

# Rediscovery and redescription of *Teneriffia quadripapillata* Sig Thor (Acari: Trombidiformes: Teneriffiidae)

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## Original research

### ABSTRACT

*Teneriffia quadripapillata* Sig Thor, the type species of *Teneriffia* Sig Thor (1911), is redescribed from new material collected on Tenerife, the island which is the type locality in the Canary Islands. Sig Thor's original material was apparently destroyed.

**Keywords** littoral mites; predatory mites; teneriffiids; redescription

## Introduction

Sig Thor (1911) described *Teneriffia quadripapillata* as the type species of his new genus, *Teneriffia*, from Tenerife, Canary Islands, Spain. Sig Thor was a controversial, stubborn person and received both praise and criticism. The Swedish arachnologist, Dr. Lundblad suggested that microscope slides of his type material must be deposited in a public museum. Unfortunately, this wish did not come true as Sig Thor apparently suffered from depression and had determined in his will that all his preparations were to be destroyed after his death. However, his widow donated some of his material, preserved in alcohol, to the zoological museum where he was a curator (Natvig 1944). Since then, no mention was made if this alcohol material contains *T. quadripapillata*. According to article 75.2 of the International Commission on Zoological Nomenclature, designation of a neotype is invalid when there is no doubt about the species' identity; in this case the "clasp" organ is a unique character of the species.

Strandtmann (1965) came across unpublished figures with more detail of *T. quadripapillata* drawn by Oudemans based on the type specimens and he published it. A redescription is necessary to add more detailed information and to confirm the presence of the "clasp" organ.

The genus *Teneriffia* currently consists of five known species: *T. quadripapillata*, *T. mexicana* McDaniel, *T. sebahatae* Ueckermann & Durucan, *T. aethiopica* Zmudzinski *et al.* and *T. hajiqaanbari* Paktinat-Saeij & Kazemi (Sig Thor 1911; McDaniel *et al.* 1976; Ueckermann and Durucan 2020; Zmudzinski *et al.* 2021 and Paktinat-Saeij and Kazemi 2022).

*Teneriffia quadripapillata* was collected for the first time on the beach in La Orotava, Tenerife, in August 1909 (Sig Thor, 1911). For more than 100 years this species remained undetected. Recently, new samplings carried out on Tenerife have revealed the presence of this species and led to its redescription.

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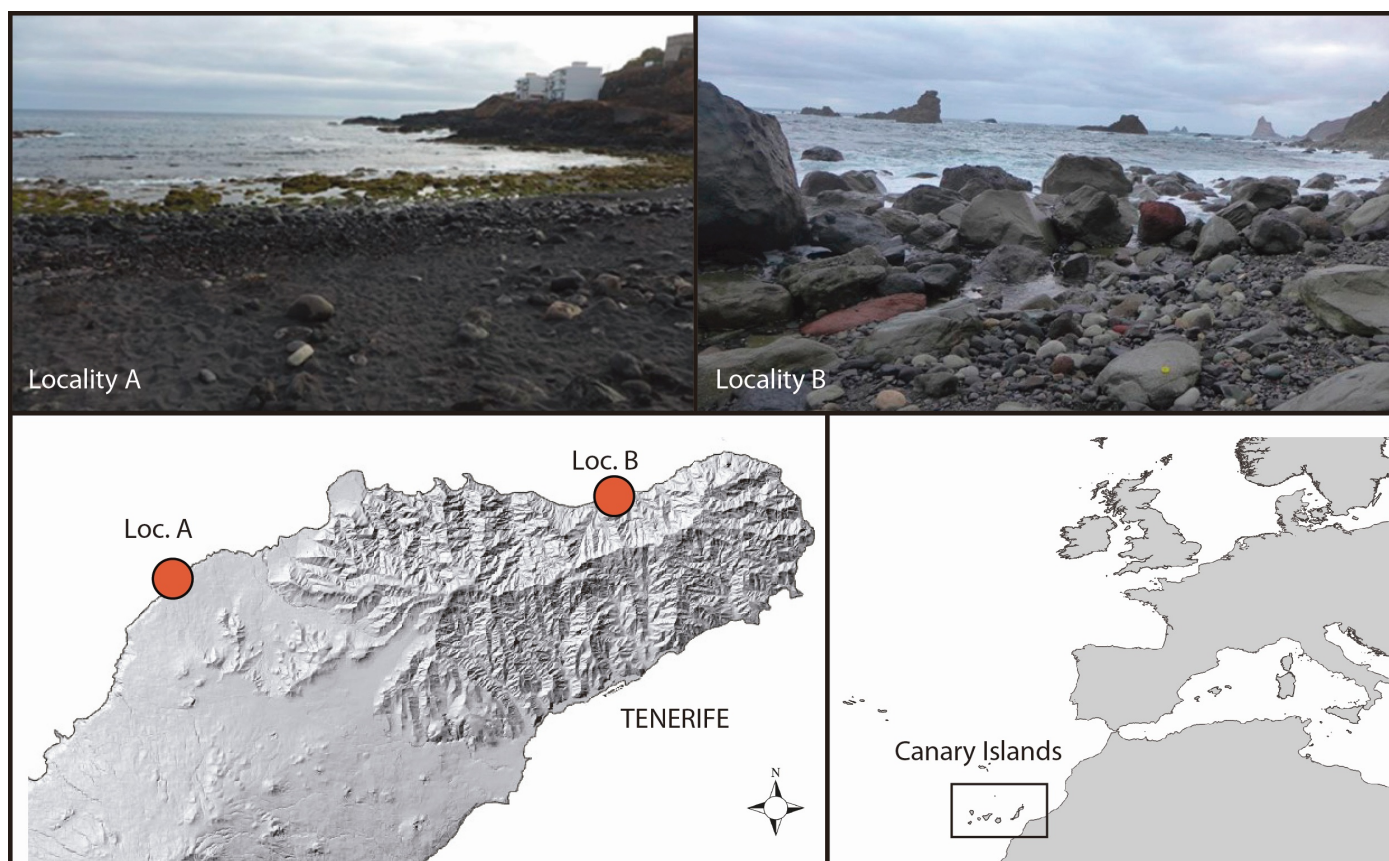
**Figure 1** Photo of *Teneriffia quadripapillata* Sig Thor.

