

FAUNA NORVEGICA

No. 1
1986

SER. B VOL. 33 NO. 1
Norwegian Journal of Entomology



PUBLISHED BY
NORSK ZOOLOGISK TIDSSKRIFTSENTRAL
OSLO

Fauna norvegica Ser. B

Norwegian Journal of Entomology

Norsk Entomologisk Forenings tidsskrift

Appears with one volume (two issues) annually
Utkommer med to hefter pr. år.

Editor-in-Chief (Ansvarlig redaktør)

John O. Solem, University of Trondheim, The Museum, Erl. Skakkess gt. 47, N-7000 Trondheim.

Editorial Committee (Redaksjonskomité)

Arne Nilssen, Zoological Dept., Tromsø Museum, N-9000 Tromsø. Ole A. Sæther, Museum of Zoology, Muséplass 3, 5000 Bergen. Albert Lillehammer, Zoological Museum, Sars gt. 1, 0562 Oslo 5.

Subscription

Members of Norw. Ent. Soc. will receive the journal free. Membership fee N.kr. 80,- should be paid to the Treasurer of NEF: Lise Hofsvang, Brattvollveien 107, Oslo 11. Postgiro 5 44 09 20. Questions about membership should be directed to the Secretary of NEF, Trond Hofsvang, P.O. Box 70, N-1432 Ås - NLH. Members of NOF receive the journal by paying N.kr. 55,-, non-members by N.kr. 75,- to: NZT, Zoological Museum, Sarsgt. 1, N-Oslo 5. Postgiro 2 34 83 65. Outside Fennoscandia: Additional postage Nkr. 10,- per year (surface mail).

Abonnement

Medlemmer av Norsk Entomologisk Forening får tidsskriftet fritt tilsendt. Medlemskontingent kr.80,- innbetales til kassereren i NEF: Lise Hofsvang, Brattvollveien 107, Oslo 11. Postgiro 5 44 09 20. Medlemmer av Norsk Ornitologisk Forening mottar tidsskriftet ved å betale kr. 55,-. Andre må betale kr.

75,-. Disse innbetalinger sendes til NZT, Zoologisk Museum, Sarsgt. 1, Oslo 5.
Postgiro 2 34 83 65.

FAUNA NORVEGICA B publishes original new information generally relevant to Norwegian entomology. The journal emphasizes papers which are mainly faunistic or zoogeographical in scope or content, including checklists, faunal lists, type catalogues and regional keys. Submissions must not have been previously published or copyrighted and must not be published subsequently except in abstract form or by written consent of the Editor-in-Chief

NORSK ENTOMOLOGISK FØRENING

ser sin oppgave i å fremme det entomologiske studium i Norge, og danne et bindeledd mellom de interesserte. Medlemskontingenten er for tiden kr. 90,- pr. år. Henvendelse om medlemskap i NEF sendes sekretæren: Trond Hofsvang, Postboks 70, 1432 Ås-NLH. Medlemmer får tidsskriftet fritt tilsendt og kan abonnere til redusert pris på FAUNA NORVEGICA serie A (generell zoologi, 1 hefte pr. år) for kr. 25,- og på serie C (ornitologi, 2 hefter pr. år) for kr. 50,-. Disse innbetalinger sendes til NZT, Zoologisk museum, Sarsgt. 1, Oslo 5.
Postgiro 2 34 83 65.

Trykket med bidrag fra Norges almenvitenskapelige forskningsråd. Opplag 800

Norsk zoologisk tidsskriftsentral (NZT) er et felles publiseringsorgan for NEF og NOF i samarbeid med de zoologiske avdelingene ved universitetsmuseene i Oslo, Bergen, Trondheim og Tromsø.
Adresse: Zoologisk museum, Sars gt. 1, 0562 Oslo 5.
Postgiro 2 34 83 65.

Managing Editor (Administrerende redaktør)

Edvard K. Barth, Zoologisk museum, Sars gt. 1, 0562 Oslo 5.

Editorial Board (Redaksjonsråd)

Wim Vader, Tromsø, Svein Haftorn og John O. Solem, Trondheim, Rolf Vik, Oslo.

Kristiansen & Wøien, Oslo.

ISSN 0332-7698

Fauna (Norsk Zoologisk Forening) har gått ut av Norsk Zoologisk Tidsskriftsentral. Avtalen om gjensidig reduserte abonnementspriser på foreningens tidsskrifter vil for fremtiden derfor bare gjelde mellom Norsk Entomologisk Forening og Norsk Ornitologisk Forening.

The Sarcophagidae (Diptera) of Norway¹

KNUT ROGNES

Rognes, K. 1986. The Sarcophagidae (Diptera) of Norway. *Fauna norv. Ser. B*, 33, 1–26.

Sarcophagid material from Norway in the museum collections of the Universities in Bergen, Oslo and Tromsø and in author's own collection has been revised and records of the 49 species presently known from Norway presented. 5 species, viz. *Amobia distorta* (Allen, 1926), *Blaesoxipha rossica* Villeneuve, 1912, *Helicophagella noverca* (Rondani, 1869), *Heteronychia boettcheriana* (Rodendorf, 1937) and *H. ostensackeni* (Rodendorf, 1937), are recorded from Scandinavia for the first time. *Phrosinella septentrionalis* Rodendorf, 1970 is established as a new junior synonym of *Tachina sannio* Zetterstedt, 1838 (now in *Phrosinella*). *Sarcophaga tuberosa verticina* Ringdahl, 1945 is tentatively established as a new junior synonym of *Parasarcophaga (Liosarcophaga) pleskei* Rodendorf, 1937. The male terminalia of *Macronychia agrestis* (Fallén, 1820), *M. polyodon* (Meigen, 1824), *M. striginervis* (Zetterstedt, 1838) and *Parasarcophaga pleskei* Rodendorf, 1937 are illustrated. The zoogeography of the Norwegian species is discussed.

K. Rognes, Stavanger Lærershøgskole, Postboks 2521 Ullandhaug, N-4001 Stavanger, Norway.

INTRODUCTION

The Sarcophagidae (rather inappropriately called fleshflies) is a large and cosmopolitan fly family whose members usually can be recognised by silvery grey and black colours, striped thorax, striped, banded, tessellate or spotted abdomen, and a strongly setose body. In the world fauna about 2300 species are known (Hennig 1973). They are very small to very large calypterate flies with strong setae in a row on the hypopleuron (meron). All members are larviparous. In the Scandinavian fauna they can be distinguished from the Tachinidae by an undeveloped postscutellum, from most Rhinophoridae by a posteriorly broad and truncate lower squama, and from most Calliphoridae by their non-metallic colour and the position of the outer *ph* seta on or medial to a line through the *prst* seta parallel with the long axis of the fly. However, some non-metallic calliphorids are similar to sarcophagids even in these respects. This applies to some species of the genus *Pollenia* Robineau-Desvoidy, recognisable e.g. by presence of long wavy golden yellow hairs in addition to the normal black thoracal vestiture, and to the genus *Helicobosca* Bezzi, recognisable by yellow palpi and very strong setae in the lower half of the parafacialia. My reasons for treating *Helicobosca* as a calliphorid rather than a sarcophagid will be

given elsewhere. The genus has for the sake of convenience been included separately at the end of the present paper.

Strøm, (1781, 1784), Zetterstedt (1838, 1844, 1845, 1855), Siebke (1877), Schøyen (1889), Storm (1891, 1896, 1907), Strand (1900), Bidentkap (1901), Ringdahl (1944a, 1944b, 1952, 1954) and Rognes (1982) have published records of Sarcophagidae from Norway, and a total of 29 species (*Helicobosca palpalis* excluded) have previously been recorded. The present revision lists 49 species from Norway, of which 5 are first records from Scandinavia. In comparison it may be noted that Lundbeck (1927) published 45 species from Denmark, Hackman (1980) 57 from Finland, Ringdahl (1952) 65 from Sweden and Pont (1975) 55 from the British Isles.

MATERIAL AND METHODS

Nearly all available Norwegian material of Sarcophagidae, i.e. about 700 specimens, partly in my own collection (380 specimens), partly in the museum collections of the Universities in Bergen (mainly O. Bidentkap, A. Fjellberg, L. Greve, A. Løken, N. Knaben, T.R. Nielsen leg.), Oslo (mainly J. Knaben and J.H.S. Siebke leg.), and Tromsø (mainly T. Soot-Ryen leg.) form the basis of the present study. In addition a few small private collections (B. Sagvolden, J.H. Simonsen) have been examined. I have not seen the Trondheim collection (mainly V. Storm leg.) revised by Ringdahl (1944a), nor foreign collections, except for occasional specimens.

The Norwegian species have been assigned to

¹) Paper no. 4 in a series based on investigations financed by a grant («vikarstipend») from Stavanger Lærershøgskole 1982–1983.

4 subfamilies, i.e. Miltogrammatinae (Miltogrammatinae), Macronychiinae, Paramacronychiinae (Agriinae) and Sarcophaginae, in accordance with the definitions (mainly based on the structure of the male postabdomen) of these or equivalent groups given by Rodendorf (1937, 1967), Zumpt (1952, 1956) and Kurahashi (1970, 1972, 1975). A short diagnosis for each subfamily based mainly on Norwegian material is given below.

The main works used for identification of species are those of Böttcher (1913–1914), Stein (1924), Lundbeck (1927), Rodendorf (1930, 1935, 1937, 1970, 1971a, 1975a, 1982), Séguy (1941), Ringdahl (1945b), Emden (1954), Kano, Field & Shinonaga (1967), Mihályi (1979c) and Verves (1982a). Numerous other papers have also been consulted, especially those of Aldrich (1916), Allen (1926), Draber-Moňko (1964–1981), Gregor & Povolný (1961), Grunin (1964), Kurahashi (1970–1975), Lehrer (1959–1981), Léonide & Léonide (1973–1982), Mihályi (1975–1979b), Parker (1916–1923), Patton (1934), Patton & Wainwright (1935–1937), Povolný (1961–1977), Povolný & Slamečková (1959–1979), Povolný & Staněk (1969), Rodendorf (1925–1978), Rodendorf & Grunin (1938), Rodendorf & Verves (1977a–1980), Shewell (1971), Strukan (1967), Venturi (1947–1960), Verves (1973–1983) and Wainwright (1928–1940). Within the Sarcophaginae (except *Blaesoxipha* Loew) no attempt has been made at naming female specimens. Even though Kulikova (1982) has given a key to 15 species based on the structure of the female postabdomen, many females are still unknown or undescribed. Almost all males which do not have visible genitalia have been dissected for examination of these parts. The terminalia have been stored in glycerol in microvials to avoid distortion or compression. Drawings have been made from such preparations.

The faunistic data have been presented in accordance with the system of Økland (1981). The distribution in terms of the European Invertebrate Survey (EIS) system for Norway (for references, see Rognes 1980) is also given. For the benefit of the reader a map (Fig. 26) is included showing the numbers assigned to each square of the EIS system.

For each species I have given some notes on its biology. I have also indicated its world distribution in broad terms. This information has been extracted from the available catalogues for different parts of the world (Downes 1965, Souza Lopes 1969, Souza Lopes et al 1977, Dear

1980), and the sources used for identification (see above). A few other papers have also been consulted (Collart 1954, 1958, Saccà & Rivoecchi 1954, Stackelberg 1962). In addition more detailed information on the North European distribution is given, extracted from Pont (1975) for the British Isles, Lundbeck (1927) for Denmark, Tiensuu (1939, 1964), Junnikkala (1960), Brander (1964), Hedström (1964), Hedström & Nuorteva (1971), Hanski & Nuorteva (1975), Hanski (1976), Hanski & Kuusela (1977, 1980), Pyörnilä & Pyörnilä (1979), Hackman (1980) and Kuusela & Hanski (1982) for Finland, and Ringdahl (1937, 1945b, 1951, 1952, 1958) and Persson (1983) for Sweden.

SYSTEMATIC LIST

Subfamily Miltogrammatinae

Diagnosis. Flies of small size. Arista bare. Gena in profile much narrower than half eye height. Prosternum, propleuron and basisternum bare. Hind coxae bare behind. Posterior spiracle of thorax operculate with unequal lappets or rhinophorid-like with two subequal fringes. Male postabdomen with a T6, a compound T7 + 8, and an epandrium. Spiracle VI in membrane, spiracle VII in T7 + 8. Processus longus absent or present. Epiphallus absent or present.

The species in this subfamily prefer dry habitats and are associated with fossorial hymenopterans, the larvae being parasites, predators or guests in their nests.

The nomenclature follows Rodendorf (1970). One new combination and one new synonymy are established.

Genus *Amobia* Robineau-Desvoidy, 1830

Pachyophthalmus Brauer & Bergenstamm, 1889

1. *Amobia distorta* (Allen)

Pachyophthalmus distortus Allen, 1926

Material: AK, Frogn: Sønderstøa Degerud. EIS 28.

Data of capture: 16 June.

Note. The single male specimen has been misidentified by Ringdahl (1944b) as *signata* Meigen. However, the dissected genitalia leave no doubt as to its identity. Two females in the Oslo collection (EIS 28, 47) and 3 females in my collection (EIS 17, 28) belong either to *distorta* or *signata*.

Biology. Bred from nests of *Trypoxylon politum* Say (Sphecidae) (Allen 1926) and *Odynerus cras-*

sicornis (Panzer) (Eumenidae) (Draber-Mońko 1964).

Distribution. Palaearctic and Nearctic Regions. Not on the British Isles. Not previously recorded from Scandinavia.

Genus *Metopia* Meigen, 1803

2. *Metopia argyrocephala* (Meigen)

Musca leucocephala Rossi, 1790, preocc.; *Tachina argyrocephala* Meigen, 1824.

Material: AK, Oslo: Alunnsjøen, Bygdøy, Tøyen; Frogn: Sønderstøa Degerud; Asker: Brønnøya. ON, Vang: Øylo. BØ, Øvre Eiker: Burud, Ulleland. BV, Røllag: ?loc. TEY, Drangedal: Tørnes. TEI, Tokke: Dalen. AAI, Åmli: Bjorevja. RY, Sandnes: Melsheia, Myrland; Stavanger: Krossberg; Klepp: Øksnevad; Rennesøy: Vikevåg. HOY, Askøy: Herdla. HOI, Kvinnherad: Rosendal. SFI, Leikanger: Fosse. NSI, Beirarn: Kvål. EIS 7, 10, 14, 16, 18, 27, 28, 31, 35, 39, 50, 52, 126.

Date of earliest and latest capture: 1 June, 11 Aug.

Note. Only males have been included. Females are not separable from those of *rondaniana* or *tshernovae* (among others) also occurring in Norway.

Biology. Séguy (1941) and Venturi (1952) cite a number of Apidae, Sphecidae and Vespidae species as hosts for the larvae. Lomholdt (1975, 1976) reports it as parasitoid of *Crabro peltarius* (Schreber), *Sphex rufocinctus* Brullé, *Ammophila pubescens* Curtis and *Oxybelus argentatus* Curtis. However, as *argyrocephala* only relatively recently has been distinguished from species such as *tshernovae* and *rondaniana* these records may not be reliable.

Distribution. Palaearctic (cf. map in Verves 1982b), Nearctic, Neotropical and Oriental (Verves 1979d). Regions. British Isles. Denmark (also specimens in my own collection), Finland (north to Ostrobotnia borealis) and Sweden (north to Torne Lappmark).

3. *Metopia campestris* (Fallén)

Tachina campestris Fallén, 1820; *Tachina amabilis* Meigen, 1824, teste Lundbeck 1927: 224. Material. AK, Oslo: Ljan, Tøyen. HES, Elverum: Grundset. OS, Gausdal: Espedal (780 m). ON, Nord-Fron: Moen. TEI, Vinje: Haukeliseter (980 m). VAI, Kvinesdal: Gjermestad. RY, Stavanger, Krossberg; Strand: Prekestolhytta. RI, Forsand: Røssdalen, Songesand. HOI, Eidfjord: Hjelmodalen (350 m), Sysenvatndammen (980 m). SFI, Balestrand: Brekke. TRI, Målselv: Fri-

hetsli. EIS 4, 7, 24, 28, 32, 33, 49, 55, 62, 147. Date of earliest and latest capture; 5 June, 1 Sept.

Biology. Bred from a *Pompilus* nest (Pompilidae) by Lundbeck (1927). Also reported as a clepto-parasite (feeding on the provisions of the host nest) of *Sphex rufocinctus* Brullé and *Gorytes latocinctus* (Lepeletier) (Sphecidae) (Lomholdt 1975).

Distribution. Palaearctic (cf. map in Verves 1982b) and Nearctic Regions. British Isles. Denmark (also specimens in my own collection), Finland (north to Ostrobotnia borealis and Regio kuusamoensis) and Sweden (north to Torne Lappmark).

4. *Metopia rondaniana* Venturi

Metopia rondaniana Venturi, 1952

Material. HES, Elverum: Grundset. EIS 55.

Date of capture: Unknown.

Biology. Unknown.

Distribution. Palaearctic Region east to Altai Mts. Not on the British Isles. Denmark (specimens in my own collection) and Finland.

5. *Metopia tshernovae* Rodendorf

Metopia tshernovae Rodendorf, 1955

Material: AK, Oslo: Oslo. BØ, Ringerike: Hønefoss. HEN, Åmot: ?loc. EIS 28, 36, 64?

Dates of capture: Unknown.

Biology: Unknown.

Distribution. Europe, Kazakhstan. Not on the British Isles. Denmark (specimen in my own collection), Finland.

Genus *Miltogramma* Meigen, 1803

6. *Miltogramma punctata* Meigen

Miltogramma punctata Meigen, 1824

Material: VAY, Lyngdal. Toftealand. EIS 4.

Date of capture: 20 Aug.

Biology. Bred from nests of *Ammophila hirsuta* Scop. (= *Podalonia viatica*) (Sphecidae) and *Colletes davesianus* Smith, *C. fodiens* Latr., *C. inexpectatus* Nosk., *C. succinctus* L. and *Halictus sexnotatus* Nyl. (Apidae) (Tiensuu 1939, Séguy 1941, Draber-Mońko 1969).

Distribution. Palaearctic Region. British Isles. Denmark, Finland (north to Tavastia australis) and Sweden (north to Gästrikland).

Genus *Miltogrammidium* Rodendorf, 1930

Pseudomiltogramma Rodendorf, 1930

7. *Miltogrammidium brevipilum* (Villeneuve)

Miltogramma brevipilum Villeneuve, 1911

Material: HES, Kongsvinger: Vinger. EIS 38?

Date of capture: June (cf. Siebke 1877: 90).

Note. The specimen stood in the Oslo collection under *Miltogramma oestracea* Fall. In 1944 it was sent to O. Ringdahl, who identified it as «*Miltogramma ? testaceifrons* Ros.» according to attached label. The specimen must be the one from Kongsvinger mentioned in Siebke (1877: 90). The frons measures 0.32x and the face 0.23x head width and it runs to *brevipilum* in Venturi's key (1960). It fits Rodendorf's (1930: 47) description well.

Biology. Unknown.

Distribution. Europe, Turkestan (in Kazakh SSSR). Not on the British Isles. Sweden (Öland, Gotland).

Genus *Oebalia* Robineau-Desvoidy, 1863

Ptychoneura Brauer & Bergenstamm, 1889

8. *Oebalia cylindrica* (Fallén)

Tachina cylindrica Fallén, 1810

Material: AK, Oslo: Tøyen. EIS 28.

Date of capture: 11 June.

Biology. Larvae live in the nests of *Crabro ambiguus* Dahlb., *C. capitosus* Schuck, *C. cinxius* Dahlb., *C. tibialis* Fabr., *Trypoxylon attenuatum* Smith (Sphecidae) (Tiensuu 1939, Rodendorf 1975a). The larvae nourish themselves from paralysed chironomid midges (Rodendorf 1975a). Distribution. Europe. British Isles. Denmark, Finland (north to Ostrobothnia borealis) and Sweden (north to Lycksele Lappmark).

9. *Oebalia minuta* (Fallén)

Tachina minuta Fallén, 1810; *Tachina rufitarsis* Meigen, 1824 (teste Ringdahl 1937: 38)

Material: AK, Oslo: Tøyen. VE, Tjøme: ?loc. EIS 19, 28.

Date of earliest and latest capture: 26 June, 7 Aug.

Biology. Larvae live in the nests of *Crabro cinxius* Dahlb., *Rhopalum clavipes* (L.) and *R. coarctatum* (Dahlb.) (Sphecidae) (Rodendorf 1975a, Lomholdt 1976).

Distribution. Europe, Japan. British Isles. Denmark and Sweden (north to Ångermanland).

Genus *Phrosinella* Robineau-Desvoidy, 1863

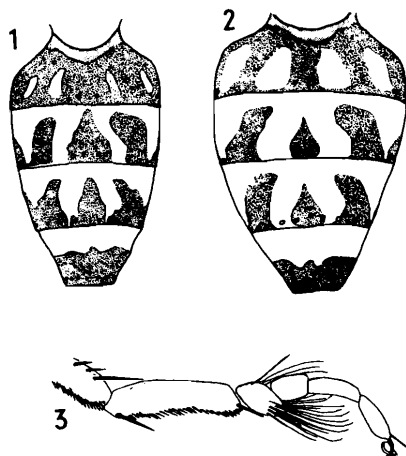
Euhilarella Townsend, 1915; *Pedimyia* Rodendorf, 1924

10. *Phrosinella sannio* (Zetterstedt), N.COMB.

Tachina sannio Zetterstedt, 1838: 636; 1844:

1020; *Tachina pilitarsis* Zetterstedt, 1844: 1021; *Phrosinella septentrionalis*: Stackelberg 1962, nomen nudum; *Phrosinella septentrionalis* Rodendorf, 1970: 643, N.SYN.

