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The western palaearctic species of *Nephrotoma* Meigen, 1803, (Diptera, Tipulidae) Part 1

PJOTR OOSTERBROEK

ABSTRACT

Part 1 of this study deals with the western palaearctic species of the *cornicina* group (Savchenko, 1973b). For each taxon the references, type-material, material examined, description, biology and distribution are presented and discussed. Six taxa are new to science (*lempkei, appendiculata pertenua, theowaldi, fontana, exastigma* and *sardegniensis*), one is redefined (*astigma*) and one is given a new status (*surcoufi*). The females of *beckeri, saccai, forcipata* and *schaeuffelei* are described for the first time. Thirty-seven names are known in the literature for twenty-six taxa discussed.

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General Introduction

The main purpose of this study is to provide a systematic revision of the species of *Nephrotoma*, occurring in the western palaearctic. The last revision of these species was published by Mannheims (1951) in Lindner's "Die Fliegen der palaearktischen Region". In this most useful study Mannheims treated 38 species, arranged in two groups: species with the cerci of the female pointed and species with the cerci ending bluntly. These two groups were divided into five and six subgroups respectively. Subsequently Savchenko (1973b), revised the *Nephrotoma* species of the entire palaearctic, dealing with 105 species. Savchenko added seven new, non-western palaearctic groups to the groups established previously by Mannheims and did not classify 22 species, including certain western palaearctic species.

The present revision was started because it became evident that a further study of the morphology of the male and female copulatory organs might render arguments, which would necessitate a revaluation of Mannheims' groups and subgroups as these are illogical from a phylogenetic point of view. This was most obvious for the subgroups, which are among others based on the colour patterns of the body. Although Savchenko's 1973 revision is fairly recent (the manuscript was finished in 1965) and added a lot to our knowledge of the palaearctic species, it did not furnish a better classification of the strictly western palaearctic species. Most of these species were known to Savchenko from the descriptions or from a few specimens only. It must be noted here that the Russian text of Savchenko's paper was not accessible to me, with the exception of the taxonomically most important parts and the distributional data, which were translated into the Dutch language.

Moreover the following considerations induced me to undertake this revision: the increase in the number of species (from 38 in Mannheims 1951 paper to about 60 nowadays), the necessity to describe the newly recognized

species and subspecies, and to supplement the inadequate descriptions of several species.

Part 1 of this study deals with the *cornicina* group (sensu Savchenko, 1973b). The other species groups will be discussed in subsequent papers. The treatment of the groups contains little information on the relationship of the species. That subject will be discussed in a special paper, together with keys.

Criteria for the Lower Taxa

Literature data hardly provide any information concerning the possibility or actual occurrence of interbreeding in *Nephrotoma*. For that reason the delimitation of species within this genus must rely on morphological characters and on the inference that the constant differences found between the various forms are due to their reproductive isolation. Subspecific ranking was undertaken under the condition of allopatry with the nearest relative, combined with a notably lesser discontinuity between these two forms, than was normally found between two closely related, sympatric species. In those cases where differences between forms are presumed to have been caused by clinal variation, generally too little material is available to arrive at proper conclusions.

Discussion of Characters

The hypopygial organs of Tipulidae males usually provide us with very reliable characters to recognize and define taxa. In recent years several new *Nephrotoma* species have been recognized because of the specificity of these structures. Other diagnostic features are mainly restricted to the colour pattern. In a few cases, for example in the species *crocata* Linnaeus, 1758, and its relatives, the colour pattern is the main attribute on which the species can be distinguished; their copulatory organs are identical. In this study special attention is given to the adminiculum of the male and the copulatory and ovipository organs of the female, which were hitherto neglected in this group of animals. The structures of these organs furnish characters for separating species and, moreover, enable a better insight in the infra-generic relationships.

Geographic Area Considered

In this study the western palaearctic is given the following extent: it includes Greenland, the Canary Islands, the Azores, Madeira, the entire Sahara — southern border at about 15° N.L. — and Saudi Arabia north of 20° N.L. The Indo-Arabian borderline is drawn different from the usual one. In general the high-mountain regions of Afghanistan, the lowlands on both sides of the Indus and the Indian desert are included (De Lattin, 1967; Franz & Beier, 1970; Oosterbroek & Schuckard, 1976). In my point of view the

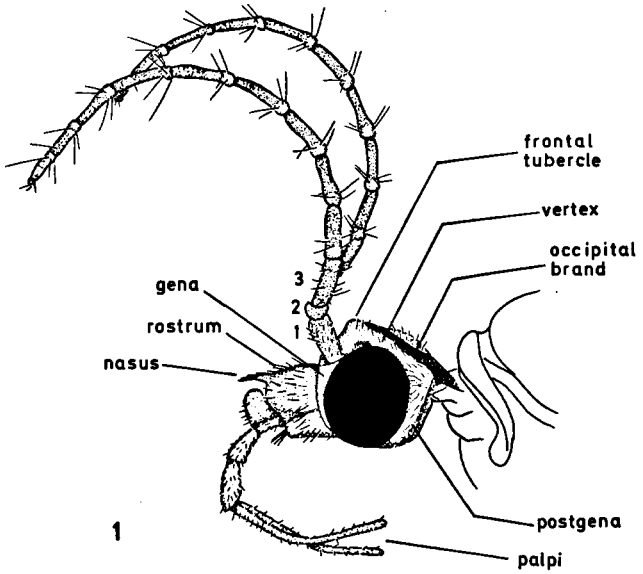
high-mountain region west of Kabul is part of the Central-Asian mountain area, with the Pamir and Tien Shan belonging to the eastern palaearctic subregion. The lowlands of the Indus should not be separated from the coastal plains surrounding India. In consequence the eastern borderline accepted here runs from a point just west of Karachi at the Indian Ocean north-westwards along the mountain areas of Pakistan and Afghanistan. East of Herat in Afghanistan the borderline turns in the direction of the Caspian Sea, north of Kopet Dag to Bandar-e Shāh. North of the Caspian sea the Ural river and Ural mountains form the eastern limit.

Material

Most of the material examined is incorporated in the Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam; the Zoologisches Forschungsinstitut und Museum Alexander Koenig (collection Mannheims), Bonn; the British Museum (Natural History), London; the Muséum National d'Histoire naturelle (collection Meigen and Pierre), Paris and the Instituto Español de Entomologia, Madrid. Moreover most of the type-material of the *Nephrotoma* species treated here, has been examined. The full data of the type-specimens labels are provided with the descriptions of the species. The data of all specimens examined are dealt with in the "Verslagen en Technische Gegevens", an internal paper of the Instituut voor Taxonomische Zoölogie, Amsterdam, available on request. The distributional areas, based on these data and on literature, are exemplified by maps. The period of flight of several species is given in diagrams, compiled from the material examined by this author and, in addition, from the material listed by Savchenko in his 1973 paper. A number of specimens without precise collecting dates were difficult to transcribe into the diagrams. These specimens were neglected, or considered one when the given collecting dates covered a brief period of time, e.g. 27.VI-4.VII. The number of specimens collected at a certain date, is omitted.

Figures and Terminology

The head, thorax and wing-venation are exemplified in figures 1, 2 and 3; the male and female copulatory organs in figures 4 and 5. Special attention has been paid to the illustrations of the genital structures because of their systematic importance. The terms used are after Frommer, 1963, Crampton, 1966 and Colless & McAlpine, 1970. Newly introduced is the term "egg-slide", used for the membrane situated antero-ventrally between the hypovalvae. The egg-slide and the hypovalvae form a small cup where the eggs pass by just before oviposition. Not mentioned in the figures is the term compressor apodeme. This is the, usually bilobate, dorsal lobe of the aedeagus. All drawings are original, unless stated otherwise, and made with the aid of a drawing-tube on a stereoscopic microscope. Prior to examina-



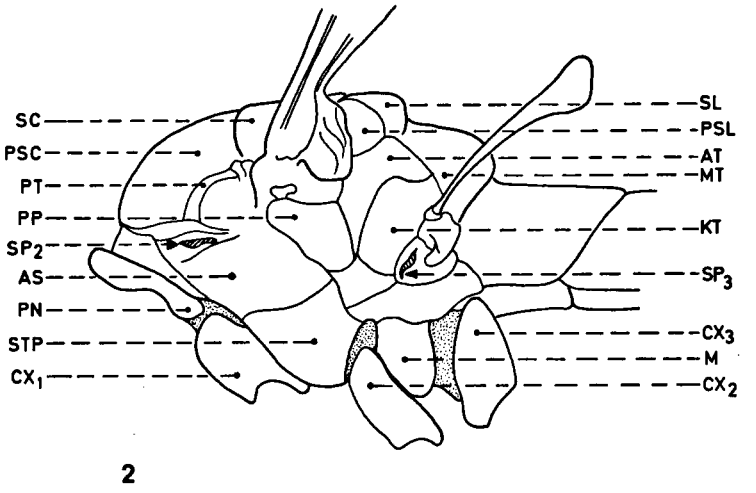
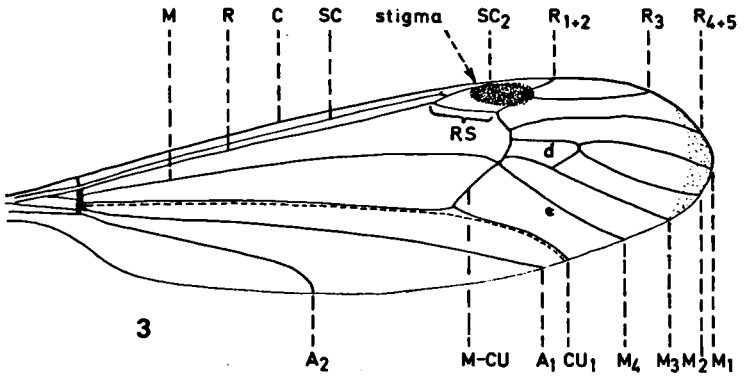


Fig. 1. Head of *N. aculeata*, lateral view; 1, scape; 2, pedicel; 3, first flagellar segment (postpedicel).

Fig. 2. Generalized drawing of the thorax, lateral view; as, anepisternite; at, anatergite; cx, coxa; kt, katatergite; m, meron; mt, mediotergite; pn, pronotum; pp, pteropleurite; psc, prescutum; psl, parascutellum; pt, paratergite; sc, scutum; sl, scutellum; sp, spiracle; stp, sternopleurite.



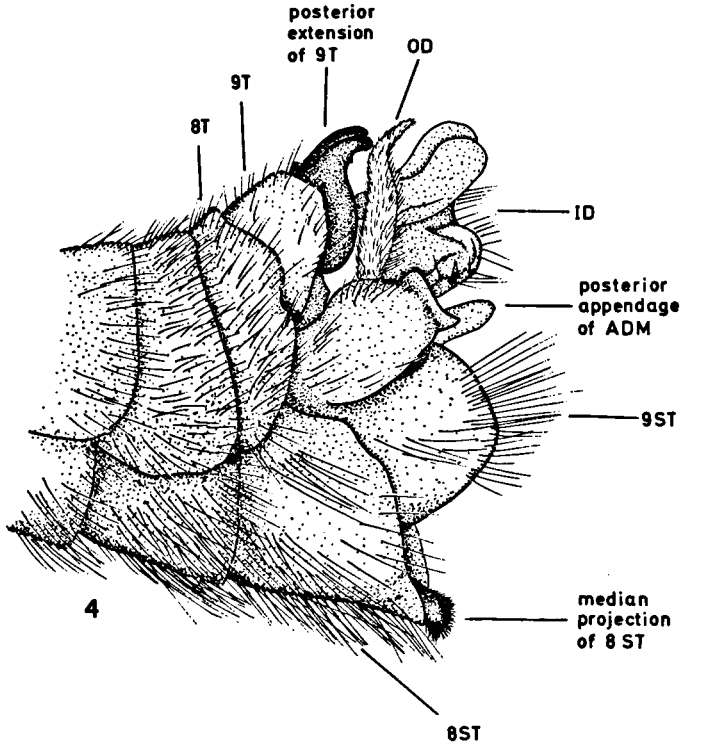


Fig. 3. Wing of *N. aculeata*; A, anal vein; C, costa; CU, cubitus; d, discoidal cell; M, medius; R, radius; SC, subcosta.

Fig. 4. Hypopygium of *N. quadrifaria*, lateral view.

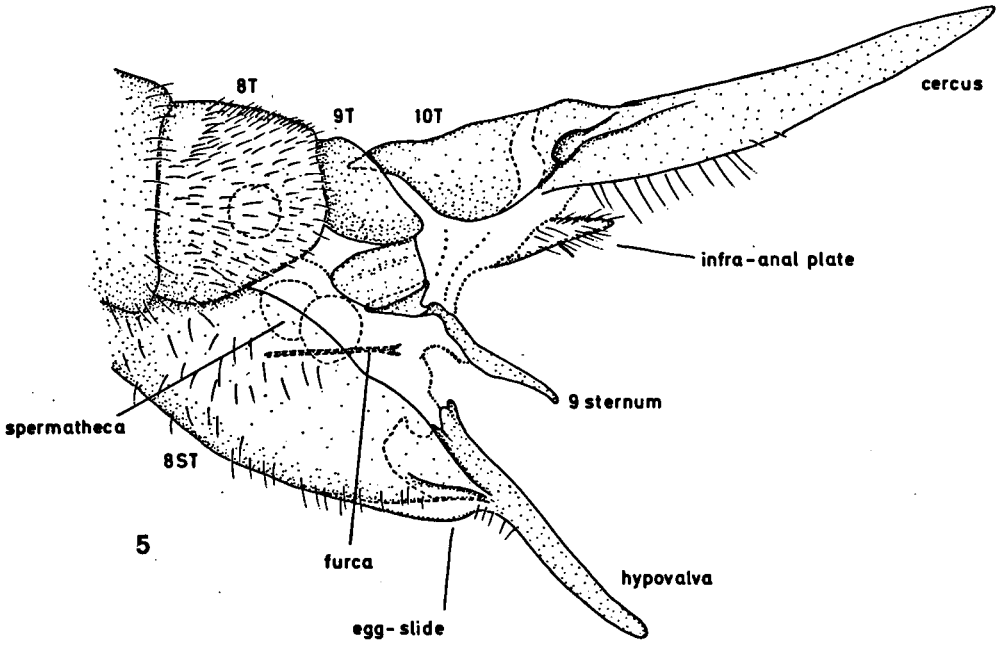


Fig. 5. Ovipositor of *N. moravica*, lateral view.

tion, the male and female genitalia were placed in nearly boiling 10% potassium hydroxide for approximately five minutes. After examination the genitalia were stored in micro-vials, filled with glycerine and pinned under the insects.

Abbreviations

In the text and drawings the following abbreviations are used:

v! M,	Type-material examined by Mannheims, followed by the year in which this examination took place.
v! O,	Type-material examined by me, followed by the year in which this examination took place.
OD	Outer dististyle.
ID	Inner dististyle.
ADM	Adminiculum.
T	Tergite.
S	Sternite.
p.p.	in part.
/	Separates two cited labels on one pin.
(as . . .)	Used in the references of a species to indicate that the referred author treated this species under the name, placed in parentheses.
BMNH	British Museum (Natural History), London.
BRIO	Biosystematic Research Institute, Ottawa.
HNHMB	Hungarian Natural History Museum, Budapest.

MAK Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn.
MM Instituto Español de Entomologia, Madrid.
MMB Moravské Museum, Brno.
MNB Museum für Naturkunde an der Humboldt-Universität, Berlin.
MNHNP Muséum National d'Histoire naturelle, Paris.
NMW Naturhistorisches Museum, Vienna.
NRS Naturhistoriska Riksmuseet, Stockholm.
RML Rijksmuseum van Natuurlijke Historie, Leiden.
SMNS Staatliches Museum für Naturkunde, Stuttgart.
UZMK Universitets Zoologiske Museum, Copenhagen.
ZIS Zoologiska Institutionen, Avdelningen för Systematik, Lund.
ZMA Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam.
ZMH Zoological Museum, Helsinki.

Nephrotoma Meigen, 1803

Synonymy:

Pales Meigen, 1800: 14. Type-species: *Tipula dorsalis* Fabricius, 1781, by designation of Hendel, 1908: 46. Suppressed in 1963, Opinion 678: 339.
Nephrotoma Meigen, 1803: 262. Type-species: *Tipula dorsalis* Fabricius, 1781, by monotypy.
Pachyrhina Macquart, 1834: 88. Type-species: *Tipula crocata* Linnaeus, 1758, by designation of Westwood, 1840: 128.

History of the genus

Meigen (1800: 14) defined the genus *Pales* as follows: „Antennes à dix-neuf articulations: la première cylindrique; la seconde cyathiforme; la troisième cylindrique; les suivants réniformes; vers l'extrémité presque cylindrique, hérisée de poils. 1 espèce".

In 1803 Meigen replaced all his Latin 1800 names by Greek names, changing *Pales* in *Nephrotoma*. The *Nephrotoma* diagnosis (Meigen, 1803: 262) is a free translation in German of the *Pales* definition. *N. dorsalis*, the type-species of *Nephrotoma* by monotypy, is without doubt also "1 espèce", mentioned in the *Pales* definition, as it is the only European species of *Nephrotoma* with nineteen antennal segments in the male. As has happened to the other Meigen-1800 names, the name *Pales* fell into obscurity and the name *Nephrotoma* was used for *dorsalis*.

The other species, attributed nowadays to the genus *Nephrotoma*, were still classified by Meigen with the large genus *Tipula* Linnaeus, 1758. In 1818 Meigen placed them in a separate section of *Tipula*, basing himself on wing-venation (Meigen, 1818: 170, 192; Pl. 6: fig. 8 and 9). This section was elevated to genus rank by Macquart (1834: 88) and named (the correct spelling) *Pachyrhina*. The author, Maquart, starts at page 88 of his paper with naming this genus *Pachyrina*. At the following pages, however, he uses the spelling *Pachyrhina*, which is the grammatically correct one (cf Riedel, 1910; Czižek, 1911; Bull. zool. Nomencl. 31:83).

Olivier (1811: 195—6) already used the name *Nephrotoma* for four species (incl. *dorsalis*) listed by him. Loew (1863: 297) and Osten Sacken (1886: 184) adduced arguments to synonymize *Nephrotoma* and *Pachyrhina*, but this

synonymy was generally accepted only after Alexander's publication on this subject (1915: 455—6), in which he pointed out that nineteen antennal segments in the male, the character by which *Nephrotoma* was distinguished from *Pachyrhina,* was also found in *Pachyrhina eucera* Loew, 1863, and that the species *Pachyrhina polymera* Loew, 1863, possesses sixteen antennal segments in the male, so, as Alexander (1915: 456) says: "there is a very considerable range in number of antennal segments, but the species included are all so very similar in the details of venation, in the male hypopygia and in their general habitus and body-colouration that they [the genera *Nephrotoma* and *Pachyrhina*] should not be separated".

After the rediscovery of the Meigen-1800 names by Hendel in 1908, the decision, whether or not to apply the Law of Priority, led to a longstanding controversy between dipterologists (see for further reading: Sabrosky, 1952). Among tipulid workers, the name *Pales* was used by several European authors, whereas Alexander, Nielsen, Tjeder and Edwards applied the name *Nephrotoma.* After the suppression of all Meigen-1800 names by the International Commission on Zoological Nomenclature in 1963, *Nephrotoma* is the valid name.

Until recently *Nephrotoma* was a large genus, not divided into subgenera. In 1971 Alexander treated the Oriental genus *Scamboneura* Osten Sacken, 1882, as a subgenus of *Nephrotoma.* Alexander based the relationships of these two groups upon wing-venation and male hypopygial structures, and considered them closely related to *Dolichopeza* Curtis, 1825. Although I only briefly examined this matter, I prefer to consider the three above-mentioned groups as genera. On account of wing-venation *Dolichopeza* is closer to *Nephrotoma* than *Scamboneura.* In hypopygial structures *Dolichopeza* and *Scamboneura* are as close to *Nephrotoma* as they are to one another.

The total number of species and subspecies of *Nephrotoma,* described up to now, is 433 (Oosterbroek & Schuckard, 1976). The numbers occurring in the zoogeographical regions are shown in table 1. In literature only little

Table 1. Number of species and subspecies per region (after Oosterbroek & Schuckard, 1976).

Region	Number of species:	Number of species confined to the region:
Nearctic	54	51
Nearctic & Neotropic	1	—
Neotropic	22	21
Nearctic & Palaearctic	2	—
Palaearctic	124	106
Palaearctic & Oriental	16	—
Oriental	114	95
Oriental & Australian	3	—
Australian	26	23
Ethiopian	94	94
Madagascar	21	21
Hawaiian	0	0

information is available on the biology of the species. In general the species of *Nephrotoma* are confined to the climates which allow the development of deciduous forests (Oosterbroek, Schuckard & Theowald, 1976). Within these areas edges of woods, meadows and riverside-meadows are obviously the most favourable habitats.

Definition

The species of *Nephrotoma* are characterized by wing-venation (fig. 3):

1) The radial sector (Rs) is very short.
2) Cross-vein M-CU meets vein M always in front of or at the anterior corner of the discal cell.
3) Cell M1 is sessile, rarely shortly petiolate.

Description

In general the western palaearctic species of *Nephrotoma* answer to the following description:

Rostrum short, half the length of the head. Frons moderately broad with a gibbous tubercle. The antennae are usually 13-segmented, ranging up to 19 segments in the male of *dorsalis*; in the male about as long as head and thorax together, in the female about twice as long as the head. The flagellar segments, ranging in shape from subcylindrical to reniform, are pubescent and bear long verticils. The terminal segments of the palpi are flagelliform and longer than the four preceding segments together. The legs are long and slender, the wings lanceolate, never mottled. The wing-stigma ranges in colour from hardly perceptable to black. The abdomen is slender, in the male slightly shorter than the wings, in the female usually longer. The ninth tergite of the male is never completely fused with the ninth sternite. The differentiated part of the ninth tergite bears small spines. The outer dististyle is usually fleshy, shaped as a more or less flattened lobe, sometimes partly sclerotized. The inner dististyle and the adminiculum are differentiated. The cerci of the female ovipositor are long, apically pointed or ending bluntly. The hypovalvae are shorter than the cerci. The body colour is yellow, with distinct brown to black markings, sometimes the yellow colouration is almost completely superseded by black.

THE *CORNICINA* GROUP

Introduction

In 1951 Mannheims divided the *Nephrotoma* species he discussed in two groups: cerci of the females pointed and cerci of the females ending bluntly. Savchenko (1973b: 5, 119), named the first group the *cornicina* group, arranging the second in several groups.

Mannheims divided the pointed cerci group in five subgroups:

a) *N. flavescens* (Linnaeus, 1758)
N. submaculosa Edwards, 1928
N. maculata (Meigen, 1804)
N. sullingtonensis Edwards, 1938
N. minuscula (Mannheims, 1951)
N. beckeri (Mannheims, 1951)

b) *N. cornicina* (Linnaeus, 1758)
N. appendiculata (Pierre, 1919)

c) *N. forcipata* (Pierre, 1918)

d) *N. tenuipes* (Riedel, 1910)
N. aculeata (Loew, 1871)

e) *N. guestfalica* (Westhoff, 1880)

He did not include the species *N. quadrifaria* (Meigen, 1804) and *N. saccai* (Mannheims, 1951). *N. quadrifaria* has the female cerci ending bluntly and *saccai,* known to Mannheims in the male sex only, was interpreted as being closely related to the former species. The species *N. astigma* (Pierre, 1925) and *N. surcoufi* (Pierre, 1925) were unknown to Mannheims.

Savchenko's *cornicina* group is, with regard to the western palaearctic species, in content, essentially the same. The group is not divided into subgroups; *saccai* and *quadrifaria* together are given group status, based on Mannheims; *guestfalica, surcoufi* and *astigma* are not classified into groups. The non-western palaearctic species, added to the *cornicina* group by Savchenko are: *N.esakii* Alexander, 1924, Japan and southern Kurils; *N. nigrostylata* Alexander, 1935, China; *N. pullata* (Alexander, 1914), Primorye and Japan; *N. neopratensis* Alexander, 1921, Japan and Sakhalin; *N. biformis* Alexander, 1935, Central China; *N. consimilis* (Brunetti, 1911), mountain regions of Central Asia, Mongolia and northern India; *N. irrevocata* Alexander, 1935, Kashmir; *N. stackelbergi* (Savchenko, 1957), southern USSR from the Ural mountains in the west to the Aldan river in the east, Mongolia; *N. saghaliensis* Alexander, 1924, Amur region, Sakhalin, Japan, the Kurils and southern Kamchatka; *N. nigrohalterata* Edwards, 1928, Tibet; *N. subopaca* Alexander, 1952, Kashmir; *N. ligulata* Alexander, 1925, southern USSR from the Pamir mountains in the west to the Baikal Sea in the east, Mongolia; *N. meraca* Alexander, 1935, Kashmir; and *N. atrostyla* Alexander, 1935, Amur region and Primorye. Savchenko also included the holarctic *N. lundbecki* (Nielsen, 1907), a species in which the characters of both sexes are incongruous with those of the *cornicina* group.

Definition

The eighth sternite of the male has a straight posterior margin and bears a median projection (absent in *guestfalica*). The cerci of the females are slightly tapering towards the pointed tip (in *forcipata* not pointed, in *schaeuffelei* and *quadrifaria* not tapering and ending bluntly).

Description

Ground colour: Head, thorax and abdomen yellow, with brown to black markings; markings not so extensive that the general yellowish appearance is lost (except in the black *N. cornicina nigrina* (Savchenko) from the Caucasus).

Head: Antennae 13-segmented. Flagellar segments subcilindrical, somewhat enlarged basally, not reniform. Occipital marking always distinct, varying in shape and size.

Thorax: Prescutum with three, brown to black, longitudinal stripes; lateral ones usually bent downwards anteriorly. Scutum with two, broad, brown to black stripes. Lateral parts of mediotergite yellow; median region with a brown to black, longitudinal stripe; posterior part in general brown to black, rarely yellow. Pleural markings ranging from faint to black, anatergite from yellow to black ("Pleuralschwiele an einer Seite oder an drei Seiten dunkel eingefasst", Mannheims, 1951a). Anterior half of katatergite always yellow, posterior half always darkened.

Abdomen: usually with dark dorsal and ventral stripes. Lateral margins of tergites with isolated spots or a dark stripe.

The western palaearctic species of the *cornicina* group are small, compared with the elongate body of the members of the *dorsalis* group and the strong, rather compactly built species of the *crocata* group. Their period of flight is limited to spring and summer. The habitats in which they occur most frequently are grasslands, gardens and scrub vegetations, usually near water or under moist conditions; a few species are recorded from dry, sandy places, a few others are found in deciduous forests.

Key to the sections

The species of the *cornicina* group discussed here, are treated in a sequence, based on the following characters:

1) Small triangle just behind ventral contact of fore coxae black (variable in *quadrifaria*, usually yellow) 2
   Small triangle yellow 4
2) Anatergite darkened 3
   Anatergite yellow . . . . . Section 1:
   N. flavescens (Linnaeus)
   Europe.
   N. astigma (Pierre)
   N. Africa
   N. submaculosa Edwards
   Europe.
3) Scape yellow . . . . . Section 2:
   N. sullingtonensis Edwards
   S. W. Europe
   N. beckeri (Mannheims)
   Cyprus, Turkey.
   N. saccai (Mannheims)
   S. Italy.
   N. lempkei spec. nov.
   Balearic Isl.
   Scape darkened . . . . . Section 3:

N. appendiculata (Pierre)
Europe.
N. minuscula (Mannheims)
E. Mediterranean.
N. theowaldi spec. nov.
W. Turkey.

4) Occipital marking narrower than shortest distance of eyes 5
Occipital marking broader than shortest distance of eyes 7
5) Occipital marking narrowly prolonged up to frontal tubercle . . . 6
Occipital marking not prolonged up to frontal tubercle . . . . . Section 6:
N. quadrifaria (Meigen)
Europe, Asia Minor.
N. fontana spec. nov.
N. Africa.

6) Male: Projection of sternite 8 a pointed spike. Female: Abdominal dorsal stripe broad and triangular towards tergite hind margins . . . . . Section 4:
N. aculeata (Loew)
Palaearctic.
N. tenuipes (Riedel)
Palaearctic.

Male: Projection of sternite 8 not a pointed spike. Female: Abdominal dorsal stripe narrow or broad, not triangular towards tergite hind margins . . . . . Section 5:
N. guestfalica (Westhoff)
Europe, N. Africa.
N. forcipata (Pierre)
S.W. Europe.
N. exastigma spec. nov.
N. Africa.

7) Male: Posterior margin of od in part sclerotized . . . . . Section 7:
N. cornicina (Linnaeus)
Palaearctic.
N. moravica (Martinovský)
S.E. Europe.
N. sardiniensis spec. nov.
Sardinia.

Male: Posterior margin of od not sclerotized . . . . . Section 8:
N. schaeuffelei (Mannheims)
Azerbaydzhan SSR. Iran.

N. nasuta Oosterbroek
E. Turkey.
N. spatha Oosterbroek
N.W. Spain.

SECTION 1

The species of this section, viz. *flavescens, astigma* and *submaculosa* are very similar to each other. Of *astigma* a neotype and paraneotypes are designated.

Nephrotoma flavescens (Linnaeus, 1758)
Figs 6—15, diagram 1, map 1

Synonymy:

Tipula flavescens Linnaeus, 1758, Systema Naturae, Ed. 10: 586; 1761: 434; Scopoli, 1763: 320; Linnaeus, 1767: 973; Fabricius, 1775: 751; 1781: 405; Schrank, 1781: 426; Fabricius, 1787: 324; 1794: 242; Schrank, 1803: 68, biology; Fabricius, 1805: 31; Zetterstedt, 1838: 845 (as *maculosa*); Haliday, 1851: 135.

Pachyrhina flavescens: Staeger, 1840: 25 (as *cornicina*); van der Wulp & Snellen van Vollenhoven, 1853: 144 (as *cornicina*); Walker, 1856: 332—3; Schiner, 1864: 506—7; van der Wulp, 1866: 17 (as *cornicina*); 1877: 381—2); Westhoff, 1880: 49, biology; 1882: 48, figures, biology; Verrall, 1886: 119; Riedel, 1910: 433; Czižek, 1911: 81.

Pales flavescens: Audcent, 1932: 8, 10; Mannheims, 1951a: 33—8, figures; 1951c: 228; Fischer, 1952: 120; Hemmingsen, 1952: 378, 409, 417, biology; Mannheims, 1953: 2; Brauns, 1954: 72, biology; Mannheims, 1954b: 39—40; Theowald, 1956: 157; 1957a: 224, figures, biology; 1957b: 10, 22, biology; Mannheims & Theowald, 1959: 17; Simova, 1960: 58; Erhan & Theowald, 1961: 249; Erhan, 1962: 92—3, figures; Simova, 1962: 101; Hemmingsen, 1962: 140; Höchstetter, 1962: 78, biology; Mannheims, 1963: 38; Mannheims & Pechlaner, 1963: 6, 13, biology; Röseler, 1963: 446; Mannheims, 1964c: 107; 1965: 7; Savchenko, 1966c: 470—2, figures; 1966d: 120; 1973b: 147—9, figures, biology; Simova, 1974: 26.

Nephrotoma flavescens: Edwards, 1938: 98—101, figures; 1939, 224; Coe, 1941: 172, biology; 1950: 10; Parmenter, 1950: 108; Tjeder, 1954: 47, biology; 1955b: 246—7; Chiswell, 1956: 44—5, biology; Coe, 1958: 181, biology; Tjeder, 1965: 46; Mannheims, 1967a: 200, biology; 1967b: 78; 1967c: 151; Theowald, 1967: 22, 63, biology; Tjeder, 1967: 21; Freeman, 1968: 342, 346; Savchenko & Mannheims, 1969: 8; Theowald, 1971: 220, 228; Mannheims & Theowald, 1971: 333—4; Stubbs, 1973: 103—6, biology; 1974: 129, biology; Klopp, 1974: 164—5, figures, biology; Oosterbroek, 1975: 120.

Tipula lineata Scopoli, 1763, Entomologia Carniolica: 320—1; Schrank, 1781: 426—7; Gmelin, 1790: 2815; Meigen, 1804: 78—9; Haliday, 1851: 135.

Pachyrhina lineata: Schiner, 1864: 507; van der Wulp, 1877: 382; Verrall, 1886: 119; Bergroth, 1889: 118; Strobl, 1900a: 656; 1900b: 207; 1906: 406, biology; Becker, 1907: 240; Lundström, 1907: 25; de Meijere, 1909: 46; Strobl, 1909: 134; Riedel, 1910: 433—4; Czižek, 1911: 81—4, figures; Lundström, 1912: 47; Vimmer, 1913: 18; Hendriksen & Lundbeck, 1917: 605—6; Nielsen, 1918: 10; Riedel, 1918/1919: 5; 1919b: 18; Goetghebuer & Tonnoir, 1921: 123; Stackelberg, 1922: 16; Brolemann, 1923: 501—4, figures; Pierre, 1924a: 29, figures, biology; Weigand, 1924: 46; Zangheri, 1949: 12; Simova, 1959: 126.

Pales lineata: Mannheims, 1951a: 36—7; Stackelberg, 1951: 741; Miller, 1954: 874; Savchenko, 1966a: 470; Zangheri, 1969: 1024; Savchenko, 1973b: 147.

Nephrotoma lineata: Nielsen, 1925: 158, figures; Alexander, 1931: 144, biology; Nielsen, 1933: 245; Hendriksen, 1939: 80; Nielsen, 1941: 96; Mannheims, 1967b: 78.

Tipula histrio Fabricius, 1794, Entomologia Systematica, 4: 237; Meigen, 1804: 71 (as *cornicina*), 77; Fabricius, 1805: 28; Meigen, 1818: 198—9; Macquart, 1826: 76—7; Schummel, 1833: 116—7, biology; Zetterstedt, 1838: 845—6; Walker, 1848: 63; Haliday, 1851: 135; Zimsen, 1964: 450.

Pachyrhina histrio: Macquart, 1834: 90; Staeger, 1840: 26; Zetterstedt, 1855: 4901—2; 1860: 6544; Schiner, 1864: 506—7; van der Wulp, 1866: 17; Palm, 1869: 407; Grzegorzek, 1873: 27; Kowarz, 1873: 455; van der Wulp, 1877: 382; Beling, 1878: 42—3; Wallengren, 1882: 15; Verrall, 1886: 119; Huguenin, 1888: 19—20; Kowarz, 1894: 7; Ord, 1897: 194; Lundbeck, 1898: 263; van der Wulp & de Meijere, 1898: 29; Thalhammer, 1900: 20; Jacobs, 1903: 352; Riedel, 1910: 433; Hendriksen & Lundbeck, 1917: 605.

Pales histrio: Mannheims, 1951a: 36—7; 1951c: 228; Theowald & Mannheims, 1956: 248; Mannheims, 1964c: 107; Savchenko, 1966a: 470; 1973b: 147.

Nephrotoma histrio: Mannheims, 1967b: 78.

Type-material

Nephrotoma flavescens (Linnaeus): In the Linnean collection, Linnean Society, Burlington House, London, one female, labeled: 16. flavescens. (v! O, 1977).

Nephrotoma lineata (Scopoli): The Scopoli collection has been destroyed (Horn & Kahle, 1937: 252).

Nephrotoma histrio (Fabricius): In 1794 Fabricius named two completely different species *Tipula histrio*, viz. a Tipulidae (Ent. Syst., 4: 237) and a Chironomidae (Ent. Syst., 4: 224). Two specimens of the former are in Copenhagen (Zimsen, 1964: 450). Dr. L. Lyneborg kindly informed me about these two syntypes, which he compared with *N. quadrifaria* and *N. flavescens*. One syntype is a female in perfect condition, the second has lost the apex of the abdomen. They are identical and in fact conspecific with *N. flavescens*. The description of Fabricius is more in conformity with *N. quadrifaria*, as already pointed out by Meigen (1804: 77). The Meigen description of *N. histrio* (Fabricius) (1818: 198-9) is without doubt *N. flavescens*, the species also found in the Meigen collection under *histrio* (MNHNP; number 375; v!M, 1951; v!O, 1976). Only in Kiel a name-label exists of the Chironomidae species named *Tipula histrio* by Fabricius in 1794 (Zimsen, 1964: 451). This name is accepted now as a junior synonym of *Stictochironomus sticticus* (Fabricius, 1781).

Material examined (556 ♂♂, 447 ♀♀) originated from the following countries: Norway (Lillehammer, Oslo), Sweden (Norsborg near Stockholm, Simlinge in Skåne, Stenäsa at Öland), Finland (Jacobstad, Pedersöre) Denmark, Ireland (Howth, Kinvarra, Lough-Corrib, Waterford), Great Britain, Netherlands (fig. 15), Belgium, Luxemburg, West Germany, Poland (Breslau, Terebrin near Hrubieszów), Czechoslovakia (Trnova), France, Andorra, Portugal, Spain, Switzerland, Italy, Austria, Romania, Yugoslavia, Bulgaria, USSR (Latviya).

Description

Body length ♂: 11-14 mm, ♀: 12-19 mm; wing length: 10-15 mm.

Head ♂: Scape dark brown, basal half somewhat brighter, pedicel dark brown; flagellar segments black; verticils up to 0.7 - 0.8 x length of flagellar

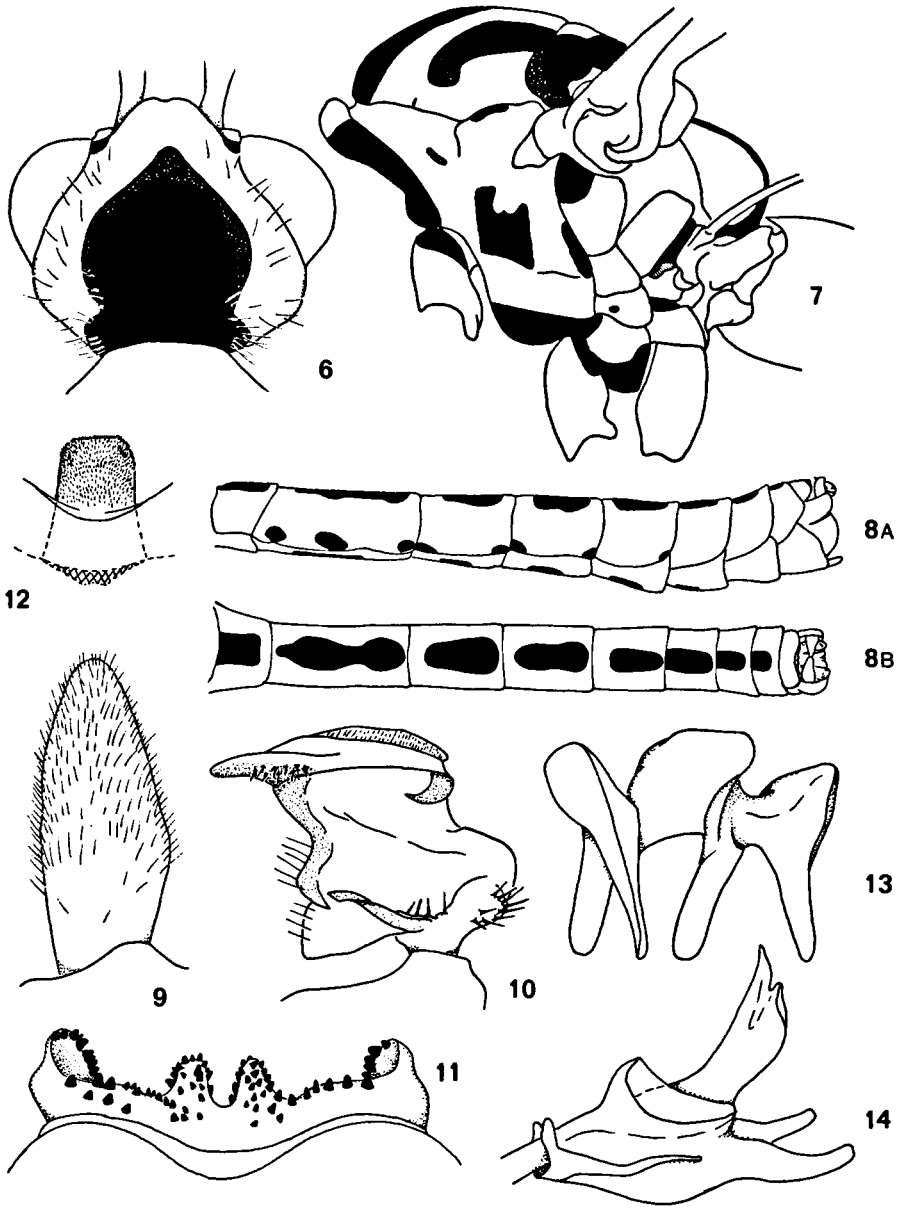
segments; first flagellar segment 1.0 - 1.1 x length of second one. Palpi light brown to dark grey. Nasus and dorsal part of rostrum dark brown to black. Genae and postgenae yellow; vertex orange-yellow. Brown spot below antennal bases not always present. Spot between eye and frontal tubercle always conspicuous, brown to black. Mark on occiput large, dark brown and shining except for the dull, usually strongly convex lateral margins and narrow, anterior prolongation. Vertex and postgenae usually not densely hairy. Marks on inner part of postgenae large (fig. 6).

Thorax ♂: Pronotum dorsally yellow, laterally brown. Prescutal stripes shining with the lateral margins narrowly dull, especially those of the median stripe. The anterior ends of the lateral stripes are bent downwards and usually conspicuously dull. In a few specimens (from Sweden, Denmark, the Netherlands, France, Portugal and Switzerland) the lateral stripes are only slightly bent anteriorly and/or without a pronounced dullness. Scutellum more or less transparent, ranging in colour from pale yellow to light brown, frequently in part darkened but never entirely black. Parascutellae yellow. Pleural markings distinct, dark brown to black (fig. 7). Anatergite yellow, sometimes, especially in specimens from southern Europe, in part tinged with brown. The small triangle just behind the ventral contact of the fore coxae is black. Coxae darkened basally. Femora basally light brown, steadily growing darker towards dark brown apices. Tibiae and tarsi brown to black. Wings light brown toned; wing-stigma faint, with macrotrichiae.

Abdomen ♂: The dorsal, brown to dark brown stripe is built up by elongate, usually isolated spots. In general the spots are widely apart at the anterior margins of the tergites, in particular on tergites 2, 3 and 4. More intensively coloured specimens, usually from south-western Europe, may possess a confluent dorsal stripe. Hind margins of tergites usually lighter coloured. Normally the lateral margins of the tergites bear six rounded spots (fig. 8 A&B), their number however ranges from zero to nine. Specimens from the south-western European mountain regions, including the Spanish and Portuguese Sierras, sometimes possess elongate lateral spots, forming a lateral stripe with small intervals in front of the middle of the tergites.

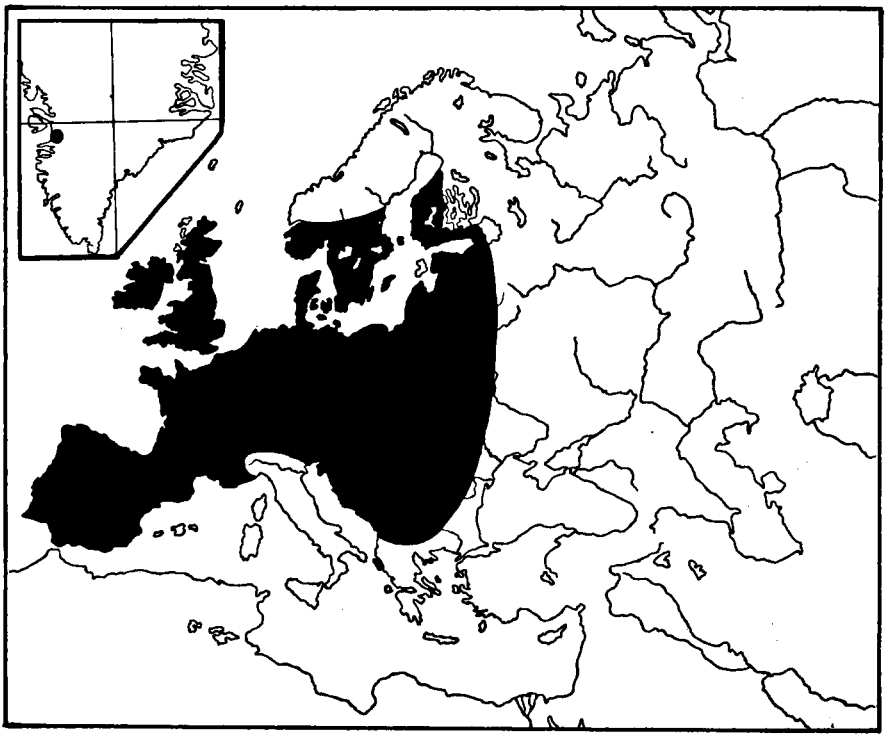
Hypopygium: Yellow. Od simple, not sclerotized (fig. 9). Id small, with a narrow, light brown sclerotized dorsal crest (fig. 10). The posterior extension of the ninth tergite has a straight outer margin and the lateral projections are not or only slightly protruding beyond the median ones (fig. 11). Median projection of sternite 8 dorsoventrally compressed, with short pubescence and two or three times as long as wide (fig. 12). The projection is not always visible in his total extent. The red-brown sclerotizations along the mid-ventral, membranous part of the ninth sternite are small. The adminiculum bears a lateral and a ventral appendage on each side, the lateral ones are elongate posteriorly (fig. 13.). Aedeagus small, compressor apodeme short (fig. 14).

Female: Similar to the male. Longest verticils only slightly shorter than flagellar segments. Abdominal colouration as found in the male, sometimes



Figs 6—14. *N. flavescens*. 6, head, dorsal view; 7, thorax, lateral view; 8, abdomen: A, lateral view, B. dorsal view; 9, od, outside; 10, id, outside; 11, posterior extension of tergite 9, dorsal view; 12, median projection of sternite 8, ventral view; 13; adminiculum, lateroposterior view; 14, aedeagus, lateral view.

less distinct. Cerci pointed. Hypovalvae, sternum 9 and furca as in *submaculosa* (fig. 28 & 29). Distal part of abdomen not darkened, ranging in colour from yellow to light reddish brown.



Map 1. Distribution of *N. flavescens*.

Distribution: map 1

Bergroth (1889: 118) and Becker (1907: 240) reported *flavescens* from Algeria. These records are doubtful because the species was never found there again and presumably are referable to *astigma*, a species very similar to *flavescens*. The only specimen known from Greenland (Lundbeck, 1898: 263), is a male which identity was checked by Theowald (Mannheims & Theowald, 1971, 333). Mannheims (1959: 17) mentioned this species from Rome (Italy, Saccà). Apparently this record applies to *submaculosa*, known to occur in Italy, including Sicily, whereas Italian *flavescens* specimens are known only from the southern slopes of the Alps.

