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This contribution is published
to honor Dr. Amnon Freidberg,
a scientist, a colleague and a friend,
on the occasion of his 75th birthday.

Gall midges (Diptera: Cecidomyiidae) associated with *Suaeda* (Chenopodiaceae) in Israel and the Mediterranean Basin

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ABSTRACT

The plant genus *Suaeda* (Chenopodiaceae) is host to approximately 30 species of gall midges mainly in Central Asia and the Mediterranean Basin. However, the actual number of cecidomyiid species on these plants is probably higher given that the faunas of Africa and Arabia are virtually unstudied and those of Central Asia and the Mediterranean Basin merit more careful study. Many gall-midge species on *Suaeda* develop without gall formation and are discovered by chance or through targeted sampling, and their host ranges have not been investigated thoroughly. In the present study we describe six new species from *Suaeda* in Israel, *Dasyneuriola prolifica, Baldratia arida, Careopalpis latita, C. lanceocercis, C. yotvata* and *Suaediola quotidiana*, some of which most likely occur also in neighboring countries. The genus *Suaediola* is newly described for four species, three of which are transferred to it from *Stefaniola*: *Suaediola defoliata* n. comb., *Suaediola rufa* n. comb. and *Suaediola siliqua* n. comb. We also provide the first description of pupae and adults for *Baldratia suaedae*, which was known so far only from its larvae. The validity of all Israeli species of *Careopalpis* and *Suaediola* is corroborated by the analysis of mtCOI sequences. Our results suggest a high level of specialization in chenopod gall-midges and demonstrate the utility of molecular data for distinguishing cryptic species and defining their host ranges.

KEYWORDS: Lasiopterini, *Baldratia*, *Careopalpis*, Chenopodiaceae, *Dasyneuriola*, *Stefaniola*, cryptic species, host range, new genus, new species, new combinations, Middle East.

INTRODUCTION

The Chenopodiaceae support approximately 330 described and many undescribed cecidomyiid species, making them one of the most important host-plant families for gall midges (Dorchin 1998; Gagné & Jaschhof 2017; Dorchin, unpubl. data). The majority of gall midges on Chenopodiaceae belong to several closely related genera in the tribe Lasiopterini (e.g. *Baldratia* Kieffer, *Careopalpis* Marikovskij, *Stefaniella* Kieffer, *Stefaniola* Kieffer), but certain genera from other tribes are also associated with chenopods, either exclusively (e.g. *Halodiplosis* Kieffer) or occasionally (e.g. *Asphondylia* Loew) (Gagné & Jaschhof 2017). Clearly, the colonization of Chenopodiaceae by gall midges and their diversification on these plants occurred several

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times independently in the evolution of the Cecidomyiidae, resulting in high gall-midge diversity in arid and saline habitats where Chenopodiaceae are abundant.

Suaeda is a large genus of halophytic Chenopodiaceae that dominate arid, coastal and salt-marsh habitats around the world, with the greatest diversity in the Mediterranean Basin and Central Asia (Schütze *et al.* 2003). Members of this genus support approximately 30 described cecidomyiid species (Gagné & Jaschhof 2017), but there is little doubt that many additional species exist on these plants given that the faunas of Africa and Arabia are virtually unexplored and those of the Mediterranean Basin and Central Asia merit more careful study. One reason for this is that many of the cecidomyiid species on *Suaeda* induce inconspicuous galls or develop in the plant without gall formation (e.g. Fedotova 1991, 1992; Dorchin 2001; Dorchin & Freidberg 2008; Elsayed *et al.* 2015), thus being often discovered by chance or by targeted sampling of potential host plants without searching for galls. The difficult taxonomy of *Suaeda* and the fact that some cecidomyiids use several host species necessitate careful study to verify host-plant identities and establish host ranges of the gall midges. Two additional factors add to this complexity. First, many cecidomyiid species from Chenopodiaceae were described from larvae (Möhn 1969, 1971), which offer very few diagnostic characters, and therefore it is difficult to recognize whether adults of a newly collected species represent an undescribed taxon or one that has been known to date only from its larvae. Second, the morphological uniformity of adults in some of the relevant genera requires DNA data in order to circumscribe species boundaries and host associations (Dorchin, unpubl. data). Describing new species based on morphological data alone and without thoroughly exploring host associations is unwarranted and counterproductive.

In the present paper we describe a new genus and six new species from *Suaeda* in Israel, some of which must occur also in Jordan and possibly in other neighboring countries. We also provide the first description of adults and pupae for *Baldratia suaedae* Möhn, an apparently circum-Mediterranean species that has been known so far only from its larvae. The integrity of all *Careopalpis* and *Suaediola* species in Israel is corroborated by an analysis of sequences of the mitochondrial COI gene, as well as by sequences of additional (mitochondrial and nuclear) genes, which will be included in a separate paper, currently in preparation.

MATERIALS AND METHODS

Collecting and rearing of insects

Field collections of galls were conducted between 1995 and 2018 in numerous sites in Israel, mostly along the Jordan rift valley and the Judaean Desert, as detailed in the material examined sections of the species descriptions. All material was collected in Israel unless otherwise specified. Galls and other plant material were kept in ventilated rearing cages in the laboratory until adult emergence, and samples were dissected to obtain the immature stages. Larvae, exuviae, and adults of the gall midges were preserved in 70 % ethanol for morphological study, and were later mounted on permanent microscope slides in Euparal according to the method outlined by Gagné (1994). Some pupae were processed for SEM imaging via chemical drying and gold sputtering. Some adults and immature stages of each species were preserved in 96 % ethanol for molecular study. The sampling for the molecular analysis included individuals from all host plants and localities of the relevant species in Israel in order to verify species boundaries and host ranges.

Taxonomy

Newly collected material was compared to types or other relevant material borrowed from the following museums: Staatliches Museum für Naturkunde, Stuttgart, Germany (SMNS), Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia (ZMAS), Swedish Museum of Natural History, Stockholm, Sweden (NHRS). Material in the Möhn collection (deposited in the SMNS) had originally been mounted on temporary microscope slides in glycerin or stored in 70 % ethanol, and many of the specimens are either lost or have deteriorated to the point that they cannot be used for taxonomic study. Some of that material that was found to be in a reasonable condition was remounted on permanent microscope slides in Euparal for the purpose of the present study and to ensure its integrity and long-term preservation.

Illustrations of morphological structures were made with the aid of a drawing tube mounted on a Leica DM1000 LED compound microscope. Pupae were studied under a scanning electron microscope. Some adults were pinned to preserve the color pattern created by the thick cover of scales typical of Lasiopterini. Ovipositor length, measured from the anterior margin of tergite 8 of the abdomen to the apex of the fused cerci, is expressed in relation to the length of tergite 8. Terminology for adult morphology follows McAlpine *et al.* (1981), except for wing venation that follows Cumming and Wood (2009), and terminology for immature morphology follows Gagné (1989). Specific terminology for the lasiopterine ovipositor follows Dorchin (2001).

Types, galls, and other associated material are deposited in the Steinhardt Museum of Natural History, Tel Aviv University, Israel (SMNHTAU) unless otherwise specified. Other depositories are specified in the material examined sections of the descriptions as follows: National Museum of Natural History, Smithsonian Institution, Washington DC, USA (USNM); Staatliches Museum für Naturkunde, Stuttgart, Germany (SMNS); Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, Germany (ZFMK); Swedish Museum of Natural History, Stockholm, Sweden (NHRS). All specimens are mounted on permanent microscope slides in Euparal unless otherwise noted.

Molecular methods

The dataset analyzed here included 56 samples of 8 putative ingroup taxa in the genera *Careopalpis* and *Suaediola* and four outgroup taxa from other Lasiopterini genera. The analysis was intended to test the validity of the taxonomic decisions in this paper and establish the host ranges of the studied species rather than provide insight about phylogenetic relationships, which will be studied elsewhere (Dorchin & Dor, in prep.). Collecting data for the samples and GenBank accession numbers are given in Table 1.

Genomic DNA was extracted from whole individual adult or immature midges using Qiagen's Blood and Tissue kit (Qiagen, Hilden, Germany). A 704 bp fragment from the 5' part of the mitochondrial COI gene was amplified using the primers LCO1490 and HCO2198 (Folmer *et al.* 1994). Optimized PCR conditions consisted of 10 min denaturation at 95 °C followed by 35 cycles of 30 s denaturation at 95 °C, 1 min annealing at 50 °C, and 1min extension at 72 °C, with final extension at 72 °C for 4 min. PCR reactions were done in a 2720 Thermal Cycler (Applied Biosystems, Foster City, CA, USA) and products were purified using an EXO/SAP enzymatic cleanup (Thermo Scientific, Vilnius, Lithuania). Sequencing was carried out using the BigDye terminator v1.1 Cycle Sequencing Kit (Applied Biosystems, Foster City, CA, USA) on an ABI PRISM 3730xl DNA analyzer and Sequencing Analysis Software v5.2 at Hy Laboratories, Rehovot, Israel.

Phylogenetic analysis

Analyses of the COI sequences were based on 56 individuals in an alignment of 704bp. Sequences were initially assembled and inspected using Geneious v7.1.9 (Biomatters Ltd.) and subsequently aligned in Clustal Omega online (EMBL-EBI). The resulting data were analyzed by Bayesian analysis methods implemented in MrBayes v3.2.6 (Huelsenbeck & Ronquist 2001; Ronquist & Huelsenbeck 2003). The most appropriate model for COI (GTR+G) was chosen by comparing BIC scores in jModeltest 2.1.10 (v20160303; Guindon & Gascuel 2003; Darriba *et al.* 2012) and the closest model available in MrBayes was implemented. In the analysis, two independent runs with four chains each were run for 10 million generations (sampling every 1,000 generations). Convergence was assessed by examining stationarity in log-likelihood scores as the correlation of split frequencies between runs (AWTY; Nylander *et al.* 2008) and by examining ESS (Effective Sample Size) in TRACER v1.6 (Drummond & Rambaut 2007). The first 2,500 trees (2,500,000 generations) were discarded as burn-in, and the remainder were used to estimate tree parameters and topology. We also conducted a Maximum Likelihood (ML) analysis using the GTR+GAMMA model with 1,000 bootstrap replicates using RAxML v8.1.21 (Stamatakis 2014) on raxmlGUI 1.5 beta (Silvestro & Michalak 2012). All trees were rooted using *Lasioptera arundinis* Schiner as an outgroup.

Table 1. Samples used in the molecular analyses with collecting data and Genbank accession numbers. Samples were collected in Israel unless otherwise indicated.

Sample name	Host plant	Collection data	GenBank accession number
Careopalpis akko 22	*Suaeda splendens*	Newe Yam, 13.vi.2014	MN207630
Careopalpis akko 24	*Suaeda splendens*	Newe Yam, 3.ix.2014	MN207631
Careopalpis lanceocercis 81	*Suaeda asphaltica*	Arad, 10 km E, 200 m, 16.iv.2015	MN207655
Careopalpis lanceocercis 82	*Suaeda asphaltica*	Mizpe Yeriho, 24.iii.2015	MN207656
Careopalpis lanceocercis 90	*Suaeda asphaltica*	Mizpe Yeriho, 16.ii.2014	MN207658
Careopalpis lanceocercis 91	*Suaeda asphaltica*	Mizpe Yeriho, 16.ii.2014	MN207659
Careopalpis lanceocercis 92	*Suaeda asphaltica*	Mizpe Yeriho, 2.iii.2104	MN207660
Careopalpis lanceocercis 93	*Suaeda asphaltica*	Mizpe Yeriho, 2.iii.2014	MN207661
Careopalpis lanceocercis 94	*Suaeda asphaltica*	Mizpe Yeriho, 2.iii.2014	MN207662
Careopalpis lanceocercis 95	*Suaeda asphaltica*	Nabi Musa, 23.xii.2014	MN207663
Careopalpis lanceocercis 96	*Suaeda asphaltica*	Nabi Musa, 23.xii.2014	MN207664
Careopalpis lanceocercis 97	*Suaeda asphaltica*	Mizpe Yeriho, 29.xii.2014	MN207665
Careopalpis lanceocercis 111	*Suaeda fruticosa*	Enot Zuqim, 23.xii.2014	MN207670
Careopalpis lanceocercis 118	*Suaeda asphaltica*	En Ovdat, 29.xii.2015	MN207672
Careopalpis lanceocercis 119	*Suaeda asphaltica*	En Ovdat, 29.xii.2015	MN207673
Careopalpis lanceocercis 120	*Suaeda asphaltica*	En Ovdat, 29.xii.2015	MN207674
Careopalpis lanceocercis 136	*Suaeda fruticosa*	Enot Zuqim, 1.ii.2017	MN207678
Careopalpis latita 16	*Suaeda aegyptiaca*	Enot Qane, 1.vi.2014	MN207627
Careopalpis latita 17	*Suaeda aegyptiaca*	Enot Zuqim, 5.x.2014	MN207628
Careopalpis latita 18	*Suaeda aegyptiaca*	Enot Zuqim, 16.iii.2014	MN207629
Careopalpis latita 30	*Suaeda aegyptiaca*	Lido junction, 1 km S, 5.x.2014	MN207632

