

Order Lepidoptera, family Nepticulidae

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INTRODUCTION

The Nepticulidae are a family of about 800 named species of very small moths (wingspan less than 10 mm), of which the larvae make leaf-mines, stem-mines or rarely galls. The family is poorly known from the desert regions in Northern Africa and the Middle East, but relatively well known from Central Asian deserts (Turkmenistan, Uzbekistan, Mongolia), thanks to the work of R. Puplesis and students (summarised in Puplesis, 1994). The family was previously hardly known from the Arabian Peninsula, except for four species, recently described from northern Oman (Puplesis & Diškus, 2003). Here the family is recorded for the first time from the UAE, with seven species, two in *Stigmella* Schrank, 1802, and five in *Acalyptis* Meyrick, 1921, of which one is described as new. Except for *S. birgittae* Gustafsson, 1985, these species are also new for the Arabian Peninsula. Because some of the recorded species are actually rather common and widespread in the desert regions of North Africa and Asia, but virtually unknown in the literature, several unpublished records and synonymies of these species are presented here and they are redescribed. In this way the family Nepticulidae is not only recorded for the first time from the UAE, but also from Libya, Sudan, Egypt, Saudi Arabia and Pakistan.

Stigmella omani Puplesis & Diškus, 2003, is synonymised with *S. birgittae* Gustafsson, 1985, *S. ziziphivora* Gustafsson, 1985, is synonymised with *S. zizyphi* Walsingham, 1911. The latter does not occur in the UAE, but is compared with the closely related *S. birgittae*. *Nepticula liochalca* Meyrick, 1916, and *N. homophaea* Meyrick, 1918, are both synonymised with *Stigmella xystodes* (Meyrick, 1916), all three described from India; this species is here reported new for many countries in the North-African-Asian warm eremic region.

In *Acalyptis*, *A. lvoovskyi* (Puplesis, 1984) is synonymised with the type species *A. psammophricta* Meyrick, 1921. *Acalyptis gielisi* is described as new; it is very close to the South African *A. lanneivora* (Vári, 1955). From a fifth species of *Acalyptis*, only one female has been collected. It is described, but not named here.

The seven recorded species probably only represent a small portion of the actual fauna, which could best be studied additionally by searching for stem- and leaf-mines on potential hostplants. The genera *Trifurcula* Zeller, 1848, and *Ectoedemia* Busck, 1907, are also likely to occur here.

DNA sequences of several specimens were used in addition to morphological characters for decisions on species identities, in particular for associating males and females. The results of the barcoding gene CO1 are discussed at the end of this chapter.

MATERIALS AND METHODS

Specimens from the UAE are partially deposited in the collection of the National Museum of natural History, Naturalis, in Leiden, The Netherlands and partially in the United Arab Emirates Invertebrate Collection. For other specimens cited, I use the name of the city of the museum as indication for the repository, rather than the cumbersome codens. Full data can be found in Evenhuis & Samuelson (2004). Dry pinned specimens were collected by J. Buszko and C. Gielis at light, except some specimens of *S. birgittae*, reared by C. Gielis. Alcohol-preserved specimens were collected in light traps by A. van Harten. Abbreviations and

number in square brackets after the number of males and females refer to genitalia slide numbers. Genitalia slide numbers have a direct relation to RMNH registry numbers, also used for DNA vouchers: RMNH.INS number = EJvN slide + 20,000. VU numbers (used up to number 2000) are equal to EJvN numbers.

Information on names and distribution of (potential) hostplants has been taken from Jongbloed (2003). Methods for preparation of genitalia, photographs of adults and genitalia and measurements follow those described in van Nieukerken (2007). Distribution maps were made with DMAP (Morton, 2000), locality coordinates, where not known, were searched with Google Earth.

Molecular methods are similar to those described in van Nieukerken (2007). DNA was extracted solely from abdomens, at the same time as genitalia preparation (protocol according to Knölke et al., 2005). The voucher data and references to sequences in BOLD and Genbank numbers are given in Table 1, and will be open access upon publication of this paper.

Phylogenetic methods follow the same paper, and the *Acalyptris* sequence data therein are also used in the analyses here, seen the predominance of that genus. As outgroup the sequences of the two *Tischeria* specimens treated in the following chapter (van Nieukerken, 2010) are also included.

SYSTEMATIC ACCOUNT

Genus *Stigmella* Schrank, 1802

Stigmella species are usually easily recognised by the collar, comprising lamellar scales, whereas these scales are piliform in most Nepticulidae, except in the Holarctic *Bohemannia* Stainton, 1859, and some tropical *Acalyptris*.

Currently *Stigmella* represents the largest genus of Nepticulidae with more than 350 named species, occurring worldwide. The genus is especially common in forested areas, and much less diverse in desert and steppe habitats. Of the two species treated here, *S. birgittae* belongs to the *paliurella* species group (all feeding on Rhamnaceae) and *S. xystodes* to an Asian-Australian group of monocot feeders (Poaceae, Cyperaceae), including *S. oplismeniella* Kemperman & Wilkinson, 1985 (Kemperman et al., 1985) from Japan, feeding on the grass *Oplismenus*. This group also has similarities to the Holarctic *S. betulicola* group, and several other tropical *Stigmella*.

Stigmella birgittae Gustafsson, 1985

Plates 1, 2, 5–9, 16, 17

Stigmella birgittae Gustafsson, 1985: 171 – Holotype ♂ GAMBIA: Kotu stream, 15.xi.1981, leaf-mines on *Ziziphus mauritania*, e.l. 27.xi.1981, B. Gustafsson, genitalia slide RM6713 (Stockholm) [examined]. *Stigmella omani* Puplesis & Diškus, 2003: 207 – Holotype ♂ OMAN, Northern region, Jabal Shams, 1100 m, 7.i.1993, B. Skule, genitalia slide Pupl017 (Copenhagen) [examined] **nov. syn.**

Specimens examined: UAE: Sharjah, 1♂, 2♀ [ethanol material], 1.i–10.ii.2005, in light trap, A. van Harten; 1♂, 1♀ [gen. preps. EJvN3731, 3865], larvae, leaf-mines, 2–19.ii.2006, mines on *Ziziphus spina-christi*, e.l. 3–20.iii.2006, leg. C. Gielis; 1♀ [EJvN3862], 1.iii.2006, leg. C. Gielis; 1♂, 21.iv.2006, leg. C. Gielis; Sharjah Desert Park, 4♂, 3♀ [ethanol material], 18.i–22.ii.2005, in light trap, leg. A. van Harten. Wadi Maidaq, 460 m, 1♂ [EJvN3864], 6.iv.2006, leg. J. Buszko.

Other material: SAUDI ARABIA: Riyadh, 2♂, 1♀, 5.iii.1985, reared from leaf-mines on *Ziziphus*, leg. Talhoek (Leiden).

Diagnosis: Separated from the much larger *Stigmella xystodes* by the dark head in combination with irrorate wings, whereas *xystodes* has uniform grey to brown wings. As *Stigmella* it differs from the other UAE Nepticulidae with similar external features by the collar with lamellar scales; the others have piliform scales. *Stigmella zizyphi* Walsingham,



Plates 1–4. *Stigmella*, adults. 1: *S. birgittae*, ♂, Wadi Madaq, EJvN3864; 2: *S. birgittae*, ♀, Sharjah, EJvN3865; 3: *S. xystodes* ♂, Wadi Madaq, EJvN3860; 4: *S. xystodes* ♂, Sudan, EJvN0435. Scale lines 1 mm.

1911, is a very similar species on the same host genus, which might be expected here. It has fewer cornuti (up to 4) than *S. birgittae* and a less indented uncus (Plate 10, see also Gustafsson, 1985, for more differences).

Redescription: Male. Forewing length 1.6–1.8 mm, wingspan 3.6–4.1 mm. Head: frontal tuft fuscous, mixed with paler scales, ochreous on frons, collar yellowish white. Scape yellowish white with some dark scales. Antenna ochreous, with 24–34 segments. Thorax and forewing ochreous, irrorate with brown scales; terminal cilia ochreous. Hindwing paler. Abdomen ochreous, no visible anal tufts, vestiture on valvae concolorous. Underside abdomen and legs white.

Female. Forewing length 1.8–1.9 mm. Antenna with 21–23 segments. Otherwise as male.

Male genitalia. Capsule length 180–210 μm (n=5), about as long as wide. Vinculum anteriorly slightly excavated; uncus strongly bilobed, with V-shaped indentation. Gnathos with widely separate long posterior processes and short but distinct anterior processes. Valva 155–160 μm (n=5), more or less triangular, tip acute, but not curved inwards; along inner margin an inwardly curved lobe below apex; transtilla long, sublateral processes curved, less than half transtilla length. Aedeagus length 155–180 μm (n=5), anteriorly truncate, posteriorly rounded; cathrema large, vesica with 6–7 long spinelike cornuti, all arranged on a row, with apex towards posterior opening.

Female genitalia. Total length ca 730 μm . T8 broadly rounded, with scattered setae and scales, a concentration of ca. 10 setae apically; anal papillae indistinct, without setae.



Plates 5–6. *Stigmella birgittae*, leaf-mines in *Ziziphus spina-christi* from Sharjah. Scale lines 5mm (5), 2mm (6).

Posterior apophyses narrow, longer than anterior ones. Bursa without accessory sac, elongate, covered with minute wart-like sclerotizations, slightly larger ones forming a distinct narrow band across bursa of ca 400 μ m long.

Biology: Hostplants are *Ziziphus mauritiana* and *Z. spina-christi*. The latter is common and widespread in the Haggar mountains (Jongbloed, 2003), elsewhere in the UAE planted.

Leaf-mine. Egg on upper surface, usually against midrib or a lateral vein. Mine a gallery, frequently forming a small blotch through coalescence of the windings; frass in narrow central line. Larva yellowish green, vacating mine through slit in upper surface. Larva described in detail by Gustafsson (1985). Mine separated from that of *S. zizyphi* by the exit slit: upperside in *S. birgittae*, underside in *S. zizyphi*. The frequent mines of *Bucculatrix* on the same host are very narrow galleries, ending in a relative long and narrow final part without frass.

Remarks: *Stigmella omani* is synonymised here, since the studied holotypes do not show real differences (Plates 8, 9). The differences listed by Puplesis & Diškus (2003) are to be considered as artefacts due to the different slide mounting of both types (much squashed in *S. birgittae*). Now that it is shown that the Arabian populations also feed on the same host genus, there is little reason to maintain two species.

S. ziziphivora Gustafsson, 1985 is synonymised with the closely related *S. zizyphi* (Walsingham, 1911) after comparing types of both species (see Plate 10) (**nov. syn.**).

Labels male holotype *Nepticula zizyphi*: “Beni Mora, Biskra, ALGERIA, Zizyphus 16.II ex. 21.III.1903 Wlsm. 96915” / “Walsingham Collection 1910–427”/ plus type labels (London). From *Stigmella ziziphivora* several paratypes and holotype were studied (GAMBIA: Bakau, Kotu stream, 7–13.xii.1982, emerged 16.xii.1982–3.i.1983, leg. Gustafsson; Stockholm).

