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The western palaeartic species of *Nephrotoma* Meigen, 1803 (Diptera, Tipulidae) Part 4, including a key to the species

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ABSTRACT

Part 4 is the final part of a revision of the western palaeartic *Nephrotoma* species. A key to these species is presented. Discussed are the species *N. analis* (Schummel, 1833), *N. euchroma* (Mik, 1874), *N. subanalis* (Mannheims, 1951), *N. semiflava* (Strobl, 1909), *N. lamellata* (Riedel, 1910), *N. flavipalpis* (Meigen, 1830), *N. malickyi* Martinovský, 1979, *N. alluaudi* (Pierre, 1921), *N. eugeniae* (Savchenko, 1957), *N. lundbecki* (Nielsen, 1907), and *N. ramulifera* Tjeder, 1955. Furthermore four species erroneously referred to *Nephrotoma*, or recorded thus from the western palaeartic are discussed.

INTRODUCTION

The individual treatment of the western palaeartic *Nephrotoma* species (Oosterbroek, 1978, 1979a, 1979b) is concluded with the eleven species dealt with in this paper. Discussed here are:

N. analis (Schummel, 1833), central and northern Europe, the Caucasus, southern and southeastern USSR.

N. euchroma (Mik, 1874), southeastern France, southern Switzerland, southwestern Austria, Italy.

N. subanalis (Mannheims, 1951), Morocco (Haut-Atlas).

N. semiflava (Strobl, 1909), southwestern France, northern Spain.

N. lamellata (Riedel, 1910), restricted areas in central Europe, western, southern and southeastern USSR.

N. flavipalpis (Meigen, 1830), western Europe, southern Sweden, northern Spain, Italy, Adriatic coast, Algeria and Tunisia.

N. malickyi Martinovský, 1979, Crete.

N. alluaudi (Pierre, 1921), northwestern Africa.

N. eugeniae (Savchenko, 1957), western Caucasus.

N. lundbecki (Nielsen, 1907), circumpolar, southern and southeastern USSR.
N. ramulifera Tjeder, 1955, northern Scandinavia, Baikal region, Amur region, Magadan.

These species altogether form a heterogeneous assembly. Their affinities will be expounded in a next paper, dealing with the phylogeny and geographic history of the western palaeartic species. The following short indications may suffice here: *analis*, *euchroma*, *subanalis*, and *semiflava* are closely related species, the same applies to *flavipalpis* and *malickyi*; *alluaudi* comes near to the *crocata* group; *ramulifera* probably (females not examined) belongs to the *dorsalis* group. Of the remaining species the relationships are not yet clear.

In addition short statements are presented about species wrongly assigned to *Nephrotoma* or erroneously recorded from the western palaeartic.

MATERIAL AND METHODS

The general statements made in part 1 of this revision (Oosterbroek, 1978) about material, figures, terminology, etc., and the remarks made in the second part (Oosterbroek, 1979a) about the use of the term „sternum”, apply to this part also.

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

Nephrotoma analis (Schummel, 1833)

Figs. 1—5, 7—12, diagram 1, map 1

Tipula analis Schummel, 1833, Beiträge zur Entomologie, Breslau, 3: 105—7, figures.

Pachyrhina analis: Schiner, 1864: 505; van der Wulp, 1866: 17 (= *flavescens*); Grzegorzek, 1873: 27; van der Wulp, 1874: 146; 1877: 379; Westhoff, 1880: 48—9, figures; 1882: 48, figures, biology; Beling, 1886: 172—3, biology; Verrall, 1886: 119; Huguenin, 1888: 19; Verrall, 1888: 21; Kowarz, 1894: 7; Strobl, 1895: 85, biology; van der Wulp & de Meijere, 1898: 28; Strobl, 1900c: 192, biology; Thalhammer, 1900: 20; Jacobs, 1903: 352; Wahlgren, 1905: 132; Strobl, 1906: 406 (= *guestfalica*); Lundström, 1907: 24; Riedel, 1910: 421, 423, 426—7, 430; Czižek, 1911: 70—1; Lundström, 1912: 47; Vimmer, 1913: 18; Nielsen, 1918: 10; Riedel, 1918/1919: 5; Pierre, 1919b: 618; Riedel, 1919b: 18; Goetghebuer & Tonnoir, 1921: 123; Pierre, 1921a: 24 (= *subanalis*?); 1921b: 150 (= *subanalis*?); Brolemann, 1923: 489—92, figures; Pierre, 1924a: 27, figures, biology; Weigand, 1924: 46.

Pales analis: Audcent, 1932: 10; Mannheims, 1951a: 17, 33—4, 36, 55—6, figures; Stackelberg, 1951: 740; Fischer, 1952: 120; Hemmingsen, 1952: 407, 417; Brauns, 1954: 70, biology; Mannheims, 1954a: 151; 1954b: 32, 41; Theowald & Mannheims, 1956: 249; Theowald, 1957a: 223, figures, biology; 1957b: 10—1; Mannheims & Theowald, 1959: 18; Erhan & Theowald, 1961: 249; Hemmingsen, 1962: 141; Höchstetter, 1962: 106; Mannheims, 1963: 39; Mannheims & Pechlaner, 1963: 6, 14, biology; Mannheims, 1964c: 107; 1965: 7; 1966a: 276; Savchenko, 1966a: 482—4, figures; 1966d: 120; Mannheims, 1967e: 317; Simova, 1974: 26; 1977: 26, 83—4, figures.

Pales analis analis: Savchenko, 1973b: 58—60, figures, biology.

Nephrotoma analis: Nielsen, 1925: 253—4, figures; Alexander, 1931: 144, biology; Nielsen, 1933:

245; Lackschewitz, 1935a: 396, figures; 1935b: 17, 22; Edwards, 1939: 244; Nielsen, 1941b: 96; Grensted, 1944: 176; Coe, 1950: 10; Parmenter, 1950: 108; Tjeder, 1955b: 246—7; Chiswell, 1956: 442, biology; Brindle, 1960: 86, 101, figures, biology; Mannheims, 1967a: 200, biology; 1967b: 152; Theowald, 1967: 20, 63, biology; Tjeder, 1967: 20; Gaunitz, 1968: 278; Starý & Martinovský, 1969: 8; Savchenko, Violovich & Narchuk, 1972: 77—8, 82—3, 92, biology; Stubbs, 1973: 103—6, figures, biology; Klopp, 1974: 160—1, figures, biology; Mannheims & Thomas, 1976: 284.

Pachyrhina cornicina: Zetterstedt, 1851: 3996.

