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Contributions to a revision of the western Palaearctic psocids.  
V. The genus *Nephax* PEARMAN (Psocoptera: Amphientomidae)

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Two species of *Nephax* are known from the western Palaearctic: *N. sofadanus* PEARMAN (type-species) from Israel and Greece, and *N. fortunatus* (NAVÁS) from the Canary Islands and the Cape Verde Islands. Males of these scaly-winged psocids are redescribed and females are described for the first time. A lectotype is designated for *N. sofadanus*.

INTRODUCTION

The entomologist who turns in spring sun-heated stones in the sparse “phrygana”-vegetation growing near the port of the small Greek island of Iraklia (Cyclades), may be surprised to discover numerous silvery scaly-winged insects. These psocids of about 3 mm length, quickly move around when disturbed and hide in the dark of stony débris or soil crevasses. The minute moth-like creature is *Nephax sofadanus*, a member of the essentially tropical family Amphientomidae.

In Psocoptera scales on body and wings have evolved twice independently, in Lepidopsocidae (suborder Trogiomorpha, family-group Atropetae) and in Amphientomidae (suborder Troctomorpha, family-group Amphientometae). In Amphientomidae (*sensu* MOCKFORD, 1967) we know at present 14 genera with about 70 species essentially living in the tropics of Asia, Africa and South America. Apart from three *Amphientomum* spp. from Baltic amber (*cf.* SMITHERS, 1967) only four species of Amphientomidae are known to occur in the western Palaearctic. Two were described from Spain as sole members of the ill defined genus *Marcenendius* NAVÁS, 1913. Both species, *M. nostras* NAVÁS, 1913, and *M. illustris* NAVÁS, 1923, are known only from the poor original descriptions and are considered as *species inquirendae*. The other two western Palaearctic amphientomids are the above mentioned *Nephax sofadanus* known from Israel and Greece, and *N. fortunatus* from the Macaronesian Atlantic Islands.

*Nephax* contains at present four species. The genus was described by PEARMAN (1935) for *N. sofadanus* (type-species) from Palestine (present day Israel), and *N. capensis* from South Africa. PEARMAN described only the male of *N. sofadanus* erroneously assuming that the type-series includes only one sex (see below). BADONNEL (1955) added *N. angolensis*, known in both sexes from tropical Africa (Angola). MEINANDER (1973) placed *Perientomum fortunatum* NAVÁS, 1917 in *Nephax*, transferring it from Lepidopsocidae to Amphientomidae. He does not mention the female though present in his material (see below).

In the following, both sexes of *N. sofadanus* and *N. fortunatus* are described and a lectotype is designated for the former. Additional distributional records are

mentioned from Greece (*N. sofadanus*) and from the Cape Verde Islands (*N. fortunatus*).

Following abbreviations are used in the descriptions: A = antenna length; B = body length; FW = forewing length; F = length of hind femur; T = length of hind tibia;  $t_1-t_3$  = length of hind tarsomeres (from condyle to condyle).

Material is deposited in following museums: BMNH = British Museum (Natural History), London; MHNG = Muséum d'Histoire naturelle, Genève; ZMUB = Zoologisk Museum, Universitetet i Bergen.

## DESCRIPTIONS

### *Nephax* PEARMAN

*Nephax* PEARMAN, 1935: 134. Type-species: *N. sofadanus* PEARMAN, by original designation.

*Diagnosis.* Antennae of 13 segments (only confirmed in *N. sofadanus*). Vertical suture present, frontal suture present or absent. Two or three ocelli. Lacinia unequally bifid, tines truncate or outer tine with some denticles, this tine only slightly curved outwards. Sensillum on second article of maxillary palpus present or absent. Femora of forelegs with comb. Pretarsal claws with one preapical tooth and a series of microtrichia. Forewings shortened, with pointed apex. Distal portion of *Sc* present or absent. *Cu* forked or not. *Rs* and *M* meeting in a point or fused for a short length. Short inflated area of radial stem present or absent. Hindwings reduced to small almost veinless flaps.

*Remarks.* This generic diagnosis is provisional. At present it is difficult to define the genera of Amphientomidae, which makes it impossible to analyze the systematic position of *Nephax* within the family.

