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Jumping plant-lice of Socotra Island (Hemiptera: Psylloidea)

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Abstract. The jumping plant-lice (Hemiptera: Sternorrhyncha: Psylloidea) of the island of Socotra (Yemen) are reviewed. A total of eight species are recorded, six of them for the first time from Socotra. Four species are described as new: *Colposcenia dioscoridis* sp. nov. (Aphalaridae), *Diaphorina caliginosa* sp. nov., *D. hagherensis* sp. nov. (both Liviidae: Euphyllurinae), and *Pauropsylla jarmilarum* sp. nov. (Triozidae). Males are described for the first time for *Diaphorina elegans* Burckhardt & Mifsud, 1998 and immatures for *Pseudophacopteron verrucifrons* Burckhardt & Harten, 2006 (Phacopteronidae). Two additional species, *Cacopsylla* sp. (Psyllidae) and *Diaphorina* sp., remain formally undescribed. Host plant, biological and distributional data (if available) are provided for each species and a key for identification of adults is supplemented. The jumping plant-louse fauna of Socotra is briefly discussed from a biogeographical viewpoint.

Key words. Sternorrhyncha, psyllids, new species, new records, adult and immature morphology, host plants, Yemen, Socotra

Introduction

Jumping plant-lice or psyllids (Hemiptera: Sternorrhyncha: Psylloidea) are phytophagous insects feeding on phloem sap of vascular, largely dicotyledonous plants. A great majority of nearly 4000 psyllid species described worldwide are narrowly host-specific, monophagous or narrowly oligophagous, being restricted to just one or a few closely related host plants, particularly in their immature stages (Hodkinson 1974, Burckhardt 1989, Burckhardt et

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al. 2014, Ouvrard 2014). The current knowledge of the Psylloidea taxonomy, biology and distribution is far from complete: while e.g. the Palaearctic fauna is comparatively well-known, there are big gaps in knowledge of tropical regions where the global psyllid diversity is largely concentrated but so far under-studied with many new taxa still awaiting description (e.g. Burckhardt et al. 2006, Burckhardt & Queiroz 2012).

Socotra is an archipelago of four islands situated in the north-western part of the Indian Ocean close to the African continent and the Arabian Peninsula. Administratively, it is part of Yemen. The largest eponymous island of the archipelago, Socotra, covers an area of 3625 km^2 and lies 232 km eastwards of the Horn of Africa (Somalia) and 351 km southwards of the Ra's Fartaq cape in southern Yemen, roughly equidistant from the Tropic of Cancer in the north and the Equator in the south. Socotra Island is east-west oriented, 133 km long from west to east and at most 43 km broad in the north to south direction. Despite the relatively small surface, the biota of Socotra are quite diverse and rich in endemic species. This is partly due to 1) a long isolation: the island is a continental fragment of east Gondwanan origin which became separated from the mainland (probably the Dhofar region in Oman in southern Arabian Peninsula) in Oligocene–Miocene, 15 million years ago at least; 2) a diverse geomorphology and geology: the island raises from coastal plains through limestone plateaus at medium elevations to granitic peaks of the Hagher mountains reaching ca. 1550 m, which offers a wide range of microclimatic conditions in an overall arid climate; 3) relatively intact ecosystems thanks to age-old traditional practices of using natural resources by man, until very recently (Cronk 1997, Batelka 2012, Brown & Mies 2012, Leroy et al. 2012). The fairly well-known flora of the Socotra Archipelago includes 842 species of vascular plants with a high proportion (37 %) of endemics (Miller & Morris 2004, Brown & Mies 2012). The first zoological explorations in Socotra date back to the second half of the 19th century followed by a number of expeditions which have lead to records and descriptions of new, often endemic animal taxa, but many groups, particularly of invertebrates, have been insufficiently studied so far (Wranik 2003, Batelka 2012).

The Psylloidea, which are generally small, inconspicuous insects, intimately associated with their host plants and studied by just a handful of taxonomists worldwide, are such a previously neglected taxon in Socotra. Only two species of *Diaphorina* Löw, 1880 (*D. elegans* Burckhardt & Mifsud, 1998 and an unnamed species) have been recorded from the island based on a few specimens collected by A. van Harten in 1993 (Burckhardt & Mifsud 1998, Burckhardt & Harten 2006). Recent field work with targeted sampling of psyllids by the Czech expedition to Socotra in June 2012 brought additional material and more detailed information on the local psyllid fauna. The aim of the present paper is to evaluate this recently collected material and review all currently available knowledge on the Psylloidea of Socotra.

Material and methods

Most specimens examined were collected by sweeping herbaceous and woody vegetation, beating branches of trees and shrubs and direct search on the host plants between 8 and 22

June 2012. This period is the beginning of the summer, south-western monsoon which is relatively hot and dry in Socotra, and characterised by strong winds and frequent cloud formation creating fog in the highlands (Scholte & de Geest 2010, Brown & Mies 2012). Approximately twenty localities were visited, representing a gradient from the sea coast and coastal plains up to the highest part of the Hagher massif (Mt. Skand, ca. 1450 m a.s.l.) and all major vegetation formations. Selection of the collecting sites was biased towards areas which recently received precipitations; these were situated mostly in central and eastern Socotra while the western half of the island, very dry in June 2012, was explored much less thoroughly. Geographical names of localities are spelled according to Bezděk et al. (2012).

The material was mounted dry, as permanent slides in Canada balsam, or preserved in ethanol. Material from the following collections was examined:

MHNG Muséum d'Histoire naturelle, Genève, Switzerland;
MMBC Moravian Museum, Brno, Czech Republic;
NHMB Naturhistorisches Museum, Basel, Switzerland;
NMPC National Museum, Prague, Czech Republic.

Habitus images were prepared using a Leica Z16APO macroscope with attached Leica DFC295 videocamera and Leica Application Suite v. 3.7 software. Drawings, microphotographs and measurements were taken from slide-mounted specimens using the Olympus BX41 microscope with attached drawing tube and Olympus Camedia 5060WZ digital camera and QuickPHOTO CAMERA 2.3 software, or a Leica DM5500 B microscope with Leica DFC320 digital camera and Leica IM50 software.

Morphological terminology follows Hollis (1976), Ossiannilsson (1992) and Yang et al. (2009). The following abbreviations are used for measurements and ratios in the descriptions:

Adults

HW	head width
AL	antenna length (including scape and pedicel)
WL	forewing length
WW	forewing width
TL	metatibia length
MPL	male proctiger length
PL	paramere length
AEL	length of distal portion of aedeagus
FPL	female proctiger length
SL	female subgenital plate length

Fifth instar immatures

BL	total body length
BW	body width
AL	antenna length
FPL	forewing pad length
TL	metatibiotarsus length
CPL	caudal plate length
CPW	caudal plate width
CRW	circumanal pore ring width

Classification of Psylloidea is adopted from Burckhardt & Ouvrard (2012). Nomenclature of host plants follows Miller & Morris (2004) and Brown & Mies (2012).

Systematic account of Psylloidea known from Socotra

APHALARIDAE
Aphalarinae

Colposcenia dioscoridis sp. nov.

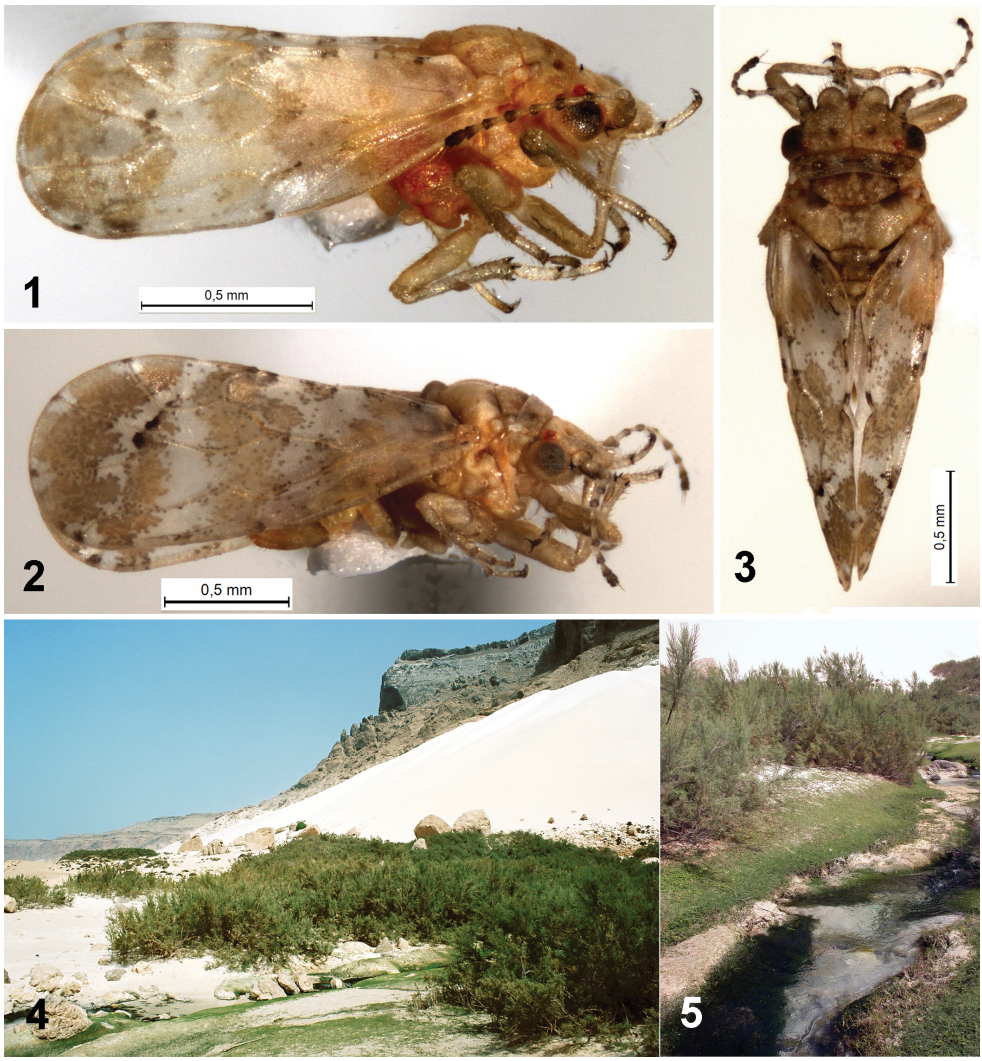
(Figs 1–3, 6–17)

Type locality. Yemen, north-eastern Socotra, Haalla coastal area, thickets of *Tamarix nilotica* in Arher spring environs, 12°33′00″N 54°27′36″E, 5–15 m a.s.l. (Figs 4–5).

Type material. Holotype: ♂ (MMBC, dry-mounted), 'YEMEN, Socotra Island / Halla area, Arher / 12°33.0′N, 54°27.6′E, 5 m / freshwater spring in sand dunes / 9.–10.vi.2012 // on *Tamarix nilotica* / I. Malenovský leg.'. Paratypes: 14 ♂♂ 7 ♀♀, same data as the holotype; 2 ♂♂ 3 ♀♀, southern Socotra, northern edge of Noged plain, Deiqab cave entrance, 12°23′03″N 54°00′56″E, 115 m, 12.vi.2012, on *Tamarix nilotica*, I. Malenovský leg.; 2 ♂♂ 3 ♀♀, southern Socotra, Noged plain, Abataro, 12°22′06″N 54°03′24″E, 20 m, 12.–13.vi.2012, sand dunes, on *Tamarix nilotica*, I. Malenovský leg. (MMBC, NHMB, NMPC; dry- and slide-mounted and preserved in alcohol).

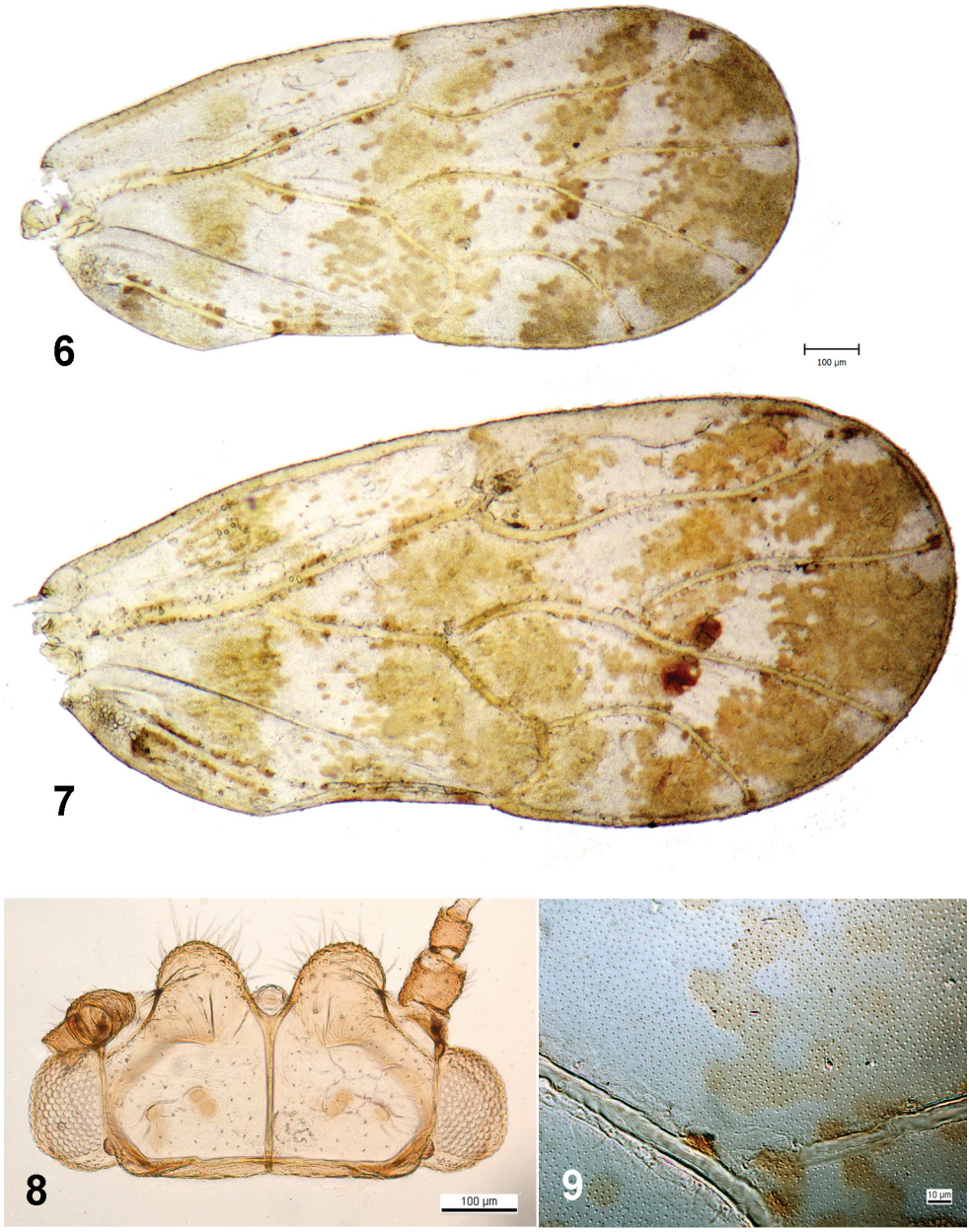
Description. ***Adult.*** *Coloration* (Figs 1–3). Body almost uniformly light green when alive, dirty yellow in specimens which are dried or preserved in alcohol. Foveae on vertex and pronotum and anterior parts of mesopraescutum and mesoscutum (in some specimens) faintly light brown. Eyes grey, ocelli red. Antenna dirty yellow with segments 1, 2 ventrally, segments 3–8 apically and segments 9, 10 entirely dark brown. Apical segment of rostrum dark brown to black. Legs uniformly dirty yellow, only apices of both tarsal segments infuscate dark brown and apical spurs on metatibia and metabasitarsus black. Forewing membrane opaque, milky white, with pattern consisting of many small light to dark brown spots, fused into four irregular transverse bands near base, medially, subapically and apically, the apical band leaving clear round patches around apices of veins R_S, M_{1+2}, M_{3+4} and Cu_{1a}; two small, more or less round, darker brown spots on membrane in cells m_1 and m_2 on either side of vein M_{3+4} slightly distal to M fork, distinct and well-delimited particularly in females, which generally have a more contrasting wing pattern than males (Figs 6, 7); veins dirty yellow, apices of all veins bearing a small dark brown spot, several small dark spots also on the anal vein A_1. Hindwing hyaline, vein C+Sc brownish.

