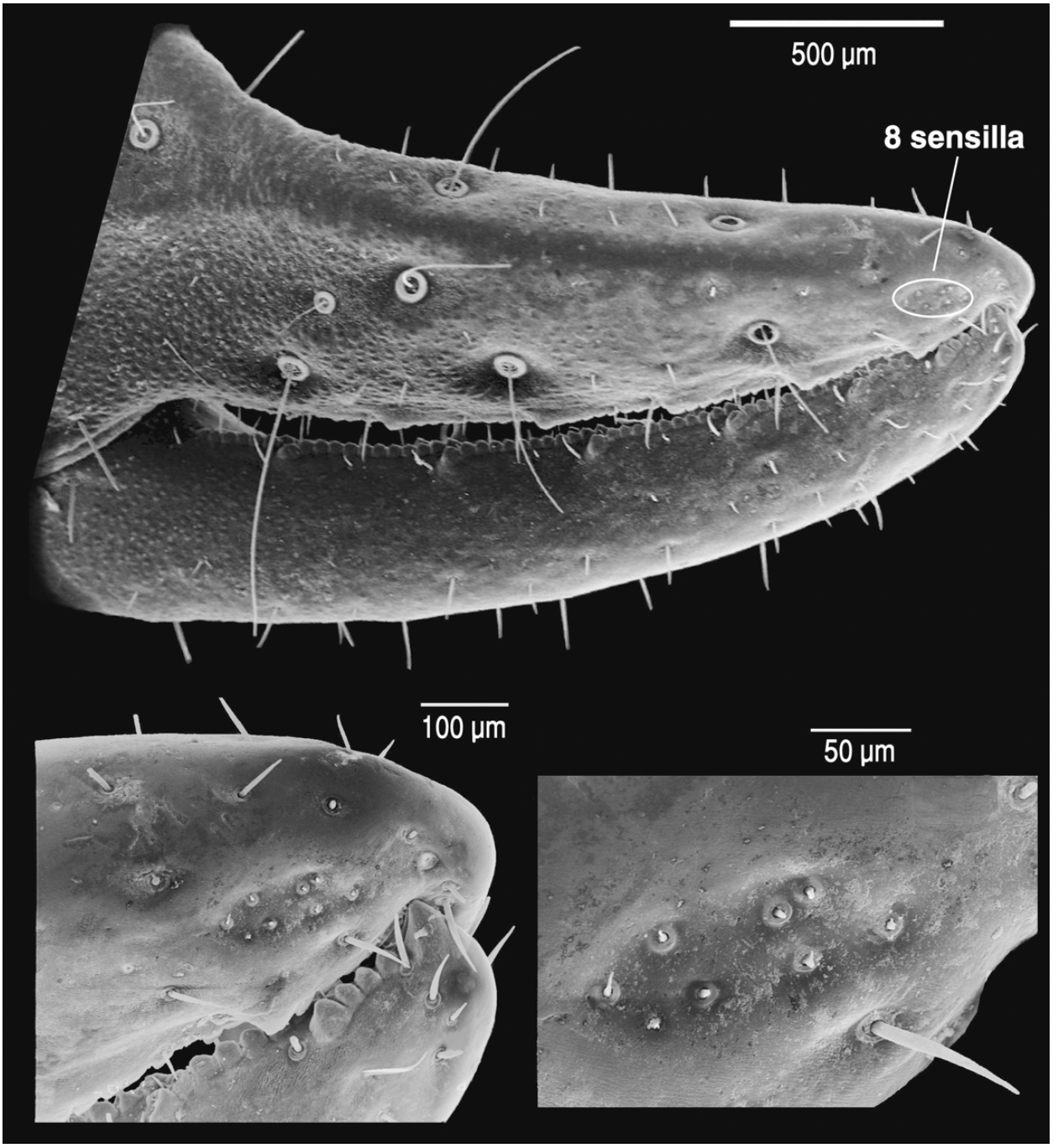

Figure 15: External view of pedipalp chela showing constellation array of *Calchas birulai*, **sp. nov.**, female, Nemrut Dağı, Turkey. Note that this species exhibits eight sensilla, considerably less than that found in *C. gruberi*, **sp. nov.**, which has 15 sensilla (see Fig. 14). Also visible are eight fixed finger trichobothria, *eb–et* and *db–dt*, showing the pattern representative of *C. birulai*.

that the presence/absence of the tibial spur did not warrant consideration as a "fundamental character" and therefore its distribution was not discussed. This subject is currently being revisited (Soleglad et al., in progress).