Biology

N. flavescens is most frequently found in meadows or other types of grassland, gardens, scrubs and less frequently in deciduous forests. Ac-

cording to Tjeder (1954: 47): „never in pine forests". Stubbs (1973: 103-6) defined the habitat of this species as follows: "on dry chalk grasslands and other chalk grasslands and similar situations on other soils. It can occur on coastal dunes but is usually replaced by the following species [*submaculosa*]. The same applies for the Netherlands as is shown in fig. 15. In the southern part of Limburg both, *flavescens* and *submaculosa* occur. In the other parts of the country *flavescens* is found in the more humid districts 3 and 7, whereas *submaculosa* is confined to the coastal dunes and the drier districts.

The altitudes reached by *flavescens* are: France: Pyrénées-Orientales, 2000 m; Hautes Pyrénées, 1800 m; Spain: Gerona, 2100 m; Léon, 1300 m; Switzerland: Wallis, 1500 m; Tessin, 1900 m; Italy: Aosta, 2100-2400 m; Bolzano, 1800 m; Trentino, 1900 m; Austria: Tirol: 2000 m; Yugoslavia: Macedonia, 1800—2000 m.

The period of flight is shown in diagram 1.

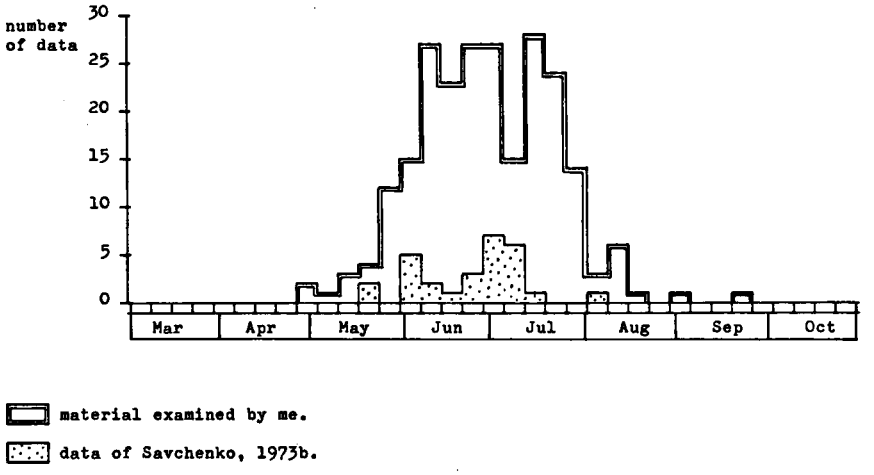


Diagram 1. Period of flight of *N. flavescens*.

Discussion

N. flavescens is very similar to *submaculosa* and *astigma*. For differentiating characters I am referring to the descriptions of these species. The most reliable character to separate *flavescens* from these two species is the narrow, dull bordering of the median prescutal stripe in *flavescens*.

Tipula flavomaculata De Geer, 1776, which is interpreted by several authors as a synonym of *flavescens*, turned out, after examination of the type, to be synonymous with *cornicina*, as was already indicated by De Geer himself (1776: 347).

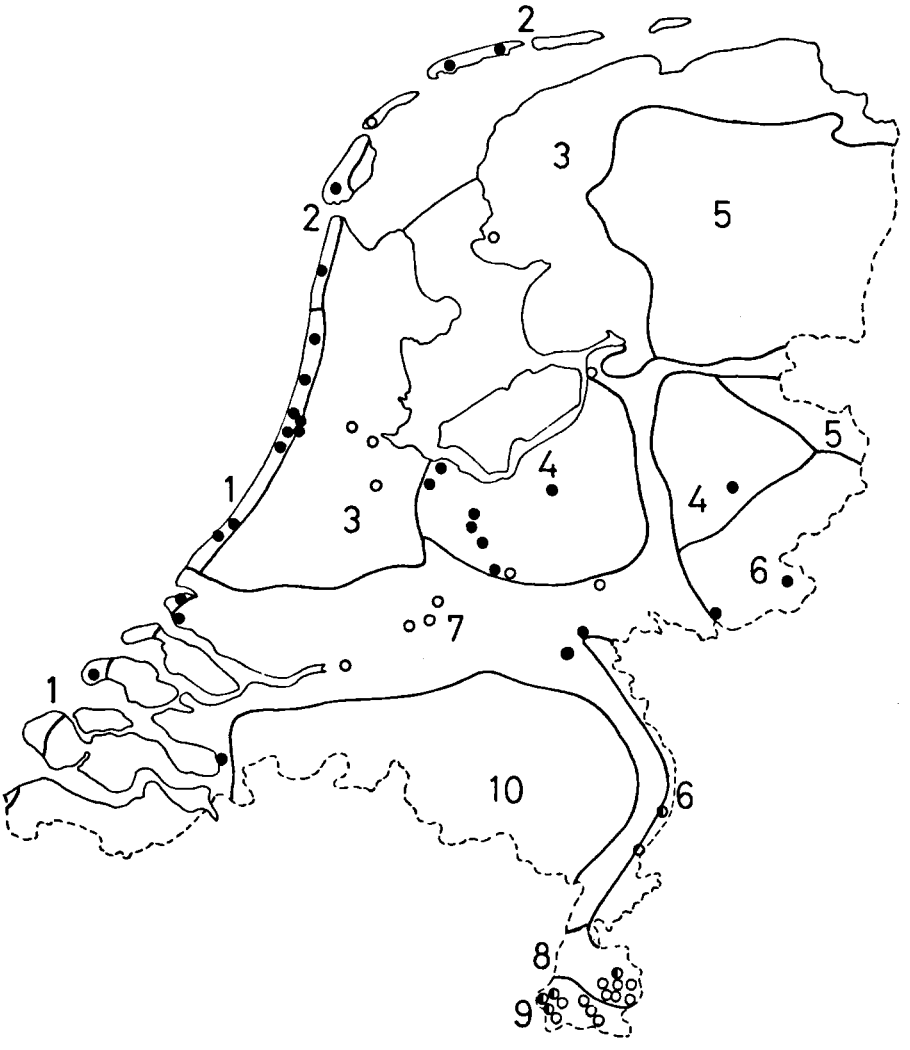


Fig. 15. Distribution of *N. flavescens* and *N. submaculosa* in the Netherlands.
○ *N. flavescens.*
● *N. submaculosa.*
◐ localities where both species are collected.
Floristic and vegetational sub-districts of the Netherlands, according to Van Soest (from Heukels & van Ooststroom: Flora van Nederland, 1956, Noordhoff, Groningen), simplified: 1, dune-district; 2, wadden-district; 3, haff-district; 4, gueldern-district; 5, drenthe-district; 6, subcentraleuropean district; 7, river-district; 8, flemish district; 9, cretaceous district; 10, kempen-district.

Nephrotoma astigma (Pierre, 1925)
Figs 16-20, map 2

Synonymy:

Pachyrhina astigma Pierre, 1925, Encyclopédie Entomologique, Série B2, 4: 10—1, figures.
Pales astigma: Mannheims, 1951a: 58; Hemmingsen, 1962: 141 (= *exastigma*); Savchenko, 1973b: 166 (= p.p. *exastigma*).
Nephrotoma astigma: Theowald, 1972a: 3 (= *exastigma*).

Type-material

According to Pierre (1925: 10—1), the Paris Museum contains "♂ et ♀ capturés par M. H. Gadeau de Kerville à Aïn-Draham (Tunesië)". As neither Mannheims (1951) nor the present author, in spite of the helpful assistance of Dr. J. J. Menier of the Paris Museum, were able to find these types, we may assume that they are lost.

The specimens labeled as *astigma* in the collection of Mannheims (MAK) do not fit the description of *astigma*, made by Pierre and are described as *exastigma* (section 5). In the collections of the MNHNP, the ZMA, the BMNH and the MAK we find however specimens from northern Africa, corresponding with Pierre's description of *astigma*. From these specimens a neotype and paraneotypes are designated herein; firstly because of the misinterpretation of *astigma* by Mannheims, secondly because the species is very similar to *flavescens* and *submaculosa*.

Neotype: ♂, Oued Medjerda près Souk-Ahras, 5-4-26; (Algeria) (MNHNP). Paraneotypes: 3 ♂, 2 ♀, labeled as the neotype; (2 ♂, 2 ♀, MNHNP; 1 ♂, ZMA). 4 ♂, Oued Medjerda, au km. 6 de la Route de Souk-Ahras à Sedrata, 5 av, 26; (Algeria) (MNHNP). 6 ♂, Forêt entre Ghardimaou et Souk-Ahras, 4-4-26; (Algeria) (5 ♂, MNHNP; 1 ♂, ZMA). 1 ♀, Ain Draham, Tunesien, 16.5.59, Roer/ Pales submaculosa Edw. Mannheims det. 1959; (ZMA). 6 ♂, iv-v. 1937, Brit. Mus. 1937-323./ Algeria, Monts du Grande Kabylie, nr. Yacouten, A. H. G. Alston & N. D. Simpson./ Pales submaculosa Edw. Mannheims det. 1962; (3 ♂, MAK; 3 ♂, BMNH). 1 ♂, 1 ♀, labeled as the preceding paraneotypes, nr. Adekat instead of nr. Yacouten; (BMNH). 4 ♂, 1 ♀, iv-v. 1937, Brit. Mus. 1937-323./ Algeria, Babouts Mts., Col de Jeniet el Jinn, A. H. G. Alston & N. D. Simpson./ Pales submaculosa Edw. Mannheims det. 1962; (BMNH). 1 ♂, iv-v. 1937, Brit. Mus. 1937-323./ Algeria, Djebbel el Meddad, nr Jeniet el Had., A. H. G. Alston & N. D. Simpson/ Pales submaculosa Edw. Mannheims det. 1962; (BMNH). 5 ♂, Algeria, Batna, 21.iv.1937, A. H. G. Alston & N. D. Simpson, B. M. 1937-323./ Pales submaculosa Edw. Mannheims det. 1962; (BMNH). 1 ♂, 1 ♀, Algeria, Bône, 15.III.1896, Rev. E. A. Eaton, B. M. 1946-136/ Nephrotoma submaculosa Edws., det. R. I. Vane-Wright, 1963; (BMNH).

Description

Body length ♂: 10 mm, ♀: 10-11 mm; wing length: 9-12 mm.

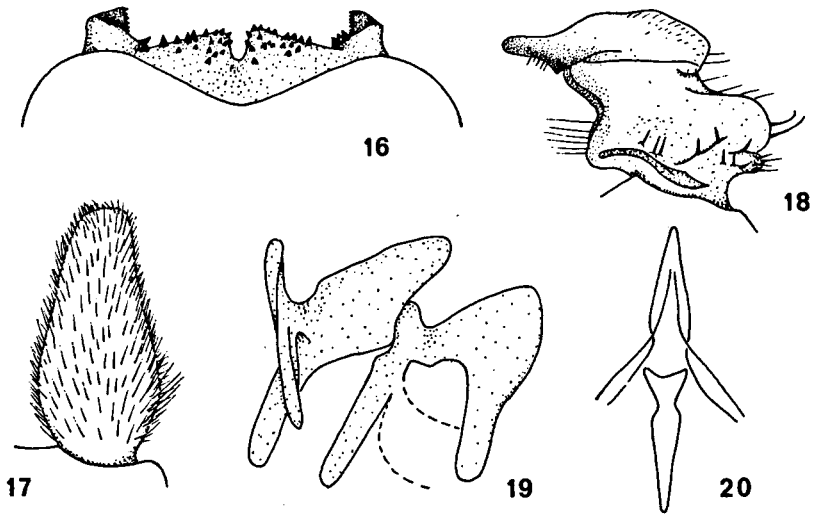
Head ♂: Scape and pedicel dark brown; flagellar segments black. Verticils short, 0.5-0.7 x length of flagellar segments. First flagellar segment 1.2 x length of second one. Palpi brown to dark brown. Rostrum brownish yellow, upper part and nasus with a shining, dark brown spot, more or less confluent with dark brown spot below antennal bases. Genae and postgenae pale brownish yellow, vertex brownish yellow. Spot between eye and frontal tubercle conspicuous, dark brown. Mark on occiput dark brown, shining but lateral margins dull bordered, large, of a shape as figured for *flavescens* (fig. 6). Anteriorly the occipital marking has a narrow prolongation, crossing the frontal tubercle and almost reaching the spot below the antennal bases. Marks on the inner part of postgenae dark brown. Vertex and postgenae moderately densely hairy, hairs long.

Thorax ♂: Pronotum dorsally yellow, laterally black. Prescutal stripes black. The anterior ends of the lateral prescutal stripes are slightly bent downwards and distally dull only. Median stripe without a dull border. Pleural markings black. Anatergite yellow. Scutellum dark brown. Parascutellae yellow. The small triangle just behind the ventral contact of the fore coxae is black. Basal half of the coxae with dark markings. Femora coloured light brown basally, steadily growing darker towards apices or only apices darkened. Tibiae light brown with darkened apices. Tarsi brown to dark brown. Wings light brown toned; wing-stigma hardly indicated, with macrotrichiae.

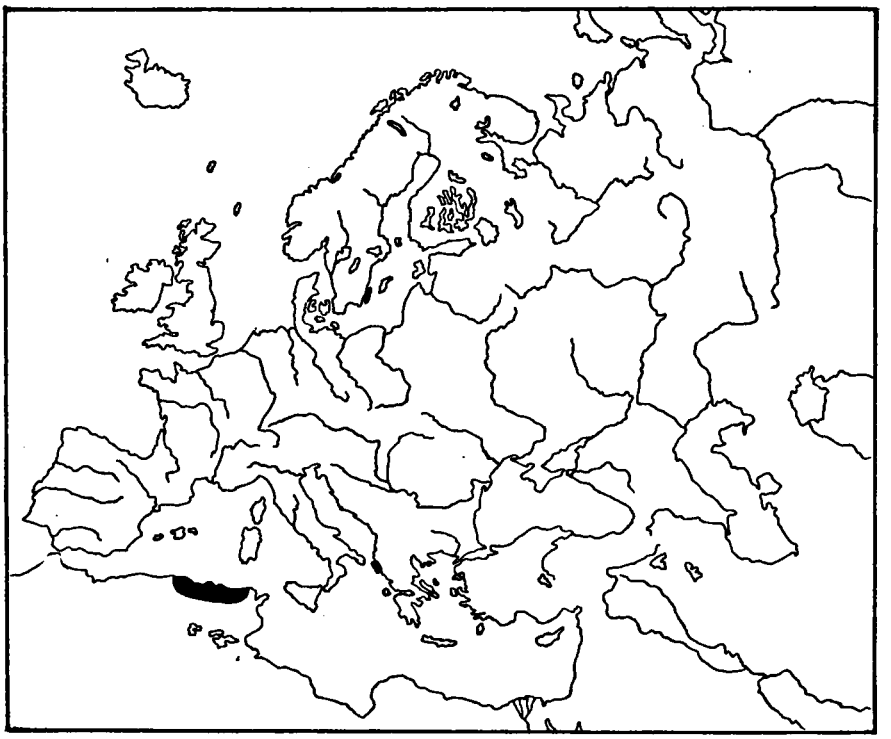
Abdomen ♂: Brownish yellow. Dorsal stripe dark brown, usually interrupted by the yellow coloured tergite hind margins only. The lateral stripe is variable in distinctness, ranging from a dark brown stripe at the lateral margin of the tergites to an only slightly indicated stripe, replaced at the posterior corners of the tergites by dark brown spots. The sternites have a distinct, dark brown median stripe, which is normally interrupted by the lighter coloured sternite hind margins with larger intervals than the dorsal stripe by the tergite hind margins is.

Hypopygium: Yellow. Posterior extension of tergite 9 (fig. 16) without distinct median projections. The outer margin is sloping sidewards from the small median incision onwards, slightly approaching the tergite itself. At the lateral half the outer margin is directed posteriorly to form the lateral, ventrally directed shells. The od is simple, not sclerotized (fig. 17). The id as in *flavescens* and *submaculosa,* but the ventral hook of the anterior beak is larger and the id bears a small projection at the outer margin of the shell (fig. 18). The adminiculum (fig. 19) is similar to *flavescens* and *submaculosa,* as is the aedeagus. The eighth sternite is somewhat elongate posteriorly, the median projection is small, triangular and slightly protruding beyond the hind margin of the eighth sternite. The sclerotizations along the mid-ventral, membranous part of the ninth sternite are small.

Female: Resembling the male. Verticils up to as long as the flagellar segments. The colour of the scape and the pedicel is dark brown (4 ♀), brown (1 ♀), or light brown (1 ♀). Tergites dorsally with isolated spots,



Figs 16—20. *N. astigma.* 16, posterior extension of tergite 9, dorsal view; 17, od, outside; 18, id, outside; 19, adminiculum, lateroposterior view; 20, furca and sternum 9, dorsal view.



Map 2. Distribution of *N. astigma.*

forming an interrupted dorsal stripe. The stripe is not as wide as in the male and narrower at the anterior part of the tergites than posteriorly. Tergite 10, cerci, sternite 8 and hypovalvae brownish yellow. Furca and sternum 9 as in fig. 20. Hypovalvae as figured for *submaculosa* (fig. 28); the eighth sternite gradually narrows to the point where it passes into the hypovalvae.

Distribution: map 2

Biology

The first record is April, 5th, the latest May, 16th. Four males were collected in a forest, probably an oak-forest.

Discussion

The specimens of *flavescens* from Algeria, referred to by Bergroth (1889: 118) and Becker (1907: 240), both without localities, presumably belong to *astigma,* a species intermediate in colour-pattern between *flavescens* and *submaculosa.*

The differences between *astigma* and *submaculosa* are discussed with the description of the latter species. The characters on which *astigma* can be separated from *flavescens* are:

Head: The spot below the antennal bases is usually less conspicuous in *flavescens* and the narrow prolongation of the occipital marking usually does not cross the frontal tubercle as in *astigma.*

Thorax: The downwardly directed anterior ends of the lateral prescutal stripes are usually larger and to a larger extent dull in *flavescens.* In *astigma* the median prescutal stripe is without narrow dull lateral borders as found in *flavescens.*

Abdomen: In the male of *flavescens* the spots, forming the dorsal stripe, are usually interrupted with large intervals at the anterior margins of the tergites, whereas in *astigma* the dorsal stripe is interrupted at the tergite hind margins only.

Hypopygium: In *astigma* the posterior extension of the ninth tergite has the median projections less distinct than found in *flavescens.* The small projection at the outer margin of the lateral shell of the id *astigma* is lacking in *flavescens.* The median projection of the eighth sternite is well protruding beyond the posterior margin of this sternite in *flavescens* and does only slightly so in *astigma.*

Nephrotoma submaculosa Edwards, 1928
Figs 15, 21-29, diagram 2, map 3

Synonymy:

Nephrotoma submaculosa Edwards, 1928, Encyclopédie Entomologique, Série B2, 4: 188-9, figures; 1938; 99-100; figures; 1939: 243-4; Coe, 1950: 11; Tjeder, 1955b: 246-7; Coulson, 1959: 159, 166-7, biology; Tjeder, 1965: 46; Theowald, 1967: 22, 63-4, figures, biology; Hartig, 1971:

123; Theowald, 1971: 220, 228; Stubbs, 1973: 103-6, biology; Klopp, 1974: 165-6, figures, biology; Oosterbroek, 1975: 120.

Pales submaculosa: Mannheims, 1951a: 17, 33-4, 37-8, figures, biology; 1951c: 228; Hemmingsen, 1952: 378, 409; Mannheims, 1953: 2; 1954b: 31; Theowald, 1957a: 229, figures, biology; 1957b: 10-1; Laever & Mannheims, 1958: 231; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961: 249; Erhan, 1962: 93-4, figures; Hemmingsen, 1962, 140, biology; Höchstetter, 1962: 38, 81; Simova, 1962: 101; Mannheims & Pechlaner, 1963: 6; Mannheims, 1964: 107-8; 1966a: 275; Savchenko, 1966a: 469-70, figures; 1966d: 120; Zangheri, 1969: 1023; Savchenko, 1973b: 145-7, figures, biology.

Type-material

Holotype: ♂, R. Porto near Evisa/ Type/ Nephrotoma submaculosa Edw. F. W. Edwards. det. VI. 1928./ Corsica, 10-25.IV.1928, F. W. Edwards B. M. 1928-214; (BMNH; v! O, 1976).
Paratypes: 1 ♂, 1 ♀, Calvi near coast/ Nephrotoma submaculosa Edw. F. W. Edwards, det. VI. 1928./ Corsica, 10-25.IV.1928, F. W. Edwards B. M. 1928-214; (BMNH; v! O, 1977).

Material examined (259 ♂♂, 239 ♀♀) originated from the following countries: Great Britain, Netherlands (fig. 15), Belgium, West Germany, East Germany, Poland (Jacobsdorf), Czechoslovakia, France, Portugal (near Faro), Spain, Italy, Hungary (Tihany near Balaton).

Description

Body length ♂: 10-12 mm, ♀: 13-18 mm; with length: 11-15 mm.

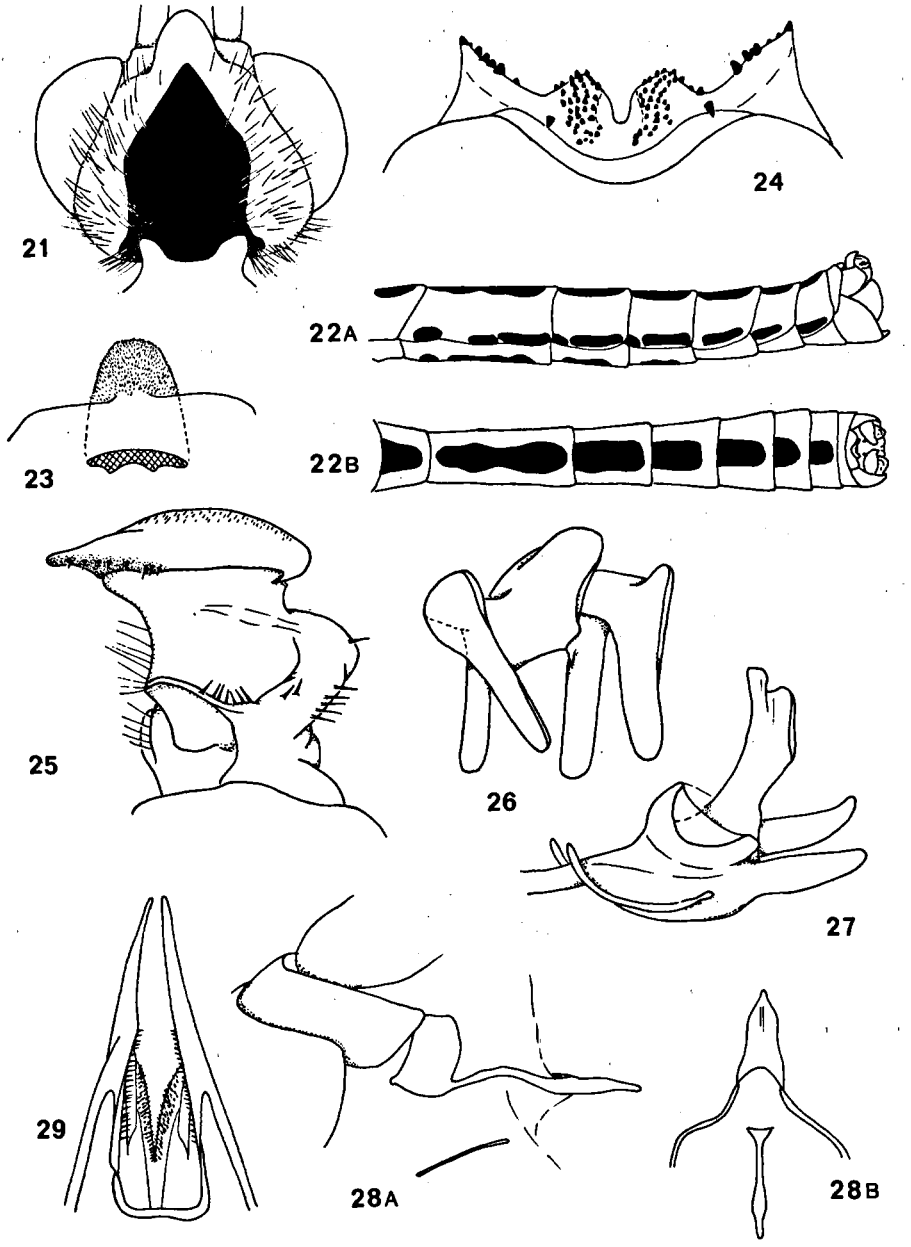
N. submaculosa is very similar to *flavescens* and *astigma.* In the description below the first part deals with the differences with *flavescens*, the second part compares *submaculosa* and *astigma.*

Head: Occipital marking usually smaller, to a lesser extent dull, and with less convex lateral margins, often even parallel; especially in Spanish and Portuguese specimens the occipital marking can be of the same shape and appearance as in *flavescens.* The vertex and postgenae are more hairy. The dark spot between the eye and the frontal tubercle is fairly variable in expression, usually absent or inconspicuous, in specimens from Spain and Portugal sometimes as pronounced as in *flavescens* (fig. 21).

Thorax: Down curved anterior ends of lateral prescutal stripes smaller and shining or somewhat dull, not as dull as in *flavescens.* Median prescutal stripes shining all over, without dull lateral margins.

Abdomen: The dorsal stripe has smaller intervals, the markings are more extended anteriorly than usually found in *flavescens* (fig. 22 A&B). The lateral spots of the abdomen are elongate, forming a lateral stripe with small intervals before the middle of the tergites; these spots however are sometimes less conspicuous.

Hypopygium: Od as in *flavescens* (fig. 9) but basally more widened. Median projection of sternite 8 smaller, visible part as long as wide (fig. 23).



Figs 21—29. *N. submaculosa.* 21, head, dorsal view; 22, abdomen: A, lateral view, B: dorsal view; 23, median projection of sternite 8, ventral view; 24, posterior extension of tergite 9, dorsal view; 25, id, outside; 26, adminiculum, lateroposterior view; 27, aedeagus, lateral view; 28, furca and sternum 9: A, lateral view, B, dorsal view; 29, hypovalvae, dorsal view.

Disk of tergite 9 more swollen than in *flavescens*, especially laterally. The posterior extension of the ninth tergite has the outer margin widely V-shaped, the lateral hooks therefore reach fairly beyond the median projections (fig. 24). Id (fig. 25), adminiculum (fig. 26) and aedeagus (fig. 27) very similar to *flavescens*.

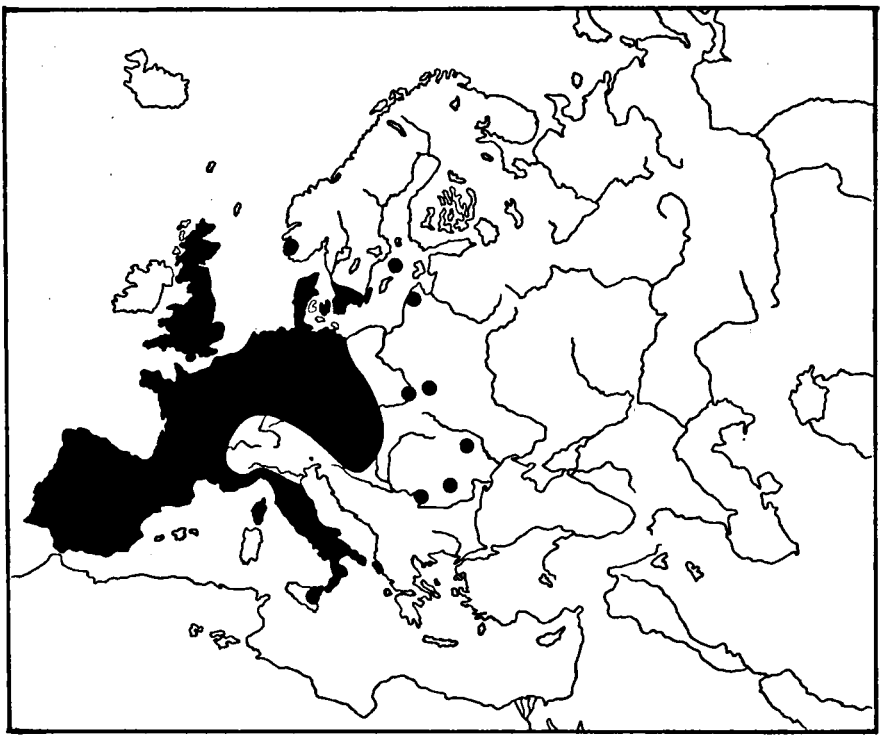
Ovipositor: Hypovalvae as in fig. 28. The long egg-slide distally bears small spines and forms anteriorly a vertical septum between the anterior ends of the hypovalvae. The eighth sternite gradually narrows to the point where it passes into the hypovalvae. Sternum 9 and furca as in fig. 29 A&B.

The differentiating characters with *astigma* are:

Head: Occipital marking of *submaculosa* usually smaller and not crossing the frontal tubercle. Spot between eye and frontal tubercle usually inconspicuous in *submaculosa*.

Thorax: In *submaculosa* the tibiae are darker than the femora and the scutellum is usually yellow to light brown.

Hypopygium: *N. astigma* possesses no median projections at the outer margin of the posterior extension of the ninth tergite, in *submaculosa* these projections are distinct. In *astigma* the median projection of the eighth sternite hardly protrudes beyond the posterior margin, in *submaculosa* this projection is fairly visible.



Map 3. Distribution of *N. submaculosa*.

Distribution: map 3

The black area of map 3 covers, except for Scandinavia, material examined in this study; the black dots in Central Europe are localities mentioned by Erhan and Savchenko. The record from Yugoslavia (Simova, 1962) was not mentioned again in Simova's list of the Yugoslavian Tipulidae of 1974. The species is not known from Switzerland.

Biology

N. submaculosa is frequently reported from the dunes (Theowald, 1957a, 1957b, 1967; Hemmingsen, 1962; Stubbs, 1973; see also figure 15), and other sandy soils (Mannheims, 1951a; Savchenko, 1973b). Klopp (1974) always collected *submaculosa* in habitats where also *flavescens* was very frequent. I also examined and/or collected specimens from France and Spain in which the locality and the date of collecting were the same in both species.

According to Theowald (1957a) the larvae were found by Parsons under the short grass and moss cover of dune-slopes near Cardiff.

Apparently *submaculosa* does not occur in the Pyrenees and the Alps above 1000 m, as does *flavescens*. Higher altitudes are only known in Spain: Picos de Europa, 1500 m; Sierra de Guadarrama, 1500 m; Sierra de Gredos, 1300 m and Sierra Nevada, 2000 m.

The period of flight is shown in diagram 2. The early dates (March) are from Spain and Portugal, the late (July) from the Netherlands, Terschelling.

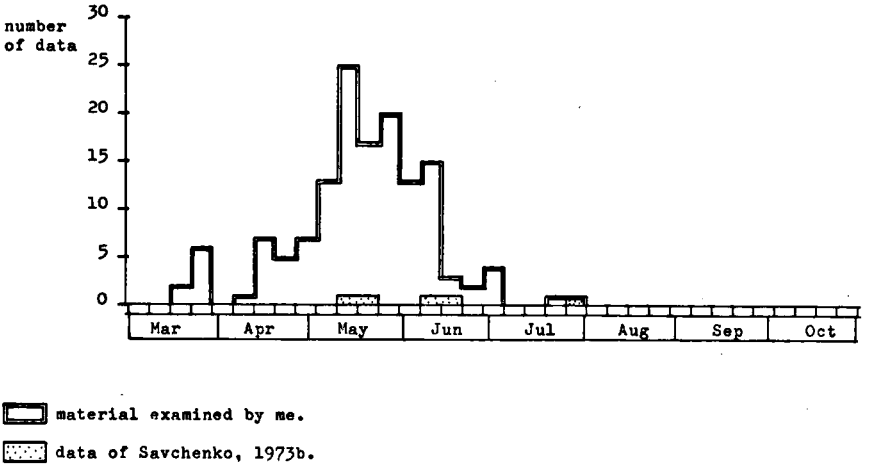


Diagram 2. Period of flight of *N. submaculosa*.

Discussion

The most reliable character to separate *flavescens* and *submaculosa* is the dullness of the lateral margins of the median prescutal stripe in *flavescens*.

The other differences listed are in general also useful, but, especially in specimens from Spain and Portugal, fading away. *N. astigma* and *submaculosa* are easily recognized by the colour of the femora and the tibiae. In *astigma* the tibiae are of about the same colour as the femora, whereas in *submaculosa* the tibiae are darker than the femora.

SECTION 2

The species of this section, viz. *sullingtonensis, beckeri, saccai,* and *lempkei,* are similar to each other. The species *lempkei* and the females of *beckeri* and *saccai* are described for the first time.

Nephrotoma sullingtonensis Edwards, 1938
Figs 30-36, diagram 3, map 4

Synonymy:

Nephrotoma sullingtonensis Edwards, 1938, Encyclopédie Entomologique, Série B2, 9: 97-9, figures, biology; 1939: 243-4; Coe, 1950: 8; Theowald, 1972a: 3; Stubbs, 1973: 103-6, biology.
Pales sullingtonensis: Mannheims, 1951a: 33-4, 39-41, figures; Hemmingsen, 1962: 140; Savchenko, 1973b: 143-4, figures.

Type-material

Lectotype: ♂, Type/ Sussex, Sullington near Pulborough, 27.IV.1936, Coll. by Miss H. Wright, Pres. by Miss L. Frederick, B. M. 1936-490./ Nephrotoma sullingtonensis Edwards 1937 Type; (BMNH; v! O, 1976).
Paralectotypes: 2 ♂, 2 ♀, labeled as the lectotype; (BMNH; v! O, 1977), 1 ♂, 1 ♀, Sussex, Sullington near Pulborough, 5.VI.1936, Miss L. Frederick, B.M. 1936-490./ Nephrotoma sullingtonensis Edwards 1937; (BMNH; v! O, 1977).

Material examined (47 ♂♂, 60 ♀♀, types not included) originated from the following countries: Great Britain (Storrington), France (Angoulême, Beller, Maisons Laffitte), Portugal (Serra da Estrêla), Spain.

Description

Body length ♂: 9-11 mm, ♀: 14-17 mm; wing length: 10-15 mm.

Head ♂: Scape yellow to light brown; pedicel dark brown; flagellar segments black. First flagellar segment as long as or slightly longer than second segment. Verticils up to 0.8 × length of flagellar segments. Palpi dark brown. Rostrum yellow, dorsally, including the nasus, dark brown to black; laterally, where rostrum and genae meet, darkened also. Genae and postgenae yellow; vertex brownish yellow. Spot below antennal bases and spot between eye and frontal tubercle small, brown to dark brown. Mark on occiput large, lateral margins strongly convex, triangular in front and sometimes prolonged up to frontal tubercle (fig. 30). The occipital marking is

dark brown, shining except for the dull lateral margins and anterior part. Vertex and postgenae more or less densely hairy. Marks on inner part of postgenae distinct.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown to black. The lateral prescutal stripes are in contact with the median one, just behind their dull, downwardly bent anterior ends (fig. 30). Scutellum dark brown to black. Parascutellae yellow. Anatergite dark brown to black. Small triangle just behind ventral contact of fore coxae black. Coxae basally with distinct, dark brown markings. Femora light brown proximally, steadily growing darker towards dark brown apices. Tibiae and tarsi brown to dark brown. Wings light brown toned; wing-stigma distinct, brown to dark brown, with macrotrichiae.

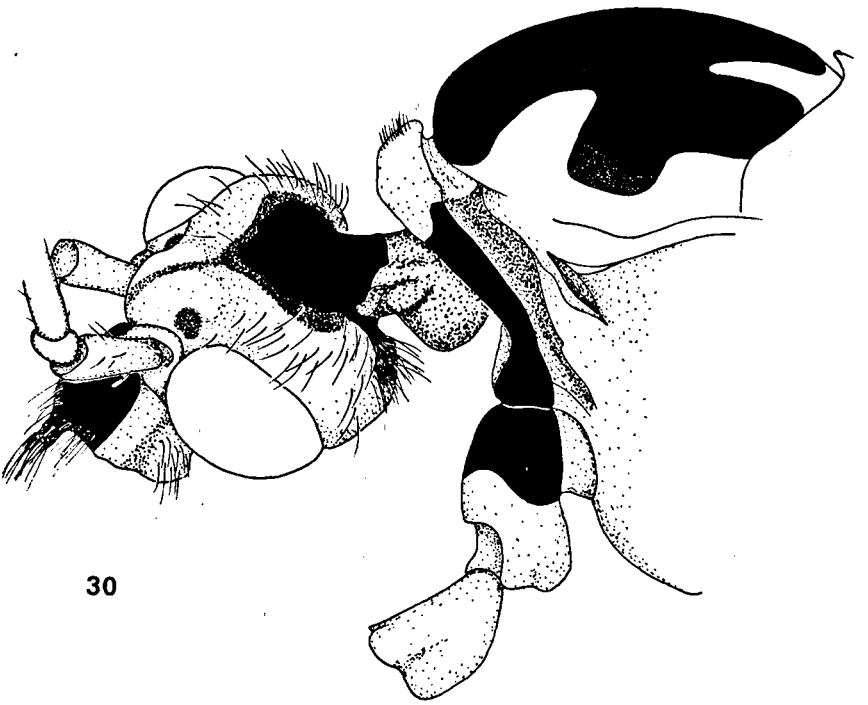
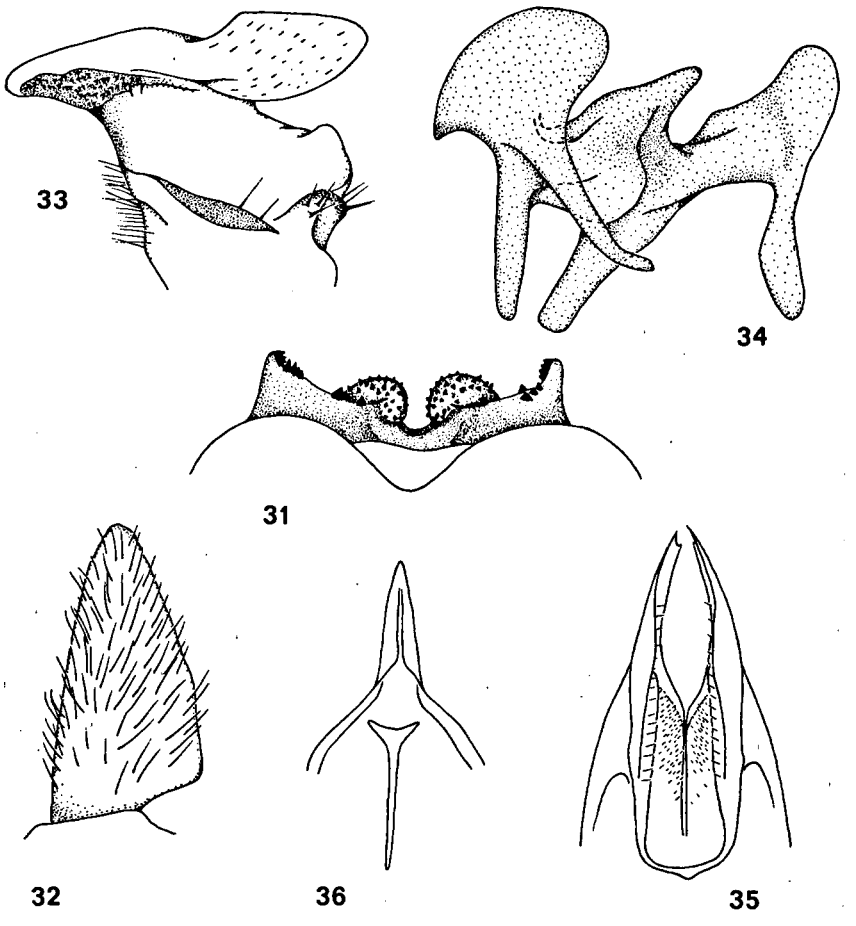


Fig. 30. *N. sullingtonensis*, head and dorsal part of thorax.

Abdomen ♂: Yellowish brown. Tergite 1 almost entirely brown. Dorsal stripe more or less narrow, dark brown; the individual spots slightly broadened posteriorly. The lateral stripes are dark brown and usually with large intervals in front of the middle of the tergites. Sternites with a median brown stripe, anteriorly only dots.

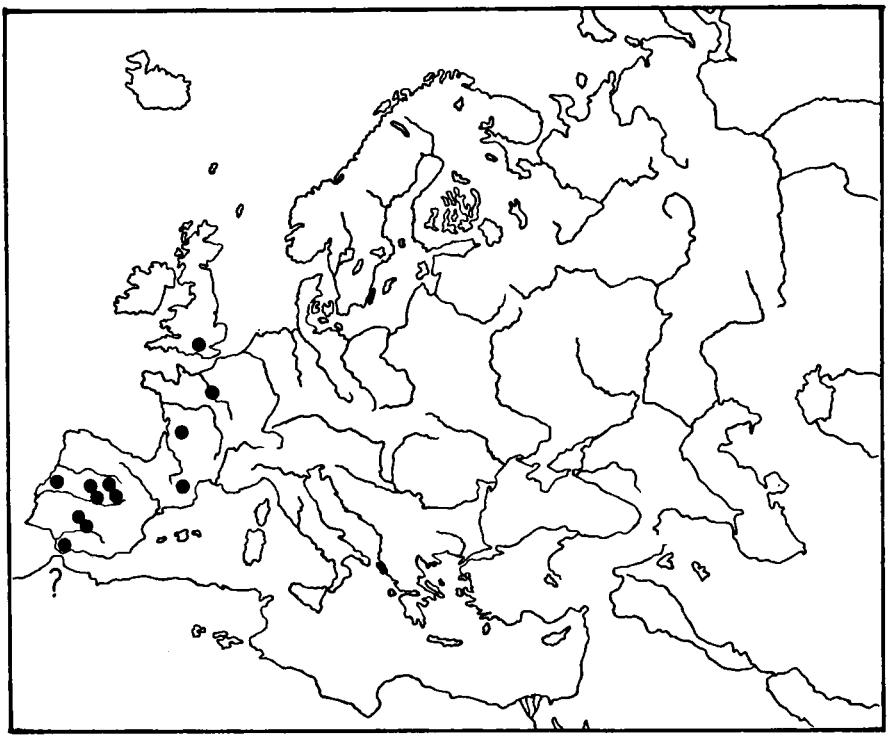
Hypopygium: Yellowish brown. The anterior and lateral parts of the eighth sternite are darkened; the mid-posterior part, in front of the median



Figs 31—36. *N. sullingtonensis*. 31, posterior extension of tergite 9, dorsal view; 32, od, outside; 33, id, outside; 34, adminiculum, lateroposterior view; 35, hypovalvae, dorsal view; 36, furca and sternum 9, dorsal view.

projection, is yellowish brown to a large extent. The posterior extension of the ninth tergite has a median incision on which the basal part is slightly excavate, giving the incision the appearance of a keyhole (fig. 31). Od simple, not sclerotized; posterior margin fairly straight and abruptly bent inside basally. The hairs of the od are strong and black (fig. 32). The posterior crest of the id is spearhead-like and the lateral shell bears a small median projection at the outer margin (fig. 33). Median projection of sternite 8 as figured for *appendiculata* (fig. 72), the visible part 1.0-1.5 × longer than wide. The adminiculum has large, lateral appendages, which are elongate posteriorly (fig. 34). The aedeagus as figured for *appendiculata* (fig. 71). The sclerotizations along the mid-ventral, membranous part of the ninth sternite are as long as the median projection of the eighth sternite.

Female: Resembling the male. Verticils slightly longer than flagellar segments. The spots which form the abdominal dorsal stripe are triangular towards the tergite hind margins. The lateral, dark brown abdominal stripe is situated at the lateral margin itself and is continuous or with small intervals just in front of the middle of the tergites only. Sternites with a median brown stripe. Tergite 10, cerci, sternite 8 and hypovalvae reddish brown. Median region of sternite 8 usually with a dark spot on each side. Median region of tergite 10 usually darkened. Egg-slide of hypovalvae long, bearing small spines and forming a vertical septum between anterior ends of hypovalvae (fig. 35). Furca and sternum 9 as in fig. 36. The eighth sternite gradually narrows to the point where it passes into the hypovalvae.



Map 4. Distribution of *N. sullingtonensis*.

Distribution: map 4

Map 4 only shows the known localities. In Mannheims' desk-copy of his 1951 revision he added the distributional notes: "Algeria, Marokko". Theowald (1972a) also mentioned that Mannheims had seen specimens from Algeria. In both cases precise localities are omitted. Specimens from these

countries are not known to me. One male and one female of *fontana*, which occurs in Algeria, were identified by Mannheims as *sullingtonensis*.

Biology

Edwards (1938) reported this species from pine-woods in Sussex, England, where it is "only known from inland dunes" (Stubbs, 1973). In Spain I also collected this species frequently in pine-woods and moreover in *Cistus* vegetations, usually rather dry and situated on slopes.

The species is not known to occur in mountain areas. The collecting altitudes in Spain (Sierra de Gredos) and Portugal (Serra da Estrêla) are 600 m.

The period of flight is given in diagram 3.

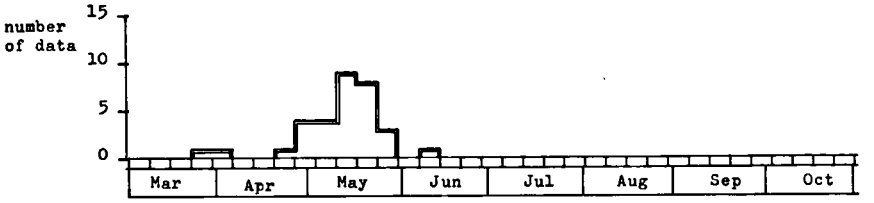


Diagram 3. Period of flight of *N. sullingtonensis*.