Structure. Integument with fine microsculpture, matt, covered with short inconspicuous light pubescence; anterior margin of vertex and genae with numerous long setae (Fig. 8). Head only slightly inclined from longitudinal body axis. Vertex flat, with large, flattened, apically broadly rounded anterior lobes (slightly longer than half of vertex length along midline), one small deep fovea on each side of median suture; lateral ocelli lying in plane of vertex, frontal ocellus clearly visible in dorsal view (Fig. 8). Genae quite flat, anteriorly and laterally rounded. Eyes subglobular. Antenna (Fig. 14) about 1.1–1.2 as long as head width, with 10 segments; segments 3–9 slightly widening to apex; segment 3 longest, segment 4 slightly shorter than 3 but longer than each of segments 5 and 6, segments 7 and 8 each shorter than 5 and 6; single elongate oval rhinarium bordered with wreath of small cuticular spines subapically on each of segments 4–9; one long and one shorter simple seta subapically on each of segments 3–8, segment 3 also with long simple seta medially; segment 10 with terminal setae subequal, longer seta about twice longer than segment 10 (Fig. 15). Clypeus nearly flat, rostrum short, both clypeus and rostrum lacking conspicuous setae. Metacoxa with relatively

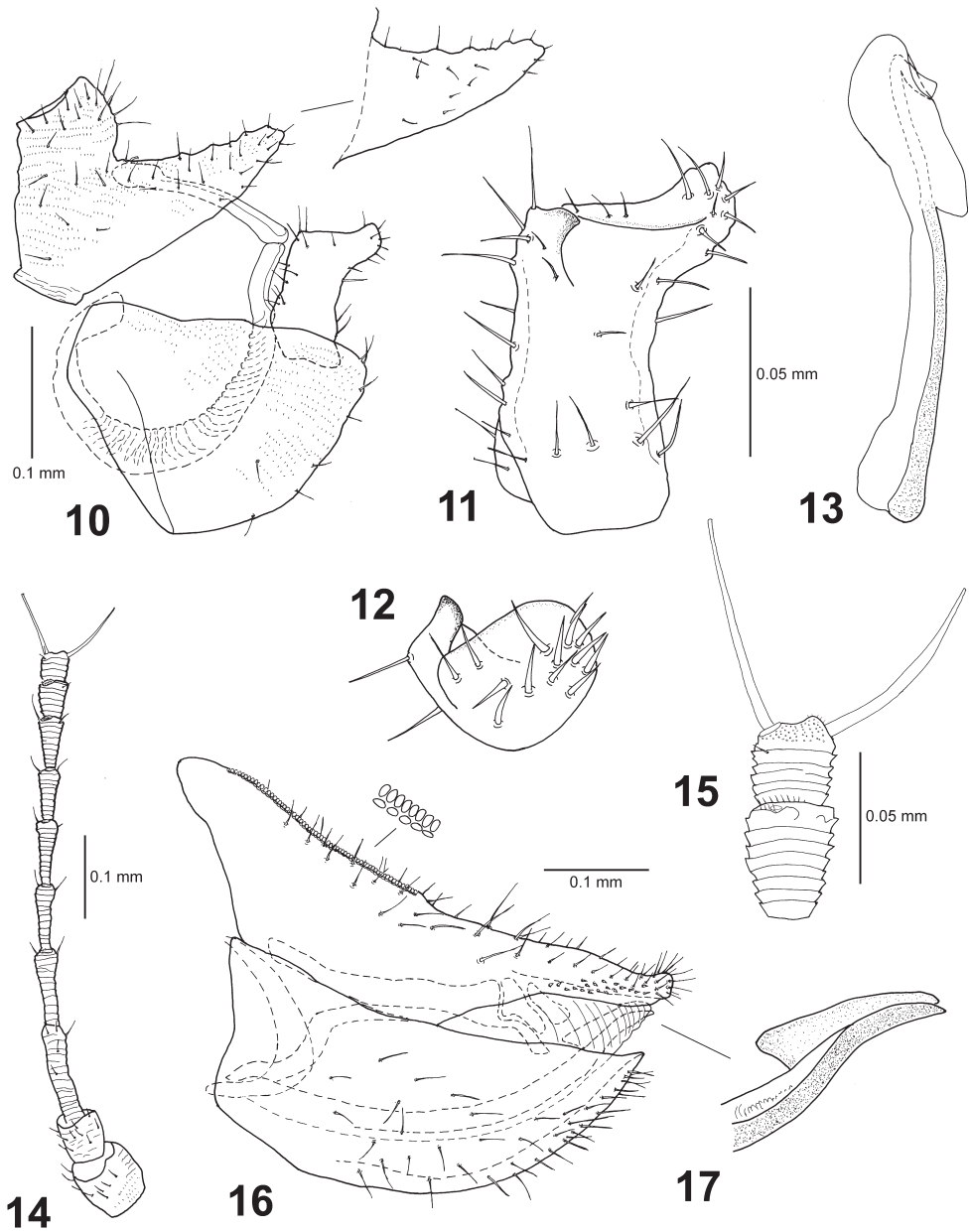


Figs 1–5. *Colposcenia dioscoridis* sp. nov., habitus and habitat. 1 – adult male (holotype), lateral view; 2 – adult female, lateral view; 3 – adult female, dorsal view; 4, 5 – coastal sand dunes with thickets of *Tamarix nilotica* near Arher spring in Haalla area (type locality; 4 – photograph by I. Malenovský, 5 – photograph by P. Kment).

long, apically blunt meracanthus. Metatibia distinctly widening towards apex, rugged basally but lacking genual spine, with 5 dark sclerotised spurs apically – three grouped together on inner side, each of the remaining two spurs separated on outer side of metatibia. Metabasitarsus laterally bearing two dark sclerotised apical spurs. Forewing (Figs 6, 7) elongate oval, slightly widening apically, broadest in apical quarter, broadly and almost symetrically



Figs 6–9. *Colposcenia dioscoridis* sp. nov, adult. 6 – male, forewing; 7 – female, forewing; 8 – head, dorsal view; 9 – detail of forewing membrane in cell m_1 at M-fork.



Figs 10–17. *Colposcenia dioscoridis* sp. nov., adult. 10 – male terminalia, outer lateral view with detail of setae on inner face of posterior lobe of proctiger; 11 – paramere, lateral view, inner face; 12 – paramere apex, dorsal view; 13 – distal segment of aedeagus, lateral view; 14 – antenna; 15 – antennal segments 9 and 10; 16 – female terminalia, lateral view, with detail of circumanal ring structure; 17 – detail of dorsal and apex of ventral valvulae, lateral view.

rounded apically, with apex lying in cell m_1; pterostigma well-developed, long, extending for approximately three quarters of length of cell r_1; vein R_S sinuate medially, apex curved obliquely anteriad, ending on outer anterior wing margin; vein Cu_{1b} shorter than Cu; forewing membrane densely covered with small round surface spinules which are irregularly arranged ca. 3.0–3.5 μm apart in middle of cells and extend up to veins; forewing veins clothed with many short setae (Fig. 9). Hindwing costal margin with 1 + 3 setae basally, 4 setae medially and 1 seta apically. Male subgenital plate with nearly straight dorsal margin and few sparse short setae postero-ventrally (Fig. 10). Male proctiger robust with posterior lobes distinctly shorter than subgenital plate, slightly curved medio-dorsad and narrowing to a subacute apex; proctiger on outer as well as inner side beset only with fine setae, spine-like setae, present subapically on posterior proctiger margin in many other *Colposcenia* spp., are missing (Fig. 10). Paramere, in lateral view, short, nearly parallel-sided, with apical part strongly produced posteriorly; inner side with several long, fine setae and a sclerotised, finger-shaped subapical process anteriorly (Fig. 11); in dorsal view, the posterior lobe is broadly rounded and bearing relatively long setae, and the finger-shaped anterior process oriented medio-posteriad (Fig. 12). Distal segment of aedeagus with a membraneous lobe on dorsal side of apical dilatation; ductus ejaculatorius short, bent dorsally (Fig. 13). Female terminalia with proctiger, in lateral view, with dorsal margin slightly concave, apex subacute; circumanal pore ring elliptic with two contiguous rows of pores; subgenital plate, in lateral view, regularly convex ventrally, with apex pointed (Fig. 16); dorsal and ventral valvulae slightly curved ventrally, smooth, lacking any teeth (Fig. 17).

Measurements (in mm). Males (n = 2): HW 0.59, AL 0.65–0.71, WL 1.35, WW 0.58, TL 0.34–0.37, MPL 0.16–0.17, PL 0.11, AEL 0.14. Ratios: AL/HW 1.20, WL/HW 2.29, WL/WW 2.33, TL/HW 0.63, MPL/HW 0.29. Females (n = 2): HW 0.61–0.63, AL 0.66–0.67, WL 1.61–1.68, WW 0.68, TL 0.39, FPL 0.51–0.52, SL 0.37–0.41. Ratios: AL/HW 1.06–1.08, WL/HW 2.63–2.67, WL/WW 2.37–2.47, TL/HW 0.62–0.64, FPL/HW 0.83–0.84, FPL/SL 1.24–1.41.

Fifth instar immature unknown.

Differential diagnosis. *Colposcenia dioscoridis* sp. nov. belongs to *Colposcenia vicina* group characterised by Burckhardt (1988) as having short posterior processes of the male proctiger not extending beyond the subgenital plate, slightly curved medio-dorsad and gradually narrowing from base to apex (type V of Loginova 1974); paramere shorter than proctiger and dilated apically; apical dilatation of the distal aedeagus segment with a large membraneous lobe dorsally; and R_S vein of forewing apically bent towards anterior wing margin, medially straight or bent anteriad. According to this definition, the *C. vicina* group includes eight species in the Palaearctic Region and south Africa (all associated with *Tamarix* spp.): *C. bidentata* Burckhardt, 1988; *C. conspurcata* Loginova, 1960; *C. forficulata* Li, 2011; *C. linzensis* Li, 2011; *C. loginovae* Baeva, 1963; *C. namibiensis* Hollis, 1974; *C. turanica* Loginova, 1974; and *C. vicina* Loginova, 1960 (Loginova 1974, Burckhardt 1988, Li 2011). The shape of the male paramere of *C. dioscoridis* sp. nov. in lateral view which is relatively slender with an elongate apical posterior lobe, is reminiscent of *C. forficulata* and *C. linzensis* from China which, however, have much shorter pterostigma on forewing (Li 2011), and *C. vicina* distributed in the Caucasus, Central Asia and China which differs in the transparent

forewing membrane and shorter anterior lobes of vertex (Loginova 1960, 1974). The milky white, opaque forewing membrane of *C. dioscoridis* sp. nov. is similar to *C. loginovae* from Central Asia which, however, differs from *C. dioscoridis* sp. nov. in its clavate paramere and reduced pterostigma (Loginova 1974). *Colposcenia bidentata*, *C. conspurcata* and *C. turanica* differ from *C. dioscoridis* sp. nov. in the shape of the paramere which is robust and clavate in the first two species and bearing a dorsally produced triangular apex in *C. turanica* (Loginova 1974, Burckhardt 1988). *Colposcenia namibiensis* from Namibia is distinct, besides the shape of the paramere, in the very short Cu vein of forewing which branches acutely, the long antennae with rhinaria missing on segments 5 and 7, and the short female terminalia with proctiger dorsally convex (Hollis 1974, Burckhardt 1988).

Etymology. Derived from "Διοσκουρίδα" (= Dioscorida), the ancient Greek name for the island of Socotra; noun in genitive case standing in apposition.

Host plant. *Tamarix nilotica* (Ehrenb.) Bunge (Tamaricaceae).

Occurrence in Socotra. *Colposcenia dioscoridis* sp. nov. has been found on both the northern and southern coast of Socotra. Its host plant, *Tamarix nilotica*, is relatively common on the island at low altitudes, forming small thickets particularly on higher sand dunes and in salt marshes (Miller & Morris 2004, Brown & Mies 2012), near fresh water springs (Figs 4, 5) and mouths of wadis, and is locally found also in seepage areas on limestone cliffs (Deiqab cave in Noged plain).

Distribution. So far only known from Socotra. The host plant, *Tamarix nilotica*, is widely distributed in coastal and arid areas of eastern Africa, Arabia and the Levant (Hassler 2014).

LIVIIDAE
Euphyllurinae

Diaphorina caliginosa sp. nov.
(Figs 18–22, 27–38)

Type locality. Yemen, central Socotra, Hagher mountains, Mt. Skand environs, 12°34′36″N 54°01′30″E, 1450 m a.s.l. (Fig. 23).

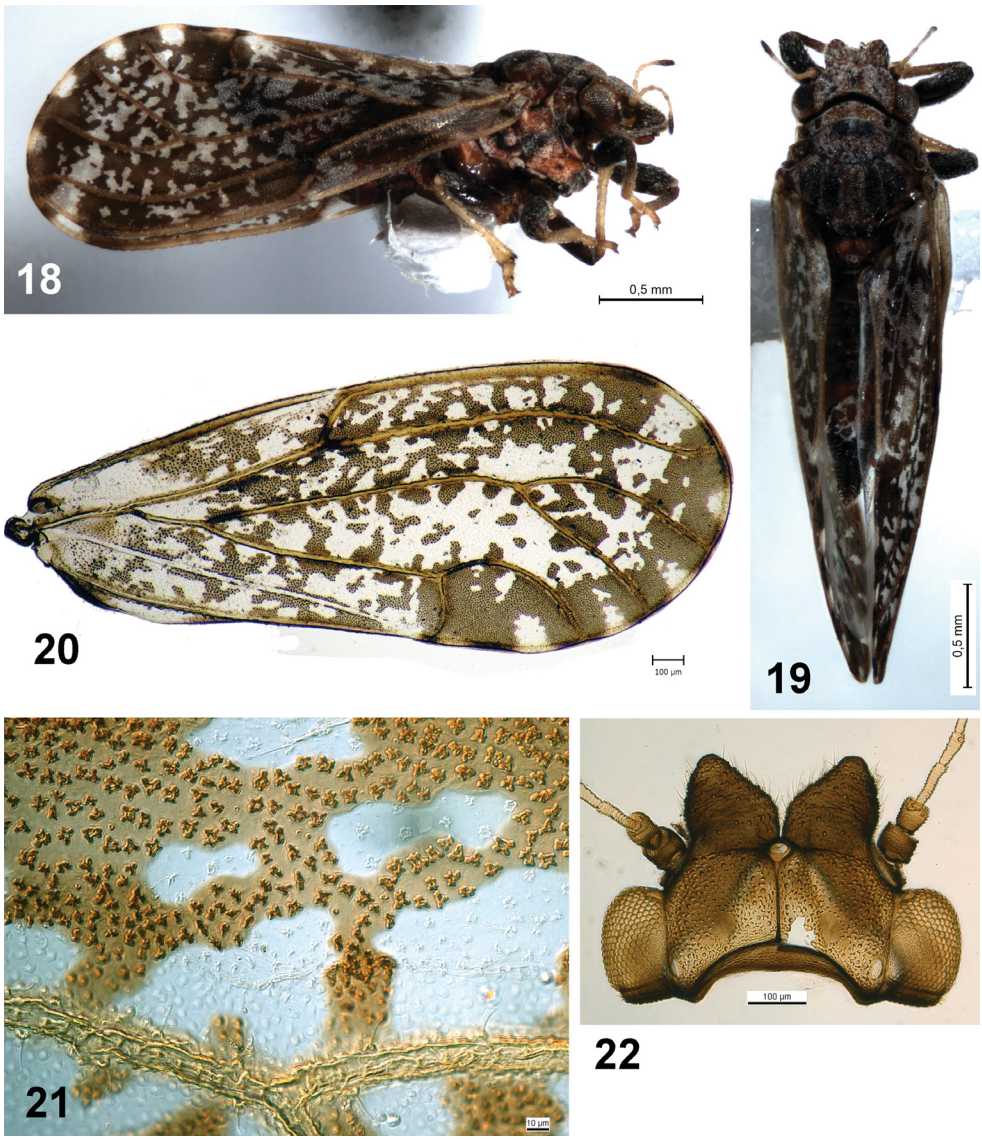
Type material. Holotype: ♂ (MMBC, dry-mounted), 'YEMEN, SOCOTRA Island / Hagher Mts., Scand Mt. env. / 12°34.6′N, 54°01.5′E, 1450 m / montane evergreen woodland / 16.-18.vi.2012 // on *Carissa spinarum* / I. Malenovský leg.'. Paratypes: 12 ♂♂ 9 ♀♀, 1 skin of fifth instar immature, same data as the holotype (MMBC, NHMB, NMPC, dry- and slide-mounted and preserved in alcohol).