## Material and methods

### Sampling and location

This study was carried out on Tenerife, the largest of the Canary Islands, Spain. It is situated near the centre of this volcanic archipelago comprising seven major islands, off the south-west Atlantic coast of Morocco. Specifically, the sampling area is situated in the northeast of the island.

The mites (Figure 1) were collected under rocks, in the supralittoral zone, about a meter above the limit of the last high tide. They were captured one by one with a fine brush moistened in sea water, then put in a small container with sea water. Under a stereomicroscope (Leica ES2), specimens were manually extracted and transferred to 100% ethanol for storage.



**Figure 2** Map of localities.

## Localities

- Locality A: La Barranquera, La Laguna, Tenerife. Beach with rocks and sand (Figure 2); coordinates 28.537908°N, 16.396246°W; sampling dates 21/07/20, 29/07/20, 01/08/20 and 10/08/20; collected by Juan Carlos de la Paz.
- Locality B: Roque de las Bodegas, Taganana, Santa Cruz de Tenerife. Beach with large rocks, boulders, pebbles and sand (Figure 2); coordinates 28.571219°N, 16.203836°W; sampling dates 24/07/20 and 25/07/20; collected by Juan Carlos de la Paz.
- Locality not used in the redescription: Las Eras, Fasnia, Tenerife, Canary Islands, Spain. Beach with pebbles and sand; coordinates 28.19373443°N, 16.42278712°W; sampling dates 03/10/20; collected by Juan Carlos de la Paz.

## Preparation of specimens

Mites were cleared in 90% lactic acid and mounted on microscope slides in PVA. They were then dried in an oven at 45-50 degrees Celsius for 24 hours. Line drawings were made from photographs of the specimens taken with a Zeiss Axioskop TM Research microscope equipped with a Zen Soft Imaging System with measuring tools and an Axiocam 208 color camera. The line drawings were prepared with a Wacom One 13" Pen display and edited using Adobe Illustrator CS5. Measurements are given in micrometres (µm).

The material will be deposited in the Zoological Collection of the Department of Animal Biology, Edaphology and Geology at the University of La Laguna (DZUL) (collection numbers

34644–34659) and the Arachnology Collection of ARC-Plant Health and Protection (ARC-PPRI) (Accession numbers, Acy: 22/381 to Acy: 22/386).

## Taxonomy

### Family Teneriffiidae Sig Thor, 1911

#### Genus *Teneriffia* Sig Thor, 1911

Type species: *Teneriffia quadripapillata*, Sig Thor, 1911: 173.

#### *Teneriffia quadripapillata* Sig Thor

(Figures 2–8B)

#### Diagnosis

**Differential diagnosis** — The character that differentiates this species from the rest of the genus is the presence of “clasps” on the venter of the gnathosoma (Figures 5D and 6). See discussion under Remarks.

