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The Malagasy Goblin Spiders of the New Genus *Molotra* (Araneae: Oonopidae)

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ABSTRACT

A new oonopid genus endemic to Madagascar, *Molotra*, is proposed and its six included species are newly described and illustrated: *M. molotra*, the type species, *M. ninae*, *M. katarinae*, *M. suzannae, M. tsingy,* and *M. milloti*. *Molotra* is defined on the basis of its unusual genitalia. The male has the palpal bulb terminating in broad, liplike lobes, unlike any previously described in Oonopidae. The female is equally unusual in lacking an apparent receptaculum, although the genitalia otherwise resemble those of silhouettelloid genera. The species of *Molotra* form three distinct groups based on somatic and genitalic characters. The *M. molotra* group includes four large, strongly spined species. The remaining two are morphologically distinct and known only from males. *M. tsingy* is a small species with unusual palpi that are complex, contorted, and with a resting position along the sternocoxal boundary, instead of an anterior sternal cavity. *M. milloti* is a very bristly species that differs somatically from other *Molotra* but has genitalia similar to the *M. molotra* group. *Molotra* is known only from Madagascar where the three species groups are strongly disjunct. The *M. molotra* group occurs in higher elevation forests (1000–1300 m) in northeastern Madagascar, *M. tsingy* is from low elevation karst (150 m) of the southwest, whereas *M. milloti* is from a coastal locality in the northwest.

INTRODUCTION

Oonopidae is a worldwide family that currently contains 684 described species (Platnick, 2011), although the actual number is believed to be much greater. Current estimates, based on the survey of existing collections by the Goblin Spider Planetary Biodiversity Inventory (PBI)

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project (http://research.amnh.org/oonopidae/index.php), suggest at least 2000 species. That goblin spiders have been inadequately sampled and studied is not surprising, as they are small and largely restricted to cryptozoic habitats. As it turns out, they may be very abundant and diverse in favorable habitats.

The goblin spiders of Madagascar have been in almost complete obscurity, a hidden fauna. The only systematic treatment given to them was a very brief mention of the family by Millot (1948). This stands in sharp contrast to the oonopids of the nearby Seychelles Islands, which were studied first by Benoit (1979) and later by Saaristo (2001). The Seychelle fauna is surprisingly diverse, with some 30–34 species currently placed in 19 genera. Given the vastness of Madagascar and the diversity of its biomes, much greater than in the Seychelles, one would expect a fauna of proportionally more species. Over the past two decades, intensive sampling of Malagasy spiders was conducted through the expeditions of Vincent and Barbara Roth, Evert Schlinger, Hannah Wood, Brian Fisher, Charles Griswold, and associates. This effort produced a huge collection of roughly 12,000 oonopid specimens, representing about 100 species, or about three times that of the Seychelle fauna.

This study describes a small component of that fauna, six new species that we are including in the new genus, *Molotra*. This is one of the rarer genera of the Malagasy fauna, being known from only 90 specimens. Of these, 70 are of *M. molotra*, the type species, upon which much of the generic description is based. In contrast, the two rarest species total only three male specimens. These are also the most divergent and enigmatic, and only provisionally included in the genus. By necessity, *Molotra* is diagnosed only by male characters, an embolus with two broad liplike lobes (figs. 1–6). This palpal configuration of broad terminal lobes as seen here does not appear to have been previously described and is regarded as a synapomorphy for the genus.

The six species included in *Molotra* are morphologically divergent and so divide unambiguously into three groups. The best known, being the only one represented by females, is the *M. molotra* group, which includes four of the species and all but three of the specimens available for this study. All are morphologically similar, being large oonopids with strong leg spines and a coarsely granulate carapace having a distinct posterior knob (figs. 15, 23, 41, 49, 57, 65, 73). The most divergent species in the group is *M. ninae*, which has a more truncate bulb with an inward-folded ventral lobe (fig. 3). The other three species have distally directed embolar lobes (figs. 1, 2, 4), with *M. molotra* having the largest lobes (fig. 1) and *M. suzannae*, the smallest (fig. 4). The same trend is present in the female genitalia, where the largest T-shaped process is found in *M. molotra* (TP in figs. 198–201), and the smallest in *M. suzannae* (figs. 204, 205). Also, males of *M. molotra* and *M. ninae* have a somewhat larger palpal patella (figs. 190–193) compared to those of *M. katarinae* and *M. suzannae* (figs. 194–197).

The remaining two species are extremely rare, known only from male specimens, and are morphologically very different from *M. molotra*, as well as each other. *M. tsingy* resembles *M. molotra* somatically, but is a smaller species, with reduced pigmentation and structures, such as a smoother carapace, smaller posterior knob, shorter leg spines, and somewhat smaller eyes (figs. 231–233). However, the important differences here are genitalic. First, although the bulb of *M. tsingy* has two broad terminal lobes, it also has two additional prongs of even less certain homology

Table 1. A comparison of the three species groups of *Molotra* based on male characters. Abbreviations: E = embolus, L = length, pro = proclaw, ret = retroclaw, TC = tarsal claw, W = width.

	M. molotra	*M. tsingy*	*M. milloti*
Pigmentation	orange-brown	orange-yellow	orange-brown
Body size (mm)	1.8–2.3	1.5	2.4
Dorsal setae L	short	short	long
Dorsal setae thickness	thin	thin	thick
Dorsal setae orientation	reclined	reclined	erect
Sternum L/W	L≥W	L>W	L<W
Carapace posterior knob	large	small	absent
Carapace texture	granulate	smooth	granulate
Scutopedicel ridges	present	absent	absent
Book lung covers	round	round	narrow scar
Leg armature	spines	spines	bristly setae
TC pro/ret dentition	similar	similar	different
Bulb orientation	normal	twisted	normal
Sternal cavities	present	absent	present
Embolus complex	2 lobes + E	2 lobes + 2 prongs	2 lobes + E
Embolar lobe fusion	free	free	fused

(figs. 5, 287). Second, the orientation of the lobes is vertical, along the dorsal-ventral axis of the bulb (fig. 5), but horizontal in other *Molotra* males (figs. 1–4, 6). Third, the bulb has a deep dorsoprolateral groove just basad of the lobes (fig. 290). Fourth, and most unusual, is that the palp of *M. tsingy* is contorted, in that the palpal bulb and tarsus are rotated on the palpal axis outward from the body (fig. 281). This rotation affects the palpal resting position, as the embolar region now lies between the sternum and coxae (figs. 242, 256). Interestingly, the anterior sternal cavity, the typical resting place of the embolus in many goblin spiders, is absent in this species (fig. 261).

M. milloti, in contrast, resembles the *M. molotra* group genitalically, where it is not greatly different from *M. suzannae*. However, the embolar region of *M. milloti* does have smaller lobes, appearing fused, which have a sigmoid lobe interface (fig. 6). Indeed, the major differences between *M. milloti* and other *Molotra* species are somatic. Unlike other species, *M. milloti* has very bristly legs that apparently lack spines (figs. 307–310, but see note after species description), a carapace and abdominal vestiture of long thick setae (figs. 293–295), book lung covers represented by narrow scars (fig. 297), and unusual claws with heterogeneous dentition of pro- and retroclaws (figs. 319–326).

A comparison of the species groups (table 1) emphasizes the major differences between *M. tsingy*, *M. milloti,* and the *M. molotra* group. The morphological gaps here are far greater than generally accepted for a genus. So, although morphology argues for moving these two species to new genera, they are included in *Molotra* largely for pragmatic reasons. It seems better in this situation to stretch the limits of the genus and include these species, instead of describing

two monotypic genera based only on males or, even worse, wait indefinitely until new specimens and species are collected.

Reproductive System

Molotra male genitalia

The palp in *Molotra* has a piriform bulb without a distal knob (figs. 1–6), although the area may have a low swelling (figs. 175, 182). The broad embolar region includes two broad lobes that are fused to the embolus.

In the *M. molotra* species group, the two lobes are seamlessly fused to the embolus, which curves from the retrobasal to the prodistal, where it opens (figs. 165, 173, 179, 187). The dorsal lobe (DL) is thin, transparent, and apparently brittle, as many specimens show some damage (figs. 169, 181, 188). Its prolateral edge is produced into a thin outward-curved blade. Its distal end attaches to the embolus, whose tip may be exposed, as in *M. molotra*, where it extends beyond the lobe as a flat prong and has a tubelike subapical opening. In *M. katarinae*, the embolus tip is less extruded, and in *M. suzannae* and *M. ninae* seems to be fully fused with the lobes. The DL is rounded basally, but in *M. suzannae* produced into a thin prong (fig. 197), unfortunately broken in the SEM preparation (fig. 188).

The ventral lobe (VL), unlike the DL, is somewhat thicker and wrinkled. The smallest occurs in *M. katarinae* and *M. suzannae*. The large VL in *M. molotra* extends outward (fig. 1), but in *M. ninae*, it is bent inward (fig. 3). This latter species also differs from the rest in having a clearly demarcated area basad of VL (VL? in fig. 173). This region differs from VL in being smooth and unwrinkled in texture, and attaches to VL by a sharp ridged boundary. The basal edge of VL? is a platelike sclerite that opposes a similar but thinner plate attached to the base of the DL (figs. 166–173). In the other species, the basal boundary of DL and VL is an oval wrinkled area (figs. 160, 178, 186).

The wrinkled tissues suggested expansion, and so two palps were treated with hot lactic acid and both indeed expanded. In *M. katarinae* both lobes opened somewhat (figs. 194, 195) and in *M. molotra* only the ventral lobe expanded, but considerably so (figs. 190, 191).

The palp of *M. milloti* is rather similar to those of the *M. molotra* group, despite the dramatic differences in somatic characters. The form of the palp and orientation of the lobes are similar in both, and *M. milloti* also has the DL produced into a thin carina (fig. 338) and the VL has a wrinkled texture (fig. 340). However, the palp of *M. milloti* differs in that its lobes are more tightly fused (or closed) than in the *M. molotra* group and that their interface is sigmoid (figs. 6, 340) rather than straight (figs. 1–4).

In *M. tsingy*, however, the palp is very different from other *Molotra*. First, the bulb and tarsus are rotated outward relative to the rest of the palp (fig. 281), as described earlier, with the result that the resting position of the embolar region is at the sternal edge (figs. 242, 256), rather than in the anterior cavities which are here absent (figs. 256–259). Second, the embolar region is divided by a transverse groove into a basal component, which contains a prong and an oval area of wrinkled tissue, and a distal component, which contains the remaining structures (figs. 290, 292). This groove gives the appearance that the embolar region has folded in on itself, suggesting

that, in addition to the rotation of both tarsus and bulb, the bulb itself has undergone a rotation. Third, the orientation of the embolar lobes is different, being vertical here, but horizontal in other *Molotra*. Indeed, the rotation of the embolar distal component by about 90° (clockwise in the left palp), would align the lobes horizontally. Fourth, another important difference is the presence of an additional embolar sclerite, which further confounds the assessment of homology.

The embolar region of *M. tsingy* has four projecting structures, two lobes (L1, L2) and two prongs (DP, VP). The lobes are fused along their dorsal boundary, with the smaller lobe (L1) on the prolateral and the larger (L2) on the retrolateral side. The two prongs are flattened and have slight terminal hooks. The dorsal prong (DP) is attached to the basal part of the embolar region, adjacent to an oval region of wrinkled membrane. The ventral prong (VP), however, is attached to the distal part of the embolar region and is connected to both L1 and L2. What is not clearly visible in this preparation is the opening of the embolus, which seems to be a small slit hidden by some debris or exudates (O in fig. 292) and situated in a zone of membrane. This membrane extends onto the base of VP, visible as the area of wrinkled tissue situated between VP and O in figure 292, and suggests that the VP may be the embolus and O its subapical opening, similar to the condition in *M. molotra*. Homology of the DL is less clear. Based on position, L1 is the most dorsal, but is of the wrong form, being fleshy and wrinkled, and can be ruled out. DP is another possibility, as it is hard and thin and originates at the wrinkled oval. However, the DP originates in the basal part of the embolar region and far from the embolus (fig. 5), whereas the DL of *M. molotra* is fused to the embolus (fig. 1). Finally, L2, a large sclerite with a smooth texture (fig. 292), seems to be the best possible homolog. It is apparently hyaline (fig. 281), has a curved edge that is thin and brittle, judging by the chipped dorsodistal edge (fig. 288), and is connected to the embolus (VP in fig. 292). Accepting this interpretation means the VL is represented by the smaller, wrinkled lobe, L1.

Although this interpretation is plausible, it does not address the different orientation of the embolar parts in *M. tsingy*. The elements, L1-L2-VP, are correctly connected to each other, but are twisted about 90° from their position in other *Molotra*. The transverse fold of the embolus, also suggests twisting. However, "opening up the fold" would twist the distal elements clockwise (in the left palp) and put L2, the suggested DL homolog, in a ventral position on the bulb. To get L2 in a dorsal position would require a turn counterclockwise which does not seem possible without destroying the structural integrity of the bulb. This suggests that L2 is VL.

However, even if L2 is not a true homolog of DL, it is clearly an analog. In consequence of the twisting and folding of the *M. tsingy* palp, in its resting posture the embolar elements are covered (protected) by the large L2 (figs. 256–259). In other *Molotra*, with normal palpi, the embolar elements are covered by the DL (fig. 87). So, even if because of positional differences the two structures are not homologs, in this situation they seem to be performing the same function, hence at least analogs.

Molotra female genitalia

The female genitalia of *Molotra* are unusual in lacking a receptaculum and are described here in some detail. Females from three species are known and were examined with light microscopy, but only *M. molotra* was viewed with SEM.

Light microscopy shows that the genitalia are rather simple. In untreated specimens the larger structures can be seen through the cuticle, depending on its transparency, and show two pairs of apodemes and a median T-shaped process (figs. 198, 202, 204) to which are attached muscles (fig. 200). Digested specimens, of course, show this in greater detail. The genitalia of the three species are very similar and the only obvious difference at this magnification is the size of the T-shaped process (TP in figs. 199, 201, 203, 205), but not that of the anterior (AA) and posterior (PA) apodemes, which seem fairly uniform in size. Also visible in this preparation are some transverse ridges between the PA, most distinct in fig. 201.

The external genitalia are very simple. The gonopore is a wide opening with sclerotized margins, especially the outward projecting posterior one (figs. 206, 207). An abdomen was separated along the epigastric furrow, showing much detail. The anterior lip has a broad flat edge and, in its center a triangular, concave process (AMP of figs. 208, 211). This sclerite has two openings, a wide median one where it attaches to the epigastric scutum (AO), and a small pore at the distal, pointed end (figs. 209, 211). The posterior lip also has a median process (PMP), which also has a median opening (PO), albeit much wider (figs. 210, 212). Unlike the AMP, the PMP is convex and has a fine median longitudinal crack (fig. 212). Attached to both the AMP and PMP are membranous remnants that are presumably the walls of the uterus internus (figs. 209–213).

In the internal scans (figs. 214–219), the T-shaped process (TP) is prominent, with its large triangular head and broad muscle attachments. The attachments align with the broad anterior apodemes (AA) which have a similarly scalloped surface (figs. 216–218). The TP is associated with two structures. The first is a low transverse ridge immediately ventrad of the TP stalk, and whose membranous edges can be seen between the arrows in figure 217. The second is a triangular sclerite, whose edge is indicated by the membranous remnants of the uterus (UI in fig. 217), and to which the TP seems to be firmly attached. Based on position, this is the same AMP as described above, and its median pore is aligned with the TP stalk.

The posterior genitalia are dominated by the large foliate posterior apodemes (PA in fig. 216) and a series of five transverse ridges (fig. 219). The posteriormost ridge connects the posterior respiratory spiracles, and the next one encircles the bases of the PA. The three anterior ridges all seem to be connected. The anteriormost has two rounded lateral projections (fig. 217), which are also visible in anterior view at the sides of the PMP (fig. 210). The next two ridges are continuous with the bases of the PA. Between them lies a field of papillae (PF in fig. 215) and a cylindrical median structure (GAp in fig. 215), which is fused to the anteriormost ridge and opposes the base of the TP (fig. 219). The posterior median process (PMP) seems to be a rigid structure that includes the three anterior ridges and their attachments (fig. 218).

A digested abdomen was subjected to a sagittal section (fig. 226) and scans were made of both the left (figs. 220, 222, 224, 225) and right (figs. 221, 223) sides. One obvious observation is that the integrity of the PMP is evident in the images. The connections between the three anterior ridges and their attachment to PA and GAp clearly show that this is one rigid unit (fig. 225). Sectioned views also show that the PMP is attached to the postepigastric scutum by much thinner tissue that looks flexible (figs. 221, 225). Also revealed are the transverse pockets asso-

ciated with the openings at the gonopore. The one associated with the anterior opening (AO) is indicated by the torn membrane ventrad of the PA (figs. 222, 223). The posterior opening (PO) goes into a pocket beneath the GAp and the field of papillae (figs. 220, 222). The dorsal wall of that pocket is sclerotized and formed by the PMP, whereas the posterior and ventral walls are membranous and connect the PMP to the posterior rim of the gonopore (fig. 230).

This posterior pocket is interesting because, except for size, it closely resembles the receptaculum described for *Silhouettella loricatula* (Roewer) by Burger et al. (2006). In their figure 7b, the posterior opening of the gonopore also enters a cavity with a membranous ventral wall that connects to a sclerotized structure which bears the papillae and GAp. Given the similarity in structure, the posterior pocket of *M. molotra* is the probable homolog (vestige) of the receptaculum.

Figure 227 shows the gonopore with its margins viewed on end. The main (median) opening is indicated by the membranous remnants of the uterus, and the anterior and posterior openings are shown by the upper and lower arrows, respectively. The sectioned view shows that these openings (arrows in fig. 228) lead into pockets. A reconstruction of the genitalia (fig. 230) gives the anterior component in green and posterior in brown, with sclerotized sections darkly pigmented.

The slitlike openings at the female gonopore combined with the broad flat dorsal lobes of the male palp suggest that the two structures couple. Without sliding too far down the slippery slope of speculation, this fascinating morphology makes it hard to avoid some discussion. First, as this species does not have external epigynal openings, insemination needs to take place within the gonopore. This means that the embolus and embolar tube need to penetrate, as does the closely connected dorsal lobe. Second, as the posterior pocket is homologous with the typical receptaculum, it seems safe to assume that insemination takes place here (as opposed to the anterior pocket, which seems to be a blind cavity on the opposite side of the gonopore).

Figure 229 shows a male *M. molotra* in oblique apical view holding the left palp outward. The image is at the same magnification as the female genitalia (fig. 230) and orientated so as to maximize the fit between the posterior gonopore margin of the female and the groove formed by the dorsal lobe of the male. A comparison of the embolar region to the female genitalia shows that the shape and curvature of the dorsal lobe would fit the posterior opening (fig. 230). The placement of the ventral lobe is ambiguous, as it may or may not need to enter the gonopore. If it does enter the gonopore, the obvious possibility is the anterior pocket. As this lobe is capable of expansion, doing so while inserted may function as a locking mechanism. The joining of the genitalia as described requires that the spider pair is positioned venter to venter and facing in the same direction. This is the same copulatory position described for *S. loricatula* (Burger and Carrera, 2011: figs. 2–4), except that its male orients the dorsal surface of the bulb against the female's abdomen, whereas the morphology of *M. molotra* requires the prolateral surface.

Relationships

The relationship of *Molotra* to other oonopids is not clear. Our search through the literature and the images available on the PBI site has not turned up any obvious sister group of the

genus. The unusual genitalia of *Molotra*, which clearly appear to be derived, suggest a relation among species with similar modifications: a broadly lobed embolar region in the male and a reduced receptaculum in the female. One possibility is *Xyphinus* Simon, where the male palp does have broad terminal lobes (see figures in Deeleman-Reinhold, 1987) and the female genitalia have recently been shown to lack a receptaculum (Burger, 2010b). However, unpublished images of the *Xyphinus* palp (made available by Y. Kranz-Baltensperger) show many differences from *Molotra*, such as a larger number and more complex arrangement of the terminal lobes and an enlarged tibia and patella with prolateral tubercles. The female genitalia of *Xyphinus* also differ from *Molotra* in having external modifications, such as cavities and scapelike structures, and a very different internal arrangement (Burger, 2010b: fig. 1A, B). Finally, the many somatic differences of *Xyphinus* (for example, the absence of leg spines, the enlarged pedicel, and various modifications in carapace and abdomen shape and ornamentation) further suggest that it is not closely related to *Molotra*.

Another place to seek relatives of *Molotra*, is among somatically similar species. The species of the *M. molotra* group closely resemble some of the silhouettelloids found on Madagascar. The group "silhouettelloids" as used here refers to those genera that have genitalia similar to that described for *Silhouettella loricatula* (Roewer) by Burger et al. (2006); see also Álvarez-Padilla et al., in press. For comparison we present a typical silhouetelloid, *Tolegnaro sagani* Álvarez-Padilla et al., in press (figs. 7, 9, 11). The female genitalia are recognized by a large oval receptaculum (fig. 7), which is missing in *Molotra* (fig. 8). Despite this difference, closer examination of *Molotra* female genitalia shows much similarity with the silhouettelloids. Both show a basic division of the genitalia into a strongly sclerotized anterior and posterior component, which together form a locking mechanism for the gonopore. Both also have:

(1) a distinct to robust central T-shaped process, TP (figs. 7, 8, 199, 203, 205.);

(2) large, broadly foliate posterior apodemes, PA (fig. 218);

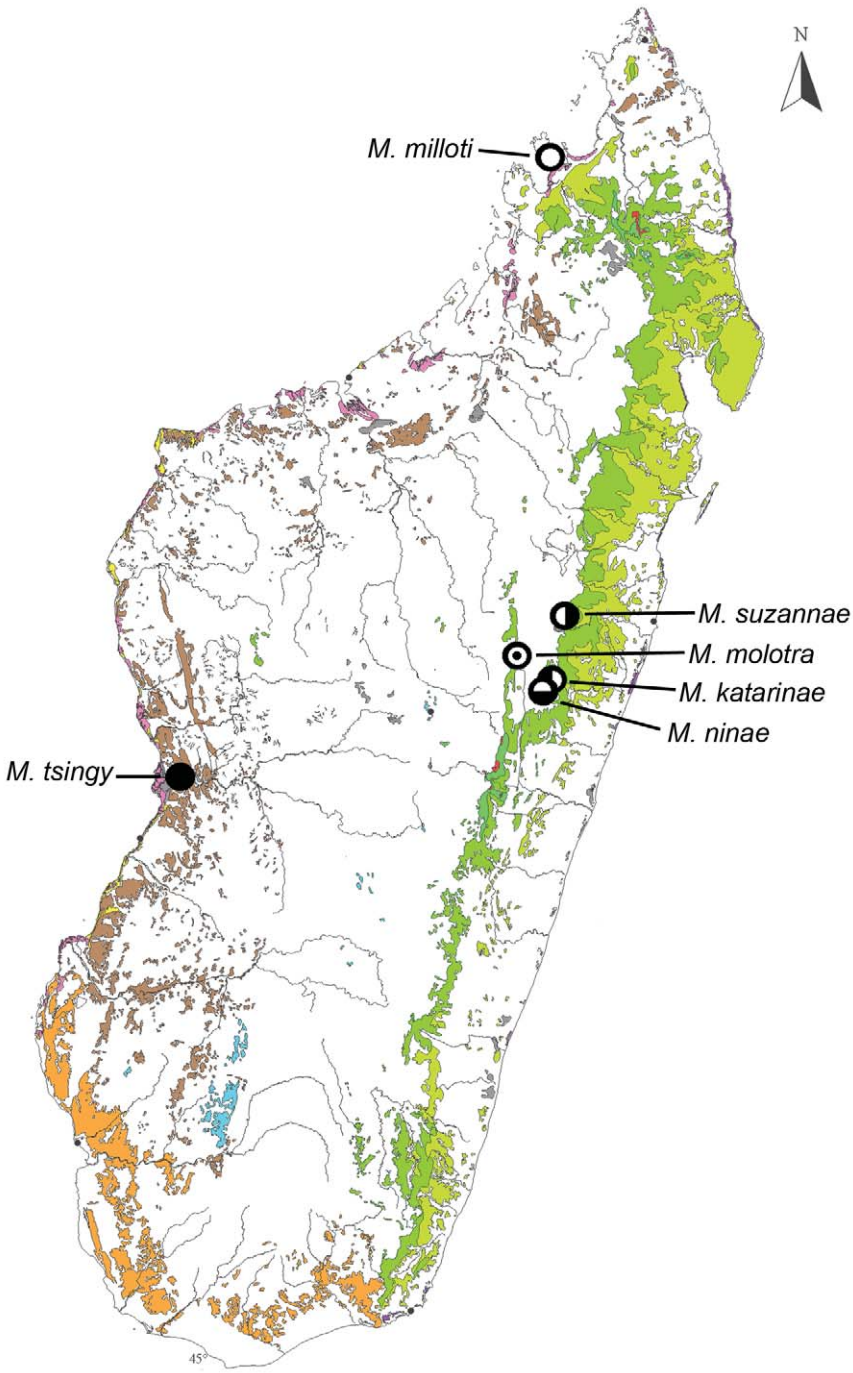
(3) PA attachment via anterior and posterior transverse ridges (fig. 219);

(4) a field of papillae between the ridges (figs. 9, 10, 215); and

(5) papillae size and shape similar to that in some silhouettelloids (figs. 8, 11, 215);

If a relationship to the silhouettelloids is suggested by female morphology, what about the male? At first glance, the *Molotra* male has a very different embolar region (fig. 12) from that of the silhouettelloid, which has several terminal attenuations (fig. 11). However, there are still some potential homologies. Both have liplike prolateral surfaces on the embolar region, a basic division into dorsal and ventral components (lobes), an embolus attached to the dorsal lobe, a subapical embolar opening, and a ventral lobe basally creased (wrinkled) and presumably expansible.

Although the association of *Molotra* with the silhouettelloids seems reasonable, a specific sister-group relationship is not obvious. Also not certain is the polarity of the different genitalic states. Is the relative simplicity of the genitalia (presence of fewer parts) a primitive state or derived as a consequence of fusion and reduction? If the absence of the receptaculum is derived on the basis of a structural loss, then the *Molotra* palp may likewise be derived, and represent a fusion and reduction of lobes. If this trend is extrapolated within *Molotra*, the derived state would be an embolar region with the shortest and most fused lobes, as in *M. milloti* (fig. 6).



MAP 1. Map of Madagascar showing the distribution of *Molotra* species.

And conversely, the palp with the largest number of structures would be the most primitive state, as *M. tsingy* (fig. 5). This latter conclusion is difficult to accept given the apparently unique (autapomorphic) states in that species, such as the palpal rotation and loss of the sternal cavities. That the palp in *M. tsingy* may have a combination of plesiomorphies and apomorphies is another possibility.

Biogeography

Given the rarity of *Molotra* in our samples, few conclusions may be drawn here. The 90 specimens examined represent less than 1% of the total Malagasy oonopids available for study. Only the type species is abundant, with the remaining five species represented by only 13 specimens, or about 0.1% of the collection. The relative abundance of *M. molotra* is curious, given that the other localities were sampled in a similar manner. Perhaps there is a seasonal factor here, as this species was the only one sampled in December, or an altitudinal one, as it comes from a slightly higher elevation (1300 m) than the others (<1100 m).

The species distributions are plotted on map 1. The three groups are geographically disjunct and occupy different biotic regions. The four species of the *M. molotra* group are allopatric to parapatric and confined to a small portion of northeastern Madagascar, in wet montane rainforests from ~1000–1300 m elevation.

M. tsingy is from the midwestern part of the island, a tropical dry forest in karst terrain (Tsingy). The two known males resemble those in the *M. molotra* group, except for size-related differences. In addition to their smaller size, these males also have paler pigmentation, shorter leg spines and reduced tuberculation, including the absence of the carapace knob and scutopedicel ridges (table 1). The reduced size and form of *M. tsingy* are most likely adaptations to life in their drier habitat. A similar pattern is known from another Malagasy oonopid, *Malagiella*, which also includes a small pale species from the more xeric western part of the country (Ubick and Griswold, 2011).

M. milloti is known from a single male specimen collected by Millot on the northwest of the island, at the coastal resort area of Ankify. A single collection from a coastal locality is suspicious and suggests the possibility that this species may be introduced. This is supported by its unusual somatic morphology, which is very different from both *Molotra* and other known Malagasy oonopids (table 1).

MATERIALS AND METHODS

Specimens were examined using a LEICA MZ 12.5, MZ16A and Nikon compound microscope. Automontaged images were made using the Leica LAS software and Helicon Focus. Specimens used for scanning electron microscopy were dehydrated in 100% ethanol, critical point dried, sputter coated, and imaged with a LEO 1450 VP or Hitachi S-520 SEM. To examine the expansion of male pedipalpi these were removed, boiled for two to five minutes in 92% DL–lactic acid solution (SIGMA-ALDRICH, Inc., St. Louis, USA), and placed in water where expansion occurred. Female genitalia were examined intact, using clove oil, lactic acid, and/or

methyl salicylate, and with the soft tissues digested using pancreatin, using the procedure described in Álvarez-Padilla and Hormiga, 2008. Two sections were made of the female genitalia of *M. molotra*: one digested abdominal venter was separated along the epigastric furrow, and another was cut with a microscalpel in an oblique sagittal section.

Descriptions were generated with the aid of the PBI goblin spider descriptive database and shortened where possible. For leg spination, only surfaces bearing spines are listed. The localities were mapped using Google Earth and the plates prepared in Adobe Photoshop. The vegetation map of Madagascar is from Du Puy and Moat (2003) and was obtained online from the GIS Unit of the Royal Botanic Gardens, Kew, and used with permission. Measurements are in millimeters, unless indicated otherwise.

All specimens studied are from the California Academy of Sciences (CAS), with the exception of the specimen of *M. milloti*, which is from the Muséum d'Histoire Naturelle, Paris (MNHN).

Abbreviations

Gender signs identify male and female genital structures.

AA	anterior apodeme (= A2 of Burger, 2010a) (♀)
AMP	anterior median process (♀)
AO	anterior opening at gonopore (♀)
BL	book lung
DL	dorsal lobe of embolar region (♂)
DP	dorsal embolar prong of *M. tsingy* (♂)
E	embolus (♂)
EO	embolar opening (♂)
GAp	globular appendix (Burger, 2010a) (♀)
GO	gonopore
L	lateral (outer) teeth of claw
L1, L2	unresolved embolar lobes of *M. tsingy* (♂)
M	median (inner) teeth of claw
ML	middle lobe of embolar region (♂)
O	opening of embolus (♂)
PA	posterior apodeme (= A1 of Burger, 2010a)
PF	papillae field (♀)
PMP	posterior median process (epigynum) (♀)
PO	posterior opening at gonopore (♀)
R	receptaculum (♀)
TP	T-shaped process (= PSc of Burger, 2010a)
UI	uterus internus (♀)
VL	ventral lobe of embolar region (♂)
VP	ventral embolar prong of *M. tsingy* (♂)

COLLECTIONS EXAMINED

CAS California Academy of Sciences, San Francisco
MNHN Muséum d'Histoire Naturelle, Paris

SYSTEMATICS

Molotra, new genus

TYPE SPECIES: *Molotra molotra*, new species.

ETYMOLOGY: The genus name is from the Malagasy word for "lip," in reference to the liplike embolar lobes of the male, and is feminine in gender.

DIAGNOSIS: The male genitalia distinguish *Molotra* from other oonopids. The palp is simple, having two broad lobes, a thin, brittle dorsal lobe, and a more inflated, wrinkled ventral lobe, which are partially to completely fused to the embolus (figs. 1–6).