Only two other specimens have been seen, both from Algeria: one female plus mine reared by Chrétien from Biskra (Paris) and one male reared by Walsingham from Hammam-es-Salahin, (London).

Distribution (Map 1): *S. birgittae* is probably widespread in the Arabian Peninsula and North Africa, recorded from Gambia, Oman and here newly recorded for Saudi Arabia and the UAE.

***Stigmella xystodes* (Meyrick, 1916)**

Plates 3, 4, 11–15, 18, 19

Nepticula xystodes Meyrick, 1916: 6 – Lectotype ♂ [here designated], INDIA: Pusa, Bengal [now Pūsa, Bihar], 2.viii.[19]11, TB F[letcher], Genitalia slide BM24106 (London) [examined].

Nepticula liochalca Meyrick, 1916: 6 – Holotype ♀, INDIA: Pusa, Bengal [now Pūsa, Bihar], bred vii.[19]08, TB F[letcher], Genitalia slide BM28327 (London) [examined] **nov. syn.**

Nepticula homophaea Meyrick, 1918: 181 – Holotype ♀, INDIA: Dharwar, Kanara [now Dhārṡwād, Karnataka], 3.vii.[19]08, RM[axwell], Genitalia slide BM28326 (London) [examined] **nov. syn.**

Specimens examined: UAE: Wadi Maidaq, 460 m, 1♂ [EJvN3860], 16.iv.2006, leg. C. Gielis.

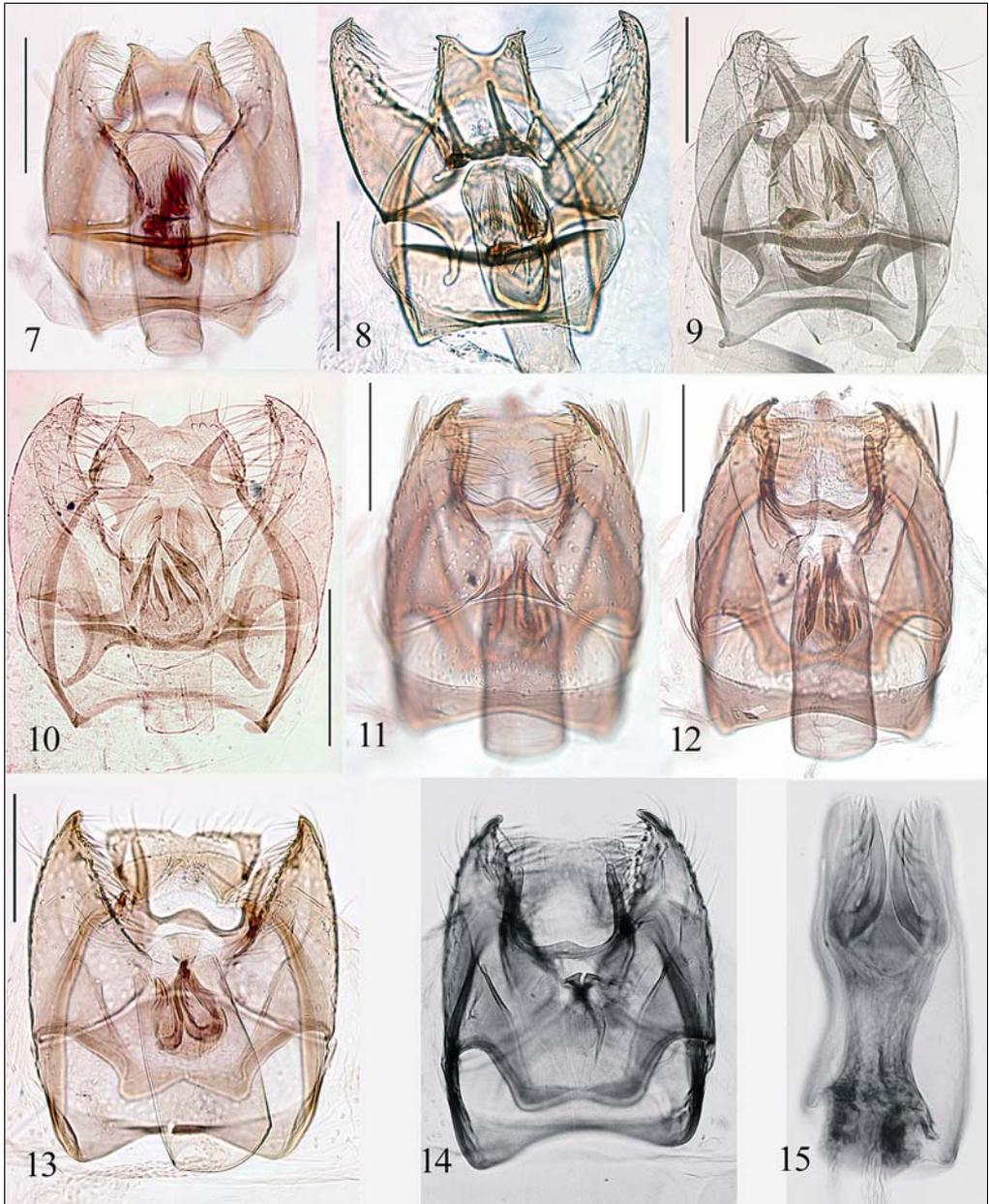
Other material: CANARY ISLANDS: 18♂ [EJvN3746, JCK15083] 2♀ [EJvN3980], Gran Canaria, Maspalomas, 21, 22, 24, 30.x.1991, 1, 2, 4.xi.1991, 24.iii.1992, 10, 12.iii.1993, 31.v.1993, 2.xi.1993, 27.xii.1994, leg. P. Grotenfelt (Helsinki, Leiden). EGYPT: 6♂ [JCK15153], Armant, 1.ii.1963, Min. Agric. Egypt (Washington, Leiden). INDIA: 1♂ [BM30252], Bihar, Pūsa, 15.vii.1911, T. Bainbrigge Fletcher, paralectotype *Nepticula xystodes*; 4♂ [BM28319, BM30262], 1♀ [BM30263], Gujarat, Kheda (Kaira), 13.ii.1918, 24.ii.1925, R.M. Maxwell; 1♂ [BM30250], Gujarat, Nadiad, 4.xii.1937, R.M. Maxwell; 1♂ 1♀, Gujarat, Surat, 16.xii.1928, 2, 15.ii.1929, R.M. Maxwell; 1♂ [BM30251] 1♀, Karnataka, Amminbhavi, Dhārṡwād, 21.i., 3.ii.1916, R.M. Maxwell (all London). PALESTINE: 2♂ [EJvN3236], Jericho, 28.xii.1931, W. Einsler & H. Amsel (Karlsruhe, Leiden). SUDAN: 4♂ [VU0435, MV1716], Wadi-Halfa, 20.i, 1, 11.ii.1962, leg. Nubien Exped. Mus. Vindob. (Vienna, Leiden, coll. Johansson).

Diagnosis: The only nepticulid species in the UAE with uniform shining grey to grey-brown forewings. Male genitalia are unmistakable, in the western Palearctic there are no species that could be confused with *S. xystodes*, whereas in the Paletropics there are more species with similar genitalia.

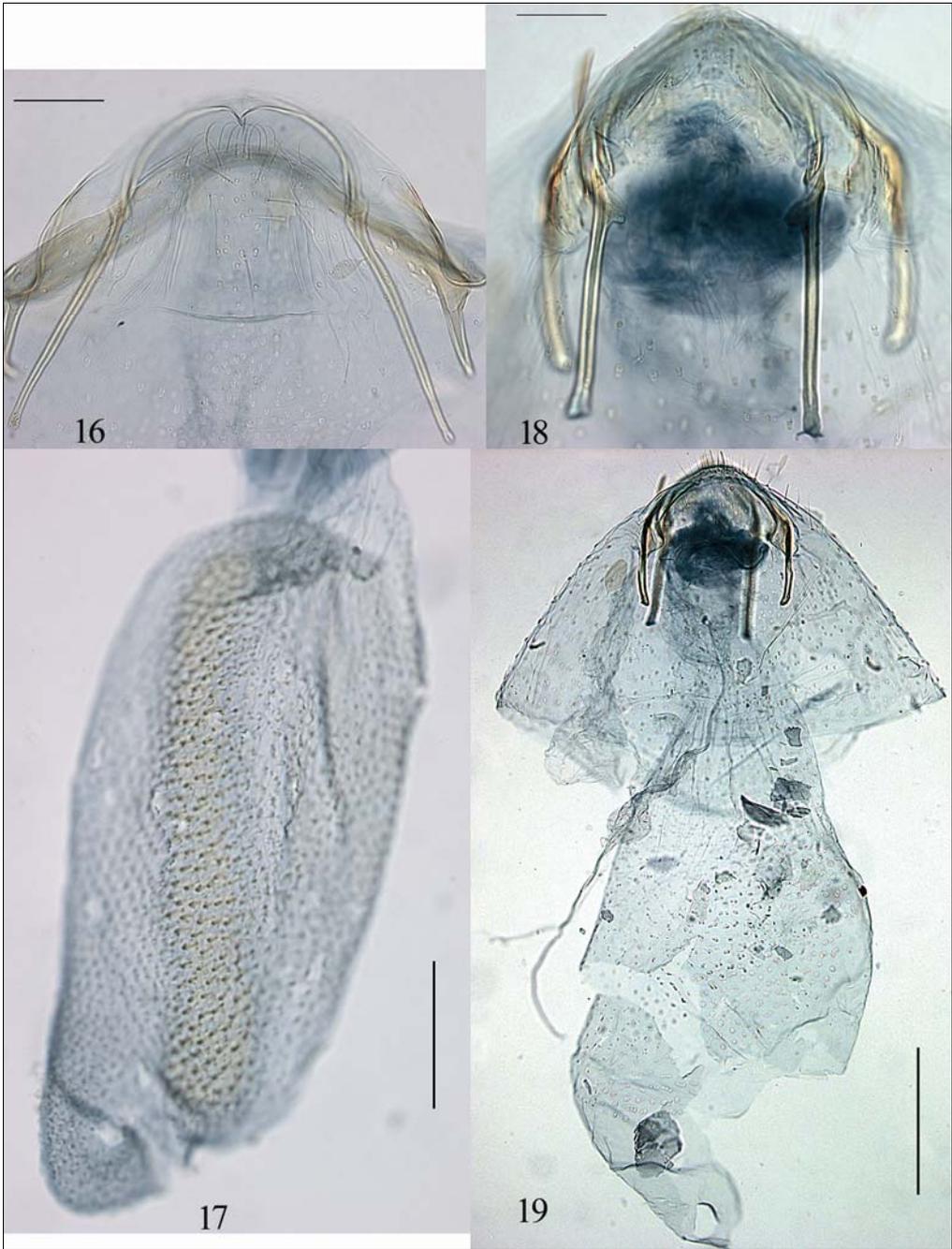
Redescription: Male. Forewing length 2.2–3.0 mm (2.6 ± 0.3 , 23), wingspan 4.9–6.6 mm. Head: frontal tuft pale ochreous, yellowish orange or dark brown, collar white. Scape white. Antenna paler greyish, with 25–30 (28.2 ± 1.5 , 20) segments. Thorax and forewing unicolorous shining ochreous grey, sometimes more bronze; terminal cilia concolorous. Hindwing pale silvery grey. Abdomen greyish, no visible anal tufts, vestiture on valvae concolorous. Underside abdomen and legs white.