Table 1. *(continued)*

Sample name	**Host plant**	**Collection data**	**GenBank accession number**
Careopalpis latita 31	*Suaeda aegyptiaca*	Lido junction, 1 km S, 5.x.2014	MN207633
Careopalpis latita 110	*Suaeda fruticosa*	Enot Zuqim, 23.xii.2014	MN207669
Careopalpis latita 135	*Suaeda fruticosa*	Enot Zuqim, 22.iii.2016	MN207677
Careopalpis latita 137	*Suaeda fruticosa*	Enot Zuqim, 1.i.2017	MN207679
Careopalpis yotvata 51	*Suaeda vermiculata*	Yotvata NR, 16.ii.2015	MN207644
Careopalpis yotvata 52	*Suaeda vermiculata*	Yotvata NR, 16.ii.2015	MN207645
Careopalpis yotvata 53	*Suaeda vermiculata*	Yotvata NR, 16.ii.2015	MN207646
Careopalpis yotvata 149	*Suaeda vermiculata*	Avrona salt marsh, 7.iii.2017	MN207680
Careopalpis yotvata 150	*Suaeda vermiculata*	Avrona salt marsh, 7.iii.2017	MN207681
Suaediola defoliata 71	*Suaeda monoica*	Neot Hakikar, 16.iv.2015	MN207653
Suaediola defoliata 72	*Suaeda monoica*	Neot Hakikar, 16.iv.2015	MN207654
Suaediola rufa 64	*Suaeda monoica*	Zohar junction, 20.iv.2015	MN207647
Suaediola rufa 65	*Suaeda monoica*	Zohar junction, 20.iv.2015	MN207648
Suaediola rufa 66	*Suaeda monoica*	Zohar junction, 20.iv.2015	MN207649
Suaediola rufa 67	*Suaeda monoica*	Zohar junction, 20.iv.2015	MN207650
Suaediola rufa 69	*Suaeda monoica*	Neot Hakikar, 16.iv.2015	MN207651
Suaediola rufa 70	*Suaeda monoica*	Neot Hakikar, 16.iv.2015	MN207652
Suaediola siliqua 108	*Suaeda monoica*	Enot Zuqim, 24.xi.2015	MN207667
Suaediola siliqua 109	*Suaeda monoica*	Enot Zuqim, 24.xi.2015	MN207668
Suaediola quotidiana 32	*Suaeda fruticosa*	Enot Zuqim, 16.ii.2014	MN207634
Suaediola quotidiana 35	*Suaeda fruticosa*	Lido junction, 1 km S, 28.iii.2014	MN207635

Table 1. *(continued)*

Sample name	Host plant	Collection data	GenBank accession number
Suaediola quotidiana 36	*Suaeda fruticosa*	En Gedi, 2.ii.2014	MN207636
Suaediola quotidiana 37	*Suaeda fruticosa*	En Gedi, 2.ii.2014	MN207637
Suaediola quotidiana 40	*Suaeda aegyptiaca*	Jordan, Wadi Assal, 6.vi.2014	MN207638
Suaediola quotidiana 42	*Suaeda aegyptiaca*	Lido junction, 1 km S, 5.x.2014	MN207639
Suaediola quotidiana 43	*Suaeda aegyptiaca*	Lido junction, 1 km S, 5.x.2014	MN207640
Suaediola quotidiana 47	*Suaeda fruticosa*	Lido junction, 1.4 km W, 16.ii.2015	MN207641
Suaediola quotidiana 48	*Suaeda fruticosa*	Zohar junction, 20.i.2015	MN207642
Suaediola quotidiana 49	*Suaeda fruticosa*	Zohar junction, 20.i.2015	MN207643
Suaediola quotidiana 83	*Suaeda fruticosa*	Lido junction, 1.4 km W, 20.i.2015	MN207657
Suaediola quotidiana 112	*Suaeda fruticosa*	Lido junction, 1.4 km W, 16.xii.2014	MN207671
Outgroups			
Lasioptera arundinis 161	*Arundo donax*	Hod Hasharon, 16.iii.2017	MN207682
Lasioptera rubi 133	*Rubus fruticosus*	Germany, NRW, Ramersdorf, 7.vii.2011	MN207676
Stefaniola fistula 128	*Seidlitzia rosmarinus*	En Boqeq, 27.vii.2016	MN207675
Stefaniola ventriosa 100	*Traganum nudatum*	Yotvata NR, 14.ii.2015	MN207666

RESULTS AND DISCUSSION

Genus *Dasyneuriola* Marikovskij, 1961

This genus was separated from *Dasineura* Rondani based on insignificant morphological attributes, and the five species included in it fit the vaguely defined generic concept of *Dasineura* (Gagné & Jaschhof 2017). All species were described from Central Asia, four from bud or stem galls on *Suaeda* and one from *Tamarix* (Marikovskij 1961; Fedotova 1984, 1995). The species from *Suaeda* appear to form a natural group, whereas the species from *Tamarix* probably does not belong here, but this will need to be corroborated by molecular tools.

Dasyneuriola prolifica Dorchin & Danon, n. sp.

(Figs 1–13)

LSID: urn:lsid:zoobank.org:act:7D8988EC-C6DD-4462-AEE4-C130773E9CE5.

Etymology: The name prolifica refers to the great abundance of this species, as attested by tens of thousands of galls at specific sites, hundreds of galls on individual plants, and multiple generations over several months.

Description:

Gall and biology: This species induces simple galls in apical and axillary buds. Galls are 1–2 cm long and 1–1.5 cm wide, and are composed of distorted leaves that are much thicker and wider than normal leaves (Figs 1, 2). The larvae feed gregariously among the deformed leaves, and each gall contained 3–30 larvae, which can be seen easily if the leaves are separated. The inside of a young gall is moist, and the tiny first instars can be seen close to the leaf bases. Mature galls contain fewer larvae (usually 3–12), suggesting that intra-specific competition limits the number of larvae that complete their development within a gall. Third-instar larvae spin white silky sheets that divide the space inside the gall into compartments in which they pupate. In the laboratory, many larvae leave the galls at this stage and pupate in the soil or on the bottom of the rearing cages, but the extent of this phenomenon in nature is unknown.

The entire life cycle, from egg to adult, may take only three weeks and the species completes at least four generations between December and April, depending on the amount of rainfall. Galls appear on the plants soon after the first rains and the population peaks in February–March, when single *S. fruticosa* shrubs can support thousands of galls (Fig. 3). Galls are much less common and conspicuous on *S. asphaltica*, and their abundance on that plant depends on the amount of rainfall in a particular year. In relatively wet years, *S. asphaltica* plants in some localities may support hundreds of galls, whereas in dry years it is difficult to find any galls in the very same localities. Larvae of the last generation (in March–April), and possibly a certain proportion of larvae from other generations, do not pupate inside the galls but leave them and dig into the soil, where they diapause until December. These larvae pupate and emerge as adults beginning from December–January. Based on laboratory and greenhouse observations, males live less than one day whereas females may live for 2–3 days at most. A newly emerged female exerts and waves her ovipositor, probably emitting pheromones to which the males are attracted. Mating, in a side-to side position, typically takes 10–30 seconds, after which the female retracts her ovipositor and usually does not mate again. Eggs are laid on leaves surrounding an apical bud and the larvae hatch and start feeding within 1–3 days. Galls become evident after about a week, and take about 20 days to reach their final size. Greenhouse experiments showed that a single female can easily spread her eggs among 15–20 buds, in which her offspring will develop successfully. Females are monogenous, hence each gall produces single-sex adults. Galls that produce adults of both sexes result from oviposition by more than one female.

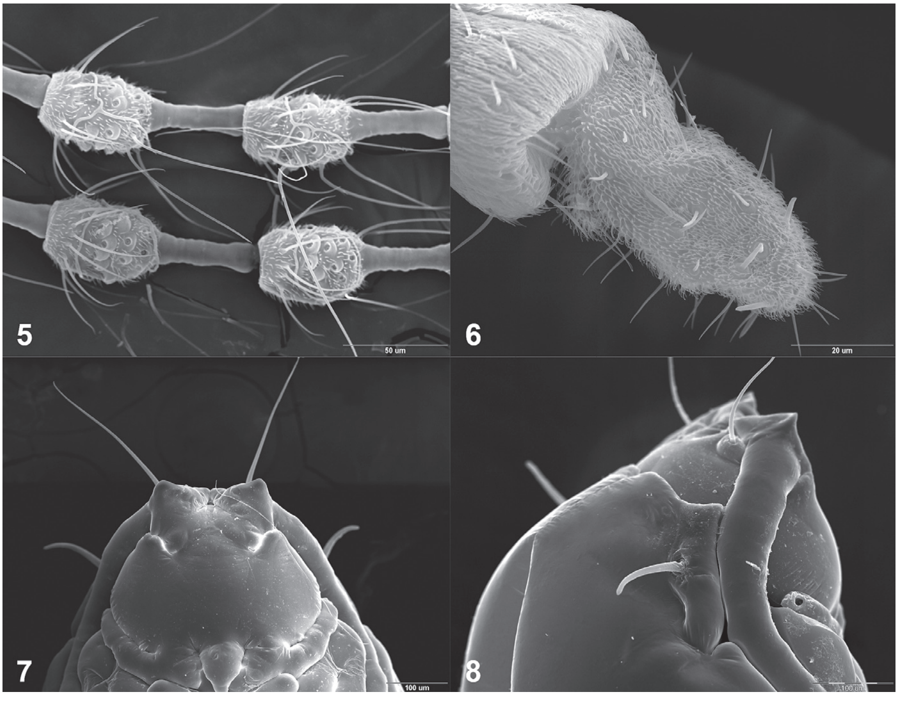
This species has been the subject of extensive studies in recent years on the mechanism of speciation through a host shift between *S. asphaltica* and *S. fruticosa* (Danon *et al.* 2017). It has been found that the gall midges on these plants constitute genetically and ecologically distinct populations that are in early stages of separation, and that the original host plant was apparently *S. asphaltica* from which the gall midges shifted to *S. fruticosa*. In rare occasions we found single galls on *S. aegyptiaca*, which grows in the same habitats with *S. fruticosa*. The genetic

Figs 1–4: *Dasyneuriola prolifica* n. sp.: (1) gall on *Suaeda fruticosa*; (2) galls on *Suaeda asphaltica*; (3) population on *Suaeda fruticosa*, showing the great abundance of galls on a single plant; (4) adult female (Photo: Oz Rittner).

profile of the midges reared from these galls was similar to that of midges from *S. fruticosa* rather than midges from *S. asphaltica* (Danon *et al.* 2017).

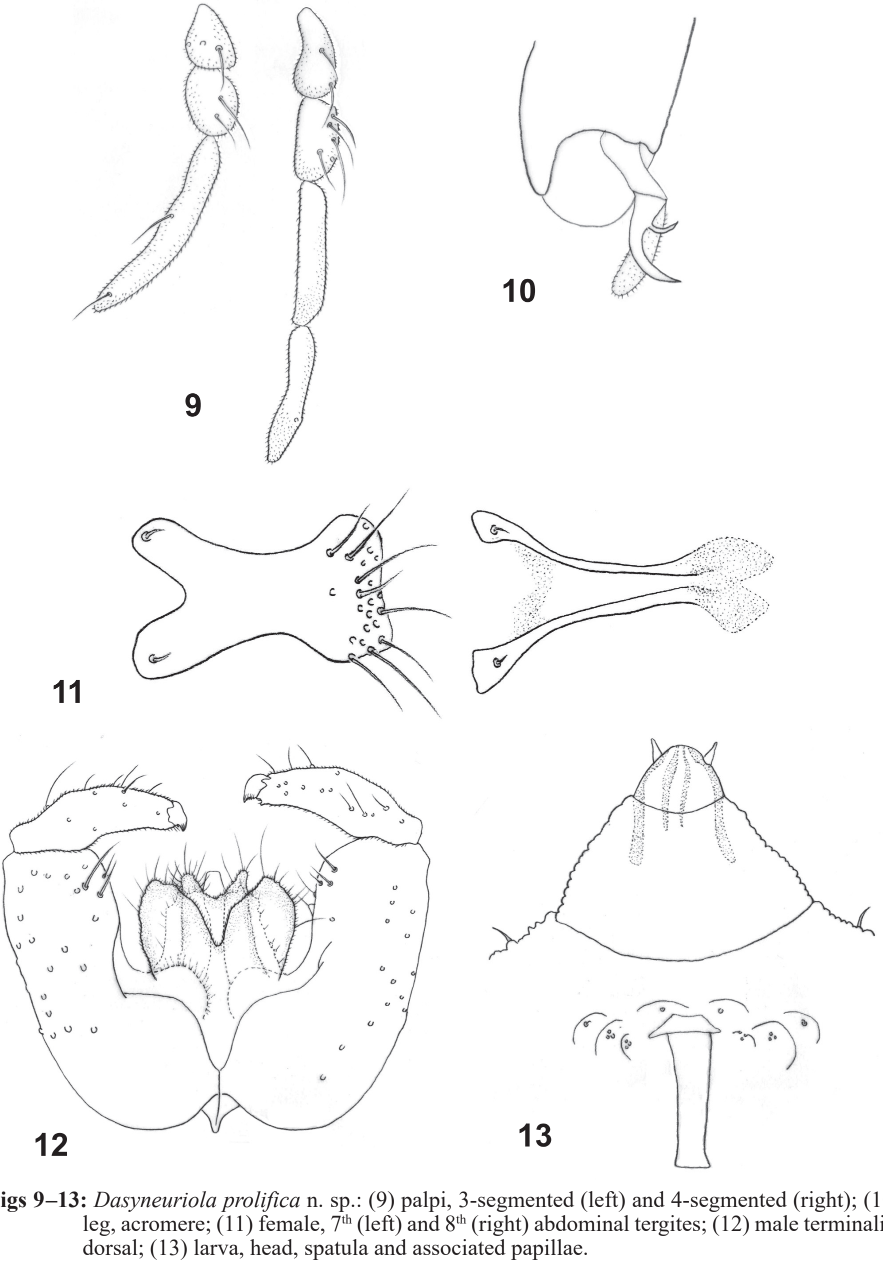
Adult. General color brownish orange, female abdomen pinkish red (Fig. 4).