DESCRIPTION: MALE: Total length 1.5–2.5. CEPHALOTHORAX: *Carapace* orange-brown, without any pattern, broadly oval in dorsal view, pars cephalica slightly elevated in lateral view, anteriorly narrowed to less than 0.49 times its maximum width, with rounded posterolateral corners, posterolateral edge without pits, posterior margin not bulging below posterior rim, anterolateral corners without extension or projections, posterolateral surface without spikes, thorax without depressions, fovea absent, without radiating rows of pits; lateral margin slightly undulate, rebordered, with blunt denticles; plumose setae near posterior margin of pars thoracica absent; nonmarginal pars cephalica setae light, present in U-shaped row; marginal setae light, needlelike. Clypeus margin unmodified, straight in anterior view, vertical in lateral view, high, ALE separated from edge of carapace by their radius or more, median projection absent; setae light, needlelike. Chilum absent. Eyes six, well developed, all subequal, ALE oval, PME squared, PLE oval; posterior eye row recurved from above, straight to slightly procurved from front; ALE separated by about their diameter, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME separated by less than PME radius. Sternum uniformly orange brown, not fused to carapace, with anterior excavation, median concavity absent, radial furrows with small pits between coxae I–II, II–III, III–IV, radial furrow opposite coxae III absent, surface smooth, covered with small round pits, microsculpture medially and in furrows, sickle-shaped structures absent, anterior margin with continuous transverse groove, posterior margin not extending posteriorly of coxae IV, anterior corner unmodified, lateral margin with infracoxal grooves, but lacking obvious pits, distance between coxae approximately equal, extensions of precoxal triangles absent, lateral margins unmodified, without posterior hump; setae light, needlelike, without hair tufts. Mouthparts: Chelicerae, endites, and labium orange-brown. Chelicerae straight, anterior face unmodified; without teeth on promargin or retromargin; fang without toothlike projections, directed medially, shape normal, without prominent basal process, tip unmodified; setae needlelike, evenly scattered; paturon inner margin with scattered setae, distal region and posterior surface unmodified, promargin with

row of flattened setae, inner margin with medial denticles, laminate groove absent. Labium trapezoidal, anteriorly indented, free from sternum, anterior margin indented at middle, same as sternum in sclerotization; with six or more setae on anterior margin, subdistal portion with unmodified setae. Endites with distal excavation, serrula present in single row, posteromedian part unmodified, same as sternum in sclerotization. ABDOMEN: Ovoid, without long posterior extension, rounded posteriorly, interscutal membrane lacking rows of small sclerotized platelets. Book lung covers smaller than pedicel diameter, without setae, anterolateral edge unmodified. Posterior spiracles connected by groove. Pedicel medium sized, ribbed, lacking plumose hairs, matted setae, or cuticular outgrowths. Dorsal scutum strongly sclerotized, orange-brown, without color pattern, covering full length of abdomen, no soft tissue visible from above, separate from epigastric scutum, anterior half without projecting denticles. Epigastric scutum strongly sclerotized, surrounding pedicel, at least slightly protruding, extending far dorsal of pedicel (scutum L > pedicel diameter), small lateral sclerites absent. Postepigastric scutum strongly sclerotized, orange-brown, covering nearly full length of abdomen, fused to epigastric scutum, anterior margin unmodified, with posteriorly directed lateral apodemes. Spinneret scutum present as incomplete ring, with fringe of needlelike setae. Supraanal scutum present. Dorsal setae light, short (except in *M. milloti*). Epigastric area setae uniform, light, needlelike. Postepigastric area setae light, needlelike. Without dense patch of setae anterior to spinnerets. Interscutal membrane with setae. Colulus represented only by setae. LEGS: Yellowish brown, without color pattern; femur IV not thickened, same size as femora I–III, patella plus tibia I shorter than carapace, tibia I unmodified, tibia IV without specialized hairs on ventral apex or ventral scopula, metatarsi I, II lacking mesoapical comb, metatarsi III, IV without ventral scopula. Trichobothria tibia: each with three; metatarsus: each with one; base longitudinally narrowed, aperture internal texture gratelike, hood covered by numerous low, closely spaced ridges. Tarsal organ with two sensilla on palp and tarsi III and IV, three sensilla on tarsi I and II. GENITALIA: Epigastric region with sperm pore oval, unmodified, situated at level of anterior spiracles, but anterior of spiracles in *M. milloti*; furrow without Ω-shaped insertions or setae. Palp normal size (not minute), not strongly sclerotized, right and left palps symmetrical, uniformly pale orange; embolar area darker, prolateral excavation absent; trochanter normal size, unmodified; femur normal size, two or more times as long as trochanter, without posteriorly rounded lateral dilation; patella shorter than femur, without prolateral row of ridges, setae unmodified; cymbium orange, ovoid in dorsal view, not fused with bulb, not extending beyond distal tip of bulb, without plumose setae or stout setae but with distal patch of setae; bulb orange, stout, about 1.5 times as long as cymbium. Embolar region consists of two broad lobes fused to embolus; dorsal lobe, thin, hyaline, brittle; ventral lobe thicker, wrinkled texture.

Female: Description given in the *M. molotra* species group.

Species Included: *Molotra katarinae*, *M. milloti*, *M. molotra*, *M. ninae*, *M. suzannae*, and *M. tsingy*.

Distribution: Known only from Madagascar.

KEY TO SPECIES

1. Carapace and abdomen covered in long, thick setae (figs. 293–300); legs with bristles, lacking spines (figs. 307–310); size large (2.4 mm); male palpal lobes small, appearing fused (closely contiguous) and with their edges forming a sigmoid interface (figs. 327–341); female not known. . . . . *M. milloti*

– Carapace and abdomen covered in short, thin setae (figs. 39–45, 231–237); legs with spines, lacking bristles (figs. 29–38, 244–247); size smaller (<2.3 mm); male palpal lobes larger, have projecting elements (i.e., are not fused) and meet along a straight line (figs. 1–5). 2

2. Size small (1.5 mm); color yellowish orange; carapace smooth; carapace knob small (figs. 234, 243, 249); scutopedicel ridges absent (figs. 262, 263); male palpal bulb rotated with embolus resting at sternal edge (figs. 242, 256–261); embolus complex with two lobes, a broad retrolateral and a smaller prolateral lobe, and two prolateral prongs (figs. 5, 279–292); female not known. . . . . *M. tsingy*

– Size larger (1.8–2.3 mm); color orange-brown; carapace granulate; carapace knob large (figs. 16, 24, 42, 50, 58, 66, 74, 85); scutopedicel ridges present (figs. 19, 27, 45, 53, 61, 69, 77, 107–111); male palpal bulb not rotated, embolus resting in anterior sternal cavity (figs. 17, 43, 51, 67, 87, 88); embolus complex with broad dorsal and ventral lobe, prolateral prongs absent (figs. 1–4); female genitalia lacking receptaculum (figs. 8, 10) . . . . . (*molotra species group*). . .3

3. Carapace with distinct declivity anterior of knob (figs. 16, 24, 42, 85); lateral margin with 12–15 setose denticles (figs. 79–86); male palpal patella > tibia (figs. 190–193); bulb with large ventral lobe (figs. 143, 147, 164, 168); female (not known in *M. ninae*) genitalia with large, thick T-shaped process (TP in figs. 198–201). 4

– Carapace somewhat flatter anterior of knob (figs. 50, 58, 66, 74); lateral margin with 15–22 setose denticles; male palpal patella ≤ tibia (figs. 194–197); bulb with small ventral lobe (figs. 151, 155, 178, 186); female genitalia with smaller, thinner TP (figs. 202–205). 5

4. Male palpal tibia swollen ventrally (fig. 143); embolar region narrower (figs. 142, 158); ventral lobe extended (figs. 158–165). . . . . *M. molotra*

– Male palpal tibia flat ventrally (fig. 147); embolar region broader (fig. 146, 166); ventral lobe retracted (figs. 166–173). . . . . *M. ninae*

5. Carapace lateral margin with 20–22 setose denticles (figs. 50, 58); male embolar region with broad lobes (figs. 151, 178, 194–196); female TP with wide head (figs. 202, 203) . . . . . *M. katarinae*

– Carapace lateral margin with 15 setose denticles (figs. 66, 74); male embolar region with narrow lobes (figs. 155, 186, 197); female TP with narrow head (fig. 204, 205) . . . . . *M. suzannae*

Molotra molotra species group

Diagnosis: Members of this group may be distinguished from the others by a combination of somatic characters: large size, darker pigmentation, larger eyes, carapace strongly granulate and with a pronounced posterior knob, short body setae, and round book lung covers (figs. 13–78). The male palp differs from others in the genus in that the DL and VL are arranged along a horizontal plane (figs. 1–4), but vertical in *M. tsingy* (fig. 5); are at least slightly separated from each other, but closely appressed in *M. milloti* (fig. 6); and meet in a straight line, but are sinuous in *M. milloti*. The female genitalia are unusual in lacking a receptaculum, but have a genitalic architecture, including a T-shaped process, apodemes, papillae, and ridges, resembling that found in the sillouettelloids (figs. 8, 10).

Description: Male: Total length 1.9–2.2. CEPHALOTHORAX: Carapace with surface of elevated portion of pars cephalica granulate, sides granulate; with prominent pointed knob on posterior margin of pars cephalica (figs. 16, 42, 50, 66, 85). Sternum slightly longer than wide, with anterior excavation wide, surface with many large pits, especially at infracoxal grooves (figs. 87–89). Endites with distal (ectal) excavation (figs. 93, 95, 96). ABDOMEN: Book lung covers medium sized, smaller than pedicel diameter, oval (figs. 19, 45, 53, 69). Posterior spiracles connected by complete groove, anterior spiracles by partial groove (figs. 102, 104, 105). Pedicel dorsal surface with lateral ridges, smaller ridges on opposing surface of epigastric scutum (figs. 107–109). Epigastric scutum dorsal extension only slightly greater than pedicel diameter (figs. 15, 41, 49, 65, 100). Postepigastric scutum with short posteriorly directed lateral apodemes (figs. 20, 46, 54, 70, 104, 105). Dorsal setae present, short. Spinnerets (of *M. molotra*): ALS with four spigots, median on large base plus three laterals on small bases; PMS with two spigots on large bases; PLS with three spigots on large bases (figs. 112–115). Leg spines present, longer than leg segment width: tibiae: I, II v4-2-2; metatarsi I, II v2-2-0. Tarsal claws examined in *M. molotra*: inferior claw absent, superior claw surfaces striate; all proclaws and retroclaws similar, with single row of five large teeth, evenly distributed along claw, in ventral position with origin slightly median, closely resembling outer claw teeth in female (figs. 131–141). GENITALIA: Palp femur attaches to patella basally. Embolar region with dorsal and ventral lobes separate, with straight interface (figs. 1–4, 142–197).

Female: Total length 2.1–2.3. CEPHALOTHORAX: Sternum with anterior cavity smaller than in male (figs. 25, 59, 75, 90–92). Endites distally not excavated, anteromedian tip unmodified (figs. 94, 97). Palp without claw; spines absent; tarsus unmodified, patella without prolateral row of ridges (figs. 33, 34). ABDOMEN: Epigastric scutum relatively flat ventrally, not protuding ventrally as in male, not fused to postepigastric scutum. Spinnerets (of *M. molotra*): ALS with four spigots, median on large base plus three laterals on small bases; PMS with four spigots on large bases; PLS with eight spigots on large bases (figs. 116–119). LEGS: pale orange; patella plus tibia I nearly as long as carapace. Tarsal claws (of *M. molotra*) with two rows of teeth; claws I and II with five large ventral (lateral) teeth, spread across entire claw length, six or five (respectively) shorter inner teeth, in median position; claws III with four ventral (lateral) teeth, medium sized, basal in position, four small, more apically positioned inner teeth; claws IV with three ventral (lateral) teeth, medium sized, basal, three or four small, apical inner teeth

(figs. 137–141). GENITALIA: Anterior and posterior apodemes prominent, T-shaped process well developed and variable in size, receptaculum absent (figs. 198–205).

Species Included: *Molotra katarinae*, *M. molotra, M. ninae*, and *M. suzannae.*

Molotra molotra, new species

Figures 1, 8, 10, 12–38, 79–145, 158–165, 190, 191, 198–201, 206–230; map 1; table 1

Types: Male holotype, female allotype and five male and five female paratypes from Madagascar, Antananarivo Province, 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, sifted litter, 1300m, 18.47333°S, 47.96000°E (5–13 Dec 2000, Fisher-Griswold Arthropod Team) deposited in CAS (CASENT9000917, PBI_OON_01990).

Etymology: Same as for genus.

Diagnosis: This species differs from other *Molotra* by the combination of carapace with prominent posterior knob and distinct dorsal declivity (figs. 15, 23), lateral margin with about 15 setose denticles (figs. 16, 24), male palpal patella larger than tibia (figs. 143, 145), embolar region with large dorsal and ventral lobes (figs. 158, 165), embolar tip free, not fused to lobes (figs. 163–165), and female with large T-shaped process (figs. 198–201).

Male (PBI_OON_01990): Total length 2.05. CEPHALOTHORAX: Carapace lateral margin with about 14 denticles on each side (figs. 16, 81–86). Sternum microsculpture medially and in furrows (figs. 17, 87–89), infracoxal grooves present, but shallow and without apparent pores (fig. 89); setae abundant, densest laterally, originating from surface. ABDOMEN: Book lung covers smaller than pedicel diameter (fig. 19). Scutopedicel region with ridges (figs. 19, 107–109), scutum not extending far dorsal of pedicel (figs. 15, 100). Epigastric scutum slightly protruding. Postepigastric scutum long, almost rectangular. Spinneret scutum without fringe of setae. LEGS: Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II v4-2-2; metatarsi: I, II v2-2-0 (figs. 29–32). Tarsi I to IV superior claws teeth examined in detail: superior claw surfaces striate; all proclaws and retroclaws similar, with single row of five large teeth (excluding distal) occupying entire space (figs. 131–136). Trichobothria examined with SEM, bothrium finely wrinkled, pit with gratelike wrinkles (figs. 120–122). Tarsal organ as in female with two sensillae on palp, tarsi III, IV; 3 sensillae on tarsi I, II. GENITALIA: Epigastric region with sperm pore small (figs. 20, 102, 103), internally with sclerotized anterior edge (figs. 105, 106), flanked by two obliquely directed apodemes (figs. 104, 105). Palp femur attaching to patella basally (figs. 143, 190); cymbium with distal scopula (figs. 158, 159); embolar region with large dorsal and ventral lobes (figs. 1, 165); embolus distal section not fused to lobes (figs. 163–165).

Female (PBI_OON_01990): Total length 2.20. As in male except as noted. CEPHALOTHORAX: Carapace lateral margin with about 16 denticles on each side (figs. 24, 79, 80). ABDOMEN: Pedicel tube short, scutopedicel region with ridges (fig. 111). Epigastric scutum without lateral joints. Postepigastric scutum separate from epigastric scutum (figs. 28, 198, 207). Spinneret scutum present, complete ring. Supraanal scutum absent. LEGS: Leg spination (only surfaces bearing spines listed, all spines longer than segment width): tibiae: I, II v4-2-2; metatarsi: I, II v2-2-0 (figs. 33–38). Tarsal claws with two rows of teeth; claws I, II with five

large ventral (= outer) teeth, spread across entire claw length, six or five (respectively) shorter inner teeth, in median part of claw; claws III with four ventral (= outer) teeth, medium sized, basal in position, four small, more apically positioned inner teeth; claws IV with three ventral (= outer) teeth, medium sized, basal, three to four small, apical inner teeth (figs. 137–141). Trichobothria (figs. 128–130), tarsal organs (figs. 123–127) as in male. GENITALIA: Internal genitalia lacking large receptaculum, but T-shaped process, apodemes well developed (figs. 201, 214–225).

Other Material Examined: **MADAGASCAR: Antananarivo:** 3 km 41° NE Andranomay, 11.5 km 147° SSE Anjozorobe, montane rainforest, sifted litter, 1300m, 18.47333°S, 47.96000°E, 5–13 Dec 2000, Fisher-Griswold Arthropod Team, 1 ♂, 1 ♀, paratypes (CAS, CASENT9003825, PBI_OON_03389); pitfall traps, 9 ♂, 7 ♀, paratypes (CAS, CASENT9001460, PBI_OON_03390);Same, 19 ♂, 22 ♀, paratypes (CAS, CASENT9001458, PBI_OON_03392); General collecting, 4 ♂, 3 ♀, paratypes (CAS, CASENT9004108, PBI_OON_03391).

Distribution: Known only from the type locality.

Molotra ninae, new species

Figures 3, 39–46, 146–149, 166–173, 192, 193; map 1; table 1

Types: Male holotype and male paratype from Madagascar, Toamasina, Ambatovy, 12.4 km NE Moramanga, 1080 m, 18.83944°S, 48.30833°E (4–7 Mar 2007, B.L. Fisher et al.) deposited in CAS (CASENT9036087, PBI_OON_03839).

Etymology: This species is named after Darrell Ubick's niece and goddaughter, Nina Jaehning, who deserves to have a species named in her honor.

Diagnosis: This species differs from other *Molotra* by the combination of carapace with prominent posterior knob and distinct dorsal declivity (fig. 41), lateral margin with about 13 setose denticles (fig. 42), male palpal patella larger than tibia (figs. 192, 193) and embolus with large ventral and dorsal lobes (figs. 146–149).

Male (PBI_OON_03395): Total length 2.16. CEPHALOTHORAX: Carapace lateral margin with about 13 denticles on each side (fig. 42). Eyes: ALE slightly larger than others, ALE circular (figs. 40–42). Sternum only slightly longer than wide (fig. 43). Mouthparts: Endites distally excavated. ABDOMEN Scutopedicel ridges present (fig. 45). Dorsal scutum middle surface smooth, sides smooth. Supraanal scutum not visible. GENITALIA: Epigastric region with sperm pore situated between anterior and posterior spiracles (fig. 46). Palp patella slightly enlarged, longer than tibia (figs. 192, 193), embolar lobes broad (figs. 146–149, 166–173).

Female: Unknown.

Notes: The embolar region is more complex than in others of the group. The VL is folded in toward the DL (fig. 3), and not splayed out as in *M. molotra* (fig. 1). Basad of the wrinkled VL is a flat smooth region (VL? on fig. 173), of unknown homology. On its prolateral side and bent inward (toward the embolus) is a thick, seemingly rigid, process (fig. 169). This process opposes a thinner flap, of externally wrinkled membrane, which is attached to the DL (figs. 168, 171).

Other Material Examined: **MADAGASCAR: Toamasina:** Torotorofotsy, 18.87083°S, 48.3475°E, 1070 m, 24 Mar 2004, montane rainforest, sifted litter, Malagasy ant team, 1♂ paratype (CAS, CASENT9023263, PBI_OON_03395).

Distribution: Known from two localities in NE Madagascar.

Molotra katarinae, new species

Figures 2, 47–62, 150–153, 174–181, 194–196, 202, 203; map 1; table 1

Types: Male holotype, female allotype, and two male paratypes from Madagascar, Toamasina, Ambatovy, montane rainforest, leaf mold, rotten wood, 1075 m, 18.85083°S, 48.32139°E (21 Mar 2004, Malagasy ant team, BLF10501) deposited in CAS (CASENT9023252, PBI_OON_03393).

Etymology: This species is named after Darrell Ubick's sister, Katarina Mijatović, in recognition for the many spiders she has collected over the years.

Diagnosis: *M. katarinae* differs from other *Molotra* by the combination of carapace with moderate posterior knob and lacking distinct dorsal declivity (figs. 49, 57), lateral margin with about 20 setose denticles (figs. 50, 58), male palpal patella smaller than tibia (figs. 151, 153, 194, 196), embolar region with large dorsal and small ventral lobes (figs. 178–181), embolar tip free of lobes (fig. 179) and female with medium-sized T-shaped process (figs. 202, 203).

Male (PBI_OON_03393): Total length 2.02. CEPHALOTHORAX: Carapace lateral margin bearing about 22 denticles per side (fig. 50). LEGS: Leg spination: tibia I with extra prolateral-ventral spine, giving 4-3-2; metatarsi: I v2-2-0; II v2-02-0. GENITALIA: Palpal patella shorter than tibia (figs. 151, 153, 194, 196); dorsal lobe large, ventral small, embolar tip free, not fused to lobes (figs. 2, 150–153, 174–181).

Female (PBI_OON_03393): Total length 2.30. As in male except as noted. CEPHALOTHORAX: Carapace lateral margin with about 20 denticles on each side (fig. 58). Sternum with anterior margin slightly excavated, less than in male (fig. 59). Endites rounded ectally. ABDOMEN: Postepigastric scutum not fused to epigastric scutum (fig. 62). LEGS: Leg spination: tibia II with extra prolateral-ventral spine, giving 4-3-1. GENITALIA: T-shaped process smaller than in *M. molotra*, but larger than in *M. suzannae* (figs. 202, 203).

Notes: The scanned male has a crack at the posterior part of the dorsal lobe (figs. 178, 181), which may be the result of damage. However, the dorsal view of that area shows structures (ridges) that do not seem damaged (bottom of fig. 177), suggesting that the crack is natural and that the posterior part of DL forms a prong. The prong is short and stout, whereas a long, slender one seems to be present in *M. suzannae* (fig. 197). The embolar region of *M. katarinae* seems to have an additional sclerite, a middle lobe (ML), situated between the dorsal and ventral (fig. 179). The embolar region expands somewhat following treatment with hot lactic acid. The dorsal and ventral lobes pivot apart, possibly swelling (figs. 194–195).

Other Material Examined: **MADAGASCAR: Toamasina:** Analamay, montane rainforest, leaf mold, rotten wood, 1068m, 18.80611°S, 48.33694°E, Mar. 21, 2004, Malagasy ant team, 1♂ paratype (CAS, CASENT9023226, PBI_OON_03394).

Distribution: Known from two localities in NE Madagascar.

Molotra suzannae, new species

Figures 4, 63–78, 154–157, 182–189, 197, 204, 205; map 1; table 1

Types: Male holotype, female allotype and female paratype from Madagascar, Toamasina, Foret Clasee Didy, 18.19833°S, 48.57833°E, 960 m, montane rainforest, sifted litter (16–23 Dec 1998, H.J. Ratsirarson, HJR131) deposited in CAS (CASENT9036040, PBI_OON_03396).

Etymology: This species is named after Darrell Ubick's wife, Suzanne Ubick, in gratitude for her help both in the field and at home.

Diagnosis: *M. suzannae* differs from other *Molotra* by the combination of carapace with moderate posterior knob and lacking distinct dorsal declivity (figs. 65, 73), lateral margin with about 14 setose denticles (figs. 66, 74); male palpal patella subequal to tibia (fig. 155), embolar region with small dorsal and ventral lobes (fig. 186), fully fused to embolus (fig. 187), showing large median lobe (fig. 187); female with small T-shaped process (figs. 204, 205).

Male (PBI_OON_03396): Total length 1.95. CEPHALOTHORAX: Carapace lateral margin with about 14 denticles on each side (fig. 66). LEGS: Leg spination: tibia IV with small distal, prolateral spine. GENITALIA: Palpal tibia as large as patella (figs. 155, 197); embolar lobes small with indistinct opening (figs. 186–188), median lobe visible (fig. 187).

Female (PBI_OON_03396): Total length 2.04. As in male except as noted. CEPHALOTHORAX: Carapace lateral margin with about 15 denticles on each side (fig. 74). LEGS: Tibia IV with small distal, prolateral spine. GENITALIA: T-shaped process small (figs. 204, 205).

Notes: The dorsal lobe of the scanned specimen is broken at its posterior end (figs. 186–189). The broken section shows that the DL is hard and tapers to a thin edge. Moreover, the break is restricted to the area marked by the arrows (fig. 189) and the adjacent posterior region is not broken, which indicates that the broken portion was an extension and not attached laterally to the palp. On different specimens viewed with a light microscope, there is a thin curved prong visible in the area (figs. 155, 197). The embolar region of this species has a prominent median lobe (ML) between the other lobes (fig. 187).

Other Material Examined: None.

Distribution: Known only from the type locality.

Molotra tsingy species group

Diagnosis: The single species included in this group is known only from the male, which differs from other members of the genus in being small (1.5 mm), pale in coloration, and with a smoother carapace (figs. 231–243). The palp is unusual in being twisted from the palpal axis and in resting laterally on the sternum, which lacks the typically large anterior cavities (figs. 242, 256–261). The embolar region differs from that in other *Molotra* in having a deep transverse groove prolaterally, lobes oriented in a vertical plane (rather than horizontal), and the presence of a dorsal and ventral prong on the prolateral surface (figs. 279–292).

Species Included: *Molotra tsingy.*

Molotra tsingy, new species

Figures 5, 231–292; map 1; table 1

Types: Male holotype and male paratype from Madagascar, Mahajanga, Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, 19.70944°S, 44.71805°E, 150 m, tropical dry forest on Tsingy, sifted litter (16–20 Nov 2001, B.L. Fisher et al., BLF 4432) deposited in CAS (CASENT9010360, PBI_OON_03397).

Etymology: The species is named after the type locality.

Diagnosis: Same as for species group.

Male: (PBI_OON_03397): Total length 1.56. CEPHALOTHORAX: Carapace pale orange, surface of elevated portion of pars cephalica smooth, sides smooth; nonmarginal pars thoracica setae absent (figs. 239–243, 248–251). Eyes: smaller than in other *Molotra* species, ALE separated by more than their diameter (fig. 252). Sternum slightly longer than wide, yellow-brown, anterior excavation very narrow, surface with few small pits (figs. 242, 256, 258). Mouthparts: Endites distally excavated, anteromedian tip with strong, knoblike projection (figs. 253–255). ABDOMEN: Book lung covers oval, larger than in *M. molotra* group, slightly smaller than pedicel cross section (figs. 235, 262). Pedicel-scutal region lacking ridges (figs. 262, 263). Dorsal scutum yellow-brown, surface smooth (figs. 232–236). Epigastric scutum dorsal extension only slightly greater than pedicel diameter (figs. 236, 262). Postepigastric scutum with short posteriorly directed lateral apodemes (not closely examined) (fig. 238). Dorsal setae present, short. LEGS: Yellow-brown, patella plus tibia I shorter than carapace. Leg spines present, longer than leg segment width: tibiae: I v4-2-2; II v3-2-2; metatarsi I, II v 2-2-0 (figs. 244–247). Tarsal claws: superior claw surfaces striate; proclaws and retroclaws with similar dentition, with five large median teeth, laterals absent (tarsus III not examined) (figs. 271–278). GENITALIA: Epigastric region with sperm pore large, oval (figs. 238, 264, 265). Palp femur attaches to patella basally (fig. 279), tibia slightly longer than patella, embolar region with a broad, ectally concave retrolateral lobe (L2), a smaller wrinkled dorso-prolateral lobe (L1) and two prolateral prongs (fig. 287); cymbium and bulb twisted, so that the morphologically dorsal surface is positioned prolaterally (fig. 281); embolar region separated from rest of bulb by a transverse groove (fig. 290).

Female: Unknown.

Notes: This species has an interesting palp, as the bulb and tarsus are rotated relative to the main palpal axis. The embolus is thus displaced outward (retrolaterally) and, in the retracted palp, rests in the space between the edge of the sternum and coxae II and III. The anterior margin of the sternum has only a slight cavity (figs. 260, 261), similar to the condition in female *Molotra* (fig. 90), but unlike the deep cavities found in other *Molotra* males (fig. 87). This unusual mode of palpal retraction is another indication that the species may be misplaced in the genus. Additional material, especially of the unknown female, will be needed to solve this problem.

Other Material Examined: None.

Distribution: Known only from the type locality.

Molotra milloti species group

Diagnosis: The single specimen representing this group is a male which differs from all other *Molotra* species in somatic characters, including its slightly larger size (2.4 mm), carapace and abdomen with thick erect setae (figs. 293–300), book lung covers reduced to narrow scars (fig. 297), legs armed with numerous bristles, some spinelike (figs. 307–310, 317, 318), and tarsal claws heterodentate (figs. 319–326). The embolar region has dorsal and ventral lobes closely contiguous (seemingly fused) and forming a sinuous interface (figs. 6, 327–341), unlike other *Molotra* where lobes are at least somewhat free and their interface straight (figs. 1–5).

Species Included: *Molotra milloti.*

Molotra milloti, new species

Figures 6, 293–341; map 1; table 1

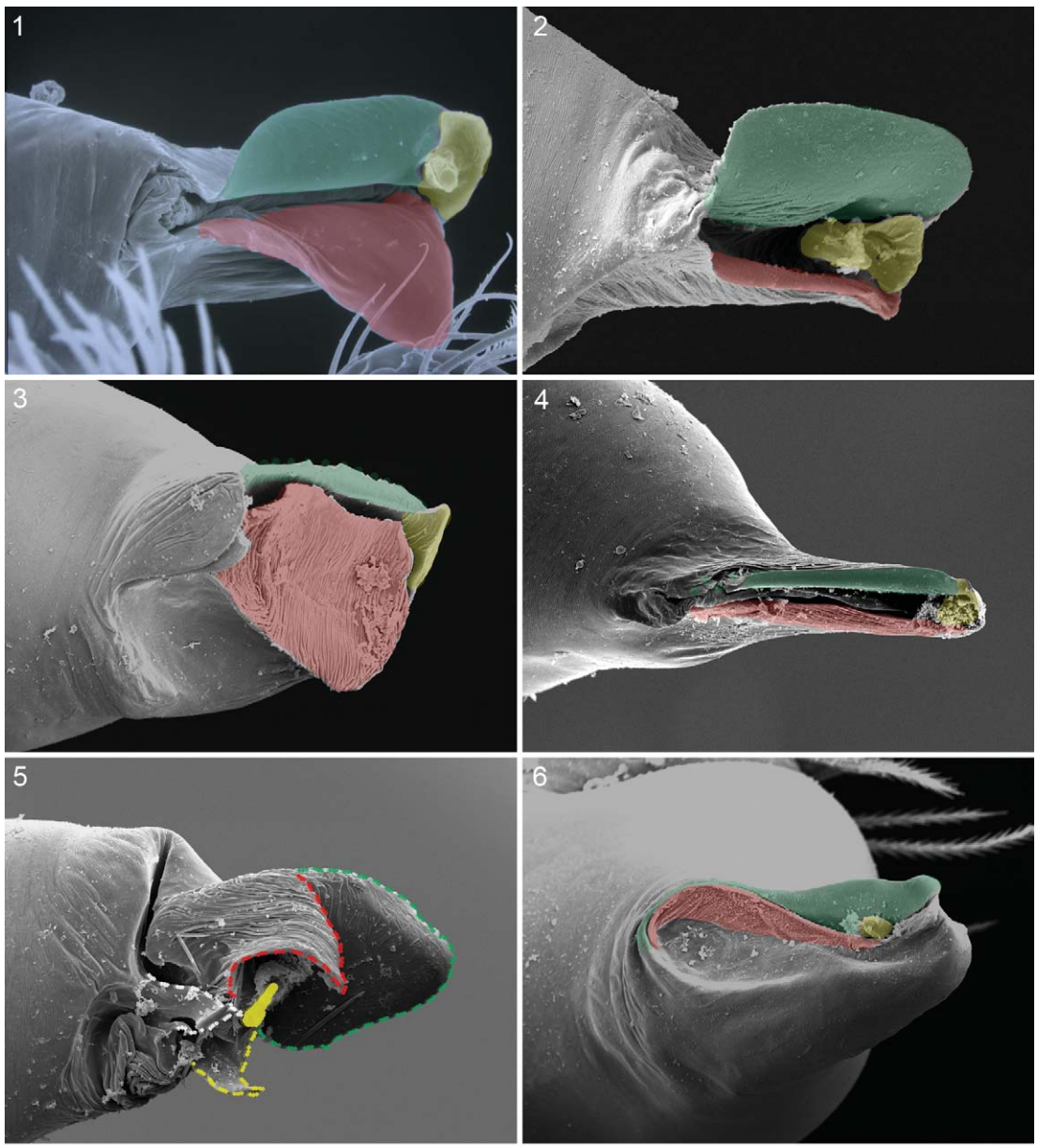
Types: Male holotype from Madagascar, Mahajanga, Reg. du Sambirano (Ankify) [= Dauphin Bleu, 13.53500°S, 48.37313°E] (Sep 1946, J. Millot), deposited in MNHN (PBI_OON_35300).