### *Nephax sofadanus* PEARMAN

*Nephax sofadanus* PEARMAN, 1935: 134.

*Coloration.* Body yellowish white to weakly light brown, with dark brown longitudinal band over genae and pleurae. Abdomen brownish laterally. Antenna and maxillary palpus light brown, compound eyes black, postclypeus very finely striate, region around lateral ocelli dark brown, vertical suture almost colourless. Legs yellowish, apex of femora light brown, tibiae with two dark brown annulations, tarsi weakly light brown, first segment darker basally. Dorsal surface of forewings covered by light and dark coloured scales forming a complex, indistinct pattern (Fig. 3; only observable in living or dry preserved specimens), wing membrane entirely hyaline or with two brown marginal spots, near the end of *R*<sub>1</sub> and *Cu*. Terminalia almost colourless, only hind-margin of epiproct and paraprocts with some dark brown pigmentation.

*Morphology.* Head rounded, slightly excavate behind but not sharp-edged. Antennae of 13 segments. Median ocellus absent, lateral ocelli widely separated, close to subhemispherical compound eyes which are not overtopping vertex. Some very fine and slightly curved pointed hairs between ommatidia of compound eyes. Vertical suture very fine, frontal suture not visible. Maxillary palpus (Fig. 9) with sensillum on inner side and 4–5 long stout setae on outer side of second article, scales present from second to fourth article. Lacinal tip (Fig. 4, 5) unequally bifid, outer tine with some rounded denticles. Mandibles (Fig. 7) stout, with shortened apical region. Forewing (Fig. 1) with *Cu* forked or not,

