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The western palaearctic species of *Nephrotoma* Meigen, 1803, (Diptera, Tipulidae) Part 2

PJOTR OOSTERBROEK

ABSTRACT

Part 2 of this study deals with the western palaearctic species of the *crocata* group: *N. crocata* (Linnaeus, 1758), *N. scalaris* (Meigen, 1818), *N. rossica* (Riedel, 1910), *N. pratensis* (Linnaeus, 1758), *N. croceiventris* (Strobl, 1909), and *N. nox* (Riedel, 1910).

Subspecific ranking is undertaken in *N. crocata* (subsp. *luteata* Meigen, 1818, status nov.), *N. scalaris* (subsp. *terminalis* Wiedemann, 1830, as senior synonym of *parvinotata* Brunetti, 1918, and *bispinosa* Alexander, 1925), *N. pratensis* (*eepi* subsp. nov.), and *N. croceiventris* (subsp. *lindneri* Mannheims, 1951, status nov.).

INTRODUCTION

The species discussed in this paper belong to the *crocata* group. This group is defined by the following characters, found in the male hypopygial organs:

1) The posterior extension of tergite nine has horn-like projections laterally.
2) The id has no crest.
3) Sternite nine has a membranous, U-shaped appendage medially: the medisternal appendage.
4) The ventral rods of the adminiculum are in contact with the medisternal appendage.
5) The hind margin of sternite eight is unmodified.

The group contains the following taxa:

Nephrotoma crocata crocata (Linnaeus, 1758): Europe, central and eastern U.S.S.R. up to Yakutsk.

Nephrotoma crocata luteata (Meigen, 1818): southwestern France, Spain, Portugal, Morocco and Algeria.

Nephrotoma scalaris scalaris (Meigen, 1818): different parts of Europe, the Causasus and Asia Minor.

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Nephrotoma scalaris terminalis (Wiedemann, 1830): southeastern Europe, central and eastern Asia.
Nephrotoma rossica (Riedel, 1910): european, central and eastern parts of the U.S.S.R. up to Yakutsk.
Nephrotoma pratensis pratensis (Linnaeus, 1758): Europe (excl. Spain).
Nephrotoma pratensis eepi subsp. nov.: Spain.
Nephrotoma croceiventris croceiventris (Strobl, 1909): Spain.
Nephrotoma croceiventris lindneri (Mannheims, 1951): different parts of Europe (excl. Spain) and Turkey.
Nephrotoma nox (Riedel, 1910): eastern Turkey and northwestern Iran.

The *crocata* group incorporates most of the species assigned by Savchenko (1973b) to the *scalaris* and *pratensis* group (*chosensis* and *semiflava* excepted, see below). The *scalaris* and *pratensis* group were interpreted by Savchenko as closely related to the *analis* group and were differentiated from the latter by colour pattern only. The *scalaris* group is characterized by Savchenko in having the anterior ends of the lateral prescutal stripes shining or semi-dull, his *pratensis* group is defined through extensive melanization. The *scalaris* group contains the species *chosensis* Alexander, 1935 (not examined by the present author and taken into account no further, the species is known from North Korea), *scalaris* Meigen, 1818, and *hartigi* Mannheims, 1951 (synonymized here with *crocata*). The *pratensis* group assembles *pratensis* Linnaeus, 1758, *lindneri* Mannheims, 1951 (interpreted here as a subspecies of *croceiventris*), *crocata* Linnaeus, 1758, *rossica* Riedel, 1910, *semiflava* Strobl, 1909 (interpreted here as a member of the *analis* group), *kozhevnikovi* Dodonov (interpreted here as a junior synonym of *nox*) and *nox* Riedel, 1910.

The name *crocata* group is introduced to replace the *scalaris* and *pratensis* groups sensu Savchenko. The present author is more inclined here to use morphological characters as the basis of his species groups than similarities in colouration. This view is reflected in the synonymy of *hartigi* with *crocata* (members of two different groups according to colour pattern) and in transferring *semiflava*, in spite of the extensive melanization, to the *analis* group. The coherence of the species inside the *crocata* group is as follows: the species *crocata, scalaris* and *rossica* are very similar in their male and female copulatory organs; the same applies to *croceiventris* and *nox*. *N. pratensis* however is in a peculiar way intermediate. The male genital structures such as tergite nine, sternite eight, id, and aedeagus are of the *croceiventris/nox* type; the female copulatory organs on the other hand are as found in *crocata/scalaris/rossica*.

Material and Methods

The general statements made in part one of this revision about material, figures, terminology, abbreviations, etc., apply with a few exceptions to this part also. The exceptions refer to the application of the term sternum.

Following Rees & Ferris (1939) sternum 1 is introduced here for what is circumscribed in part one as "small triangle just behind the ventral contact of the fore coxae". The usage of the term sternum is usually restricted to the thorax. Therefore sternum 9, applied in part one after Frommer (1963) for the small sclerotized plates above the vulva, is replaced here by fused valvulae (Byers, 1961).

It should be noted that the drawings of the hypopygial and ovipository organs are made after macerated abdominal terminalia again. Consequently comparison of dried specimens with these illustrations is sometimes less instructive.

Nephrotoma crocata (Linnaeus, 1758)

Figs. 1—13, diagram 1—2, maps 1—2

Of *N. crocata* two subspecies are recognized here, the nominate one from Europe and central and eastern U.S.S.R. up to Yakutsk, and the subspecies *luteata* from southwestern France, Spain, Portugal, Morocco, and Algeria.

N. crocata is in general easily recognized from the other species of the *crocata* group by the abdominal colouration, but in particular the frequently lighter coloured specimens from southeastern France and Italy resemble *N. scalaris*. In the latter the narrow occipital marking is elongate anteriorly and the downwardly directed ends of the lateral prescutal stripes, as well as the dark brown to black transverse bands on the posterior parts of the abdominal tergites are shining.

The nominate subspecies differs from *c. luteata* in minor characters of the male hypopygium and in colour pattern. For example the anterior part of tergite two is yellow with a brownish tinge in *c. luteata* and broadly blackened in the typical, dark coloured *crocata*.

Nephrotoma crocata crocata (Linnaeus, 1758)

Tipula crocata Linnaeus, 1758, Systema Naturae, Ed. 10: 585; 1761: 431; Scopoli, 1763: 318; Linnaeus, 1767: 971; Fabricius, 1775: 748; 1781: 401; Schrank, 1781: 423—4; Fabricius, 1787: 322; Gmelin, 1790: 2813; Fabricius, 1794: 234; Schrank, 1803: 63—4, biology; Meigen, 1804: 72—3; Fabricius, 1805: 25; 1818: 192—3; Macquart, 1826: 77—8; Schummel, 1833: 120—2, biology; Zetterstedt, 1838: 845; Walker, 1848: 63—4; Haliday, 1851: 133.

Pachyrhina crocata: Macquart, 1834: 88—9; Staeger, 1840: 23; Zetterstedt, 1851: 3987—9; Van der Wulp & Snellen van Vollenhoven, 1853: 144; Walker, 1856: 333; Zetterstedt, 1860: 6543; Schiner, 1864: 507—8; Van der Wulp, 1866: 16—7; Palm, 1869: 406; Grzegorzek, 1873: 26; Van der Wulp, 1877: 376; Beling, 1878: 40—1, biology; Westhoff, 1880: 48, biology; Wallengren, 1881: 208; 1882: 13; Westhoff, 1882: 48, figures, biology; Verrall, 1886: 119; Bergroth, 1888: 656; Huguenin, 1888: 21; Strobl, 1893: 165; Kowarz, 1894: 7; Strobl, 1895: 48, biology; Van der Wulp & De Meijere, 1898: 28; Thalhammer, 1900: 20; Jacobs, 1903: 352; Wahlgren, 1905: 132; Lundström, 1907: 24; Riedel, 1910: 417—8, 421, 429, biology; Czižek, 1911: 86—8; Lundström, 1912: 47; Vimmer, 1913: 18; Nielsen, 1918: 10; Goetghebuer & Tonnoir, 1921: 122; Pierre, 1921c: 662—4, figures biology; Saunt, 1921: 186, biology; Stackelberg, 1922: 16; Brolemann, 1923: 486—9, figures; Alfken, 1924: 434; Pierre, 1924a: 28, figures, biology; Wei-

gand, 1924: 46; De Jong, 1925: 46—7, 49, 56, biology; Pierre, 1934: 37, biology; Zangheri, 1949: 12; Simova, 1959: 128.

Pachyrhina crocata var. *luteata:* Riedel, 1910: 418—9 (partim: Korsika only).

Pales crocata: Audcent, 1932: 9; Grensted, 1944: 176; Mannheims, 1951a: 32—4, 50—2, biology; 1951b: 140; 1951c: 228; Stackelberg, 1951: 340; Fischer, 1952: 120; Hemmingsen, 1952: 367, 409; Mannheims, 1953: 2; Gaunitz, 1954: 77; Mannheims, 1954b: 32, 40—1; Theowald & Mannheims, 1956: 249; Theowald, 1957a: 223—4, figures, biology; 1957b: 10—1; Mannheims & Theowald, 1959: 18; Erhan & Theowald, 1961: 249; Savchenko, 1961: 1895; Hemmingsen, 1962: 140; Höchstetter, 1962: 38, 53, 78, 106, biology; Mannheims, 1963: 39; Mannheims & Pechlaner, 1963: 6, 14, biology; Mannheims, 1964c: 106; 1965: 7; 1966a: 276; 1966b: 490—2; Savchenko, 1966a: 496—9, figures; 1966d: 120; Mannheims, 1967e: 317; Savchenko & Violovich, 1967: 359; Zangheri, 1969: 1024; Loi, 1973: 1—9, biology; Savchenko, 1973b: 77—9, figures, biology; Simova, 1974: 26; 1977: 26, 84—6, figures.

Nephrotoma crocata: Olivier, 1811: 195; Nielsen, 1925: 149—50, figures; Edwards, 1939: 244; Coe, 1950: 8; Tjeder, 1954: 47, biology; 1955b: 246—7; Brindle, 1960: 80, 86, 101, figures, biology; Mannheims, 1967c: 152; Theowald, 1967: 18, 64, biology; Tjeder, 1967: 20; Stary & Martinovský, 1969: 8; Stubbs, 1970: 50, biology; Hartig, 1971: 124; Theowald, 1971: 220; Savchenko, Violovich & Narchuk, 1972: 77—93, biology; Savchenko, 1972: 740; Stubbs, 1973: 103—6, figures, biology; Klopp, 1974: 166—7, figures.

Tipula flavofasciata De Geer, 1776, Mémoires pour servir à l'histoire des Insectes, 6: 349; Zetterstedt, 1838: 846.

Pachyrhina flavofasciata: Schiner, 1864: 508; Van der Wulp, 1877: 376; Verrall, 1886: 119.

Pales flavofasciata: Mannheims, 1951a: 50; Savchenko, 1973b: 77.

Tipula perpulcher Harris, 1776, An exposition of English insects: 159—60, figures.

Pachyrhina perpulcher: Verrall, 1886: 119.

Pales perpulcher: Mannheims, 1951a: 50; Savchenko, 1973b: 77.

Pales hartigi Mannheims, 1951, Die Fliegen der palaearktischen Region, Lief. 167: 33—6, 48—9 1953: 2; Mannheims & Theowald, 1959: 17; Simova, 1960: 58; Hemmingsen, 1962: 140 Mannheims & Pechlaner, 1963: 6; Savchenko, 1973b: 72.

Nephrotoma zonata: Edwards, 1928: 188.

Type-material & Synonymy

Tipula crocata Linnaeus, 1758: In the Linnean collection, Linnean Society, Burlington House, London, one female, labeled: 3 crocata. (v! 0 1977; head in capsule).

Tipula flavofasciata De Geer, 1776: The three specimens under *flavofasciata* in the De Geer collection (NRS; v! 0 1976) are conspecific with *crocata*. They are in a bad conditon, a female is designated as lectotype (labeled nr 367), a male (nr 368) and a female (nr 369) are labeled paralectotype. The synonymy with *crocata* was already stated by De Geer himself.

Tipula perpulcher Harris, 1776: Verrall, 1886, was the first to synonymize *perpulcher* with *crocata*. Judging from Harris' illustration of the female (1776: plate 48, fig. 6), this synonymy is correct.

Pales hartigi Mannheims, 1951: New synonymy. The Mannheims collection contains the following types (MAK; v! 0 1977). Holotype ♂: Catania Sic., Plaia Pineta, 22-VI-49, Htg 1./ Pales hartigi n.sp., Mannheims det. 1950/Holotypus (genitalia on a slide). Paratypes: ♀, Catania Sic., Orto Botanico, 12-V-49, Hartig leg./Pales opaca n.sp., Mannheims det. 1950/ Paratypoid/Pales hartigi n.sp./Mannheims det. 1950. ♂, Sicilia, Zappulla, 8-

VI-36/ex coll. Inst. Naz. Ent. Roma/Pales hartigi n.sp., Mannheims det. 1950/ Paratypoid. ♀, Korzika, 55019.V/ex Coll. Berlin/Pales hartigi n.sp., Mannheims det. 1950/Paratypoid./26. 2♂, Syrakus, 53959.V./ex Coll. Berlin/Pales hartigi n.sp., Mannheims det. 1950/ Paratypoid/ 24, respectively 25.

Other material: 80 males and 183 females from the following countries: Great Britain, the Netherlands, Belgium, West Germany, East Germany, Poland, Czechoslovakia, France, Spain, Switzerland, Italy, Austria, Hungary, Rumania, Albania, U.S.S.R. (Estoniya) and Egypt (questionable).

Description

General remark: Throughout the distribution area of the nominate *crocata* little variation is found in the dark colouration of the body except in specimens from southeastern France and Italy which can exhibit a distinctly lighter colour pattern. The description of these latter specimens follows the one of the "typical' *crocata*, given below.

Body length male: 14—16 mm, female: 18—22 mm; wing length: 11—15 mm.

Head male: Antennae 13-segmented. Scape dark brown, usually in part yellowish; pedicel brown to dark brown; flagellar segments dark brown; first flagellar segment 1.0—1.3 × length of second one; second and following flagellar segments nodulose basally; verticils up to 1.1 × length of flagellar segments. Head usually dark brown except heart-shaped, yellow spot on frontal tubercle and anterior part of vertex; sometimes lateral parts of rostrum, genae and postgenae, rarely entire head, lighter coloured. Frontal tubercle well developed. Vertex and postgenae densely set with moderately long hairs.

Thorax male: Pronotum dorsally yellow, laterally dark brown. Thorax dorsally yellow with broad, prescutal and scutal stripes; lateral stripes usually in contact with median stripe; downwardly bent anterior ends of lateral stripes large and dull. Scutellum and parascutellae brown to dark brown. Mediotergite usually with two small, yellow spots at anterior margin. Lateral parts of thorax brown to dark brown, except for small yellow spots on paratergite and pteropleuron; anterior half of katatergite yellow; dorsal half of meron in general brown, rarely lighter coloured. Sternum 1 black. Coxae dark brown. Trochanters dark brown, sometimes, especially those of the fore legs, in part yellowish. Femora basally yellow to brown, of fore legs dark brown at anterior half, of middle and hind legs broadly dark brown at tips only. Tibiae light to dark brown, tips darkened. Tarsi brown to dark brown. Wings brown toned; wing-stigma dark brown, with macrotrichiae; basal part of vein R4+5, cross-veins R-M, M1+2, M-CU, veins M4 and CU1 beyond cross-vein M-CU, and wing-tip dark shaded. Halteres brown to dark brown, apical part of knob yellow.

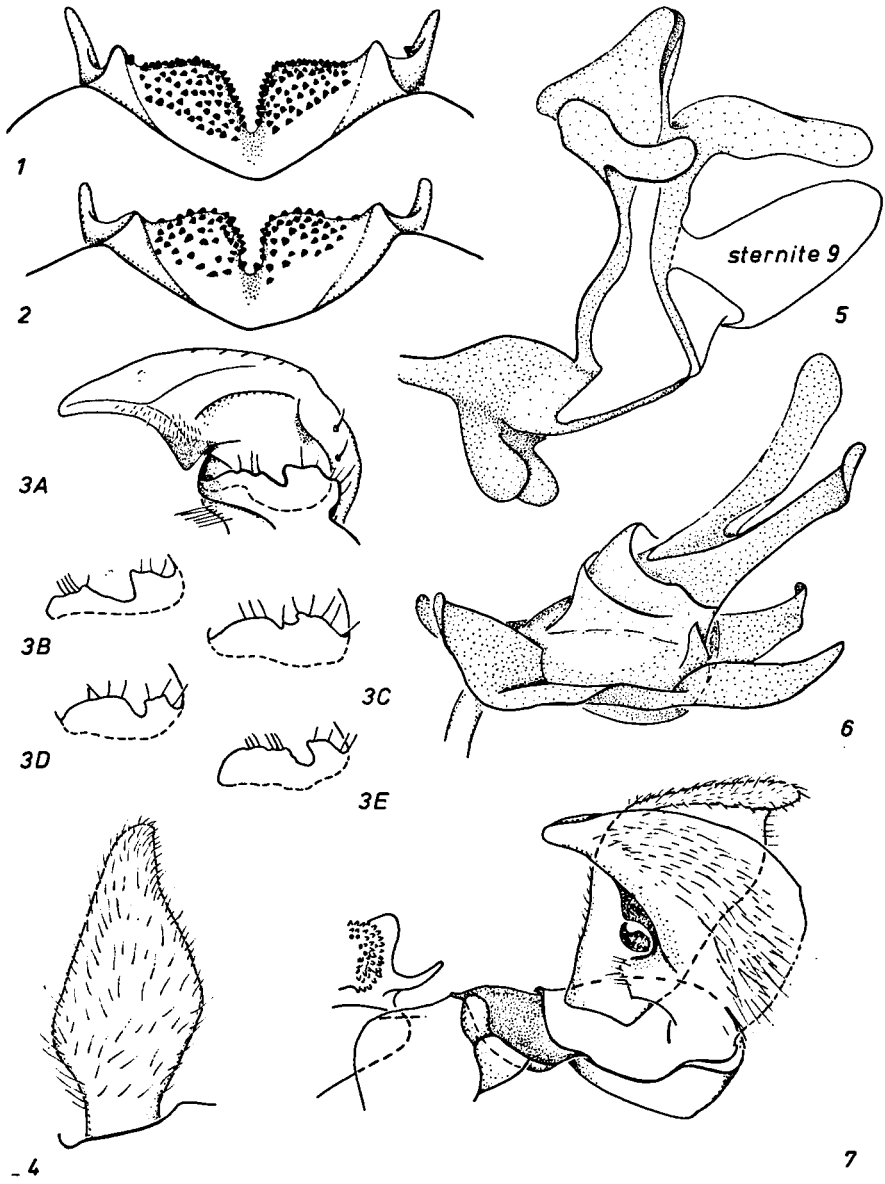
Abdomen male: Dark brown to black with broad, transverse, yellow

bands on tergites 2, 3 and 4 in front of broad darkening of hind margins. Tergite 5 usually with two smaller, yellow spots on anterior half, in part underlying tergite 4. Lateral parts of sternites 2, 3 and 4 with yellow spots, rarely entirely darkened or with transverse yellow bands as pronounced as on the tergites.

Hypopygium (figs. 1—8): Small. Disk of tergite 9 ranging from yellow to (usually) black. Posterior extension of tergite 9 with a median incision and densely set with small spines, except on the lateral parts, which bear tooth-like projection. Od a small, fleshy lobe. Id without crest; outer margin of lateral shell excavate medially. At inner side of dorsal edge of sternite 9 a shell-like deformation between base of od and posterior extension of tergite 9. Each side of adminiculum with two appendages, ventral ones connected with membranous, U-shaped median projection of sternite 9. U-shaped projection shortly pubescent and with a bilobate, ventral appendage. Aedeagus as in fig. 6. Outer margin of sternite 8 medially concealed by a shortly pubescent membrane.

Female (figs. 12—13): Coloured as the male. Verticils up to 1.4× length of flagellar segments. Abdomen sometimes with yellow spots on lateral parts of tergite 6. Tergites 9, 10, cerci and hypovalvae light reddish brown. Sternite 8 usually broadly darkened on anterior part and with darkened, oval spots laterally. Cerci bluntly ending; shape of cerci and hypovalvae as figured for *scalaris* (fig. 20). Egg-slide forming a distinct septum between anterior ends of hypovalvae and more or less densely set with fine hairs at central region; lateroposteriorly with a narrow, sclerotized ridge at each side. Dorsal edge of hypovalvae outcurved anteriorly; hypovalvae gradually tapering towards tip. Furca and fused valvulae as in fig. 13.

