

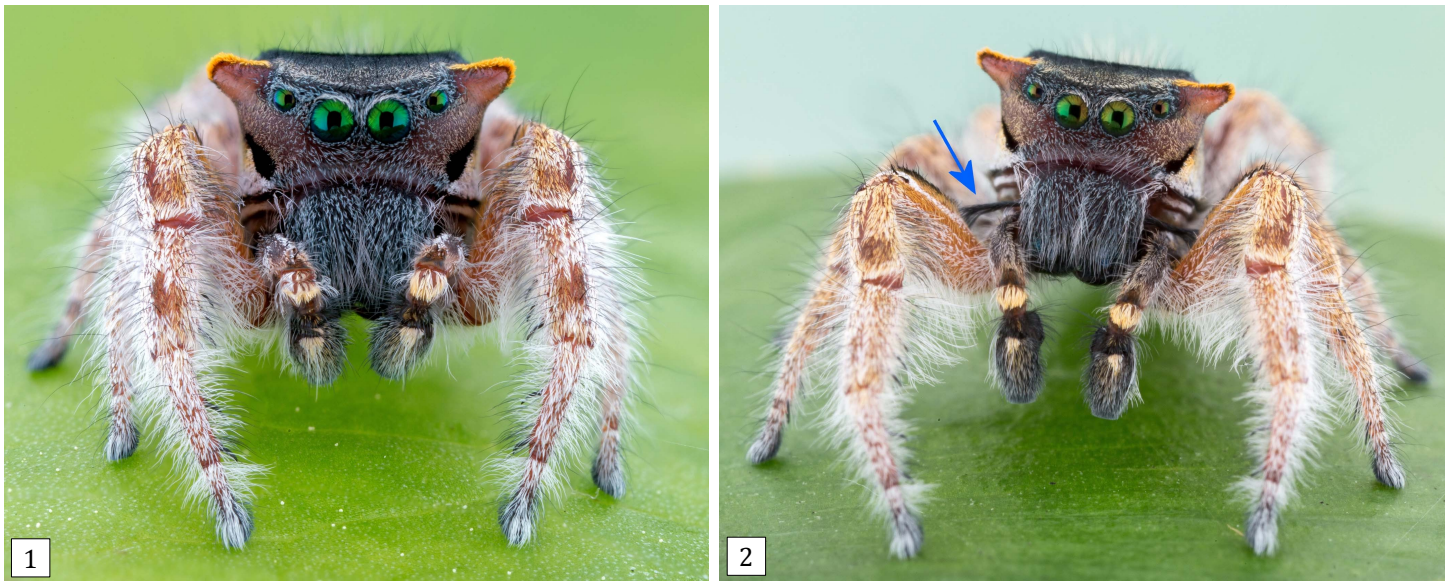
Description of *Phidippus pacosauritus* sp. nov.
(Salticidae: Salticinae: Dendryphantini: Dendryphantina),
with a reanalysis of related species in the *mystaceus* group

G. B. Edwards¹

¹ Curator Emeritus: Arachnida & Myriapoda, Florida State Collection of Arthropods, Division of Plant Industry, Gainesville, Florida 32608 USA, *email* GB.Edwards@fdacs.gov

Abstract. *Phidippus pacosauritus* sp. nov. belongs to the section of the genus that contains *P. mystaceus* (Hentz, 1846), *P. arizonensis* (Peckham & Peckham, 1883), and *P. cruentus* F. O. Pickard-Cambridge, 1901, and its courtship behavior resembles the latter two species. Morphologically, however, it more resembles other *mystaceus* group members in general appearance, and rather than having expanded carapace ‘cheeks’ like *P. adonis* Edwards 2004, *P. arizonensis*, and *P. cruentus*, the male carapace modifications are smaller and more aptly described as ‘ears.’

Keywords. Mazatlán, Mexico, Sinaloa, tropical deciduous forest



Figures 1-2. *Phidippus pacosauritus* male, anterior view. **Figure 2.** Arrow pointing at femur I dorsal setal tuft. Photo credits: Colin Hutton.

Introduction

The genus *Phidippus* C. L. Koch, 1846 was revised by Edwards (2004), 16 years ago. Despite the fact that these large and usually colorful jumping spiders are fairly often seen, no new species has been described until now. In the past few years, some photographs were posted online that suggested a potential new species in the vicinity of Mazatlán, Sinaloa, Mexico. A nature photographer, Colin Hutton, with the permission and assistance of the original photographer and private reserve landowner, his son the reserve director, and a reserve biologist (see *Acknowledgments*), went to the places in the reserve where

the spiders had been observed. He was able to collect a couple of females with eggsacs, from which he raised several young to adulthood to get pristine adults of both sexes to photograph. When these specimens were subsequently sent to me, it was quickly obvious that this was a new species in the *toro* clade of the *mystaceus* group.

The *toro* clade was characterized by Edwards (2004) with males having the first legs decorated with longitudinally banded femora and prominent white or yellow fringes. In addition, the males of some species [*P. adonis* Edwards, 2004, *P. arizonensis* (Peckham & Peckham, 1883), and *P. cruentus* F. O. Pickard-Cambridge, 1901] have prominent integumental expanded 'cheeks' on the anterolateral areas of the carapace (e.g., Figures 27-29). Also, the latter two species [and *P. mystaceus* (Hentz, 1846)] have conspicuous elongate black dorsal setal tufts on the leg I femora (Figures 27-28), a cluster of macrosetae at the distal end of the palpal embolic groove (e.g., Figures 20-21) [*P. mystaceus* has more macrosetae and a palpal stridulatory mechanism (Edwards 1981)], and ventrolateral abdominal markings or fringes that they display by laterally turning the venter of the abdomen toward the female during courtship (e.g., Figure 43). Males of *Phidippus pacosauritus* sp. nov. have all of these modifications and behaviors as well, but have narrowed and extended the upper 'cheek' area into what are more aptly alluded to as 'ears.' What is most intriguing is that all of these modifications (with minor exceptions in leg fringe color) occur only in one subgroup with seven species, yet are found nowhere else in the entire genus, which now contains 61 species. The six species originally placed here were called the *toro* clade, as *P. toro* Edwards, 1978 was previously the basal species in the clade, but since, as will be shown later, this is no longer the case, it is now referred to by the oldest species name in the clade, i.e., the *mystaceus* clade of the *mystaceus* group (Figure 44).

The character that set the *mystaceus* group apart from other species groups was that all the included species had females (and most with males as well) that had the lateral band III pair present on the abdomen; only lateral band I (basal band), II, and IV are present in other species groups. The *mystaceus* group is also transitional in the absence/presence of epigynal flaps. The more basal *octopunctatus* and *putnami* groups lack flaps, while more distal groups have complete flaps. Within the *mystaceus* group, the *asotus* clade lacks flaps, while the *mystaceus* clade is mixed; *P. mystaceus* has little more than elevated ridges (incipient flaps), whereas others (e.g., *P. adonis*) have the flaps partially developed (incomplete flaps) but not covering the copulatory openings as is normally the case. For phylogenetic purposes, we could consider the version of *P. mystaceus* as a rudimentary type of incomplete flap, as in both cases the end of the flap is directed into or toward the copulatory opening rather than covering it. But the bigger picture is that we appear to have here evidence that flaps are developed as extensions of the raised middle area of the epigyne. These extensions can often be seen to follow the inner edge of the rim that anteriorly defines the larger atrial area, and which at their fullest extent become separated on their posterior edge, forming a complete flap that covers the copulatory opening and the groove leading to it. Some other dendryphantine genera have flaps on the epigyna, but as occurs just within this one small clade, the flaps can be repeatedly lost and regained. However, that does not negate the possibility that a common ancestor existed for all clades containing species with flaps on the epigyna, and even some that have lost them.