Description. ***Adult.*** *Coloration* (Figs 18, 19). Body partly covered with grey waxy secretions. Head including genal processes and thorax dark brown, pronotum medially and mesoscutellum slightly lighter brown, mesoscutum dorsally with blackish brown longitudinal stripes, lateral sclerites of thorax partly red. Eyes dark brown, ocelli red. Antenna dirty yellow, segments 1 and 2 brown, segment 8 fumous, segments 9 and 10 entirely dark brown to black. Legs with tarsi dirty yellow, apical tarsal segments slightly infuscate, tibiae largely dirty yellow, dark brown basally, femora and coxae dark brown. Forewing membrane opaque, off-white, covered from base to apex with many sharply contrasting dark brown irregular patches, fusing into a narrow continuous dark brown band at outer-posterior wing margin, extending from apical tip of r_1 to apex of cu_2 cells and leaving small light semioval patches medially in cells r_2, m_1,

m_2 and cu_1 at wing margin (Fig. 20); veins light brown, short basal portions of M+Cu, M, R_1, R_S and Cu_{1a} dark brown, wing margin with several short dark brown sections at apices of R_1 and Cu_{1b} and in apical wing quarter. Hind wing hyaline, C+Sc vein entirely and apical veins basally dark brown. Abdomen including terminalia dark brown.

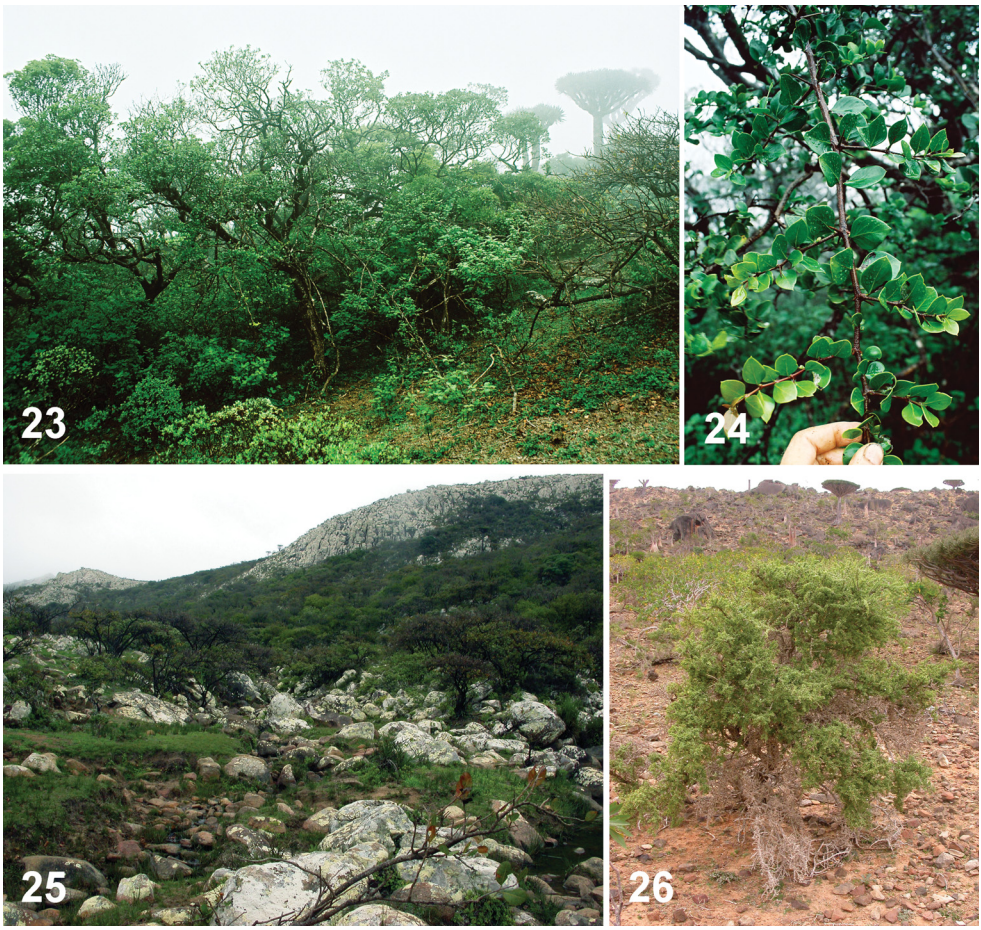
Structure. Integument with coarse microsculpture, matt, covered with short greyish setae. Head slightly inclined from longitudinal body axis. Vertex flat with one distinct fovea on each side of median suture; lateral ocelli lying in plane of vertex, frontal ocellus clearly visible in dorsal view. Genal processes approximately as long as vertex along midline, with straight inner margins contiguous basally and strongly diverging in apical two thirds, lateral margins convex, and apex subacute (Fig. 22). Eyes subglobular. Antenna (Fig. 32) relatively long, about 0.9 as long as head width, with 10 segments; segments 3–7 nearly cylindrical, segment 8 strongly widening to apex; segment 3 longest, segments 4–6 each subequal in length, segments 7 and 8 each shorter than more proximal flagellar segments but each slightly longer than segment 9; single circular rhinarium subapically on segments 4, 6, 8 and 9; rhinaria on segments 4 and 6 each associated with simple seta; segment 10 with terminal setae greatly differing in length: one short (ca. 0.02 mm), stout, and truncate, the other long (ca. 0.06 mm) and slender (Fig. 33). Clypeus nearly flat, basally with few short inconspicuous setae; rostrum short, apical segment with two long setae. Metacoxa with relatively long, pointed meracanthus. Metatibia elongate, rugged basally but lacking genual spine, slightly widening to apex, with a crown of 7 or 8 dark sclerotised spurs apically. Metabasitarsus laterally bearing two dark sclerotised apical spurs. Forewing (Fig. 20) elongate, relatively narrow, broadest in apical quarter, broadly and almost symmetrically rounded apically, with apex lying in cell r_2 close to R_S vein apex; R_S vein sinuate in apical half; membrane densely covered in large, star-shaped surface spinules which are irregularly arranged ca. 7 (6–11) µm apart in middle of cells (Fig. 21) and becoming smaller, simply radular and more densely arranged near veins and along apical wing margin; fore wing veins associated with many short setae inserted into membrane close to veins (Fig. 21). Hind wing costal margin with 2 + 8 ungrouped setae basally and 1 seta apically. Male subgenital plate with slightly sinuate dorsal margin and few sparse short setae postero-ventrally (Fig. 27). Male proctiger relatively broad, with large, apically broadly rounded posterior lobes (Fig. 27). Paramere, in lateral view, nearly parallel-sided, straight; apical part slightly asymmetrical with anterior margin more strongly narrowing to apex than posterior margin; apex narrowly rounded, bearing a small tooth on inner side; inner face covered with numerous long unsclerotised setae (Fig. 28). Distal segment of aedeagus with a simple, obovate apical dilatation, ductus ejaculatorius short and sinuate (Fig. 29). Female terminalia with proctiger, in lateral view, with dorsal margin slightly concave, apex narrowly rounded; circumanal pore ring elliptic with two contiguous rows of pores; subgenital plate, in lateral view, with distinct ventral hump medially, in apical half straight and narrowing to pointed apex (Fig. 30); dorsal and ventral valvulae slightly curved ventrally, smooth, lacking any teeth (Fig. 31).

Measurements (in mm). Males (n = 2): HW 0.59, AL 0.52–0.57, WL 2.21–2.25, WW 0.85–0.89, TL 0.57, MPL 0.31–0.33, PL 0.24–0.25, AEL 0.17–0.18. Females (n = 2): HW 0.60–0.62, AL 0.51–0.54, WL 2.37–2.40, WW 0.94–0.95, TL 0.58, FPL 0.62–0.63, SL 0.47–0.48. Ratios: AL/HW 0.85–0.97, WL/HW 3.75–4.00, WL/WW 2.47–2.60, TL/HW 0.94–0.97, MPL/HW 0.53–0.56, FPL/HW 1.02–1.03, FPL/SL 1.29–1.34.



Figs 18–22. *Diaphorina caliginosa* sp. nov., adult. 18 – habitus, lateral view; 19 – habitus, dorsal view; 20 – forewing; 21 – detail of forewing membrane in cell m_1 at M-fork; 22 – head, dorsal view.

Fifth instar immature (Fig. 34). Body brownish, broad, flat. Margins of head and wing pads lacking any visible setae, caudal plate margin with 120 densely arranged, relatively long, pointed lanceolate setae (Fig. 35). Antenna with 3 segments; apical segment posteriorly with three pointed lanceolate setae and four rhinaria (Fig. 36). Forewing pad with broadly rounded humeral lobe. Tarsal arolium broadly triangular (Fig. 37). Anus ventral,

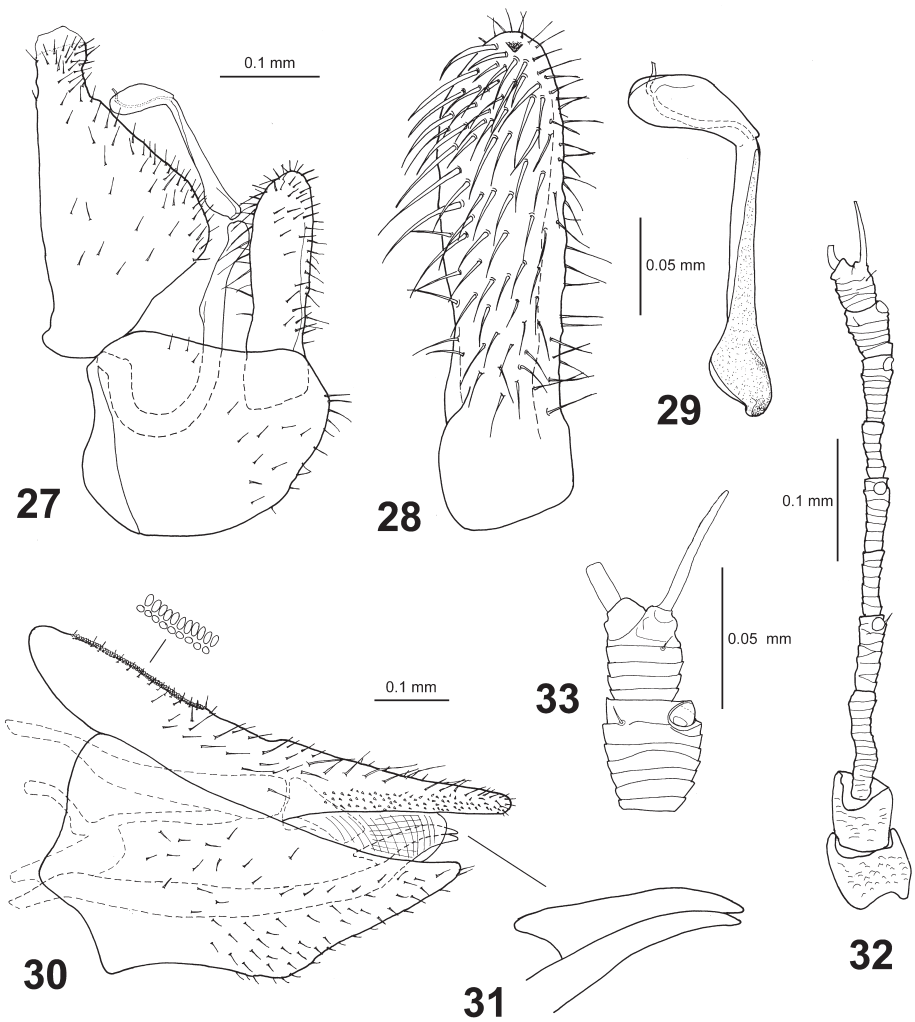


Figs 23–26. Habitats of *Diaphorina* spp. in Socotra. 23 – montane evergreen woodland in Skand area, Hagher Mts., with a *Carissa spinarum* tree in foreground (centre): type locality of *D. caliginosa* sp. nov. 24 – detail of a *Carissa spinarum* twig, host plant of *D. caliginosa* sp. nov. 25 – montane shrubland with open grassland patches in wadi Madar, Hagher Mts.: type locality of *D. hagherensis* sp. nov. 26 – open dry woodland on limestone plateau near Firmihin with a *Lycium sokotranum* shrub in foreground: habitat and host plant of *D. elegans* Burckhardt & Mifsud, 1998. Photographs by I. Malenovský (23, 24) and P. Kment (25, 26).

outer circumanal ring elongate with lateral sides slightly bent forwards, consisting of single row of pores (Fig. 38).

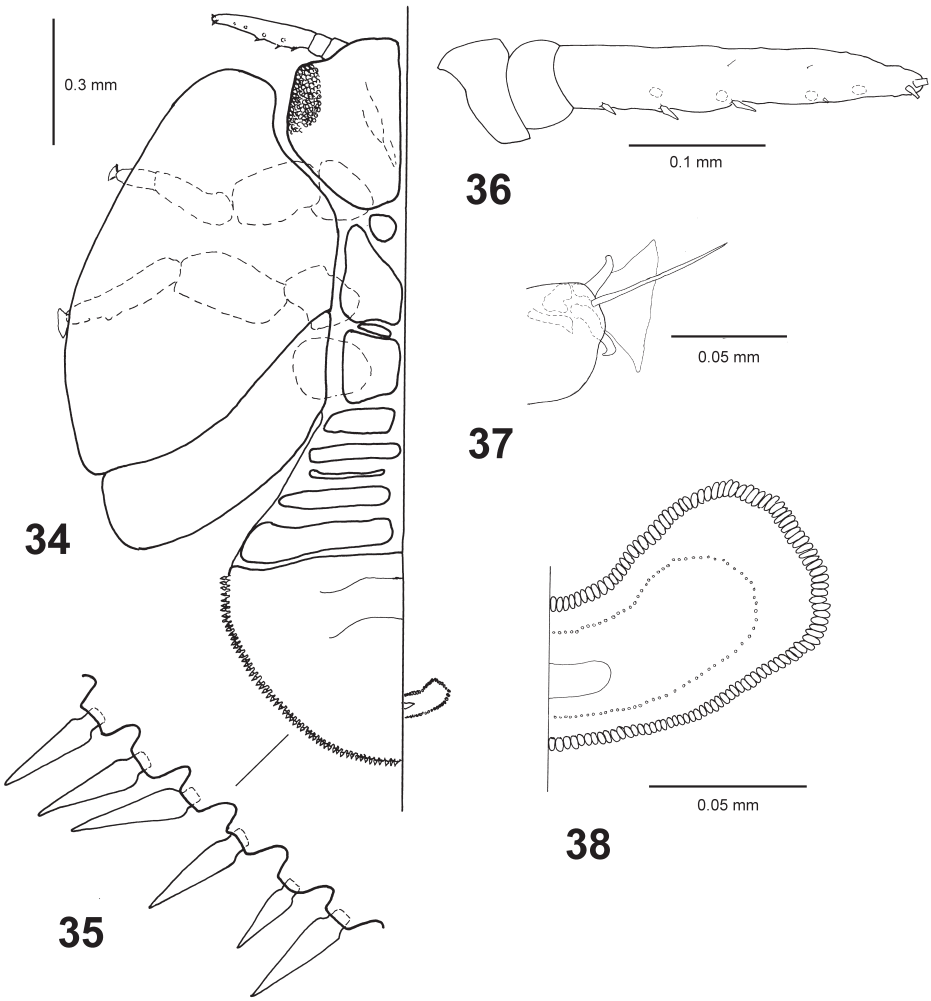
Measurements (n = 1; in mm). BL 1.67, BW 1.66, AL 0.35, FL 1.04, TL 0.34, CPL 0.50, CPW 0.82, CRW 0.18. Ratios: BL/BW 1.01, AL/FL 0.34, CL/CW 0.61, CRW/CPW 0.22.