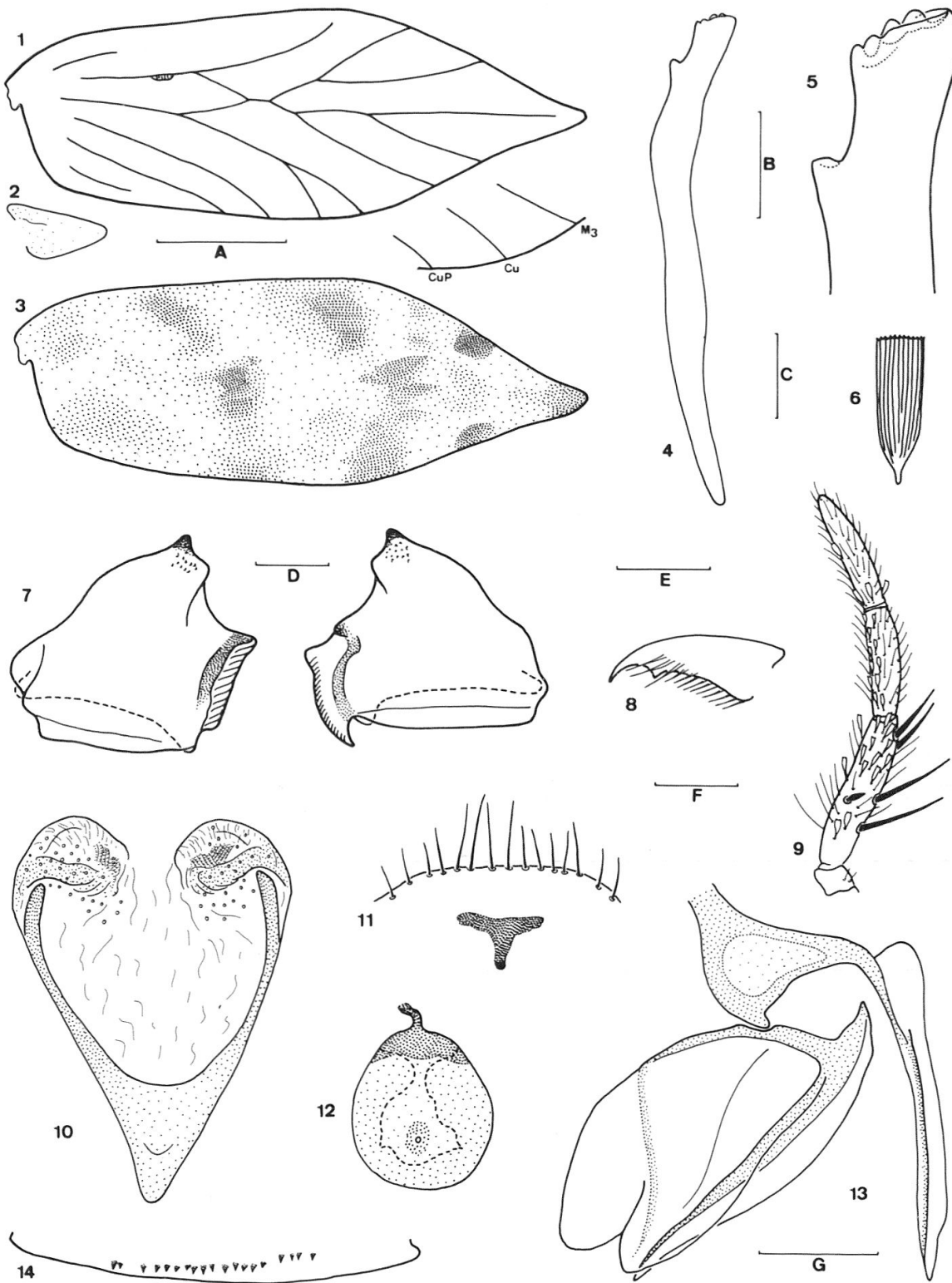


Fig. 1–14. *Nephax sofadanus* PEARMAN. Fig. 1–9, 11–14: ♀ from Greece; Fig. 10: ♂ from Greece. 1, forewing without scales (with variant of venation). 2, hindwing. 3, colour pattern of forewing produced by scales (after photograph of living specimen). 4, lacinia. 5, lacinial tip. 6, scale of forewing. 7, mandibles. 8, pretarsal claw. 9, maxillary palpus. 10, phallosome. 11, posterior margin of subgenital plate. 12, spermapore. 13, ovipositor valvulae. 14, anterior carina of first femur. – Scale bars: A = 0.5 mm (Fig. 1–3); B = 0.05 mm (Fig. 5); C = 0.025 mm (Fig. 6); D = 0.1 mm (Fig. 7, 14); E = 0.02 mm (Fig. 8); F = 0.1 mm (Fig. 4, 9, 10, 11); G = 0.1 mm (Fig. 12, 13).

distal portion of *Sc* absent, radial stem with short inflated area, *CuP* and *An<sub>1</sub>* entering hind-margin separately (no nodulus), *Rs* and *M* fused for a short length. Wing scales longitudinally striate, with truncate apex (Fig. 6). Hindwings strongly reduced (Fig. 2). Femora of forelegs with a row of small ventral denticles on anterior side (Fig. 14). Pretarsal claws (Fig. 8) with distinct preapical tooth and several microtrichia.

Female terminalia: Epiproct and paraprocts simple. Subgenital plate with T-shaped sclerite (Fig. 11). Ovipositor with pointed ventral and dorsal valvulae and large, bilobed external valvula (Fig. 13). Spermatheca with very long and coiled duct and membranous sac divided in three parts (Fig. 15): the basal part, containing the origin of the spermathecal duct, somewhat helical in form, with a tuberculate sculpture and a row of about 6 to 10 larger pointed denticles; the middle part, with a fine sculpture consisting of slightly curved rows of short parallel ridges; the apical part, with "glandular cilia". Spermatophore slightly sclerotized (Fig. 12). Spermatophore with S-shaped canal and globular vesicle (Fig. 15).

Male terminalia: Epiproct, paraprocts and hypandrium simple. Phallosome (Fig. 10) simple, without internal sclerifications.