Methods and Materials

The descriptive technique used here largely follows that utilized by Edwards (2004), with modifications in line with nomenclatorial formats that have become standard. Specimens used for the description were all reared by Colin Hutton from one population and a few sets of siblings, therefore size and color variation as described herein may not be entirely representative of the species. Five specimens of each

sex were measured, with an attempt to account for size variation. Measurements are in millimeters and are given as 'type =, range = smallest (mean) largest' (H = holotype, A = allotype). All specimens other than the holotype are to be considered paratypes. Photographs were edited in Corel Paintshop Pro X9. Figures 45-46 were created in LibreOffice.

Taxonomy

Family Salticidae
Subfamily Salticinae
Tribe Dendryphantini
Subtribe Dendryphantina
Genus *Phidippus* C.L. Koch, 1846

Phidippus C.L. Koch, 1846: 125.

Type species: *Attus audax* Hentz, 1845: 199.

***Phidippus pacosauritus*, sp. nov.**

Figures 1-23, 26, 36, 42-43

Type Material. Holotype male and paratype series all from type locality, MEXICO: Sinaloa: Mazatlán, Paco's Reservera de Flora y Fauna, tropical deciduous forest ('selva baja caducifolia'), on opuntia and sotol, 1 July 2019, coll. Colin Hutton. Other specimens represented by online photographs have been found on trees and shrubs; in this habitat, trees are often only 4-10 m high, or rarely to 15 m (Albert van der Heiden, personal communication 2020). All specimens in the type series were reared from 2-3 eggsacs from two females collected on this date. The holotype, allotype, and several other paratypes of each sex are deposited in the Universidad Nacional Autónoma de México (UNAM). The remaining paratypes are deposited in the Florida State Collection of Arthropods (FSCA), Gainesville.

Etymology. Based on the names of the two gentlemen named Francisco, nickname 'Paco', from the type locality (see *Acknowledgments*), and the Latin word *auritus* = having long ears. To be translated as "Pacos' long-eared *Phidippus*;" as a common name, "Pacos' long-eared jumper;" or, in Spanish, "saltarina orejuda de los Pacos."

Diagnosis. Both sexes with distinctive color patterns including short wide median triangular mark on abdomen, which along with white leg I fringes in male, are somewhat similar to *P. adonis*, but male does not have red face of the latter species. Males can be distinguished from *P. adonis*, *P. arizonensis*, and *P. cruentus* by the smaller lateral carapace projections, and from the latter two species by having white rather than yellow foreleg fringes; additionally can be distinguished from *P. arizonensis* by having contrasting ventrolateral abdominal stripes like *P. cruentus* rather than a black ventral abdominal fringe; and embolus distal end relatively thick, most similar to *P. mystaceus*. Female epigyne similar to *P. cruentus*, lacking flaps, but median part with more angulate lateral edges.

Description. Male (Figures 1-6, 13, 16, 20-21, 26, 36, 42-43): body length H = 9.70, range = 9.04 (9.57) 10.13; carapace length H = 4.40, range = 4.40 (4.54) 4.79; carapace width H = 3.61, range = 3.55 (3.64) 3.80. Carapace mostly black, but face integument dark reddish brown. Face area mostly covered with darker gray scales as an anterior ocular band above anterior eye row and across clypeus, with scattered lighter gray and orange scales on slightly expanded lower 'cheek' area. Anterior ventrolateral areas of the carapace with two iterations of alternating white/black banding, the lower black band appearing as an

extension of the black clypeal/cheliceral border in direct facial view. Gray scales continue onto upper part of chelicerae, and rest of chelicerae covered with long gray setae. Chelicerae with metallic blue integument, but mostly this is not visible due to the scale and setal cover. Upper 'cheek' area narrowed and extended dorsolaterally to a blunt point (more like an 'ear'); anterior surface convex, lower part light gray to cream colored, upper part reddish brown, or all reddish brown; posterior, dorsal, and upper lateral surface of 'ear' covered with orange scales. No long carapace setal tufts (Figures 1-2). Ventral cephalothorax with black chelicerae, endites, labium, sternum, coxae, and basal half of trochanters. Integument of remaining leg segments reddish brown. Legs generally covered with white scales and setae, except some pale orange scales on distal edges of femora and bases of patellae, and a dorsal bare spot on distal end of tibiae IV. Dorsal abdomen black with orange basal band followed by a pair of short, posteriorly diverging orange bands of variable width (presumed to represent spot pair I), spot pair II fused (typical for genus) into a short, wide, orange triangle, and an orange transverse band near posterior (presumed fused spot pair IV, atypical for genus) (Figures 3-6); spot pair III appears to be unrepresented, although some specimens show a small orange spot far laterally in this position, but one well-marked male shows this to be more likely the tip of lateral band IV (Figure 6; see *Notes on Morphology* below). Ventral abdomen black or dark tan with ventrolateral narrow rusty reddish brown band each side, usually edged with white or yellow, and if median area not entirely black, some medial symmetrical gray markings and/or a darker gray median stripe present (Figures 13, 16). Spinnerets dark reddish brown. Entire leg I covered with white setae extending into long fringes especially on the venter; also a cover of white scales on the distal segments except for patches of orange scales on dorsum of patella and tibia. Femur I anterior surface covered with orange scales except for two longitudinal white scale bands, one medial and one ventral; dorsum with a black stripe that ends subdistally (with the end of the median white band extending around it at the distal end of the segment like *P. arizonensis* (Figures 1-2, 26; compare to Figure 27), from which a long black setal tuft emerges angling medially from the basal third (Figures 2, 36). Palpi reddish brown proximally to black distally with short white dorsal and lateral markings on the femur, some orange scales on the distal edge of the femur and dorsum of the tibia, a dense patch of pale orange scales on the dorsum of the patella, and pale orange or white scales medially on the dorsal base of the cymbium. Cymbium also with intermixed long white setae medially continuing to near the distal end, with some orange and white setae to either side (Figures 1-2, 26). The ventral side of the palp has the wide but shallow ventral part of the embolic haematodocha ('salticid palea') like *P. arizonensis*, a distal sclerotized ridge that is very narrow until it widens laterally, and an apical part of the embolus that is fairly broad and clearly twisted, but tapers distally like *P. mystaceus*, unlike *P. cruentus* that does not taper (Figure 20).

Female (Figures 7-10, 14-15, 17-19, 22-23): body length A = 11.63, range = 10.23 (10.77) 11.63; carapace length A = 4.44, range 4.18 (4.62) 5.18; carapace width A = 3.80, range = 3.63 (3.83) 4.26. Carapace except black posterior thoracic slope mostly covered with light tan scales, darker tan to dark brown scales on dorsal eye field, light gray scales immediately surrounding anterior eye row, and a row of long white setae on the narrow clypeus. Four typical large setal tufts on the anterior quarter of the carapace, an exceptionally long dorsal pair and a lateral pair. Chelicerae with light tan band of scales basally, then metallic blue or blue-green for remainder of length (Figure 7). Dorsal abdomen with basal band, spot pair II, and spot pair IV like male except they are very light tan in color, as are lateral bands II-IV, that intersect with or are mostly covered by wide lateral stripes. These stripes are typically darker tan in color, but may be reddish tan or reddish in color (Figures 8-10). Ventral abdomen similar to male, except with a broader reddish brown stripe each side, medial gray markings coalesced into median stripe, and a darker narrow median stripe within it (Figure 14). Another variation is three gray stripes on a pale background, so that it appears there are four pale stripes, with darker areas of varying intensity (Figures 17-19); or the venter may be mostly covered with tan and gray scales (Figure 15). Legs and palps with reddish brown integument covered with white setae and light tan scales.