Introduction

N. analis, *N. euchroma* and *N. subanalis* are closely related species. *N. euchroma* has faint pleural markings and the median prescutal stripe posteriorly usually red-brown bordered, in the female the prescutal and scutal stripes are usually red-brown bordered in part. In *analis* and *subanalis* the pleural markings are distinct and the prescutal and scutal stripes dark brown to black. The *analis* male has long, incurved hairs along the hind margin of sternite 8, concealing the medisternal appendage; in *subanalis* these hairs are short and not incurved.

Savchenko (1973b) interpreted *subanalis* as a subspecies of *analis*, basing himself on the original description of *subanalis* only. The present author is more inclined to treat *analis*, *subanalis* and *euchroma* as full species, judging from the differences found in the copulatory organs, especially those of the female.

Type-material

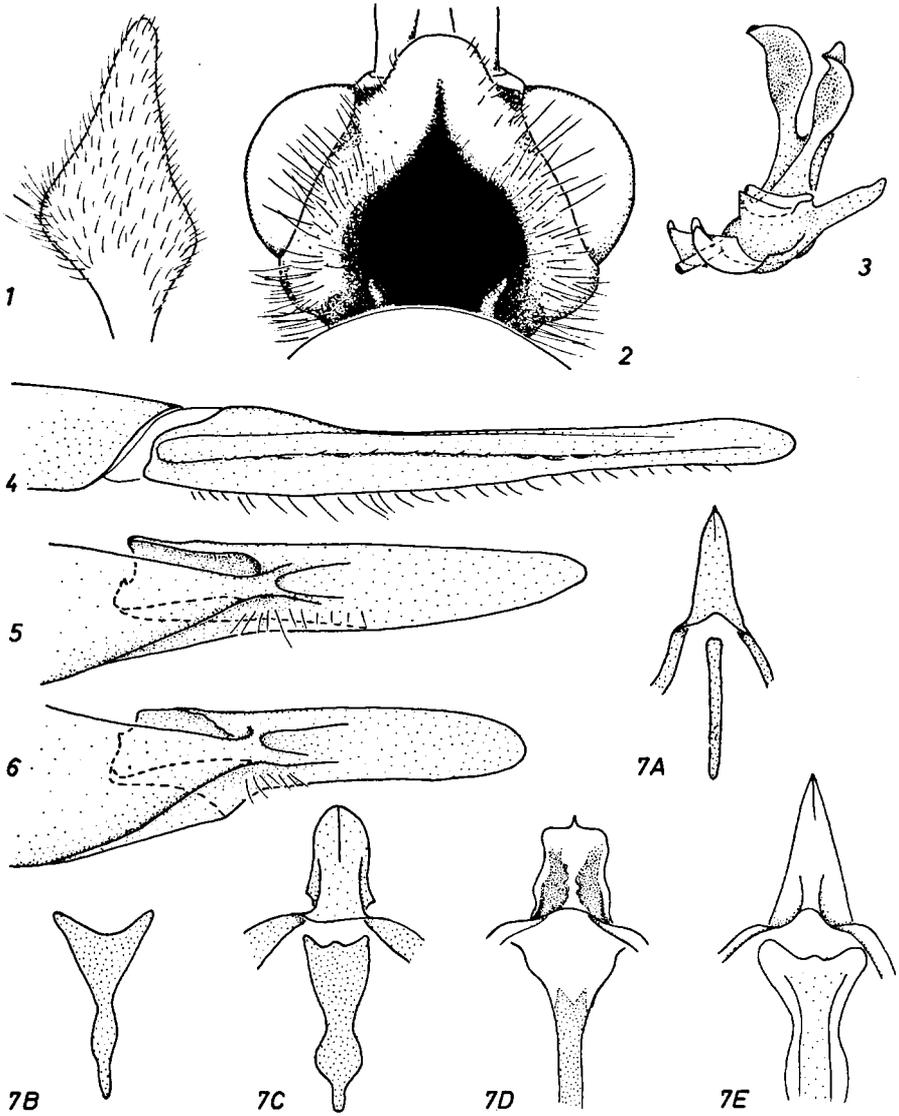
Type-specimens are no longer preserved (Horn & Kahle, 1937). The type-locality is Pilsnitz near Breslau. The interpretation of *analis* is based upon the extensive original description and upon Schiner (1864), who examined the type-series.

Other material: 121 males and 115 females from the following countries: Norway, Sweden, Finland, Great Britain, the Netherlands, Belgium, Luxemburg, West Germany, East Germany, Poland, Czechoslovakia, France, Andorra, Switzerland, Liechtenstein, Italy, Austria, Roumenia, Yugoslavia, Bulgaria, Greece, Turkey and Iran.

Description

Body length male: 12—15 mm, female: 17—22 mm; wing length: 13—16 mm.

Head male: Scape and pedicel yellow, sometimes brownish in part; flagellar segments dark brown (first one sometimes less dark, in specimens from Turkey and Iran basal nodes of flagellar segments darker than remainder of segments); second and following flagellar segments slightly reniform, apical segments nodulose basally only; verticils up to 0.9 × length



Figs. 1—5. *N. analis*. 1, od, outside; 2, head, dorsal view; 3, aedeagus; 4, cercus, lateral view; 5, hypovalva, lateral view.

Fig. 6. *N. subanalis*, hypovalva, lateral view.

Fig. 7. Furca and fused valvulae, dorsal view; A, *N. analis*, B, *N. euchroma*, C, *N. subanalis*, D, *N. alluaudi*, E, *N. lamellata*.

of flagellar segments; first flagellar segment 1.0—1.1 × length of second one. Head pale yellow to yellow, on vertex to brownish yellow. Dorsal part of rostrum shining and, especially near nasus, brown to dark brown. Spot between eye and frontal tubercle brown, rarely absent. Frontal tubercle conspicuous. Occipital marking dark brown, shining with lateral margins usually dull; in general triangular shaped and as broad as frontal tubercle, sometimes more rounded and much broader (fig. 2) and narrowly extended on frontal tubercle. Hairs on vertex and postgenae moderately long, near eye-margin more or less in a row. Inner part of postgenae below neck darkened.

