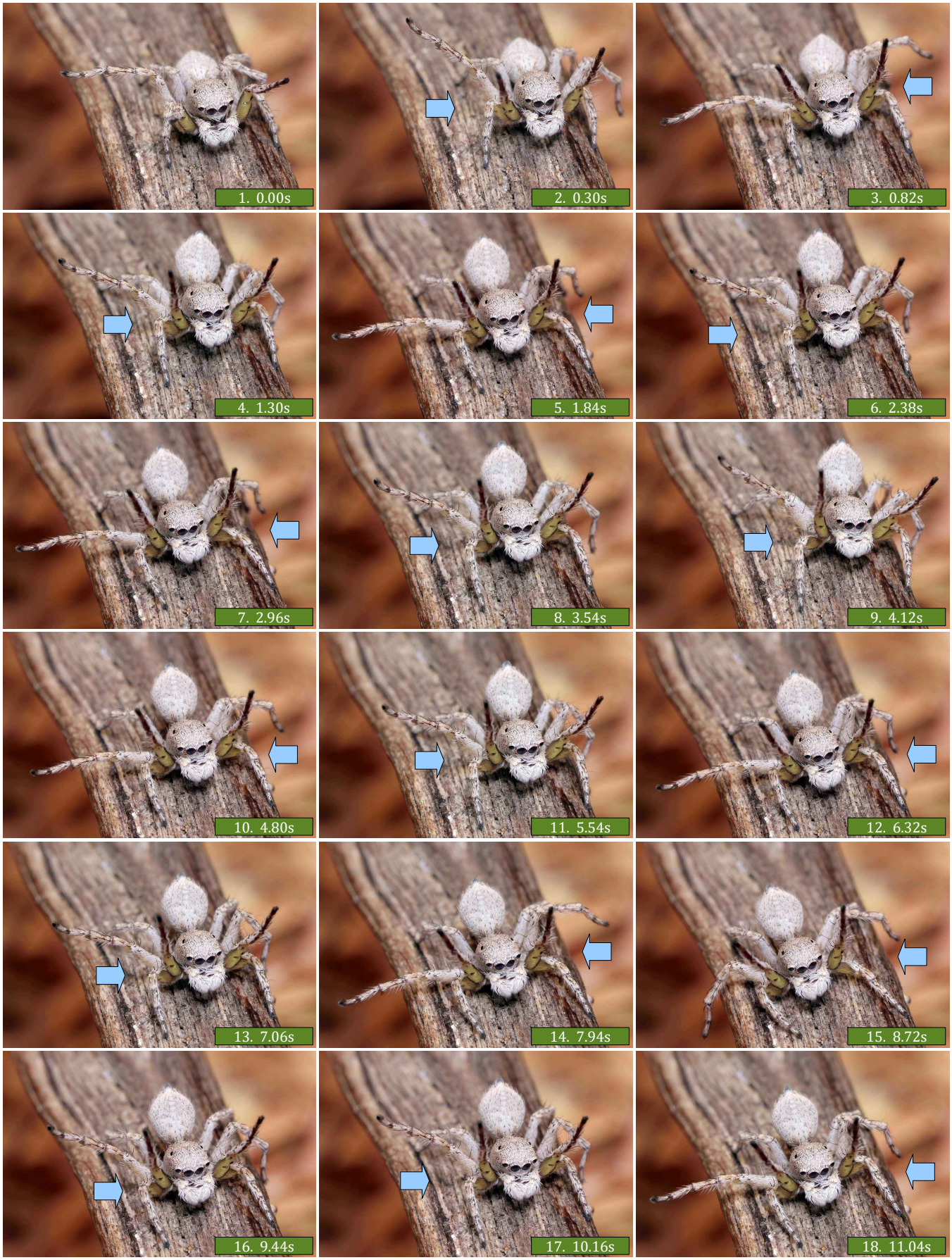


Figure 13 (continued on next page). Sequential frames from a 50 fps video of courtship by a male *Maratus ammophilus.* At times (e.g., 8-9) a male may make more than one pivot in the same direction, with legs II in place.

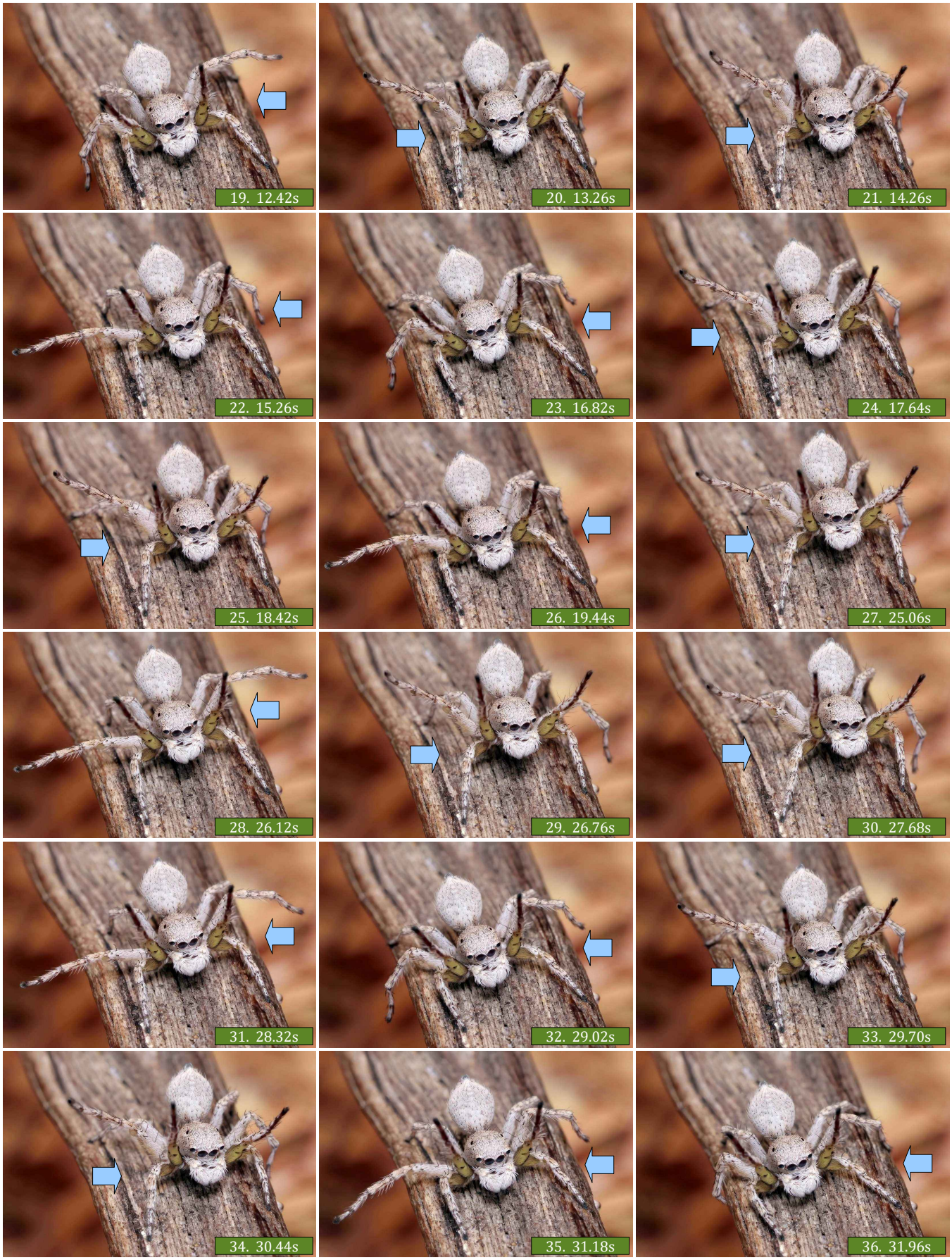


Figure 13 (continued from previous page). Sequential frames from a 50 fps video of courtship by a male *Maratus ammophilus*.

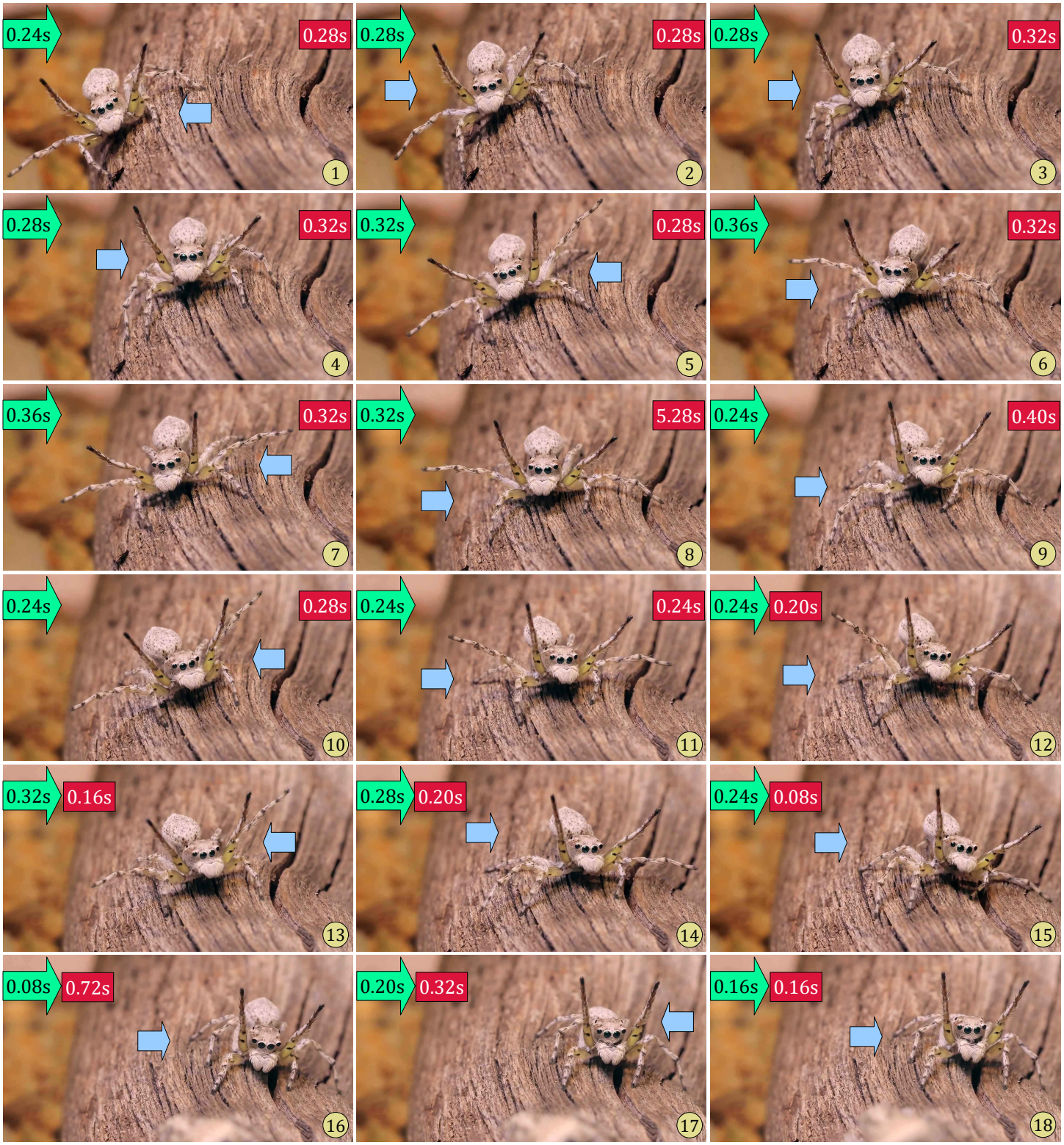


Figure 14. Frames from a 25 fps video of a courting male *Maratus ammophilus*, showing successive positions held by that male in front of a female. The time of transition from the previous position is shown in each green arrow, and the time that this spider remained in the depicted position is shown in each red rectangle. The direction of movement from the previous frame is shown with a blue arrow.