*Measurements.* 1♀ from Greece: B = 2.8 mm; A = 2.31 mm; FW = 2.27 mm; F = 663 µm; T = 1086 µm; t<sub>1</sub> = 620 µm; t<sub>2</sub> = 88 µm; t<sub>3</sub> = 121 µm. – 1♂ from

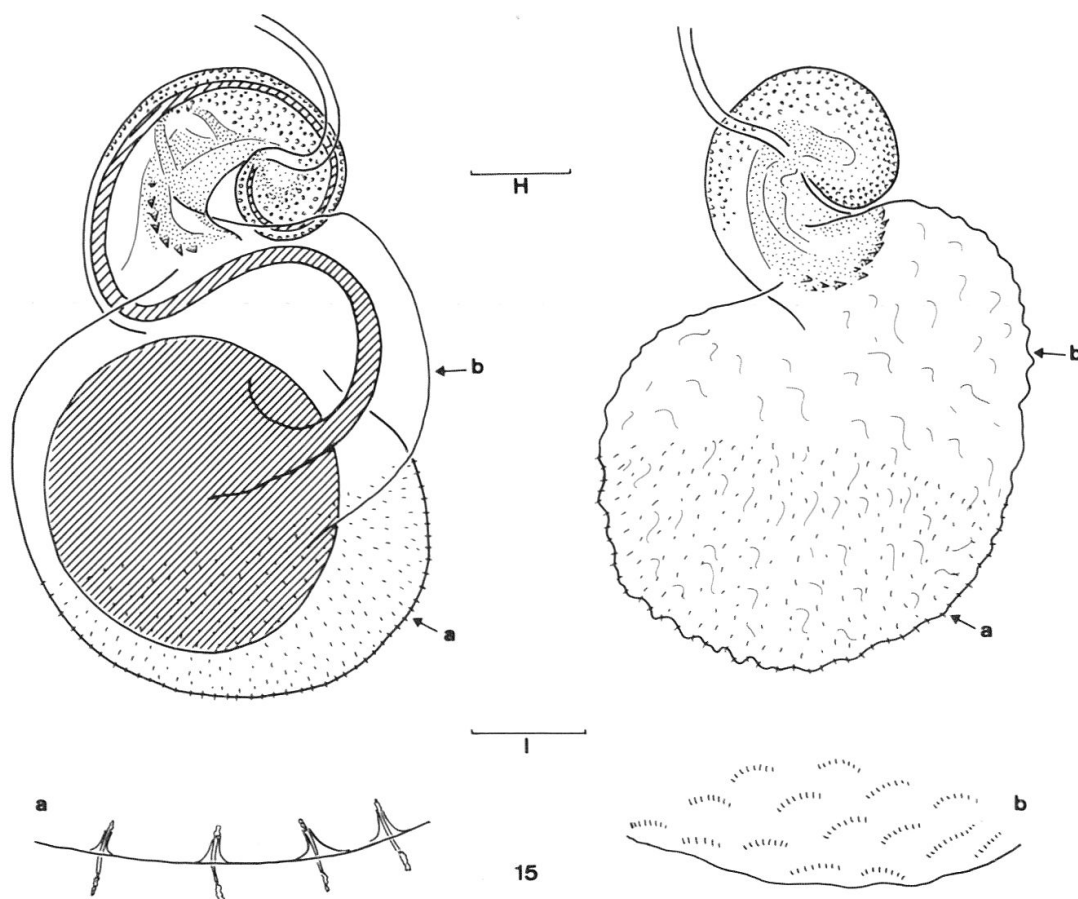


Fig. 15. *Nephax sofadanus* PEARMAN. Spermatheca of fecundated ♀ (left) and virgin ♀ (right) from Greece; spermatophore hatched; a) detail of surface structure of spermathecal membrane in apical part of vesicle; b) *idem* in central part. – Scale bars: H = 0.1 mm; I = 0.02 mm.

Greece: B = 2.7 mm; A = 2.42 mm; FW = 2.25 mm; F = 677  $\mu$ m; T = 1128  $\mu$ m;  $t_1$  = 690  $\mu$ m;  $t_2$  = 94  $\mu$ m;  $t_3$  = 127  $\mu$ m.