Thorax male: Pronotum dorsally yellow, laterally, especially where in contact with anepisternite, dark brown. Prescutal and scutal stripes black; downwardly bent anterior ends of lateral prescutal stripes dull. Scutellum yellow, in general with a dark brown to black median stripe. Parascutellae yellow. Lateral parts of mediotergite yellow, median region with a dark brown to black stripe which distinctly widens on posterior part of mediotergite. Lateral parts of thorax yellow with distinct dark brown to black markings, especially those between coxae and on posterior half of katatergite, those on anepisternite and anatergite sometimes faint, transparently brown. Sternum 1 yellow. Coxae and trochanters yellow. Femora and tibiae light brown, tips darkened. Tarsi brown to dark brown. Wings light brown toned; wing-stigma distinct, brown to dark brown, with macrotrichiae; basal part of vein R4 + 5 and cross-vein R-M with a minor brown shade; wing tip brown shaded.

Abdomen male: Yellow with a dark brown to black apical ring. Dorsal stripe brown to dark brown, interrupted by narrow yellow colouration along hind margins of tergites, sometimes with larger intervals on anterior part of tergites and usually less developed on tergites 5 and 6; dorsal stripe in general narrow and straight but sometimes broadening halfway tergite 2 and on posterior parts of tergites. Tergite 8 and posterior two-third of tergite 7 dark brown to black. Sternites 1—6 yellow. Sternite 7 usually entirely dark brown to black, sometimes anterior one-third yellow. Sternite 8 dark brown to black except lighter coloured hind margin.

Hypopygium: Posterior extension of tergite 9 divided in two by a narrow median incision flanked by large, spiny protuberances; lateral horn-like projections almost vertically directed (fig. 8 A). Od as in fig. 1. Id without crest; lateral shell large (fig. 10 A & C). Dorsal edge of sternite 9 between base of od and tergite 9 with a hairy, bulbous protuberance on inner part (fig. 11). Lateral appendage of adminiculum broad, triangular; ventral appendages in contact with dorsal edge of sclerotized, U-shaped projection between two halves of sternite 9 (fig. 9 A). Aedeagus as in fig. 3. Sternite 8 clothed with long golden hairs, especially those near U-shaped projection distinctly incurved and concealing the projection.

Female: Resembling the male. First flagellar segment 1.2—1.3 × length of second one; verticils up to 1.8 × length of flagellar segments. Dorsal abdominal stripe brown to dark brown; on anterior part of tergites narrow and straight, on posterior part and halfway tergite 2 usually distinctly broadened; dorsal stripe interrupted by narrow yellow colouration along hind margins of tergites and sometimes, especially on posterior tergites, with larger intervals on anterior part of tergites. Tergites laterally with narrow, infuscated stripes. Sternites medially with a straight stripe, ranging from faint to brown. Tergite 8 and posterior two-third of tergite 7 black. Tergite 9 ranging from reddish brown to black. Anterior part of sternite 8 black, posterior part reddish brown and laterally without darkened oval spots. Cerci and hypovalvae reddish brown. Cerci long and slender, ending blunt (fig. 4). Fused valvulae triangular and connected with tergite 9; furca very slender (fig. 7 A). Hypovalvae as in figs. 7 & 12 D. Egg-slide with a vertical septum between anterior ends of hypovalvae and ventrally provided with fine hairs; the eighth sternite gradually narrows to the point where it passes into the hypovalvae (fig. 12 D).

Biology (diagram 1)

N. analis is found in woods and scrubs, especially near water. Larvae live under leaf-mould in damp soil. According to Beling (1886) the pupal rest takes 8—12 days.

The main period of flight is from the second half of June until the end of July; late records are 24 August (Amsterdam) and 1 September (Oostvoorne).

Altitudes above 1000 metres are known from France (H. Pyr., 1050 m) Andorra (1150 m), Switzerland (Wald, 900—1100 m), Bulgaria (Rilski Manastir, 1200 m) and Turkey (near Mus, 1600 m; Askale, 1200 m).

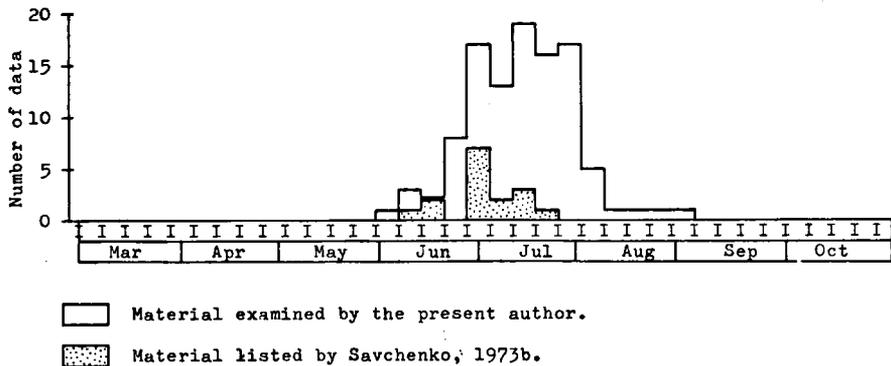
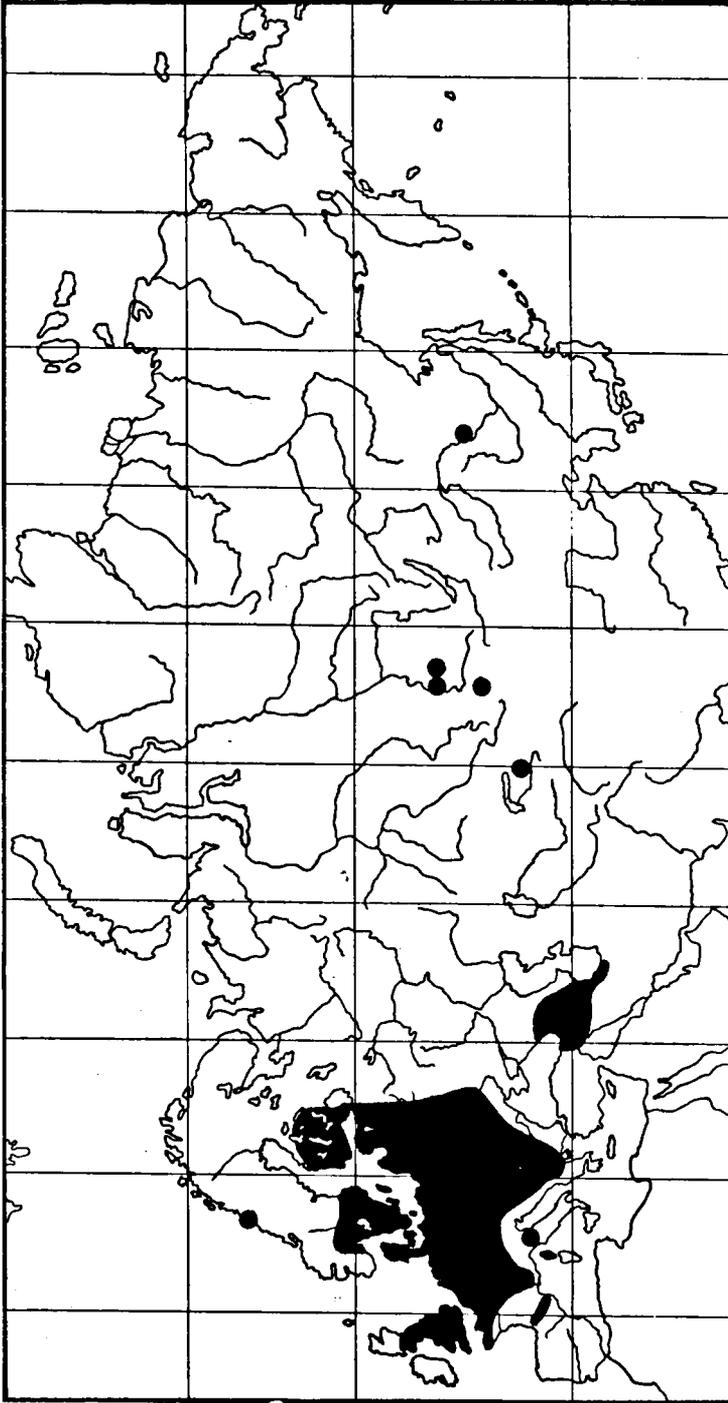