Note on taxonomy. I have examined the ♀ holotype of *Tachina sannio* captured in Sweden at «Åsele d. 28. Jul. 1832» (in Museum of Zoology, Lund). I find it to be conspecific with the ♀ paratype of *Phrosinella septentrionalis* from «Norv. Dowre» (in Naturhistorisches Museum, Vienna) (also examined). Furthermore, I have examined the ♂ holotype of *Tachina pilitarsis* which was captured in Norway at «Oestre Næs Værdalæ 10 Jul. 1840» (in Museum of Zoology, Lund). Zetterstedt (1844: 1022) suggested that *sannio* and *pilitarsis* were conspecific, and Ringdahl (1934, 1937, 1945a) agreed with this, though misidentifying both as *Phrosinella nasuta* (Meigen). The abdominal pattern of the male and female, and the very characteristic fore tarsus of the male are shown in Figs. 1—3. The true *P. nasuta* which apparently does not occur in Scandinavia (see below), is smaller, has a different abdominal pattern (cf. Rodendorf 1971a: figs. 106, 109), and unmodified fore tarsi in the male sex. I have seen 1♂ 1♀ from southern Yugoslavia (R.L. Coe) (cf. Mihályi 1980), 2♀ from southern France (C.J. Wainwright) and 1♀ from Spain (O.W. Richards) of *nasuta* (all in British Museum (Natural History), London). Rodendorf (1970, 1971a, 1971b) knew his *septentrionalis* only from the female sex. Verves (1980f) described the male of *septentrionalis* on



Figs. 1—3. *Phrosinella sannio* (Zetterstedt, 1838). 1 — Male abdominal pattern (Sandá), 2 — Female abdominal pattern (Lauve), 3 — Fore tarsus of male, medial view, (Sandá).

the basis of 2 ♂♂ from Taymyr in the Asiatic part of the USSR. It is the same as Zetterstedt's *pilitarsis* and conspecific with Scandinavian material. Most interestingly, the Palearctic *sannio* and all the Nearctic *Phrosinella* species listed by Downes (1965) have modified fore tarsi in the male (cf. Allen 1926, Reinhard 1961). Verves (1980f) therefore united them in a separate subgenus *Euhilarella* Townsend, as opposed to *Phrosinella* (s.str.) containing the remaining Palearctic species (including *nasuta*) which have unmodified male tarsi.

Material: TEI, Kviteseid: Lauve (E of Skredtveit), Nordbø; Tokke: Lårdal. AAI, Åmli: Sandå. ON, Dovre: ?loc. (paratype ♀ of *septentrionalis*). NTI, Verdal: Østre Nes (holotype ♂ of *pilitarsis*). EIS 10, 17, 71?, 98.

Date of earliest and latest capture: 28 June, 10 July.

Habitat: Roadsides, gravel pits, sandy ground. Biology. Unknown.

Distribution. Leningrad region and Taymyr N.O. in USSR. All records from Finland (Tiensuu 1939, Hackman 1980) of *nasuta* (north to Ostrobothnia borealis and Regio kuusamoensis) probably belong to the present species. I have seen 3 ♂♂ from Sortavala (Karelia ladogensis) (now USSR) (Tiensuu leg.) and 3 ♂♂ 1 ♀ from Paanajärvi (Regio kuusamoensis) (now USSR) (R. Frey leg.) (all Museum of Zoology, Helsinki) reported as *nasuta* by Tiensuu (1939), which all belong to *sannio*. All records from Sweden (north to Lule Lappmark) also probably belong to the present species (cf. Ringdahl 1952). I have seen 6 ♂♂ 17 ♀♀ from Småland, Norrbotten and Lule Lappmark (Ringdahl leg.) (all Museum of Zoology, Lund) identified as *nasuta* by Ringdahl which all belong to *sannio*. One of the females («Luleå 14.7—17») carries Villeneuve's determination label.

Genus *Senotainia* Macquart, 1846
Sphixapata Rondani, 1859; *Sphecapata*, emend.

11. *Senotainia conica* (Fallén)
Tachina conica Fallén, 1810

Material: Ø, Halden: near Halden. AK, Oslo: Tøyen. HES, Elverum: near Elverum. HEN, Åmot: ?loc. OS, «Land» (Nordre Land or Søndre Land): ?loc. BØ, Ringerike: Hønefoss. VE, Brunlanes: Oddanesand. TEI, Kviteseid: Nordbø; Tokke: Dalen, Lårdal. RY, Hå: Brusand; Klepp: Orresanden. EIS 3, 7, 11, 16, 17, 20, 28, 36, 45?, 55, 64?

Date of earliest and latest capture: 15 June, 7 July.

Biology. Bred from nests of *Halictus gracilis* Mor., *H. subauratus* Rossi (Apidae) and *Bembex integra* Panz., *Crabro scutellatus* Schev., *Oxybelus uniglumis* L., *Philanthus apivorus* Latr., *P. triangulum* Fabr., *Sphex albisectus* Lep., *Tachytes unicolor* Panz., *Thyreopus peltarius* Schreb. (Sphecidae) (Lundbeck 1927, Tiensuu 1939, Séguy 1941, Draber-Moňko 1978).

Distribution. Palearctic Region. British Isles. Denmark, Finland (north to Ostrobothnia borealis and Regio kuusamoensis), Sweden (north to Norrbotten).

12. *Senotainia imberbis* (Zetterstedt)

Tachina imberbis Zetterstedt, 1838; *Ptychoneura crabronum* Kramer, 1920

Material: AK, Oslo: Tøyen; Bærum: Østerås. OS, Lunner: Grua. HOI, Ullensvang: Lofthus. EIS 28, 32, 36.

Date of earliest and latest capture: 8 June, 27 July.

Biology. Bred from nests of «*Coelocrabo cinxius* Dahlb. et *capitosus* Schuck.» (Séguy 1941).

Distribution. Europe. Not on the British Isles. Finland (north to Regio kuusamoensis), Sweden (north to Torne Lappmark).

Subfamily Macronychiinae

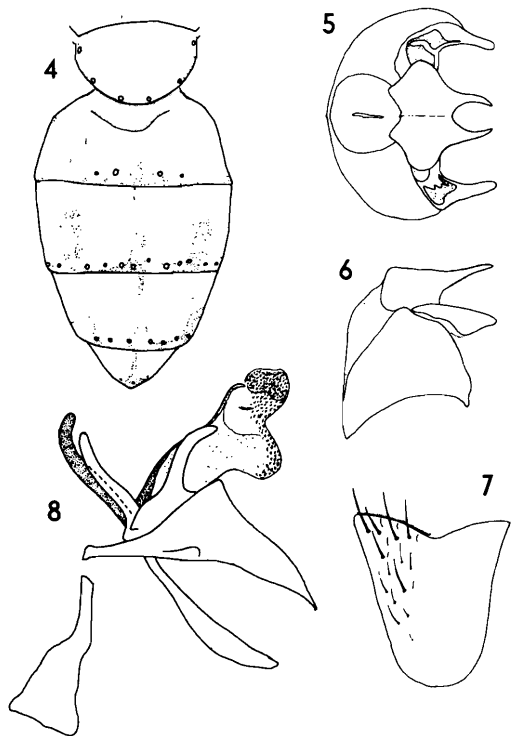
Diagnosis. Flies of moderate to large size. Arista bare. Gena in profile about half of eye height. Head shorter at vibrissae than at lunula, in profile view. Prosternum, propleuron and basisternum bare. Hind coxae bare behind. Posterior spiracle non-operculate, similar to the one in Rhizophoridae, with hairs along circular rim very short ventrally, developed as longer fringes anteriorly and posteriorly. Male postabdomen with a free T6, T7 and T8 partly to fully separate (Figs. 13, 19), and an epandrium. T6 and T7 each with a transverse row of strong setae. Spiracle VI in membrane, spiracle VII in T7. Processus longus present. Epiphallus present. Female postabdomen developed as a black pointed piercing ovipositor in some species.

The species are associated biologically with subterranean hymenopterans. A single genus, *Macronychia* Rondani (Rodendorf 1967).

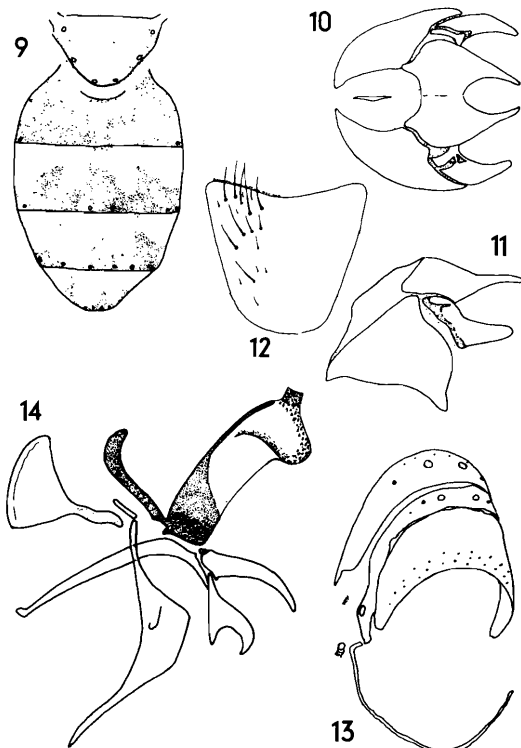
The nomenclature adopted is that of Verves (1982a).

Genus *Macronychia* Rondani, 1859

Macronichia Rondani, 1859: 229; *Macronychia* Rondani, 1859: 239; *Moschusa* Robineau-Desvoidy, 1863.



Figs. 4—8. *Macronychia agrestis* (Fallén, 1820). 4 — Scutellar and abdominal pattern, including bases of marginal setae, 5 — Epandrium, surstyli and cerci, posterior view, 6 — Epandrium, surstyli and cerci, left lateral view, 7 — ST 5, ventral view, 8 — phallosome, epiphallus, hypandrium, pregonite, postgonite, phallapodeme and ejaculatory sclerite, left lateral view, (Hof).



Figs. 9—14. *Macronychia polyodon* (Meigen, 1824). 9 — Scutellar and abdominal pattern, including bases of marginal setae, 10 — Epandrium, surstyli and cerci, posterior view, 11 — Epandrium, surstyli and cerci, left lateral view, 12 — ST 5, ventral view, 13 — male postabdomen (T6, T7, T8 and ST 6) (epandrium removed), posterolateral view, 14 — phallosome, epiphallus, hypandrium, pregonite, postgonite, phallapodeme and ejaculatory sclerite, left lateral view, (Hidra).

13. *Macronychia agrestis* (Fallén)

Tachina agrestis Fallén, 1820

Material: AK, Ås: ?loc. HES, Åsnes: Hof. EIS 28, 47.

Date of earliest and latest capture: 19 June, 29 July.

Note. A male from Hof dated 19 June 1848 has been dissected. The scutellar and abdominal pattern, including bases of marginal setae, and the terminalia are shown in Figs. 4—8.

Biology. Unknown.

Distribution. Europe. Altai. Not on the British Isles. Denmark, Finland (north to Tavastia australis), Sweden (north to Östergötland).

14. *Macronychia polyodon* (Meigen)

Tachina polyodon Meigen, 1824

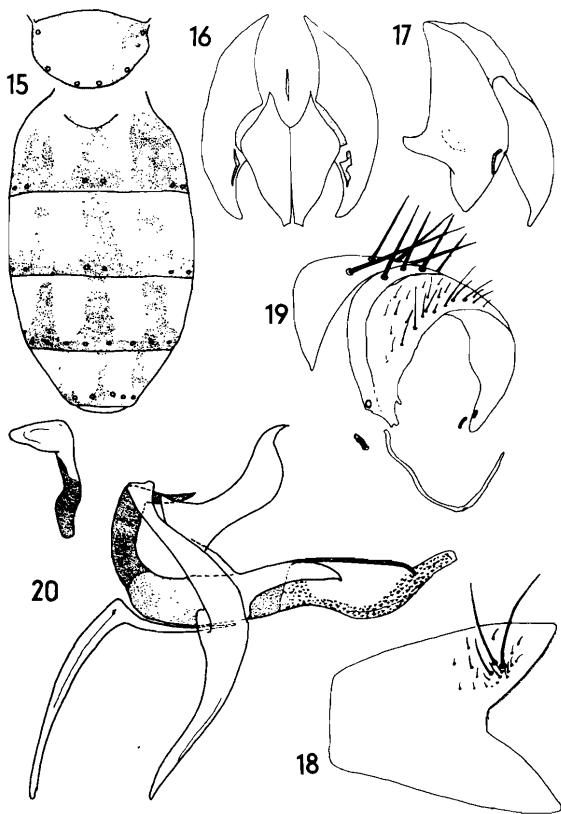
Material. VAY, Flekkefjord: Hidra. EIS 4.

Date of capture: 23 July.

Note. The only specimen available has been dissected. The scutellar and abdominal patterns, including bases of marginal setae, and the terminalia are shown in Figs. 9—14.

Biology. Larvae in nests of *Cemonus* Panz., *Clytochrysis chrysostratus* (Lep.), *Coelocrabro cinxius* Dahlb., *Crossocerus elongatulus* (van der Linden), *Oxybelus uniglumis* (L.), *Solenius larvatus* Wesm. (Sphecidae) and *Bombus hortorum*, *B. terrestris* (Apidae) (Séguy 1941, Lomholdt 1976, Verves 1982a).

Distribution. Palaearctic Region. British Isles. Denmark, Finland (Regio aboensis) and Sweden (Skåne, Östergötland).



Figs. 15–20. *Macronychia striginervis* (Zetterstedt, 1838). 15 — Scutellar and abdominal pattern, including bases of marginal setae, 16 — Epandrium, surstyli and cerci, posterior view, 17 — Epandrium, surstyli and cerci, left lateral view, 18 — ST 5, ventral view, 19 — male postabdomen (T6, T7, T8 and ST 6) (epandrium removed), posterolateral view, 20 — phallosome, epiphallus, hypandrium, pregonite, postgonite, phallopodeme and ejaculatory sclerite, left lateral view, (Stangenes).

15. *Macronychia striginervis* (Zetterstedt)

Xysta striginervis Zetterstedt, 1838; *Miltogramma unguilans* Pandellé, 1895.

Material. HEN, Tynset: Tyllidalen. TEI, Tokke: Dalen. VAY, Kristiansand: Stangenes. EIS 2, 16, 72.

Date of earliest and latest capture: 28 June, 4 July.

Note. The male from Stangenes has been dissected. The scutellum and abdomen, including terminalia are shown in Figs. 15–20.

Biology. Larvae in the nests of *Clytochrysus cavifrons* Thoms. (Sphecidae) (Emden 1954).

Distribution. Palaearctic Region. British Isles.

Denmark, Finland and Sweden (north to Lule Lappmark).

Subfamily Paramacronychiinae

Diagnosis. Flies of moderate to large size. Arista long pubescent or bare. Prosternum, propleuron and basisternum bare (but propleuron hairy in *Dexagria* Rodendorf, 1978). Hind coxae bare behind. Posterior spiracle of thorax operculate, posterior lappet larger than anterior one. Male postabdomen with T6, T7 and T8 all fused into a single large sclerite in front of the epandrium, carrying at least a transverse row of strong setae near fore margin. Behind this row a trace of a suture indicating posterior border of the T6 part. Spiracle VI and VII within the sclerite. Surstyli sometimes fused with the epandrium. Processus longus absent or very strongly reduced. Epiphallus absent (Norwegian material) or present.

The larvae are associated with other live or dead insects. Members of some genera are known to cause myiasis in man (*Wohlfartia* Brauer & Bergenstamm, *Angiometopa* Brauer & Bergenstamm).

The nomenclature follows Verves (1982a). Note that the genus *Helicobosca* Bezzi is placed in this subfamily by most authors (cf. Verves 1980c, 1982a), but that I consider it as belonging in the Calliphoridae. My reasons for this will be given elsewhere.

Genus *Agria* Robineau-Desvoidy, 1830

Pseudosarcophaga Kramer, 1908 (see Shewell, 1971)

16. *Agria mamillata* (Pandellé)

Sarcophila mamillata Pandellé, 1896.

Material: AK, Oslo: Sognsvatn, Sørkedalen; Bærum: Steinshøgda. TEI, Kviteseid: Kviteseid gamle kirke. EIS 17, 28, 36.

Date of earliest and latest capture: 21 June, 26 June.

Biology. Bred from various *Hyponomeuta* species (Lundbeck 1927, Tiensuu 1939, Séguy 1941, Junnikkala 1960, Pyörnilä & Pyörnilä 1979) and *Lasiocampa pini* (Séguy 1941) (both Lepidoptera). The fly «... oviposits on the skin of the last-instar larvae of *Hyponomeuta* species. The hatching larvae penetrates the skin and lives as an endoparasite of its host. After destroying the first host, the parasite larva attacks a second one and so on until it is ready for pupation. The parasite hibernates as a pupa in the ground.» (Junnikkala 1960: 34–35).

Distribution. Palaearctic Region. British Isles. Denmark, Finland (north to Ostrobothnia borealis) and Sweden (Skåne, Värmland).

Genus *Brachycoma* Rondani, 1856.
Brachycoma, emend.

17. *Brachycoma devia* (Fallén)
Tachina devia Fallén, 1820; *Tachina vilis* Zetterstedt, 1844; *Brachycoma devia borealis*: Ringdahl 1944b.

Material: AK, Oslo: Tøyen. HEN, Åmot: ?loc.; Tynset: Tyllidalen. OS, Sør-Fron: Harpefoss. ON, Vågå: Vågåmo. BØ, Kongsberg: Hvittingfoss; Hurum: Filtvet; Flesberg: Hvila. BV, Rollag: Rollag stasjon. VE, Tjøme: Tjøme. TEI, Bø: Øvre- rebø; Seljord: Ulvenes; Kviteseid: Kviteseid, Skredi; Fyresdal: between Aslestad and Slystøyl (650 m); Tokke: Langesæ (650 m). VAY, Lindesnes: Ytre Jørgenstad. VAI, Kvinesdal: Gjemlestad. RY, Stavanger: Byhaugen, Krossberg, Stavanger, Tjensvoll; Randaberg: near Hålandsvatn. RI, Forsand: Lerang. HOY, Bergen: Lakesvåg, Storetveit, Åstveit (Golfbanen). NTI, Steinkjer: Gulbergaunet. FN, Porsanger (FI, Karasjok?): Vuorje. EIS 1, 4, 7, 16, 17, 18, 19, 27, 28, 30, 39, 62, 64?, 71, 72, 101, 166.

Additional material (not seen). «Tromsø» (TRY, Tromsø: Tromsø, EIS 162) (Ringdahl 1954).

Date of earliest and latest capture: 24 April, 6 Aug.

Note. The specimen from Vuorje («Vuorjegais») has been identified by O. Ringdahl as «*Brachycoma borealis* Ringd.» (according to label) and published as «*Brachycoma devia borealis* Ringd.» by Ringdahl (1944b). It does not fit the original description of *borealis* particularly well (cf. Ringdahl 1932). The arista is thickened on distinctly less than inner half, the frontal stripe hardly broader than an orbit, and in other features it hardly differs from most specimens of *devia*. Neither does it fit Verves' (1982a) redescription very well, as it has 2 medial marginal setae on T3 and dusting on definitely more than basal half of the abdominal tergites (though rather weak). I am very much in doubt about this specimen, but prefer to treat it as *devia* for the present time.

Biology. Bred from a number of *Bombus* Latreille species (Apidae) and from «*Vespa silvestris*» (Vespidae) (Séguy 1941). In the Bergen collection are several specimens bred by Ove Meidell from nests of *Bombus agrorum* F. (= *B. pascuorum* (Scop.) of Løken 1973). A label on one of them reads: «Snyltet i larvæ av *Bombus agrorum*» («parasitised a larva of. . .», my translation). This is in accordance with Emden (1954) who reports the larvae «to attack and kill the prepupal stage of the host. . .». Rather surpris-

singly it was attracted to meat bait by Gregor & Povolný (1961).

Distribution. Palaearctic and Nearctic Regions. British Isles. Denmark, Finland and Sweden (north to Torne Lappmark).

Subfamily Sarcophaginae

Diagnosis. Flies of very small to very large size. Arista with long hairs in basal half. Prosternum and basisternum hairy. Propleuron bare. Hind coxae hairy behind. Posterior spiracle of thorax operculate, with large posterior lappet. Coxopleural streak absent (cf. Downes 1955). Male post-abdomen with T6 reduced to narrow transverse strips carrying long hairs or completely absent. T7 + 8 (first genital segment) without indications of sutures and never with transverse row of setae near fore margin, but often with marginal row. Spiracle VI in membrane, spiracle VII in T7 + 8. Surstylus small. Processus longus very strongly reduced (see also Patton 1934, Patton & Wainwright 1935a, 1935b, 1936a, 1936b, 1937, as «spiracle VIII» or «proximal segment of ninth coxite», and Zumpt & Heinz (1950), as «10th sternum»). Epiphallus absent.

Some species have larvae which are saprophagous, developing in excrement, small-size carrion or other kinds of decomposing animal matter. A few are known to cause myiasis in man. Several species are parasitic in various kinds of invertebrates. The biology of a large number of species is unknown.

I have adopted the generic and specific nomenclature of Rodendorf (1965, 1970) with a few exceptions, and have listed the genera in accordance with Rodendorf (1965). Some synonyms have been taken from Séguy (1941), Souza Lopes et al (1977) and Dear (1980). One new specific synonymy is tentatively proposed.

Genus *Blaesoxipha* Loew, 1861

Listeria Robineau-Desvoidy, 1863; *Servaisia* Robineau-Desvoidy, 1863.

18. *Blaesoxipha agrestis* (Robineau-Desvoidy)
Musca lineata Fallén, 1817, preocc.; *Listeria agrestis* Robineau-Desvoidy, 1863.

Material: ON, Nord-Fron: Kvam. BV, Nes: Nesbyen. EIS 44, 62.

Dates of capture: The specimen from Kvam was captured 2 Aug.

Biology. Larvae parasitic in grasshoppers (Rodendorf 1937, Séguy 1941, Léonide & Léonide 1971).

Distribution. Palaearctic and Afrotropical Regions. Not on the British Isles. Not reported from Denmark by Lundbeck (1927), but I have collected 22 ♀♀ in that country on a locality where it was very numerous on dry sun-exposed ground (East Jutland, Mols Bjerger 12 July 1979). Also known from Sweden (north to Hälsingland).

19. *Blaesoxipha gladiatrix* (Pandellé)

Sarcophaga gladiatrix Pandellé, 1896; *Blaesoxipha laticornis*: Rodendorf 1937 (only males); Wainwright 1940.

Material: AK, Oslo: Kværner; Bærum: Østerås, Øverland. BØ, Øvre Eiker: Ulleland. TEI, Sauherad: Nordagutu. MRY, Gjemnes: Osmarka (Raumyr). EIS 18, 28, 84.

Date of earliest and latest capture: 23 June, 5 Aug.

Note. The males and females agree with Léonide & Léonide's (1979, 1982) concept of *gladiatrix*. Biology. Parasitic in grasshoppers, mostly of the *Chorthippus bicolor-mollis-biguttulus* group (Léonide & Léonide 1979). *C. bicolor* and *C. biguttulus* occur in Norway (Knaben 1943).