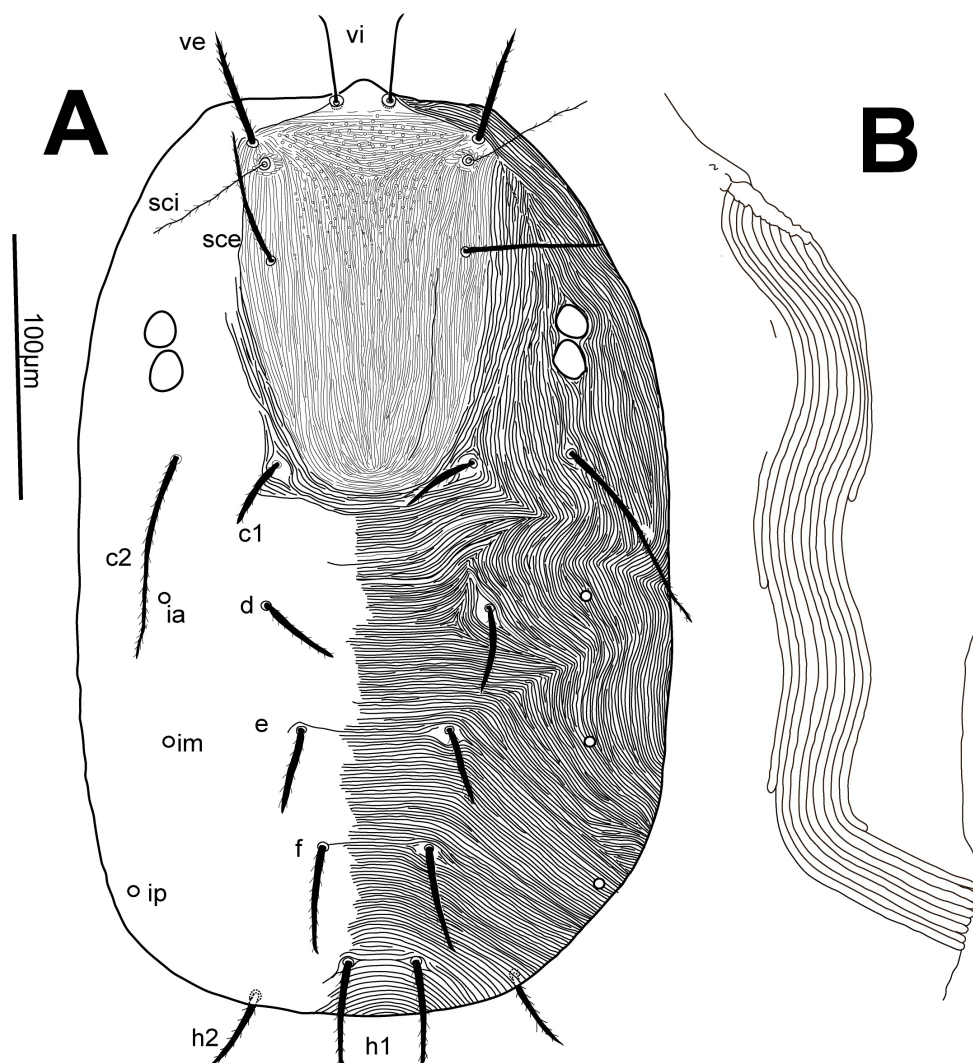
#### Description

**Female** — (n=6). Idiosoma ovate, 648–782 long (from tip of naso to posterior margin of opisthosoma) and 412–476 wide at level of setae *c* (Figure 3A).

**Dorsal idiosoma** – Peritremes situated anterolaterally on propodosoma consisting of 9 long and 7 shorter branches (Figure 3B). Naso small, situated between setae *vi* (Figure 3A), the latter arising from cuplike bothridia. Prodorsal shield 323–348 long and 171–190 wide, demarcated by fine transverse striae behind setae *vi* and between setae *ve*, longitudinal on rest of shield, bearing setae *vi*, *ve*, *sci* and *sce*, setae *vi* smooth, *ve* and *sce* serrate and *sci* coarsely serrate, the latter also inserted into bothridia surrounded by 10–13 vesicles forming a “rosette”. Flanking the prodorsum, are two pairs of equal eyes. Opisthosoma transversely striated medially and diagonal laterally, all setae serrate, each situated on small sclerite; setae *c2* the longest setae on idiosoma. Lengths of setae: *vi* 79–97, *ve* 86–99, *sci* 93–110, *sce* 108–119, *c1* 59–67, *c2* 150–174, *d* 68–78, *e* 73–78, *f* 87–108, *h1* 92–108, *h2* 55–63. Distances between setae: *vi*–*vi* 33–42, *ve*–*ve* 147–176, *sci*–*sci* 134–158, *sce*–*sce* 127–149, *c1*–*c1* 128–158, *c2*–*c2* 254–307, *d*–*d* 160–174, *e*–*e* 112–141, *f*–*f* 81–105, *h1*–*h1* 44–49, *h2*–*h2* 130–169. Four pairs of ordinary circular cupules present with *ia* lateral to setae *d*, *im* lateral to setae *e* and *ip* lateral to setae *f*, and *ih* ventrally, lateral to setae *ps4*.

**Ventral idiosoma** – Venter striate with coxal fields I–IV finely striated (Figure 4A). Anal opening situated caudally, each anal valve with four pairs of pseudanal setae: *ps1* 43–56, *ps2* 37, *v2*–*h1* 54, *ps3* 36–54 and *ps4* 37–43. Coxal formula: 6 to 7–6 to 7–6–5. All coxal setae slightly barbed; *1f*, *2g*, *3a*, and *4f* longest setae. Lengths of coxal setae: *1a* 57–68, *1b* 27–34, *1c* 28–41, *1d* 28–43, *1e* 32–45, *1f* 90–100, *1g* 57–68; *2a* 27–33, *2b* 25–31, *2c* 24–28, *2d* 27–33, *2e* 26–31, *2f* 33–46, *2g* 54–62; *3a* 63–78, *3b* 27–30, *3c* 25–30, *3d* 23–28, *3e* 44–55, *3f* 27–34; *4a* 24–27, *4b* 19–26, *4c* 21–27, *4d* 22–26, *4e* 24–28, *4f* 77–82, *4g* 26–30. Genital valves with 6 pairs of genital setae (*gl*–6), varying between 13–22. Genital opening with 5 pairs of eugenital setae and 3 papillae (Figure 4B). Genital opening surrounded by 20–25 pairs of setae, aggenital setae included, aggenital setae (*agl*–6) varying between 24–38, showing asymmetry with 6 setae on one side and 7 on the other in some specimens. All these setae slightly barbed.

