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Three new alien spider mites (Prostigmata, Tetranychidae) from south-eastern France

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Short note

ABSTRACT

During this survey in southeastern France, there were found three new alien spider mites species: *Aponychus corpuzae* found on *Phyllostachys* sp. and *Semiarundinaria yashadake*; the Persea mite *Oligonychus perseae* found on *Persea americana* and most probably also on *Vitis vinifera*; *Stigmaeopsis nanjingensis* found on *Phyllostachys* sp. and *S. yashadake*. In connection with the new records of *A. corpuzae*, we propose an identification key for the world species of the genus *Aponychus*.

Keywords avocado; bamboo; biodiversity; invasive mite pests; Mediterranean basin

Introduction

Any of these new alien mite species that manages to establish itself in a new environment is of concern, both for environmental and economic reasons if it feeds on crop plants (see Mack *et al.*, 2000 for a review). Due to their minute size, spider mites are difficult to detect before (interception) and early after their introduction into new environments, which may allow them to become permanently established in the newly colonised area. For this reason, their early detection is one of the important challenges in bioinvasion management allowing the adoption of measures to reduce the spread and the impact of the newly introduced mite.

In this context, because of our territorial alert mission, following the sending of a sample by a private individual, we undertook a survey in the south-east of France.

Now we provide the first evidence of the presence in southern France of three alien spider mites species. We also took advantage of the discovery of a species belonging to the genus *Aponychus* to fill a gap: to build an identification key for the 21 species belonging to this genus.

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Results and discussion

Family Tetranychidae Donnadieu, 1875

Subfamily Tetranychinae Berlese, 1913

Tribe Eurytetranychini Reck, 1950

Genus *Aponychus* Rimando, 1966

Aponychus Rimando, 1966: 105-113. Type-species: *Aponychus corpuzae* Rimando

Aponychus corpuzae Rimando, 1966

Figures 1A–B, 3A–D

According to Migeon and Dorkeld (2022), this species is only recorded from Oriental and Palearctic regions on Myrtaceae, Poaceae, Rosaceae and Rutaceae plant species. In Palearctic