Etymology: It is a pleasure to name this species after J. Millot, collector of the holotype and the first arachnologist to report on Malagasy oonopids.

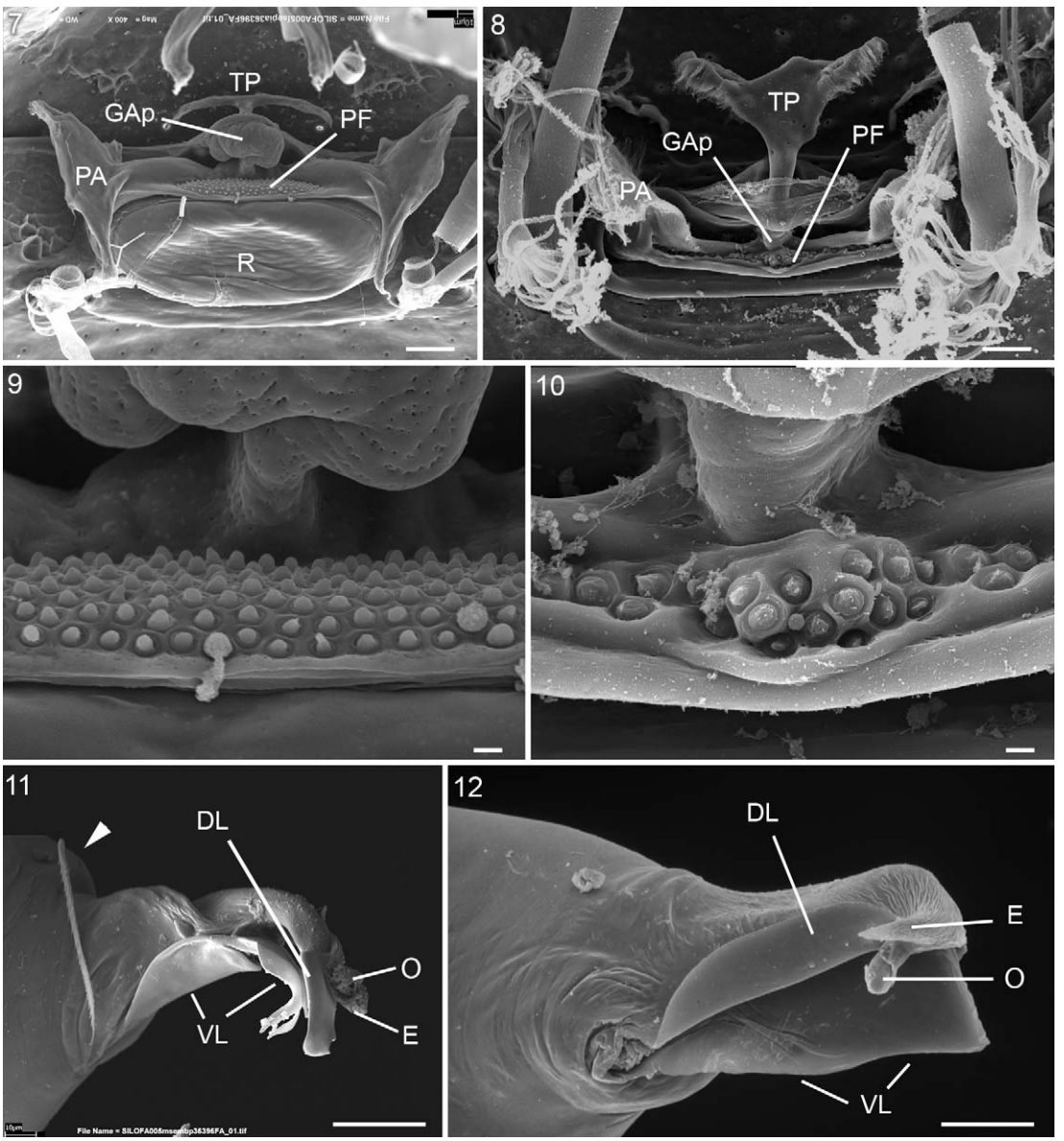
Diagnosis: Same as for species group.

Male (PBI_OON_35300): Total length 2.40. CEPHALOTHORAX: Carapace with surface of elevated portion of pars cephalica granulate, sides granulate (fig. 305); nonmarginal pars cephalica setae light, long and stout (figs. 304–306). Sternum wider than long, surface finely reticulate (pitted), anterior margin with moderate transverse excavation, setae abundant, densest laterally on mounds between the furrows (fig. 303). Mouthparts: endites distally excavated. ABDOMEN: Book lung covers small, very narrow (fig. 297). Posterior and anterior spiracles connected by grooves (fig. 301). Pedicel with scutopedicel region unmodified, without ridges (fig. 298). Dorsal scutum surface granulate. Epigastric scutum dorsal extension more than two times pedicel diameter (figs. 295, 305). Postepigastric scutum with posteriorly directed lateral apodemes, prominent in ventral view, extend beyond posterior tracheal groove, external openings evident (fig. 301). Dorsal setae present, light, stout, long and erect. LEGS: Yellow-brown, patella plus tibia I shorter than carapace. Legs with numerous erect bristles, few spinelike: tibiae I, II v0-1p-0 and tibia IV v0-0-1p (figs. 307–310, 317, 318). Tarsal claws: superior claw surfaces striate; proclaws and retroclaws with dissimilar dentition; tarsus I proclaw with three lateral (broad, basal) and four to five median (apical, thinner) teeth, retroclaw with three broad median teeth, laterals absent; tarsus III proclaw with three lateral (broad) and five median (short, apical) teeth, retroclaw with three broad median teeth, laterals absent; tarsus IV proclaw with three lateral (broad) and five median (short, apical) teeth, retroclaw with five large median teeth, laterals absent (figs. 319–326). GENITALIA: Epigastric region with sperm pore small, situated anteriad of anterior spiracles; prominent groove present, connecting anterior respiratory spiracles and apodeme openings (fig. 301). Palp femur attaches to patella subbasally (figs. 327–330), tibia larger than patella; embolar region wrinkled dorsally (fig. 339), dorsal lobe large, with prolateral carina, ventral lobe wrinkled basally (fig. 340).

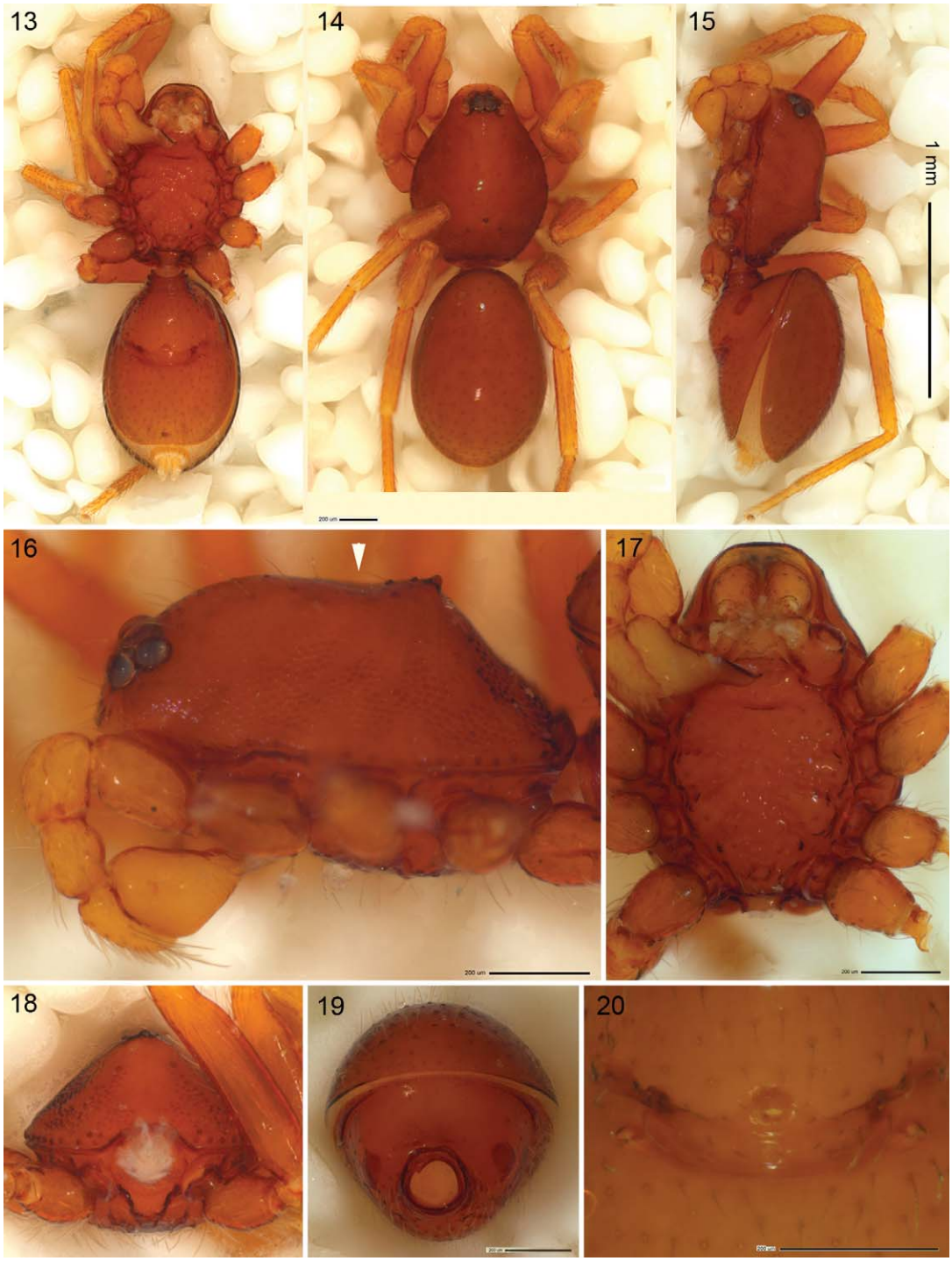
Female: Unknown.



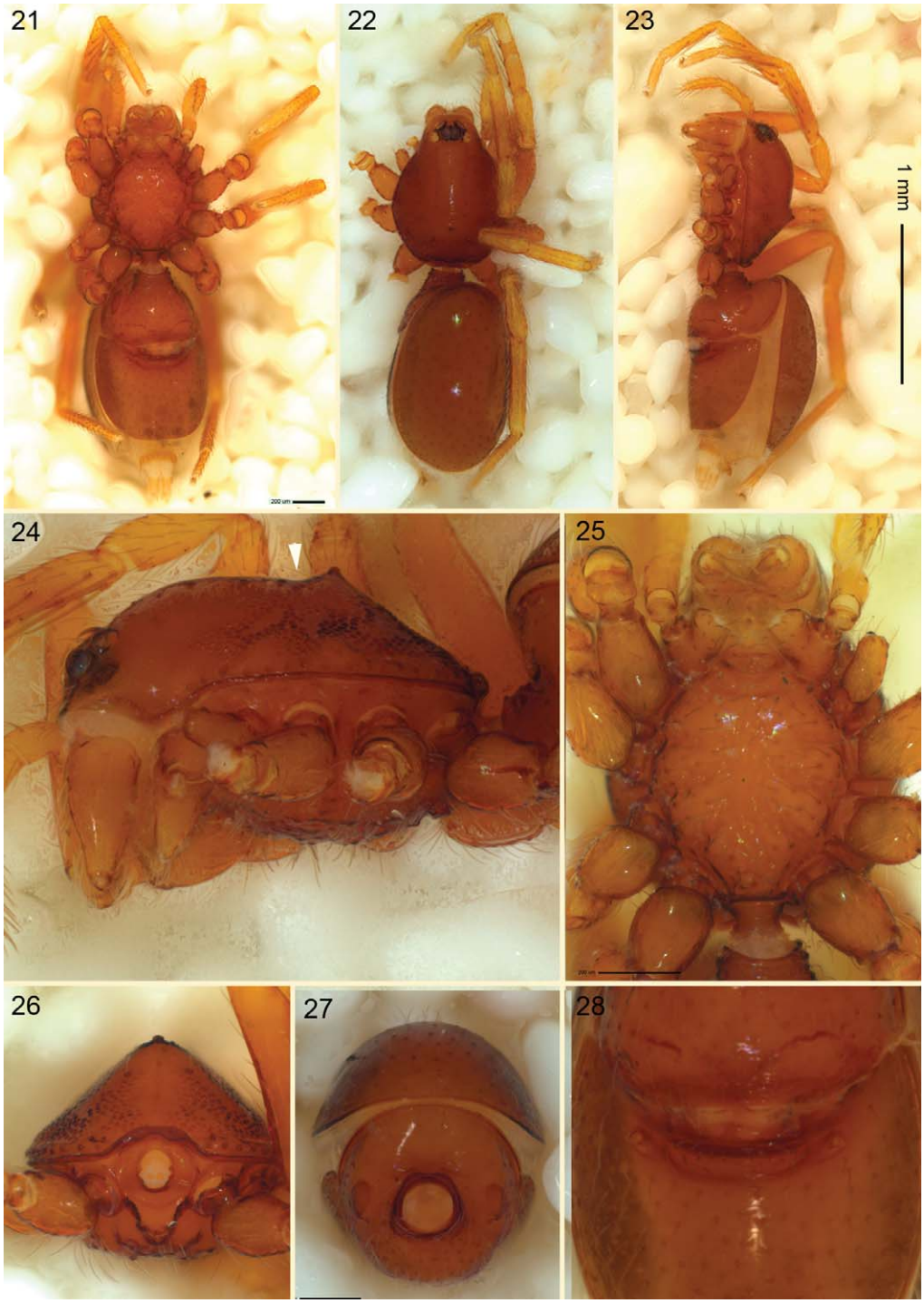
FIGS. 1–6. *Molotra* species, embolar region of male palpi, prolateral view. **1.** *M. molotra*. **2.** *M. katarinae*. **3.** *M. ninae*. **4.** *M. suzannae*. **5.** *M. tsingy*. **6.** *M. milloti*. Colors show homologous parts: yellow embolus, green dorsal lobe, red ventral lobe. The tentative homologies of the *M. tsingy* palp are shown as dashed lines and the unhomologized dorsal prong is shown in white dash.



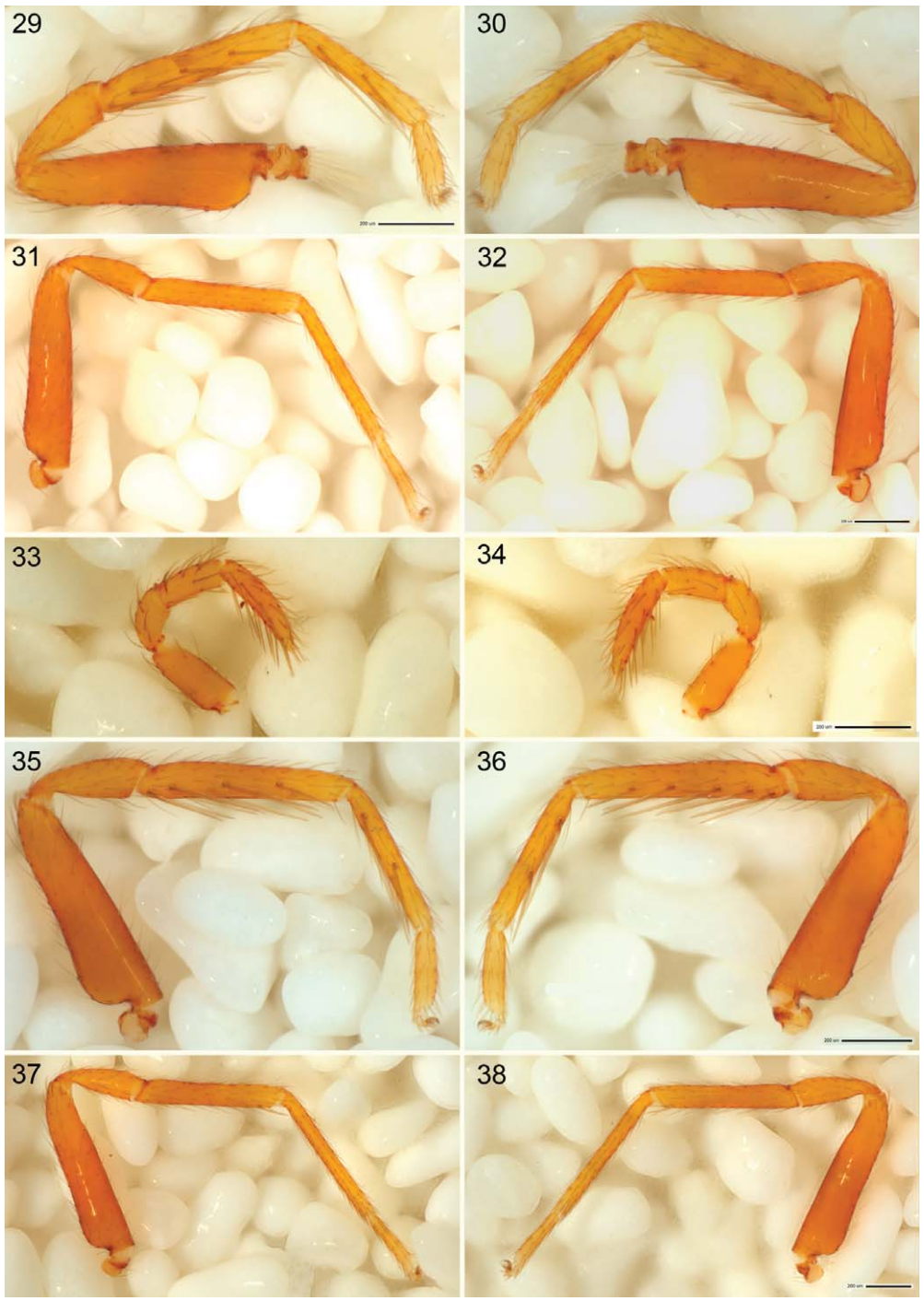
FIGS. 7–12. A comparison of the genitalia of *Molotra* and a typical silhouettelloid. 7, 9, 11. *Tolegnaro sagani* Álvarez-Padilla et al., in press (PBI_OON 36396). 8, 10, 12. *Molotra molotra* (PBI_OON 01990). **7, 8.** Female genitalia, dorsal view, showing T-shaped process (TP), median knob (GAp), papillae field (PF), posterior apodeme (PA), and receptaculum (R). **9, 10.** Same, magnified view of papillae field. **11, 12.** Male embolar region, prolateral view, showing embolus (E), embolar opening (O), dorsal lobe (DL), and ventral lobe (VL), with arrow to dorsoapical knob of bulb. Scale bars: 3 μm (9, 10); 30 μm (7, 8, 11, 12).



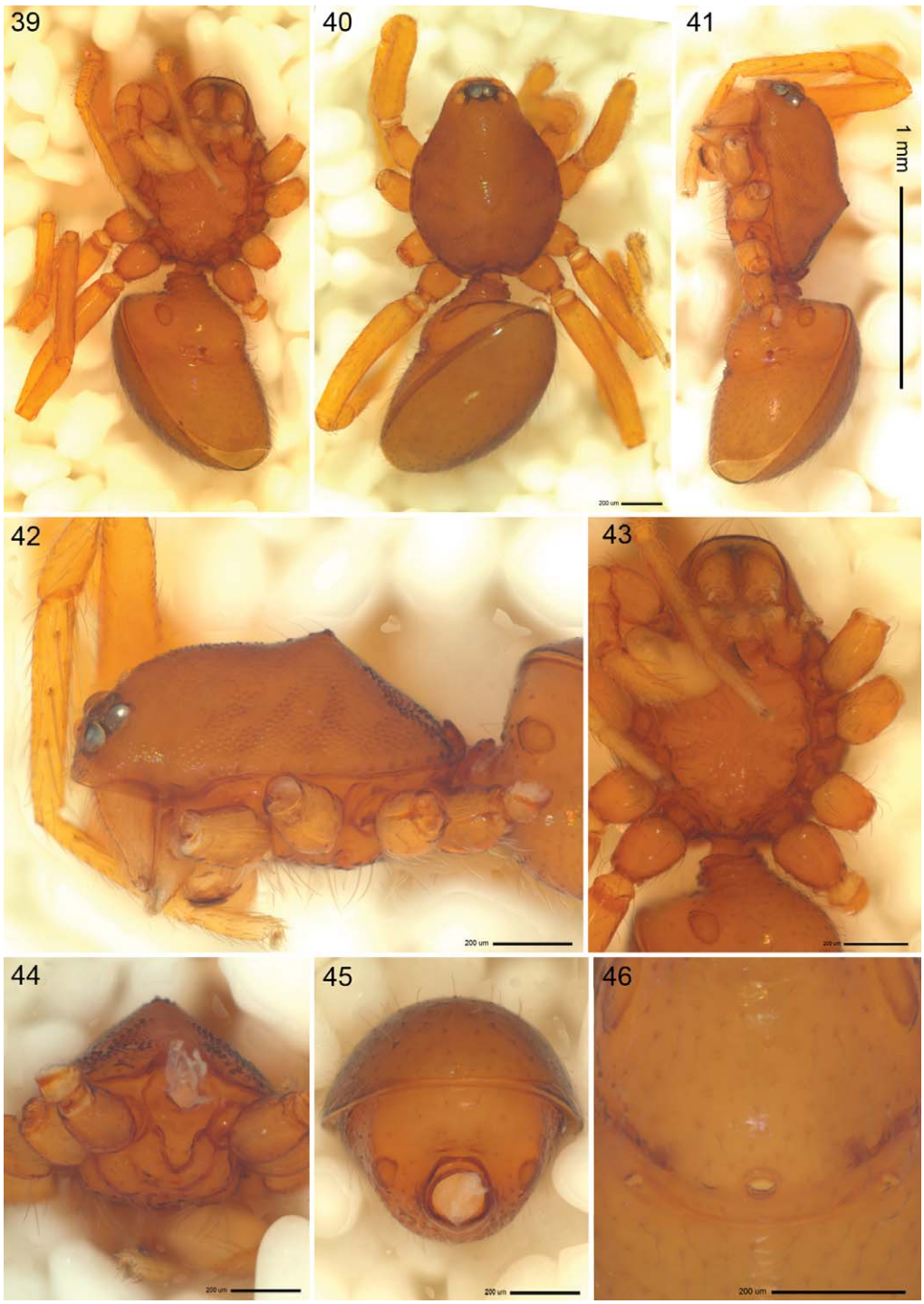
FIGS. 13–20. *Molotra molotra*, new species, male (PBI_OON 03391). **13–15.** Habitus, ventral, dorsal and lateral views. **16–18.** Cephalothorax, lateral, ventral, and posterior views, with arrow showing dorsal declivity. **19.** Abdomen, anterior view. **20.** Epigastric region, ventral view.



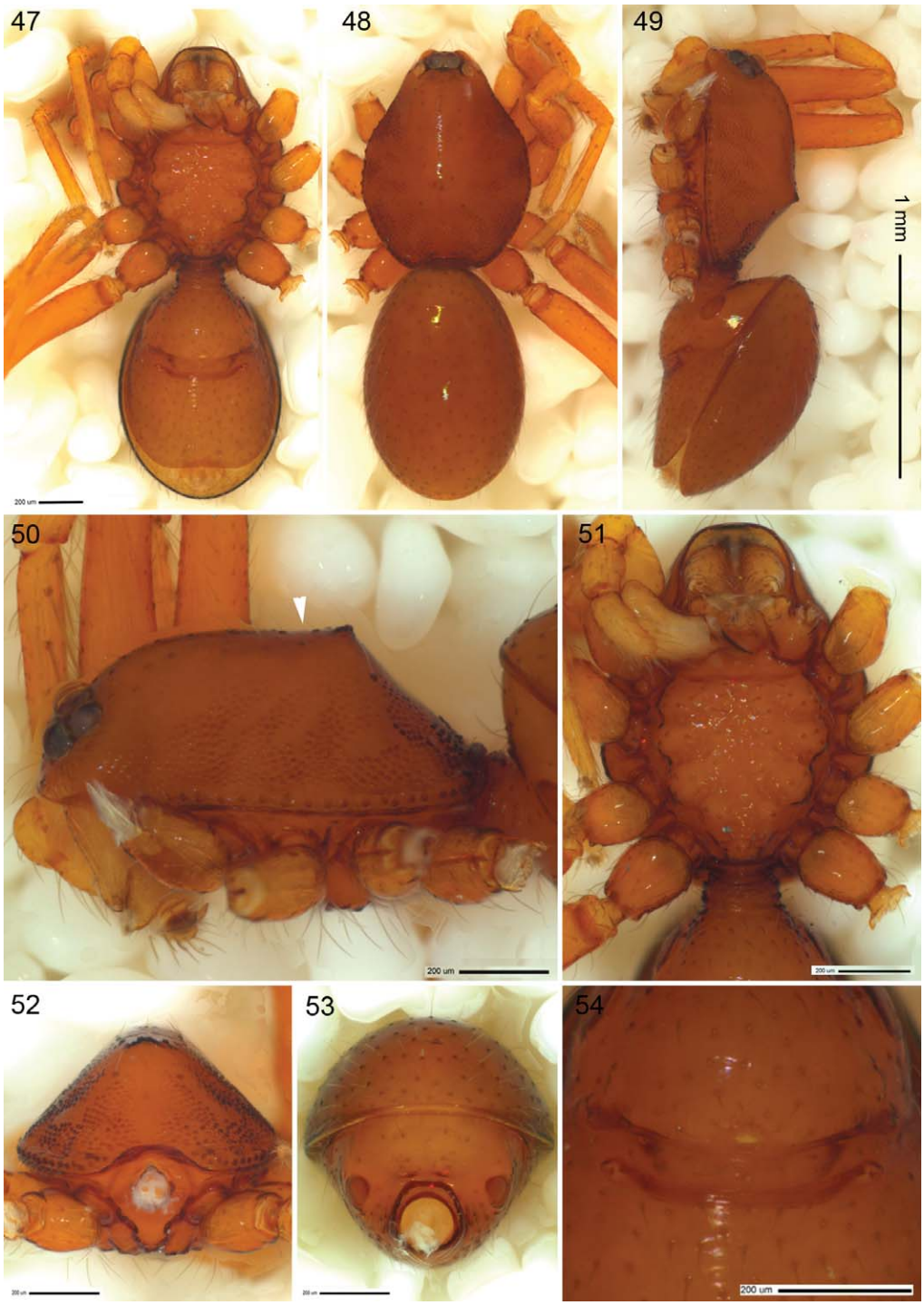
FIGS. 21–28. *Molotra molotra*, new species, female (PBI_OON 03391). **21–23.** Habitus, ventral, dorsal and lateral views. **24–26.** Cephalothorax, lateral, ventral, and posterior views, with arrow showing dorsal declivity. **27.** Abdomen, anterior view. **28.** Epigastric region, ventral view.



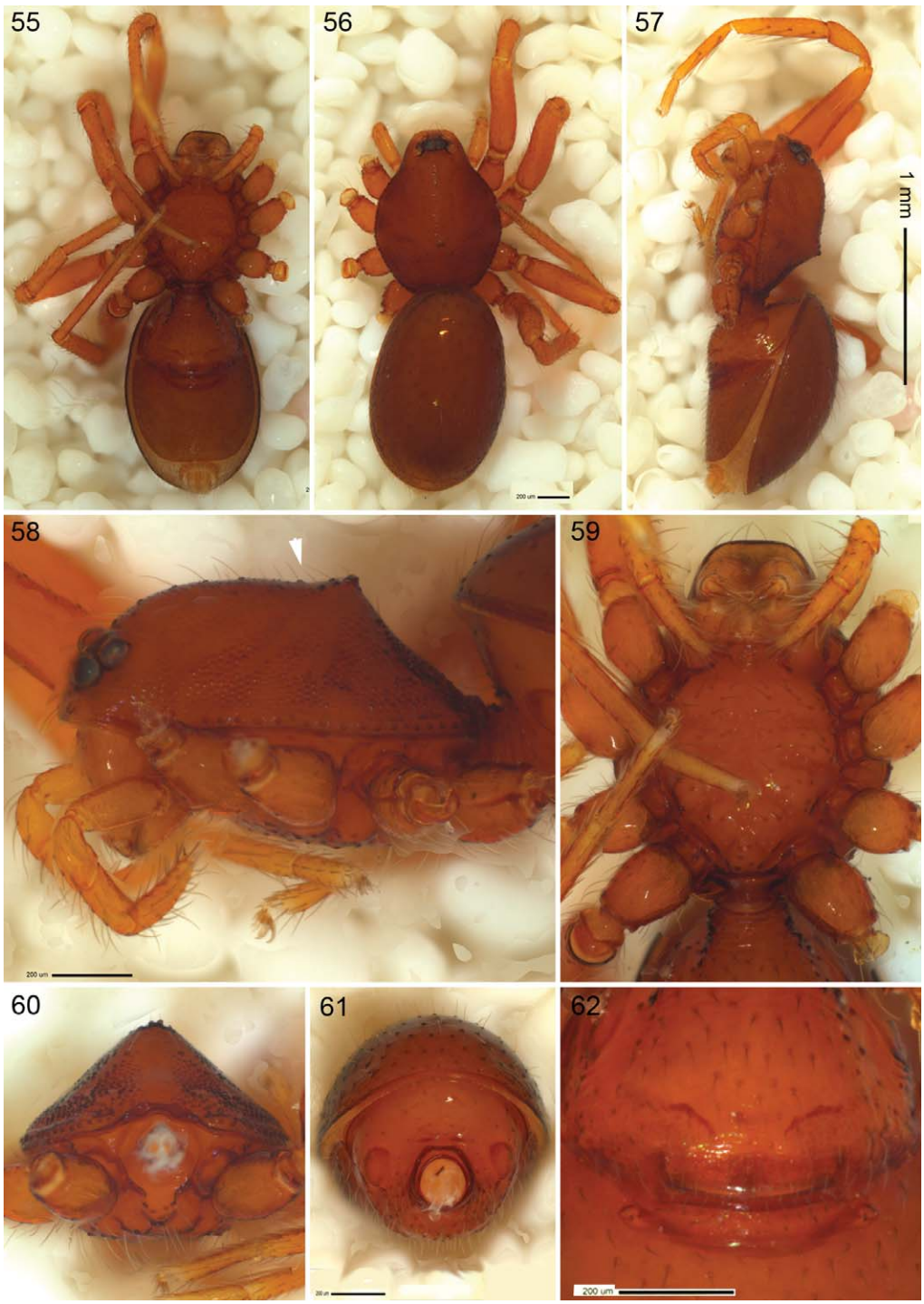
FIGS. 29–38. *Molotra molotra*, new species, appendages (PBI_OON 03391). 29–32. Male. 33–38. Female. **29, 30.** Leg I, prolateral and retrolateral views. **31, 32.** Leg IV, prolateral and retrolateral views. **33, 34.** Palp, prolateral and retrolateral views. **35, 36.** Leg I, prolateral and retrolateral views. **37, 38.** Leg IV, prolateral and retrolateral views.