Female. Forewing length 2.3–2.5 mm, wingspan 5.0–5.5 mm. Antenna with 21–23 segments. Otherwise as male.

Male genitalia. Capsule length 195–235 μm (219.1 ± 13.9 , 9). Vinculum anteriorly slightly excavated, posteriorly slightly protruded towards juxta. Tegumen band shaped. Uncus almost rectangular, with very slight medial indentation posteriorly. Gnathos with widely separate posterior processes, shorter but distinct, almost triangular anterior processes, transverse bar with small medial protuberance. Valva length 170–226 μm (184.1 ± 15.8 , 10), almost triangular, apex slightly narrowed, hardly curved inward, inner margin with subapical tooth. Juxta halter shaped, filling open space between valvae and vinculum, anteriorly wider than posteriorly; transtilla medially constricted, sublateral processes absent. Aedeagus 145–195 μm (165.2 ± 12.8 , 10) long, ratio aedeagus/capsule 0.7–0.8 (0.76 ± 0.04 , 9), tubular, with opening for ejaculatory duct at anterior end, coecum absent; vesica with distinct cathrema and posteriorly with symmetric set of 6 cornuti: two long curved ones, two shorter spines and two plates with serrate margin.



Plates 7–15. *Stigmella*, male genitalia. 7: *S. birgittae*, UAE, EJvN3831; 8: *S. birgittae*, holotype of *S. omani*, Pupl017; 9: *S. birgittae*, holotype, RM6713; 10: *S. zizyphi*, paratype of *S. ziziphivora*, RM6846; 11, 12: *S. xystodes*, UAE, EJvN3860; 13: *S. xystodes*, Sudan, EJvN0435; 14, 15: *S. xystodes*, lectotype, BM24106. Scale lines 100 μ m.



Plates 16–19. *Stigmella*, female genitalia. 16, 17: *S. birgittae*, UAE, EJvN3865, dorsal view of abdominal tip (16) and corpus bursae (17); 18, 19: *S. xystodes*, Gran Canaria, EJvN3980, dorsal view of abdominal tip (18); complete genitalia (19). Scale lines 50 μm (16, 18), 100 μm (17), 200 μm (19).

Female genitalia. Total length ca 700–900 μm . Abdominal tip rounded, rather narrow; T8 with a few setae (up to 16 counted) and scales; anal papillae indistinct, without setae. Posterior apophyses narrow, longer than anterior ones. Bursa with small accessory sac, corpus bursae globular, covered with small single spines and pectinations, mostly concentrated in an elongated band; ductus spermathecae with 2–3 very shallow convolutions.

Biology: Hostplant is *Cyperus rotundus* (Fletcher, 1920). The hostplant is a problematic invasive weed, native to Asia, Africa and southern Europe, but now found on most continents. In the UAE it occurs along the coast, but not inland (Jongbloed, 2003), so that in the UAE locality Wadi Maidaq *S. xystodes* probably feeds on another species, such as the widespread *C. conglomeratus*.

Leaf-mine. Larva yellow, transparent, head brown; mine starts either from the apex or middle of the leaf, the larva mines down for some length and then takes a turn and mines up, the second portion being exactly parallel to the first, frass in midline all along the mine; pupation in flat, golden-yellow oval cocoons (Fletcher, 1920). After Fletcher nobody else has recorded this mine.

Voltinism. Adults fly mostly in winter between October and April with one May record in Gran Canaria. In India, Bihar also found in July and August.

Remarks: *Nepticula xystodes* was described on the basis of two males, one is here designated as Lectotype (Plates 14, 15). *Nepticula liochalca* was reared by Fletcher (1920), who mentioned two specimens. However, Meyrick (1916) mentioned only one specimen, a female, which is thus the holotype, the same applies to *N. homophaea*. Since *N. xystodes* and *liochalca* are both described in the same paper and same page, I am acting as first reviser and give priority to *xystodes* over *liochalca*. This choice is based on the fact that males in *Stigmella* provide better diagnostic characters than the females, despite the fact that the *liochalca* holotype was reared. Also the majority of specimens both in Meyrick's collection and elsewhere are males. The conspecificity of the males and females is concluded on the fact that many specimens with the same external features occur in the Indian localities, with only one or two males probably belonging to a different, but closely related species. Also one female taken on Gran Canaria at the same locality as many males, has clearly similar genitalia as the few Indian females.

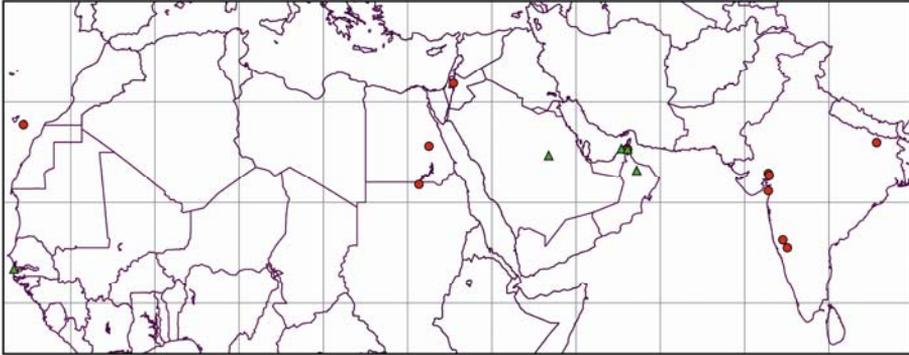
Distribution (Map 1): Widespread in northern and western India, single localities in UAE, Palestine, Egypt, Sudan and Gran Canaria, to be expected throughout this area. New for all these countries except India.

Genus *Acalyptris* Meyrick, 1921

Acalyptris species can best be recognised by the venation, but that character is hard to see without making a preparation (van Nieukerken, 1986). The collar safely separates the Arabian species from similarly coloured *Stigmella*, but some *Ectoedemia* Busck, 1907 (not yet found in the UAE) might be hard to separate without dissection.

The genus *Acalyptris* is particularly well represented in tropical and subtropical areas, and less common in temperate regions (van Nieukerken, 2007; Puplesis & Robinson, 2000; Scoble, 1980). The *Acalyptris platani* and *staticis* groups of Europe and the Mediterranean were recently treated by van Nieukerken (2007). *Acalyptris gielisi* **nov. spec.** belongs to the *platani* group, see also phylogenetic discussion.

Three species are recognised from the *A. repeteki* group, a group in which eight species were recognised by Puplesis (1990, 1994), but he overlooked the fact that also the type species of the genus, *A. psammophricta* Meyrick, 1921, belongs to this group (van Nieukerken, 1986). The species of this group, confined to desert areas, are very difficult to separate and some of



Map 1. Distribution of *Stigmella* species, green triangles: *S. birgittae*; red dots: *S. xystodes*.

the characters used originally seem to vary. Particularly the forewing colour, degree of sclerotization of abdominal sclerites, and valval length and shape seem to be variable. A further two species are only known from females (*A. psammophricta* and *A. vittatus* (Puplesis, 1984)). It is, therefore, likely that the actual number of species is lower than eight. Unfortunately the biology of this group remains unknown, and can thus shed no light on species boundaries. On the basis of careful comparison of material from various localities, including the UAE, and the DNA sequences of UAE specimens, the type species is now associated with males previously identified as *A. Iovovskyi* (Puplesis, 1984), and the synonymy is established. Another – usually much larger – species, with a distinct dark stripe on the forewing, often occurring together with *A. psammophricta* (but not yet found in the UAE) is *A. falkovitshi* (Puplesis, 1984), which may be the same as *A. arenosus* (Falkovitsh, 1986) and *A. vittatus* (Puplesis, 1984). The second species in the UAE is here identified as *A. repeteki* (Puplesis, 1984), the third as *A. galinae* (Puplesis, 1984).

***Acalyptris gielisi* van Nieukerken nov. spec.**

Plates 20, 21, 28–30, 33–36

Specimens examined: Holotype: ♂, United Arab Emirates, Wadi Madaq, 460 m, 25°20'N 56°07'E, 16.iv.2006, leg. C. Gielis, sta 70, Genitalia slide EJvN 3861 (Leiden). Paratype ♀, same data, Genitalia slide EJvN 3940 (Leiden).

Diagnosis: Males are easily recognised by the dark androconial scales on the hindwings and characteristic genitalia. Females can only be identified after dissection. Male genitalia very similar to those of *A. lanneivora* (see below).

Description: Male. Forewing length 1.9 mm, wingspan 4.2 mm. Head: frontal tuft pale ferruginous, collar ochreous white. Scape small, ochreous white. Antenna pale brown, with 31 segments. Thorax and forewing pale ochreous white, a few darker ochreous scales on wings. Hindwing basal third covered with dark brown androconial scales, a darker concentration near frenulum; costal bristles absent. Abdomen ochreous white, including vestiture on genitalia; anal tufts inconspicuous.

Female. Forewing length 2.1 mm, wingspan 4.5 mm. Antenna with 30 segments. Brown scales on hindwing absent.

Male genitalia. Capsule length 430 µm. Vinculum with long and rounded anterior extension. Tegumen a narrow hairy pseuduncus. A pair of lateral support rods from gnathos along vinculum lateral arms. Uncus with small tip, divided in lateral view. Gnathos with pointed

central process, not reaching uncus tip. Valva 215 µm long, about 1/2× capsule length, narrow, at basis with small posteriorly directed digitate process with some setae on tip, and midway a rounded inward projection, apex setose; transtilla absent. Aedeagus 340 µm long; with ventral bifurcate carinate process; a pair of lateral, pointed carinae and an asymmetric dorsal lobe; vesica with many small cornuti.

Female genitalia. Total length ca 1100 µm, corpus bursae ca 750 µm. Abdominal tip strongly pointed, anal papillae narrow, each with ca. 12 setae; T8 with a few setae, no scales. Vestibulum with a vaginal sclerite at left side [broken in slide], and internally with a group of many close-set spines; corpus bursae elongate, narrowed anteriorly, without sclerotizations on wall, except a pair of reticulate signa, 305 and 330 µm long, with crenulated margins and 4–5 cells wide. Ductus spermathecae lost in preparation.

Biology: Hostplant unknown (see below). Adults flying in April.

Remarks: Particularly in the male genitalia *A. gielisi* is extremely similar to *A. lanneivora* (Vári, 1955) from South-Africa, but the androconial scales in *A. gielisi* (absent in *lanneivora* types) and the female genitalia (Plate 37) separate the species. Scoble (1980: Fig. 12) cited two subsequent specimens that also show these androconials: they could either also be *gielisi* or another species. In the male genitalia *A. lanneivora* is characterised by a longer valva (ca 60% of capsule length) and longer gnathos (almost reaching uncus) (Plates 31, 32).

Acalyptis lanneivora feeds on the tree *Lannea discolor* (Anacardiaceae) (Scoble, 1980; Vári, 1955), but this plant species and genus are absent from the UAE. In fact the whole family Anacardiaceae is poorly represented with just *Pistacia kinjok*, only known from a single locality in the far north (Jongbloed, 2003). It is thus likely that despite the similarity, *A. gielisi* uses another host plant family.