Diagram 1. Period of flight of *N. analis*.



Map 1. Distribution of *N. analis*.

Distribution (map 1)

The northernmost locality in Scandinavia is Sømnes (Lackschewitz, 1935b, near 66° N, 1 ♂). The distribution in the British Isles is based among others on data kindly presented by Mr. A. E. Stubbs. Apart from Corse (Gaunitz, 1968) and the northern slopes of the Pyrenees (Eaux-Chaudes, Gèdre, Cauterets, Prats-de-Mollo, Villefranche-de-Conflent, Fontpedrous) the southernmost locality in France is Malaucène in Vaucluse (2 ♂, H. Keiser leg., Museum Basel. Mannheims i.l.). The Spanish record by Strobl (1906) is referred to *guestfalica*. Italian records are Bolzano, Tarvisio and Roncobilaccio near Bologna. The only coastal locality in the Mediterranean area is Thessaloníki. *N. analis* is known from NE Turkey (Rize, Cat, Van Gölü, Ilica N of Van Gölü, Mus, Askale), Iran (Talysh mountains, Gilan) and the Caucasus (Savchenko, 1973b: Kabardino-Balkarskaya ASSR, Gruzinskaya SSR, Armyanskaya SSR, Azerbaydzhan SSR, Nakhichevan ASSR). The Central and East Asian localities are based on Savchenko (1973b) (Kazakhskaya SSR, Krasnoyarskiy kray, Altayskiy kray, Amurskaya obl.). The records from North Africa by Pierre (1921) are discussed under *subanalis*.

***Nephrotoma euchroma* (Mik, 1874)**

Figs. 7—10, 12, map 2

Pachyrhina aurantiaca Mik, 1866, Verhandlungen des Zoologisch-Botanischen Vereins in Wien, 16: 304—5 (preocc. by Macquart, 1838).

Pachyrhina euchroma Mik, 1874, Verhandlungen des Zoologisch-Botanischen Vereins in Wien, 24: 353 (new name for *aurantiaca* Mik, 1866); Riedel, 1910: 420; Czižek, 1911: 89; Pierre, 1924a: 28.

Pales euchroma: Mannheims, 1951a: 33—6, 47—8; 1951b: 140; 1951c: 228; 1953: 2; Mannheims & Theowald, 1959: 17; Hemmingsen, 1962: 140; Mannheims & Pechlaner, 1963: 6; Mannheims, 1964d: 112; Zangheri, 1969: 1024; Savchenko, 1973: 60—1, figures.

Pachyrhina chromicolor Pierre, 1919, Bulletin de la Société Entomologique de France, 1919: 284—5, figures; 1920: 77; 1924a: 28, figures.

Pales chromicolor: Mannheims, 1951a: 47—8; 1951b: 140; 1951c: 228; 1964d: 112.

Nephrotoma chromicolor: Nielsen, 1929: 49.

Introduction

For the distinction of *euchroma* see the introduction under *analis*.

Type-material & Synonymy

Pachyrhina euchroma Mik, 1874: The type-series comprises two females, collected by Mik „an feuchten Waldstellen bei Görz [= Gorizia], eines im Juli 1864, das andere im August 1865”. Both types are preserved in the Vienna Museum. One female labeled: Illyria Görz/2 . . . 8.3/ *aurantiaca* det Mik/ *euchroma* det. Riedel, is designated here as lectotype (NMW, v! 0 1976).

Pachyrhina chromicolor Pierre, 1919: According to Pierre (1919) the type specimens (10 ♂ 7 ♀) were collected at Roche-cardon near Lyon "pendant les premiers jours de septembre 1918 et 1919". The specimens in the Paris Museum (v! 0 1976) labeled Type (2 ♂, 2 ♀) and Cotype (3 ♂, 1 ♀) are from 14 August 1918 and the Cotypes (1 ♂, 1 ♀) in the British Museum (Natural History) (v! 0 1977) are from 28 August 1918; these 10 specimens are labeled Lyonnais. Mannheims (1951a) synonymized *euchroma* and *chromicolor* because of the conformity in the original descriptions and this view is assented to here but it remains questionable whether the so-called types (Mannheims, 1951c, 1964d, the ten specimens mentioned above) belong to the type-series of *chromicolor*.

Other material: 10 males and 15 females from France (Coll. Pierre, 1 ♂, 2 ♀, without locality), Italy (incl. 1 ♂ from Biviere di Cesaro, Sicily), and Switzerland (Campocologna near Poschiavo).

Description

Remark: The description below deals with the French, Swiss, and Italian specimens examined. A male from Sicily, in colour intermediate between *analis* and *euchroma* but according to hypopygial characters belonging to the latter is discussed subsequently.

Body length male: 13—15 mm, female: 19—22 mm; wing length: 13—19 mm.