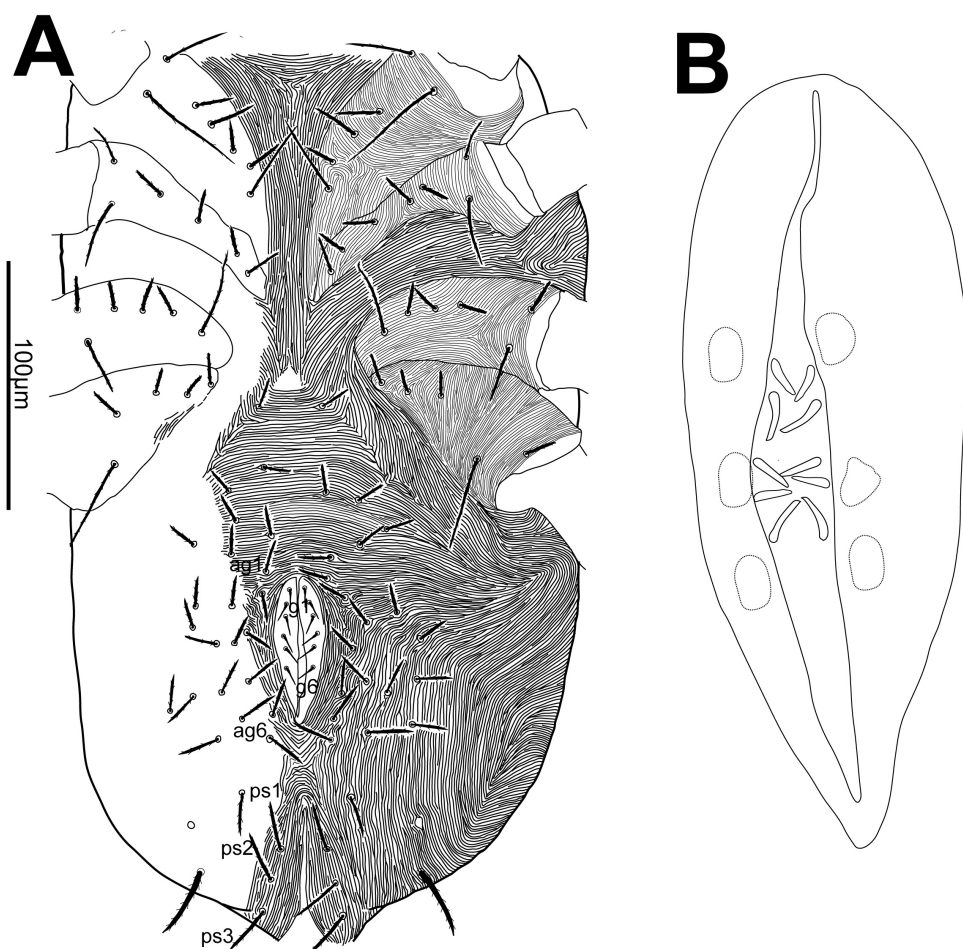
**Gnathosoma** – Palp 5-segmented; tarsus reduced, bearing 3 long serrate and 4 shorter smooth setae (1 stout), 1 minute solenidion and 1 microseta (Figure 5B). Tibia with 1 long, strong spur, *o1* 56–64, 2 subterminal spurs (*o* 2–3), 17–21 and 17–20 long and one serrate seta. Genu and femur each with one long, serrate seta, 80–93 and 105–119 long, respectively, oncophyis absent. Palp supracoxal, seta 7 long. Chelicerae 186–219 long with movable digit



**Figure 3** *Teneriffia quadripapillata* Sig Thor. A Dorsal view; B Peritreme (enlarged).

26–33 long and setae *cha* and *chb* 39–48 and 44–50 long, respectively (Figure 5A). Gnathosoma ventrally with subcapitular setae *m* 59–70 long and 3 pairs of adoral setae, *or1* 18–24, *or2* 10–17 and *or3* 34–41. The unique “clasp” organ of this species on the venter of the gnathosoma is only outlined in Figure 5C but clearly visible in Figures 5D and 6. It is an internal organ that is clearly visible before the treatment with lactic acid (Also see video in supplementary material).

**Legs** – Leg IV clearly longer than body. Each side of claws on tarsi I–II with 18 pectinations, empodium absent (Figure 7A), tarsal claws III–IV smooth with a tiny peg-like empodium between them (Figure 7B). Lengths of leg segments: Ta I 172–193, Ti I 139–160, Ge I 98–125, TF I 86–113, BF I, 89–103, Tr I 72–100, Cx I 174–220; Ta II 159–180, Ti II 118–131, Ge II 74–102, TF II 72–91, BF II 65–91, Tr II 75–88, Cx II 170–198; Ta III 208–223, Ti III 117–145, Ge III 96–107, TF III 86–98, BF III 71–88, Tr III 72–103, Cx III 155–189; Ta IV 250–302, constricted before trichobothrium, Ti IV 164–183, Ge IV 120–134, TF IV 111–125, BF IV 75–91, Tr IV 109–123, Cx IV 163–186. Trichobothrium III 102–118 and trichobothrium 121–130 long. Setal formulae of leg segments: Tarsi 27 (3 ω)-27 (3 ω)- 22+ 1 trich. –22 (1 ω)