The conspecificity of the male and female described here was suggested by the same locality and date, and corroborated by the analysis of the CO1 gene, which show a 99.4% similarity, only differing in two basepairs (see below) and the 28S gene which is 100% similar.

Etymology: This species is dedicated to Cees Gielis, who collected the types, and the majority of microlepidoptera of the UAE as treated in this series.

Distribution: UAE.

Acalyptis psammophricta Meyrick, 1921

Plates 22–24, 38–40, 44, 46, 47

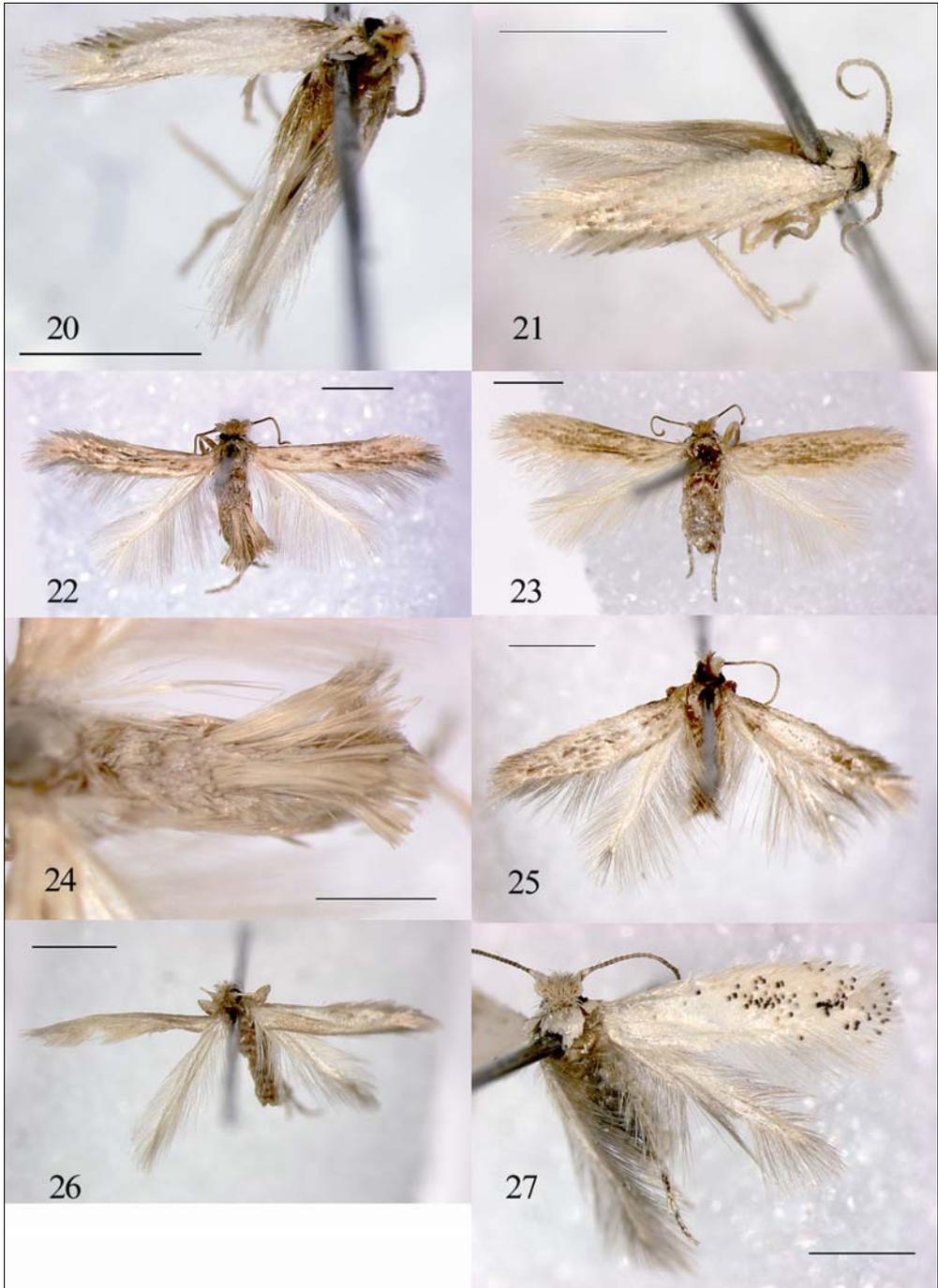
Acalyptis psammophricta Meyrick, 1921: 410 – Holotype ♀, INDIA: Ahmedabad, Bombay [now Ahmadābād, Gujarat], 5.x.[19]18, R M[axwell], genitalia slide BM22601 (London) [examined].

Microcalyptis lvoivskyi Puplesis, 1984: 494 – Holotype ♂, MONGOLIA: Bajan Chongor aimak [Bayanhongor prov.], 160 km S Shine-Dzhinst [Shinejinst], 11.viii.1981, A. Lvovsky, genitalia in glycerine (St. Petersburg) [examined] **nov. syn.**

[*Acalyptis falkovitchi*; van Nieukerken, 1986: fig. 24 [abdominal tufts]; van Nieukerken & Dop, 1987: 117, fig. 27 [antennal sensilla]. Misidentifications]

Specimens examined: UAE: Al-Ajban, 75 m, 1♂ [EJvN3866, genitalia lost], 27.iii.2006, leg. C. Gielis. 5 km SE of Mahafiz, 4♂ [EJvN3732, 3982], 25.iii.2006, leg. C. Gielis; 2♂ [EJvN3868]; 4.iv.2006, leg. C. Gielis; 1♀ [EJvN3846], 17.iv.2006, leg. C. Gielis. Sharjah Desert Park, 1♂ [ethanol material], 25.i–22.ii.2005, in light trap, leg. A. van Harten.

Other material: IRAN: 17 km E Bandar Abbas, Dunes, 1♂ [VU1432], 1♀, 15.iv.1972; 2♀ [VU1272], ibidem, 21, 24.iv.1974. 8 km E Bandar Abbas, Dunes, 2♀ [VU0922], 11.iv.1972, all Exp. Mus. Vind. (Vienna, Leiden). ISRAEL: Tel-Aviv, Dunes, at light, 1♂ [EJvN2360], 19.v.1930, H. Amsel (Karlsruhe). LIBYA, Gharian, Wadi El Hira, 2♂ [EJvN3992], 6.v.1983, U. Seneca (Copenhagen, Leiden). PAKISTAN: 150 km SW of Quetta, 1♂ [VU0484], 13.v.1965, Kasy & Vartian (Vienna). TUNISIA: Nefta, 5♂ [VU1271; SEM 11.6], 20, 31.iii, 29.iv.1927, L. Dumont (Paris, Leiden); Nefta, 1♂ [EJvN3128], 14–16.iii.1986, Zool. Mus. Copenhagen Exp.; Nefta area, 1♂ [EJvN3985], 1–4.v.1988, O. Karsholt (Copenhagen). TURKMENISTAN: Sandy-Katschi [Sandikachi], 20♂ [EJvN3990, JCK15209, 15210, 15211, glyc. preps], 2♀ [EJvN3991], 29.iv–5.v.1986, R. Puplesis (Leiden).



Plates 20–27. *Acalyptris*, adults. 20: *A. gielisi*, ♂, holotype; 21: *A. gielisi*, ♀, paratype; 22, 24: *A. psammophricta*, ♂, 5 km SE of Mahafiz, EJvN3982; 23: *A. psammophricta*, ♀, 5 km SE of Mahafiz, EJvN3846; 24: Lateral detail abdomen of 22; 25: *A. repeteki*, ♂, EJvN3847; 26: *A. galinae*, ♂, EJvN3981; 27: *A. species*, ♀, EJvN3867. Scale lines 1 mm.

UZBEKISTAN: 70 km NW Gazli, Kyzylkum, 1♂, [EJvN3745], 26.v.1965, Falkovitsh, paratype *Microcalyptis lvovskyi* (Leiden).

Diagnosis: The long abdominal tufts on segments 4–8 separate male *A. psammophricta* immediately from other UAE Nepticulidae, but also *A. pallens* (Puplesis, 1984) and *A. falkovitshi* (Puplesis, 1984) have similar tufts, and could be expected to occur here. *A. falkovitshi* is usually much larger and has a dark stripe on the forewings, the gnathos is pointed; *A. pallens* has a rounded gnathos and very wide uncus (see also Puplesis, 1990). Female *A. psammophricta* can be recognised from other UAE species by the broad, hairy abdominal tip, and other genitalia characters, but the females of *A. repeteki* and *A. galinae* are as yet unknown.

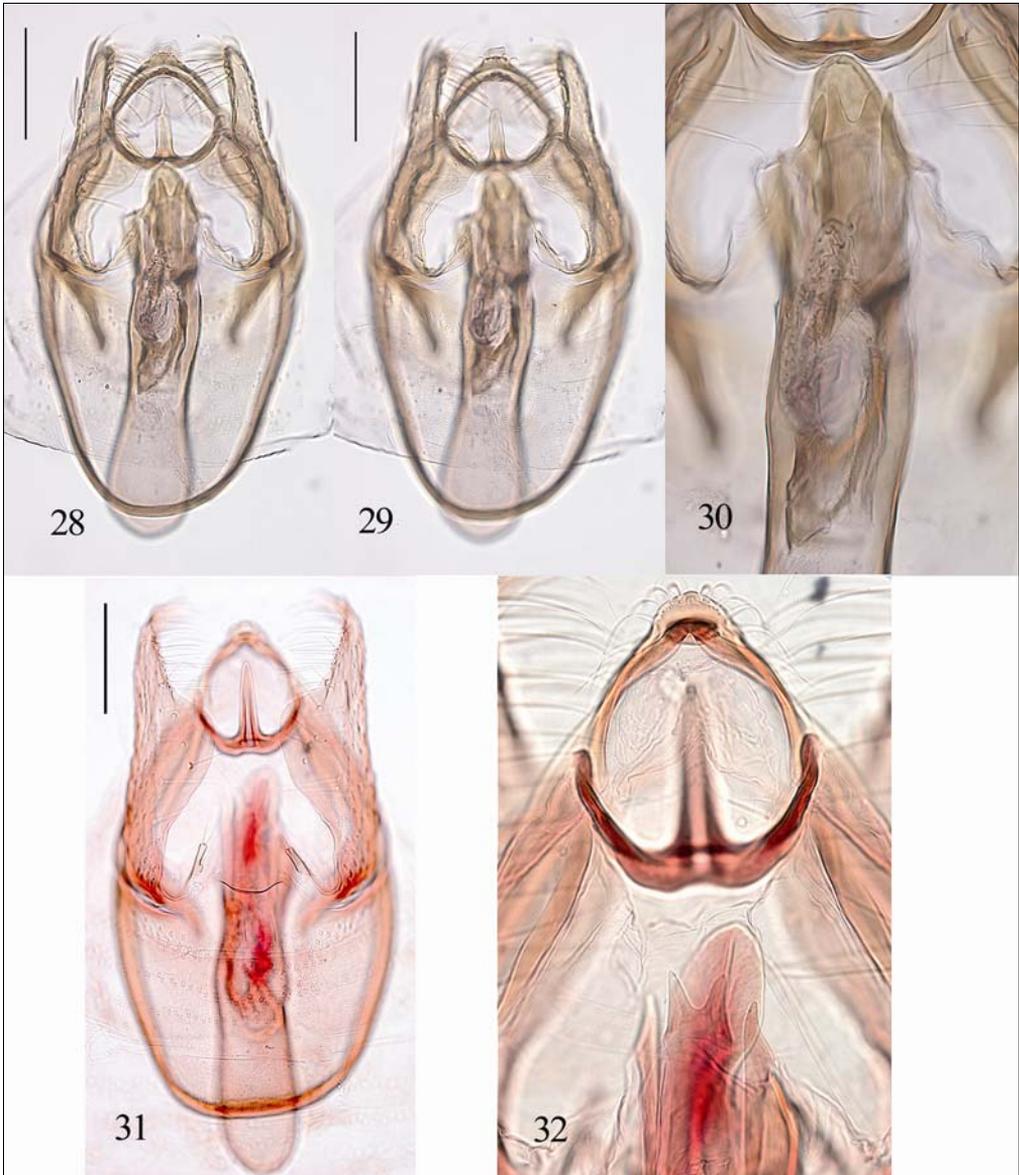
Redescription: Male. Forewing length 2.3–3.2 mm (2.7 ± 0.3 , 18), wingspan 4.9–6.9 mm. Head: frontal tuft pale ochreous, or pale yellowish orange, collar ochreous white. Scape small, ochreous white. Antenna pale brown, with 33–44 (39.2 ± 3.4 , 13) segments. Thorax unicolorous pale ochreous; forewing ochreous, irrorate with pale brown scales, occasionally brown scales covering wing almost completely, except narrow stripe along dorsal margin; terminal cilia concolorous. Hindwing pale ochreous; costal bristles present. Abdomen ochreous white, on segments 4–8 with long ochreous dorsal scale tufts, hairscales pointing posteriorly, completely covering rest of abdomen; abdominal tergites 4–8 in addition with narrow, reinforced sclerotizations anteriorly to scale tufts, with medial posterior projection between the tufts; these sclerotizations only well visible in microscopic preparations, amount and visibility of sclerotization may vary. Underside completely pale ochreous.