Head male: Scape and pedicel yellow; first flagellar segment light brown; following segments brown and slightly reniform, apical segments nodulose basally only; first flagellar segment 1.1 × length of second one; verticils up to 1.7 × length of flagellar segments. Head pale yellow, dorsal part of rostrum and vertex yellow to brownish yellow. Occipital marking small, at most reaching base of frontal tubercle, triangular and shining, brown with a longitudinal lighter coloured medial stripe. Hairs on vertex and postgenae moderately short and not densely set as in *analis*, anteriorly more or less in a row close to margin of eye. Postgenae transparently brown below neck.

Thorax male: Pronotum yellow, along anepisternite brownish yellow. Prescutal and scutal stripes dark brown; lateral prescutal stripes with dull, downwardly directed anterior ends; medial stripe with red-brown lateral margins on posterior two-third. Scutellum and mediotergite with a brown medial stripe, posterior part of mediotergite not dark brown as in *analis*. Parascutellae yellow. Lateral parts of thorax pale yellow to yellow, markings faintly indicated by transparently light brown. Sternum 1, coxae and trochanters yellow. Femora yellow, tips darkened. Tibiae light brown, tips darkened. Tarsi brown. Wings light brown toned; wing-stigma distinct, brown, with macrotrichiae; basal part of vein R4 + 5, cross-vein R-M and wing-tip with a minor brown shade.

Abdomen male: Yellow with a dark brown to black apical ring. Brown to dark brown dorsal stripe interrupted by narrow, lighter coloured hind margins of the tergites and usually with larger intervals halfway tergite 2 and on anterior part of tergites. Spots forming dorsal stripe anteriorly narrow, more or less straight, posteriorly much broader and triangular. Anterior one-third of tergite 7 yellow, remainder dark brown to black. Tergite 8 dark brown to black except yellow hind margin. Sternites 1—6 yellow. Posterior two-third of sternite 7 usually dark brown, sometimes yellow. Sternite 8 dark brown to black.

Hypopygium: Very similar to *analis* . The dorsal edge of the posterior extension of tergite 9 bears two small, triangular shaped protuberances (fig. 8 B). The lateral shell of the id has a more acute anterior corner (figs. 10 B&D). The lateral appendages of the adminiculum are not as broad as in *analis* . (fig. 9 B). The compressor apodeme of the aedeagus is not blackened and the posterior appendages of the aedeagus are about 1.5 × as long as in *analis* .

Female: Resembling the male but to a large extent lighter coloured. Flagellar segments yellowish brown; first flagellar segment 1.1 × length of second one; verticils up to 1.6 × length of flagellar segments. Occipital marking sometimes faint. Prescutal and scutal stripes with broad, lighter coloured lateral margins. Medial stripe of scutellum and mediotergite faint or absent. Abdominal dorsal spots as in the male but restricted to posterior two third of the tergites. Posterior part of tergite 7 usually broadly dark brown. Tergite 8 usually dark brown laterally. Tergite 9, 10, cerci, sternite 8 and hypoalvae yellow. Cerci as in *analis* but slightly broader. Fused valvulae as in *subanalis* . Furca slender at basal half, broadly triangular apically (fig. 7 B). Hypoalvae as in *analis* with produced and outcurved antero-dorsal corners and a more rounded vertical septum between anterior ends (fig. 12 B).

The only known specimen from Sicily (male, Biviere di Cesaro, 600—1250 m, 2.VIII.1961, ZMA) shows the hypopygial characters mentioned above. The colouration of the body however is intermediate between *analis* and *euchroma* . It resembles the latter by the presence of a lighter coloured medial stripe in the occipital marking and by the yellow lateral parts of the thorax. More like *analis* is the dark brown colouration of the second and following flagellar segment, the black thoracic stripes without red-brown fringes, the brown lateral part of the pronotum and the dark brown posterior part of the mediotergite.

Biology

N. euchroma is known to be on the wing from July until the first week of September, with one record from 20 May (Mannheims, i.l.). The species flies in damp woods and scrubs, especially near water. Specimens collected near Bologna had oviposited in moist trenches (Theowald, i.l.).



Map 2. Distribution of *N. euchroma*.

Distribution (map 2)

N. euchroma is known from the following localities: Rochecardon near Lyon (v O!), Torino (v O!), Orascio near Maccagno (v O!), Tirol (Mannheims, 1951a), Görz (= Gorizia, v O!), Carniola slov (Mannheims, i.l.), near Bologna (v O!), Forli (Mannheims, 1951a), Castelli (Mannheims, 1951a), Lazio (Mannheims, 1951a), Campigna (Zangheri, 1969), Biviere di Cesaro, Sicily (v O!), and Campocologna near Poschiavo, the only Swiss locality (v O!, 1 ♀, 20.VIII.1978, kindly presented to the ZMA by Mr. C. Dufour, Lausanne).

***Nephrotoma subanalis* (Mannheims, 1951)**

Figs. 6, 7, 9, 12, map 3

Pales subanalis Mannheims, 1951, Die Fliegen der palaearktischen Region, Lief. 167: 33—6, 55—7, figures; Vaillant, 1955: 238; Hemmingsen, 1962: 141.

Pales analis subanalis: Savchenko, 1973b: 60, figures.

Pachyrhina analis: Pierre, 1921a: 24 (= *subanalis*?); 1921b: 150 (= *subanalis*?).

Pachyrhina lunulicornis: Pierre, 1921a: 24 (= *subanalis*?).