Calchas is also equipped with a pair of **pedal spurs** located on the ventral surface at the juncture of the basitarsus and tarsus (see Fig. 18). These spurs are typical of Recent scorpions; they are smooth, neither exhibiting spinelets as in *Hadrurus* and *Hoffmanni-hadrurus* (family Caraboctonidae), nor showing morphometric differences between the spurs as seen in some environmentally adapted scorpions such as psammophiles.

Fet et al. (2004) presented a detailed analysis of the iuroid leg tarsus. In this important study, it was shown that all six iuroid genera had some form of **spinule**

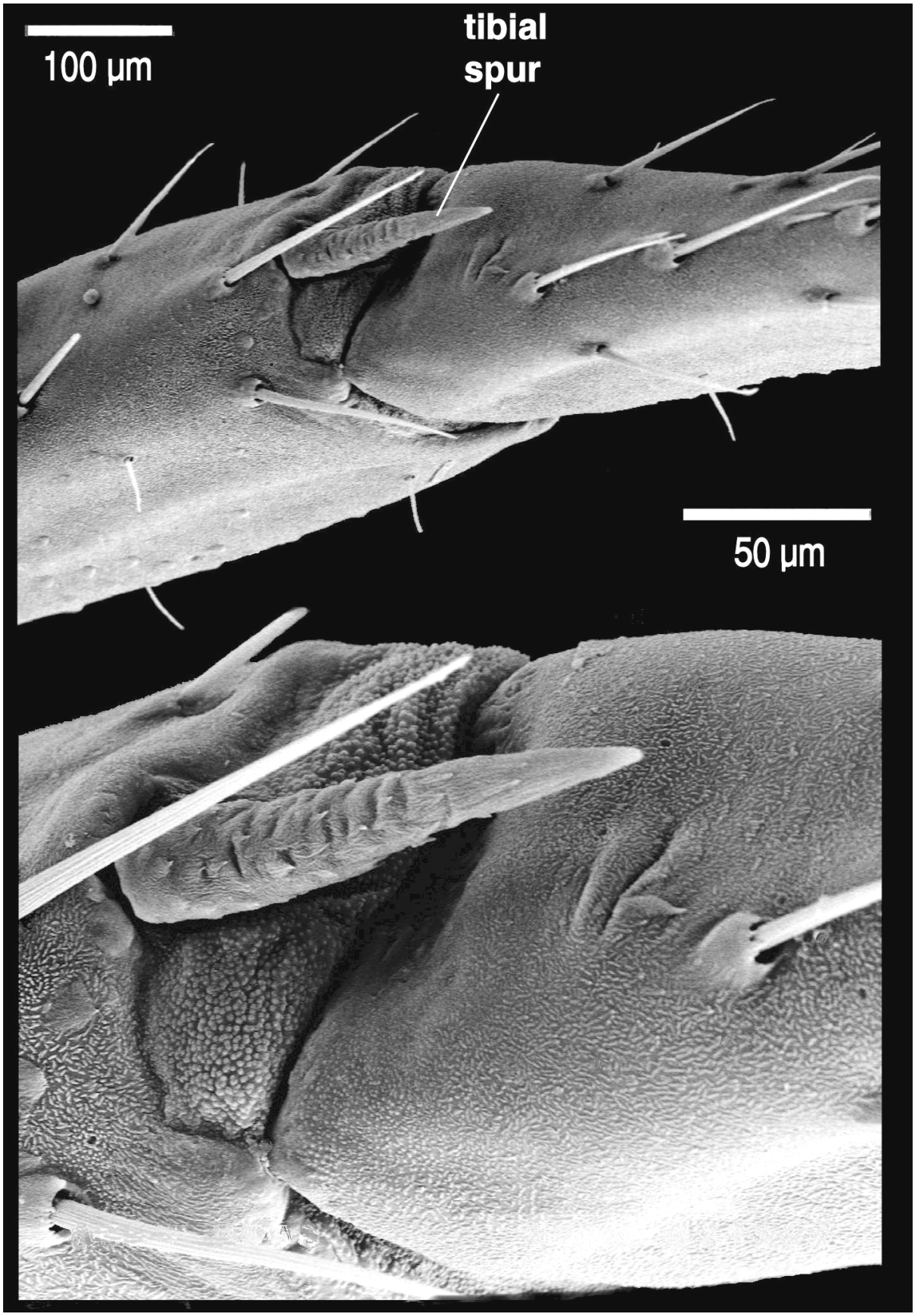

Figure 16: Leg III tibial spur. *Calchas birulai*, **sp. nov.**, female, Nemrut Dağı, Turkey.