Head: Eye facets round; gap between eyes on vertex 1.5–2.5 facets wide. Antennal flagellomeres 11–13 in female, 13–16 in male; number sometimes differs between antennae of same individual. Male flagellomeres each, except last, composed of node and neck (Fig. 5), necks 0.76–1.17 as long as nodes (n=40), first two flagellomeres partially fused; nodes entirely setulose, girdled by 1–2 loops of closely appressed, anastomosing circumfila and numerous strong setae originating from prominent sockets; necks bare. Apical flagellomere without neck, node smaller than nodes of preceding flagellomeres, tapering, vestiture as on nodes of preceding flagellomeres; sometimes fused with node of preceding flagellomere to form a single long node. Female flagellomeres cylindrical, without necks, about twice as long as wide, two basal flagellomeres partially fused, apical flagellomeres sometimes fused in one or both antennae to form a single unit 2–3 times as long as preceding flagellomeres; vestiture as in male. Frontoclypeal membrane with group of 8–10 very long, thin setae on each side. Palpus 3–4-segmented (Fig. 9), rarely 2-segmented. First and second segments 1–2 times as long as wide, third (and fourth if present) 2–3 times



Figs 5–8: *Dasyneuriola prolifica* n. sp.: (5) male antennal flagellomeres; (6) female fused cerci; (7) pupa, frontal; (8) pupa, lateral.

as long as preceding; when 2 or 3-segmented, last segment often appears composed of two merged segments. First segment often rudimentary, resembling palpiger. Segment number occasionally differs between palpi of same individual.



Figs 9–13: *Dasyneuriola prolifica* n. sp.: (9) palpi, 3-segmented (left) and 4-segmented (right); (10) leg, acromere; (11) female, 7th (left) and 8th (right) abdominal tergites; (12) male terminalia, dorsal; (13) larva, head, spatula and associated papillae.

Thorax: Wing transparent, sparsely covered by fine microtrichia. R_1 reaching C shortly before wing mid-length, R_{4+5} straight, reaching C shortly before wing apex, M_4 and CuA weak, forming a fork. Wing length 1.27–2.08 mm in female (n=130), 1.48–2.25 mm in male (n=104). Legs densely covered by scales; claws evenly curved, with long and thin tooth; empodia considerably longer than bend in claw (Fig. 10).

Female abdomen: Tergites 1–6 with anterior pair of trichoid setae and posterior row of long setae; tergite 7 (Fig. 11) about twice as long as wide, divided anteriorly into two lobes, each with trichoid seta, widest posteriorly, with several rows of strong setae; tergite 8 (Fig. 11) divided into two enlongate sclerites, each with anterior trichoid seta as the only vestiture, with diffusing pigmentation toward wider posterior section. Sternites 2–7 anteriorly with closely situated pair of trichoid setae, transverse patch of weak pigmentation proximal to 1–2 posterior rows of long setae, and numerous long setae medially. Ovipositor 3–7 times as long as tergite 8 (n=40). Fused cerci evenly setulose, with several long and thick setae (Fig. 6). Hypoproct evenly setulose with a couple of long apical setae.

Male abdomen: Sclerites only slightly differentiated from surrounding tissue. Tergites 1–7 with anterior pair of trichoid setae, posterior row of long setae and few long setae medially, more numerous on posterior tergites; tergite 8 much smaller than preceding, with anterior pair of trichoid setae as the only vestiture. Sternites each with closely situated pair of trichoid setae anteriorly, and scattered long setae medially and posteriorly. Terminalia (Fig. 12): Gonocoxite cylindrical, dorsally with numerous strong setae, anterior part of mediobasal lobes globose, densely setose, posterior part rectangular, not tapered distally, strongly ragged and setose, clearly shorter than aedeagus; gonostylus approximately same width throughout length, evenly and thoroughly setulose with numerous strong setae and medium-sized apical tooth. Cerci ragged, separated almost to base, rounded apically, densely setose and setulose, each with two very long setae apically and numerous long setae elsewhere; hypoproct relatively narrow, same width throughout length, apically bilobed, strongly ragged and setose, with numerous strong setae apically on each lobe; aedeagus truncate apically.

Larva (third instar) (Fig. 13). Light orange; length: 1.38–2.57 mm (n=11). Integument rugose. Posterolateral apodemes longer than head capsule. Spatula long-shafted, with trapezoid anterior lobe; on each side with two sets of three tiny lateral papillae. Terminal papillae with very short setae.

Pupa (Figs 7, 8). Light orange. Antennal bases developed into short, tapered 'horns'. Face smooth, without papillae. Cephalic seta long and fine. Prothoracic spiracle very long and tapered. Abdominal segments evenly covered by tiny spicules.

Holotype: ♀, **Israel:** Givat Gorni [31°19'07.59"N 35°19'54.41"E], 2.ii.2014, N. Dorchin & G. Danon, ex bud gall on *Suaeda asphaltica*. On permanent microscope slide in Euparal (SMNHTAU).

Paratypes: Israel: From *Suaeda asphaltica*: 2♀, same data as holotype; 3♀, 1♂, Mizpe Yeriho, 1 km E, Rt. 1 (sea level sign), 9.ii.2012, N. Dorchin; 4♀, Nabi Musa, 9.ii.2012, G. Danon; 1♀ 14♂, Nabi Musa, 6.xii.2012, G. Danon; 1♀ 2♂, Mizpe Yeriho, 1 km E, Rt. 1, 13.ii.2013, G. Danon & M. Baharal;

4♂, Nahal Havarim, En Ovdat Nature Reserve, 3.iii.2013, G. Danon; 2♀ 3♂, Har Yishay, 10.iii.2013, G. Danon; 3♀ 3♂, Arad, 10 km E, Rt. 31, 200 ASL sign, 12.iii.2013, G. Danon.

From *Suaeda fruticosa*: 2♀ 1♂, Lido junction, 1 km W, Rt. 1, 31.i.1995, N. Dorchin; 4♀ 3♂, En Gedi Nature Reserve, 13.ii.1996, N. Dorchin; 2♀ 3♂, Zohar junction, 12.iii.2001, N. Dorchin; 2♀ 2♂, Lido junction, 1 km W, Rt. 1, 20.i.2013, G. Danon; 2♂, Enot Zuqim Nature Reserve, 9.ii.2013, N. Dorchin & G. Danon; 3♀ 2♂, Nahal Mor, Rt. 90, 10.iii.2013, G. Danon.

Other material examined: Israel: 11 larvae (on four slides), Nabi Musa, 29.xi.2012, G. Danon, ex *Suaeda asphaltica*; 5 larvae (on two slides), Nabi Musa, 6.xii.2012, G. Danon, ex *Suaeda asphaltica*; 4 larvae, En Gedi Nature reserves, 13.ii.1996, N. Dorchin, ex *Suaeda fruticosa*; 6 larvae (on two slides), Lido junction, 1 km W, Rt. 1, 20.i.2013, G. Danon, ex *Suaeda fruticosa*. **Spain:** 5♀ 6♂, Almeiria Province, Aguadulce, 19.iii.1982, E. Sylvén (NHRS-GULI000013507-17); 8♀ Fuerteventura, Jandia, Punta del Matorral, 5–7, 17.xii.1986, E. Sylvén (NHRS-GULI000015383-90); 3 gall samples, Aguadulce, 19.iii.1982, E. Sylvén (host plant incorrectly identified as *Suaeda maritima*/*S. vera*), deposited in NHRS (gall samples: NHRS-GULI 000011390,1,2).

Distribution: Probably circum-Mediterranean, as the species was reared from similar galls on *S. fruticosa* in Israel and Spain (incl. Canary Islands). Known in Israel from the northern Dead Sea area (on *S. fruticosa*) and the Judaean Desert (on *S. asphaltica*), and in southern Spain from Aguadulce, near Almeria and Fuerteventura in the Canary Islands.

Host plants: *Suaeda fruticosa* and *S. asphaltica* (rarely *S. aegyptiaca*).

Remarks: *Dasyneuriola* species are morphologically similar and, in the lack of molecular data, the best attributes for distinguishing among them are those of the galls and host associations. The structure of *D. prolifica* galls and their great abundance resemble those described for *D. suaedae* Marikovskij from *Suaeda microphylla* in Kazakhstan (Marikovskij 1961), although *D. suaedae* was reported to have a single generation a year, whereas *D. prolifica* is multivoltine. The host plants belong to the same section within the genus *Suaeda* (sect. *Salsina*; Schütze *et al.* 2003) but it seems unlikely that the gall midges on them belong to the same species given the vast geographic distance and the different habitats where the plants grow (Central Asia vs. Mediterranean; Dehghani & Akhani 2009).

Dasyneuriola salicorniae Fedotova from *Suaeda altissima* and *D. suaedigemmae* Fedotova from *S. acuminata* in Kazakhstan form bud galls that are similar to those of *D. suaedae* and were distinguished from *D. suaedae* based on morphological attributes that appear superficial (Fedotova 1995). The rarer and smaller galls of *D. suaedigemmae* and its pupation in the soil could be attributed to the association with that particular host plant. *D. suaediramea* Fedotova develops in multi-chambered stem galls on *S. physophora*, which are strikingly different from the galls of all other *Dasyneuriola* species on *Suaeda*, and the host plant belongs to a very different section within *Suaeda* (sect. *Suaeda*; Schütze *et al.* 2003).

In summary, three of the Central Asian species of *Dasyneuriola* (*D. suaedae*, *D. salicorniae* and *D. suaedigammae*) appear similar to each other and a molecular study may show that they are conspecific. Despite the general morphological similarity of these species to *D. prolifica*, we describe the latter as new to science based on its geographical distribution, habitat and host range, a decision that could be tested by molecular data once available.

Genus *Baldratia* Kieffer, 1897

Baldratia is an Old World genus in the tribe Lasiopterini, currently with 39 described species (Gagné & Jaschhof 2017), all on Chenopodiaceae in Central Asia and the Mediterranean Basin. The genus was revised by Möhn (1969) based only on larvae, and most of the 17 species described in that work are still known only from the larval stage. Several additional species from Chenopodiaceae in Israel (and elsewhere) are yet to be described. Some species form conspicuous galls but most develop in leaves or stems with very slight to no external signs of their presence. Adults are usually larger and slenderer compared to those of other chenopod-associated genera, in particular *Stefaniola* and *Careopalpis*, and their legs are relatively longer. Flagellomere numbers vary within a species and sometimes also between antennae of the same individual. Females usually have more flagellomeres than males, and apical flagellomeres in both sexes are frequently fused. Palpi are almost always one-segmented but are two-segmented in some species. The aculeus of the female ovipositor is always curved ventrally (convex) and bears modified, strongly curved setae. Some species have an additional thick and straight spine at the base of the aculeus. The sclerotized lateral plate of the female's cercal segment sheathes the base of the apical lamella entirely or partially, and bears simple or split setae, the latter situation being unique to *Baldratia*. The known pupae have well developed antennal and facial horns. Larvae are typically more elongate and slender than those of other chenopod-associated Lasiopterini; they have a well-developed bi- or tridentate spatula with a reduced number of mostly asetose lateral papillae, and their dorsal and terminal papillae usually bear relatively long setae.

Baldratia arida Dorchin, n. sp.