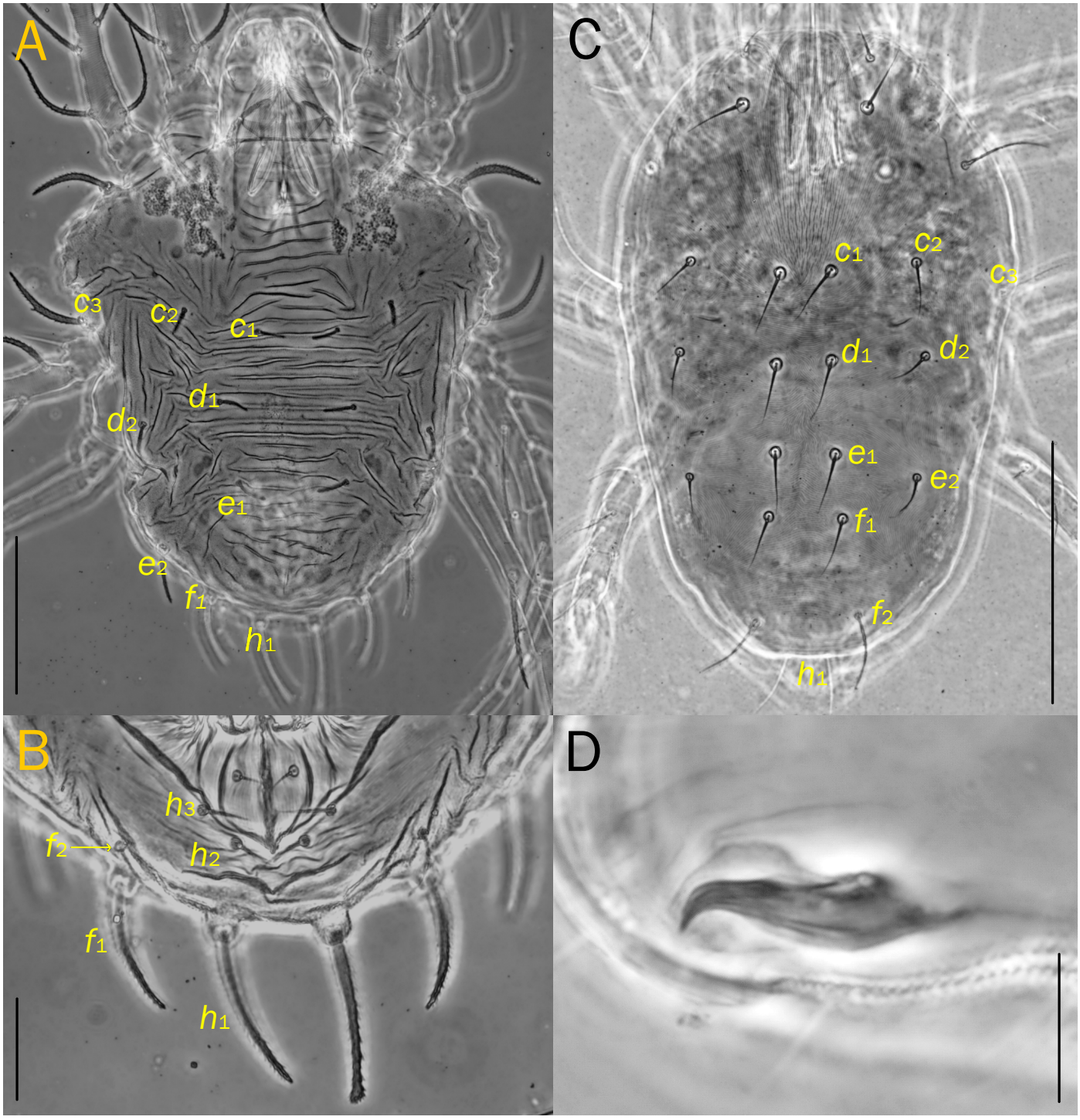

Figure 1 A–B *Aponychus corpuzae*, female: A – dorsal view *in habitus*; B – ventral view of caudal part showing ventral position of setae f_2.; C–D *Oligonychus perseae*: C – female dorsal view *in habitus*; D – male aedeagus; scale bars A=100 µm, B=25 µm; C=100 µm, D=10 µm.

region, *A. corpuzae* was earlier recorded from China (Wang, 1981), Japan (e.g. Gotoh *et al.*, 2003) and Korea (Lee, 1989). The only hitherto record in Europe is the most recent ones and concerns Italy and Slovenia (Seljak, 2015).

Records: 1 female, 2 males, 1 nymph collected on *Phyllostachys* sp. (Poaceae), Val Rahmeh Botanical Garden, (43.7847°N 7.5113°E, alt. 45 m a.s.l.), Menton (Alpes-Maritimes), France