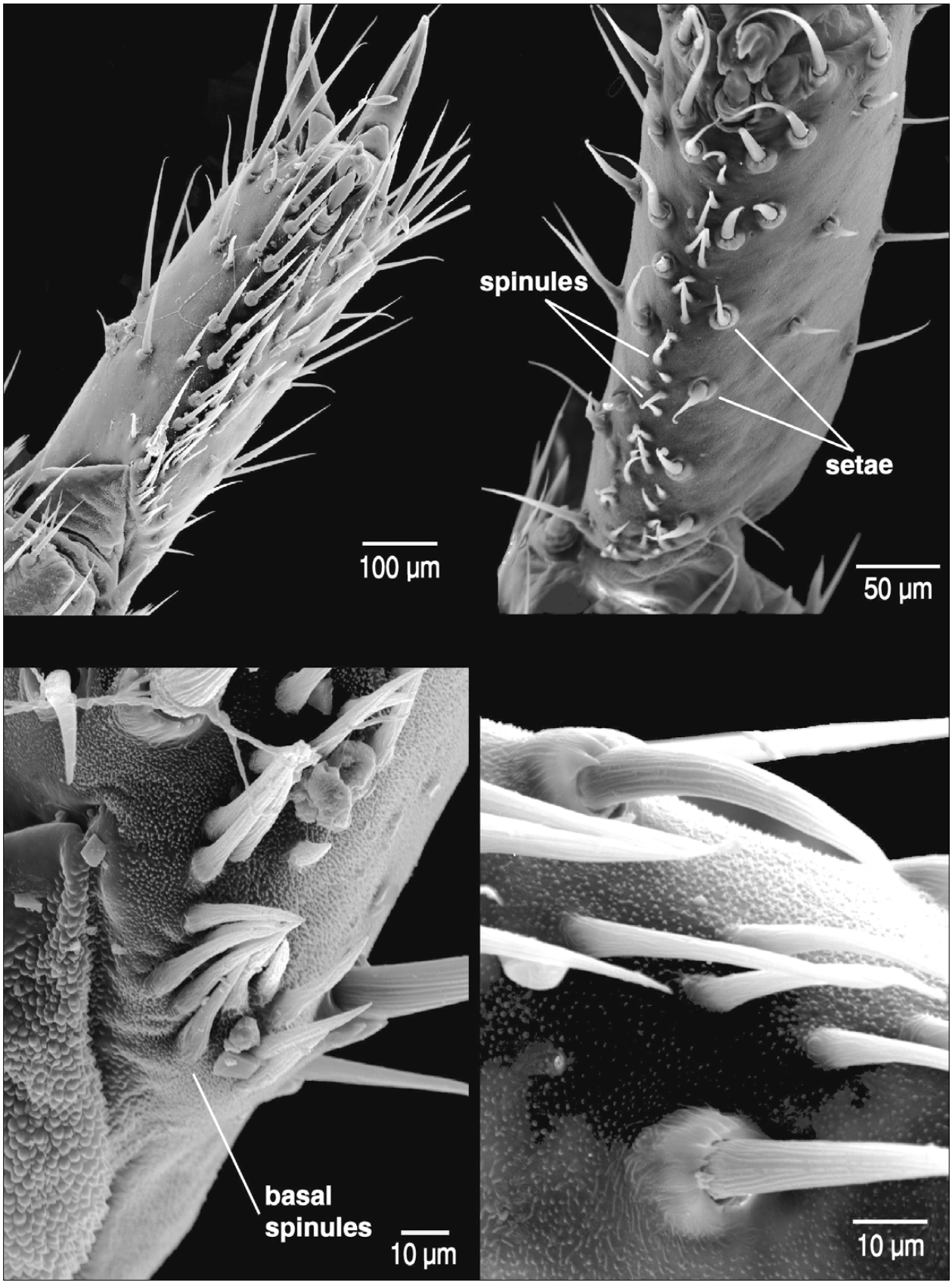

Figure 17: Leg tarsus spination in *Calchas gruberi*, **sp. nov.**, ventral surface, juvenile male, Antalya, Turkey.

clusters on the ventral surface of the **leg tarsus**. The variety and overall manifestation of this spination, however, is considerable across the six genera, which we summarize here:

(a) in *Calchas* (Fig. 17) the spinules, in juveniles, occur in irregularly configured clusters extending medially the entire length of the tarsus; in adults, the spinules are reduced in number, only occurring at the tarsus base;
(b) in *Iurus*, the individual spinules are exceptionally small and form actual clusters of dense spinules in a medial line along the tarsus, terminating in a pair of enlarged clusters;
(c) in *Caraboctonus* and *Hadruroides*, we see a similar clustered configuration as in *Iurus*;
(d) in *Hadrurus* and *Hoffmannihadrurus*, the spinule clusters are "fused" into a striated structure resembling a large spinule. Fet et al. (2004) hypothesized that these tarsal structures with their striations emanating from the base are the remnants of fused spinule clusters.

Soleglad & Fet (2003b: character 57, state=3) and Fet & Soleglad (2008: character 4, state=1) demonstrated that the ventral aspect of the tarsus with heavy spination is a synapomorphy for superfamily Iuroidea.