Distribution. Incompletely known because *gladiatrix* only recently (Léonide & Léonide 1979, 1982) has been kept apart from *Blaesoxipha grylloctona* Loew. Known with certainty from France (including Corsica) and the British Isles.

20. *Blaesoxipha rossica* Villeneuve

Blaesoxipha rossica Villeneuve, 1912

Material: MRY, Gjemnes: Osmarka (Raumyr). EIS 84.

Date of capture: 14 July.

Note. The ovipositor is very well visible and the specimen fits the description of Rodendorf (1937) and Emden (1954) very well.

Biology. Larvae parasitic in grasshoppers (Rodendorf 1932, 1937, Séguy 1941, Léonide 1967, Léonide & Léonide 1971). Of the hosts mentioned by Léonide & Léonide (1971), *Chorthippus bicolor* and *C. biguttulus* occur in Norway (cf. Knaben 1943).

Distribution. Palaearctic Region. British Isles. Not previously reported from Scandinavia. It may, however, have been confused with *B. erythrura* (Meigen) which has been recorded from Denmark, Finland and Sweden.

Genus *Sarcotachinella* Townsend, 1917

Arhopocnemis Enderlein, 1928

21. *Sarcotachinella sinuata* (Meigen)

Sarcophaga sinuata Meigen, 1826; *Sarcophaga arvorum* Meigen, 1826.

Material: Ø, Halden: near Halden. RY, Stavanger: Sunde (indoors on window). EIS 7, 20. Dates of capture: The specimen from Sunde was captured 20 June.

Note. Zetterstedt (1845: 1289) reported this species in Norway «ad Næs Verdaliæ» (NTI, Verdal: Nes) (cf. Schøyen 1889: 7), but the record was retracted by Zetterstedt (1859: 3267). I have not seen this material.

Biology. Parasite of grasshoppers (Aldrich 1916, Rodendorf & Verves 1978). Lundbeck reared it from a pupa found in the ground. Attracted to faeces (Rodendorf 1959). A single specimen captured on food markets in Budapest (Aradi & Mihályi 1971).

Distribution. Palaearctic and Nearctic Regions. British Isles. Denmark, Finland (north to Karelia borealis) and Sweden (north to Gällivare in Torne Lappmark).

Genus *Helicophagella* Enderlein, 1928

Bellieria: authors, not Robineau-Desvoidy, teste Souza Lopes (1955) and Souza Lopes et al (1977).

22. *Helicophagella agnata* (Rondani)

Sarcophaga agnata Rondani, 1860

Material: RI, Forsand: Songesand. SFI, Balestrand: Bøyum. EIS 7, 59.

Additional material (not seen). «Aurland 1 ex.» (SFI, Aurland: Aurland, EIS 51) (Ringdahl 1954). The specimen could not be found in Ringdahl's collection in Lund (R. Danielsson in litt. 2 Sept. 1983).

Biology. Bred from *Helix aspersa* Müller, 1774 (Emden 1954). This snail is not known from Norway (cf. Kerney & Cameron 1979).

Distribution. Europe. British Isles. Denmark, Finland and Sweden (Skåne, Småland).

23. *Helicophagella crassimargo* (Pandellé)

Sarcophaga crassimargo Pandellé, 1896

Material: AK, Oslo: Tøyen; Eidsvoll: Eidsvoll. HES, Elverum: Grundset. OS, Sør-Fron: Harpefoss. ON, Nord-Fron: Vinstra. VAI, Kvinesdal: Gjemlestad. NNØ, Sørfold. Røsvik. EIS 4, 28, 37, 55, 62, 131.

Date of earliest and latest capture: 8 July, 20 Aug.

Biology. Keilin (1919) bred a female of supposedly this species from *Helicella virgata* (da Costa), which is unknown from Norway (cf. Kerney & Cameron 1979). A specimen was captured

red on food-markets in Budapest (Aradi & Mihályi 1971).

Distribution. Palaearctic Region east to Central Asia. British Isles. Denmark, Finland (north to Ostrobothnia *kajanensis*) and Sweden (north to Norrbotten).

24. *Helicophagella melanura* (Meigen)

Sarcophaga melanura Meigen, 1826; *Myiophora striata* Robineau-Desvoidy, 1830

Material: AK, Oslo: Bekkelaget, ?loc.; Bærum: Nordli NW of Østerås. HEN, Rendalen: Solbakken near Storsjøen. AAY, Grimstad: Ryvingen. VAY, Mandal: Mandal (Kvisla). RY, Klepp: Boresanden, Orresanden; Randaberg: Sandestranden. SFI, Årdal: Svalheim i Utladalen. EIS 2, 6, 7, 28, 51, 64.

Date of earliest and latest capture: 1 June, 27 Aug.

Biology. Breeds in human and animal faeces, animal carcasses, privies and garbage (Rodendorf 1959, Mihályi 1965, Ishijima 1967, Kano, Field & Shinonaga 1967, Sýchevskaya 1970, Rodendorf & Verves 1978), sometimes parasitic on various molluscs (Keilin 1921, Séguy 1941), insects (Séguy 1941), birds (Emden 1954) and mammals (Séguy 1941, Emden 1954, Nielsen, Nielsen & Walhovd 1978). Adults visit faeces, meat (including dead snails) and fruits for nourishment (Kirchberg 1954, Gregor & Povolný 1961, Aradi & Mihályi 1971). Synanthropic species of hygienic importance.

Distribution. Palaearctic, Nearctic and Oriental Regions. British Isles. Denmark, Finland (north to Ostrobothnia *media*) and Sweden (north to Torne Lappmark).

25. *Helicophagella noverca* (Rondani)

Sarcophaga noverca Rondani, 1860

Material: NSY, Meløy: Storglomvatn (above tree-line at about 520 m). EIS 126?

Note. In dorsal view first genital segment (T7 + 8) of examined male specimen with large circular dusted spot surrounded by narrow band of black gloss, hind margin dusted, the marginal setae hairlike and long. Terminalia dissected.

Biology. Bred from a dead *Helix* sp. (Schmitz 1917) and from *Helix pomatia* L. (Enderlein 1928, Séguy 1941). Eberhard (1955) bred it from horse meat baits and kept it easily in culture on meat. No larval development occurred on faeces. A single specimen captured on the food-markets in Budapest (Aradi & Mihályi 1971).

Distribution. Europe (mainly in mountainous districts), Caucasus. Not on the British Isles. Not previously reported from Scandinavia. The

single, rather northern locality in Scandinavia suggests a disjunct boreo-alpine or boreo-montane distribution in Europe, even though it has been taken in Belgium (Collart 1958) and near the Polish Baltic coast (Draber-Moňko 1973a).

26. *Helicophagella rosellei* (Böttcher)

Sarcophaga rosellei Böttcher, 1912

Material: AK, Oslo: Bygdøy; Frogn: Drøbak; Bærum: Nordli NW of Østerås. OS, Ringebu: Elstad; Nordre Land: Dokka. VE, ?loc. VAY, Flekkefjord: Lauvnes. NSY, Meløy: Storglomvatn (above tree-line at about 520 m). NSI, Salt-dal: Rognan. EIS 4, 19?, 28, 45, 63, 126?, 127. Date of earliest and latest capture: 31 May, 30 July.

Biology. Unknown.

Distribution. Europe. Altai Mts in Central Asia. British Isles. Northern Sweden (Härjedalen, Jämtland, Ångermanland, Torne Lappmark). A disjunct boreo-alpine or boreo-montane distribution in Europe.

Genus *Thyrsoctema* Enderlein, 1928

27. *Thyrsoctema incisilobata* (Pandellé)

Sarcophaga striata Meigen, 1826, preocc. in *Sarcophaga* by *Musca striata* Fabricius, 1794 (= *Ravinia pernix* Harris); *Sarcophaga incisilobata* Pandellé, 1896; *Sarcophaga privigna* Pandellé, 1896, preocc.

Material: AK, Oslo: Bekkelaget, Hovedøya, Oslo; Frogn: Sønderstøa Degerud; Bærum: Øverland. OS, Sør-Fron: Harpefoss; Øyer: Øyer. ON (OS?), «Fron» (Nord-Fron or Sør-Fron): ?loc. BØ, Lier: Gjellebekk; Røyken: ?loc. BV, Ål: Torpo. VE, Brunlanes: Mølen. TEI, Sauherad: Nordagutu; Kviteseid: Lauve, Skredi; Tokke: Lårdal. VAY, Flekkefjord: Hidra (Dragøy, Kirkhamn, Kråkedal). RY, Sandnes: Sviland. RI, Forsand: Songesand. HOI, Granvin: Skjervet. EIS 4, 7, 11, 17, 18, 28, 41, 43, 54, 62.

Date of earliest and latest capture: 8 June, 11 Aug.

Biology. Larvae coprophagous, also reported to parasitise a grasshopper (Séguy 1941). Bred from a snail (Keilin 1919, Rodendorf 1967). Adults attracted to faeces, meat and dead snails (Kirchberg 1954, Gregor & Povolný 1961).

Distribution. Palaearctic Region east to Central Asia. British Isles. Denmark, Finland (north to Karelia *borealis*) and Sweden (north to Jämtland).

28. *Thyrsochnema kentejana* Rodendorf
Thyrsochnema kentejana Rodendorf, 1937; *Thyrsochnema kentejana lapponica* Tiensuu, 1939
Material: NSI, Grane: Majavatn (310 m). EIS 111.

Date of capture: 22 July.

Biology. Unknown.

Distribution. North China, Mongolia, USSR (South Siberia, Indigirka Basin, Sikhote-Alin), Central Europe (Romania). Not on the British Isles. Finland (Lapponia inarensis) and North Sweden (south to Härjedalen). A disjunct boreo-alpine distribution in Europe.

Genus *Bellieromima* Rodendorf, 1937
Bellieromima Rodendorf, 1937, as subgenus of *Thyrsochnema*.

29. *Bellieromima subulata* (Pandellé)
Sarcophaga subulata Pandellé, 1896; *Sarcophaga laciniata* Pandellé, 1896.

Material: AK, Oslo: Bygdøy. EIS 28.

Date of capture: 25 June.

Biology. Unknown.

Distribution. Europe, Caucasus. British Isles. Denmark, Finland (Nylandia) and Sweden (Skåne, Ångermanland).

Genus *Pierretia* Robineau-Desvoidy, 1863
Thyrsochnema: Rodendorf 1937, in part.

30. *Pierretia clathrata* (Meigen)
Sarcophaga clathrata Meigen, 1826; *Sarcophaga hinei* Aldrich, 1916

Material: HEN, Åmot: ?loc. VE, Hof: Thorrud. TEI, Kviteseid: Skredi; Fyresdal: between Aslestad and Slystøyl (650 m); Tokke: Dalen. VAY, Flekkefjord: Nuland. HOI, Granvin: Eide. EIS 4, 16, 17, 28, 41, 64?

Date of earliest and latest capture: 24 June, 28 July.

Biology. Bred from egg-sacks of «*Epeira cornuta*» (= *Araneus cornutus* Clerck, 1757 of Locket & Millidge 1953) (Mik 1890, Lundbeck 1927) and *Clubiona* sp. (Grunin 1964), and from grasshoppers (Séguy 1941).

Distribution. Palaearctic and Nearctic Regions. British Isles. Denmark, Finland (north to Lapponia enontekiensis) and Sweden (north to Torne Lappmark).

31. *Pierretia soror* (Rondani)
Sarcophaga soror Rondani, 1860
Material: AK, Oslo: Tøyen; Bærum: Nordli NW of Østerås, Østerås. BØ, Røyken: Slemmestad; Hurum: Filtvet. EIS 28.

Date of earliest and latest capture: 30 May, 11 Aug.

Biology. Occasional parasite «de l'escargot» (Séguy 1941), of *Helix aspersa* (Rodendorf 1967, Draber-Moňko 1978).

Distribution. Europe, Caucasus. British Isles. Denmark and Sweden (Skåne, Gotland).

Genus *Discachaeta* Enderlein, 1928

32. *Discachaeta pumila* (Meigen)
Sarcophaga pumila Meigen, 1826
Material: AK, Oslo: Hovedøya, Tåsen; Bærum: Nordli NW of Østerås, Østerås. BØ, Røyken: Slemmestad. EIS 28.

Date of earliest and latest capture: 15 July, 16 Aug.

Biology. Unknown.

Distribution. Europe. North Africa. British Isles. Denmark, Finland (north to *Tavastia borealis*) and Sweden (north to Uppland).

Genus *Heteronychia* Brauer & Bergenstamm, 1889

Pierretia: Rodendorf 1937 (misidentification)

33. *Heteronychia boettcheriana* (Rodendorf)
Pierretia (s.str.) *boettcheriana* Rodendorf, 1937
Material: TEI, Tokke: Lårdal. EIS 17.

Date of capture: 4 July.

Biology. Unknown.

Distribution. Europe, Caucasus. Not on the British Isles. Not previously known from Scandinavia. Séguy (1941) reports it north to South Sweden, but his source appears to be Lundbeck's (1927) information concerning «*offuscata*», listed as a synonym by Séguy. Lundbeck's *offuscata* has the postabdomen black and is not the present species (probably *obscurata* Rodendorf).

34. *Heteronychia haemorrhoea* (Meigen)
Sarcophaga haemorrhoea Meigen, 1826
Material: AK, Oslo: Bekkelaget, Grefsen; Frogn: Drøbak, Sønderstøa Degerud; Bærum: Høvik, Nordli NW of Østerås, Østerås. VE, ?loc. TEI, Tokke: Lårdal. VAY, Mandal: Mandal. EIS 2, 17, 19?, 28.

Date of earliest and latest capture: 10 June, 27 Aug.

Biology. Bred from *Cepaea hortensis* (L.) (Mik 1890, Schmitz 1917, Keilin 1919).

Distribution. Europe. British Isles. Denmark, Finland (Ålandia) and Sweden (north to Uppland).

35. *Heteronychia obscurata* (Rodendorf)
Pierretia (s.str.) *obscurata* Rodendorf, 1937
Material: AK, Bærum: Øverland. EIS 28.
Date of capture: 23 June.
Note. Ringdahl (1944b) recorded a male from AK, Bærum: Høvik 16 Aug. 1935 (EIS 28). The specimen was not in the museum collections examined.
Biology. Unknown.
Distribution. Palaearctic and Oriental Regions. British Isles. Denmark, Finland (Regio Aboensis) and Sweden (north to Härjedalen).

36. *Heteronychia ostensackeni* (Rodendorf)
Pierretia s.str. *osten-sackeni* Rodendorf, 1937
Material: AK, Oslo: Bekkelaget. EIS 28.
Date of capture: 27 Aug.
Note. The two specimens (Oslo collection nos. 7764 (♂), 7763 (♀)) were associated in the original drawer and stood under the name «*Sarcophila latifrons* Fall.» Both sexes carry identical labels in Siebke's handwriting «Bæklag 27.8.46». The vein r_1 has a single seta on the upper wing surface in both specimens. Each measures 4 mm.
Biology. Unknown.
Distribution. Czechoslovakia, Poland (Pienin), West Germany (Heidelberg, terra typica) (Draber-Moňko 1978). Not previously known from Scandinavia. The few records available suggest a boreo-alpine or boreo-montane distribution in Europe.

37. *Heteronychia vagans* (Meigen)
Sarcophaga vagans Meigen, 1826; *Sarcophaga frenata* Pandellé, 1896; *Sarcophaga cruenta* Pandellé, 1896
Material: Ø, Halden: near Halden. AK, Oslo: Oslo, Tåsen; Bærum: Nordby gård. HEN, Åmot: ?loc. OS, Lillehammer: Maihaugen in Lillehammer, near Gausa river by Flåkåli bru W of Fåberg; Sør-Fron: E of Hundorp. ON, Nord-Fron: 3 km E of Vinstra. BØ, Ringerike, Løvli. VE, ?loc. TEI, Kviteseid: Heggtveit, Skredtveit; Tokke: Lårdal. HOY, Bergen: Fantoft; Samnanger: Ådland. SFI, Aurland: Fretheim. NSI, Saltdal: Saltfjell. TRY, Tromsø: Tromsøya. EIS 17, 20, 28, 30, 36, 40, 41, 54, 62, 63, 64?, 127?, 162.
Date of earliest and latest capture: 11 June, 1 Aug.
Note. The female recorded by Rognes (1982) from Dovre is not accepted here.
Biology. Bred from snails of the family Succineidae (Verves 1976).
Distribution. Palaearctic Region. British Isles.

Denmark, Finland (north to Lapponia inarensis) and Sweden (north to Torne Lappmark). Reported from above tree-line in Jämtland (Sweden) (Ringdahl 1951).

38. *Heteronychia vicina* (Macquart)
Sarcophaga vicina Macquart, 1835; *Sarcophaga ebrachiata* Pandellé, 1896
Material: AK, Bærum: Nordby gård. HEN, Åmot: ?loc. OS, Gausdal: Aulestad; Nordre Land: 3 km N of Dokka. ON, Vang: Øylo. VAY, Flekkefjord: Rasvåg. VAI, Kvinesdal: Gjemlestad. RY, Karmøy: Kopervik. RI, Forsand: towards Prekestolen. STI, Oppdal: Kongsvoll (Blesbekken). NSY, Bodø: Bodø. EIS 4, 7, 13, 28, 45, 52, 54, 64?, 79, 130.
Date of earliest and latest capture: 18 May, 11 Aug.
Note. Ringdahl's male specimen (1944b, as «*?ebrachiata*») from TRY, Karlsøy: Måkeskjær (EIS 170) could not be found in the Tromsø or other Norwegian collections. The identification is queried by Ringdahl himself so it should probably not be accepted. The recorded from ON, Dovre: Hjerkin (EIS 71?) (Ringdahl 1954) is accepted.

Biology. Unknown.
Distribution. Mountainous regions in Central Europe, Caucasus. British Isles. North Sweden (Torne Lappmark south to Härjedalen). Recorded from above the tree-line in Jämtland (Sweden) (Ringdahl 1951). A disjunct boreo-alpine distribution in Europe.

Genus *Parasarcophaga* Johnson & Tiegs, 1921

39. *Parasarcophaga aratrix* (Pandellé)
Sarcophaga aratrix Pandellé, 1896
Material. AK, Oslo: Sognsvatn. OS, Sør-Fron: E of Hundorp. AAY, Hisøy: Hisøy. VAY, Kristiansand: Vrånes. HOY, Fitjar: ?Fitjar. EIS 2, 6, 22, 28, 63.
Date of earliest and latest capture: 21 June, 22 July.
Biology. Bred from *Lymantria monacha* L. (Lepidoptera) and *Prionus coriarius* L. (Coleoptera) (Lundbeck 1927, Séguy 1941), from horse meat baits (Eberhardt 1955), and from a bird bait (Kusela & Hanski 1982). Adults attracted to faeces, meat and fruits (Gregor & Povolný 1961).
Distribution. Palaearctic Region east to Kamchatka. British Isles. Denmark, Finland (north to Ostrobotnia borealis) and Sweden (Skåne, Småland).

40. *Parasarcophaga emdeni* Rodendorf

Sarcophaga teretirostris: Lundbeck 1927, *Parasarcophaga* (*Liosarcophaga*) *teretirostris*: Rodendorf 1937, not Pandellé (misidentifications); *Parasarcophaga emdeni* Rodendorf, 1959, nomen nudum; *Parasarcophaga emdeni* Rodendorf, 1969, 1970

Note. Previously some confusion existed as to the correct use of the name *teretirostris* Pandellé, 1896. Emden (1954) and Rodendorf (1969, 1970) applied it to the species described as *kroeberti* Rodendorf, 1937. Rodendorf (1969, 1970) introduced the name *emdeni* for the species misidentified as «*teretirostris*» in his 1937 work. See Povolný & Slamečková (1979) for a discussion of this problem. Note that these authors miscite the date of *emdeni*, Rodendorf's paper of 1969 having apparently been overlooked. Note also that Nordic records of «*teretirostris*» (Tiensuu 1939, Hedström 1964, Brander 1964, Ringdahl 1952) probably all refer to *emdeni*. The true *teretirostris* is apparently absent from the Nordic countries but occurs in Western Europe from the British Isles southwards to Spain, and also in E. Germany and Poland (Povolný & Slamečková 1979). Hackman (1980) appears to regard the names as synonyms, though provides both names with a question-mark.

Material. TEI, Tokke: Lårdal. EIS 17.

Date of capture: 1 July.

Biology. Adults attracted to faeces (Rodendorf 1959). Collected on the food-markets in Budapest (Aradi & Mihályi 1971). Breeds in dead *Helicella candicans* (Verves & Kuz'movich 1979). This snail does not occur in Norway (Kerney & Cameron 1979, as *H. obvia*).

Distribution. Palaearctic Region (including North Africa) east to Altai Mts. Not on the British Isles. Denmark, Finland (north to Ostrobothnia borealis) and Sweden (Skåne, Öland, Gotland).

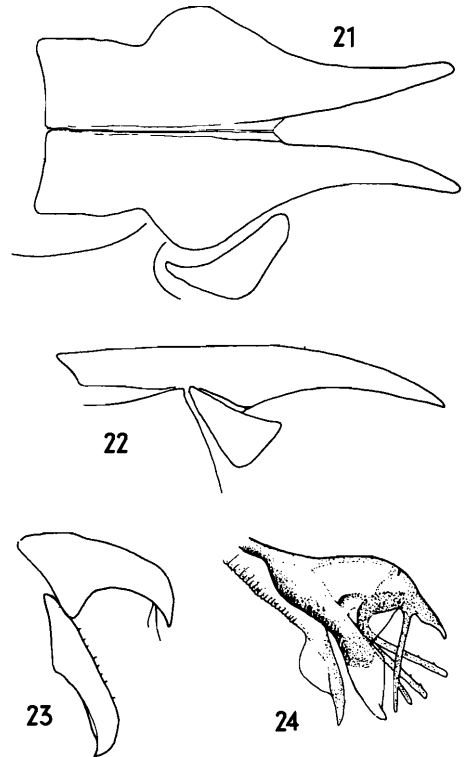
41. *Parasarcophaga pleskei* Rodendorf

Parasarcophaga (*Liosarcophaga*) *pleskei* Rodendorf, 1937; *Sarcophaga tuberosa* Pandellé ssp. *verticina* Ringdahl, 1945a, TENTATIVE N.SYN.; *Sarcophaga tuberosa* var. *harpax*: Aldrich 1916 (excluding right part of his fig. 79); *Sarcophaga harpax*: Roback 1954, Downes 1965.