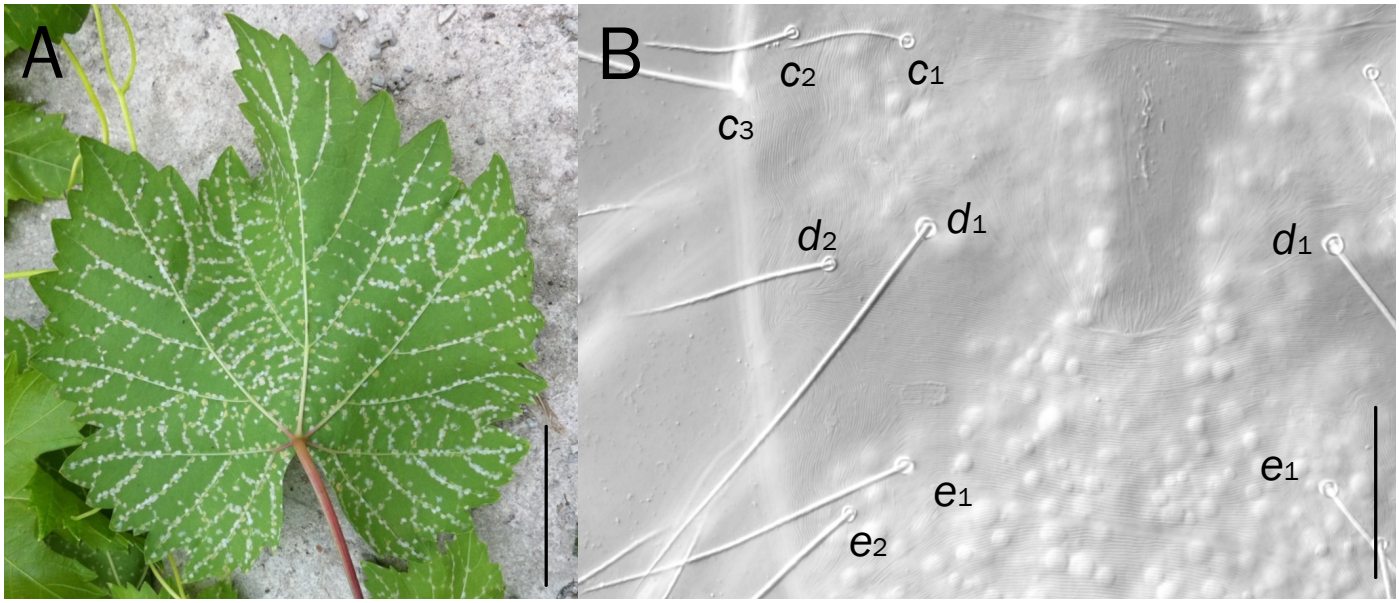

Figure 2 A – abaxial side of a vine leaf with nests of spider mite most likely produced by *Oligonychus perseae*; B – *Stigmaeopsis nanjingensis*, female. Part of the dorsal hysterosoma showing the length of setae d_1 and the relative distances between members of setae e_1 and d_1; scale bars A=5 cm, B=50 µm.

30-IX-2019, leg. Auger P. & Migeon A.; 4 females, 1 male collected on *Semiarundinaria yashadake* Makino (Poaceae), (43.7348°N 3.9804°E, alt. 86 m a.s.l.), Saint-Drézéry (Hérault), France 26-XI-2017, leg. Migeon A.

Like Seljak (2015), overwintering females (female body colour was orange, males and juveniles were not found) (Fig. 3C) were found in November (late autumn), indicating that the species is potentially adapted and probably well established in south France.

Distinctive characters (Fig. 1A, B): females of this species are readily distinguished by their lateral expansions of the propodosoma, by the ventral position of outer sacrals setae (f_2), setae f_2 being half as long as setae f_1, setae sc_1, c_1, c_2, d_1, e_1 being subequal in length and setae h_1 being longer than setae f_1.

Note: new species for France and new host record on the bamboo *S. yashadake*.

Tribe Tetranychini Reck, 1950

Genus *Oligonychus* Berlese, 1886

Oligonychus Berlese, 1886: 24. Type-species: *Heteronychus brevipodus* Targioni Tozzetti.

Oligonychus perseae Tuttle, Baker and Abbatiello, 1976

Figures 1C–D, 2A, 3E–H

Native from Central America (Tuttle *et al.*, 1976), the Persea mite, *Oligonychus perseae* Tuttle, Baker and Abbatiello, 1976 is recorded from Nearctic, Neotropical and Palearctic regions. Considered as an invasive pest, this species was recorded for the first time in Europe in Portugal (Ferreira *et al.*, 2006; Naves *et al.*, 2021), then in Spain (Alcázar *et al.*, 2005) and more recently in Italy (Sicily) (Zappalà *et al.*, 2015).