*Material examined.* LECTOTYPE ♂ (here designated), PALESTINE: Sofad District (present day ISRAEL: Upper Galilee: Zefat), 13.XI.1926, G. F. Huckleby (mounted on two microscopic slides by J. V. Pearman) (BMNH). PARALECTOTYPES. 2 ♂♂, 1 ♀ (in alcohol; identified as 3 ♂♂ by J. V. Pearman) and 1 ♂ (mounted on two microscopic slides by J. V. Pearman), same collecting data as Lectotype (BMNH). – Other material. GREECE: Cyclades: Island of Iraklia: Agios Georgios, above port, under stones, 10.V.1985, C. Lienhard, 35 ♂♂, 15 ♀♀, 56 nymphs (MHNG). GREECE: Cyclades: Island of Iraklia: near cave Agios Ioannis, under stones, 26.IV.1987, C. Lienhard, 10 nymphs (MHNG). GREECE: Cyclades: Island of Paros: Krotiri near Paroika, under stones, 28.IV.1987, C. Lienhard, 3 nymphs (MHNG).

*Discussion.* *N. sofadanus* was known so far only from Israel (type-series) and has been reported from Greece without exact collecting data (LIENHARD, 1987). For distinction from the other species of the genus see below.

### *Nephax fortunatus* (NAVÁS)

*Perientomum fortunatum* (NAVÁS), 1917: 20.

*Nephax fortunatus* (NAVÁS); MEINANDER, 1973: 143.

*Coloration.* Body yellowish white to light brown, with dark brown longitudinal band over genae and pleurae. Abdomen brown laterally. Antenna brown, maxillary palpus light brown, compound eyes black, postclypeus with dark brown longitudinal striae, some dark brown pigment around ocelli, vertical suture brown, frontal suture almost colourless. Legs yellowish to light brown, apex of femur and base of first tarsal segment darker, tibiae with two dark brown annulations. Dorsal surface of forewings covered by light and dark coloured scales (mostly lost in alcohol preserved specimens). Wing membrane light brown in basal half, almost hyaline in apical third, with a dark brown fascia between these regions (Fig. 16), which is clearly delimited apically and fading basally; this fascia is reduced to two marginal spots in some specimens.

*Morphology.* Head rounded, excavate behind with fairly sharp-edged vertex. Antennae in all specimens incomplete. Lateral ocelli well-developed, widely separated, close to subhemispherical compound eyes which are not overtopping vertex. Some very short straight hairs with rounded apex between ommatidia of compound eyes. Median ocellus present but much smaller than lateral ocelli (♂ from Candelaria), or only represented by a small pigment spot (♀ from Candelaria), or completely absent (♀ from São Jorge). Vertical suture distinct, frontal suture visible but very faint. Maxillary palpus (Fig. 27) without sensillum and long stout setae on second article, scales only on this article. Lacinial tip (Fig. 17, 18) unequally bifid, outer tine broadly rounded, with a faint incision on apical margin and sometimes some rounded denticles. Mandibles relatively slender, their apical region not shortened (Fig. 19). Forewing (Fig. 16) with *Cu* forked, distal portion of *Sc* absent or rudimentary (detail to Fig. 16), radial stem with short inflated area, *CuP* and *An<sub>1</sub>* entering hind-margin separately (no nodulus), *Rs* and *M* fused for a short length. Wing scales longitudinally striate, with truncate apex. Hindwings strongly reduced. Femora of forelegs with ventral row of small denticles (Fig. 26). Pretarsal claws (Fig. 25) with distinct preapical tooth and several microtrichia.