Material: HEN, Åmot: ?loc. TRI, Balsfjord: Aspenes. EIS 64?, 154.

Dates of capture: The specimen from Aspenes has been captured 11 July.

Notes. The male specimen from Aspenes, which has the genitalia extended and fully visible, has



Figs. 21—24. *Parasarcophaga pleskei* (Rodendorf, 1937). 21 — Cerci, posterior view, 22 — Cerci and surstyli, left lateral view, 23 — pregonite and postgonite, left lateral view, 24 — phallosome, distal half, left lateral view (both styli shown), (Åmot).

been identified and published by Ringdahl (1944b) as *Sarcophaga tuberosa* Pand. The specimen from Åmot has been dissected by me (Figs. 21—24). Note that in most specimens I have examined (not the one figured) there is a slight bulge distally on the lower edge of the cerci as seen in profile as shown in Rodendorf's (1937) fig. 328. I have examined 4 ♂♂ (Museum of Zoology, Lund) from Torne Lappmark (labelled «Abisko» and «Jebrenj.») (Sweden) (Ringdahl leg.) identified as *tuberosa* Pand. (according to labels) by Ringdahl and placed in his collection as *tuberosa* spp. *verticina*. The genitalia which are in an extended position are closely similar to those of the Norwegian specimens. Recently I have collected 2 ♂♂ on Newfoundland (Canada) which also are conspecific with the Norwegian material. They fit Aldrich's (1916) and later American authors' concept of «*harpax*», and G.E. Shewell, Ottawa, has identified my specimens as such. Note that this con-

cept of «*harpax*» is quite different from that of Rodendorf (1937), Gregor & Povolný (1961), Kano, Field & Shinonaga (1967) and Mihályi (1979c).

Biology. Unknown.

Distribution. Caucasus, Central Asia, China (Rodendorf 1937, Fan 1965, Verves 1978d). Sweden (Torne Lappmark, Härjedalen) (alpine and subalpine zones). Also in North America (according to own specimens from Newfoundland, see above).

42. *Parasarcophaga portschinskyi* Rodendorf
Parasarcophaga (*Liosarcophaga*) *portschinskyi*
Rodendorf, 1937.

Material: TEL, Tokke: Lårdal. EIS 17.

Date of capture: 4 July.

Biology. Larvae coprophagous (Rodendorf 1959). Adults attracted to meat baits (Gregor & Povolný 1961). Also collected on food-markets in Budapest (Aradi & Mihályi 1971). «The larvae are necrophagous and may be facultative predators of butterfly larvae.» (Rodendorf & Verves 1978). «... can be reared with decomposing animal matter in the laboratory. Sometimes... parasites of lepidopterous larvae.» (Zhang 1982).

Distribution. Palaearctic Region east to China. Not on the British Isles. In the Nordic countries previously listed only from Finland (Hackman 1980). I have collected a male in Denmark (East Jutland, Mols Bjerger 12 July 1979), and in the Bergen collection is a male from Sweden (Lule Lappmark, Messaure 1—8 July 1974, K. Müller leg.). Of 10 males in coll. Ringdahl (Lund) positioned under the name «*tuberosa* Pand.», 9 belonged to the present species (the 10th was *similis* Meade, see below). They were from Skåne, Uppland and Öland. Thus the species is probably widely distributed in the Nordic countries.

43. *Parasarcophaga similis* (Meade)

Sarcophaga similis Meade, 1876; Pandellé, 1896; *Sarcophaga appendiculata* Kramer, 1905
Material: Ø, Onsøy: Ramseklo. AK, Frog: Sønderstøa Degerud. AAY, Grimstad: Skiftenes. EIS 6, 20?, 28.

Date of earliest and latest capture: 5 July, 8 Aug. Note. The specimen from Sønderstøa has been published by Ringdahl (1944b) as *scoparia* Pand.

Biology. Bred from larvae of *Mamestra oleracea* L. (Lepidoptera) and from a dead nestling of *Delichon urbica* L. (Tiensuu 1939). Visits faeces, apparently only for nutritive purposes (Kirchberg 1954). Attracted to and reared from meat

baits (including liver, horse meat, dead snails) (Kirchberg 1954, Eberhardt 1955, Gregor & Povolný 1961, Mihályi 1965, Hanski 1976, Hanski & Kuusela 1977, 1980). «... one of the most common sarcophagid flies in Japan... Larvae breed in garbage, dead animals, animal excrement and occasionally in lavatories. Some cases of intestinal myiasis... have been reported in Japan.» (Kano, Field & Shinonaga 1967).

Distribution. Palaearctic and Oriental Regions. British Isles. Finland (Nylandia, Tavastia australis), Sweden (I have examined a male from Uppland, Sandhamn 21 July 1929, Ringdahl leg., misidentified as *tuberosa* by Ringdahl, see above under *P. portschinskyi*) (not recorded by Ringdahl 1952), but not reported from Denmark.

Genus *Robineauella* Enderlein, 1928

44. *Robineauella scoparia* (Pandellé)

Sarcophaga caerulea Zetterstedt, 1838, teste Ringdahl 1944a, 1945a, 1945b, 1952; *Sarcophaga scoparia* Pandellé, 1896; *Sarcophaga scoparia nearctica* Parker, 1916.

Notes. I have retained Pandellé's name pending a modern revision of all Zetterstedt's types. I have also examined 2♂♂ of *nearctica* from Newfoundland (Canada). They have the epanthrium and partly the T7 + 8 red but otherwise the terminalia appear identical with those of the Norwegian specimens.

Material: Ø, Marker: Flagghytta. AK, Oslo: Alunnsjøen. HES, Stange: Stange. HEN, Åmot: ?loc. BØ, Øvre Eiker: Burud, Ulleland. TEL, Kviteseid: Skredi; Tokke: Dalen, Lårdal. AAY, Hissøy: Ramsø. AAI, Evje og Hornnes: Hornnes. OS, Ringebu: Elstad. EIS 5, 6, 16, 17, 21?, 27, 28, 46, 64?

Date of earliest and latest capture: 28 June, 7 Aug.

Biology. Larvae predatory on immature stages of other insects (Rodendorf 1959). Adults breed in animal corpses (Sýchevskaya 1970). The larvae are necrophagous and facultative predators of butterfly pupae (Rodendorf & Verves 1978). Adults attracted to and reared from meat baits (Eberhardt 1955, Gregor & Povolný 1961, Mihályi 1965, Hanski & Kuusela 1977, 1980, Kuusela & Hanski 1982). Kept in culture on meat, no development occurred on faeces (Eberhardt 1955). Parker (1916) reports that «specimens captured by Metz larviposited on dung and refuse», and that another one «was captured on cow manure».

Distribution. Palaearctic and Nearctic Regions. British Isles. Denmark, Finland (north to Lappo-

nia inarensis) and Sweden (north to Torne Lappmark).

Genus *Sarcophaga* Meigen, 1826

45. *Sarcophaga carnaria* (L.)

Musca carnaria Linné, 1758; *Sarcophaga atropos* Meigen, 1826; *Sarcophaga carnaria*: Patton 1934: 582, fig. 3; *Sarcophaga carnaria carnaria*: Rodendorf 1937; ?*Sarcophaga carnaria* spp. *vulgaris*: Kirchberg 1954: 110, Abb. 2.

Note. Kirchberg (1954) has apparently mixed up the names in the legends to his figures 1 and 2 (p. 110). I disagree with Lehrer (1973) who identifies Kirchberg's fig. 2 as *lehmanni*. I find the styli too large and the apical tooth on the cerci in profile view too little developed to belong to that species. The figure shows the typical appearance of a dried *carnaria* phallosome.

Material: Ø, Halden: Halden; Hvaler: ?loc.; Kråkerøy: Glombo. AK, Oslo: Bygdøy, Hovedøya, Sognsvatn, Tøyen, Tåsen; Ås: Landbrukshøgskolen; Frogn: Sønderstøa Degerud; Bærum: Høvik, Nordby gård, Nordli NW of Østerås, Ostøya, Steinshøgda, Østerås. HEN, Åmot: Ygle, ?loc. OS, Lillehammer: Lillehammer, near Gausa river by Flåkåli bru; Sør-Fron: E of Hundorp; Gausdal: Svatsum; Nordre Land: Dokka, 3 km N of Dokka; Nord-Aurdal: Between Fagernes and Leira. ON, Sel: Lårgård. BØ, Kongsberg: Efteløt, Hvittingfoss, Komnes, Kongsberg; Lier: Lahell; Hurum: Filtvedt. BV, Hol: Hovet; Rollag: Rollag st., Rollag, Øyi. VE, Sem: Jarlsberg, Teigen; Tjølling: Bisjord, Gon; Hedrum: Vestmarka. TEY, Kragerø: Kragerø; Drangedal: Tørnes. TEI, Bø: Øvrebø; Sauherad: Nordagutu; Tinn: Rjukan; Kviteseid: Skredi; Tokke: Dalen, Lårdal. AAY, Tvedestrand: Dypvåg; Tromøy: Tromøy kirke, 2.5 km N of Tromøy kirke; Hisøy: Hisøy. AAI, Evje og Hornnes: Hornnes; Bygland: Bygland. VAY, Kristiansand: Randsund, Stangenes; Mandal: Lindland (near Møll), Mandal (Kvisla, Rona); Flekkefjord: Hidra (Dragøy, Kirkhamn, Rasvåg). VAI, Kvinesdal: Foseland, Gjemlestad. RY, Sandnes: Austrått, Bogafjell, Bråstein, Eltravåg, Gisketjønn, Hetli, Stølsvik, Vagleskogen; Stavanger: Byhaugen, Forus, Gosen, Krossberg, Kvernevikskogen, Madlalia, Sunde, Tjensvoll, Ullandhaug; Hå: Ognå; Klepp: Øksnevad; Rennesøy: between Dale and Sel, Hodne. RI, Hjelmeland: Hjelmeland. HOY, Bergen: Fjøsanger, Nesttun, Storetveitmarken; Fitjar: ?Fitjar; Askøy: ?loc. HOI, Ullensvang: Dønno; Granvin: Eide, Skjervet. SFY, Gloppen: Sandane. SFI, Stryn: Innvik. MRI, Rauma: Lerheim. NSY, Sømna: Sandvåg;

Brønnøy: Hommelstø. NSI, Rana: Grønli (i Røvasdalen). TRY, Tromsø: Tromsø. TRI, Målselv: Målsnes. EIS 2, 3, 4, 5, 6, 7, 9, 11, 12, 14, 16, 17, 18, 19, 20, 22?, 26, 27, 28, 30, 35, 39, 41, 43, 45, 53, 54, 55, 63, 64?, 68, 71, 77, 110, 114, 123, 154, 162.

Date of earliest and latest capture: 20 May, 3 Sept.

Biology. Larvae apparently obligatory parasites of earthworms and unable to develop in other media under natural conditions (Eberhardt & Steiner 1952, Kirchberg 1954, Eberhardt 1955, Kirchberg 1961, Viktorov-Nabokov & Verves 1975, Rodendorf & Verves 1978). As hosts are known *Allolobophora chlorotica* (Savigny, 1826) and *A. rosea* (Savigny, 1826) (Kirchberg 1961). According to the distribution of these earthworms in Norway (cf. Stöp-Bowitz 1969) other species must also serve as hosts for *carnaria* in this country. Adults attracted to faeces, meat (including dead snails) and fruits, probably for nutritive purposes only (Kirchberg 1954, Gregor & Povolný 1961, Mihályi 1965). Captured on the food-markets in Budapest (Aradi & Mihályi 1971). A case of cannibalism (larvae devouring parts of mother) is reported by Draber-Moňko (1937b). The larvae were subsequently fed on bird liver and adults successfully reared from them.

Distribution. Palaearctic Region east to Kamchatka and Vladivostok (cf. map in Verves 1980d). Not in Japan. Séguy's (1941) record from Réunion (Afrotropical Region) not listed by Dear (1980). British Isles. Denmark (according to specimens in my own collection), Finland (north to Savonia borealis and Karelia borealis). Published records from Sweden by Ringdahl are unreliable as *lehmanni* and *schulzi* are not kept apart from *carnaria* in his works, but probably occurs all over the country.

46. *Sarcophaga lehmanni* Mueller

Sarcophaga lehmanni Mueller, 1922; *Sarcophaga carnaria meridionalis* Rodendorf, 1937

Material: AK, Oslo: Bekkelaget. ON, Sel: Lårgård. ON or OS: Nord-Fron or Sør-Fron: ?loc. VE, Larvik: Larvik; Sem: Jarlsberg. EIS 19, 28, 62?, 71.

Date of earliest and latest capture: 10 July, 27 Aug.

Biology. Breeds in earthworms (Viktorov-Nabokov & Verves 1975). Adults attracted to meat and faeces (Gregor & Povolný 1961).

Distribution. Palaearctic Region east to central Asia. Not on the British Isles. Denmark (according to specimen captured by myself in East Jut-

land), Finland (Nylandia, Karelia australis), Sweden (according to specimen in British Museum (Natural History), London, from Skåne, Rövarekulan 2 Aug. 1980, A.C. Pont leg., which I have dissected and identified as the present species). Danish and Swedish collections are in need of revision. The specimen from Lårgård is the northernmost known (cf. Tiensuu 1939 and map in Verves 1980d).

47. *Sarcophaga schulzi* Mueller

Sarcophaga carnaria varietas *schulzi* Mueller, 1922; *Sarcophaga carnaria*: Patton 1934: 581, fig. 2; *Sarcophaga subvicina vulgaris* Rodendorf, 1937; *Sarcophaga carnaria* f. *vulgaris*: Emden 1954: 116, fig. 39 G; *Sarcophaga carnaria*: Kirchberg 1954: 110, Abb. 1; *Sarcophaga dolosa* Lehrer, 1967

Material: Ø, Fredrikstad: Øra. AK, Oslo: Bygdøy, Oslo; Bærum: Østerås. HES, Elverum: Grundset. HEN, Stor-Elvdal: Koppang. BØ, Modum: ?loc. AAY, Hisøy: Hisøy. VAY, Kristiansand: Hamre. RI, Suldal: Sandsa. HOY, Bergen: Stend. SFI, Leikanger: Fylkesgården (near Nybø). EIS 2, 6, 15, 20, 28, 30, 50, 55, 64.

Date of earliest and latest capture: 21 May, 1 Aug.

Biology. Larvae parasitic in earthworms (Kirchberg 1954, Grunin 1964). Adults attracted to faeces and meat (including dead snails) (Kirchberg 1954, Gregor & Povolný 1961).

Distribution. Palaearctic Region east to Altai Mts. British Isles. In the USSR north to the Kola Peninsula (Verves 1981b). Finland (north to Tavastia borealis and Savonia borealis), Sweden (according to specimen from Uppland, Ledsundet W of Öregrund 15 — 16 July 1980, A. C. Pont leg., in British Museum (Natural History), London, which I have dissected and identified as the present species). Probably mixed with *carnaria* and *lehmanni* in Danish and Swedish collections.

48. *Sarcophaga subvicina* Rodendorf

Sarcophaga vicina Villeneuve, 1899, preocc.; *Sarcophaga subvicina subvicina* Rodendorf, 1937.

Material: AK, Oslo: Bygdøy; Bærum: Høvik, Nordby gård, Ostøya; Asker: Brønnøya. OS, Ringebu: Elstad. BØ: Drammen: Drammen. TEI, Tokke: Lårdal. VAY, Mandal: Mandal. RY, Sandnes: Austrått, Bogafjell, Melsheia, Stølsvik; Stavanger: Forus, Godalen, Gosen, Krossberg, Lille Stokkavatn, Madlalia, Sunde, Tjensvoll, Ullandhaug; Klepp: Øksnevad; Strand: 1 km E of Jøssang; Rennesøy: between

Dale and Sel, Hodnefjell; Karmøy: Kopervik. HOY, Bergen: Espegrend, Fana kirke, Fjøsanger, Grønnestølen, Hop, Myravatn (Tveiterås), between Råtål and Stend, Storetveit, Åstveit; Fitjar: ? Fitjar; Samnanger: Ådland; Askøy: Herdla. SFI, Leikanger: Njøs. MRI, Rauma: Lerheim. NTI, Steinkjer: Gulbergaunet. NSY, Bodø: Bodø. EIS 2, 7, 13, 14, 17, 22?, 28, 30, 39, 40, 50, 63, 77, 101, 130.

Date of earliest and latest capture: 11 May, 29 Sept.

Biology. Adults attracted to faeces and dead snails, apparently for feeding only (Kirchberg 1954).

Distribution. Palaearctic Region east to Ural and Caucasus. Vladivostok. In the USSR north to Leningrad region (Verves 1981b). British Isles. Denmark, Finland (north to Tavastia australis) and Sweden (Skåne, Dalarna). The record from Bodø appears to be the northernmost known. *S. subvicina* is the most common sarcophagid in the coastal areas of Western Norway.

Genus *Ravinia* Robineau-Desvoidy, 1863

49. *Ravinia pernix* (Harris)

Musca pernix Harris, 1780; *Musca striata* Fabricius, 1794, preocc.; *Sarcophaga haematodes* Meigen, 1826; *Ravinia striata*: Rodendorf, 1937, 1970.

Material: Ø, Halden: near Halden. AK, Oslo: Tøyen; Frogn; Sønnerstøa Degerud; Bærum: Nordli NW of Østerås. HES, Elverum: Grundset. ON, Vågå: Vågåmo; Sel: Lårgård; Vang: Nystuen. BØ, Ringerike: Hønefoss; Flesberg: Hvila. VAY, Mandal: Mandal. EIS 2, 20, 27, 28, 36, 52, 55, 71.

Date of earliest and latest capture: 5 July, 9 Aug. Biology. Breeds in faeces, also human (Kirchberg 1954, Mihályi 1965, Sýchevskaya 1970). Occasional producer of intestinal myiasis in man (Rodendorf & Verves 1978). Bred from snails, grasshoppers and a beetle (Séguy 1941, Rodendorf & Verves 1978). Adults attracted to faeces, meat and fruits (Eberhardt 1955, Gregor & Povolný 1961). Captured on the food-markets in Budapest (Aradi & Mihályi 1971). «... breeds in human faeces and dead animals in nature and is easily reared from such media in the laboratory» (Kano, Field & Shinonaga 1967).

Distribution. Palaearctic and Oriental Regions. British Isles. In the USSR north to the Arctic Circle near the Kola Peninsula (Verves 1981b). Denmark, Finland (north to Lapponia kemensis) and Sweden (north to Lule Lappmark).

Notes on other species

Below are given some annotations concerning species recorded from Norway by Ringdahl (1952), but which I do not accept as belonging to the Norwegian fauna on the basis of presently available evidence. However, they may ultimately be captured in this country.

Hilarella hilarella (Zetterstedt, 1844)

Recorded from Norway by Ringdahl (1952: 147, No. 325). The record is probably based on Siebke (1877: 90, as *Miltogramma hilarella*) who reports to have taken a female «Ad Christianiam in horto botanico. . . 14 August 1850». No corresponding specimen could be traced in the Oslo museum, neither is there any evidence in the museum correspondence that Ringdahl ever received any specimen under this name for identification. As Siebke's collection was rearranged by W.M. Schøyen after its reception by the museum (cf. Natvig 1943), the specimen actually before Siebke may be impossible to locate. Record not accepted.

Phrosinella nasuta (Meigen, 1824)

Recorded from Norway by Ringdahl (1952: 147, No. 323). Record probably based on holotype of *Tachina pilitarsis* Zetterstedt, 1844 from Norway (cf. Siebke 1877: 81) erroneously synonymised by Ringdahl with *nasuta* Meigen. See above under 9. *Phrosinella sannio*. Record not accepted.

Angiometopa ruralis (Fallén, 1817)

Recorded from Norway by Ringdahl (1952: 147, No. 309). The record is probably based on Siebke (1877: 96, as *Sarcophaga ruralis*) who reports to have captured a female «ad Aaset in par. Aamodt Østerdaliae 27 Juli 1870. . .». In the Oslo collection a single specimen (No. 7749) stood under the name *Sarcophaga ruralis* Fall. It was labelled (1) «Aamot» (2) «Siebke» and must be the one referred to by Siebke (l.c.). It is a female *Billaea triangulifera* (Zetterstedt) (Tachinidae). Record not accepted.

Brachicoma devia borealis Ringdahl, 1932

Recorded from Norway by Ringdahl (1944b, 1952). I have seen the specimen on which this record was based. See above under 17. *Brachicoma devia*.

Miltogramma oestraceum (Fallén, 1820).

Recorded from Norway by Ringdahl (1952: 147, No. 312). The record is probably based on

Siebke (1877: 90) who cites two localities, i.e. Kongsvinger, and Sarpsborg. The specimen from Sarpsborg could not be found in the collection. The specimen from Kongsvinger is a female *Miltogrammidium brevopilum*. See above under that name (no. 7).

ZOOGEOGRAPHIC DISCUSSION

The highest number of sarcophagid species are known from the southern or south-eastern parts of Norway (Fig. 25), which have the highest summer temperatures (Abrahamsen et al 1977, Gjessing & Ouren 1983). This is in accordance with the distribution of sarcophagids in Finland and Sweden (Tiensuu 1939, Ringdahl 1952).

The Norwegian species can be divided into four groups according to their presently known distribution in Norway. However, as the number of specimens captured in Norway is very low, the presented picture is likely to undergo considerable changes in the future. (1) Widely distributed species: 2. *Metopia argyrocephala*, 3. *M. campestris*, 17. *Brachicoma devia*, 23. *Helicophagella crassimargo*, 26. *H. rosellei*, 37. *Heteronychia vagans*, 38. *H. vicina*, 41. *Parasarcophaga pleskei*, 45. *Sarcophaga carnaria* and 48. *S. subvicina*. (2) Species known only from Northern Norway: 25. *Helicophagella noverca* and 28. *Thyrocnema kentejana*. (3) Species known only from Western Norway: 20. *Blaesoxipha rossica* and 22. *Helicophagella agnata*. (4) Species known only from Southern Norway: All species not mentioned above under (1), (2) or (3). The majority of species in this fourth group is known exclusively from the southern or south-eastern parts of Norway, but about one third are known also from Western Norway.