Both sexes with leg macrosetae typical for the genus (see Edwards 2004). As is usual for many salticids, the color pattern of the penultimate male (Figures 11-12) is quite similar to that of an adult female. It appears that incipient 'ears' have already formed on the penultimate male, as a slight protuberance can be seen on each side of the upper carapace covered with a small patch of pale orange scales.

Notes on Morphology. One exceptionally well-marked male (Figure 6) shows lateral bands II-IV, suggesting that the small dorsolateral spot pair between spot pairs II and IV is the tip of lateral band IV (confirmed by comparing to the female lateral bands – Figure 9). This specimen also has the most development of spot pair I. Lateral band III is slightly shorter than II and IV in both sexes, as is usually the case. For reference, the so-called basal band is considered to be the anteriorly fused pair of lateral band I; some specimens of other species are missing the middle fused part of the basal band, which can be seen in these cases to consist of two lateral bands.



Figures 3-6. *Phidippus pacosauritus* male. Variation in dorsal pattern, clockwise from top left, least to most developed pattern. **Figure 6.** Note presence of lateral abdominal bands. Photo credits: Colin Hutton.



Figures 7-10. *Phidippus pacosauritus* female. **Figure 7.** Anterior view. **Figures 8-10.** Variation in dorsal abdominal pattern in color and visibility of lateral abdominal bands. **Figure 10.** Dark integument and scales variant. Photo credits: Figures 7-9, Colin Hutton; Figure 10, David Hill.



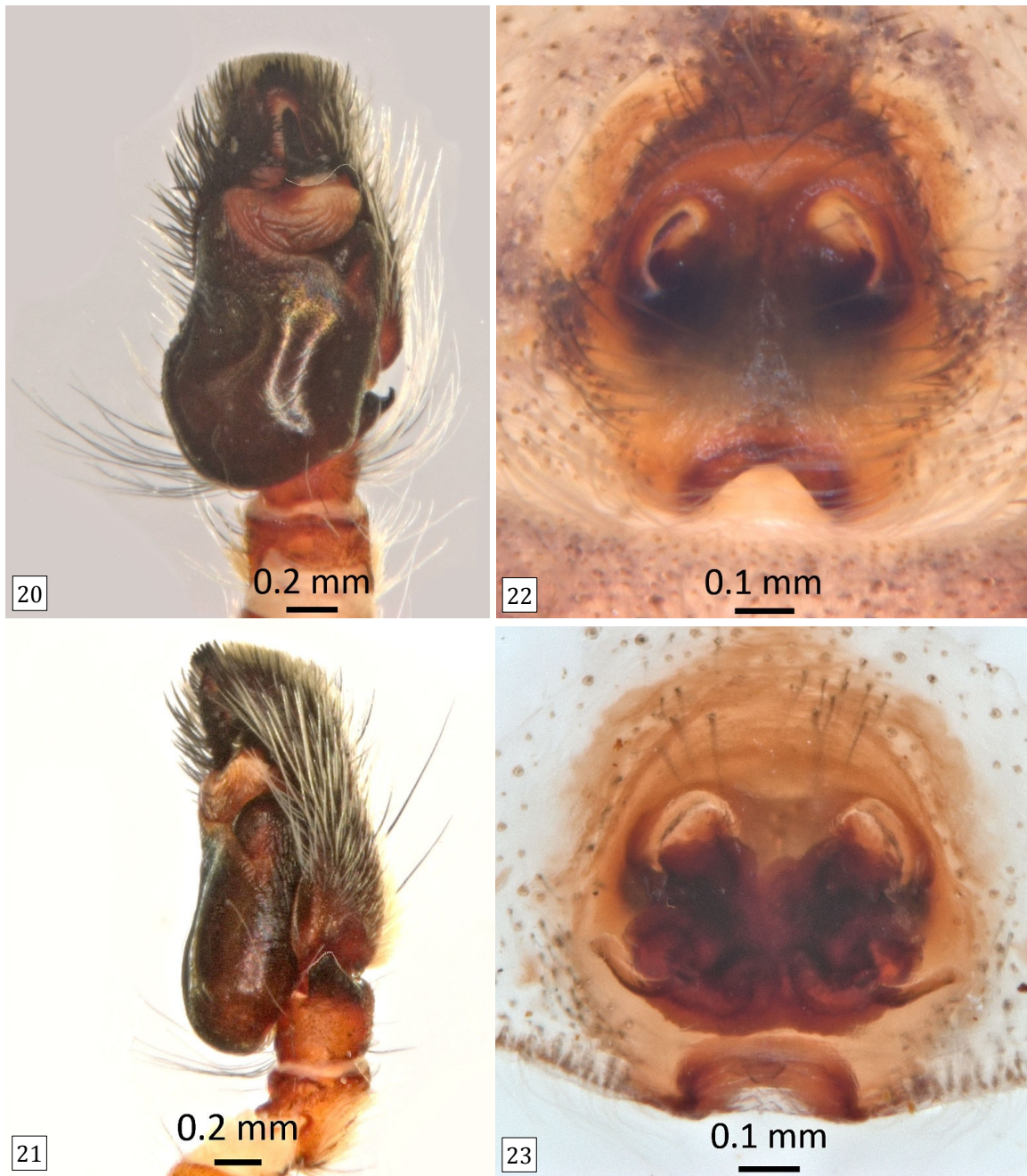
Figures 11-12. *Phidippus pacosauritus* penultimate male. Color pattern similar to female with red dorsal abdominal scales, but note the incipient 'ears' formed on the upper lateral carapace with a narrow cover of pale orange scales. Photo credits: David Hill.



Figures 13-15. Live *Phidippus pacosauritus*, ventral view. **Figure 13.** Male. **Figures 14-15.** Female variations. Photo credits: David Hill.



Figures 16-19. Preserved *Phidippus pacosauritus*, ventral view. **Figure 16.** Male. **Figures 17-19.** Female variations.