Lighter coloured specimens from Italy and southeastern France (figs. 11 A&B): Yellow coloured to a greater extent. Scape yellow, in part brownish; pedicel yellow to brown. Head usually yellow to orange-yellow except darker coloured dorsal part of rostrum, occipital marking and postgenae. Lateral prescutal stripes not in contact with median stripe. Scutellum and parascutellae lighter coloured. Lateral parts of mediotergite broadly yellow. Pleurae yellow with dark brown markings. Sternum 1 dark brown to black. Trochanters usually yellow. Male abdomen broadly yellow in front of broad, triangularly blackened posterior parts of tergites 1—5; median region of these tergites and anterior part of tergite 2 sometimes infuscated, lateral margins with a broad, interrupted, black stripe. Tergites 6—8 black, sometimes with small yellow spots on lateral parts of tergite 6. Sternites variable in colouration, usually anterior sternites yellow with a narrow, transverse, dark brown band in front of lighter coloured sternite hind margins and posterior sternites black. Hypopygium yellow to reddish brown. Female abdomen broadly yellow in front of broad, triangularly blackened distal part of tergites; lateral margins usually with broad, hardly interrupted, black stripes; anterior and dorsal parts of tergites sometimes infuscated; tergite 8 usually without a broadly darkened hind margin; tergites



Figs. 1—7. *N. crocata crocata*. 1, posterior extension of tergite 9 after a male from the Netherlands, Kotten, dorsal view; 2, idem after a male from Sicily; 3, id from outside showing variability in the lateral shell: A, B, & C; after males from the Netherlands, D: male from Naples, E: male from Sicily; 4, od, outside; 5, adminiculum and medisternal appendage, lateroposterior view; 6, aedeagus, lateral view; 7, shell-like deformation at upper margin of sternite 9 between base of od and tergite 9, from inside.

9, 10, cerci and hypovalvae light reddish brown. Sternites variable in colouration, as described for the male. Sternite 8 usually light reddish brown.

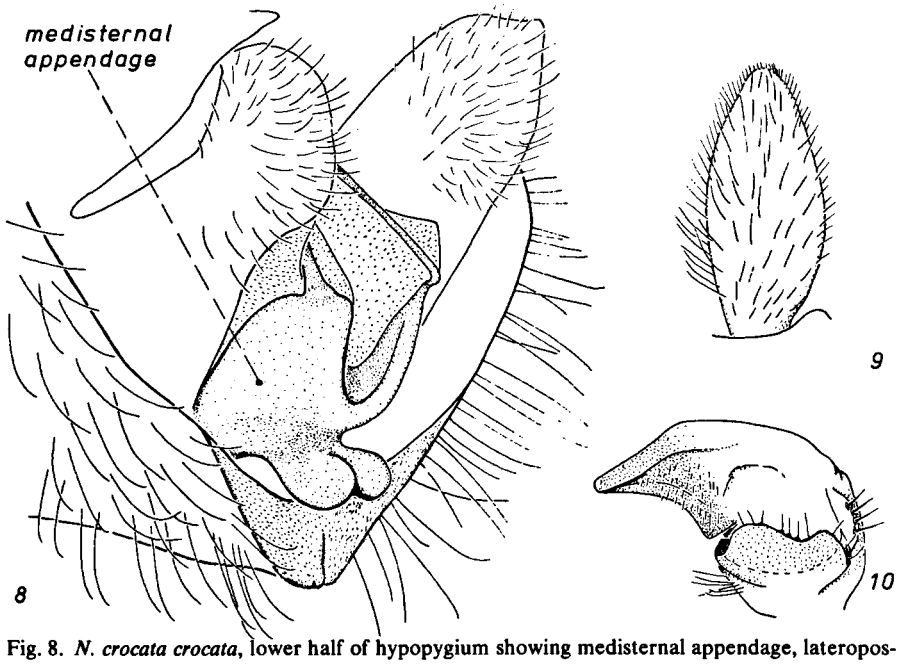


Fig. 8. *N. crocata crocata*, lower half of hypopygium showing medisternal appendage, lateroposterior view.
Figs. 9—10. *N. crocata luteata*. 9, od, outside; 10, id, outside.

Biology (diagram 1)

N.c. crocata is found along the fringes of woods, hedgerows, sandy paths in heathland woods (Stubbs, 1973), and clearings, and it is frequently reported from gardens. Oviposition is in the soil (Saunt, 1921; Pierre, 1924a, 1934; Stubbs, 1970). Saunt witnessed a female depositing the eggs: "With the abdomen at right angles beneath the thorax it kept rising about six inches, then, apparently with all its forces centred in the downward movement, it struck the ground with its ovipositor; it then remained stationary for a few seconds while it appeared to deposit ova. This took place eight or nine times in the space of about two minutes". The larvae feed on the roots of grasses, agricultural crops and forest seedlings, but usually without causing severe damage because of the low larval density.

The period of flight varies considerably within the distribution area. Diagram 1 compares the collecting dates of the material examined from Great Britain, the Netherlands, southwestern Europe (Spain, France south of Rochefort-Lyon, and Italy), together with the dates mentioned by Savchenko (1973b). In Great Britain, the Netherlands and eastern Europe the period of flight is short, two and a half to three months during summer, with only a few specimens collected in the second half of August or September (for Great Britain one female was examined collected in August at Woodwalton Fen, Hunts). From Scandinavia only two collecting dates are provided in literatu-

re; Ryssby, 3 July (Gaunitz, 1954) and Kullaberg, 10 June (Tjeder, 1967). The eastern European specimens examined by the author or listed by Simova (1959), Erhan & Theowald (1961), Mannheims (1966a, 1966b), Savchenko (1966d), Stary & Martinovský (1969), and Savchenko (1973b), were collected in the period 21 May until 30 July. In Asia (Altai, Tuva, Mongolia, the Irkutsk and Yakutsk regions) too the period during which *c. crocata* is on the wing seems to be short; records are from 29 May till 20 July (Savchenko, 1961, 1972, 1973b; Savchenko & Violovich, 1967; Savchenko, Violovich & Narchuk, 1972; one Mongolian record refers to 15.VIII-1.IX).

On the other hand, in southern Europe the period of flight is much longer, lasting from the end of March until the end of October (Loi, 1973, even mentioned 30 November), with an enumeration of data from the second half of May until the second half of June. Pierre (1921c), Mannheims (1951a), and

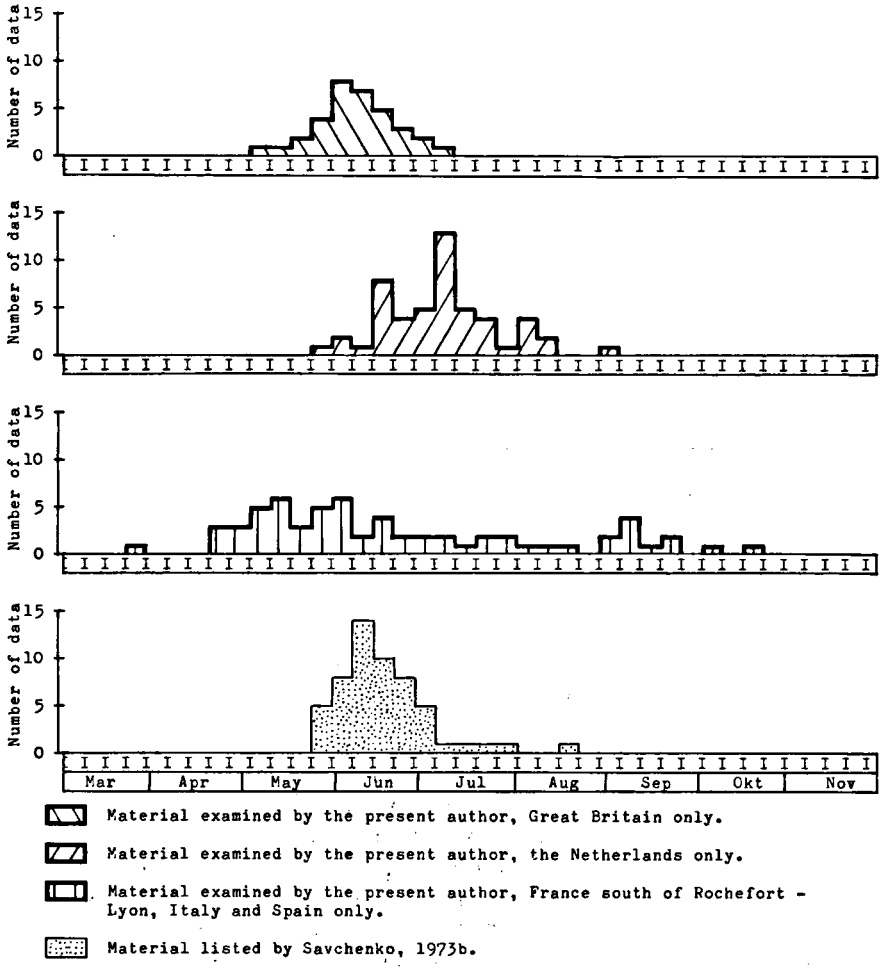
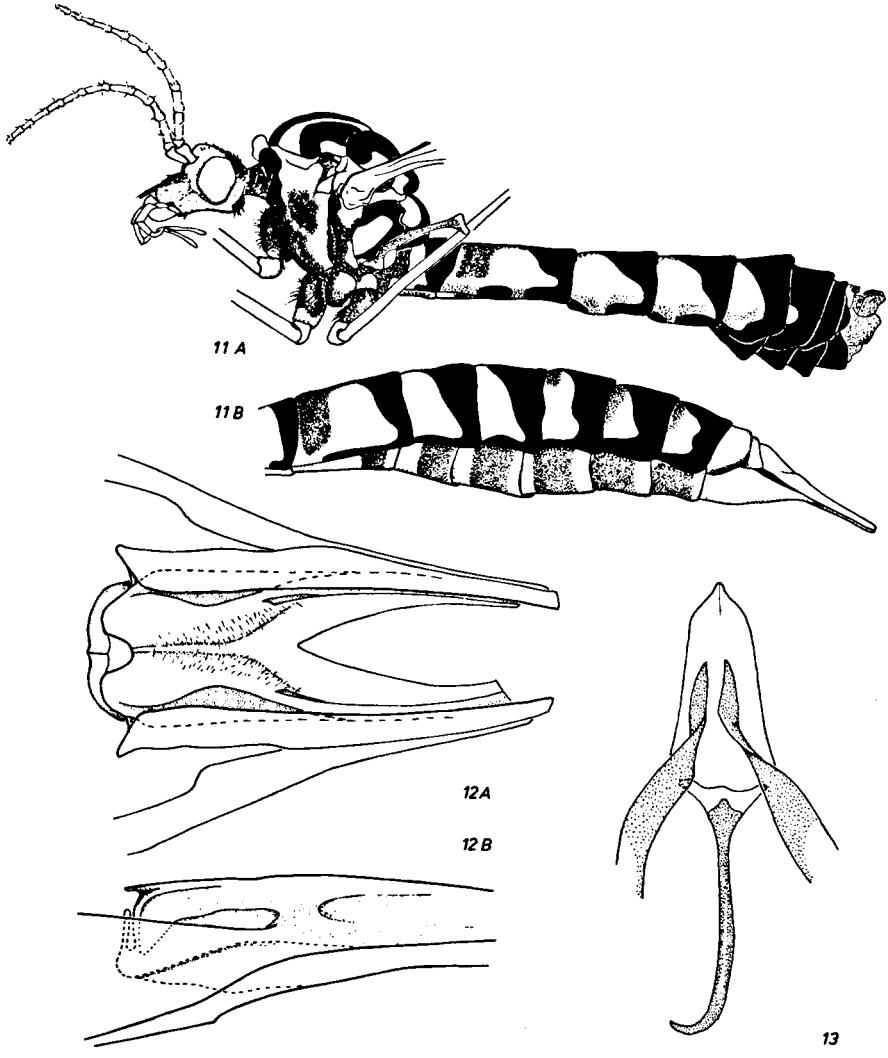
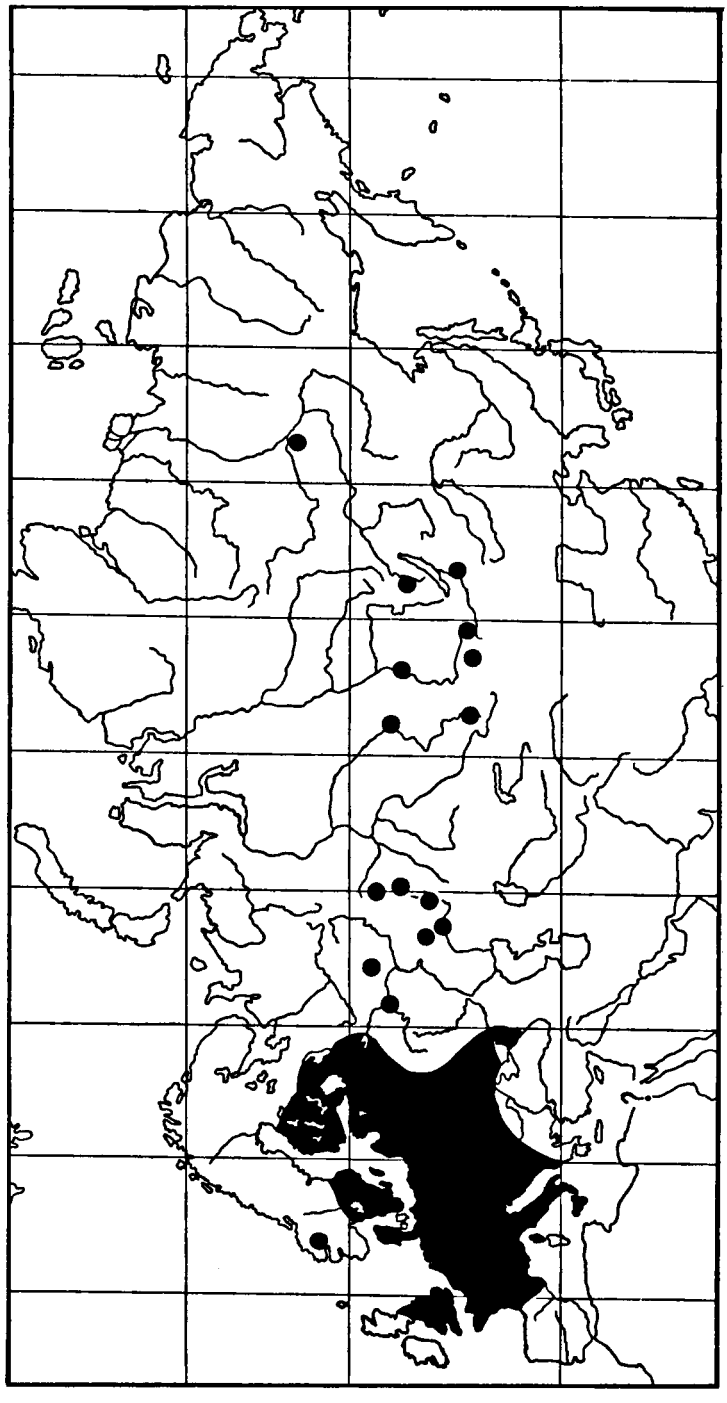


Diagram 1. Period of flight of *N. crocata crocata*.



Figs. 11—13. *N. crocata crocata*. 11A, male from Sicily, Syracuse (paratype of *hartigi*); 11B, abdomen female from Naples; 12, hypovalvae: A, dorsal view, B: lateral view; 13, furca and fused valvulae, dorsal view.

Loi (1973) considered *c. crocata* to have several distinct generations a year. From the material examined it is clear that there are no distinct generations during a certain period of time. Apparently the duration of the larval development can be largely influenced by climatic conditions. Indoor rearing by De Jong (1925), resulted in a generation-length of 70 days; Loi (1973), revealed that it took about 120 days to rear adults from eggs indoors (first larval stage 12—21 days, second stage 13—29, third stage 21—36, fourth stage 42—57, pupal rest 8—10). The highest altitude known for *c. crocata* is 1500 m (Switzerland, Griments; Spain, Sort).



Map 1. Distribution of *N. crocata crocata*.

Distribution (map 1)

The only record from Norway is by Wallengren (1882: Dovre). The distribution in the British Isles is among others based on data kindly presented by Mr. A. E. Stubbs (pers. comm., 1977). The reference to Cairo in Egypt (Mannheims, 1951a; Savchenko, 1973b) is based on one male, labeled Cairo (MAK; v! 0 1977). The Andrees Handatlas (1906) lists three additional Cairo's in Italy. The presence of *crocata* in Egypt therefore needs further confirmation. *N.c. crocata* is known in Spain from the southern slopes of the Pyrenees south of Andorra (Sort, Tossa del Mar), whereas the Spanish subspecies *N.c. luteata*, shows a more southwestern distribution and "enters" France west of the Pyrenees (map 2). The records listed by Savchenko (1973b) for central and southeastern Russia are represented on map 1 by dots (Gor'kowskaya Obl., Kirovskaya Obl., Bashkir A.S.S.R., Sverdlovskaya Obl., Orenburgskaya Obl., Chelyabinskaya Obl., Tomsk, Altayskiy Kray, Tuvinskaya Aut. Obl., Irkutskaya Obl., Yakutskaya A.S.S.R.).

Discussion

Mannheims (1951a) described the lighter coloured specimens from southern Italy and Sicily under the name *hartigi*, as a species closely related to *scalaris*. It is obvious from the material examined that *hartigi* and *crocata* belong to the same species. Subspecific ranking of the lighter coloured *hartigi* is not established here; intermediate forms are very frequent from Lyon to Rome and the typical *"crocata"* and *"hartigi"* are found within this region too. Mannheims (1951a) and Savchenko (1973b) even mentioned the dark coloured *crocata* from Sicily. Pierre (1921c) states that *crocata* has two, well sepatated generations, one from the end of April till the end of May and a second from the end of July till September. According to Pierre the dark coloured specimens always belong to the first generation and the lighter coloured forms to the second. As there is apparently not a fixed number of generations in *crocata*, Pierre's first statement is erroneous; the second must be based on few specimens, because supporting evidence was not derived from the data investigated during this study.

Nephrotoma crocata luteata (Meigen, 1818)

Tipula luteata Meigen, 1818, Systematische Beschreibungen, 1: 193—4. *Pachyrhina crocata* var. *luteata*: Riedel, 1910: 418—9 (partim: Spain an Portugal only).

Pachyrhina luteata: Pierre, 1924a: 29.

Pales luteata: Mannheims, 1951a: 33—4, 36, 51—2; 1951b: 140; 1951c: 228; Hemmingsen, 1962 140; Mannheims, 1964d: 113; 1967e: 317; Savchenko, 1973b: 77—9.

Nephrotoma luteata: Mannheims, 1969: 188.

Pachyrhina castellana Strobl, 1906, Memorias de la Real Sociedad española de Historia natural, 3: 406—7; 1909b: 134; Riedel, 1910: 418; Pierre, 1924a: 30.

Pales castellana: Mannheims, 1951a: 51; 1951b: 140.

Pachyrhina zonata Pierre, 1919, Bulletin de la Société Entomologique de France, 1919: 285—6, figures; 1920: 77; 1924a: 30.
Pales zonata: Mannheims, 1951a: 51; 1951b: 140; 1951c: 228; 1964d: 113; Savchenko, 1973b: 77.
Nephrotoma zonata: Edwards, 1928: 188 (= *c. crocata*).

Type-material & Synonymy

Tipula luteata Meigen, 1818: No type preserved in the Meigen collection (MNHNP). Wiedemann (in Meigen, 1818) described *luteata* after one female, meanwhile comparing it with *crocata.* From this the interpretation of *luteata* is well founded. Savchenko (1973b) is the first to synonymize *luteata* with *crocata,* basing himself on literature only. The present author follows Riedel (1910) in giving *luteata* subspecific rank.

Pachyrhina castellana Strobl, 1906: Mannheims (1951a) checked the types in the Strobl collection at Admont, Austria, and confirmed the synonymy with *luteata.* Mannheims designated one male, nr. 529, as holotype (should be lectotype), and one female, nr. 530, as paratype (paralectotype).

Pachyrhina zonata Pierre, 1919: The holotype male is labeled: Biscarosse, 30—61 Type (MNHNP; v! 0 1976). *P. zonata* has been synonymized with *luteata* since Mannheims (1951a).

Other material: 68 males, 39 females from France, Spain, Portugal, Morocco, and Algeria.

Description

Body length male: 13—15 mm, female: 17—21 mm; wing length: 10—14 mm.

Head male: Antennae 13-segmented; black, pedicel sometimes brownish; first flagellar segment up to 1.1 x length of second one; verticils up to as long as flagellar segments. Rostrum and nasus shining black, frontal edge of rostrum sometimes with two, brownish yellow spots below nasus. Palpi black. Head black except for usually yellow to brownish yellow upper part of genae, antennal sockets, frontal tubercle, and anterior half of vertex; vertex black along eye-margin; lower part of postgenae, just behind eyes, sometimes brownish yellow. Colouration of head dull, except shining, midposterior part of vertex. Vertex and postgenae densely hairy. (In some specimens from northern Africa the head is lighter coloured; the colouration of the thorax and the abdomen is as found in the European specimens, although not always as conspicuous).

Thorax male: Pronotum dorsally yellow, laterally black. Prescutal stripes black; lateral ones almost or actually in contact with median stripe. Downwardly bent anterior ends of lateral stripes large and dull. Scutellum black. Parascutellae yellow, blackened at wing-base. Mediotergite laterally broadly yellow; median region with a broad, black stripe which distinctly widens towards posterior margin. Anepisternite broadly yellow between second spiracle and wing-base, lower half blackened. Sternopleurite black.

Anterior two-third of pteropleurite black, posterior one-third, just below wing-base, yellow. Anatergite black. Anterior half of katatergite yellow, posterior half black. Upper one-third of meron yellow, lower inner two-third black. Sternum 1 black. Coxae black. Trochanters brown to black. Femora brown, tips black. Tibiae dark brown to black. Tarsi black. Wings brown; wing-stigma dark brown to black, with or without macrotrichiae; basal part of R4+5 and cross-vein R-M brown shaded. Halteres dark brown, apical half of knob yellow.