As far as their world distribution is concerned, the Norwegian species appear to belong to three distributional types: (1) Species occurring only in Fennoscandia and northern parts of the USSR. Only one species, the miltogrammine *Phrosinella sannio* belongs here. Its closest relatives, judged by the apomorphic fore tarsus in the males, live in North America. (2) Species with disjunct northern and southern distributional areas in Eurasia (boreo-alpine or boreo-montane distribution). Six species belong here, viz. 25. *Helicophagella noverca*, 26. *H. rosellei*, 28. *Thyrocnema kentejana*, 36. *Heteronychia ostensackeni* (?), 38. *H. vicina* and 41. *Parasarcophaga pleskei*. (3) Species with a more or less continuous southern distribution in Europe or Eurasia, reaching north to the lowlands of



Fig. 25. Number of sarcophagid species recorded from each square of the EIS system for Norway.

Southern Norway to a greater or lesser extent, sometimes high into the mountains or farther north, often synanthropic. The 42 remaining species belong to this group. No doubt several zoogeographical groups are included within this concept «southern» (cf. e.g. Rodendorf 1959), but an analysis is not possible on the basis of the material at hand.

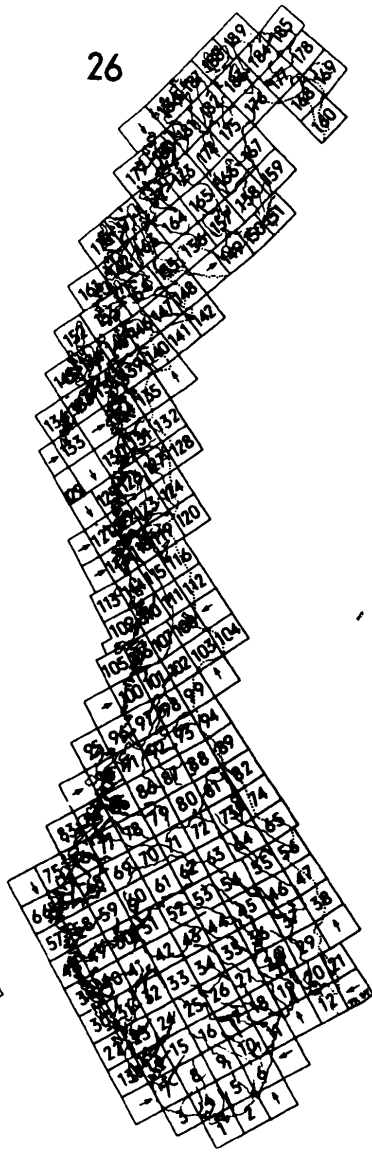


Fig. 26. The numbered squares of the EIS system for Norway.

Note on *Helicobosca palpatis* (Robineau-Desvoidy, 1830)

I consider the genus *Helicobosca* Bezzi, 1906 as belonging in the Calliphoridae (see above, Introduction, Paramacronychiinae). For convenience, data on the known Norwegian material is presented below.

Material. VE, ?loc. AK, Bærum: Steinshøgda, Ostøya. TEI, Tokke: Dalen. NSI, Saltdal: Rognan. EIS 16, 19?, 28, 127.

Date of earliest and latest capture: 19 June, 29 July.

Note. The specimens from VE, labelled «*Theria muscaria* Meig.» in Bidenkap's hand, have apparently never been published. As they do not carry Ringdahl's determination labels, they are probably not the source for Ringdahl's (1952) listing of the present species from Norway. Most probably Ringdahl's source is Siebke's record (1877: 96, as *Sarcophaga muscaria* Meig.) from «Løiten Hedemarkiæ 15 Juli 1870». In the Oslo collection a specimen stood under *Theria muscaria* Meig. labelled (1) Løiten (2) Siebke (No. 7766) which must be the specimen referred to by Siebke. It is a female *Billaea triangulifera* (Zetterstedt) (Tachinidae).

Distribution. Western Palaearctic Region, east to Altai (Verves 1982a). British Isles. Denmark, Finland and Sweden (north to Jämtland and Ångermanland).

ACKNOWLEDGEMENTS

Many thanks are due to L. Greve Jensen, Museum of Zoology, Bergen, J.E. Raastad, Museum of Zoology, Oslo, and A. Fjellberg, Tromsø Museum, for having made the collections of calypterate Diptera in their care available to me; to R. Danielsson, Lund, R. Contreas-Lichtenberg, Vienna, B. Lindeberg, Helsinki, and A.C. Pont, London, for loan of material; to A.C. Pont, L. Greve Jensen and F. Midtgaard for help with literature; to G.E. Shewell, Ottawa, for having checked my identification of some Newfoundland Sarcophagidae and for useful information; to J.-C. Léonide, Marseille, for having checked the identity of the *Blaesoxipha* material; to Torbjørn Rognes for help with the preparation of the maps; to S. Andersen, Copenhagen, T. Jonassen, F. Midtgaard, T.R. Nielsen, A.-J. Nilsen and S. Svendsen for gift of material; and to B. Sagvolden and J.H. Simonsen for letting me see their collections. The grant from Stavanger Lærerhøgskole 1982—1983 is gratefully acknowledged.

REFERENCES

- Abrahamsen, J., Dahl, E., Jacobsen, N.K., Kalliola, R., Pålsson, L. & Wilborg, L. 1977. *Naturgeografisk regionindelning av Norden*. Nordiske Utredninger 1977 no. 34, Stockholm, ISBN 91-7052-339-8, 130 pp.
- Aldrich, J.M. 1916. *Sarcophaga and allies in North America*. The Thomas Say Foundation of the Entomological Society of America, LaFayette, Indiana, 302 pp, 16 pls.
- Allen, H.W. 1926. North American species of two-winged flies belonging to the tribe Miltogrammini. *Proc. U.S. Nat. Mus.* 68 (9), 1—106.
- Aradi, M.P. & Mihályi, F., 1971. Seasonal investigations of flies visiting food markets in Budapest. *Acta Zool. Acad. Scient. Hung.* 17, 1—10.
- Bidenkap, O. 1901. Foreløbig oversigt over de i det arktiske Norge hidtil bemærkede Diptera Brachycera. *Tromsø Mus. Aarsh.* 23 (1900), 13—112.
- Böttcher, G. 1912a. Zu Meigen's und Pandellé's *Sarcophaga*-Typen nebst Anmerkungen zu Kramer's «Tachiniden der Oberlausitz». *D. ent. Zeitschr.* 1912, 343—350.
- Böttcher, G. 1912b. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. I. Allgemeines. *D. ent. Zeitschr.* 1912, 525—544.
- Böttcher, G. 1912c. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. (Dipt.) II. Spezieller Teil. *D. ent. Zeitschr.* 1912, 705—736.
- Böttcher, G. 1913a. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. (Dipt.) (Fortsetzung.). *D. ent. Zeitschr.* 1913, 1—16.
- Böttcher, G. 1913b. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. (Dipt.) (Fortsetzung.). *D. ent. Zeitschr.* 1913, 115—130.
- Böttcher, G. 1913c. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. (Dipt.) (Fortsetzung.). *D. ent. Zeitschr.* 1913, 239—254.
- Böttcher, G. 1913d. Die männlichen Begattungswerkzeuge bei dem Genus *Sarcophaga* Meig. und ihre Bedeutung für die Abgrenzung der Arten. (Dipt.) (Fortsetzung.). *D. ent. Zeitschr.* 1913, 351—378.
- Böttcher, G. 1914. *Sarcophaga lunigera* nov. spec. (Dipt.). *D. ent. Zeitschr.* 1914, 434—436.
- Brander, T. 1964. Lounais-Hämeen kärpäsistä, Brachycera (Diptera). *Lounais-Hämeen Luonto* 16, 51—69.
- Collart, A. 1954. Quelques Sarcophaginæ d'Italie (Diptera, Calliphoridae). *Bull. Ann. Soc. ent. Belg.* 90, 260—263.
- Collart, A. 1958. Notes sur la faune des Hautes-Fagnes en Beligues. *Inst. r. Sci. nat. Belg.* 34 (31), 1—5.
- Dear, J. 1980. 91. Family Sarcophagidae. — In: Crosskey, R.W. (ed.), *Catalogue of the Diptera of the Afrotropical Region*, British Museum (Natural History), London, pp. 801—818.
- Downes, W.L. 1955. Notes on the morphology and

- classification of the Sarcophagidae and other calyptrates (Diptera). *Proc. Iowa Acad. Sci.* 62, 514—538.
- Downes, W.L. 1965. Family Sarcophagidae (Stephanostomatidae, Metopiidae). — In: Stone, A., Sabrosky, C.W., Wirth, W.W., Foote, R.H. & Coulson, J.R. (eds.), *A catalog of the Diptera of America North of Mexico*, Agriculture Handbook no. 276, United States Department of Agriculture, Washington D.C., pp. 933—961.
- Draber-Mońko, A. 1964. *Pachyophthalmus distortus* All. (Diptera, Sarcophagidae) a new parasite of *Odynerus crassicornis* (Panz.) (Hymenoptera). *Bull. Acad. Pol. Sci. Cl. II, 12*, 579—582.
- Draber-Mońko, A. 1966. Bemerkungen über die paläarktischen Arten der Gattung *Pachyophthalmus* B.B. (Diptera, Sarcophagidae). *Polskie pismo ent.* 36, 395—405.
- Draber-Mońko, A. 1969. Übersicht der in Polen vorkommenden *Miltogramma*-Arten (Diptera, Sarcophagidae). *Polskie pismo ent.* 39, 321—330.
- Draber-Mońko, A. 1971. Niktore Calyptrata (Diptera) Bieszczadów. *Fragm. Faun. Warsz.* 17, 483—543.
- Draber-Mońko, A. 1973a. Przegląd krajowych gatunków z rodziny Sarcophagidae (Diptera). *Fragm. Faun. Warsz.* 19, 157—225.
- Draber-Mońko, A. 1973b. Einige Bemerkungen über die Entwicklung von *Sarcophaga carnaria* (L.) (Diptera, Sarcophagidae). *Polskie pismo ent.* 43, 301—308.
- Draber-Mońko, A. 1978. Scathophagidae, Muscinae, Gasterophilidae, Hippoboscidae, Calliphoridae, Sarcophagidae, Rhinophoridae, Oestridae, Hypoderatidae i Tachinidae (Diptera) Pienin. *Fragm. Faun. Warsz.* 22, 45—229.
- Draber-Mońko, A. 1981. Sarcophagidae and Rhinophoridae (Diptera) of Warsaw and Mazovia. *Memorabilia Zoologica* 35, 131—140.
- Eberhardt, A.I. 1955. Untersuchungen über das Schmarotzen von *Sarcophaga carnaria* an Regenwürmern und vergleich der Biologie einiger *Sarcophaga*-Arten. *Z. Morph. Ökol. Tiere* 43, 616—647.
- Eberhardt, A.I. & Steiner, G. 1952. Untersuchungen über das Schmarotzen von *Sarcophaga* spp. in Regenwürmern. *Z. Morph. Ökol. Tiere* 41, 147—160.
- Emden, F.I. van 1954. Diptera Cyclorrhapha Calyptrata (I). Section (a) Tachinidae and Calliphoridae. *Handbk Ident. Br. Insects* 10 (4) (a), 1—133.
- Enderlein, G. 1928. Klassifikation der Sarcophagiden. Sarcophagiden-Studien I. *Arch. klassif. phylogen. Ent.* 1, 1—56.
- Fan, Tse-Teh 1965. *Key to species of common synanthropic flies in China*, Peking, 330 pp. < Only parts seen >
- Gjessing, J. & Ouren, T. 1983. *Det Bestes store Norge Atlas*. Forlaget Det Beste, Oslo, 232 pp., ISBN 82-7010-152-4.
- Gregor, F. & Povolný, D. 1961. Výsledky stacionárního výzkumu synantropních much okolí východoslovenské vesnice. *Zoologické Listy <Folia Zoologica>* 10, 17—44.
- Grunin, K. Ya. 1964. K biologii i rasprostraneniyu nekotorykh vidov mukh podsemeistva Sarcophaginae (Diptera, Sarcophagidae) fauny SSSR < On the biology and distribution of certain Sarcophaginae (Diptera, Sarcophagidae) in the USSR >. *Ent. obozr.* 63, 71—79. (In Russian. English translation in *Ent. Rev. Wash.* 43, 36—39, 1964).
- Hackman, W. 1980. A check list of the Finnish Diptera. II. Cyclorrhapha. *Notul. ent.* 60, 117—162.
- Hanski, I. 1976. Breeding experiments with carrion flies (Diptera) in natural conditions. *Ann. ent. fenn.* 42, 113—121.
- Hanski, I. & Kuusela, S. 1977. An experiment on competition and diversity in the carrion fly community. *Ann. ent. fenn.* 43, 108—115.
- Hanski, I. & Kuusela, S. 1980. The structure of carrion fly communities: differences in breeding seasons. *Ann. zool. fenn.* 17, 185—190.
- Hanski, I. & Nuorteva, P. 1975. Trap survey of flies and their diel periodicity in the subarctic Kevo Nature Reserve, northern Finland. *Ann. ent. fenn.* 41, 56—64.
- Hedström, L. 1964. Lounais-Hämeen kärpäsiä, Bra-chycera (Diptera). *Lounais-Hämeen Luonto* 15, 77—89.
- Hedström, L. & Nuorteva, P. 1971. Zonal distribution of flies on the hill Ailigas in subarctic northern Finland. *Ann. ent. fenn.* 37, 121—125.
- Hennig, W. 1973. 31. Diptera (Zweiflügler). *Handb. Zool.* 4 (2) 2/31: 1—337 (Lieferung 20).
- Ishijima, H. 1967. Revision of the third stage larvae of synanthropic flies of Japan (Diptera: Anthomyiidae, Muscidae, Calliphoridae and Sarcophagidae). *Jap. J. san. Zool.* 18, 47—100.
- Junnikkala, E. 1960. Life history and insect enemies of *Hyponomeuta malinellus* Zell. (Lep., Hyponomeutidae) in Finland. *Ann. zool. Soc. zool. bot. fenn. 'Vanamo'* 21 (1), 1—44.
- Kano, R., Field, G. & Shinonaga, S. 1967. *Fauna Japonica Sarcophagidae (Insecta, Diptera)*. Biogeographical Society of Japan, Tokyo, 168 pp, 41 plates.
- Keilin, D. 1919. On the life-history and larval anatomy of *Melinda cognata* Meigen (Diptera Calliphoridae) parasitic in the snail *Helicella (Heliomanes) virgata* da Costa, with an account of the other Diptera living upon molluscs. *Parasitology* 11, 430—455.
- Keilin, D. 1921. Supplementary account of the dipterous larvae feeding upon molluscs. *Parasitology* 13, 180—183.
- Kerney, M.P. & Cameron, R.A.D. 1979. *A field guide to the land snails of Britain and North-West Europe*. Collins, London, 288 pp.
- Kirchberg, E. 1954. Zur Larvennahrung einiger heimischer *Sarcophaga*-Arten, insbesondere zur Frage, ob *S. carnaria* L. als obligatorischer Regenwurmparasit anzusehen sei (Diptera, Tachinidae). *Z. Morph. Ökol. Tiere* 43, 99—112.
- Kirchberg, E. 1961. Zucht von *Sarcophaga carnaria*

- L. (Dipt., Tachinidae) aus einer Freilandpopulation von Regenwürmern des Genus *Allolobophora* Eisen (Oligoch. Lumbricidae) (Zur Kenntnis der Gattung *Sarcophaga* Mg. III). *Anzeiger für Schädlingskunde* 34, 6—7.
- Knaben, N. 1943. Oversikt over Norges Orthoptera. *Bergens Mus. Aarb.* 1943 (2), 1—43.
- Kulikova, N.A. 1982. Ispol'zovanie morfologii yaitsekladov dlya opredeleniya samok serykh myasnykh mukh (Diptera, Sarcophagidae) < Utilisation of ovipositor morphology for identification of female flies (Diptera, Sarcophagidae) >. *Zool. Zh.* 61, 1518—1523.
- Kurahashi, H. 1970. Studies on the calypterate muscoid flies from Japan VII. Revision of the subfamily Miltogramminae (Diptera, Sarcophagidae). *Kontyû, Tokyo* 38, 93—116.
- Kurahashi, H. 1972. Studies on the calypterate muscoid flies from Japan IX. Subfamily Macronychiinae (Diptera, Sarcophagidae). *Kontyû, Tokyo* 40, 173—180.
- Kurahashi, H. 1975. Studies on the calypterate muscoid flies from Japan XI. Subfamily Agriinae (Diptera, Sarcophagidae). *Kontyû, Tokyo* 43, 202—213.
- Kuusela, S. & Hanski, I. 1982. The structure of carrion fly communities: the size and the type of carrion. *Holarct. Ecol.* 5, 337—348.
- Lehrer, A.Z. 1959. Neue oder seltene Sarcophagidae aus der Rumänischen Volksrepublik (Diptera). *Beitr. Ent.* 9, 900—908.
- Lehrer, A.Z. 1961a. Contribution à la connaissance des Sarcophagines (Diptera, Sarcophagidae) du Maramourèche (Roumanie). *Fragm. faun. Warsz.* 8, 527—537.
- Lehrer, A.Z. 1961b. Étude critique sur les Sarcophagines de la région de Jassy (Roumanie) (Diptera, Sarcophagidae). *Fragm. faun. Warsz.* 9, 123—134.
- Lehrer, A.Z. 1966. Quelques données bio-morphologiques sur l'espèce *Discachaeta cucullans* Pandellé 1896. (Fam. Sarcophagidae, Diptera). *Bull. Ann. Soc. r. belg. ent.* 102, 197—200.
- Lehrer, A.Z. 1967. Espèces nouvelles du genre *Sarcophaga* Meigen (Fam. Sarcophagidae, Diptera). *Zool. Anz.* 178, 210—219.
- Lehrer, A.Z. 1973. La taxonomie du genre *Sarcophaga* Meigen (Fam. Sarcophagidae, Diptera). *Annot. zool. bot.* 89, 1—22.
- Lehrer, A.Z. 1975a. Deux nouvelles espèces paléarctiques du genre *Sarcophaga* Meigen (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 111, 102—108.
- Lehrer, A.Z. 1975b. Sur *Sarcophaga rosellei* Böttcher, 1912 et deux espèces affines nouvelles (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 11, 278—284.
- Lehrer, A.Z. 1975c. Statut de *Bellieria novercoides* (Bött.) et établissement de deux espèces nouvelles du genre *Bellieria* Rob.-Desv. (Diptera Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 111, 285—288.
- Lehrer, A.Z. 1976a. Diagnose de *Bellieria cepelaki* Lehrer, 1975 (Diptera Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 112, 158—161.
- Lehrer, A.Z. 1976b. *Leclercqomyia*: genre nouveau de Sarcophagines paléarctiques (Diptera: Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 112, 195—203.
- Lehrer, A.Z. 1976c. Nouvelles Sarcophagines d'Eurasie (Diptera Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 112, 259—266.
- Lehrer, A.Z. 1976d. Cinq espèces nouvelles pour la faune paléarctiques des diptères Sarcophagidae. *Annot. zool. bot.* 115, 1—11.
- Lehrer, A.Z. 1977a. *Sarcophaga baraschi* n.sp. (Diptera, Sarcophagidae). *Bull. Soc. ent. Mulhouse* 1977, 13—15.
- Lehrer, A.Z. 1977b. Espèces nouvelles du genre *Heteronychia* B.B. de la faune de la Bulgarie (Diptera, Sarcophagidae). *Acta zool. Bulg.* 7, 27—36.
- Lehrer, A.Z. 1977c. Nouveaux Sarcophagides d'Europe occidentale (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 113, 52—62.
- Lehrer, A.Z. 1977d. Deux nouvelles *Heteronychia* de Turquie (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. ent.* 113, 223—228.
- Lehrer, A.Z. 1978a. Calliphorides et Sarcophagides nouveaux de la faune de l'Espagne. *EOS Rev. Esp. Ent.* 52, 139—148.
- Lehrer, A.Z. 1978b. Une nouvelle *Sarcophaga* à la mémoire du Dr Josef Moucha (Diptera, Sarcophagidae). *Bull. Soc. ent. Mulhouse* 1978, 1—3.
- Lehrer, A.Z. 1978c. Deux nouvelles *Sarcophaga* Meigen d'Autriche (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. Ent.* 114, 127—131.
- Lehrer, A.Z. 1981. *Parasarcophaga paularnaudi* n.sp. nouvelle Sarcophagine du Proche-Orient (Diptera, Sarcophagidae). *Bull. Ann. Soc. r. belg. Ent.* 117, 186—188.
- Léonide, J. 1967. Contribution à l'étude biologique des Diptères Sarcophagidés, parasites d'Acridiens. Cycle biologique de *Blaesoxipha rossica* Vill., injection de larves dans le corps de l'hôte par les femelles de Sarcophagidés. *C. r. Acad. Sc. Paris (D)* 265, 232—234.
- Léonide, J. & Léonide, J.-C. 1971. Contribution à l'étude des Diptères Sarcophagidés acridiophages, V: Notes faunistiques et biologiques. *Bull. Soc. ent. Fr.* 76, 111—122.
- Léonide, J. & Léonide, J.-C. 1973. Contribution à l'étude des Diptères Sarcophagidés acridiophages, VII. Description de *Blaesoxipha dupuisi* n.sp. *Bull. Soc. ent. Fr.* 78, 277—289.
- Léonide, J. & Léonide, J.-C. 1974. Contribution à l'étude des Diptères Sarcophagidés acridiophages, IX. *Blaesoxipha lautaretensis* Villeneuve est-elle une espèce valable? Commentaires sur l'état actuel de la systématique des *Blaesoxipha*. *Bull. Soc. ent. Fr.* 79, 152—157.
- Léonide, J. & Léonide, J.-C. 1979. Contribution à l'étude des Diptères Sarcophagidés acridiophages. XII. Biotaxonomie de *Blaesoxipha gladiatrix* (Pandellé 1896) Villeneuve 1911. *Bull. Soc. ent. Fr.* 84, 247—265.