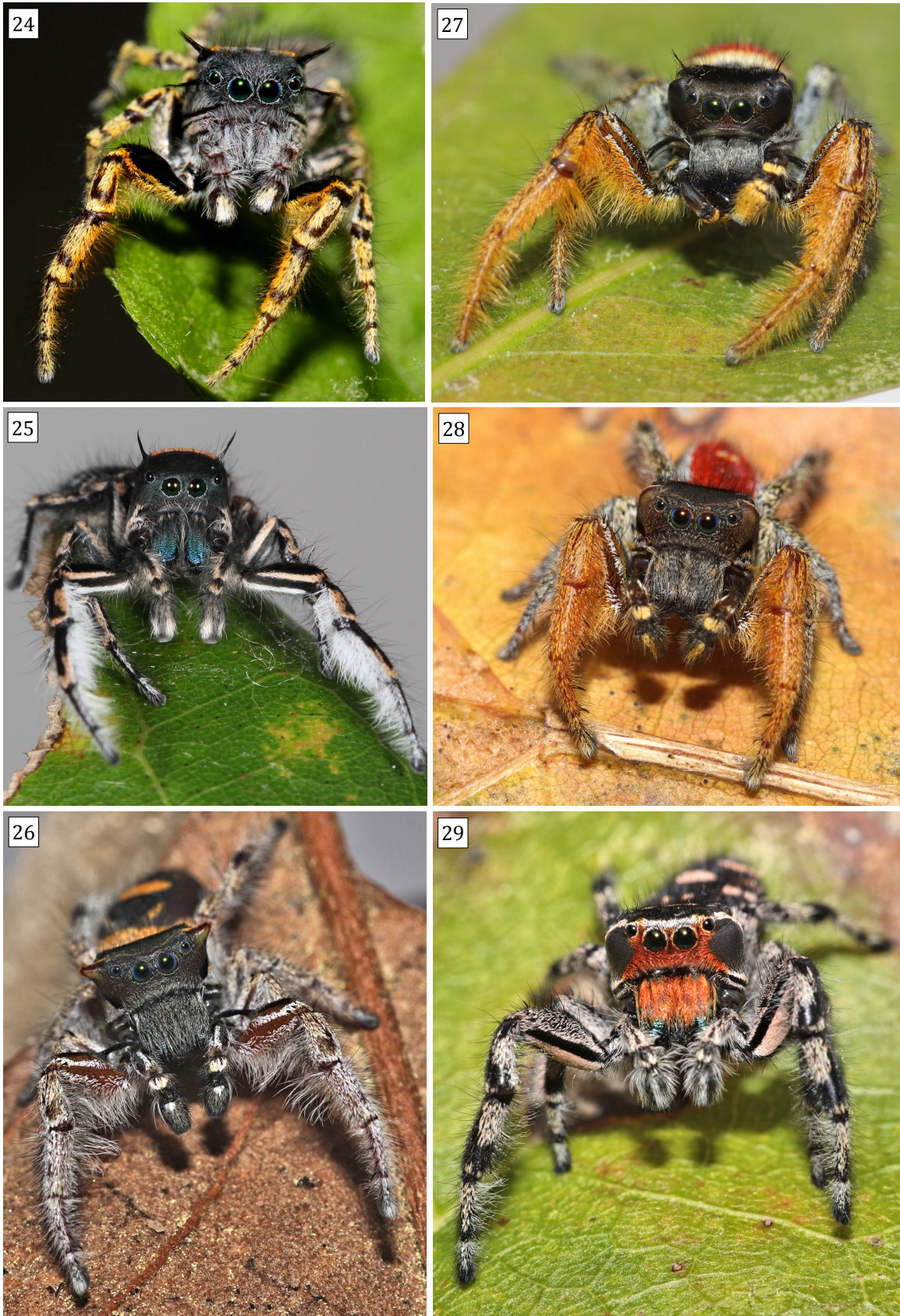
Figures 20-23. *Phidippus pacosauritus* genital structures. **Figures 20-21.** Male palp. **Figure 20.** Ventral view. **Figure 21.** Lateral view. **Figures 22-23.** Female epigyne. **Figure 22.** Ventral view. **Figure 23.** Dorsal view cleared.

Distribution and Habitat. Only known from the type locality in western Mexico. The habitat where the species was found extends through much of lowland southwestern Sinaloa (also north central Sinaloa and central Sonora), which might be expected to approximate the range of this species. This coastal range is generally north and west of the area where *P. cruentus* is known to occur, although both seem to be distributed on the west side of the Sierra Madre Occidental mountain range. The dividing line between them seems to roughly correspond with the Rio San Pedro, and *P. pacosauritus* seems to live in somewhat drier tropical deciduous forest than *P. cruentus*, although the latter species has also been taken from cactus, agave, and small trees and shrubs in an open grassy area where the forest had mostly been cleared (C. Hutton, personal communication 2020, and personal observation).

Notes on Relationships. Edwards (2004) defined the *mystaceus* group as having two subgroups (*asotus* clade, and *toro* clade – now *mystaceus* clade); the *mystaceus* clade (Figure 44; Table 1) included six species: *P. arizonensis*, *P. cruentus*, and *P. mystaceus*, all of which have males with yellow leg I decorations (Figures 24, 27-28, 31, 34), and *P. adonis*, *P. toro*, and *P. tigris* Edwards, 2004, all of which have males with entirely or mostly white leg I decorations (Figures 25, 29-30, 32-33, 35, 37). In addition, all these species except *P. tigris* have some type of integumental modification to the anterior carapace. *Phidippus mystaceus* (more prominently in its rare Florida morph) and *P. toro* have a raised transverse dorsal ridge anterior to the posterior lateral eyes between prominent dorsal setal tufts (along with, respectively, red or pinkish orange ('coral') scales on the ridge; Figures 34-35). *Phidippus adonis*, *P. arizonensis*, and *P. cruentus* have a broadly expanded anterolateral 'cheek' area. *Phidippus pacosauritus* has a convex narrow lateral extension ('ear') where the dorsal edge of the 'cheek' area would be in the latter three species, and also in a position lateral to where the transverse ridge exists in the former two species. This suggests that there is a common ancestor that is responsible for the initial and ultimately three types of integumental variations, as no integumental carapace modifications occur anywhere else in the genus.

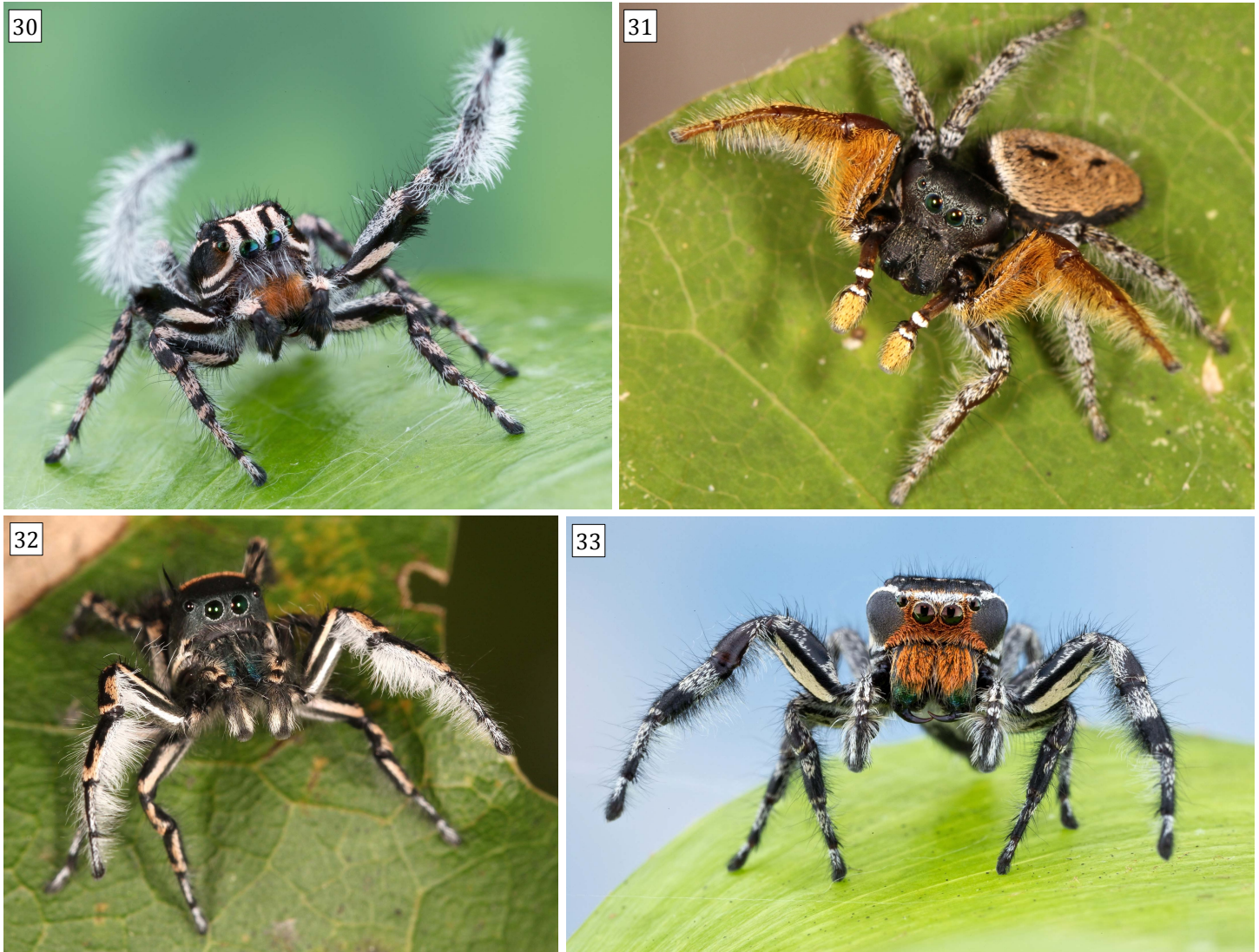
This also suggests some changes should be made in the species order of this clade, and suggests a possible placement for *P. pacosauritus*. The first change would be to move *P. tigris* to the basal position, since it does not have carapace integumental modifications (It does have a unique complex color pattern on the carapace; Figure 30). Both *P. tigris* and *P. adonis* have alternating black and white circumferential banding on the leg segments, although the fringes are mostly white, especially in *P. tigris* (Figure 30). In the case of *P. adonis*, it has carapace 'cheeks,' but other characters suggest it is not a direct sister species to the two other species with 'cheeks,' *P. arizonensis* and *P. cruentus*. It is possible that *P. tigris* and *P. adonis* are sister species, as originally proposed by Edwards (2004), in that they both have red on the face, a short, wide fused second spot pair, and broad dorsoprolateral bands on femur I made up of white scales. *Phidippus toro* fits well in the middle part of the clade, with entirely white fringes on the legs (like *P. pacosauritus*), except for the fact that it has an integumental carapace ridge like *P. mystaceus*, which in one phylogenetic hypothesis would be several branches further up the clade.