Abdomen male: Segment 1 black, anterior margin sometimes paler. Tergites 2—5 and sternites 2—4 yellow with broadly blackened hind margins and lateral margins. Anterior one-fourth of tergite 2 usually more or less transparent and brownish tinged. Anterior one-third of sternite 2 black, usually median region narrowly yellow. The segments bear two small, transparent or blackened, transverse spots at or in front of the middle, and are usually narrowly tinged with brown in front of the black hind margins. Tergites 6—8 and sternites 5—8 black, tergite 6 and sternite 5 usually with traces of yellow laterally, sternite 5 sometimes coloured as preceding sternites.

Hypopygium: Disk of tergite 9 reddish brown to black with yellow lateral margins. Posterior extension of tergite 9, adminiculum, aedeagus and median projection of sternite 9 as figured for the nominate subspecies. Od usually not as slender as in *c. crocata* (fig. 9). Id as in fig. 10.

Female: Similar to the male, head and abdomen usually lighter coloured. Verticils up to 1.4× length of flagellar segments. Scape and pedicel in part or entirely brownish. Lateral parts of rostrum sometimes brownish. Yellow colouration of vertex more extended posteriorly, sometimes even in contact with brownish yellow colouration of lower part of postgenae just behind eyes. Colouration of tergites 1—6 and sternites 1—5 as described for the male tergites 1—5 and sternites 1—4. Median, posterior and lateral parts of tergite 7 broadly blackened, inbetween yellow. Tergite 8 yellow to reddish brown, posterior corners and sometimes hind margin and lateral margins broadly blackened (in one female tergite 8 entirely black). Tergites 9, 10 and cerci reddish brown. Sternite 6 as preceding sternites or dark brown to black with traces of yellow anteriorly; posterior margin pale-yellow. Sternite 7

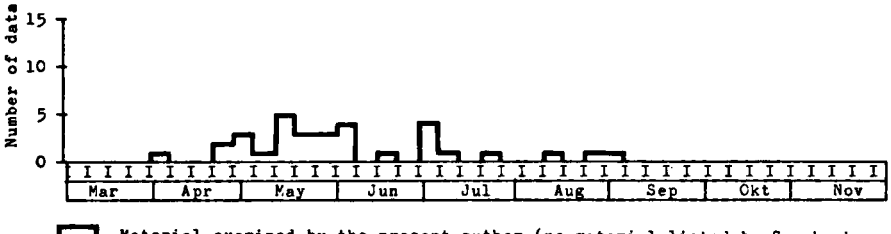


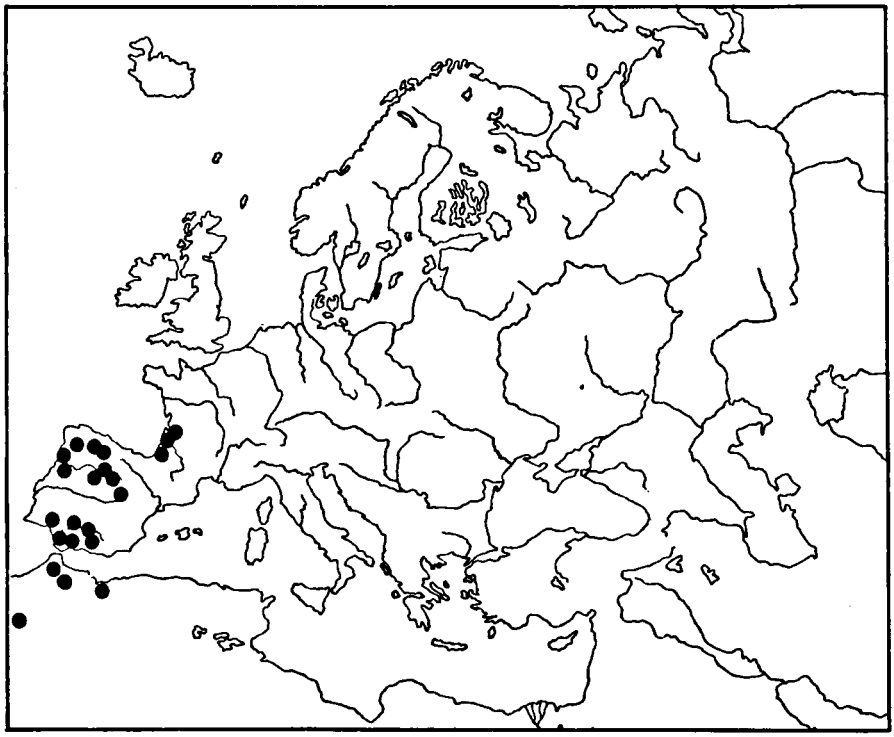
Diagram 2. Period of flight of *N. crocata luteata*.

brownish yellow to dark brown, laterally blackened and posterior margin pale yellow or yellow. Sternite 8 and hypovalvae reddish brown, sternite 8 sometimes broadly dark brown or black in front of base of hypovalvae with large, dark brown to black oval spots. Cerci ending bluntly. Hypovalvae, egg-slide, furca and fused valvulae as in *c. crocata.*

Biology (diagram 2)

Mr. Boersma and I collected *c. luteata* in the Sierra de Gredos (Central Spain, May 1976) in a variety of habitats, such as inundated meadows, gravel river-sides with willow scrubs, oak-woods, but always in the neighbourhood of running water. At the central upland plains of the Sierra de Gredos (1400—1600 m), *c. luteata* was a much less frequent species, compared with the southern slopes. During the first half of June 1976, no specimens were observed in the Cantabrian Mountains.

The period of flight is represented in diagram 2. *N.c. luteata* has been collected in France between 28 April and 30 June; in Spain from 23 April until 10 July with one record from 2 September; in Portugal at 2 April, 12—13 July, 10 August and 25 August-2 September; in Morocco between 16 May and 1 July (Haut Atlas) and was found in Algeria on 27—28 April.



Map 2. Distribution of *N. crocata luteata.*

Distribution (map 2)

In southwestern France *c. luteata* is known from the following localities: Angoulême (Charente), Biscarosse (Landes, type-locality of *zonata*) and Contis Plage (Landes); in Spain (provinces): Orense, Leon, Palencia, Segovia, Avila, Madrid, Cuenca, Jaen, Granada, Cordoba, Malaga, Cadiz and Huelva; in Portugal: Lago da Palmeira (Minho), Manteigas and Serra da Estrêla (Beira Alta); in Morocco: Kasba Taguendaft and near Oukaimeden (Haut Atlas), Tagsut Senhaia and Xauen (Rif); in Algeria Tlemcen. The records from Marseille (Riedel, 1910) and Corsica (Riedel, 1910; Edwards, 1928) refer to the typical subspecies. It is not known whether the latter and *c. luteata* are sympatric in southwestern France (Charente and Landes).

Discussion

Savchenko (1973b) synonymized *luteata* and *crocata* because there are differences in colouration only. These differences, being constant, are a basis for subspecific ranking, which is supported by the distributional record and by additional discriminative characters in the hypopygium.

Nephrotoma scalaris (Meigen, 1818)

Figs. 14—20, diagrams 3—4, maps 3—4

The species *scalaris* is subdivided here into *scalaris scalaris* and *scalaris terminalis*. The former is distributed throughout different parts of Europe, the Caucasus and Asia Minor. The extensive range of *s. terminalis* covers southeastern Europe and central and eastern Asia.

N. scalaris is, with respect to the other species of the *crocata* group a yellow species, to be recognized by the shape of the occipital marking and by the glossy aspect of the downwardly directed anterior ends of the lateral prescutal stripes (as in the melanistic *rossica*).

The differences between the two subspecies are found in the colouration of the abdomen.

Nephrotoma scalaris scalaris (Meigen, 1818)

Tipula scalaris Meigen, 1818, Systematische Beschreibung, 1: 195—6; 1830: 286.

Pachyrhina scalaris: Schiner, 1864: 508; Van der Wulp, 1866: 17; Palm, 1869: 406; Van der Wulp, 1877: 377; Riedel, 1910: 417—8, 429, 434; Cižek, 1911: 88—9; Vimmer, 1913: 18; Riedel, 1919b: 18; 1920: 15; Goetghebuer & Tonnoir, 1921: 123 (= *flavipalpis*); Brolemann, 1923: 515—8, figures (= *flavipalpis*); Pierre, 1924a: 29, figures, biology (= *flavipalpis*); Nielsen, 1925: 149, figures; De Meijere, 1939: 147; Frey, 1941: 44; Brauns, 1949: 159, biology; Zangheri, 1949: 12; Simova, 1959: 128.

Pales scalaris: Mannheims, 1951a: 33—4, 47—53; 1951c: 228; 1953: 2; 1954a: 151; 1954b: 32; Savchenko, 1954: 626, 634, figures, biology; Theowald, 1957a: 229, figures, biology; 1957b: 10—1; Mannheims & Theowald, 1959: 17; Erhan & Theowald, 1961: 249; Erhan, 1962: 97—8, figures; Hemmingsen, 1962: 140; Mannheims & Pechlaner, 1963: 6; Mannheims, 1964b: 1—2; 1964c: 106; 1965: 1; 1966a: 276; 1966b: 490—2; Savchenko, 1966a: 488—491, figures; Mann-

heims, 1967e: 317; Zangheri, 1969: 1024; Simova, 1977: 26, 80—2, figures.

Pales scalaris scalaris: Savchenko, 1973b: 65—8, figures, biology.

Nephrotoma scalaris: Nielsen, 1933: 245; Tjeder, 1955b: 246—7; Coe, 1958: 181 (*scalaris* dark var. = *scalaris scalaris*); Theowald, 1967: 18, 64, biology; Mannheims, 1969: 188; Theowald, 1971: 220, 228; Hartig, 1971: 124; Simova, 1974: 26.

Tipula imperialis Meigen, 1818, Systematische Beschreibung, 1: 196, figures; 1830: 286; Schummel, 1833: 118—20.

Pachyrhina imperialis: Macquart, 1834: 89; Staeger, 1840: 24; Walker, 1848: 63 (= *flavipalpis*); Zetterstedt, 1851: 3991—2; Walker, 1856: 333 (=*flavipalpis*); Zetterstedt, 1860: 6543; Schiner, 1864: 508; Van der Wulp, 1866: 17; Grzegorzek, 1873: 26; Van der Wulp, 1877: 377; Westhoff, 1882: 48; Verrall, 1886: 119 (= *flavipalpis*); Bergroth, 1888: 656; Huguenin, 1888: 21; Verrall, 1888: 21 (= *flavipalpis*); Strobl, 1895: 85 (= *flavipalpis*); Van der Wulp & De Meijere, 1898: 28; Thalhammer, 1900: 20; Jacobs, 1903: 352 (= *flavipalpis*); Wahlgren, 1904: 13; Vimmer, 1905b: 104; Strobl, 1906: 406; Riedel, 1910: 417; Miles, 1921: 176; De Meijere, 1939: 147.

Pales imperialis: Mannheims, 1951a: 48; 1951c: 228; 1964c: 106; Savchenko, 1973b: 65.

Pachyrhina terminalis: Zangheri, 1949: 12.

Pales terminalis: Mannheims, 1951a: 33—4, 49—50 (partim: Poros only); Hemmingsen, 1962: 140.

Pachyrhina flavipalpis: Strobl, 1895: 85; 1897: 17; Thalhammer, 1900: 20; Riedel, 1910: 417.

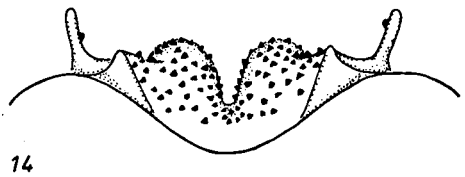
Pales flavipalpis: Erhan & Theowald, 1961: 249.

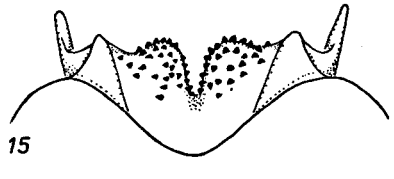
Type-material & Synonymy

Tipula scalaris Meigen, 1818: No types preserved in the Meigen collection (MNHNP; Mannheims, 1951c: 228), the description however can hardly be misinterpreted and moreover Meigen himself (1830: 286) synonymized *scalaris* with *imperialis* of which the female type is in his collection.

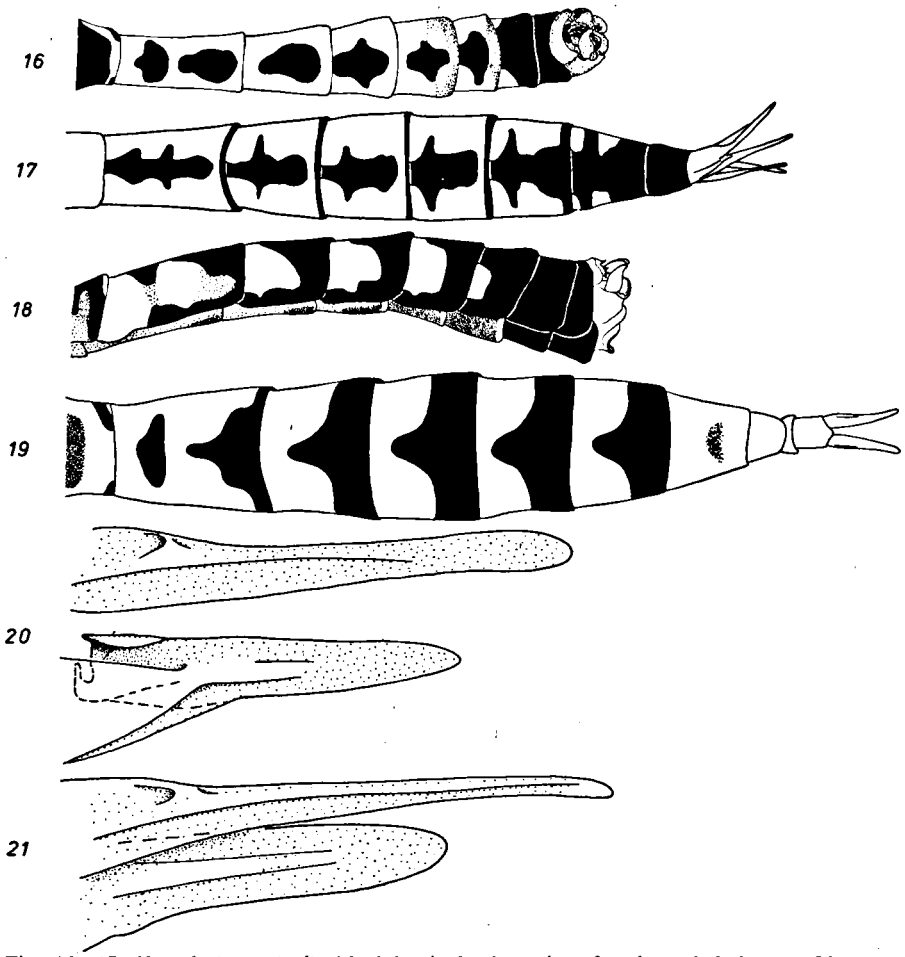
Tipula imperialis Meigen, 1818: One female in the Meigen collection (MNHNP; v! M 1950; v! 0 1976). Synonymy see above. As suggested by Van der Wulp (1877), *scalaris (imperialis)* was synonymized with *flavipalpis* by Strobl (since 1895) and Riedel (1910). During a certain period of time the species was treated by several authors under one of these three names, whereas the name *crinicauda* Riedel, 1910, was used for the species *flavipalpis*.

Other material: 152 males and 160 females from the following countries: the Netherlands, Poland, Czechoslovakia, France, Spain, Italy, Austria, Hungary, Rumania, Yugoslavia, Albania, Bulgaria, Greece, U.S.S.R. (Kiyev), Turkey, Syria and Iran.





Figs. 14—15. *N. scalaris scalaris*. 14, posterior extension of tergite 9 after a male from the Netherlands, Ankeveen, dorsal view; 15, idem after a male from Italy, Marina di Massa.



Figs. 16—17. *N. scalaris terminalis*. 16, abdominal colouration after the male holotype of *bispinosa*; 17, abdominal colouration after a female from Kashmir, Gulmarg.

Figs. 18—20. *N. scalaris scalaris*. 18, abdominal colouration after a male from Hungary, Budapest; 10, abdominal colouration after a female from Hungary, Budapest; 20, cercus and hypovalva after a female from Spain, Lanjaron, lateral aspect.

Fig. 21. *N. pamirensis*, cercus and hypovalva after the female syntype from Muskol (MNB), lateral aspect.

Description

Introduction: The description below deals with the European specimens of *scalaris scalaris*. Towards the southeastern limits of its range the colouration of head, thorax and abdomen frequently tends to become paler and the characteristic, dark brown markings can be less conspicuous, less developed or even absent on certain parts of the body. Especially the uniform dark colouration of the prescutal stripes may become light reddish brown in part (such forms were interpreted by Mannheims as *terminalis*

Wiedemann), and/or the abdominal markings at the posterior margins of the tergites may loose contact with the darkened, lateral margins of the tergites. The absence of a connection between the dorsal and lateral markings is presented by Savchenko (1973b) as characteristic for *scalaris bispinosa*. This character-state is found also in the typical subspecies, and, as it is the only character to discriminate between the two subspecies, identification of specimens from Asia Minor and, according to Savchenko (1973b), from the Caucasus and Ukraine is extremely difficult (see also discussion under *scalaris terminalis*).

Body length male: 11—17 mm, female: 17—21 mm; wing length: 10—16 mm.

Head male: Scape and pedicel yellow, sometimes in part or entirely brown; flagellar segments dark brown; first flagellar segment 1.0—1.2 x length of second one; second and following flagellar segments nodulose basally; verticils up to 1.1 x length of flagellar segments. Nasus and dorsal part of rostrum dark brown, shining. Genae and postgenae pale yellow to yellow; vertex orange-yellow, tinged with brown. Dark brown occipital marking narrow and elongate, posteriorly triangular or rounded, anteriorly with a narrow prolongation up to frontal tubercle. Hairs on vertex and postgenae of moderate length. Frontal tubercle well developed. Markings at inner part of postgenae usually well developed, rarely absent.

Thorax male: Pronotum dorsally yellow, laterally dark brown. Prescutal and scutal stripes dark brown to black; downwardly bent anterior ends of prescutal stripes shining and lighter coloured than stripes themselves. Scutellum brownish yellow to black. Parascutellae yellow. Lateral parts of mediotergite broadly yellow. Pleural markings conspicuous, dark brown to black. Sternum 1 brownish yellow, lateral margins sometimes darkened. Fore coxae broadly dark brown with brownish yellow tips; coxae of middle and hind legs brownish yellow, dark brown at base and inner half. Trochanters yellow to brown. Femora light brown, sometimes anteriorly steadily growing darker, tips dark brown. Tibiae brown, tips dark brown. Tarsi brown to dark brown. Wings light brown toned; wing-stigma dark brown, with macrotrichiae; basal part of vein R4+5 and usually cross-vein R-M broadly brown shaded; wing-tip with a minor brown shade. Halteres brown to dark brown, apical part of knob yellow.

Abdomen male (fig. 18): Tergite 1 brownish yellow, dorsally with a broad, dark brown spot which is usually in contact with narrow, dark brown stripe along lateral parts of hind margin. Anterior part of tergite 2 brownish yellow with a large, dark brown spot dorsally. Posterior part of tergite 2 and tergites 3—6 brownish yellow with large, dark brown spots dorsally which are usually distinctly triangular towards hind margins and broadly, at anterior tergites sometimes narrowly or not at all, connected with dark brown stripe at lateral margin of tergites. Tergite 7 dark brown with a small, brownish yellow spot underlying tergite 6. Tergite 8 dark brown. Sternite 1 usually broadly brown to dark brown. Sternites 2—7 brownish yellow with a small,

dark brown spot in front of hind margin, or, less frequently, sternites 5—7 with broadly darkened hind margins, rarely colouration of sternites and tergites more or less identical or sternites entirely dark brown. Sternite 8 dark brown.

Hypopygium (figs. 14—15): As in *c. crocata*. Minor differences are found in the posterior extension of tergite 9: in *c. crocata* (figs. 1—2), the outer margin on either side of the median incision is more or less straight; *s. scalaris* has a more convex outer margin (figs. 14—15), in dried specimens however, this difference is hardly visible. Moreover the od of *s. scalaris* can be more slender than in *c. crocata*.

Female (figs. 18—20): Colouration of head and thorax as in the male. Verticils up to 1.4 x length of flagellar segments. Dark brown bordering of the hind margins of the tergites not as triangular as in the male. Tergites 6 and 7 yellow with dark brown lateral margins or coloured as preceding tergites. Sternites brownish yellow, usually with a narrow, median stripe which is interrupted by the lighter colouration of the hind margins of the sternites. Especially posterior sternites sometimes infuscated. Tergites 9, 10, cerci, sternite 8 and hypovalvae reddish brown; usually median region of tergite 10 and anterior part of sternite 8 darkened and lateral parts of sternite 8 with darkened, oval spots. Female copulatory organs as in *c. crocata*, lateral aspect as in fig. 20.