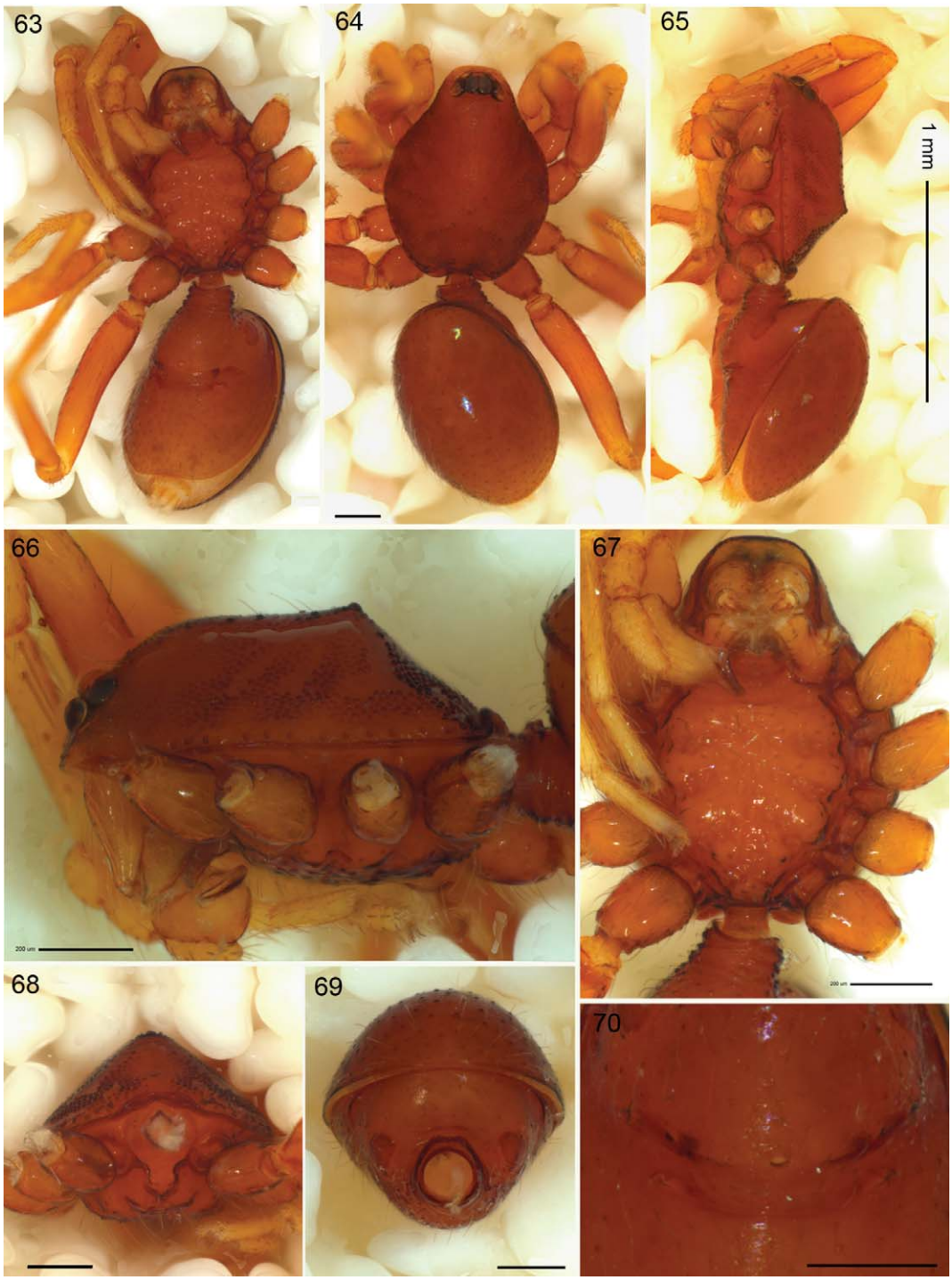
FIGS. 39–46. *Molotra ninae*, new species, male (PBI_OON 03395). **39–41.** Habitus, ventral, dorsal, and lateral views. **42–44.** Cephalothorax, lateral, ventral, and posterior views. **45.** Abdomen, anterior view. **46.** Epigastric region, ventral view.



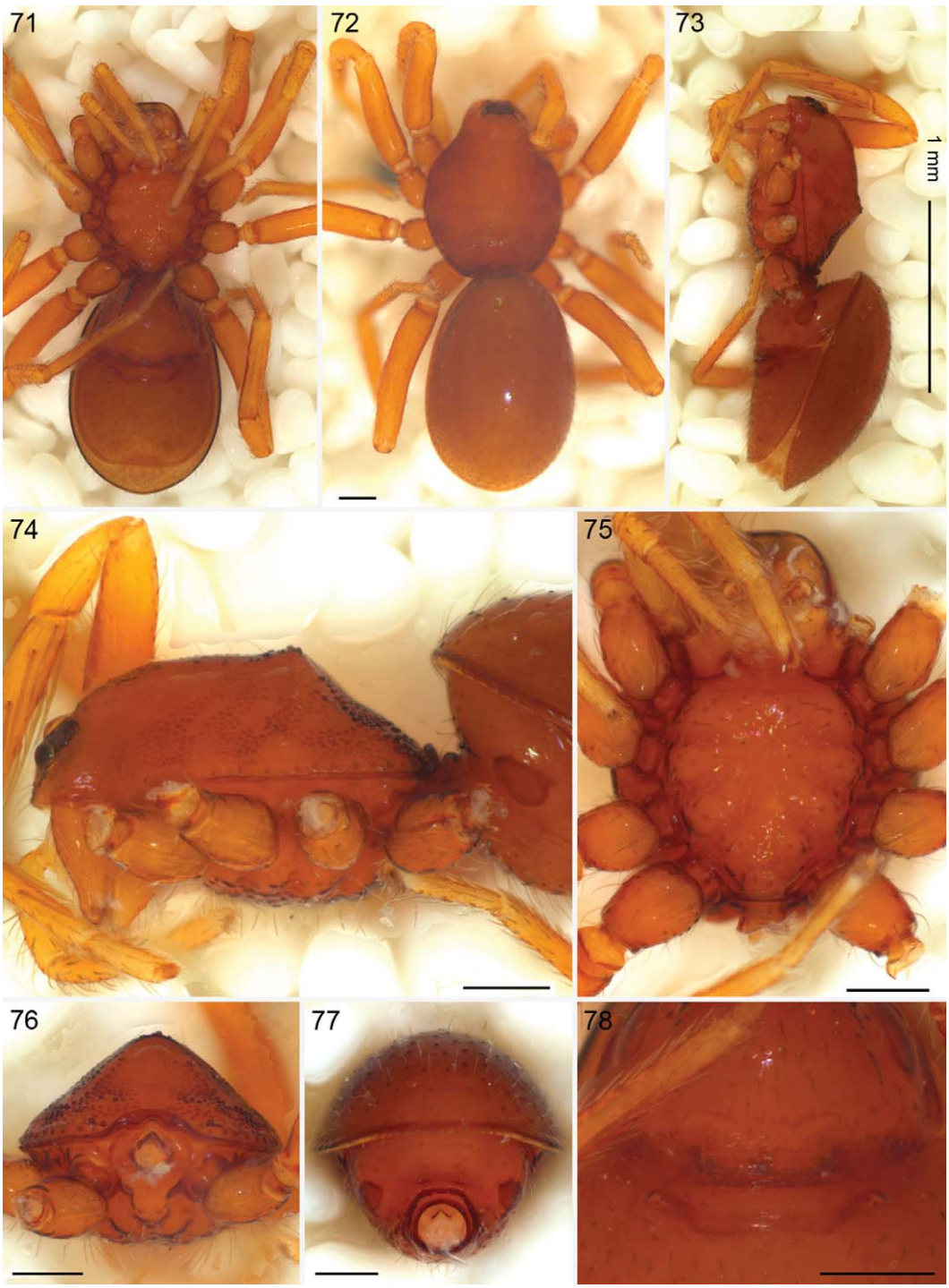
FIGS. 47–54. *Molotra katarinae*, new species, male (PBI_OON 03393). **47–49.** Habitus, ventral, dorsal, and lateral views. **50–52.** Cephalothorax, lateral, ventral, and posterior views, with arrow showing relatively flat dorsum. **53.** Abdomen, anterior view. **54.** Epigastric region, ventral view.



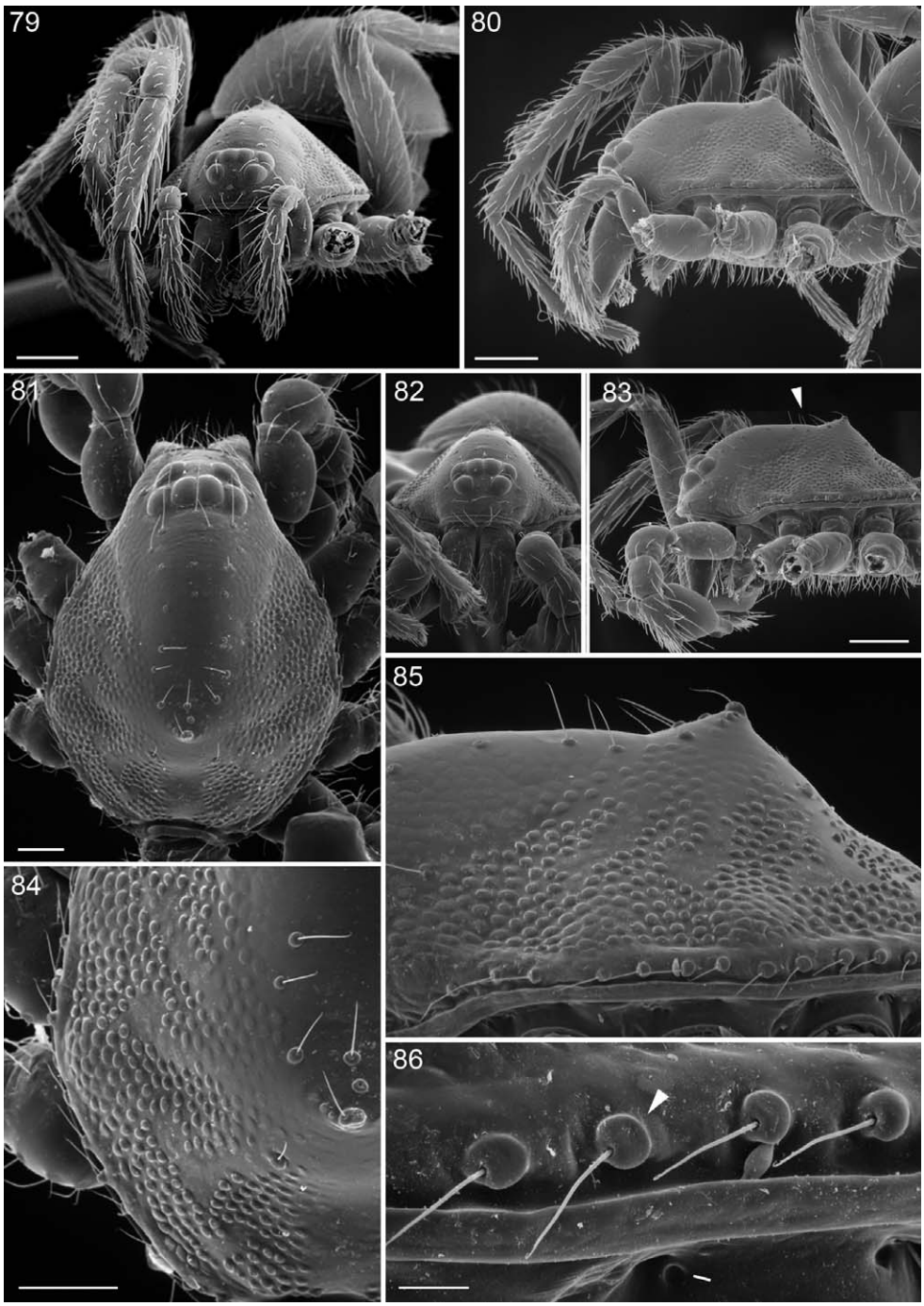
FIGS. 55–62. *Molotra katarinae*, new species, female (PBI_OON 03393). **55–57.** Habitus, ventral, dorsal, and lateral views. **58–60.** Cephalothorax, lateral, ventral, and posterior views, with arrow showing relatively flat dorsum. **61.** Abdomen, anterior view. **62.** Epigastric region, ventral view.



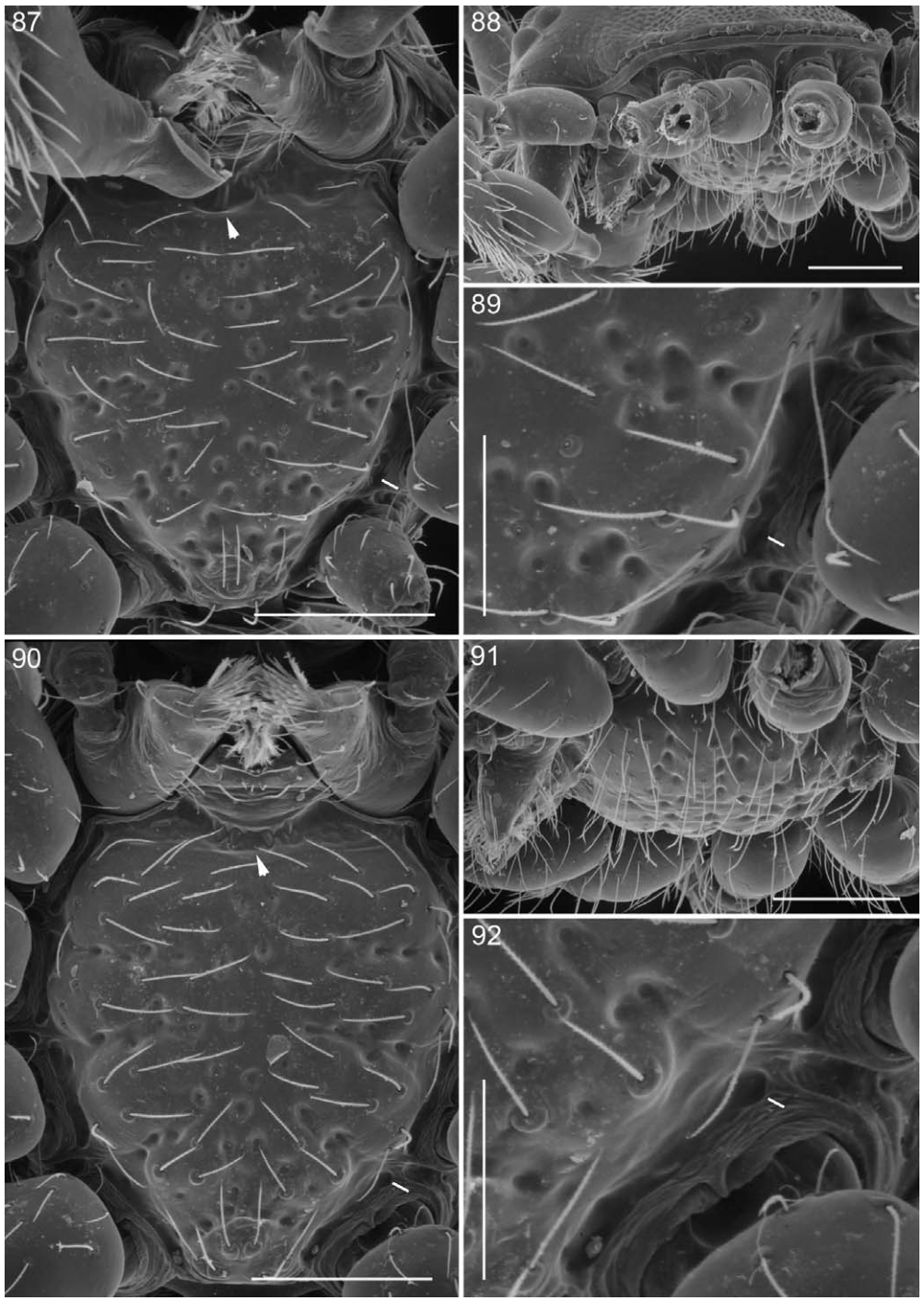
FIGS. 63–70. *Molotra suzannae*, new species, male (PBI_OON 03396). **63–65.** Habitus, ventral, dorsal, and lateral views. **66–68.** Cephalothorax, lateral, ventral, and posterior views. **69.** Abdomen, anterior view. **70.** Epigastric region, ventral view.



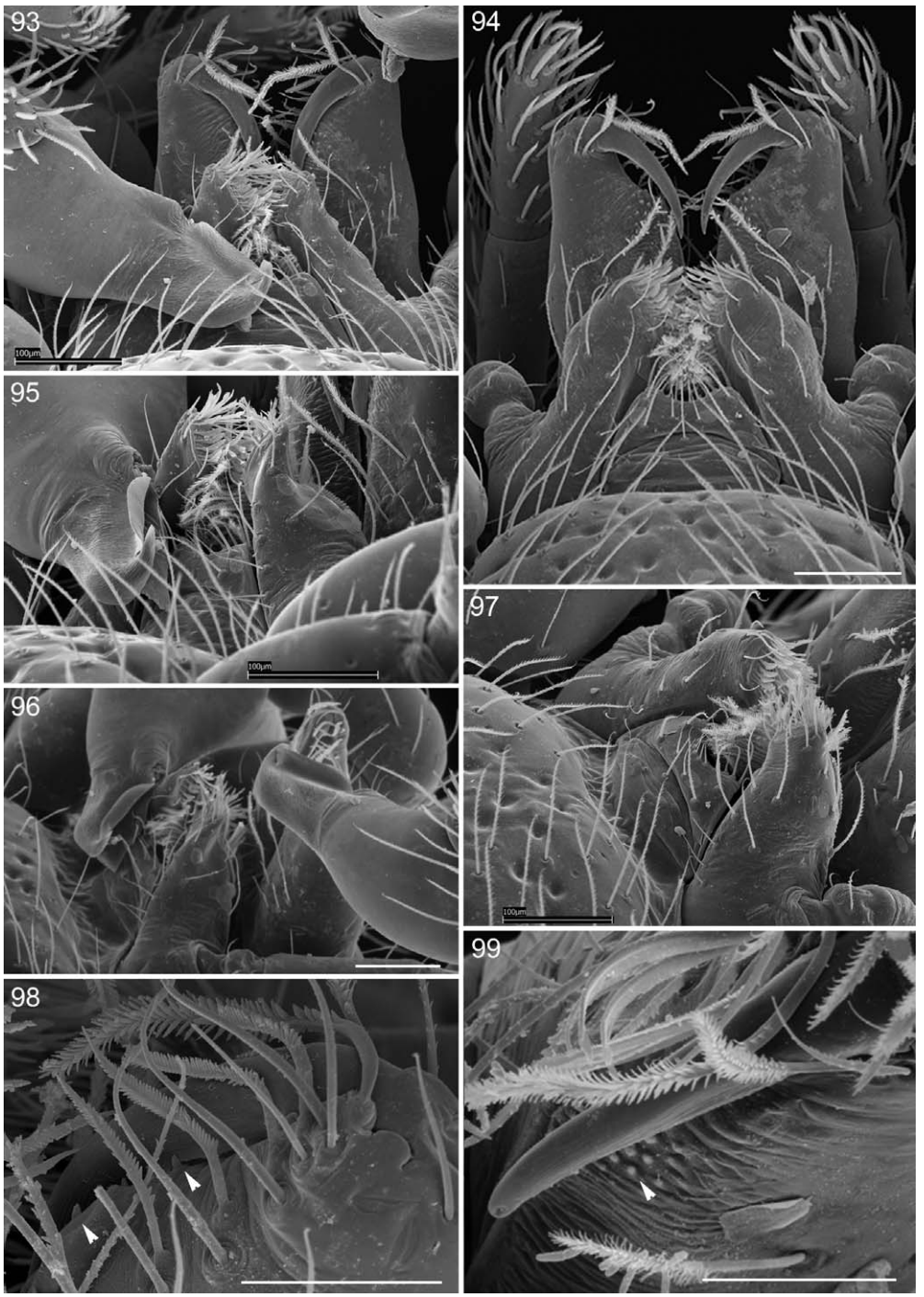
FIGS. 71–78. *Molotra suzannae*, new species, female (PBI_OON 03396). **71–73.** Habitus, ventral, dorsal, and lateral views. **74–76.** Cephalothorax, lateral, ventral, and posterior views. **77.** Abdomen, anterior view. **78.** Epigastric region, ventral view.



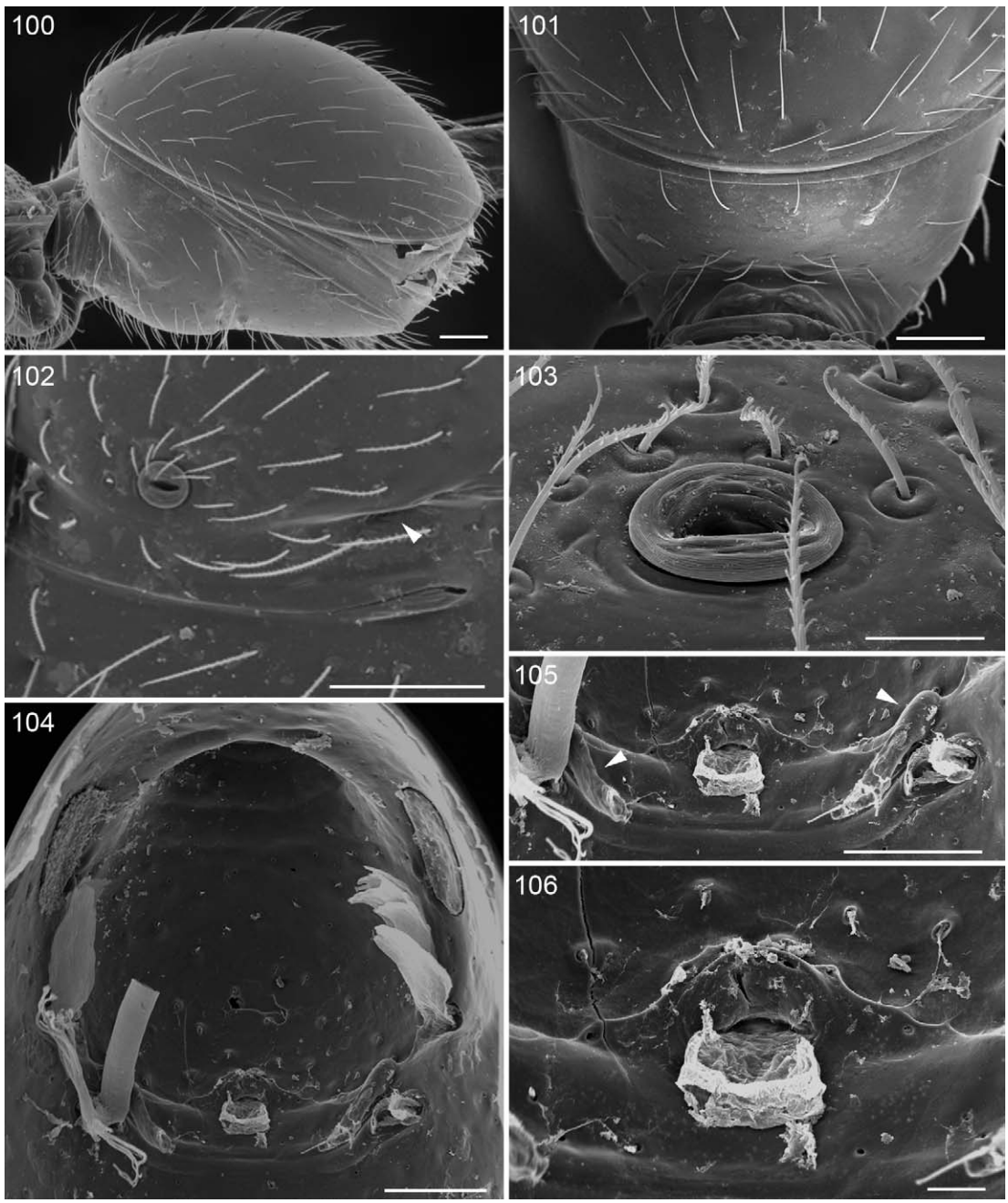
FIGS. 79–86. *Molotra molotra*, new species, female (79, 80) and male (81–86) cephalothorax (PBI_OON 01990). **79, 82.** Habitus, anterior views. **80, 83.** Cephalothorax, lateral views, with arrow to dorsal declivity. **81, 84.** Carapace, dorsal views. **85, 86.** Carapace, lateral view with close-up showing setose denticle (arrow) and coxal pore (dash). Scale bars: 200 μm (79, 80, 83); 100 μm (81, 84) 20 μm (86).



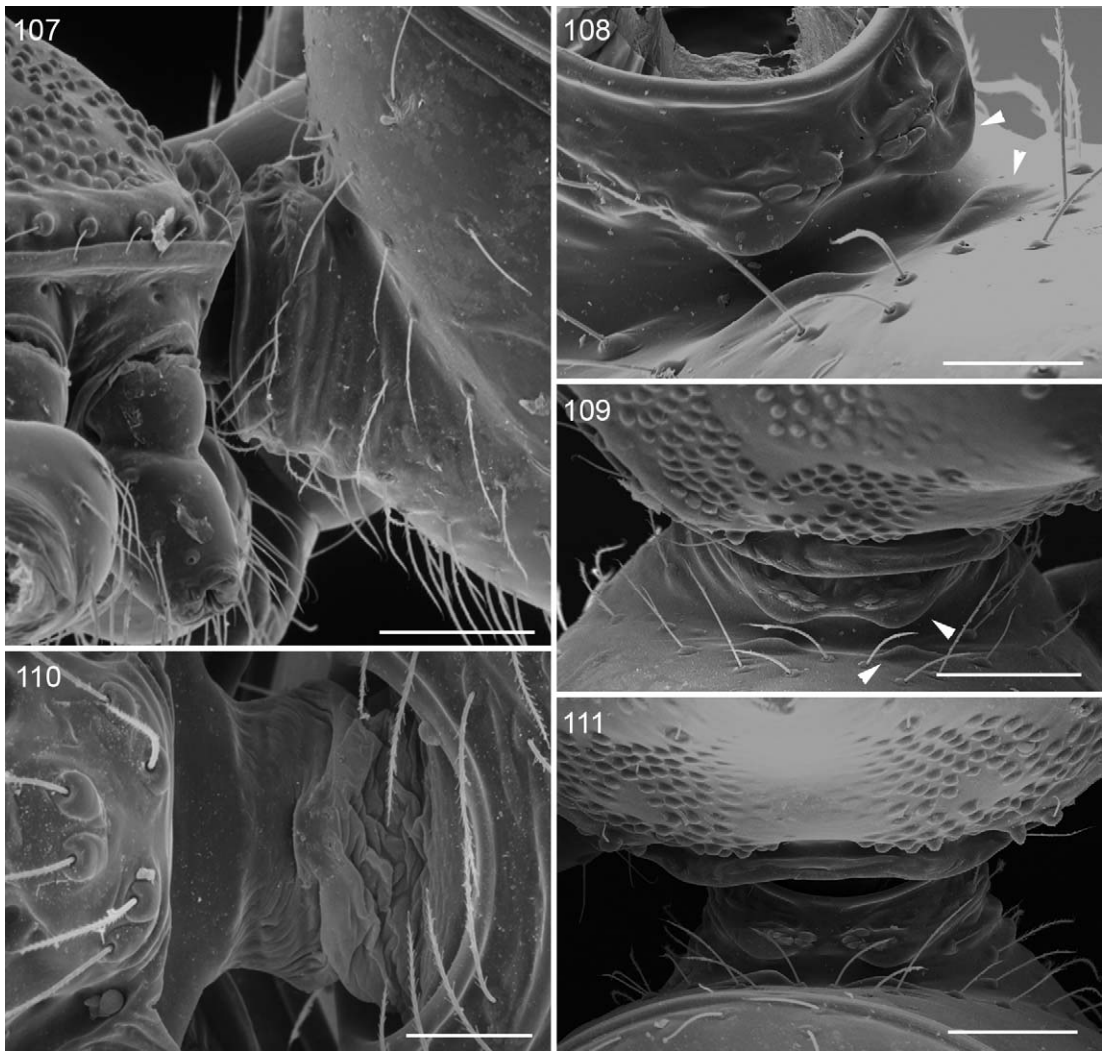
FIGS. 87–92. *Molotra molotra*, new species, male (87–89) and female (90–92) sternum (PBI_01990). **87, 89, 90, 92.** Sternum, ventral views. Arrows show the anterior sternal cavities and dashes the very shallow pore of the coxal furrow. **88, 91.** Same, lateral views. Scale bars: 100 μm (89, 92); 200 μm (all others).



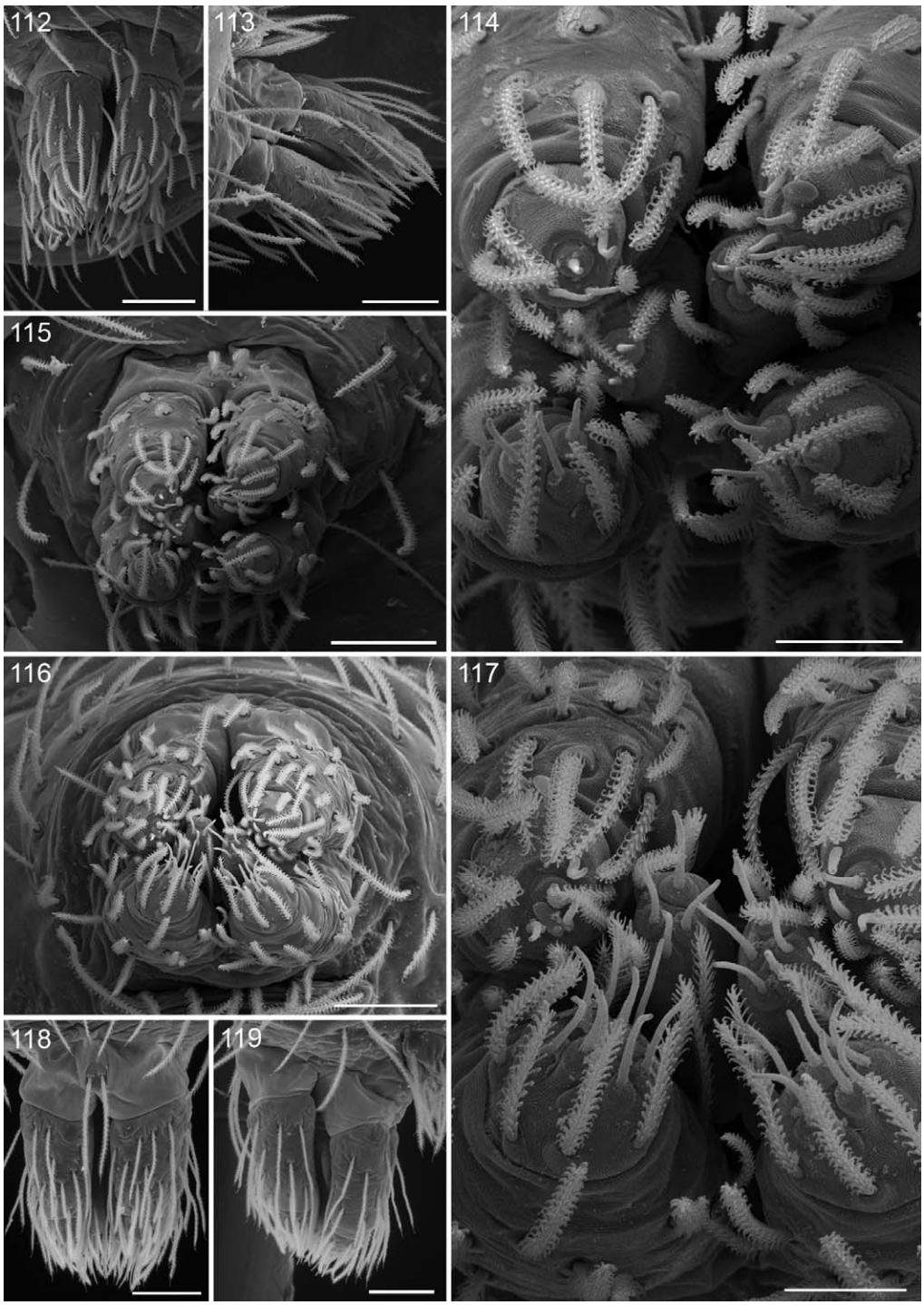
FIGS. 93–99. *Molotra molotra*, new species, male (93, 95, 96, 98) and female (94, 97, 99) mouthparts (PBI_01990). **93, 94.** Chelicerae and endites, posterioventral views. **95–97.** Same, ventrolateral views. **98, 99.** Cheliceral fang, anterior and ventral views, with arrows showing denticles. Scale bars: 50 μm (98, 99), 100 μm (all others).