If we assume that the three species with yellow forelegs in the male (*P. arizonensis*, *P. cruentus*, and *P. mystaceus*) are each other's closest relatives, then the logical placement of *P. pacosauritus* would be immediately basal to the yellow-legged clade (Figure 45), as here it would continue with the entirely white leg fringes previously introduced with *P. toro*. Also this would correspond to the synapomorphic unique elements of its courtship behavior to the three species of the yellow legged clade, and the morphological synapomorphies of the four species having a femur I dorsal black setal tuft and distal cymbial macrosetae involved in percussive sound production during courtship (See *Notes on Courtship Behavior* below for a brief summary). This placement would not require a reversal to white legs if, e.g., *P. pacosauritus* was thought to be sister to *P. cruentus*, which has the most similar courtship behavior. Instead, it suggests that *P. pacosauritus* is sister to the three species of the yellow legged clade, and the shared courtship similarities are ancestral for the four species; this would make sense as both *P. arizonensis* and *P. mystaceus* have autapomorphic variations in their courtship behavior and morphology. It is also noteworthy that completely yellow leg fringes are absent in the rest of the genus, and completely white leg fringes are extremely rare outside this clade. For the most part, other species groups have multiple alternations between black and white fringes on each foreleg (Figures 38-41).



Figures 24-29. *Phidippus mystaceus* clade group members, male anterior view. **Figure 24.** *Phidippus mystaceus*, Oklahoma. **Figure 25.** *Phidippus toro*, Arizona. **Figure 26.** *Phidippus pacosauritus*, Sinaloa. **Figure 27.** *Phidippus arizonensis*, central Mexico, state uncertain. **Figure 28.** *Phidippus cruentus*, Jalisco. **Figure 29.** *Phidippus adonis*, Morelos. Photo credits: Figures 24, 26-29, David Hill.

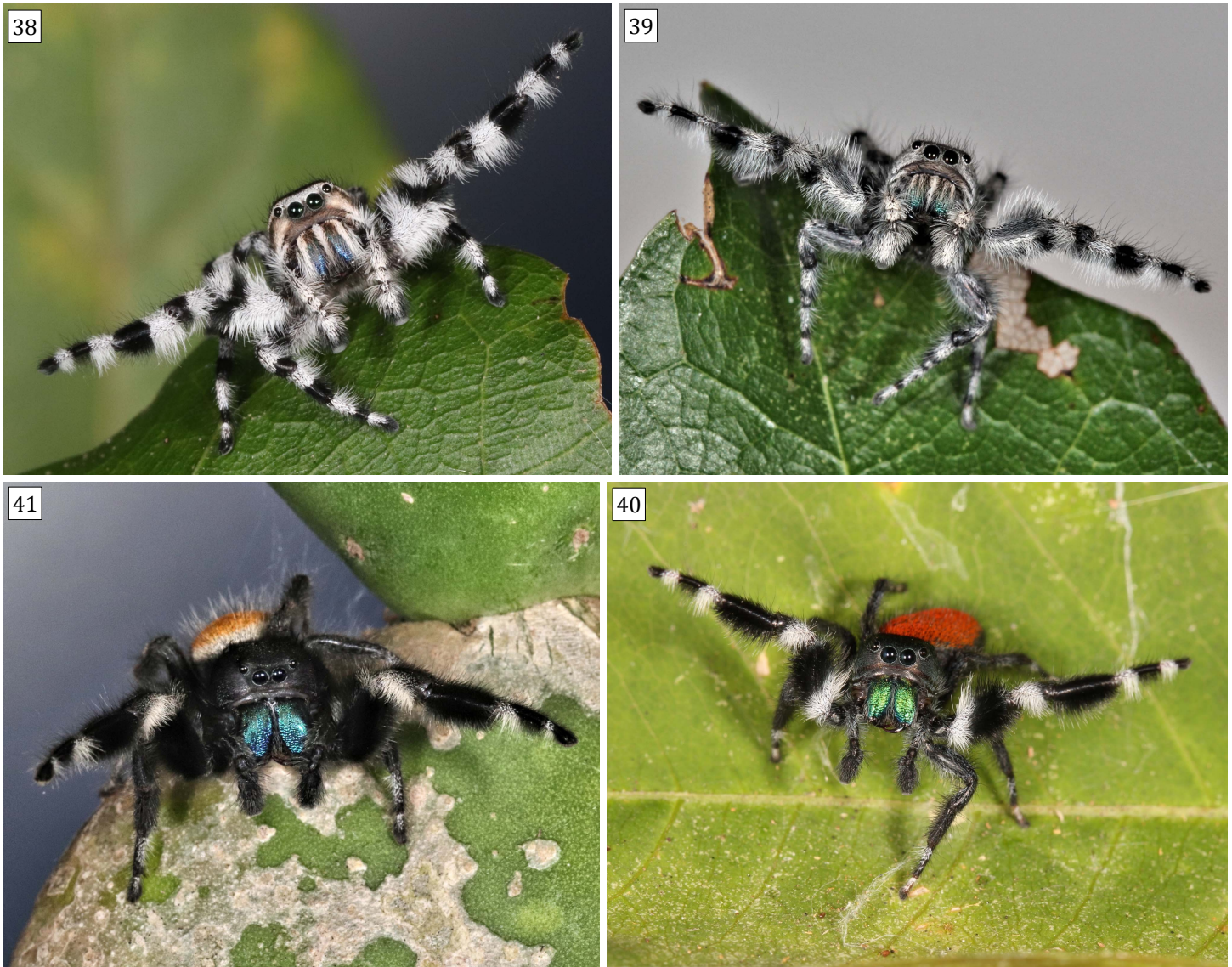
However, what if we rearrange the species to eliminate behavioral and associated morphological homoplasy in *P. arizonensis*, *P. cruentus*, *P. mystaceus*, and *P. pacosauritus* (Figure 46)? By doing so, we also eliminate some of the other morphological homoplasy (the species with a transverse dorsal ridge are now in sequence), and no longer require *P. mystaceus* to have lost a ventral display. There is still homoplasy with the species having fully expanded 'cheeks,' and *P. pacosauritus* reverses from yellow to white leg fringes. In this version, *P. pacosauritus* is sister only to the *P. arizonensis* - *P. cruentus* pair, with which it shares the most behavioral synapomorphies. Overall, this version seems more likely as it resolves more problems than it creates. In either hypothetical phylogeny, it might be considered that the 'ears' of *P. pacosauritus* could be a version of the expanded 'cheeks.'