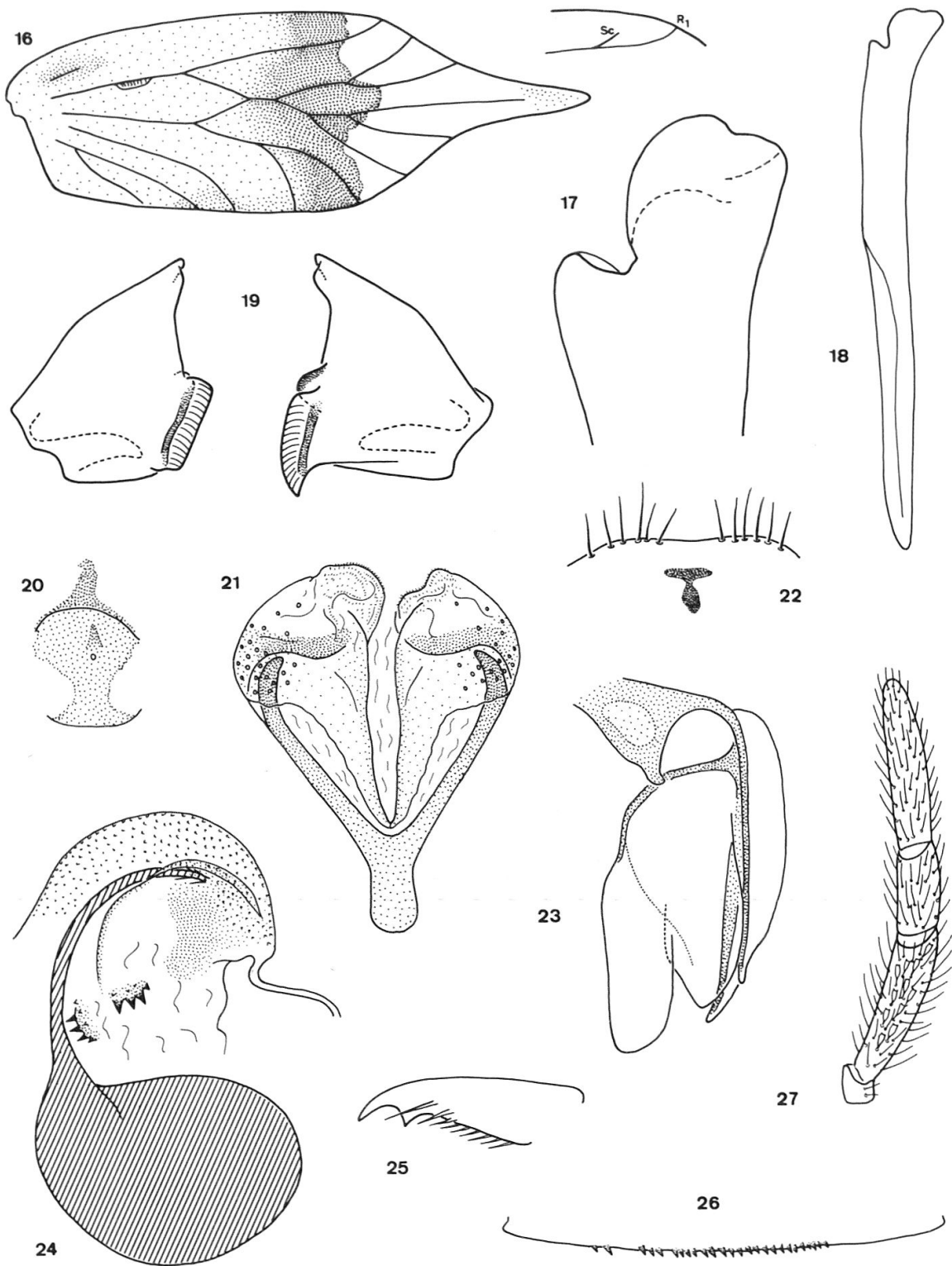


Fig. 16–27. *Nephax fortunatus* (NAVÁS). Fig. 16, 18, 19, 22, 25, 27: ♀ from Cape Verde Islands; Fig. 17, 20, 23, 24, 26 and variant to fig. 16: ♀ from Canary Islands; Fig. 21: ♂ from Canary Islands. 16, forewing without scales (with variant of venation). 17, lacinial tip. 18, lacinia. 19, mandibles. 20, spermapore. 21, phallosome. 22, posterior margin of subgenital plate. 23, ovipositor valvulae. 24, basal part of spermatheca with spermatophore (hatched). 25, pretarsal claw. 26, anterior carina of first femur. 27, maxillary palpus. – Scale bars as for corresponding structures in Fig. 1–15.

Female terminalia: Epiproct and paraprocts simple. Subgenital plate with T-shaped sclerite (Fig. 22). Ovipositor with pointed ventral and dorsal valvulae and large, bilobed external valvula (Fig. 23). Spermatheca essentially as in *N. sofadanus*, canal of spermatophore bent but not S-shaped (Fig. 24). Spermapore slightly sclerotized (Fig. 20).

Male terminalia: Epiproct, paraprocts and hypandrium simple. Phallosome internally weakly sclerified on either side of midline (Fig. 21).