**Figure 4** *Teneriffia quadripapillata* Sig Thor. A Ventral view; B Genitalia (enlarged).

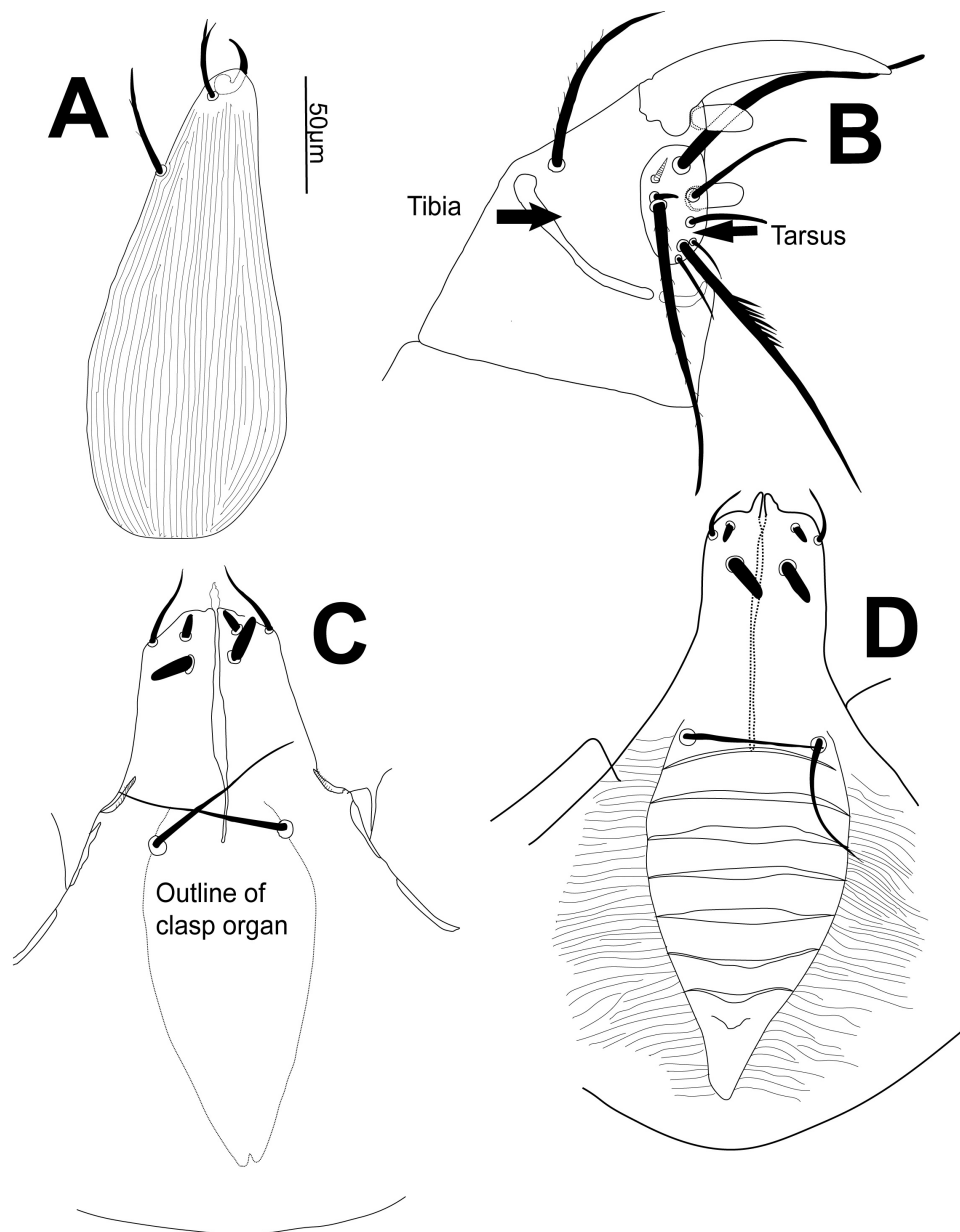
+ 1 trich (Figure 7C); tibiae 14 (1 $\phi$ ) (1 $\kappa$ )-12(1 $\phi$ )-12(1 $\phi$ )-11(1 $\phi$ ); genua 10(1 $\sigma$ )-8(1 $\sigma$ )-7(1 $\sigma$ )-6; telofemora 5-5-4-4; basifemora 5-6-4-4; trochanters 1-2-2-2; coxae 6 or 7-8-6-6.

**Male** — (n=5). Idiosoma elongate-oval, body length 640–705, width at level of setae *c2*, 340–422.

*Dorsal idiosoma* – Prodorsal shield oval, 308–316 long and 175–178 wide. Similar to that of female. Lengths of setae: *vi* 89–102, *ve* 81–105, *sci* 100–127, *sce* 104–113, *c1* 56–63, *c2* 154–164, *d* 56–77, *e* 67–78, *f* 87–103, *h1* 90–100 and *h2* 55–64. Distances between setae: *vi*–*vi* 30–38, *ve*–*ve* 147–166, *sci*–*sci* 136–149, *sce*–*sce* 128–141, *c1*–*c1* 140–145, *c2*–*c2* 246–269, *d*–*d* 153–170, *e*–*e* 118–130, *f*–*f* 79–93, *h1*–*h1* 37–42, *h2*–*h2* 133–145.

Four pairs of ordinary circular cupules present, with *ia* lateral to setae *d*, *im* lateral to setae *e* and *ip* lateral to setae *f*, and *ih* ventrally, lateral to setae *ps4*.

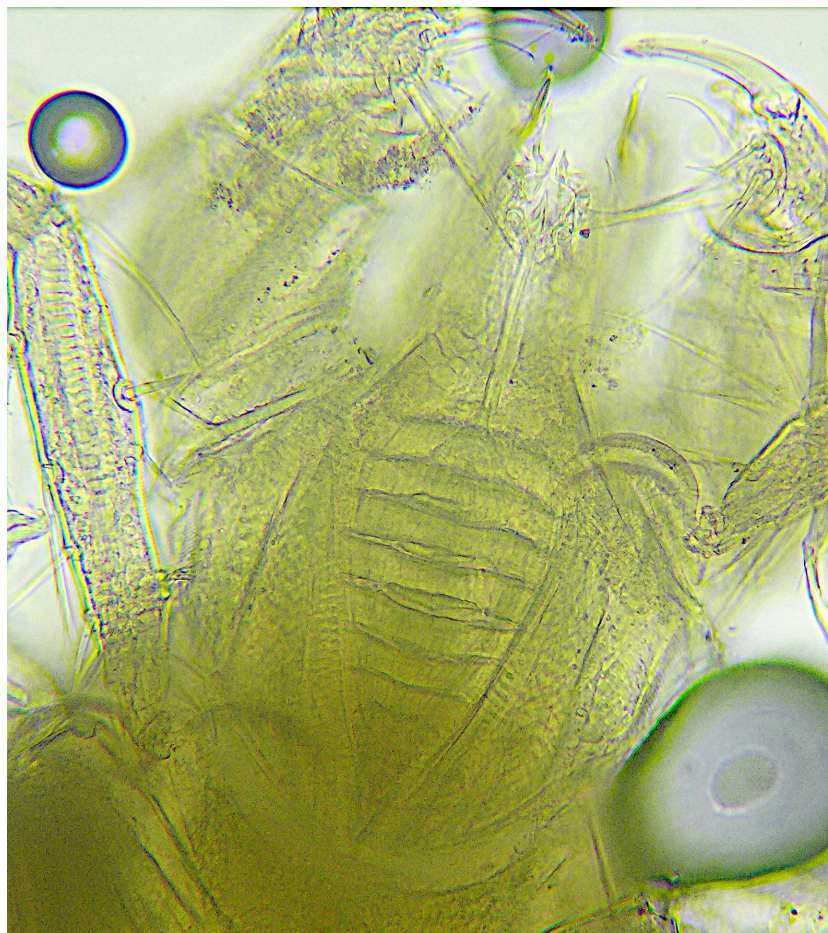
*Ventral idiosoma* – Striate. With 19–28 pairs of serrate setae, including aggenitals. Coxisternal shields I–II separated from III–IV by a striate band. Anogenital area with 6 pairs of aggenital setae but more setae closely associated with aggenital setae, 6 pairs of genital setae and internal male genitalia with 2 pairs of eugenital setae easily detected (Figure 8A). Genital setae smooth and aggenital setae serrate. Lengths of coxal setae: *1a* 51–60, *1b* 25–34, *1c* 25–31, *1d* 31–46, *1e* 36–47, *1f* 88–104, *1g* 59–70, *2a* 25–31, *2b* 23–27, *2c* 25–31, *2d* 25–35, *2e* 22–31, *2f* 55–66, *2g* 33–44, *3a* 64–68, *3b* 23–31, *3c* 25–29, *3d* 22–29, *3e* 45–62, *3f*