The leg tarsus of *Calchas* is covered ventrally with numerous **large socketed setae**, essentially obscuring the underlying spination discussed above (Fig. 18). It is interesting to point out that some of these setal sockets are armed with small pointed spines circling the setal base. A similar armed setal socket is illustrated for *Chaerilus* (Soleglad & Fet, 2003b: figs. 13–14).

In Figure 19 we illustrate a curious **"rosette"-like structure** in *Calchas* emanating from the extreme distal edge of the basitarsus, illustrated here for two specimens of *C. gruberi*. This structure is formed as a cluster of five to seven highly tapered acuminate denticle-like substructures with conspicuous striations occurring vertically along their shaft. Their length is shorter than that of a pedal spur. In Figure 19, a conspicuous slit sensilla is seen next to the "rosette", aligned vertically.

Birula (1917a) writes concerning the leg of *C. nordmanni*:

> "…on the third and fourth pairs of legs, in contrast to other Chactidae, well developed spurs are present; there are two spines on all legs near the base of the tarsus … ventrally bears four rows of bristles arranged in a series, two on each side …".

Vachon (1971: figs. 11–12) illustrates leg IV of a male *C. nordmanni*, showing the two pedal and tibial spurs as well as the dense setation of the ventral surface of the tarsus. Note that this figure does not show spinule clusters that most probably occurred on the tarsus base.