Female. Forewing length 2.3–2.9 mm (2.6 ± 0.2 , 8) mm, wingspan 5.1–6.4 mm. Antenna with 33–40 (36.9 ± 2.6 , 7) segments. Abdominal tufts absent; abdominal tip broad and blunt, hairy. Male genitalia. Capsule length 345–437 μm (376.1 ± 26.4 , 13). Vinculum anteriorly slightly excavated, posteriorly with rounded extension, joined to ventral process of aedeagus; a pair of support rods along lateral arms. Tegumen bilobed, setose. Uncus with short central element, divided dorso-ventrally. Gnathos with long central element, apex truncate or slightly excavate. Valva elongate, 213–271 μm (234.6 ± 16.3 , 13) long, with almost parallel sides, or slightly constricted in middle; a pecten of ca 30–55 close-set spines runs along inner margin in posterior half and around apex; length usually about half valval length, sometimes shorter; transtilla absent. Aedeagus length 280–350 μm (316.6 ± 18.9 , 13); with a central tongue shaped carinal process and pair of pointed lateral carinae; vesica with many small spinelike or scobinate cornuti.

Female genitalia. T8 narrow, laterally produced into setose lobes, no scales present. T9 ending in two widely separate hairy anal papillae each with many setae (ca 35), in dorsal view overlapped by T8. S7 with row of long setae. Vestibulum folded, with indistinct sclerotization at right side. Corpus bursae bulbous, 550–600 μm long, without pectinations; reticulate signa long, 350–440 μm long, both almost of similar length, 7–11 cells wide. Ductus spermathecae with 3–3.5 convolutions.

Biology: Hostplant unknown, always in deserts or coastal dunes (Tel Aviv). Adults flying from February to May in Middle East and Northern Africa, May to June and August–September in central Asia, October in India.

Remarks: *Acalyptis psammophricta* was described from a single female from western India, and redescribed by me (van Nieukerken, 1986). At that time I noticed already the close resemblance to some Iranian specimens (recorded here). With more material, including the female from the UAE, it is now clear that they are conspecific with *A. psammophricta*. The males, associated in the present material and in Bandar Abbas in Iran, with truncate uncus, long abdominal tufts and irrorate wings are similar to material identified by Puplesis as *A. lvovskyi*, including one paratype. The holotype of *A. lvovskyi* was studied by me in 1985, and



Plates 28–32. *Acalyptris*, male genitalia. 28–30: *A. gielisi*, holotype, EJVn3861, with detail of aedeagal tip and carinae (30); 31–32: *A. lanneivora*, holotype, TM6743, S Africa, Pretoria, 3.ii.1951, L. Vári. Scale lines 100 μ m.

notes made then confirm the identity with the other material, despite some variation in valva length and shape and forewing pattern. The conspecificity of the UAE material is further corroborated by the CO1 gene, identical in three specimens, and with 99.6–99.8% similarity (1–2 nucleotide differences) between these and the other two (see below).

Puplesis (1990) synonymised *Microcalypttris turanicus* Puplesis, 1984, with *A. Lvovskyi*, but because *turanicus* has a pointed gnathos, I think it is more likely to be *A. falkovitshi* (Puplesis, 1984). The remarkably formed sensillum vesiculocladum on the flagellar segments was illustrated and described by van Nieukerken & Dop (1987), incorrectly under the name *A. falkovitshi* Puplesis.

Distribution (Map 2): From India westwards to Tunisia and northwards to Mongolia. New records for Pakistan, Iran, UAE, Israel, Libya and Tunisia.

Acalypttris repeteki (Puplesis, 1984)

Plates 25, 41, 42, 45

Microcalypttris repeteki Puplesis, 1984: 494 – Holotype ♂, TURKMENISTAN: Repetek, 4.v.1983, M. Falkovitsh, genitalia in glycerine (St. Petersburg) [examined]

Specimens examined: UAE: Sharjah Desert Park, 80 m, 1♂ [EJvN3847], 10.iv.2006, leg. C. Gielis.

Diagnosis: Males can be separated from *A. psammophricta* by the absence of very long abdominal tufts, although short tufts are present, but rather inconspicuous. In the male genitalia the gnathos is pointed and the valval pecten is comparatively short on a very long valva (ca 0.7 × capsule length). *A. galinae* differs by smaller size and considerably shorter valvae (ca. half capsule length).

Redescription: Male. Forewing length 2.6 mm, wingspan 5.6 mm. Head: frontal tuft pale ochreous, collar ochreous white. Scape small, ochreous white. Antenna pale brown, with 37–41 (n=2) segments. Thorax unicolorous pale ochreous; forewing ochreous, irrorate with pale brown scales. Hindwing pale ochreous. Abdomen ochreous white, on segments 5–8 with short inconspicuous ochreous dorsal scale tufts (sockets difficult to see in slide preparations); abdominal tergites without reinforced sclerotizations. Underside completely pale ochreous.

Female. Unknown.

Male genitalia. Capsule length ca 370 µm. Vinculum anteriorly slightly excavated, posteriorly with rounded extension, joined to ventral process of aedeagus; a pair of support rods along lateral arms. Tegumen bilobed, setose. Uncus with truncate central element. Gnathos with long, pointed central element. Valva elongate, ca 260 µm long, with almost parallel sides; a pecten of ca 28 close-set spines runs along inner margin in posterior third and around apex; transtilla absent. Aedeagus length ca 300 µm; with a central tongue-shaped carinal process and pair of pointed lateral carinae, dorsally an asymmetrical lobe; vesica with a few small spinelike cornuti.

Biology: Hostplant unknown, in deserts. Adults known from April (UAE) and May.

Remarks: *A. repeteki* has only been found twice, the holotype and the present specimen.

Distribution: Turkmenistan and UAE. New for the UAE.

Acalypttris galinae (Puplesis, 1984)

Plates 26, 43

Microcalypttris galinae Puplesis, 1984: 502 – Holotype ♂, MONGOLIA: Bajan Chongor aimak, [Bayanhongor prov.], 160 km S Shine-Dzhinst [Shinejinst], 3–11.viii.1981, A. Lvovsky, genitalia in glycerine (St. Petersburg) [not examined]

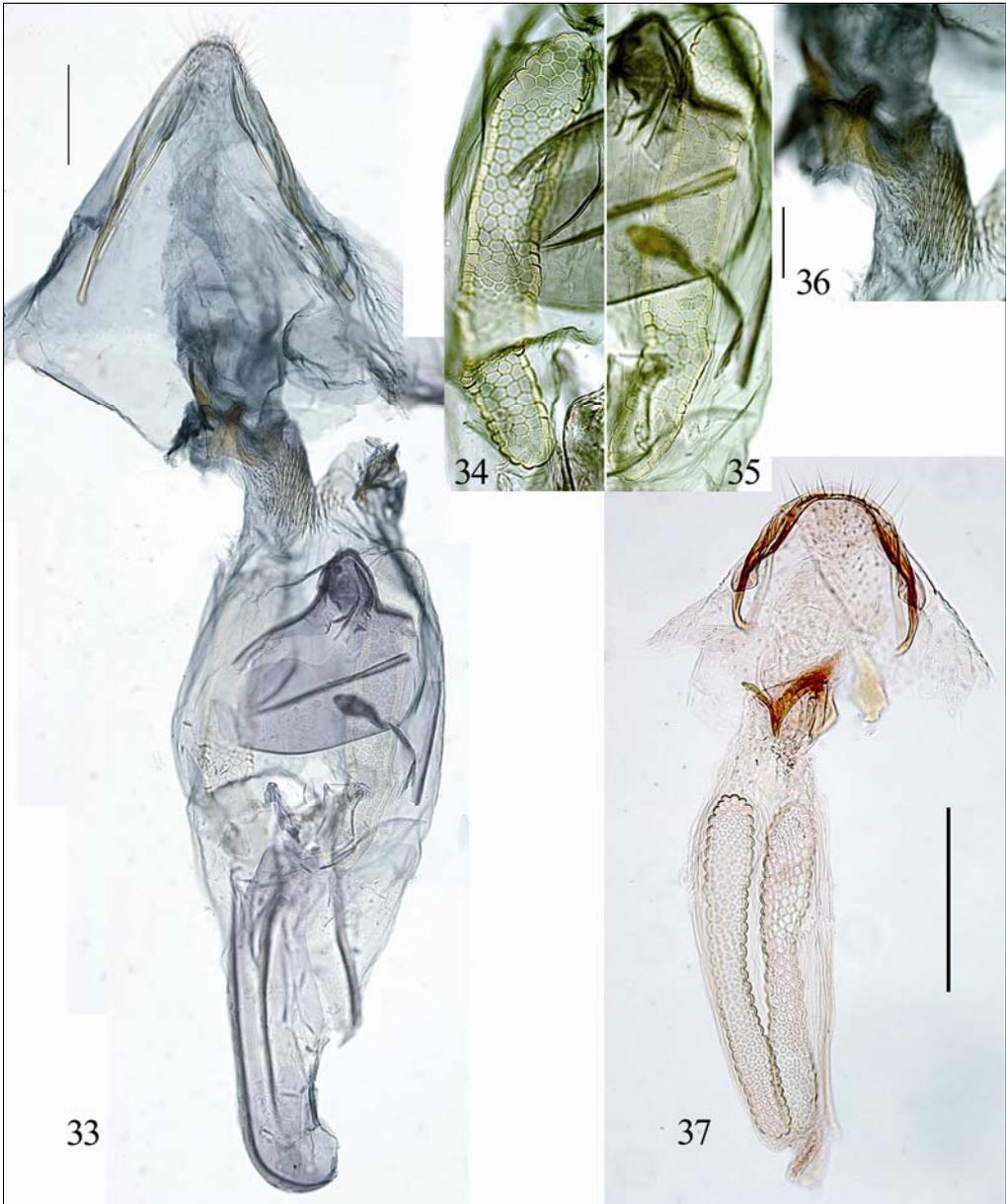
Microcalypttris galinae mesasiaticus Puplesis, 1984: 503 – Holotype ♂, UZBEKISTAN: Zhamansaj, 140 km NW Shafirkan [Safirkon], 20.v.1967, M. Falkovitsh, genitalia in glycerine (St. Petersburg) [not examined]

Specimens examined: UAE: Sharjah Desert Park, 80 m, 1♂ [EJvN3981], 10.iv.2006, leg. C. Gielis.