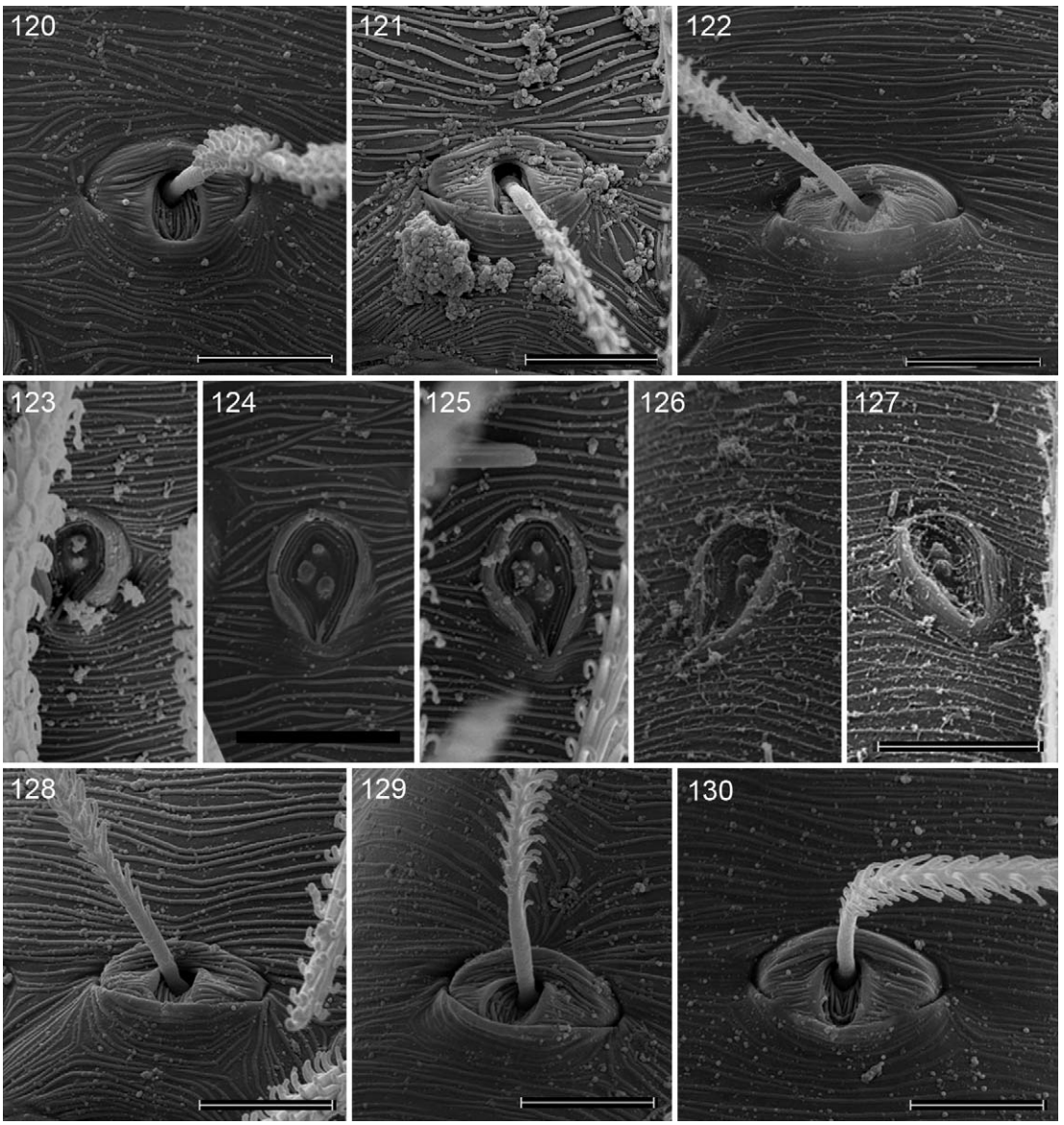
FIGS. 100–106. *Molotra molotra*, new species, male abdomen (PBI_01990: 100–103; PBI_03392: 104–106). **100.** Abdomen, lateral view. **101.** Same, anterior view. **102.** Epigastric area, ventrolateral view, with arrow to apodeme opening. **103.** Spermpore, posterioventral view. **104.** Abdomen, cleared, dorsal view. **105.** Epigastric area, dorsal view, with arrows to apodemes. **106.** Sperm pore, dorsal view. Scale bars: 20 μm (103, 106), 100 μm (all others).



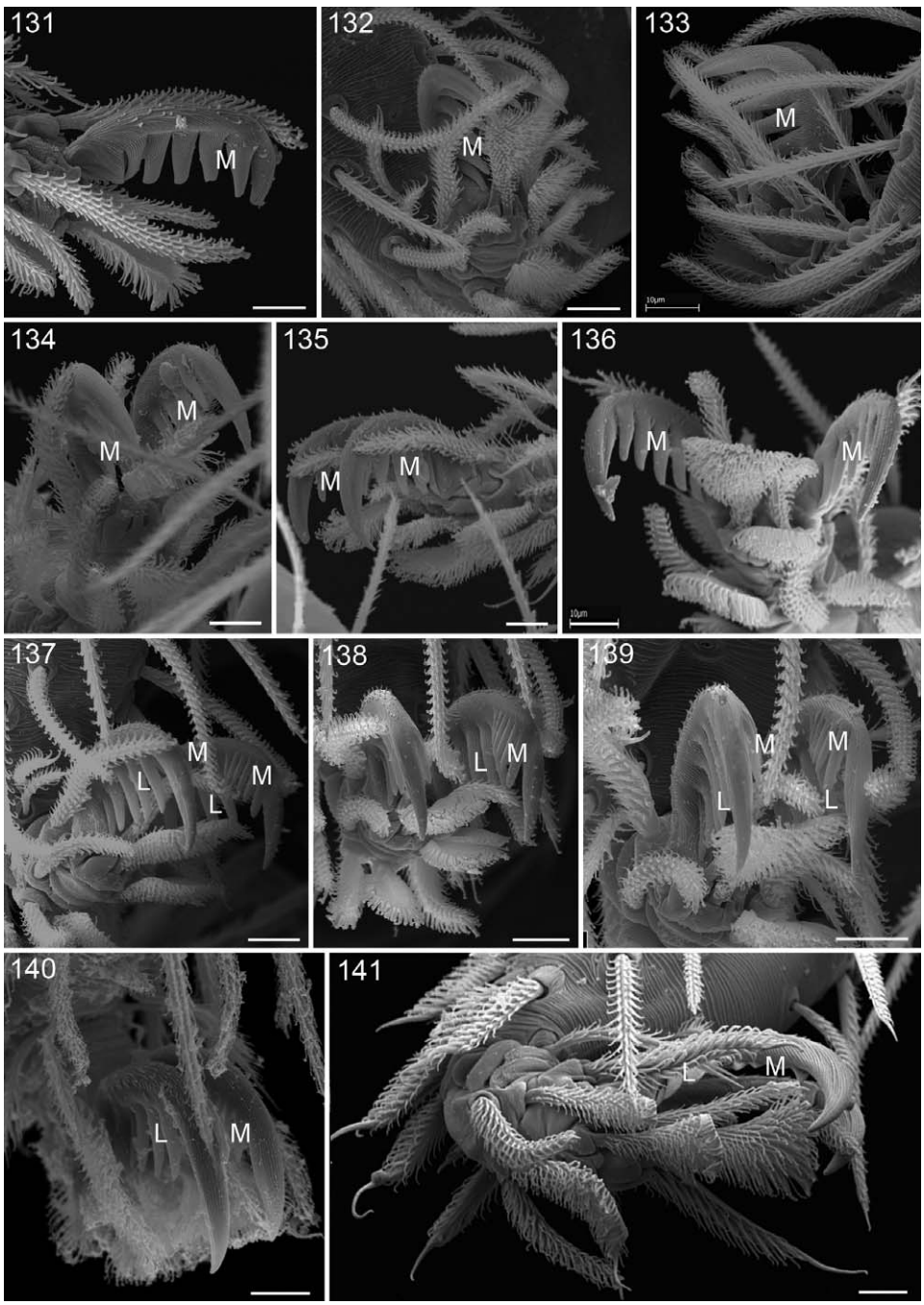
FIGS. 107–111. *Molotra molotra*, new species, male (107–109) and female (110, 111) pedicel region (PBI_01990, except 108 = PBI_03392). **107.** Pedicel, lateral view. **108.** Same, anterior view, arrows to pedicel and scutal ridges. **109, 111.** Same, dorsal view. **110.** Same, ventral view. Scale bars: 50 μm (108, 110), 100 μm (all others).



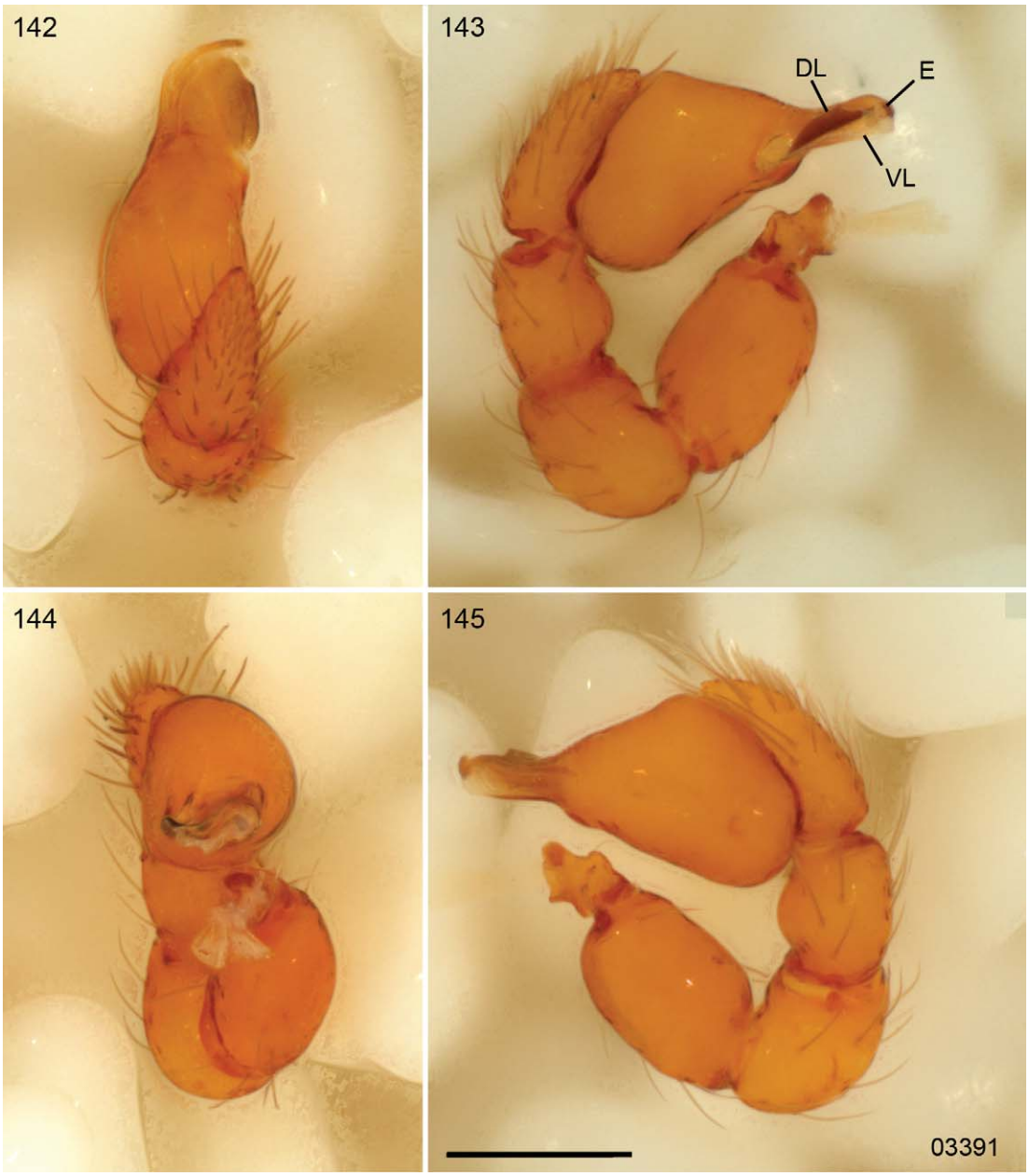
FIGS. 112–119. *Molotra molotra*, new species, male (112–115) and female (116–119) spinnerets (PBI_01990). **112, 118.** Ventral view. **113, 119.** Lateral view. **114–117.** Apical view, with enlargement showing spigots. Scale bars: 20 μm (115, 117), 50 μm (all others).



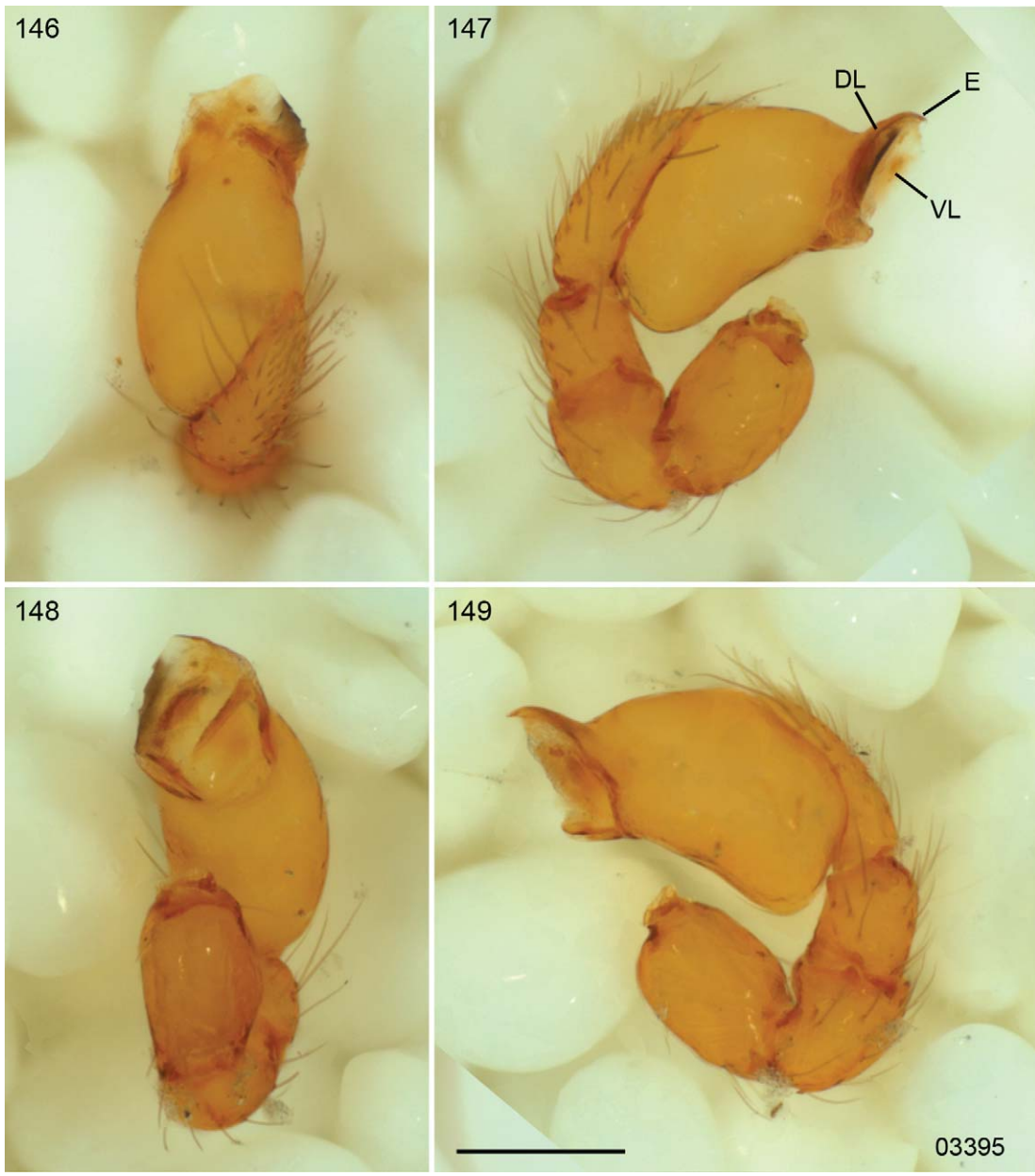
FIGS. 120–130. *Molotra molotra*, new species, male (120–122) and female (123–130) sensory structures (PBI_01990), showing variation. **120.** Trichobothrium palpal tibia, dorsal view. **121.** Same, metatarsus II. **122.** Same, tibia III. **123.** Tarsal organ palp, dorsal view. **124.** Same, leg I. **125.** Same, leg II. **126.** Same, leg III. **127.** Same, leg IV. **128.** Trichobothrium, metatarsus I, dorsal view. **129.** Same, metatarsus IV. **130.** Same, tibia III. Scale bars: 10 μm.



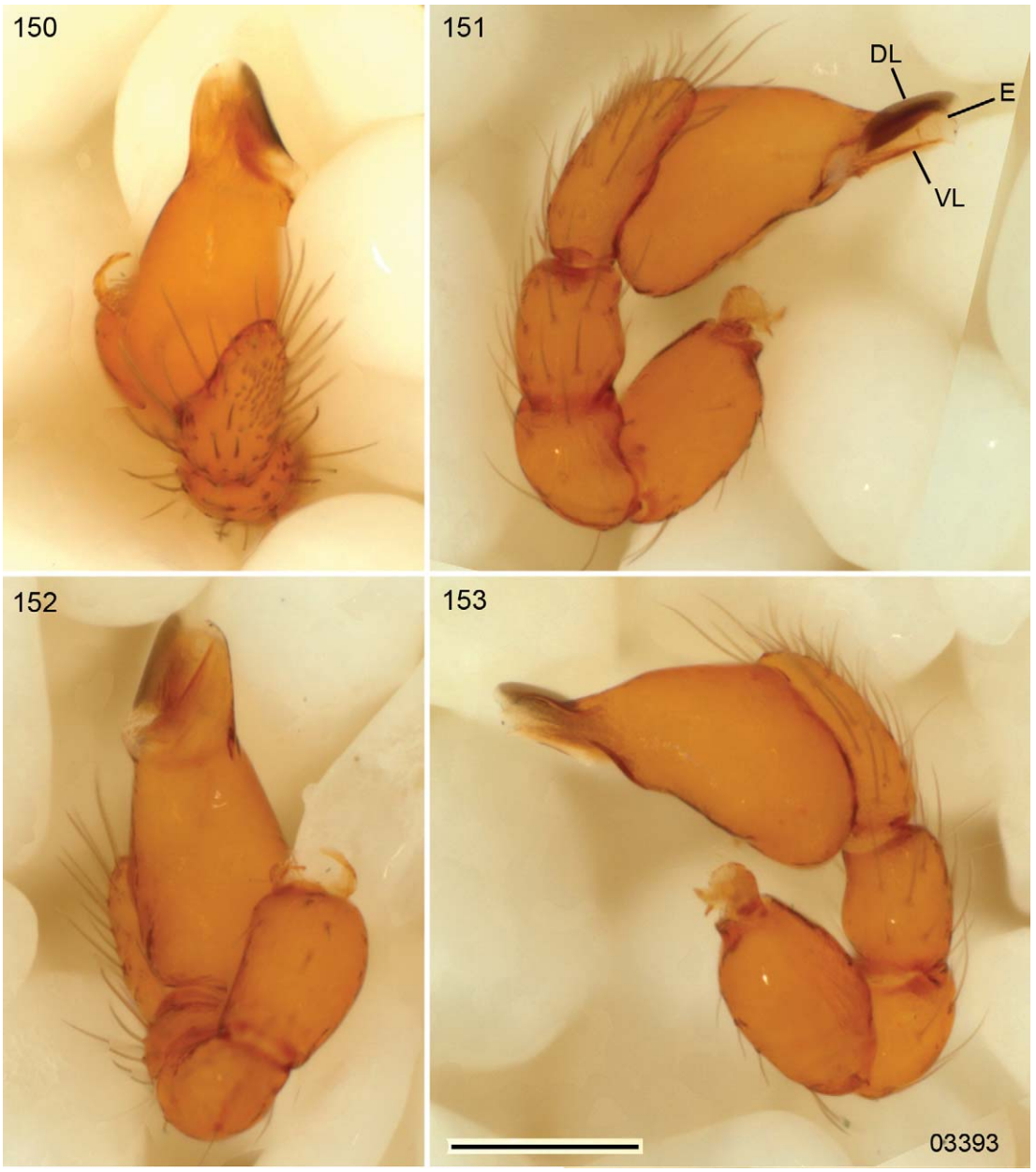
FIGS. 131–141. *Molotra molotra*, new species, male (131–136) and female (137–141) tarsal claws. (PBI_01990). **131.** Claw I of right leg (missing retroclaw) in prolateral view. **132, 133.** Claws II in subventral and retrolateral views. **134, 135.** Claws III in ventrolateral and retrolateral views. **136.** Claws IV in apical view. **137, 138.** Claws I in prolateral and apical views. **139.** Claws II in apical view. **140.** Claws III in prolateral view. **141.** Claws IV in ventral view. Labels identify median (M) and lateral (L) teeth. Scale bars: 10 μm.



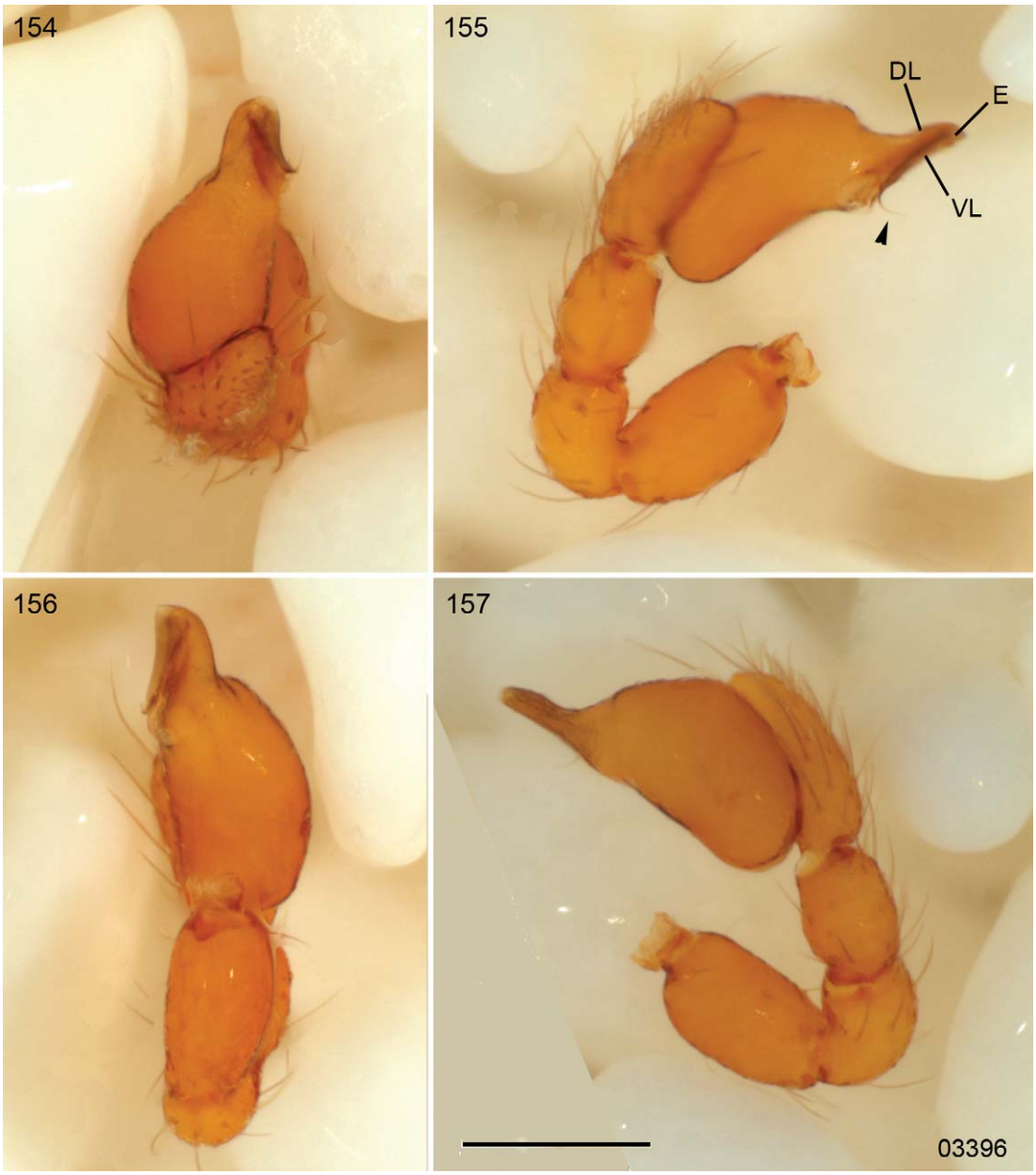
FIGS. 142–145. *Molotra molotra*, new species, male palp (PBI_03391). **142.** Dorsal view. **143.** Prolateral view. **144.** Ventral view. **145.** Retrolateral view. DL = dorsal lobe, E = embolus, VL = ventral lobe. Scale bar: 200 μm.



FIGS. 146–149. *Molotra ninae*, new species, male palp (PBI_03395). **146.** Dorsal view. **147.** Prolateral view. **148.** Ventral view. **149.** Retrolateral view. DL = dorsal lobe, E = embolus, VL = ventral lobe. Scale bar: 200 μm.

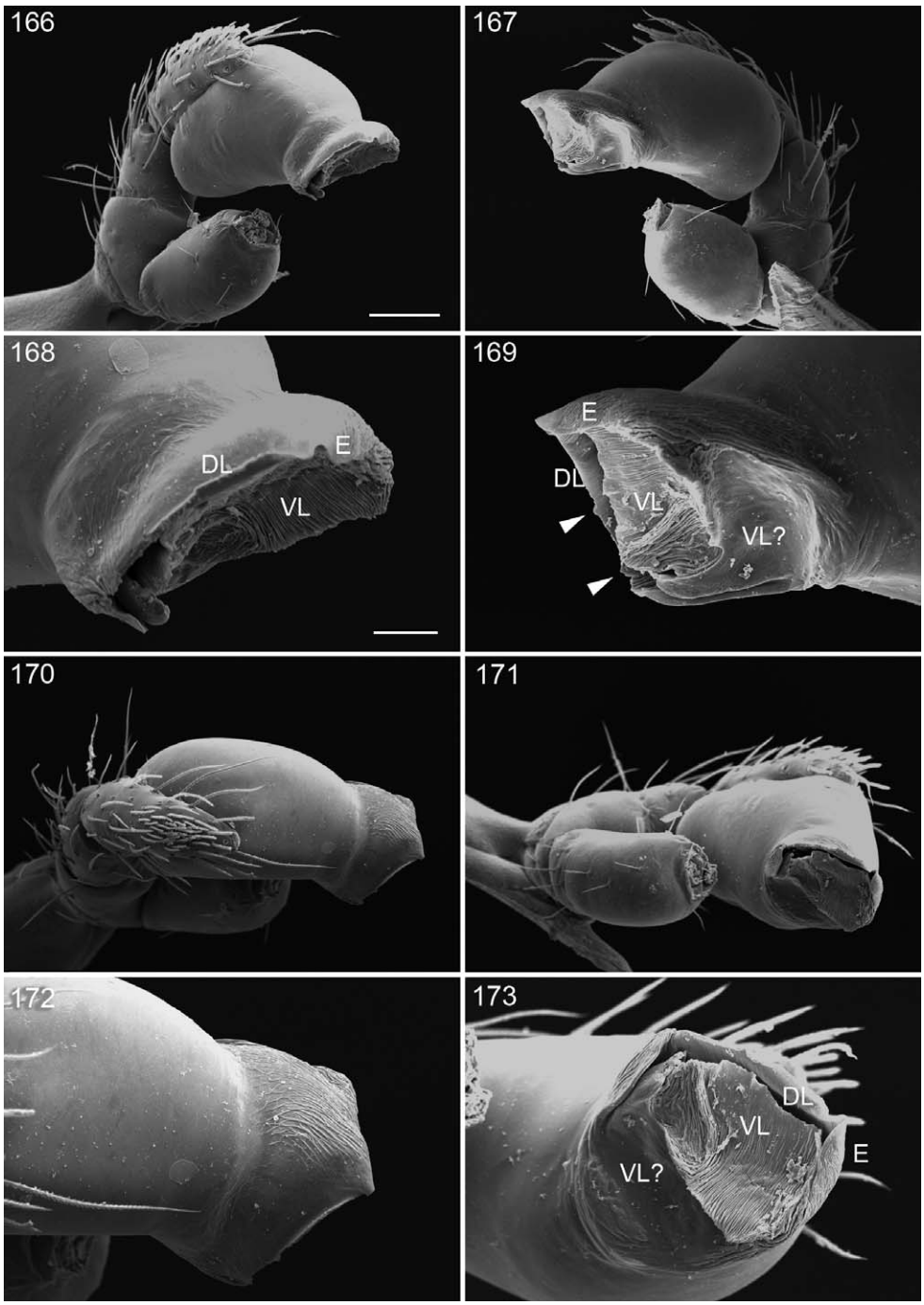


FIGS. 150–153. *Molotra katarinae*, new species, male palp (PBI_03393). **150.** Dorsal view. **151.** Prolateral view. **152.** Ventral view. **153.** Retrolateral view. DL = dorsal lobe, E = embolus, VL = ventral lobe. Scale bar: 200 μm.