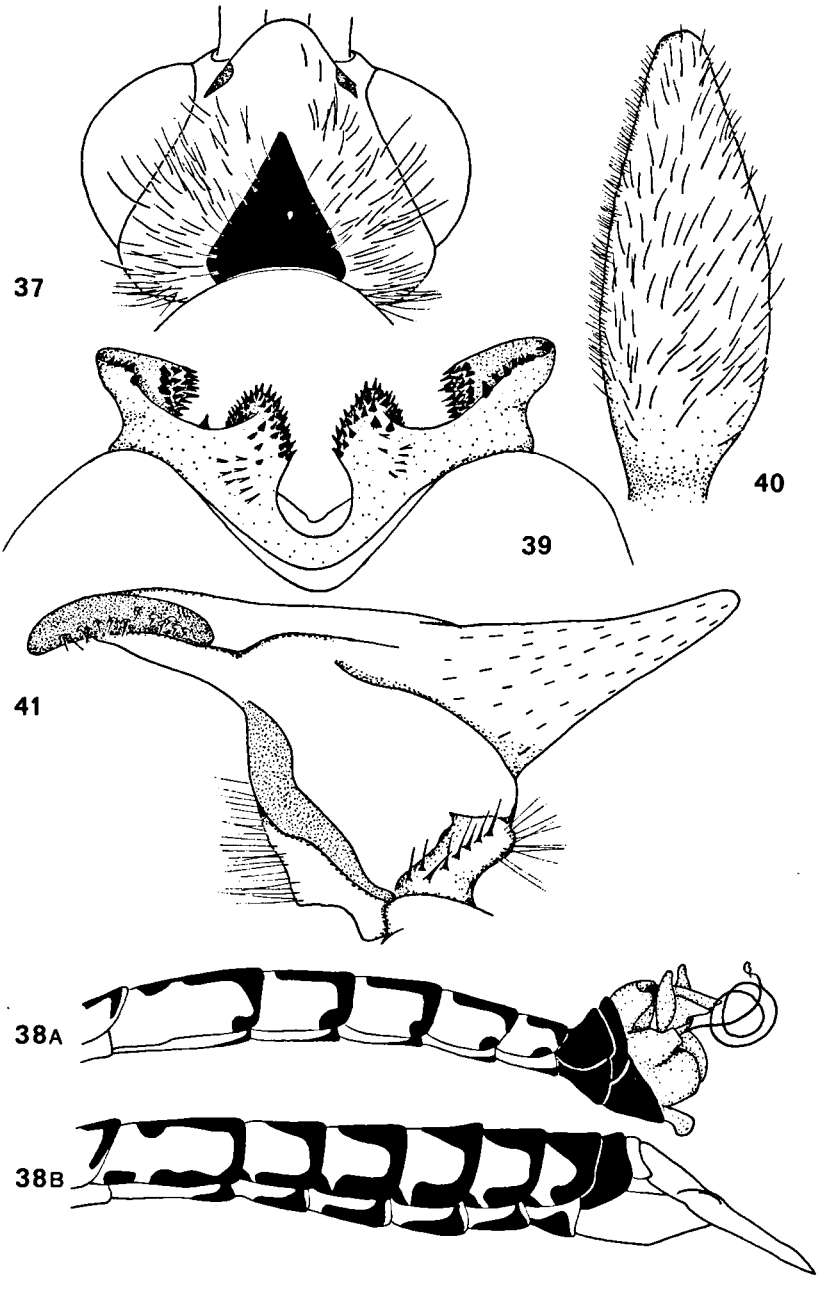
Discussion

N. sullingtonensis is readily distinguished from the other three species of this section by the fact that the lateral prescutal stripes are in contact with the median stripe (fig. 30). Furthermore it differs from *beckeri* and *saccai* in the shape of the occipital marking, which is rather small and triangular in these two species, and by the pronounced colouration of the dorsal part of the rostrum, being much less developed in *beckeri* and *saccai*. Within this section, *sullingtonensis* is most similar to *lempkei*. The downwardly bent anterior ends of the lateral prescutal stripes are shining in *lempkei* and dull in *sullingtonensis*.

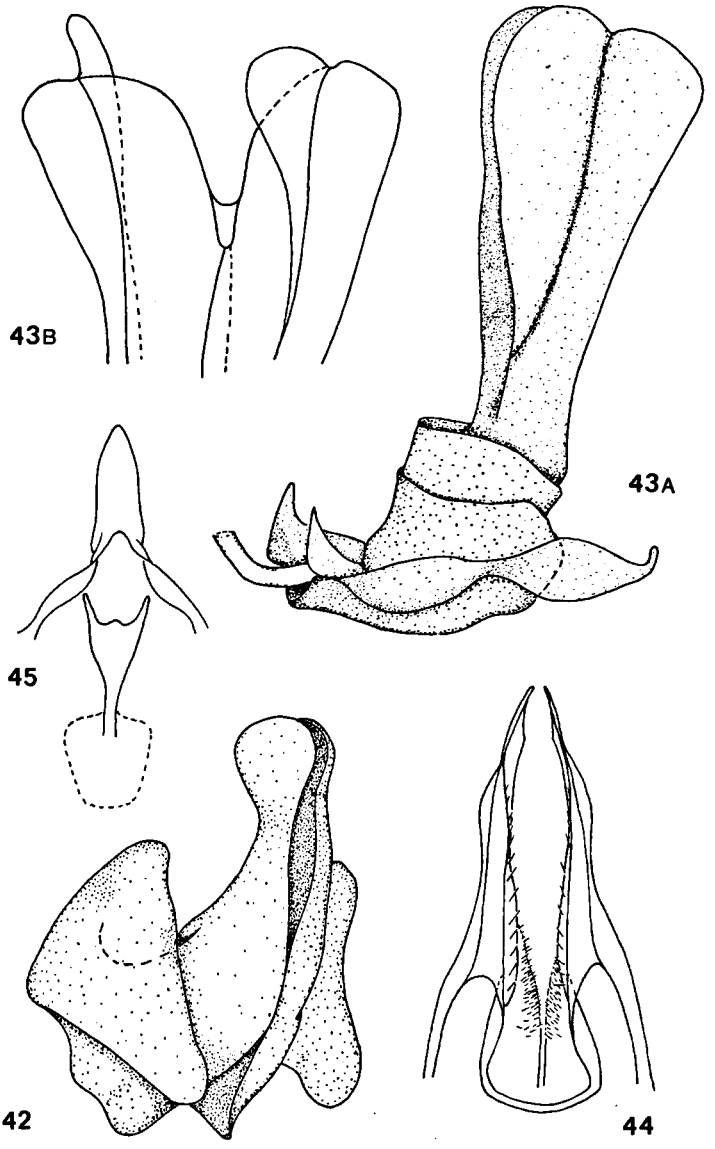
Nephrotoma beckeri (Mannheims, 1951)
Figs 37-45, map 5

Synonymy:

Pales beckeri Mannheims, 1951, Die Fliegen der palaearktischen Region, Lief. 167: 33-5, 41, figures; Hemmingsen, 1962: 140; Savchenko, 1973b: 144-5, figures.
Nephrotoma beckeri: Oosterbroek, 1975: 120.



Figs 37—41. *N. beckeri*. 37, head, dorsal view; 38, abdomen: A, male, lateral view, B, female, lateral view; 39, posterior extension of tergite 9, dorsal view; 40, od, outside; 41, id, outside.



Figs 42—45. *N. beckeri*. 42, adminiculum, lateroposterior view; 43, aedeagus: A, lateral view, B: dorsal part of compressor apodeme; 44, hypovalvae, dorsal view; 45, furca and sternum 9, dorsal view.

Type-material

Holotype: ♂, Asia Minor, Taurus Cilic, 1895, Holtz/ 515/ Pachyrhina sp?/ Ex Coll. Berlin/ Pales beckeri n.sp. Mannheims det. 1950/ Holotypus; (MNB; v! O, 1976).

Material examined (12 ♂♂, 13 ♀♀) is from Cyprus, except for the holotype, which is from Turkey, Taurus Mts.

Description

Body length ♂: 12-14 mm, ♀: 15-17 mm; wing length: 12-14 mm.

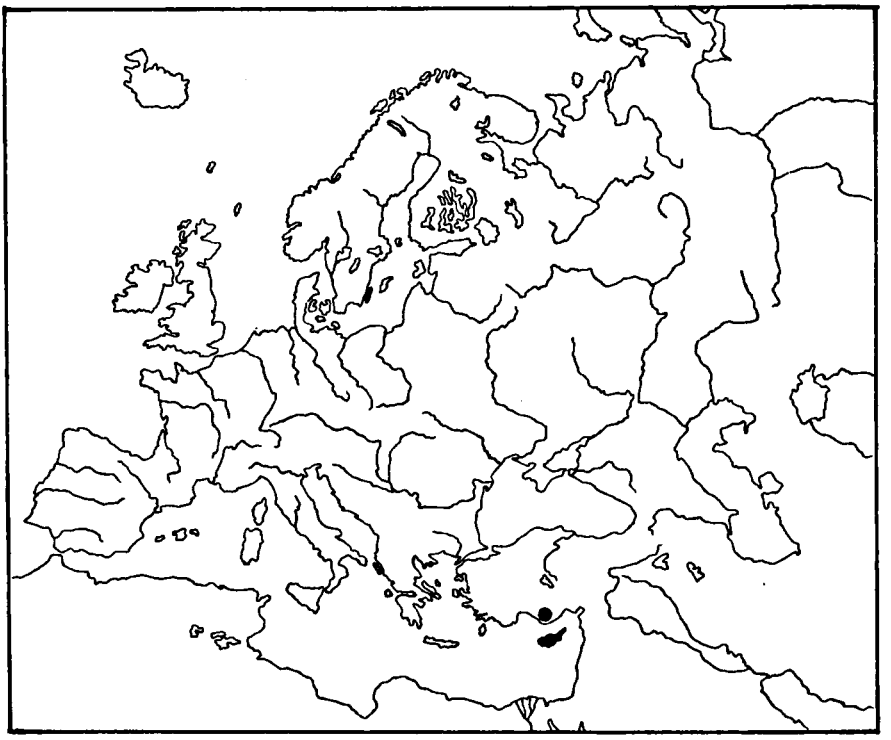
Head ♂: Scape and pedicel yellow; flagellar segments black and slightly longer than verticils. First flagellar segment as long as second one. Palpi brown to dark brown. Nasus and dorsal part of rostrum brown, shining; brown colouration rather faint, especially in dorsal aspect. No spot between antennal bases. Spot between eye and frontal tubercle small, brown. Genae and postgenae pale yellow; vertex yellow to orange-yellow. The small, triangular mark on the occiput is dark brown and shining. Vertex and postgenae densely hairy, hairs long (fig. 37). Marks on inner part of postgenae inconspicuous.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Prescutal stripes dark brown. The downwardly bent anterior ends of the lateral stripes are shining and lighter coloured than the stripes themselves. Scutellum more or less transparent, yellow, median region anteriorly brown. Parascutellae yellow. Pleural markings brown to dark brown. Anatergite dark brown. Triangle just behind ventral contact of fore coxae dark brown with black lateral margins. Coxae basally darkened. Femora yellowish brown, apices darkened. Tibiae brown to dark brown. Tarsi dark brown, apices darkened. Wings light brown toned; wing-stigma distinct, brown, with macrotrichiae.

Abdomen ♂: Yellow with a narrow, brown to dark brown dorsal stripe, segments 7 and 8 entirely dark brown. The dorsal stripe is widely interrupted at the anterior parts of the tergites and is posteriorly narrowly extending along the hind margins of the tergites 2, 3 and 4, sometimes also 5, to contact the dark brown spots at the posterior corners of the tergites. Sternites with a median brown stripe, posteriorly darker and widened towards the hind margins of sternites 2, 3 and 4 (fig. 38 A).

Hypopygium: Large, more than twice the diameter of the abdomen. Posterior extension of tergite 9 with a large, keyhole like, median incision and pronounced lateral shells (fig. 39). Od three times longer than wide (fig. 40). Id with a long and narrow beak and a large, triangular, posteiror crest (fig. 41). Adminiculum with a fleshy lobe on each side and without ventral rods (fig. 42). The aedeagus has a large compressor apodeme of which the two, parallel-sided wings have a median septum (fig. 43 A&B). Median projection of sternite 8 wide, dorsally flattened and ventrally keeled. The entire projection has a smooth pubescence. The sclerotizations along the mid-ventral, membranous part of the ninth sternite are hardly perceptable.

Female: Resembling the male. Verticils up to 1.3 x length of flagellar segments. The spots, forming the dorsal abdominal stripe, have a more triangular shape than in the male. They narrowly extend along the hind margins of the tergites 2-7. Lateral stripe of tergites distinct, with intervals in front of the middle of the tergites and posteriorly in contact with the dorsal stripe (fig. 38 B). The median spots of the sternites are broader and more triangular than in the male and narrowly extend laterally in front of the yellow coloured hind margins of the sternites. Abdomen without a darkened, subapical ring, only tergite 8 entirely dark brown. Tergite 9, cerci and hypovalvae reddish brown (fig. 38 B). Egg-slide long, bearing small spines; anteriorly forming a vertical septum between anterior ends of hypovalvae. The eighth sternite gradually narrows to the point where it passes into the hypovalvae (fig. 44). Furca and sternum 9 as in fig. 45.



Map 5. Distribution of *N. beckeri.*

Distribution: map 5

The holotype is the only known specimen from Turkey, the other specimens are all from Cyprus.

Biology

The species is known to fly from the end of March till the beginning of May.

Discussion

Mannheims (1951a) interpreted *beckeri* as closely related to *sullingtonensis* and *appendiculata (maculata).* The species however resembles *saccai.* In the latter species the scutellum is normally dark brown, whereas in *beckeri* it is yellowish, only in part coloured brown, never dark brown. The males differ in several characters of the hypopygium, which is for example distinctly swollen in *beckeri.* The females of *saccai* have a, hardly interrupted, straight, median stripe at the sternites. In *beckeri* females this stripe is build up by isolated spots, which are distinctly widened towards the posterior margin of the sternites. The other two species of this section, *sullingtonensis* and *lempkei,* have the occipital spot not markedly triangular as found in *saccai* and *beckeri.*

Nephrotoma saccai (Mannheims, 1951)
Figs 46-56, map 6

Synonymy:

Pales saccai Mannheims, 1951, Die Fliegen der palaearktischen Region, Lief. 167: 33-4, 36, 57, figures; 1953: 2; Mannheims & Theowald, 1959: 17; Hemmingsen, 1962: 140; Mannheims & Pechlaner, 1963: 6; Mannheims, 1964b: 2-3; Savchenko, 1973b: 156, figures.
Nephrotoma saccai: Hartig, 1971: 124.

Type-material

Holotype: According to Mannheims (1951a): "1 ♂ Coll. Saccá, ohne Fundort und Zeitangabe (wahrscheinlich Umgebung Rom) in Coll. Inst. Naz. di Ent. Roma". Letters sent to this institute remained unanswered. The author's knowledge of this species is based among others on specimens identified by Mannheims.

Material examined (7 ♂♂, 6 ♀♀) originated from south west Italy, including Sicily.

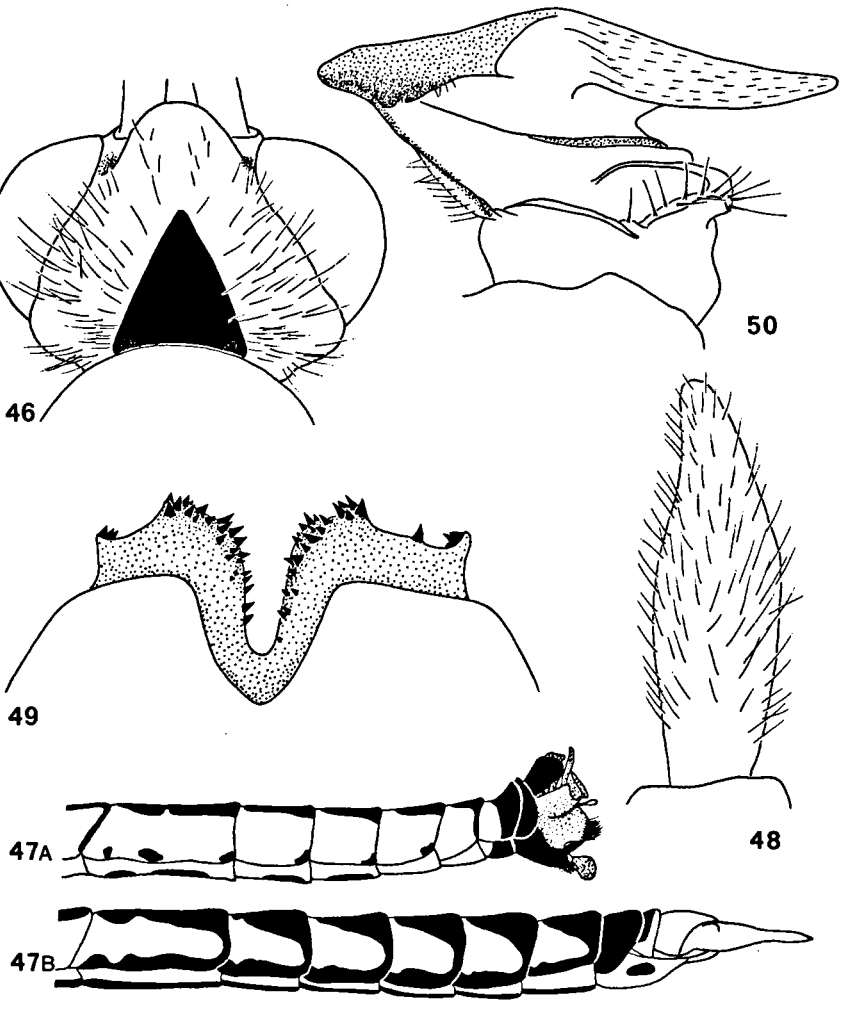
Description

Body length ♂: 11-13 mm, ♂: 14-16 mm; wing length: 12-14 mm.

Head ♂: Scape yellow; pedicel light brown; flagellar segments ranging in colour from olive brown to dark brown. First flagellar segment slightly longer than second one. Verticils up to as long as flagellar segments. Palpi light brown to brown. Brown colouration of dorsal part of rostrum and nasus hardly indicated. Spot below antennal bases absent or small. Spot between eye and frontal tubercle absent. Genae and postgenae pale yellow, vertex

yellow to orange-yellow. Small, triangular mark on occiput dark brown and shining (fig. 46). Vertex and postgenae densely hairy. Hairs of normal length. Marks on inner part of postgenae inconspicuous.

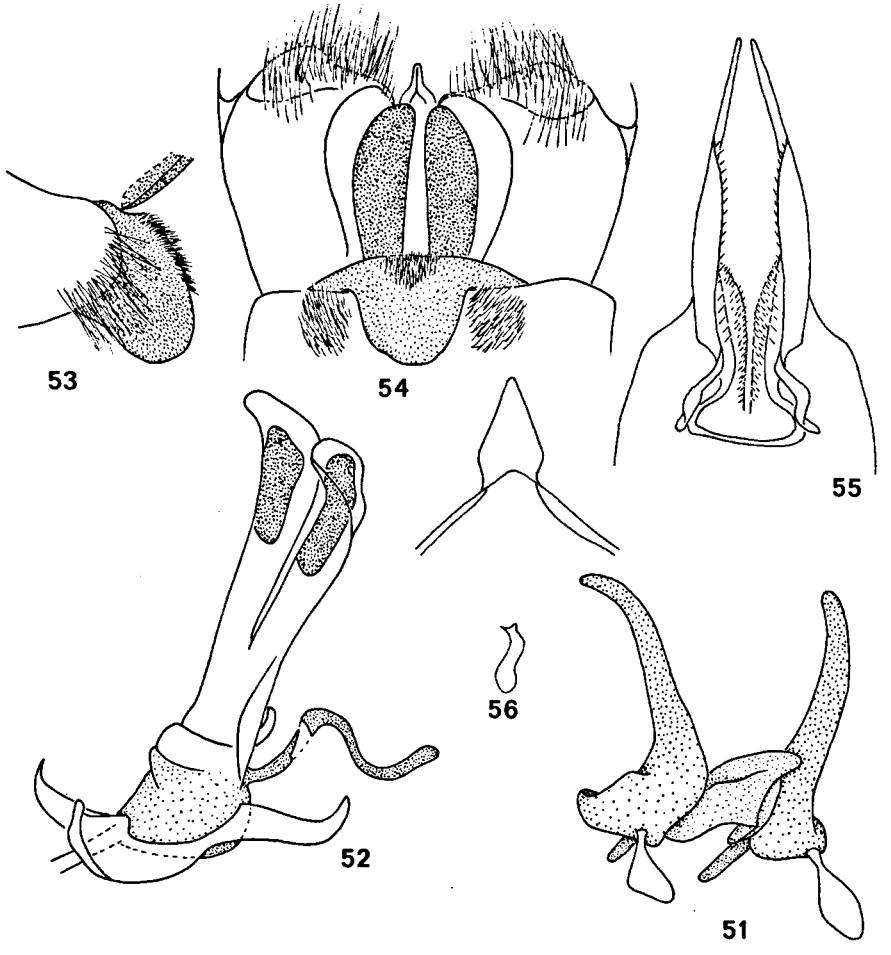
Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes shining, lighter coloured than stripes themselves. Scutellum transparent, dark brown. Parascutellae yellow. Pleural markings dark brown. Anatergite dark brown. Small triangle just behind ventral contact of fore coxae dark brown with black lateral margins. Coxae basally dark brown. Femora yellow to light brown, tips slightly or



Figs 46—50. *N. saccai*. 46, head, dorsal view; 47, abdomen: A, male, lateral view, B, female, lateral view; 48, od, outside; 49, posterior extension of tergite 9, dorsal view; 50, id. outside.

distinctly darkened. Tibiae light brown. Tarsi light brown to brown. Wings light brown toned; wing-stigma brown to dark brown, with macrotrichiae.

Abdomen ♂: Brownish yellow. Dorsal stripe dark brown. The individual spots are more or less triangular towards the posterior margins of the tergites. Hind margins of tergites 1 and 6 usually with a narrow, dark brown border. Hind margin of tergite 7 broadly dark brown. Tergites 8 and 9 conspicuously darkened. Posterior corners of tergites with dark brown spots, variable in extent but usually small (fig. 47 A). Sternites with elongate, brown spots at posterior half of sternites 2, 3 and 4. Posterior half of sternite 7 dark brown. Sternite 8 entirely darkened except for surroundings of median projection.



Figs 51—56. *N. saccai*. 51, adminiculum, lateroposterior view; 52, aedeagus, lateral view; 53, median projection of sternite 8, lateral view; 54, hypopygium, ventral view; 55, hypovalvae, dorsal view; 56, furca and sternum 9, dorsal view.

Hypopygium: Yellowish to reddish brown. Disk of tergite 9 large, dark brown. Posterior extension of tergite 9 with a deep median incision and bearing black spines, especially at the widely V-shaped posterior part (fig. 49). Od long, not sclerotized (fig. 48). Crest of id narrow and elongate; id hardly sclerotized except for beak (fig. 50). Adminiculum with elongate dorsal appendages and small, balloon-like posterior projections (fig. 51). Aedeagus with a large compressor apodeme and posteriorly bearing a long, strongly curved appendage (fig. 52). Median projection of sternite 8 large, not dorsoventrally compressed but somewhat curved around the hind margin of sternite 8. The projection is pubescent, dorsally shortly hairy (fig. 53). The red-brown sclerotizations along the mid-ventral, membranous part of the ninth sternite are large. Hind margin of sternite 8 with a moderately large tuft of hairs on either side of the median projection (fig. 54).

Female: Resembling the male except for the colouration of the abdomen. Verticils up to 1.5 x length of flagellar segment. Colouration of abdomen as in fig. 47 B. The dorsal spots of the tergites are usually broad and distinctly triangular towards the hind margins, where they contact the dark brown to black lateral stripe. Sternites with a median, almost continuous stripe. Sternite 8 usually black anteriorly and with two distinct, dark brown spots laterally, at the base of the hypovalvae. Tergite 8 dark brown to black. Tergite 9 in part, tergite 10, cerci and hypovalvae reddish brown. Egg-slide long, bearing small spines. The anterior ends of the hypovalvae are distinctly bent outwards. The vertical septum between them, formed by the egg-slide, is small (fig. 55). Sternum 9 and furca as in fig. 56. The furca is reduced and not near the ninth sternum, which is the generally noted position. The eighth sternite is moderately broad distad.

Distribution: map 6

The species is known from the west coast of Italy, south of Napoli, and from Sicily. The holotype is assumed to have been collected in the neighbourhood of Rome, a locality which needs confirmation.

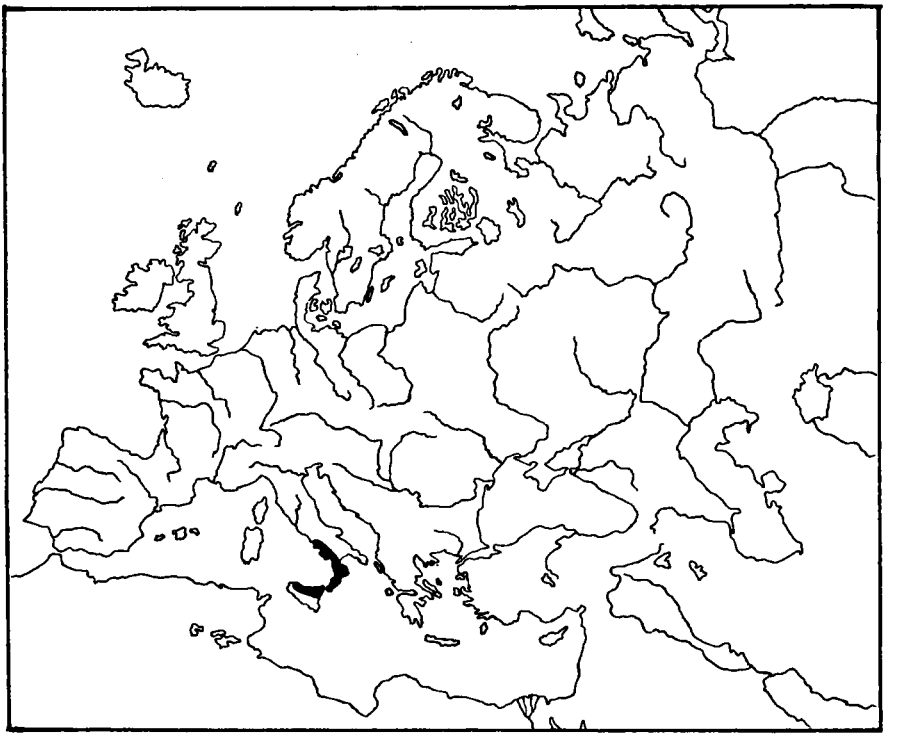
Biology

N. saccai flies from the end of April till the beginning of July.

Discussion

The differences between *saccai* and *beckeri*, within this section the two most similar species, and the differences found between these two and the other species of this section, are discussed under *beckeri*.

Mannheims (1951a) was not familiar with the female of *saccai*. The males of *quadrifaria* and *saccai* are more or less similar in the shape of the median projection of the eighth sternite. The two species therefore were interpreted



Map 6. Distribution of *N. saccai.*

as closely related and not included in the pointed cerci group of Mannheims because of the bluntly ending female cerci of *quadrifaria.* Savchenko (1973b) classified both species in one, separate species group. Although *saccai* and *quadrifaria* have a few characters in common, they cannot be interpreted as closely related. There are, for example, noticeable differences in the shape of the female ovipositor.

A male from Sicily, one of the paralectotypes of *crinicauda* Riedel, 1910, examined in the Vienna Museum by Martinovský in 1975, turned out to belong to *saccai.*

Nephrotoma lempkei spec. nov.
Figs 57-65, map 7

Type material

Holotype: ♂, España, Mallorca, Soller, 22-IV/5-V-1976, B. J. Lempke; (ZMA).

Paratypes: 1 ♂, 1 ♀ (without terminalia), labeled as the holotype; (ZMA). 2 ♀, Quercus ilex/ Menorca, 6-V-75, B. J. Post; (ZMA). 2 ♂, Majorca, Pollensa; 14-V-67, C. N. Colyer/ Ex coll. C. N. Colyer, B. M. 1970-489;

(BMNH). 1 ♂, 1 ♀, Majorca, Formentor, 26.IV.1971, C. E. Dyte- BM 1972-201; (1 ♂, ZMA; 1 ♀ BMNH). 3 ♂, 1 ♀, Majorca, Cala Ratjada, 21.IV.1971, C. E. Dyte; (BMNH). 1 ♂, Mallorca, Palma, 2-V-1954, A. Compte Leg/ A. Compte; (MAK); 1 ♀, Mallorca, Camp de Mar, 14.V.1956, F. Keizer; (MAK); 1 ♀, Mallorca, Camp de Mar, 20.V.1956, F. Keizer; (MAK).

Description

Body length ♂: 8-10 mm, ♀: 13-15 mm; wing length: 10-15 mm.

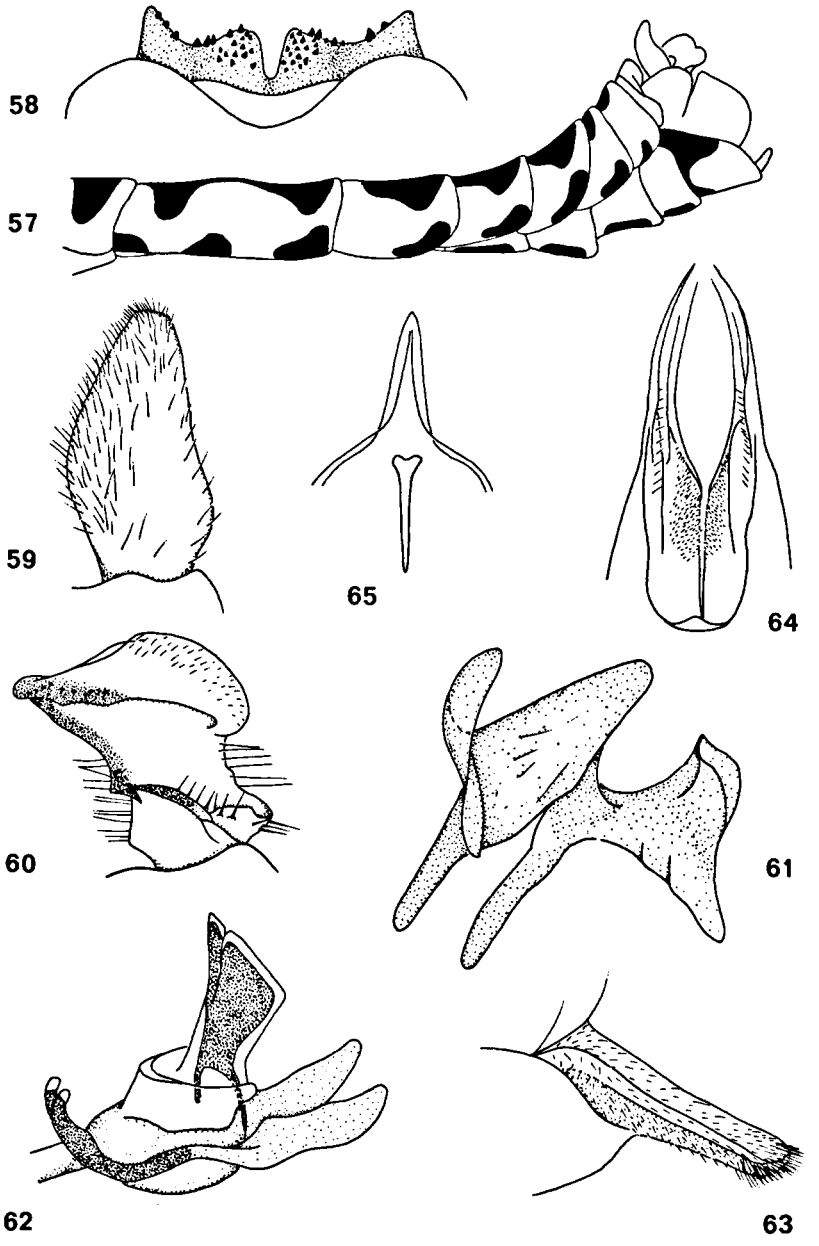
Head ♂: Scape yellow to brownish yellow; pedicel and flagellar segments dark brown to black, pedicel sometimes with a lighter coloured apical ring. First flagellar segment 1.2 x length of second one. Verticils up to as long as flagellar segments. Palpi brown to dark brown. Dorsal part of rostrum and nasus dark brown. Spot below antennal bases and spot between eye and frontal tubercle small. Genae and postgenae pale yellow; vertex yellow to brownish yellow. Occipital marking large with strongly convex lateral margins, triangular in front (shape more or less as figured for *sullingtonensis*, fig. 30), shining all over or with narrow dull margins. Hairs of vertex and postgenae short to moderately long, not densely set. Marks on inner part of postgenae distinct.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes small, shining. Scutellum brown to dark brown, median region sometimes black. Parascutellae yellow, at wing-base dark brown. Anatergite ranging in colour from brown to dark brown, darker than anterior half of katatergite but lighter than posterior half of katatergite. Small triangle just behind ventral contact of fore coxae black. Femora light brown, tips darkened. Tibiae dark brown. Tarsi dark brown to black. Wings light brown toned; wing-stigma distinct, brown to dark brown, with macrotrichiae.

Abdomen ♂: Yellow to brownish yellow. Dark brown dorsal stripe widely interrupted halfway tergite 2 and by lighter coloured tergite hind margins. Dorsal stripe broad at tergite 1 and usually at anterior half of tergite 2; at posterior half of tergite 2 and at tergites 3-7 posteriorly widened, sometimes in contact with large, elongate, lateral spots at posterior corners of tergites. Tergite 2 moreover with large spots at anterior corners and halfway. Sternites yellow with a narrow, brown, median stripe, broadly interrupted by lighter coloured sternite hind margins. Sternite 8 darkened except for surroundings of median projection. (fig. 57).

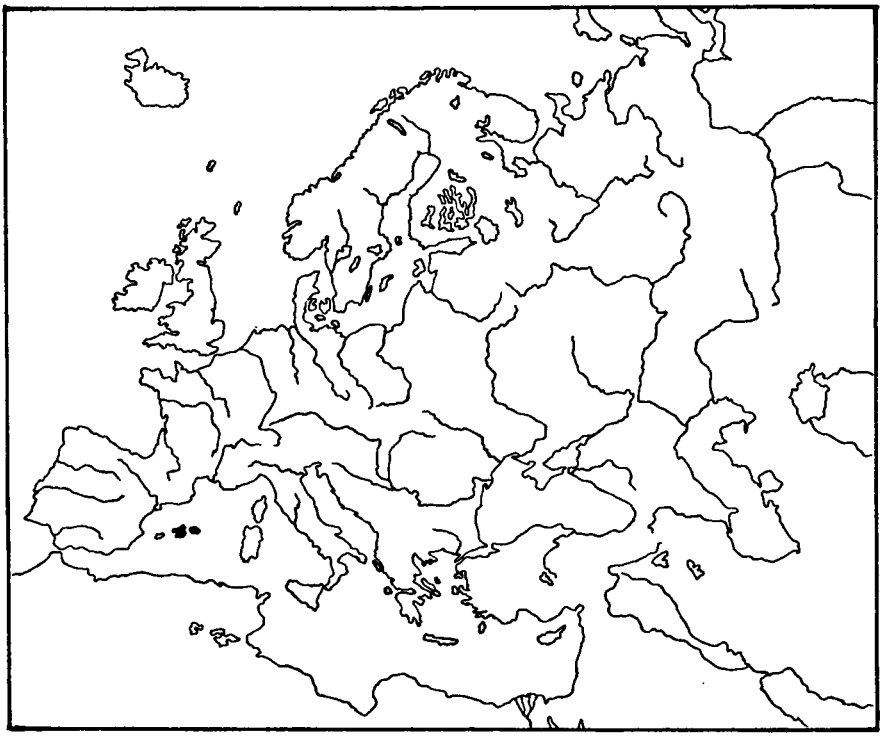
Hypopygium: Brownish yellow. Median projections of posterior extension of tergite 9 small (fig. 58). Posterior half of od less hairy than anterior half (fig. 59). Dorsal crest of id rounded (fig. 60). Adminiculum as in fig. 61. Aedeagus as in fig. 62. Median projection of sternite 8 small, longer than wide and dorsally flattened; pubescent, at tip with short hairs (fig. 63).

Female: Resembling the male. Verticils up to slightly longer than flagellar segments. Abdominal stripe very broad at tergite 1, broad at tergites



Figs 57—65. *N. lempkei*. 57, abdomen, lateral view; 58, posterior extension of tergite 9, dorsal view; 59, od, outside; 60, id, outside; 61, adminiculum, lateroposterior view; 62, aedeagus, lateral view; 63, median projection of sternite 8, lateral view; 64, hypovalvae, dorsal view; 65, furca and sternum 9, dorsal view.

2-6, at tergite 7 narrow, widely interrupted halfway tergite 2 and by lighter coloured tergite hind margins. On posterior half of tergite 2 and on tergites 3-6 distinctly triangular towards tergite hind margins (in one female in contact with lateral stripe). Tergites laterally with a dark brown stripe with small intervals in front of middle of tergites. Sternites with a narrow, brown, median stripe, widely interrupted by lighter coloured sternite hind margins. Tergite 10, cerci, sternite 8 and hypovalvae reddish brown. Tergite 10 laterally and medially darkened. Sternite 8 with dark brown spots laterally. Anterior ends of hypovalvae confluent with egg-slide (fig. 64). Furca and sternum 9 as in fig. 65. The eighth sternite gradually narrows to the point where it passes into the hypovalvae.



Map 7. Distribution of *N. lempkei.*

Distribution: map 7

Biology

The species is known to fly from 21 April till 20 May. Lempke collected this species in a vegetation of grasses under scrubs; the specimens collected by Post are from a *Quercus ilex* vegetation.

Discussion

The characters which differentiate this species from the other species of this section are discussed under *sullingtonensis*.

Etymology

The species is named after Mr. B. J. Lempke, who contributed a lot of interesting Tipulidae to the collection of the Instituut voor Taxonomische Zoölogie, Amsterdam.

Section 3

The species of this section, viz. *appendiculata, minuscula* and *theowaldi*, are very similar. *N. theowaldi* and *N. appendiculata pertenua* are new to science.

Nephrotoma appendiculata (Pierre, 1919)
Figs 66-75, diagram 4 and 5, maps 8 and 9

Synonymy:

Pachyrhina appendiculata Pierre, 1919, Bulletin de Muséum d'Histoire naturelle, 1919: 618—9, figures.

Pales appendiculata: Mannheims, 1951a: 33-4, 41; 1951c: 228; 1954a: 149; 1964d: 112; Savchenko, 1973b: 141.

Nephrotoma appendiculata: Theowald, 1971: 220; Stubbs, 1973: 103-6, biology; Klopp, 1974: 163, figures, biology; Stubbs, 1974: 129, biology; Oosterbroek, 1975: 121-2.

Tipula maculata Meigen, 1804, Klassifikazion und Beschreibung der europäischen Zweiflügeligen Insekten, 1: 71-2.

Pachyrhina maculata: Westhoff, 1882: 48, figures, biology; Verrall, 1886: 119; Bergroth, 1888: 655; Kowarz, 1894: 7; Strobl, 1895: 85, biology; Ord, 1897: 194; Strobl, 1900a: 656; 1900b: 207; Thalhammer, 1900: 20; Strobl, 1904: 575; 1906: 405-6; Lundström, 1907: 25; Strobl, 1909b: 134; Riedel, 1910: 428-9, 433-4; Czižek, 1911: 78-81; figures; Lundström, 1912: 47; Vimmer, 1913: 18; Nielsen, 1918: 10; Riedel, 1918/1919: 5; Pierre, 1919b: 618; Riedel, 1919b: 18; 1920: 15; Goetghebuer & Tonnoir, 1921: 123; Brolemann, 1923: 498-501, figures; Pierre, 1924a: 29, figures, biology; Weigand, 1924: 46; de Jong, 1925: 42-3, 54, biology; Balachowsky & Mesnil, 1935: 869-70, figures; Zangheri, 1949: 12; Simova, 1959: 126.

Pales maculata: Audcent, 1932: 9; Mannheims, 1951a: 17, 33-5, 37-40, figures; 1951c: 228; Stackelberg, 1951: 741; Fischer, 1952; 120; Hemmingsen, 1952: 409, 417; Mannheims, 1953: 2; 1954a: 151; 1954b: 32, 40; Miller, 1954: 874; Theowald, 1956: 157, 1957a, 227, figures, biology; 1957b: 10-1, biology; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961: 249; Erhan, 1962: 93, figures; Hemmingsen, 1962: 140; Höchstetter, 1962: 38, 47-8, 79; Simova, 1962: 101; Mannheims, 1963: 38; Mannheims & Pechlaner, 1963: 6, 13, biology; Mannheims, 1964c: 107; Savchenko, 1966a: 466-9, figures; 1966d: 119; Zangheri, 1969: 1023-4; Savchenko, 1973b: 140-3, figures, biology; Simova, 1974: 26.

Nephrotoma maculata: Nielsen, 1925, 157-8, figures; Alexander, 1931: 145, 148, biology; Lackschewitz, 1933: 249; Edwards, 1939: 244; Nielsen, 1941: 96; Coe, 1950: 9; Parmenter: 1950: 108, biology; Tjeder, 1955: 246-7; Coe, 1960: 44, biology; Theowald, 1967: 22, 63-4, biology, Tjeder, 1967: 21; Freeman, 1968: 342, 346; Starý & Martinovský, 1969: 8; Hartig, 1971: 124.

Tipula maculosa Meigen, 1818, Systematische Bemerkungen, 1: 197; Macquart, 1826: 77; Brullé, 1832: 625; Schummel, 1833: 144-5, biology; Zetterstedt, 1838: 845 (=*flavescens*).

Pachyrhina maculosa: Macquart, 1834: 89; Staeger, 1840: 26; Zetterstedt, 1851: 3997-9; 1880: 6544; Schiner, 1864: 506; van der Wulp, 1866: 17; Palm, 1869: 407; Grzegorzek, 1873: 27; van der Wulp, 1877: 381-2; Beling, 1878: 36-7, biology; Westhoff, 1880: 49, biology; Wallengren, 1882: 15; Westhoff, 1882: 48, biology; Verrall, 1886: 119; Bergroth, 1888: 655; Huguenin, 1888: 20; van der Wulp & de Meijere, 1898: 29; Jacobs, 1903: 352; Mannheims, 1951a: 37-9: Theowald & Mannheims, 1956: 248; Mannheims, 1964c: 107; 1965: 7; 1966a: 275; 1966b: 490-1; Savchenko, 1973a: 37; 1973b: 141.

Nephrotoma maculosa: Cuthbertson, 1926: 86, biology; Edwards, 1928: 188; 1938: 97-8, figures; Mannheims, 1967c: 152; 1969: 187; Hartig, 1971: 123-4.

Nephrotoma appendiculata appendiculata (Pierre, 1919)

Figs 66-74, diagram 4, map 8

Type-material

Nephrotoma appendiculata (Pierre): Holotype: ♂, Macédoine, Starova, Cap^e. Vuillaume, 1918/ Pales maculata Meig. det. Mannh. 47/ Type; (MNHNP; v! M, 1947; v! O, 1976).

Nephrotoma maculata (Meigen): in MNHNP: 1 ♂, 2 ♀ (v! M, 1951; v! O, 1976).

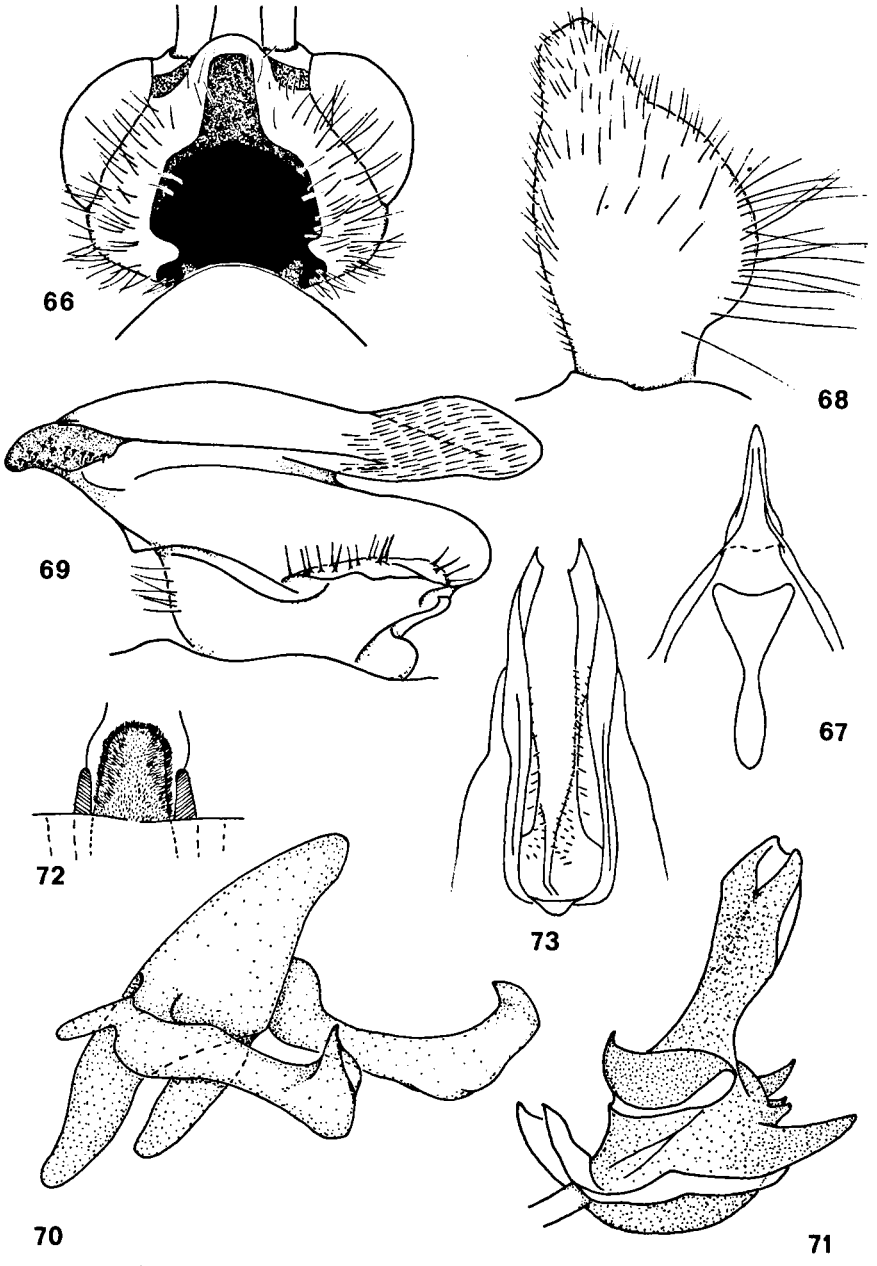
Material examined (658 ♂♂, 347 ♀♀, types not included) originated from the following countries: Sweden (Simlinge in Skåne), Great Britain, Netherlands, Belgium, West Germany, East Germany (Forst Grumsin), Czechoslovakia, France, Switzerland, Austria, Romania, Italy (Sardinia), Yugoslavia, Albania, Greece, Turkey, Lebanon.

Description

Body length ♂: 10-15 mm, ♀: 11-15 mm; wing length: 10-14 mm.

Head ♂: Scape and pedicel dark brown to black; flagellar segments black. Verticils up to almost as long as flagellar segments. First flagellar segment 1.1 × length of second one. Palpi dark brown to black. Nasus and dorsal part of rostrum black; black colouration posteriorly often in contact with dark spot below antennal bases and laterally extending along border of genae and rostrum. Genae, postgenae and vertex yellow to brownish yellow, vertex usually slightly darker than genae and postgenae. Dark brown spot between eye and frontal tubercle conspicuous. Hairs on vertex and postgenae normally long and densely set. Occipital marking large, dark brown to black, shining except for dull lateral margins and anterior part (fig. 66). The shape of the occipital marking is usually as figured, but ranges from triangular to rounded (lateral margins strongly convex). Marks on inner part of postgenae large.