Differential diagnosis. *Diaphorina* is a large genus with some 80 species described from tropical and subtropical regions of the Old World (Loginova 1978, Ouvrard 2014). Only one of them, *Diaphorina carissae* (Pettey, 1924) from South Africa, has been reported from



Figs 27–33. *Diaphorina caliginosa* sp. nov., adult. 27 – male terminalia, outer lateral view; 28 – paramere, lateral view, inner face; 29 – distal segment of aedeagus, lateral view; 30 – female terminalia, lateral view, with detail of circumanal ring structure; 31 – detail of dorsal and apex of ventral valvulae, lateral view; 32 – antenna; 33 – antennal segments 9 and 10.

Carissa sp., i.e. the same or related host plant as *D. caliginosa* sp. nov. According to the published description, *D. carissae* is generally smaller (HW = 0.4 mm, WL = 1.65 mm, WW = 0.7 mm for female), with lighter head and abdomen (pale yellowish brown to yellow), and shorter genal processes (only a little more than half as long as vertex) than *D. caliginosa* sp. nov. (Pettey 1924, 1925). Both species, however, share a similar forewing shape and macu-



Figs 34–38. *Diaphorina caliginosa* sp. nov., fifth instar immature. 34 – body, dorsal view (left side only, with position and relative size of ventral circumanal pore ring indicated on right side of midline); 35 – detail of lanceolate setae on caudal plate margin; 36 – antenna; 37 – detail of tibiotarsus apex; 38 – detail of circumanal pore ring (right side only).

lation (the dark pattern is perhaps more expanded in *D. carissae*) and may be closely related. A similar forewing shape and pattern is also present in *D. petteyi* Capener, 1970 from South Africa which is, however, slightly larger compared to *D. caliginosa* sp. nov., paler in general coloration, and its immatures have circumanal pore ring composed of four rows of pores and are associated with a different plant (*Polygala myrtifolia* L., Polygalaceae) (Capener 1970). The coarse surface spinulation of the forewing membrane of *D. caliginosa* sp. nov. is similar to *D. citri* Kuwayama, 1907 and *D. communis* Mathur, 1975 which are associated with

Murraya and *Citrus* spp. (Rutaceae) and differ, besides other characters, in a more angulate apical portion of anterior forewing margin (Mathur 1975, Loginova 1978), which is regularly rounded in *D. caliginosa* sp. nov. From other three *Diaphorina* spp. currently known from Socotra, *D. caliginosa* sp. nov. differs in characters given in the key below.

Etymology. Derived from the Latin adjective *caliginosus* (= covered with mist, foggy, cloudy, dark, gloomy), referring to the weather conditions under which the type series was collected and the generally dark coloration of the species.

Host plant. *Carissa spinarum* L. (Apocynaceae) (Figs 23–24).

Biology. Adults and one skin of a fifth instar immature were found close to the central vein on lower surface of leaves of the host plant. Adults, often immerged in water drops from condensed fog, were attached to the leaf only with their fore body, with abdomen oriented almost vertically towards the ground. No deformations of the host plant could be observed.

Occurrence in Socotra. Found only in one small area in the highest part of the Hagher mountains, in a dense montane evergreen woodland belonging to the *Leucas hagghierensis--Pittosporum viridiflorum* community (Kürschner et al. 2006, Brown & Mies 2012; Fig. 23).

Distribution. So far only known from the Socotra Island. The host plant, *Carissa spinarum*, in its currently accepted taxonomic definition, is very widely distributed throughout Africa, Madagascar, Seychelles, Mascarenes, Arabia, India, China, South East Asia, Australia and New Guinea (Hassler 2014).

Diaphorina elegans Burckhardt & Mifsud, 1998

(Figs 39–43, 49–55)

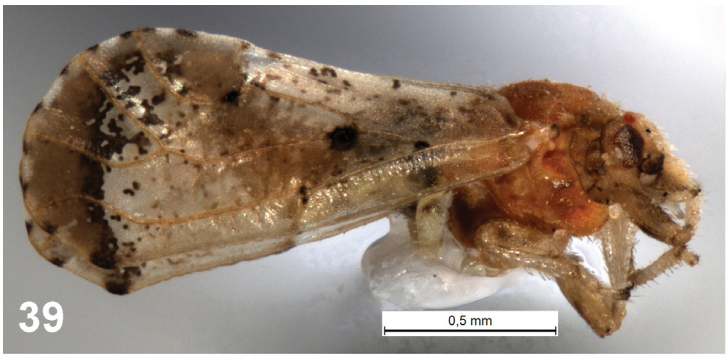
Diaphorina elegans Burckhardt & Mifsud, 1998: 26; Burckhardt & Harten (2006): 204.

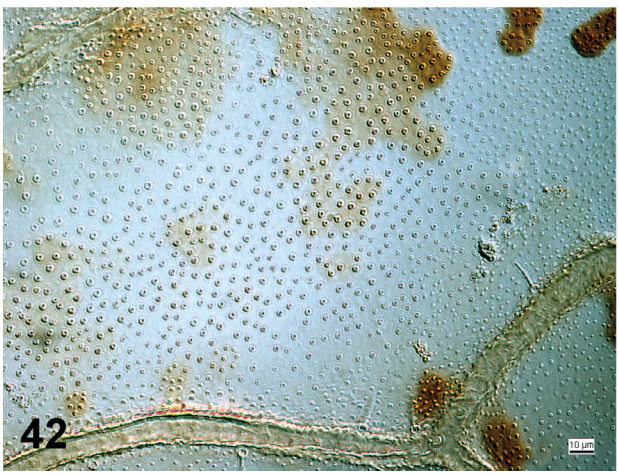
Type material examined. Holotype ♀ (MHNG, dry-mounted): Yemen, Socotra, Noged, 16.iv.1993, on *Suaeda* sp., A. van Harten leg. Paratype: 1 ♀, same data as holotype but Noged to Hadiboh (MHNG, slide-mounted).

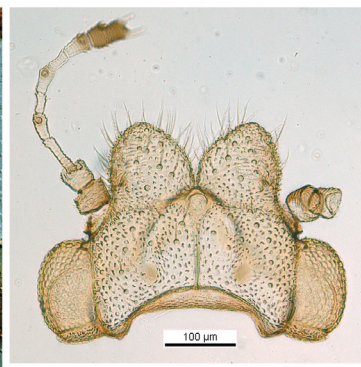
Additional material examined. 12 ♂♂ 16 ♀♀, north-eastern Socotra, Homhil protected area, 12°34′30″N 54°18′30″E, 435 m, 11.vi.2012, open dry woodland with *Boswellia elongata* and *Dracaena cinnabari* trees, on *Lycium sokotranum*, I. Malenovský, P. Kment & J. Bezděk leg.; 6 ♂♂ 6 ♀♀, north-eastern Socotra, Kazazhan area, 12°33′48″N 54°19′48″E, 540 m, 10.vi.2012, dry shrubland, on *Lycium sokotranum*, I. Malenovský leg.; 1 ♂, central Socotra, Dixam plateau, wadi Zerig, 12°29′36″N 53°59′30″E, 655 m, 13.–14.vi.2012, open *Dracaena cinnabari* woodland, I. Malenovský leg.; 5 ♂♂ 4 ♀♀, southern Socotra, northern edge of Noged plain, Deiqab cave entrance environs, 12°23′03″N 54°00′56″E, 115 m, 12.vi.2012, *Croton socotranus* and *Jatropha unicostata* shrubland, on *Lycium sokotranum*, I. Malenovský leg. (MMBC, NHMB, NMPC; dry- and slide-mounted and preserved in alcohol).

Description. ***Adult*** female was described by Burckhardt & Mifsud (1998). Here we provide description also for the male: Similar in coloration and structure to female. Male subgenital plate with slightly sinuate dorsal margin and few sparse, moderately long setae posteroventrally (Fig. 49). Male proctiger relatively broad, with well-developed, broadly rounded posterior lobes (Fig. 49). Paramere, in lateral view, slightly clavate with apex slightly bent posteriorly; apex broadly rounded, bearing a small tooth on inner side; inner face covered with numerous long unsclerotised setae (Fig. 50). Distal segment of aedeagus with a simple, obovate apical dilation, ductus ejaculatorius short and sinuate (Fig. 51).

Measurements (in mm). Males (n = 2): HW 0.43, AL 0.35–0.37, WL 1.46–1.51, WW 0.63–0.72, TL 0.38–0.41, MPL 0.24–0.25, PL 0.18, AEL 0.14. Females (n = 3, including







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Figs 39–43. *Diaphorina elegans* Burckhardt & Mifsud, 1998, adult. 39 – habitus, lateral view; 40 – habitus, dorsal view; 41 – forewing; 42 – detail of forewing membrane in cell m_1 at M-fork; 43 – head, dorsal view.

values from Burckhardt & Mifsud 1998): HW 0.43–0.46, AL 0.34–0.35, WL 1.53–1.60, WW 0.69–0.74, TL 0.36–0.40, FPL 0.41–0.49, SL 0.29–0.38. Ratios: AL/HW 0.74–0.86, WL/HW 3.33–3.63, WL/WW 2.03–2.40, TL/HW 0.84–0.93, MPL/HW 0.56–0.58, FPL/HW 0.85–1.00, FPL/SL 1.21–1.41.

Fifth instar immature unknown.

Differential diagnosis. *Diaphorina elegans* is easily diagnosable within the genus by the strongly angular apical portion of the forewing anterior margin and the forewing pattern (Figs 39, 41).

Host plant. *Lycium sokotranum* Wagner & Vierh. (Solanaceae) (Fig. 26). Although no immature stages could be collected, *D. elegans* was invariably associated with this plant in Socotra. *Suaeda* sp. (Chenopodiaceae) reported by Burckhardt & Mifsud (1998) and Burckhardt & Harten (2006) as a possible host plant (based on a record of a single specimen) is not confirmed here.

Biology. Unknown. No deformations were observed on the host plant with the presence of the psyllid.

Occurrence in Socotra. Probably widespread, although perhaps somewhat local, at lower and medium elevations in the vegetation of the coastal plains (e.g. the *Croton socotranus* community *sensu* Brown & Mies 2012) and open woodland on limestone plateaus (*Buxanthus pedicellatus–Dracaena cinnabari* community, Brown & Mies 2012), including dry and grazed areas (Fig. 26).

Distribution. So far only known from the Socotra Island. The host plant is endemic to Socotra (Miller & Morris 2004, Brown & Mies 2012).

Diaphorina hagherensis sp. nov.

(Figs 44–48, 56–62)

Type locality. Yemen, central Socotra, Hagher mountains, wadi Madar, 12°33′12″N 54°00′24″E, 1180–1230 m a.s.l. (Fig. 25).

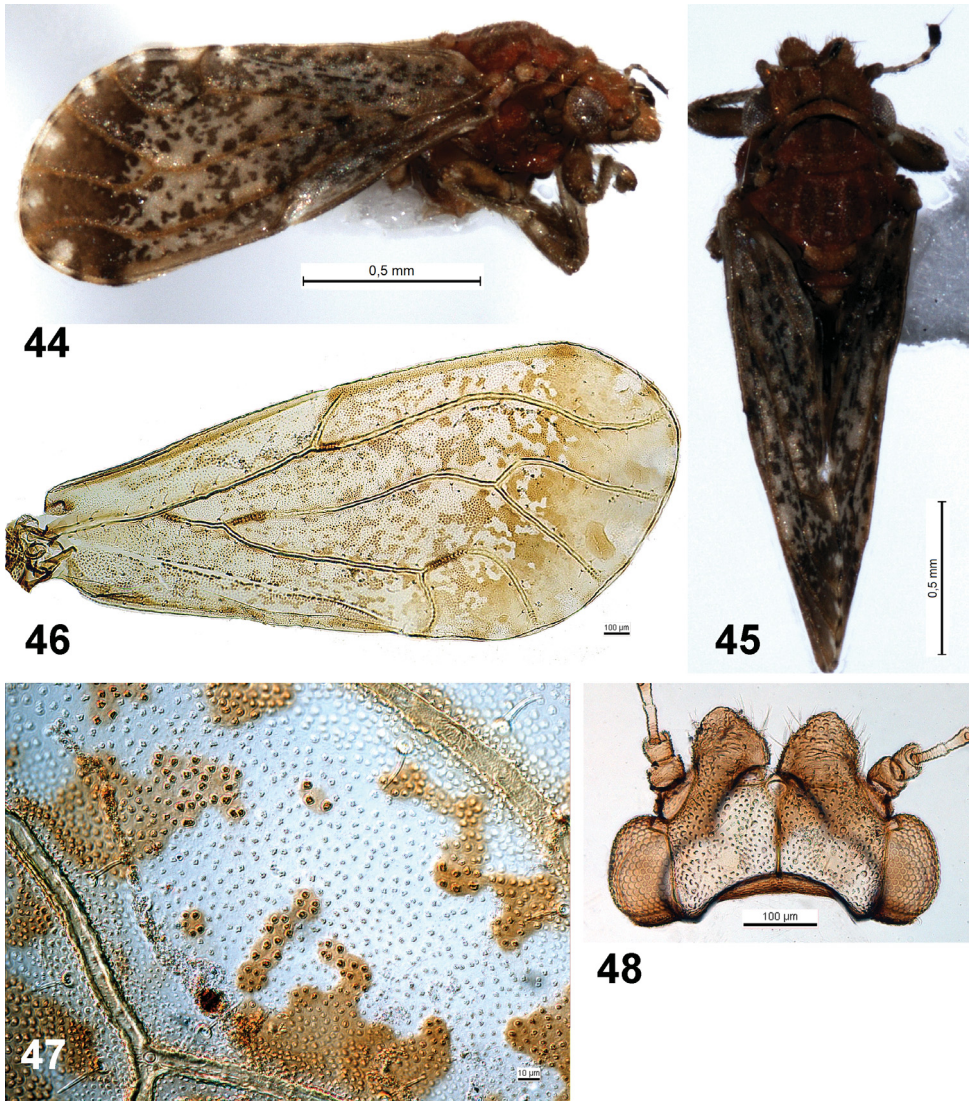
Type material. Holotype: ♂ (MMBC, dry-mounted, abdomen detached and stored in glycerin in a plastic vial pinned under the specimen), 'YEMEN, Socotra Island / Al Haghier Mts. / wadi Madar, 1180–1230 m / 12°33.2′N, 54°00.4′E / J. Bezděk leg., 12-14.xi.2010'. Paratypes: 1 ♀, same locality as the holotype but 1170 m, 18.vi.2012, swept from herbaceous vegetation in montane shrubland with dominant *Cephalocroton socotranus*, I. Malenovský leg. (MMBC, dry-mounted); 1 ♀, central Socotra, Hagher mountains, Tudhen, 12°32′42″N 53°59′54″E, 1135 m, 22.vi.2012, swept from herbaceous vegetation in montane shrubland with dominant *Commiphora planifrons*, I. Malenovský leg. (MMBC, slide-mounted); 1 ♂, same data (NHMB, dry-mounted).

Description. ***Adult.*** *Coloration* (Figs 44, 45). Head including genal processes, pronotum and mesoscutellum orange brown. Mesopraescutum, mesoscutum, metascutum and lateral sclerites of thorax slightly darker red brown with indistinct longitudinal brownish stripes on anterior part of mesopraescutum and dorsum of mesoscutum. Eyes grey. Antenna dirty yellow, segment 1 light brown, apices of segments 4, 6, 8 and entire segments 9, 10 dark brown to black. Legs with tibiae and basal tarsal segments dirty pale yellow, apical tarsal segments infuscate, pro- and mesofemur extensively dark brown on inner (posterior) side, metafemur ochreous, metacoxa largely dark brown with dirty pale yellow meracanthus. Forewing membrane opaque, off-white, with many small dark brown patches densely and irregularly scattered in basal three quarters of wing and a broad dark brown band in apical quarter leaving small

light semioval patches medially in cells r_1, r_2, m_1, m_2 and cu_1 at wing margin; veins ochreous, M+Cu, M, R_S and Cu_{1a} basally shortly dark brown, wing marginal vein with short dark brown sections at apices of R_1 and Cu_{1b} and ca. 11 sections in apical wing quarter at nearly regular intervals, costal and anal veins basally brownish (Fig. 46). Hind wing hyaline, C+Sc vein dark brown. Abdomen with tergites dark brown, sternites lighter brown, terminalia ochreous.