Figures 30-33. *Phidippus mystaceus* clade group members, male anterior view. **Figure 30.** *Phidippus tigris*, Arizona. **Figure 31.** *Phidippus arizonensis*, New Mexico. **Figure 32.** *Phidippus toro*, Arizona. **Figure 33.** *Phidippus adonis*, Morelos. Observe that many species have the foreleg pattern repeated on the following legs. This is particularly noticeable when the male raises the forelegs, as the second leg pair are shifted forward to support him. The four leg pattern formed by the first and second pair of legs is quite striking when the pattern is complex, and it seems likely that the second pair of legs augments the display when the forelegs are raised, perhaps during courtship (Figure 30), but also during threat displays (Figure 31, with forelegs raised; Figures 32-33 taken just after forelegs were lowered from full threat display). Note also that in *P. arizonensis* and *P. cruentus* (see previous figure plate), this is not true, as at least the femora of the forelegs are unique, unlike the succeeding leg pairs. Photo credits: Figures 30, 33, Colin Hutton.



Figures 34-37. *Phidippus mystaceus* clade group members, males with transverse ridge in dorsal eye field area. **Figure 34.** *Phidippus mystaceus*, Georgia. **Figure 35.** *Phidippus toro*, Arizona. Arrows at ridge with red or coral scales, respectively. **Figures 36-37.** Posterodorsal view. **Figure 36.** *Phidippus pacosauritus*, Sinaloa, foreleg femoral tufts readily apparent. **Figure 37.** *Phidippus toro*, Arizona. Observe that the 'ears' of *P. pacosauritus* are just lateral of where the large tufts and ridge occur on *P. toro*, and in this view, almost seem to replace the tufts. Photo credits: Figures 34, 36, David Hill; Figure 37, Colin Hutton.

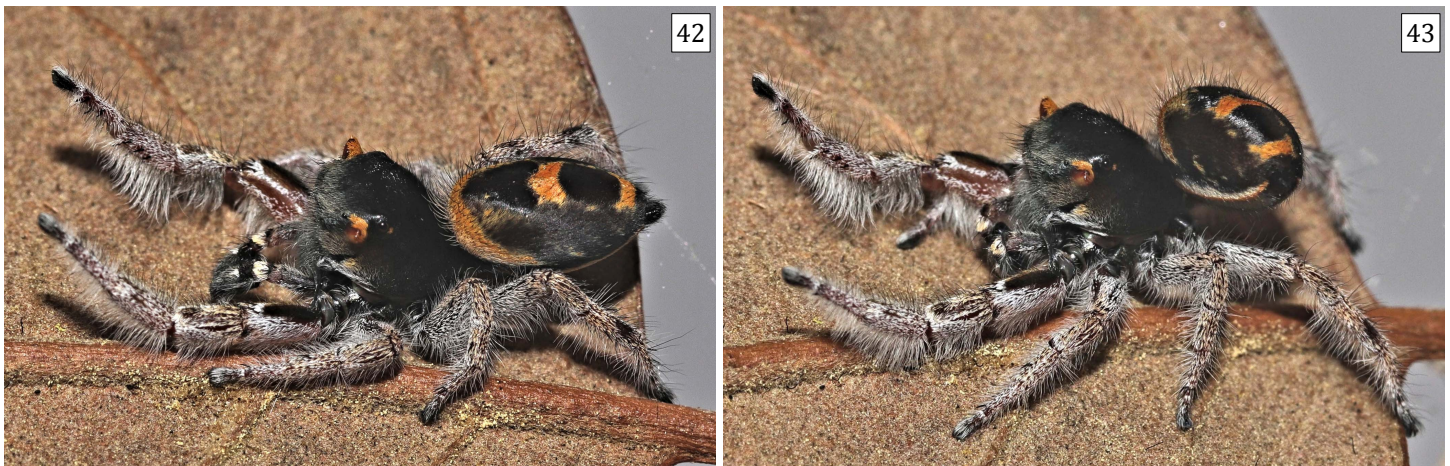


Figures 38-41. Male *Phidippus* species with alternating black and white fringes on the forelegs; not *mystaceus* group members. Arranged clockwise from upper left by decreasing number of primary white fringes. **Figure 38.** *Phidippus tyrrelli*, Oregon, 6 white fringes. **Figure 39.** *Phidippus adumbratus*, California, 5 white fringes. **Figure 40.** *Phidippus boei*, California, 4 white fringes. **Figure 41.** *Phidippus ardens*, Idaho, 3 white fringes. Observe the much greater complexity of white palp and facial decorations (anterior ocular band above first eye row, lateral ‘cheek’ areas, clypeus, and chelicerae) in those species with a greater number of white leg fringes.

Notes on Courtship Behavior. Courtship as discussed here is a set of behaviors that occur after a male and female are aware of each other and is initiated by the male. It does not include behaviors that lead to mounting and copulation; i.e., I am only discussing the behaviors that get the male close enough to attempt touching the female. There are two primary positions in *Phidippus* courtship: a back-and-forth lateral movement phase where the abdomen trails laterally behind, and a stationary phase where the abdomen points directly away from the female, or at least begins to transition to the other side as the male changes direction. The lateral movement phase is typical of many species, and, after some initial leg waving to get a female’s attention, probably serves to initiate courtship. The changes of direction could possibly disorient the female from making an immediate predatory attempt on the male, while also allowing him to edge forward toward her in a circumspect manner. The stationary phase is typically where the male ‘does his thing,’ i.e., where he performs species specific movements of the forelegs and palps intended to properly identify him to the female. This phase can occur quickly as the male transitions to a different direction, or it can be a prolonged affair while the male goes through a more

complex repertoire, and is species dependent. It is clear that if willing to mate, females can be very attentive at this stage, and potentially deadly if the male does not perform as she expects (e.g, in the case of a wrong species), or he is distracted and not paying attention to her, even for a moment. Interestingly, the amount of aggressiveness of one sex toward the other varies quite a bit from species to species (David Hill, personal communication, 2020).

The four species with cymbial macrosetae share certain features of their courtship behavior. While *P. mystaceus* does have an abbreviated lateral movement stage, it spends most of its time in the stationary phase where it repeatedly drums its palps on the substrate, at the same time activating a stridulatory mechanism on the lateral side of each palp (Edwards 1981). Its forelegs are lowered toward the female with the distal segments turned upward and periodically flicked slightly. The three other species, *P. arizonensis*, *P. cruentus*, and *P. pacosauritus*, all have a similar stationary position: lowered forelegs with upturned distal segments, and palps drumming with audible percussion on the substrate (Figure 42). However, all three species have modified the lateral movement into a display by turning the abdomen laterally in a more raised position and twisting it so that the venter is facing the female. Depending on the species, a black fringe (*P. arizonensis*) or contrasting stripes are presented forward, visible to the female (Figure 43). The abdominal display phase and the stationary percussive phase are alternated several times, with the abdomen switching from one side to the other as the male works his way toward the female. Detailed descriptions of all these courtships are in preparation (Hill & Edwards).



Figures 42-43. Primary courtship positions for *P. pacosauritus*. **Figure 42.** Stationary position. **Figure 43.** Lateral display position. Photo credits: David Hill.