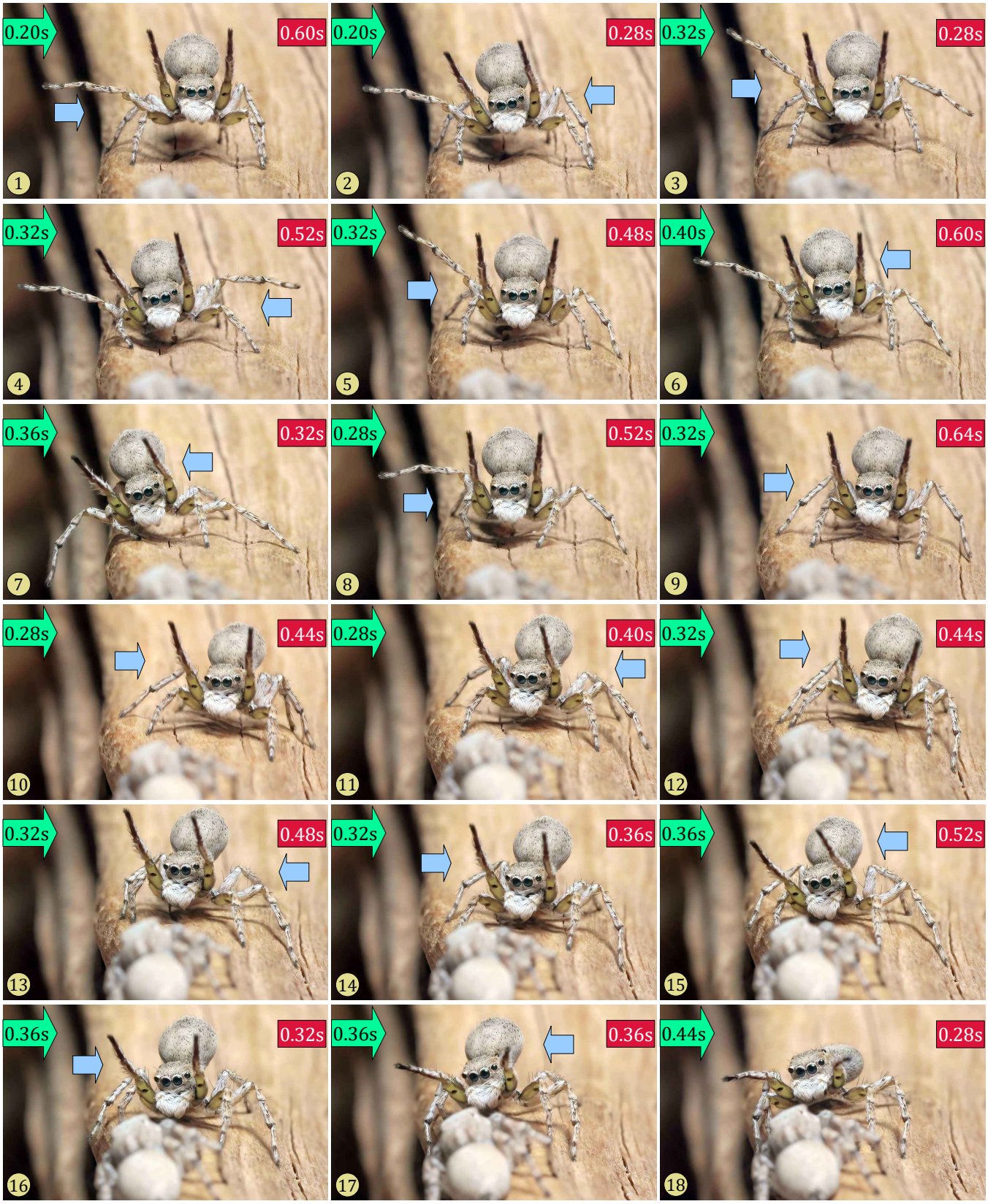


Figure 15. Frames from a 25 fps video of a courting male *Maratus ammophilus*, showing successive positions held by that male in front of a female. The time of transition from the previous position is shown in each green arrow, and the time that this spider remained in the depicted position is shown in each red rectangle. **18,** At the end of this sequence the male reached down to touch the courted female with legs I.

Figure 16 (continued on next page). Courting positions of male *Maratus ammophilus*. **4, 16-17,** During courtship legs III are not always extended. **5-6,** At times, particularly when more distant from a female, males did not elevate the opisthosoma during this display.

Figure 16 (continued from previous page). Courting positions of male *Maratus ammophilus*.

Mating. The erection of spines during mating by spiders corresponds to the transient increase in internal fluid pressure that occurs as seminal fluid is pumped from each pedipalp into the corresponding (same side) sperm duct of the female. This is documented for *Maratus ammophilus* in Figure 17.

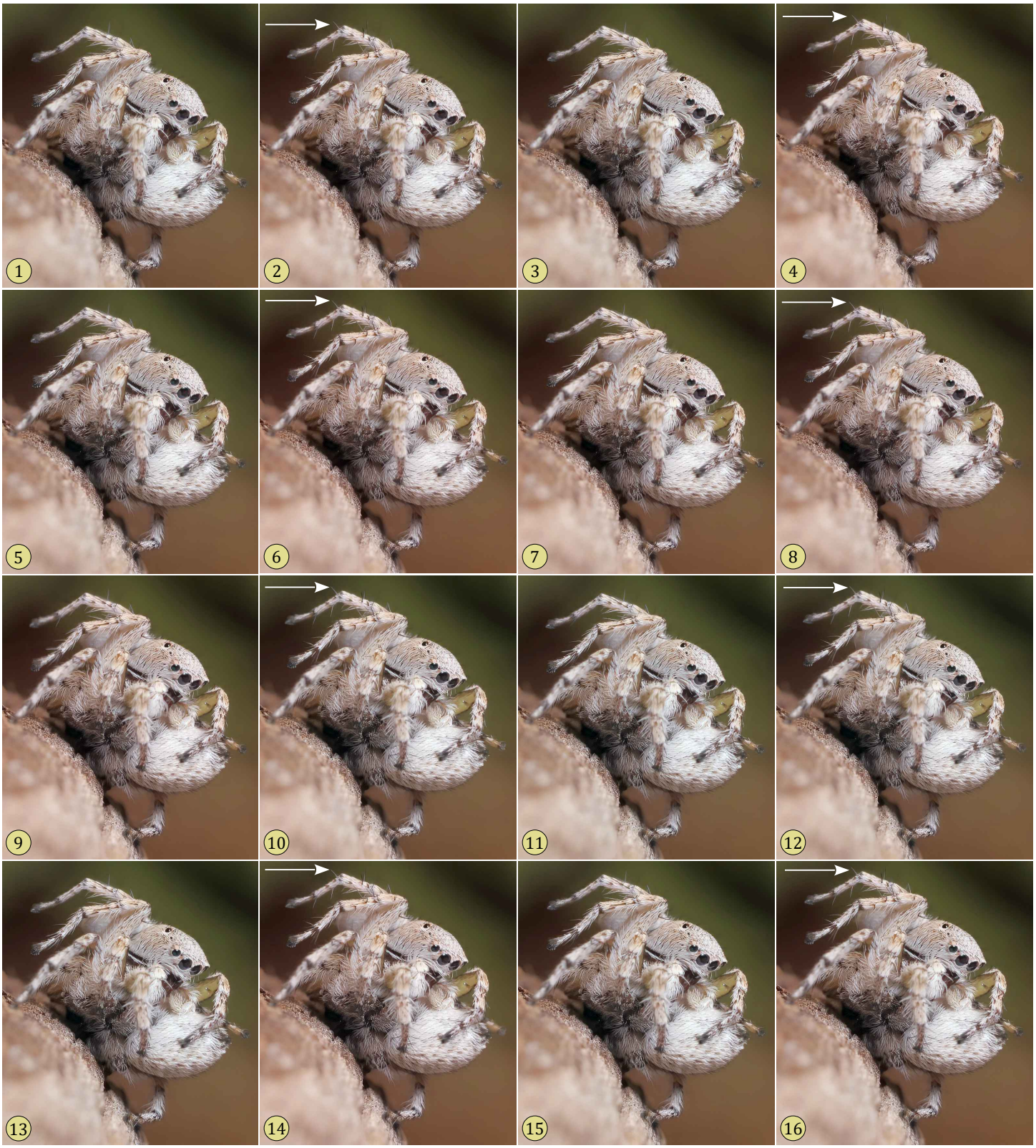


Figure 17. Sequential frames from a 25 fps video showing a mating pair of *Maratus ammophilus*. Extension of spines (arrows in even-numbered frames corresponds to a transient increase in internal fluid pressure of the male.

Habitat. *Maratus ammophilus* has been found on sandy ground, in coastal dunes along the Indian Ocean in Western Australia (Figures 2, 3:1-2, 18-19).

Figure 18. Sandy ground and coastal dunes at South Bay, Green Head, in Western Australia. Green Head is located midway between Perth and Geraldton.

Figure 19 (continued on next page). *Maratus ammophilus* at the beach at Kalbarri (27.703654°S, 114.167276°E). **1-2,** Adult male. Photo credits: 1-2, © Michael Lun, used with permission.

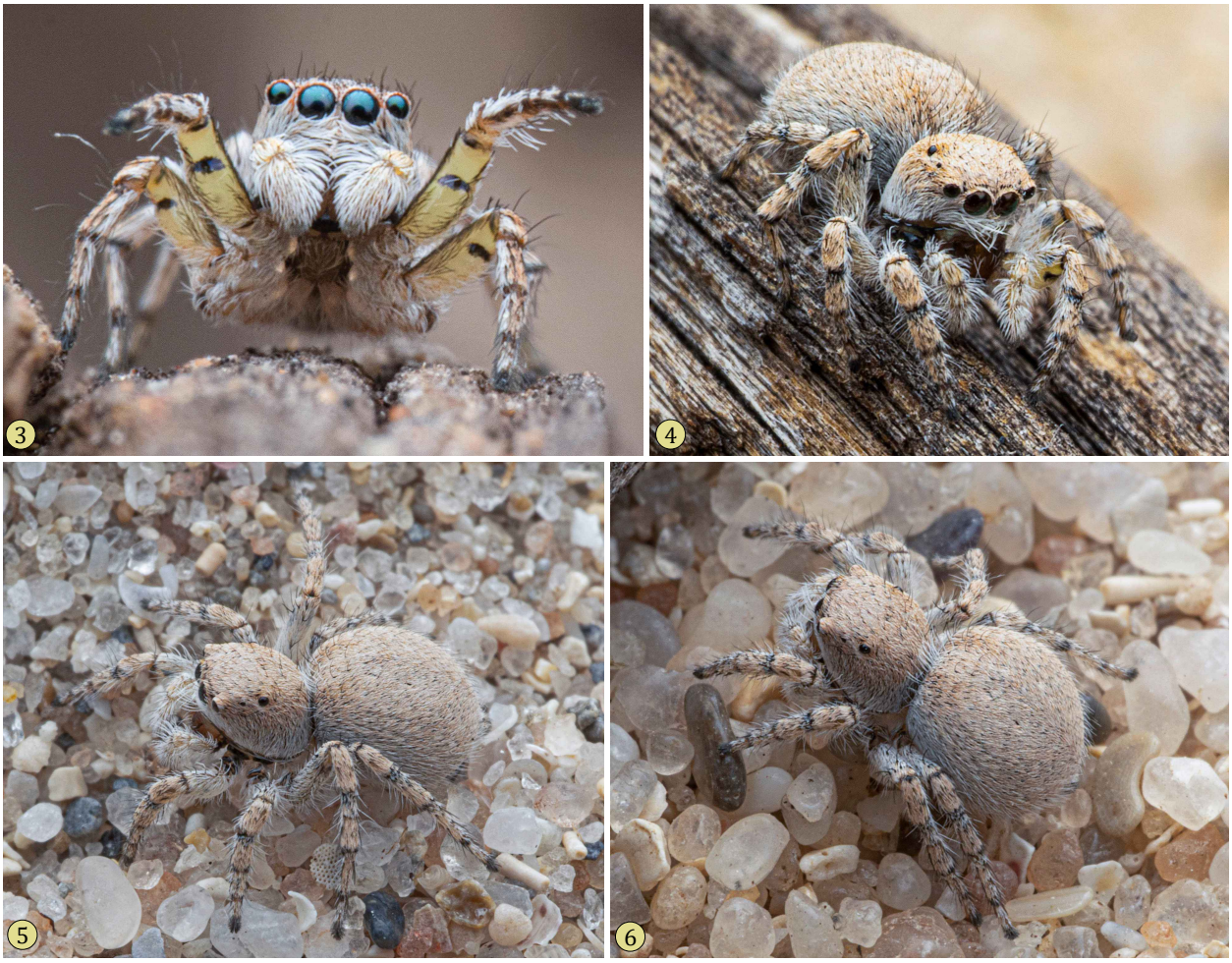


Figure 19 (continued from previous page). *Maratus ammophilus* at the beach at Kalbarri (27.703654°S, 114.167276°E). **3,** Adult male, showing the distinctive colouration of this species beneath femora I-II. **4-6,** Adult female. Photo credits: 3-6, © Michael Lun, used with permission.

Maratus fimbriatus **Otto & Hill 2016**

Maratus fimbriatus Otto & Hill 2016, ♂♀
Maratus licunxini Baehr & Whyte 2016, ♂ only, **new synonym**

Here we present a revised description of this species, as well as updated documentation of the male courtship display, including a comparison of populations in the interior of New South Wales and Queensland. Specimens collected in Queensland have previously been identified as *Maratus licunxini*. After a reexamination of the description and detailed photographs of type specimens for *M. licunxini* (Figure 20:1-7), as well as our study of a new male variety of this species from Queensland, we have determined that these forms all represent a single species, based in part on the variability of the scale patterns of the dorsal opisthosoma of the male (Figures 20-21), but also on the close similarity of all other characters that we have examined.