Structure. Integument with coarse microsculpture, matt, covered with conspicuous, relatively long yellowish setae; particularly on head and thorax dorsum and forewings in females setae appear clavate due to waxy exudations. Head slightly inclined from longitudinal body axis. Vertex flat with one distinct fovea on each side of median suture; lateral ocelli lying in plane of vertex, frontal ocellus clearly visible in dorsal view. Genal processes distinctly shorter than vertex, about 0.75 times as long as vertex along midline, with strongly diverging inner margins, convex lateral margins and narrowly rounded apex (Fig. 48). Eyes subglobular. Antenna (Fig. 61) relatively short, about 0.8 as long as head width, with 10 segments; segments 3, 5, 6 nearly cylindrical, segments 4, 6 slightly, segment 8 strongly widening to apex; segment 3 longest, segments 4–7 each subequal in length, segment 8 shorter, about as long as segment 9; single circular rhinarium subapically on segments 4, 6, 8 and 9; rhinaria on segments 4 and 6 each associated with simple seta; segment 10 with terminal setae greatly differing in length: one short (ca. 0.02 mm), stout, and truncate, the other long (ca. 0.06 mm) and slender (Fig. 62). Clypeus nearly flat, basally with few short inconspicuous setae; rostrum short, apical segment with two long setae. Metacoxa with relatively long, pointed meracanthus. Metatibia elongate, rugged basally but lacking genual spine, slightly widening to apex, with a crown of six dark sclerotised spurs apically. Metabasitarsus laterally bearing two dark sclerotised apical spurs. Forewing narrowly and asymmetrically pyriform, strongly diverging to apex, broadest in apical quarter; costal margin nearly straight in basal three quarters and slightly angulate in apical quarter, apex narrowly rounded, lying in cell r_2 close to R_S apex; R_S vein strongly sinuate (Fig. 46); forewing membrane densely covered in small, somewhat star-shaped surface spinules which are irregularly arranged ca. 5 (3–8) μm apart in middle of cells and become smaller, simply radular and more densely arranged near veins and along wing apical margin; fore wing veins associated with conspicuous, relatively long setae which are inserted into membrane relatively wide apart from veins (Fig. 47). Male subgenital plate with slightly sinuate dorsal margin and few sparse, moderately long setae postero-ventrally (Fig. 56). Male proctiger relatively narrow, with small posterior lobes (Fig. 56). Paramere, in lateral view, slightly clavate with apex strongly bent posteriorly; apex broadly rounded, bearing a small tooth on inner side; inner face covered with numerous long unsclerotised setae (Fig. 57). Distal segment of aedeagus with a simple, obovate apical dilation, ductus ejaculatorius short and sinuate (Fig. 58). Female terminalia with proctiger, in lateral view, with dorsal margin nearly straight, apex narrowly rounded; circumanal pore ring elliptic with two contiguous rows of pores; subgenital plate, in lateral view, with distinct hump at middle of its length ventrally, in apical half straight and narrowing to pointed apex (Fig. 59); dorsal and ventral valvulae slightly curved ventrally, smooth, lacking any teeth (Fig. 60).

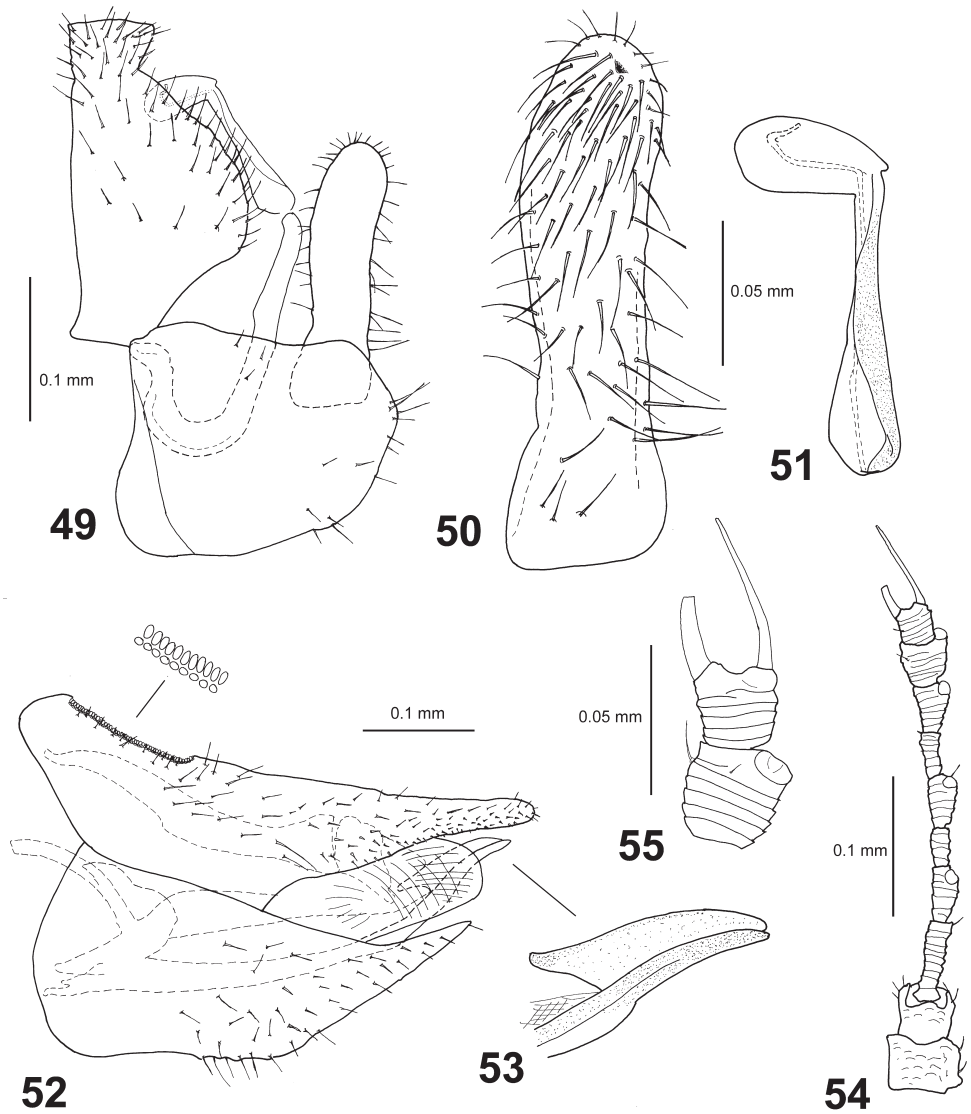
Measurements (in mm). Male (n = 1, holotype, measured dry-mounted, except for terminalia): HW 0.45, AL 0.35, WL 1.40, WW 0.63, TL 0.35, MPL 0.26, PL 0.18, AEL 0.13.



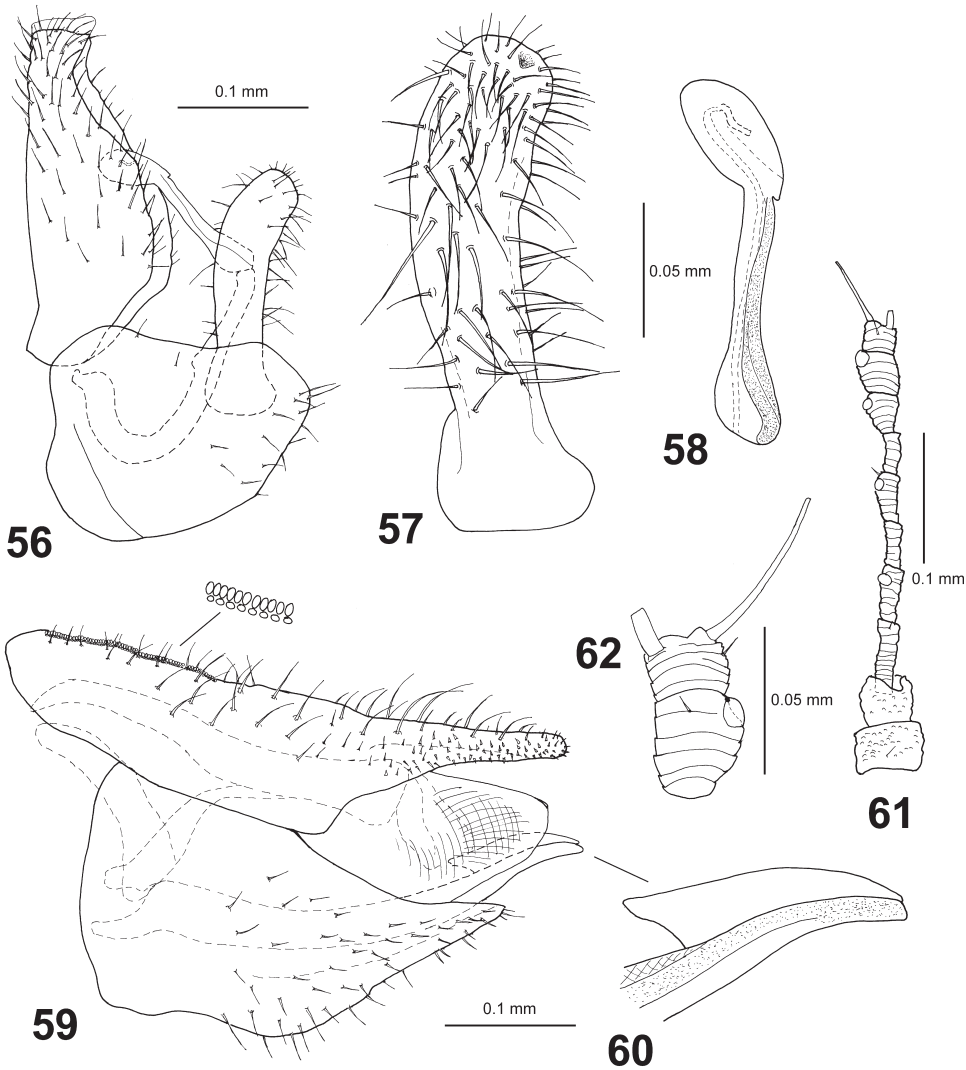
Figs 44–48. *Diaphorina hagherensis* sp. nov., adult. 44 – habitus, lateral view; 45 – habitus, dorsal view; 46 – forewing; 47 – detail of forewing membrane in cell m_1 at M-fork; 48 – head, dorsal view.

Female (n = 1): HW 0.44, AL 0.36, WL 1.43, WW 0.65, TL 0.35, FPL 0.42, SL 0.32. Ratios: AL/HW 0.78–0.82, WL/HW 3.11–3.25, WL/WW 2.20–2.22, TL/HW 0.78–0.80, MPL/HW 0.58, FPL/HW 0.95, FPL/SL 1.31.

Fifth instar immature unknown.



Figs 49–55. *Diaphorina elegans* Burckhardt & Mifsud, 1998, adult. 49 – male terminalia, outer lateral view; 50 – paramere, lateral view, inner face; 51 – distal segment of aedeagus, lateral view; 52 – female terminalia, lateral view, with detail of circumanal ring structure; 53 – detail of dorsal and apex of ventral valvulae, lateral view; 54 – antenna; 55 – antennal segments 9 and 10.



Figs 56–62. *Diaphorina hagherensis* sp. nov., adult. 56 – male terminalia, outer lateral view; 57 – paramere, lateral view, inner face; 58 – distal segment of aedeagus, lateral view; 59 – female terminalia, lateral view, with detail of circumanal ring structure; 60 – detail of dorsal and apex of ventral valvulae, lateral view; 61 – antenna; 62 – antennal segments 9 and 10.

Differential diagnosis. From described *Diaphorina* species, *D. hagherensis* sp. nov. is perhaps most similar in general habitus, shape of the genal processes, shape of the forewing, presence of a continuous dark brown band along apical forewing margin, and shape of the female terminalia to *D. luteola* Loginova, 1978, known from Sudan, mainland Yemen, Bahrain, United Arab Emirates, Palestine and Iran (Loginova 1978, Burckhardt & Mifsud 1998, Burckhardt 2008). The latter species is, however, generally larger (WL = 1.62–1.90 mm) and paler in general body coloration as well as the forewing pattern; the dark band along apical wing margin is narrower (covering apical one fifth to seventh of wing) and less continuous (e.g. the light patch at apex of r_1 cell extends across R_S vein into r_2 cell in many specimens) in *D. luteola* than in *D. hagherensis* sp. nov.; further differences include the shape of the male paramere which is nearly straight in *D. luteola* (figured in Loginova 1978 and Burckhardt & Mifsud 1998) but distinctly bent backwards in *D. hagherensis* sp. nov. Similar form of the genal processes, female terminalia and forewing pattern is probably also present in *D. heslopharrisoni* Loginova, 1978 and *D. cluytiaria* Loginova, 1978 described from Ethiopia; both species are, however, much larger in general size (FW > 2.8 mm in *D. heslopharrisoni* and 4.0 mm in *D. cluytiaria*; Loginova 1978) than *D. hagherensis* sp. nov. From species currently known from Socotra, *D. hagherensis* sp. nov. is most similar to *D. elegans* which is different mainly in the forewing shape and pattern (see the key below).

Etymology. Derived from the Hagher mountains in central Socotra where the type series was collected; adjective.

Host plant and biology. Unknown. Adult specimens of the type series were swept from grassland patches (herb layer) within a species-rich montane shrubland vegetation but could not be associated with any definite host plant.

Occurrence in Socotra. Found only in two small localities in the Hagher mountains within the montane shrubland zone dominated by *Cephalocroton socotranus* Balf.f., *Croton sulcifructus* Balf.f. and *Commiphora planifrons* (Balf.f.) Engl. but with small open (grazing) places with fresh to moderately humid grassland (Fig. 25).

Distribution. So far only known from the Socotra Island.

Diaphorina sp.

Diaphorina sp. 2: Burckhardt & Mifsud (1998): 37.
Diaphorina sp. Y2: Burckhardt & Harten (2006): 205.

Material examined. 1 ♂ 2 ♀♀, Socotra, Noged to Hadiboh, 16.iv.1993, A. van Harten leg. (MHNG, dry- and slide-mounted).

Comments. Adult male and female were briefly described by Burckhardt & Mifsud (1998) including illustrations of head, forewing, male and female terminalia. The forewing is elongate, apically broadly rounded, with a faint pattern consisting of dark spots and dark veins, and differs from the other *Diaphorina* spp. reported from Socotra in the present paper. The relative size and shape of the genal processes and the weakly produced posterior lobes of the male proctiger resemble *D. hagherensis* sp. nov., which, however differs in a smaller general size and the paramere apically curved backwards. The material probably represents an undescribed species which has not been formally described, awaiting more material, ideally also immatures, and host plant information (Burckhardt & Harten 2006).

PHACOPTERONIDAE

Pseudophacopteron verrucifrons Burckhardt & Harten, 2006

(Figs 63–69)

Pseudophacopteron sp.: Burckhardt & Mifsud (1998): 10.
Pseudophacopteron verrucifrons Burckhardt & Harten, 2006: 191; Malenovský & Burckhardt (2009): 30.

Material examined. Numerous ♂♂ ♀♀, 4 fifth and 1 fourth instar immatures, central Socotra, Hagher mountains, Tudhen, 12°32′42″N 53°59′54″E, 1135 m, 18. and 22.vi.2012, on *Commiphora planifrons*, I. Malenovský & P. Kment leg.; 2 fourth and 1 third instar immatures, central Socotra, Dixam plateau, wadi Dirhor near Firmihin protected area, 12°28′00″N 54°00′30″E, 340 m, 15.vi.2012, open dry woodland with *Boswellia ameero* trees, on *Commiphora parvifolia*, I. Malenovský leg.; 2 ♂♂ 8 ♀♀, north-eastern Socotra, Homhil protected area, 12°34′30″N 54°18′30″E, 435 m, 10.–11.vi.2012, open dry woodland with *Boswellia elongata* and *Dracaena cinnabari* trees, on *Commiphora parvifolia*, I. Malenovský leg.; 1 ♂♂ 3 ♀♀, north-eastern Socotra, Kazazhan area, 12°33′48″N 54°19′48″E, 540 m, 10.vi.2012, open dry woodland, on *Commiphora parvifolia*, I. Malenovský leg. (MMBC, NMPC; dry- and slide--mounted and preserved in alcohol).