Other material: TURKMENISTAN: Sandy-Katschi, 5♂ [JCK15208, glyc. preps], 29.iv–3.v.1986, R. Puplesis (Leiden).

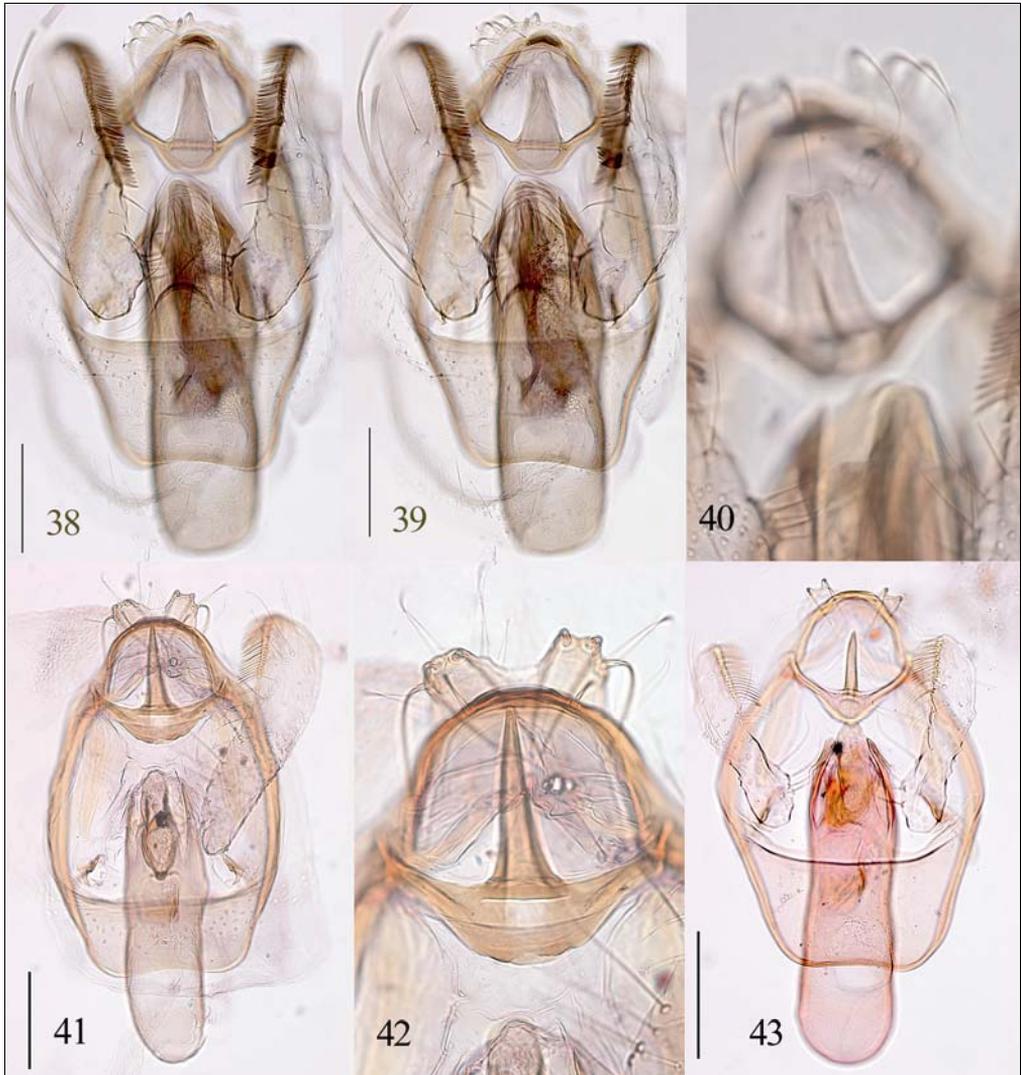
Diagnosis: See *A. repeteki*.

Redescription: Male. Forewing length 2.0–2.5 mm (2.3 ± 0.2, 6), wingspan 4.4–5.5 mm. Head: frontal tuft pale ochreous, collar ochreous white. Scape small, ochreous white. Antenna pale brown, with 24–34 (28.6 ± 4.1, 5) segments. Thorax unicolorous pale ochreous; forewing



Plates 33–37. *Acalyptris*, female genitalia. 33–36: *A. gielisi*, paratype, EJvN3940, details of signa (34, 35) and vestibulum (36); 37: *A. lanneivora*, paratype, TM6744, S Africa, Pretoria, 21.iv.1950, L. Vári. Scale lines 100 μm (33), 50 μm (36), 200 μm (37).

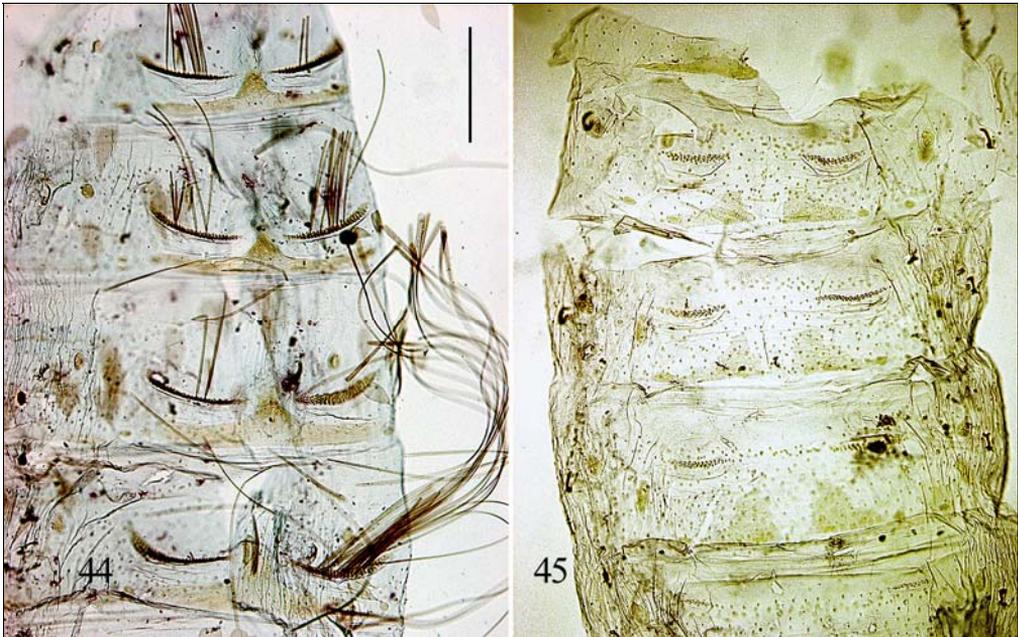
ochreous, irrorate with pale brown scales. Hindwing pale ochreous. Abdomen ochreous white, on segments 5–8 with short inconspicuous ochreous dorsal scale tufts (sockets difficult to see in slide preparations); abdominal tergites without reinforced sclerotizations. Underside completely pale ochreous.



Plates 38–43. *Acalyptris repeteki* group, male genitalia. 38–40: *A. psammophricta*, 5 km SE Mahafiz, EJVN3732 (38, 39), EJVN3868 (40), with detail of uncus; 41–42: *A. repeteki*, EJVN3847, with detail of gnathos and uncus; 43: *A. galinae*, EJVN3981. Scale lines 100 μm .

Female. Unknown.

Male genitalia. Capsule length ca 300 μm . Vinculum anteriorly slightly excavated, posteriorly with rounded extension, joined to ventral process of aedeagus; a pair of support rods along lateral arms. Tegumen bilobed, setose. Uncus with truncate central element. Gnathos with long, pointed central element. Valva elongate, 160–165 μm long, slightly more than half capsule length, with almost parallel sides; a pecten of ca 18–20 close set spines runs along inner margin in posterior third and around apex; transtilla absent. Aedeagus length 270–295



Plates 44–45. *Acalyptris repeteki* group, abdomen in slide preparation. 44: *A. psammophricta*, EJvN3732, large tufts of long scales and strong sclerotizations; 45: *A. repeteki*, EJvN3847, smaller tufts of short scales and indistinct sclerotizations.

μm ($n=2$); with a central tongue shaped carinal process and pair of pointed lateral carinae, dorsally an asymmetrical lobe; vesica with a few small spinelike cornuti.

Biology: Hostplant unknown, always in deserts. Adults flying from April to June (April in UAE).

Remarks: A division in subspecies as originally suggested was not followed in later treatments (Puplesis, 1990; 1994) and is also not followed by me.

Distribution: Mongolia, Uzbekistan, Turkmenistan. New for the UAE.