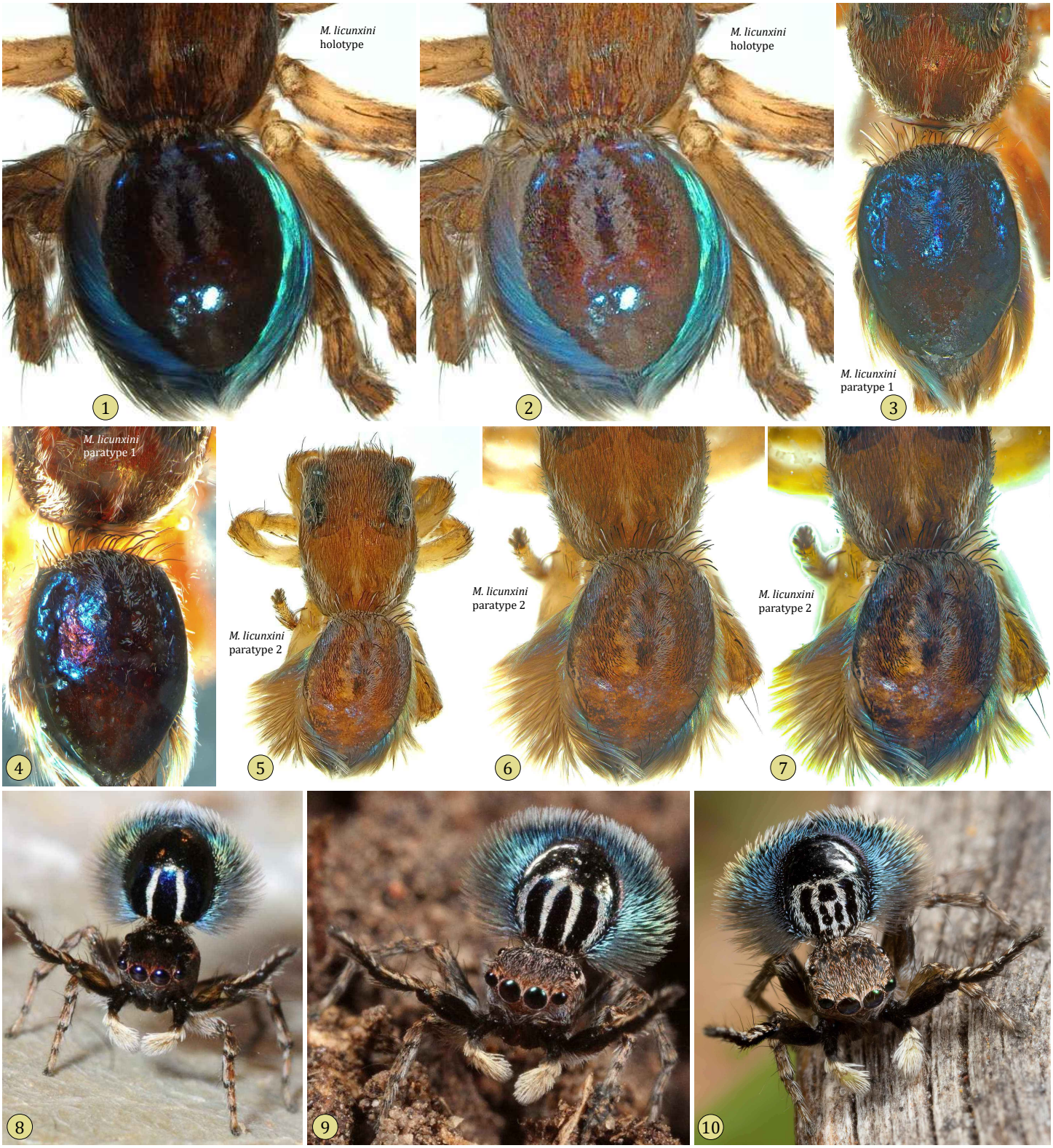


Figure 20. Comparison of male types for *Maratus licunxini* with other variants of *M. fimbriatus*. **1-2,** Two versions of the same image depicting the holotype for *M. licunxini*, Carnarvon QLD. The description of that species (Baehr & Whyte 2016) referred to the presence of an *inverted Y-shaped patch of dense white setae at the anterior edge* of the opisthosoma, visible in (1). However (2) reveals the presence of an additional, curved tract of white setae on either side of this Y-shaped tract, not mentioned in that description. **3-4,** Paratype 1 for *M. licunxini* is clearly rubbed and the pattern of setae is not clear. **5-7,** Setation of paratype 2 for *M. licunxini* is intact and reveals a more complex pattern. **8,** *M. fimbriatus*, Coolatai NSW. **9,** *M. fimbriatus*, northwest of Wyuna QLD. **10,** *M. fimbriatus*, west of Rewan QLD. Photo credits: 1-7, Owen Seeman, Queensland Museum, used with permission; 8, Stuart Harris and 9, Laurence Sanders each used under a CC BY-NC 3.0 AU license.

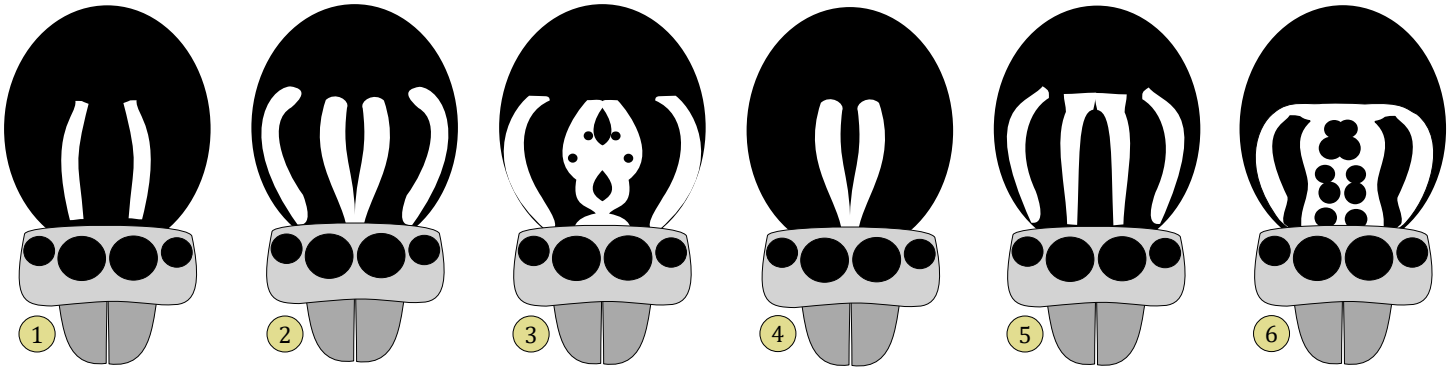


Figure 21. Schematic drawings depicting variation in the placement of white scale tracts on the dorsal opisthosoma of male *Maratus fimbriatus*. **1,** Typical form that has been found in New South Wales. **2,** Holotype male for *M. licunxini*, Carnarvon QLD (Figure 20:1-2). **3,** Paratype 2 for *M. licunxini* (Figure 20:5-7). **4,** Holotype male for *M. licunxini* according to published description (Baehr & Whyte 2016). **5,** *M. fimbriatus*, northwest of Wyuna QLD (Figure 20:9), with medial white tracts similar in shape to those found in specimens from New South Wales but otherwise similar to the holotype for M. *licunxini* (2). **6,** *M. fimbriatus*, west of Rewan QLD, with all four white tracts converging toward the rear, and five pairs of black spots near the median (Figure 20:10).

The description of the male *Maratus licunxini* from Carnarvon QLD also included a *chimney-like embolus opening at the prolateral part of the embolus* as a diagnostic character for that species, with reference to an SEM image of the same (Baehr & Whyte 2016). However we consider this to represent a general feature for species in the *fimbriatus* group, and in all respects, including details of the colouration of setae, we can find no characters of the male pedipalp to distinguish *M. licunxini* from other forms of *M. fimbriatus*.

A single female paratype was also described for *M. licunxini*, based on collection at the type locality, with the qualification that *conspecifity may be established when the courtship of this species is observed and the DNA is tested* (Baehr & Whyte 2016, p. 508). The epigynum of this female is distinctly different from that of female *M. fimbriatus* from either New South Wales or Queensland, for which courtship and mating with males has been observed and documented. We consider this female specimen to represent an undetermined (or indeterminate) species.

New material examined. Two male (♂ #1-2) and one female (♀ #1) *Maratus fimbriatus* were collected about 75 km east of the type locality for *M. licunxini*, 14 km west of Rewan, Queensland (24.976330°S, 148.390200°E, 21 NOV 2021, coll. Donna and Laurence Sanders. All specimens will be deposited in the Queensland Museum, Brisbane.

Etymology. The species group name (*fimbriatus*, Latin, m., adjective, English translation *fringed*) refers to the presence of a prominent fringe of long setae encircling the opisthosoma of the adult male (Otto & Hill 2016).

Diagnosis. The dorsal opisthosoma is encircled by a prominent fringe, and bears a variable series of white scale tracts in front, with the black, glabrous dorsal plate (scute) exposed to the rear. The inner and outer rings of the embolus of the male pedipalp are fused and shaped like a wheel rim, a characteristic shared with other members of the *fimbriatus* group. Legs I are elevated by the male, to display the dark brown or black/dark yellow-green anterior (prolateral) surface of each femur during courtship display. Unlike other members of the *fimbriatus* group, legs III are not extended laterally during that display.

Description of male (modified after Otto & Hill 2016; Figures 22-26). Males from New South Wales (N=26) ranged from 3.8 to 4.3 mm in length. New males from Queensland (N=2) ranged from 3.3 to 3.5 mm in length. The carapace is dark brown to black in life, fading to a lighter yellow-brown on the sides in preserved specimens. The carapace, including the clypeus, bears an incomplete and variable covering of off-white setae with more prominent off-white stripes extending to the rear behind the lateral eye row on either side. As in other *Maratus*, one or more stout setae may project forward at the median between the AME. Red-brown setae are scattered along the margins of the eye region. An indistinct middorsal or thoracic tract of off-white setae may extend to the rear behind the eye region, or it may be lacking. The margins of the carapace may be glabrous and dark brown, or a thin marginal line of white setae may be present. The proximal segments of the pedipalps, and the chelicerae are all dark brown to black and glabrous. The eyes do not have the blue or green colouration found in many other *Maratus*. The ALE are about 4/7 the diameter of the AME, separated from them by less than 1/5 the diameter of an AME. The small PME are nearly equidistant between the ALE and the PLE.

The anterior 2/3 of the dorsal plate of the opisthosoma is covered with a circular area of black scales, interrupted by variable tracts of white scales (Figures 20-21). Behind this the dorsal plate is exposed, black, glabrous, and very shiny. Laterally the dorsal plate is flanked by a thick fringe of long, curved, bicoloured setae on either side. These appear bright white when folded against the opisthosoma where only the distal part of each seta is exposed, but project a brilliant blue, iridescent colour toward the front when the opisthosoma is flattened and these fringes are extended to expose the coloured, proximal part of each seta. From the rear, the proximal portion of each fringing setae is dark brown and not iridescent. The lateral fringes come together at an acute angle (point) toward the rear when retracted. The underside of the opisthosoma is covered with off-white setae but may bear a circular area of brown setae toward the rear, and the brown covers of the book lungs are exposed. The spinnerets are relatively small, brown, and unremarkable.

The coxae and trochanters of all legs are dark with a cover of off-white setae. The sternum is dark brown to black with off-white setae around the margins. Like the chelicerae, the labium and proximal segments of the pedipalps including the endites are dark brown to black and glabrous. Legs I and II are about the same length, much shorter than legs III and IV. Legs III and IV are about the same length. All legs are indistinctly marked and covered with off-white to light-brown setae, with more white on the dorsal femora. Legs I have special markings used in display, however, to include glabrous dark brown or black to dark yellow-green surfaces of the anterior femora, with all segments distal to the femora dark brown on the underside with few setae.

As viewed from below the pedipalps resemble those of other *Maratus*. The circular embolus has the appearance of a wheel rim, darker or more sclerotized at each rim margin, with a terminal projection bearing a seminal pore at the prolateral side of the rim. The long, bright white to off-white setae of each dorsal tibia and cymbium resembles a 'pom pom', offset by the dark, glabrous proximal segments of each pedipalp. These figure prominently in the male display, when the pedipalps are held in a lower position to display the dark brown, glabrous paturon of each chelicera .

Figure 22. Male *Maratus fimbriatus* from the type locality near Nyngan, New South Wales.

Figure 23. Two male *Maratus fimbriatus* from 14 km west of Rewan, Queensland. Note the complex pattern of white scales on the anterior 2/3 of the dorsal opisthosoma. **11-12,** Depending on the relative angle of illumination, the reflectance of the glabrous posterior 1/3 of the dorsal opisthosoma varies.

Figure 24. Two male *Maratus fimbriatus* from 14 km west of Rewan, Queensland, in alcohol.