Metasoma and telson

The **metasomal** structure of *Calchas* is typical of many Iurida scorpions. Segments I–IV become narrower and longer beginning from the basal segment, segment IV usually the narrowest and longest of the four segments. Segment V is considerably longer than segment IV, 1.50 to 1.70 times longer. Segments I–IV exhibit dorsal, dorsolateral, lateral, ventrolateral, and ventromedian carinal pairs, the lateral being complete on segment I, and decreasing in size to obsolete on segments II–IV. These carinae are well developed and usually granulate, or crenulate to serrate. The dorsal and dorsolateral carinae terminate in a slightly enlarge dentical. The dorsolateral carinae of segment IV are not flared distally, but terminate at the condyle. Segment V has dorsolateral, lateral, ventrolateral, and ventromedian carinae, the latter singular. The lateral carinae are present on the anterior two-thirds of the segment. As with the other carinae, segment V carinae are granulate to serrate. The single ventromedian carina is straight, not exhibiting any form of bifurcation. The distal portion of the metasoma of species *C. birulai*, **sp. nov.** (Figs. 49, 50), and *C. gruberi*, **sp. nov.** (Figs. 66, 67), is illustrated below in the species level descriptions.

The **telson** in *Calchas* is unique within its species, exhibiting both conspicuous morphometric proportion differences as well as an unusual positioning of the subaculear setal pair (SSP) in some of its species. In Figure 20, showing *C. birulai*, **sp. nov.**, and *C. gruberi*, **sp. nov.**, we see that the vesicle in the former is considerably more elongated, with a shorter, abruptly curving aculeus. In *C. gruberi*, **sp. nov.**, the vesicle is more globular and the aculeus longer and less abruptly curved. In Figure 21, we see that in *C. gruberi* and *C. birulai* the SSP is not found at the same location. In *C. gruberi*, the SSP is located at the vesicle/aculeus juncture, as in most scorpions, in *C. birulai*, it is placed on the base of the aculeus. Below, when we discuss the species of *Calchas*, we will see that the SSP position in *C. nordmanni* is also on the aculeus base, as in *C. birulai*.

We consider the enlarged setal pair found on the aculeus base in *C. nordmanni* and *C. birulai* to be homologous to the pair found in *C. gruberi* for the following reasons:

- the SSP are enlarged setae, emanating from a raised area of the cuticle caused, in part, by the enlarged areolae (quite visible in Fig. 21)
- this raised area, depending on its size, can form a subaculear tubercle as found in some scorpions