Biology (diagram 3)

The habitats mentioned for *s. scalaris* are meadows, arable land, brush-woods and forests with a dense undergrowth. Brauns (1949) reports reed

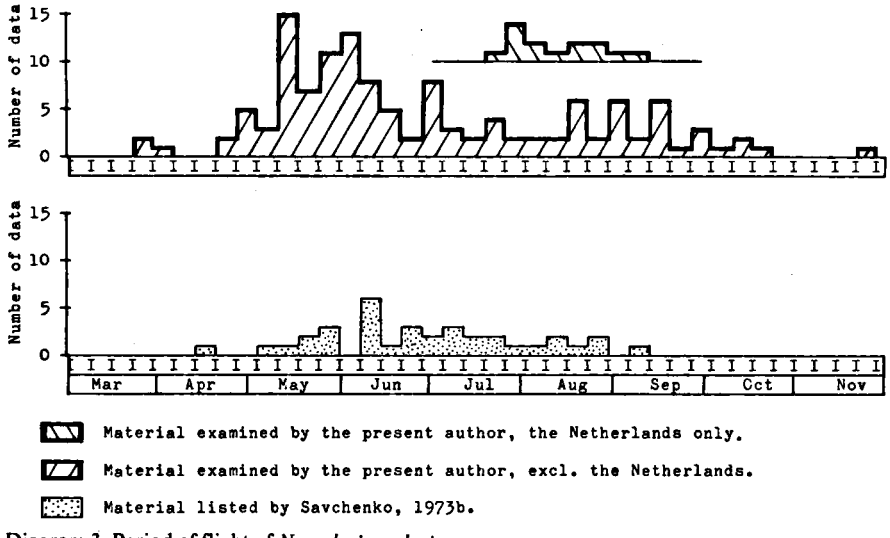


Diagram 3. Period of flight of *N. scalaris scalaris*.

vegetations bordering brackish swamps near the Kieler Bucht.

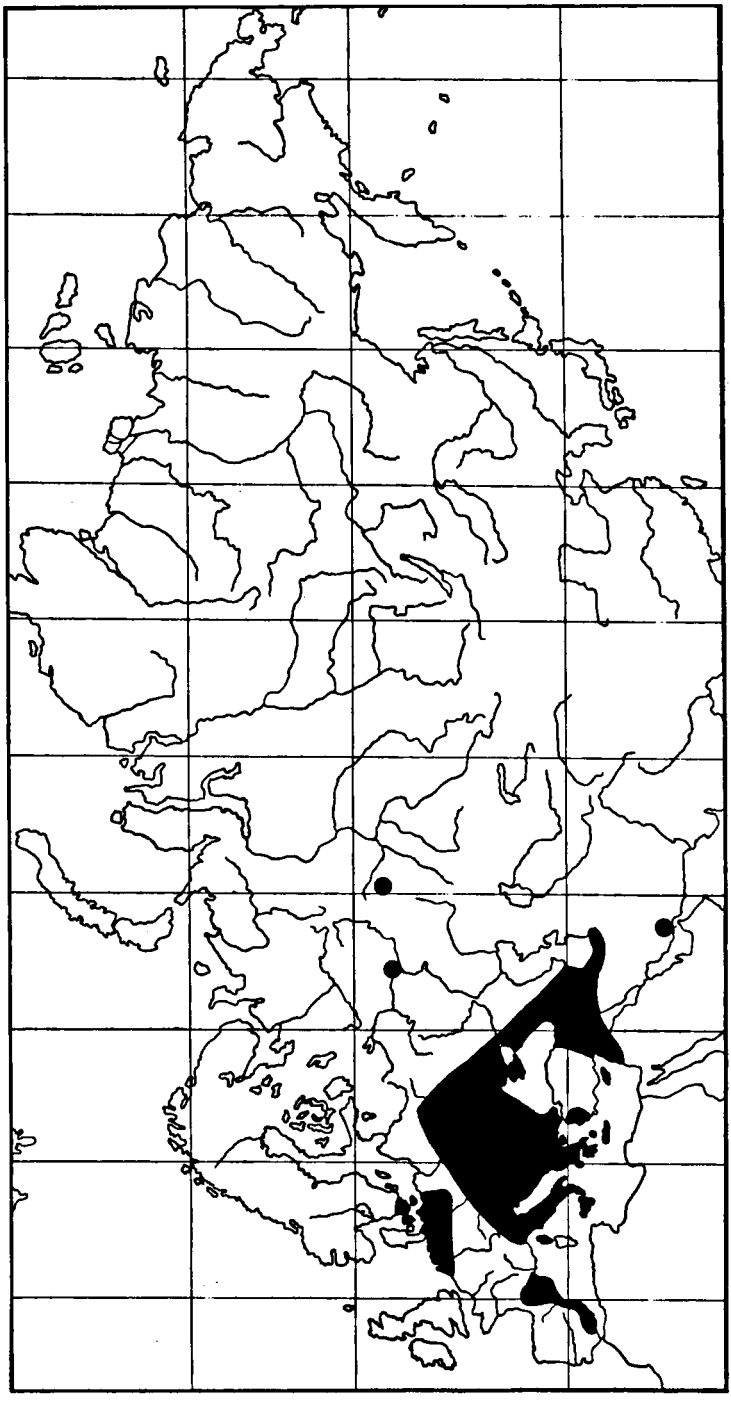
Oviposition is in the soil. According to Savchenko (1973b) the larvae hibernate just below the surface, usually in the second stage (72% of the larvae found 13 november 1949 in the L'vov province measured 12—15 mm, 28% were full-grown, measuring 30—35 mm; at 15 november 1949 in the Kiyev province larvae with a length of 8—13 mm were found only; in the same province 44% of the larvae collected 26 november 1949 measured 14—20 mm, 44% 20—25 mm and only 12% measured more than 25 mm), and hence larval feeding may continue until the beginning of June. Larvae affect the roots of cabbage, clover and grains but damage rarely becomes a problem (Miles, 1921, noted severe damage to oats and other grains in Great Britain; the species however is not known to occur in the British Isles). Pupation takes place in May until July and lasts for 9—14 days. Before the adults emerge the pupae expose themselves halfway above the soil.

As is clear from diagram 3 there are in central and southern Europe, and in Asia Minor (material examined by the present author) and in the U.S.S.R. (material from Savchenko, 1973b) several generations a year. In the Netherlands however the period of flight is short and there seems to be one generation only, from the end of July until the beginning of September, as is apparently also the case in Denmark (Nielsen, 1925, 1933) and East Germany (Riedel, 1919).

Savchenko (1973b) mentions altitudes of 2000 m in the Caucasus, about the same altitudes are found for specimens from Turkey (1800 m) and Iran (up to 2200 m). In Europe *s. scalaris* rarely occurs above 1000 meter (Pyrenees near Sort, 1500 m).

Distribution (map 3)

The distribution in northwestern Europe is based upon relatively few data (Sweden, Skåne, Tjeder, 1955; Denmark, Sjaelland and Bornholm, Nielsen, 1925, 1933; West Germany, Fehmarn, Brauns, 1949, Lippstadt, Westhoff, 1882; East Germany, Berlin, Meigen, 1818; Frankfurt a/Oder, Riedel, 1919; Poland, Hrubieszów, Breslau, Schummel, 1833; the Netherlands, 7 localities in the province of Noord- and Zuid-Holland, 1 in the province of Drenthe). In France 4 localities are known: Castel Jaloux, Cirque de Navacelles (Aude), Corse and Thuir. The French records listed by Brolemann (1923) and Pierre (1924a) refer to *flavipalpis*, which applies also for those from Belgium (Jacobs, 1903, Goetghebuer & Tonnoir, 1921) and Great Britain (Walker, 1848, 1856, Verrall, 1886, 1888). *N.s.scalaris* is known from 4 provinces in Spain: Granada, Valencia, Gerona and Lerida; the *scalaris* var. *flavirostris* Strobl, 1909, from Orense is synonymous with *flavipalpis*. One female (MNHMP) is known from the out-ranged locality Bandar-e Lengeh in southern Iran. Savchenko (1973b) mentions the outer localities Kazan' and Sverdlovsk. The species has been listed for Finland (Frey, 1941) and Switzerland (Huguenin, 1888) without confirmation.



Map 3. Distribution of *N. scalaris scalaris*.

Discussion

See *scalaris terminalis.*

Nephrotoma scalaris terminalis (Wiedemann, 1830)

Tipula terminalis Wiedemann, 1830, Aussereuropäische zweiflügelige Insekten, 2: 612.
Pachyrhina terminalis: Riedel, 1910: 427—8.
Pales terminalis: Mannheims, 1951a: 33—4, 49—50 (partim: except Poros); 1961: 309; 1964b 1—2.
Pales scalaris terminalis: Savchenko, 1973b: 71.
Nephrotoma terminalis: Mannheims, 1967d: 177—9.
Pachyrhina parvinotata Brunetti, 1918, Records of the Indian Museum, 15: 276.
Pales scalaris? parvinotata: Savchenko, 1973b: 71—2.
Nephrotoma bispinosa Alexander, 1925, Annals and Magazine of Natural History, (9), 15: 404—5; Alexander, 1936: 17; Lackschewitz, 1935a: 395—6, figures; Wu, 1940: 4.
Nephrotoma scalaris bispinosa: Mannheims & Savchenko, 1967: 148; 1973: 162—3 (incl. forma *rufula*).
Pales bispinosa: Savchenko, 1961: 1895; Zinovjev & Savchenko, 1962: 567, 570; Mannheims, 1964b: 2; Savchenko, 1966a: 491—2; Savchenko & Violovich, 1967: 357—8.
Pales scalaris bispinosa: Savchenko, 1973b: 68—71.
Pachyrhina fedtshenkoi Dodonov, 1926, Entomologische Mitteilungen, Berlin-Dahlem, 15: 107—8, figures.
Pales fedtshenkoi: Savchenko, 1973b: 68—9.
Nephrotoma brierei Alexander, 1937, Notes d'Entomologie Chinoise, 4: 23; Wu, 1940: 4; Alexander, 1954: 23—4.
Pales scalaris? brierei: Savchenko, 1973b: 68—9.
Nephrotoma scalaris: Nielsen, 1962: 165.

Type-material & Synonymy

Tipula terminalis Wiedemann, 1830: The number of type-specimens is not mentioned by Wiedemann. Riedel (1910) lists three male types and one female type in the Vienna Museum. Out of this series Mannheims (1951a) saw one male, which he designated as lectotype, and one female. These two last-mentioned specimens were examined by the present author. The labeling is as follows: lectotype ♂: Syria, coll. Winthem/ terminalis, det. Wiedem./ Pachyrhina ♂, terminalis Wied., det. Riedel/ Pales terminalis Wied., Mannheims det. 1950/ Lectotypus, des. Mannhs. 50 (NMW; v! 0 1977, abdomen attached to the pin by me); paralectotype ♀: Syria, coll. Winthem./ terminalis, det. Wiedem./ Pach. ♀ terminalis Wied., det Riedel/ Pales terminalis Wiedem, Mannheims det. 1950 (NMW; v! 0 1977); this paralectotype belongs to *scalaris scalaris.*

Pachyrhina parvinotata Brunetti, 1918: The holotype male bears the following labels: small, round, red bordered label, written ♂, printed Type/ Pres. by Agric. Inst., Pusa, 1921—427./ Peschawar Dist. Taru, 16—29.V.1915, Fletcher coll/ Pachyrhina parvinotata Brun, Type ♂ (BMNH; v! 0 1977). Paratype ♀: labeled as the holotype, code ♂ replaced by ♀ twice (BMNH; v! 0 1977). According to Brunetti (1918) there should be two female cotypes, labeled as the above-mentioned paratype, and one female cotype from

Haripur Hazara, North-West Frontier (Pakistan), in the Pusa collection (Dehli, India). *P. parvinotata* is synonymized here with *T. terminalis* for the first time (see discussion).

Nephrotoma bispinosa Alexander, 1925: The labeling of the holotype male is as follows: Museum Paris, Mongolie, vallée près de la Koure de Bandie, 1500 m d'alt, Mission de Lacoste, Dr. du Chazaud, 1909/ Holotype Nephrotoma bispinosa C.P. Alexander (MNHNP; v! 0 1977). *N. bispinosa* is synonymized here with *T. terminalis* for the first time (see discussion).

Pachyrhina fedtshenkoi Dodonov, 1926: Savchenko (1973b) makes the following remarks about the type: "in the collection of the Zoological Museum of the State University in Moskou. It bears an, in Fedtshenkoi's own handwriting label (Zeravshan, 30 May), corresponding with Dodonov's first description of *P. fedtshenkoi.* The author-label from Dodonov is not preserved". The type was not sent to Amsterdam for examination because of its uniqueness. According to Savchenko (1973b) *P. fedtshenkoi* is synonymous with *N. bispinosa.*

Nephrotoma brierei Alexander, 1937: The types of *brierei* are preserved in the Museum Heude, Shanghai, China (Alexander, 1937: 1♂ holotype, 1♀ allotopotype, 1♀ paratopotype, all from China, Kiangsu, Wangko). Letters sent to Shanghai returned undeliverable. Savchenko (1973b) states that *N. brierei* in all probability is a junior synonym of *N. bispinosa.*

Other material: 34 males and 45 females from the U.S.S.R. (Kazakhskaya S.S.R.), Mongolia, China, India, Pakistan, Afghanistan and Iran.

Description

Introduction: *N. scalaris terminalis* even shows more variability in colouration than the nominate subspecies. Discrimination between three different colour patterns is possible but intermediates occur:

1. Specimens from central and eastern Russia, Mongolia and China (described by Alexander as *bispinosa* (1925) and *brierei* (1937);
2. Specimens from Syria, Iran, Afghanistan, northern Pakistan and northern India (described by Wiedemann as *terminals* (1830) and by Brunetti as *parvinotata* (1918));
3. Specimens from the Karakoram region (*bispinosa* Alexander sensu Lackschewitz, 1935).

The three colouration patterns are described below:

1. Specimens from central and eastern Russia, Mongolia and China:

Colouration of head and thorax as in the typical *scalaris*, sometimes dark brown markings less conspicuous; abdominal colouration different (fig. 16, holotype male *bispinosa*). Dark brown markings on posterior parts of tergites 2—6 not in contact with lateral stripes of tergites and usually not triangular but oval and situated well in front of the hind margins of the tergites. Tergite

8 and posterior part of tergite 7 dark brown. Lateral margins of tergites with broad, dark brown stripes. Sternites 1—6 brownish yellow with a narrow, median stripe which is interrupted by the lighter colouration of the hind margins of the sternites, sometimes sternites 1—6 entirely yellow or infuscated. Sternite 7 as preceding sternites or dark brown. Sternite 8 dark brown. Female abdominal colouration as in the male; sternite 8 as preceding sternites.

According to Savchenko (1973b) specimens from central Asia may show light brown or reddish brown prescutal stripes with traces of a paler central region, darker coloured pleural markings and bicolorous flagellar segments (described as *brierei* Alexander, 1937). Darker coloured specimens are mentioned by Savchenko from the northern parts of the Ukraine, the southern Wolga region, the Trans-Caucasus and northern Iran, which sometimes come so close to the typical subspecies that naming them correctly is extremely difficult. Mannheims & Savchenko (1973) applied the forma *rufula* for specimens from the Gobi Altaj and Mongol Altaj, in which the abdomen has a peculiar, reddish yellow colouration.

2. Specimens from Syria, Iran, Afghanistan, northern Pakistan and northern India:

The description below is made after the holotype male and paratype female of *parvinotata* (Dodonov's original description is much shorter).

Head male: Scape and pedicel yellow; first flagellar segment light brown, 1.3 x length of second; second and following flagellar segments brown, at base slightly nodulose and somewhat infuscated; verticils up to 1.1 x length of flagellar segments. Head brownish yellow, genae and postgenae yellow; small, triangular occipital marking hardly indicated. Hairs of vertex and postgenae short and densely set.

Thorax male: Pronotum dorsally yellow, laterally brown. Median prescutal stripe brown to dark brown, anteriorly with a broad, lighter coloured central part. Lateral stripes brown to dark brown with shining, downwardly bent anterior ends. Scutal stripes brown, at wing-base dark-brown. Scutellum transparently yellow. Parascutellae yellow. Lateral parts of mediotergite broadly yellow, median region with a narrow, transparently yellow, longitudinal stripe, posterior part broadly transparently yellow. Pleurae yellow, pleural markings replaced by transparently yellow, anatergite yellow. Sternum 1 yellow. Coxae and trochanters yellow to light brown. Femur of left fore leg (other legs missing) light brown, at apical half dark brown in front of lighter coloured apical one-fifth, tip darkbrown. Tibia light brown to brown, tip darkened. Tarsus brown to dark brown. Wings light brown toned; wing-stigma brown, with macrotrichiae; basal part of vein R4 + 5 and wing-tip with a brown shade.

Abdomen male: Shining brown; tergites dorsally with traces of oval, darkened spots and laterally with broadly interrupted, dark brown stripes.

Tergite 8 and dorsal part of tergite 7 dark brown. Anterior part of sternite 8 broadly darkened.

Female: Resembling the male. Verticils up to 1.7 x length of flagellar segments. Prescutal stripes almost uniformly dark brown, anterior central part to a lesser degree brown coloured. Fore legs as described for the male. Femora of middle and hind legs light brown to brown, tips darkened. Tibiae brown, tips darkened. Tarsi brown to dark brown. Anterior half of abdominal tergites yellow, posterior half brownish yellow; dorsally, at borderline of these two colourations small, longitudinal, brown spots; lateral margins of tergites with conspicuous, dark brown stripes, interrupted at anterior and posterior corners of tergites. Tergite 8 and anterior part of sternite 8 dark brown.

The lectotype male of *terminalis* resembles the holotype of *parvinotata*, the pleural markings of the former however are more conspicuous, the bordering of the lateral prescutal stripes is light brown and the femora of the fore legs are light brown with darkened apices, without a broadly darkened ring at apical half. In other specimens from northern Pakistan and northern India the dark brown oval spots on the abdominal tergites can be very distinct, especially in the females.

3. Specimens from the Karakoram region.

Prescutal and scutal stripes broad and uniformly dark brown, downwardly bent anterior ends of lateral stripes sometimes lighter coloured. Pleural markings reddish brown. Fore femora light brown at basal part, apical two-third conspicuously darkened, tips dark brown. Tergites 2-6 with irregular shaped, longitudinal spots which are, especially in the females, elongate, forming a dorsal stripe (fig. 17). Hind margins of the tergites with a narrow, dark brown border, especially distinct in the females. Lateral stripe of

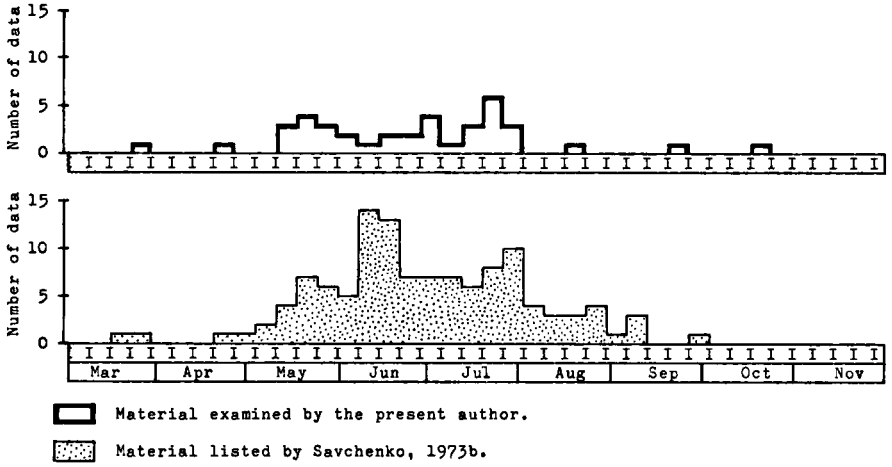


Diagram 4. Period of flight of *N. scalaris terminalis*.

tergites distinct, dark brown. Sternites 1-6 uniformly yellow. Male segment 8 and posterior half of segment 7 dark brown to black. Female tergite 8, posterior half of tergite 7 and anterior part of sternite 8 dark brown to black. Sternite 8 with large, dark brown, oval spots laterally.

The abdominal colouration of these specimens is similar to that of *N. pamirensis* (Enderlein) from the Karakoram and Pamir regions. Of the latter species two females, belonging to the type-series (MNB; v!0 1978, 1 ♀ Muskol, 1 ♀ Ak-su) are examined after which the following description is made:

Scape and pedicel dark brown. Rostrum and coxae almost entirely dark brown. Occipital marking large, onion-shaped, posteriorly wider than dorsal distance of the eyes. Pleural markings distinct, dark brown, in contact with each other by extended brown borders. Anatergite dark brown. Scutellum transparently yellowish brown. Parascutellae yellow. Anterior half of mediotergite with a yellow, longitudinal, median stripe, laterally bordered by transparently brown; posterior half of mediotergite dark brown. Wing-stigma distinct, brown, without macrotrichiae. Abdomen dorsally with a narrow, dark brown stripe; hind margins of tergites yellow; lateral margins with a dark brown stripe. Sternites with a narrow, dark brown stripe medially; hind margins of the sternites yellow. Segment 8, tergites 9 and 10, cerci and hypovalvae shining brown. The male genitalia are figured by Savchenko (1973b); the female cerci and hypovalvae are exemplified here after the female syntype from Muskol (fig. 21). The cerci are very long and slender, the hypovalvae are broader and apically more blunt than in *scalaris*.