Records: 6 females, 2 males collected on *Persea americana* Mill. (Lauraceae), Val Rahmeh Botanical Garden, (43.7847°N 7.5113°E, alt. 45 m a.s.l.), Menton (Alpes-Maritimes), France 30-IX-2019, leg. Auger P., Migeon A.; 4 females, 1 male collected on *P. americana*, Route

de Super Garavan (43.7901°N 7.5169°E, alt. 189 m a.s.l.), Menton (Alpes-Maritimes), France 24-VIII-2016, leg. Dr René d'Agro.

All the specimens of *O. perseae* were collected on avocado, *P. americana*, on the French Côte d'Azur, at Menton, near the Italian border. The first sample came from the private garden of Dr René d'Agro who sent us a sample of mite from infested avocado leaves. He also sent some pictures of grapevine leaves, *Vitis vinifera* L. (Vitaceae), from his neighbor's garden near his own, which were infested by a spider mite whose leaf symptoms were similar (silk nests on the underside of leaves, mainly located along the midrib and main veins) to those produced by *O. perseae* (Fig. 2A). Although we did not observe under the microscope the mites responsible for these symptoms on grape (we did not have the opportunity to collect mite material because the owner wished to remain anonymous), we also believe that the mite responsible for this damage is *O. perseae*. However, this possible occurrence of *O. perseae* will be the third record of this species on grapevine. The first report was in Madeira Island and the second in Algarve, Portugal mainland (Ferreira *et al.* 2006, 2007). A second sample was collected in the botanical garden of Menton and other avocado trees showing symptoms of infestation by *O. perseae* were also observed [not collected: as the symptoms observed were typical of *O. persae* (see above), we did not consider it necessary to expand the number of samples] here and there in the city.

Distinctive characters (Fig. 1C, D): among the species whose male have an aedeagus which shape is *O. ununguis*-like, females of this species can be distinguished by: (1) their dorsal striae forming a reversed V-pattern between dorsal setae e_1, (2) setae c_1 and d_1 not reaching the base of the next row whereas the setae e_1 reach the base of the setae f_1, (3) the combination of their tarsal and tibial leg chaetotaxy (tarsus I with 4 setae and one solenidion proximal to proximal duplex setae, tarsus II with 2 setae proximal to duplex setae).

Note: new species for France.

Remarks: this species can represent a phytosanitary risk in France, taking into account (1) the expansion of avocado crop (its main host plant) in the country (Côte d'Azur, Pyrénées-Orientales and Corse) and (2) the pest status and yield losses reported in production areas in affected countries (e.g. Torres *et al.* 2023). Although there is no evidence indicating damage to other crops besides avocado, reports of the species on grapevine in Europe as well as observation of symptoms in localities close to the infested avocados (in this study) warn about the possible adaptation and impact that this species could cause in European vineyards under climate change scenarios. According to EFSA pest categorization (European Food Safety Authority 2022), *O. persea* satisfies the criteria to be regarded as a potential Union quarantine pest and avoiding its spread is important.

Genus *Stigmaeopsis* Banks, 1917

Stigmaeopsis Banks, 1917: 195. Type-species: *Stigmaeopsis celarius* Banks

Stigmaeopsis nanjingensis (Ma & Yuan, 1980)

Figures 2B, 3I–L

Stigmaeopsis nanjingensis is known only from Oriental region, from China (Palearctic region probably), and from Europe: in Italy (Pellizzari and Duso, 2009), in Hungary (Kontschan and Nemenyi, 2013) and in mainland Portugal (Naves *et al.* 2021). According to Migeon and Dorkeld (2022), this species inhabits several bamboos species belonging to the genera *Fargesia*, *Phyllostachys* and *Pseudosasa.*

Records: 7 females, 3 males collected on *Phyllostachys* sp. (Poaceae) French-Italian Border post, (43.7859°N 7.5277°E, alt. 26 m a.s.l.), Menton (Alpes-Maritimes), France 30-IX-2019, leg. Auger P., Migeon A.