- Léonide, J. & Léonide, J.-C. 1982. Contribution à l'étude des Diptères Sarcophagidés acridiophages. XIII. — Biotaxonomie de *Blaesoxipha grylloctona* Loew 1861. Nouvelles réflexions sur la systématique de ce genre et les méthodes d'investigation. *Ann. Soc. ent. Fr. (N.S.)* 18, 483—506.
- Locket, G.H. & Millidge, A.F. 1953. *British spiders Vol. II*, The Ray Society, London, 449 pp.
- Løken, A. 1973. Studies on Scandinavian bumble bees (Hymenoptera, Apidae). *Norsk ent. Tidsskr.* 20, 1—218.
- Lomholdt, O. 1975. The Sphecidae (Hymenoptera) of Fennoscandia and Denmark. *Fauna ent. scand.* 4 (1), 1—224.
- Lomholdt, O. 1976. The Sphecidae (Hymenoptera) of Fennoscandia and Denmark. *Fauna ent. scand.* 4 (2), 225—452.
- Lundbeck, W. 1927. *Diptera Danica. Part VII. Platypozidae, Tachinidae*. G.E.C. Gad, Copenhagen, 560 pp.
- Mihályi, F. 1965. Rearing flies from faeces and meat, infected under natural condition. *Acta zool. Acad. sc. hung.* 11, 153—164.
- Mihályi, F. 1975. Beschreibung vier neuer Sarcophagiden Arten aus Ungarn (Diptera). *Acta zool. Acad. sc. hung.* 21, 101—108.
- Mihályi, F. 1979a. New and little known Sarcophagidae in the Carpathian basin (Diptera). *Acta zool. Acad. sc. hung.* 25, 159—164.
- Mihályi, F. 1979b. Beschreibung von *Bellieria hortobagvensis* sp.n. aus Ungarn (Diptera: Sarcophagidae) *Folia ent. hung.* < Rovartani Közlemények > *Ser. nov.* 32, 171—172.
- Mihályi, F. 1979c. Fémeslegyek — Húslegyek Calliphoridae — Sarcophagidae. *Fauna Hungariae* 135, 1—152. < Magyarország Állatvilága XV. kötet (Diptera II.) 16. füzet >
- Mihályi, F. 1980. Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Institutes. 93. Beitrag, Diptera: Calliphoridae, Sarcophagidae, Rhinophoridae. *Beitr. Ent. Berlin* 30, 333—341.
- Mik, J. 1890. Dipterologische Miscellen. XVI. *Wien ent. Zeit.* 9, 153—158.
- Natvig, L.R. 1943. Entomologien ved Det Kongelige Frederiks Universitet. Et bidrag til norsk entomologisk historie. I. Tidsrommet 1813—1907. *Norsk ent. Tidsskr.* 7, 1—73.
- Nielsen, S.A., Nielsen, B.O. & Walhovd, H. 1978. Blowfly myiasis (Diptera: Calliphoridae, Sarcophagidae) in the hedgehog (*Erinaceus europaeus* L.). *Ent. Meddr* 46, 92—94.
- Økland, K.A. 1981. Inndeling av Norge til bruk ved biogeografiske oppgaver — et revidert Strandsystem. *Fauna, Oslo* 34, 167—178.
- Parker, R.R. 1916. New species of New England Sarcophagidae. *Can. Ent.* 48, 359—364, 422—427.
- Parker, R.R. 1919. Concerning the subspecies of *Sarcophaga dux* Thomson. *Bull. Brookl. ent. Soc.* 14, 41—46.
- Parker, R.R. 1923. New Sarcophagidae from Asia, with data relating to the *dux* group. *Ann. Mag. nat. Hist.* (9) 11, 123—129.
- Patton, W.S. 1934. Studies on the higher Diptera of medical and veterinary importance. A revision of the species of the genus *Glossina* Wiedemann based on a comparative study of the male and female terminalia. *Ann. trop. Med. Parasit.* 28, 579—588. < This paper deals in fact with the genus *Sarcophaga* s.lat. >.
- Patton, W.S. & Wainwright, C.J. 1935a. The British species of the subfamily Sarcophaginae, with illustrations of the male and female terminalia. *Ann. trop. Med. Parasit.* 29, 73—90.
- Patton, W.S. & Wainwright, C.J. 1935b. The British species of the subfamily Sarcophaginae, with illustrations of the male and female terminalia. *Ann. trop. Med. Parasit.* 29, 517—532.
- Patton, W.S. & Wainwright, C.J. 1936a. The British species of the subfamily Sarcophaginae, with illustrations of the male and female terminalia. *Ann. trop. Med. Parasit.* 30, 187—201.
- Patton, W.S. & Wainwright, C.J. 1936b. The British species of the subfamily Sarcophaginae, with illustrations of the male and female terminalia. *Ann. trop. Med. Parasit.* 30, 337—350.
- Patton, W.S. & Wainwright, C.J. 1937. The British species of the subfamily Sarcophaginae, with illustrations of the male and female terminalia. *Ann. trop. Med. Parasit.* 31, 303—317.
- Persson, P.I. 1983. Flugor på Ölands Stora alvar. *Ent. Tidskr.* 104, 151—164.
- Pont, A.C. 1975. 80. Sarcophagidae. — In: Kloet, G.S. & Hincks, W.D. (eds.), A check list of British insects. Second edition. Part 5: Diptera and Siphonaptera. *Handbk Ident. Br. Insects* 11 (5), 106—107.
- Povolný, D. 1961. *Parasarcophaga sachtlebeni* Leherer 1959 ein Synonym von *Parasarcophaga jacobsoni* Rhodendorf 1937 (Diptera: Sarcophagidae). *Beitr. Ent.* 11, 229—232.
- Povolný, D. 1977. Zur Frage der Variabilität der Genitalien bei *Bellieria novercoides* (Böttcher, 1913). *Dtsch. ent. Z. N.F.* 24, 283—288.
- Povolný, D. & Slamečková, M. 1959. Kritische Bemerkungen zur Taxonomie der Gattung *Pierretia* R.-D. (Dipt. Sarcophagidae) nebst Beschreibung von zwei unbekanntenen Arten aus der Slowakei. *Acta ent. Mus. Nat. Pragae* 33, 423—433.
- Povolný, D. & Slamečková, M. 1967. *Heteronychia (Spathulapica) slovacica* sp.n. nebst Bemerkungen zur Taxonomie von *Heteronychia (Spathulapica) rohdendorfi* (Povolný & Slamečková, 1959) (Diptera). *Acta ent. bohemoslov.* 64, 314—318.
- Povolný, D. & Slamečková, M. 1969. Das Vorkommen von *Bellieria novercoides* (Bött.) in der Tschechoslowakei; zur Genitalmorphologie einiger mitteleuropäischer Arten der Gattung *Bellieria* (Dipt., Sarc.). *Acta ent. bohemoslov.* 66, 55—60.
- Povolný, D. & Slamečková, M. 1979. Zur Taxonomie und Ökologie einiger Sarcophagini (Diptera,

- Sarcophagidae) aus der Tschechoslowakei. *Acta ent. bohemoslov.* 76, 108—121.
- Povolny, D. & Staněk, M. 1969. Zur taxonomischen Stellung von *Heteronychia (Heteronychia) enderleini* (Jacentkovský) (Diptera, Sarcophagidae). *Acta ent. bohemoslov.* 66, 184—187.
- Pyörnilä, M. & Pyörnilä, A. 1979. Role of parasitoids in termination of a mass occurrence of *Yponomeuta evonymellus* (Lepidoptera, Yponomeutidae) in northern Finland. *Notul. ent.* 59, 133—137.
- Reinhard, H.J. 1961. New American Tachinidae and Sarcophagidae. *J. Kans. ent. Soc.* 34, 204—213.
- Ringdahl, O. 1932. Eine neue *Brachycoma*-Art. *Notul. ent.* 12, 21.
- Ringdahl, O. 1934. Bidrag til kannedomen om en del av Zetterstedts tachinid-typer (Diptera). *Ent. Tidskr.* 55, 266—272.
- Ringdahl, O. 1937. Bidrag til kannedomen om de svenska tachinidernas utbredning. *Ent. Tidskr.* 58, 31—38.
- Ringdahl, O. 1944a. Revision av V. Storms Diptersamling. 1. Familjen Tachinidae. *K. norske Vidensk. Selsk. Forh.* 17 (19), 79—81.
- Ringdahl, O. 1944b. Contributions to the knowledge of the tachinids and muscids of Norway. *Tromsø Mus. Aarsh.* 65 (1942), (4), 1—27.
- Ringdahl, O. 1945a. Förteckning över de av Zetterstedt i Insecta Lapponica och Diptera Scandinaviae beskrivna tachiniderna med synonymmer jämte anteckningar över en del arter. *Opusc. ent.* 10, 26—35.
- Ringdahl, O. 1945b. Översikt över de hittills från Sverige kända arterna av familjen Tachinidae (Diptera). *Ent. Tidskr.* 66, 177—210.
- Ringdahl, O. 1951. Flugor från Lapplands, Jämtlands och Härjedalens fjälltrakter (Diptera, Brachycera). *Opusc. ent.* 16, 113—186.
- Ringdahl, O. 1952. Catalogus Insectorum Sueciae XI Diptera Cyclorrapha: Muscaria Schizometopa. *Opusc. ent.* 17, 129—186.
- Ringdahl, O. 1954. Nya fyndorter för norska Diptera. *Norsk ent. Tidsskr.* 9, 46—54.
- Ringdahl, O. 1958. Dipterologiska notiser 16 och 17. *Opusc. ent.* 23, 90—94.
- Roback, S.S. 1954. The evolution and taxonomy of the Sarcophaginae (Diptera, Sarcophagidae). *Illinois Biological Monographs* 23 (3—4), 1—181.
- Rodendorf, B.B. 1925. 6. Miltogramminen-Studien I. *Zool. Anz.* 62, 80—85.
- Rodendorf, B.B. 1927. 4. Miltogramminen-Studien IV. *Zool. Anz.* 71, 157—169.
- Rodendorf, B.B. 1928. 4. Sarcophagen-Studien I. Beiträge zur Kenntnis der Gattung *Blaesoxipha* Lw. *Zool. Anz.* 77, 23—28.
- Rodendorf, B.B. 1930. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der Palaearktischen Region*, Lieferung 39, pp. 1—48.
- Rodendorf, B.B. 1932. Materialy k poznaniyu mukh, parazitiruyushchikh na saranchevykh < Beiträge zur Kenntnis der zweiflügeligen Parasiten der Acrididen >. *Trudy po zashchite rastenii* < Bulletin of plant protection > *Seriya 1, vyp. 3*, 171—190.
- Rodendorf, B.B. 1935. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*, Lieferung 88, pp. 49—128.
- Rodendorf, B.B. 1937. *Fauna SSSR. Nasekomye dvukrylye. T. XIX, vyp. 1. Sem. Sarcophagidae (ch. 1)*. Zoologicheskii Institut Akademii Nauk SSSR, Novaya Seriya no. 12, pp. 1—501.
- Rodendorf, B.B. 1938. Novye vidy Sarcophaginae, sobrannye K.Ya. Gruninym v Sikhote-Alinskome zapovednike. < New species of Sarcophaginae from the Sikhote-Alin state reserve territory. > *Trudy Sikhote-Alinskogo Gos. Zapovedn.* 2, 101—110.
- Rodendorf, B.B. 1955. Vidy roda *Metopia* Mg. (Diptera, Sarcophagidae) fauny SSSR i sopredel'nykh stran. *Ent. obozr.* 34, 360—373.
- Rodendorf, B.B. 1959. Vidy mukh podsemeistva Sarcophaginae (Diptera) v faunisticheskikh sinantropnykh kompleksakh razlichnykh landshaftnykh zon SSSR < The species of Sarcophaginae flies in the faunistic synanthropic complexes of different landscape zones of the U.S.S.R. >. *Ent. obozr.* 38, 790—797. (English translation in *Ent. Rev. Wash.* 38, 708—714.)
- Rodendorf, B.B. 1961. Studien über südiranische Sarcophagen (Dipt.). *Stuttg. Beitr. Naturk.* 58, 1—13.
- Rodendorf, B.B. 1962. Novye i maloizvestnye Calliphorinae i Sarcophaginae (Diptera, Larvaevoridae) iz Azii < Neue und wenig bekannte Calliphorinen und Sarcophagen (Diptera, Larvaevoridae) aus Asien >. *Ent. obozr.* 41, 931—941. (English translation in *Ent. Rev. Wash.* 41, 576—581.)
- Rodendorf, B.B. 1963a. Über das System der Sarcophagen der äthiopischen Fauna. *Stuttg. Beitr. Naturk.* 124, 1—22.
- Rodendorf, B.B. 1963b. Über wenig bekannte nordische Miltogrammatinen der Gattung *Oebalia* R.-D. (Diptera, Sarcophagidae). *Beitr. Ent.* 13, 445—454.
- Rodendorf, B.B. 1964. Nekotorye dannye o seriykh myasnnykh mukhakh (Diptera, Sarcophagidae) yuzhnogo Kitaya < Zur Kenntnis der Sarcophagen (Diptera, Sarcophagidae) von südlichen China >. *Ent. obozr.* 43, 80—85.
- Rodendorf, B.B. 1965. Sostav triby Sarcophagini (Diptera, Sarcophagidae) evrazii. < Composition of the tribe Sarcophagini (Diptera, Sarcophagidae) of Eurasia >. *Ent. obozr.* 44, 676—695. (English translation in *Ent. Rev. Wash.* 44, 397—406).
- Rodendorf, B.B. 1967. Napravleniya istoricheskogo razvitiya sarkofagid (Diptera, Sarcophagidae). *Trudy paleontologicheskogo instituta Akademii Nauk SSSR*, 116, 1—92.
- Rodendorf, B.B. 1969. Nekotorye novye vidy Sarcophaginae (Diptera, Sarcophagidae) iz Azii < New species of Sarcophaginae (Diptera, Sarcophagidae) from Asia >. *Ent. obozr.* 48, 943—950. (English translation in *Ent. Rev. Wash.* 48, 600—604.)

- Rodendorf, B.B. 1970. 109. Sem. Sarcophagidae — Sarkofagidy. — In: Bei-Bienko, G.Ya. (ed.), *Opredelitel' nasekomykh evropeiskoi chasti SSSR, V, Dvukrylye, Blokhi*, pp. 624—670. Akademiya Nauk SSSR, Zoologicheskii Institut, Leningrad.
- Rodendorf, B.B. 1971a. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*, Lieferung 285, pp. 129—176.
- Rodendorf, B.B. 1971b. Palearkticheskie vidy dvukrylykh roda *Phrosinella* R.-D. (Diptera, Sarcophagidae) < Palaearctic species of the genus *Phrosinella* R.-D. (Diptera, Sarcophagidae) >. *Ént. obozr.* 50, 446—453. (English translation in *Ent. Rev. Wash.* 50, 254—258.)
- Rodendorf, B.B. 1975a. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*, Lieferung 311, pp. 177—232.
- Rodendorf, B.B. 1975b. Some Sarcophagidae from Southern Spain. *Steenstrupia* 3, 197—204.
- Rodendorf, B.B. 1978. *Dexagria* gen.n. — novyi rod sarkofagid (Diptera, Sarcophagidae) iz srednei Azii < *Dexagria* gen.n. — a new genus of Sarcophaginae from middle Asia >. *Ent. obozr.* 57, 416—418. (English translation in *Ent. Rev. Wash.* 57, 293—294.)
- Rodendorf, B.B. 1982. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*, Lieferung 327, 233—235.
- Rodendorf, B.B. & Grunin, K.Ya. 1938. K faune Sarcophaginae vostochnykh sklonov srednego Sikhote-Alinya. *Trudy Sikhote-Alinskogo Gos. Zapovedn.* 2, 87—100.
- Rodendorf, B.B. & Verves, Yu. G. 1977a. K faune Sarcophagidae (Diptera) Mongolskoi Narodnoi Respubliki. I. Sarcophaginae i Sarcotachininae < On the fauna of Sarcophagidae (Diptera) of the Mongolian People's Republic. I. Sarcophaginae and Sarcotachininae >. *Nasekomye Mongolii* 5, 716—730.
- Rodendorf, B.B. & Verves, Yu. G. 1977b. New species of the genus *Blaesoxipha* Löw (Diptera, Sarcophagidae) from Transcaucasia and the Kopetdag. *Ent. Rev. Wash.* 56, 134—136. (Russian original in *Ént. obozr.* not seen.)
- Rodendorf, B.B. & Verves, Yu. G. 1978. Sarcophaginae (Diptera, Sarcophagidae) from Mongolia. *Ann. hist.-nat. Mus. nat. hung.* 70, 241—258.
- Rodendorf, B.B. & Verves, Yu.G. 1979a. K faune Sarcophagidae (Diptera) Mongolskoi Narodnoi Respubliki. II. Novye dannye o Sarcophaginae < On the fauna of Sarcophagidae (Diptera) of the Mongolian People's Republic. II. New data on Sarcophaginae >. *Nasekomye Mongolii* 6, 475—497.
- Rodendorf, B.B. & Verves, Yu.G. 1979b. Novye dvukrylye podsem. Sarcophaginae (Diptera, Sarcophagidae) iz Palearktiki < New Palaearctic Sarcophaginae (Diptera, Sarcophagidae) >. *Ént. obozr.* 58, 190—199. (English translation in *Ent. Rev. Wash.* 58, 114—121.)
- Rodendorf, B.B. & Verves, Yu.G. 1980. K faune Sarcophagidae (Diptera) Mongolskoi Narodnoi Respubliki. III. Miltogrammatinae < On the fauna of Sarcophagidae (Diptera) of the Mongolian People's Republic. III. Miltogrammatinae >. *Nasekomye Mongolii* 7, 445—517.
- Rondani, C. 1859. *Dipterologiae Italicae Prodromus, Vol. III.* 243 (+ 2) pp. Stocchi, Parmae (= Parma).
- Rognes, K. 1980. The blow-fly genus *Lucilia* Robineau-Desvoidy (Diptera, Calliphoridae) in Norway. *Fauna norv. Ser. B.* 27, 39—52.
- Rognes, K. 1982. A small collection of calypterate Diptera (Tachinidae, Sarcophagidae, Calliphoridae, Muscidae) from the Dovre mountains, Southern Norway. *Fauna norv. Ser. B* 29, 110—114.
- Saccà, G. & Rivosecchi, L. 1954. Contributo alla conoscenza faunistica del genere *Sarcophaga* in Italia (Diptera, Calliphoridae). *Rend. Ist. sup. San.* 17, 174—187.
- Schmitz, H. 1917. Biologische Beziehungen zwischen Dipteren und Schnecken. *Biol. Zentralbl.* 37, 24—43.
- Schøyen, W.M. 1889. Supplement til H. Siebke's Enumeratio Insectorum Norvegorum, Fasc. IV. (Diptera). *Christiania Vidensk. Selsk. Forh.* 1889 (12), 1—15.
- Séguy, E. 1941. Études sur les mouches parasites. Tome II Calliphorides. Calliphorines (suite), Sarcophagines et Rhinophorines de l'Europe occidentale et meridionale. Recherches sur la morphologie et la distribution géographique des Diptères à larves parasites. *Encycl. ent. (A)* 21, 1—436.
- Shewell, G.E. 1971. On the type of *Agria*, with description of a new Nearctic species (Diptera, Sarcophagidae). *Can. Ent.* 103, 1179—1191.
- Siebke, J.H.S. 1877. *Enumeratio Insectorum Norvegorum Fasciculum IV. Catalogum Dipteriorum Continentem.* A.W. Brøgger, Christiania (= Oslo), 255 pp.
- Soot-Ryen, T. 1943. A review of the literature on Norwegian Diptera until the year 1940. *Tromsø Mus. Aarsh.* 65 (1942) 3, 1—46.
- Souza Lopes, H.de 1955. Considera coes sobre os gêneros de Sarcophagidae (Diptera) propostos por Robineau-Desvoidy em 1830 e 1863. *Arquivos do Museu Nacional* 42, 265—272.
- Souza Lopes, H. de 1969. 103. Family Sarcophagidae. — In: Papavero, N. (ed.), *A catalogue of the Diptera of the Americas South of the United States.* Departamento de Zoologia, Secretaria da Agricultura, Sao Paulo, pp. 1—88.
- Souza Lopes, H. de, Kano, R., Shinonaga, S. & Kura-hashi, H. 1977. Family Sarcophagidae. — In: Del-finado, M.D. & Hardy, D.E. (eds.), *A Catalog of the Diptera of the Oriental Region. Vol. III. Suborder Cyclorrhapha (excluding Division Aschiza).* The University Press of Hawaii, Honolulu, pp. 557—583.
- Stackelberg, A.A. 1962. Materialy po faune dvukrylykh Leningradskoi oblasti. VI. Diptera, Calypt-rata, chast' 1 < List of Diptera of the Leningrad Region, VI. Diptera Calypt-rata, Part 1 > *Trudy*