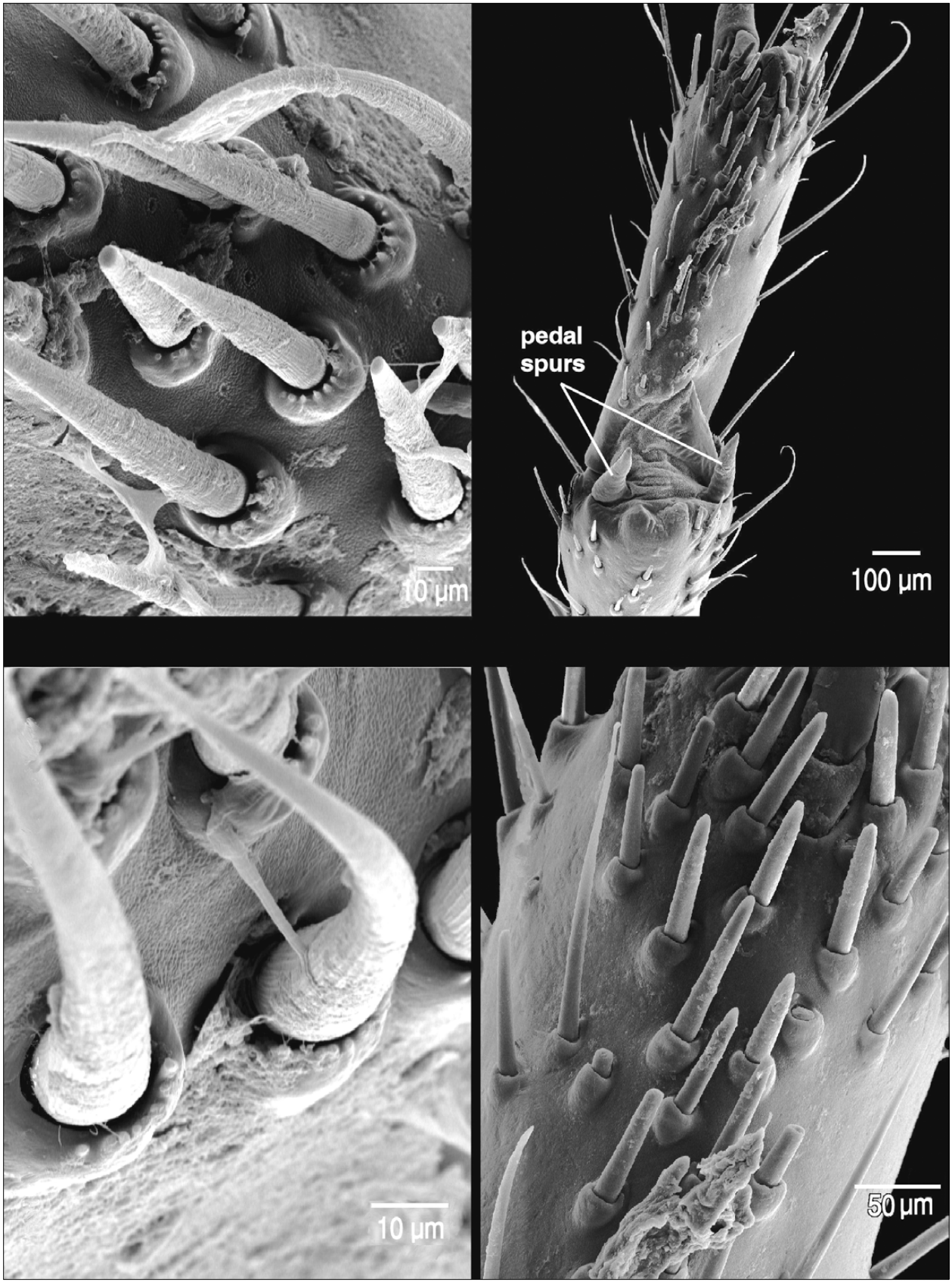

Figure 18: Leg tarsus setation in *Calchas gruberi*, **sp. nov.**, ventral surface. **Left.** Adult male, Antalya, Turkey. **Right.** Adult female, Antalya, Turkey, pedal spurs indicated.