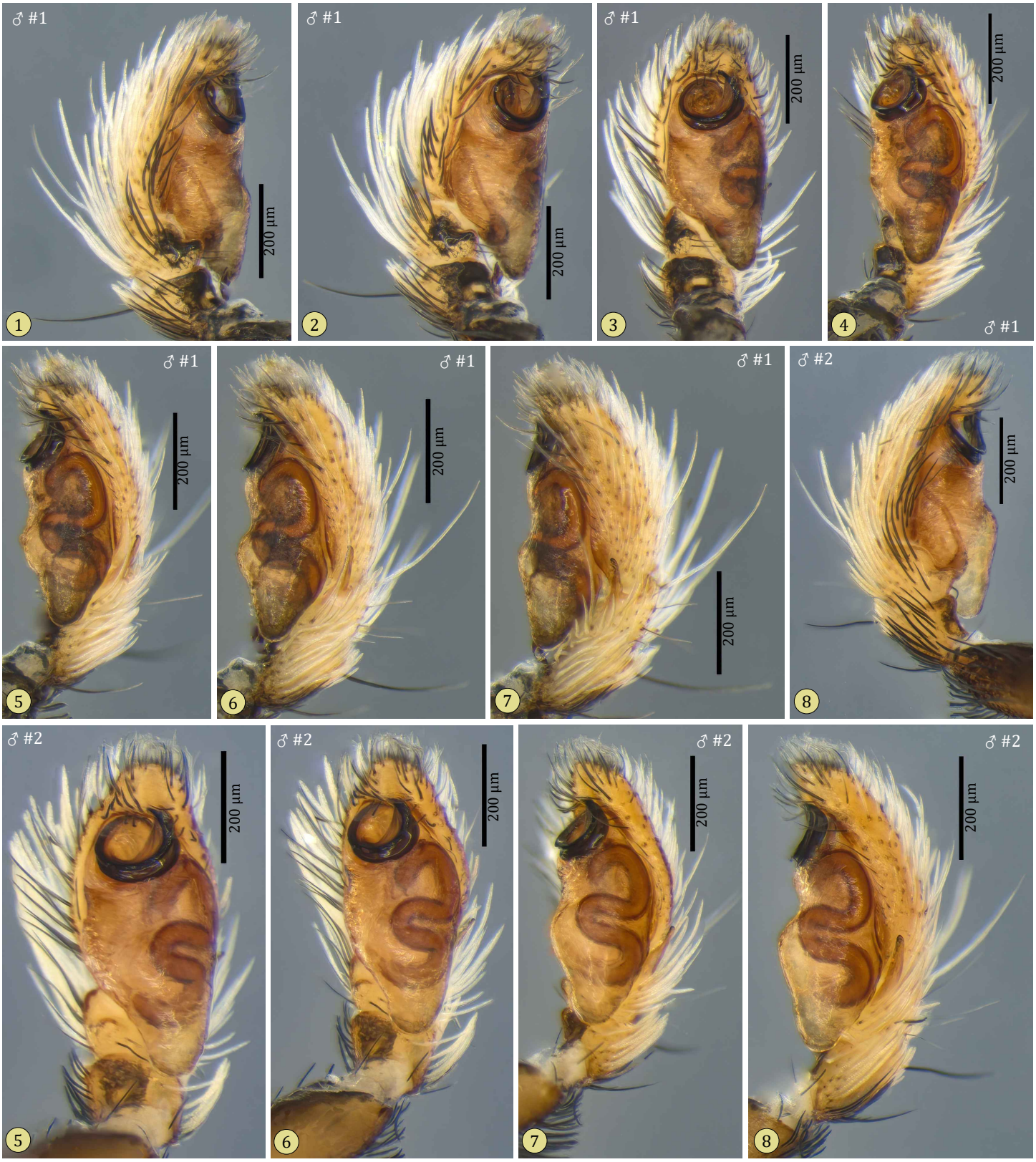


Figure 25. Medial to lateral views of the left pedipalp of two male *Maratus fimbriatus* from 14 km west of Rewan, Queensland, in alcohol.

Figure 26. Ventral views of two male *Maratus fimbriatus* from 14 km west of Rewan, Queensland.

Description of female (modified after Otto & Hill 2016; Figures 27-28). The two paratype females and five females from the collection of the Australian Museum (N=7) ranged from 3.6 to 4.9 mm in length. One additional female from 14 km west of Rewan, Queensland, illustrated here, was 3.7 mm in length. In all details our female from Queensland closely resembles females collected previously in New South Wales.

The body, legs, and pedipalps of females are covered with a *salt and pepper pattern* of light to dark grey or brown setae with many light or dark brown spots. Many long white setae project anteromedially from the clypeus, with the appearance of a distinct median tuft above the chelicerae. As in other *Maratus*, one to several small, stout setae may extend toward the front from the median of the clypeus, just below the AME row. The sides of the carapace bear a covering of long off-white setae. Above each lateral margin of the carapace, closely placed white scales or setae are aligned vertically. The chelicerae are dark brown and glabrous. The ALE are about 1/2 the diameter of the AME. The small PME are almost equidistant from the ALE and the PLE.

The anterodorsal midline of the opisthosoma may bear a black figure in the shape of a double-headed arrow, but otherwise the overall *salt and pepper pattern* of scales covering the opisthosoma is fairly uniform, with lighter and less patterned setae around the margins. Usually a pair of lighter, but otherwise indistinct, spots, each appearing as a small triangle, can be seen about 2/3 of the distance to the rear from the front of the opisthosoma. The spinnerets are relatively small and brown. The underside of more distal leg segments are more glabrous and brown. The sternum is brown and glabrous but fringed with off-white setae as in the male. Legs I and II are nearly equal in length, much shorter than legs III and IV which are also nearly equal in length.

The paired 'windows' (fenestrae or fossae) of the epigynum are large as is typical in *Maratus*. The paired posterior spermathecae are prominent but relatively small, somewhat separated from the fenestrae. Prominent ducts with a variable degree of sclerotization can be seen anterior to the large posterior spermathecae.

Figure 27. Female *Maratus fimbriatus* from 14 km west of Rewan, Queensland.

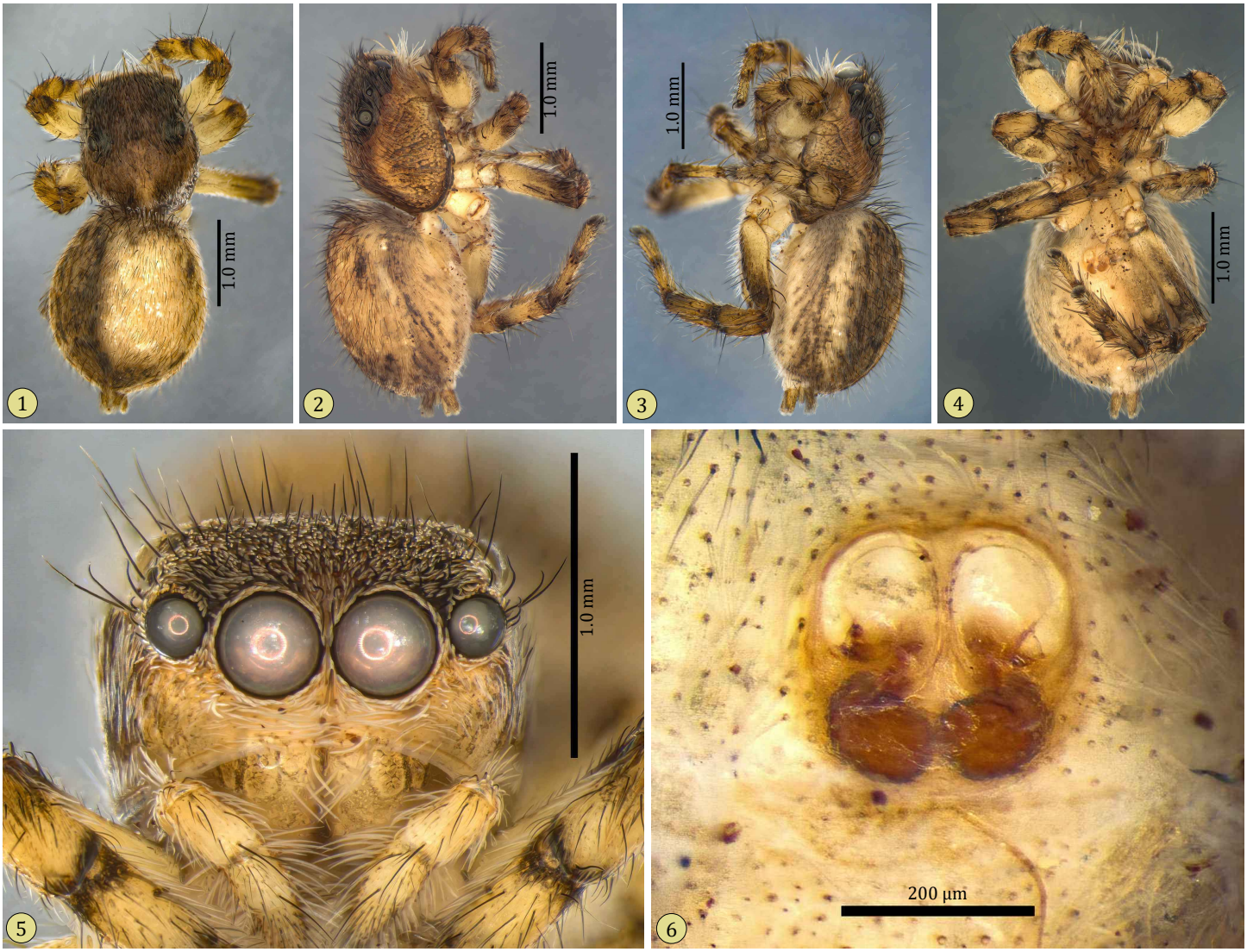


Figure 28. Female *Maratus fimbriatus* from 14 km west of Rewan, Queensland, in alcohol.

Immatures (Figure 29). Immature *Maratus fimbriatus* have not been described previously. The pattern of pigmentation of the first emergent instars (instar II, Figure 29:1-4), with two dark spots toward the rear, resembles that of older instars (Figure 29:5-13).

Courtship display (Figures 30-34). This is an update to our earlier description of the courtship display of male *Maratus fimbriatus*. As the male moves in a series of discreet steps (5.3-7.4 Hz) in front of a courted female, the expanded and elevated fan, with fringes extended, is first rotated slightly in a direction *opposite* to the direction of stepping, then quickly rotated back in the direction of stepping. We have observed the same behaviour in males from both New South Wales and Queensland populations, but similar movement does not appear to be a feature of the display of other members of the *fimbriatus* group. During display, the bright white pedipalps are held in lower position that exposes the dark and glabrous surface of each paturon.

Figure 29. Two immature male *Maratus fimbriatus* from 14 km west of Rewan, Queensland. **1-4,** Second instar of the first male. Note the distinct pair of dark spots toward the rear of the opisthosoma.

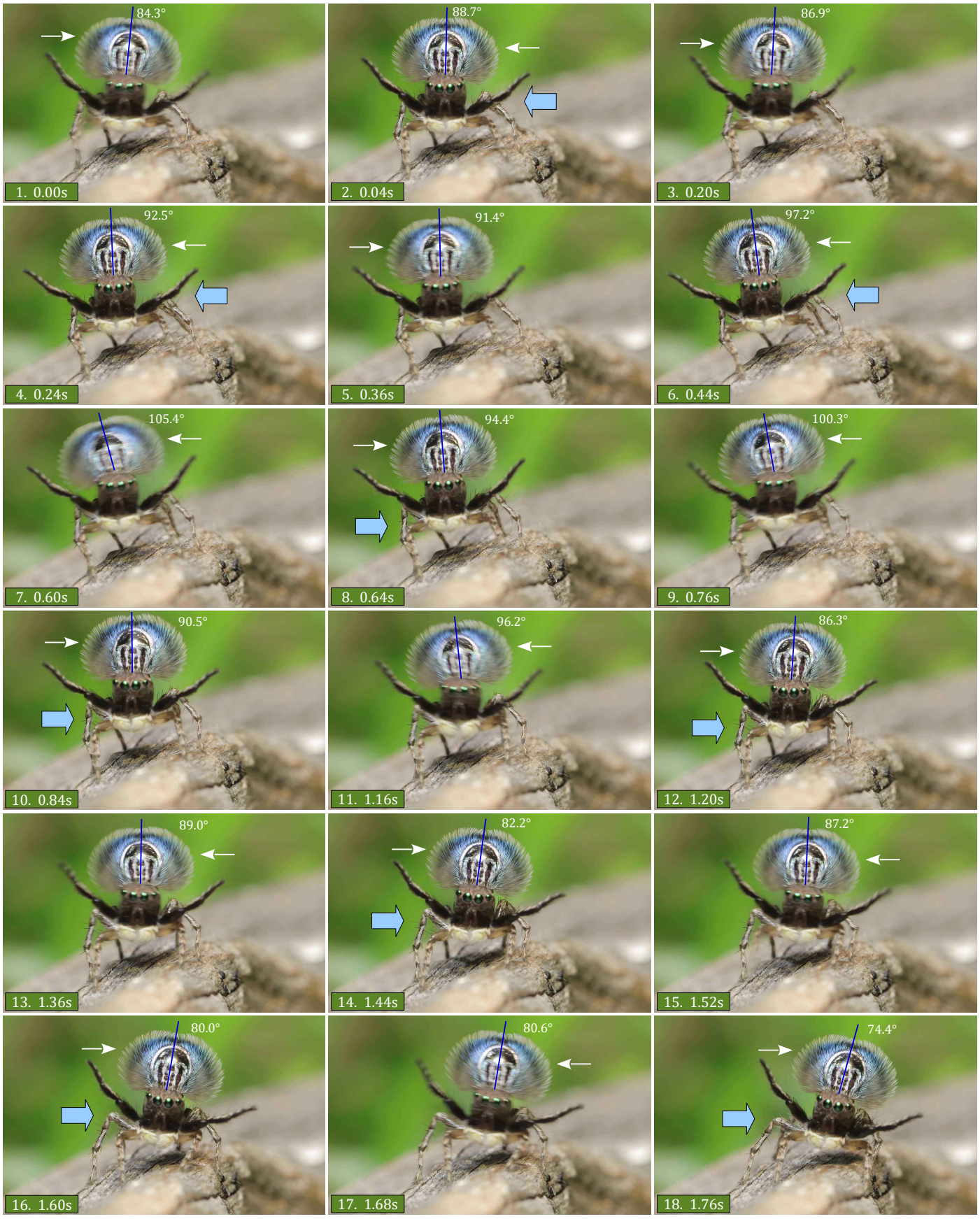


Figure 30 (continued on next page). Sequential frames from a 25 fps video of courtship display by a male *Maratus fimbriatus* from 14 km west of Rewan, Queensland (5.3 Hz steps). Rotation of the fan in a direction opposite to the stepping direction in followed by rotation of the fan in the direction of each step.