Biology (diagram 4)

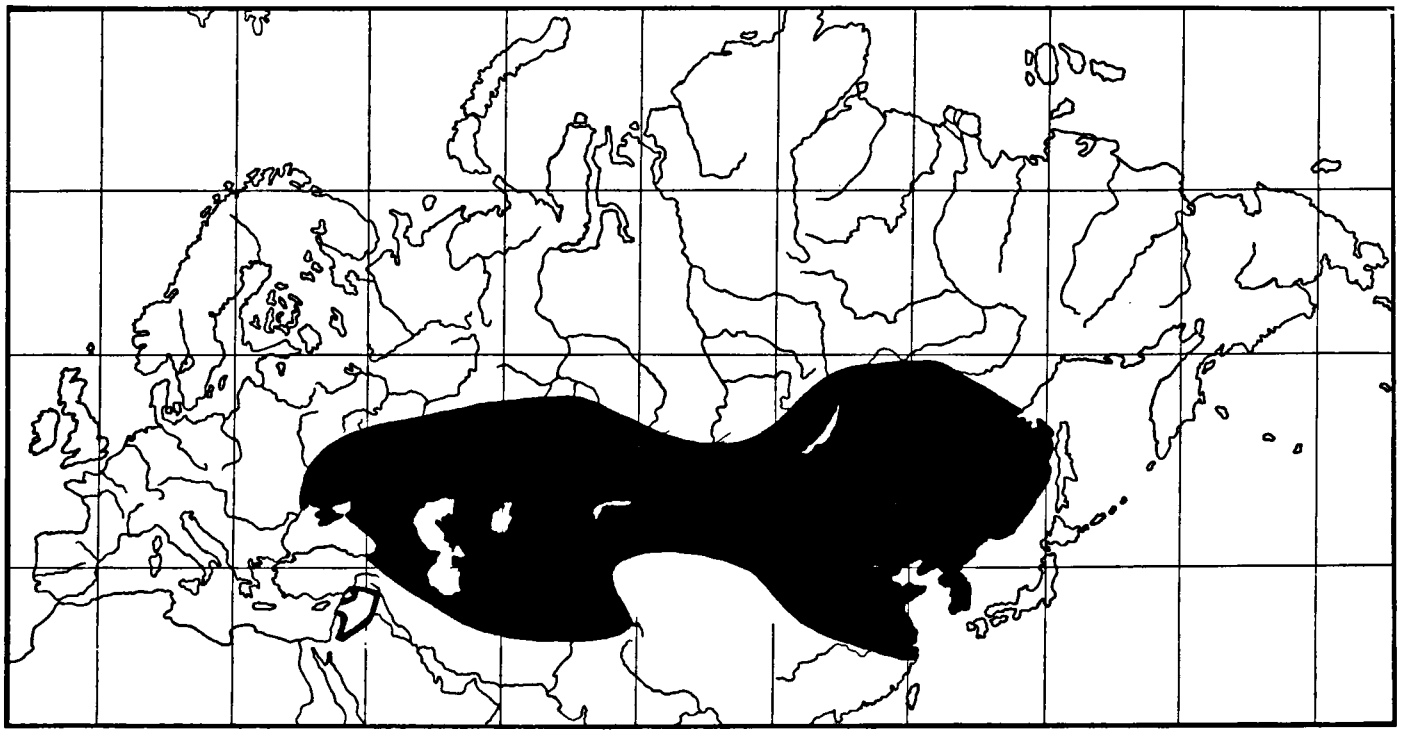
According to Savchenko (1973b) *terminalis* can be found in valleys, heathlands, as well as mountain areas up to 4000 meters and is especially frequent in meadows with lucerne. Fullgrown larvae feed on roots and damage has been reported from cabbage and several grains. In central Asia damage frequently occurs when both the larvae of *terminalis* and *Tipula orientalis* are present. The period of flight is represented in diagram 4.

Distribution (map 4)

The type-locality „Syria" lies outside the presently known distribution of *terminalis*.

Discussion

Savchenko (1973b) recognizes three subspecies of *scalaris*, the typical *scalaris* from Europe, *scalaris bispinosa* from Asia Minor and central and east Asia, and *scalaris terminalis* from Asia Minor. Savchenko (l.c.) questions whether *parvinotata* from north Pakistan and Kirgiziya is a subspecies of *scalaris*. The present author maintains two subspecies of *scalaris* only: *scalaris*



Map 4. Distribution of *N. scalaris terminals*, heavy lines showing boundaries of "Syria", the type-locality os *terminals*.

scalaris and *scalaris terminalis*. After examination of the types the latter is interpreted as senior synonym of *parvinotata* and *bispinosa*.

Discrimination between the two subspecies is based on the shape and size of the dark brown markings on the abdominal tergites only, and, according to Savchenko, intermediates between *scalaris* and *terminalis* occur where the two taxa are sympatric. Of *terminalis* three types of colour patterns are described. Intermediates, again, occur, for example the type of *fedtshenkoi* of which Savchenko (1973b) states: „differs in nothing from *P. scalaris bispinosa*, except for the unusual pale, almost whitish colouration of the body, which can not be a basis for considering it as a species or subspecies".

Nephrotoma rossica (Riedel, 1910)
Figs. 22—25, map 5

Pachyrhina rossica Riedel, 1910, Deutsche Entomologische Zeitschrift, Berlin, 1910: 419—20; 1920: 15 (= *nox*); Pierre, 1924a: 29.

Pales rossica: Mannheims, 1951a: 33—6, 51—2 (partim, Armenien refers to *nox*); 1951b: 139—40; 1954b: 32; Hemmingsen, 1962: 140; Savchenko, 1966a: 499—501, figures; 1973b: 80—1, figures, biology.

The species *rossica* is characterized by the extensive chocolate brown colouration of the thorax, combined with the glossy, downwardly bent anterior ends of the lateral prescutal stripes and the abdominal colouration. The female of *rossica* in a way resembles the female of *nox*. Apart from the characters mentioned above, discrimination of the females of these two species is facilitated by the colour pattern of the sternites two and three.

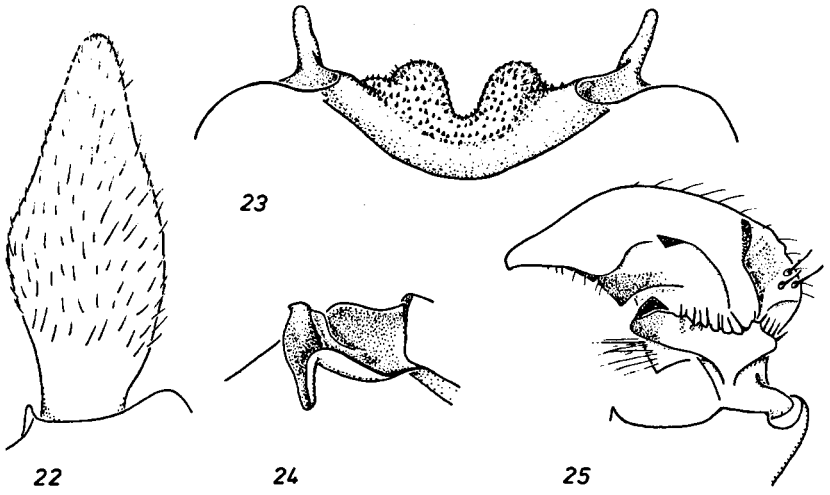
Type-material

Riedel described *rossica* after „2 ♂ 1 ♀ Wiener Museum. Patria: Rossia", mentioning "Die mir vorliegenden Exemplare trugen den Vermerk: *rossica* (in litt.) von Schiners Hand". Of the three males and three females present in the Vienna Museum and identified by Riedel, only one male (v! 0 1977) is labeled "rossica det. Schiner/rossica Schin. i.l./P. ♂ rossica Ried. det. Riedel", thus corresponding with the original description, and designated here as lectotype. The remaining types presumably are lost, as they are neither in Vienna nor in Berlin. The material interpreted by Mannheims as Riedel's original specimens does not belong to the type-series (Mannheims, 1951a: 52, Waloniki, R.m., Velitchowski, one male designated as lectotype).

Other material: 9 males and 4 females from the U.S.S.R.

Description

Body length male: 11-14 mm, female: 17-19 mm; wing length: 11—14 mm.



Figs. 22—25. *N. rossica*. 22, od, outside; 23, posterior extension of tergite 9, dorsal view; 24, shell-like deformation at upper margin of sternite 9 between base of od and tergite 9, from inside; 25, id, outside.

Head male: Antennal segments dark brown to black; first flagellar segment 1.3 x length of second one; second and following flagellar segments nodulose basally; verticils up to as long as flagellar segments. Head entirely chocolatebrown except for reddish brown colouration of frontal tubercle and lateral parts of vertex. Median region of vertex in general with a longitudinal stripe, terminating on top of frontal tubercle in a large, oval spot. Vertex and especially postgenae set with moderately short hairs.

Thorax male: Chocolate brown; prescutal and scutal stripes, scutellum, mediotergite and ventral part of thorax usually darker, sometimes even black; colouration inbetween prescutal and scutal stripes reddish or yellowish brown. Downwardly bent anterior ends of lateral prescutal stripes large and shining. Coxae and trochanters chocolate brown. Basal half of fore femora light brown, apical half dark brown, of femora two and three tips darkened only. Tibiae brown, tips darkened. Tarsi dark brown to black. Wings light brown toned; wing-stigma distinct, dark brown, without or with a few macrotrichiae. Shading of veins as described for *c. crocata* but less conspicuous. Halteres dark brown, basal half of knob blackened, apical half pale yellow to dark brown.

Abdomen male: Segment 1 entirely black, sometimes posterior part of tergite reddish brown. Tergites 2 and 3 entirely yellowish brown except narrow, black border along hind margins and small, irregular black spots just in front of or at hind margins and broad, black, lateral stripes. Tergite 4 coloured as preceding tergites or yellowish brown at anterior half only. Tergite 5 entirely black or yellowish brown at anterior half. Tergites 6, 7 and 8 black. Sternites 2 and 3 entirely yellowish brown except broad, black,

lateral stripes and (usually present) narrow, black border along hind margins. Sternite 4 coloured as preceding sternites or entirely black. Sternites 5—8 entirely black.

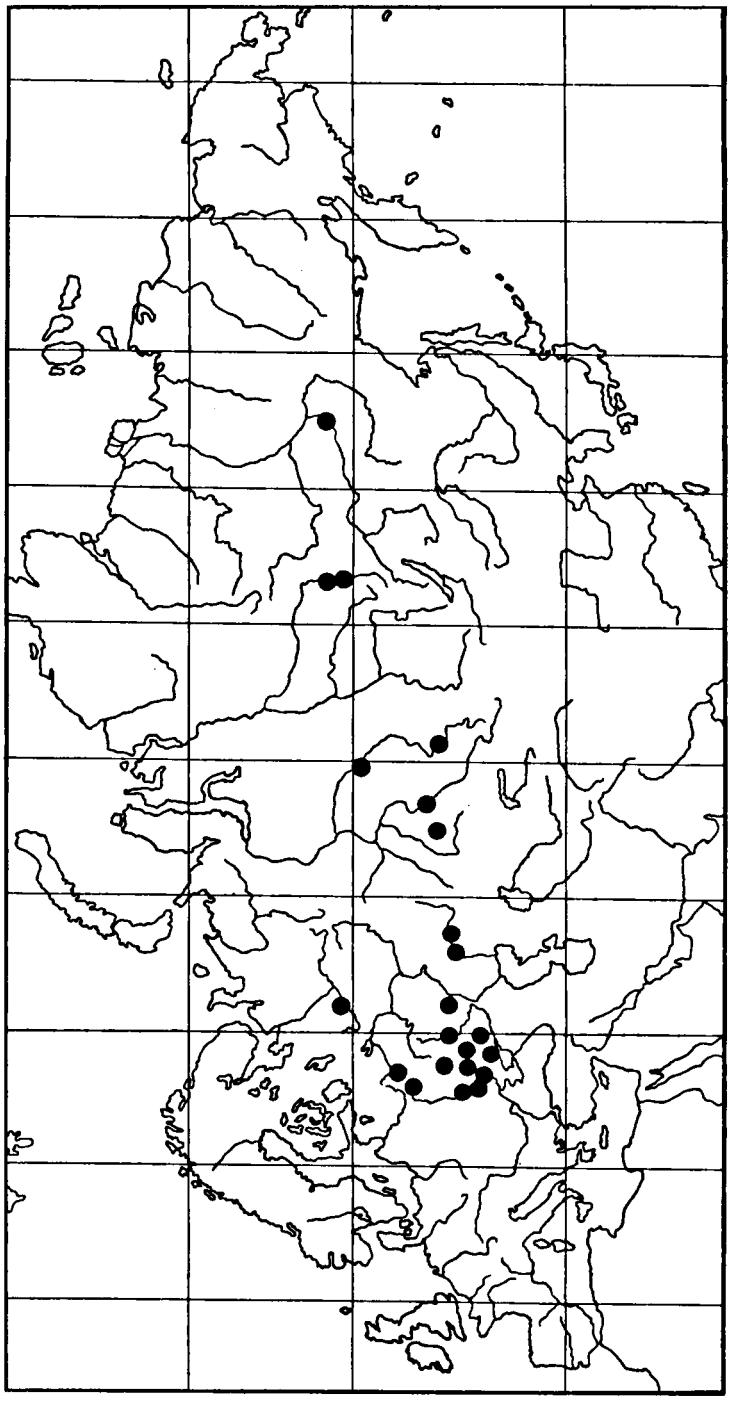
Hypopygium (figs. 22—25): The posterior extension of tergites 9, the od, the id, and the shell-like deformation between base of od and tergite 9 are exemplified in figures 22—25; the small, sclerotized triangle at the central part of the id is absent in some males. The adminiculum, aedeagus, hind margin of sternite 8 and medisternal appendage as in *c. crocata,* the medisternal appendage with an unilobe ventral projection.

Female: Resembling the male. Verticils up to 1.2 x length of flagellar segments. Colouration of head and thorax as in the male, but reddish brown colouration of vertex usually more extended posteriorly, median region of vertex without a longitudinal stripe and frontal tubercle entirely reddish brown. Dorsal part of pronotum, intermediate region between prescutal stripes and lateral parts of mediotergite in general yellowish, and to a larger extent lighter coloured than in the male. Tergite 1 black, along hind margin yellowish brown. Tergites 2—7 with a broad, dark brown to black lateral stripe. Tergite 2 yellowish brown, hind margin with a narrow dark brown border. Tergite 3 yellowish brown except median dark brown spot posteriorly and narrow, dark brown border of hind margin. Anterior and lateral parts of tergites 4 and 5 yellowish brown, median and posterior region with a triangular, dark brown spot which broadly extends along tergites hind margin. Tergites 6 and 7 yellowish brown anterolaterally, median and posterior region dark brown, sometimes hind margin of tergite 7 yellowish brown. Tergites 8—10 ranging from yellowish brown to black. Sternites 2 and 3 yellowish brown with dark brown lateral and posterior margins. Sternites 3—8 dark brown to black, sternite 8 usually medially yellowish brown. Female copulatory organs as in *c. crocata.*

Biology

According to Savchenko (1973b) *rossica* is a common species, inhabiting the micro relief of the steppe-zone, for example ravins, and in the woodsteppe the outer marches and water-meadows along rivers (this latter preference is especially clear on map 5).

The period of flight is from the end of April until the end of August. The majority of the data (± 80%) lies between 27 May and 2 July, the other data mainly refer to Kiyév (30.IV, 26.VII, 7.VIII and 29.VIII). Savchenko (1973b) concludes that the "very long period of flight" is an adaptation to the biotope of inundated areas in which moreover the duration and intensity of the inundations varies considerable from year to year ("In the Kiyév region the animals already appear at the beginning of May or even at the end of April when there has been or is only few inundation, whereas in years with high waters the species is on the wing from June till the second half of August" Savchenko, op cit.).



Map 5. Distribution of *N. rossica*.

Distribution (map 5)

The records by Riedel, 1920 (Turkey, Kagizman), and Mannheims, 1951a (Turkey, Armenia, 1 ♀, v! 0 1977), both refer to *nox*.

Nephrotoma pratensis (Linnaeus, 1758)
Figs. 26—35, 42, diagram 5, maps 6—7

Of *N. pratensis* a new subspecies is described from Spain after specimens collected by Mr. Eep Boersma and the present author in the Sierra de Gredos (central Spain) and the Cantabrian mountains (northern Spain). The typical subspecies from Europe is white-grey tinged, especially uniformly so on the abdominal tergites. The Spanish subspecies *p. eepi* differs in hypopygial as well as colour characters; in respect to the colour pattern of the abdomen it resembles the European *croceiventris lindneri*.

Nephrotoma pratensis pratensis (Linnaeus, 1758)

Tipula pratensis Linnaeus, 1758, Systema Naturae, Ed. 10: 586; 1761: 432; Poda, 1761: 112; Scopoli, 1763: 319; Linnaeus, 1767: 972; Fabricius, 1775: 750; 1781: 403: Schrank, 1781: 418—9; Fabricius, 1787: 322; Gmelin, 1790: 2814; Fabricius, 1794: 237; Schrank, 1803: 65—6, biology; Meigen, 1804: 73; Fabricius, 1805: 27; Meigen, 1818: 194—5; Schummel, 1833: 122—4, figures, biology; Bouché, 1834: 32—3, figures; Walker, 1848: 64; Haliday, 1851: 134.

Pachyrhina pratensis: Macquart, 1834: 89; Staeger, 1840: 23—4; Zetterstedt, 1851: 3989—90; Van der Wulp & Snellen van Vollenhoven, 1853: 144; Zetterstedt, 1855: 4901; 1860: 6543; Schiner, 1864: 503, 507; Van der Wulp, 1866: 17; Palm, 1869: 406; Grzegorzek, 1873: 26; Van der Wulp, 1877: 376—7; Westhoff, 1880: 48, biology; Wallengren, 1882: 13; Westhoff, 1882: 48, figures, biology; Beling, 1886: 175—6, biology (= p.p. *c. lindneri*); Verrall, 1886: 120; Bergroth, 1888: 656; Huguenin, 1888: 20—1; Verrall, 1888: 21; Kowarz, 1894: 7; Strobl, 1897: 17; Van der Wulp & de Meijere, 1898: 28; Strobl, 1900a: 656; 1900b: 207 (= *p. eepi*?); 1900c: 192; Thalhammer, 1900: 20; Jacobs, 1903: 352; Wahlgren, 1905: 132; Lundström, 1907: 24; Nielsen, 1907: 391; Riedel, 1910: 417—8, 420—1, 429; Czižek, 1911: 84—6; Lundström, 1912: 47; Vimmer, 1913: 18; Nielsen, 1918: 10; Riedel, 1918/1919: 5; Pierre, 1919b: 617 (= p.p. *c. lindneri*); Riedel, 1919b: 18; 1920: 15; Goetghebuer & Tonnoir, 1921: 123; Stackelberg, 1922: 16; Brolemann, 1923: 484—6, figures; Pierre, 1924a: 29, figures, biology; Weigand, 1924: 46; Dodonov, 1925: 109; De Jong, 1925: 47—9, 56, biology; Balachowsky & Mesnil, 1935: 862, figures; Szilády, 1939: 118—9, biology; Zangheri, 1949: 12; Simova, 1959: 127.

Pales pratensis: Mannheims, 1951a: 33—4, 36, 52—5, figures, biology; 1951c: 228; Stackelberg, 1951: 741; Fischer, 1952: 120; Hemmingsen, 1952: 409, 417; Mannheims, 1953: 2; Brauns, 1954: 72, biology; Gaunitz, 1954: 76; Mannheims, 1954b: 32, 41; Savchenko, 1954: 626, 634, figures, biology; Miller, 1956: 874; Theowald & Mannheims, 1956: 249; Theowald, 1957a: 227—8, figures, biology; 1957b: 10—1, biology; Mannheims & Theowald, 1959: 18; Erhan & Theowald, 1961: 249; Hemmingsen, 1962: 140; Höchstetter, 1962: 38, 47—8, 60, 79—80, 106, biology; Mannheims & Pechlaner, 1963: 6, 14, biology; Mannheims, 1964c: 106; 1965: 7; 1966a: 275—6; Savchenko, 1966a: 492—5, figures; 1966d: 120; Zangheri, 1969: 1024; Savchenko, 1973b: 73—5, figures, biology; Simova, 1974: 26; 1977: 26, 86, figures.

Nephrotoma pratensis: Olivier, 1811: 195; Alexander, 1919: 11c; 1921: 133; Nielsen, 1925: 150—1, figures; Alexander, 1931: 145, biology; Nielsen, 1933: 245; 1941b: 96; Tjeder, 1947: 31; Alexander, 1952: 335; Tjeder, 1954: 47, biology; 1955b: 246—7; Mannheims, 1967c: 152; Theowald, 1967: 20, 64, biology; Tjeder, 1967: 21; Stary & Martinovský, 1969: 8; Hartig, 1971: 124; Theowald, 1971: 220; Klopp, 1974: 167, figures, biology.

Tipula variegata: De Geer, 1776: 346; Haliday, 1851: 134.
Pachyrhina variegata: Riedel, 1910: 420.
Pales variegata: Mannheims, 1951a: 52; Savchenko, 1973b: 73.

Type-material

Tipula pratensis Linnaeus, 1758: In the Linnean collection, Linnean Society, Burlington House, London, one female without abdomen, labeled: 9. pratensis. (v! 0 1977).