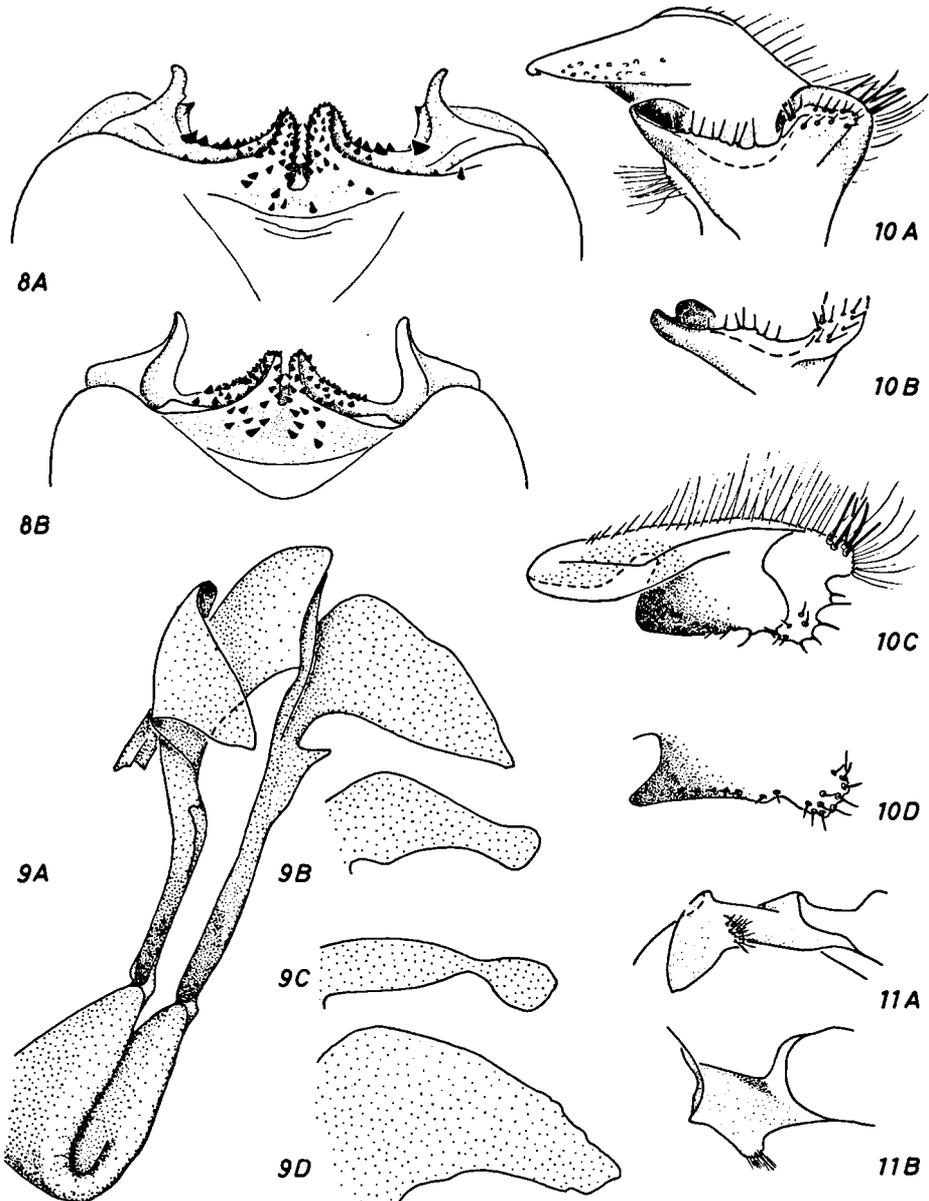


Fig. 8. Posterior extension of tergite 9, dorsal view; A, *N. analis*, B, *N. euchroma*.

Fig. 9. A. Adminiculum and U-shaped projection (medisternal appendage) of sternite 9 in *N. analis*; B, lateral appendage of adminiculum in *N. euchroma*; C, in *N. subanalis*; D, in *N. semiflava*.

Fig. 10. Id; A, *N. analis*, outside, B, *N. euchroma*, outside, lateral shell only, C, *N. analis*, dorsal view, D, *N. euchroma*, dorsal view, lateral shell only.

Fig. 11. Dorsal margin of sternite 9 between base of od and tergite 9 in *N. analis*, A, from inside, B, dorsal view.

- dark brown. Pleural markings faint. Anatergite yellow. Hind margin of male tergite 9 widely V-shaped (fig. I, 194). Median projection of male sternite 8 small, triangular, slightly protruding beyond hind margin of sternite. *N. spatha*, I: 121—123.
- These characters not combined.21.
21. Inner margin of od swollen and clothed with fine white hairs (fig. I, 176). Crest of id isolated from anterior part of id (fig. I, 177). Median projection of male sternite 8 short, swollen. *N. schaeuffelei*, I: 113—117.
- Female with cerci blunt, keyed out in couplet nr. 42.
- Inner margin of od not swollen. Crest of id not isolated from anterior part of id. Median projection of male sternite 8 dorsoventrally compressed or knob-like.22.
22. Occipital marking small, triangular (as figured for *quadrifaria*, fig. I, 134). Downcurved anterior ends of lateral prescutal stripes shining. Pleural markings distinct. *N. fontana*, I: 97—100.
- Occipital marking large, usually with rounded lateral margins, rarely small triangular. Downcurved anterior ends of lateral prescutal stripes dull. Pleural markings ranging from faint to distinct.23.
23. Median projection of male sternite 8 flattened, dorsoventrally compressed. Od elongate (fig. I, 185). Pleural markings distinct. Anterior part of parascutellae yellow, posterior part darkened. Anterodorsal margin of hypovalvae distinctly swollen (fig. I, 190). *N. nasuta*, I: 117—121.
- Median projection of male sternite 8 knob-like (fig. I, 160). Outer margin of od with a pointed sclerotization (fig. I, 158). Pleural markings usually less distinct, especially those on anepisternite and sternopleuron. Parascutellae not bicolorous. Anterodorsal margin of hypovalvae not distinctly swollen.24.
24. Crest of id posteriorly very short (fig. I, 167). Membranous ventral inner part of male sternite 9 bulged out between sternites 8 and 9. Spots composing abdominal dorsal stripe distinctly triangular in the female (fig. I, 165). Furca slender (fig. I, 169). . . . *N. moravica*, I: 109—111.
- Crest of id extended posteriorly (fig. I, 159). Membranous ventral inner part of male sternite 9 not bulged out beyond sternite 8. Spots composing abdominal dorsal stripe in the female straight (*cornicina*) or triangular (*sardiniensis*, rarely so in *cornicina*). Furca broad (fig. I, 163).25.
25. Occipital marking not broadly prolonged up to frontal tubercle (fig. I, 171). Abdominal segment 8 not darkened or tergite 8 dorsally only. Id with a large posterior appendage (fig. I, 173). *N. sardiniensis*, I: 111-113.

prolongation on frontal tubercle. Both sexes with 13 antennal segments. First antennal segment yellow with extensive dark brown patches or entirely darkened. Pleural markings dark brown to black, anatergite ranging from yellow to dark brown. Male with a distinct, bifurcate projection on ventral half of sternite 9; male sternite 8 with a small, narrow, median incision (fig. IV, 82). . . . *N. ramulifera*, IV: XXXX.

Lateral prescutal stripe straight or slightly downcurved, therefore keyed out again in couplet nr. 41. Female similar to *lundbecki* female, in the latter the downcurved anterior ends of the lateral prescutal stripes are very conspicuous, in contact with the paratergite.