Thorax ♂: Pronotum dorsally yellow, laterally black. Prescutal stripes black, shining. Downwardly bent anterior ends of lateral prescutal stripes shining and large, almost or actually in contact with paratergite. Scutellum more or less transparent, ranging in colour from light brown to black. Parascutellae yellow, darkened at wing-base. Pleural markings distinct,



Figs 66—73. *N. appendiculata appendiculata.* 66, head, dorsal view; 67, furca and sternum 9, dorsal view; 68, od, outside; 69, id, outside; 70, adminiculum, lateroposterior view; 71, aedeagus, lateral view; 72, median projection of sternite 8, ventral view; 73, hypovalvae, dorsal view.

black. Anatergite black. Small triangle just behind ventral contact of fore coxae black. Wings toned light brown; wing-stigma usually faint, sometimes darkened (dark brown in specimens from Sardinia and the Cyclades in which also the body colour is darker). Wing-stigma usually with macrotrichiae. Coxae basally with distinct, black markings. Femora and tibiae light brown to dark brown, tips darkened. Tarsi black.

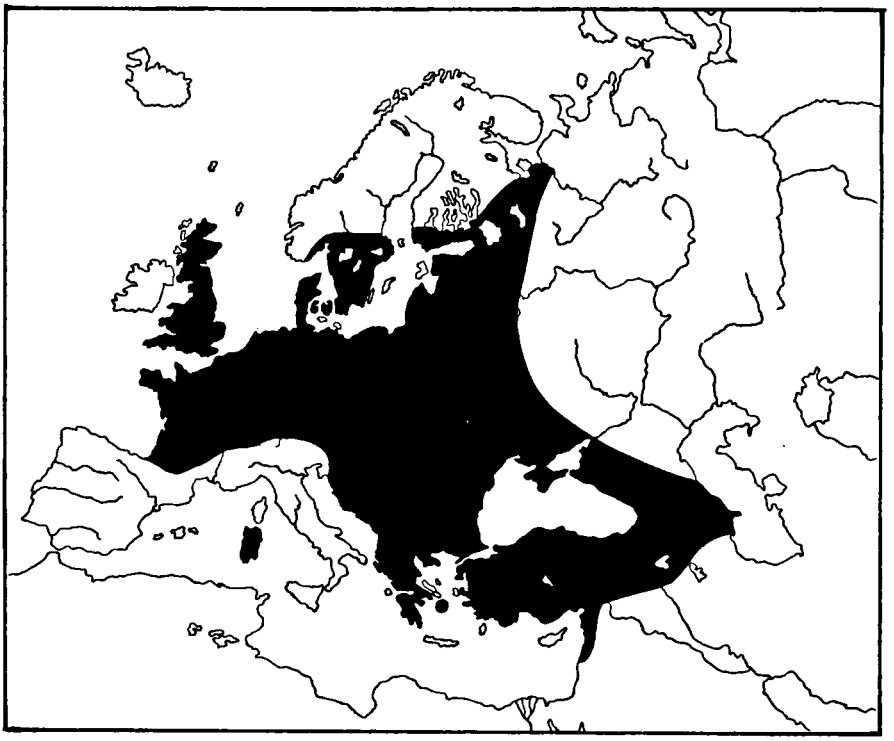
Abdomen ♂: The broad dorsal and ventral stripes are interrupted on the posterior margins of the segments which are narrowly lighter coloured. The lateral margins of the tergites have an irregular, broad, light to dark brown stripe, which is in general most distinct on the anterior corners. Tergite 2 with two, large, lateral dots. The abdomen is yellow to reddish brown between the dorsal, ventral and lateral stripes. The eighth segment has the lateral parts of the tergites broadly yellow to reddish brown, whereas the sternite is usually conspicuously darkened, except for the surroundings of the median projection.

Hypopygium: Normally light brown but ranging in colour from yellow to reddish brown, in tergite 9 even to black. Sternites 8 and 9 densely set with long hairs. The posterior extension of the ninth tergite has roundish, rather stout median projections, which only slightly protrude beyond the almost straight outer margin (fig. 74 A&B). Od large but short, the posterior margin with very long hairs (fig. 68). Id oblong, the elongate crest inserted posteriorly (fig. 69). Adminiculum on each side with a posteriorly directed prong, of which the tips are distinctly upcurved (fig. 70). Median projection of sternite 8 dorso-ventrally compressed, visible part about two times longer than wide. The projection is pubescent, the lateral margins and tip are shortly hairy (fig. 72). The red-brown sclerotizations along the mid-ventral, membranous part of the ninth sternite are small (fig. 72). Aedeagus as in fig. 71, the small compressor apodeme only slightly bilobate.

Female: Resembling the male. Verticils longer than flagellar segments. Dorsal abdominal stripe straight or, less frequently, triangular towards posterior margins of tergites; in a few specimens on each tergite with distinctly concave lateral margins (as figured for *theowaldi*, fig. 82 A). Tergite 8 and sternite 10 yellowish brown to conspicuously reddish brown. Tergite 10 usually darkened dorsally and with two dark spots at lateral part of anterior half. Sternite 8 sometimes with two, large, dark brown spots laterally. Eggslide long, bearing small spines and forming a vertical septum between anterior ends of hypovalvae. The eighth sternite gradually narrows to the point where it passes into the hypovalvae (fig. 73). Furca and sternum 9 as in fig. 67.

Distribution (see also discussion): map 8

In Scandinavia the subspecies is known from southern Finland (Mannheims, several papers), southern Sweden (Tjeder, 1967) and southern Norway (after one specimen only, mentioned by Lackschewitz, 1933: 249, from



Map 8. Distribution of *N. appendiculata appendiculata.*

Røken, near Oslo, in the Siebke collection); the statement by Savchenko (1973b: 142) that *appendiculata* occurs in Lapland is in all probability erroneous. The *maculosa* of Zetterstedt (Insecta Lapponica, 1838: 845) is in general interpreted as *flavescens*; although not actually known from Lapland, this species has a more northerly distribution than *appendiculata.*

Biology

N. a. appendiculata is usually found in open grasslands, along hedgerows and streams, in scrub vegetations and along edges of woods, rarely within woods. Sometimes mass aggregations occur. In 1975 and 1976 about a thousand specimens were collected in one of the new polders of the IJsselmeer (Netherlands), where it was flying in a pioneer vegetation of grasses and herbs on clay. Also Savchenko reports that *a. appendiculata* is frequent and sometimes found in large numbers, especially on damp but not inundated meadows and, in higher and dryer situations, in scrubs.

According to Beling, De Jong, Höchstetter and Savchenko the eggs are laid 3-4 days after copulation and the oviposition takes place in damp soils, 0.3-1.0 cm below the surface. About 175-275 eggs are laid which stay for two and a half months in diapause and hatch at the end of the summer. The

young larvae feed on decaying plants, older larvae also on roots of grasses, including cultivated ones. At the end of autumn most larvae reach their last (4th) instar, the stage in which they hibernate. In spring they start feeding again. The full grown larvae can cause damage to oats, rye, sugarbeets, flax, cabbage and (Cuthbertson) coniferous seedlings. Not only the roots, but also the young petioles are affected. Damage is most frequent in low, damp soils, mainly after the sowing of biennial cerials and can be facultative, only occurring if not enough organic matter is left after the earth has been ploughed. Pupation occurs in May at the surface. At a temperature of 21.5°C. the adults hatch after 7-8 days.

In the Pyrenees (Gavarnie) *a. appendiculata* is not found beyond 1400 m. In Yugoslavia (Kotor), Turkey (Cubak Baraj) and, according to Savchenko (1973b: 143) in the Caucasus the collecting altitude was 1000 m.

The period of flight is shown in diagram 4.

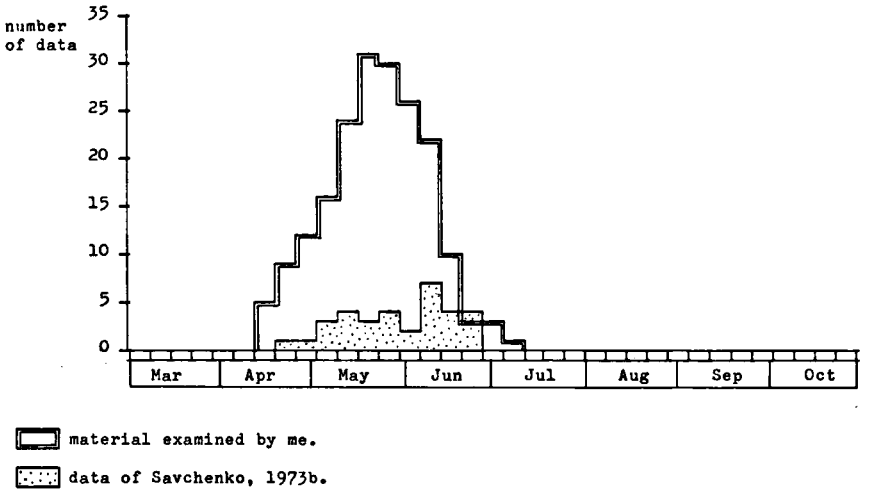


Diagram 4. Period of flight of *N. appendiculata appendiculata.*

Discussion

Pierre described *appendiculata* after one male from Starova, Makedonija. The species is identical with *Tipula maculata* Meigen, 1804. The name *maculata* was replaced by Meigen (1818: 197) by *maculosa* because the former name was preoccupied by *Tipula maculata* Linnaeus, 1758. The name *maculosa* however is preoccupied by *Tipula maculosa* Gmelin in Linnaeus, 1790. The synonymy of *appendiculata* with the Meigen species was already mentioned by Mannheims (1951c: 228) but only since Theowald (1971: 220) the name *appendiculata* is used.

The species of this section are in fact so similar that the males can be with certainty identified by their hypopygial characters only. One of these

characters is the length of the od: short in *appendiculata* (fig. 68), of average length in *minuscula* (fig. 77), and very long in *theowaldi* (fig. 84). The females of *minuscula* can not with certainty be distinguished. The females of *theowaldi* differ in the number of dark spots on the eighth sternite; two large ones and in front of these, two smaller and even darker ones (fig. 82 B). In *appendiculata* these smaller spots are always lacking and the larger ones are usually much less pronounced than in *theowaldi* (exception: 1 ♀ from Yugoslavia, Otocac, and 1 ♀ from Sardinia with the large spots very distinct, black; the small spots nevertheless lacking). How far this difference between females of *appendiculata* and *theowaldi* will prove to be reliable, has to be checked if more material of the latter species becomes available. *N. a. appendiculata* differs from the new subspecies *pertenua* in the shape of the posterior extension of the ninth tergite only. The distributional areas of the two forms are obviously widely apart. They are separated by the Pyrenees in the west and the Alps in the east. In the intermediate region, southern France, *pertenua* is known from localities very near to the Mediterranean coast only. The most northern locality in France is Moustiers Ste Marie, lying at a distance of 65 km from the coast. On the other hand, the typical form does not cross the line Andorra - Toulouse - Lyon - Geneva in south-easterly direction.

Savchenko (1973a: 37) mentioned that in the Caucasus, *appendiculata* and *cornicina* exhibit melanism. Such specimens of *appendiculata* are not examined by me.

Nephrotoma appendiculata pertenua subsp. nov.
Figs 75 A&B, diagram 5, map 9

Type-material

Holotype: ♂, Italia, Cattolica, 20-30.IV.60, A. P. Vink; (ZMA).

Paratypes: 9♂, 1♀, labeled as the holotype; (ZMA). 2♂, 1♀, Italia, Varese; 6.IV.1972, leg. Katwijk; (ZMA). 1 ♂, Lazio, Italia, Lago di Fondi, 17.III.64, Coll. F. Hartig; (ZMA). 4 ♂, France, (Alpes-Mar.), Antibes, 15-4-1954, C. N. Cock; (ZMA). 7 ♂, France, (Alpes-Mar.), Vence, 18-4-1954, C. N. Cock; (ZMA). 1 ♂, France, A. M., Vence, 9-IV-1961, G. Kruseman en J. Stock; (ZMA). 1 ♂, 1 ♀, France, A. M., Villeneuve-Loubet, 9-IV-1961, G. Kruseman en J. Stock; (ZMA). 2 ♂, France, A. M., Colomars Gare, 12-IV-1961, G. Kruseman en J. Stock; (ZMA). 2 ♂, 2 ♀, France, A. M., le Rouret, 9-IV-1961, G. Kruseman en J. Stock; (ZMA). 1 ♂, Corsica, 10-25-iv.1928, F. W. Edwards, B. M. 1928-214/ Corte, R. Restonica/ maculosa Mg var., F. W. Edwards. det. 1928; (MAK). 1 ♂, Corse; Col de Bavella, Alt. 1250 m, 6-VI-1972, L. Matile rec; (MNHNP). 1 ♂, 1 ♀, Sicilia, Toarmina, 26-31.III.21, leg. Maidl; (MAK). 1 ♂, 1 ♀, Sicilia, Segesta, 12.IV.55, F. Keiser; (MAK). 1 ♂, Marocco, Rifgebied, 13-IV-1961, J. Dorgelo/ Dardara, 9 km Z.W. v. Xauen; (ZMA). 1 ♂, 1 ♀, Spanien, S. Nevada, 2000-2500 m, 14. V. 1955,

Mannheims; (ZMA). 1 ♂, España, Gerona, Caldas de Malavella, 14.III.1966, M. C. et G. Kruseman; (ZMA).

Material examined (92 ♂♂, 68 ♀♀, types not included) originated from the following countries: France, Portugal, Spain, Italy, Malta, Morocco.

Description

N. a. pertenua is identical with the typical subspecies, differing in the shape of the posterior extension of the ninth tergite only: the median projections are less robust and they well exceed beyond the posterior margin (fig. 75 A&B). Females are not distinguishable, in general *pertenua* is to a larger extent coloured black and has a darker wing-stigma.

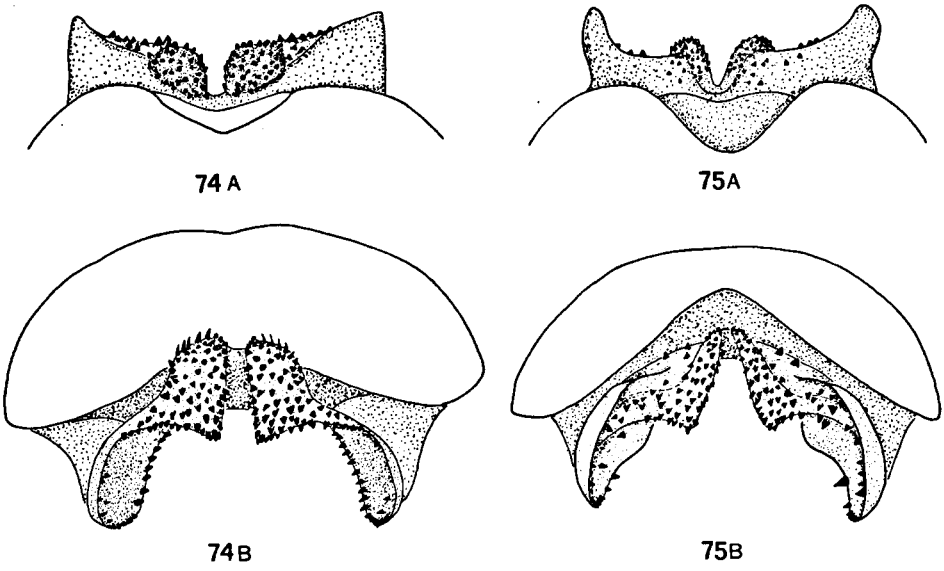


Fig. 74. *N. appendiculata appendiculata*, posterior extension of tergite 9: A, dorsal view, B, posterior view.

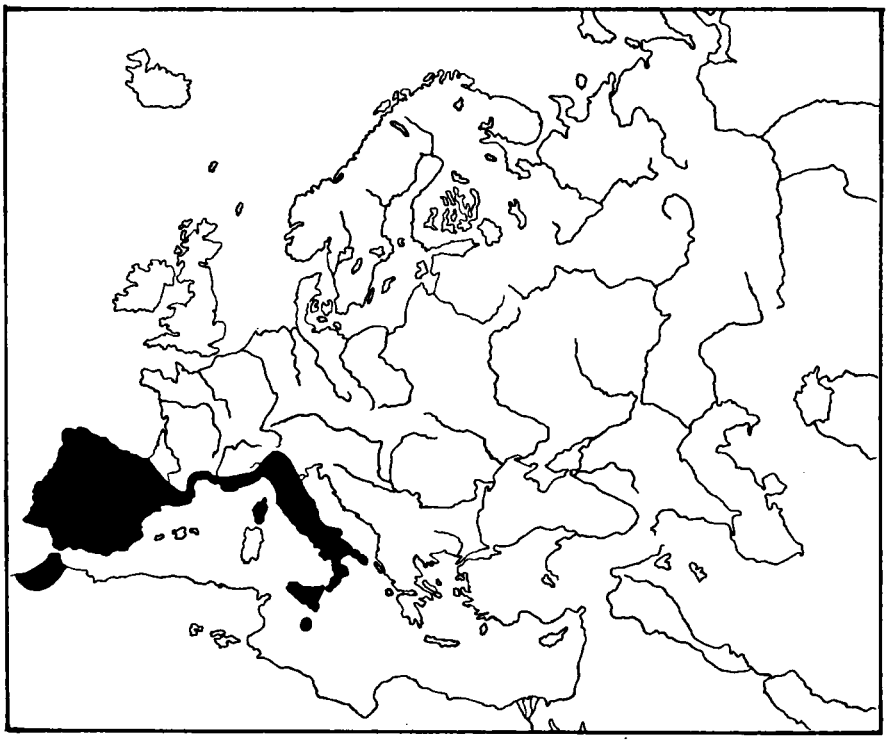
Fig. 75. *N. appendiculata pertenua*, posterior extension of tergite 9: A, dorsal view, B, posterior view.

Distribution: map 9

The distributional areas of *pertenua* and *appendiculata* are compared under the latter subspecies. *N. a. pertenua* is not known from Sardinia, where the typical form occurs.

Biology

Edwards (1928: 188) collected "*maculosa*" on dry hill sides. One of his specimens is designated here as paratype. The *maculata*, recorded by Strobl



Map 9. Distribution of *N. appendiculata pertenua.*

(1900b: 207; 1906: 405-6), and collected in meadows, judging from the distributional information, belongs to *pertenua.* In northern Spain (Potes, Raiño), I collected *pertenua* in scrub vegetations and in hedgerows, bordering inundated grassland.

Of *pertenua* only two altitudes above 1000 m are known: Spain, Sierra Nevada, 2000 m, and Italy, Lucania, 1050 m.

The period of flight is shown in diagram 5.

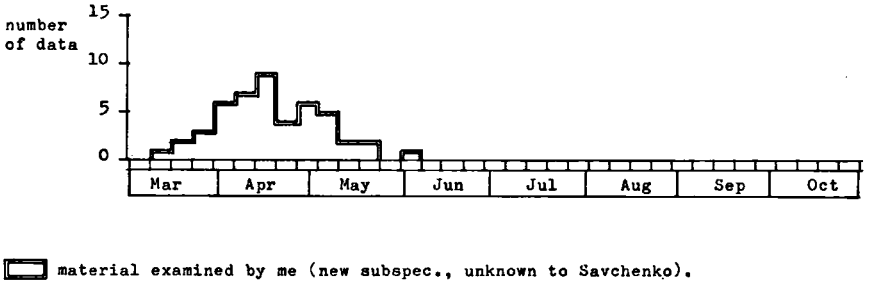


Diagram 5. Period of flight of *N. appendiculata pertenua.*

Etymology

The name *pertenua* means "hardly perceptable" and is given to this form because of the minor difference with the typical *appendiculata.*

Nephrotoma minuscula (Mannheims, 1951)
Figs 76-80, map 10

Synonymy:

Pales minuscula Mannheims, 1951a, Die Fliegen der palaearktischen Region, Lief. 167: 33-5, 40-1, figures; Hemmingsen, 1962: 140; Savchenko, 1973b: 144, figures.
Nephrotoma minuscula: Theowald, 1972b: 133 (= *theowaldi*).

Type-material

Holotype: ♂, Jerusalem, Scopusberg, 16.II.23, J. Ahori/ det. maculata Riedel; (coll. Lindner, Stuttgart; v! O, 1976).

Paratypes: 4 ♂, 3 ♀, Anti-Libanon, Zebdani Syr, Mai 31 Kulzer/ Zool. Staatsslg. München/ Pales minuscula n.sp. Mannheims det. 1950; (2 ♂, 2 ♀, Zool. Staatsslg. München; 2 ♂, 1 ♀, MAK; v! O, 1976). 1 ♀, according to Mannheims (1951a: 40) a "Paratopotypoid, 9.III.23" (coll. Lindner, Stuttgart).

Mannheims' list of type-material also mentions 3 ♂, 3 ♀ paratypes from Asia Minor (MNB, collection Loew) and 1 ♂, 2 ♀ paratypes from Beirut and Brumana (MNB, collection Becker). Dr. Schumann of the MNB kindly confirmed that these nine types are in Berlin. Out of the collection Loew, 2 ♂, 2 ♀ were sent to Amsterdam. These specimens were labeled as follows: 1 ♀ with a small blue label, the other three specimens with a small yellow label; all underneath this first label a small purple label; 1 ♂ had a third label with the number 9215: all four of them were labeled: Pales minuscula n. sp. and 1 ♀: Mhs. det., 1 ♀: Mhs. and the 2 ♂: G. sn. 50; finally all four bore the label: Paratypus. These four paratypes of *minuscula* turned out to belong to *N. theowaldi* n. sp. Dr. Schumann, who checked the five paratypes, left in Berlin, informed me that the third male in the collection Loew also belongs to *theowaldi* and that the male paratype from Brumana is a *minuscula.* The female paratypes were not identified by Dr. Schumann, we may assume however that the two females from Beirut in the collection Becker belong to *minuscula.*

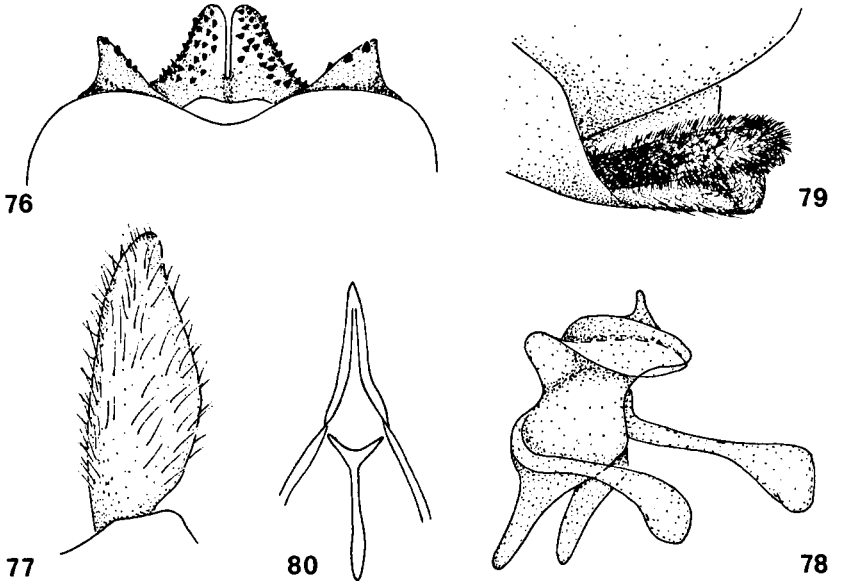
Material examined (63 ♂♂, 20 ♀♀, types not included) originated from the following countries: Greece (Cyprus), Turkey (Antiochia, Belen in Amanus Mts), Lebanon (Beirut), Israel (Haifa, Jerusalem, Caesarea, Nahr ez Zerkâ).

Description

Body length ♂: 9-10 mm, ♀: 11-14 mm; wing length: 10-13 mm.

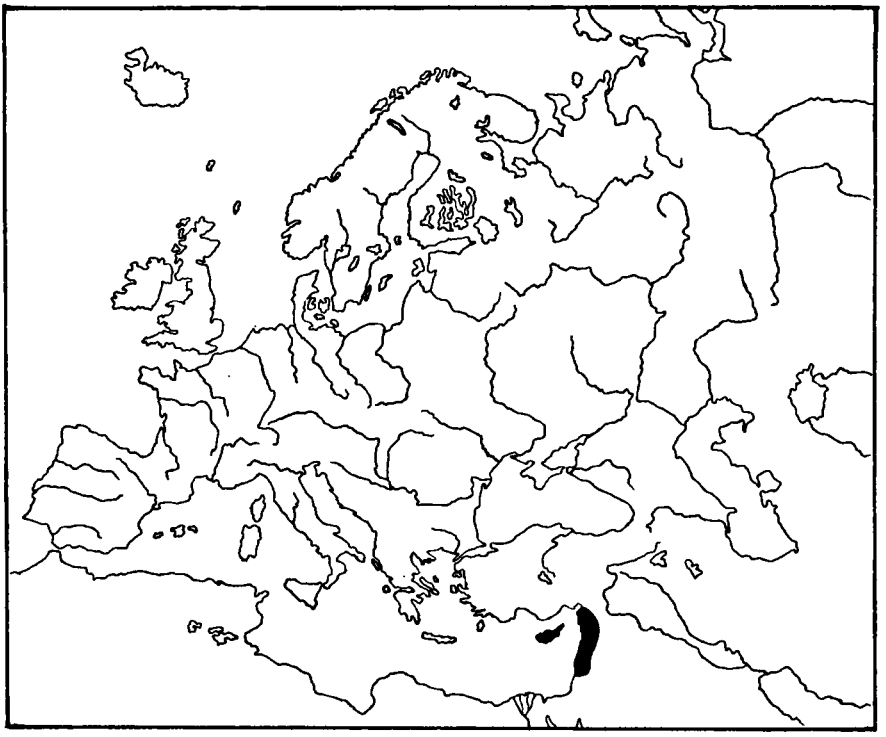
N. minuscula differs from *appendiculata* mainly in the hypopygial charac-

ters: The posterior extension of the ninth tergite has very elongate median projections, which are near to each other (fig. 76). The lateral shells of the median projection are small with the ventral margins straight (*appendiculata* has large, rounded ventral margins, fig. 74 B and 75 B). The od is elongate and without very long hairs at the posterior margin (fig. 77). The crest of the id is less prolonged posteriorly. The long, posterior rods of the adminiculum are directed downwards (fig. 78). The aedeagus is as in *appendiculata* with the short compressor apodeme only slightly bifurcate (fig. 71). The median projection of the eighth sternite is broad, especially the flattened dorsal half, which is densely set with relatively long, red-brown hairs (fig. 79).



Figs 76—80. *N. minuscula*. 76, posterior extension of tergite 9, dorsal view; 77, od, outside; 78, adminiculum, lateroposterior view; 79, median projection of sternite 9, lateroposterior view; 80, furca and sternum 9, dorsal view.

The females of *minuscula* and *appendiculata* are hardly distinguishable. The furca of *minuscula* (fig. 80) is smaller than the furca of *appendiculata* (fig. 67). In general the wing-stigma is darker coloured in *minuscula*. The number of macrotrichiae in the wing-stigma of *minuscula* is usually less than in *appendiculata* (in *minuscula* ranging from 0-16, usually less than 5, in *appendiculata* ranging from 0-37, usually between 10 and 20; examined are 95 *appendiculata* males and 44 *appendiculata* females from Turkey, 56 *minuscula* males and 21 *minuscula* females; when analyzed with the student's t test, the difference between male and female *appendiculata* is not significant, the difference between male and female *minuscula* is weakly significant, $5<P<10\%$, and the difference between *appendiculata* and *minuscula* is, after pooling of the sexes, strongly significant, $t=12.3$, $df=214$, $P\ll 0.5\%$).



Map 10. Distribution of *N. minuscula.*

Distribution: map 10

Biology

N. minuscula is one of the earliest species, already known from 17 January (Beirut) and 16 February (Jerusalem). It flies till the beginning of May. The habitat is not known.

Discussion

The species *appendiculata* and *minuscula* are very similar. The only reliable characters to separate them are found in the male hypopygia and in the furca of the female. The body size and wing length, used by Mannheims (1951a) to distinguish the species, has no validity; the average *appendiculata* indeed is larger than *minuscula,* but smaller specimens of the former are frequent, especially in southern areas.

Nephrotoma theowaldi spec. nov.
Figs 81-87, map 11

Synonymy:

Nephrotoma minuscula: Theowald, 1972a:133 (=*theowaldi*).

Type-material

Holotype: ♂, Asia Minor, Turkey, Kusadasi, 19-22.IV.1974, W. H. Gravestein et S. J. van Ooststroom; (ZMA).
Paratypes: 1 ♂, 4 ♀, labeled as the holotype, the ♀♀ with the date 10-16.IV.1974; (ZMA). 1 ♂, 2 ♀, Asia Minor, Turkey, Ephesos, 13.IV.1974, W. H. Gravestein et S. J. van Ooststroom; (ZMA). 1 ♂, Kruising weg Rhodos - Kattavia en de Gaduras, 5-IV-1971/ Hellas, Rhodos, V. S. v.d. Goot; (ZMA). 1 ♀, Ellas, Rodos, 10 km N v. Malona, 11.IV.1970, A. C. et W. N. Ellis; (ZMA) (Dr. W. N. Ellis informed me that the two last-mentioned localities are the same). 1 ♂, 3 ♀, Turkey, Aydin, Bozdagan, 200 m, 22.iv.1962, Guichard & Harvey, B. M. 1962-229 / [only the ♂] Nephrotoma sp. nr. maculata Mg. appendiculata Pierre? ?, det. R. I. Vane-Wright, 1963, (Note long Od-cf. maculata); (BMNH). 1 ♂, Hellas, Ródhos, Attaviros, 24-IV-1975, H. G. M. Teunissen; (ZMA). 1 ♂, Asiatic Turkey, Izmir-Bornova, 8-10.iv.1932, N. Shevket bey; (BMNH).

Material examined (types not included) are 2 ♂, 3 ♀, paratypes of *minuscula* (discussed under *minuscula*) and 1 ♂, (MAK), without locality, identified by Riedel as *maculosa*, by Mannheims as *minuscula*.

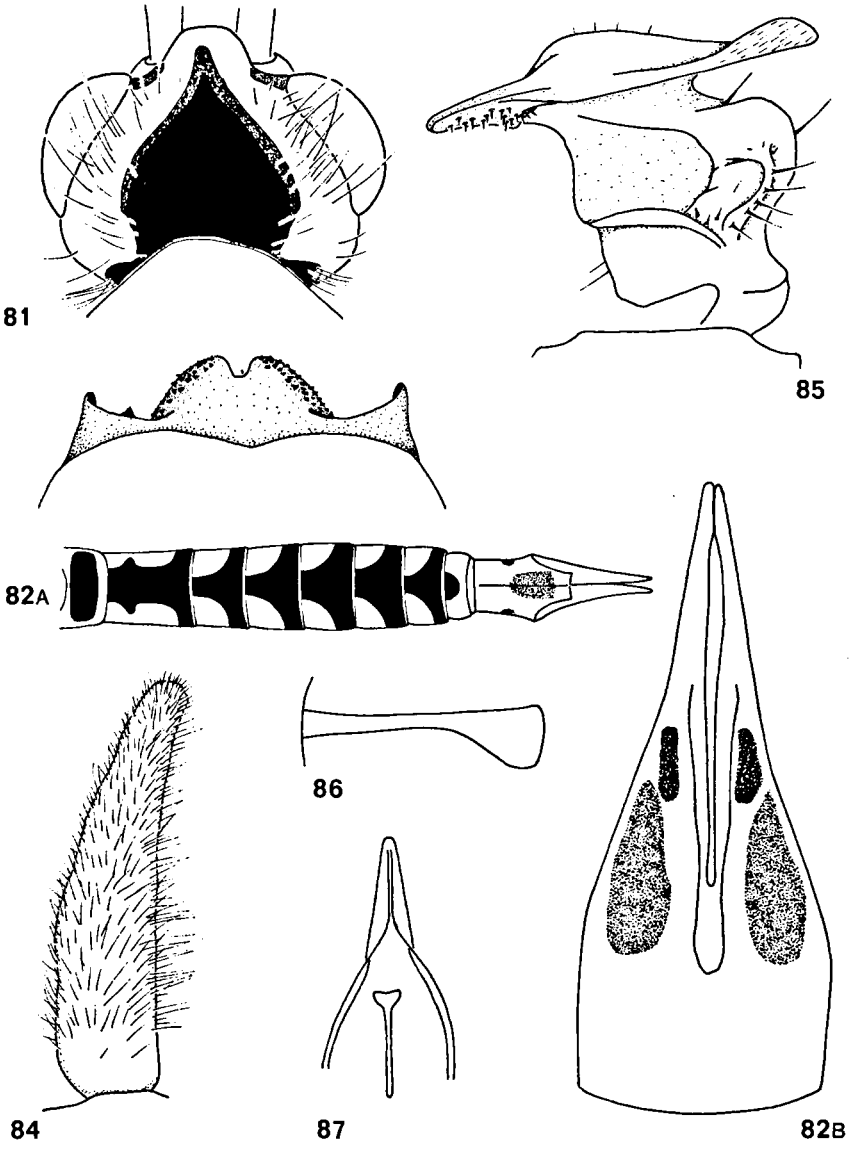
Description

Body length ♂: 10 mm, ♀: 12-15 mm; wing length: 10-13 mm.

Head ♂: Scape and pedicel dark brown; flagellar segments black. First flagellar segment 1.1 × length of second one. Verticils almost as long as flagellar segments. Palpi dark brown. Nasus and dorsal part of rostrum black, shining. Genae yellow; vertex brownish yellow; postgenae orange-yellow. Brown spot below antennal bases distinct. Brown spot between eye and frontal tubercle small. The large and black mark on the occiput is convex laterally and triangular in front; the lateral and anterior margins are dull. Hairs on vertex and postgenae long, moderately densely set (fig. 81). Marks on inner part of postgenae distinct.

Thorax ♂: Pronotum dorsally yellow, laterally black. Downwardly bent anterior ends of lateral prescutal stripes large and shining. Pleural markings distinct. Anatergite black. Scutellum more or less transparent, brown to black. Parascutellae yellow, darkened at wing-base. Small triangle just behind ventral contact of fore coxae black. Femora light brown, tips darkened. Tibiae brown, tips darkened. Tarsi dark brown to black. Wings toned light brown; wing-stigma distinct, brown, with macrotrichiae.

Abdomen ♂: The broad, dark brown dorsal stripe distinctly widens

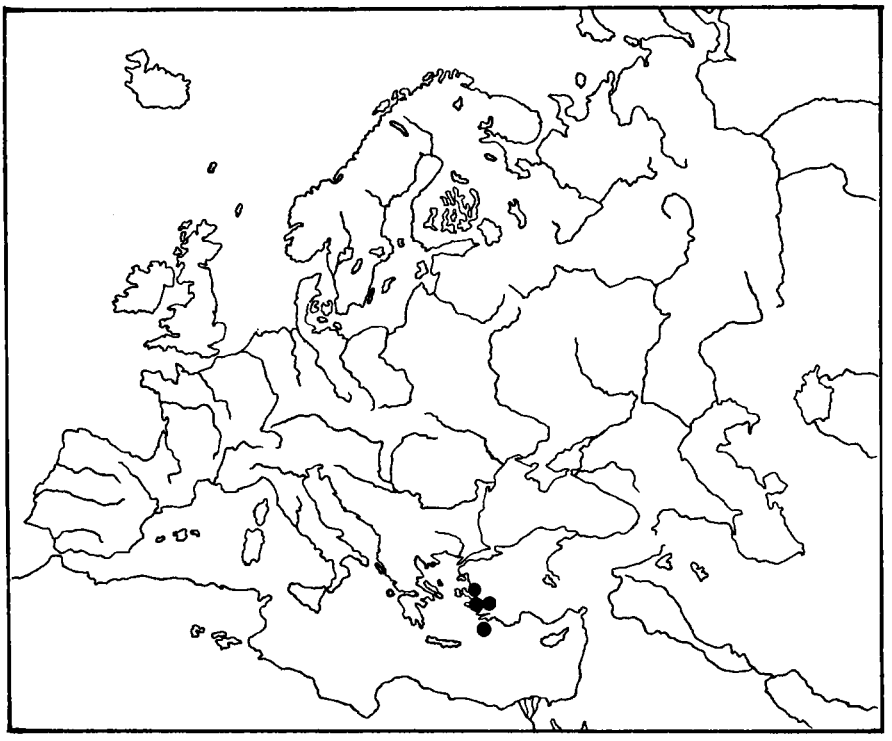


Figs 81—87. *N. theowaldi*. 81, head, dorsal view; 82, abdomen female: A, dorsal view, B, hypovalvae, ventral view; 83, posterior extension of tergite 9, dorsal view; 84, od, outside; 85, id, outside; 86, posterior appendage of adminiculum, lateral view; 87, furca and sternum 9, dorsal view.

towards the hind margins of the tergites (fig. 82 A). Lateral margins of tergites with a broad, light to dark brown stripe, with two brown spots on tergite 2 and sometimes at anterior corners of tergite 3. Sternites with a broad, brown, median stripe. Sternite 8 dark brown, except for surroundings of median projection.

Hypopygium: Disk of tergite 9 ranging in colour from light brown to dark brown. The median projections of the posterior extension of tergite 9 distinctly exceed the outer margin and are very close to each other, separated by a small median incision (fig. 83). The lateral shells of the posterior extension are not rounded ventrally as they are in *appendiculata* (fig. 74 B and 75 B), but the ventral margins are straight. Od very long and slender (fig. 84). Id with an elongate beak and crest, the latter is twisted outside around its longitudinal axis (fig. 85). The long, posteriorly directed appendages of the adminiculum have tips directed downwards (fig. 86). The median projection of the eighth sternite and the aedeagus are as found in *appendiculata*. The red-brown sclerotizations along the mid-ventral, membranous part of the ninth sternite are small.

Female: Resembling the male. Verticils longer than flagellar segments. Dorsal stripe of abdomen as in fig. 82 A. Ventral stripe widened posteriorly



Map 11. Distribution of *N. theowaldi*.

on sternites 2 and 3. Lateral stripe on abdomen irregular, light brown to greyish brown, with two spots on tergite 2 and distinct spots at anterior corners of tergites (female of Rhodos without anterior spots). Sternite 8 and tergite 10 yellowish brown to reddish brown. Tergite 10 with two lateral spots and a darkened, central-posterior half. Sternite 8 with a large, dark brown spot on each side and in front of this large one a smaller, even darker spot (fig. 82 B) (the female of Rhodos has the tenth tergite and eighth sternite yellowish brown, both with the above-mentioned spots, but less darkened). Furca and sternum 9 as in fig. 87. Hypovalvae as in *appendiculata.*

Distribution: map 11

Biology

The species is hitherto only collected in April. Ellis collected *theowaldi* on Rhodos in a sandy river bed with an opulent *Cistus* vegetation.

Discussion

The characters distinguishing *theowaldi* from the other species of this section are discussed under *appendiculata.*

Etymology

The species is named in honour of Dr. Br. Theowald, who encouraged me to undertake this revision by his great enthusiasm for the Tipulidae.

SECTION 4

This section contains the species *aculeata* and *tenuipes.* The species *tenuipes* has hairy wing-tips.

Nephrotoma aculeata (Loew, 1871)
Figs 1, 3, 88-97, map 12, diagram 6

Synomymy:

Pachyrhina aculeata Loew, 1871, Beschreibung europäischer Dipteren, Halle, Bd. 2: 20-22; Grzegorzek, 1873: 27; Kowarz, 1873: 455; Strobl, 1895: 84, biology; 1900c: 192; Lundström, 1907: 25; Riedel, 1910: 430-1; Czižek, 1911: 69-74, figures; Riedel, 1918/1919: 5; Pierre, 1919b: 619; Thalhammer, 1920: 20; Broleman, 1923: 504-7, figures; Pierre, 1924a: 27, figures; Simova 1959: 127.

Pales aculeata: Audcent, 1932: 10; Mannheims, 1951a: 17, 33-5, 42-3; Stackelberg, 1951: 740; Fischer, 1952: 120; Theowald, 1952: 47; 1953: 66; Mannheims, 1954a: 151; 1954b: 31, 40; Theowald, 1957: 10-1; Laever & Mannheims, 1958: 231; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961, 249; Erhan, 1962: 96, figures; Zinovjev & Savchenko, 1962: 567-9, biology; Hemmingsen, 1962: 140; Mannheims & Pechlaner, 1963: 6, 13, biology; Mannheims, 1963: 39; 1965: 7; 1966a: 275; Savchenko, 1966a: 461-3, figures; 1966d: 119; Savchenko, 1973b: 131-3, figures, biology; Simova, 1974: 26.

Nephrotoma aculeata: Alexander, 1924a: 448; 1924b: 599; 1925b: 20; Edwards, 1926: 31; Lackschewitz, 1933: 249; 1935: 17, 22; Tjeder, 1936: 135; Edwards, 1939: 244; Grensted, 1944: 176; Coe, 1950: 9; Tjeder, 1955b: 246-7; 1965: 46; Savchenko & Violovich, 1967: 358; Mannheims, 1967c: 152; Starý & Martinovský, 1969: 8; Martinovský, 1971: 50, figures; Theowald, 1971: 228; Hartig, 1971: 124; Savchenko, Violovich & Narchuk, 1972: 77-8, 82-3, 92, biology; Stubbs, 1973: 103-6, biology; Klopp, 1974: 156, figures, biology; Tjeder, 1974: 4.

Nephrotoma aculeata atricauda Alexander, 1924, Philippine Journal of Science, 24: 599; Masaki, 1933: 92.

Pales aculeata atricauda: Savchenko, 1973b: 131-2.

Type-material

Nephrotoma aculeata (Loew): Loew (1871: 20-1), described this species from "Der Harz, Steiermark, Kärnten und das Bairische Hochgebirge" and "der Tatra", without mentioning the number of type-specimens. Mannheims (1951a: 43) saw in the collection Loew (MNB) 4 ♂ and 6 ♀, out of which he designated a lectotype. From this series, Dr. Schumann sent me 2 ♂ and 2 ♀, including the lectotype, labeled as follows: Lectotype: ♂, Leonh., Aug 55/ aculeata m/ small, purple, quadrate label/ 9211/ Lecto-Typus des. MHS. 50. Paralectotypes: 1 ♂, 27-7 67/ small, purple, quadrate label/ aculeata. 1 ♀, Tatra, Jul. 69/ small, purple, quadrate label/ aculeata. 1 ♀, 20-7 67/ an oblong, rectangular label with 8 or 10 unreadable words, including the name dentata/ small, purple, quadrate label/ aculeata. This latter specimen belongs to *tenuipes.*

Nephrotoma aculeata atricauda Alexander: According to Alexander (1924b: 599), the type-series contains the following specimens: "1 ♂, holotype, Toyohara, August 8, 1922 (T. Esaki); 1 ♀, allotopotype and 1 ♂, paratopotype". These types were "returned to Esaki", one paratype being retained. In my material I have a further specimen that had been compared with the type (a metatype) -data, Saghalien - Maoka, July 17, 1932 (coll. M. Hori)" (Alexander, pers. comm., 1976). None of these specimens was examined by me. Savchenko (1973b: 132) concluded that *atricauda* should not be interpreted as a distinct subspecies (see discussion).

Material examined (162 ♂♂, 149 ♀♀, types not included) originated from the following countries: Norway (Laksfors), Finland (Tammela), Great Britain (Inverness, Moray, Banff), Netherlands (Denekamp, South Limburg), Belgium (Liège, Sclessin), West Germany, Czechoslovakia (near Brezno), USSR (Kiyév, Central Siberia), France (near Gavarnie, Lardy), Andorra, Switzerland, Liechtenstein, Italy, Austria, Hungary, Romania (Călimănesti, Sinaia), Yugoslavia, Bulgaria (Pamporovo), Greece (near Thessaloníki).

Description

Body length ♂: 12-13 mm, ♀: 16-18 mm; wing-length: 11-15 mm.

Head ♂: Scape pale yellow to yellow; pedicel yellow to light brown; first flagellar segment entirely yellow or basally only; following flagellar segments brown to dark brown. Flagellar segments long, first segment as long as second one. Verticils up to slightly longer than flagellar segments. Palpi light to dark brown. Rostrum pale yellow, dorsally not distinctly darkened but

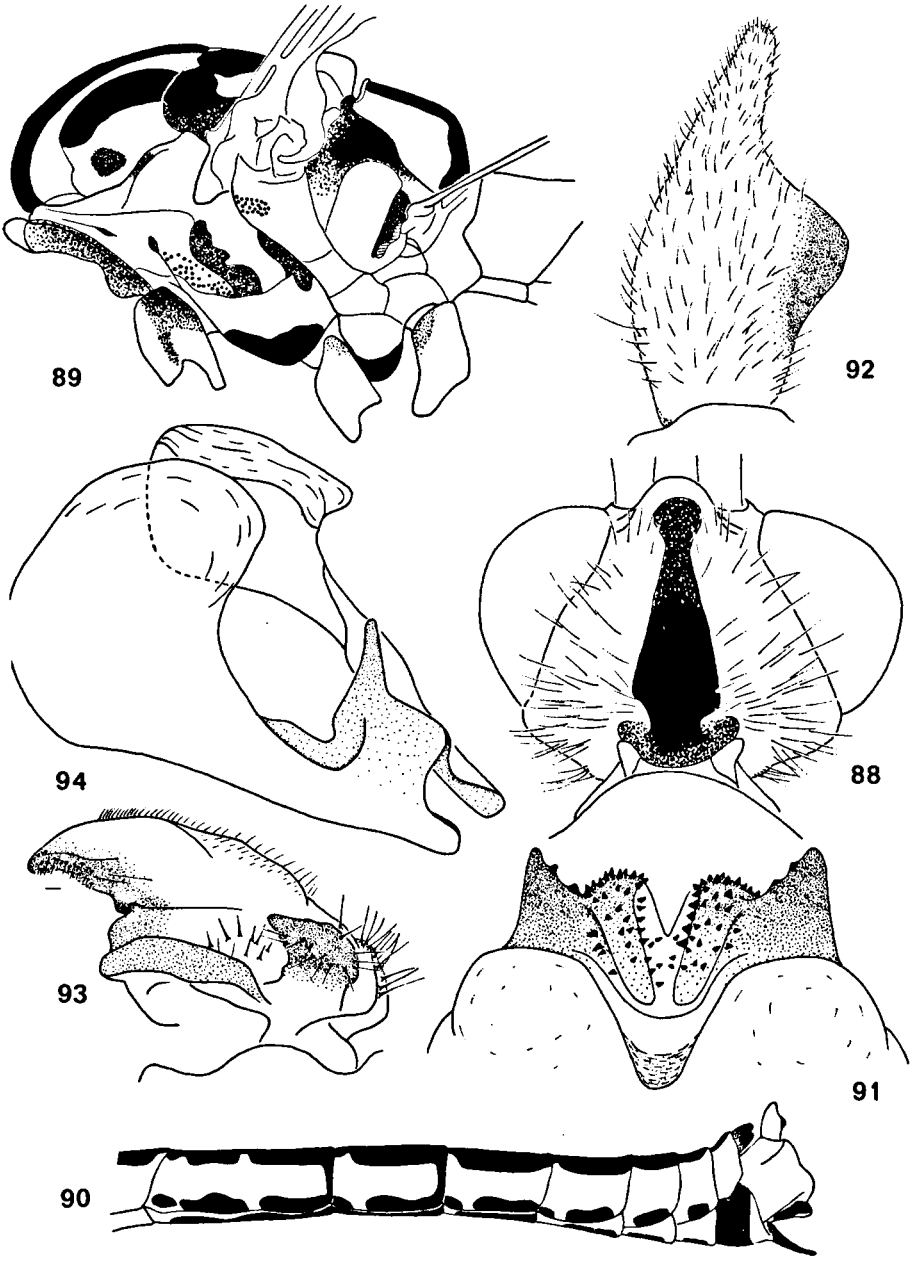
apically tinged with brown; lower lateral half or rostrum tinged with brown or conspicuously brown. Genae and postgenae pale yellow; vertex yellow, tinged with brown. Mark on occiput narrow and elongate, usually with a broad, roundish prolongation on top of frontal tubercle, brown to dark brown, shining, apical part dull. Vertex and postgenae hairy (fig. 88). Spot below antennal bases absent. Spot between eye and frontal tubercle indistinct or absent. Marks on inner part of postgenae less conspicuous.