***Acalyptris* spec.**

Plates 27, 48, 49

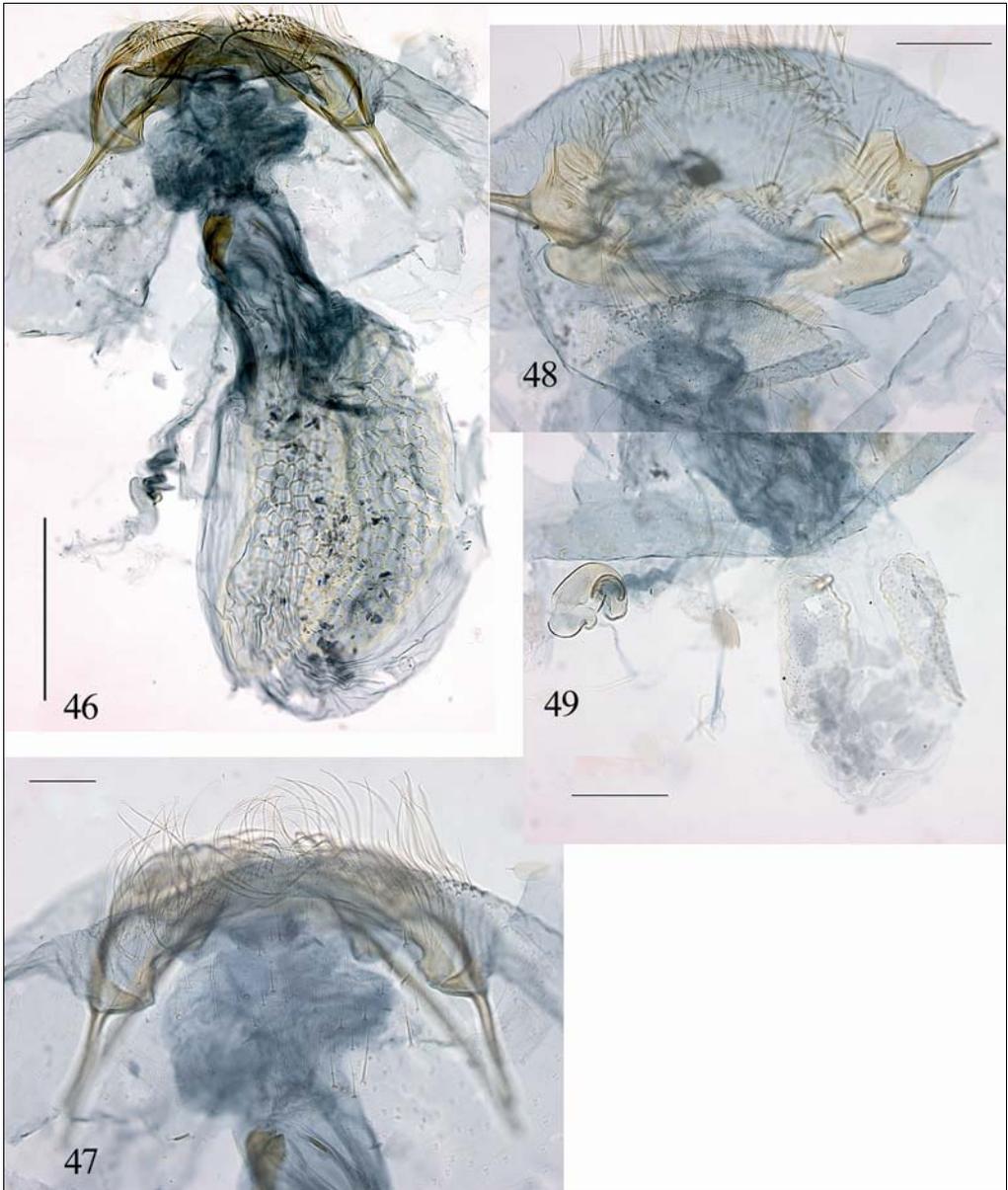
Specimens examined: UAE: Al-Ajban, 80 m, 1♀ [EJvN3867], 10.xi.2007, leg. C. Gielis.

Diagnosis: This female differs from other UAE Nepticulidae by almost pure white wings, irrorate with black scales. The genitalia are characteristic, separated from *A. psammophricta* by very short bursa and signa.

Redescription: Male. Unknown.

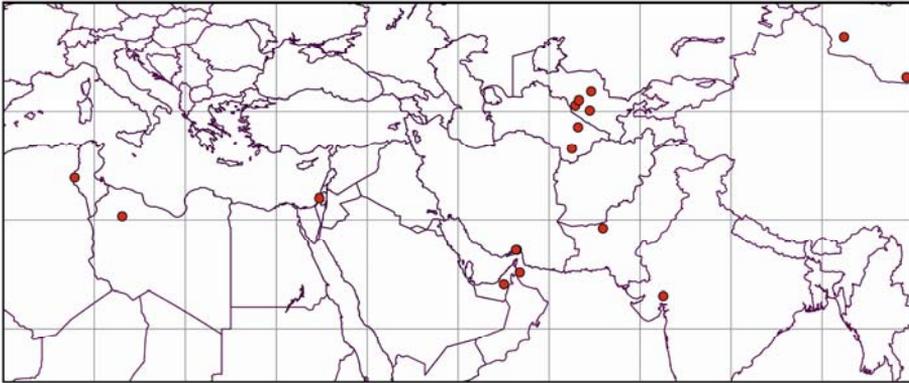
Female. Forewing length 2.8 mm, wingspan 6.3 mm. Head: frontal tuft pale ochreous, collar white. Scape small, white. Antenna pale brown, 36 segments. Thorax and forewings almost unicolorous yellowish white; forewing irrorate with some black-tipped scales, particularly along fringe line. Hindwing silvery white.

Female genitalia. T8 not distinctly recognizable, covered with many long setae. T9 forming two separate hairy anal papillae each with many setae (ca 40). S7 also with many long setae. Apophyses short, configuration as shown in photograph possibly, but not certainly a



Plates 46–49. *Acalyptris*, female genitalia. 46–47: *A. psammophricta*, EJVN3867, complete genitalia in dorsal view and terminal segments focussed more ventrally; 48–49: *Acalyptris* spec., terminal segments in dorso-caudal view and bursa. Scale lines 50 µm (47), 100 µm (48, 49), 200 µm (46).

preparation artifact. Vestibulum folded, no sclerotizations. Corpus bursae very small, ca 470 µm long, without pectinations; reticulate signa very short, slightly dissimilar, respectively 155 and 170 µm long, ca 6 indistinct cells wide. Ductus spermathecae with 3 convolutions. Biology: Unknown.



Map 2. Distribution of *Acalyptris psammophricta*.

Remarks: This female almost certainly represents a new species. I refrain from naming it here on the basis of a single female. There is a remote possibility that the female belongs to one of the species only known from males, described from Central Asia or Africa. However, the phylogenetic analysis strongly suggests that this species belongs to the *A. stacticis* group. Distribution: only known from the UAE.

MOLECULAR ANALYSIS

In Figure 1 the neighbour joining tree of the CO1 sequences is given, together with those of the European and Mediterranean *Acalyptris* species and the type species of *Stigmella* (all from van Nieukerken, 2007). The conspecificity of the different specimens of *Tischeria ptarmica* Meyrick, 1908, *Stigmella birgittae* and *Acalyptris psammophricta* is clearly seen, there are hardly differences; the larger difference of *S. birgittae* 23731 is an artefact, due to short sequence length. The maximum parsimony analysis of the same CO1 sequences found six shortest trees, with a length of 313 steps, consistency index = 0.476 and retention index = 0.666. Of 665 characters, 206 are parsimony informative. The strict consensus tree is well resolved, and the only difference with the majority rule consensus tree (Fig. 2) is the resolution on the European *platani* group.

The data here show the monophyly of the *A. repeteki* group, and the correct placement of *A. gielisi* in the *platani* group, although both have no bootstrap support. *Acalyptris* species (23867) most likely belongs to or is closely related to the *A. stacticis* group.

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I would like to thank Cees Gielis (Lexmond, Netherlands) and Jaroslaw Buszko (Toruń, Poland) for collecting these tiny moths, and Tony van Harten (Sharjah, UAE) for undertaking this huge and interesting project, and his editorial work. For the loan or gift of material I am indebted to: Don Davis (Washington DC, USA), Bert Gustafsson (Stockholm, Sweden), Roland Johansson (Växjö, Sweden), Lauri Kaila (Helsinki, Finland), Ole Karsholt

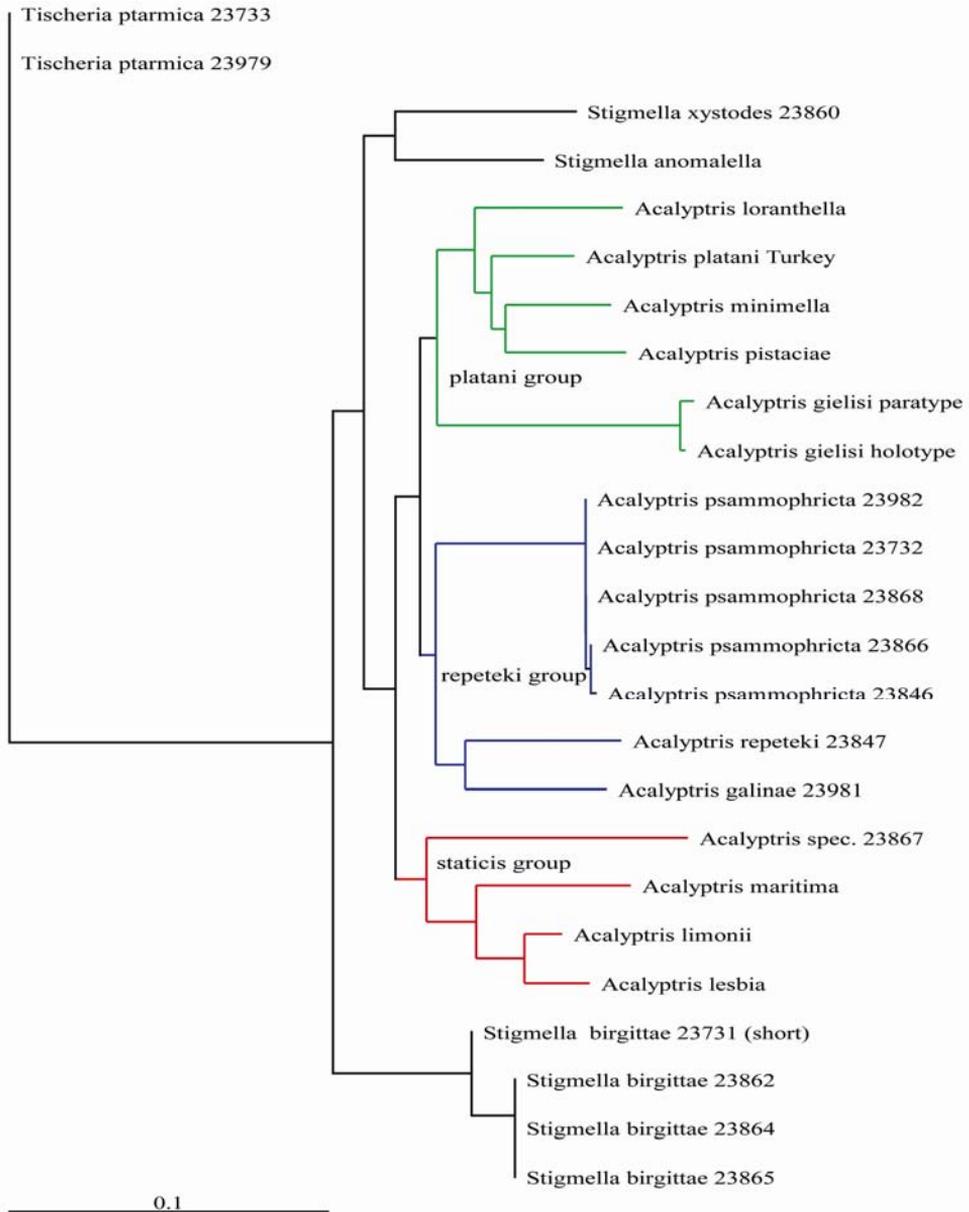


Figure 1. Neighbour joining tree of CO1 sequences of UAE Nepticulidae and Tischeriidae combined with the *Acalyptris* species and *Stigmella anomalella* (type species) from van Nieukerken (2007), with relative distances (K2P distances). The three species groups of *Acalyptris* are indicated by different colours. Numbers refer to RMNH registry numbers (table 1).