Other material: 67 males and 68 females from the following countries: the Netherlands, Belgium, West Germany, East Germany, Poland, Czechoslovakia, France, Italy, Austria, Hungary, Greece, U.S.S.R. (Latviya), and Turkey (Trapezunt).

Description

Body length male: 14—16 mm, female: 18—23 mm; wing length 15—18 mm.

Head male: Antennae 13—segmented; dark brown to black; first flagellar segment 1.2 x lenght of second one; verticils up to as long as flagellar segments; first flagellar segment cylindrical, following segments with weakly developed nodules basally. Palpi dark brown to black. Nasus and rostrum shining, dark brown to black, usually with yellow spots at bases of palpi and sometimes yellowish brown laterally. Genae yellow, sometimes in part darkened. Black spot below antennal bases usually in contact with rostrum and prolonged between antennal sockets and yellow to orange yellow frontal tubercle. Remainder of head black, except for the usually partly yellow to brownish postgenae (postgenae rarely entirely black), and greyish ventral region between eyes. Vertex and especially postgenae densely set with long, pale hairs.

Thorax male: Pronotum dorsally yellow, laterally black. Prescutal stripes black; lateral ones nearly always anteriorly in contact with median stripe; downwardly bent anterior ends of lateral stripes large, shining. Scutellum black. Parascutellae yellow to brownish yellow, distinctly darkened at wing-base. Lateral parts of mediotergite yellow; median stripe broad, posteriorly widening towards mediotergite hind margin. Lateral parts of thorax to a large extent dark brown to black, in part white-grey tinged; yellow to yellowish brown are: upper anterior part of anepisternite (upper posterior part ranging from brownish yellow to black), posterior half of pteropleuron, anterior half of katatergite and outer, upper half of meron. Sternum 1 black. Coxae dark brown to black, white-grey tinged. Trochanters yellow to reddish brown. Basal half of femur one light brown, apical half dark brown; femora two and three only tips darkened. Tibiae brown to dark brown. Tarsi dark brown to black. Wings light brown to brown toned; wing-stigma distinct, dark brown, without or with a few macrotrichiae; basal part

of vein R 4+5, cross-vein R—M and wing-tip with a minor brown shade, sometimes vein R 4+5 narrowly shaded beyond cross-vein R—M. Halteres yellow to light brown, basal half of knob dark brown.

Abdomen male: Dorsal and ventral stripe broad, continuous (sometimes interrupted by lighter coloured hind margins of posterior sternites), and uniformly dark brown to black and, especially dorsally, white-grey tinged. Dorsal stripe sometimes extending along hind margins of tergites to contact broad, dark brown lateral stripes on tergites 2—7. Ventral stripe more or less straight. Lighter coloured parts between dorsal, lateral and ventral stripes usually confined to segments 1—7, irregular in shape and usually centrally yellow, bordered by brown.

Hypopygium (figs. 26—32): Posterior extension of tergite 9 as in fig. 29, in dried specimens median incision usually less distinct and spiny region less protruding. Od broad. Id large, without a crest, outer margin of shell deeply incised. Shell-like deformation between base of od and tergite 9 as in fig. 26. Adminiculum connected with U-shaped median projection of sternite 9; U-shaped projection as in *c. crocata*, but ventral, bilobate appendage smaller. Aedeagus as in fig. 28. Hairs along hind margin of sternite 8 not distinctly incurved (fig. 31).

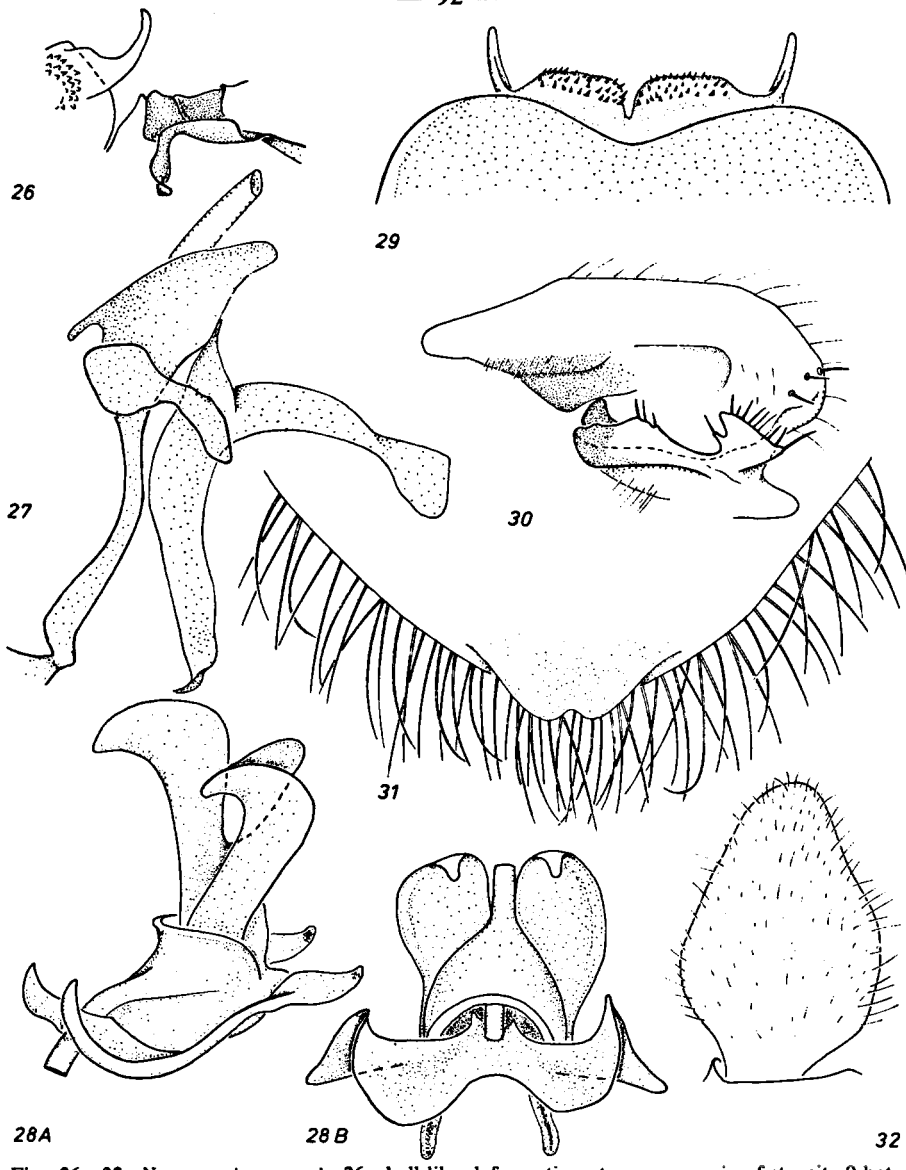
Female (fig. 42): Resembling the male. Verticils up to 1.5 x length of flagellar segments. Colouration of abdomen as in the male. Tergite 8 yellowish brown laterally. Tergites 9, 10, cerci, sternite 8 and hypovalvae reddish brown, shining. Sternite 8 anteriorly usually darkened with large, dark brown to black, oval spots laterally and small, distinctly black spots along borderline with egg-slide at base of hypovalvae. Cerci conspicuously broader than in *c. croceiventris* (fig. 42). Hypovalvae, furca and fused valvulae as in *c. crocata.*

Biology (diagram 5)

According to Tjeder (1954) *p. pratensis* is merely restricted to cultivated lands such as gardens and meadows, whereas Savchenko (1973b) reports that large numbers of larvae occur in wasteland only, which is the major reason why damage by larvae of *p. pratensis* hardly ever becomes a serious problem.

Oviposition is described by Schrank (1803) in a way similar as cited for *c. crocata* and takes place in the soil. The eggs develop without diapause within nine (Höchstetter, 1962) or sixteen (De Jong, 1925) days. According to Bouché (1834) and Savchenko (1973b) most larvae are fullgrown by the end of the summer and hibernate in this stage. The pupal stage, to be found in April or May, lasts for eight to twelve days (Bouché: two to three weeks).

Larvae are found beneath leaf-mould in rich soils. Brauns (1954) reports larvae from mouldered tree-stumps. Höchstetter (1962) concludes that *p. pratensis* is a specialist for extreme dry localities, larvae were collected by him under the grass-cover of a sand excavation. Westhoff (1880), Mannheims (1951a), Theowald (1957b) and Savchenko (1973b) also mention that adult



Figs. 26—32. *N. pratensis pratensis*. 26, shell-like deformation at upper margin of sternite 9 between base of od and tergite 9, from inside; 27, adminiculum, lateroposterior view; 28, aedeagus, A: lateroposterior view; B: dorsal view; 29, posterior extension of tergite 9, dorsal view; 30, id, outside; 31, hind margin of sternite 8, rear view; 32, od, outside.

specimens of *p. pratensis* are usually found near sandy soils. The localities from which *p. pratensis* is known in the Netherlands confirm this view, only four out of twenty two localities are situated in the more humid parts of the Netherlands (Bodegraven, Kortenhoef, Muiderberg and Leiden, eight localities lie in the dunes).

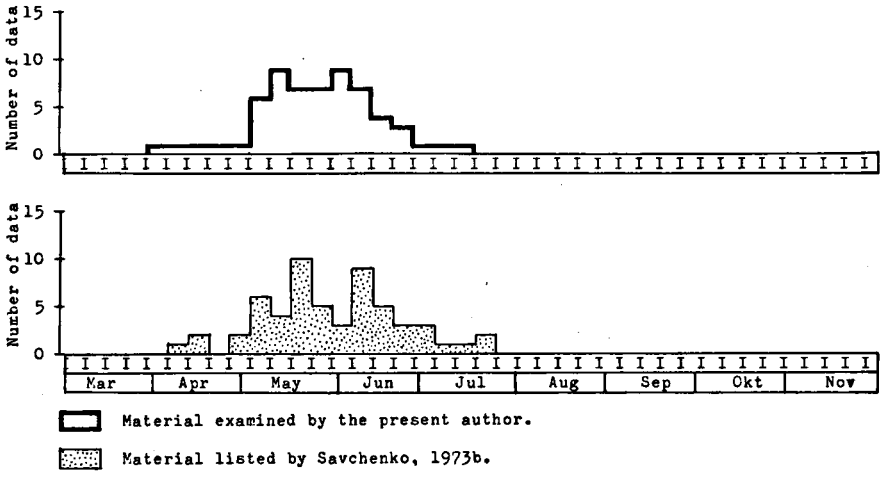


Diagram 5. Period of flight of *N. pratensis pratensis*.

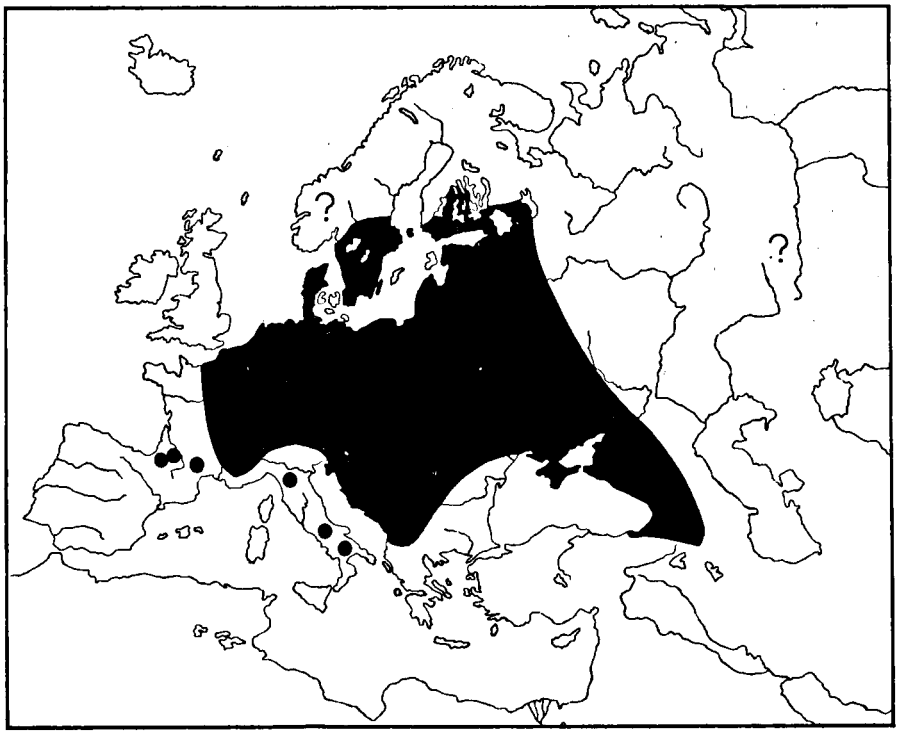
N. p. pratensis is scarcely recorded from altitudes above 1000 m. Examined are specimens from the northern Apennines (Abetone, 1300 and 1700 m). Savchenko (1973b) mentions 1800 m (Gryziya SSR) and 3000 m (Armeniya SSR).

The period of flight is represented in diagram 5. The extreme records (Pau, I.IV; Apt, 6.IV; Teberda, 8.IV; Kiyév, 14.IV; Ordzhonikidze, Severo-Osetinskaya A.S.S.R., 16.IV; Hilversum 3.VII; Vienna, 15.VII; Krym, 15.VII; Kiyév, 20.VII) and Petrodvorets, 21.VII give the impression that second generation specimens occur now and again, especially in the southern part of the distribution area.

N. pratensis is the species of which Zetterstedt (1855; and in addition Schiner, 1864) reports that myriads of larvae were raining out of the sky at Skara, southern Sweden, from 22—28 February 1852.

Distribution (map 6)

Wallengren (1882) mentions *p. pratensis* for southern Norway but the species is not listed by Tjeder (1965). The record for Great Britain by Walker (1848) remained unverified until now, this in spite of the statement by Verrall (1886) "Surely must be British". Specimens from France were examined from Pau, Apt and Maisons Laffitte. Pierre (1924a) lists several other localities in France. These latter records, although processed in map 6, could refer to the next species (specimens from the localities mentioned by Pierre are not preserved in the Paris museum). *N. p. pratensis* is known from four localities in Italy: Collelbo, Abetone, Pescasseroli and Potenza. Florina is the only Greek locality. Savchenko (1973b) states that the species is found in the southern parts of the Ural mountains also, without mentioning localities or material examined. The record by Alexander (1952) of one female from the Dü Chu Valley in eastern Tibet is erroneous.



Map 6. Distribution of *N. pratensis pratensis*.

Discussion

In the eastern and northeastern parts of Turkey specimens occur which are in a way intermediate between *pratensis* and *croceiventris*; they are discussed under the latter species.

N. castellana var. *croceiventris* (Strobl, 1909), interpreted by Mannheims (1951a) and Savchenko (1973b) as a junior synonym of *pratensis*, is treated here as a senior synonym of *lindneri* Mannheims, 1951.

Tipula variegata Linnaeus, 1758, sensu De Geer, 1776, turned out to belong to *pratensis*. The De Geer collection contains under *variegata* two specimens (NRS; v! 0 1976).

Nephrotoma pratensis eepi subsp. nov.

Type-material

Holotype: ♂, Espana, Avila, Sierra de Gredos, P. Oosterbroek & E. Boersma/ tussen Navarredonda de la Sierra en Pico de Almanzor, 1400—1600 m, 19.V—5.VI.1976, Station 26 (ZMA).

Paratypes: 9 ♂, labeled as the holotype (ZMA). 6 ♂, labeled as the

holotype, but Station 24 instead of 26 (ZMA). 7 ♂, 2 ♀, Espana, Leon, P. Oosterbroek & E. Boersma/ Llanaves de la Reina, 1500 m, 10.VI.1976 (ZMA).

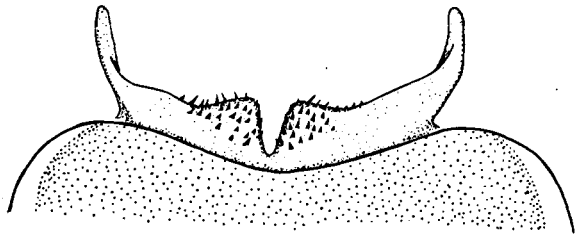
Description

The subspecies *eepi* differs from the nominate *pratensis* in the following characters:

Head: Second and following flagellar segments more nodulose basally. Head entirely black (genae and postgenae sometimes yellow) except brownish yellow frontal tubercle. Spot between eye and frontal tubercle dull, remainder of black colouration shining. Hairs on vertex and postgenae black.

Thorax: Entirely darkened with the exception of the dorsally yellow pronotum. The lighter coloured parts, in the typical *pratensis* yellow to yellowish brown, are brown to dark brown. Downwardly bent anterior ends of lateral prescutal stripes in part dull. Wings dark brown toned; wing-stigma dark brown, almost black. Trochanters dark brown to black.

Abdomen: Segment 1 and anterior one-third of segment 2 entirely black, white-grey tinged except for narrow band in front of hind margin of tergite 1 and in front of lighter coloured parts of tergite 2. Dorsal stripe broad and black, on anterior two-third of tergites white-grey tinged on posterior one-third without white-grey tinge and extending along the hind margin of the tergites to contact broad, black, lateral stripes. Ventral stripe broad and



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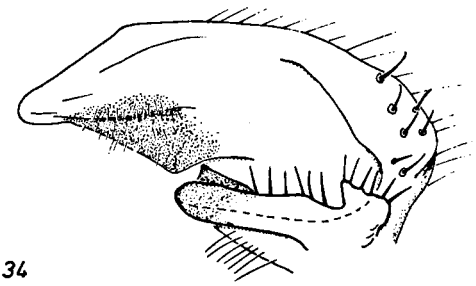

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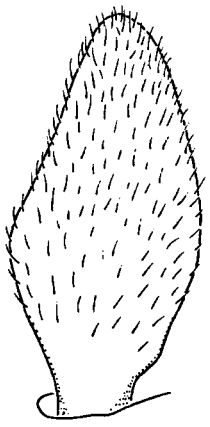


35

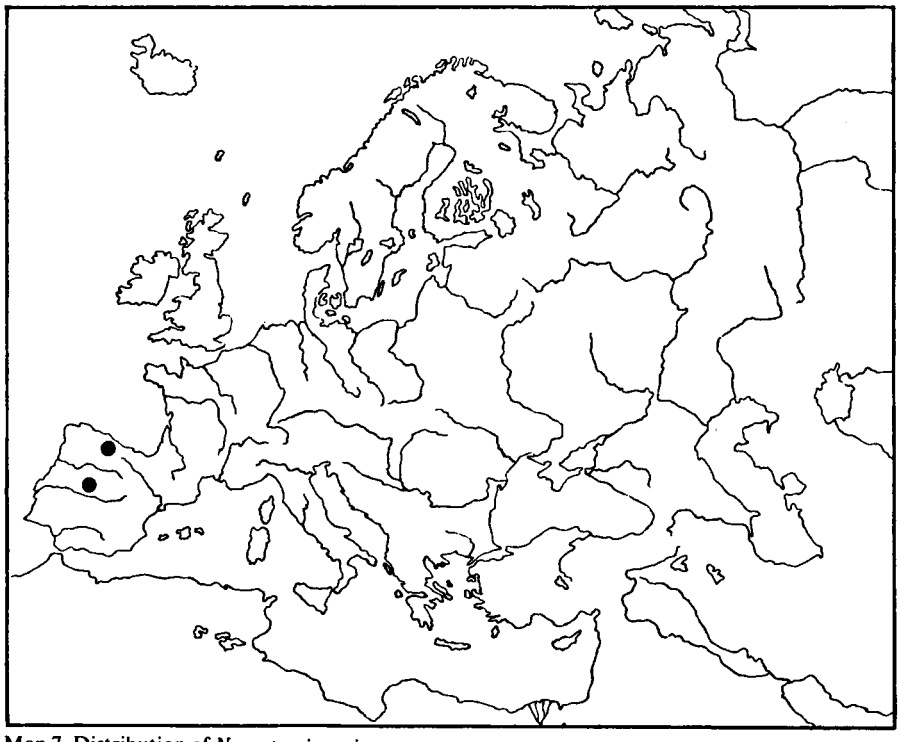
Figs. 33—35. *N. pratensis eepi*. 33, posterior extension of tergite 9, dorsal view; 34, id, outside; 35, od, outside.

black, white-grey tinged, sometimes anterior sternites without white-grey tinge along hind margins. Dorsal and ventral stripe continuous. Lighter coloured lateral parts confined to segments 2—7, segment 8 usually entirely black.

Hypopygium (figs. 33—35): Lateral appendages of posterior extension of tergite 9 longer than in the typical *pratensis* and median region less protruding. Od more slender. Id with a smaller incision at outer margin. Aedeagus as in the nominale subspecies but apical parts of lateral shells and bilobate compressor apodeme without pointed, curled tips. Hind margin of sternite 8 as in fig. 31, but median lobes smaller.

Biology

The specimens from the Sierra de Gredos were collected along small streams in an open pine-wood at the central upland plains, flying about two meters above ground level and hardly visible because of their dark colouration and rapid flight. In the Cantabrian mountains collecting took place between willow trees along gravel riversides; here too fast flight at an altitude of two meters was noted.



Map 7. Distribution of *N. pratensis eepi.*

Distribution (map 7)

Not included in map 7 are the Spanish localities mentioned by Strobl (1900b, Jativa), and Mannheims (in. litt., Sort, Madrid) for *pratensis*.