Thorax ♂: Pronotum dorsally yellow with a narrow, brown, median stripe. Pronotum laterally brown. Prescutal stripes dark brown, shining. Lateral prescutal stripes straight, with a lighter coloured, isolated spot just beneath anterior end; isolated spot variable in size, rarely absent or enlarged and in contact with lateral stripe. Scutellum more or less transparent, yellow to light brown. Parascutellae yellow, darkened anteriorly on either side of scutellum. Pleural markings as in fig. 89. Anatergite ranging in colour from light brown to dark brown. Small triangle just behind ventral contact of fore coxae yellow, sometimes with darkened lateral margins. Femora yellow to light brown, tips darkened. Tibiae light brown, tips darkened. Tarsi brown to dark brown. Wings light brown toned; wing-stigma distinct, brown to dark brown, with macrotrichiae; basal part of vein R4+5 and cross-vein R-M with a broad, brown shade; wing-tip with a minor brown shade (fig. 3).

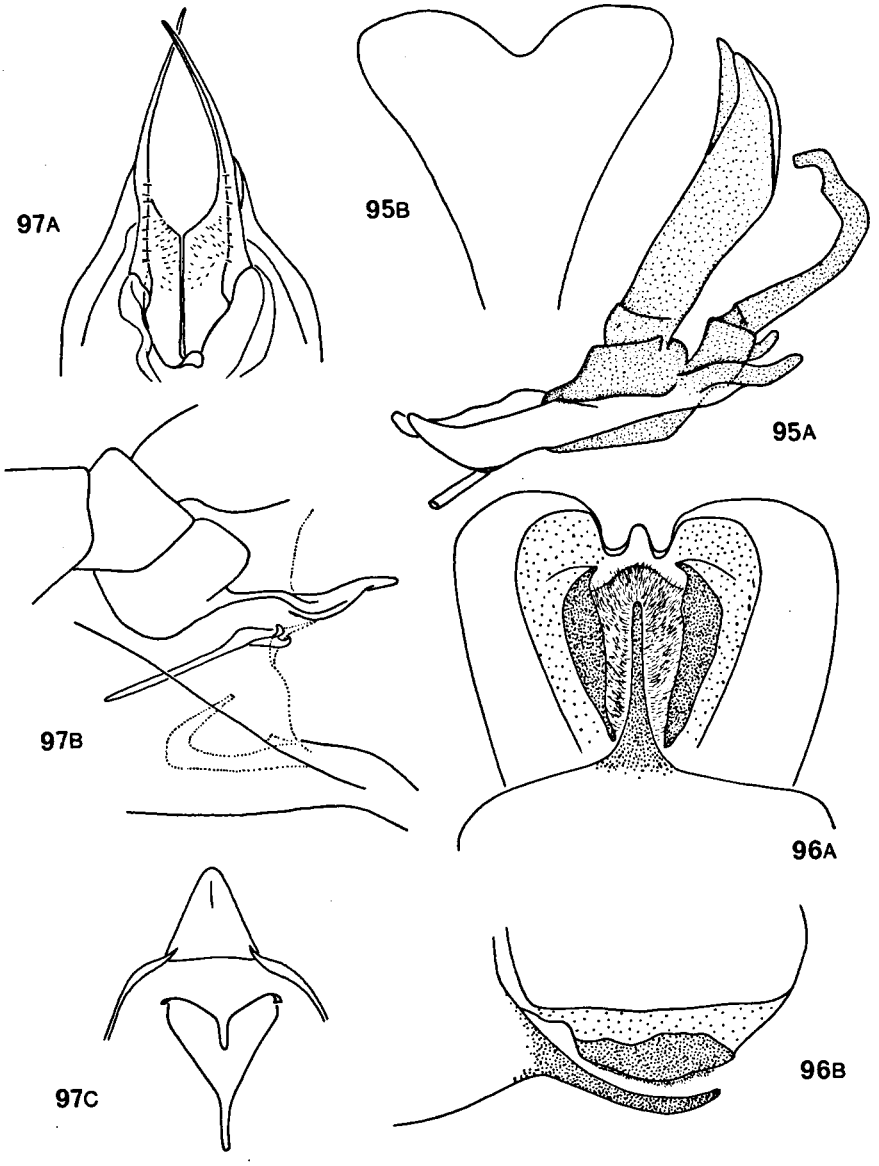
Abdomen ♂: Brownish yellow. Dorsal stripe dark brown to black, lateral margins straight or slightly triangular towards tergite hind margins. Dorsal stripe narrower halfway tergite 2 and at anterior part of tergite 3. Hind margins of tergite 2 and 3 usually darkened. Lateral parts of tergites with elongate, dark brown to black spots at posterior corners and large, rounded spots at anterior corners (sometimes faint). Sternites with a narrow, dark brown to black, median stripe. Sternite 8, sometimes also sternite 7, conspicuously black except for yellow hind margin(s) (fig. 90).

Hypopygium: Brownish yellow to reddish brown. Disk of tergite 9 swollen and with a deeply incised hind margin. Posterior extension of tergite 9 with long, narrow V-shaped median projections. The outer margin is widely V-shaped and its lateral hooks well exceed the median projections (fig. 91). Od with a convex and sclerotized outer margin (fig. 92). Id almost without crest and with a large, sclerotized projection at outer shell (fig. 93). Lateral appendages of adminiculum elongate anteriorly and terminating in large shells (fig. 94). Aedeagus with a large median appendage between the two posterior projections and with a large compressor apodeme (fig. 95 A&B). Median projection of sternite 8 a pointed spike, without pubescence (fig. 96 A&B). The red-brown sclerotizations along the ventral inner margins of the ninth tergites are large and well protruding behind the sternites. The membrane between these sclerotizations is covered with white hairs (fig. 96 A&B).

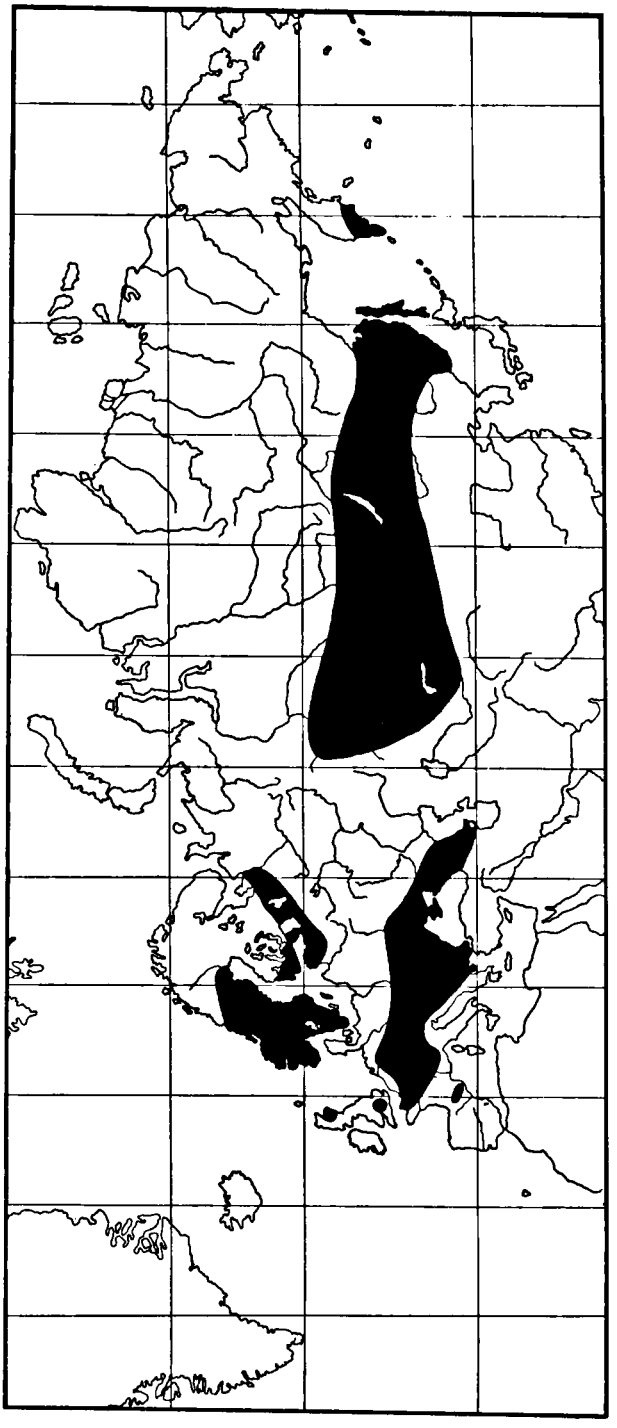
Female: Differing from the male in the abdominal colouration. Verticils distinctly longer than flagellar segments. Usually broad abdominal dorsal stripe triangular towards tergite hind margins. Sternites with a dark brown,



Figs 88—94. *N. aculeata*. 88, head, dorsal view; 89, thorax, lateral view; 90, abdomen ♂, lateral view; 91, posterior extension of tergite 9, dorsal, view; 92, od, outside; 93, id, outside; 94, adminiculum, lateroposterior view.



Figs 95—97. *N. aculeata*. 95, aedeagus: A, lateral view, B, dorsal part of compressor apodeme; 96, median projection of sternite 8: A, ventral view, B, lateral view; 97, ovipositor: A, hypovalvae, dorsal view, B, furca and sternum 9, lateral view, C, furca and sternum 9, dorsal view.



Map 12. Distribution of *N. aculeata*.

median stripe, triangular towards sternite hind margins, especially at sternite 3. Hind margins of abdominal segments, especially the anterior segments, sometimes with a narrow brown border. Sternite 8 conspicuously darkened. Egg-slide of hypovalvae broad and elongate anteriorly. Anterior ends of hypovalvae slightly outcurved and basally confluent with egg-slide. The eighth sternite is broad up to its distal end, then gradually narrows to the point where it meets the hypovalvae (fig. 97 A). The furca is very broad and bilobate, the tips of the lobes are upcurved. The ninth sternum is widely triangular (fig. 97 B&C).

Distribution: map 12

Pierre (1924a: 27) stated that *aculeata* is found in the whole of France. As far as I know the species does not occur in southern France, except for the Pyrenees (Gedre, Gavarnie). Savchenko (1973b: 132) mentioned the Apennines as part of the distributional area (without localities) but all Italian references are confined to the Alps. Besides the Scottish districts mentioned with the material examined, *aculeata* is collected in Great Britain in Berkshire only.

Biology

N. aculeata is usually found in damp places such as riverside meadows, moist grasslands, moist clearings in deciduous and mixed forests, brookvalleys.

The altitudes known of *aculeata* are: France: Hautes Pyrénées, 1500 m; Andorra: 1300 m; Switzerland: Zürich, 1000 m; Italy: Aosta, 1250 m, Friuli, 1400 m; Austria: Tirol, 1000 m, Steiermark, 700 m; and in the Caucasus, Tebarda, 1100 m.

The period of flight of *aculeata* is shown in diagram 6.

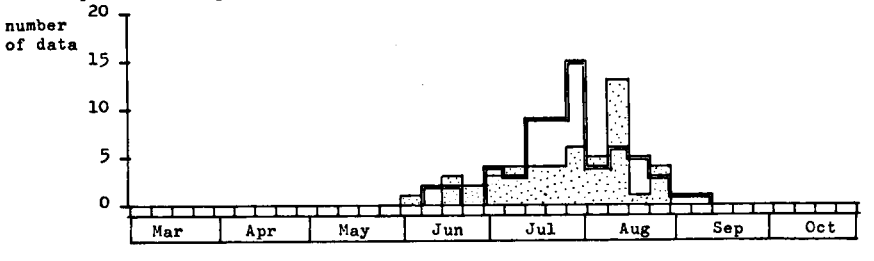


Diagram 6. Period of flight of *N. aculeata.*

Discussion

From Loew's description (1871: 21-2) and Czižek's remarks (1911: 71-4) we may conclude that their *aculeata* specimens belonged in part to *tenuipes.* The

hairy wing tip of *tenuipes* is not mentioned by these authors, but even Riedel (1910: 431-2) dit not use this character in describing *tenuipes*.

Alexander (1924b: 599) defined the differences between the typical *aculeata* and his *atricauda* as follows: "Generally similar to the typical *aculeata* (Loew) of Europe, differing as follows: Body heavier, including hypopygium. Male hypopygium shiny black, appendages larger and more prominent. Aculeate spine on eighth sternite stouter and more strongly curved". Savchenko (1973b: 132) compared several males from South Sakhalin, the type locality of *atricauda*, with extensive material from the continent and concluded that the specimens from Sakhalin should not be interpreted as a distinct subspecies because all the characters mentioned by Alexander fall within the variability of the species.

Nephrotoma tenuipes (Riedel, 1910)
Figs 98-105, map 13, diagram 7

Synonymy:

Pachyrhina tenuipes Riedel, 1910, Deutsche entomologische Zeitschrift, 1910: 431-2; Lundström, 1912: 48; Pierre, 1924a: 29; Slipka, 1948: 103; Simova, 1959: 127.

Pales tenuipes: Mannheims, 1951a: 33-4, 42-3, 57; Stackelberg, 1951: 742; Mannheims, 1953: 2; 1954b: 31, 40; Theowald, 1958: 32; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961: 249; Erhan, 1962: 95, figures; Hemmingsen, 1962: 140; Mannheims, 1963: 38; Mannheims & Pechlaner, 1963: 6, 13, biology; Mannheims, 1965: 7; 1966a: 275; Savchenko, 1966a: 459-61, figures; 1966d: 119; 1973b: 135-6, figures, biology; Simova, 1974: 26.

Nephrotoma tenuipes: Nielsen, 1929: 50, figures; Tjeder, 1955b: 246-7; 1965: 46; Mannheims & Savchenko, 1967: 148; Mannheims, 1967c: 152; Savchenko & Violovich, 1967: 358; Savchenko, 1968: 767; Hartig, 1971: 124; Martinovský, 1971: 50, figures; Savchenko, Violovich & Narchuk, 1972: 78-9, 82-3, 92, biology.

Type-material

Riedel (1910: 431-2) described this species after 4 ♂ and 3 ♀, "Im Trafoiertal an den Rinnsalen der Stilfserjochstrasse; Ende August (1909)". Dr. Schumann of the MNB wrote to me that the Berlin Museum contains 1 ♂, 1 ♀, labeled as Type and 2 ♀, labeled as Cotype. The types and one cotype are labeled, according to Dr. Schumann: Stelvio 8-09, the remaining cotype is labeled: Sölden Tirol, 13.8.10. This latter specimen does not belong to the type-series, Sölden is not in the Trafoiertal. The two specimens, labeled Type were sent to Amsterdam for examination. According to Mannheims (1951a: 43) the Berlin Museum possesses 1 ♂ and 2 ♀ labeled as Cotype and he also mentions a male type in the Vienna Museum. Dr. Lichtenberg of the Vienna Museum kindly informed me that this specimen belongs to the species *tenuipes* (wing-tips hairy) and that it was designated as lectotype by Mannheims in 1949. The labeling of this specimen is as follows, according to Dr. Lichtenberg: Stelvio, 8.09, Riedel Ürdingen/ Type/ Pachyrhina tenuipes Ried. det M. P. Riedel/ Lectotypus, des. Mannheims 49/

Pales tenuipes Ried. det. Mannheims 1947. The lectotype designation, although not published by Mannheims, is accepted here.
Material examined (27 ♂♂, 52 ♀♀, types not included) originated from the following countries: Norway (Moi Rana, Narvik, Nevernes), Sweden (Duved), Finland (Tammela), West Germany (Hinterzarten Hochmoor, Oberstdorf, Stuttgart), Czechoslovakia (Vysoké Tatrý), France (Les Cabannes), Andorra, Switzerland, Liechtenstein, Italy, Austria, Bulgaria (Pamporovo), USSR (Latviya, Central Siberia).

Description

Body length ♂: 13-15 mm, ♀: 15-17 mm; wing length: 13-15 mm.

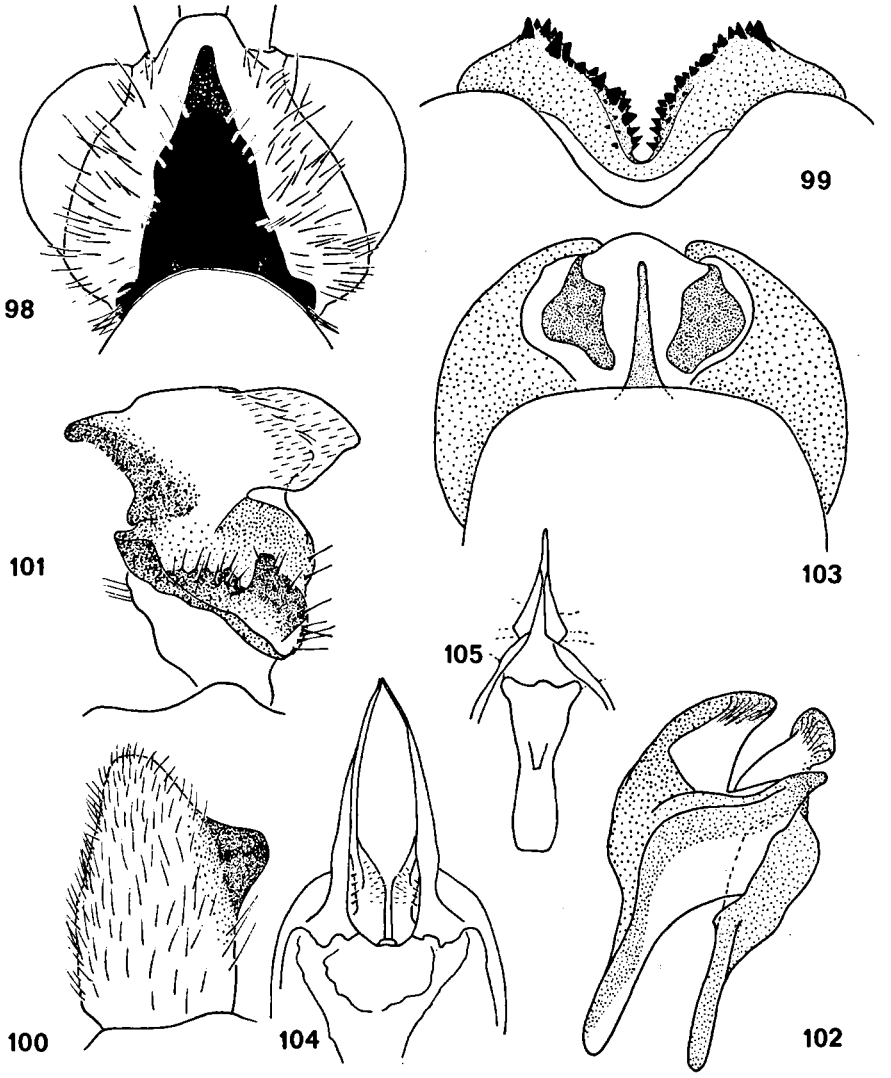
Head ♂: Scape and pedicel yellow, sometimes tinged with brown; flagellar segments long, dark brown to black. First flagellar segment 1.1 × length of second. Verticils slightly longer than flagellar segments. Palpi light to dark brown. Dorsal part of rostrum and nasus brown. Genae and postgenae pale yellow; vertex yellow. No spots below antennal bases or between eye and frontal tubercle. Occipital marking brown, narrowly triangular and usually prolonged up to frontal tubercle, posterior half shining, anterior half dull. Vertex and postgenae usually densely hairy, hairs moderately long (fig. 98). Marks on inner part of postgenae distinct.

Thorax ♂: Pronotum dorsally yellow, laterally brown. Downwardly bent anterior ends of lateral prescutal stripes shining, variable in size, sometimes almost lacking. Scutellum more or less transparent, yellow to light brown. Parascutellae yellow. Pleural markings usually brown but variable in distinctness, ranging to even faint. Anatergite always to a larger extent darkened brown. Small triangle just behind ventral contact of fore coxae yellow, lateral margins black. Wings light brown toned. Wing-stigma distinct, dark brown, with macrotrichiae. Basal part of vein R4+5 and of cross-vein R-M broad brown shaded. Wing-tip with numerous small macrotrichiae, at least between veins R3-R4+5, R4+5-M1, M1-M2, M2-M3, and M3-M4. Coxae yellow, basally tinged with brown. Femora light brown, tips darkened. Tibiae light brown, tips dark brown. Tarsi dark brown.

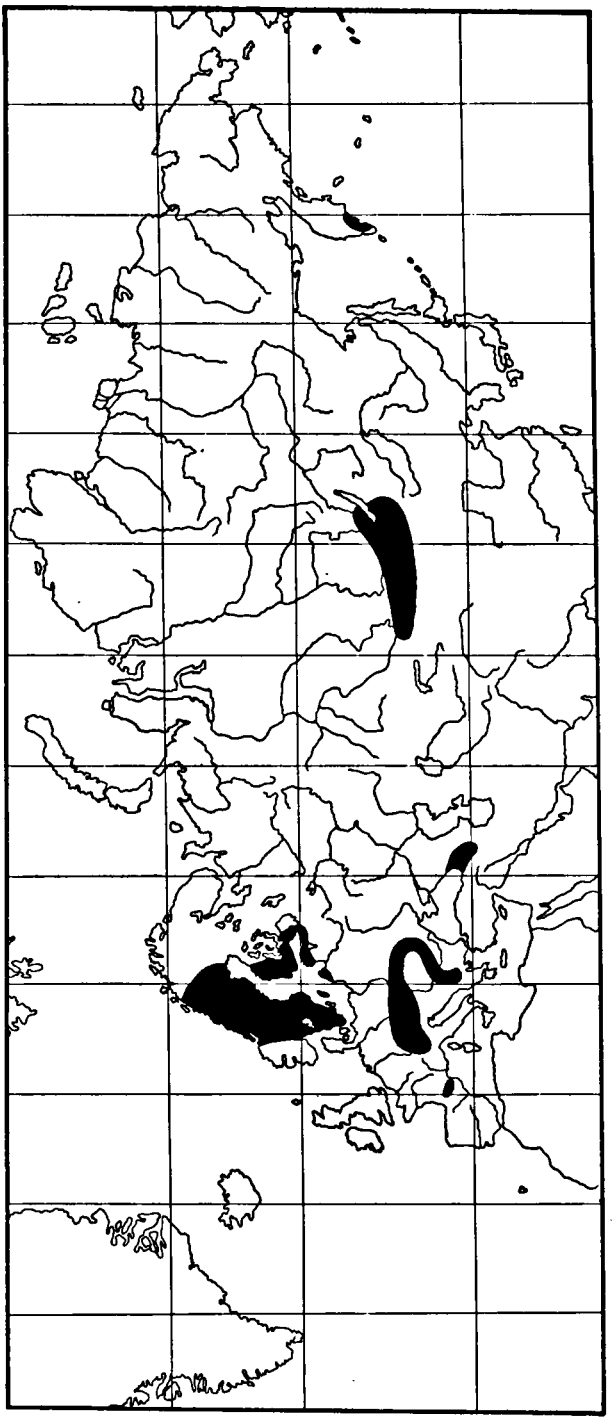
Abdomen ♂: Dorsal abdominal stripe dark brown, moderately broad with straight lateral margins and interrupted by narrow, brownish yellow colouration of the tergite hind margins. The lateral sides of the tergites with elongate, dark brown spots at the posterior corners and rounded spots at the anterior corners. The spots are situated at the lateral margin itself or just above it. Sternites with a median, dark brown stripe. Tergites 7 and 8 usually to a greater extent darkened. Sternite 8 conspicuously black except for surroundings of median projection.

Hypopygium: Reddish brown to dark brown, disk of tergite 9 dark brown to black. Median incision of posterior extension of tergite 9 deep and widely V-shaped, bearing moderately large spines (fig. 99). Od short, the outer margin in part strongly convex and sclerotized (fig. 100). Id with a distinct crest; median region of lateral shell sclerotized; outer margin of

lateral shell with a sclerotized projection (fig. 101). Adminiculum on each side with two appendages: a ventral one and a dorsal one which is strongly bent (fig. 102). Aedeagus as in *aculeata* but less sclerotized. The red-brown sclerotizations along the ventral inner margins of the ninth sternites are not exceeding the ninth sternites ventrally as they do in *aculeata*. The membrane between these sclerotizations is bare and, in lateral view, slightly visible



Figs 98—105. *N. tenuipes*. 98, head, dorsal view; 99, posterior extension of tergite 9, dorsal view; 100, od, outside; 101, id, outside; 102, adminiculum, lateroposterior view; 103, median projection of sternite 8, ventral view; 104, hypovalvae, dorsal view; 105, furca and sternum 9, dorsal view.



Map 13. Distribution of *N. tenuipes*.

behind the ninth sternite (fig. 103). The median projection of the eighth sternite is a pointed spike, bare, not or somewhat darkened (fig. 103).

Female: Resembling the male. Verticils distinctly longer than flagellar segments. Abdominal dorsal stripe triangular towards tergite hind margins. The lateral stripe of the tergites is broad, dark brown, with small intervals in front of the middle of the tergites and situated almost at the lateral margin itself. Tergite 9, basal part of tergite 10 and sternite 8 usually dark reddish brown. Cerci and hypovalvae reddish brown. Egg-slide short and without a distinct vertical septum between anterior ends of hypovalvae. Hypovalvae distinctly widened anteriorly. Sternite 8 broad, almost rectangularly bent towards hypovalvae (fig. 104). Furca and sternum 9 as in fig. 105. Furca broad.

Distribution: map 13

In Europe the species *tenuipes* has an arcto-alpine (sensu De Lattin, 1967) distribution. The species also occurs in the Caucasus, the Altai and Tuva mountains, Mongolia and Kamchatka. Mannheims (1951a: 43) saw in Berlin material from the "Ural".

Biology

Riedel collected this species along the open drainage of a road in the Italian Alps. According to Mannheims & Pechlaner (1963: 13) the biotope in Tirol is the alder and willow vegetation along small mountain rivers. The habitats mentioned by Savchenko (1973: 136) are clearings in forests, scrub vegetations and marshy grasslands with a scrub vegetation.

The altitudes at which *tenuipes* is collected lie in the Pyrenees, the Alps and the Carpathian mountains between 750-1800 m, in the Caucasus at 1000 m and in the Altai at 1500 m.

The period of flight is shown in diagram 7.

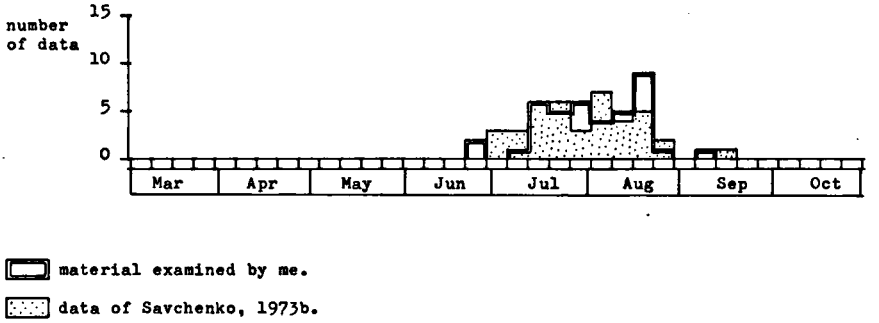


Diagram 7. Period of flight of *N. tenuipes*.

Section 5

This section contains the species *guestfalica, forcipata* and *exastigma.* The form *surcoufi* (Pierre), is a subspecies of *guestfalica*; the female of *forcipata* is described for the first time; the name *exastigma* is given to the not yet described species, interpreted by Mannheims as congruous with *astigma* (Pierre).

Nephrotoma guestfalica (Westhoff, 1880)

Figs 106-114, maps 14 & 15, diagram 8

Of this species two forms are recognized: the typical, European *guestfalica,* and the North African *g. surcoufi,* differing from *g. guestfalica* mainly in the absence of the dorsal crest of the id.

Nephrotoma guestfalica guestfalica (Westhoff, 1880)

Figs 106-114, map 14, diagram 8

Synonymy:

Pachyrhina guestfalica Westhoff, 1880, Jahresbericht des Westfälischen Provinzial-Vereins für Wissenschaft und Kunst, Münster, 8: 49-51, figures, biology; 1882: 48, figures, biology; Verrall, 1886: 119; de Meijere, 1907: 155; Riedel, 1910: 432-2; Czižek, 1911: 78; Nielsen, 1918: 10; Riedel, 1918/1919: 5; de Meijere, 1916: 297; Nielsen, 1919: 10; Riedel, 1919: 18; Goetghebuer & Tonnoir, 1921: 123; Pierre, 1921a: 24 (= *g. surcoufi*); Brolemann, 1923: 512-5, figures; Pierre, 1924a: 28-9, figures, biology; de Meijere, 1935: 201, biology; Brauns, 1949: 159, biology; Zangheri, 1949: 12; Simova, 1959: 127-8.

Pales guestfalica: Audcent, 1932: 10; Mannheims, 1951a: 17, 33, 35, 43-4; 1953: 2; 1954a: 151; 1954b: 32; Theowald & Mannheims, 1956: 248; Theowald, 1957a: 227, figures, biology; 1957b: 10-1; Mannheims & Theowald, 1959: 17; Hemmingsen, 1962: 140; Mannheims & Pechlaner, 1963: 6; Mannheims, 1966a: 275; 1966b: 490-1; Savchenko, 1966a: 458-9, figures; Zangheri, 1969: 1024; Savchenko, 1973b: 156-8, figures, biology: Simova 1974: 26.

Nephrotoma guestfalica: Nielsen, 1925: 156-7, figures; Edwards, 1939: 244; Nielsen, 1941a: 90-1: Tjeder, 1941: 62; Grensted, 1944: 176; Coe, 1950: 39; Parmenter, 1950: 108; Tjeder, 1955b: 246-7; Savchenko, 1968a: 471; Mannheims, 1969: 188; Theowald, 1971: 220; Stubbs, 1973: 103-6, figures, biology; Oosterbroek, 1975: 120.

Pachyrhina analis: Strobl, 1906: 406 (= *guestfalica*?)

Pachyrhina analis var. *escorialensis* Strobl, 1909, Verhandlungen der Zoologischen-Botanischen Gesellschaft in Wien, 59: 134; Riedel, 1910: 432; Morge, 1974: 195.

Pales analis var. *escorialensis:* Mannheims, 1951a: 43; Savchenko, 1973b: 156 (as var. *escorialis*).

Type-material

Nephrotoma guestfalica guestfalica (Westhoff): With the description of *guestfalica,* Westhoff only mentioned the type-locality: "Guestfalia", not the number of specimens. In the Westfälischen Provinz Museum für Naturkunde in Münster, West Germany, where the collection Westhoff is preserved, Dr. H. O. Rehage found under the name *Pachyrhina guestfalica* 7 specimens on 5 pins, with small, written labels: 239, 240, 241, 242 and 243. These numbers are not mentioned in one of Westhoff's papers on Tipulidae, and can not be

traced from Westhoff's own notebooks, as they are lost in World War II. The 7 specimens all belong to *guestfalica guestfalica* and are assumed to be syntypes. The male, pinned together with a female, and labeled: 242 is designated here as lectotype; this specimen is missing the flagellar segments and the legs. The other specimens, 1 ♂, 1 ♀, pinned together, labeled 239, 1 ♂, 240, 1 ♀, 241, 1 ♀, pinned together with the lectotype and 1 ♂, 243, are paralectotypes. Most of them are missing the flagellar segments and legs. In 1 ♂ and 2 ♀ the abdomen is attached to the pin by me.

Nephrotoma analis var. *escorialensis* (Strobl): The collection Strobl in Admont, Austria, contains one specimen, named by Strobl *analis* var. *escorialensis* and *guestfalica* (Morge, 1974: 195). Riedel (1910: 433) stated about the synonymy: "Die v. *escorialensis* ist, wie mir Herr Prof. Strobl nach Einsicht meiner zum Vergleich gesandten *guestfalica* bestätigte, Synonym".

Material examined (241 ♂♂, 124 ♀♀, types not included) originated from the following countries: Great Britain, Netherlands, Belgium, West Germany, France, Portugal (Gouveia), Spain, Italy (Triest, Sardinia), Austria, Yugoslavia (Buna in Hercegovina), Greece, Turkey (near Smyrna).

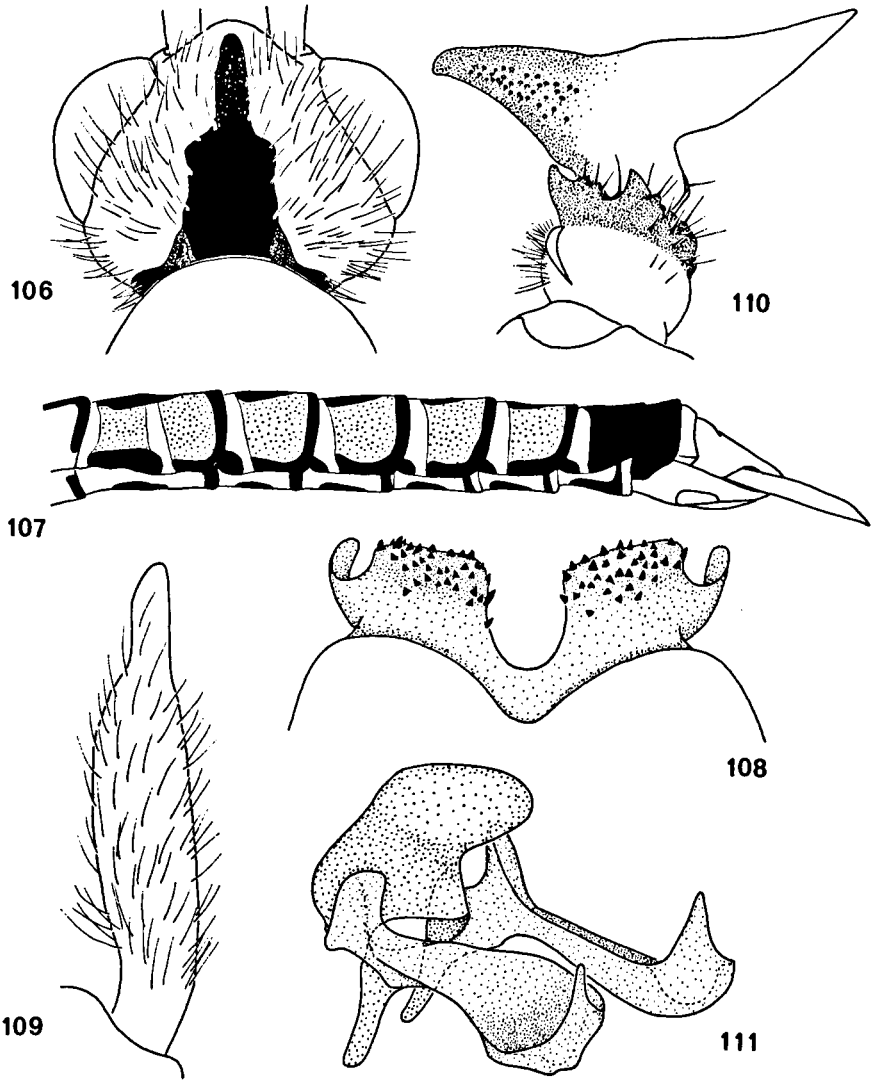
Description

Body length ♂: 10-13 mm, ♀: 12-16 mm; wing length: 9-14 mm.

Head ♂: Scape yellow, sometimes tinged with brown; pedicel yellow to light brown; flagellar segments black. First flagellar segment about as long as second one. Verticils somewhat longer than flagellar segments. Palpi pale brown, in part darkened. Rostrum yellow, dorsally tinged with brown or distinctly brown coloured. Nasus dark brown. Genae and postgenae yellow; vertex yellow to brownish yellow. Spot below antennal bases indistinct. Spot between eye and frontal tubercle brown, sometimes faint. Mark on occiput narrow, shining except for dull, anterior prolongation. Vertex and postgenae usually densely hairy, hairs moderately long (fig. 106). Marks on inner part of postgenae distinct, dark brown.

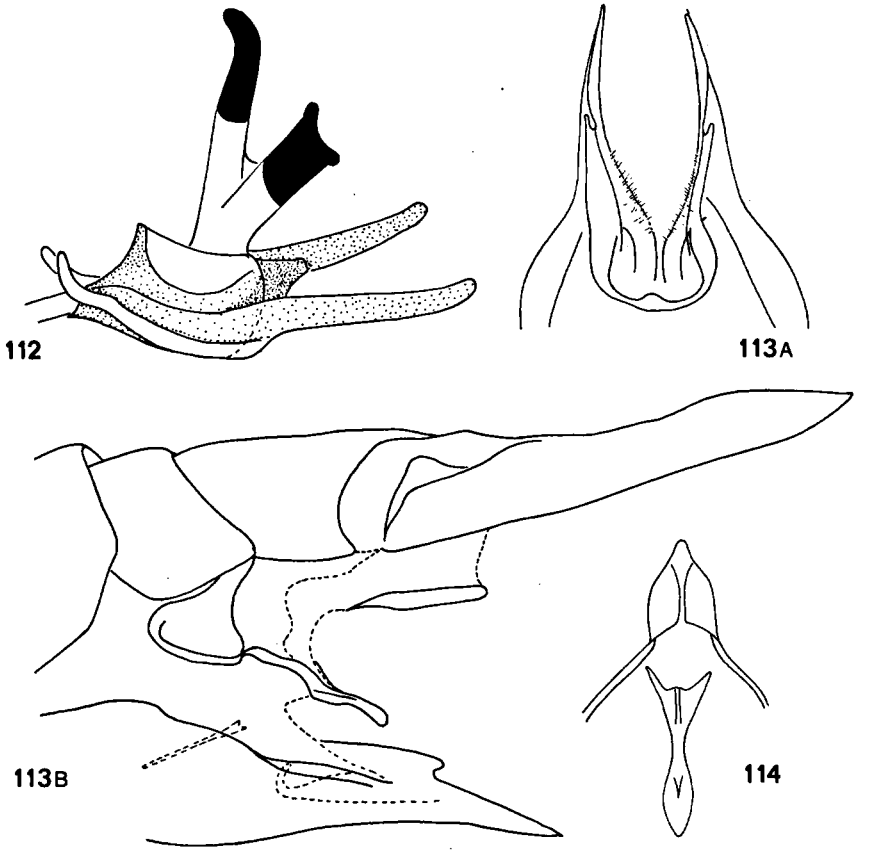
Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes large, shining, usually lighter coloured than stripes themselves. Scutellum yellow with a narrow, median, light brown stripe. Parascutellae darkened. Yellow part of mediotergite conspicuously hairy. Pleural markings brown to dark brown. Anepisternite tinged with brown underneath paratergite. Anatergite brown to dark brown. Small triangle just behind ventral contact of fore coxae yellow. Femora and tibiae light brown, tips dark brown. Tarsi reddish brown to dark brown. Wings light brown toned. Wing stigma distinct, dark brown, with macrotrichiae. Basal part of vein R4+5 with an inconspicuous brown shade.

Abdomen ♂: Brownish yellow. The dorsal median spots of the tergites are more or less isolated and triangular towards the anterior margins of the tergites. The hind margin of tergite 1 and usually, at least in part, the hind margins of tergites 2, 3 and 4 have a brown border. At anterior parts of



Figs 106—111. *N. guestfalica guestfalica*. 106, head, dorsal view; 107, abdomen female, lateral view; 108, posterior extension of tergite 9, dorsal view; 109, od, outside; 110, id, outside; 111, adminiculum, lateroposterior view.

tergites and also halfway tergite 2 a transverse, broad, pale yellow band, Laterally, behind pale yellow band, elongate brown spots, posteriorly connected with brown bordering of tergites 2, 3 and 4. The elongate brown spots are often hardly indicated or absent (fig. 107). Anterior parts of sternites 2-6 usually with brown spots, sternites sometimes conspicuously darkened. Hind margin of sternites 1-4 bordered brown. Segments 7 and 8 usually conspicuously darkened.

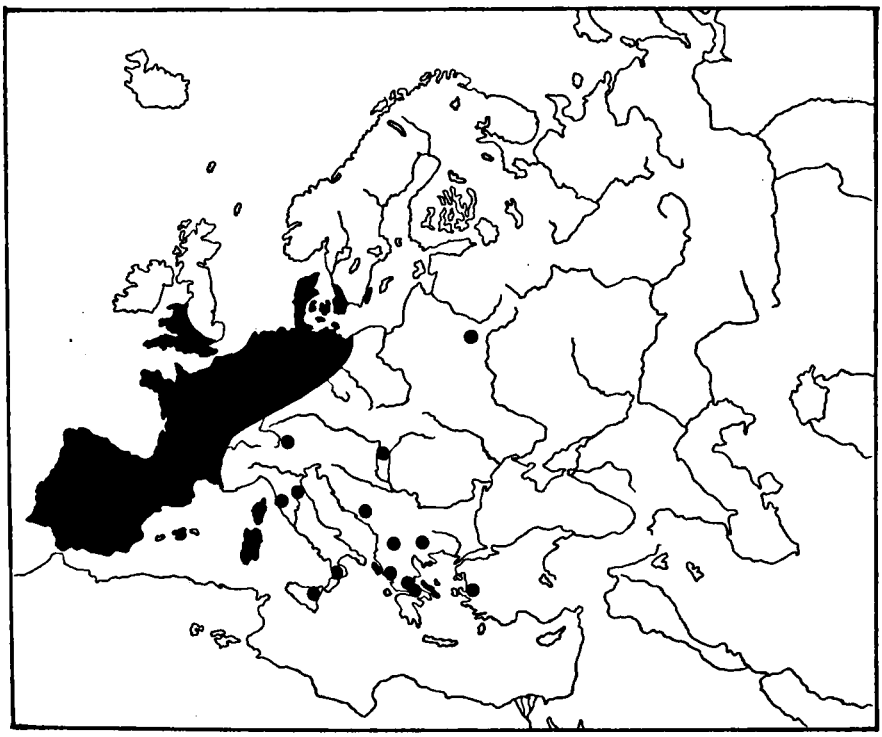


Figs 112—114. *N. guestfalica guestfalica*. 112, aedeagus, lateral view; 113, ovipositor: A, hypovalvae, dorsal view, B. ovipositor, lateral view; 114, furca and sternum 9, dorsal view.

Hypopygium: Yellowish brown to reddish brown, disk of tergite 9 dark reddish brown. Posterior extension of tergite 9 large, with a wide, U-shaped, median incision and bearing small black spines (fig. 108). Od very long (fig. 109). Id with a large, triangular beak; posterior crest long, pointed; lateral shell heavily sclerotized and with a rough outer margin, bearing short bristles (fig. 110). Adminiculum on each side with a ventral appendage and a very long, posterior appendage; the latter ones are usually protruding beyond the hypopygium with their widened, dish-like, posterior parts which have an upright projection at the outer margin (fig. 111). The aedeagus has long, posterior appendages and a bifurcate compressor apodeme of which the apical halves are blackened (fig. 112). Hind margin of sternite 8 straight, without a median projection. Sternite 9 elongate and ventrally flattened; without sclerotizations along ventral inner margins.

Female: Resembling the male. Verticils distinctly longer than flagellar

segments. The dorsal spots of the tergites are triangular towards the anterior margins of the tergites. The posterior margins of the tergites 1-6 have a narrow, brown to dark brown border. There is at the anterior parts of the tergites and also halfway the second tergite a transverse, broad, pale yellow band. On either side of this band there are brown to dark brown spots, the posterior ones connected with the brown bordering of the tergite hind margins (fig. 107). Sternites with a narrow, brown to dark brown border along hind margins. Tergite 8 conspicuously darkened, normally also tergite 9 and posterior half of tergite 7 darkened. Tergite 10 and sternite 8 yellowish brown to reddish brown, sternite 8 with an oval, brown spot on each side. Hypovalvae short with a dorsal, blunt ending crest at anterior half. Egg-slide short and forming a distinct septum between anterior ends of hypovalvae. Eighth sternite distally broad (fig. 113 A&B). Furca and sternum 9 as in fig. 114.



Map 14. Distribution of *N. guestfalica guestfalica.*

Distribution: map 14

N. g. guestfalica is well known in Western Europe. In the remaining part of the distributional area the records are scarce, as indicated in map 14. The subspecies is not known from Switzerland and Czechoslovakia.

Biology

According to Savchenko (1973b: 158) *guestfalica* is a wood inhabitant, as is also reported for Great Britain by Stubbs (1973: 106): "Found in woods especially near water". In Spain (Sierra de Gredos) I collected *g. guestfalica* in large numbers along river banks in willow and alder vegetations. Brauns (1949: 156) mentions the following habitats: "Mit Vorliebe am Wasser: Auf Amrum in den dem Meere zu liegenden Talkesseln (mit *Empetrum-Calluna* Heide und mit *Salix repens* bestanden) — am Bottsand in den jungen Dünenbeständen — auf Fehmarn im Schilfgürtel längs brackigen Gewässer; im Binnenlande in feuchten Wäldern, wo Larven unter Laub und in hohlen Bäumen vorkommen". Another habitat from which *g. guestfalica* is very frequently reported are gardens; larvae have been found in garden mould by de Meijere (1935: 201).

The period of flight is shown in diagram 8.

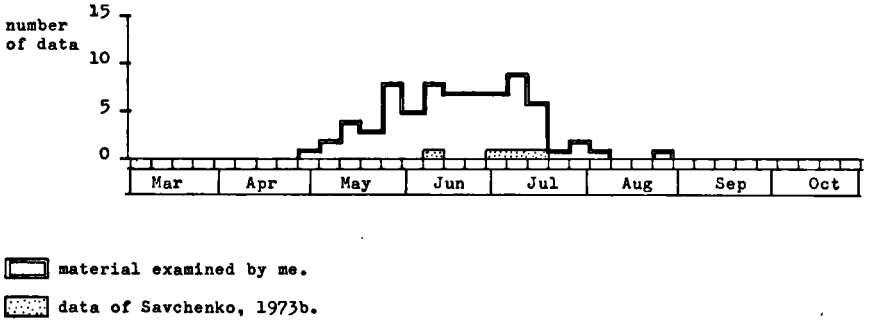


Diagram 8. Period of flight of *N. guestfalica guestfalica.*

Nephrotoma guestfalica surcoufi (Pierre, 1925), status novus
Map 15

Synonymy:

Pachyrhina surcoufi Pierre, 1925, Encyclopédie Entomologique, Série B2, 2: 9, figures.
Pales surcoufi: Mannheims, 1951a: 35, 57-8; Hemmingsen, 1962: 140; Savchenko, 1973b: 159.
Nephrotoma surcoufi: Theowald, 1972a: 3; Oosterbroek, 1975: 120.
Pachyrhina guestfalica: Pierre, 1921a: 24.