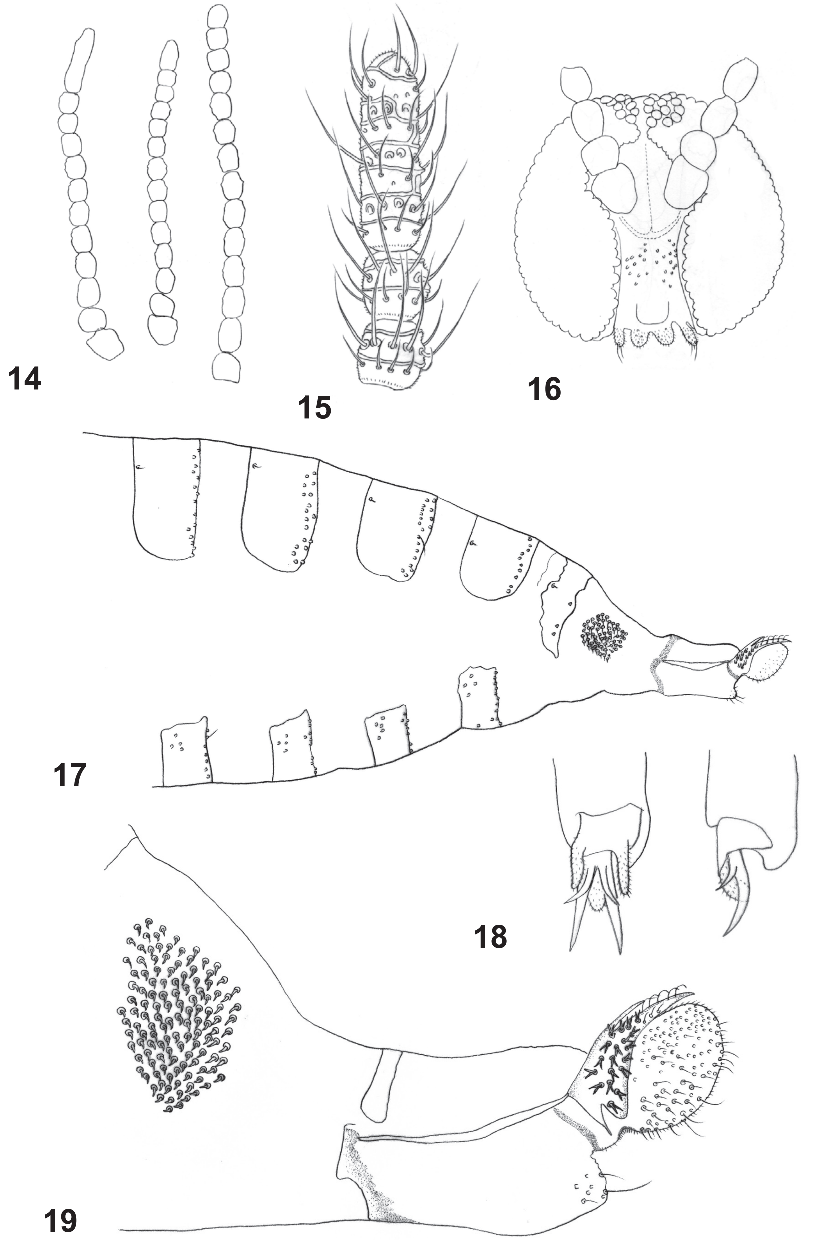
(Figs 14–23, 44, 45)

LSID: urn:lsid:zoobank.org:act:D3AD7F22-F0C3-4C21-B7CE-76D4A62F202C.

Etymology: The species is named after its typical habitats: arid slopes of the Judean Mountains and along the Dead Sea valley.

Description:

Gall and biology: This species develops without gall formation in leaves of *Suaeda asphaltica* and *S. aegyptiaca*. At most, a slight swelling can be seen in close examination of *S. aegyptiaca* leaves, but the presence of the gall midge usually becomes evident only once the adults emerge and the empty exuviae are found stuck in the leaf. One individual develops per leaf. Although the annual or biennial *S. aegyptiaca* is available for galling almost throughout the year, we reared the gall midges from this plant only in April, June and November but not during most of the summer (July–September). The second host plant, *Suaeda asphaltica*, is a subshrub whose above-ground parts are completely dry between May and December, and gall midges were reared from it only between February and April. These data suggest that *B. arida* completes several generations between November and June, and first-instar



Figs 14–19: *Baldratia arida* n. sp.: (14) antennae, showing variation in flagellomere numbers; (15) female, apical antennal flagerllomeres, showing apical flagellomere composed of three fused units; (16) head; (17) female abdomen, lateral; (18) leg, acromere, frontal (left) and lateral (right); (19) ovipositor, lateral.

larvae probably spend the summer in diapause inside viable parts of the host plants. The species can be abundant in some sites but usually emerges in smaller numbers compared to those of other species on the same host plants.

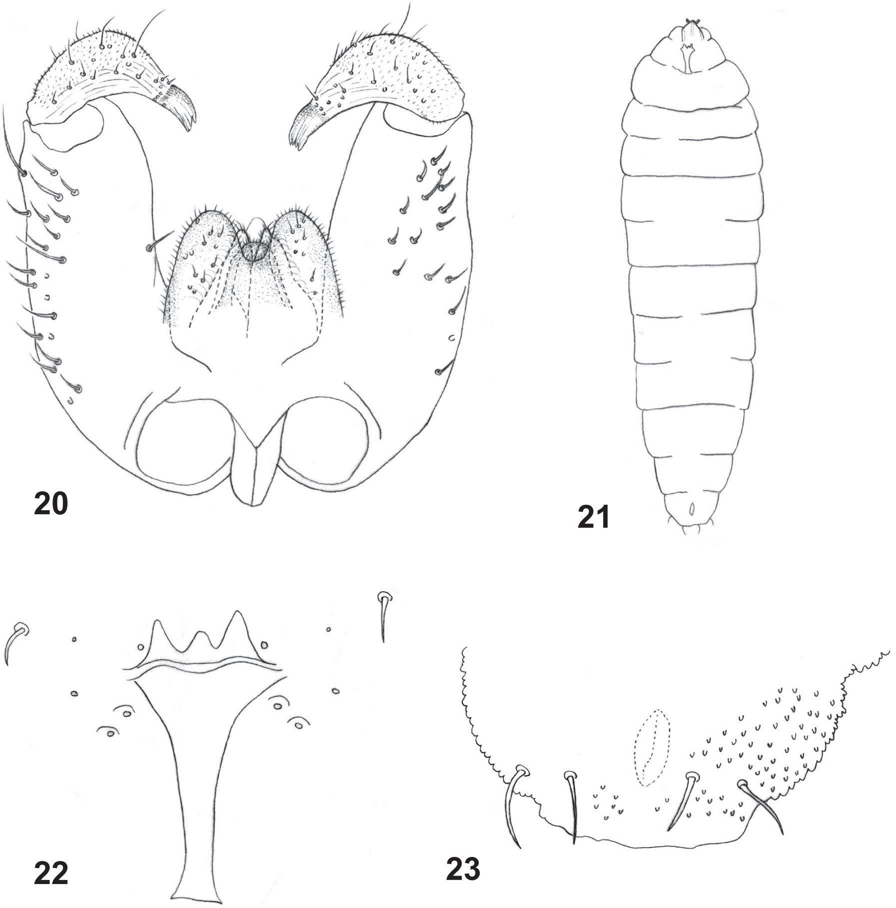
Adult. General color of female pinkish, of male greyish to light orange. Face, occiput, thorax and ventral and lateral parts of abdomen covered by white scales. Legs densely covered by white scales ventrally, black scales dorsally. Dorsal part of abdomen with black-and-white scale pattern created by three black triangles on white background on each segment.

Head: Eye facets round; gap between eyes on vertex 1–2 facets wide. Antenna: Scape wide trapezoid, pedicel spherical, both covered by white scales; number of flagellomeres 10–13 in female (n=36), 10–11 in male (n=32), number occasionally differs between antennae of same individual; flagellomeres (Fig. 14) cylindrical to barrel-shaped in male, shorter to almost quadrate in female; each flagellomere with two whorls of appressed circumfila with longitudinal connection, one whorl of strong setae originating from prominent sockets between two circumfila whorls, one whorl of smaller setae proximal to circumfila, and otherwise evenly covered by microtrichia; apical flagellomere almost always composed of 2–3 entirely or partially fused units, apically rounded, with 4–8 circumfila and several whorls of long setae (Fig. 15). Frontoclypeal membrane with long setae and scales. Palpus strongly reduced, 1-segmented, about 2–3 times as long as wide, with few long setae and otherwise evenly setulose (Fig. 16). Labella about as long as wide, setulose, with several long setae.

Thorax: Greyish, covered by white scales and setae. Wing transparent, with sparse hair-like setae on entire surface and long hair-like setae along posterior margin; wing length 1.39–2.76 mm in females (n=37), 1.54–2.64 mm in males (n=33); C broken distal to junction with R_{4+5}; R_{4+5} joining C around mid-length of wing; C and R_{4+5} densely covered by mixed black and white scales to meeting point; M_4 absent, M_{1+2} straight, CuA curved at proximal third. Stem of halter light orange, without scales; knob covered by black and white scales. Legs: Tarsal claws (Fig. 18) moderately and evenly arched, with small tooth, slightly to strongly curved close to base; empodia clearly shorter than bend in claw; pulvilli distinct, about 0.3 as long as claw.

Female abdomen (Fig. 17): Tergites 1–7 with anterior pair of trichoid setae, 1–2 posterior rows of strong setae, and evenly distributed scales; tergite 8 shorter than 7, extending farther ventrally, with anterior pair of trichoid sensilla and few small setae, without posterior row of strong setae. Sternites 2–7 without anterior trichoid setae, with posterior row of setae, several setae at proximal half, and evenly distributed scales; sternite 8 undifferentiated from surrounding membrane. Ovipositor (Fig. 19): segment 8 with large lateral group of hyaline, curved setae on prominent sockets; segment 9 with pigmented patches basally, pigmented rod-like sclerite along segment, and several long and strong setae apicoventrally. Cercal segment in obtuse position relative to segment 9, strongly sclerotized lateral plate sheathing almost entire base of apical lamella, with thick, basal spine extending to half-length of aculeus, and about 20 straight, paired setae laterally; aculeus thick, evenly curved ventrally, with two rows of 5–6 strongly hooked setae on distal half. Apical lamella ovoid, setose and setulose.

Male abdomen: Tergites 1–8 as in female. Sternites 2–7 as in female, except setation stronger on posterior sternites. Sternite 8 smaller but more setose than preceding. *Terminalia* (Fig. 20): Gonocoxite elongate, cylindrical, about same width throughout length, with numerous strong setae laterally; mediobasal lobe without typical bulge dorsally, ventral part elongate, narrows posteriorly, sheathing aedeagus almost to apex, longitudinally divided by deep grooves into two lobes on each side, densely setose. Gonostylus strongly arched, widest at mid-length, narrowed abruptly from mid-length toward apex, with wide apical tooth, numerous setae more closely situated at base of tooth, setulose along distal half dorsally and ventrally, striate



Figs 20–23: *Baldratia arida* n. sp.: (20) male, terminalia, dorsal; (21) larva, habitus, ventral; (22) larva, spatula and associated papillae; (23) larva, terminal segment, dorsal.

elsewhere. Aedeagus only slightly longer than mediobasal lobes, rounded apically. Hypoproct entire, narrow, rounded apically, setose and setulose. Cerci separated by rounded notch on distal third, rounded apically, setose and setulose.

Larva (third instar) (Figs 21). Light to bright orange. Elongate. Integument completely covered by tapered verrucae. Antennae about 3 times as long as wide. Posterolateral apodemes about as long as head capsule. Spatula (Fig. 22) prominent, tridentate, long shafted, shaft very wide immediately posterior to teeth, mid tooth distinctly shorter than lateral teeth. On each side of spatula 1 asetose sternal papilla, 3 asetose lateral papillae, 2 of which on separate elevated bumps, the third without such bump, and 1 asetose ventral papilla. Pleural and dorsal papillae with long setae. Terminal abdominal segment (Fig. 23) with 2 papillae bearing long setae on each side.

Pupa (Figs 44, 45). Light to dark orange. Antennal bases forming wide, tapered horns, pointed ventrally. Vertex with short cephalic seta on prominent bulge. Prothoracic spiracle tapered, narrowed abruptly at distal third, where trachea opens. Face with prominent, straight anterior horn and shorter, slightly curved and wide-based posterior horn; without apparent facial papillae. Abdominal segments entirely covered by tiny, tapered spicules.

Holotype: ♀, **Israel:** Lido junction, 1 km S, Rt. 90 [31°46'12.8"N 35°29'56.0"E], 7.ii.1996, N. Dorchin, reared from leaf of *Suaeda aegyptiaca*. On permanent microscope slide in Euparal (SMNHTAU).

Paratypes: Israel: From *Suaeda aegyptiaca*: 1♀, same data as holotype; 1♀ 5♂, Lido junction, 1 km S, Rt. 90, 19.ii.1996, N. Dorchin; 10♀ 10♂, 9 larvae (on 2 microscope slides), 28 pupal exuviae (on 5 microscope slides), Enot Qane, 1.vi.2014, A. Freidberg.

From *Suaeda asphaltica*: 7♀ 2♂, Mizpe Yeriho, 1 km E, Rt 1, sea level, 13.ii.2013, G. Danon; 10♀ 6♂, Mizpe Yeriho, 1 km E, Rt 1, sea level, 7.iv.2013, G. Danon (1♀ 1♂, USNM, 1♀ ZFMK, others SMNHTAU); 2♀ 6♂, Mizpe Yeriho, 1 km E, Rt 1, sea level, 16.ii.2014, G. Danon; 3♀ 1♂, Nabi Musa, 7.iv.2013, G. Danon; 1♂, 1 exuviae, Mizpe Yeriho, 1 km E, Rt 1, sea level, 1.ii.2017, N. Keidar; 2 exuviae (on same microscope slide), Mizpe Yeriho, 1 km E, Rt. 1, sea level, 14.ii.2017, N. Bonda; 2 exuviae (on same microscope slide), 1♀ 1♂, Nabi Musa, 14.ii.2017, N. Keidar.

Other material examined: Israel: 1♀ 1♂, Mizpe Yeriho, 1 km E, Rt 1, sea level, 13.ii.2013, G. Danon, ex *Suaeda asphaltica*.

Distribution: Currently known only from the northern Dead Sea area (on *S. aegyptiaca*) and the Judean Desert (on *S. asphaltica*) in Israel. Probably also occurs in Jordan on the same host plants.