Description. ***Adult*** male and female described and figured by Burckhardt & Harten (2006) and Malenovský & Burckhardt (2009).

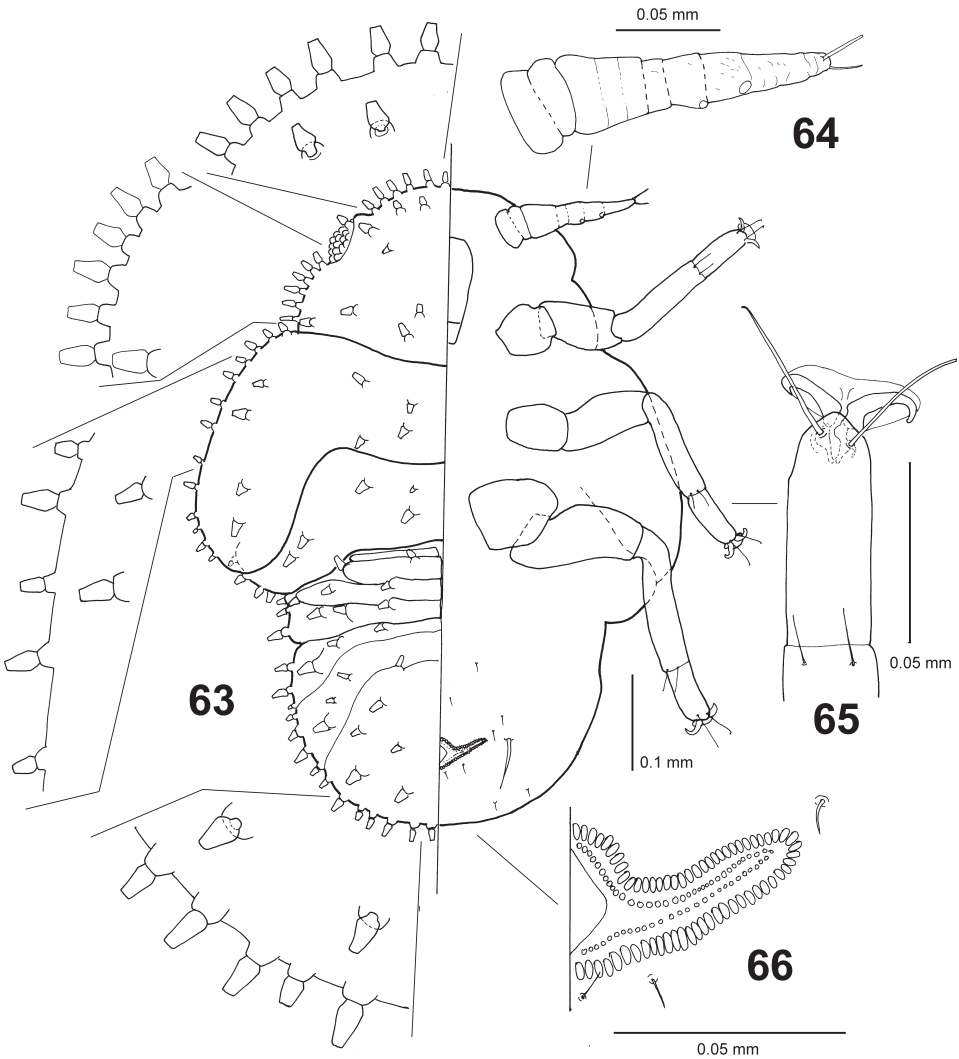
Fifth instar immature (Figs 63, 69). Pale yellow with numerous small dark brown markings on body dorsum. Body robust, oval. Body margin and dorsum with large truncate lanceolate setae in following numbers: margin (one side only, except abdomen): head 5–8, prothorax 5–7, forewing pad 12–16, hindwing pad 3–5, abdomen (both sides) 30–32; dorsum (one side only): cephaloprothorax 8–10, mesothorax including forewing pads 8–16, metathorax including hindwing pads 6–8, abdomen 18–22. Eye with 1 truncate lanceolate seta. Antenna straight, directed obliquely forwards, short, 2-segmented, basal segment with one and flagellum with five incomplete subdivisions, flagellum with two rhinaria (Fig. 64). Tarsal arolium membranous, fan-shaped, as large as claws (Fig. 65). Abdomen dorsally with four free sclerites and incompletely fused caudal plate; caudal plate margin broadly rounded. Anus in ventral position. Circumanal ring moderately large, with fore and hind margin close together; outer ring composed of a single row of pores, not sinuate (Fig. 66).

Measurements (n = 4; in mm). BL 0.72–0.90, BW 0.53–0.59, AL 0.15–0.19, FL 0.28–0.31, TL 0.22–0.25, CPL 0.31–0.41, CPW 0.34–0.45, CRW 0.10–0.11. Ratios: BL/BW 1.31–1.53, AL/FL 0.50–0.61, CL/CW 0.86–0.91, CRW/CPW 0.22–0.29.

Differential diagnosis. The fifth instar immature of *P. verrucifrons* resembles immatures of *P. marmoratum* Malenovský & Burckhardt, 2009 (sympatric with *P. verrucifrons* on *Commiphora africana* in Kenya) and *P. stigmatum* Malenovský & Burckhardt, 2009 (associated with *Aucoumea klaineana* in tropical West Africa and South Africa) in the relatively robust body (ratio BL/BW ≤ 1.50), ventral anus, and short, obliquely forwards directed antenna. Lanceolate setae in both these similar species are, however, confined only to the body margin (in *P. marmoratum* only to the apex of the caudal plate) and are completely missing on the body dorsum, in contrast to *P. verrucifrons*. The fifth instar immature of *P. marmoratum* is also larger than *P. verrucifrons* (BL > 1.0) (Malenovský & Burckhardt 2009).

Host plants. Found on *Commiphora africana* (A.Rich.) Endl. in Kenya (Burckhardt & Harten 2006, Malenovský & Burckhardt 2009); in Socotra associated with *Commiphora parvifolia* (Balf.f.) Engl. and *C. planifrons* (Balf.f.) Engl. (Burseraceae) (Fig. 70).

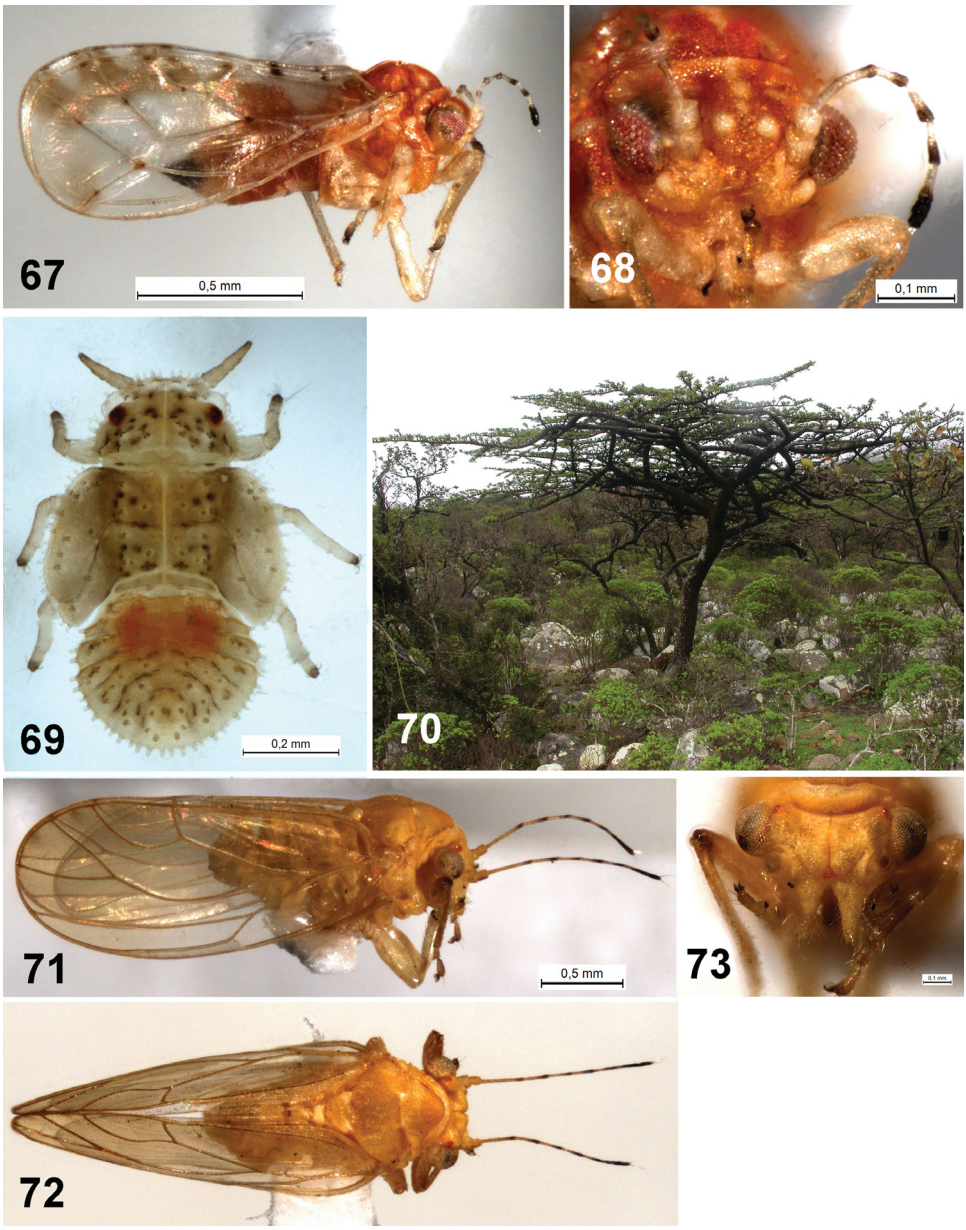
Biology. Immatures were found free-living on lower surface of leaves of *Commiphora parvifolia* and *C. planifrons* which are quite small in size (only one immature individual of *P.*



Figs 63–66. *Pseudophacopteron verrucifrons* Burckhardt & Harten, 2006, fifth instar immature. 63 – body, left dorsal view with details of lanceolate setae on cephaloprothorax, forewing pad and abdomen, right ventral view; 64 – antenna; 65 – detail of tibiotarsus apex; 66 – detail of circumanal pore ring (right side only).

verrucifrons per leaf was observed each time). No deformations were observed on the hosts which could be associated with the development or feeding activity of *P. verrucifrons*.

Occurrence in Socotra. Probably widespread, although quite local on *Commiphora parvifolia* in open dry woodland on limestone plateaus in central and eastern Socotra and on *C. planifrons* in montane shrubland on southern slopes of the Hagher Mts. (Fig. 70).



Figs 67–73. 67–70 – *Pseudophacopteron verrucifrons* Burckhardt & Harten, 2006, habitus and habitat. 67 – adult, habitus, lateral view; 68 – adult, head, oblique frontal view; 69 – fifth instar immature, dorsal view (alcohol-preserved specimen); 70 – montane shrubland with *Commiphora planifrons* in Tudhen, Hagher Mts.: habitat and host plant of *P. verrucifrons* (photograph by P. Kment). 71–73 – *Cacopsylla* sp., adult. 71 – habitus, lateral view; 72 – habitus, dorsal view; 73 – head, frontal view.

Distribution. Kenya, mainland Yemen (Burckhardt & Harten 2006, Malenovský & Burckhardt 2009); Oman (unpublished record; A. Al-Wahaibi, pers. comm.), Socotra (new record). One of the known host plants, *Commiphora africana*, is widely distributed in the Afrotropical Region and the Arabian Peninsula (Hassler 2014) while *C. parvifolia* and *C. planifrons* are endemics of Socotra (Miller & Morris 2004, Brown & Mies 2012).

PSYLLIDAE

Cacopsylla sp.

(Figs 71–73)

Material examined. 7 ♂♂ 2 ♀♀, central Socotra, Hagher Mts., Mt. Scand env., 12°34′36″N, 54°01′30″E, 1450 m, montane evergreen woodland, 16.–18.vi.2012, on *Pittosporum viridiflorum*, I. Malenovský & P. Kment leg. 1 ♂, central Socotra, Aloove village environs, 12°30′58″N, 54°06′39″E, 270–350 m, 3.–4.ii.2010, at light, L. Purchart & J. Vybíral leg. (MMBC, NHMB, dry-mounted and preserved in alcohol).

Host plant. Adults were collected on *Pittosporum viridiflorum* Sims (Pittosporaceae) which is probably the host plant.

Occurrence in Socotra. Probably restricted to the montane evergreen woodland of the *Leucas hagghierensis-Pittosporum viridiflorum* community (Kürschner et al. 2006, Brown & Mies 2012) at the highest elevations of the Hagher Mts. One specimen (vagrant?) has been collected at light also at low altitude.

Comments. The specimens probably belong to an undescribed species related to *Cacopsylla tobirae* (Miyatake, 1964) which is associated with *Pittosporum tobira* (Thunb.) W.T. Aiton, occurs in eastern Asia (Japan, Korea, China and Taiwan) and has recently been introduced into California (Yang 1984, Percy et al. 2012). The Socotra specimens may be closely related to or conspecific with the material reported from *Pittosporum viridiflorum* in Cameroon by Dzokou et al. (2009). No formal description is provided here, awaiting a revision of the whole group of *Pittosporum* feeding Psyllinae which includes additional taxa. The host plant of *Cacopsylla* sp. from Socotra, *Pittosporum viridiflorum*, is widely distributed throughout the Afrotropical Region, Madagascar, southern India and has been introduced into the Hawaii Islands (Hassler 2014).

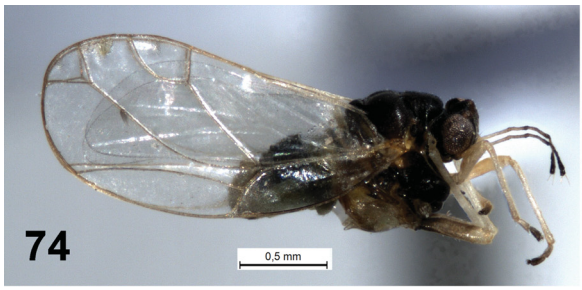
TRIOZIDAE

Pauropsylla jarmilarum sp. nov.

(Figs 74–76, 78–94)

Type locality. Yemen, central Socotra, Dixam plateau, ca. 1 km NE Shibhon village, limestone cliffs at viewpoint over gorges, 12°29′20″N 53°59′49″E, ca. 680 m a.s.l.