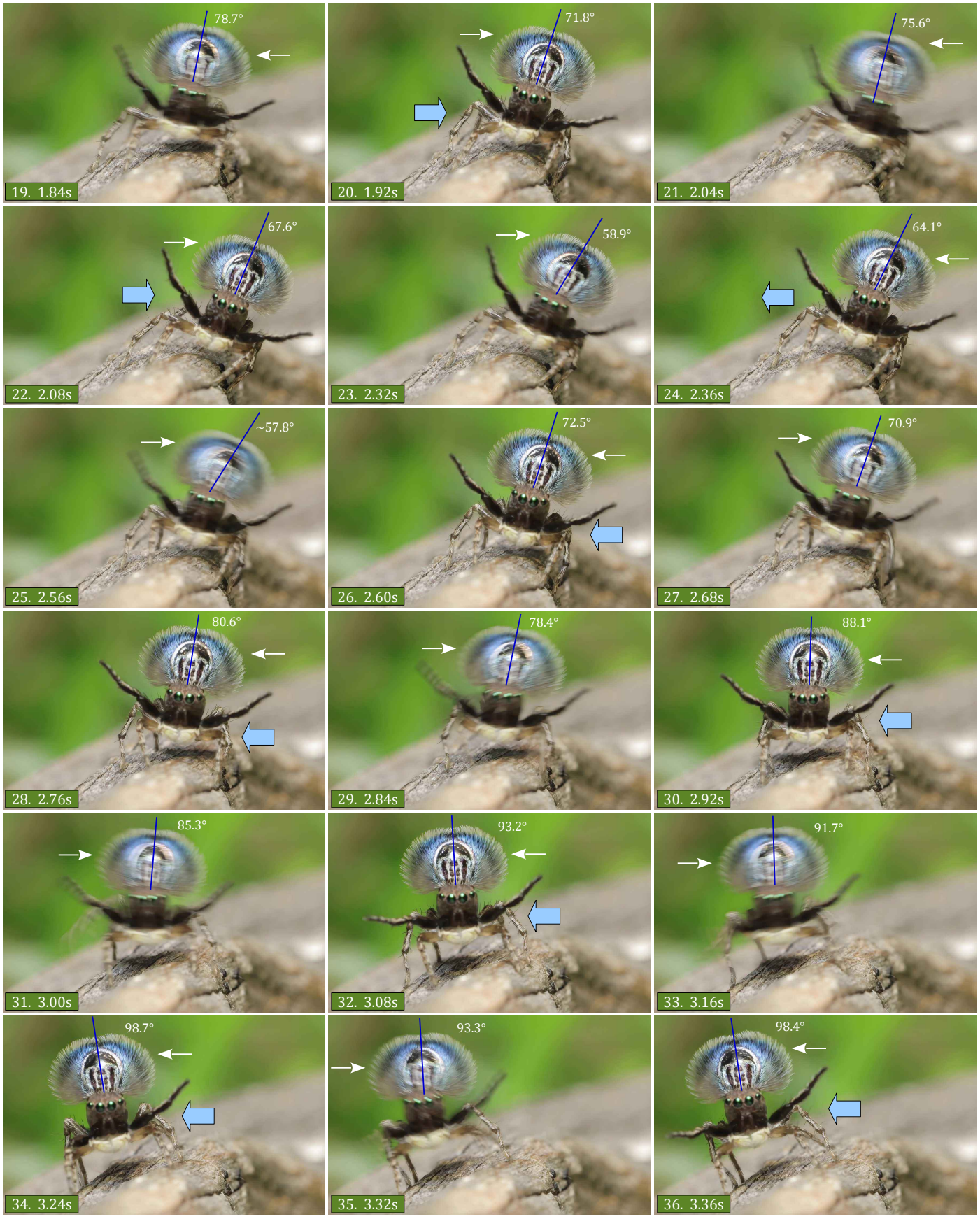


Figure 30 (continued from previous page). Sequential frames from a 25 fps video of courtship display by a male *Maratus fimbriatus* from 14 km west of Rewan, Queensland (5.3 Hz steps). Rotation of the fan in a direction opposite to the stepping direction in followed by rotation of the fan in the direction of each step.

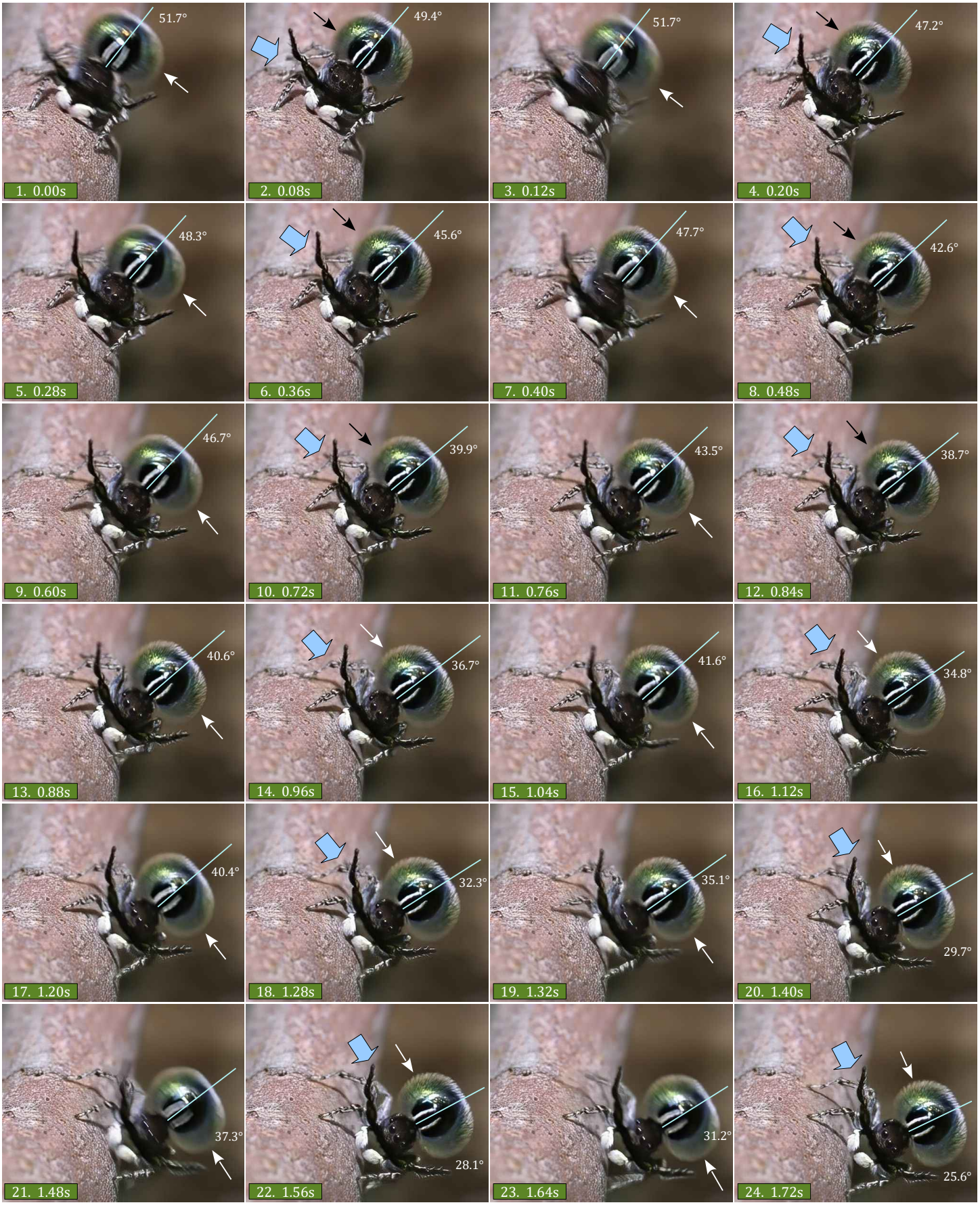


Figure 31. Sequential frames from a 25 fps video of courtship display by a male *Maratus fimbriatus* from the type locality near Nyngan, New South Wales (6.8 Hz steps), showing rotation of the fan in two stages with each step.

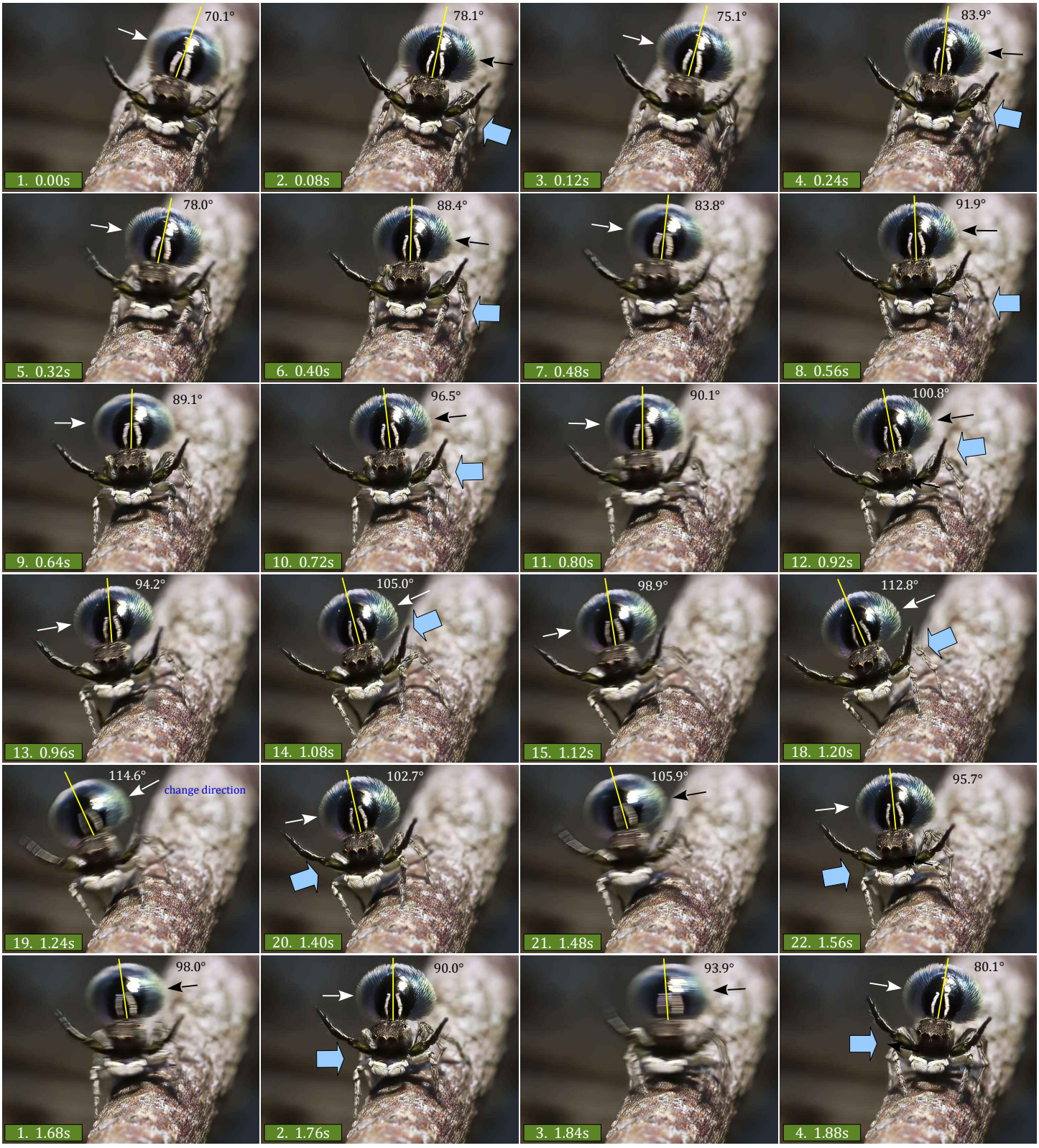


Figure 32. Sequential frames from a 25 fps video of courtship display by a male *Maratus fimbriatus* from the type locality near Nyngan, New South Wales (6.3 Hz steps), showing rotation of the fan in two stages with each step. Note the change of direction (19).