Remarks: This species belongs to a morphologically uniform group within *Baldratia*, in which the female ovipositor has a strong spike at the base of the cercal segment in addition to the aculeus and paired spines on the lateral plate. It differs from other members of this group in Israel (*B. salicorniae* Kieffer and *B. suaedae* Möhn) by pupal and larval characters. The pupa of *A. arida* has anterior and posterior facial horns and no facial papillae, whereas in *B. salicorniae* it does not have a posterior facial horn but bears facial papillae, and in *B. suaedae* the pupa has a minute posterior facial horn and clearly setose facial papillae, and its adults are much smaller than those of *B. arida* and *B. salicorniae*. The arrangement of lateral papillae in the larva is similar in *B. arida* and *B. salicorniae* but differs between them and *S. suaedae*. Other species from *Suaeda* in this region include *Baldratia* *occulta* Dorchin from *S. monoica* in Israel (Dorchin 2001) and *Baldratia karamae* Elsayed from *S. acuminata* in Egypt (Elsayed *et al.* 2015). *Baldratia occulta* differs from *B. arida* in that its pupa does not have a posterior facial horn and the female ovipositor lacks an additional spine at the base of the aculeus. *Baldratia karamae* is much smaller than *B. arida* based on its published description, and is found almost throughout the year (Elsayed *et al.* 2015), whereas *B. arida* was reared only in spring. Molecular data (Dorchin & Dor, unpubl.) confirm that *B. arida* is distinct from *B. suaedae*, *B. occulta* and *B. salicorniae*. The remaining *Baldratia* species currently known from *Suaeda* are *B. aelleni* Möhn from *Suaeda microphylla* in Iran, known only from larvae (Möhn 1969), and *B. suaedifolia* Fedotova and *B. terteriani* Mamaev & Mirumian from Central Asia.

Baldratia suaedae Möhn, 1969

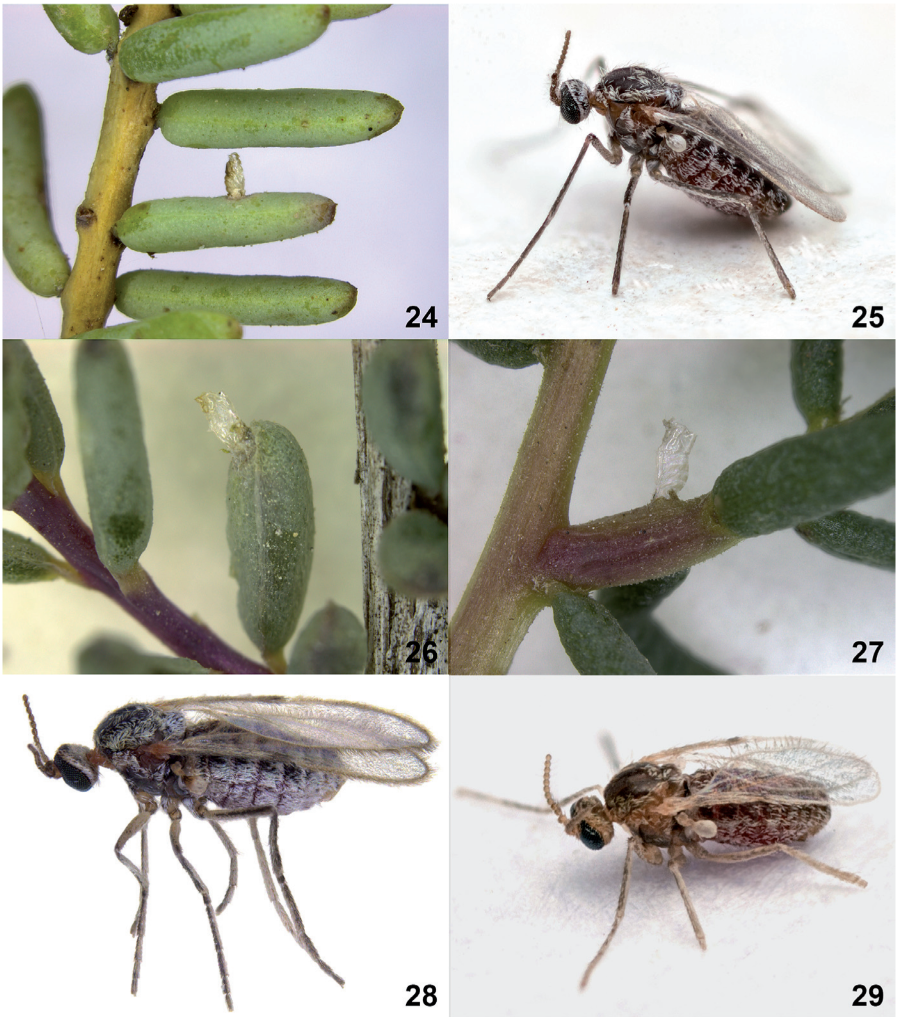
(Figs 24, 25)

Description: Similar to *B. arida* except for the following.

Gall and biology. This species develops in leaves of *Suaeda vera* without gall formation (our observations; Fig. 24) or by causing a slight swelling of the leaf (Möhn 1969). The fusiform, orange eggs are stuck individually in the leaves, perpendicular to the leaf surface, such that the larva hatches directly into the leaf. Möhn (1969) described the species from material collected in Israel, Algeria and the Canary Islands, stating that it has two generations a year. However, over the years we reared adults in Israel from February to September, practically whenever the host plant was sampled, suggesting that the species is multivoltine. In Israel, *B. suaedae* is found wherever its host plant grows along the coastal plain – from Caesaria National Park in the north, where isolated plants grow near and on the walls of the historical city of Caesarea, to Tel Dor Nature Reserve and Ashkelon National Park in the south, where small populations of the plant grow on cliffs overlooking the sea. *Suaeda vera* is a rare species in Israel and its population in Jaffa, from which the species was originally described, apparently no longer exists. Apart from its sporadic occurrence along the coastal plain in Israel, this plant is locally abundant also in the central Negev Desert, in En Ovdat Nature Reserve. Interestingly, repeated sampling of that desert population on multiple occasions never yielded any gall midges, therefore it appears that *B. suaedae* is restricted to the Mediterranean coast.

Adult (Fig. 25). General color of female pinkish, male brownish to light orange, dorsal part of thorax and abdominal tergites dark. Face, occiput, thorax and ventral and lateral parts of abdomen covered by white scales. Legs covered by white scales ventrally, black scales dorsally. Abdominal tergites each with three triangular patches of black scales on white background, forming three black lines along abdomen.

Head: Flagellomeres barrel-shaped to almost quadrate in both sexes; two flagellomeres sometimes partially fused in mid antenna, two or three apical flagellomeres almost always fused, slightly tapering apically.



Figs 24–29: Cecidomyiid adults and pupal skins on *Suaeda* in Israel: (24) *Baldratia suaedae*, exuviae in leaf of *Suaeda vera*; (25) *Baldratia suaedae*, female (Photo: Oz Rittner); (26) *Careopalpis latita* n. sp., exuviae in leaf of *Suaeda fruticosa*; (27) *Careopalpis latita* n. sp., exauviae in young stem of *Suaeda fruticosa*; (28) *Careopalpis latita* n. sp., female; (29) *Suaediola quotidiana* n. sp., female (Photo: Oz Rittner).

Thorax: Wing length 1.33–1.89 mm in females (n=36), 1.23–1.73 mm in males (n=36); C and R_{4+5} densely covered by black scales almost to meeting point, with patch of white scales at meeting point. Tarsal claws with thin tooth, strongly curved at base.

Larva (third instar). Light orange. Integument rugose. On each side of spatula three asetose lateral papillae, evenly distributed.

Pupa. Light orange. Antennal bases forming wide and short tapered horns, pointed ventrally. Face with small, straight anterior horn and small, wide-based posterior horn, with two clearly setose papillae half way between anterior and posterior horns.

Holotype: Larva, **Israel:** Jaffa, 12.vii.1912, E. Möhn, ex leaf of *Suaeda vera* (Möhn collection number 9710). Remounted on a permanent microscope slide in Euparal and labeled as the holotype by N. Dorchin (deposited in SMNS). Other material from the Möhn collection did not survive (Möhn slide numbers 9710, 9492/10, 9492/11, listed in Möhn 1969).

Material examined (all from *Suaeda vera*): **Israel:** 4♀ 2♂, Qaesaria National Park, 23.iv.1998, A. Freidberg; 16♀ 16♂, 1 larva, 15 pupal exuviae (on 3 microscope slides), Qaesaria National Park, 8.ix.2014, N. Dorchin & A. Freidberg (1♂, 1♀, 2 pupal exuviae USNM, 1♂ 1♀ SMNS, 1♂ 1♀ ZFMK); 7♀ 7♂, Qaesaria National Park, 27.vii.2016, N. Dorchin; 6♀ 2♂, Tel Dor Nature Reserve, 31.viii.2016, N. Dorchin. **Portugal:** 5♀ 4♂, Tejo Estuary, 15.ix.2016, D. Simon.

Distribution: Recorded from Israel, Algeria, Portugal and the Canary Islands; apparently circum-Mediterranean.

Remarks: This species was known to date only from its larvae and this is the first description of its adults and pupa. Adults do not differ morphologically from those of *B. arida* and *B. karamae*, except for the bigger size of *B. ardia*. The pupa and larva differ from those of *B. arida*, *B. salicorniae* and *B. occulta* (other species occurring in Israel) as discussed above under *B. arida*.

Genus *Careopalpis* Marikovskij, 1961

Careopalpis is an Old World genus in the tribe Lasiopterini, currently with 15 described species (Gagné & Jaschhof 2017), all on Chenopodiaceae, mostly in Central Asia. Some species develop in conspicuous stem or leaf galls whereas others live in the plant tissues without causing any discernible deformation. Adults superficially resemble those of *Stefaniola*, being small and stout, but are easily distinguishable from them in the shape of the female ovipositor, and are uniform morphologically contrary to the morphologically diverse *Stefaniola*. Antennal flagellomeres always number 10 in both sexes, palpi are minute and one-segmented, and the aculeus of the female ovipositor is always curved ventrally over an ovate or fusiform apical lamella. Known pupae have well developed antennal and facial horns. Larvae are short and stout, lacking a sternal spatula and with greatly reduced papillae and vestiture.

Careopalpis latita Dorchin, n. sp.

(Figs 26–28, 30, 31, 33, 35, 36)

LSID: urn:lsid:zoobank.org:act:E77EA295-FF6E-4CF2-BD87-48D5CAE0BD41.

Etymology: The species name is from the Latin *latita* for *hidden* or *lurking*, with reference to the lack of any external signs of the gall midge presence in the leaves.

Description:

Gall and biology. This species develops without apparent external signs in leaves or young stems of *Suaeda aegyptiaca* and *S. fruticosa*. Its presence in the plant becomes apparent only after adult emergence, when empty pupal exuviae are found stuck in it (Figs 26, 27). The species appears to be equally abundant on its two host plants, which share the same habitats along the rift valley. Apparently it alternates between them according to season, having been reared from *S. aegyptiaca* from April to October and from *S. fruticosa* from November to February.

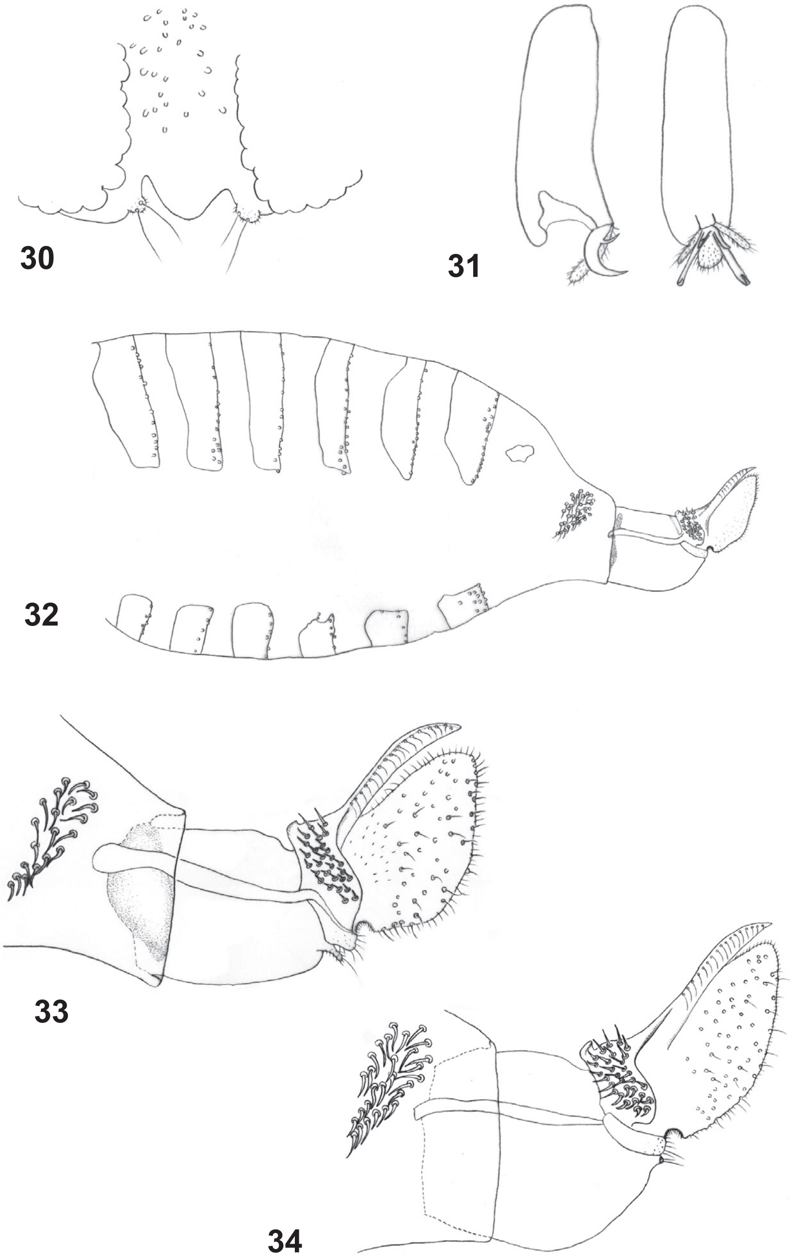
Adult. General color of female pinkish, of male brownish orange, mostly covered by white scales (Fig. 28); dorsal part of abdomen with three longitudinal lines of black scales formed by three triangular patches on each tergite.