- Zoologicheskogo Instituta Akademii Nauk SSSR 31, 318—388.
- Stein, P. 1924. Die verbreitetsten Tachiniden Mitteleuropas nach ihre Gattungen und Arten. *Arch. Naturg.* 90 (A) (6), 1—271.
- Stöp-Bowitz, C. 1969. A contribution to our knowledge of the systematics and zoogeography of Norwegian earthworms (Annelida Oligochaeta: Lumbricidae). *Nytt. Mag. Zool.* 17, 169—280.
- Storm, V. 1891. Diptera brachycera, quæ observavit determinavitque. *K. norske Vidensk. Selsk. Skr.* 1891, 283—313.
- Storm, V. 1896. Dipterologiske undersøgelser. *K. norske Vidensk. Selsk. Skr.* 1895, 225—241.
- Storm, V. 1907. Supplerende jagttagelser over Insecta Diptera ved Trondhjem. *K. norske Vidensk. Selsk. Skr.* 1907 (5), 1—11.
- Strand, E. 1900. Bidrag til Hallingdals og Lyngørs insektfauna. *Nyt Mag. Naturv.* 37, 46—72.
- Strøm, H. 1781. *Udkast til en Beskrivelse over Hårdanger i Bergens Stift i Norge samlet og sammenskrevet af Sal. Hr. Marcus Schnabels efterladte Papirer ved H.S. Kiøbenhavn.* <Not seen. Cited from Soot-Ryen 1943 >
- Strøm, H. 1784. *Physisk-Oeconomisk Beskrivelse over Eger-Præstegjeld i Aggerhus-Stift i Norge; tilligemed et geographisk Kort over samme, af Hans Strøm, Prof. Theol. og Sognepræst til Eger. Kiøbenhavn.* <Not seen. Cited from Soot-Ryen 1943 >
- Strukan, D. 1967. Remarques sur deux Sarcophaginae peu connus de Yougoslavie (Diptera, Sarcophagidae). *Cahiers des Naturalistes, Bull. N.P., n.s.* 23, 45—47.
- Sýchevskaya, V.I. 1966. O sinantropnykh mukhakh Pamira. *Zool. Zh.* 45, 390—399.
- Sýchevskaya, V.I. 1970. Zonal'noe raspredelenie koprofil'nykh i skhizofil'nykh mukh (Diptera) v srednei Asii <Zonal distribution of coprophilus and schizophilus flies (Diptera) in middle Asia >. *Ent. obozr.* 49, 819—831. (English translation in *Ent. Rev. Wash.* 49, 498—505).
- Thompson, W.-R. 1921. Contributions à la connaissance des formes larvaires des Sarcophagides (Dipt.). II. *Ptychoneura rufitarsis* Meig. *Bull. Soc. ent. Fr.* 1921, 219—222.
- Tiensuu, L. 1939. Die Sarcophagiden (Dipt.) Finnlands. *Ann. ent. fenn.* 5, 255—266.
- Tiensuu, L. 1964. Huomion arvoisia kärpäslöytöjä Lounais-Hämeestä <Bemerkenswerte Fliegenfunde aus Südwest-Häme >. *Lounais-Hämeen Luonto* 15, 76—77.
- Venturi, F. 1947. Notulae dipterologicae. I. Miltogrammini e Metopiini (Dipt. Sarcophagidae) dell'Italia centrale. *Redia* 32, 119—139.
- Venturi, F. 1952. Notulae dipterologicae. V. Revisione sistematica del genere *Metopia* Meigen (Diptera, Sarcophagidae) in Italia. *Boll. entom. Bologna.* 19, 147—170.
- Venturi, F. 1960. Sistematica e geonomia dei Sarcophagidi (excl. *Sarcophaga* Meig. s.l.) italiani (Diptera). *Frustula entomologica* 2 (7), 1—124.
- Verves, Yu.G. 1973. Novi vidi sarkofagid (Diptera, Sarcophagidae) z Ukraini. *Dopovidi Akademii Nauk Ukrain's'koi RSR, Seriya B, Geologiya, Geofizika, Khimiya ta Biologiya, Kiiiv* 1973, 946—948.
- Verves, Yu.G. 1974. K faune sarkofagid (Diptera, Sarcophagidae) SSSR. I. Triba Sarcophagini (Sarcophaginae) (po materialam kolektsii Instituta Zoologii A N USSR). *Vestnik zoologii* 1974, 30—37.
- Verves, Yu.G. 1975a. Novye vidy mukh roda *Heteronychia* B.B. (Diptera, Sarcophagidae) <New species of the genus *Heteronychia* B.B. (Diptera, Sarcophagidae)>. *Ent. obozr.* 54, 665—667. (English translation in *Ent. Rev. Wash.* 54, 130—131.)
- Verves, Yu.G. 1975b. K faune sarkofagid (Diptera, Sarcophagidae) SSSR. II. Podsemeistva Sarcophaginae (Triba Agriini), Macronichiinae i Miltogrammatinae (po materialam kolektsii Instituta Zoologii A N USSR). *Vestnik zoologii* 1975, 73—77.
- Verves, Yu.G. 1976. K izucheniyu sarkofagid (Diptera, Sarcophagidae) — parazitov nazemnykh bryukhnonogik mollyuskov. *Vestnik zoologii* 1976, 28.
- Verves, Yu.G. 1977a. Novii vid rody *Heteronychia* B.B. z Tyan'-Shanya (Sarcophagidae) <New species of the genus *Heteronychia* B.B. from the Tien Shan (Sarcophagidae)>. *Dopovidi Akademii Nauk Ukrain's'koi RSR, Seriya B, Geologichni, Khimichni ta Biologichni Nauki, Kiiiv* 1977, 266—267.
- Verves, Yu.G. 1977b. Novi vidi sarkofagid (Diptera, Sarcophagidae) z Kavkazy i Sere'dn'oi Azii <New species of sarcophagid flies (Diptera: Sarcophagidae) from the Caucasus and Middle Asia >. *Dopovidi Akademii Nauk Ukrain's'koi RSR, Seriya B, Geologichni, Khimichni ta Biologichni Nauki, Kiiiv* 1977, 351—354.
- Verves, Yu.G. 1978a. Vertikal'no-zonal'nii rozpodil sarkofagid Krymy (Diptera, Sarcophagidae). *Visnik Kiiivs'kogo Universitetu, Biologiya* 20, 93—96.
- Verves, Yu.G. 1978b. Novye i maloizvestnye Sarcophagidae (Diptera) Sibiri i Dal'nego Vostoka <New and little-known species of Sarcophagidae from Siberia and Far East >. *Taksonomiya i ekologiya chlenistonogikh Sibiri (Novye i maloizvestnye vidy fauny Sibiri), Novosibirsk* 1978, 184—187.
- Verves, Yu.G. 1978c. Sarkofagidi (Diptera, Sarcophagidae) z baseinu Indigirki <Sarcophagid flies (Diptera, Sarcophagidae) from the Indigirka basin >. *Dopovidi Akademii Nauk Ukrain's'koi RSR, Seriya B, Geologichni, Khimichni ta Biologichni Nauki, Kiiiv* 1978, 180—182.
- Verves, Yu.G. 1978d. K faune Sarcophaginae (Sarcophagidae, Diptera) Kavkaza. *Nauchnye Doklady Vysshei Shkoly, Biologicheskie Nauki* 1978, 36—45.
- Verves, Yu.G. 1979a. Palearkticheskie vidy podroda *Spatulapica* Fan roda *Heteronychia* (Diptera, Sar-

- cophagidae) < Palearctic species of the subgenus *Spatulapica* Fan of the genus *Heteronychia* (Diptera, Sarcophagidae) >. *Zool. Zh.* 58, 860—870.
- Verves, Yu.G. 1979b. Description of *Paramacronychia hackmani* sp. n. (Diptera, Sarcophagidae, Paramacronychiinae). *Ann. ent. fenn.* 45, 31—32.
- Verves, Yu.G. 1979c. Novyi vid sarkofagid — *Robineauella kopetdaghica* sp. n. (Diptera, Sarcophagidae). *Trudy vsesoyuznogo éntomologicheskogo obshchestva* 61, 213—215. (Akademiya Nauk SSSR).
- Verves, Yu.G. 1979d. Obzor dvukrýlykh podsem. Miltogrammatinae (Diptera, Sarcophagidae) fauny Shri Lanki < A review of the subfamily Miltogrammatinae (Diptera, Sarcophagidae) of Sri Lanka >. *Ént. obozr.* 58, 883—897.
- Verves, Yu.G. 1979e. Dva novikh roda Miltogrammatinae (Sarcophagidae, Diptera) z Ukraini i Turkmenii < Two new genera of Miltogrammatinae (Sarcophagidae, Diptera) from the Ukraine and Turkmenia >. *Dopovidi Akademii Nauk Ukrain'skoi RSR, Seriya B, Geologichni, Khimichni ta Biologichni Nauki, Kiiiv* 1978, 638—642.
- Verves, Yu.G. 1980a. Some Sarcophagidae (Diptera) from Afghanistan. *Fol. ent. hung.* 41, 355—357.
- Verves, Yu.G. 1980b. Novýe i maloizvestnyé vidy roda *Blaesoxipha* Löw, 1861 (Sarcophagidae, Diptera) iz Sibiri i Dal'nego Vostoka < New and little-known species of the genus *Blaesoxipha* Löw, 1861 (Sarcophagidae, Diptera) from Siberia and the Far East >. *Sistematika i ékologiya zhivotnykh (Novýe i maloizvestnyé vidy fauny Sibiri)* 1980, 137—145. (Akademiya Nauk SSSR, Sibirskoe otdelenie, Novosibirsk)
- Verves, Yu.G. 1980c. Sostav podsemeistva Paramacronychiinae (Diptera, Sarcophagidae) Starogo Sveta < The composition of the subfamily Paramacronychiinae (Diptera, Sarcophagidae) of the Old World >. *Zool. Zh.* 59, 1476—1482.
- Verves, Yu.G. 1980d. Karta 70 *Wohlfahrtia meigeni* (Schiner, 1862), Karta 71 *Sarcophaga carnaria* (Linnaeus, 1758), Karta 72 *Sarcophaga lehmanni* Müller, 1922. — In: Gorodkov, K.B. (ed.), *Arealy nasekomykh evropeiskoi chasti SSSR, Atlas. Kartý xx—xx*. < Provisional atlas of insects of the european part of the U.S.S.R. >. Akademiya Nauk SSSR, Zoologicheskii Institut, Leningrad.
- Verves, Yu.G. 1980e. Novýe i maloizvestnyé dvukrýlye podsemeistv Miltogrammatinae i Macronychiinae (Diptera, Sarcophagidae) iz aziatskoi chasti SSSR < New and little known flies of the subfamilies Miltogrammatinae and Macronychiinae (Diptera, Sarcophagidae) from the asiatic part of the USSR >. *Ent. obozr.* 59, 914—924.
- Verves, Yu.G. 1980f. Taksonomicheskie zametki o nekotorykh sarkofagidakh (Diptera, Sarcophagidae). *Vestnik zoologii* 1980, 26—31.
- Verves, Yu.G. 1981a. Sarcophagidae (Diptera) from Korea. *Folia ent. hung.* 42, 197—210.
- Verves, Yu.G. 1981b. Karta 122 *Ravinia striata* (Fabricius, 1794), Karta 123 *Sarcophaga schulzi* Müller, 1922, Karta 124 *Sarcophaga subvicina* Rohdendorf, 1937. — In: Gorodkov, K.B. (ed.), *Arealy nasekomykh evropeiskoi chasti SSSR, Atlas. Kartý xx—xx*. < Provisional atlas of insects of the european part of the U.S.S.R. >. Akademiya Nauk SSSR, Zoologicheskii Institut, Leningrad.
- Verves, Yu.G. 1982a. 64h. Sarcophaginae. — In: Lindner, E. (ed.), *Die Fliegen der palaearktischen Region*, Lieferung 327, pp. 235—296.
- Verves, Yu.G. 1982b. Karta 176 *Metopia argyrocephala* (Meigen, 1803), Karta 177 *Metopia campestris* (Fallén, 1820), Karta 178 *Bercaea cruentata* (Meigen, 1826). — In: Gorodkov, K.B. (ed.), *Arealy nasekomykh evropeiskoi chasti SSSR, Atlas. Kartý 126—178*. < Provisional atlas of insects of the european part of the U.S.S.R. > Akademiya Nauk SSSR, Zoologicheskii Institut, Leningrad.
- Verves, Yu.G. 1983. The American species of the genus *Macronychia* Rondani (Macronychiinae Sarcophagidae, Diptera). *Rev. brasil. Biol.* 43, 345—354.
- Verves, Yu.G. & Kuz'movich, L.G. 1979. Sarkofaginý (Diptera, Sarcophaginae) — parazity nazemnykh bryukhonogikh molluskov v Ternopol'skoi oblasti. *Vestnik zoologii* 1979, 16—21.
- Viktorov-Nabokov, O.B. & Verves, Yu.G. 1975. K izucheniyu mukh (Diptera: Calliphoridae, Sarcophagidae), parazitiruyushchikh v dozhdevykh chervyak (Oligochaeta, Lumbricidae). *Problemy pochvennoi zoologii (Vil'nyus)* 1975, 97—98.
- Wainwright, C.J. 1928. The British Tachinidae (Diptera). *Trans. ent. Soc. Lond.* 76, 139—254.
- Wainwright, C.J. 1932. The British Tachinidae (Diptera). First supplement. *Trans. ent. Soc. Lond.* 80, 405—424.
- Wainwright, C.J. 1940. The British Tachinidae (Diptera): Second supplement. *Trans. ent. Soc. Lond.* 90, 411—448.
- Zetterstedt, J.W. 1938. Sectio Tertia Diptera. Pp. 477—868, in his *Insecta Lapponica*, vi + 1140 pp. Lipsiae (= Leipzig), «1840».
- Zetterstedt, J.W. 1844. *Diptera Scandinaviae disposita et descripta*. 3, 895—1280.
- Zetterstedt, J.W. 1845. *Diptera Scandinaviae disposita et descripta*. 4, 1281—1738.
- Zetterstedt, J.W. 1855. *Diptera Scandinaviae disposita et descripta*. 12, 4547—4942.
- Zetterstedt, J.W. 1859. *Diptera Scandinaviae disposita et descripta*. 13, 4943—6190.
- Zhang, Mengyu 1982. A study of the larvae of some common sarcophagid flies from China. *Entomotaxonomia* 4, 93—106. (In Chinese with English summary).
- Zumpt, F. 1952. Remarks on the classification of the Ethiopian Sarcophaginae with descriptions of new species. *Proc. r. ent. Soc. Lond. (B)* 21 (1—2), 1—18.
- Zumpt, F. 1956. Calliphoridae (Diptera Cyclorrhapha) Part I: Calliphorini and Chrysomyiini. *Exploration du Parc National Albert Mission G.F. de Witte (1933—1935) Fascicule* 87, 1—200.
- Zumpt, F. & Heinz, H.J. 1950. Studies in the sexual armature of Diptera. II. — A contribution to the study of the morphology and homology of the male terminalia of *Calliphora* and *Sarcophaga* (Dipt., Calliphoridae). *Entomologist's mon. Mag.* 86, 207—216.

Taxonomic differences between populations of *Leuctra hippopus* Kempny (Plecoptera) in Norway

ALBERT LILLEHAMMER

Lillehammer, A. 1986. Taxonomic differences between populations of *Leuctra hippopus* Kempny (Plecoptera) in Norway. *Fauna norv. Ser. B*, 33, 27–32.

The morphological differences of five spatially widely-separated populations of *Leuctra hippopus* Kempny, living under different climatic conditions, was studied. Clear differences were found in body and wing lengths, wing ribs, in the shapes of the genitalian appendages, and in the microstructure of the genitalian appendages when examined under the scanning electron microscope (SEM).

In the laboratory, nymphs from three of the populations were reared and given similar conditions such as water temperatures and food. The morphological differences between the specimens from the field still held for the generation reared. This regards the body sizes of the newborn nymphs and taxonomical characteristics of adults.

The morphological differences between populations are significant and seem to be stable. Despite certain ecological differences between populations, such as in growth rates, the most convenient approach is to consider them as polymorphic populations of a single species. They have most probably originated because of local differences in the watertemperature regimes, in the course of the post-glacial evolution of the Fennoscandian stonefly fauna.

Albert Lillehammer, Zoological Museum, Sarsgt. 1, N-0562 Oslo 5, Norway.

INTRODUCTION

Leuctra hippopus Kempny is widely distributed in Europe, and also occurs in the Middle East and in Siberia (Zwick 1973). It is recorded from Atlantic climatic regions as far west as Ireland (Hynes 1977), from typical Continental climatic regions of Central Europe, and from regions with a sub-arctic climate, such as the Varanger peninsula in northern Norway (Lillehammer 1974b).

In Norway there are a number of local populations of *L. hippopus* which possess such distinctive morphological characteristics (Lillehammer 1974a, 1976) that the question of their true taxonomical status arises. The most marked population is also obligatorily brachypterous.

A couple of species belonging to the *L. hippopus* group occur in Central Europe, and there are certain indications that this specific separation is a recent phenomenon. If this is true, the Fennoscandian *L. hippopus* populations may be developing in the same direction. A study of both the ecology and the morphology of some of these separate populations was therefore carried out. This paper presents results of morphological studies and discusses taxonomic implications of five distinct *L. hippopus* populations.

STUDY AREA

The Isterfoss population of *L. hippopus* only occurs in the outlet stream between the lakes Isterfoss and Galten. The stream is only 200 m in length, but quite wide and about 600 m above sea-level (Fig. 1A). In this continental and eastern part of Norway the climate is dry, with a cold winter which lasts for about 6 months, from the middle of October to the middle of April (Johannesen 1963). The mean January air temperature is -8°C .

The Nøklevann population occurs in a small, shaded, forest stream about 150 m a.s.l., just outside Oslo in south-eastern Norway (Fig. 1B). The climate is less continental than at Isterfoss. The precipitation and the mean air temperatures are higher than at Isterfoss (Johannesen 1963) (mean January air temperature -4°C). Winter lasts for four-to-five months, from the middle of November to the middle of March.

The Suldalslågen population occurs in the river flowing from the lake Suldalsvatn, at 68 m a.s.l., in the inner fjord region of south-western Norway (Fig. 1C). The climate is semi-Atlantic, and the winter lasts for about 2–3 months, from the middle of December to the beginning of March (mean January temperature about 0°C). Precipitation is heavy.

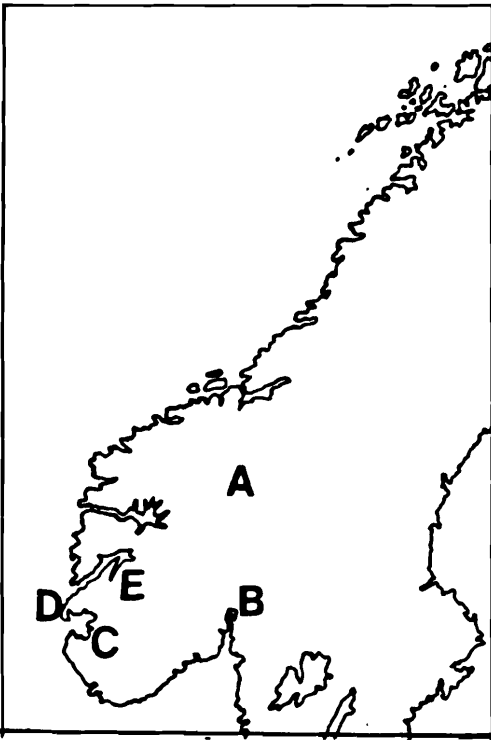


Fig. 1. Map of Norway, showing the sites of the populations studied. A = Isternfoss, B = Nøklevann, C = Suldalslågen, D = Sveio, E = Botnavatn.

The Sveio population occurs in a small stream flowing over heathland in the coastal part of south-western Norway, at only 20–30 m above s.l. (Fig. 1D). The climate is exceedingly Atlantic, with no real winter at all (mean January air temperature 2°C).

The Botnavatn population occurs in a small stream in the upper part of the *Salix* belt of the low-alpine vegetation belt about 700 m a.s.l. north of Sauda in south-western Norway (Fig. 1E). The climate is severe here, the winter starts in October and the snow usually melts in May; the winter lasts about 7 months. In some years the snow-cover remains for yet another month. The mean January air temperature is about –2°C.

Annual water temperatures

The two main types of annual stream temperature fluctuation are shown in Fig. 2. The Nøklevann stream is of the continental type, with cold water in winter and warm in summer. The contrasting type is shown by the Suldalslågen river,

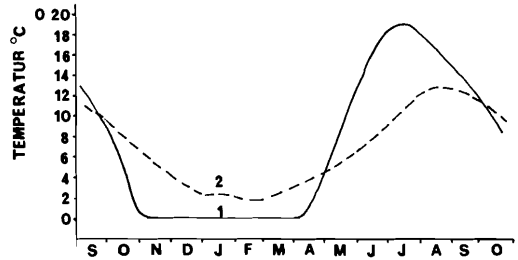


Fig. 2. The two main types of annual water-temperature pattern prevailing in the studied streams (mean temperature values based on data previously published by Lillehammer (1974, 1980). 1 = Nøklevann, 2 = Suldalslågen.

which is warm in winter and relatively cold in summer. Although situated in an area with a mean January temperature of about 0°C, the river water is nevertheless warm in winter due to its source being the lake Suldalsvatn. This moderates the annual amplitude of water temperature. That the river water is cold in summer is due to the influx of snow melting during most of the summer, from the mountains surrounding the lake.

The water temperature of the stream at Sveio is similar to that at Suldalsvatn, although the summer temperature is higher because there is no influx of snow melt-water here.

At Isternfoss, the water temperature in winter lies between the values for Nøklevann stream and the Suldalslågen river, i.e. it is less cold in winter than the nearby, longer streams.

The high altitude stream at Botnavatn is cold in both summer and winter, and is the most extreme habitat of all the five localities studies.

MATERIAL AND METHODS

Imagines for the morphological studies were collected by handnetting in the vegetation and by turning stones over in the stream bed. The nymphs were collected by the kick method described by Frost et al. (1971). Altogether the material consisted of 1530 nymphs, and 1650 adults. The morphological analyses of the degree of variation in the taxonomical characteristics were made by calculating the mean values for each of the variable characteristics for each of the local populations studied and based on the description made by Lillehammer (1974).

The material was examined in laboratory and measured under a stereomicroscope. The microstructures were studied under a scanning elect-

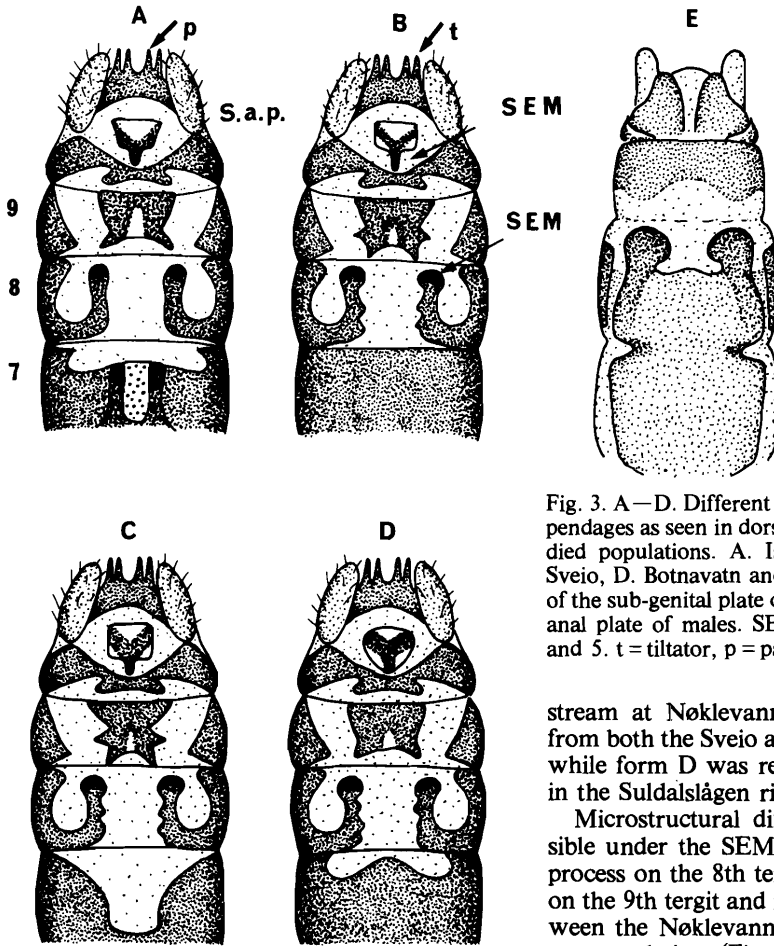


Fig. 3. A—D. Different shapes of male genitalian appendages as seen in dorsal view possessed by the studied populations. A. Isternfoss, B. Nøklevann, C. Sveio, D. Botnavatn and Suldalslågen. E. The shape of the sub-genital plate of the females. S.a.p. = Supra-anal plate of males. SEM = photos shown in fig. 4 and 5. t = tiltator, p = paraproct.

ron-microscope (SEM). The nymph rearing method used has been described previously by Lillehammer (1975).