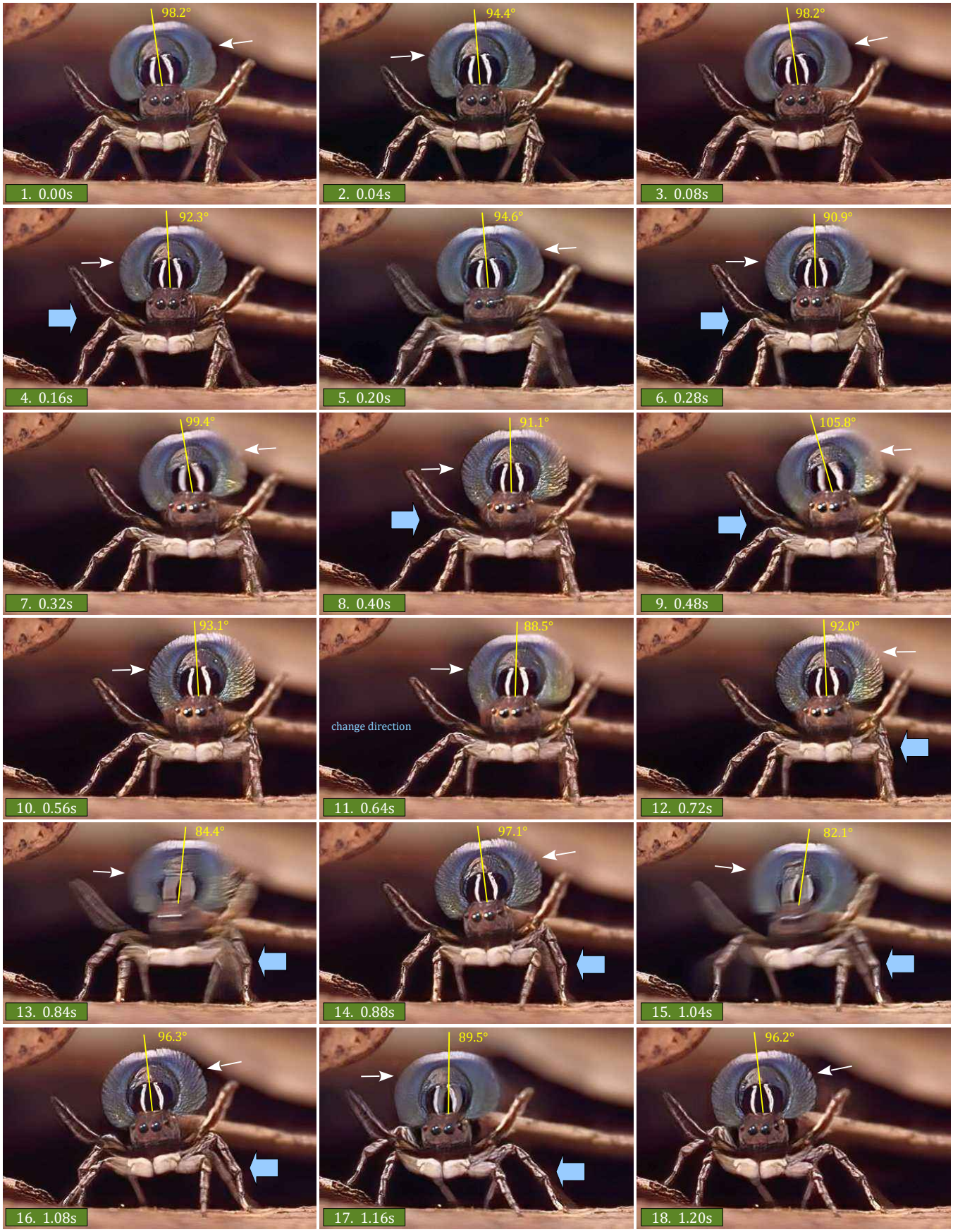


Figure 33. Sequential frames from a 25 fps video of courtship display by a male *Maratus fimbriatus* from the type locality near Nyngan, New South Wales (7.4 Hz steps), showing rotation of the fan in two stages with each step. Here the male was displaying from a horizontal surface. Note the change of direction (11).

Figure 34. Courtship display by two male *Maratus fimbriatus* from 14 km west of Rewan, Queensland. **12,** Note how the extended fringe is directed toward the front, on either side of the fan.

Habitat and distribution (Figures 2, 35-36). Like most other *Maratus*, *M. fimbriatus* has generally been found on or near the ground. In interior Queensland, this species was found on gravel and on an embankment at the side of a rural road.

Figure 35. Male *Maratus fimbriatus* on or near the ground west of Rewan, Queensland (24.97704°S, 148.3904°E). Photo credits: 1-6, © Wayne Winnington-Martin, used with permission.

Figure 36. Habitat of *Maratus fimbriatus* 14 km west of Rewan, Queensland (24.976330°S, 148.390200°E). These spiders were collected in gravel and on the embankment below a tree. 1-4, © Donna and Lawrence Sanders, used with permission.

***Maratus speculifer* (Simon 1909)**

Habrocestum speculiferum Simon 1909
Lycidas speculifer Żabka 1987
Maratus speculiferus Otto & Hill 2012
Maratus speculifer Otto & Hill 2017

For more than a century, this species, endemic to coastal areas near Perth, was the only known member of the *fimbriatus* group. Fortunately earlier descriptions by Simon (1909) and later by Żabka (1987) are quite good. We previously published Simon's description with an English translation (Otto @ Hill 2012, p. 78). However good published photographs of this species, and the undescribed female in particular, are lacking.

Etymology. The species name, *speculifer* (Lat., m., adj.); the English meaning *bearing a mirror* is clearly a reference to the shiny black scute that covers the dorsal opisthosoma of the adult male.

Diagnosis. Most closely related to *M. ammophilus*, n. sp., found along the coast to the north in Western Australia. See the diagnosis of that species for a comparison. Photographs of the living male and female, as well as Żabka's (1987) drawings of the male pedipalp, are shown in Figures 37-40.

Figure 37. Adult male *Maratus speculifer*, near Mindarie Marina (31.69498°S, 115.70220°E), collected by David Knowles. The mostly glabrous and glossy opisthosoma is distinctive. As in *M. ammophilus* new sp., femora I and II have two subsegments, separated by a shelf on the glabrous yellow-green ventral side. However, in *M. speculifer*, no black bands cross the distal end of each subsegment.

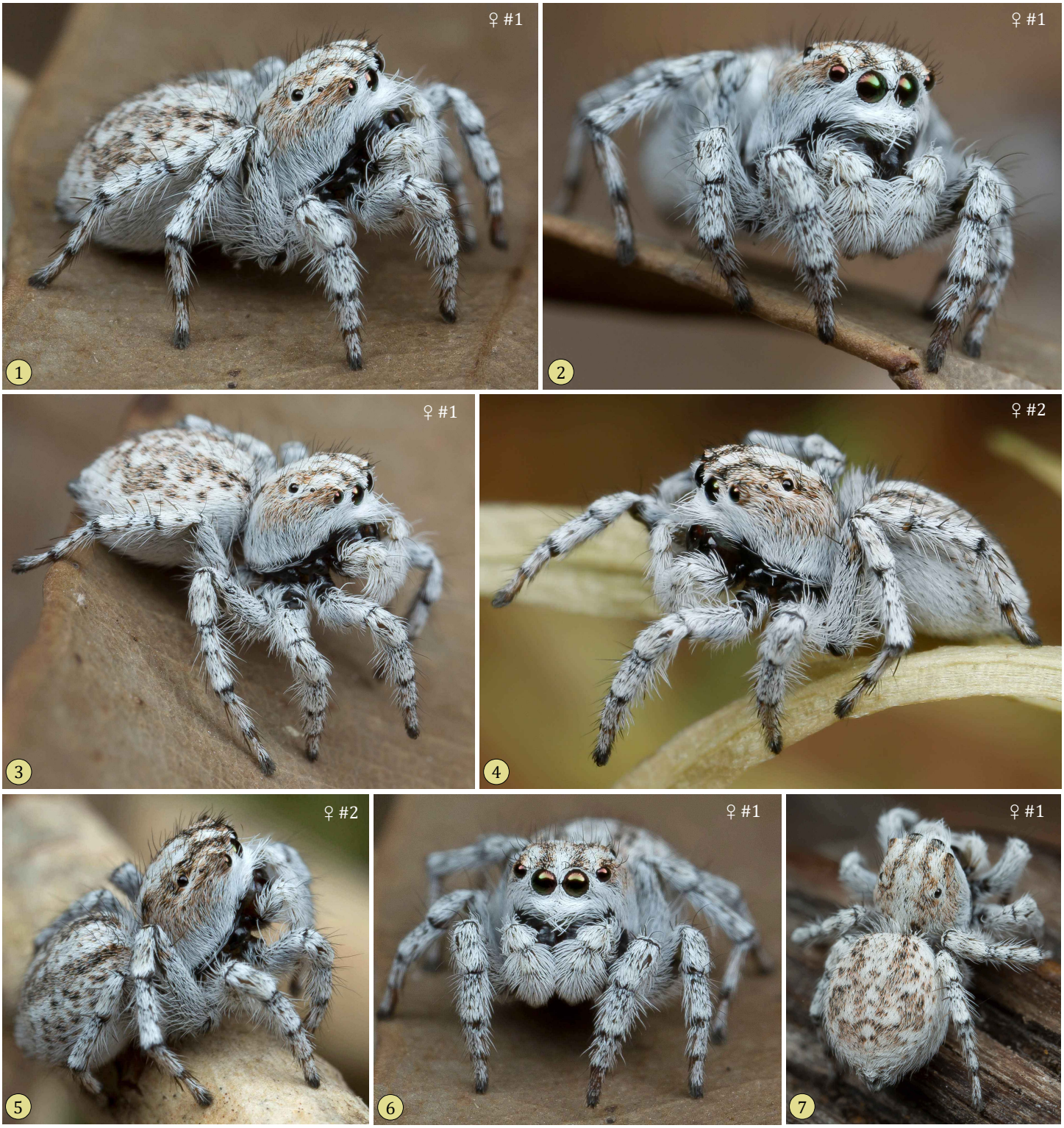
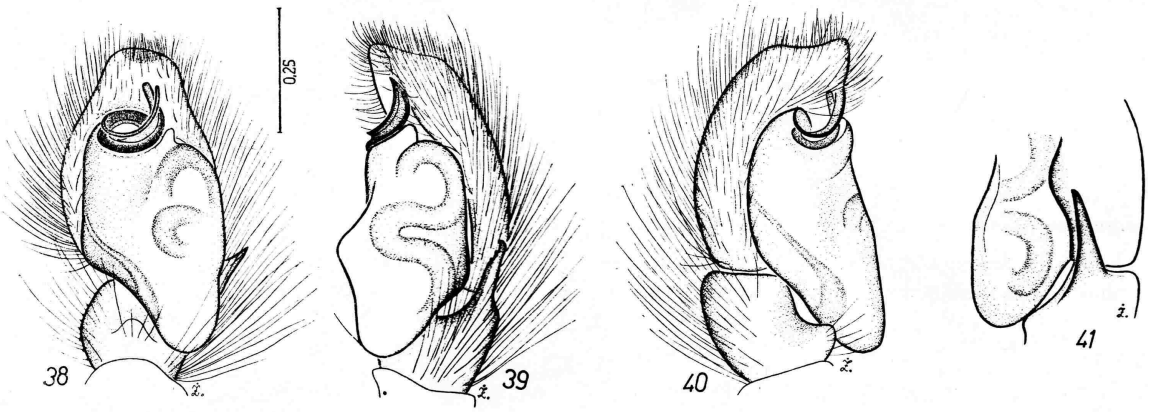


Figure 38. Two adult female *Maratus speculifer*, near Mindarie Marina (31.69498°S, 115.70220°E), collected by David Knowles. The bright white female *M. speculifer* resembles the female *M. ammophilus*, but is more patterned than that species on the dorsum.

Figure 39. Two photographs of a jumping male *Maratus speculifer*. **1,** Near maximum extension of legs IV, rocking the spider forward. **2,** After extension of legs IV, the flexed legs III extend, positioned to provide more of a vertical component to the jump.



Figs. 38–41. ♂ *Lycidas speculifer* (Simon, 1909): palpal organ.

Figure 40. Drawings of the left pedipalp of the holotype specimen for *Maratus speculifer*. This specimen came with the label "*Habrocestum speculiferum* Simon, Holotypus, North Fremantle." After Zabka (1987), used with permission.

Courtship (Figures 41-45). The courtship display of the male *Maratus speculifer* resembles that of *M. ammophilus*, with perhaps an even greater emphasis on *rocking* or *see-saw* movement from side to side, with legs I elevated and extended, legs III extended to the sides, and legs II and IV held in place.