Etymology

The new subspecies is named after my fellow collector, Mr. Eep Boersma.

Nephrotoma croceiventris (Strobl, 1909)
Figs. 37—41, 45—51, diagram 6, maps 8—10

Strobl (1909) described *croceiventris* as a variety of *castellana* (= *luteata*). Mannheims (1951a) synonymized *croceiventris* with *pratensis*. In the same paper Mannheims described *lindneri* as a species closely allied to *pratensis* and distributed in Europe. This new species *lindneri* is interpreted here as conspecific with *croceiventris*, of which it represents the European subspecies *croceiventris lindneri*. The nominate subspecies, *croceiventris croceiventris*, occurs in Spain.

N. croceiventris is similar to *pratensis*, in particular the European *croceiventris lindneri* resembles the Spanish *pratensis eepi* in abdominal colouration, as both have the posterior region of the tergites distinctly blackened. The hairs along the hind margin of the male sternite eight and the width of the female cerci facilitate discrimination between *croceiventris* and *pratensis*. The Spanish *croceiventris croceiventris* can be easily recognized by the colouration of the abdominal sternites.

Nephrotoma croceiventris croceiventris (Strobl, 1909), status novum

Pachyrhina castellana var. *croceiventris* Strobl, 1909, Verhandlungen der Zoologischen-Botanischen Gesellschaft, Wien, 59: 134; Riedel, 1910: 418.
Pachyrhina croceiventris: Pierre, 1924a: 30.
Pales castellana var. *croceiventris*: Mannheims, 1951a: 52—3; Savchenko, 1973b: 73.
Nephrotoma lindneri: Mannheims, 1969: 188.

Type-material

Strobl (1909) described var. *croceiventris* after one female from the province of Madrid, collected by Georg Lauffer. This specimen is neither in the collection Strobl at Admont (Morge, 1974), nor preserved in the Instituto Espanol de Entomologia, Madrid, visited by the present author in 1976 (see discussion).

Other material: 26 males and 14 females from seven Spanish provinces.

Description

Body length male: 14—18 mm, female: 18—25 mm; wing length: 15—19 mm.

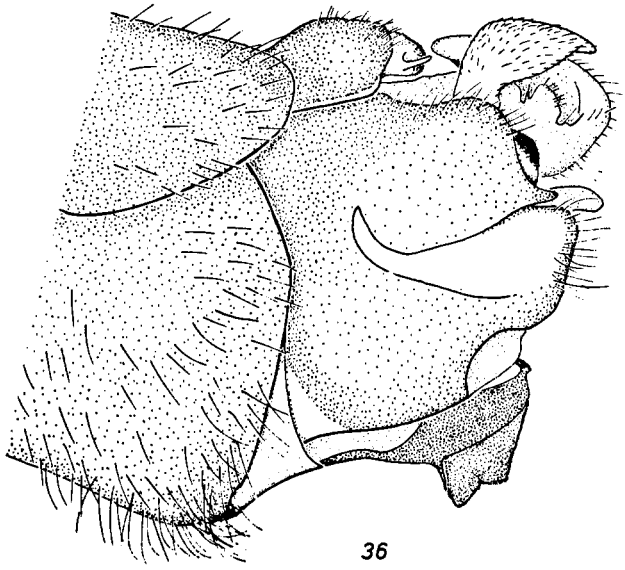
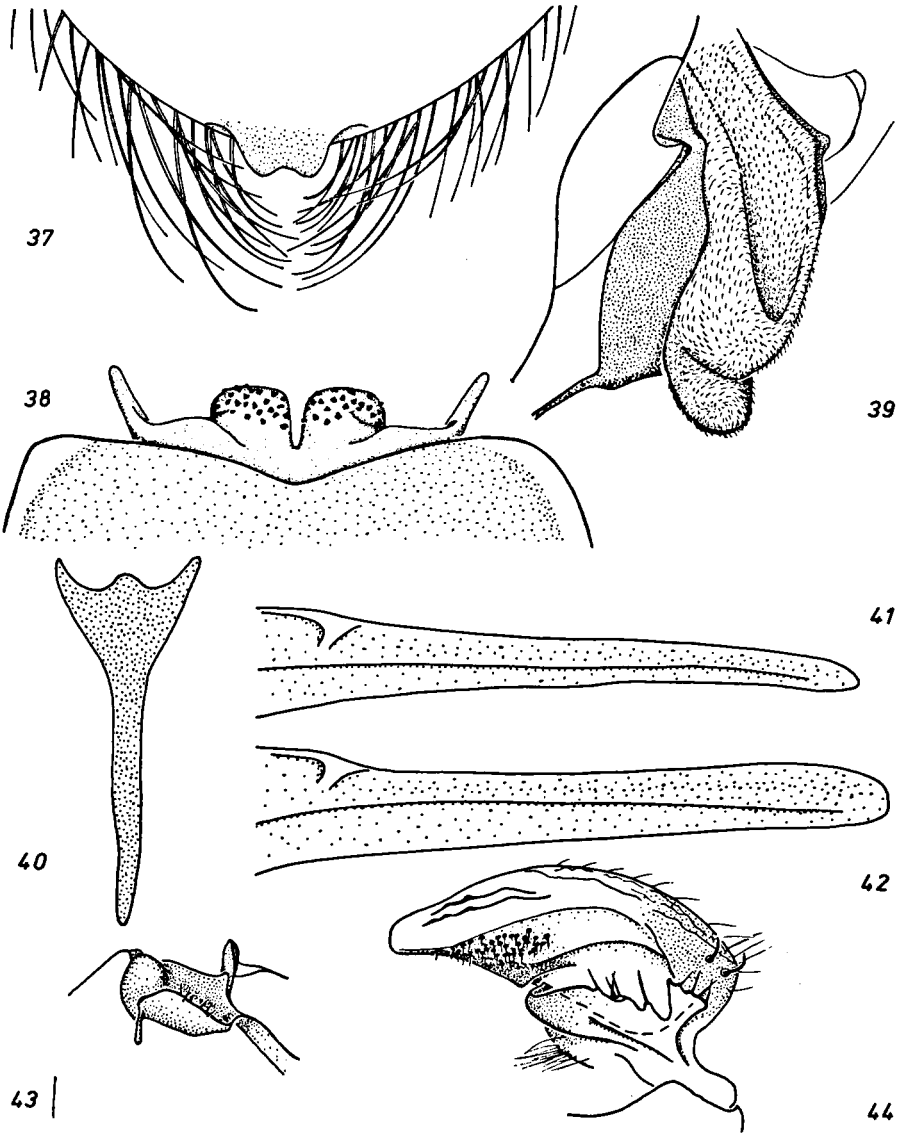


Fig. 36. *N. croceiventris croceiventris*, hypopygium, lateral view.

Head male: Antennal segments black; first flagellar segment 1.2 × length of second one; second and following flagellar segments nodulose basally; verticils up to as long as flagellar segments. Head usually entirely black except for frontal tubercle, sometimes postgenae brownish. Vertex and especially postgenae densely set with long, black hairs.

Thorax male: Pronotum dorsally yellow, laterally black. Dorsal prescutal stripes usually well apart, sometimes intermediate region very narrow of stripes touching each other. Downwardly bent anterior ends of lateral prescutal stripes especially dull near paratergites. Prescutum and scutum usually yellow between stripes. Scutellum black. Parascutellae yellow, distinctly darkened at wing-base, sometimes entirely darkened. Mediotergite laterally yellow, median longitudinal stripe broad and posteriorly distinctly widened towards mediotergite hind margin. Lateral parts of thorax almost entirely darkened, anterior half of paratergite usually yellow, posterior half black; dorsal part of anepisternite below paratergite ranging from pale yellow to entirely black; anterior half of katatergite yellow; upper, outer half of meron sometimes brown. Sternum 1 black. Coxae black, white-grey tinged. Trochanters dark brown to black. Basal half of fore femur light brown, apical half dark brown; femora of middle and hind legs with tips darkened only. Tibiae and tarsi dark brown to black. Wings brown to dark brown toned; wing-stigma dark brown to black, without or with a few macrotrichiae; basal part of vein R 4+5, cross-vein R-M and wing-tip with a minor dark shade, sometimes vein R 4+5 narrowly shaded beyond cross-vein R-M or all apical veins and cross-veins with a narrow shade. Halteres brown, basal half of knob dark brown, apical half yellow.



Figs. 37—41. *N. croceiventris croceiventris*. 37, hind margin of sternite 8, rear view; 38, posterior extension of tergite 9, dorsal view; 39, medisternal appendage, lateroposterior view; 40, furca, dorsal view; 41, cercus, lateral aspect.

Fig. 42. *N. pratensis pratensis*, cercus, lateral aspect.

Figs. 43—44. *N. nox*. 43, shell-like deformation at upper margin of sternite 9 between base of od and tergite 9, from inside; 44, id, outside.

Abdomen male (fig. 45): Segment 1 and anterior part of tergite 2 white-grey tinged. Dark coloured dorsal stripe broad and white-grey tinged in front of broadly blackened (without tinge) posterior region. Lateral stripe usually

in contact with black colouration of posterior region. Lighter coloured lateral parts between dorsal and lateral stripes irregular in shape, coloured yellow centrally bordered by brown and confined to tergites 2—7. Tergite 8 black. The white-grey tinged ventral stripe occupies the anterior half of sternite 2 and the entire sternites 6—8,on sternites 3 to 5 the stripe is distinctly triangular towards the hind margins of the sternites.

Hypopygium (figs. 37—39): Posterior extension of tergite 9 centrally distinctly protruding beyond outer margin, set with small spines and divided in two by a median incision (fig. 38, in dried specimens the outer margin might look almost straight and the median incision less distinct). Od, id, shell between base of od and tergite 9, adminiculum and aedeagus as figured for *p. pratensis*, od sometimes more slender. U-shaped, median projection of sternite 9 with a small, downwardly directed, ventral appendage (fig. 39, in dried specimens the lateral sides of the U-shaped projection are in general very close to each other). Hind margin of sternite 8 ventrally with a tuft of distinctly incurved hairs (fig. 37).

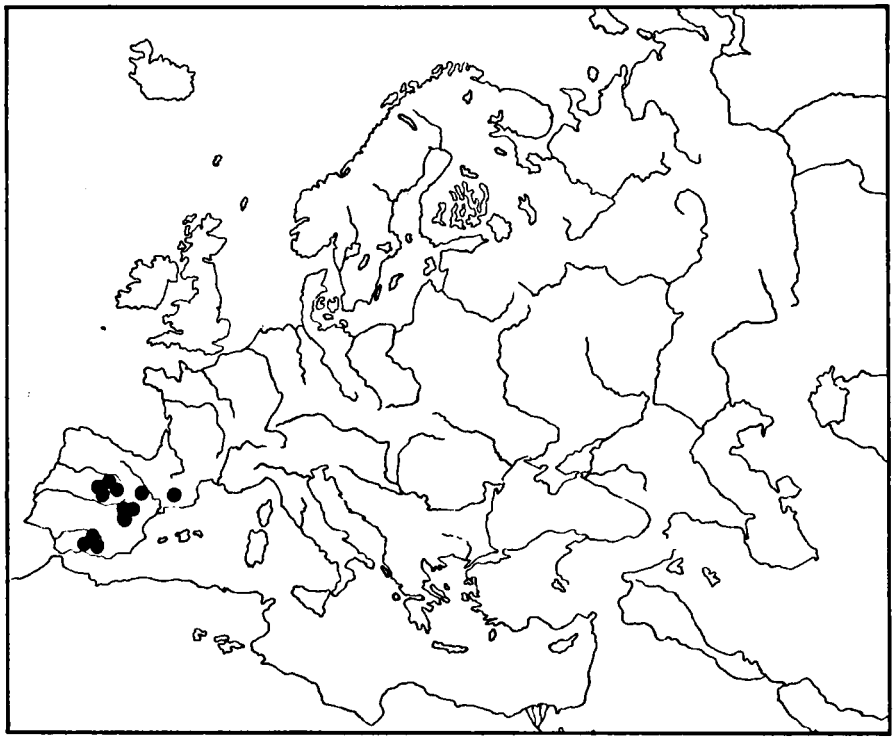
Female (figs. 40—41, 46—47): Colouration of head and thorax as in the male. Verticils up to 1.3 x length of flagellar segments. Spots composing abdominal dorsal stripe small; usually well separated by lighter coloured anterior and posterior parts of tergites (in one female from the Sierra Nevada spots triangular and situated at posterior margin); spots not white-grey tinged or shining unless they extent up to anterior region of tergites. Hind margins of tergites without or with a narrow, dark border. Sternites 1—3 black, sternites 2 and 3 with yellow spots laterally. Ventral stripe of sternites 4—7 moderately broad and distinctly triangular towards lighter coloured hind margins of the sternites and in broad contact with lateral stripes. Tergites 8 and 9, cerci, sternite 8 and hypovalvae yellowish to reddish brown. Sternite 8 without dark brown spots laterally. Cerci very slender (fig. 41), not as broad as in *p. pratensis*. Hypovalvae as in *c. crocata* but not distinctly tapering towards rounded tip. Fused valvulae as in *c. crocata*, furca apically broadened and trifurcate (fig. 40).

Biology

The subspecies is known to fly between 30 April and 5 June. Mr. Boersma and I collected *c. croceiventris* in 1976 in grasslands along small mountain streams at two localities in the central upland plains of the Sierra de Gredos, at altitudes between 1400—1600 m.

Distribution (map 8)

Specimens were examined from the following provinces in Spain: Lerida, Avila, Madrid, Cuenca, Granada and Almeria. Further Mannheims (i.l.) mentions Zaragoza.



Map 8. Distribution of *N. croceiventris croceiventris*.

Discussion

Both Mannheims (1951a) and Savchenko (1973b) treated *croceiventris* as a synonym of *pratensis*. The original description of *croceiventris* is as follows: — "Var. *croceiventris* m. Gleich der Normalform [*castellana* = *luteata*] mit ganz schwarzen Brustseiten, aber der Hinterleib ist oberseits fast ganz safrangelb; nur die Mitte trägt eine in Längsflecke aufgelöste Strieme und die umgeschlagenen Seitenränder sind schwarz". The description perfectly fits the examined Spanish material of *Pales lindneri* Mannheims, 1951. As it is clear that the Spanish material represents a distinct subspecies, *lindneri* cannot be the nominate subspecies because of the seniority of the name *croceiventris*.

From the Sierra Nevada one male and one female are available only. It is feasible that the aberrancy found in the female is characteristic for populations from that area.

Nephrotoma croceiventris lindneri (Mannheims, 1951), status novum

Pales lindneri Mannheims, 1951, Die Fliegen der palaearktischen Region, Lief. 167: 33—6,

52—4, figures; 1954a: 151; 1954b: 32; Theowald, 1954b: 194; Theowald & Mannheims, 1956: 249; Theowald, 1957a: 230; 1957b: 10—1; Erhan & Theowald, 1961: 249; Erhan, 1962: 98—9, figures; Hemmingsen, 1962: 140; Simova, 1962: 101; Mannheims & Pechlaner, 1963: 6, 14, biology; Mannheims, 1966a: 490—2; 1966b: 275; Savchenko, 1966a: 495—6, figures; 1966d: 120; 1973b: 76—7, figures, biology; Simova, 1974: 26; 1977: 26, 87—8, figures.

Pachyrhina lindneri: Simova, 1959: 128.

Nephrotoma lindneri: Tjeder, 1955b: 246—7; Mannheims, 1969: 188 (= *c. croceiventris)*; Theowald, 1971: 220, 228.

Tipula salicina Bouché, 1834, Naturgeschichte der Insekten: 34—5.

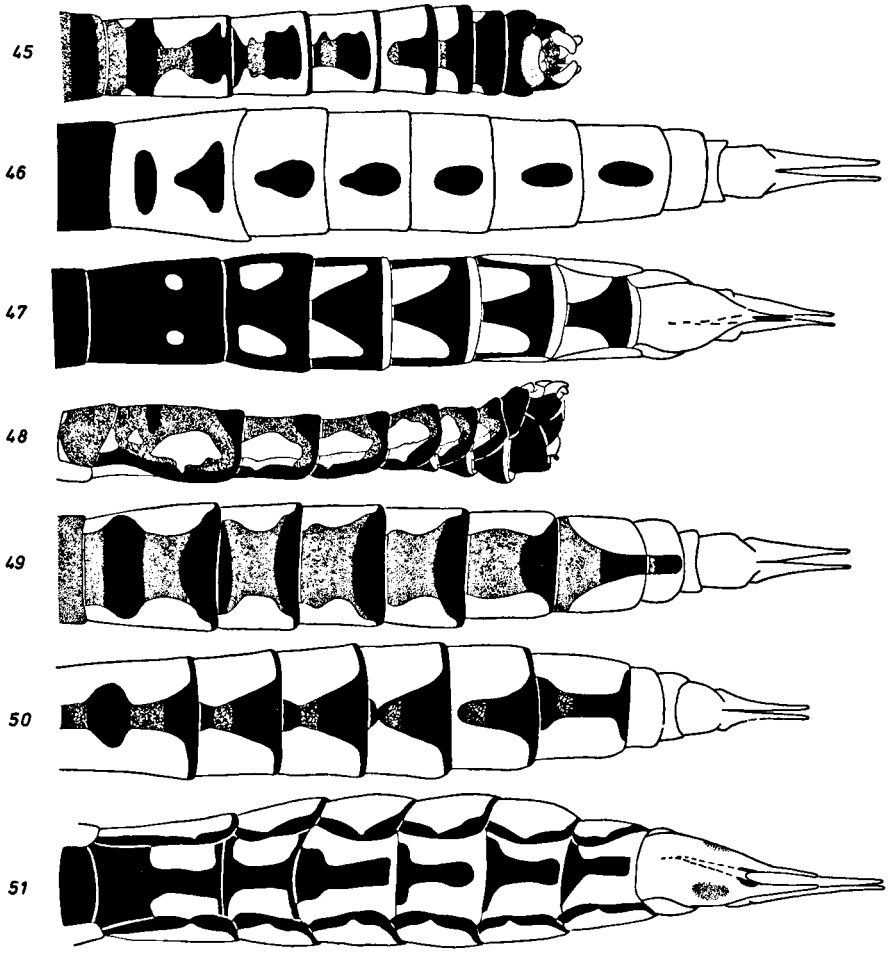
Pachyrhina salicina: Westhoff, 1880: 48; Czižek, 1911: 86.

Type-material

Pales lindneri Mannheims, 1951: The holotype male bears the following labels: Üexküll am Schwanensee, 10.5.36, Lettland/ subpratensis n.sp., Mannheims det. 1947/ Pales lindneri n.sp., Mannheims det. 1950/ Holotypus/ 27 (MAK; v! 0 1977).

Paratypes: According to Mannheims (1951a) there are "11♂ und 12♀ Paratypoide unter Nr. 27, 28—38 und 39—50 i. Coll. Mannhs., Mus. A. Koenig, Bonn. Weitere Paratypoide in Ungar. Nat. Mus., Nat. Hist. Mus. Wien und Mus. f. Natkde., Stuttgart". Examined are 14 male and 11 female paratypes (abbreviations used for the paratype labels: C, Coll. Mus. Nat. Hung.; Pa, Paratypoide; PlM, Pales lindneri Mhs. Mannheims det. 19..; Pp, Pales pratensis L.; PpR, Pales pratensis L. det. M. P. Riedel 1911; PpS, Pales pratensis det. Szilády; PsM, Pales subpratensis n.sp. Mannheims det. 19..): 1♂, Bamberg, Weidendam, 7.5.48/ PlM/ Pa/ 29 (MAK). 1♂, idem/ 30 (MAK). 1♂, Burgenland, Breitenbrm., Zerny, 14.5.34/ PlM/ Pa/ 28 (MAK). 1♂, Burgenland, Gols, Zerny, 9.5.29/ PlM/ Pa/ 32 (MAK). 1♂, Magyaróvár, 1948, IV.28, Ruff/ coll. Ruff/ C/ PlM/ Pa/ 34 (MAK). 1♂, ♂/ Magyaróvár, 1948, V.6, Ruff/ coll. Ruff/ C/ PlM/ Pa/ 35 (MAK). 1♀, Alban. Exp., 1918, Gjalica Ljums, 17-26.VI/ PlM/ Pa/ 43 (MAK). 1♀, Rapsa, 10-18.V/ Alban.-montenegr. Grenze, Penther, 14/ PlM/ Pa/ 44 (MAK). 1♀, Vernosa, 12.VI/ Alban.-montenegr. Grenze, Penther, 14/ PlM/ Pa (NMW). 1♀, Akschehir Tal, Anatolia, 1500 m, Lindner, 14.V.34 (SMNS). 1♂, Machowoje b. Tschigri, Rossia, VI.1942, B. J. Mannheims leg./ PlM/ Pa/ 33 (MAK). 1♀, idem/ 40 (MAK). 1♀, idem/ 41 (MAK). 1♀, idem/ 42 (MAK). 1♀, IV.17, Tihany Mihalyi, 934/ PpS/ C/ PsM/ PlM/ Pa/ 48/ Pres. by B. Mannheims, Brit. Mus. 1955—469 (BMNH). 1♂, IV.20, Tihany Mihalyi, 934/ PpS/ C/ PlM/ Pa (ZMA). 1♂, Tihany, 1940, Szil., V.11/ C/ PlM/ Pa/ 36 (MAK). 1♂, Budapest, Kertesz/ PpR/ C/ PlM/ Pa/ 38 (MAK). 1♀, Karst., 18.VI/ PpR/ PsM/ Pa/ 50 (MAK). 1♀, Pécel., 18.IV/ PpR/ PsM/ Pa/ 47 (MAK). 1♂, Nagyenyed, 909, IV.30/ Pp/ C/ PlM/ Pa (MAK). 1♀, Nagyenyed, 909, IV.30/ C/ PsM/ Pa/ 49 (MAK). 1♀, Marchegg, Zerny, N.Ö., 31.5.14/ PsM/ Pa/ 45 (MAK). 1♂, Austr. inf., Schönbühel, Zerny, 14.5.33/ PlM/ Pa/ 31 (MAK). 1♂, D. Altenberg, N.Ö., 12, 5.IV/ Pp/ PsM/ Pa (NMW).