Head: Eye facets circular, gap between eyes on vertex 0–0.5 facets wide. Antenna: Scape trapezoid, pedicel spherical, flagellomeres barrel-shaped, about 1.3–2.0 times as long as wide, each with two whorls of appressed circumfila around mid-length with longitudinal connections, proximal whorl of thin setae, distal whorl of thicker, longer setae on large sockets, and otherwise setulose; apical flagellomere rounder or slightly tapered. Adjacent flagellomeres occasionally fused to form one larger unit. Frontoclypeal membrane with about 10 setae and numerous scales. Palpus (Fig. 30) vestigial, barely visible, with two very long setae. Labella absent.

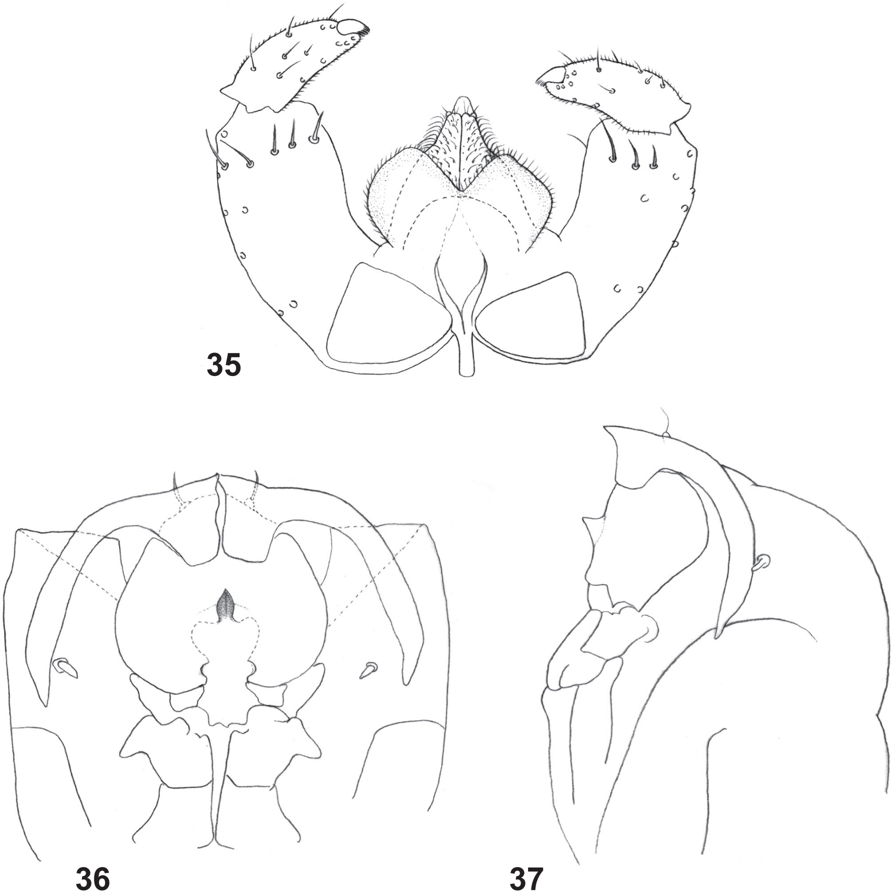
Thorax: Wing transparent, with sparse hair-like setae on entire surface and long delicate hair-like setae along posterior edge; wing length 1.34–1.96 mm in female (n=38), 1.20–1.72 mm in male (n=17); R_{4+5} reaching C proximal to mid-length of wing; C broken beyond junction with R_{4+5}, both densely covered by black and white scales to junction point; M_4 absent, M_{1+2} straight, CuA curved at mid-length. Legs (Fig. 31): Tarsal claws toothed on all legs, evenly curved, tooth curved basally, empodia longer than bend in claw, pulvilli about as long as bend.

Female abdomen (Fig. 32): Tergites 1–7 without anterior trichoid seate, with posterior row of strong setae and evenly distributed scales; pigmented section of tergite 8 very small, without vestiture. Sternites 2–7 without anterior trichoid setae, with posterior row and median group or setae, more numerous on sternites 6–7; sternite 7 often weakly sclerotized; sternite 8 undifferentiated from surrounding membrane. Ovipositor (Fig. 33): Segment 8 laterally with relatively small group of about 20 long, curved, occasionally almost S-shaped setae on prominent sockets. Segment 9 with sclerotized patches basally and wide rod-like sclerite joining setose laterobasal plate of cercal segment. Cercal segment with strongly sclerotized lateral plate sheathing entire base of segment, with small dorsal saddle-shaped projection and 30–35 straight setae on prominent sockets. Aculeus conspicuously thick, slightly curved ventrally, about same width throughout length, with row of ventrally pointed, long, fine setae to apex. Apical lamella ovoid, widest at base, about as long as aculeus.

Male abdomen: General color brownish orange; scale pattern as in female. Tergites 1–7 rectangular, without anterior trichoid setae, with posterior row of setae and evenly distributed scales; tergite 8 almost entirely undifferentiated from surrounding membrane, without vestiture. Sternites 2–6 without anterior trichoid



Figs 30–34: *Careopalpis* spp.: (30) *C. latita* n. sp., palpi; (31) *C. latita* n. sp., leg, acromere, lateral (left) and frontal (right); (32) *C. lanceocercis* n. sp., female abdomen, lateral; (33) *C. latita* n. sp., ovipositor, lateral; (34) *C. lanceocercis* n. sp., ovipositor, lateral.



Figs 35–37: *Careopalpis* spp.: (35) *C. latita* n. sp., male terminalia, dorsal; (36) *C. latita* n. sp., pupal exuviae, frontal; (37*) C. lanceocercis* n. sp., pupal exuviae, lateral.

setae, with irregular posterior row of setae and several setae medially; sternite 8 similar but pigmented area much smaller. Terminalia (Fig. 35): Gonocoxite short and wide, same width throughout length, with several strong setae denser around articulation with gonostylus; mediobasal lobes widest around mid-length, divided apically into two lobes, one of which with short, distinct seta, otherwise covered by strong, curved setae almost to apex, clearly shorter than edeagus. Gonostylus short and compact, almost same width throughout length, evenly setulose dorsally and ventrally, with several strong setae more numerous around small apical tooth. Cerci separated by triangular depression to mid-length, wider than mediobasal lobes, evenly setose and setulose. Hypoproct very short and wide, rounded apically. Aedeagus rounded apically.

Larva. Unknown.

Pupa (Figs 36, 37). Light orange. Antennal bases well developed into short, curved and tapered horns. Cephalic seta short and fine, on conspicuous socket. Frons with short, straight and tapered horn, without associated papillae. Prothoracic spiracle 2–3 times as long as wide, trachea opens close to apex. Dorsal part of abdominal tergites with transverse field of tiny spicules medially.

Holotype: ♀, **Israel:** Enot Qane Nature Reserve, Rt. 90 [31°37'19.8"N 35°24'34.3"E], 1.vi.2014, A. Freidberg, reared from *Suaeda aegyptica* leaf. Mounted on permanent microscope slide in Euparal (SMNHTAU).

Paratypes: Israel: From *Suaeda aegyptiaca*: 1♀, same data as holotype; 2♀, Yafit, Rt. 90, 17.iv.1996, N. Dorchin; 1♀, Pazael, Rt. 90, 17.iv.1996, N. Dorchin; 1♀, Lido junction, 1 km S, Rt. 90, 7.iv.2013, G. Danon; 1♀, Lido junction, 1 km S, Rt. 90, 27.iv.2014, N. Dorchin; 2♀ 1♂, Lido junction, 5.x.2014, N. Dorchin; 4♀ 4♂, Enot Zuqim Nature Reserve, Rt. 90, 5.x.2014, N. Dorchin.

From *Suaeda fruticosa*: 1♀, Lido junction. 1 km W, Rt. 1, 31.i.1995, N. Dorchin; 3♀ 1♂, Lido junction 1 km W, Rt. 1, 7.xi.1996, N. Dorchin; 1♀, Lido junction, 1 km W, Rt. 1, 2.i.2013, G. Danon; 1♂, Enot Zuqim Nature Reserve, 13.ii.2013, G. Danon; 7♀ 2♂, Nahal Zruya, Rt. 90, 16.ii.2014, G. Danon; 1♂, Nahal Mor, Rt. 90, 16.ii.2014, G. Danon; 1♂, Enot Zuqim Nature Rreserve, 23.xii.2014, N. Dorchin; 4♀ 1♂, Nahal Hatrurim, Rt. 90, 1.iii.2016, N. Keidar; 2 exuviae, 1♀, Enot Zuqim Nature Reserve, 29.xii.2016, N. Bonda; 1♀, Enot Zuqim Nature Reserve, 12.i.2016, N. Keidar; 2 exuviae, 2♀ 1♂, Enot Zuqim Nature Reserve, 3.i.2017, N. Bonda; 4 exuviae, 1♀ 2♂, Enot Zuquim Nature Reserve, 17.i.2017, N. Keidar & N. Bonda; 4 exuviae, Nahal Hatrurim, Rt. 90, 1.ii.2017, N. Keidar; 3 exuviae, 1♀, Enot Zuqim Nature Reserve, 1.ii.2017, N. Keidar & N. Bonda; 1 exuviae, Lido junction 1 km W, Rt. 1, 14.ii.2017, N. Keidar.

Distribution: Currently known only from the central rift valley in Israel. Most probably occurs in Jordan on the same host plants.

Remarks: Females of *C. latita* differ from those of *C. lanceocercis* in the ovoid rather than fusiform apical lamella of the ovipositor (Fig. 33 vs. Fig. 34), and so can be separated from them when reared from their common host plant, *S. fruticosa*. *Careopalpis latita* does not differ morphologically from *C. akko* Dorchin & Freidberg and *C. yotvata* that occur in Israel on other *Suaeda* species, and is also similar to the four Central Asian species from *Suaeda* (*C. kenderlensis* Fedotova, *C. suaedae* Fedotova, *C. suaedicola* Fedotova and *C. suaediphila* Fedotova (Fedotova 1983, 1985, 1992, 1998). The type material of *C. kenderlensis* was unavailable for comparison, and that of the remaining species had not been cleared properly before having been mounted on slides or contain only males, which are not diagnostic. Even if proper material had been available to us for examination, we doubt that we would have found morphological differences among the species given the general morphological uniformity of this genus. Our molecular results (Fig. 48; details below) suggest that morphologically indistinguishable populations of *Careopalpis* from different host plants even in the same small country constitute distinct species, hence we assume with a high level of confidence that the Central Asian species are not conspecific with the Israeli ones.

Furthermore, three of the Central Asian species are found on host-plant species from very different sections within *Suaeda*, and all but *C. suaediphila* cause conspicuous leaf galls, whereas all Israeli species develop in leaves or young stems without apparent gall formation. As for *C. suaediphila*, its original description states that it develops without gall formation in leaves of three *Suaeda* species in Kazakhstan (Fedotova 1992), each belongs in a different section within *Suaeda*. Not only do we argue that this species must differ from the *Careopalpis* species in Israel, but we also suspect that if *C. suaediphila* populations from those three host plants are subjected to molecular study they may prove to represent separate species.

Careopalpis lanceocercis Dorchin, n. sp.

(Figs 32, 34, 37)

LSID: urn:lsid:zoobank.org:act:A1D85CA9-33EC-4E24-978C-138016F7401B.

Etymology: The name *lacneocercis* refers to the typical lanceolate shape of the apical lamella of the female ovipositor.

Description: Similar to *C. latita* except the following.

Gall and biology. This species develops without any external signs in leaves or young stems of *Suaeda asphaltica* and occasionally *S. fruticosa*. Its presence in the plant becomes apparent only after adult emergence, when empty pupal exuviae are found stuck in the plant. Adults were reared from the two host plants during winter and early spring (December–March), representing the activity season of these plants. In other times of the year *S. asphaltica* is unavailable for the midges because its above-ground parts are completely dry, and *S. fruticosa* is apparently not suitable as a host given that the other cecidomyiids associated with it in Israel (*Dasyneuriola prolifica* and *Suaediola quotidiana*) also use it only in winter. *C. lanceocercis* must complete several generations during winter, and larvae of the last generation probably spend the summer diapausing in or on the plant until the next winter.

Adult. *Thorax*: Wing length 1.10–1.73 mm in female (n=25), 1.09–1.83 mm in male (n=26).