**Figure 5** *Teneriffia quadripapillata* Sig Thor. A Chelicera; B Palptarsus; C Venter of gnathosoma; D Clasps.

28–31, 4a22–28, 4b 19–24, 4c 21, 4d 21, 4e 22–25, 4f 71–87, 4g 22–30, g1 17–20, g2 16–21, g3 16–22, g4 17–22, g5 16–22, g6 17–20, ag1 26–29, ag2 24–28, ag3 24–29, ag4 28–30, ag5 30–34, ag6 26–35, ag7 26–35, ps1 34–40, ps2 39–45, ps3 37–48, ps4 35–56, supracoxal seta 5–8.

*Gnathosoma* – Palp 5-segmented; tarsus reduced with 3 serrate and 4 smooth setae, 1 microseta and 1 minute solenidion. Tibia with 1 long, strong spur, o1 60–65, 2 subterminal spurs (o2–3), 18–21 long and 16–19, respectively, and 1 serrate seta. Genu and femur each with 1 long serrate seta, 84–94 and 109–122 long, respectively. Palp supracoxal seta 5 long. Oncophysis absent. Chelicerae 188–200 long with movable digit 21–28 long and setae cha and chb 40–55 and 42–51 long, respectively. Ventrally, gnathosoma with subcapitular setae m 56–67 long and 3 pairs of adoral setae, or 1 18–23, or2 12–17 and or 3 35–44. Outlines of



**Figure 6** *Teneriffia quadripapillata* Sig Thor. Photo of "clasps".

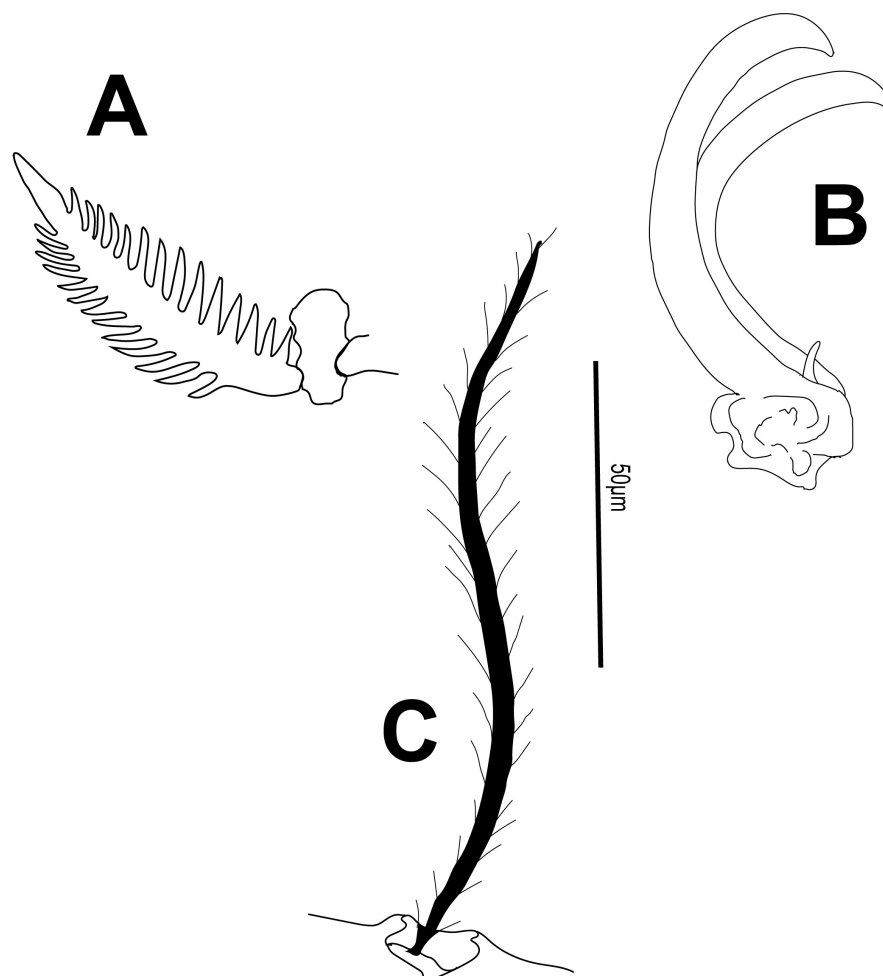
clasp organ vaguely visible in male. Palp coxa with one supracoxal seta, 4 long.