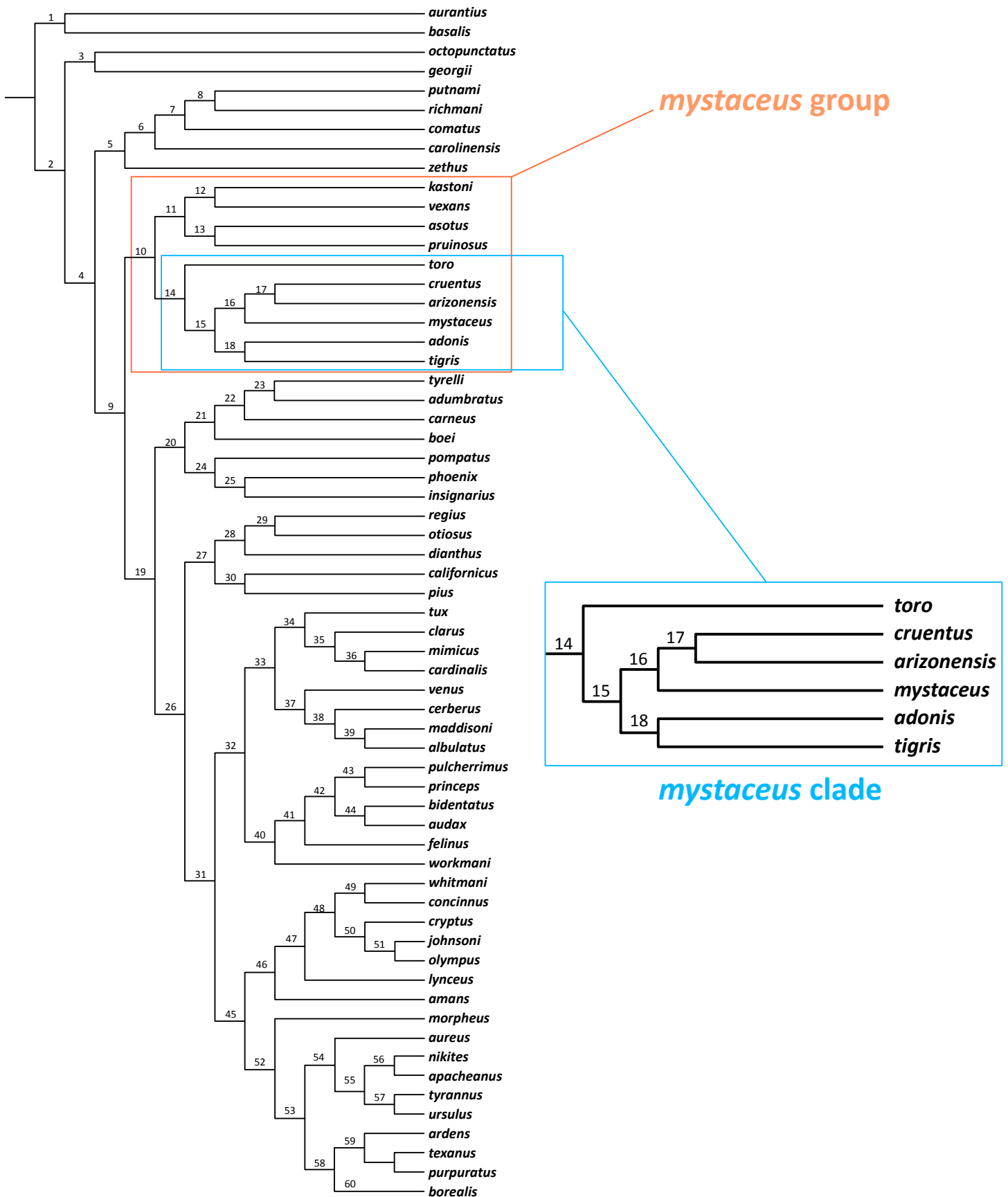


Figure 44. *Phidippus* phylogeny based only on morphological characters, proposed by Edwards (2004), with *mystaceus* group in orange box and clade containing *P. mystaceus* in blue box and enlargement.

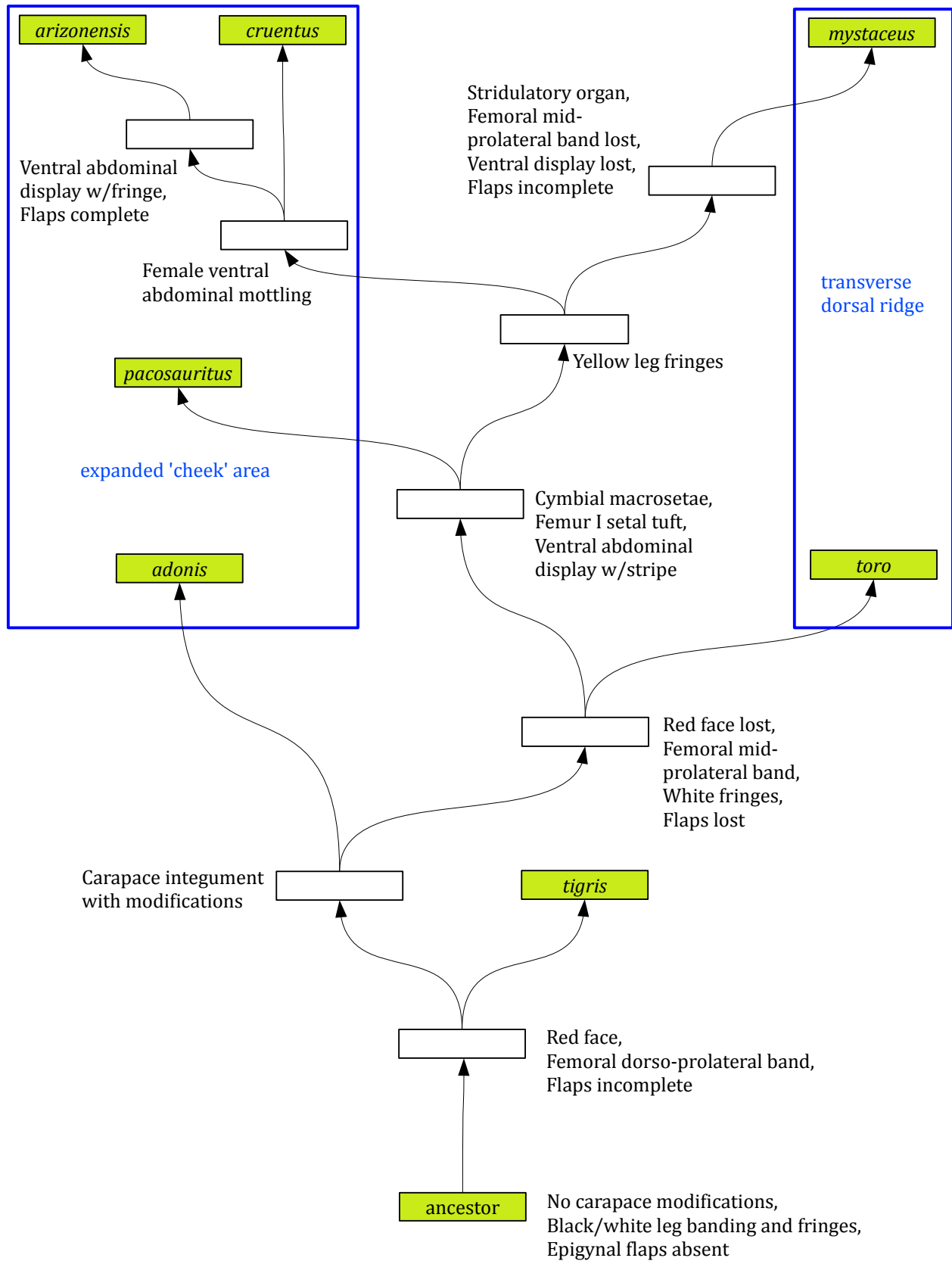


Figure 45. New proposed phylogeny of *mystaceus* clade with addition of *P. pacosauritus*. Version without leg fringe color reversal. Homoplasious carapace modifications in blue.