Female abdomen (Figs 32, 34): Ovipositor: Apical lamella fusiform, relatively slender, widest past proximal third or at mid-length.

Holotype: ♀, **Israel:** Mizpe Yeriho, 1 km E, Rt. 1, sea level [31°48'00.47"N 35°24'11.08"E], 2.ii.2014, N. Dorchin & G. Danon, reared from *Suaeda asphaltica* leaf. Mounted on permanent microscope slide in Euparal (SMNHTAU).

Paratypes (all from *Suaeda asphaltica*): **Israel:** 4♀ 11♂, 2 exuviae (on one slide), same data as holotype; 2♀, Nabi Musa, 15.i.1997, N. Dorchin; 2♀, Mizpe Yeriho, 1 km E, Rt. 1, sea level, 9.ii.2012, N. Dorchin; 3♀, 1♂, Nabi Musa, 16.ii.2014, G. Danon; 1♀, Mizpe Yeriho, 1 km E, Rt. 1, sea level, 2.iii.2014, G. Danon; 2♀ 3♂, Nabi Musa, 16.iii.2014, G. Danon; 3♀ 3♂, Nahal Havarim, En Ovdat Nature Reserve, 25.xii.2015, N. Dorchin; 1 exuviae, 1♂, Mizpe Yeriho, 29.xii.2016, N. Bonda; 3 exuviae (on two slides), 3♀ 2♂, Mizpe Yeriho, 3.i.2017, N. Bonda; 1 exuviae, 1♂, Nabi Musa, 17.i.2017, N. Bonda; 2 exuviae, 1♀ 1♂, Mizpe Yeriho, 1.ii.2017, N. Keidar.

Distribution: Israel: Judean Desert (on *S. asphaltica*) and central Rift Valley (on *S. fruticosa*). Probably also occurs in Jordan on the same host plants.

Remarks: *Careopalpis lanceocercis* differs from the other three *Careopalpis* species in Israel (all from *Suaeda* spp.) by the fusiform, more slender shape of the apical lamella of the female ovipositor. For comparison with non-Israeli species see the remarks section under *C. latita*. Although *C. latita* and *C. lanceocercis* are found in similar habitats along the central rift valley, our data suggest that adults of *C. latita* are found year-round, whereas those of *C. lanceocercis* are active only in winter. This disparate phenology is probably dictated by the phenology of the respective host plants, namely the suitable conditions for the development of *C. latita* in summer on *S. aegyptiaca* but their lack thereof for *C. lanceocercis* on *S. asphaltica* and *S. fruticosa*. This ecological factor may account for the sympatric existence of distinct species even when sharing a common host plant.

Careopalpis yotvata Dorchin, n. sp.

LSID: urn:lsid:zoobank.org:act:590DECE0-0258-411D-B63E-9E49998D3499.

Etymology: The species is named after Yotvata salt marsh—the site in which it was first discovered—where a small population of its rare host plant is found. The name is a noun in apposition.

Description: Similar to *C. latita* except for the following.

Gall and biology. This species develops without apparent gall formation in leaves of *Suaeda vermiculata*. Its presence in the leaves becomes apparent only after adult emergence, when empty pupal exuviae are found stuck in the leaves. It was reared only in winter and early spring (February–March) but it is possible that adults are present in other winter months in which the host plant has not been sampled. It is unlikely that *C. yotvata* is active in summer and fall given its extremely harsh habitat, characterized by very high temperatures and exceedingly limited precipitation.

Adult. *Thorax*: Wing length 1.23–1.63 mm in female (n=22), 1.10–1.60 mm in male (n=15).

Larva. Unknown.

Pupa. Unknown.

Holotype: ♀, **Israel**: Avrona salt marsh Nature Reserve [29°49'35.8"N 35°02'34.7"E], 7.iii.2017, N. Dorchin, reared from *Suaeda vermiculata* leaf. Mounted on permanent microscope slide in Euparal (SMNHTAU).

Paratypes (all from *Suaeda vermiculata*): 11♀ 6♂, same data as holotype; 8♀ 7♂, Yotvata salt marsh Nature Reserve, 17.ii.2015, N. Dorchin.

Distribution: Israel: Yotvata and Avrona salt marshes. No doubt the species also occurs in Jordan on the same host plant.

Remarks: *Careopalpis yotvata* does not differ morphologically from *C. latita* and *C. akko* that are found on other *Suaeda* spp. in Israel. It differs from *C. lanceocercis* by the ovoid rather than fusiform shape of the apical lamella of the female ovipositor. For comparison with non-Israeli species see remarks section under *C. latita*. *Suaeda vermiculata*, the host plant of *C. yotvata*, is a rare plant in Israel, and is virtually limited to the localities where we sampled it. While *Suaeda aegyptiaca* co-occurs in the same habitats, sampling that plant south of the Dead Sea area never yielded gall midges, whereas in the northern parts of its distribution range it hosts *C. latita*. It is therefore possible that *C. yotvata* became separated from *C. latita* and established as a distinct species on *S. vermiculata* in areas where *S. aegyptiaca* is not suitable as a host plant. This hypothesis is supported by our molecular data (Fig. 48), which suggest that *C. yotvata* and *C. latita* are more closely related to each other than to any other *Careopalpis* species in Israel.

Suaediola Dorchin, n. gen.

LSID: urn:lsid:zoobank.org:act:D88B16C7-0B0C-4DE3-9AA2-B46D2C8B83C5.

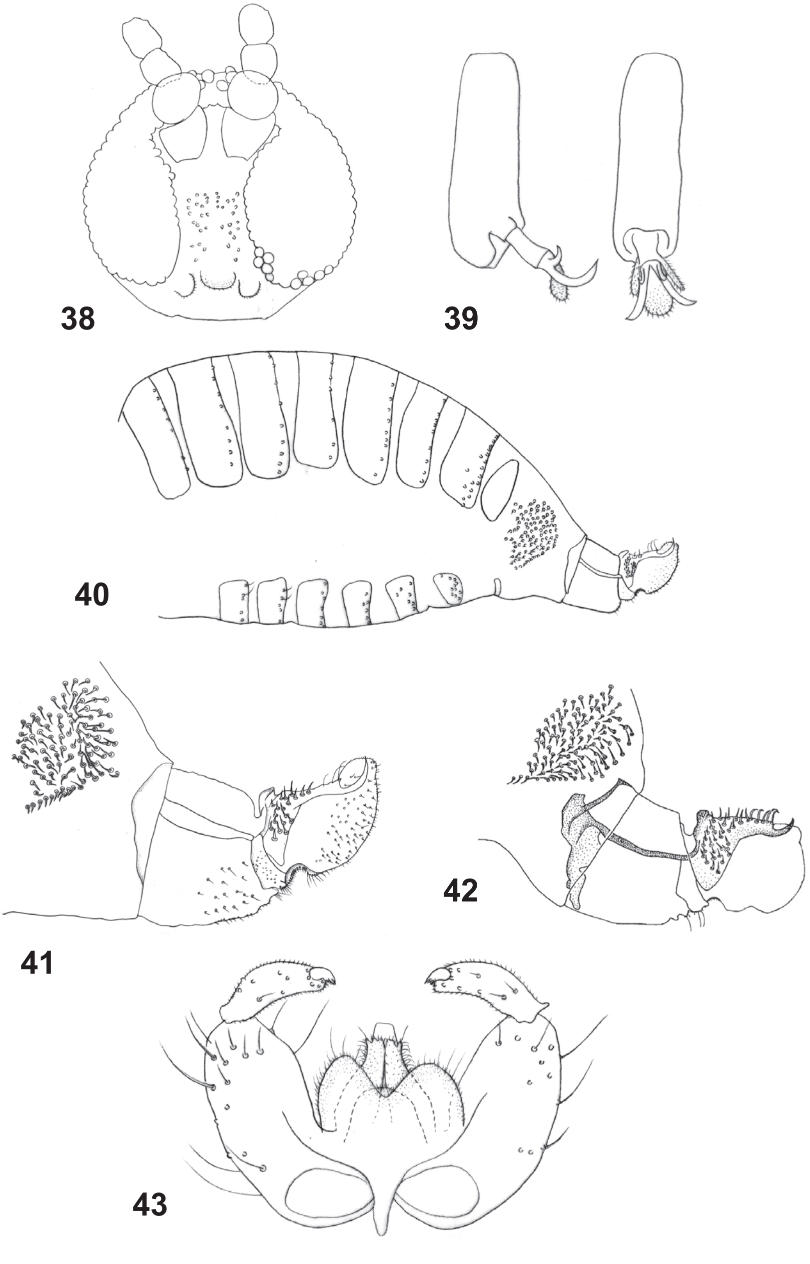
Etymology: *Suaediola* combines *Suaeda*, the host of all known species in this genus, with the diminutive suffix 'ola', with reference to the generally small size of the midges.

Type species: *Suaediola quotidiana* Dorchin, n. sp.

Diagnosis: This genus belongs to the subtribe Baldratiina within the tribe Lasiopterini based on the characteristic morphology of adults and the association with Chenopodiaceae host-plants. *Suaediiola* resembles *Careopalpis* and *Stefaniola* in its small size, lack of spatula in the third-instar larva, and the overall chubby appearance of adults. *Baldratia*, by contrast, is usually larger and more slender in all developmental stages, and its third-instar larvae have a well-developed spatula. *Suaediola* resembles *Careopalpis* also in the invariable number of ten antennal flagellomeres (their number often irregular in *Baldratia* and *Stefaniola*) but is easily distinguished from it by the dorsally rather than ventrally curved aculeus of the female ovipositor. It differs from *Izeniola* Fedotova and *Stefaniola* in the presence of a dorsal saddle-like projection at the base of the lateral plate of the female cercal segment, and the aculeus that is narrowed abruptly past its mid-length to form a dorsally curved sickle. By contrast, *Izeniola* and *Stefaniola* have a uniformly curved or straight aculeus and the ovipositor in *Izeniola* is strikingly longer. A molecular study currently underway (Dorchin & Dor, in prep.) suggests that the genera most closely related to *Suaediola* are *Izeniola* and *Careopalpis*, whereas *Stefaniola* is more distantly related to it.

Description: Adult. *Head* (Fig. 38): Eye facets round; gap between eyes on vertex 0–2 facets wide. Antenna: 10 flagellomeres in both sexes, occasionally two adjacent flagellomeres partially fused; flagellomeres barrel-shaped to almost quadrate in both sexes, without necks, each with 1–2 whorls of appressed, interconnected circumfila, 1 whorl of strong setae on prominent sockets between two circumfila whorls, 1 whorl of thinner, shorter setae proximal to circumfila, evenly setulose elsewhere. Frontoclypeal membrane with long setae and scales. Palpus 1-segmented, strongly reduced, 1–2 times as long as wide, setulose, with few long setae. Labella strongly reduced to completely absent.

Thorax: Wing transparent, with sparse delicate hair-like setae on entire surface; C broken beyond junction with R_{4+5}; R_{4+5} reaching C proximal to mid-length of wing; C and R_{4+5} very thick and densely covered by scales to meeting point; M_4 absent, M_{1+2} straight, CuA curved posteriorly past mid length. Legs (Fig. 39): Tarsal



Figs 38–43: *Suaeidiola* spp.: (38) *S. quotidiana* n. sp., head; (39) *S. quotidiana* n. sp., leg, acromere, lateral (left), frontal (right); (40) *S. quotidiana* n. sp., female abdomen, lateral; (41) *S. quotidiana* n. sp., ovipositor, lateral; (42) *S. siliqua*, ovipositor, lateral (originally published in Dorchin (2001)); (43) *S. quotidiana* n. sp., male terminalia, dorsal.

claws toothed on all legs, moderately and evenly arched, tooth curved close to base; empodia longer than bend in claw; pulvilli 0.3–0.5 times as long as claw.

Female abdomen (Fig. 40): Densely covered by scales forming black-and-white pattern along dorsum. Tergites 1–6 rectangular, with no anterior pair of trichoid setae, posterior row of strong setae, and evenly distributed scales; tergite 7 same vestiture but somewhat longer than preceding; tergite 8 shorter and smaller than 7, pigmentation considerably reduced, without any vestitutre. Sternites 2–7 rectangular, without anterior trichoid setae, with few setae forming posterior row along pigmented section and several setae medially; sternite 8 with small patch of pigmented area or undifferentiated from surrounding membrane, more setose than preceding. Ovipositor (Figs 41, 42): Segment 8 with large lateral group of straight to slightly curved setae on prominent sockets; segment 9 with pigmented patches basally, pigmented rod-like sclerite along segment, and few long setae apicoventrally. Cercal segment in straight or almost straight position relative to segment 9, with distinct proximal plate sheathing base of segment, ventral shallow depression with field of closely packed short setae, sclerotized lateral plate with proximal saddle-like projection dorsally and about 20 straight to slightly curved setae on prominent sockets laterally; aculeus formed proximally of elongation of lateral plate, abruptly narrowed past mid-length, tapering into sickle-shaped spine distally; proximal section with several long, hooked setae; distal sickle-shaped section without setae. Apical lamella variably shaped, as long as or slightly longer than aculeus, setose and setulose.