This new occurence is not very surprising as Pellizzari and Duso (2009) previously reported this species in the Italian town of Ventimiglia (Imperia district) which is located close to the French border (less than 10 km).

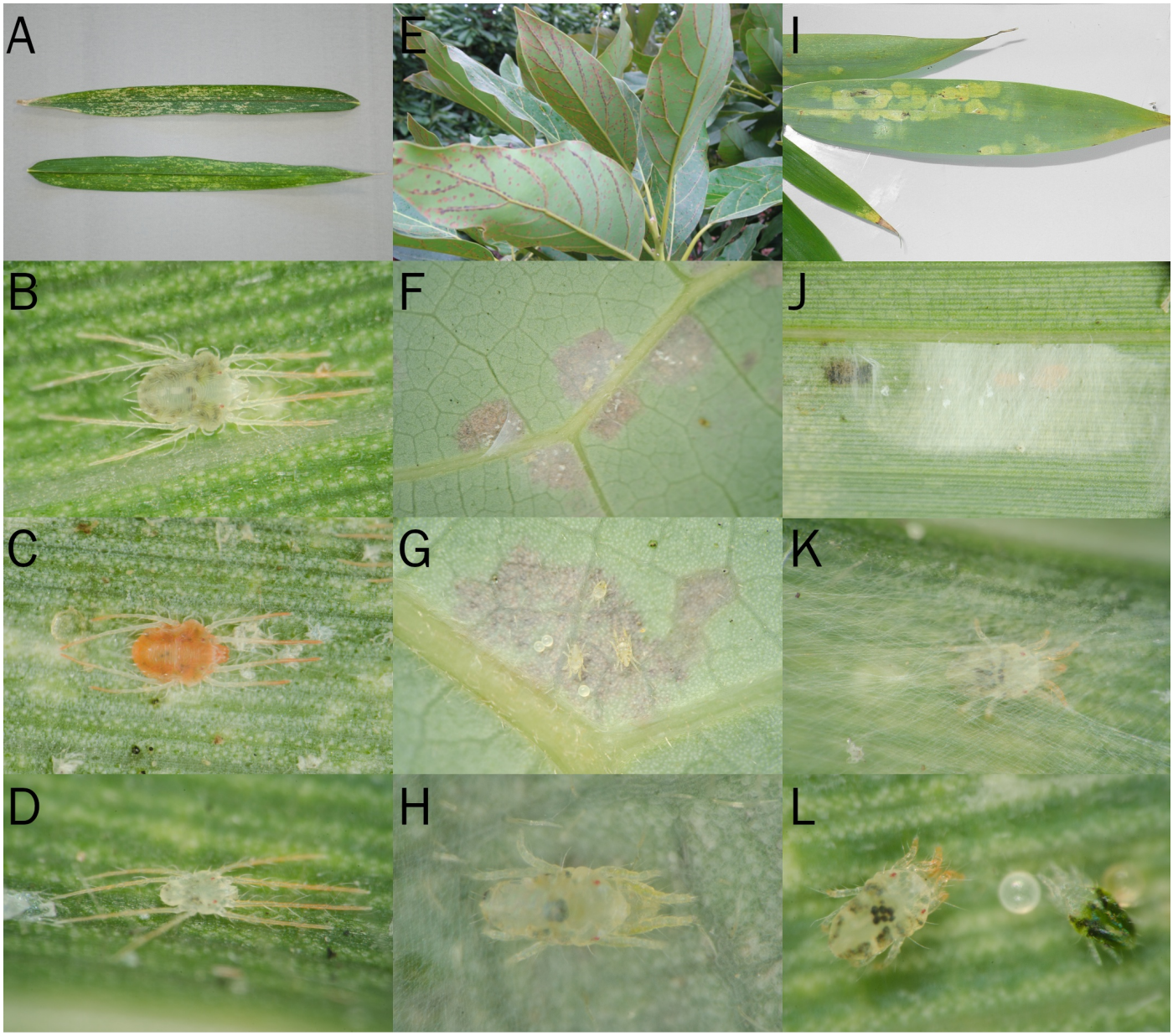

Figure 3 A–D *Aponychus corpuzae*: A – symptoms on bamboo leaves; B – female; C – female harbouring winter coloration; D – male. E–H *Oligonychus perseae*: E – symptoms under avocado leaves; F – nests along the vein, abaxial side of avocado leaf; G – details of a nest showing two females, a nymph and three eggs; H – female. I–L *Stigmaeopsis nanjingensis*: symptoms under bamboo leaves with inhabited and abandoned nests, abaxial side of bamboo leaf; J – details of a nest showing faeces accumulated on the left side; K – female under the silk web of a nest; L – female, nymph and two eggs.

Distinctive characters (Fig. 2B): (1) in females, the distance between insertions of setae e_1 is similar to that found between insertions of setae d_1; (2) the setae d_1 are longer than the distance between the insertions of setae d_1 members (Saito *et al.* 2018).

Note: this species was erroneously reported as *Stigmaeopsis celarius* Banks, 1917 by Auger and Migeon (2007) (12 females, 10 males collected on *Phyllostachys viridiglaucescens* Rivière & C. Rivière (Poaceae), Bambouseraie de Prafrance (44.0718°N, 3.9796°E, alt. 144 m a.s.l), Générargues (Gard), France 16-IX-2003, leg. Migeon A.) and it was previously collected in Southern France but had not been identified until this work (4 females, 1 male collected on *S. yashadake*, (43.7348°N 3.9805°E, alt. 86 m a.s.l.), Saint Drézéry (Hérault), France 26-XI-2017,

leg. Migeon A.); new species for France and new host record on *S. yashadake*.

Key to the world species of *Aponychus* females