- Occipital marking absent, hardly indicated or narrow and triangular, at most as broad as lateral prescutal stripes. Male sternite 8 with a large, median incision. First antennal segment yellow to brownish yellow, sometimes apically darkened. Pleural markings ranging from faint to distinct.33.
- 33. Male with 19 antennal segments, female with 15 (rarely male 17—20, female 14). Male tergite 8 divided in two along posterior two-third of ventral line with the very elongate lateral corners close to each other, apically rounded and upcurved. Occipital marking dark brown. Pleural markings faint to brown, those on sternopleuron, meron, and in front of halteres dark brown. Cerci broad (fig. III, 30). *N. dorsalis*, III: 159—164.
Nominate subspecies: northern and central Europe incl. western Russia; Amur and Primorye regions, southern Magadan, Kamchatka; replaced on Sakhalin, northern Japan and Kurile by subsp. *sachalina* Alexander.
- Male and female with 13 or 14 antennal segments. Male tergite 8 widely V-shaped. Occipital marking dark brown or faint. Pleural markings dark brown or faint. Cerci slender (figs. III, 31 & 32).34.
- 34. Occipital marking about as broad as lateral prescutal stripe. Male and female with 14 antennal segments. Verticils in the female up to $1.1 \times$ length of flagellar segments.
. *N. austriaca*, III: 186—189.
- Occipital marking narrower, half as broad as lateral prescutal stripe, or faint. Male and female with 13 antennal segments. Verticils $1.3 \times$ (*scurra*) or 1.6 — $1.8 \times$ length of flagellar segments.35.
- 35. Prescutal and scutal stripes with lighter coloured lateral margins or in part lighter coloured. Male sternite 8 widely V-shaped but without protruding lateral corners. Occipital marking usually absent or basally indicated only, rarely dark brown all over. Wing-stigma faint, rarely brown. Abdominal dorsal stripe very narrow, at most half as broad as scutellum. *N. scurra*, III: 180—186.
- Prescutal and scutal stripes uniform, dark brown to black. Male tergite 8 widely V-shaped with protruding lateral corners. Occipital marking

usually distinct, dark brown, sometimes less developed. Wing-stigma ranging from light brown to dark brown. Abdominal dorsal stripe in the female about as broad as scutellum or broader.36.

36. Male with a flattened projection on ventral inner part of sternite 9, protruding beyond base of widely V-shaped incision of sternite 8 (fig. III, 20). Pleural markings distinct. Female with the third antennal segment 1.2—1.6 × as long as fourth one. Furca of female distinctly bifurcate (fig. III, 23). Wing-stigma distinct, brown to dark brown.
. *N. lunulicornis*, III: 172—179.

Nominate subspecies: northern and central Europe, Pyrenees; Altai, Irkutsk, Krasnoyarsk, Minusinsk, Tomsk, Yakutsk; replaced in Tuva, Primorye, southern Sachalin and Japan by subsp. *angustistria* Alexander.

- Male without a projection on ventral inner part of sternite 9 (fig. III, 10). Pleural markings usually hardly indicated, sometimes lower half of sternopleuron and in front of halteres dark brown. Third antennal segment in the female 1.8—2.2 × as long as fourth one. Female furca not bifurcate. Wing-stigma less distinct, light brown, rarely brown.
. *N. quadristriata*, III: 164—172.

37. Sternum 1 yellow or light gray (*ramulifera*) or yellow with blackened lateral margins (*scalaris*). Body colour yellow with brown to black markings. First and second antennal segments yellow to light brown (in *subanalis* and *scalaris* ranging up to brown, in *ramulifera* up to dark brown).38.

- Sternum 1 dark brown to black. Body, especially thorax, extensively darkened or dusted grey. First and second antennal segments dark brown to black (lighter coloured *crocata* specimens from southeastern France and Italy may have lighter coloured basal antennal segments and a yellow body colour with dark brown markings).48.

38. Tergites laterally with a distinct stripe or row of spots.39.

- Tergites laterally without a distinct stripe, at most with an irregular black line well above lateral margin.43.

39. Abdomen with brown to black, transverse bands on posterior parts of tergites. Occipital marking narrow triangular. Posterior extension of male tergite 9 as in fig. II, 14 & 15. Medisternal appendage U-shaped, ventrally bearing a small, bulbous projection.
. *N. scalaris*, II: 72—85.

The nominate subsp. is known from Europe and Asia Minor, the subsp. *terminalis* (Wiedemann) occupies the southern Palaearctic from the Black Sea to the Pacific coast; in the latter subsp. the abdominal dorsal markings usually lie in front of the tergites hind margins and are laterally abbreviated, see for discussion and variability,

II: 72—85. *N. s. scalaris* is similar to the lighter coloured *crocata* specimens from south-eastern France and Italy which have sternum 1 blackened, the anterior ends of the lateral prescutal stripes dull and the sides of the thorax usually more blackened.

- Abdominal tergites without transverse posterior bands but with a dorsal stripe or a row of isolated spots. Occipital marking narrow triangular (*forcipata*) or broad. Posterior extension of male tergite 9 not as in figs. II, 14 & 15. Medisternal appendage not U-shaped. 40.
- 40. Longitudinal stripe on anterior part of mediotergite not in contact with narrow, dark brown stripe along hind margin of mediotergite, intermediate part transparently yellow. Occipital marking narrow triangular, anteriorly prolonged on or even crossing frontal tubercle.
. *N. forcipata*, I: 80—84.
Male with inner margin of od sclerotized, keyed out in couplet nr. 18.
- Posterior part of mediotergite broadly darkened and confluent with longitudinal stripe on anterior part of mediotergite. Occipital marking basally broad, with convex lateral margins and usually narrowly prolonged on frontal tubercle. Inner margin of od not sclerotized. . 41.
- 41. Sternites with a median stripe. Medisternal appendage terminating in a bifurcate outgrowth (fig. IV, 82). Od simple. Female cerci blunt, of normal shape. *N. ramulifera*, IV: XXXX.
See also key nr. 32.
- Sternites yellow. Medisternal appendage absent. Female cerci broad and relatively short, hypovalvae acute and slender (fig. IV, 56). Od with an acute tip on outer margin (*eugeniae*) or with inner margin swollen and clothed with fine hairs (*schaeuffelei*). 42.
- 42. Pleural markings faint. Abdomen with a broad dorsal stripe on tergites 1—5 (male) or 1—6 (female). *N. schaeuffelei*, I: 113—117.
Male keyed out under nr. 22.
- Pleural markings distinct. Abdomen with a row of large, rounded spots on the posterior part of tergites 1—7. *N. eugeniae*, IV: XXXX.
- 43. Tergite 1 dorsally darkened with central region to a lesser or greater extent yellow. Parascutellae yellow with a darkened, brown stripe along zone of contact with scutellum. Male sternite 8 as in fig. IV, 29. *N. flavipalpis*, IV: XXXX.
- Tergite 1 dorsally dark brown, central part not lighter coloured. Parascutellae yellow. 44.
- 44. Abdominal tergites with broad, anteriorly rounded, transverse bands, occupying on tergites 3—5 at least the posterior half of the tergites. Male sternite 8 with stiff, strongly bent hairs or bristles along hind