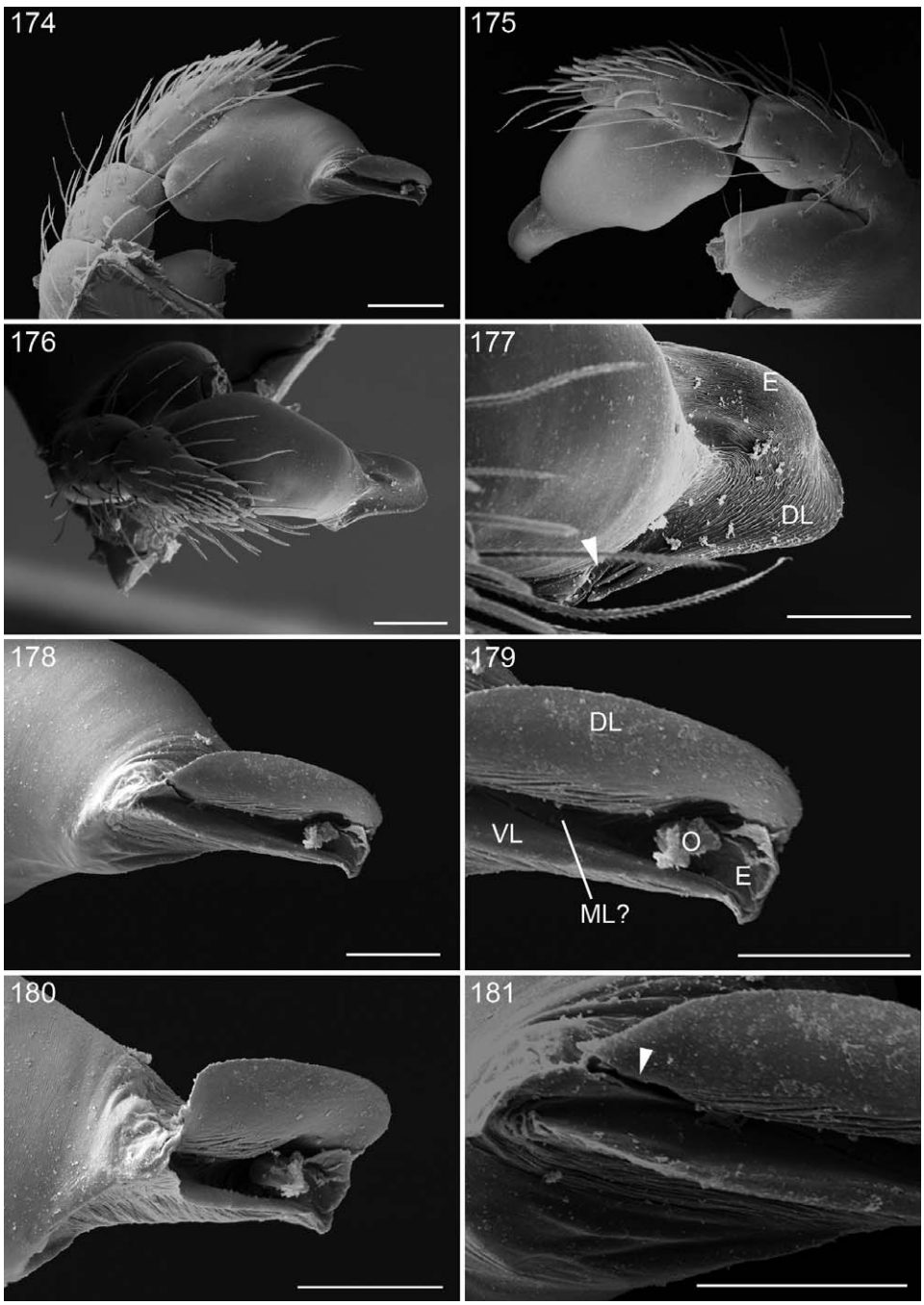


FIGS. 154–157. *Molotra suzannae*, new species, male palp (PBI_03396). **154.** Dorsal view. **155.** Prolateral view. **156.** Ventral view. **157.** Retrolateral view. DL = dorsal lobe, E = embolus, VL = ventral lobe, arrow shows basal projection of DL. Scale bar: 200 μm.

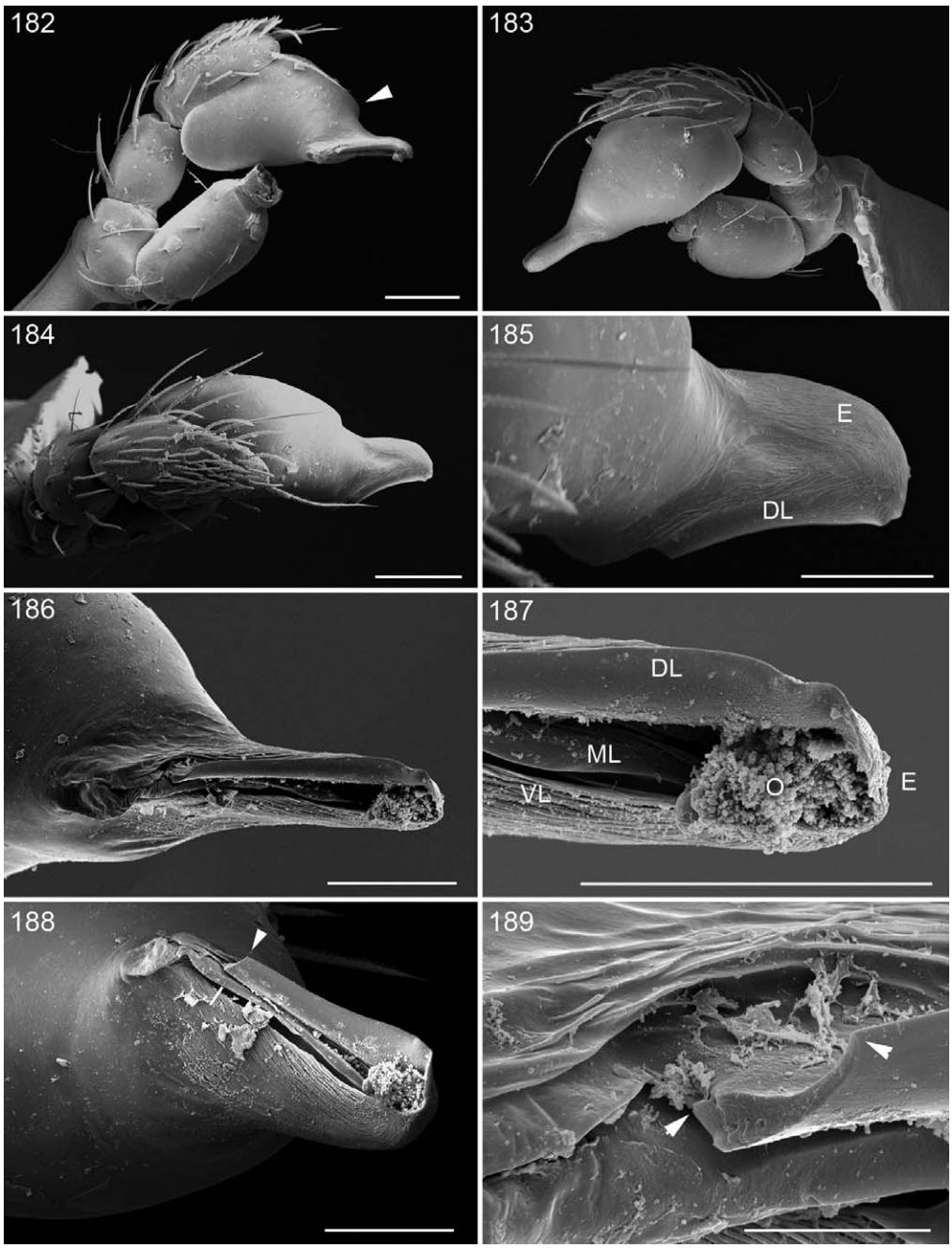
FIGS. 158–165. *Molotra molotra*, new species, male palp (PBI_01990). **158, 159.** Palp in prolateral and retrolateral views. **160.** Embolar region, prolateral view. **161.** Same, dorsal view. **162.** Same, retrolateral view. **163.** Embolus (E) showing subapical tube with opening (O), prolateral view. **164.** Embolar region, ventrolateral view. **165.** Same, ventral view. DL = dorsal lobe, E = embolus, O = embolar opening, VL = ventral lobe. Scale bars: 200 μm (158, 159), 10 μm (163), 50 μm (all others).



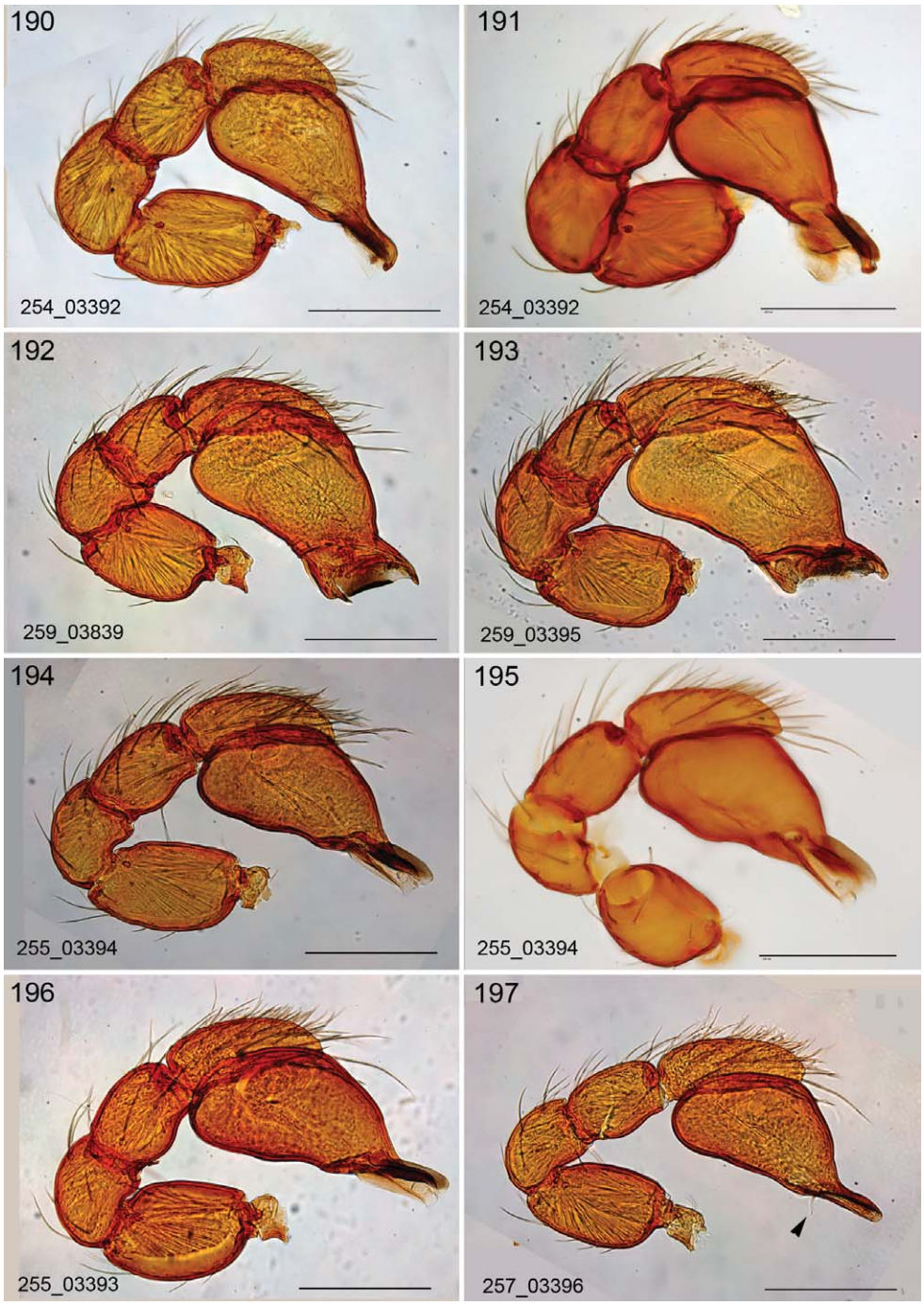
FIGS. 166–173. *Molotra ninae*, new species, male palp (PBI_03395). **166, 167.** Palp in prolateral and retrolateral views. **168.** Embolar region, prolateral view. **169.** Same, retrolateral view, arrows show irregular (broken) edge of DL. **170.** Palp, dorsal view. **171.** Same, ventral view. **172.** Embolar region, dorsal view. **173.** Same, ventral view. DL = dorsal lobe, E = embolus, VL = ventral lobe, VL? = possible basal extension of VL. Scale bars: 100 μm (166, 167, 170, 171), 30 μm (168, 169, 172, 173).



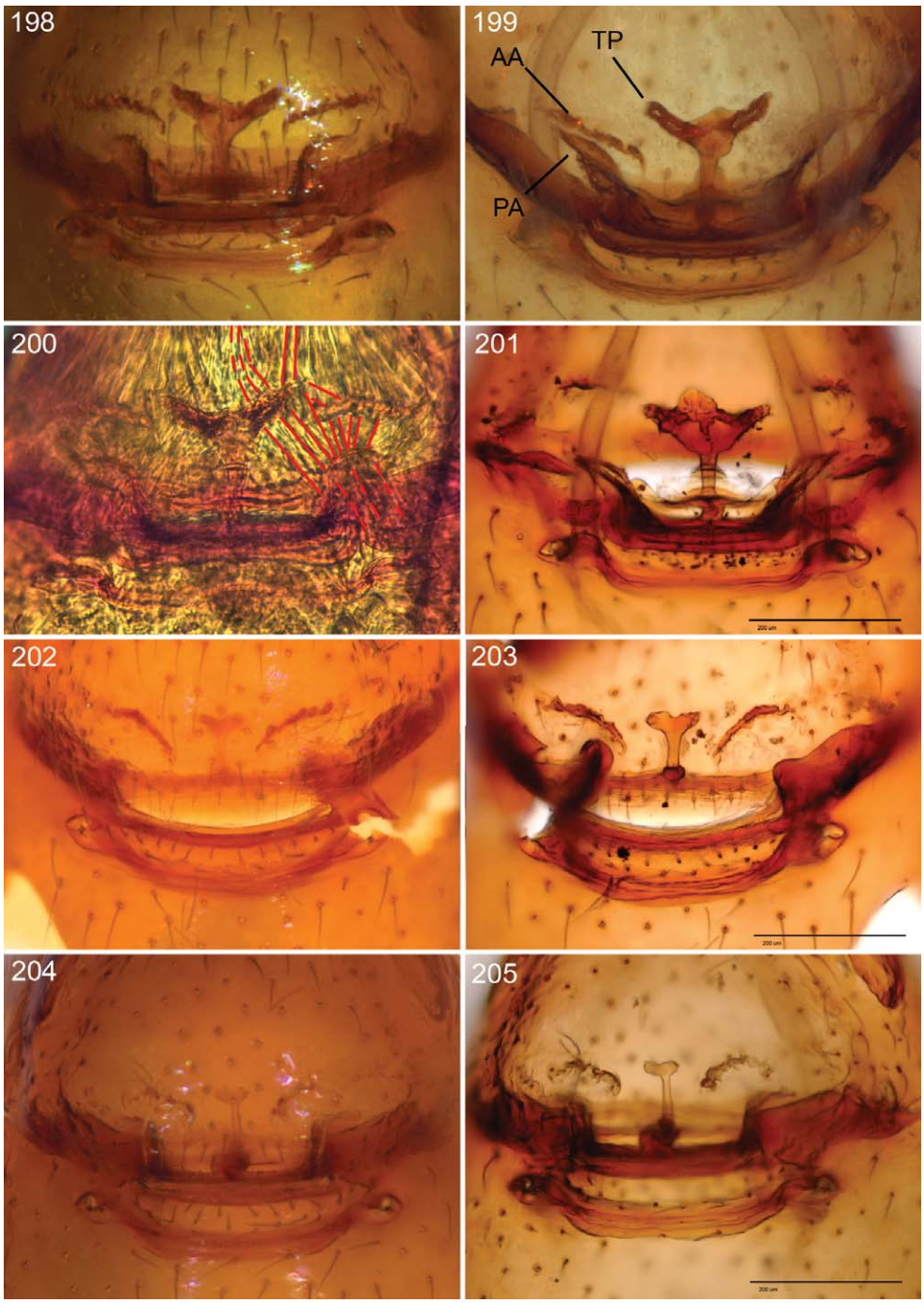
FIGS. 174–181. *Molotra katarinae*, new species, male palp. (PBI_03393). **174, 175.** Palp, prolateral and retrolateral views. **176.** Same, dorsal view. **177.** Same, embolar region, with arrow showing ridged (? broken) area. **178.** Embolar region, prolateral-ventral view. **179.** Same, magnified view. **180.** Same, ventral view. **181.** Same, magnified view of basal portion showing crack in dorsal lobe (arrow). DL = dorsal lobe, E = embolus, ML? = possible median lobe, O = embolar opening, VL = ventral lobe. Scale bars: 100 μm (174–176), 50 μm (all others).



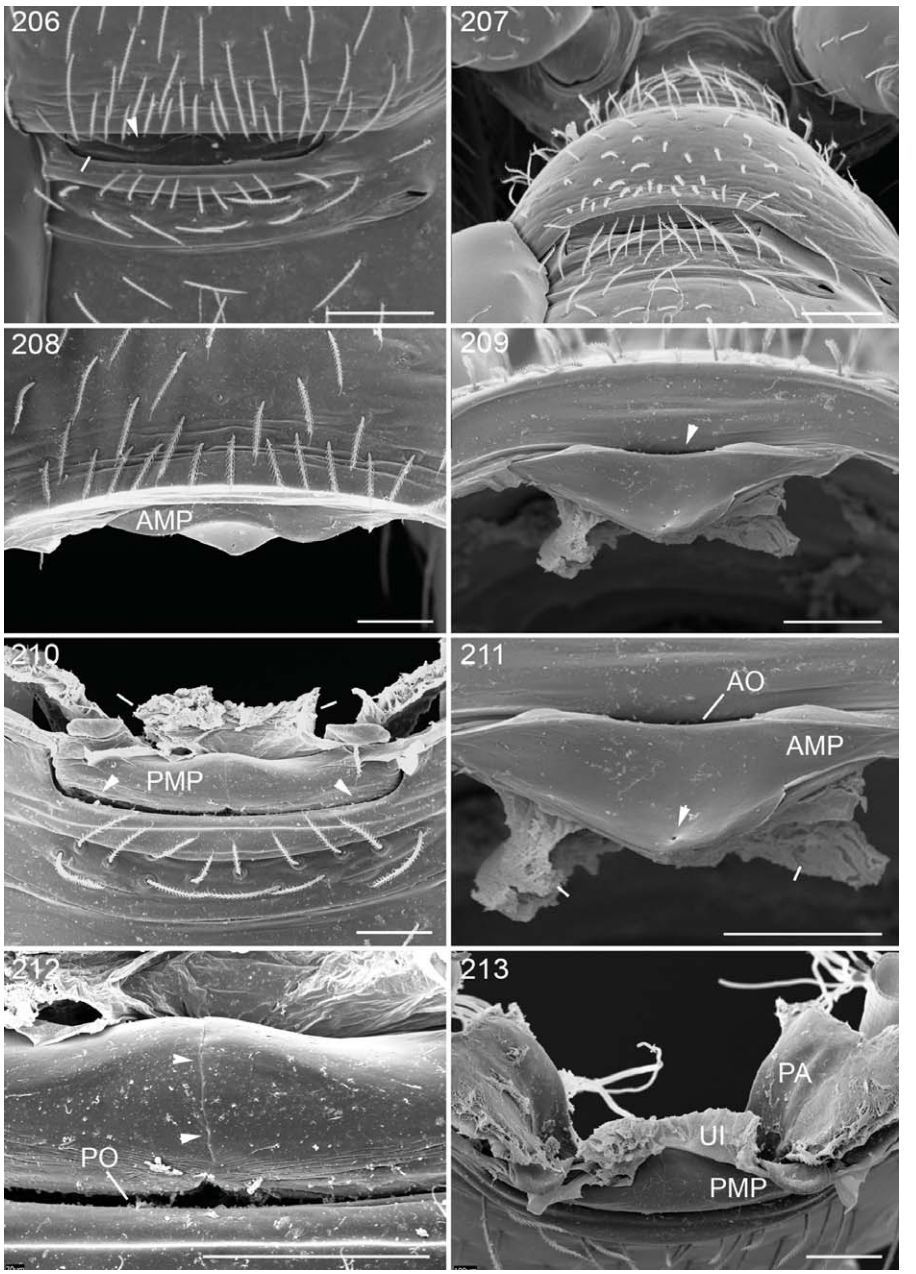
FIGS. 182–189. *Molotra suzannae*, new species, male palp. (PBI_03396). **182, 183.** Palp, prolateral and retrolateral views, with arrow to slight dorsoapical swelling of bulb. **184.** Same, dorsal view. **185.** Same, embolar region. **186.** Embolar region, prolateral view. **187.** Same, magnified view of apical region. **188.** Embolar region, ventral view, showing basal break in dorsal lobe (arrow) and an unresolved median lobe (dash). **189.** Same, magnified view of basal portion showing break in dorsal lobe (arrows). DL = dorsal lobe, E = embolus, ML = median lobe, O = embolar opening, VL = ventral lobe. Scale bars: 100 μm (182–184), 10 μm (189), 50 μm (all others).



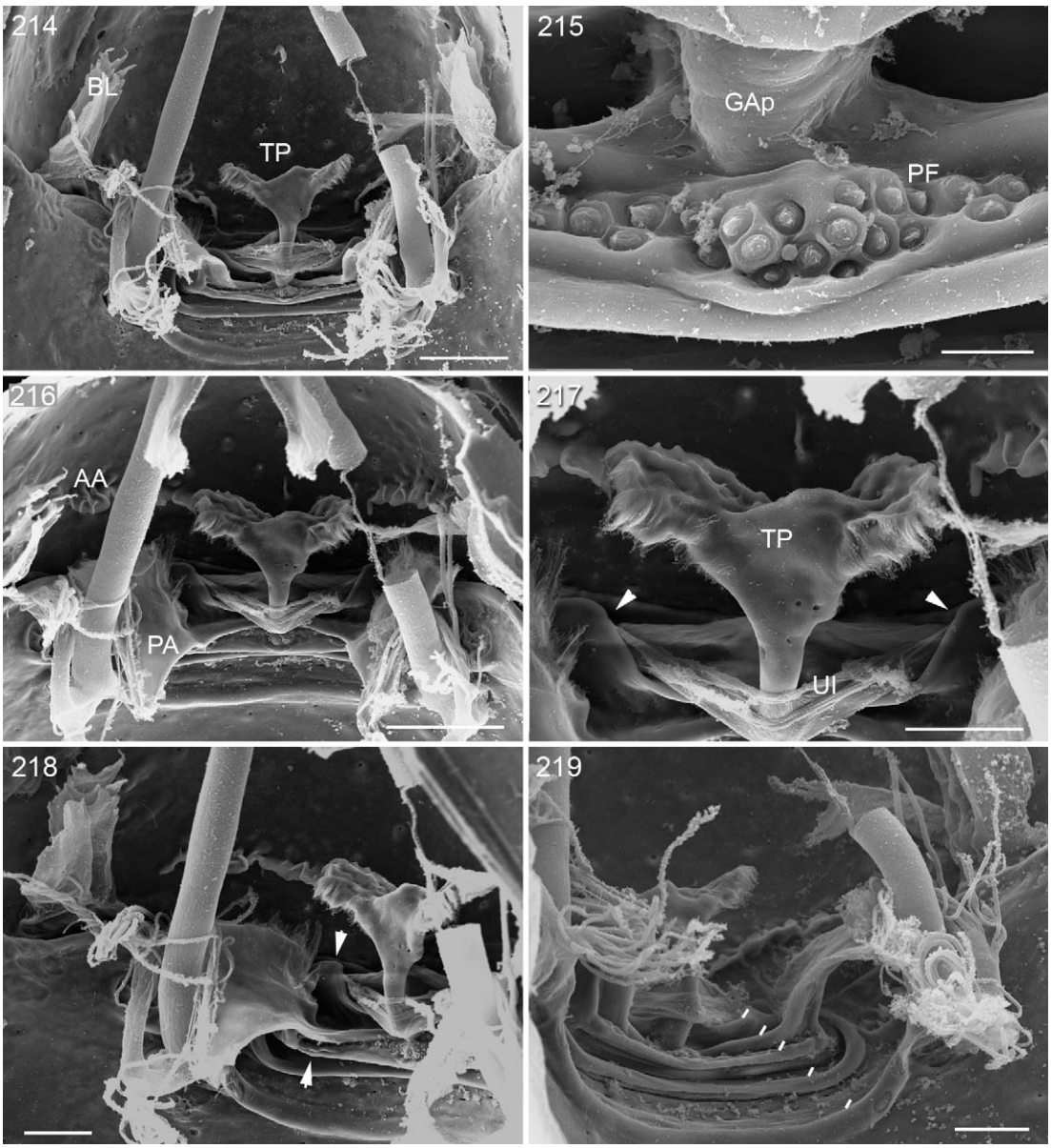
FIGS. 190–197. *Molotra* species, male palp, prolateral view. **190, 191.** *M. molotra*, same palp before and after treatment with hot lactic acid showing expanded embolar region. **192, 193.** *M. ninae*, palpi of specimens from different localities. **194–196.** *M. katarinae*, palpi of specimens from different localities, including one expanded with lactic acid (195). **197.** *M. suzannae*, with arrow to slender basal projection of dorsal lobe. Scale bars: 200 μm.



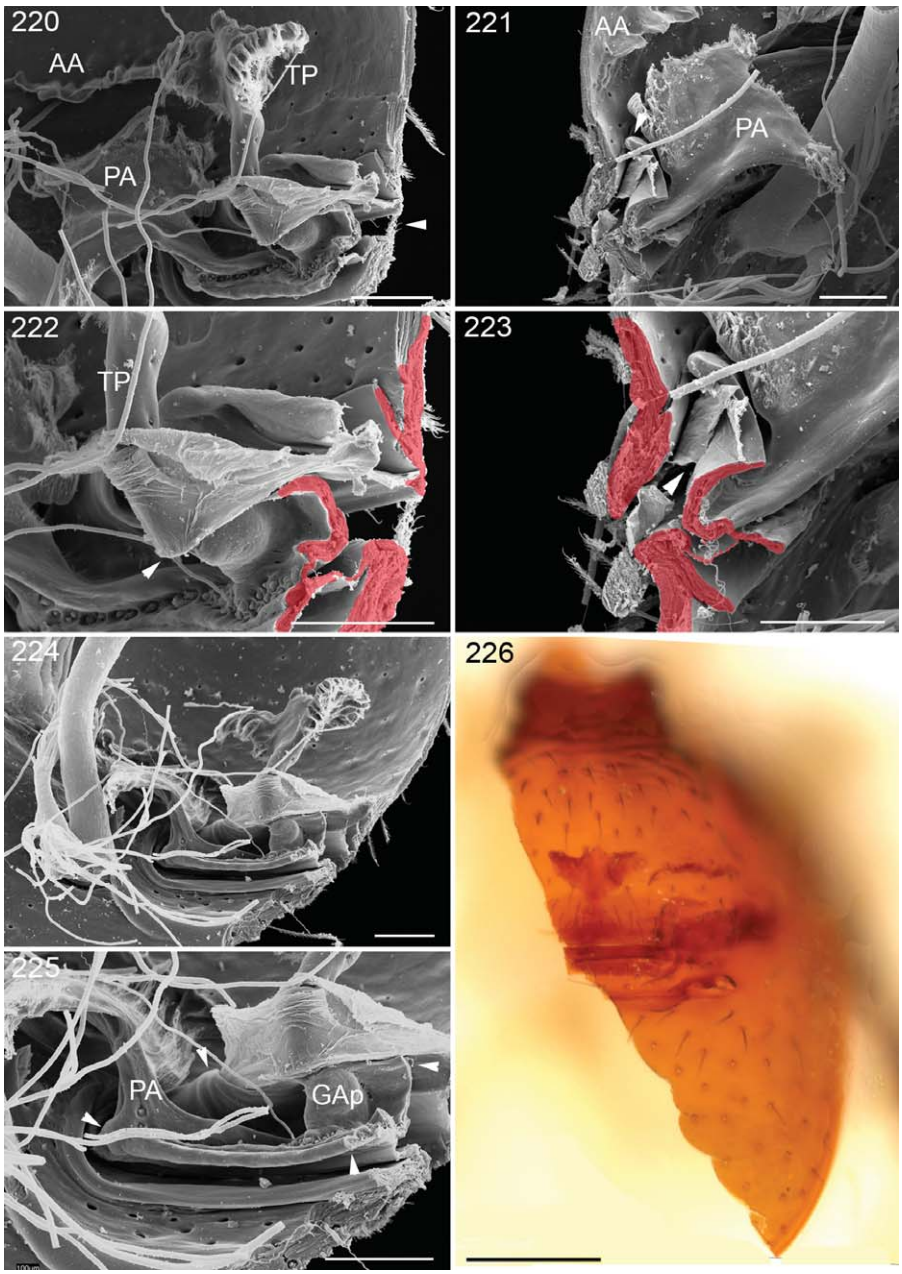
FIGS. 198–205. *Molotra* species, female genitalia. **198.** *M. molotra*, ventral view. **199.** Same, digested specimen, anteriodorsal view. **200.** Same, cleared, dorsal view, red lines show muscles. **201.** Same, posteriodorsal view. **202.** *M. katarinae*, ventral view. **203.** Same, digested specimen, dorsal view. **204.** *M. suzannae*, ventral view. **205.** Same, digested specimen, dorsal view. AA = anterior apodemes, PA = posterior apodemes, TP = T-shaped process. Scale bars: 200 μm.



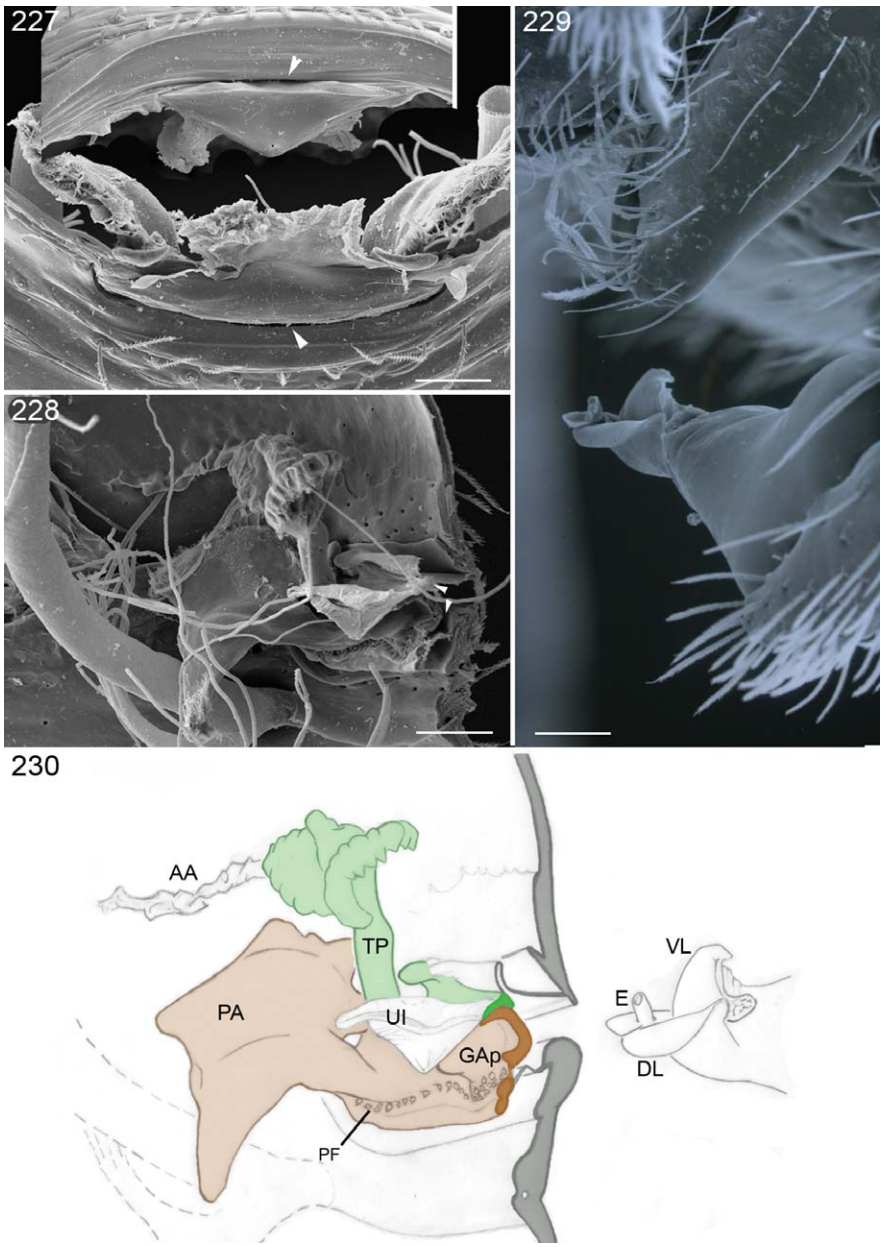
FIGS. 206–213. *Molotra molotra*, new species, female external genitalia. (PBI_01990: 206, 207; PBI_03392: 208–213). **206.** Ventral view with gonopore slightly open showing anterior (arrow) and posterior (dash) median process. **207.** Posterior view. **208.** Anterior margin of gonopore, ventral view, showing anterior median process (AMP). **209.** Same, posterior view, arrow to anterior opening (AO). **210.** Posterior margin of gonopore, ventral view, showing posterior median process (PMP) with arrows to posterior opening (PO) and dashes to posterior wall of uterus internus (UI). **211.** Anterior margin, magnified, arrow to distal pore, dashes to anterior wall of UI. **212.** Posterior margin, magnified, with arrows showing crack on surface of PMP. **213.** Same, anterior view, showing the large posterior apodemes (PA). Scale bars: 100 μm (206, 207), 50 μm (all others).