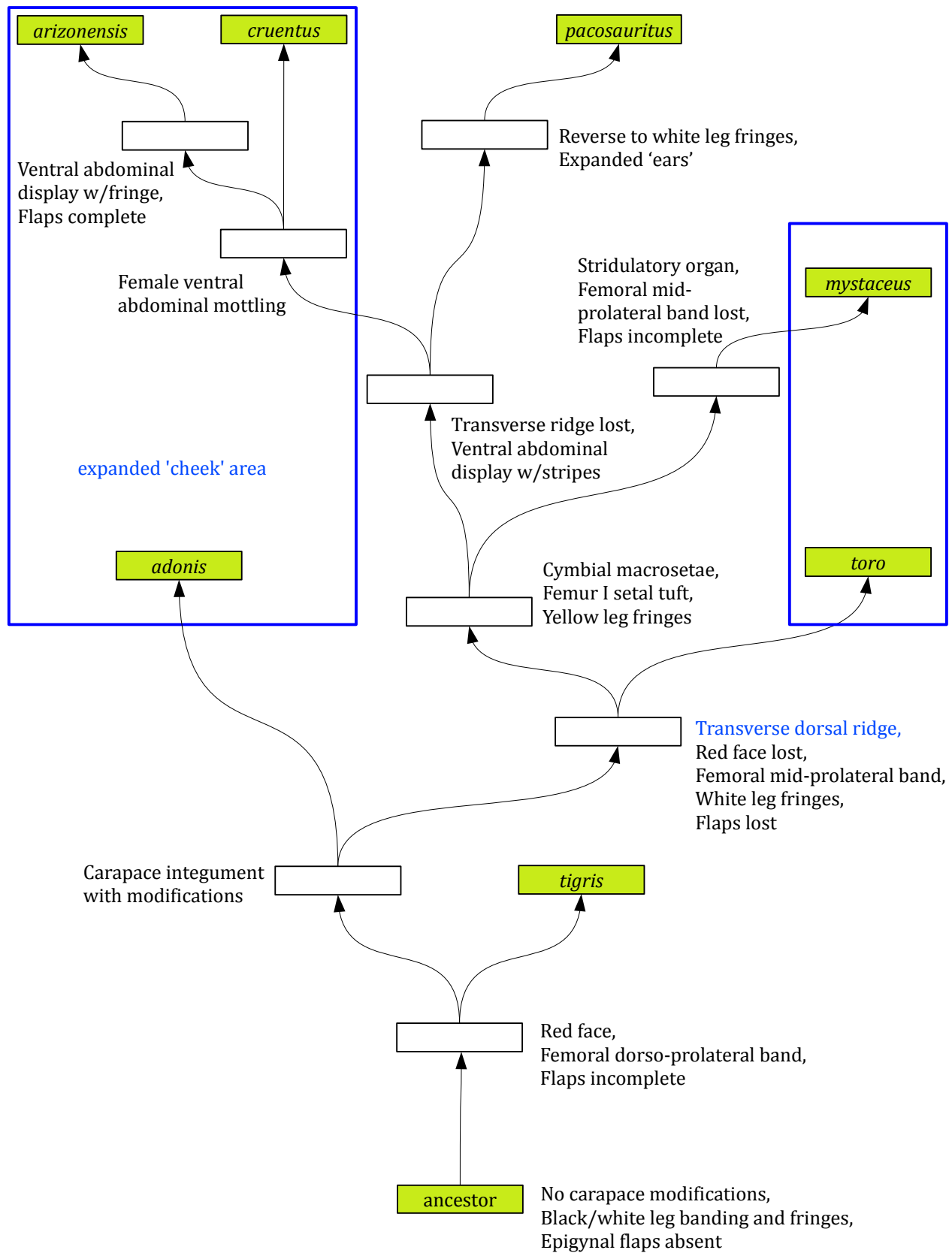


Figure 46. New proposed phylogeny of *mystaceus* clade with addition of *P. pacosauritus*. Version resolving behavioral and some morphological homoplasy. One of the two homoplasious carapace modifications (in blue) resolved.

Characters	femur I prolateral stripe	femur I dorsal tuft	leg I integument banded	leg I fringes	cymbial macrosetae	carapace modification	abdominal venter display	epigynal flaps	ventral abdominal mottling
States									
0	absent	absent	yes	black/white	absent	absent	absent	absent	absent
1	dorso-prolateral	present	no	entirely white	end of embolic groove	transverse ridge	stripe	incomplete	present
2	mid-prolateral			entirely yellow	entire end of cymbium	'ears'	fringe	complete	
3						expanded 'cheeks'			
<i>Phidippus</i> species									
<i>arizonensis</i>	2	1	1	2	1	3	2	2	1
<i>cruentus</i>	2	1	1	2	1	3	1	0	1
<i>pacosauritus</i>	2	1	1	1	1	2	1	0	0
<i>mystaceus</i>	0	1	1	2	*2	1	0	*1	0
<i>toro</i>	2	0	1	1	0	1	0	0	0
<i>adonis</i>	1	0	0	0	0	3	0	1	0
<i>tigris</i>	1	0	0	*0	0	0	0	1	0
				*mostly white	*with stridulatory organ			*poorly developed	

Table 1. Character set (branches 14-18) for original *toro* clade, now *mystaceus* clade, of proposed phylogeny from Edwards (2004), with *P. pacosauritus* added. With minor corrections, these characters are still useful for establishing relationships. Characters shared by all species removed. Species arranged top to bottom by most to least number of derived characters. Color coded characters: male = light blue, female = light orange.

Acknowledgments

I wish to extend many thanks to Colin Hutton for his efforts to collect and rear specimens of this and many other species of *Phidippus*. Not only has this resulted in nice series of extremely rare species in addition to the species described herein, but it has presented the opportunity to study courtship behaviors of many species previously only known from preserved specimens. David Hill and I are presently compiling and analyzing videos of these courtships. For allowing access, Colin and I wish to thank the owner and founder of Paco's Reservera de Flora y Fauna, Francisco Farriols Sarabia, and his son and director of the reserve, Francisco Farriols Estrada; these gentlemen posted the first photographs of this species and brought awareness of its existence. We also want to thank Diego Barrales Alcalá, reserve administrator and biologist, and a member of the spider lab at UNAM (under the direction of Oscar Francke). The latter two gentlemen also took Colin to locations in the reserve and helped look for spiders. We also want to thank Oscar Francke and Dariana Guerrero of UNAM for assistance obtaining permits to collect and export specimens, and for logistical assistance on other trips to Mexico. For habitat data, thanks are due to Albert van der Heiden and Tom van Devender.

Photographs used in this paper were by myself, David Hill, and Colin Hutton, with permission; those other than my own are acknowledged with the relevant photographs. David also helped with advice and editorial assistance, and made me aware of LibreOffice, which I greatly appreciate.

References

- Edwards, G. B. 1981. Sound production by courting males of *Phidippus mystaceus* (Araneae: Salticidae). *Psyche* 88 (3-4): 199-214.
- Edwards, G. B. 2004. Revision of the jumping spiders of the genus *Phidippus* (Araneae: Salticidae). *Occasional Papers of the Florida State Collection of Arthropods* 11: viii + 1-156.