*Measurements.* 1 ♀ from Canary Islands: B = 2.5 mm; FW = 2.50 mm; F = 804 µm; T = 1354 µm; t<sub>1</sub> = 705 µm; t<sub>2</sub> = 110 µm; t<sub>3</sub> = 143 µm. – 1 ♀ from Cape Verde Islands: B = 2.4 mm; FW = 2.26 mm; F = 663 µm; T = 1184 µm; t<sub>1</sub> = 649 µm; t<sub>2</sub> = 105 µm; t<sub>3</sub> = 127 µm.

*Material examined.* CANARY ISLANDS: Tenerife: Candelaria, under stone, 23.IV.1972, A. Fjellberg, 1 ♂, 1 ♀, 1 nymph (identified as 2 ♂♂, 1 nymph by M. Meinander; cf. MEINANDER, 1973) (ZMUB). CAPE VERDE ISLANDS: Santiago: São Jorge dos Orgãos, A. van Harten, 1 ♀ (VI.–VII.1982), 1 nymph (XII.1983–II.1984) (MHNG).

*Discussion.* *N. fortunatus* was known so far only from Tenerife (MEINANDER, 1973), its presence on Cape Verde Islands is reported here for the first time. The species is relatively close to *N. angolensis* from Angola (BADONNEL, 1955); the two species are characterized by the maxillary palpus with simple pilosity, lacking the conical sensillum on the inner side of the second article. The four known species of *Nephax* differ as follows (data for *N. capensis* and *N. angolensis* are taken from PEARMAN, 1935, and BADONNEL, 1955 respectively):

- 1 Forewings very short, only about half their length projecting beyond thorax. Body length about 4 mm. . . . . *N. capensis* PEARMAN
- Forewings reaching or slightly surpassing the abdominal apex. Body length 1.8–2.8 mm. . . . . 2
- 2 Second article of maxillary palpus with sensillum and some long stout setae clearly differing from ordinary pilosity (Fig. 9). Mandibles stout, with shortened apical region (Fig. 7). . . . . *N. sofadanus* PEARMAN
- Second article of maxillary palpus without sensillum and with simple pilosity (Fig. 27). Mandibles relatively slender, not shortened apically (Fig. 19). . . . . 3
- 3 Radial stem with short inflated area (Fig. 16). Membrane of forewing usually with a continuous brown fascia about one third from apex (Fig. 16), sometimes reduced to marginal spots. In forewing *CuP* and *An<sub>1</sub>* entering hind-margin separately. Sclerite of subgenital plate T-shaped (Fig. 22). Phallosome internally weakly sclerified on either side of midline (Fig. 21). *N. fortunatus* (NAVÁS)
- Radial stem simple. Membrane of forewing entirely hyaline. In forewing *CuP* and *An<sub>1</sub>* meeting hind-margin at same point. Sclerite of subgenital plate V-shaped. Phallosome without internal sclerifications . . . *N. angolensis* BADONNEL

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## ZUSAMMENFASSUNG

Die vor mehr als 50 Jahren aus Israel beschriebene Art *Nephax sofadanus* PEARMAN (Typus-Art von *Nephax*) wurde auf den griechischen Ägäis-Inseln Iraklia und Paros (Zykladen) wiederentdeckt. Diese infolge ihrer dicht beschuppten Flügel silbergrau glänzende Psocoptere kann im Frühling unter Steinen in Küstennähe sehr zahlreich auftreten. Die zweite westpaläarktische Art der Gattung, *N. fortunatus* (NAVÁS), war bisher lediglich von der Kanarischen Insel Teneriffa bekannt; sie konnte nun auch auf der Kapverdischen Insel Santiago nachgewiesen werden. Das Männchen beider Arten wird wiederbeschrieben, das Weibchen zum erstenmal beschrieben. Die Familie der Amphientomidae ist vorwiegend tropisch verbreitet; auch die Gattung *Nephax* enthält neben den beiden erwähnten Arten noch zwei afrikanische Vertreter. Ein Bestimmungsschlüssel zur Unterscheidung der vier Arten wird hier vorgelegt.

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