Type-material

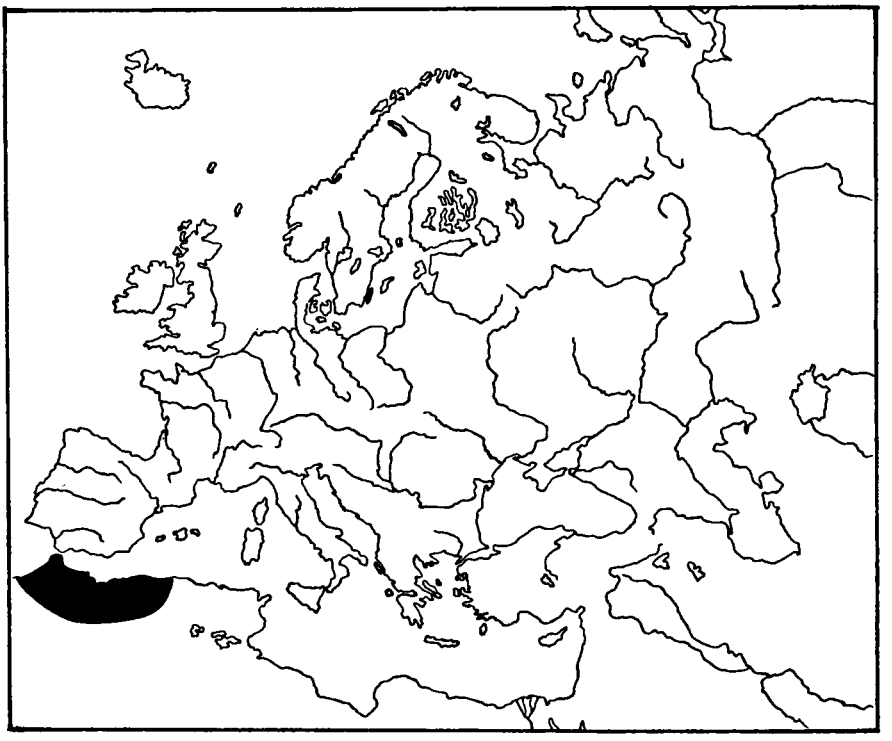
Holotype: ♂, Museum Paris, Rouiba, dep. d'Alger, J. Surcouf 1923/Type/ Pachyrhina surcoufi Pierre, Rouiba, (Algérie); (MNHNP; v! O, 1976).

Material examined (24 ♂♂, 9 ♀) is from Morocco and Algeria.

Description

In *g. surcoufi* the dorsal crest of the id is absent, the tips of the compressor

apodeme of the aedeagus are not darkened and the furca of the female is very slender. A less reliable character is the number of hairs on the thorax: in *g. surcoufi* the hairs are very sparse or absent, in the typical *guestfalica* the thorax is usually hairy, especially the yellow region in front of the downwardly bent anterior ends of the lateral prescutal stripes.



Map 15. Distribution of *N. guestfalica surcoufi.*

Distribution: map 15

Biology

The period of flight is between 8 April and 10 July.

Discussion

The female of *analis* from Madrid, mentioned by Strobl (1906: 406), is the only Spanish record of this species and interpreted here as *guestfalica* because Strobl's *analis* var. *escorialensis* also turned out to be synonymous with *guestfalica.* The *guestfalica* from Morocco (Pierre, 1921: 24) is the only record from northern Africa and transferred by me to the North African subspecies *surcoufi.*

Pierre mentioned in the description of *surcoufi* that the wing-tips of the type-specimen are densely set with macrotrichiae. Examination of the type showed that the wing-tips are without macrotrichiae.

Besides the marked differences found in the genitalia, *guestfalica* is easily distinguished from the other species of this section by the colouration of the abdomen: the dorsal spots of the tergites are triangular towards the anterior margin of the tergites.

Nephrotoma forcipata (Pierre, 1918)
Figs 115-123, map 16

Synonymy:

Pachyrhina forcipata Pierre, 1918, Bulletin de la Société Entomologique de France, 1918: 230-2, figures, biology; 1920: 77; 1924a: 28, figures.
Pales forcipata: Mannheims, 1951a: 33-4, 36, 42; Simova, 1960: 58; Hemmingsen, 1962: 140; Sav chenko, 1973b: 140.

Type-material

Holotype: ♂, 389/ Type/ Lyonnais, 15.7.18/ Coll Pierre/ Type; (MNHNP; v! O, 1976).

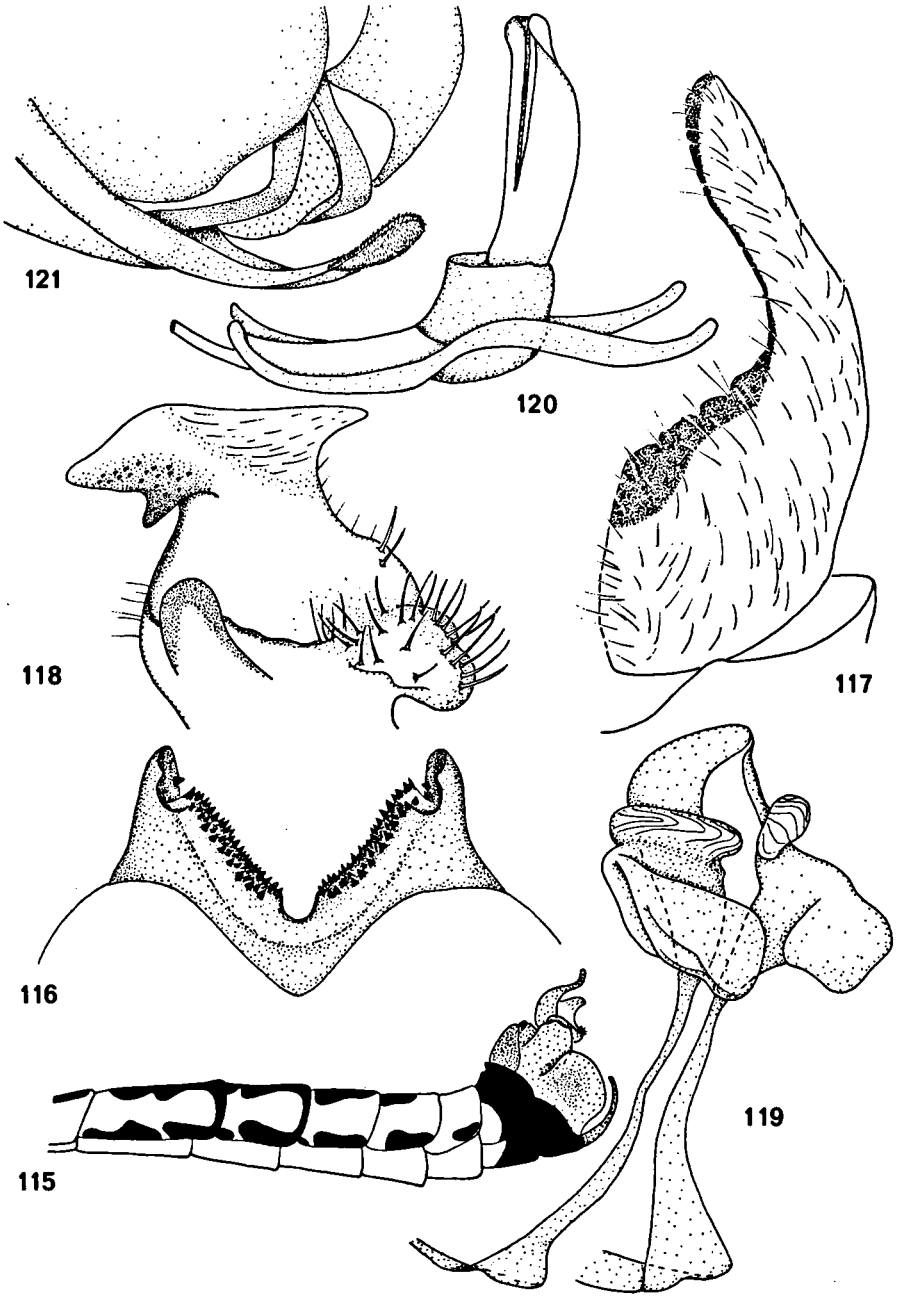
Material examined is from France and Spain (see distribution).

Description

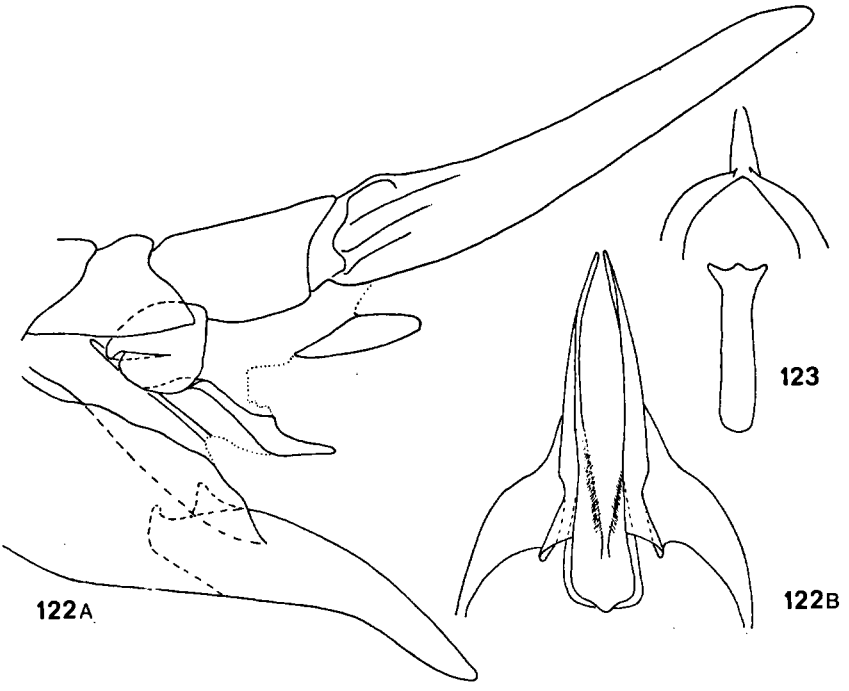
Body length ♂: 11 mm, ♀: 15 mm; wing length: 11-12 mm.

Head ♂: Scape yellow; pedicel yellow to ligth brown; flagellar segments dark brown to black, dorsal half of first flagellar segment yellowish brown. First flagellar segment 1.1 x length of second one. Verticils up to as long as flagellar segments. Palpi light brown to dark brown. Nasus and dorsal part of rostrum brown to dark brown, not always distinct. No spot between eye and frontal tubercle. Spot below antennal bases sometimes inconspicuous. Genae and postgenae pale yellow; vertex yellow. The posterior half of the narrow, dark brown occipital marking is shining and triangular, the anterior half is dull and prolonged, usually very narrowly crossing the frontal tubercle to contact the antennal bases. Postgenae and especially vertex densely hairy. Marks on inner part of postgenae inconspicuous.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes large, shining, lighter coloured than stripes themselves. Scutellum more or less transparent, yellow with a narrow, dark brown, median stripe. Parascutellae yellow, darkened on either side of scutellum. Mediotergite laterally yellow; median, dark brown stripe posteriorly pointed and not in contact with narrow, dark brown stripe along posterior margin of mediotergite. Pleural markings distinct, dark brown. Anatergite brown to dark brown. Coxae basally darkened. Femora yellow to light brown, tips darkened. Tibiae light brown, tips darkened. Tarsi brown to



Figs 115—121. *N. forcipata*. 115, abdomen ♂, lateral view; 116, posterior extension of tergite 9, dorsal view; 117, od, outside; 118, id, outside; 119, adminiculum, lateroposterior view; 120, aedeagus, lateral view; 121, median projection of sternite 8, lateroposterior view.



Figs 122—123. *N. forcipata*. 122, ovipositor: A lateral view, B, hypovalvae, dorsal view; 123, furca and sternum 9, dorsal view.

dark brown. Small triangle just behind ventral contact of fore coxae yellow. Wings light brown toned; wing-stigma distinct, brown, with macrotrichiae; basal part of vein R4+5 and cross-vein R-M brown shaded; wing-tip with a minor brown shade.

Abdomen ♂: Yellow with the narrow, dorsal stripe usually confined to anterior tergites. Hind margins of tergites 2 and 3, sometimes 4, dark brown bordered. Lateral parts of tergites with a broad, dark brown stripe, with small intervals in front of middle of tergites. Sternites yellow with a, not always distinct, brown, median stripe. Hind margins of sternites 2 and 3 dark brown bordered. Segment 8 and posterior half of segment 7 black (fig. 115).

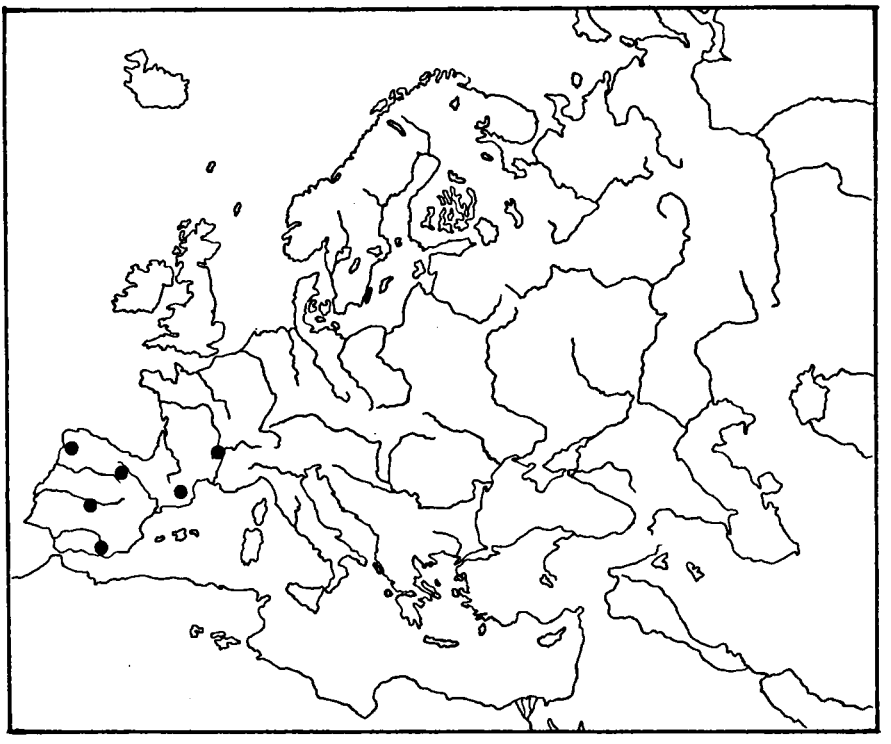
Hypopygium: The very large hypopygium is reddish brown, the disc of the ninth tergite and the lateral parts of the ninth sternites are darkened. Outer margin of posterior extension of tergite 9 very widely V-shaped and densely covered with small spines (fig. 116). Od very large and of a peculiar shape, inner margin sclerotized (fig. 117). The dorsal, triangular crest of the id is turned outside along its longitudinal axis; the anterior beak of the id has a moderately large, sclerotized projection ventrally; the outer margin of the large, lateral shell bears posteriorly a large, bulbous projection, set with long bristles; anteriorly, the outer margin has a flattened, in part sclerotized projection (fig. 118). The adminiculum has three appendages on each side:

two lateral ones and a very long ventral one, the latter is apically connected with the sclerotizations along the mid-ventral, shortly pubescent, membranous part of the ninth sternite (fig. 119, 121). The dorsoventrally flattened, median projection of the eighth sternite is very long, curved upwards and has a rounded and densely pubescent apex (fig. 121). Aedeagus as in fig. 120.

Female: Resembling the male. Verticils distinctly longer than flagellar segments. Abdominal dorsal stripe, usually absent at tergite 7, moderately wide with broad intervals at anterior part of tergites. Narrow, dark brown border of posterior margin of tergites 2-7 usually in contact with lateral stripe. Sternites yellow with an, usually less distinct, median stripe. Tergites 8 and 9, anterior part of tergite 10 and sternite 8 darkened. Cerci ending bluntly (fig. 122 A). Egg-slide of hypovalvae long, basal cup in front of anterior ends of hypovalvae. Hypovalvae slightly widened anteriorly. Sternite 8 very broad distad (fig. 122 B). Furca and sternum 9 as in fig. 123.

Distribution: map 16

In map 16 all known localities of *forcipata* are indicated by dots: France: Rhône, Brignais (holotype); Pyrénées Orientales, Villefrance-de-Conflent



Map 16. Distribution of *N. forcipata.*

(1 ♂, 1 ♀, 8.VII.1967, Theowald, ZMA); Spain: Logroño, Sierra de Cameros (1 ♂, 20.VII.1969, Niethammer, MAK); Pontevedra, Mondariz (2 ♀, 1.VII.1962, Franz, MAK); Toledo, Talavera de la Reina (9 ♂, 20.V.1961, Mannheims, 8 ♂ MAK, 1 ♂ coll. Savchenko), and Granada, Sierra Nevada (2 ♂, VII.1901, Thalhammer, Hungarian Natural History Museum, see Mannheims, 1951a: 42). The record of *forcipata* from Yugoslavia by Simova (1960: 58, Makedonija, Skopje, 20.VIII.1957, Simova) was apparently based on a misinterpretation, Simova did not mention the species in her 1974 list of the Yugoslavian Tipulidae.

Biology

N. forcipata is a rare species, flying in or near woods of hilly countries from May till July.

Discussion

A very useful character to distinguish *forcipata* from the other species of this section and in fact from all members of the *cornicina* group is found in the colouration of the mediotergite. Usually the median stripe at the anterior part of the mediotergite is in contact with the narrow or broad stripe at the posterior part of the mediotergite. In *forcipata* the median stripe is posteriorly pointed and not in contact with the narrow, dark brown stripe along the mediotergite hind margin.

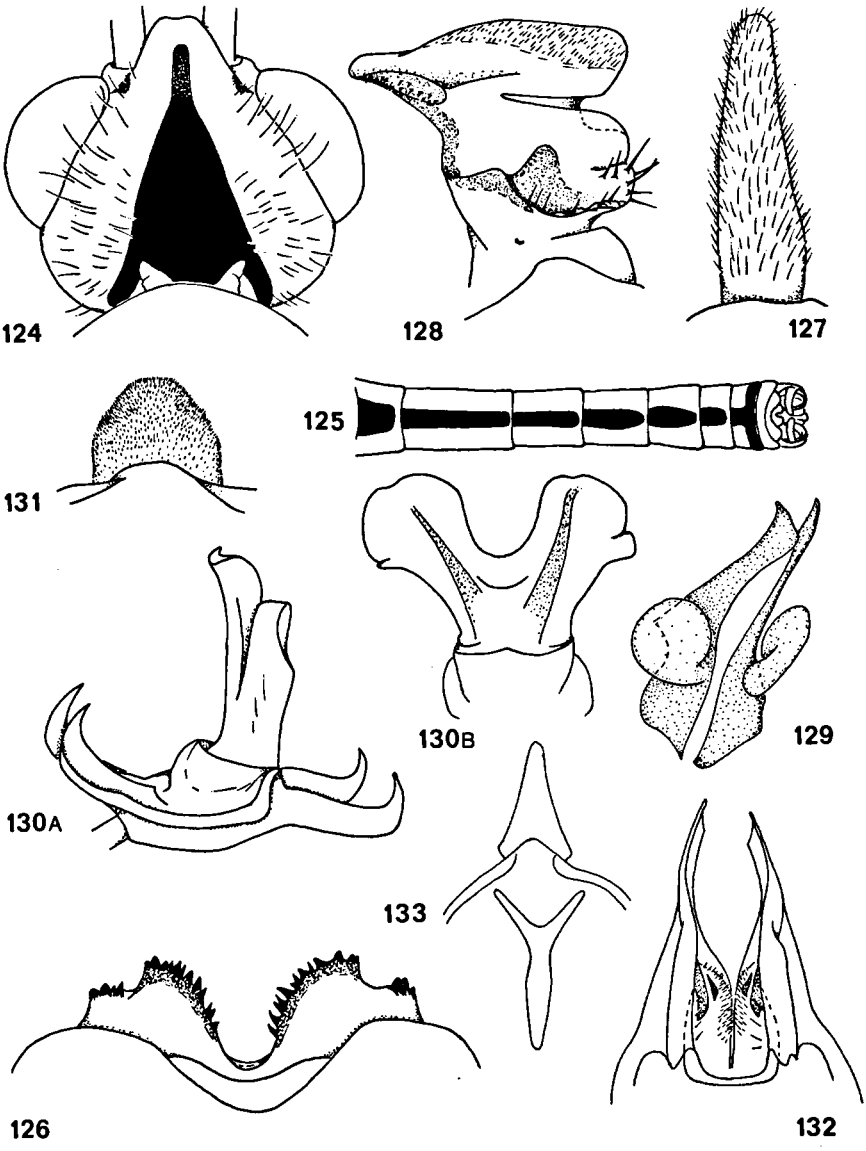
Nephrotoma exastigma spec. nov.
Figs 124-133, map 17

Synonymy:

Pales astigma: Savchenko, 1973b: 166 (p.p. = *exastigma*).
Nephrotoma astigma: Theowald, 1972a: 3 (= *exastigma*).

Type-material

Holotype: ♂, Souk el Arba, Tunesien, 17.V.59, Roer/ Pales astigma p. Mannheims det. 1959; (ZMA).
Paratypes: 7 ♂, 3 ♀, labeled as the holotype; (6 ♂, 2 ♀, MAK; 1 ♂, 1 ♀, ZMA). 1 ♀, Tabarka, Tunesien, 15.5.59, Roer/ Pales astigma p. Mannheims det. 1959; (MAK). 1 ♀, Algeri, 4-'50, Saccà/ Pales astigma Pierre' Mannheims det. 1952; (MAK). 4 ♂, N-O-Algeria, b. Guelma, III u IV 1955, Fittkaü/ Pales astigma p. Mannheims det. 1959; (3 ♂, MAK; 1 ♂, ZMA). 1 ♂, 30 km S W Tünis, 17.4.57, J. Nieth./ Pales sullingtonensis Edw. Mannheims det. 1957/ Nephrotoma p. Mannheims det. 1966; (MAK). 1 ♀, Alger-Jardins De l'Université, 19-2-26; (MNHNP). 1 ♀, Rouiba, (Dep' d' Alger.), III. 1919; (MNHNP).



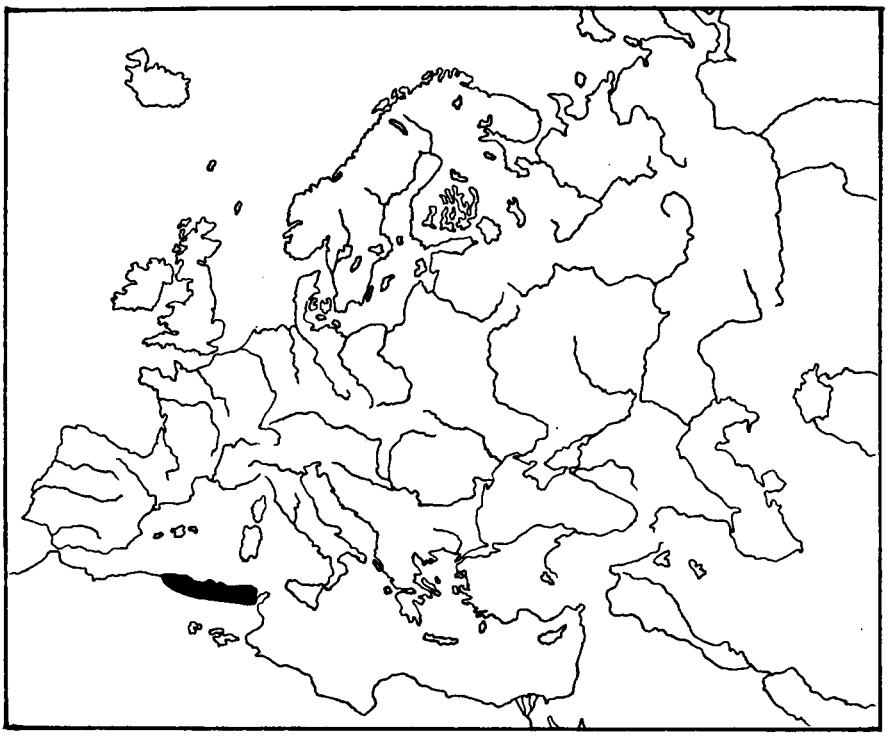
Figs 124—133. *N. exastigma*. 124, head, dorsal view; 125, abdomen, dorsal view; 126, posterior extension of tergite 9, dorsal view; 127, od, outside; 128, id, outside; 129, adminiculum, lateroposterior view; 130, aedeagus: A, lateral view, B, compressor apodeme; 131, median projection of sternite 8, ventral view; 132, hypovalvae, dorsal view; 133, furca and sternum 9, dorsal view.

Description

Body length ♂: 9-11 mm, ♀: 13-14 mm; wing length: 10-12 mm.

Head ♂: Scape yellow, pedicel light brown, flagellar segments black. First flagellar segment 1.2-1.3 × length of second one. Verticils up to 0.8 × length of flagellar segments. Palpi light brown. Nasus and dorsal part of rostrum brown, shining. No spot below antennal bases. Spot between eye and frontal tubercle small or absent. Genae and postgenae pale yellow. Vertex orange-yellow. Occipital marking narrowly triangular, shining, dark brown, except for dull, narrow, anterior prolongation. Vertex and postgenae moderately densely hairy; hairs short except for those closer to eyes (fig. 124). Marks on inner part of postgenae small.

Thorax ♂: Pronotum dorsally yellow, usually tinged brownish; pronotum laterally brown. Prescutal stripes shining, not dull bordered. Lateral prescutal stripes straight. Scutellum more or less transparent, yellow to light brown with a median brown stripe anteriorly. Parascutellae yellow. Pleural markings dark brown. Anatergite yellow. Small triangle just behind ventral contact of fore coxae yellow. Wings toned light brown; wing-stigma faint, with or without macrotrichiae. Coxae basally darkened. Femora and tibiae yellow to light brown, tips darkened. Tarsi dark brown to black.



Map 17. Distribution of *N. exastigma*.

Abdomen: Yellow. Dorsal stripe narrow, brown to dark brown, more or less straight and interrupted by lighter coloured tergite hind margins. Hind margin of tergite 7 usually with a brown border (fig. 125). Tergites laterally with a faint, brown stripe, replaced at tergites 2 and 3 by dots. Sternites with a brown, median stripe. Sternite 7 and anterior half of sternite 8 usually darkened.

Hypopygium: Yellow. The posterior extension of the ninth tergite has a large and wide median incision, bearing rather long spines (fig. 126). Od elongate (fig. 127). The id has a small dorsal crest; the outer margin of the lateral shell is set with moderately strong bristles, especially posteriorly; the median region of the shell bears a sclerotized, flattened lobe, connected with the sclerotized anterior margin of the shell (fig. 128). The adminiculum is small, with a bulbous projection on each side (fig. 129). The anterior and posterior appendages of the aedeagus are elongate; the compressor apodeme is bilobate (fig. 130 A&B). The dorsoventrally compressed median projection of the eighth sternite is pubescent (fig. 131). The red-brown sclerotizations along the mid-ventral, membranous part of the ninth sternite are small.

Female: Resembling the male. Verticils slightly longer than flagellar segments. Abdomen yellow; dorsal stripe narrow, straight. Hind margin of sternite 7 usually not darkened. Lateral stripe of tergites irregular, sometimes faint. Sternites with a narrow, median stripe. Sternite 8 not darkened. Egg-slide of hypovalvae with a vertical septum between anterior ends of hypovalvae; anterior part of egg-slide with two sclerotized plates on each side (fig. 132). The eighth sternite is moderately broad and gradually narrows to the point where it passes into the hypovalvae. Furca and sternum 9 as in fig. 133.

Distribution: map 17

Biology

The species is known to fly from 19 February till 17 May.

Discussion

The specimens, interpreted by Mannheims (and in addition by Savchenko and Theowald, who received material from him) as *astigma* Pierre, 1925, are described here as *exastigma*. This species differs from Pierre's description of *astigma* in the following: spot between eye and frontal tubercle small or absent; mark on occiput narrow; scape and pedicel yellow to light brown; lateral prescutal stripe straight, not bent downwards anteriorly; hypopygium darkened in part; sternite 8 of the male not elongate posteriorly.

N. exastigma is the only species in the *cornicina* group in which the lateral prescutal stripes are straight and without an isolated spot below the anterior ends (as found in *aculeata*).

Etymology

This species is named *exastigma* as it was interpreted by Mannheims as *astigma* (Pierre).

SECTION 6

This section contains the species *quadrifaria* and *fontana*. The former species is the only one within the *cornicina* group with a distinct wing-bar. The species *fontana* is new to science.

Nephrotoma quadrifaria (Meigen, 1804)
Figs 4, 134-146, diagram 8, map 18 & 19

Of this species two subspecies are known, the typical European one and *q. farsidica* from Iran, described by Savchenko in 1957 after 1 ♂ and 3 ♀, collected in 1905. A second male was found in the Paris Museum.

Nephrotoma quadrifaria quadrifaria (Meigen, 1804)
Figs 4, 134-142, diagram 9, map 18

Synonymy:

Tipula quadrifaria Meigen, 1804, Klassifikazion und Beschreibung der europäischen Zweiflügeligen Insekten, 1: 72; 1818: 199-200; 1830: 286 (= *flavescens*); Schummel, 1833: 103-4, figures; Walker, 1848: 63.

Pachyrhina quadrifaria: Staeger, 1840: 25 (= *flavescens*); Zetterstedt, 1851: 3993, 3996 (= *cornicina*); van der Wulp & Snellen van Vollenhoven, 1853: 144 (= *flavescens*); Walker, 1856: 332; Schiner, 1864: 504-5; van der Wulp, 1866: 17 (= *flavescens*); Kowarz, 1873: 455; van der Wulp, 1874: 145-6; 1877: 378-9; Beling, 1878: 37-9, biology; Westhoff, 1880: 48, figures, biology; Wallengren, 1882: 14; Westhoff, 1882: 48, figures, biology; Verrall, 1886: 119; Huguenin, 1888: 19; Strobl, 1895: 85, biology; van der Wulp & de Meijere, 1898: 28; Strobl, 1900c: 192; Thalhammer, 1900: 20; Wahlgren, 1904: 13; Strobl, 1909a: 272; Riedel, 1910: 422-3, 426, 430; Czižek, 1911: 64-70, 73, figures; Vimmer, 1913: 18; Nielsen, 1918: 10; Riedel, 1918/1919: 5; Pierre, 1919b: 618; Riedel, 1919: 18; Goetghebuer & Tonnoir, 1921: 123; Brolemann, 1923: 510-2, figures; Pierre, 1924a: 29, figures, biology; Weigand, 1924: 46; Becker & Schwabl, 1926: 34; Simova, 1959: 127.

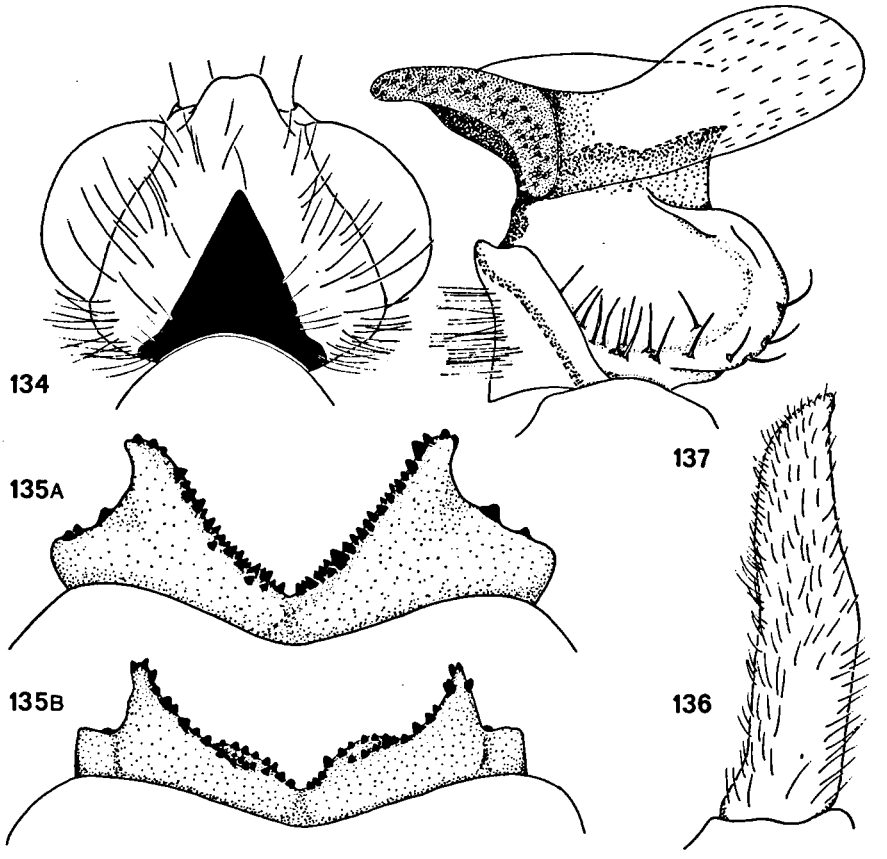
Pales quadrifaria: Audcent, 1932: 10; Mannheims, 1951a: 17, 33-4, 36, 57; 1951c: 228; Fischer, 1952: 120; Mannheims, 1953: 2; Brauns, 1954: 70, biology; Mannheims, 1954a: 151; 1954b: 31; Theowald & Mannheims, 1956: 249; Savchenko, 1957: 218-9 (as subspecies), figures; Theowald, 1957a: 229, figures; 1957b: 10-1; Mannheims & Theowald, 1959: 18; Erhan & Theowald, 1961: 249; Hemmingsen, 1962: 140-1, figures; Höchstetter, 1962: 38, 53, 60, 80, biology; Mannheims & Pechlaner, 1963: 6; Mannheims, 1964c: 107; 1966a: 275; 1966b: 490, 492; Savchenko, 1966a: 455-7, figures; Zangheri, 1969: 1024; Savchenko, 1973b: 153-5 (as subspecies), figures, biology; Simova, 1974: 26.

Nephrotoma quadrifaria: Nielsen, 1925: 155-6, figures; 1933: 245; Edwards, 1939: 244; Coe, 1941: 172, biology; Nielsen, 1941b: 96; Coe, 1950: 8; Parmenter, 1950: 108; Tjeder, 1954: 47, biology; 1955b: 246-7; Chiswell, 1956: 442-4, figures, biology; Brindle, 1960: 86, 101, figures, biology; Freeman, 1967: 135-6, biology; Theowald, 1967: 21, 63, biology; Tjeder, 1967: 21; Freeman, 1968: 342, 346, 353, biology; Theowald, 1971: 220, 228; Stubbs, 1973: 103-6, figures, biology; Klopp, 1974: 159-60, figures, biology; Oosterbroek, 1975: 120-1.

Tipula dentata Meigen, 1838, Systematische Beschreibungen, 7: 35.
Pachyrhina dentata: Staeger, 1840: 24-5; Zetterstedt, 1851: 3992-3; van der Wulp & Snellen van Vollenhoven, 1853: 144; Zetterstedt, 1860: 6543; van der Wulp, 1866: 17; 1874: 145-6; 1877: 378-9; Wallengren, 1882: 14; Verrall, 1886: 119; Wahlgren, 1904: 13; Riedel, 1910: 430; Czižek, 1911: 68-70.
Pales dentata: Mannheims, 1951a: 57; 1951c: 228; 1964c: 107-8; Savchenko, 1973b: 153.
Pachyrhina fascipennis Zetterstedt, 1851, Diptera Scandinaviae, 10: 3993-4; 1860: 6543; Schiner, 1864: 505; van der Wulp, 1866: 17; 1874: 145-6; 1877: 378-9; Verrall, 1886: 119; Riedel, 1910: 430; Czižek, 1911: 67-70.
Pales fascipennis: Mannheims, 1951a: 57; Savchenko, 1973b: 153.

Type-material

Nephrotoma quadrifaria quadrifaria (Meigen): No types in the collection Meigen (MNHNP). Meigen described this species after both sexes, mentioning the shading of certain wing-veins, found in this species only.



Figs 134—137. *N. quadrifaria quadrifaria.* 134, head, dorsal view; 135, posterior extension of tergite 9, dorsal view: A, before copulation, B, after copulation; 136, od, outside; 137, id, outside.

Nephrotoma dentata (Meigen): In the collection Meigen, under number 377, 1 ♀ (MNHNP; v! O, 1976).
Nephrotoma fascipennis (Zetterstedt): As far as I known the collection Zetterstedt (ZIS), was not yet reexamined. The synonymy of *fascipennis* with *quadrifaria* was established for the first time by Schiner (1864: 505).

Material examined (308 ♂♂, 229 ♀♀, types not included) originated from the following countries: Great Britain, Netherlands, Belgium, Luxemburg, West Germany, East Germany, Czechoslovakia, France, Spain (Pesaguero), Switzerland, Italy, Austria (Admont), Romania (Tecuci), Yugoslavia, Greece.

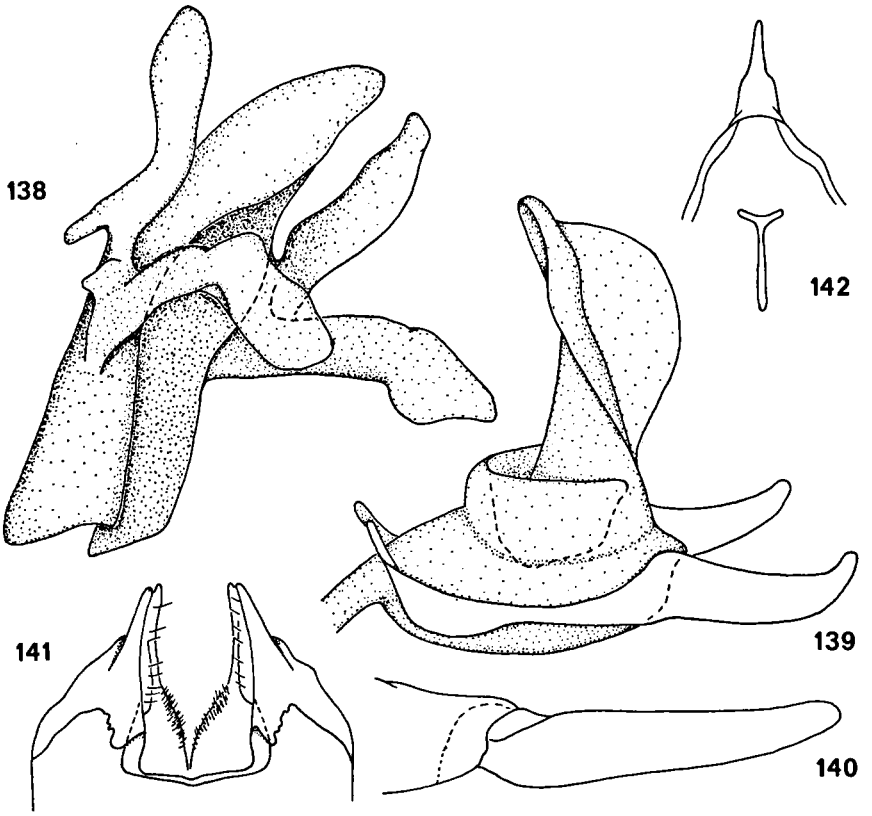
Description

Body length ♂: 11-13 mm, ♀: 13-15 mm; wing length: 12-15 mm.

Head ♂: Scape and pedicel yellow to light brown; flagellar segments dark brown, first flagellar segment sometimes lighter coloured basally, apical flagellar segments usually darker than basal segments. First flagellar segment 1.1 × length of second one. First three flagellar segments somewhat reniform, following segments nodulose basally. Verticils up to as long as flagellar segments. Palpi brownish. Nasus and dorsal part of rostrum dark brown, shining. Genae and postgenae pale yellow. Vertex yellow, sometimes conspicuously brown. Spot below antennal bases brown to dark brown. Spot between eye and frontal tubercle small or absent. Vertex and especially postgenae usually densely hairy, hairs long. Mark on occiput triangular, small, not prolonged up to frontal tubercle, dark brown and shining. Marks on inner part of postgenae usually distinct (fig. 134).

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes shining and lighter coloured than stripes themselves. Scutellum more or less transparent, ranging in colour from light brown to dark brown. Parascutellae yellow. Scutellum and posterior half of mediotergite usually densely hairy, hairs long. Pleural markings dark brown. Anatergite brown to dark brown. Small triangle just behind ventral contact of fore coxae yellow with dark brown lateral margins, sometimes entire triangle dark brown. Coxae yellow, basally darkened. Femora and tibiae light brown, tips darkened. Tarsi dark brown. Wings light brown toned; wing-stigma distinct, dark brown, with macrotrichiae; basal part of vein R4+5, cross-vein R-M and M-CU and apical part of vein CU1 broadly brown shaded; wing-tip with a minor brown shade.

Abdomen ♂: Brownish yellow. Anterior margin of tergite 1 broadly pale yellow, posterior part brown. Dorsal stripe moderately broad at tergite 2, narrow at tergites 3 and 4, usually inconspicuous at tergites 5 and 6. Tergites with a narrow, continuous, dark brown stripe at lateral margin, usually less distinct at tergites 5 and 6. Tergite 7 dark brown. Tergite 8 light reddish brown. Sternites 1-6 yellow; sternite 7 and anterior half of sternite 8 dark brown; posterior half of sternite 8 reddish brown. Dark brown, subapical ring sometimes less distinct or absent.



Figs 138—142. *N. quadrifaria quadrifaria.* 138, adminiculum, lateroposterior view; 139, aedeagus, lateral view; 140, cercus, lateral view; 141, hypovalvae, dorsal view; 142, furca and sternum 9, dorsal view.

Hypopygium: Light reddish brown. Outer margin of tergite 9 widely V-or U-shaped and bearing black spines (fig. 135 A&B, fig. 135 B is discussed under *q. farsidica*). Od simple, very long and narrow (fig. 136). Id with a distinct, sclerotized beak and a large, posteriorly rounded crest; outer margin of lateral shell set with strong bristles (fig. 137). Each side of adminiculum with three appendages of which the long, posteriorly directed ones are usually protruding behind the hypopygium (fig. 138). Aedeagus as in fig. 139. Median projection of sternite 8 yellow, pubescent, laterally compressed, about as long as high and in line with longitudinal axis of sternite 8 (fig. 4). Red-brown sclerotizations along mid-ventral, membranous part of sternite 9 distinctly bent.

Female: Differing from the male in the abdominal colouration. Verticils up to twice as long as flagellar segments. In one female from Yugoslavia, Macedonia, the scutellum is black. Abdominal dorsal stripe broad, triangular towards hind margins of tergites 2-6. Tergite 7 and usually also tergite 8 dark

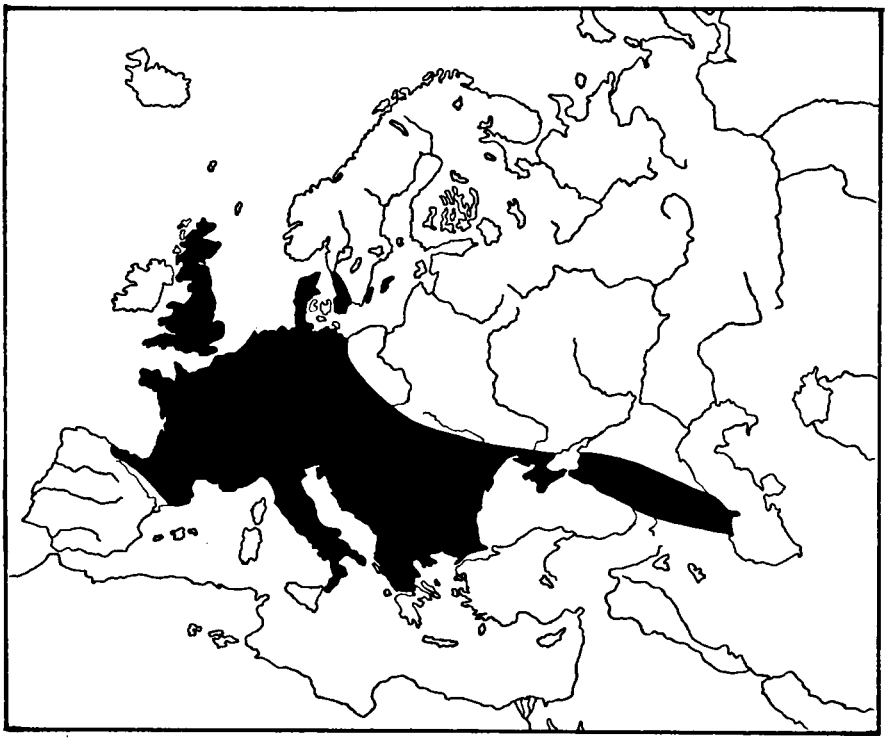
brown. Lateral stripe of tergites 2-6 distinct, posteriorly in contact with narrow, dark brown bordering of tergite hind margins. Sternites with a narrow, brown, median stripe. Sternite 7 brown to dark brown. Tergites 9 and 10, and sternites 8 and 9 light reddish brown, sometimes in part or conspicuously darkened. Cerci and hypovalvae reduced, cerci ending bluntly (fig. 140). Egg-slide of hypovalvae short, forming a vertical septum between anterior ends of hypovalvae (fig. 141). Eighth sternite very broad distad. Furca and sternum 9 as in fig. 142.

Distribution: map 18

According to Savchenko (1973b: 155) the record of *quadrifaria* from the northern region of the Baikal area by Becker & Schnabl (1926: 34), should be related to *bifusca* Alexander, which, unlike *quadrifaria*, does occur in that region.

Biology

The typical *quadrifaria* is very frequently reported from deciduous forests, hedgerows and scrub vegetations. The larvae live in leaf-mould and humic,



Map 18. Distribution of *N. quadrifaria quadrifaria.*

damp soils. Beling (1878) found larvae in old, mouldered ash stumps, their pupation took place at the end of May and in June, the pupal stage lasted 7-10 days. The same period of time is reported by Höchstetter (1962) who found larvae in leaf-mould under birch and hornbeam. Coe (1941) collected a pupa in old cow-dung on March 31, 1941 of which the imago merged on 17 May.

The period of flight is shown in diagram 9.