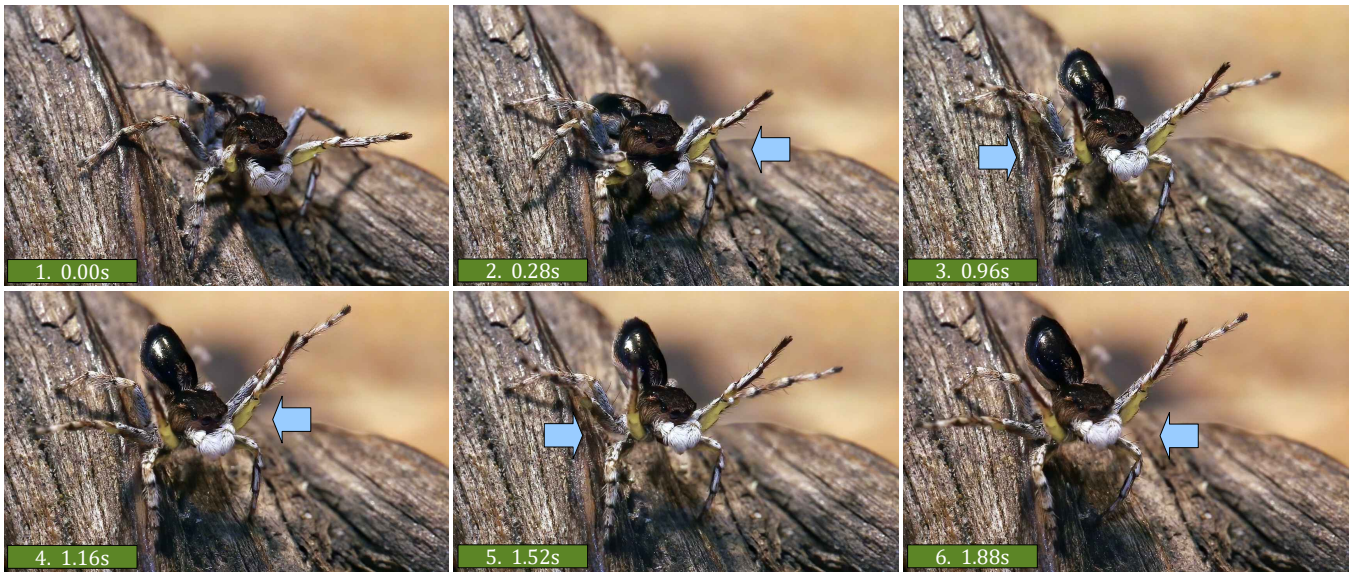


Figure 41. Sequential frames from a 25 fps video of courtship by a male *Maratus speculifer*. Blue arrows indicate side to side or rocking movement relative to the previous frame.

Figure 42. Sequential frames from a 25 fps video of courtship by a male *Maratus speculifer*. Blue arrows indicate side to side or rocking movement relative to the previous frame. For the most part the foot positions for legs II and IV, as well as the extension of legs I and III, were maintained throughout this sequence.

Figure 43 (continued on next page). More sequential frames from a 25 fps video of courtship by a male *Maratus speculifer*.

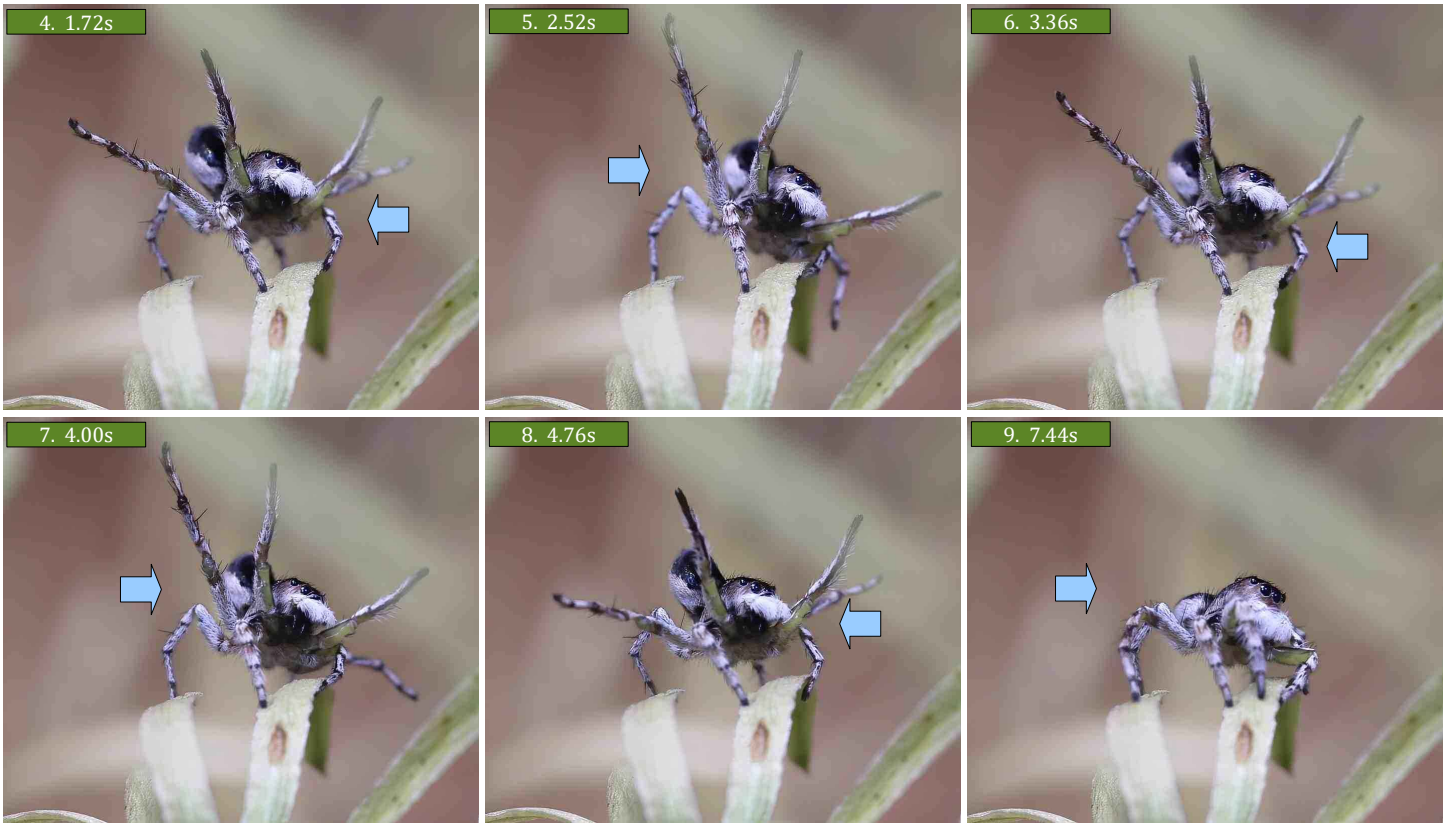


Figure 43 (continued from previous page). More sequential frames from a 25 fps video of courtship by a male *Maratus speculifer*.

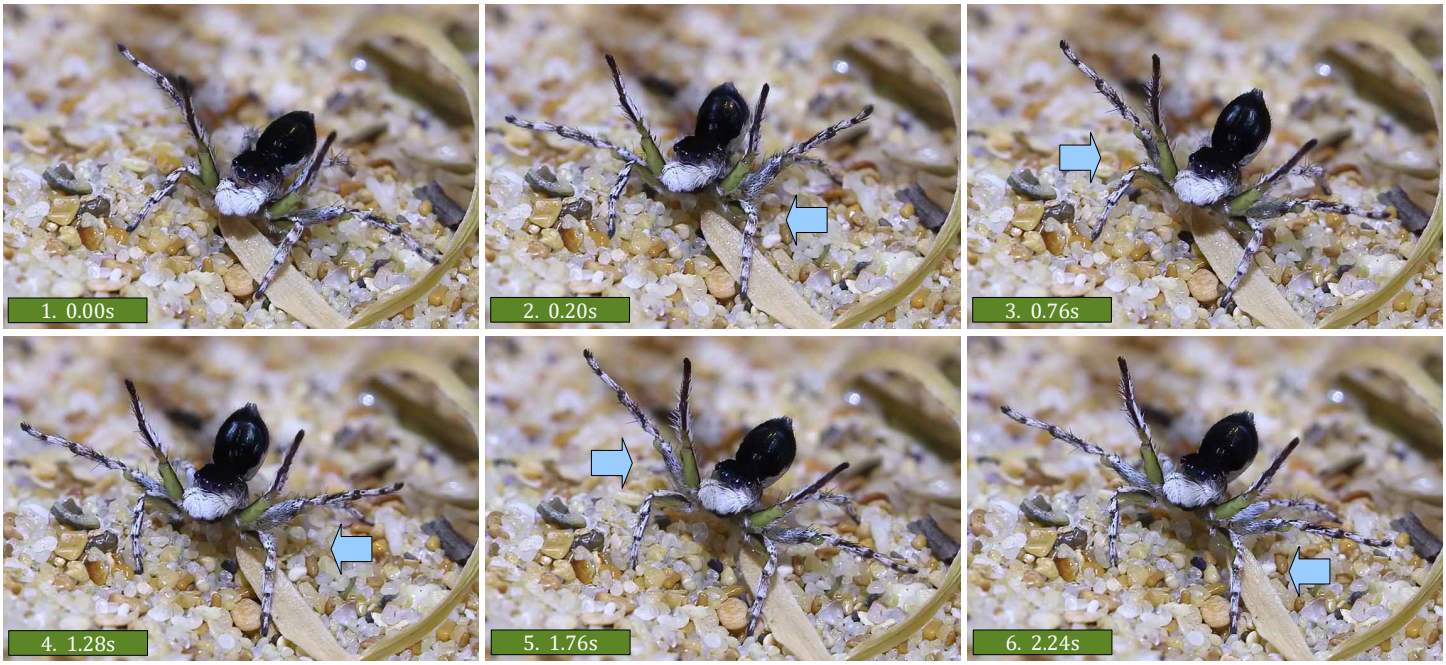


Figure 44. Sequential frames from a 25 fps video of courtship by a male *Maratus speculifer*, on a sand substrate.

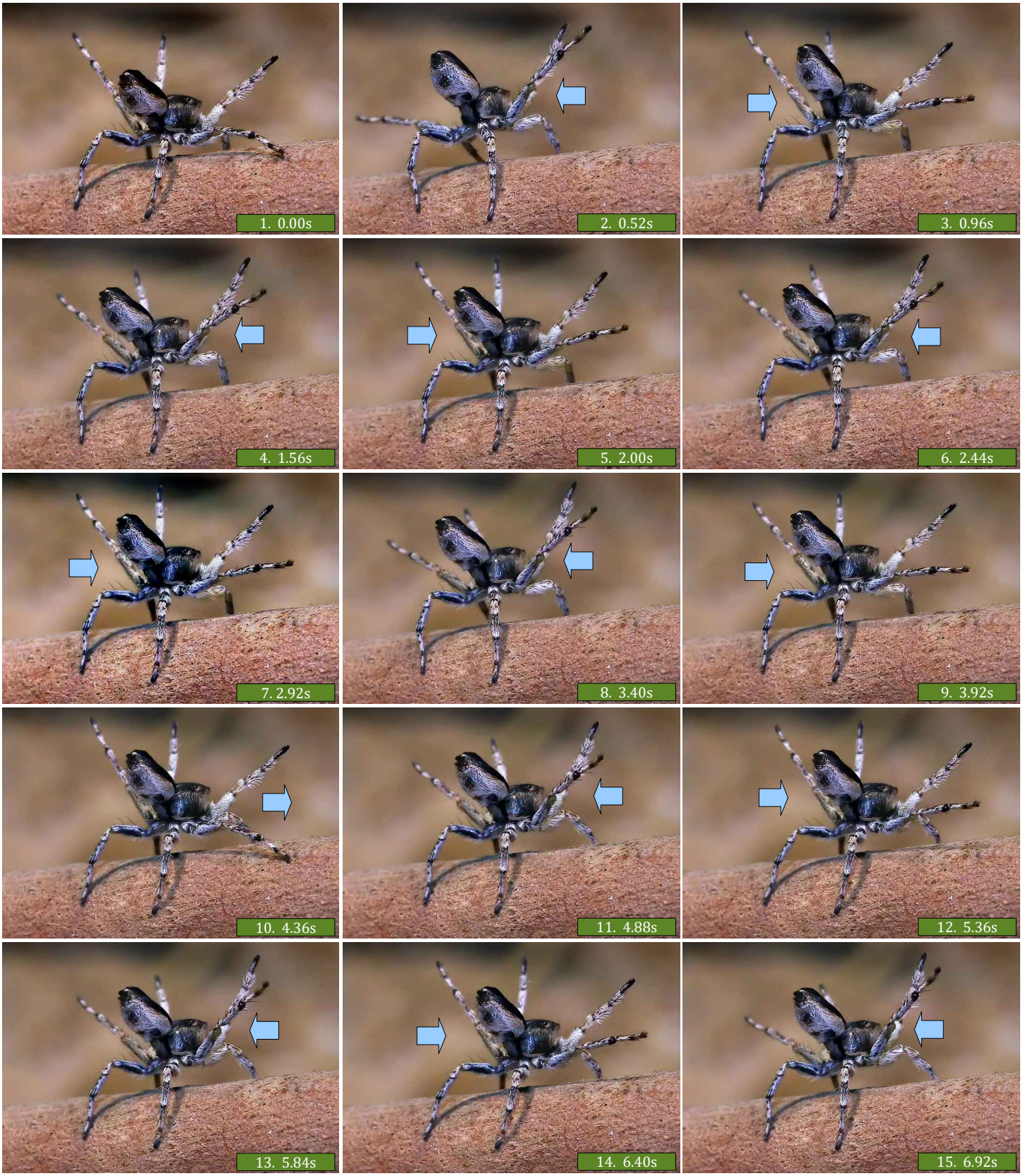


Figure 45 (continued on next page). Sequential frames from a 25 fps video of courtship display by a male *Maratus speculifer*, viewed from the rear.