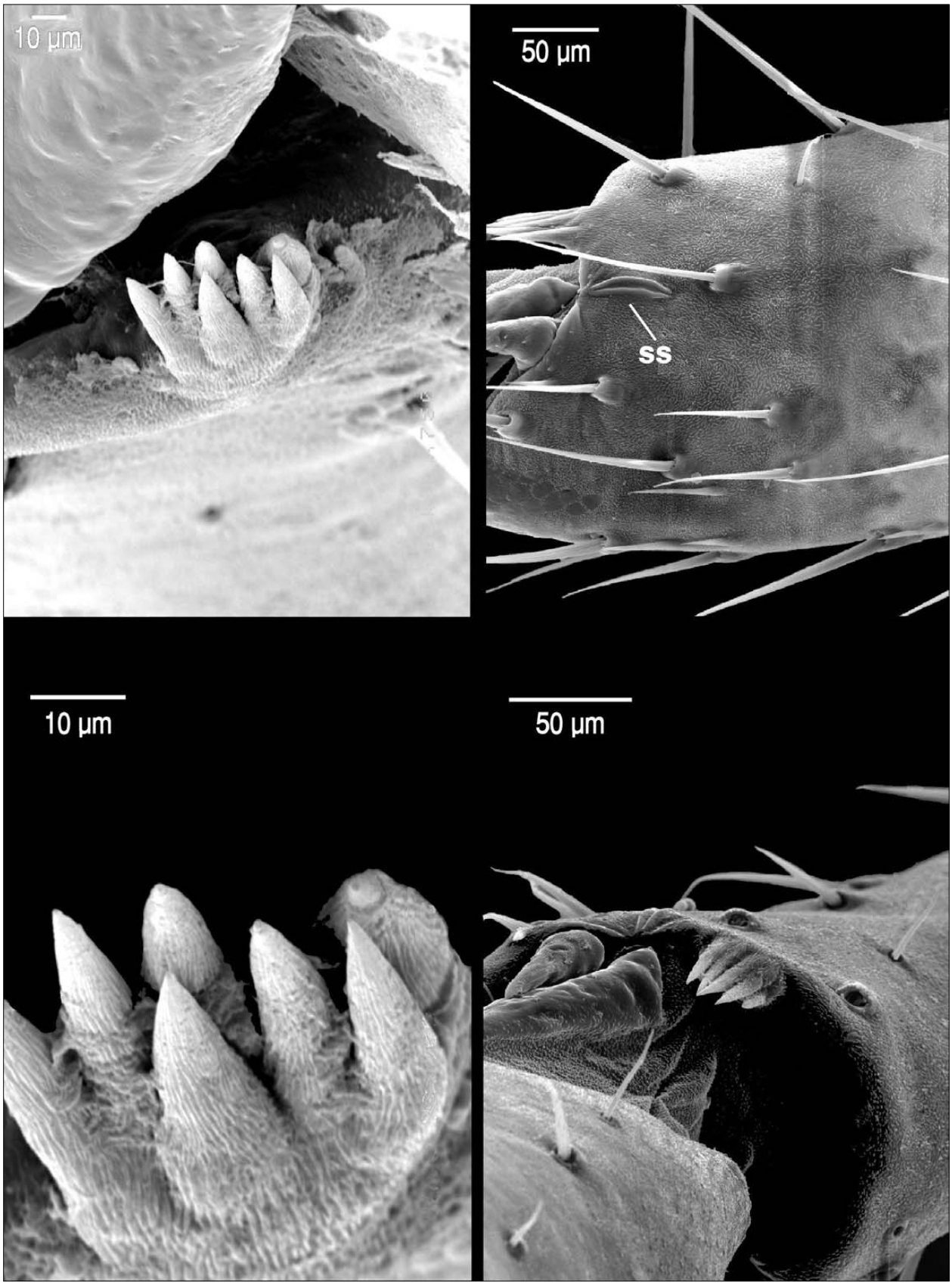

Figure 19: Distal aspect of leg basitarsus in *Calchas gruberi,* **sp. nov.**, Antalya, Turkey. **Left.** Adult male, showing "rosette" structure with seven denticles. **Right-Bottom.** Juvenile male, "rosette" with five denticles. **Right-Top.** Slit sensilla (indicated by *ss*) and "rosette".