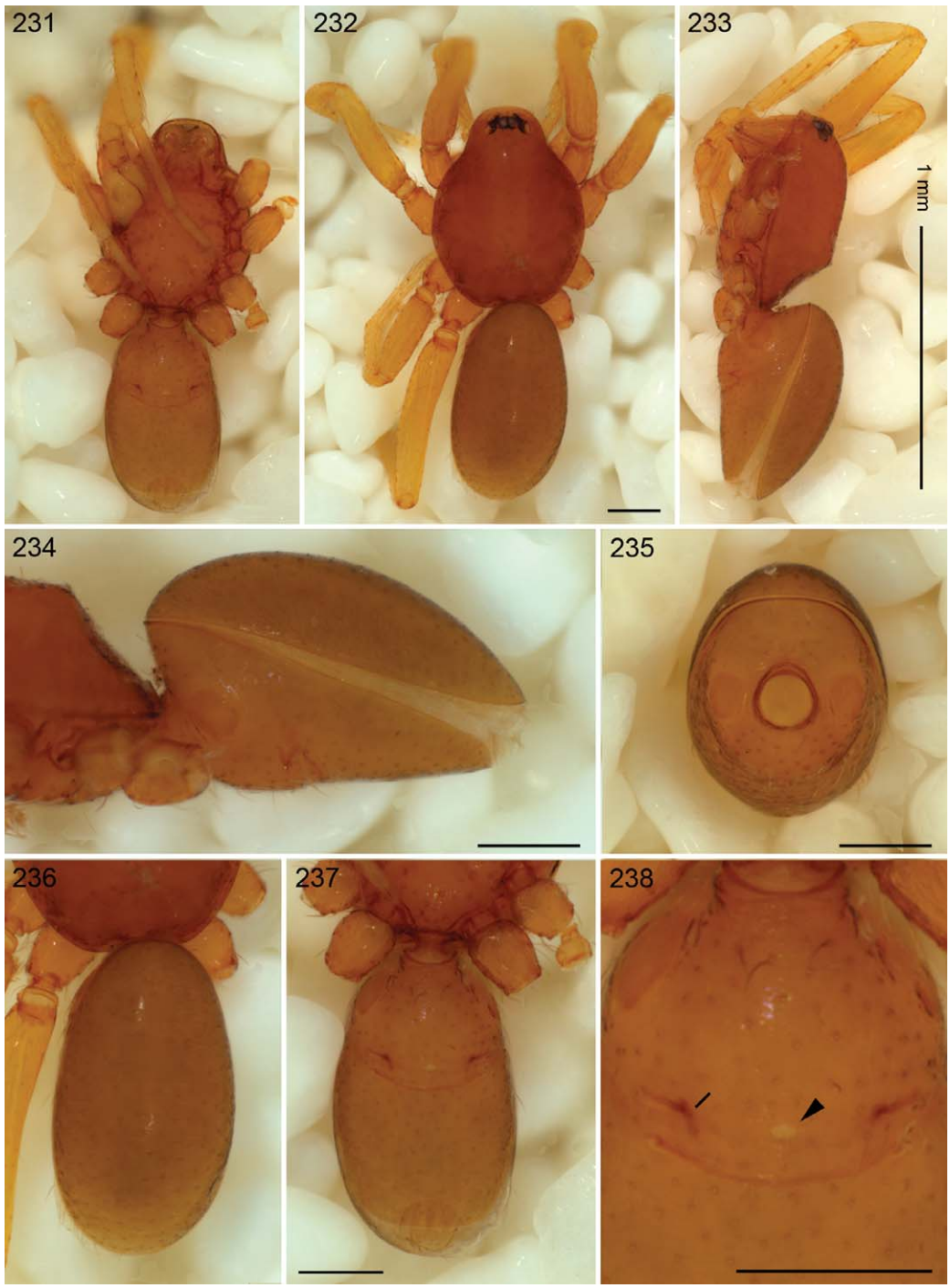
FIGS. 214–219. *Molotra molotra*, new species, female internal genitalia. (PBI_01990). **214.** Dorsal view. **215.** Same, magnified, showing median knob (GAp) and papillae (PF). **216.** Anteriodorsal view. **217.** Same, magnified, showing T-shaped process (TP) and remnants of uterus internus (UI), arrows show rounded anterior lobes of the PMP. **218.** Laterodorsal view, arrows show the anterior and posterior edges of the PMP. **219.** Posteriodorsal view, showing the five transverse ridges (dashes) of the posterior scute. AA = anterior apodeme, BL = book lung, PA = posterior apodeme, PMP = posterior median process. Scale bars: 100 μm (214, 216), 50 μm (217–219), 10 μm (215).



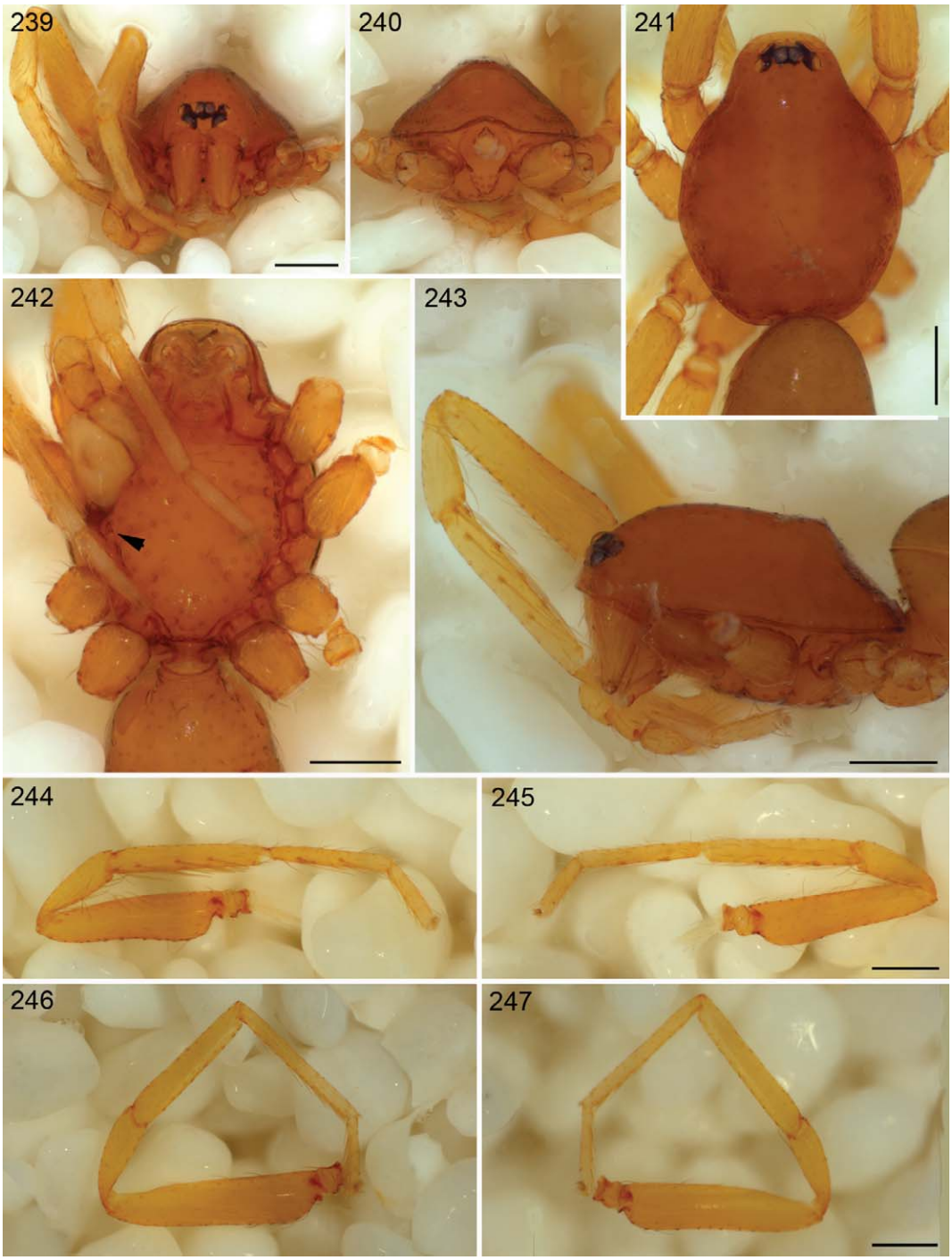
FIGS. 220–226. *Molotra molotra*, new species, female internal genitalia, oblique sagittal section (PBI_01990). **220.** Left section, dorsolateral view, arrow to gonopore. **221.** Right section, lateral view, showing posterior and anterior apodemes, arrow points to anterior lobe of the posterior median process. **222.** Left section, magnified view, arrow shows the junction of the median knob (GAp) to base of T-shaped process (TP), cuticle cross section highlighted. **223.** Right section, magnified view, arrow shows anterior opening of gonopore, cuticle cross section highlighted. **224.** Left section, a more posterior view. **225.** Same, magnified view, arrows show edges of PMP. **226.** Abdomen, ventral view, showing left half of sagittal section. AA = anterior apodeme, GAp = globular appendix (median knob), PA = posterior apodeme, TP = T-shaped process. Scale bars: 200 μm (226), 50 μm (all others).



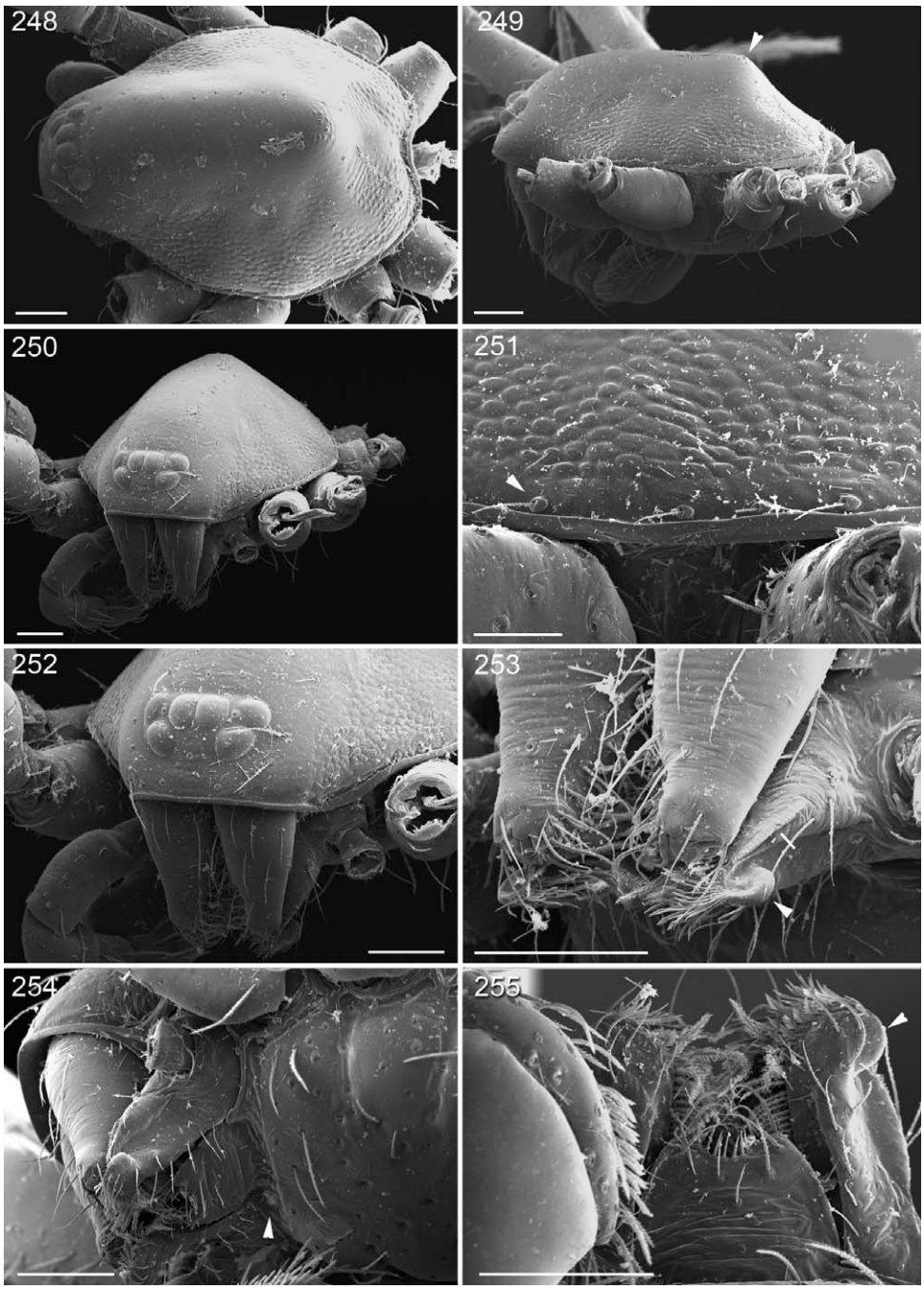
FIGS. 227–230. *Molotra molotra*, new species, male and female genitalia. (PBI_01990). Female (227, 228, 230), male (229, 230). **227.** Composite image of gonopore with anterior and posterior sections separated and rotated. Anterior section (upper image), posterior view, arrow to anterior opening. Posterior section, anterior view, arrow to posterior opening. **228.** Left sagittal section, laterodorsal view, with arrows showing anterior and posterior openings. **229.** Left palpus, attached to body, in anteriolateral view. **230.** Reconstructions of female and male genitalia in hypothesized precopulatory positions. Anterior median process shown in green, posterior process in brown, cuticle section in gray. AA = anterior apodeme, DL = dorsal lobe, E = embolus, GAp = globular appendix (median knob), PA = posterior apodeme, PF = papillae field, TP = T-shaped process, UI = uterus internus, VL = ventral lobe. Scale bars: 50 μm.



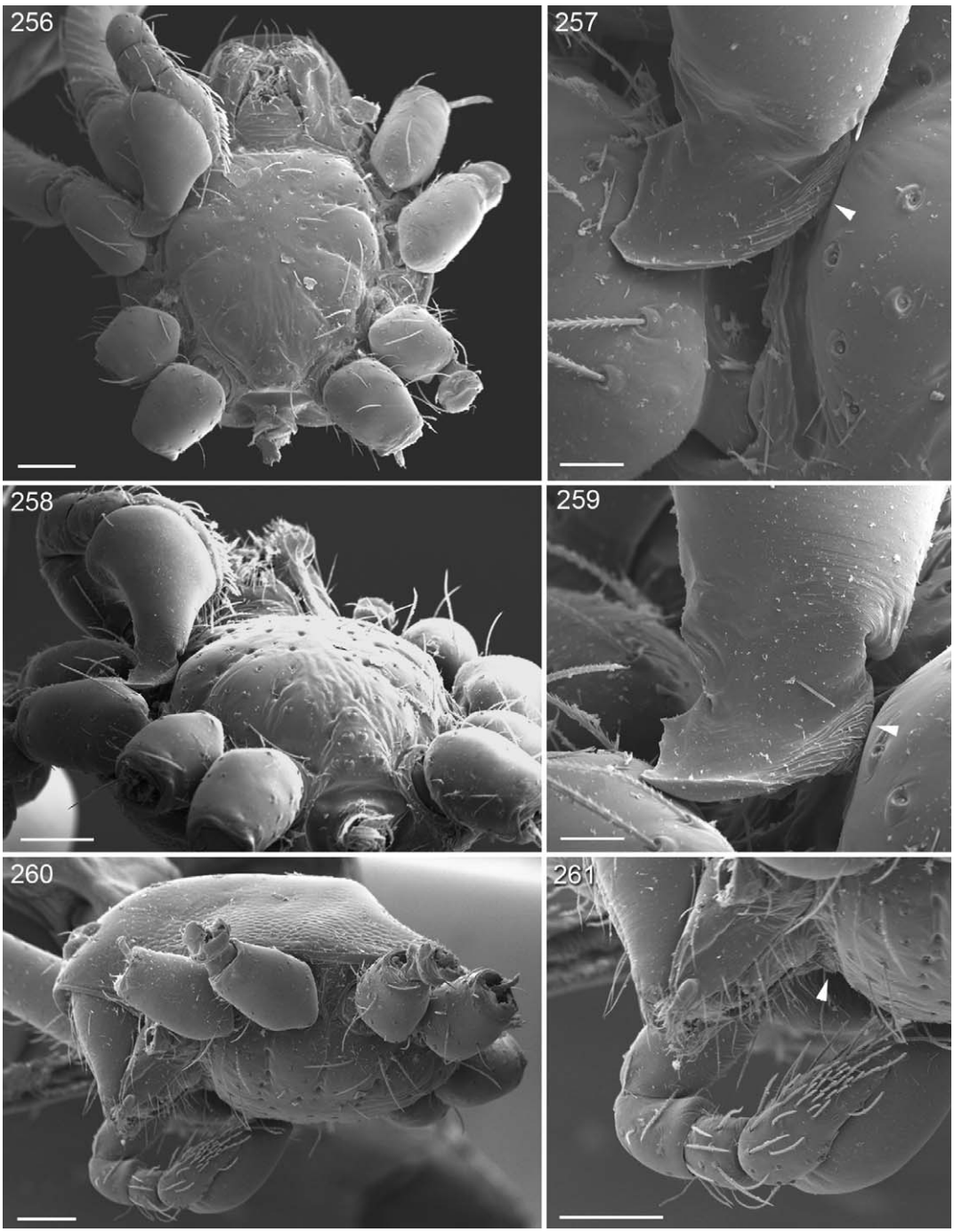
FIGS. 231–238. *Molotra tsingy*, new species, male (PBI_OON 03397). **231.** Habitus, ventral view. **232.** Same, dorsal view. **233.** Same, lateral view. **234.** Abdomen, lateral view. **235.** Same, anterior view. **236.** Abdomen, dorsal view. **237.** Same, ventral view. **238.** Epigastric region, ventral view. Arrow to sperm pore, dash to apodeme.



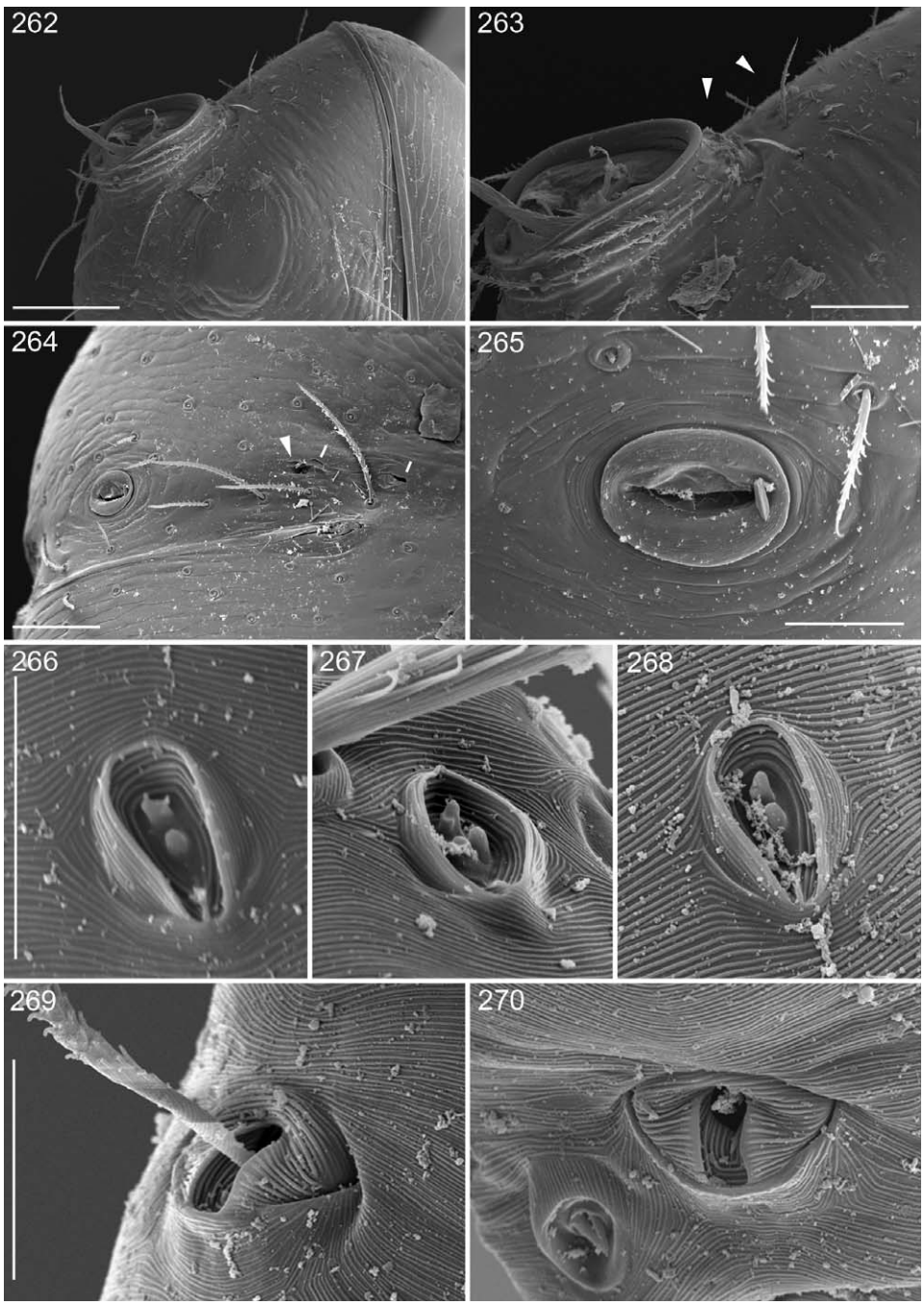
FIGS. 239–247. *Molotra tsingy*, new species, male (PBI_OON 03397). **239.** Cephalothorax, anterior view. **240.** Same, posterior view. **241.** Same, dorsal view. **242.** Same, ventral view, showing the resting position of the embolus (arrow). **243.** Same, lateral view. **244.** Leg I, prolateral view. **245.** Same, retrolateral view. **246.** Leg IV, prolateral view. **247.** Same, retrolateral view. Scale bars: 200 μm.



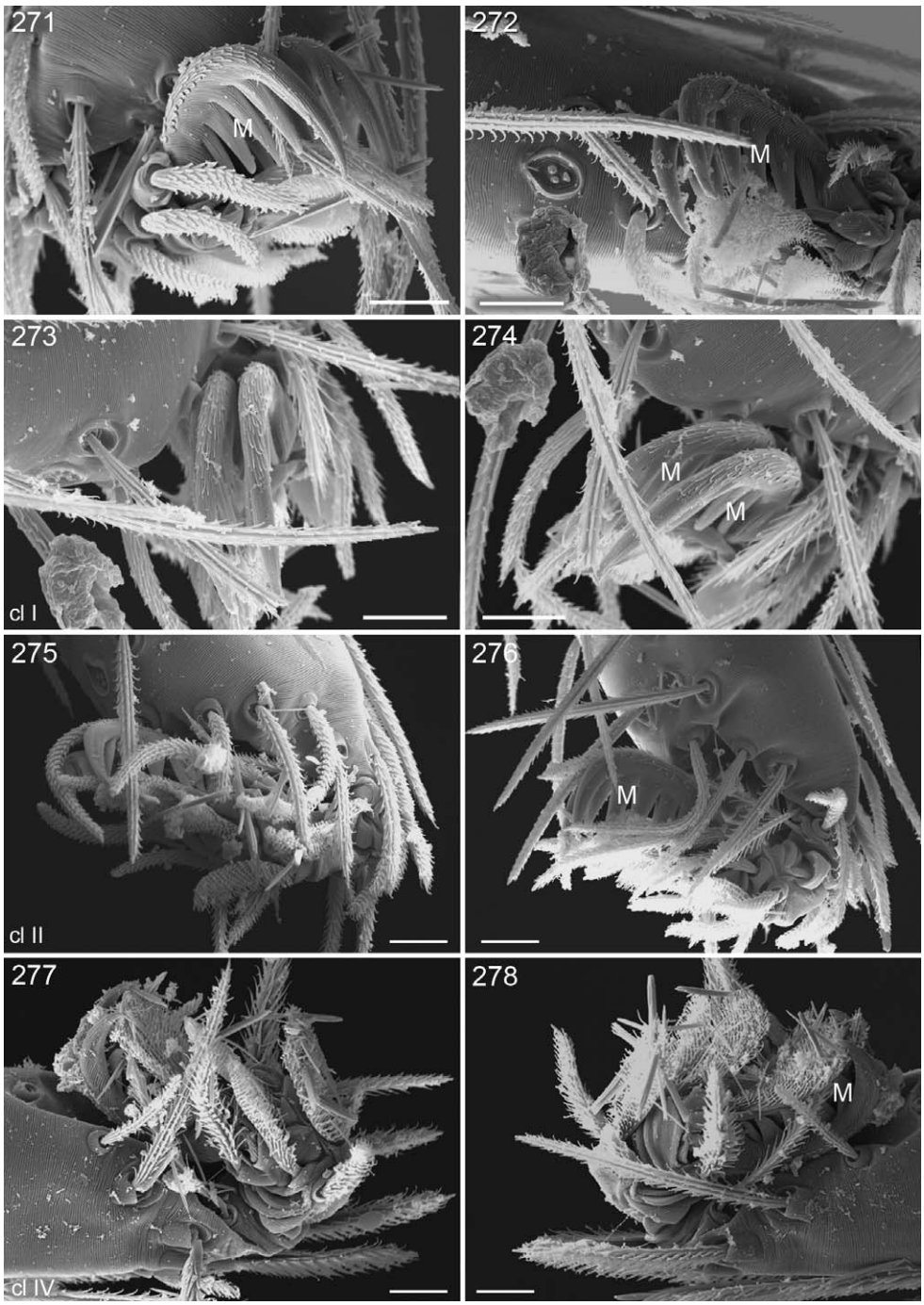
FIGS. 248–255. *Molotra tsingy*, new species, male (PBI_OON 03397). **248.** Carapace, dorsal view. **249.** Same, lateral view, with arrow showing posterior knob. **250.** Same, anterior view. **251.** Same, close up of margin, lateral view, with arrow to setose denticle. **252.** Same, anterior view. **253.** Mouthparts, anterolateral view, with arrow to distolateral knob of endite. **254.** Sternum and mouthparts, ventrolateral view, with arrow to narrow anterior cavity of sternum. **255.** Labium and endites, posterioventral view, with arrow to endite knob. Scale bars: 50 μm (251), 100 μm (all others).



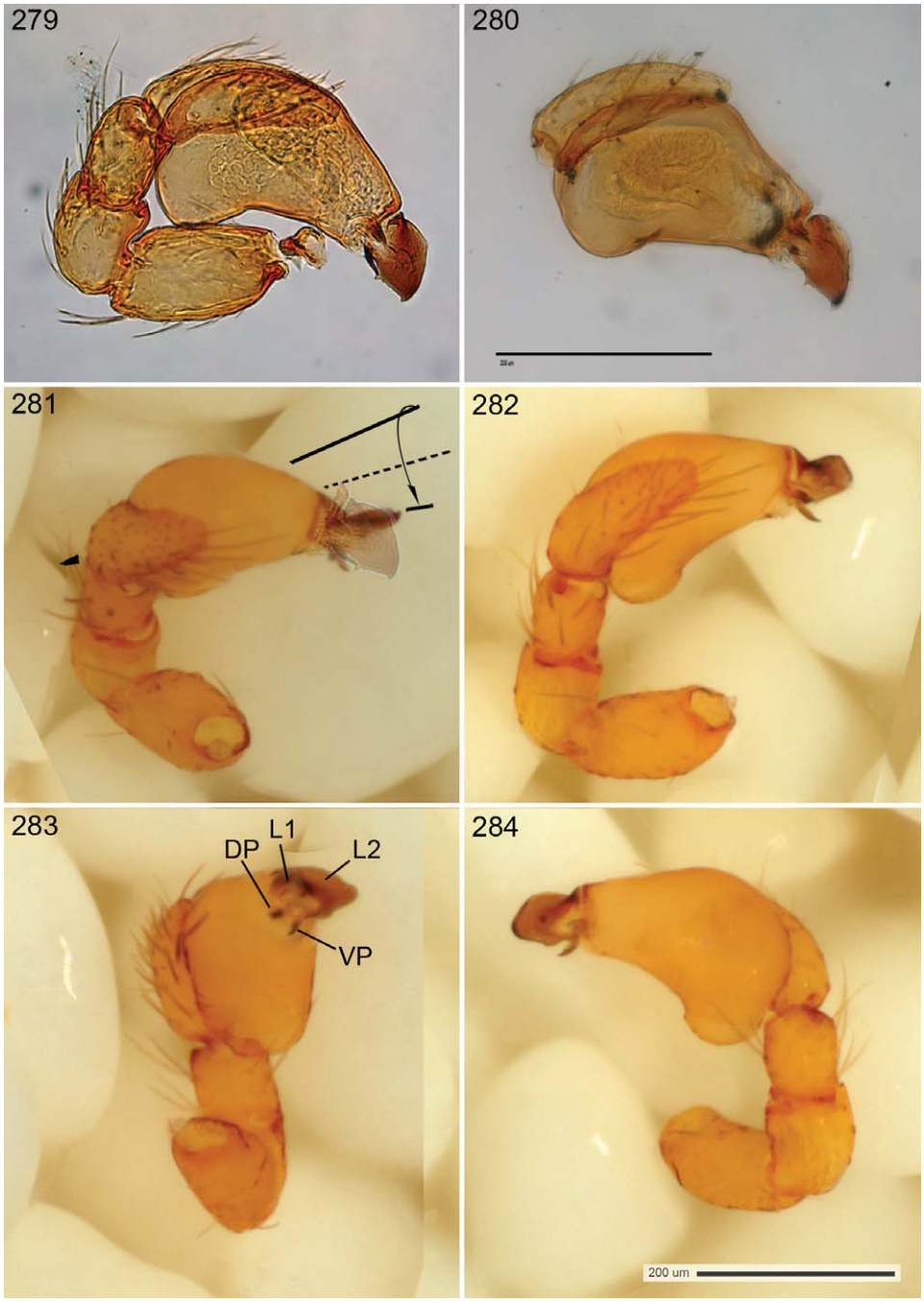
FIGS. 256–261. *Molotra tsingy*, new species, male (PBI_OON 03397). **256.** Cephalothorax, ventral view. **257.** Same, magnified view showing resting position of embolar region, with arrow to wrinkled edge of lobe. **258.** Cephalothorax, posteroventral view. **259.** Same, magnified view, with arrow to wrinkled edge of lobe. **260.** Cephalothorax, lateral view. **261.** Same, magnified view showing narrow sternal cavity (arrow). Scale bars: 20 μm (257, 259), 100 μm (all others)



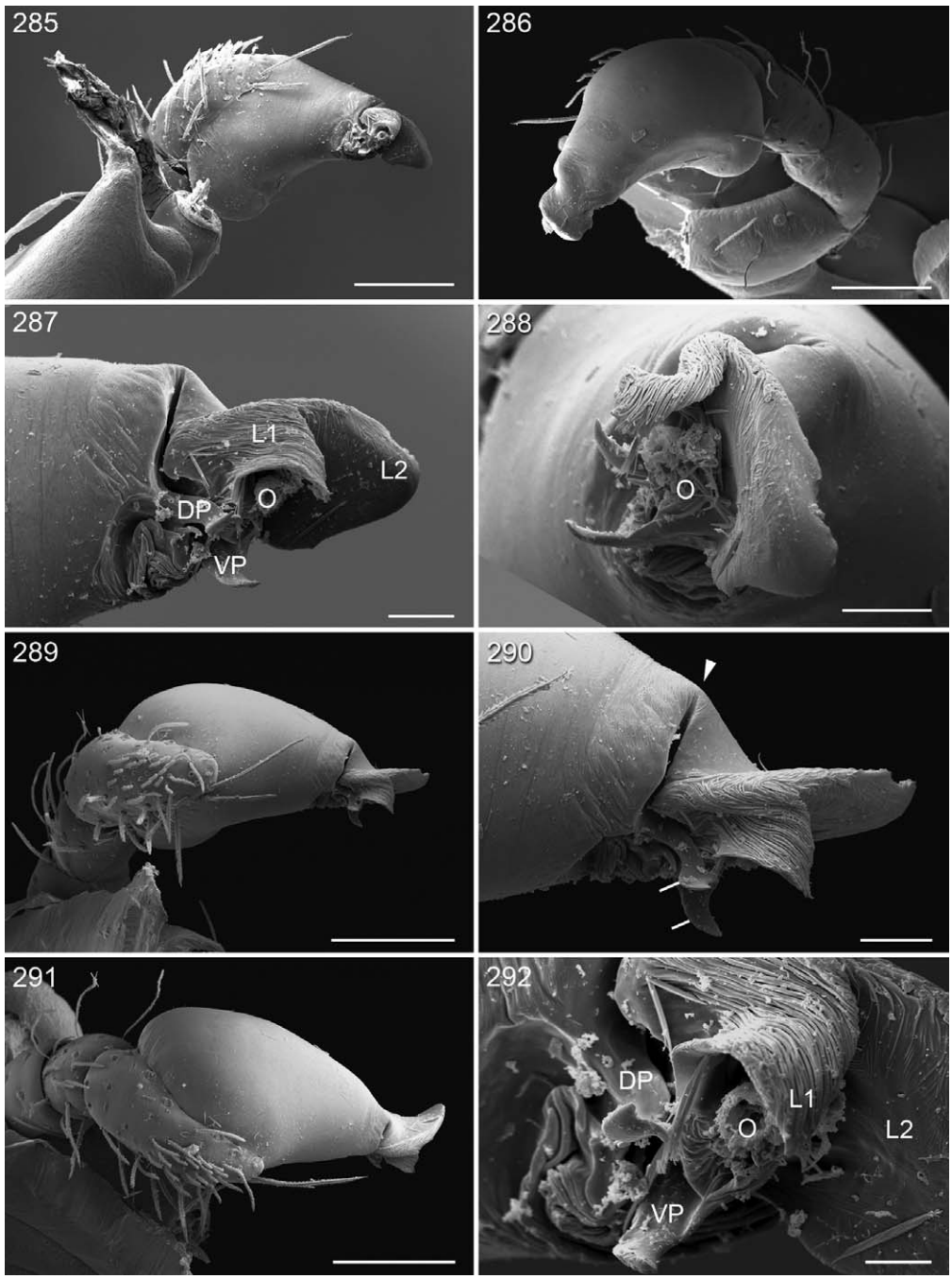
FIGS. 262–270. *Molotra tsingy*, new species, male (PBI_OON 03397). **262.** Abdomen, lateral view of anterior end. **263.** Same, magnified view of pedicel with arrows showing absence of ridges. **264.** Epigastric region, ventrolateral view, dashes to anterior respiratory spiracle and arrow to apodeme opening. **265.** Sperm pore, ventral view. **266.** Tarsal organ of palpus, dorsal view. **267.** Same, tarsus II. **268.** Same, tarsus IV. **269.** Trichobothrium of tibia IV, sublateral view. **270.** Same, tibia II, dorsal view. Scale bars: 100 μm (262), 50 μm (263, 264), 20 μm (265), 10 μm (266–270).