**Legs** – Leg IV clearly longer than body. Each side of claws on tarsi I–II with 17–18 pectinations, empodium absent, tarsal claws III–IV smooth with a tiny peg-like empodium between them. Lengths of leg segments: Ta I 162–182, Ti I 142–149, Ge I 95–100, TF I 67–99, BF I 84–100, Tr I 60–77, Cx I 165–216; Leg I 775–923: Ta II 157–178, Ti II 117–126, Ge II 82–89, TF II 56–88, BF II 77–87, Tr II 66–79, Cx II 172–185; Leg II 727–832: Ta III 215–226, Ti III 135–150, Ge III 90–103, TF III 74–93, BF III 68–76, Tr III 76–102, Cx III 159–177; Leg III 817–927: Ta IV 256–266, Ti IV 160–179, Ge IV 109–134, TF IV 91–119, BF IV 73–95, Tr IV 91–122, Cx IV 156–167; Leg IV 936–1082, IP 3255–3764. Setal formulae of leg segments: Tarsi 27 (3 ω)-27 (3 ω)-22+ 1 trich-22 (1 ω) + 1 trich; tibiae 14 (1 φ) (1 κ)-12 (1 φ)-12 (1 φ)-11 (1 φ), genua 10 (1 σ)-8 (1 σ)-7 (1 σ)-6; telofemora 5-5-4-4; basifemora 5- 6-4-4; trochanters 1-2-2-2; coxae 6 or 5-8-6-6 or 5. Trichobothrium III 107–125 and trichobothrium IV 126–136.

**Nymph** — (n=3). Idiosoma elongate-oval, body length 535–601, width at level of setae c2, 293–425.

**Dorsal idiosoma** – Prodorsal shield oval, 249–258 long and 148–154 wide. Similar to that of female. Lengths of setae: vi 73–78, ve 79–84, sci 84–109, sce 98–109, c1 48–50, c2 135–146, d 60–63, e 68–75, f 85–89, h1 88–91 and h2 51. Distances between setae: vi–vi 27–32, ve–ve 131–138, sci–sci 118–124, sce–sce 104–117, c1–c1 119–130, c2–c2 212–272, d–d 138–150, e–e 104–122, f–f 65–74, h1–h1 35–36, h2–h2 127–143.

Four pairs of ordinary circular cupules present with ia lateral to setae d, im lateral to setae



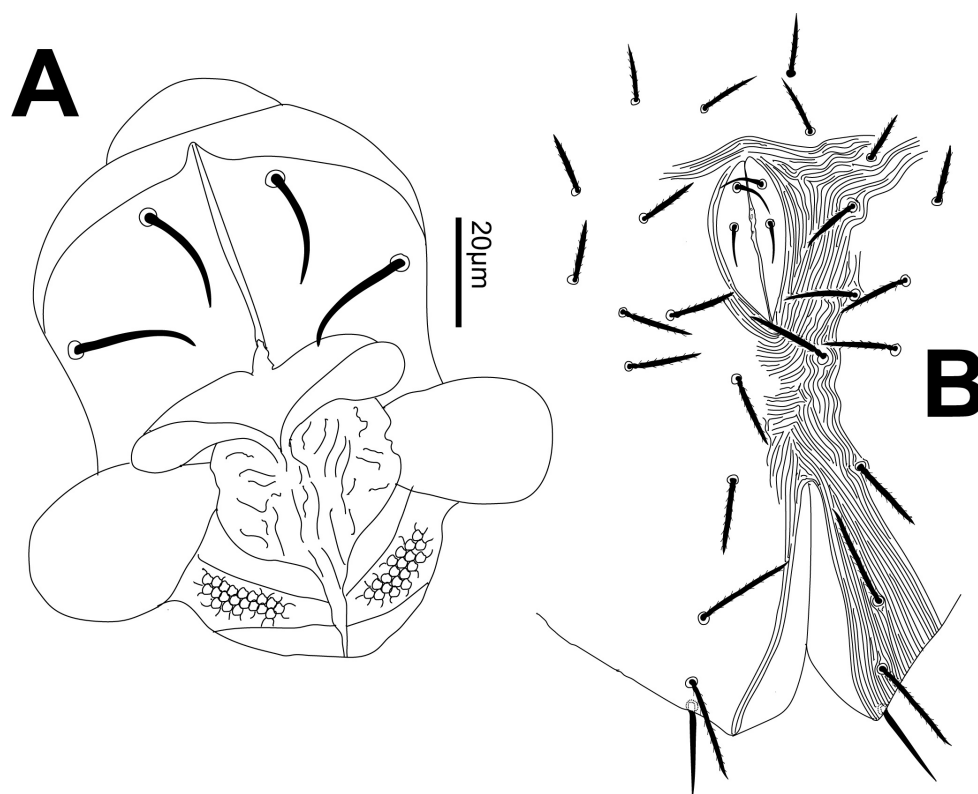
**Figure 7** *Teneriffia quadripapillata* Sig Thor. A Tarsal claw leg I; B Tarsal claw legs III-IV; C Trichobothrium, legs III-IV.

*e* and *ip* lateral to setae *f*, and *ih* ventrally, lateral to setae *ps4*.

**Ventral idiosoma** – Striate. With 11–12 pairs of serrate setae, aggenitals included. Coxisternal shields I–II separated from III–IV by a striate band. Anogenital area with 2 (or 2 on one side and 3 on the other side) pairs of aggenital setae, 2 pairs of genital setae (Figure 8B). Genital setae smooth and aggenital setae serrate. Lengths of setae: *1a* 46–51, *1b* 24, *1c* 23, *1d* 31–33, *1e* 28–31, *1f* 67–70, *1g* 47–55, *2a* 22–25, *2b* 20–21, *2c* absent, *2d* 22–26, *2e* 21–25, *2f* 42–46, *2g* 27–31, *3a* 53–57, *3b* 21–22, *3c* 20–22, *3d* 21, *3e* 32–38, *3f* 21–28, *4a* 17–20, *4b* 17, *4c* 18–19, *4d* absent, *4e* absent, *4f* 43–56, *4g* 21–23, *g1* 16–17, *g2* 15–17, *ag1* 19–23, *ag2* 20–26, *ag3* 23–30, *ag4* 26–31, *ps1* 34–40, *ps2* 32–34, *ps3* 31, *ps4* 33–34, supracoxal seta 6–7.