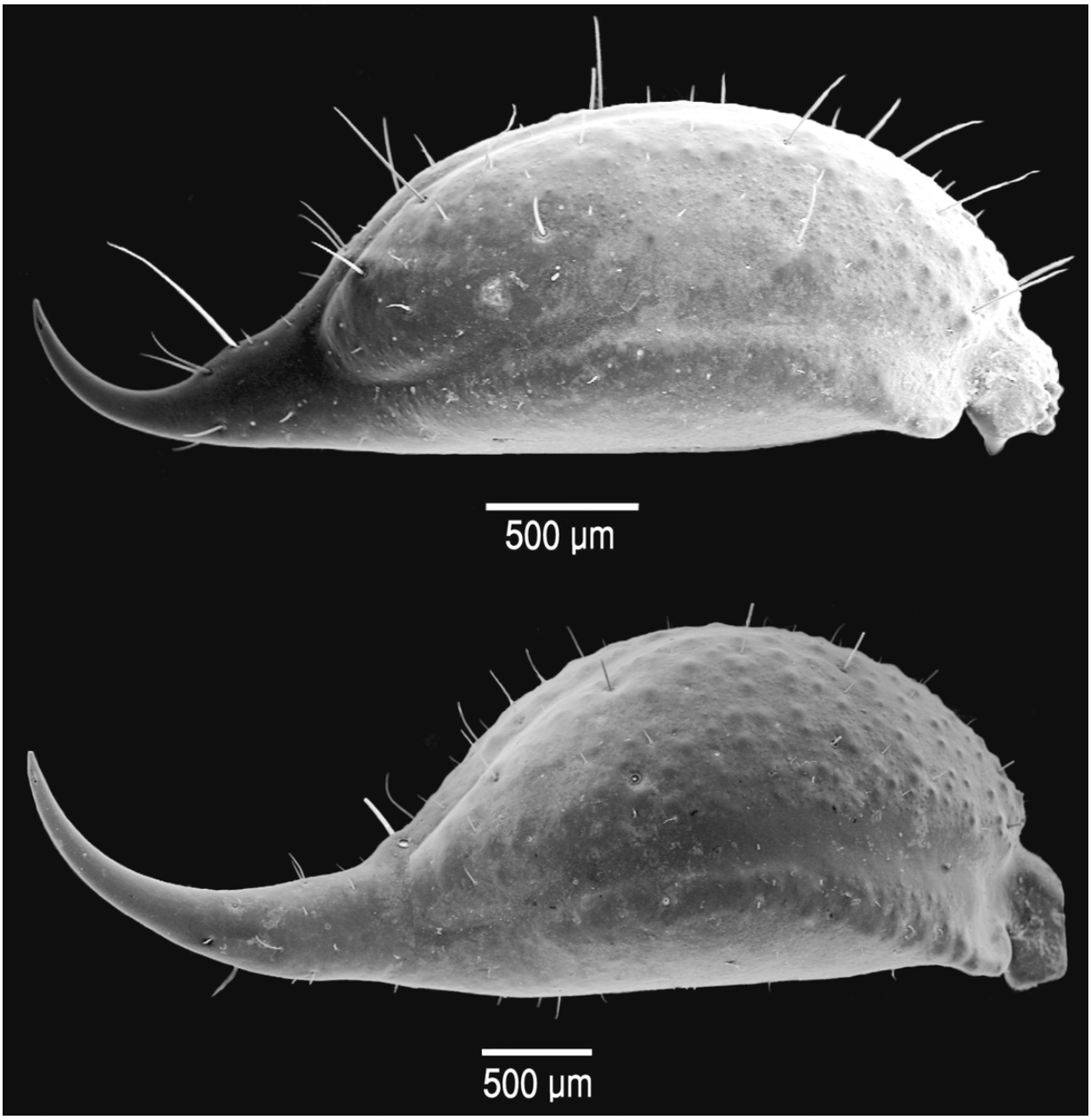

Figure 20: Telson, lateral view, of *Calchas* species. **Top.** *C. birulai*, **sp. nov.**, female, Nemrut Dağı, Turkey. **Bottom.** *C. gruberi*, **sp. nov.**, female, Antalya, Turkey.

- the enlarged setae and raised area are not found on the vesicle/aculeus juncture in *C. nordmanni* and *C. birulai* further implying that the SSP has moved forward onto the aculeus
- the ventral distal setal pair (VDSP) is more distal on the aculeus essentially adjacent to the dorsal distal setal pair (DDSP) in *C. nordmanni* and *C. birulai*; in *C. gruberi*, the VDSP is proximal to DDSP, common to many scorpions, concluding that the VDSP has moved distally as well, probably caused by the forward movement of the SSP (see Fet et al., 2006b, on their discussion of the LAS (Laterobasal Aculear Serrations) in the family Vaejovidae where DDSP and VDSP are further discussed)

The unique telson of *C. nordmanni* was also discussed in great detail by Birula (1917a: fig. 13):

> "… dorsally the telson … has two smooth, shallow, longitudinal grooves which distinctly separate the base of the sting from the surface of the telson, laterally on the end; only at the base of the vesicle … the sting,