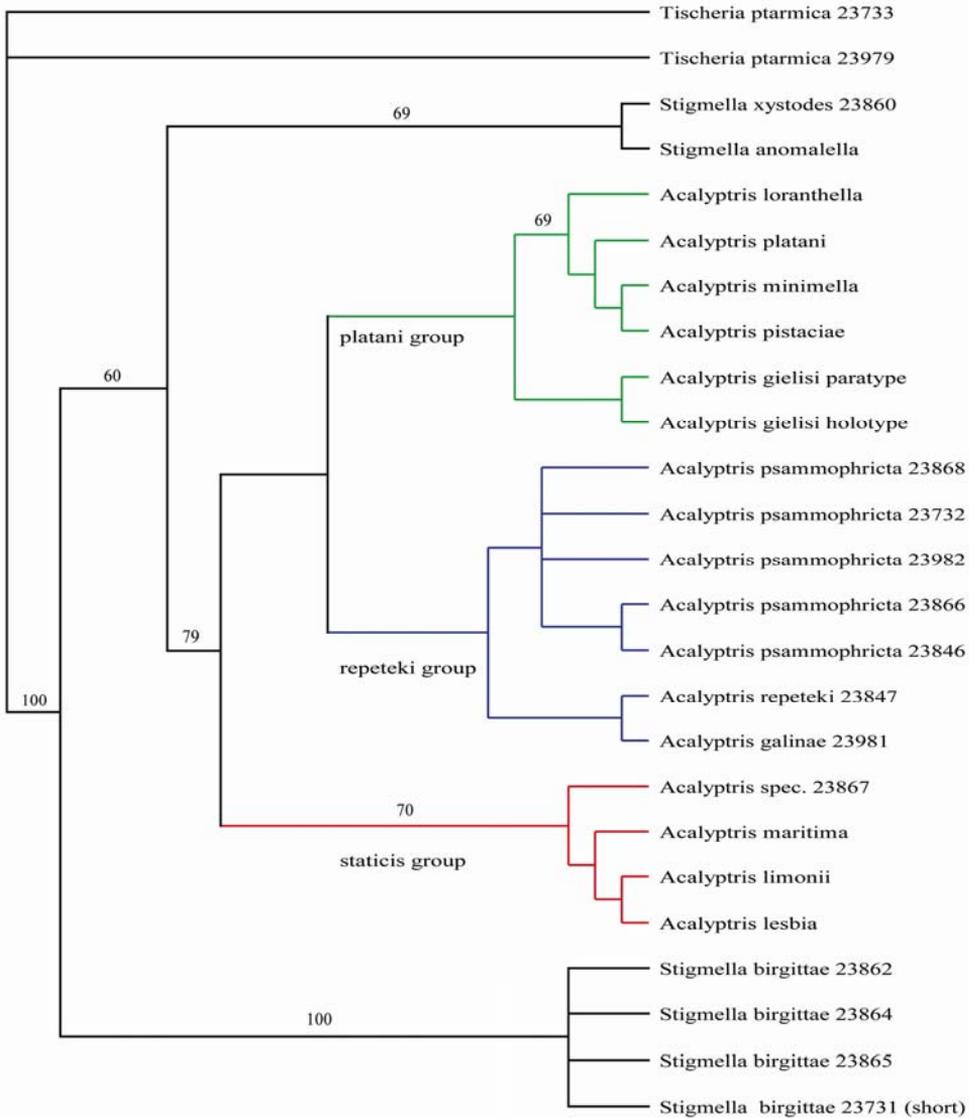


Figure 2. Cladogram of UAE Nepticulidae and Tischeriidae (as outgroup) combined with the *Acalyptris* species and *Stigmella anomalella* (type species) from van Nieuwerkerken (2007), based on mitochondrial CO1 sequences. Majority rule consensus tree of six shortest trees, found with heuristic search. Figures indicate bootstrap values (larger than 50), found after 100 bootstrap replicates with each 100 addition sequence replicates. The three species groups of *Acalyptris* are indicated by different colours. Numbers refer to RMNH registry numbers (table 1).

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REFERENCES

- Evenhuis, N.L. & G.A. Samuelson (2004): *The insect and spider collections of the world website*. Bishop Museum. URL: <http://hbs.bishopmuseum.org/codens/codens-r-us.html> (visited 19 June 2009).
- Fletcher, T.B. (1920): Life-histories of Indian insects, Microlepidoptera, 8. Tineidae and Nepticulidae. *Memoirs of the Department of Agriculture in India, Entomological Series*, 6 (8): 181–196, pls. 153–157.
- Gustafsson, B. (1985): New species of *Stigmella* from the Gambia (Lepidoptera, Nepticulidae). *Tijdschrift voor Entomologie*, 127 (8): 165–177.
- Jongbloed, M. (2003): *The comprehensive guide to the wild flowers of the United Arab Emirates*. Abu Dhabi Environmental Research and Wildlife Development Agency, 576 pp.
- Kemperman, T.C.M., C. Wilkinson, H. Kuroko & T. Kumata (1985): Japanese species of the genus *Stigmella* (Nepticulidae: Lepidoptera). *Insecta Matsumurana*, 32: 1–107.
- Knölke, S., S. Erlacher, A. Hausmann, M.A. Miller & A.H. Segerer (2005): A procedure for combined genitalia dissection and DNA extraction in Lepidoptera. *Insect Systematics and Evolution*, 35 (4): 401–409.
- Meyrick, E. (1916): *Exotic Microlepidoptera*, 2 (1): 1–32.
- Meyrick, E. (1918): *Exotic Microlepidoptera*, 2 (6): 161–192.
- Meyrick, E. (1921): *Exotic Microlepidoptera*, 2 (13): 385–416.
- Morton, A. (2000): *DMAP for Windows, version 7.0e*. Winkfield, Windsor, Berkshire. Available from <http://www.dmap.co.uk/welcome.htm>
- Nieukerken, E. J. van (1986): Systematics and phylogeny of Holarctic genera of Nepticulidae (Lepidoptera, Heteroneura: Monotrysia). *Zoologische Verhandelingen*, 236: 1–93.
- Nieukerken, E. J. van (2007): *Acalyptis* Meyrick: revision of the *platani* and *staticis* groups in Europe and the Mediterranean (Lepidoptera: Nepticulidae). *Zootaxa*, 1436: 1–48.
- Nieukerken, E. J. van (2010): Order Lepidoptera, family Tischeriidae. *Arthropod fauna of the UAE*, 3: 514–517.
- Nieukerken, E. J. van & Dop, H. (1987): Antennal sensory structures in Nepticulidae (Lepidoptera) and their phylogenetic implications. *Zeitschrift für Zoologische Systematik und Evolutionsforschung*, 25 (2): 104–187.
- Puplesis, R. (1984): Obzor vidov roda *Microcalyptis* (Lepidoptera, Nepticulidae) iz pustyn' Mongolii i SSSR (A review of nepticulid moths of the genus *Microcalyptis* (Lepidoptera, Nepticulidae) from the deserts of Mongolia and the USSR). *Nasekomye Mongolii*, 9: 484–507. [in Russian]
- Puplesis, R. (1990): The genus *Acalyptis* Meyrick (Lepidoptera, Nepticulidae) in the USSR: distribution and taxonomy. *Nota Lepidopterologica*, 13 (1): 62–88.
- Puplesis, R. (1994): *The Nepticulidae of eastern Europe and Asia. Western, central and eastern parts*. Leiden, Backhuys Publishers.
- Puplesis, R. & Robinson, G. S. (2000): A review of the Central and South American Nepticulidae (Lepidoptera) with special reference to Belize. *Bulletin of the Natural History Museum London, Entomology*, 69 (1): 3–114.

- Puplesis, R. & Diškus, A. (2003): Strategic regional revisions with description of new species. Pp. 176–289 in: R. Puplesis & A. Diškus (eds), *The Nepticuloidea & Tischerioidea (Lepidoptera) - a global review, with strategic regional revisions*. Lutute publishers, Kaunas.
- Scoble, M. J. (1980): The genus *Niepeltia* Strand: taxonomy, and comments on structure and relationships (Lepidoptera: Nepticulidae). *Annals of the Transvaal Museum*, 32 (8): 197–229.
- Vári, L. (1955): South African Lepidoptera 1. Descriptions of new leafmining Tineina. *Annals of the Transvaal Museum*, 22 (3): 331–351.
- Walsingham, L. (1911): Algerian Microlepidoptera. *Entomologist's Monthly Magazine*, 47 (567): 187–193.

Table 1. Specimen data for vouchers and CO1 sequences of Nepticulidae and Tischeriidae of the UAE. fl = fragment length.

Species	Sex	Voucher ID	Gen. slide	BOLD ID	Genbank ID	fl
<i>Stigmella birgittae</i>	♂	RMNH.INS.23731	EJvN3731	NEPT001–09	GU451324	310
<i>Stigmella birgittae</i>	♀	RMNH.INS.23862	EJvN3862	NEPT007–09	GU451325	665
<i>Stigmella birgittae</i>	♂	RMNH.INS.23864	EJvN3864	NEPT008–09	GU451326	665
<i>Stigmella birgittae</i>	♀	RMNH.INS.23865	EJvN3865	NEPT009–09	GU451327	665
<i>Stigmella xystodes</i>	♂	RMNH.INS.23860	EJvN3860	NEPT005–09	GU451328	665
<i>Acalyptis gielisi</i>	♂	RMNH.INS.23861	EJvN3861	NEPT006–09	GU451315	665
<i>Acalyptis gielisi</i>	♀	RMNH.INS.23940	EJvN3940	NEPT013–09	GU451316	665
<i>Acalyptis psammophricta</i>	♂	RMNH.INS.23732	EJvN3732	NEPT002–09	GU451317	665
<i>Acalyptis psammophricta</i>	♀	RMNH.INS.23846	EJvN3846	NEPT003–09	GU451318	665
<i>Acalyptis psammophricta</i>	♂	RMNH.INS.23866	EJvN3866	NEPT010–09	GU451319	665
<i>Acalyptis psammophricta</i>	♂	RMNH.INS.23868	EJvN3868	NEPT012–09	GU451320	665
<i>Acalyptis psammophricta</i>	♂	RMNH.INS.23982	EJvN3982	NEPT015–09	GU451321	665
<i>Acalyptis repeteki</i>	♂	RMNH.INS.23847	EJvN3847	NEPT004–09	GU451322	665
<i>Acalyptis galinae</i>	♂	RMNH.INS.23981	EJvN3981	NEPT014–09	GU451314	665
<i>Acalyptis</i> sp.	♀	RMNH.INS.23867	EJvN3867	NEPT011–09	GU451323	665
<i>Tischeria ptarmica</i>	♂	RMNH.INS.23733	EJvN3733	TISCH001–09	GU451329	665
<i>Tischeria ptarmica</i>	♀	RMNH.INS.23979	EJvN3979	TISCH002–09	GU451330	665

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