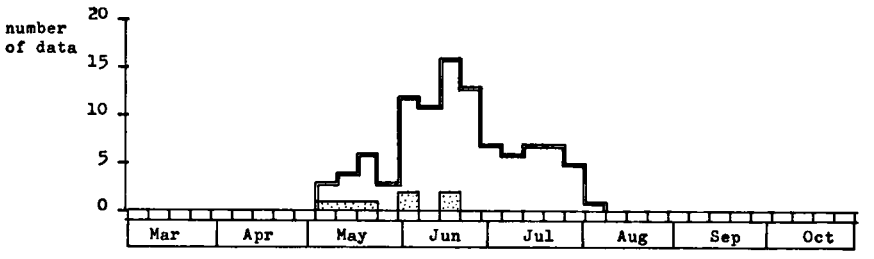


Diagram 9. Period of flight of *N. quadrifaria quadrifaria.*

Discussion

The small triangle just behind the ventral contact of the fore coxae ranges in colour from yellow to dark brown. This does not agree with the previously mentioned characters of the sections. *N. quadrifaria* however can be readily distinguished from the other species of the *cornicina* group by the distinct bar along the cross-veins of the wing. Within this group, *quadrifaria* has a rather peculiar position because of the reduced, bluntly ending female cerci. The tentative classification of this species into the *cornicina* group is based upon the presence of a median projection of the eighth sternite in the male.

Nephrotoma quadrifaria farsidica (Savchenko, 1957)
Figs 143-146, map. 19

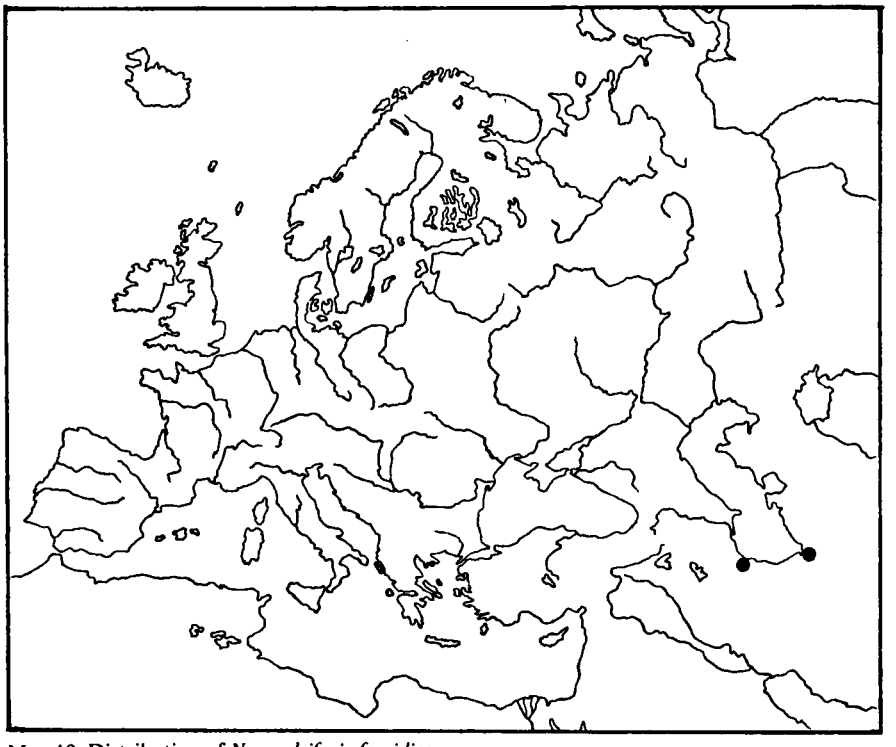
Synonymy:

Pales quadrifaria farsidica Savchenko, 1957, Revue d'Entomologie de l'URSS, 36: 218-9, figures; 1966a: 457; 1973b: 155-6, figures.

Type-material

Savchenko described *farsidica* after 1♂, 21.IV.1905 and 3♀, 13-20.IV.1905, from Iran, Astrabad, collected by Filipowitsj. The types are, according to Savchenko (pers. comm., 1976) in the Entomological Department of the Leningrad State University; Dr Tyschenko, head of this department,

informed me that the types are absent.
Material examined is 1 ♂, labeled: Iran Guilan, Foret d'Assalem, I-VII-1963, L. Matile rec; (MNHNP). The localities were not traceable. Guilan is interpreted as Gilan, in concordance with the localities, visited in Iran in 1963 by the collector, L. Matile of the Paris Museum.



Map 19. Distribution of *N. quadrifaria farsidica.*

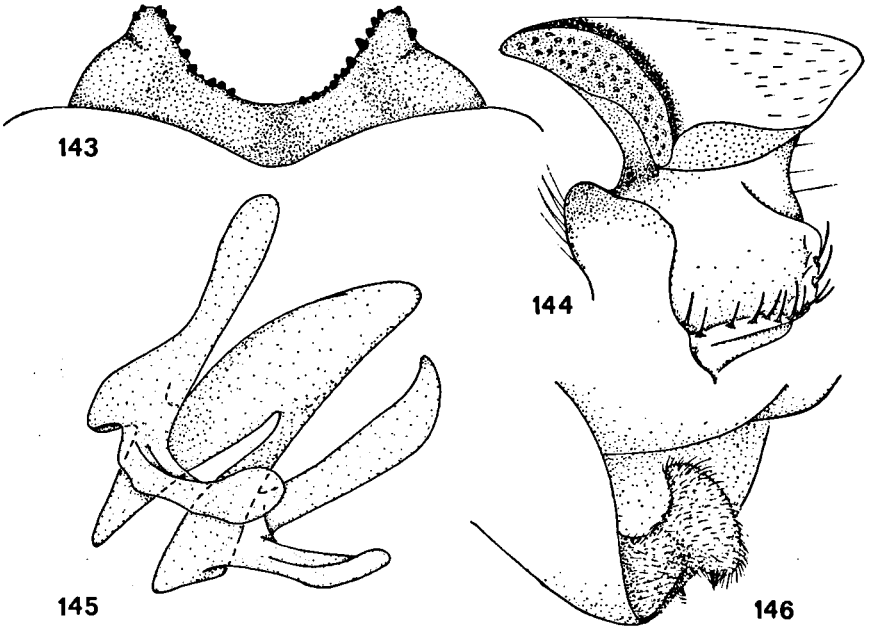
Discussion

Savchenko (1957: 218-9) listed the following differences between *q. farsidica* and *q. quadrifaria*, mentioning that both forms are of about the same size and that the female of *farsidica* is not noteworthy different from the male:

N. q. quadrifaria	*N. q. farsidica*
1) Top of frontal tubercle with a small median impression.	Top of frontal tubercle without a median impression.
2) Scutellum greyish with a dark, median stripe.	Scutellum entirely black, shining.
3) Tip of wing only slightly darkened.	Tip of wing broadly and intensively darkened.
4) Cell M1 petiolate.	Cell M1 sessile.
5) Abdominal sternites entirely yellow.	Sternites 3-8 with a broad, dark brown, median stripe.

6a) Od long and slender, protruding beyond disk of tergite 9.	Od broad and short, somewhat leaf-shaped, not protruding beyond disk of tergite 9.
6b) Posterior extension of tergite 9 with large, blunt-conical projections. Median incision wide and deep, about as wide as deep.	Posterior extension of tergite 9 with short projections. Tips of projections almost straight. Median incision deep, but not as deep as wide.
6c) Crest of id posteriorly broad and rounded. Anterior beak of id bent and sclerotized, black.	Id, instead of a membranous crest, posteriorly with a bluntly ending, sclerotized projection, Anterior beak almost straight, not sclerotized.
6d) Hind margin of sternite 8 without a tooth-shaped projection.	Hind margin of sternite 8 with a tooth-shaped projection.

The male specimen of *q. farsidica,* examined by me, does not share all differences, listed above. My comment on these differences is the following:
1) The frontal tubercle of *q.quadrifaria* can be with or without a median impression; in the *q. farsidica* examined the frontal tubercle is almost absent and (therefore) without a median impression.
2) The scutellum of the *q. farsidica* examined is brown. In *q. quadrifaria* the colour of the scutellum ranges from light brown to dark brown, in one female of Yugoslavia even to black.



Figs 143—146. *N. quadrifaria farsidica.* 143, posterior extension of tergite 9, dorsal view; 144, id, outside; 145, adminiculum, lateroposterior view; 146, median projection of sternite 8, lateroposterior view.

3) In the *q. farsidica* examined the wing-tip is not darkened to a larger extent or more intensively than normally found in *q. quadrifaria.*
4) Cell M1 of *q. quadrifaria* can be petiolate, very narrowly sessile or broadly sessile, which is apparently also the case in *q. farsidica,* in the male examined cell M1 is broadly sessile.
5) The male of *q. farsidica* examined has sternites 2-4 in part darkened. This darkening is artificial. The sternites 1, 5 and 6 are yellow.
6a) The od of *q. farsidica* examined is of the same shape as the od of *q. quadrifaria.*
6b) In the typical *quadrifaria* the median incision of the posterior extension of tergite 9 has large lateral projections. The median incision is usually as wide as deep or deeper (fig. 135 A). In males, collected in copula, however, the median incision can be very wide (fig. 135 B). The lateral shells of the posterior extension embrace the female hypovalvae during copulation, resulting in a disposition of the lateral shells and, in consequence, a widening of the posterior extension. The posterior extension of *q. farsidica* is shown in fig. 143.
6c) The crest of the id of the *q. farsidica* examined is as pointed out by Savchenko. The anterior beak of the id is smaller than in the typical *quadrifaria* and less sclerotized (fig. 144).
6d) In *q. quadrifaria* the median projection of sternite 8 is in line with the longitudinal axis of the sternite. In *q. farsidica* the median projection has a vertical position at the hind margin of sternite 8, as mentioned and figured by Savchenko. The median projection is laterally compressed and has a long pubescence (fig. 146).

The comments, mentioned above, in a way suggest that the male of *q. farsidica,* examined by me, is intermediate between the typical *quadrifaria* and the *q. farsidica,* described by Savchenko. The Gilan district in Iran, where the male I studied was presumably collected, is also intermediate between the type-locality of *q. farsidica,* Asterabad, and the easternmost locality of the typical *quadrifaria*, the Azerbaydzhan SSR in the Caucasus. Whether or not *quadrifaria* exhibits clinal variation, resulting in the form *farsidica,* cannot be well reasoned at the moment. The types of *q. farsidica* could not be examined by me and *q. quadrifaria* material from the Azerbaydzhan SSR was not available. Material from the Azerbaydzhan SSR, however, was examined by Savchenko (1973b: 155) and perhaps compared with the types of *q. farsidica.* The form *farsidica* is interpreted here as a subspecies of *quadrifaria* because a few characters, mentioned by Savchenko in the description of *farsidica,* are found also in the male examined by me: shape of the posterior crest of the id; size of lateral projection of posterior extension of tergite 9; position and shape of median projection of sternite 8.

Nephrotoma fontana spec. nov.
Figs 147-155, map 20

Type-material

Holotype: ♂, Aïn Mimoun, Juin, 1950/ Algerien, 1200 m, Vaillant 19./ Pales sullingtonensis Edw. Mannheims det. 1952; (MAK).

Paratypes: 1 ♀, labeled as the holotype; (ZMA). 1 ♂, Ben Chicao, 27 mai 1923, coll. H. Gauthier; (MNHNP).

Material examined is the type-series.

Description

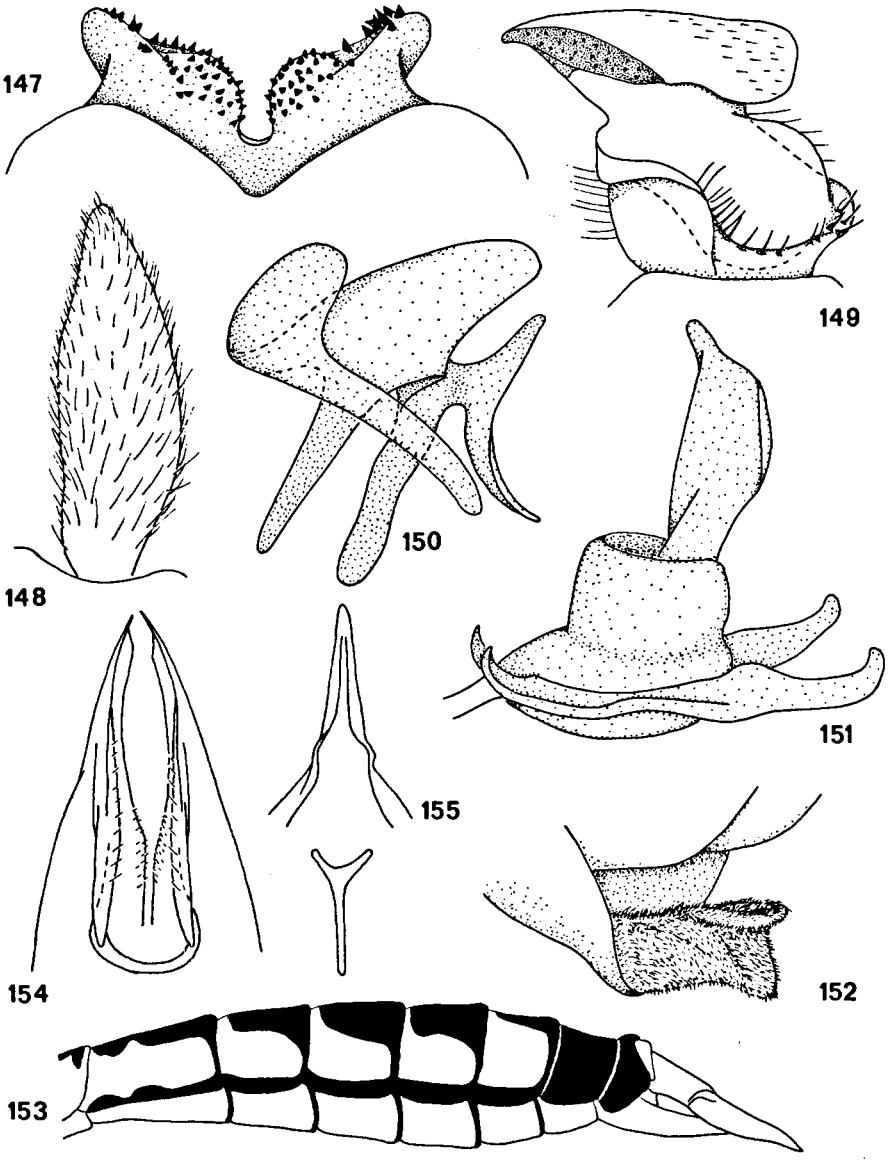
Body length ♂: 9 mm (holotype), 12 mm (paratype), ♀: 15 mm; wing length 10-12 mm.

Head ♂: Scape and pedicel yellow; flagellar segments dark brown. First flagellar segment as long as second one. Verticils up to as long as flagellar segments. Palpi brown. Nasus and dorsal part of rostrum brown. Genae and postgenae pale yellow; vertex yellow, light brown tinged. No spot below antennal bases. Spot between eye and frontal tubercle small or absent. Mark on occiput small, triangular, shining except for dull anterior edge, brown to dark brown, shape as figured for *quadrifaria*, fig. 134. Vertex sparsely hairy, hairs more or less in a row closer to eye margin than to occipital marking. Marks on inner part of postgenae small but distinct.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Prescutal stripes dark brown to black. Downwardly bent anterior ends of lateral prescutal stripes shining, lighter coloured than stripes themselves. Scutellum light brown, median region brown. Scutellum more or less transparent. Parascutellae yellow. Pleural markings distinct, dark brown. Anatergite ranging in colour from light brown to brown. Small triangle just behind ventral contact of fore coxae yellow with black lateral margins. Coxae yellow, basally darkened. Femora yellow to light brown, tips darkened. Tibiae light brown, tips darkened. Tarsi dark brown. Wings light brown toned; wing-stigma light brown, with macrotrichiae.

Abdomen ♂: Yellow to brownish yellow. Dorsal stripe narrow with straight lateral margins, brown, less conspicuous on tergite 6. Hind margins of tergites 2 and 3 with a narrow brown border. Narrow, lateral stripe brown, less conspicuous at tergites 4-6. Tergites 7 and 8 dark brown. Sternites 1-6 yellow, with or without an indistinct, brown, median stripe. Hind margins of sternites 2-4 with a narrow brown border. Sternite 7 dark brown. Sternite 8 dark brown except for surroundings of median projection.

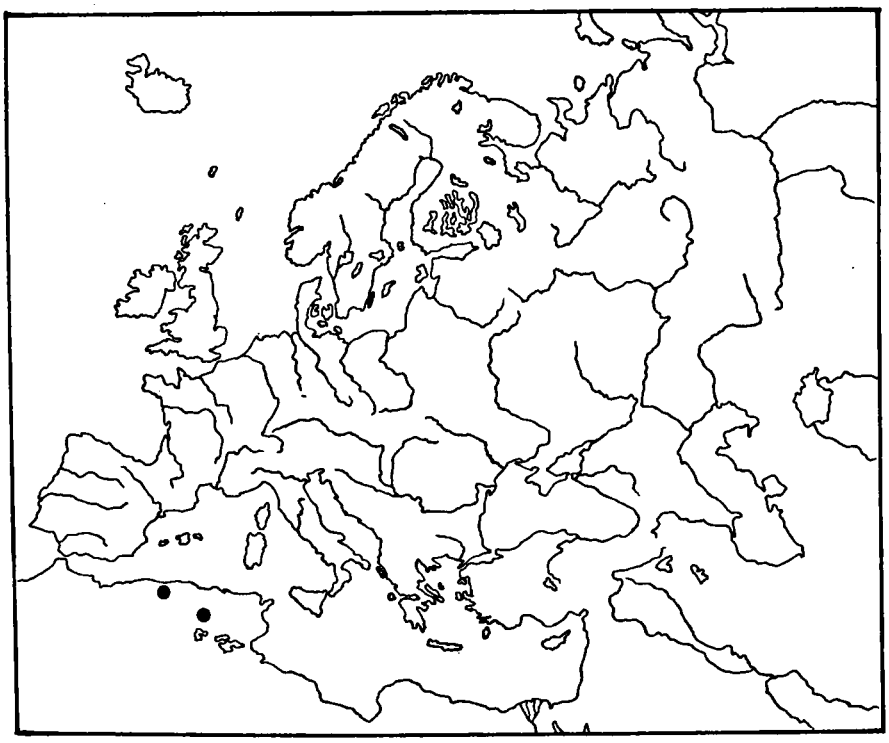
Hypopygium: Yellow (holotype) or light reddish brown (paratype). Disk of tergite 9 light brown, in part darkened (holotype) or dark brown (paratype). Posterior extension of tergite 9 with a basally rounded, median incision, more or less key-hole-like; outer margin laterally exceeding the rounded protuberances of median incision (fig. 147). Od as in fig. 148. Id with



Figs 147—155. *N. fontana.* 147, posterior extension of tergite 9, dorsal view; 148, od, outside; 149, id, outside; 150, adminiculum, lateroposterior view; 151, aedeagus, lateral view; 152, median projection of sternite 8, lateroposterior view; 153, abdomen female, lateral view; 154, hypovalvae, dorsal view; 155, furca and sternum 9, dorsal view.

a small, sclerotized beak; crest small, situated posteriorly; outer margin of lateral shell with bristles (fig. 149). Adminiculum with two appendages on each side, lateral ones elongate posteriorly (fig. 150). Compressor apodeme of aedeagus not bifurcated (fig. 151). Red-brown sclerotizations along ventral inner margin of sternite 9 small. Median projection of sternite 8 moderately large, about as long as broad, dorsally flattened and ventrally keeled, terminating in a pointed lobe (fig. 152).

Female: Differing from the male in the colouration of the abdomen. Verticils about 1.3 x length of flagellar segments. Mark on occiput shining all over. Abdomen yellow with a broad, dorsal stripe at tergites 1-5, narrow at tergite 6. Stripe with small intervals at anterior margin of tergites and distinctly triangular towards tergite hind margins. Hind margins of tergites 2-6 with a narrow brown border. Lateral stripe of tergites broad, dark brown, posteriorly in contact with brown bordering of tergite hind margins. Tergites 7 and 8 dark brown. Sternites yellow with a brown, median stripe, less conspicuous at sternites 2, 6 and 7. Hind margins of sternites with a narrow brown border. Tergite 10, cerci, sternite 8 and hypovalvae light brown, shining (fig. 153). Egg-slide of hypovalvae long. Vertical septum of egg-slide between anterior ends of hypovalvae low. The eighth sternite gradually



Map 20. Distribution of *N. fontana*.

narrows to the point where it passes into the hypovalvae (fig. 154). Furca and sternum 9 as in fig. 155.

Distribution: map 20

Specimens are known from two localities only: Aïn Mimoun, situated on the northern slopes of the Aurès mountains and Ben Chicao, between Médéa and Berrouaghia, both in Algeria.

Discussion

The other species of this section, *quadrifaria* has a distinct bar along the cross-veins of the wing and a more pronounced, dark brown, wing-stigma.

Etymology

This species is named *fontana* after the Algerian "Aïn", which means well or source.

Section 7

The species of this section, viz. *cornicina, moravica* and *sardiniensis,* are very similar. *N. sardiniensis* is new to science.

Nephrotoma cornicina (Linnaeus, 1758)
Figs 156-164, diagram 10, map 21

Synonymy:

Tipula cornicina Linnaeus, 1758, Systema Naturae, Ed. 10: 586; 1761: 433; 1767: 972; Fabricius, 1775: 750; 1781: 403; 1787: 322; Gmelin, 1790: 2815; Fabricius, 1794: 238; Schrank, 1803: 66; Fabricius, 1805: 29; Macquart, 1826: 76; Schummel, 1833: 101; Zetterstedt, 1838: 646; Haliday, 1851: 134.

Pachyrhina cornicina: Macquart, 1834: 90, figures; Staeger, 1840: 25 (= *flavescens*); Zetterstedt, 1851: 3994, 3996; van der Wulp & Snellen van Vollenhoven, 1853: 144 (= *flavescens*); Walker, 1856: 331-2; Schiner, 1864: 505, 509; van der Wulp, 1866: 17 (= *flavescens*); 1874: 146; 1877: 380; Westhoff, 1880: 49, figures, biology; Wallengren, 1882: 14; Westhoff, 1882: 48, figures, biology; Verrall, 1886: 119; Strobl, 1895: 85, biology; van der Wulp & de Meijere, 1898: 28; Thalhammer, 1900: 20; Jacobs, 1903: 352; Lundström, 1907: 24; Riedel, 1910: 426-33; Czižek, 1911: 73-8; Lundström, 1912: 47; Vimmer, 1913: 18; Nielsen, 1918: 10; Riedel, 1918/1919: 5; Pierre, 1919b: 618; Riedel, 1919: 18; 1920: 15; Goetghebuer & Tonnoir, 1921: 123; Stackelberg, 1922: 16; Brolemann, 1923: 507-9, figures; Pierre, 1924a: 28, figures, biology; Weigand, 1924: 46; Lackschewitz, 1927: 4; Zangheri, 1949: 12; Simova, 1959: 127.

Pales cornicina: Audcent, 1932: 10; Mannheims, 1951a: 33-5, 41-3, 49; 1951c: 228; Stackelberg, 1951: 740, biology; Fischer, 1952: 120; Mannheims, 1953: 2; 1954a: 151; 1954b: 32; Savchenko, 1954: 618, 625, 634, figures, biology; Theowald, 1957a: 223, figures, biology; 1957b: 10; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961: 249; Mannheims, 1961: 309; Savchenko, 1961: 1895; Erhan, 1962: 94-5, figures; Hemmingsen, 1962: 140; Höchstetter, 1962: 78; Zinovjev & Savchenko, 1962: 567-9, biology; Mannheims, 1963: 38; Mannheims & Pechlaner, 1963, 6, 13, biology; Mannheims, 1964c: 107; 1965: 7; 1966a: 275; Savchenko,

1966a: 463-6, figures; 1966b: 56; 1966d: 119; Zangheri, 1969: 1024; Savchenko, 1973b: 136-40, figures, biology; Simova, 1974: 26.

Nephrotoma cornicina: Olivier, 1809: 195-6; Alexander, 1924a: 448; 1924b: 599; 1925b: 20; Nielsen, 1925: 156, figures; Alexander, 1931: 144, biology; Esaki, 1932: 179; Lackschewitz, 1933: 249; Masaki, 1933: 90; Nielsen, 1933: 245; Alexander, 1937: 23; Edwards, 1939: 244; Wu, 1940: 4; Coe, 1950: 10; Parmenter, 1950: 108; Alexander, 1953: 145; Forsslund, 1954: 44-50, biology; Tjeder, 1954: 47, biology; 1955b: 246-7 Brindle, 1960: 86, 101, figures, biology; Coe, 1960: 44; Nielsen, 1962: 165; Tjeder, 1965: 46; Mannheims, 1967a: 200, biology; 1967b: 78; 1967c: 152; Savchenko & Violovich, 1967: 358-9; Theowald, 1967: 19, 63, biology; Tjeder, 1967: 20; Mannheims, 1969: 187; Starý & Martinovský, 1969: 8; Savchenko, 1970: 121; Hartig, 1971: 124; Martinovský, 1971: 45-51, figures; Theowald, 1971: 220; Savchenko, Violovich & Narchuk, 1972: 77-8, 82-3, 92, biology; Mannheims & Savchenko, 1973: 161; Stubbs, 1973: 103-6, biology; Klopp, 1974: 162, figures, biology; Oosterbroek, 1975: 120.

Tipula flavomaculata De Geer, 1776, Mémoires pour servir a l'Histoire des Insectes, 6: 347; Zetterstedt, 1838: 845-6.

Pachyrhina flavomaculata: Schiner, 1864: 506; van der Wulp, 1877: 382; Verrall, 1886: 119; Riedel, 1910: 433.

Pales flavomaculata: Mannheims, 1951a: 36; Savchenko, 1973b: 136.

Nephrotoma flavomaculata: Edwards, 1938: 101.

Tipula iridicolor Schummel, 1833, Beiträge zur Entomologie, Breslau, 3: 101-2; Haliday, 1851: 134.

Pachyrhina iridicolor: Schiner, 1864: 505; van der Wulp, 1866: 17; Palm, 1869: 406; Grzegorzek, 1873: 27; van der Wulp, 1874: 146; 1877: 380; Beling, 1878: 39-40, biology; Wallengren, 1882: 14; Verrall, 1886: 119; Huguenin, 1888: 19; Kowarz, 1894: 7; Strobl, 1900c: 192; Thalhammer, 1900: 20; Vimmer, 1905a: 70-5, figures, biology; 1906: 37-49; Riedel, 1910: 432; Czižek, 1911: 77.

Pales iridicolor: Mannheims, 1951a: 42; Theowald & Mannheims, 1956: 248; Savchenko, 1973b: 136.

Tipula sannio Meigen, 1838, Systematische Beschreibungen, 7: 36.

Pachyrhina sannio: Staeger, 1840: 25; Zetterstedt, 1851: 3994-5; 1852: 4360; 1860: 6544; Schiner, 1864: 505; van der Wulp, 1866: 17; 1874: 146; 1877: 380; Verrall, 1886: 119; Riedel, 1910: 432; Czižek, 1911: 77.

Pales sannio: Mannheims, 1951a: 42; 1964c: 107; Savchenko, 1973b: 136.

Nephrotoma sannio: Lackschewitz, 1933: 249.

Type-material

Nephrotoma cornicina (Linnaeus): In the Linnean collection, Burlington House, London, one female, labeled: 11. cornicina; (v! O, 1977).

Nephrotoma flavomaculata (De Geer): In the collection De Geer under nr 365 one female (NRS; v! O, 1976; designated here as lectotype) and under nr 366 one specimen of *aculeata.*

Nephrotoma iridicolor (Schummel): According to Horn & Kahle (1937: 251) the collection Schummel, being already greatly destroyed, was sold. The description by Schiner (1864: 505) is unequivocal.

Nephrotoma sannio (Meigen): In the collection Meigen under number 371 3 ♂♂, 1 ♀ (MNHNP; v! M, 1950; v! O, 1976).

Material examined (504 ♂♂, 489 ♀♀, types not included) originated from the following countries: Norway (Stjördalshalsen), Sweden (Byske, Haparanda, Umeå), Great Britain, Netherlands, West Germany, Czechoslovakia (Hronec near Brezno, Kostolany), France, Andorra, Spain, Switzer-

land, Italy, Austria, Hungary, Romania, Yugoslavia, Albania, Greece, USSR (Liwny near Kursk, Irkutsk, Central Siberia, North West Siberia), Turkey, Lebanon (Bcharre), Iran, Afghanistan, Pakistan (Chitrall, Wazirabad), India (Kashmir), China (Hsiacling).

Description

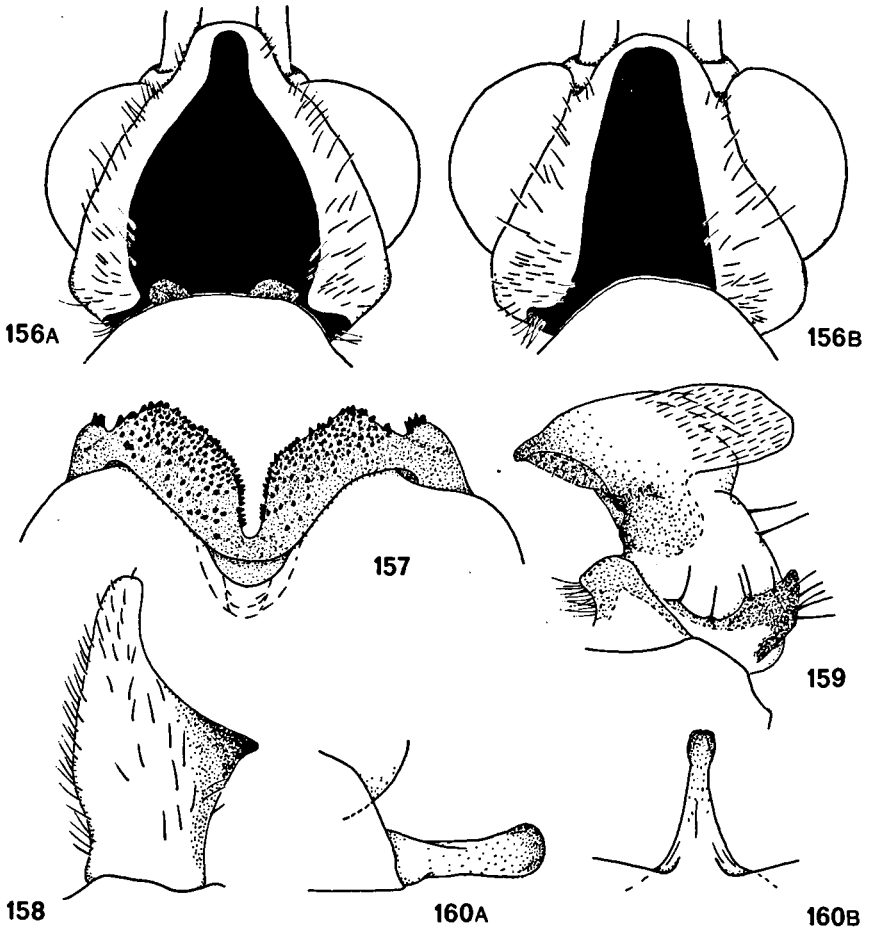
General remark: In material from Asia Minor and Pakistan we find differences with the European specimens, with respect to the adminiculum (fig. 161 A-D), the ninth tergite and the od. In these specimens the ground colour tends to be pale yellow, as found in some specimens from south eastern Europe. The description below is that of the European *cornicina*. The specimens studied from Asia are dealt with in the discussion, together with *cornicina nigrina*, a form from the Caucasus in which the yellow colour is superseded by black.

Body length ♂: 11-15 mm, ♀: 14-18 mm; wing length: 9-13 mm.

Head ♂: Scape yellow or yellow-brown, with a slightly or distinctly darkened apex; pedicel light brown to dark brown; flagellar segments dark brown to black. First flagellar segment about as long as second one. Verticils almost as long as flagellar segments. Palpi light brown. Nasus and dorsal part of rostrum dark brown. Genae, vertex and postgenae yellow, vertex sometimes tinged with brown. No spot below antennal bases. Spot between eye and frontal tubercle small, dark brown. Mark on occiput triangular or with convex lateral margins, usually large and broadly extending up to frontal tubercle, sometimes of a narrow shape (fig. 156 A&B). Vertex moderately densely hairy, hairs more or less in rows, especially those closer to eyes. Postgenae sometimes densely hairy, hairs shorter than at vertex. Marks on inner part of postgenae usually distinct.

Thorax ♂: In general yellow, in some specimens from south eastern Europe pale yellow. Dorsal and lateral parts of pronotum yellow to light brown; usually brown to dark brown where in contact with anepisternite; median, dorsal region tinged with brown. Downwardly bent anterior ends of lateral prescutal stripes dull, rarely absent or loosely attached to stripe (as in *aculeata*). Scutellum more or less transparent, normally yellow but ranging in colour to dark brown, in some specimens from the Pyrenees even to black. Parascutellae yellow to light brown. Pleural markings usually slightly indicated, sometimes distinct except for those at anepisternite and sternopleuron. Anatergite ranging in colour from yellow to brown, usually darker than yellow anterior half of katatergite. Small triangle just behind ventral contact of fore coxae yellow. Coxae yellow, sometimes basally darkened. Femora and tibiae light brown, tips slightly or distinctly darkened. Tarsi black. Wings light brown toned; wing-stigma distinct, usually brown, ranging from light brown to dark brown, with macrotrichiae; wing-tip sometimes slightly darkened.

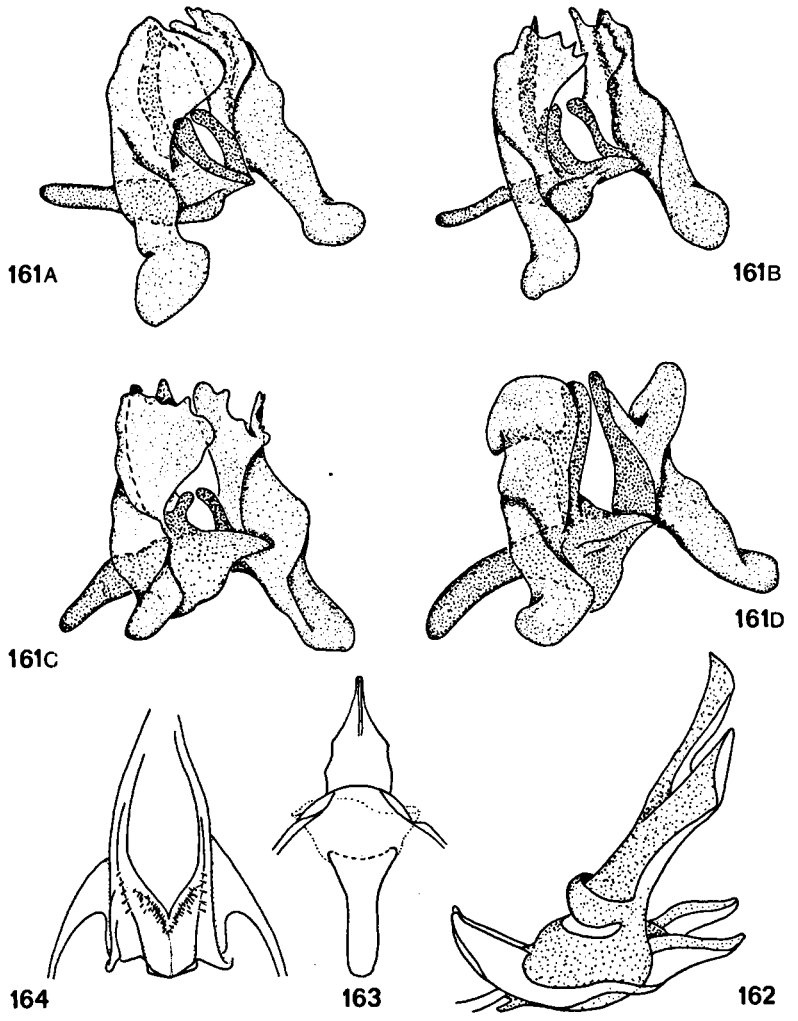
Abdomen ♂: Brownish yellow, in some specimens from south eastern



Figs 156—160. *N. cornicina*. 156, head, dorsal view, showing variability in shape of occipital brand; 157, posterior extension of tergite 9, dorsal view; 158, od, outside; 159, id, outside; 160, median projection of sternite 8: A, lateral view, B, ventral view.

Europe pale yellow. Broad, dorsal stripe usually distinct, light brown to brown, frequently narrowly interrupted by lighter coloured tergite hind margins. Posterior half of tergite 7, tergite 8 and hypopygium in general conspicuously darkened. Tergites laterally with a dark brown, narrow stripe, situated well above lateral margins. Sternites usually with a narrow, light brown, median stripe.

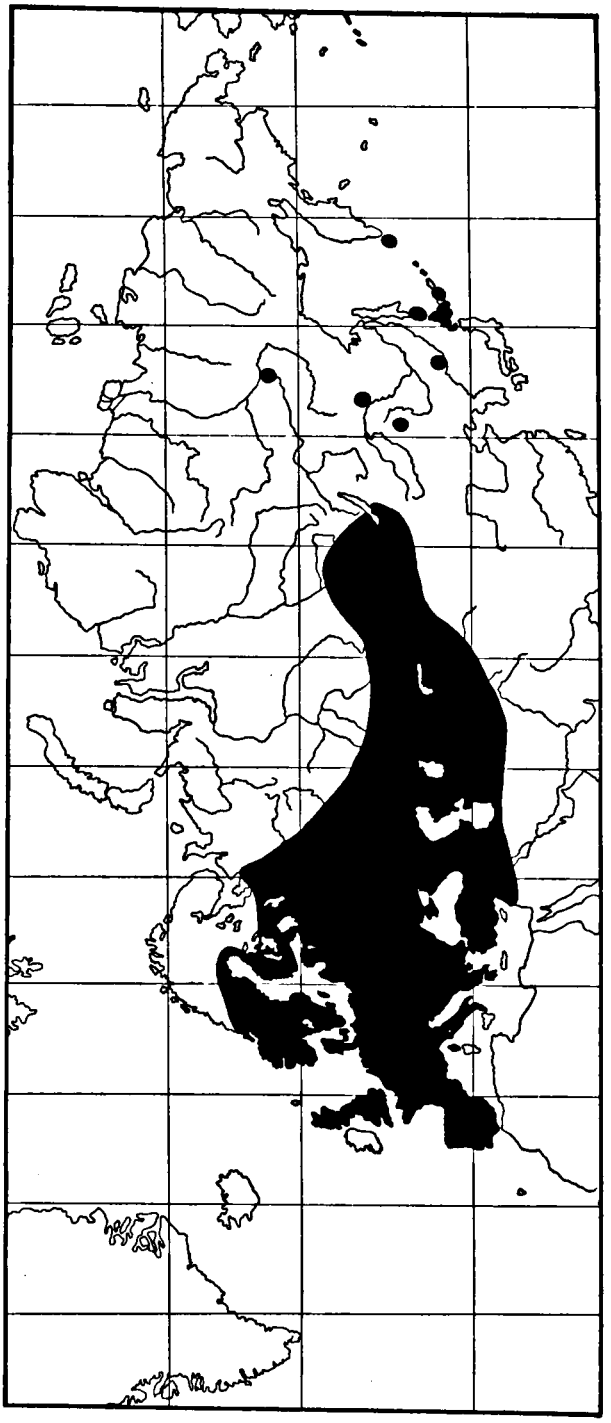
Hypopygium: Deep, median incision of posterior extension of tergite 9 apically widely V-shaped; posterior extension bearing small, black spines (fig. 157). Od large, sclerotized part of posterior margin usually as figured (fig. 158), sometimes less triangular. Crest of id elongate posteriorly; outer margin of lateral shell with a distinct, apically blackened projection (fig. 159). Median projection of sternite 8 not dorsoventrally compressed, terminating



Figs 161—164. *N. cornicina*. 161, adminicula, lateroposterior view: A, Turkestan, B, Turkey, Armenia (*N. cornicina nigrina*), C, Iran, Elburz mountains, D, Hungary, Pest; 162, aedeagus, lateral view; 163, furca and sternum 9, dorsal view; 164, hypovalvae, dorsal view.

in a knob, variable in size; pubescent, especially at apical half (fig. 160). Red-brown sclerotizations along mid-ventral, membranous part of sternite 9 small. The adminiculum is of a complicated structure, each side has four appendages (fig. 161 D). Aedeagus as in fig. 162.

Female: Resembling the male but differing in the abdominal colouration. Verticils longer than flagellar segments. Dorsal abdominal stripe usually with straight, lateral margins, rarely triangular towards tergite hind margins and/or narrowly extended along tergite hind margins; dorsal stripe frequently



Map 21. Distribution of *N. cornicina*.

less distinct than in male and absent at tergite 7. Tergite 8 in general conspicuously darkened. Tergites laterally with a broad, dark brown stripe, situated well above lateral margin. Egg-slide short; vertical septum between anterior ends of hypovalvae low; anterior ends of hypovalvae distinctly widened; sternite 8 broad (fig. 164). Furca and sternum 9 broad (fig. 163).

Distribution: map 21

Biology

The species *cornicina* is found in a variety of habitats: fields, meadows, gardens, bushes, fringes of woods, in the Amur region in moist mixed and birch forests (Zinovjev & Savchenko), in the Altai mountain region in the forests and steppe areas (Savchenko, Violovich & Narchuk). According to Savchenko (1973b) "the eggs are laid in boggy soils or in soils covered with leaves. For the oviposition the lower situated, moist spots are preferred. Most likely the eggs do not hatch before autumn and the development of the larvae does not stop in wintertime but they feed on roots of grasses, including cultivated plants. In the Kiev region most larvae pupate in mid-June. Research in 1951 showed that the pupal stage took 11-12 days at a temperature of 22-23°C. Stackelberg mentions that, under the environmental circumstances of the Leningrad region, the pupa needs circa three weeks for the development".

Damage by *cornicina* larvae has been reported from beet, in May (Vimmer, 1905a), cabbage (Savchenko, 1954) and of one year old spruce-firs, in July (Forsslund, 1954). In the latter case the larvae were not affecting the roots but the bark of the young spruce-firs and they were in all probability introduced by mulching.

In the European mountain regions *cornicina* does not occur beyond 1800 m above sea-level and Savchenko (1973b) gives altitudes of 1750-1800 m in the

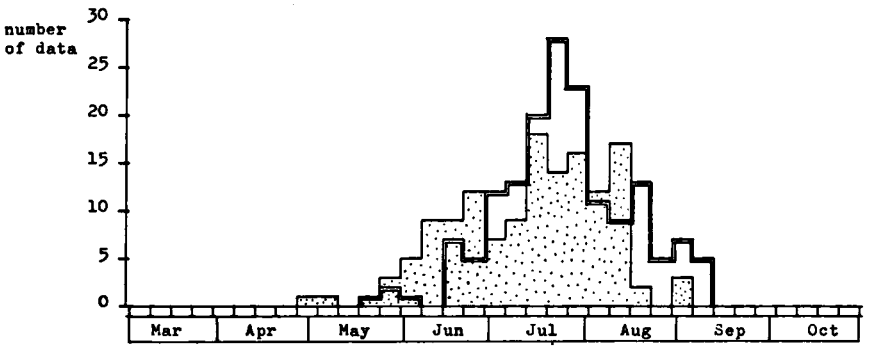


Diagram 10. Period of flight of *N. cornicina*.

Tien-Shan, of 2000 m in the Caucasus [*cornicina nigrina*: 2300-2600] and of 2700 m in Kashmir.

The period of flight is shown in diagram 10.

Discussion

Because of the short description of *Tipula cornicina* by Linnaeus (1758: 586, no. 11, "T. alis hyalinis puncto marginali fusco, abdomine flavo lineis tribus fuscis"), this species was misinterpreted by several authors until Haliday (1851: 134) stated, after examination of the type specimen, that *cornicina* is the same as *iridicolor* Schummel, of which Schiner (1864: 505) gave a very good description. The misinterpretations are:

A. *cornicina* L., sensu Meigen, 1804, = *histrio* Fabricius, sensu Meigen, 1818, = *flavescens* L. In 1804 Meigen described, at page 72, *Tipula quadrifaria* and provided at page 77 a German translation of Fabricius' latin description of *Tipula histrio*, writing: "Sie (histrio) scheint von der *Tipula quadrifaria* wenig verschieden, oder wohl die nämliche zu sein". In 1818, page 198-199, Meigen redescribed *Tipula histrio* Fabricius, and stated that he was not familiar with *Tipula cornicina* Linnaeus. The material on which the redescription of *histrio* was based, was apparently from Fabricius' own collection (see the introduction of Meigen, 1818, page VI and VII). The redescription does hold for *flavescens* and in the Meigen collection (MNHNP; v! M, 1951; v! O, 1976) we find under *histrio* 1 ♂ and 1 ♀ of *flavescens*. In 1830, page 286, Meigen however stated: "*Tip. quadrifaria* ist wohl ziemlich gewiss *Tip. cornicina* Linn. und in Fabricius Sammlung steckt sie als *Tip. histrio*, doch scheint dieser mehrere Arten verwechselt zu haben. Die Art muss also die ursprüngliche Linneischen Namen wieder annehmen". The synonymy of these three names was accepted by: Staeger, 1840: 25; Zetterstedt, 1851: 3996; 1852: 4360; 1860: 6544 and by van der Wulp & Snellen van Vollenhoven, 1853: 144; van der Wulp, 1866: 17. These authors discussed the species *quadrifaria* under the name *dentata* Meigen. In the collection Meigen we find under *cornicina* 1 ♂ of *appendiculata* and 1 ♀ (without name-label) of *lunulicornis* (see also Mannheims, 1964c: 107 and Savchenko, 1973b: 141).

B. *flavomaculata* De Geer, 1776, = *flavescens*, and not *cornicina*, as stated by De Geer himself (1776: 347), Edwards, 1938: 101 and Savchenko, 1973b: 136. Examination of the type-series showed that these three authors were correct, *flavomaculata* = *cornicina*.

C. *cornicina* L., sensu Zetterstedt, 1851, = *analis* Schummel, as pointed out by Schiner, 1864: 505; van der Wulp, 1874: 146; 1877: 379; Riedel, 1910: 426; Czižek, 1911: 71; Lackschewitz, 1933: 249; Mannheims, 1951a: 55 and Savchenko, 1973b: 58.

The species was well interpreted after Haliday and Schiner, as it was the only species until 1971 in which the median projection of the male eighth sternite is knob-like. In 1971, Martinovský described *Nephrotoma moravica*, a species very similar to *cornicina*. Another such species is described here as

sardiniensis. From the literature it is not traceable whether these three species were mixed up. In the collection Mannheims (MAK), I found two females of *moravica*, identified as *cornicina*. The type-series of *sardiniensis* also was identified as *cornicina*. The differences between males of *cornicina*, *moravica* and *sardiniensis* are discussed under the two last-mentioned species. The females of *cornicina* are in general less easily distinguished. They can be separated from the species of the *cornicina* group, in which the small triangle just behind the ventral contact of the fore coxae is yellow, by the combination of the following characters: mark on occiput usually large and broad; downwardly bent anterior ends of lateral prescutal stripes dull; pleural markings never very conspicuous; dorsal abdominal stripe moderately broad and straight, rarely triangular towards tergite hind margins. The most similar females are those of *moravica*, *sardiniensis* and *nasuta*. In *nasuta* the pleural markings are very distinct, in the other two species the females have the dorsal abdominal stripe triangular towards the tergite hind margins.