The key was built according to the valid species mentioned by Migeon and Dorkeld (2022) taking into account that, following the revision by Hernandes (2010), which concluded that several species of *Aponychus* should probably be synonymized, only *A. aequilibris* is considered a junior synonym of *A. corpuzae* (Hernandes and Feres, 2013). As a consequence, twenty-one species are here considered valid.

As we observed some variations in sacral setae labelling in the literature when they are both in dorsal marginal position (e.g. *A. chiavegatoi* vs. *A. mai*), we decide to name f_2 the closest seta to clunal setae (h_1).

1. First 3 pairs of dorsocentral setae (c_1, d_1, e_1) well developed (seta c_1 reaching or surpassing well the base of d_1), not spatulate, more or less elongate, inserted on obvious or strong tubercles 2
– First 3 pairs of dorsocentral setae (c_1, d_1, e_1) short (seta c_1 far from reaching base of d_1), not inserted on strong tubercles 9

2. Seta c_2 tiny, displaced anteriorly onto the prodorsum ..... *A. chiavegatoi* Feres & Flechtmann, 1988
— Seta c_2 well developed 3

3. Some dorsal setae subspatulate-lanceolate (obviously widened near the middle) to spatulate 4
— All dorsal setae elongate 5

4. Setae sc_2, c_3 and h_1 short, lanceolate; tibia II with 4 tactile setae ..... *A. mauritianum* Ferla & Ferla, 2020
— Setae sc_2, c_3 and h_1 short, broadly spatulate; tibia II with 5 tactile setae ..... *A. schultzi* (Blanchard, 1940)

5. Dorsal setae subequal in length (except seta h_1, the longest) ..... *A. mallotus* Ho, 2003
— Some dorsal setae obviously smaller 6

6. Dorsocentral seta c_1 surpassing well the base of seta d_1 7
— Dorsocentral seta c_1 reaching or almost reaching the base of seta d_1 8

7. Seta f_2 short and subspatulate; tibiae I with 6 setae and II with 4 setae ..... *A. taishanicus* Wang, 1981
— Seta f_2 short and slender, sometimes blunt; tibiae I with 5 setae and II with 3 setae ..... *A. spinosus* (Banks, 1909)