**Gnathosoma** – Palp 5-segmented; tarsus reduced with 3 serrate and 4 smooth setae, 1 minute solenidion, 1 microseta. Tibia with 1 long, strong spur, *o1* 50–54, 2 subterminal spurs (*o2–3*), 14–16 long and 15–16, respectively, and 1 serrate seta. Genu and femur each with 1 long serrate seta, 50–65 and 97–103 long, respectively. Palp supracoxal seta 5 long. Oncophysis absent. Chelicerae 148–156 long with movable digit 20–22 long and setae *cha* and *chb* 36–38 and 33–37 long, respectively. Ventrally, gnathosoma with subcapitular setae *m* 49–53 long and 3 pairs of adoral setae, *or1* 15–16, *or2* 9–12 and *or3* 27–35. Clasp organ outline on venter of gnathosoma. Palp coxa with 1 supracoxal seta, 4 long.

**Legs** – Leg IV clearly longer than body. Each side of claws on tarsi I–II with 17 pectinations,



**Figure 8** *Teneriffia quadripapillata* Sig Thor. A Genitalia of male; B Genital opening of nymph (enlarged).

empodium absent, tarsal claws III–IV smooth with a tiny peg-like empodium between them. Lengths of leg segments: Ta I 133–140, Ti I 113–121, Ge I 82–87, TF I 73–84, BF I 76–91, Tr I 51–69, Cx I 145–186; Leg I 673–778: Ta II 129–131, Ti II 90–100, Ge II 71–75, TF II 76–70, BF II 70–74, Tr II 58–71, Cx II 133–157; Leg II 627–678: Ta III 165–170, Ti III 107–110, Ge III 73–81, TF III 67–72, BF III 52–72, Tr III 63–74, Cx III 137–148; Leg III 664–727: Ta IV 184–204, Ti IV 119–131, Ge IV 86–107, TF IV 57–72, BF IV 59–69, Tr IV 72–102, Cx IV 132–152; Leg IV 709–837, IP 2 673–3 020. Setal formulae of leg segments: Tarsi 23 (2  $\omega$ )-23 (2  $\omega$ )-19+ 1 trich-18 (1  $\omega$ ) + 1 trich; tibiae 12 (1 $\phi$ ) (1 $\kappa$ )-12(1 $\phi$ )-12(1 $\phi$ )-11(1 $\phi$ ), genua 10(1 $\sigma$ )-8(1 $\sigma$ )-7(1 $\sigma$ )-6; telofemora 5-5-4-4; basifemora 5- 6-4-3; trochanters 1-2-2-2; coxae 5-6-5-4. Trichobothrium III 96–106 and trichobothrium IV 120–124.

#### Material examined

Three females, two males and one nymph from rocks and sand at La Barranquera, La Laguna, Tenerife, coordinates 28.537908°N, 16.396246°W, 21/07/2020, coll. Juan Carlos de la Paz; two females, two males and one nymph from rocks and sand at La Barranquera, La Laguna, Tenerife, coordinates 28.537908°N, 16.396246°W, 29/07/2020, coll. Juan Carlos de la Paz; two females, two males from rocks and sand at La Barranquera, La Laguna, Tenerife, coordinates 28.537908°N, 16.396246°W, 10/08/2020, coll. Juan Carlos de la Paz; one female, two males and one nymph from rocks and sand at La Barranquera, La Laguna, Tenerife, coordinates 28.537908°N, 16.396246°W, 01/08/2020, coll. Juan Carlos de la Paz; four females and three males, Roque de las Bodegas, Taganana, Santa Cruz de Tenerife, from large rocks, boulders, pebbles and sand, coordinates 28.571219°N, 16.203836°W, 24/07/20, coll. Juan Carlos de la Paz; three females, one male and one nymph, Roque de las Bodegas, Taganana, Santa

Cruz de Tenerife, from large rocks, boulders, pebbles and sand, coordinates 28.571219°N, 16.203836°W, 25/07/20, coll. Juan Carlos de la Paz.

## Discussion

The redescription of *T. quadripapillata* allowed us to confirm in principle the presence of the unique diagnostic character within the *Teneriffia* genus (“clasps” on the venter of the gnathosoma). The unpublished figures of *T. quadripapillata* by Oudemans (Strandmann, 1965) showed more characters than the original figures of Sig Thor and was apparently the first to point out the “clasps”. In their revision of the Teneriffiidae McDaniel *et al.* (1976) recognised only two monotypic genera, namely *Teneriffia* and *Parateneriffia* Sig Thor, 1911 but recognised 3 species in the former and 5 in the latter. These authors described the field with “clasps” as follows: “8 transverse chitinous clasps for muscles of the pharynx” and that it has not been mentioned in any other species up to 1976. Judson (1994) in his description of *Neoteneriffiola coineau* described the pharynx as large and with irregular transverse ridges but the figure bears no resemblance to that of *T. quadripapillata*. An examination of the types of *T. sebahatae* clearly confirms the absence of “clasps” in this species. Zmudzinski *et al.* (2021) also confirms the absence of “clasps” in their new species *T. aethiopica* but suggested further studies about the presence or absence of “clasps” in the other representatives of the Teneriffiidae. According to Pakinat-Saeij & Kazemi (2022) “clasps” are also absent in their new species *T. hajiqaanbari*. In a video clip produced (supplementary material) by the second author it is clear that the “clasps” are not sclerotised but show movement almost in a pump-action.

Furthermore, this sampling on Tenerife detected this species again after more than 100 years, and also widen its known distribution on the island.

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