- margin (fig. IV, 34). *N. malickyi*, IV: XXXX.
- Abdominal tergites with a dorsal stripe or row of spots. Male sternite 8 not as above. 45.
45. Pleural markings faint, indicated by transparently light brown only. Median prescutal stripe of the male usually with red brown borders along posterior part, female with the prescutal and scutal stripes usually red-brown coloured in part. Posterior part of mediotergite usually transparently yellow. *N. euchroma*, IV: XXXX.
- Pleural markings distinct, those on anepisternite and anatergite sometimes less conspicuous. Prescutal and scutal stripes dark brown to black. Posterior part of mediotergite broadly darkened. 46.
46. Abdominal dorsal spots almost reaching hind margins of tergites, hind margins with a narrow, yellow colouration; medisternal appendage large (figs. IV, 20 & 21). Female with large, darkened, oval spots on lateral sides of sternite 8. Hypoalvae inside sternite 8 elongate, about as long as part beyond sternite 8. *N. lamellata*, IV: XXXX.
- Hind margins of tergites with a yellow colouration at least half as broad as diameter of femora. Medisternal appendage small, not distinctly protruding from sternite 9. Female without darkened oval spots on sternite 8. Hypoalvae inside sternites 8 much shorter than part beyond sternite 8. 47.
47. Male with the hairs along hind margin of sternite 8 short, and not incurved. Female with the anterodorsal margin of hypoalvae narrow (fig. IV, 12E); hypoalvae in lateral aspect as in fig. IV, 6. Markings on head and thorax very distinct; coxae basally with dark brown to black spots. *N. subanalis*, IV: XXXX.
- Male with long, incurved hairs along hind margin of sternite 8, concealing the medisternal appendage. Female with the anterodorsal margin of hypoalvae broader (fig. IV, 12D); lateral aspect of hypoalvae as in fig. IV, 5. Markings on head and thorax less conspicuous; coxae without dark brown spots basally.
. *N. analis*, IV: XXXX.
48. Downcurved anterior ends of lateral prescutal stripes shining. . . . 49.
- Downcurved anterior ends of lateral prescutal stripes dull. . . . 52.
49. Abdomen with a dorsal stripe. 50.
- Abdomen with broad, transverse bands along hind margin of tergites or posterior tergites extensively darkened only. 51.
50. Sternites darkened, hind margins pale yellow. Anterior half of kata-

tergite and anterolateral parts of mediotergite usually darkened.

. *N. lundbecki*, IV: XXXX.

Male with a small median projection on sternite 8, keyed out in couplet nr. 1; see also key nr. 32. See for variability IV:

- Sternites with a broad median stripe. Anterior half of katatergite and anterolateral parts of mediotergite usually yellow. Male sternite 8 without a median projection. *N. pratensis pratensis*, II: 89—94.

See for subsp. *eepi* Oosterbroek, key nr. 55. *N. pratensis* differs from *croceiventris* among others in the shape of the female cerci (figs. II, 41 & 42), and the hairs along male sternite 8 (figs. II, 31 & 37).

- 51. Rostrum and postgenae darkened, chocolate brown. Male abdominal tergites 2 and 3 yellowish or reddish brown except narrow black border along hind margin, small black spot in front of hind margin, and lateral stripes; tergites 6—8 black. Female tergites 2 and 3 yellowish or reddish brown with a narrow black border along hind margins, on tergite 3 with a posterior black spot also; tergites 4—7 lighter coloured anterolaterally, on 4 and 5 anterodorsally also; tergites laterally with a broad stripe. *N. rossica*, II: 85—89.

- Rostrum laterally yellow, postgenae at least yellow along eye margin. Abdominal tergites with broad, transverse bands along hind margins. posterior tergites usually darkened. *N. scalaris*, II: 72—85.

See also key nr. 39.

- 52. Margins of prescutal stripes dull bordered, occupying the area in between the lateral and median stripes. 53.

- Prescutal stripes not dull bordered; area inbetween lateral and median stripes yellow or occupied by stripes themselves. 54.

- 53. Male abdomen completely black, tergites with a steel-grey lustre on anterior half. Tergite 1 of female black, tergites 2 and 3 almost entirely reddish brown with triangular black marks in front of hind margins, tergites 4—7 with broad, reddish brown spots laterally.
. *N. nox*, II: 107—110.

- Male and female abdomen with tergites 2—4 entirely yellowish or reddish brown except narrow dark brown stripe along hind margins and lateral stripes, tergite 5 as preceding tergite or black, tergites 6—9 black in the male, in the female with lighter coloured markings laterally or anteriorly. *N. semiflava*, IV: XXXX.

- 54. Abdominal tergites with broad transverse bands along hind margin. posterior tergites usually darkened. *N. crocata*, II: 59—72.

Nominate subsp.: Europe incl. northeastern Spain, Great Britain, southern Scandinavia, excl. Greece, Bulgaria; in southern and eastern Russia up to Yakutsk. Replaced

in southwestern France, Spain, Morocco and Algeria by subsp. *luteata* (Meigen). The nominate *crocata* differs from *c. luteata* among others in the black colouration of the anterior part of tergite 2, in lighter coloured *c. crocata* specimens from southeastern France and Italy the anterior part of tergite 2 can be as yellow as in *c. luteata*, these lighter coloured specimens have the lateral parts of the rostrum yellowish, whereas in *c. luteata* the rostrum is black.

— Abdominal tergites with a dorsal stripe. 55.

55. Hairs along hind margin of male sternite 8 near midventral line distinctly incurved (fig. II, 37). Female cerci slender (fig. II, 41).

. *N. croceiventris*, II: 97—106.

N. c. croceiventris is known from Spain, it has distinctly triangular markings on sternites 3—5 (male) or 4—7 (female); the European subsp. *lindneri* (Mannheims) has the sternites darkened (male) or with a broad median stripe (male and female).

— Hairs along hind margin of male sternite 8 not incurved (fig. II, 31). Female cerci broader (fig. II, 42). *N. pratensis eepi*, II: 94—97.

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