Tipula salicina Bouché, 1834: Types not yet traced (see discussion).



Figs. 45—47. *N. croceiventris croceiventris*, abdominal colouration. 45, male from Spain, Sierra de Gredos, dorsal view; 46, female from Spain, Sierra de Gredos, dorsal view; 47, female from Spain, Sierra de Gredos, ventral view.

Figs. 48—51. *N. croceiventris lindneri*, abdominal colouration. 48, male from Yugoslavia, Serbia, lateral view; 49, female from Yugoslavia, Serbia, dorsal view; 50, female from Yugoslavia, Montenegro, dorsal view; 51, female from Yugoslavia, Serbia, ventral view.

Other material: 254 males and 136 females from the Netherlands, Czechoslovakia, France, Switzerland, Italy, Austria, Rumania, Yugoslavia, Albania, Greece, U.S.S.R. (Latviya), Turkey and Iraq.

Description

Differing from the typical subspecies in the colouration of the abdomen.

Abdomen male (fig. 48): Segment 1 almost entirely black, white-grey tinged, sometimes anterior and lateral margins yellowish. Dorsal stripe broad

and continuous, usually occupying entire anterior one-third of tergite 2 and broadly extending along hind margins of the tergites to contact the broad, lateral stripes. The dorsal stripe is white-grey tinged except for the black marking on the anterior one-third of tergite 2 and the broad, transverse, black markings on the posterior parts of the tergites. The lighter coloured lateral spots between the dorsal and lateral stripes are confined to tergites 2—7, irregular in shape, and usually centrally yellow and bordered brown. Ventral stripe broad, more or less straight; usually, especially anterior sternites, white-grey tinged on anterior half, without tinge on posterior half. Hind margins of posterior sternites sometimes lighter coloured. Segment 8 black.

Abdomen female (figs. 49—51): First abdominal segment usually entirely black. Dorsal abdominal stripe brown to black; in general not as wide as in the male. On the anterior parts of the tergites the stripe is more or less straight and white-grey tinged, on the posterior parts and in front of the middle of tergite 2 the stripe is triangular, without tinge and in contact with lateral stripes along hind margins of the tergites (fig. 49; dorsal stripe sometimes less distinct at anterior parts of tergites (fig. 50), in one female from Greece spots not triangular but oval and separated from narrow darkening of hind margins). Ventral stripe more or less straight, not triangular, ranging from moderately broad to narrow, and interrupted by lighter coloured hind margins of sternites 4—7. Ventral stripe connected with dark brown, lateral stripes along the hind margins of tergites 2 and 3. Tergite 8 yellowish brown, rarely darkened. Tergites 9, 10, cerci, sternite 8 and hypovalvae reddish brown. Sternite 8 with small, black spots along borderline with egg-slide present and the oval, lateral spots less distinct or absent (fig. 51).

Biology (diagram 6)

Savchenko (1973b) states: "The biology is as of *pratensis*, but [*c. lindneri*] is predominantly found in wet meadows, mainly low-lying meadows by the side of a river". So in eastern Europe these two species presumably are found in different biotopes, in the Netherlands nevertheless *c. lindneri* is restricted to

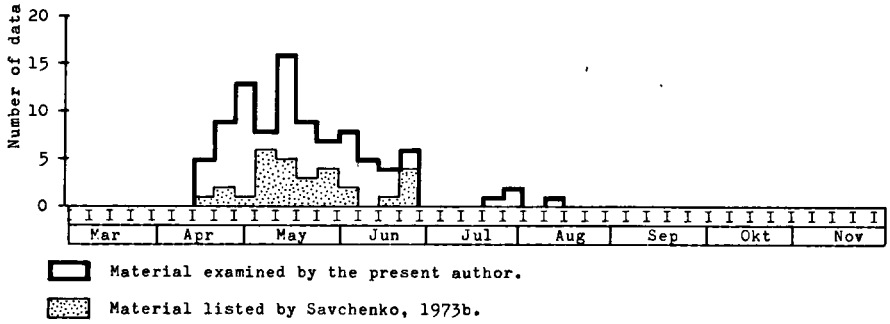


Diagram 6. Period of flight of *N. croceiventris lindneri*.

sandy areas for which *pratensis* shows preference too. In Austria, Tirol, the two species were collected at the same localities also (Mannheims and Pechlaner, 1963).

Lofty altitudes are known from France (Savoie, 1600 m), Yugoslavia (Kosovo, 1700—1800 m), Greece (Fthiótis, 1500 m), Turkey (Ankara, 1600 m; eastern Turkey, 2260 m) and Iraq (Kurdestan, 1600 m).

The period of flight is represented in diagram 6, the July-August dates refer to specimens from eastern Turkey (see discussion).

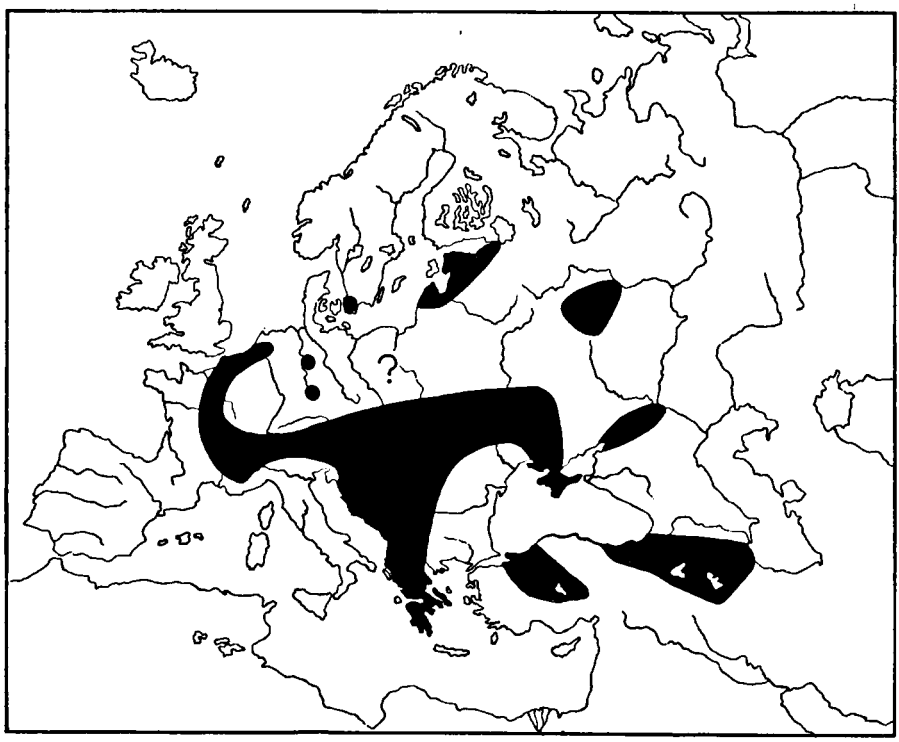
Distribution (map 9)

In western Europe *c. lindneri* is a rare species, known from Sweden (Skåne), the Netherlands (Laag Soeren, Chaam, Oostvoorne, Koudekerke), Belgium (La Panne), France (11 districts), Switzerland (Valais, Engadin) and Italy (Merano). From West Germany, being extensively surveyed in recent years near Bonn by Mannheims, near Frankfurt (Vogelsberg) by Cramer and in the Allgau by Mendl, only two localities are know, Bamberg and the Harz. Savchenko (1973b) records this species from Poland without mentioning localities. *N.c. lindneri* is found in Greece and western Turkey at a notable number of localities, which might be coherent with the absence of *pratensis*.

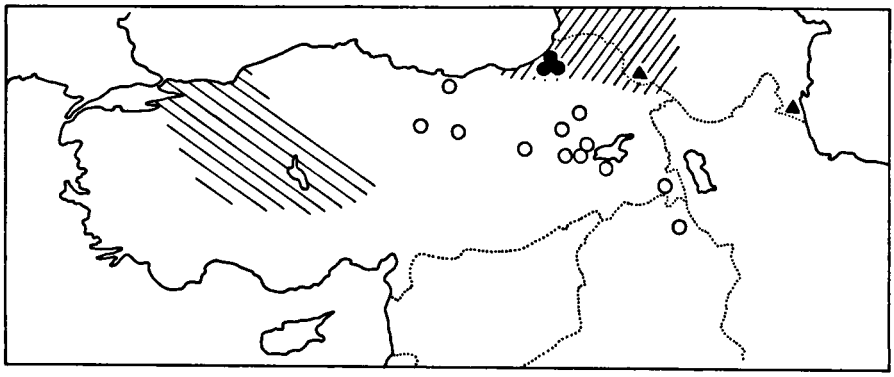
Discussion (map 10)

Tipula salicina Bouché, 1934, is interpreted here as conspecific with *c. lindneri*. The differences between *pratensis* and *salicina*, as listed by Bouché, correspond with the characters used by Mannheims to discriminate between *pratensis* and *lindneri*. The types of *salicina* are not yet traced (see Horn & Kahle, 1937: 78, 322; Prof. Dr. Hüsing kindly informed me that types might turn up in the von Röders collection in the Martin-Luther Universität, Halle-Wittenberg, when this collection is rearranged). The name *Tipula salicina* Bouché, 1834, is preoccupied by *Tipula salicina* Schrank, 1871. Next in line to replace *lindneri* is the name *croceiventris* Strobl, 1909.

The specimens examined from eastern Turkey differ from those of western Turkey and Europe. In 46 males and 13 females examined (type A on map 10), there is only a minor difference, the hairs along the hind margin of the male sternite 8 are not distinctly incurved. In 10 males and 10 females (type B on map 10), the colouration of head, thorax and abdomen is very similar to *p. pratensis*, as are the hairs along the hind margin of the male sternite 8. It is quite possible that these specimens represent hybrids between *croceiventris* and *pratensis*, although hybridization between these two species is not known from elsewhere. It is conspicuous that these specimens from eastern Turkey were collected between 25 July and 9 August, whereas all other dates for *c. lindneri* lie between 12 April and 27 June.



Map 9. Distribution of *N. croceiventris lindneri*.



N. pratensis pratensis.

N. croceiventris lindneri, western Turkey.

N. croceiventris lindneri, eastern Turkey, type A.

N. croceiventris lindneri, eastern Turkey, type B.

N. croceiventris lindneri, material mentioned by Savchenko, 1973b.

Map 10. Distribution of *N. pratensis* and *N. croceiventris* in eastern Turkey, see main text for discussion.

Nephrotoma nox (Riedel, 1910)
Figs. 43—44, map 11

Pachyrhina nox Riedel, 1910, Deutsche Entomologische Zeitschrift, 1910: 420—1; Dodonov, 1925: 109.
Pales nox: Mannheims, 1951a: 33—6, 54—5 (partim, Tunkun Sajan refers to *erebus*); Hemmingsen, 1952: 141; Savchenko, 1973b: 83.
Nephrotoma nox: Alexander, 1919: 11c.
Pachyrhina kozhevnikovi Dodonov, 1925, Konowia, 4: 108—9.
Pales kozhevnikovi: Savchenko, 1973b: 82—3, figures, biology.
Nephrotoma kozhevnikovi: Savchenko, 1968c: 935.
Pachyrhina rossica: Riedel, 1920: 15.
Pales rossica: Mannheims, 1951a: 52 (partim, Armenien only).

N. nox is characterized by the extensive darkening of the head and thorax, in combination with the velvety dull, downwardly bent, anterior ends of the lateral prescutal stripes. The blackened abdomen of the male is shiny steel-grey on the anterior parts of the tergites and broadly velvety dull on the posterior parts and the lateral margins of the tergites. The female of *nox* in a way resembles the female of *rossica*, especially in the orange-brown colouration of the abdomen. Discrimination between the females of these two species is facilitated by the colour pattern of the second and third abdominal sternite.

Aberrant specimens from Iran, in abdominal colouration very similar to *rossica* females are treated in the discussion.

Type-material & Synonymy

Pachyrhina nox Riedel, 1910: The holotype, according to Riedel (1910), a male, bears the following labels: Kappadocia/ Pachyrrhina Nox Riedel, det M. P. Riedel [the abdomen glued on this label belongs to a *tenuipes* male] coll. Lichtwardt/ Pachyrrhina nox Riedel (Ehemaliges Deutsches Entomologisches Institut, Eberswalde, DDR; v !0 1978). Of this specimen only the dorsal part of the prothorax, the prescutum, the scutum, the parascutellae, the mediotergite, the anatergites, the two wings and the two fore legs are preserved.

Pachyrhina kozhevnikovi Dodonov, 1925: The male holotype, kept in the Zoological Museum of Moscow?, could not be examined yet. Material out of the Dodonov collection in Moscow and kindly sent to Amsterdam through Dr. N. Krivosheina did not contain this specimen. Savchenko (1973b) already accounts for the similarities between *nox* and *kozhevnikovi*. He refrains from synonymy because, following the original description of *nox*, the black colouration of this species is "Wenig glänzend". The original description of *nox* however is insufficient. From what is left of the holotype of *nox* and from the description of *kozhevnikovi* it is most reasonable to accept *nox* as senior synonym of *kozhevnikovi*.

Other material: 34 males and 26 females from Turkey, Iran and the U.S.S.R. (Yerevan and Ordubad).

Description

Body length male: 12—16 mm, female: 18—24 mm; wing length: 12—16 mm.

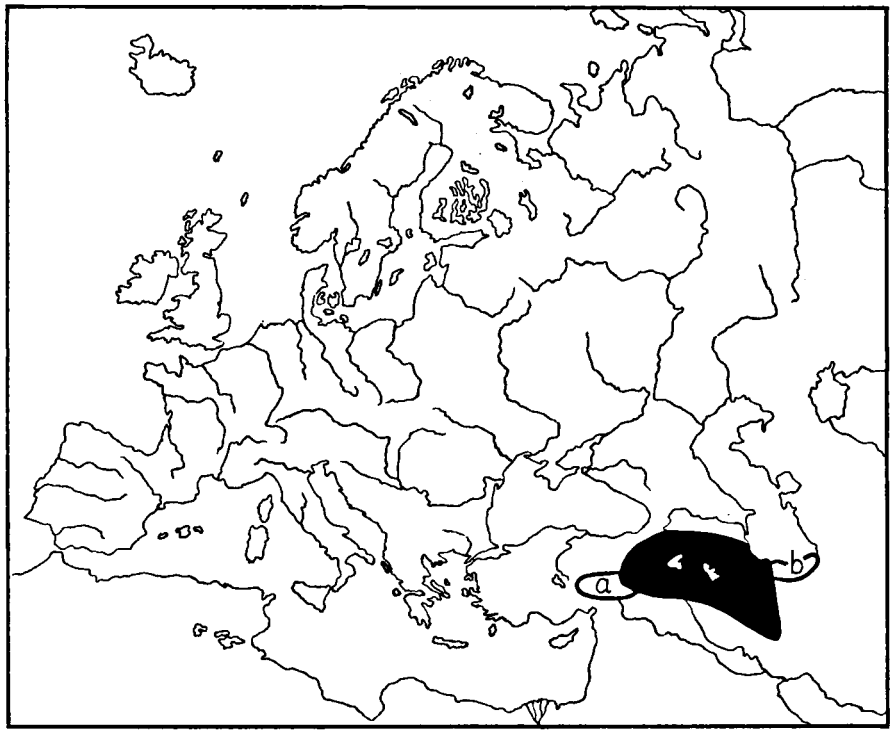
Head male: Antennal segments black; first flagellar segment 1,2—1.3 x second one; verticils up to as long as flagellar segments. Rostrum brownish black, shining. Head almost entirely brownish black, dorsally with a heart-shaped, orange-yellow marking in front of the shiny black posterior vertex; black colouration along dorsal margin of eyes, at anterior part of frontal tubercle and between antennal bases velvety dull.

Thorax male: Thorax and legs to a large extent brownish black. Prescutal and scutal stripes shining black; black coloured region in between the stripes, between anterior ends of lateral stripes and paratergites, at anterior border of scutal stripes, and anterior half of katatergite velvety dull. In general there are yellow or at least lighter coloured spots on either side of the velvety dullness above the paratergite, between the scutal stripe and the wing, which spot continues on the parascutellae (of which the anterior margin however is black), and on the anterolateral parts of the mediotergite. Wings heavily tinged with brown; wing-stigma dark brown, without or (rarely) with a few macrotrichiae; basal part of vein R4+5 and cross-vein R-M broadly brown shaded, veins R3 and especially R4+5 beyond cross-vein R-M with a narrow brown shade.

Abdomen male: Brownish black or black, sometimes with small, orange-yellow spots along anterior margin of tergite 2 and on lateroposterior parts of tergites 2 and 3. The anterior parts of the tergites have a steel-grey luster, whereas the posterior and lateral margins are very broadly velvety dull. The sternites are almost entirely velvety dull.

Hypopygium: Posterior extension of tergite 9 as in *c. croceiventris* (fig. 38), but the median protruberances are more extended ventrally. Od as slender as in *p. eepi* (fig. 35). Anterior beak of id (fig. 44) with irregular ridges dorsally, posterior part darkened. Shell-like deformation between base of od and tergite 9 as in fig. 43. Lateral appendages of adminiculum not as broad as in *c. croceiventris*. U-shaped projection of sternite 9 without or with a tiny, unilobe appendage ventrally. Aedeagus as in *c. croceiventris*. Hind margin of sternite 8 with short, more or less straight hairs. The membrane between tergites 8 and 9 has a small bilobate part that slightly conceales the hind margin of sternite 8 medially.

Female: Head, thorax, legs and wings as in the male. First flagellar segment 1.4—1.7 x length of second one; verticils up to as long as flagellar segments. Black colouration between prescutal stripes and between scutal stripes sometimes less dull. Abdomen not black as in the male but laterally with orange-brown markings, segments 2 and 3 extensively orange-brown. Segment 1 black. Segments 2 and 3 orange-brown, the tergites and sternites posteriorly with triangular shaped, velvety black markings (on tergite 3 broader than on tergite 2, on sternites 2 and 3 usually prolonged anteriorly)



Map 11. Distribution of *N. nox*; a = Kappadocia, the type-locality of *nox*; b = Elburs Mountains, the type-locality of *kozhevnikovi*.

which narrowly extend along the hind margins of the segments; lateral margins broadly velvety black. Dorsal, black colouration of tergites 4—7 shining on anterior half, velvety dull on posterior parts, lateral margins of tergites 4—7 broadly black. Tergite 8 and sternites 4—7 entirely black. Sternite 8 anteriorly darkened and posterolateral with black, oval spots. Tergites 9, 10, cerci and hypovalvae to a larger extent darkened also. Female copulatory organs as in *c. croceiventris*.

Biology

The period of flight is short, records are from 10 May until 10 July, one male from Yerevan was collected 19 August. Altitudes in Turkey are from 700 m to 2200 m, in Iran from 1400 m to 2100 m.

Distribution (map 11)

Map 11 is based on the following localities, in Turkey: Gerger, Ispir, Tortum, Gevas, Yüksekova, Kağizman (Riedel, 1920, as *rossica*), Kuzgunkiran geçidi south of Van Gölü, 12 km & 30 km southeast of Tatvan,

and 50 km west of Mus; in Iran: Sonnateh east of Saqqez, Talysh, Nowshahr, 50 km southeast of Khorramābād in Luristan, and Sanandaj; in the Azerbaydzhan S.S.R.: Lerik and Lenkoran; in the Nakhichevan A.S.S.R.: Paragachai and Ordubad; and finally in the Armeniya S.S.R.: Yerevan and Megri. The localities for Iran mentioned by Savchenko (1973b) could not be traced. Both the type-locality of *nox*, "Kappadocia", and *kozhevnikovi*, "Berge Elburs (Persien)", are indicated on map 11.

Discussion

Material collected 50 km SE of Khorramābād (Iran, Prov. of Luristan), 1900 m, 14.V.1976, by Holzshuh and Ressl, contained one black coloured male of *nox* and four males, one female, having the segments 2 and 3 orange-brown, except the small, black, triangular spots at the narrow, also black border of the hind margins and except the black lateral stripes. The female, lacking the median black stripe on sternites 2 and 3, resembles the female of *rossica*; the colouration of head and thorax, as well as the copulatory organs of these specimens are as found in *nox*.

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Part one of this revision concludes with an extensive list of references. Here new titles or additional information on titles cited in the first list are provided only.

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Drs. P. OOSTERBROEK
Institute of Taxonomic Zoology
Department of Entomology
P.O. Box 20125
1000 HC Amsterdam - The Netherlands