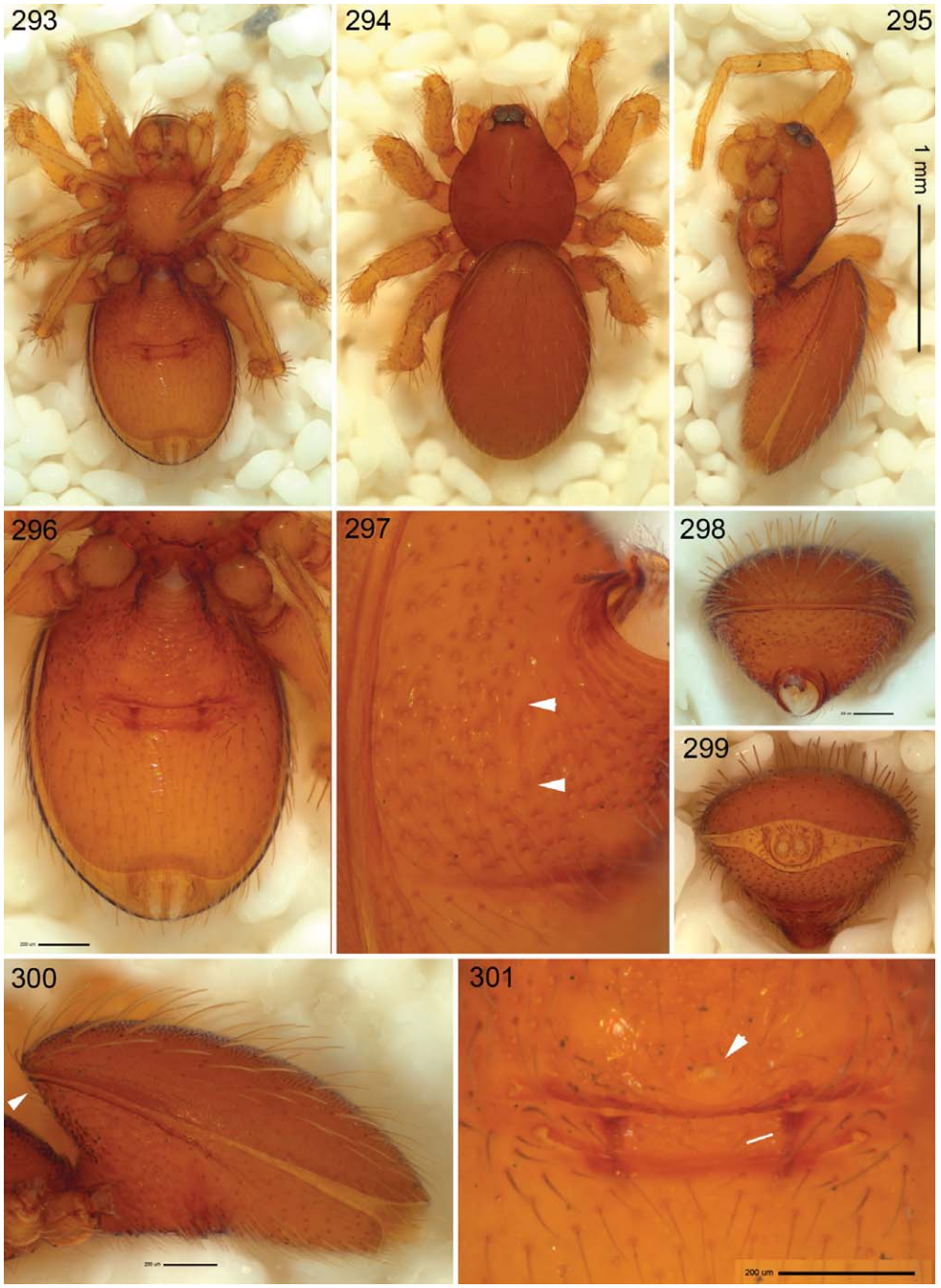
FIGS. 271–278. *Molotra tsingy*, new species, male claws (PBI_OON 03397). **271.** Claws of tarsus I, prolateral view. **272.** Same, retroventral view. **273.** Same, anterior view. **274.** Same, dorsolateral view. **275.** Claws of tarsus II, ventrolateral view. **276.** Same, retrolateral view. **277.** Claws of tarsus IV, prolateral view. **278.** Same, retrolateral view. Lateral teeth absent, median teeth labeled (M). Scale bars: 10 μm.



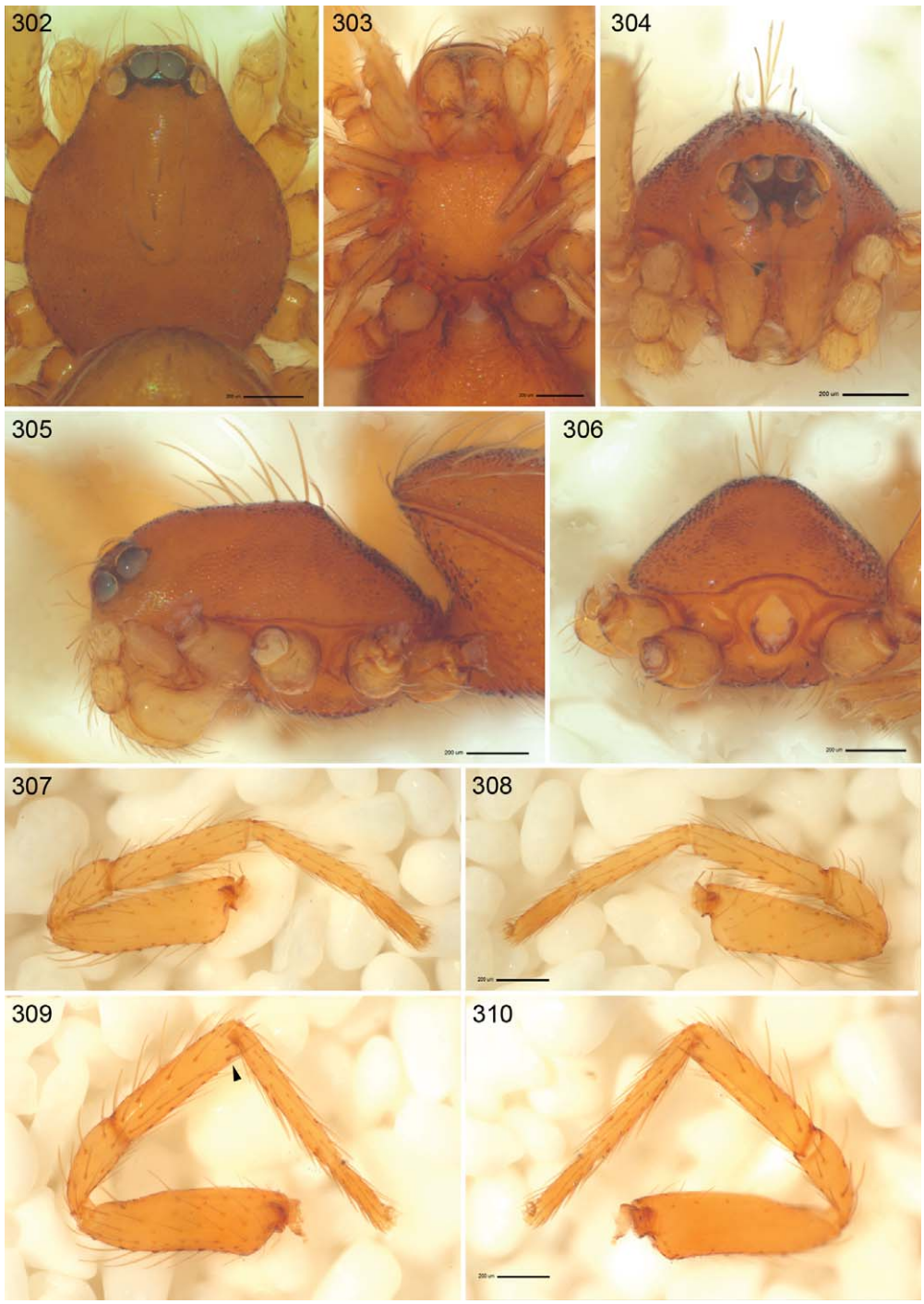
FIGS. 279–284. *Molotra tsingy*, new species, male palp. (PBI_03397). **279.** Prolateral view, methyl salicylate prep. **280.** Same, after treatment in hot lactic acid and showing no obvious expansion. **281.** Bulb and cymbium in dorsal view, arrow shows degree of rotation relative to the rest of the palp, dotted line gives the approximate axis of rotation. **282.** Subprolateral view. **283.** Ventral view. **284.** Retrolateral view. DP = dorsal prong, L1 = smaller lobe, L2 = larger lobe, VP = ventral prong. Scale bars: 200 μm.



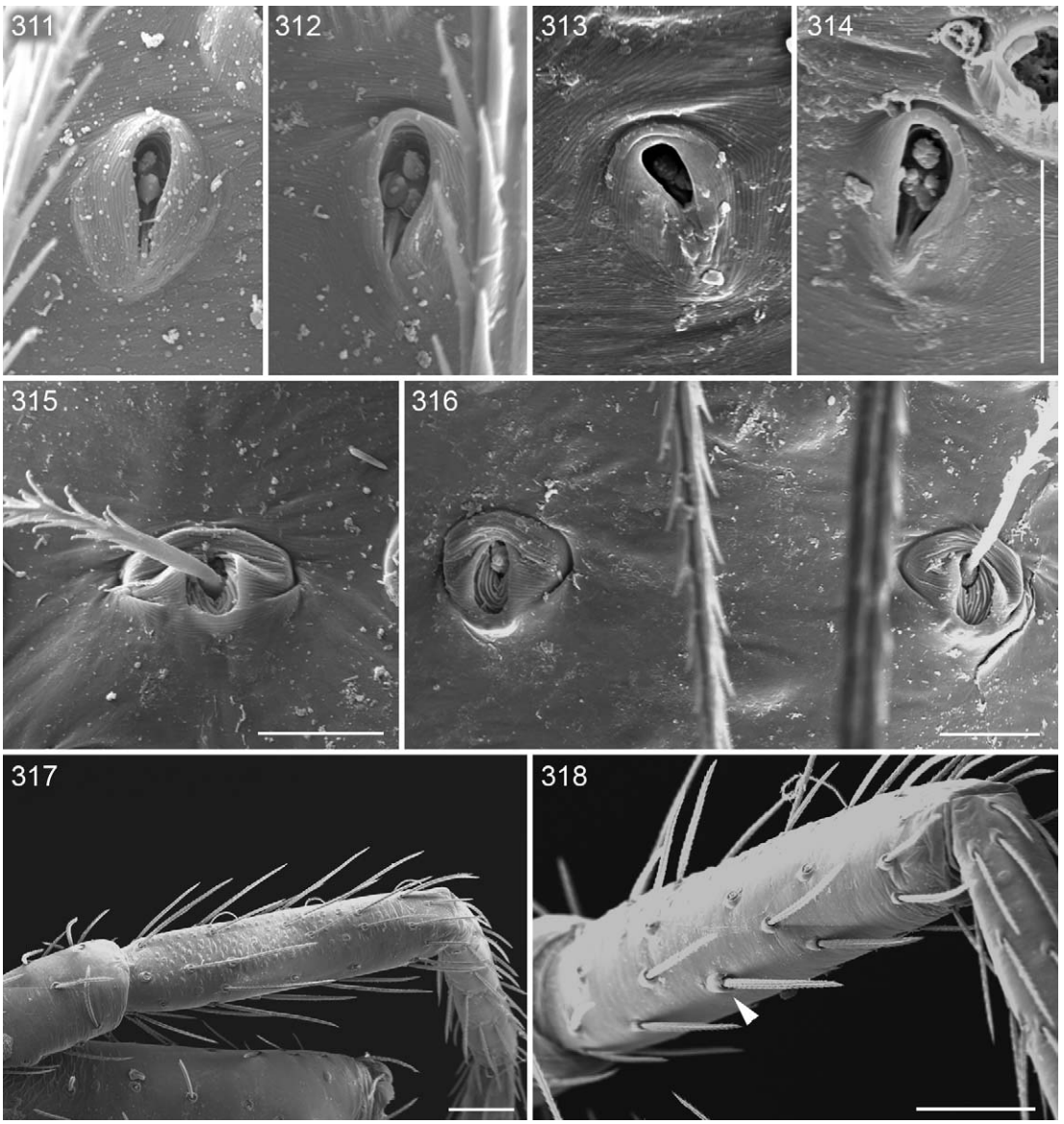
FIGS. 285–292. *Molotra tsingy*, new species, male palp. (PBI_03397). **285.** Palp, prolateral view. **286.** Same, retrolateral view. **287.** Embolar region, prolateral view. **288.** Same, apical view. **289.** Palp, dorsal view. **290.** Embolar region, dorsal view, arrow to subapical groove, dashes to prongs. **291.** Palp, dorsolateral view. **292.** Embolar region, prolateral view. DP = dorsal prong, L1 = smaller lobe, L2 = larger lobe, O = embolar opening, VP = ventral prong. Scale bars: 100 μm (285, 286, 289, 291), 20 μm (287, 288, 290, 292).



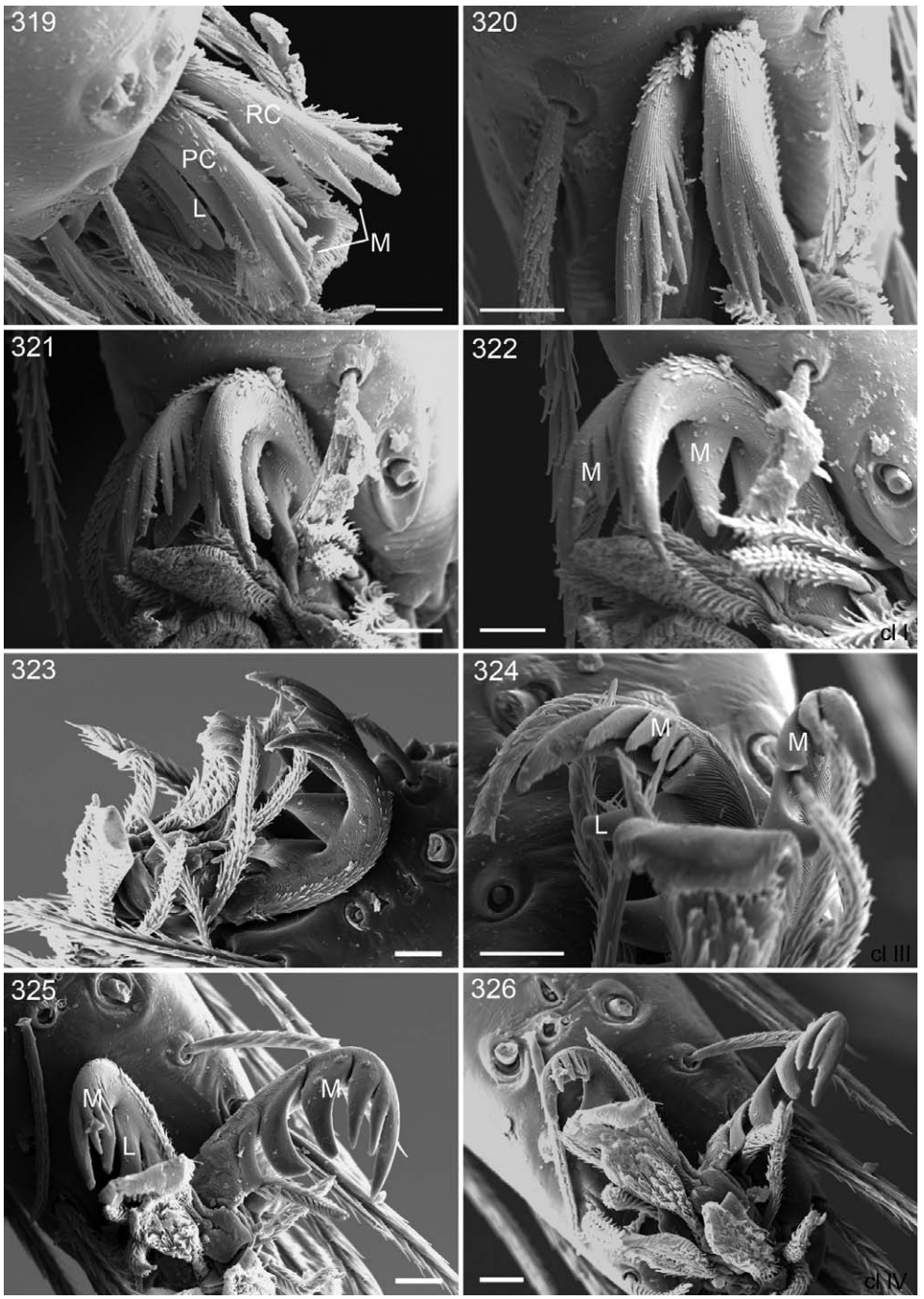
FIGS. 293–301. *Molotra milloti*, new species, male (PBI_35300). **293.** Habitus, ventral view. **294.** Same, dorsal view. **295.** Same, lateral view. **296.** Abdomen, ventral view. **297.** Same, sublateral view, with arrows showing reduced book lung cover. **298.** Same, anterior view. **299.** Same, posterior view. **300.** Same, lateral view, with arrow showing anterior overhang of abdomen. **301.** Epigastric region, ventral view, with arrow to sperm pore and dash to posterior apodeme visible through cuticle. Scale bars (horizontal): 200 µm.



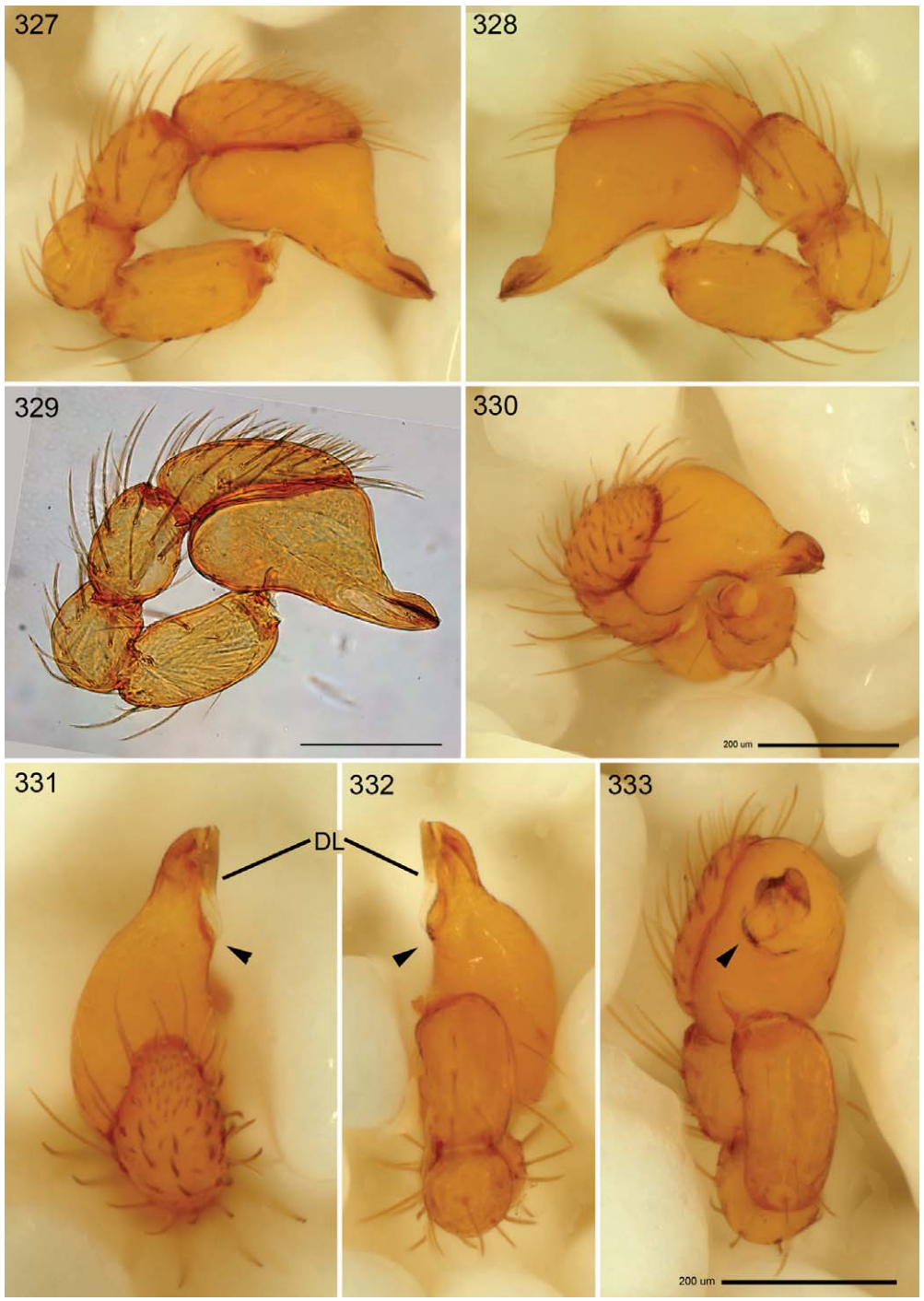
FIGS. 302–310. *Molotra milloti*, new species, male (PBI_35300). **302.** Cephalothorax, dorsal view. **303.** Same, ventral view. **304.** Same, anterior view. **305.** Same, lateral view. **306.** Same, posterior view. **307.** Leg I, prolateral view. **308.** Same, retrolateral view. **309.** Leg IV, prolateral view, with arrow showing spinelike bristle. **310.** Same, retrolateral view. Scale bars: 200 μm.



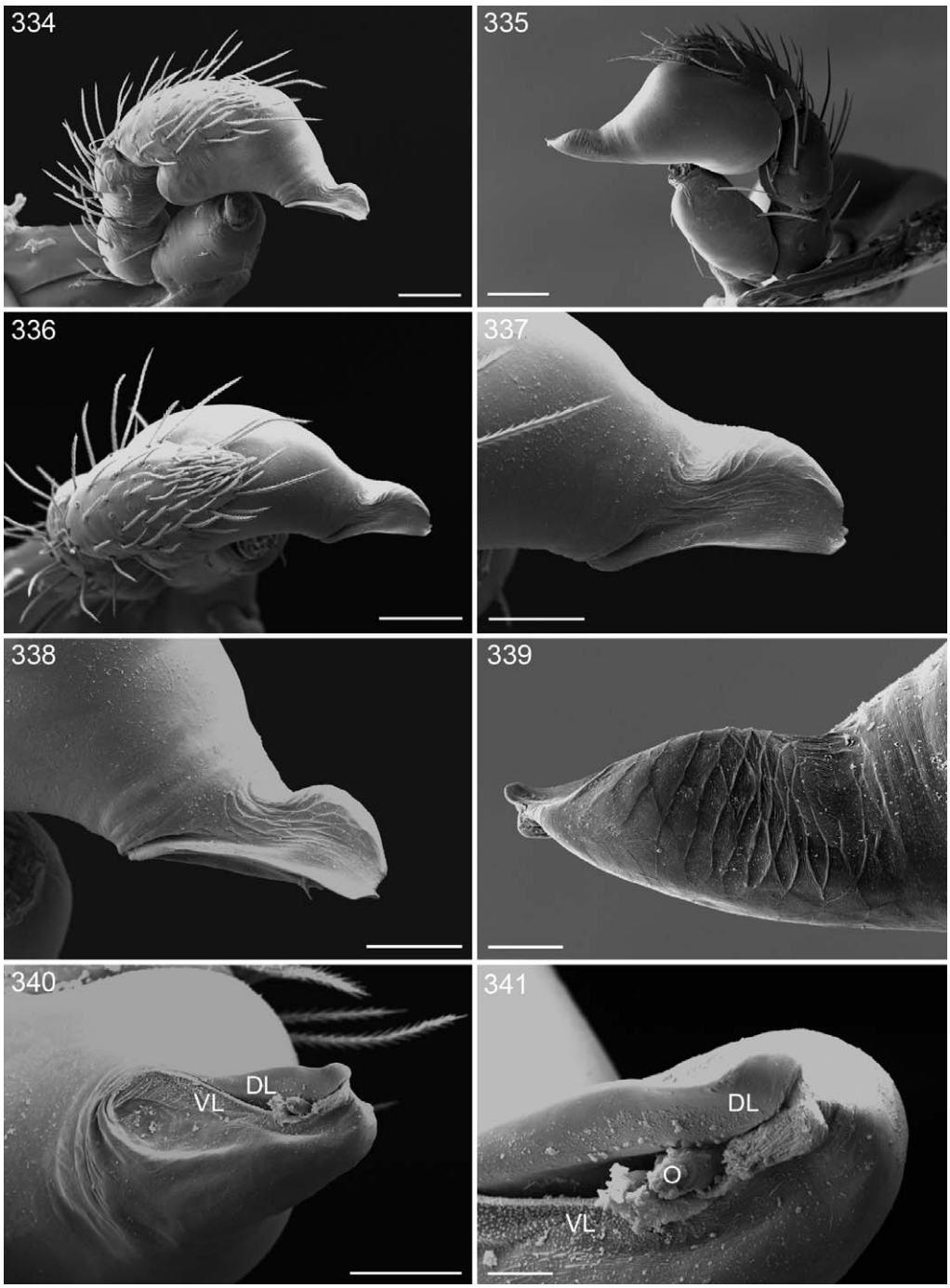
FIGS. 311–318. *Molotra milloti*, new species, male (PBI_35300). **311.** Tarsal organ of palp, dorsal view. **312.** Same, tarsus I. **313.** Same, tarsus III. **314.** Same, tarsus IV. **315.** Trichobothrium of metatarsus I, dorsal view. **316.** Same, tibia I. **317.** Leg I, dorsolateral view. **318.** Tibia I, subventral view, with arrow showing spinelike socket. Scale bars: 100 μm (317, 318), 10 μm (311–316).



FIGS. 319–326. *Molotra milloti*, new species, male claws (PBI_35300). **319.** Tarsal claws I, dorsal view. **320.** Same, dorsal view. **321.** Same, anterior view. **322.** Same, retrolateral view. **323.** Tarsal claws III, retrolateral view. **324.** Same, ventral view. **325.** Tarsal claws IV, anterior view. **326.** Same, subventral view. L = lateral (outer) teeth of tarsal claw, M = median (inner) teeth, PC = proclaw, RC = retroclaw. Scale bars: 10 μm.



FIGS. 327–333. *Molotra milloti*, new species, male palp (PBI_35300). **327.** Prolateral view. **328.** Retrolateral view. **329.** Prolateral view, methyl salicylate preparation. **330.** Apical view. **331.** Dorsal view. **332.** Ventral view. **333.** Same, different angle. Arrows point to proximal junction of the embolar lobes. DL = dorsal lobe. Scale bars: 200 μm.



FIGS. 334–341. *Molotra milloti*, new species, male palp. (PBI_35300). **334.** Palp, prolateral view. **335.** Same, retrolateral view. **336.** Same, dorsal view. **337.** Embolar region, dorsal view. **338.** Same, prolateral view. **339.** Same, dorsolateral view. **340.** Same, ventral view. **341.** Magnified view of embolar tip. DL = dorsal lobe, O = embolar opening, VL = ventral lobe. Scale bars: 100 μm (334–336), 50 μm (337, 338, 340), 20 μm (339), 10 μm (341).

NOTES: The generic placement of this species is tentative because of its striking somatic differences from other *Molotra*. The discovery and study of the female will be essential for resolving this problem.

The legs of this species are densely covered in bristles, a few of which are spinelike. The prolateral bristle on tibia IV is slightly thicker than the surrounding bristles, although it is also shorter than most (fig. 309). Also, the prolateral bristle on tibia I, although no thicker than the rest, has a larger and notched socket (fig. 318). This spinelike bristle is positioned in a paired ventral series, similar to that of spines in other *Molotra* (and many other oonopids), suggesting homology between both types of bristles and typical leg spines.

OTHER MATERIAL EXAMINED: None.

DISTRIBUTION: Known only from the type locality.

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