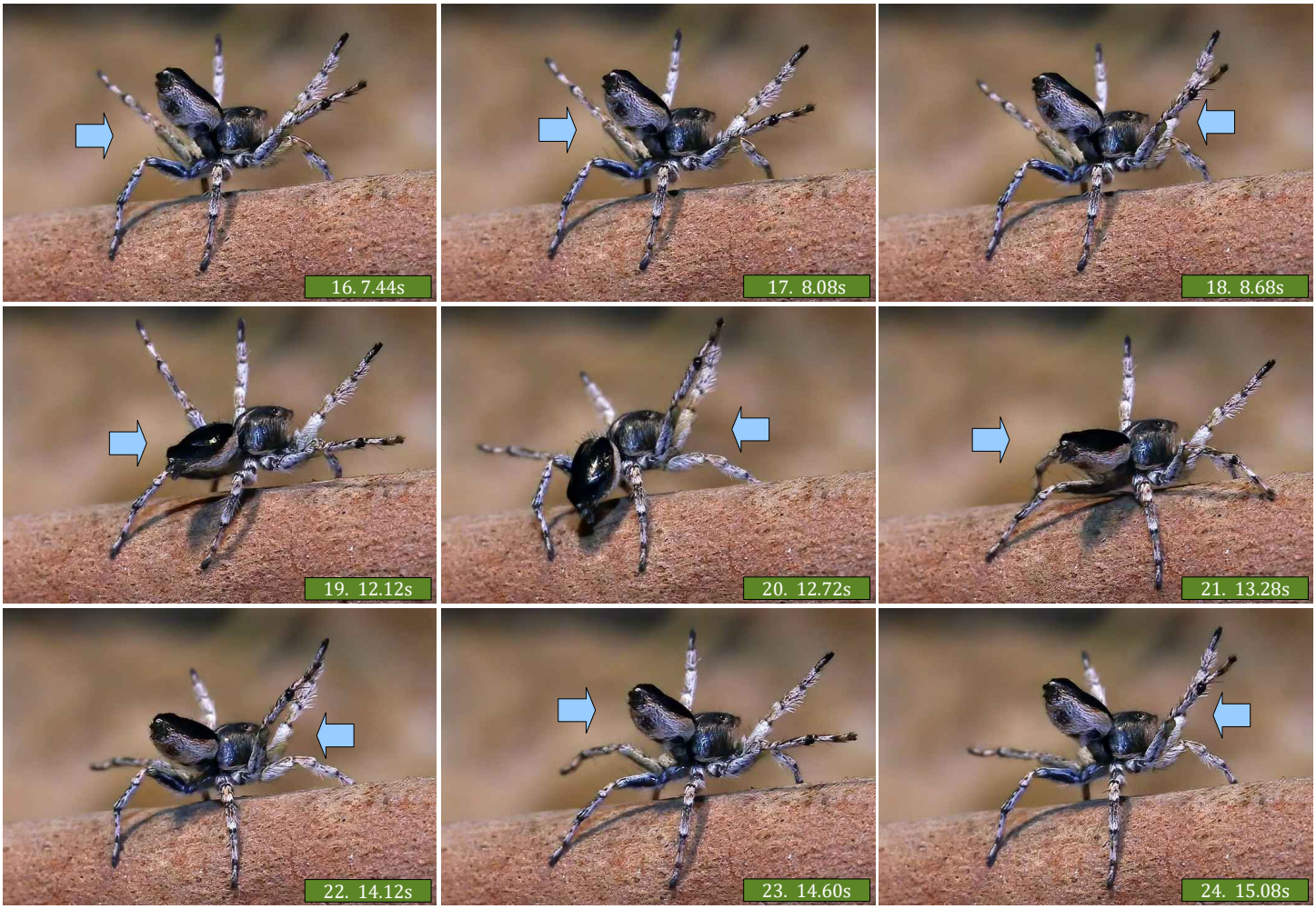


Figure 45 (continued from previous page). Sequential frames from a 25 fps video of courtship display by a male *Maratus speculifer*, viewed from the rear.

***Maratus volpei* Schubert 2020**

Maratus volpei Schubert 2020

This species is known only from Lake Hart in South Australia. The male displays the elevated and expanded opisthosoma, as well as the ornamented ventral side of legs I and II; also like other members of the *fimbriatus* group, the circular embolus resembles a wheel rim (Schubert 2020).

Etymology. This species is named for Nick Volpe, who collected the type specimens.

Diagnosis. *Maratus volpei* may be readily identified by the unique appearance of the adult male (Figure 46:1-2), with a thick, dark red-brown fringe or flap on either side of the opisthosoma. The female (Figure 46:3) is similar to other females in the *fimbriatus* group, covered with fairly uniform white to off-white setae.

Figure 46. Adult male holotype (1-2) and female paratype (3) for *Maratus volpei*. Photo credits: 1-3, © Nick Volpe, used with permission

Maratus sp. A "carmel"

designated as "carmel" by Girard et al. 2021

Like the next species (*Maratus* sp. B) we cannot assign a species group name to this spider as we have no type specimen. An exhaustive search through several museums in Australia has led us to conclude that, if a voucher specimen for *Maratus* sp. A did exist at one time, it has been liquified, presumably in preparation for DNA sequencing. However, we can figure the male of this species as this had been loaned to the senior author (JO) by Maddie Girard prior to completion of her study. *Maratus* sp. A and *Maratus* sp. B, each known from a single locality (Figure 2), are important as they played an important role in the recent DNA study of the genus *Maratus* (Table 2; Girard et al. 2021). That study reported the collection of 3 males for *Maratus* sp. A (designated *carmel_SA_12C*, *carmel_SA_23C* and *carmel_SA_93C*) from Spring Hill Salt Flats, South Australia (32.6382°S, 135.8784°E, 1 DEC 2015).

Diagnosis. *Maratus* sp. A, like other members of the *fimbriatus* group, displays with elevated and extended legs I. Only the ventral femoral patellar joints of legs I are yellow-green, and there is a dark stripe along the underside of each leg I. This species can be identified by comparison with our photographs of the male (Figure 47).

Figure 47 (continued on next page). Adult male *Maratus* sp. A "carmel". **1,** Display with elevated legs I.

Figure 47 (continued from previous page). Adult male *Maratus* sp. A "carmel".

Maratus sp. B "flame"

designated as "flame" by Girard et al. 2021

This species also played an important role in the recent DNA study of the genus *Maratus* (Girard et al. 2021). That study reported the collection of 3 males for *Maratus* sp. B (designated *flame_SA_18C*, *flame_SA_26C* and *flame_SA_95C)* from Lake Gairdner, Thurlga, South Australia (23.3222°S, 135.8875°E, 30 NOV 2015).

Diagnosis. This species can be recognized from the colours of the adult male (Figures 48, 51). It resembles a more colourful version of *Maratus* sp. A, but the underside of legs I and II is dull yellow-green, and lateral margins of the fan have a fringe of off-white setae that can be expanded during courtship display. As with other members of this group, the male assumes a series of display positions, moving from side to side in front of the female with pedipalps in front of the chelicerae (Figures 49-51).

Figure 48. Adult male *Maratus* sp. B "flame".

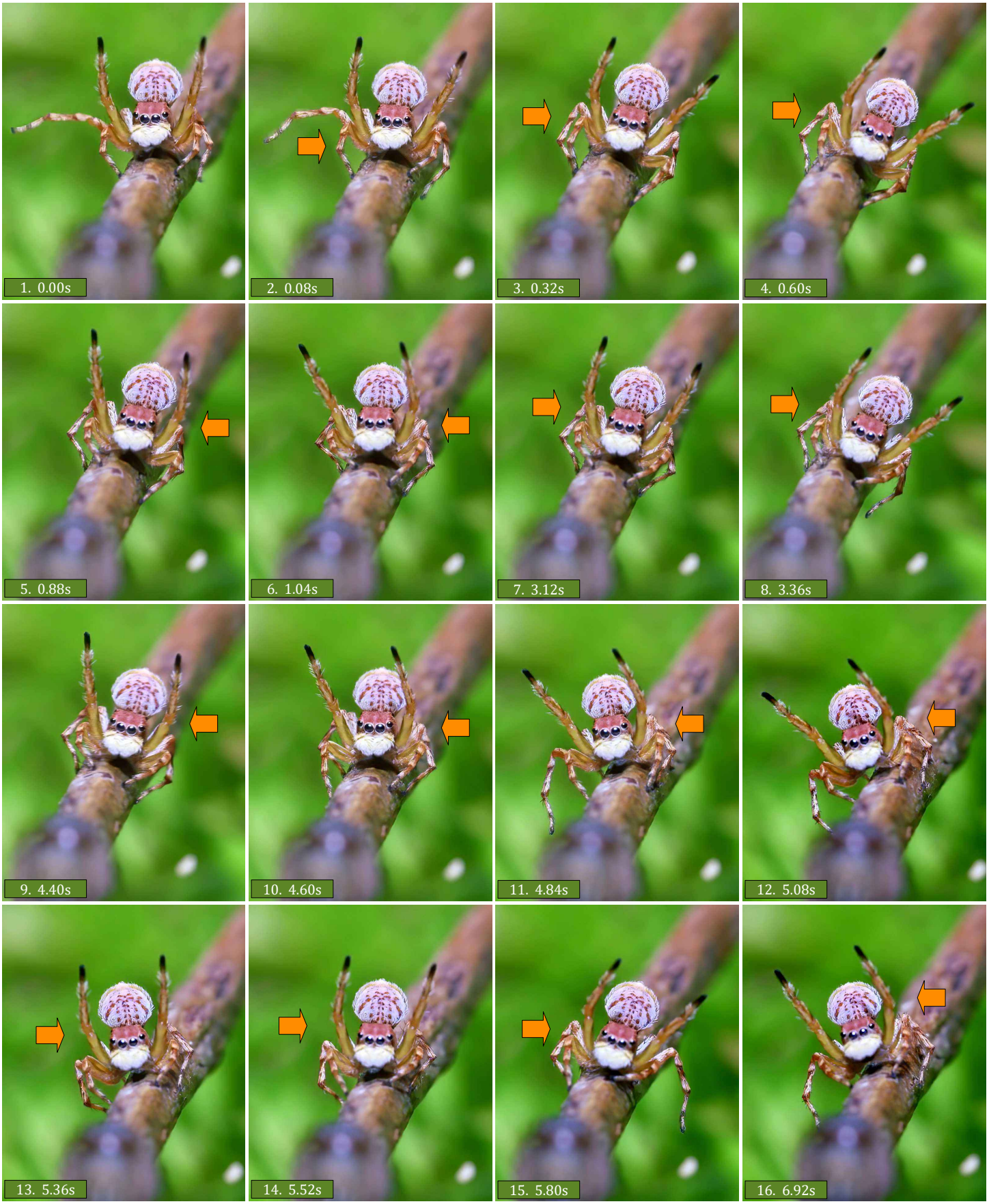


Figure 49. Sequential frames from a 25 fps video of courtship by an Adult male *Maratus* sp. B "flame", recorded in the laboratory with a female *Maratus* of a different species. Note the occasional use of an extended leg III in this display.

Figure 50. More sequential frames from a 25 fps video of courtship by an Adult male *Maratus* sp. B "flame", recorded in the laboratory with a female *Maratus* of a different species.

Figure 51. Positions assumed during courtship display by an adult male *Maratus* sp. B "flame".

Acknowledgements

We thank Caleb Bartell, Stuart Harris, David Knowles, Michael Lun, Su Rammohan, Donna Sanders, Laurence Sanders, Owen Seeman, Nick Volpe and Wayne Winnington-Martin for contributing specimens, photographs and locality data, Maddie Girard for lending us the live spiders that we have identified as "carmel" and "flame," Damien Elias, Maddie Girard, Mark Harvey, Marshall Hedin, Peter Hudson, Michael Kasumovic, Graham Milledge, Matthew Shaw, Kate Sparks and Julianne Waldock for assisting in our exhaustive search for voucher specimens of “carmel” and “flame,” and Helen Smith for assisting us with the examination of an undescribed Pilbara specimen. We also thank the Department of Biodiversity, Conservation and Attractions of Western Australia for issuing collecting and export permits. Unless otherwise noted, all photographs are © Jürgen C. Otto.

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