In 1973, Savchenko described the form *cornicina nigrina* (Savchenko, 1973a, Pratsi Instytutu Zoolohiyi, Kȳyiv, 35: 36-7, as "*Nephrotoma nigrina* Mnnhs. in litt."), writing: "New species, described by the late Dr. B. Mannheims from the mountain areas of northern Turkey. As is clear from examination of the type-series, *N. nigrina* apparently should not be listed as a species because there are, besides the melanistic colouration, no fundamental differences with the transpalaearctic species *N. cornicina* L., especially not in the structure of the male hypopygium, and it is closely related to the, in colouration intermediate form from the Transcaucasus . . . Therefore *N. nigrina* must be regarded as the Asia Minor form of *N. cornicina* from the high mountain regions". Although Mannheims did not describe *nigrina*, the type-series, mentioned by Savchenko, is the 3 ♂, 9 ♀, from: Türkisch-Armenien, Villayet Karz (NO-Türkei), vic. Göle (=Merdenik), alt 2300-2600 m, VIII.IX.1965, leg. Achtelig & Nauman, (MAK; v! O, 1976), of which one male is labeled as holotype. The general appearance of these specimens is black. In the male the genae and the posterior half of the vertex are brownish yellow. The ventral half of the rostrum and the postgenae are pale yellow. The small areas between the black, prescutal and scutal stripes are brown. The paratergites and lateral parts of the mediotergite are brown. The pleurae are brown with black markings. The legs are dark brown to black. The colour pattern of the female head and thorax is as found in the typical *cornicina*, but the colour is brownish yellow and the dark markings are more intensively coloured. The basal half of the femora is in the female brownish yellow, the apical half, the tibiae and the tarsi are dark brown to black, as is the abdomen. The cerci and basal half of the hypovalvae are reddish brown.

As Savchenko pointed out, *nigrina* should not be listed as a species. His statement, however, that there are no fundamental differences in the male hypopygia of *nigrina* and the transpalaearctic *cornicina* is incorrect. In fig. 161 A-D, the adminicula of several specimens of *cornicina* are shown. The specimens from Asia Minor and Iran show in their adminicula a few

characters in common, which do not occur in European specimens (dissected are males from Italy, the Netherlands, Austria and Hungary). In the European males the, more sclerotized, inner margins of the dorsal appendages are longer and the smooth, upper margin of the dorsal appendages is elongate anteriorly. In males from Asia Minor and Iran the, more sclerotized, inner margins are shorter and the upper margin of the dorsal appendages is more or less pectinate and elongate posteriorly. The form *nigrina* (fig. 164 B), belongs without doubt to the Asia Minor and Iran forms of *cornicina*. Within this group there is variability in the colouration of the body and in the dorsal appendage of the adminiculum. I also noted variability in the shape of the median projection of the eighth sternite and in the shape and sclerotization of the od. A subdivision of the species *cornicina*, especially with regard to the above mentioned forms, is not feasible at the moment. There is too little information about the possible clinal character of the differences and about eventual borderlines. A detailed study, based on extensive material, has to be undertaken first.

Nephrotoma moravica Martinovský, 1971
Figs 5, 165-170, map 22

Synonymy:

Nephrotoma moravica Martinovský, 1971, Acta entomologica bohemoslovaca, 68: 45-51, figures.

Type-material

Holotype: ♂, Moravia, 1967, Brno, 3.IX, leg. J. Martinovský/Collection J. Martinovský/ Holotypus/ Nephrotoma moravica sp.n, det. J. Martinovský; (Moravské Museum, Brno; v! O, 1976).
Paratypes: 1 ♂, 2 ♀, 1 ♂ pupa, labeled as the holotype, the ♂ however: e. l. 18.6.1969; (Martinovský collection, Olomouc). According to Martinovský, 1971, the types are also labeled: -Jiráskův les (217 m ü. d. M.), these latter data are not on the holotype labels.

Material examined: the holotype and 2 ♀♀ from Hungary (MAK).

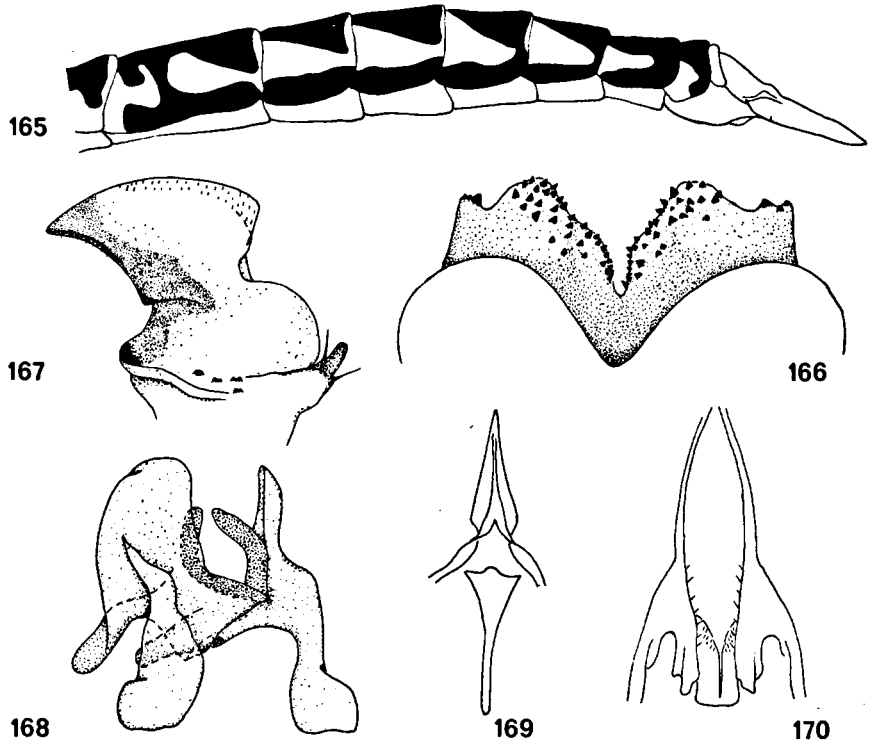
Description

Body length: ♂ 11 mm, ♀: 12 mm; wing length: 10-12 mm.

N. moravica is very similar to the previously described *cornicina*. The differentiating characters with the latter species are:

Head: Scape pale yellow. Pedicel yellow (holotype) or light brown (2♀♀). Nasus dark brown. Dorsal part of rostrum brown. Genae and postgenae pale yellow. Mark on occiput brown, variable in size, in the holotype and in one female large, anteriorly broad, touching the eyes and without defined boundaries, in the other female smaller, triangular. Mark on inner part of postgenae less distinct.

Thorax: Paler yellow than usually found in *cornicina*. Lateral parts of



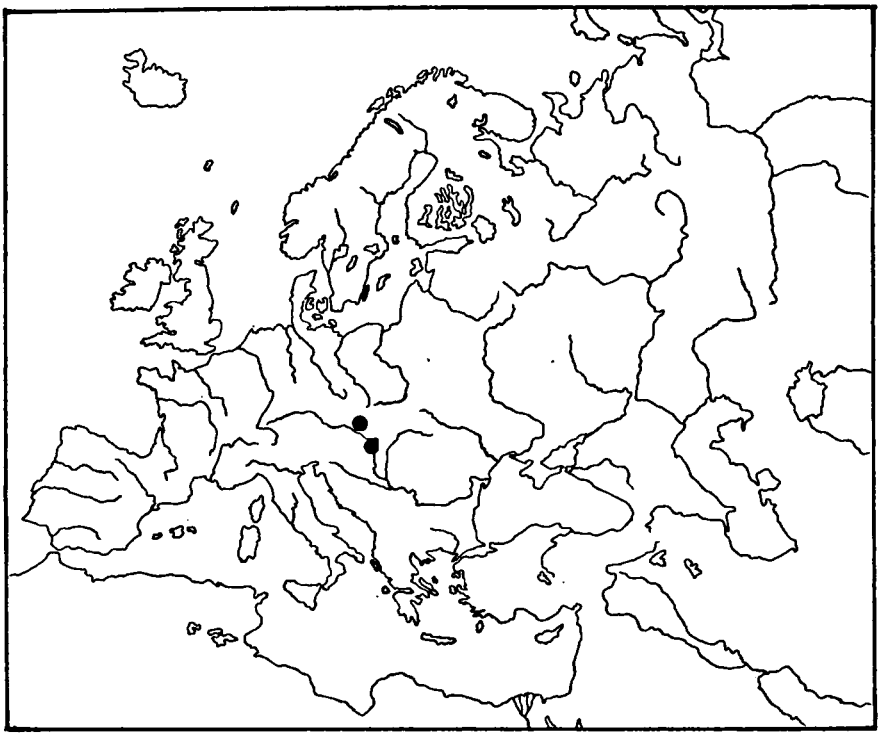
Figs 165—170. *N. moravica.* 165, abdomen female, lateral view; 166, posterior extension of tergite 9, dorsal view; 167, id, outside; 168, adminiculum, lateroposterior view; 169, furca and sternum 9, dorsal view; 170, hypovalvae, dorsal view.

pronotum somewhat darkened. Pleural markings absent (holotype) or light brown (2 ♀♀). Anatergite and posterior half of katatergite brown.

Abdomen: The abdominal dorsal stripe of the females is broad and distinctly widened towards tergite hind margins, at tergites 5-8 posteriorly in contact with lateral stripe (fig. 165).

Hypopygium: The posterior extension of the ninth tergite has the posterior half of the median incision narrow V-shaped with slightly concave inner margins (fig. 166). The tip of the od is less pointed than normally found in *cornicina.* The crest of the id is small and not extended posteriorly (fig. 167). Adminiculum as found in the European *cornicina* (fig. 168). The membrane between the ventral inner margins of the ninth sternite is protruding behind the hypopygium. Median projection of sternite 8 less knob-like. Compressor apodeme of the aedeagus longer than in *cornicina.*

Ovipositor: Furca and sternum 9 as in fig. 169. Sternite 8 moderately broad distad (fig. 170).



Map 22. Distribution of *N. moravica.*

Distribution: map 22

The species is known from Czechoslovakia (type series) and Hungary (1 ♀ Pomáz and 1 ♀ Leanyfalu, both localities near Budapest).

Biology

The species is known to fly in July (1 ♀, 7.VII) and September.

Discussion

The following differentiating characters, used by Martinovský to separate *moravica* and *cornicina,* are found to be less useful, due to the large variability of the latter species: shape of occipital marking, shading of wing tip, colour of abdominal dorsal stripe and colour of the eighth tergite in the female.

Nephrotoma sardiniensis spec. nov.
Figs 171-174, map 23

Type-material

Holotype: ♂, Sardinien, Gennargentu oberhalb Afrika/1000 m, H. Noack, 1.7-10.8.1938; (MAK).

Paratypes: 8 ♂, 17 ♀, labeled as the holotype; (7 ♂, 16 ♀, MAK; 1 ♂, 1 ♀, ZMA). 1 ♂, Sardinia near Arilzo; 1000 m, 1.7-10.8.1938, Noack leg. Peus

ded. (ZMA). 2 ♂, Sardinia, Gennargentu, 1400 m, Br Spina, 7.VIII.74, coll. F. Hartig; (Hartig collection, Bolzano).

Material examined: type-series

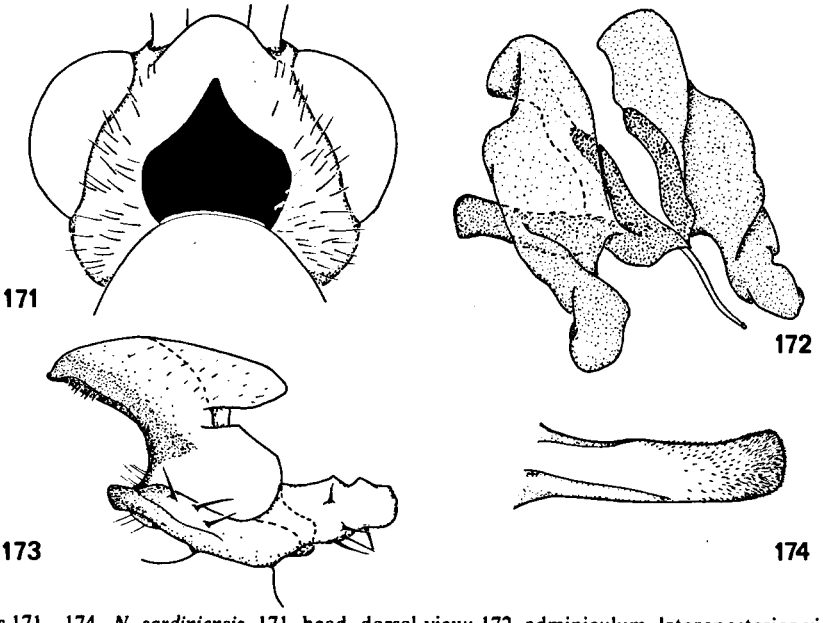
Description

N. sardiniensis is of the same size as and very similar to *cornicina,* differing from the latter in the following characters:

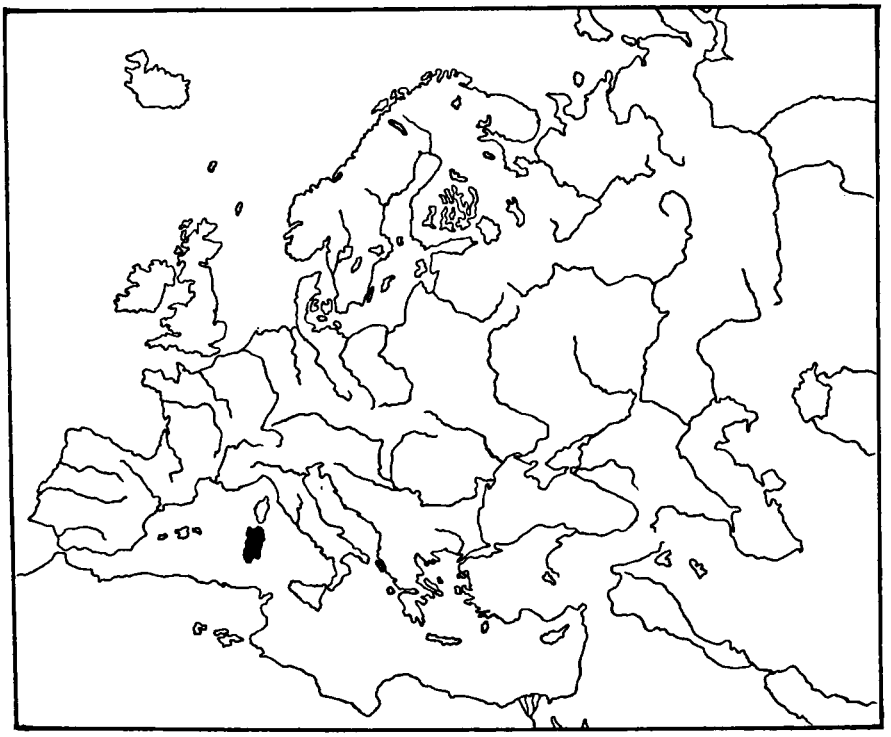
Male: Colouration of head, thorax and abdomen much more yellow than usually found in *cornicina.* Scape ranging from yellow to light brown. Mark on occiput brown, smaller than in *cornicina,* less triangular, basally more rounded and not broadly prolonged up to frontal tubercle (fig. 171). Pleural markings faint or brown. Anatergite usually brown, sometimes even yellow. Abdominal dorsal stripe light brown, in general confined to tergites 1-5 and slightly widened towards tergite hind margins. Hind margins of tergites 2-5 usually with a brown border. Segments 7 and 8 not darkened as normally found in *cornicina.* Tergite 8 usually brown to dark brown dorsally.

Hypopygium: Dorsal appendages of adminiculum not bilobe; sclerotized inner margins of dorsal appendages shorter than in *cornicina* (fig. 172). Projection at lateral shell of id very long (fig. 173). Median projection of sternite 8 slender, more or less laterally compressed (fig. 174).

Female: Resembling the male. Abdominal dorsal stripe confined to tergites 1-6, brown, somewhat triangular towards tergite hind margins. Hind margins of tergites 2-6 brown bordered. Lateral stripe of tergites posteriorly



Figs 171—174. *N. sardiniensis.* 171, head, dorsal view; 172, adminiculum, lateroposterior view; 173, id, outside; 174, median projection of sternite 8, lateral view.



Map 23. Distribution of *N. sardiniensis.*

in contact with brown bordering of tergite hind margins. Posterior part of abdomen yellow, cerci and hypovalvae reddish brown. Furca, sternum 9 and hypovalvae as in *cornicina.*

Distribution: map 23

The only known specimens are those of the type-series, all from Sardinia.

SECTION 8

The species of this section are *schaeuffelei, nasuta* and *spatha.* They are quite dissimilar. The female of *schaeuffelei* is described for the first time, the female of *spatha* is unknown.

Nephrotoma schaeuffelei (Mannheims, 1964)
Figs 175-182, map 24

Synonymy:

Pales schaeuffelei Mannheims, 1964, Stuttgarter Beiträge zur Naturkunde, 126: 1-3, figures; Savchenko, 1973a: 35-36, figures; 1973b: 277.

Type-material

Holotype: ♂, Iran (Persia), Mirchomand, 8.51, 2300 m, Schauffele lg; (SMNS).

Paratypes. 2 ♂, labeled as the holotype (1 ♂ MAK; v! O, 1976; 1 ♂ SMNS;. Mannheims (1964: 3) named the paratypes Paratopotypoide, without mentioning any further data. I assume that the holotype labeling is the same as in the paratype (MAK), examined by me.

Material examined is one paratype (MAK) and 5 ♂, 2 ♀ (MAK), from Iran, Talysch mountains.

Description

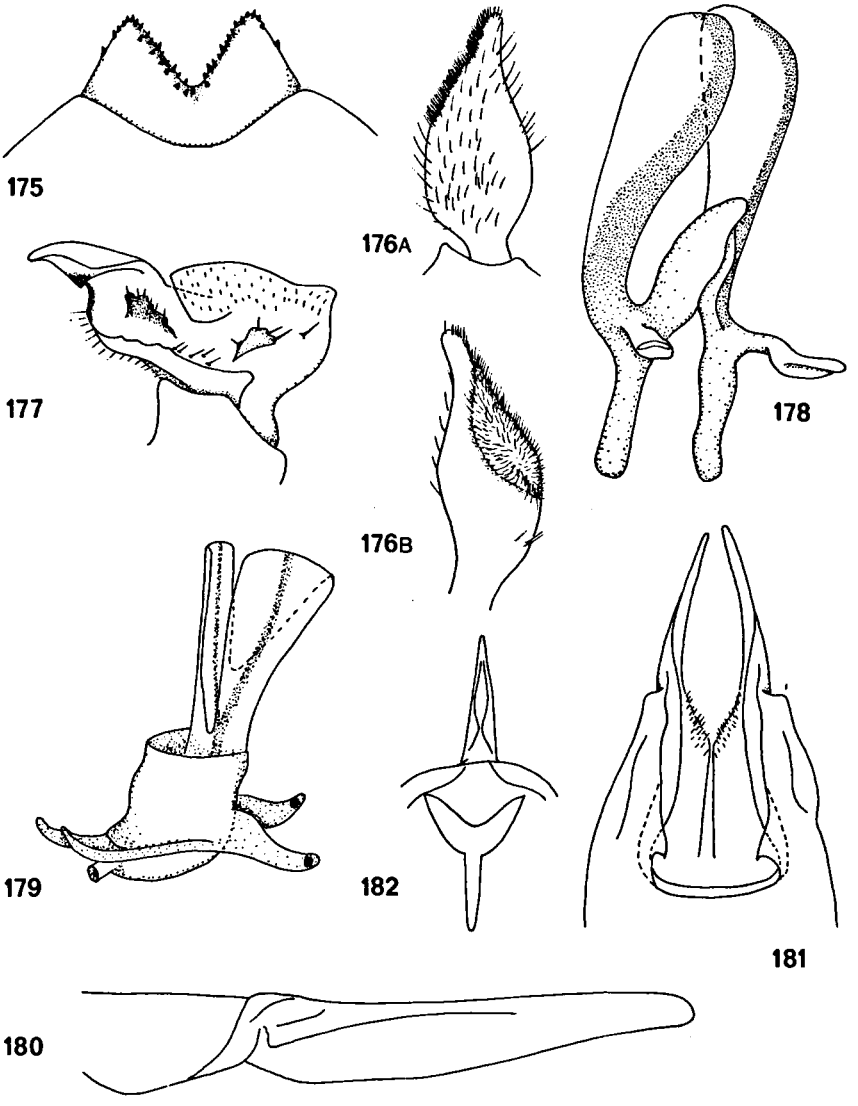
Body length ♂: 10-11 mm, ♀: 14 mm; wing length: 10-12 mm.

Head ♂: Scape and pedicel yellow, pedicel sometimes in part light brown; flagellar segment dark brown. First flagellar segment 1.2 x length of second one. Verticils as long as flagellar segments. Palpi light brown. Nasus and dorsal part of rostrum brown, shining. Genae, vertex and postgenae yellow, vertex tinged with brown. Spot below antennal bases brown. Spot between eye and frontal tubercle obscure, brown. Mark on occiput moderately large, dark brown, triangular anteriorly with a narrow, short prolongation, shining except for dull prolongation. Vertex and postgenae sparsely set with long hairs. Marks on inner part of postgenae inconspicuous, brown.

Thorax ♂: Pronotum dorsally yellow, laterally brown. Prescutal stripes dark brown. Downwardly bent anterior ends of lateral prescutal stripes large, in contact with paratergites, dull. Scutal stripes very broad. Scutellum yellow to light brown. Parascutellae brown to dark brown. Pleural markings faint except for brown to dark brown anatergite and posterior half of katatergite. Small triangle just behind ventral contact of fore coxae yellow. Coxae yellow. Femora yellow to light-brown, tips brown. Tibiae brown. Tarsi brown to dark brown. Wings light brown toned; wing-stigma dark brown, with macrotrichiae.

Abdomen ♂: Dorsal stripe usually confined to tergites 1-4 (2 ♂♂ also tergite 5), dark brown, very broad at tergite 1, narrowed halfway tergite 2 and somewhat triangular towards tergite hind margins. Hind margins of tergites 2, 3 and 4 in part or completely dark brown bordered. Lateral stripe of tergites distinct or represented on tergites 4, 5 and 6 by isolated spots. Sternites yellow, anterior half with narrow, transverse dots. Segments 7 and 8 dark brown.

Hypopygium: Reddish brown. Posterior extension of tergite 9 small, widely V-shaped and with small, black spines (fig. 175). Od basally broad, apically narrow; inner margin in part curled inside, swollen and densely covered with fine hairs (fig. 176 A&B). Id elongate; posterior crest more or less isolated from anterior beak; lateral shell with two, small, sclerotized projections (fig. 177). Adminiculum with three appendages at each side of which the dorsal ones are very large (fig. 178). Compressor apodeme of



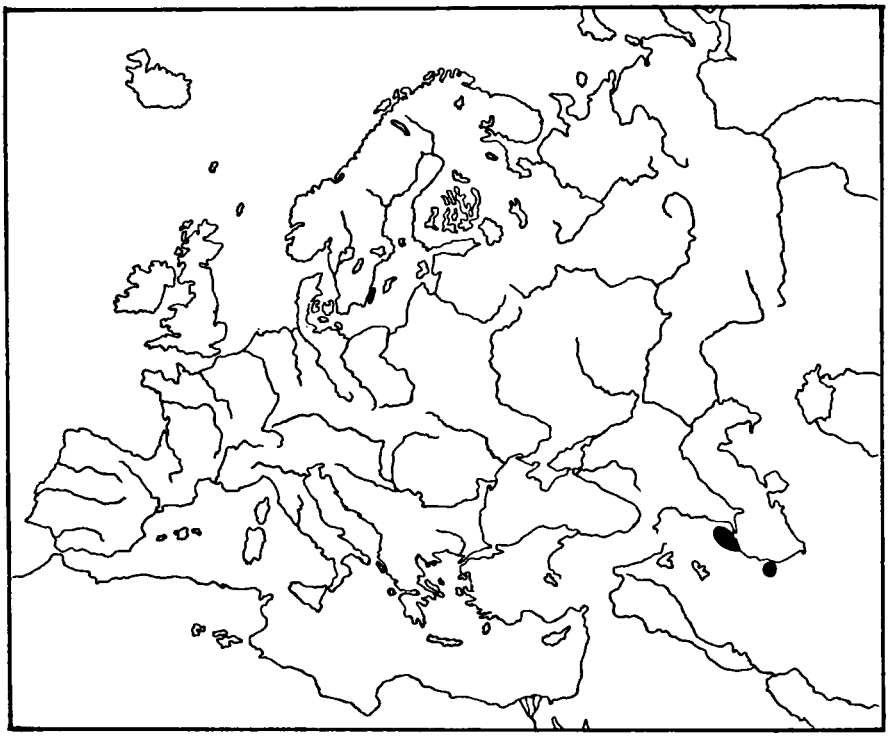
Figs 175—182. *N. schaeuffelei.* 175, posterior extension of tergite 9, dorsal view; 176, od: A, outside, B, inside; 177, id, outside; 178, adminiculum, lateroposterior view; 179, aedeagus, lateral view; 180, cercus, lateral view; 181, hypovalvae, dorsal view; 182, furca and sternum 9, dorsal view.

aedeagus bilobe (fig. 179). Red-brown sclerotizations along mid-ventral, pubescent, membranous part of sternite 9 moderately broad and long. Median projection of sternite 8 swollen, pale yellow, about 0.5 × length of red-brown sclerotizations and pubescent.

Female: Resembling the male. Verticils up to 1.5 × length of flagellar segments. Rostrum dorsally tinged with brown. Abdominal dorsal stripe broader than in the male, confined to tergites 1-6. In one of the two females examined the hind margins of the tergites have a narrow brown border, in the other female the bordering is inconspicuous or absent. Sternites yellow, anterior half with narrow, transverse dots. Tergites 7 and 8 dark brown. Tergites 9 and 10 reddish brown. Cerci yellowish. Sternite 7 brown. Sternite 8 reddish brown, laterally with darker, red-brown spots. Hypovalvae yellowish. Cerci ending bluntly (fig. 180). Egg-slide of hypovalvae posteriorly set with small spines; anteriorly elongate and forming a low, vertical septum between anterior ends of hypovalvae. The lateral margins of the eighth sternite are gradually narrowing to the point where they abruptly bend inside to meet the hypovalvae under a rectangular angle (fig. 181). Furca and sternum 9 as in fig. 182.

Distribution: map 24

The type-locality Mirchomand is in the Elburz Mountains part of the province Māzandarān. Savchenko (1937a: 35) mentions five localities in the Talysch mountain ridge, the natural boundary between the Azarbaydzhan SSR and Iran, south of Lenkoran'. H. M. Steiner collected in 1968 5 ♂ and 2 ♀ near Assalem, also in the Talysch mountains.



Map 24. Distribution of *N. schaeuffelei.*

Biology

The holotype is the only specimen from August, the other specimens are from July. Altitudes mentioned are between 780 and 2300 meters.

Discussion

The most obvious differences in the colour pattern, found between *schaeuffelei* and the other two species of this section, *nasuta* and *spatha*, are the following:
nasuta: Pleural markings distinct (in part faint in *schaeuffelei*). Coxae basally with dark brown spots (yellow in *schaeuffelei*). Parascutellae in part yellow (brown to dark brown in *schaeuffelei*). Sternites with a median brown stripe, vaguely indicated in the male (sternites of *schaeuffelei* anteriorly with transverse spots). Sternite 7 of the female yellow (in *schaeuffelei* brown).
spatha: Scape and pedicel darkened (in *schaeuffelei* yellow). Hairs at vertex and postgenae short (in *schaeuffelei* long). Anatergite yellow (brown to dark brown in *schaeuffelei*). Parascutellae yellow (brown to dark brown in *schaeuffelei*). The female cerci of *schaeuffelei* end bluntly. The other females of sections 7 and 8 have pointed cerci (female of *spatha* unknown).

Mannheims' illustration of the posterior extension of tergite 9 (1964: fig. 1), differs markedly from the one figured here (fig. 175). This is due to the fact that Mannheims made drawings from a dried specimen.

Nephrotoma nasuta Oosterbroek, 1975
Figs 183-191, map 25

Synonymy:

Nephrotoma nasuta Oosterbroek, 1975, Bulletin Zoölogisch Museum Universiteit van Amsterdam, 4: 121-2, figures.

Type-material

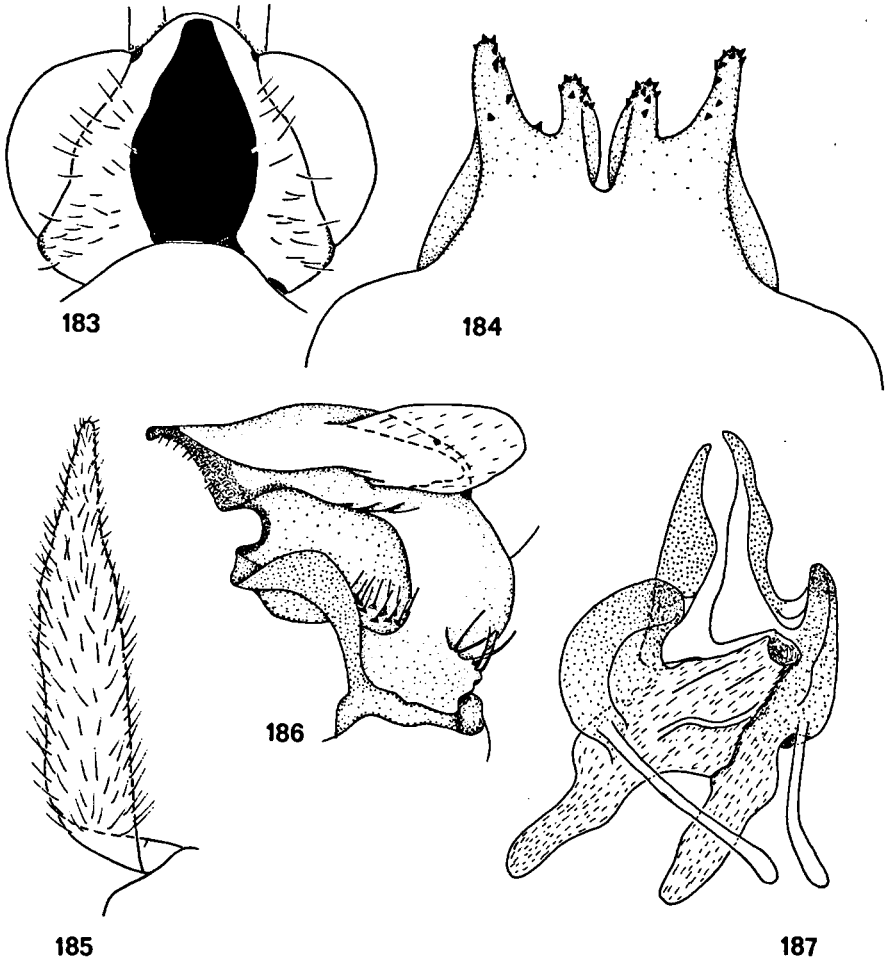
Holotype: ♂, 10. Orient-Expedition Dr. Kumerloeve/ Türkei, 1968, Van Gölü o. Tatvan, 10.VII, Mittendorf; (MAK).
Paratypes: 2 ♂, 3 ♀, labeled as the holotype (1 ♂, 2 ♀, MAK; 1 ♂, 1 ♀, ZMA).

Material examined: type-series, one female labeled as the types, very callow (ZMA), and one female, labeled: Türkei, 1965, Van-See, VII H. Noack leg; (MAK).

Description

Body length ♂: 11 mm, ♀: 14-15 mm; wing length: 12-13 mm.

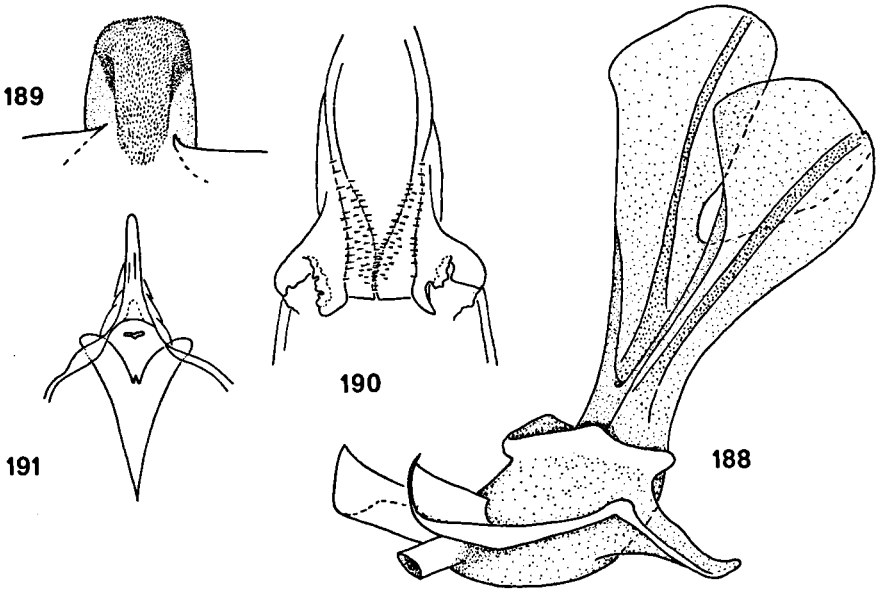
Head ♂: Scape and pedicel light brown; flagellar segments dark brown. First flagellar segment as long as second one. Verticils slightly longer than flagellar segments. Palpi light brown to dark brown. Nasus black. Dorsal part of rostrum dark brown. Genae, vertex and postgenae yellow. Spot below



Figs 183—187. *N. nasuta*. 183, head, dorsal view; 184, posterior extension of tergite 9, dorsal view; 185, od, outside; 186, id, outside; 187, adminiculum, lateroposterior view.

antennal bases and spot between eye and frontal tubercle small, brown. Occipital marking oval, large and broadly prolonged up to frontal tubercle. Hairs of vertex and postgenae more or less sparse, moderately short (fig. 183). Marks on inner part of postgenae small.

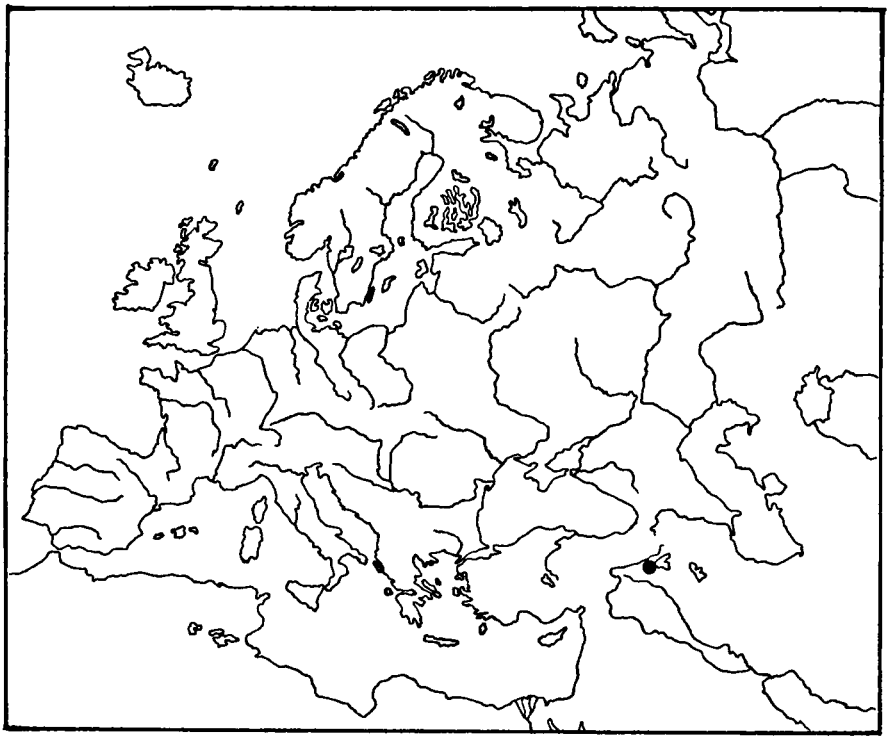
Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Prescutal stripes almost black. Downwardly bent anterior ends of lateral stripes almost black, dull. Scutellum more or less transparent, yellow, median region brown to dark brown. Anterior half of parascutellae yellow, posterior half dark brown. Pleural markings distinct, anatergite dark brown. Small triangle just behind ventral contact of fore coxae yellow. Coxae yellow, basally darkened. Femora pale yellow, tips darkened. Tibiae brown. Tarsi brown to black. Wings light brown toned; wing-stigma distinct, brown, without macrotrichiae.



Figs 188—191. *N. nasuta.* 188, aedeagus, lateral view; 189, median projection of sternite 8, ventral view; 190, hypovalvae, dorsal view; 191, furca and sternum 9, dorsal view.

Abdomen ♂: Tergite 1 almost entirely brown. Anterior end of dorsal stripe laterally with a narrow, transverse, brown stripe. Dorsal stripe broad, brown to dark brown, narrowly interrupted by lighter coloured tergite hind margins. Tergites 7 and 8 conspicuously darkened. Tergites laterally with an irregular, dark brown stripe just above lateral margin and less distinct in posterior tergites. Sternites yellow with a vaguely indicated, brown, median stripe. Sternites 7 and 8 conspicuously darkened (holotype and one paratype) or yellow (one paratype).

Hypopygium: Yellow. Disk of tergite 9 without a distinct posterior margin, but confluent with elongate, posterior extension. Median incision of posterior extension narrow, elongate corners with small spines apically; outer margin of posterior extension widely V-shaped; lateral corners well exceeding the median ones and with small spines apically (fig. 184). Od slender, four times as long as wide (fig. 185). Crest of id rounded; anterior beak elongate; lateral shell small, outer margin posteriorly bearing bristles, central region with a cluster of bristles (fig. 186). At each side of adminiculum four appendages; dorsal ones moderately high; lateral ones bulbous; posterior ones long and slender, hardly visible (fig. 187). Apical lobes of compressor apodeme of aedeagus parallel to each other (fig. 188). Red-brown sclerotizations along ventral inner margin of sternite 9 small.



Map 25. Distribution of *N. nasuta.*

Median projection of sternite 8 broad, visible part slightly longer than broad; dorsoventrally compressed; pubescent, especially at ventral and apical parts (fig. 189).

Female: Resembling the male. Verticils somewhat longer than flagellar segments. In one female wing-stigma with a few macrotrichiae. Abdominal dorsal stripe as in the male, but somewhat triangular towards tergite hind margins. Tergites 7 and 8 dark brown except for anterior half of sternite 7. Sternites yellow with a brown, median stripe. Egg-slide of hypovalvae without a vertical septum between anterior ends of hypovalvae. Anterior ends of hypovalvae distinctly swollen, bulbous. Sternite 8 moderately broad distad (fig. 190). Furca and sternum 9 as in fig. 191.

Distribution: map 25

Biology

The species is known to fly in July.

Discussion

The difference found between *nasuta, schaeuffelei* and *spatha* are discussed

under the two last-mentioned species. The female of *nasuta* is similar to the females of section 7. In these species the pleural markings are less developed (in *nasuta* very distinct).

Oosterbroek (1975: 121-22) discussed the similarity between *nasuta* and *appendiculata,* but overlooked the small triangle just behind the ventral contact of the fore coxae, which is dark brown in *appendiculata,* and yellow in *nasuta.*

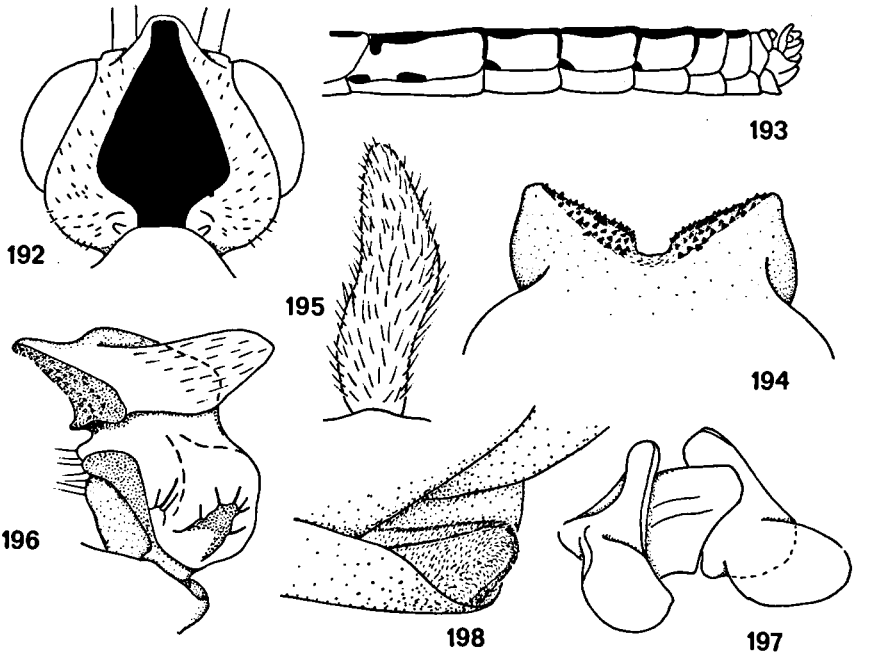
Nephrotoma spatha Oosterbroek, 1975
Figs 192-198, map 26

Synonymy:

Nephrotoma spatha Oosterbroek, 1975, Bulletin Zoölogisch Museum Universiteit van Amsterdam, 4: 119-121, figures.

Type-material

Holotype: ♂, Valle de Lozera, lg. H. Franz/ Prov. Lugo, Hisp. bor; (MAK). Paratypes: 2 ♂, Sierra de Ancares, Hip. b., lg. H. Franz/ Prov. Lugo Hisp. bor; (1 ♂, MAK; 1 ♂, ZMA).



Figs 192—198. *N. spatha.* 192, head, dorsal view; 193, abdomen, lateral view; 194, posterior extension of tergite 9, dorsal view; 195, od, outside; 196, id, outside; 197, adminiculum, lateroposterior view; 198, median projection of sternite 8, lateroposterior view.

Material examined is the type series, other specimens of this species are not known.

Description

Body length ♂: 9-11 mm, (♀ unknown); wing length: 9-10 mm.

Head ♂: Scape dark brown, basal part lighter coloured; pedicel dark brown; flagellar segments black. First flagellar segment as long as second one or slightly longer. Verticils 0.5 x length of flagellar segments. Palpi light brown. Nasus and dorsal part of rostrum dark brown, shining. Genae and postgenae pale yellow; vertex orange-yellow. No spot below antennal bases. Spot between eye and frontal tubercle not conspicuous. Mark on occiput large, triangular and broadly prolonged up to frontal tubercle, shining, dark brown. Hairs at vertex and postgenae short (fig. 192). Marks on inner part of postgenae small.

Thorax ♂: Pronotum dorsally yellow, laterally dark brown. Downwardly bent anterior ends of lateral prescutal stripes somewhat dull. Scutellum more or less transparent, light brown. Parascutellae yellow. Pleural markings faint, slightly indicated except for dark spots at sternopleuron, episternum and posterior half of katatergite. Anatergite yellow. Small triangle just behind ventral contact of fore coxae yellow. Coxae yellow, fore coxae basally darkened. Femora yellow, tips darkened. Tibiae and tarsi brown to dark brown. Wings toned light brown; wing-stigma light brown, with a few macrotrichiae.

Abdomen ♂: Yellow to reddish brown. Dorsal stripe dark brown, narrow. Hind margin of tergites 2, 3, 4, sometimes also 5, with a narrow dark brown border. Tergites laterally with dark spots at anterior corners. Sternites yellow (fig. 193).

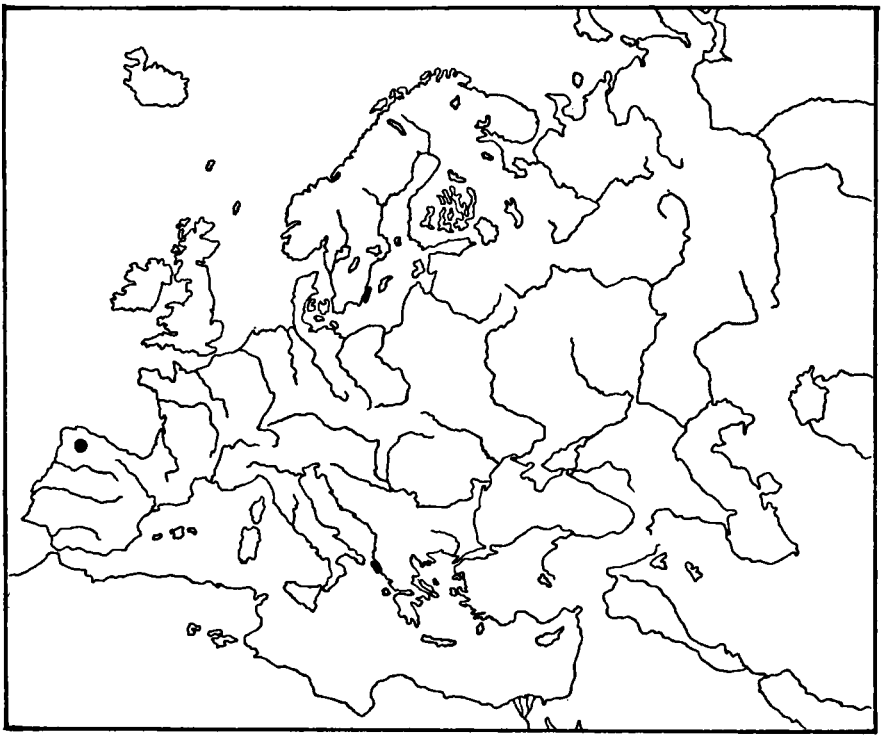
Hypopygium: Yellow. Disk of tergite 9 without a distinct hind margin, but confluent with posterior extension. The outer margin of posterior extension bears small spines and is very widely V-shaped with a small median incision (fig. 194). Od three times as long as wide (fig. 195). Id with a distinct crest and an upright projection at outer margin of lateral shell (fig. 196). Each side of small adminiculum with two appendages, posterior ones bulbous (fig. 197). Red-brown sclerotizations along ventral inner margin of sternite 9 small. Median projection of sternite 8 small, triangular; slightly protruding beyond hind margin of sternite 8; pubescent (fig. 198). Aedeagus not examined.

Female: unknown.

Distribution: map 26

Discussion

The differences in colour pattern between *spatha* and *schaeuffelei* are discussed under the latter species. Those between *spatha* and *nasuta* are: Scape and pedicel darkened (in *nasuta* light brown). Pleural markings faint



Map 26. Distribution of *N. spatha.*

(in *nasuta* distinct). Parascutellae yellow (in *nasuta* in part yellow). Anatergite yellow (in *nasuta* dark brown)

N. spatha has a rather isolated position within the *cornicina* group and is not closely related to *cornicina* and *guestfalica*, as was suggested by Oosterbroek (1975: 120).

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Drs. P. OOSTERBROEK
Institute of Taxonomic Zoology
Department of Entomology
Plantage Middenlaan 53
Amsterdam 1018 DC - The Netherlands