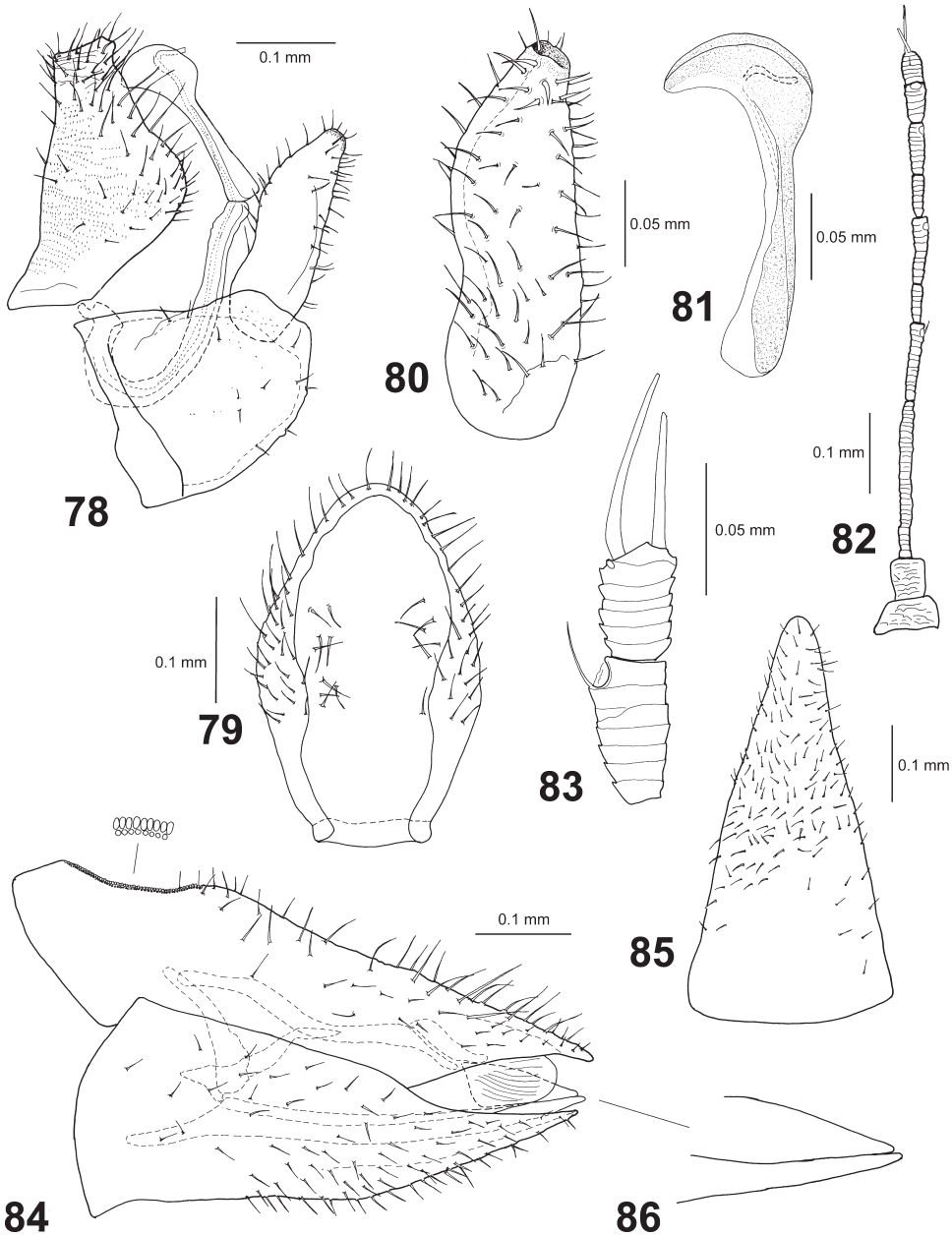
Type material. Holotype: ♂ (MMBC, dry-mounted), 'YEMEN, SOCOTRA Island / Dixam plateau, view point near / Shibhon village, 15.vi.2012 / 12°29′20″N, 53°59′49″E, 550-680 m / rocks+*Croton socotranus* shrubland // inducing pit galls / on *Ficus vasta* / I. Malenovský leg.'. Paratypes: 2 ♂♂ 3 ♀♀, same data as the holotype; 3 ♂♂, 7 fifth instar and 6 fourth instar immatures, north-eastern Socotra, Homhil protected area, surroundings of Ain Tsahrin spring, 12°34′12″N 54°18′30″E, 435 m, 11.vi.2012, on *Ficus vasta*, I. Malenovský leg.; 2 ♂♂ 3 ♀♀, north-eastern Socotra, Kazazhan area, 12°33′48″N 54°19′48″E, 540 m, 10.vi.2012, limestone cliffs, in sink holes, on *Ficus vasta*, I. Malenovský leg. (MMBC, NHMB, NMPC; dry- and slide-mounted).



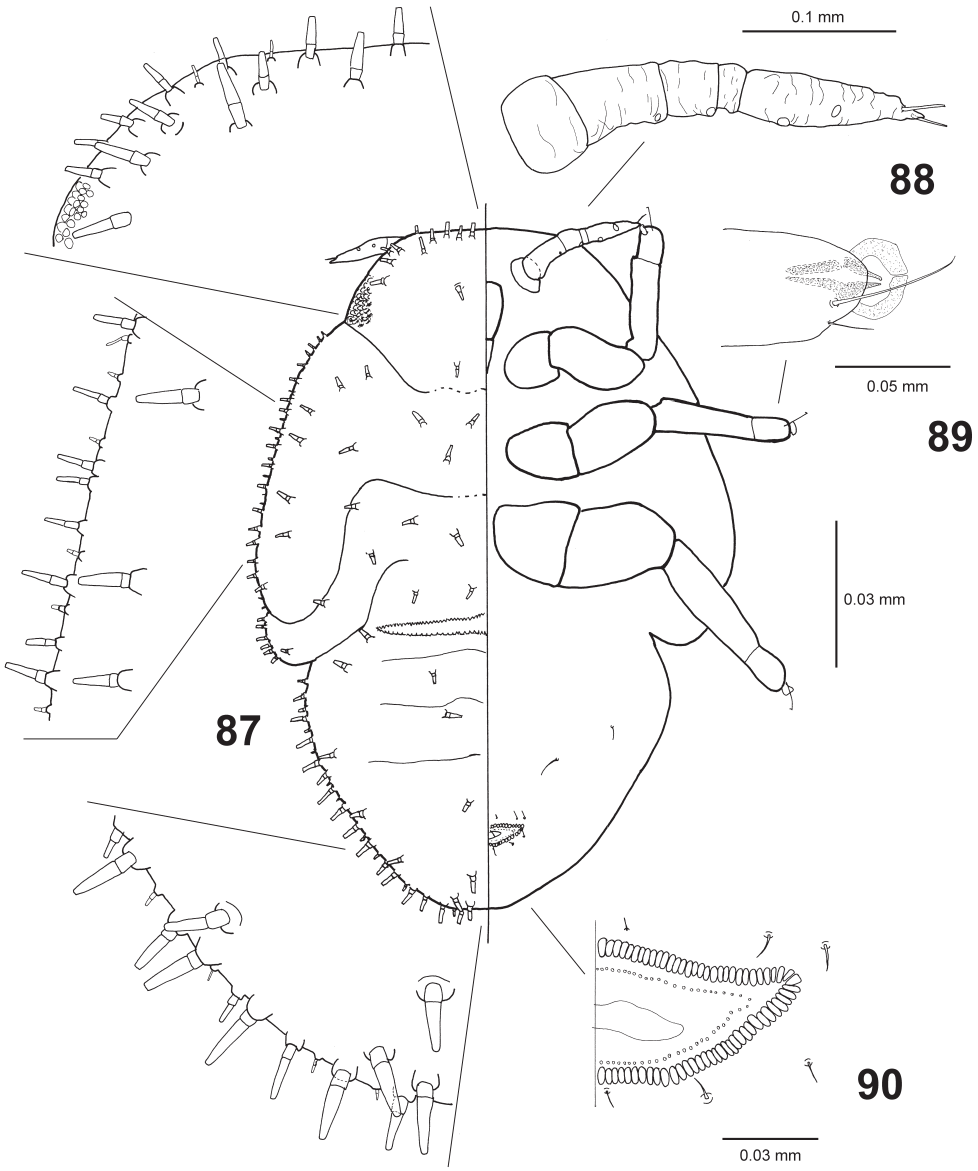
Figs 74–77. *Pauropsylla jarmilarum* sp. nov., adult and habitat. 74 – habitus, lateral view; 75 – head, frontal view (slide-mounted); 76 – forewing; 77 – sink holes with limestone rocks on plateau in Kazazhan near Homhil area with *Ficus vasta* (broad-leaved trees in centre), habitat of *P. jarmilarum* sp. nov. (photograph by J. Hájek).

Description. ***Adult.*** *Coloration* (Figs 74, 91). Head and thorax in males almost uniformly dark brown to black, in females vertex laterally, mesopraescutum in posterior two thirds and mesoscutum (except for four dorsal dark brown stripes in some specimens) lighter ochreous brown. Antenna basally (segments 1–3 except for apex of segment 3) pale yellow, gradually becoming darker towards apex (apices of segments usually slightly darker): central portion (apex of segment 3 to segment 6) infuscate light brown, segment 7 and base of segment 8 dark brown, apical two thirds of segment 8 and entire segments 9 and 10 black. Rostrum basally pale yellow, apically dark brown to black. Legs uniformly pale yellow except for second tarsal segments of all legs (in both sexes) and metafemur (particularly in males) which are brownish. Forewing membrane hyaline, veins uniformly pale yellow, costal and anal veins basally brownish (Fig. 76). Hind wing hyaline. Abdomen in males with tergites 1–2 light green-yellow, tergites 3–8 dark brown to black, sternites and terminalia green-yellow, first visible sternite basally and male subgenital plate brownish; in females almost uniformly light green-yellow including terminalia.

Structure. Integument with fine microsculpture, shiny, covered with very short setae. Head (Fig. 75) with vertex rounded down in front, dorsally elevated on sides, lateral ocelli lying on tubercles above the plane of vertex; median suture of vertex completely developed. Frons narrowly elliptic. Genae rounded, only very weakly bulging laterally below eyes. Eyes prominent, hemispherical. Antenna slender, with 10 segments, segments hardly narrowing to apex, segment 3 longest (Fig. 82); single oval rhinarium subapically on segments 4, 6, 8 and 9; rhinaria not associated with any other conspicuous sensilla; segment 10 with terminal setae subequal, the longer seta ca. 1.3 times longer than segment 10, shorter seta about as long as segment 10 (Fig. 83). Clypeus irregularly hemispherical, with few short setae at apex; rostrum lacking conspicuous setae. Fore trochanter with 3–4 long fine setae, lacking strong ventroapical spur. Metacoxa with well-developed meracanthus. Metatibia elongate, with three (one outer, two inner) dark sclerotised spurs and 10 tightly packed smaller and finer but still stout, unsclerotised setae apically. Metabasitarsus lacking apical spurs, about as long as or slightly shorter than apical tarsal segment. Forewing (Fig. 76) broadest in apical third, with narrowly rounded apex in cell m_1; R+M+Cu stem trifurcating, common M+Cu stem absent; R_S vein convex; m_1 cell relatively small, distinctly smaller than cu_1 cell; forewing membrane lacking surface spinules, with radular spinules arranged in narrow triangular fields in cells m_1, m_2 and cu_1; fore wing veins only with minute, inconspicuous setae. Male subgenital plate subglobular, with slightly sinuate dorsal margin and few sparse short setae postero-ventrally (Fig. 78). Male proctiger flask-shaped, medially with well-developed, broadly rounded posterior expansions (Fig. 78); inner surface of each expansion bearing 6–9 fine setae arranged in irregular dorso-ventral line (Fig. 79). Paramere, in lateral view, with nearly straight posterior margin, anterior margin weakly S-shaped: constricted in basal third, convex medially and gradually narrowing in apical third; apex narrowly truncate, well-sclerotised, bearing small tooth oriented towards front; inner face covered with fine setae, subapically with five stouter setae; another row of six stouter setae situated along anterior margin medially (Fig. 80). Distal segment of aedeagus with simple, broadly sickle-shaped apical dilation, ductus ejaculatorius relatively long and sinuate (Fig. 81). Female terminalia very long, covered with numerous short to moderately long setae; proctiger, in lateral view, with dorsal margin straight, apex



Figs 78–86. *Pauropsylla jarmilarum* sp. nov., adult. 78 – male terminalia, outer lateral view; 79 – male proctiger, posterior view; 80 – paramere, lateral view, inner face; 81 – distal segment of aedeagus, lateral view; 82 – antenna; 83 – antennal segments 9 and 10; 84 – female terminalia, lateral view, with detail of circumanal ring structure; 85 – female subgenital plate, ventral view; 86 – detail of dorsal and apex of ventral valvulae, lateral view.



Figs 87–90. *Pauropsylla jarmilarum* sp. nov., fifth instar immature. 87 – body, left dorsal view with details of lanceolate setae on cephaloprothorax, forewing pad and abdomen, right ventral view; 88 – antenna; 89 – detail of tibiotarsus apex; 90 – detail of circumanal pore ring (right side only).

acutely pointed; circumanal pore ring elliptic with two contiguous rows of pores; subgenital plate, in lateral view, regularly slightly convex ventrally, with long, narrow apical extension, pointed at apex (Fig. 84), in ventral view, narrowly triangular, narrowly rounded at apex (Fig. 85); dorsal and ventral valvulae smooth, lacking any teeth (Fig. 86).

Measurements (in mm). Males (n = 2): HW 0.58, AL 0.71–0.76, WL 1.92–1.94, WW 0.91–0.92, TL 0.71–0.72, MPL 0.26–0.27, PL 0.21, AEL 0.18. Females (n = 2): HW 0.59–0.60, AL 0.73, WL 1.98–2.15, WW 0.95–1.00, TL 0.71–0.72, FPL 0.51–0.53, SL 0.42–0.50. Ratios: AL/HW 1.22–1.31, WL/HW 3.31–3.58, WL/WW 2.08–2.15, TL/HW 1.18–1.24, MPL/HW 0.45–0.47, FPL/HW 0.86–0.88, FPL/SL 1.06–1.21.

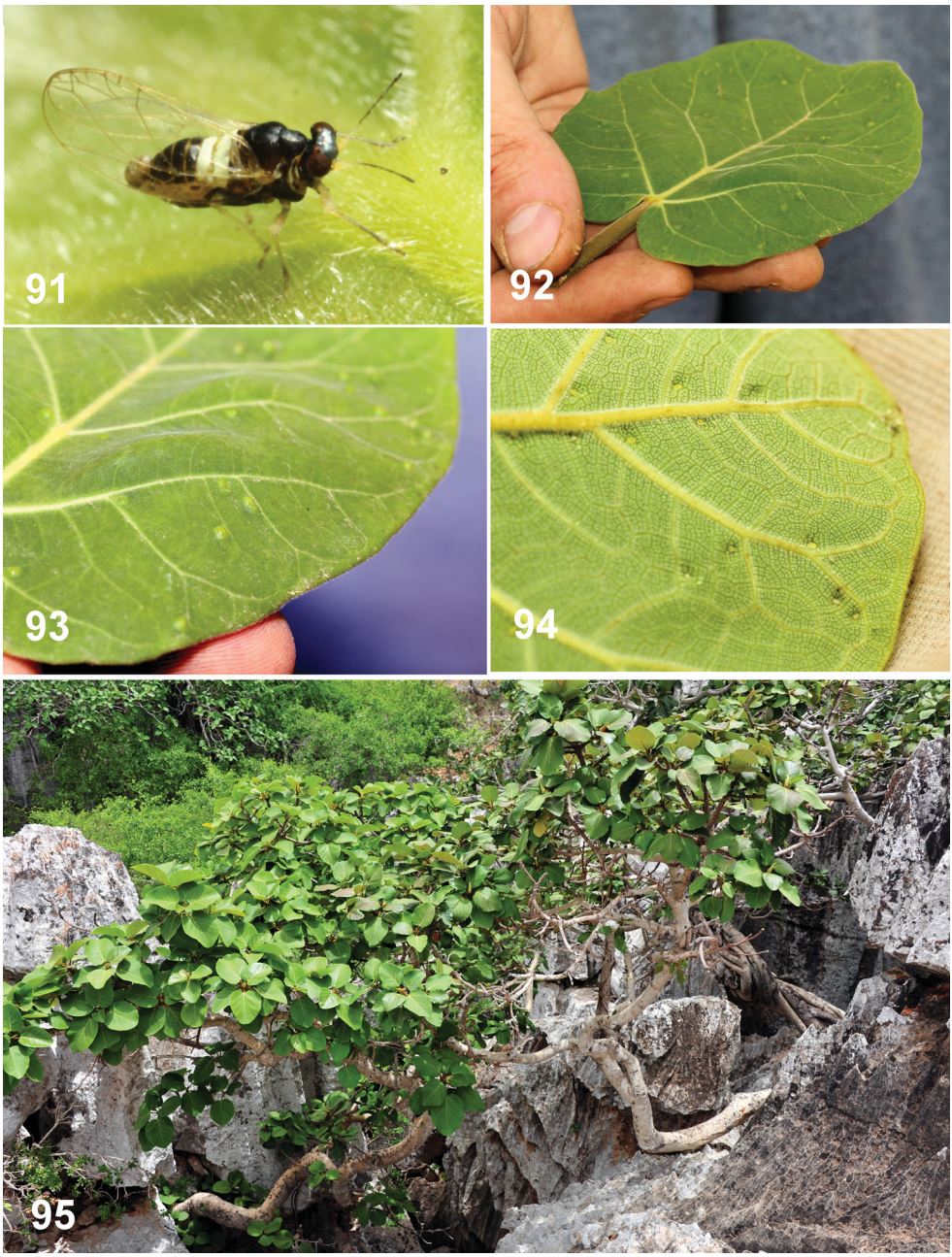
Fifth instar immature (Fig. 87). Uniformly pale yellow-white. Body oval, elongate. Body margin bearing many slender trucate sectasetae arranged in three rows; outer row with alternating large and small sectasetae; dorsum of cephalothorax and caudal plate with sparse similar, large, truncate sectasetae. Antenna divided into five or six segments, bearing four rhinaria (Fig. 88). Cephalothorax partly indistinctly subdivided; posterior margin of cephalothorax and anterior margin of caudal plate finely serrate. Forewing pad with humeral lobe slightly surpassing posterior eye margin. Anus ventral; outer circumanal pore ring consisting of one row of pores (Fig. 90).