8. Dorsal setae stout, some of them rounded distally; seta c_3 about half the length of c_2, h_1 about half the length of f_1 ..... *A. pilipinus* Corpuz-Raros, 1978
— Dorsal setae tapering acute distally; seta c_3 and h_1 about 3/4 the length of c_2 and f_1, respectively ..... *A. firmianae* (Ma & Yuan, 1965)

9. Seta f_1 or f_2 very reduced or absent 10
— Setae f_1 and f_2 present and well developed 13

10. Seta f_2 absent ..... *A. bambusae* Gupta & Gupta, 1990
— Seta f_2 present, sometimes in ventral position 11

11. Seta f_1 tiny, f_2 and h_1 subspatulate of same size; seta v_2 very short ..... *A. sarjui* Gupta, 1980
— Seta f_1 not tiny, short or elongate 12

12. Seta c_1 longer than distance between insertions of c_1 members; seta f_1 setiform widened to lanceolate sometimes somewhat rounded distally, about 1/4 the length of seta h_1; seta f_2 enlarged near the middle gradually narrowing distally, subequal in length to seta h_1 ..... *A. mai* Pan, Jin & Yi, 2022
— Seta c_1 obviously shorter than distance between insertions of c_1 members; setae f_1 and f_2 setiform slender, seta f_1 slightly shorter than seta h_1; f_2 in ventral position, about 1/3 the length of seta h_1 or more ..... *A. corpuzae* Rimando, 1966

13. Seta f_2 as long as seta h_1, both longer than seta f_1 .. *A. siamensis* Ehara & Wongsiri, 1975
— Seta f_2 longer than setae h_1 and f_1 14

14. Among first 3 pairs of dorsocentral setae (c_1, d_1 and e_1) some being lanceolate to narrowly lanceolate 15
— All first 3 pairs of dorsocentral setae (c_1, d_1 and e_1) spatulate to subspatulate with rounded tip 16

15. Third pair of dorsocentral seta (e_1) obviously shorter than first and second pairs (c_1 and d_1); femur I with 6 setae, femur II with 5 setae ..... *A. imperatus* Hafaz & EI-Badry, 1980
— Third pair of dorsocentral setae (e_1) longer or as long as first and second pairs (c_1 and d_1); femur I with 9 setae, femur II with 6 setae.. ..... *A. grandidieri* (Gutierrez, 1966)

16. Seta v_2 shorter than seta sc_1, v_2 about 2/3 the length of sc_1; tibiae III and IV with 1 solenidion; stylophore shallowly cleft ..... *A. solimani* Zaher, Gomaa & EI-Enany, 1982
— Seta v_2 obviously longer than seta sc_1 17

17. Seta c_1 shorter than seta e_1 18
— Seta c_1 longer or as long as seta e_1 19

18. Seta sc_2 4 times as long as seta sc_1; seta e_2 twice as long as seta d_2; seta d_2 less than 1.5 the length of seta c_2; seta d_1 shorter than the half distance c_1– d_1 ..... *A. lupus* Chaudhri, 1972
— Seta sc_2 about twice as long as seta sc_1; seta e_2 about 1.25 the length of seta d_2; seta d_2 twice as long as seta c_2; seta d_1 longer than the half distance c_1– d_1 ..... *A. sulcatus* Chaudhri, 1972

19. Seta v_2 more than twice longer than seta sc_1 ..... *A. rarus* Rimando, 1966
— Seta v_2 less than twice longer than seta sc_1 20

20. Seta c_1 as long as seta d_2; seta sc_1 as long as seta d_1 ..... *A. expansus* Chaudhri, 1972
— Seta c_1 shorter than seta d_2 (c_1 about ¾ to 3/5 the length of d_2); seta sc_1 slightly longer than seta d_1 ..... *A. parydrus* (Meyer, 1987)

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