Male abdomen: Tergites 1–7 rectangular, vestiture as in female; pigmented part of tergite 8 greatly reduced or tergite completely undifferentiated from surrounding tissue. Sternites 2–7 without proximal trichoid setae, with 1–2 posterior rows of very long setae and several long setae medially; sternite 8 considerably shorter and much less pigmented than preceding, with several setae. *Terminalia* (Fig. 43): Compact and stout. Gonocoxite cylindrical, almost same width throughout length, with numerous long and strong setae ventrally, more numerous next to articulation with gonostylus; dorsal part of mediobasal lobe undeveloped, ventral section wide at base, tapered distally, divided apically into several short lobes, sheathing aedeagus almost to apex, densely setose. Gonostylus widest at mid length, tapering gradually toward small to medium tooth; evenly setulose dorsally and ventrally, with several setae more closely situated close to tooth. Aedeagus truncate or with small notch apically. Hypoproct entire, rounded apically or with very shallow depression, setulose. Cerci widely separated at least to mid-length, rounded apically, setose and setulose.

Larva (third instar). Light orange. Cylindrical. Integument covered by tapered verrucae. Spatula absent. Vestiture greatly reduced, hardly discernible. Otherwise not studied or unknown.

Pupa (Figs 46, 47). Light orange. Antennal bases well developed into tapered horns, pointed ventrally. Vertex with short cephalic seta on prominent bulge. Prothoracic spiracle about 3 times as long as wide. Face with prominent, straight anterior horn and prominent, slightly curved and wide-based posterior horn; no facial papillae present. Dorsum of abdominal segments with tiny, tapered spicules.

Remarks: The genus currently includes four species, all from leaf or stem galls on *Suaeda* species in Israel, Egypt (Sinai), Jordan, Arabia, and possibly Northeast Africa. Three of these species, *Suaediola defoliata* (Dorchin, 2001) **n. comb.**, *Suaediola rufa* (Dorchin, 2001) **n. comb.** and *Suaediola siliqua* (Dorchin, 2001) **n. comb.**, were originally described under *Stefaniola* (Dorchin 2001) and are transferred here to the new genus based on morphology of the female ovipositor and on molecular evidence (Dorchin & Dor, unpubl. data). It is possible that additional species within the large and morphologically diverse *Stefaniola* will prove to belong in *Suaediola*, when subjected to a more careful morphological study and in particular when molecular data become available for them.

Suaediola quotidiana Dorchin, n. sp.

(Figs 29, 38–41, 43, 46, 47)

LSID: urn:lsid:zoobank.org:act:DE397272-6C71-4AB6-B71D-E4325606E4ED.

Etymology: The name *quotidiana* is a Latin adjective for 'ordinary' or 'common', with reference to the great abundance of this species throughout winter and spring, especially on *S. fruticosa*.

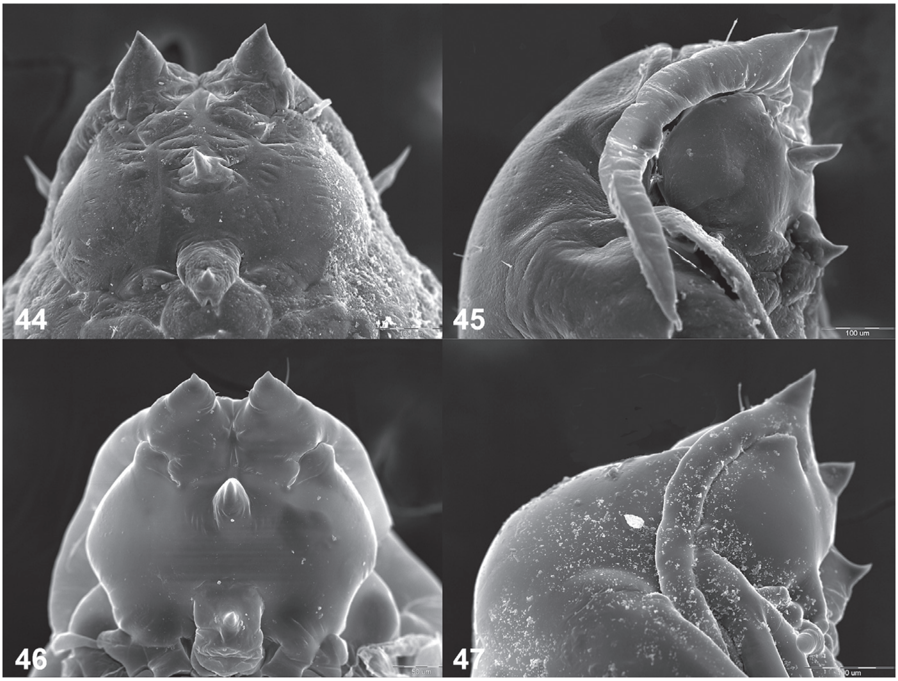
Description:

Gall and biology. This species develops without evident gall formation in leaves of *Suaeda fruticosa* and *S. aegyptiaca*. The presence of a gall midge in the leaf becomes obvious only when the adults emerge, as the empty pupal exuviae are left stuck in the leaf. Usually only one but occasionally two individuals develop per leaf. The area of the leaf around a larva is somewhat more rigid than the normal, soft tissues of the leaf. Adults were reared in great numbers from December to April, suggesting that the species completes several generations during winter and early spring. Larvae of the last generation (in spring) probably enter a resting period and spend the summer months in hidden parts of the plant until the next rainy season.

Adult (Fig. 29). General color of female pinkish, of male brownish orange; Face, occiput, thorax, legs and ventral part of abdomen covered by white scales, much denser in female than in male; dorsal part of female abdomen with three black patches on each segment, forming three lines along dorsum; dorsal part of abdomen in male brownish, with sparse cover of white scales. *Head* (Fig. 38): Gap between eyes on vertex 0–1 facets wide. Flagellomeres about as long as wide, with 1 whorl of circumfila. Palpus minute, about as long as wide; labella absent.

Thorax: Wing length 0.98–1.39 mm in females (n=52), 0.78–1.58 mm in males (n=60).

Female abdomen (Figs 40, 41): Sternite 8 with small patch of pigmented area. Cercal segment in slight obtuse angle relative to segment 9; lateral plate relatively



Figs 44–47: Pupae of cecidomyiid species from *Suaeda* in Israel: (44) *Baldratia arida* n. sp., frontal; (45) *Baldratia arida* n. sp., lateral; (46) *Suaediola quotidiana* n. sp., frontal; (47) *Suaediola quotidiana* n. sp., lateral.

short. Aculeus long and narrow, with 3–4 long, erect, apically hooked setae immediately proximal to sickle-shaped section. Apical lamella ovoid to triangular, slightly longer than aculeus, clearly extending beyond aculeus dorsally.

Male abdomen: Pigmented part of tergite 8 greatly reduced or pigmentation very weak. Aedeagus truncate, without apical notch (Fig. 43).

Larva. Unknown.

Pupa (Figs 46, 47). As in genus description.

Holotype: ♀, **Israel:** Enot Zuqim Nature Reserve [31°42'53.85"N 35°27'6.45"E], 2.ii.2014, N. Dorchin & G. Danon, reared from *Suaeda fruticosa* leaf. Mounted on permanent microscope slide in Euparal (SMNHTAU).

Paratypes: Israel: From *Suaeda fruticosa*: 4♀ 5♂, same data as holotype; 1♂, Lido junction, 1.4 km W, Rt. 1, 31.i.1995, N. Dorchin; 2♀ 4♂, En Gedi, Rt. 90, 13.ii.1996, N. Dorchin; 5♀ 1♂, Lido junction, 1.4 km W, Rt. 1, 11.iii.1996, N. Dorchin; 1♀ 1♂, Lido junction, 1.4 km W, Rt. 1, 7.xi.1996, N. Dorchin; 4♀ 4♂, Lido junction, 1.4 km W, Rt. 1, 2.i.2013, G. Danon; 6♀ 8♂, Lido junction, 1.4 km W, Rt. 1, 13.ii.2013, G. Danon; 2♂, Lido junction, 1.4 km W, Rt. 1, 20.i.2014, G. Danon; 3♀ 5♂, En Gedi reservoir, Rt. 90, 2.ii.2014, N. Dorchin & G. Danon; 1♀, Zohar junction, 2.ii.2014, G. Danon; 3♀ 3♂, Nahal Zruya, Rt. 90, 16.ii.2014, G. Danon; 5♀ 5♂, Nahal Mor, Rt. 90, 16.ii.2014, G. Danon; 3♀ 3♂, Zohar junction, 2.iii.2014, G. Danon.

From *Suaeda aegyptiaca*: 3♀ 4♂, Yafit, Rt. 90, 17.iv.1996, N. Dorchin; 4♀ 1♂, Pazael, Rt. 90, 17.iv.1996, N. Dorchin; 1♂, Enot Zuqim Nature Reserve, 7.iv.2013, G. Danon.

Other material examined: Jordan: 1♀, Wadi Assal, 6.vi.2014, G. Danon, ex *Suaeda aegyptiaca* (GenBank accession no. MN207638).

Distribution: Israel and Jordan, along the central rift valley.

Remarks: Females of *S. quotidiana* are easily distinguishable from those of its three congeners (all unique to *Suaeda monoica*) by its more slender aculeus and the cylindrical to triangular apical lamella of the cercal segment. By contrast, the aculeus in all three species from *S. monoica* is thicker and shorter, and their apical lamella is near rectangular (compare Figs 41 and 42). Furthermore, *S. quotidiana* is generally smaller and more delicate than the species from *S. monoica* and its males have a much sparser and duller scale pattern on the abdomen compared to the distinct black-and-white pattern of its congeners.

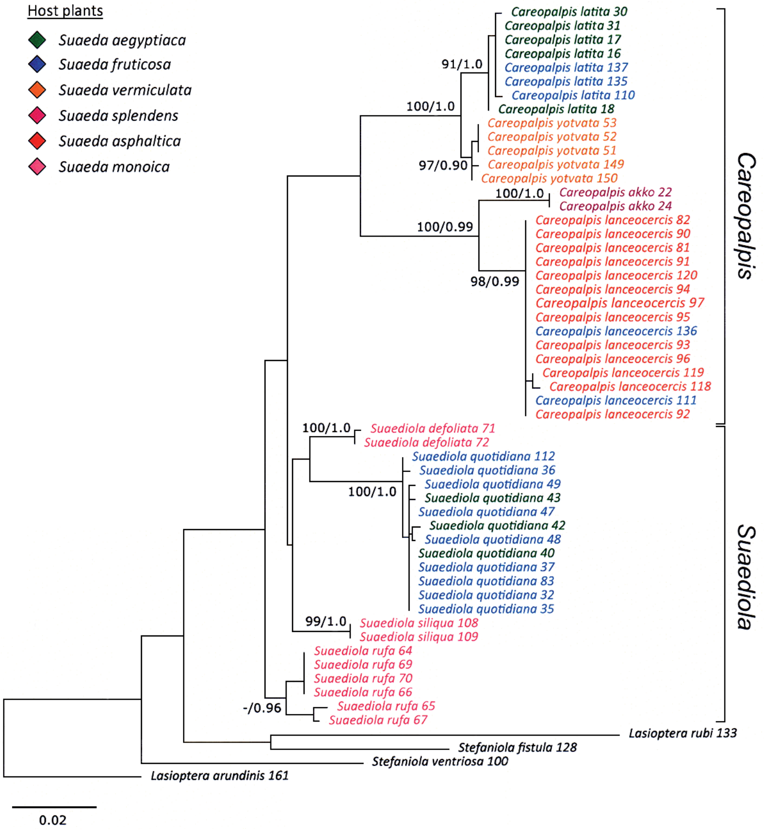


Fig. 48: Bayesian phylogenetic tree for *Careopalpis* and *Suaediola* species in Israel based on sequences of the mitochondrial COI gene. Support values (ML bootstraps/Posterior probabilities) are shown next to the nodes.

Genetic analysis

The molecular analyses conducted in this study verified the validity of all *Careopalpis* and *Suaediola* species in Israel, which gained strong support in both the Bayesian and ML analyses (Fig. 48). Despite striking morphological uniformity within *Careopalpis*, our results show that this genus includes four distinct species in Israel, each on one or two *Suaeda* species as its host plants. *Careopalpis latita* appears to use *S. fruticosa* and *S. aegyptiaca* to a similar extent; *C. lanceocercis* uses *S. fruticosa* occasionally together with its main host-plant, *S. asphaltica*, and *C. akko* and *C. yotvata* are each associated with a single, different *Suaeda* species. Only females of *Careopalpis* from *S. fruticosa* can be ascribed to a species by morphological characters based on the shape of the apical lamella of the ovipositor, which is fusiform in *C. lanceocecis* but ovoid in *C. latita* (Figs 34 and 33, respectively). Males can be identified with certainty only by genetic markers. These results demonstrate the importance of genetic data for corroborating taxonomic decisions and verification of host-plant ranges in *Careopalpis*.

The genus *Suaediola* is established in this paper for four species despite lack of support for its monophyly from analysis of sequences of the mtCOI, a gene that is known to provide good resolution on the species level but not for deeper nodes. *Suaediola* is strongly supported in a more extensive genetic analysis of the Lasiopterini that is based on five mitochondrial and nuclear genes (Dorchin & Dor, in prep.). This genus currently includes the type species, *S. quotidiana*, and three species that are transferred to it from *Stefaniola*. *Suaediola defoliata* and *S. siliqua*, for which no distinguishing morphological characters were found (Dorchin 2001), are fully supported here as distinct species by the molecular data.

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