Measurements (n = 6; in mm). BL 1.30–1.42, BW 0.90–1.02, AL 0.29–0.33, FL 0.58–0.65, TL 0.34–0.38, CPL 0.50–0.62, CPW 0.69–0.74, CRW 0.12–0.13. Ratios: BL/BW 1.35–1.48, AL/FL 0.49–0.55, CL/CW 0.68–0.83, CRW/CPW 0.16–0.18.

Differential diagnosis. *Pauropsylla* Rübsaamen, 1899 currently includes 23 valid species from the Afrotropical, Oriental and Palaearctic Regions (Mathur 1975, Hollis 1984, Li 2011, Ouvrard 2014). The adults of *P. jarmilarum* sp. nov. can be differentiated from all previously described species by the following combination of characters: median suture of vertex completely developed; antenna 10-segmented, with a single rhinarium each on segments 4, 6, 8 and 9, lacking bifid sensilla; fore trochanter lacking a strong ventroapical spur; metatibia with 2+1 sclerotised apical spurs; forewing relatively narrow with apex narrowly rounded; vein R+M+Cu of forewing trifurcating, common stem M+Cu absent; male proctiger flask-shaped, with moderately developed posterior lobes bearing relatively few fine setae on their inner side; paramere shape; apical segment of aedeagus simply sickle-shaped; female terminalia very long, with subgenital plate narrowly rounded at apex.

The fifth instar immature of *P. jarmilarum* sp. nov. resembles *P. willcocksi* Dçbski, 1918, widely distributed in northern Africa and Arabia, from which it differs in slightly narrower body shape (BL/BW = 1.3 in *P. willcocksi*; Hollis 1984) and smaller number of marginal sectasetae. Adult *P. willcocksi* have a strong ventroapical spur on the fore trochanter, numerous peg-like setae on inner side of the lobes of the male proctiger, a strongly curved, sickle-shaped paramere, and female subgenital plate with a ventral transverse groove in apical third (Hollis 1984).

The shape of the male and female terminalia is reminiscent of four species from India, namely *P. depressa* Crawford, 1912, *P. ficicola* Kieffer, 1905, *P. purpurescens* Mathur, 1975, and *P. reticulata* Mathur, 1975 which are generally larger than *P. jarmilarum* sp. nov., have forewings with a distinct vein M+Cu, and shorter female terminalia; *P. depressa* and *P. purpurescens* also differ in the absence of the median suture of vertex and a more truncate



Figs 91–95. *Pauropsylla jarmilarum* sp. nov. on its host plant, *Ficus vasta*. 91 – adult male; 92 – leaf with galls; 93 – detail of upper leaf surface with galls; 94 – detail of lower leaf surface with galls and immatures; 95 – *Ficus vasta* tree in Kazazhan near Homhil. Photographs by V. Hula and J. Niedobová (91–94) and J. Hájek (95).

forewing apex and the lack of sectasetae on dorsum of the fifth instar immatures (sectasetae are missing completely in *P. depressa*); *P. ficicola* differs in the concave vein R_S and a large m_1 cell of forewing and different number of sclerotised apical spurs on metatibia. Finally, *P. reticulata* differs in broader and apically truncate forewing and 2+2 apical spurs on the metatibia (Mathur 1975).

The Oriental *Pauropsylla triozoptera* Crawford, 1913 resembles *P. jarmilarum* sp. nov. in the absence of M+Cu and the long female terminalia but differs in broader forewing and the shape of the paramere which bears a basal anterior lobe, as well as in a number of immature characters (Yang 1984, as *Sympauropsylla triozoptera*; Li 2011, as *Neotrioza triozoptera*; Yang et al. 2013).

Etymology. Derived from the Czech feminine personal name 'Jarmila'. Named after Jarmila Malenovská and Jarmila Jurová, mother and grandmother of the first author.

Host plant. *Ficus vasta* Forssk. (Moraceae).

Biology. Immatures induce small pit galls on lower surface of the leaves of the host plant. The galls are circular depressions, ca. 2 mm large in diameter, appearing as light green nipples on the above surface of the leaves. There can be up to ca. 60 pit galls per leaf scattered over the leaf blade; individual galls are situated more or less close to larger veins (Figs 92–94).

Occurrence in Socotra. Found at middle elevations on limestone plateaus in central and north-eastern Socotra, together with the host plant in moderately humid microhabitats on limestone cliffs and boulders, associated often with sink holes and terraces (Figs 77, 95).

Distribution. So far only known from the Socotra Island. The host plant is widely distributed in southern parts of Arabian Peninsula and mainland eastern Africa (Hassler 2014).

Identification key to adults of Psylloidea known from Socotra

1 Head rounded down in front, lacking large anterior processes or lobes. 2
– Head anteriorly bearing large cone-shaped processes or flat lobes. 3
2 Forewing with common R+M+Cu stem bifurcating into R and M+Cu veins; R_S vein medially strongly angulate, curved posteriad and touching M_{1+2}; membrane with a light brown band along outer posterior wing margin and a small round patch on R_1 apex (Fig. 67). Vertex with two small tubercles on transition to frons; genae with small, apically pointed dorso-lateral projections below antennal insertions (Fig. 68). General body colour in both sexes orange-brown with lighter markings. Generally very small species (FL < 1.2 mm). On *Commiphora parvifolia* and *C. planifrons*. .... **Phacopteronidae: *Pseudophacopteron verrucifrons*** Burckhardt & Harten, 2006
– Forewing with common R+M+Cu stem trifurcating into R, M and Cu veins; R_S vein only slightly convex, separated from M_{1+2}; membrane clear, lacking dark pattern (Fig. 76). Vertex smooth on transition to frons, lacking tubercles; genae rounded below antennal insertions, lacking small pointed projections (Fig. 75). At least males with dark brown to black head and thorax. Generally larger (FL > 1.8 mm). On *Ficus vasta*. ....**Triozidae: *Pauropsylla jarmilarum* sp. nov.**
3 Forewing membrane transparent with a yellowish tinge, lacking any dark pattern. Body uniformly light green in alive and dark yellow in dry-mounted or alcohol-preserved

specimens (Figs 71, 72). Head with long and slender, nearly symmetrical, conical genal processes (Fig. 73). On *Pittosporum viridiflorum*. ..... **Psyllidae: *Cacopsylla* sp.**

– Forewing membrane semi-transparent to opaque, with a more or less pronounced pattern consisting of numerous brown spots or bands. Body not uniformly light green or yellow. Head different. 4

4 Head with vertex anteriorly produced into flat, apically rounded lobes (Fig. 8), genae small. Forewing pattern consisting of four irregular light brown transverse bands and a couple of small dark brown spots at M_{3+4} vein (Figs 1–3, 6–7). Male proctiger apically with long pointed posterior lobes (Fig. 10). On *Tamarix nilotica*. .... **Aphalaridae: *Colposcenia dioscoridis* sp. nov.**

– Head with vertex anteriorly straight but genae bearing large, irregularly cone-shaped processes (Figs 22, 43, 48). Forewing pattern different. Male proctiger apically broadly rounded (Figs 27, 49, 56). (**Liviidae: *Diaphorina***). 5

5 Forewing pattern consisting of dark spots and dark veins not fused into a band along apical wing margin (figured in Burckhardt & Mifsud 1998: 37, Fig. 94). ..... ***Diaphorina* sp.**

– Forewing pattern consisting of well-defined dark spots, fusing into a band along apical wing margin. 6

6 Body almost uniformly dark brown (Figs 18–19), generally larger (WL > 2.2 mm). Forewing elongate (WL/WW > 2.5), apically almost symmetrically rounded, with narrow continuous apical dark band (Fig. 20); membrane with coarse surface spinulation (Fig. 21). Head with genal processes approximately as long as vertex along midline, apically subacute (Fig. 22). Antenna relatively elongate (Fig. 32; AL/HW > 0.85). Paramere straight (Figs 27, 28). Female terminalia elongate (Fig. 30, FPL/HW > 1.0). On *Carissa spinarum*. ..... ***Diaphorina caliginosa* sp. nov.**

– Body lighter brown (Figs 40, 45), generally smaller (WL < 1.6 mm). Forewing broader (WL/WW < 2.5), apically asymmetrical, with broad continuous apical dark band (Figs 41, 46); membrane with finer surface spinulation (Figs 42, 47). Head with genal processes distinctly shorter than vertex along midline, apically less acute (Figs 43, 48). Antenna relatively robust (Figs 54, 61; AL/HW ≤ 0.85). Paramere apically bent backwards. Female terminalia relatively shorter (Figs 52, 59; FPL/HW < 1.0). 7

7 Forewing anterior margin in apical portion strongly angulate; forewing pattern consisting of light brown spots basally and darker brown band apically (Figs 39, 41). Male proctiger robust (Fig. 49). Paramere slightly bent apically (Figs 49, 50). On *Lycium sokotranum*. ..... ***Diaphorina elegans*** Burckhardt & Mifsud, 1998

– Forewing anterior margin in apical portion more regularly curved, not angulate; forewing pattern consisting of dark brown spots basally and apical band of same colour (Figs 44, 45). Male proctiger slender (Fig. 56). Paramere strongly bent apically (Figs 56, 57). ..... ***Diaphorina hagherensis* sp. nov.**

Discussion

The eight species reported from Socotra represent probably only a fraction of the Psylloidea fauna of the island taking into consideration its size and floristic richness. Future collecting,

particularly during different seasons, may yield additional species. For comparison, altogether 54 species of Psylloidea are known from mainland Yemen (Burckhardt & Harten 2006). While islands generally have fewer species per unit area than the mainland (Whittaker & Fernández-Palacios 2007), adaptive radiation of particular groups can multiply the species number of these taxa. Adaptive radiation is documented for the psyllids of some island systems such as the Canary Islands and Madeira (Percy 2003, Percy et al. 2004), the Hawaiian Islands (Crawford 1918, Caldwell 1940, Nishida et al. 1980) or New Zealand (Tuthill 1952, Dale 1985). Our psyllid data from Socotra do not suggest the presence of a species-rich group which underwent a rapid speciation on the island.

Many groups of organisms show a high proportion of endemic species in the Socotra Archipelago, e.g. vascular plants (37 % of 842 spp.; Miller & Morris 2004, Brown & Mies 2012), land snails (95 % of ca. 110 spp.; Neubert 2006, 2009) and reptiles (90 % of 31 spp.; Razzeti et al. 2011, Sindaco et al. 2012). As for insects, at least 4 of 50 species-group taxa (8 %) of ground beetles (Coleoptera: Carabidae), 10 of 26 species-group taxa (38 %) of butterflies (Lepidoptera: Rhopalocera) and 27 of 50 species (54 %) of grasshoppers and crickets (Orthoptera) recorded from the archipelago are endemic (Desutter-Grandcolas & Felix 2012, Felix et al. 2012, Fric & Hula 2013). Other insect groups are less well-studied but apparently include also a considerable amount of endemic taxa; there are currently about 50 valid insect genera from ten orders endemic to the Socotra Archipelago (Batelka 2012). Six out of eight species of the Socotran Psylloidea are known only from Socotra but their status as endemics is difficult to assess. While the psyllid fauna of the Arabian Peninsula is fairly well-known (Burckhardt & Mifsud 1998, Burckhardt & Harten 2006, Burckhardt 2008) that of East Africa definitely is not. Incidentally, some of the psyllid host species recorded in the present paper are widely distributed in eastern Africa and southern Arabia, namely *Carissa spinarum* (host for *Diaphorina caliginosa* sp. nov.), *Ficus vasta* (for *Pauropsylla jarmilarum* sp. nov.) and *Tamarix nilotica* (for *Colposcenia dioscoridis* sp. nov.). A very likely endemic to Socotra is *Diaphorina elegans*, associated with an endemic host plant, *Lycium sokotranum*, which shows a characteristic external morphology making it easy to identify and less likely to be overlooked in collections.

Socotra and its biota provide an interesting model for historical biogeographic studies. An increasing number of publications dealing with Socotran species in a phylogenetic and historical context suggest that the local flora and fauna are composed of a mixture of relictual (palaeoendemic) species which had been once widely distributed and became extinct in the ancestral areas except for Socotra, species arisen by vicariance at the time of the separation of Socotra from the Arabian mainland, and (probably more numerous) more recent dispersal events from Africa and Arabia (e.g. Macey et al. 2008, Brown & Mies 2012, Gómez-Díaz et al. 2012, Šmíd et al. 2013). Unfortunately it is impossible to analyse the Socotran psyllid fauna in this way at the moment as the knowledge of the psyllid fauna of the wider region is still only fragmentary and the phylogenetic framework is lacking.

The Socotran Psylloidea belong to five different families and five genera which are only distantly related. All five genera are widely distributed and include species outside Socotra. *Pseudophacopteron* Enderlein, 1921 is a large pantropical genus with many species in tropical Africa and a single species in the south of the Arabian Peninsula, *P. verrucifrons*: the species

is recorded here from Socotra and has been previously reported from Kenya. *Pseudophacopteron verrucifrons* is probably closely related to two other species from Kenya which are also associated with the *Commiphora*, *P. arcuatum* Malenovský & Burckhardt, 2009 and *P. marmoratum* Malenovský & Burckhardt, 2009, and probably represents an Afrotropical element in the Socotran and Arabian fauna (Malenovský & Burckhardt 2009). *Cacopsylla* sp. collected on *Pittosporum viridiflorum* in the Hagher mountains may represent another widely distributed Afrotropical species – it looks similar to an undescribed species collected on the same host in Cameroon (material in NHMB) with which it may be conspecific. In this species group, all associated with *Pittosporum*, is at least another undescribed species in Africa and some species, including *Cacopsylla tobirae*, in Asia. The distribution of *Pauropsylla* Rübsaamen, 1899 is largely restricted to the Old World tropics and hosts from the genus *Ficus*; the Socotran *P. jarmilarum* sp. nov. resembles in some morphological characters the north African and Arabian *P. willcocksi* but also some Indian and Oriental species (Mathur 1975, Hollis 1984, Yang et al. 2013) and its detailed phylogenetic relationships are unclear. *Diaphorina* is a species-rich genus with remarkably diverse host plant associations: some eighty described species exploit host plants in no less than 18 families in ten orders of dicotyledonous plants (Hollis 1987). *Diaphorina* spp. are distributed mainly in drier parts of the Old World, e.g. the Mediterranean Basin, the Sahel region of Africa, South and South-West Africa, the Middle East and the arid parts of the Indian subcontinent and Central Asia. Hollis (1987) suggested that *Diaphorina* have radiated successfully in a limited environment and host plant capture may have depended more upon an ability to colonize similarly adapted but unrelated hosts rather than tracking resources along phylogenetic lines. This hypothetic evolutionary trait might have also aided the colonization of Socotra: *Diaphorina* is represented by four species there. Finally, *Colposcenia* Enderlein, 1929 is a genus with 35 species largely restricted to arid regions of the Old World; most species are known from the Palaearctic Region, particularly the Mediterranean Basin, Middle East, Central Asia and China, while only two species have been recorded from the Afrotropical Region (Namibia in south-western Africa). All *Colposcenia* spp. are associated with *Tamarix* spp. (Hollis 1974, Loginova 1974, Burckhardt 1988, Li 2011, Malenovský et al. 2012, Ouvrard 2014).

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