MORPHOLOGICAL CHARACTERS

Genitalian appendages

The males are generally identified by the tergal process on their 7th and 8th tergite, the sclerotized plate on their 9th tergite and possession of a supra-anal plate (Fig. 3). In addition, the shape of the paraprocts and tiltators can be used as a criterion. The females are generally identified by the shape of their sub-genital plates.

Marked differences were found in the genitalian appendages of the males of the five populations. Form A was dominant in the Isternfoss stream population, and form B in that of the

stream at Nøklevann. Form C was recorded from both the Sveio and Botnavatn populations, while form D was recorded for the population in the Suldalslågen river.

Microstructural differences were clearly visible under the SEM in the cases of the tergal process on the 8th tergite in the sclerotized plate on the 9th tergite and in the supra-anal plate between the Nøklevann, Isternfoss and Suldalslågen populations (Figs. 4a, b, c and 5a, b). The arrangements of structures of the tergal processes on the 8th tergite of the Nøklevann specimens (Fig. 4b) differed most markedly from those of the other two populations mentioned.

Body- and wing-morphometry

Differences, such as those found between the Sveio and Botnavatn populations, existed in body length, wing length, length and width of head capsule and of the clypeus, and in femur length (Table 1).

Short-wingedness and irregularity in the wing veins

Only the Isternfoss population has normally been found to consist entirely of short-winged forms (Lillehammer 1974a), whereas only some short-winged specimens occurred in the other

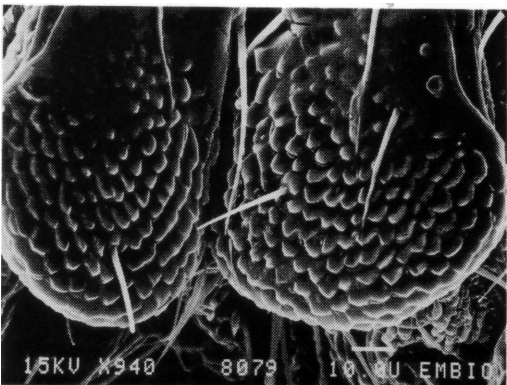
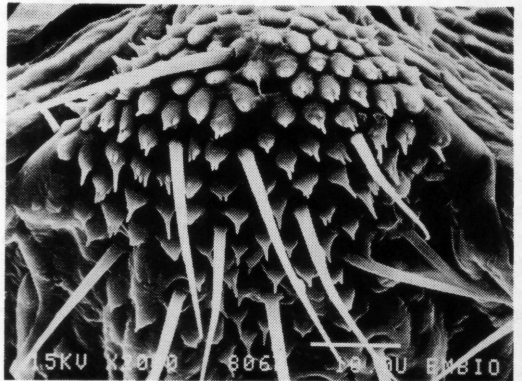
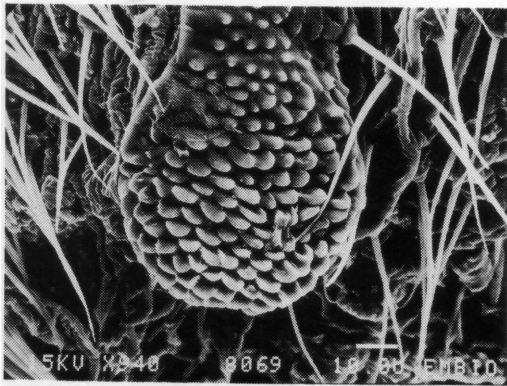
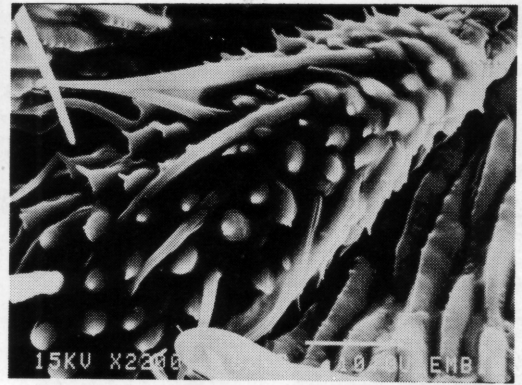
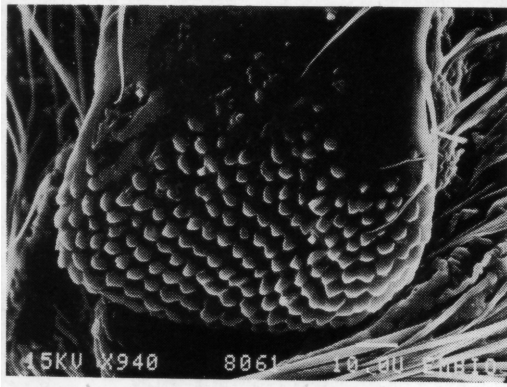


Fig. 5. The microstructure of the anterior part of the supra-anal plates of males from the Suldalslågen (A) and the Nøklevann (B) populations. SEM photos; scales of enlargement x 2200 and x 2000 respectively.

Fig. 4. Microstructure of the tergal process of the 8th tergite of (A) the Isterfoss, (B) the Nøklevann and (C) the Suldalslågen males. SEM photos; scale of enlargement x 940.

populations. Short wings are broader than normal wings (Fig. 6) and have a high degree of irregularity in the wing veins, e.g. in the wings of

the Isterfoss specimens. Studies made in Rogaland have shown that such irregularity of the wing veins is more common in populations living at high (Botnavatn) than at low (Sveio) altitudes (Tab. 1).

SEM studies of the wing structures revealed no visible differences in the microstructure of the wing membrane.

Morphological characteristics of specimens reared in the laboratory

When reared at the same water temperature (8°C), the newborn nymphs hatched from eggs from the Suldalslågen, Isterfoss and Nøklevann adults proved to have different length of the body and cerci and different head widths.

Table 1. Body measurements (mm) of adult females from two widely-separated populations of *Leuctra hippopus*.

Locality	Body length		Wing length		Irregularity in wing venation		
	N	$\bar{x} \pm sd$	$\bar{x} \pm sd$	%			
Sveio	26	6.85 0.45	7.32	0.31	0		
Botnavatn	45	5.56 0.56	5.89	0.34	47		
Locality	N	Head width		Front length		Femur length	
		$\bar{x} \pm sd$	$\bar{x} \pm sd$	$\bar{x} \pm sd$	$\bar{x} \pm sd$		
Sveio	20	1.06	0.04	0.53	0.02	1.92	0.11
Botnavatn	20	0.91	0.06	0.47	0.03	1.62	0.09

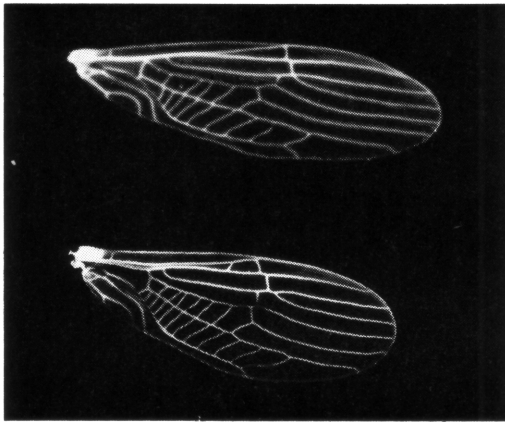


Fig. 6. The normal wing form (A) and the brachypterous (short-winged) form (B).

Table 2. Body measurements (mm) of newly-hatched nymphs of three local populations of *Leuctra hippopus* (N = 20 for each locality).

Locality	Body length	Head length	Head width	Cerci length	
Suldalslågen:	\bar{X}	1.03	0.17	0.20	0.51
	sd.	0.03	0.01	0.006	0.02
Isternfoss:	\bar{X}	0.78	0.15	0.15	0.36
	sd.	0.07	0.01	0.005	0.02
Nøklevann:	\bar{X}	0.76	0.14	0.15	0.36
	sd.	0.05	0.01	0.007	0.02

The newborn nymphs from Suldalslågen were also significantly larger overall than those of the other three populations (Tab. 2). Specimens

from various collecting sites and reared under the same conditions for one complete generation in the laboratory retained the differences in their adult characteristics noted previously, such as wing shape, wing length, wing ribs and also in the form of genitalian appendages seen in adult specimens collected in the field. 76 % of the specimens of the Isternfoss population collected in a field showed some degree of irregularity in their wing veins, compared to 85 % of the specimens reared in the laboratory. The values for the Nøklevann population were 16 and 15 percent, respectively. In field the dominating form of 7th, 8th, 9th tergal process and the supra-anal plate (Fig. 3) for the Nøklevann population (N = 34) were 80 %, 100 %, 90 % and 100 % respectively, while the laboratory specimens (N = 21) were 76 %, 100 %, 100 % and 80 %. The Isternfoss population (N = 37), 76 %, 84 %, 100 % and 100 % in field, and 70 %, 92 %, 96 % and 80 % in laboratory (N = 26).

DISCUSSION

Some of the morphological differences found between the five populations of *L. hippopus* are probably dependent on differences in habitat ecology. In their «Thermal Equilibrium» hypothesis, Sweeney and Vannot (1978) and Vannot and Sweeney (1980) state that the body size and fecundity of the adults largely depends on the water temperature prevailing during the larval period. Small-sized adults and a reduction in fecundity occur when the water temperature is either above or below the optimum value. Studies made by Brittain et al. (1984) indicate that the water temperature during the egg incubation period also has an influence on the morphometry of the newborn nymphs.

The morphometrical differences found between the two populations in western Norway, the Sveio one in the coastal area and the high-altitude one at Botnavatn, seem to support the «Thermal Equilibrium» hypothesis. The small-sized specimens encountered among the Botnavatn population (Lillehammer 1974a) were probably living under sub-optimal conditions for this population.

However, some of the morphological differences found between the five studied populations call for some other kind of explanation. The wide differences noted in the shape of the genitalian appendages, and in wing venation, form and length between the Isternfoss and Nøklevann populations were maintained in the next generation even though the nymphs of

both populations had been reared under exactly the same environmental conditions. The same holds true as regards the morphological differences seen in the newborn nymphs reared at the same temperature. This indicates the existence of genetic differences between the two populations.

Besides the recorded morphological divergence, differences in the population ecology also existed (Lillehammer 1986).

Studies of eggs and nymphs from two of the populations, Isternfoss and Nøklevann, showed that the day°C requirement for completing emergence of the Isternfoss nymphs was significantly lower than that of the Nøklevann nymphs, and at the same water temperature significant differences in nymphal growth rate existed (Lillehammer 1986). Thus some of these isolated populations seem to have evolved a number of characteristics, both ecological and morphological, which seem to be genetically controlled.

Studies made by e.g. Ruprecht (1969) and Stewart et al. (1982), on the drumming signals used during mating, have shown that these signals are highly species-specific and that even 'dialects' may occur. A study of the drumming signals made by different, isolated, populations of *L. hippopus* might be of value in indicating the existence of ethological differences which might eventually restrict any cross-breeding.

The overall taxonomic status of the populations studied is still debateable, they may be full species, or subspecies, or even only polymorphic populations of a single species. The differences between the populations must be a result of local selection pressure during the post-glacial period in Fennoscandia, and in which certain genetic differences have evolved that find their expression both taxonomically and ecologically.

ACKNOWLEDGEMENTS

I am grateful to Philip Tallantire for correcting the language and to Hans Olsvik, Karsten Sund and Jan H. Simonsen for technical assistance.

REFERENCES

- Brinck, P. 1949. Studies on Swedish stoneflies (Plecoptera). *Opusc. Ent. Suppl.* 11, 1–250.
- Brittain, J.E. 1977. The effect of temperature on the egg period of *Taeniopteryx nebulosa* (Plecoptera). *Oikos* 29, 302–305.
- 1978. Semivoltinism in mountain populations of *Nemourella pictetii* (Plecoptera). *Oikos* 30, 1–6.
- Lillehammer, A. & Saltveit, S.J. 1984. The effect of temperature on infraspecific variation in egg biology and nymphal size in the stonefly *Capnia atra* (Plecoptera). *J. Anim. Ecol.* 53, 161–169.
- Frost, S., Huni, A. & Kershaw, W.E. 1971. Evaluation of a kicking technique for sampling stream bottom fauna. *Can. J. Zool.* 49, 167–183.
- Haaland, Ø. 1981. Livssyklusstudier av steinfluene *Capnopsis schilleri* (Capniidae) og *Leuctra nigra* (Leuctridae) (Plecoptera). Unpubl. thesis, Univ of Oslo, 55 pp.
- Hynes, H.B.N. 1977. A Key to the Adults and Nymphs of British Stoneflies. *F.B.A. Scientific publication No. 17*, 90 pp.
- Iversen, T.M. 1978. Life cycle and growth of three species of Plecoptera in a Danish spring. *Ent. Meddr.* 46, 57–62.
- Johannesen, T.W. 1963. Vær og klima i Norge. pp. 65–92 in J.T. Ruud (ed.) Dette er Norge, 1814–1964. Gyldendal, Oslo.
- Lillehammer, A. 1974a. Norwegian stoneflies I. Analyses of the morphological and structural characters used in taxonomy. *Norsk ent. Tidsskr.* 21, 61–109.
- 1974b. Norwegian stoneflies II. Distribution and relationship to the environment. *Norsk ent. Tidsskr.* 21, 195–250.
- 1975. Norwegian stoneflies III. Field studies on ecological factors influencing distribution. *Norw. J. Ent.* 22, 71–80.
- 1976. Norwegian stoneflies V. Variation in morphological characters compared to differences in ecological factors. *Norw. J. Ent.* 23, 161–172.
- 1986. Intraspecific variation in the biology of eggs and nymphs of Norwegian populations of *Leuctra hippopus* (Plecoptera). *J. Nat. Hist.* (In Press).
- Rekstad, O. 1979. Vekst og livssyklusstudier av tre steinfluearter (fam. Nemouridae) fra Sørkedalen. Unpubl. thesis, University of Oslo, 46 pp.
- Ruprecht, R. 1969. Zur Artsspezifität der Trommelsignale der Plecopteren (Insecta). *Oikos* 20, 26–33.
- Saltveit, S.J. 1977. Field and laboratory studies on stoneflies (Plecoptera), with special emphasis on the genus *Amphinemura* (Ris). (In Norwegian). Unpubl. thesis. Univ. of Oslo. 244 pp.
- & Lillehammer, A. 1984. Studies on egg development in the Fennoscandian *Isoperla* species. *Annls Limnol.* 20, 91–94.
- Stewart, K.W., Szczytho, S.W. & Stark, B.P. 1982. Drumming behaviour of North American Pteronarcyidae (Plecoptera): Dialects in Colorado and Alaskan *Pteronarcella badia*. *Ann. Entom. Soc. Am.* 75, 530–533.
- Sweeney, B.W. & Vannot, R.L. 1978. Size Variation and the Distribution of Hemimetabous Aquatic Insects. Two Thermal Equilibrium Hypotheses. *Science* 200, 444–446.
- Vannot, R.L. & Sweeney, B.W. 1980. Geographical analysis of the thermal equilibria: A conceptual model for evaluating the effect of natural and modified thermal regimes on aquatic insect communities. *Am. Nat.* 115, 667–695.
- Zwick, P. 1973. Insecta: Plecoptera, Phylogenetisches System und Katalog. *Das Tierreich (Berlin)* 94, XXXII + 465 pp.

Received 30 April 1985

Spiders (Araneae) from the Eidanger peninsula, Grenland, Telemark, SE Norway

GEIR E. ELLEFSEN & ERLING HAUGE

Ellefsen, G. E. & Hauge, E. 1986. Spiders (Araneae) from the Eidanger peninsula, Grenland, Telemark, SE Norway. *Fauna norv. Ser. B.* 33–39.

Pitfall trapping from March to November 1983 in 3 different plant associations on the Eidanger peninsula in Telemark, SE Norway, gave a total of 86 spider species. The composition of communities and comments on habitat preferences and species distribution is discussed. Two species, *Ceratinella scabrosa* (O.P.-Cambridge, 1871) and *Cicurina cicurea* (Fabricius, 1793) are new to Norway.

Geir E. Ellefsen & Erling Hauge, Museum of Zoology, University of Bergen, Museclass 3, N-5000 Bergen, Norway.

INTRODUCTION

During 1983, invertebrates were collected in a temporarily protected forest area and its nearest surroundings on the Eidanger peninsula. The investigation was granted by The Norwegian Ministry for the Environment (Miljøverndepartementet) and focused on the lepidopterous fauna (Ellefsen 1984). However, ground living invertebrates were collected in pitfall traps and the present paper outlines the spider communities in the three different vegetation types.

The field work was carried out by G.E. Ellefsen, and the spiders were identified by E. Hauge.

STUDY AREA

The study area is situated in the southwestern parts of Eidanger peninsula in Grenland, SE Telemark (Fig. 1). The coastal areas of Telemark have a favourable climate with warm summers and relatively mild winters. Mean January temperature is -3°C , and the average annual precipitation is about 800 mm.

The rocks are Cambro-Silurian sediments, mainly limestone and shales.

The vegetation has been thoroughly investigated (e.g. Bjørndalen 1977, 1980). Two plant associations are predominant: Basiphilous pine forests and thermophilous deciduous forests. Permanent conservation has been suggested for the large stands of these two vegetation types (Bjørndalen et al. 1973). In particular the dry variant of the basiphilous pine forest has a restricted distribution in Norway. A humid stand of ash (*Fraxinus excelsior*) with *Equisetum hie-*

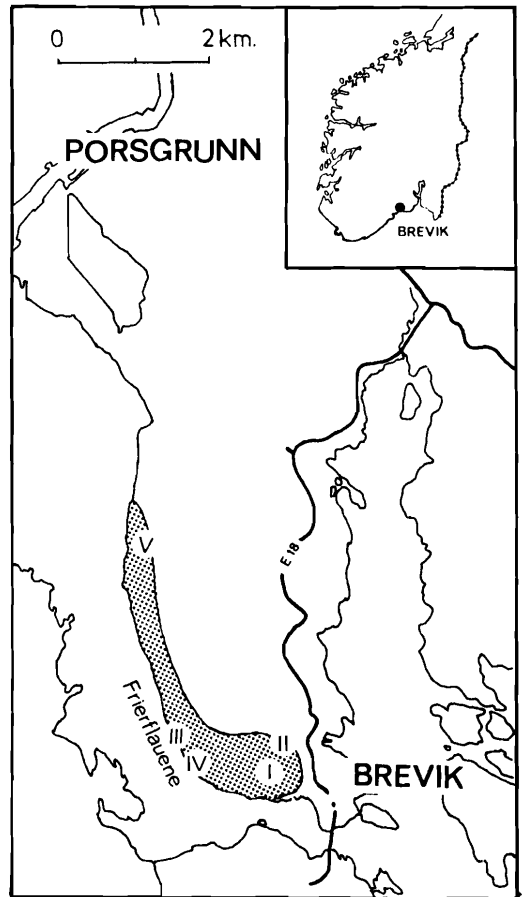


Fig. 1. Map of the Eidanger peninsula, Grenland. The localities are numbered according to Tab. 1.

male in the field layer, is forming another interesting vegetation type in the area.

Pitfall traps were used in five localities:

LOC. I. Dammane, Brevik, UTM: 32VNL390469. (15 traps.)

A south-eastern association of the Norwegian basiphilous pine forests (*Convallario-Pinetum*). The tree layer is dominated by pine (*Pinus sylvestris*), but spruce (*Picea abies*), juniper (*Juniperus communis*) and several deciduous tree species, particularly hazel (*Corylus avellana*) are frequent. The field layer is extremely rich in herbs and grasses. Characteristic species are *Convallario majalis*, *Brachypodium sylvaticum* and *Melampyrum pratense*.

Five of the pitfall traps were sited near the shore of a small man-made pond.

LOC. II. Dammen, Brevik, UTM: 32VNL391474. (5 traps.)

A small damp area with the very rare plant association *Equiseto-Fraxinetum*. In Norway this plant association is restricted to coastal areas on the western side of the Oslo fjord. Ashes (*Fraxinus excelsior*) dominate the tree layer. The field layer is composed exclusively of *Equisetum hiemale*, and the ground is covered by mosses. The traps were situated not far from a small pond where alder (*Alnus incana*) dominated the shore. The locality is surrounded by spruce forest.

LOC. III. Frierflaune, Brevik, UTM: 32VNL379473. (5 traps.)

A xerophilous variant of basiphilous pine forests forming a forest rim community at the edge of the precipices at Frierflaune. Typical plant species in the ground and field layers are *Arctostaphylos uva-ursi*, *Artemisia campestris* and *Geranium sanguineum*.

LOC. IV. Frierflaune, Brevik, UTM: 32VNL380470. (10 traps.)

The locality was situated in the steep slopes beneath the Frierflaune. The vegetation is undisturbed by man; decaying tree trunks are abundant. The vegetation consists of thermophilous deciduous forest (*Ulmo-Tilietum*) dominated by lime (*Tilia cordata*), elm (*Ulmus glabra*), with scattered ash, hazel and maple (*Acer platanoides*). The field layer is in spring dominated by *Hepatica nobilis*, in summer and autumn by grasses.

LOC. V. Gravastranda, Porsgrunn, UTM: 32VNL372499. (10 traps.)

A more humid variant of the thermophilous deciduous forest described above. In addition to lime and elm, ash are frequent. Five pitfall traps were placed in a shady area on both sides of a

small brooklet, the other five in an area with a well developed field layer with *Polygonum multiflorum* and *Rosa* sp., among others.

METHODS

The total of 50 pitfall traps containing 4% formaldehyde were used from March 24 to November 4 1983. At Loc. III the trapping was terminated at August 17.

Species richness, and the dominance among the species in the material, are expressed by Menhinick's Index, $D = S/\sqrt{N}$, where S is the number of species, and N is the total number of specimens (Menhinick 1964) and Berger-Parker's Dominance Index, $d = N_{\max}/N_T$, which expresses the proportion of the total catch, N_T , that is due to the most dominating species, N_{\max} (Southwood 1978).

When calculating these indices the localities from the basiphilous pine forests (Loc. I and Loc. III) have been grouped together. Similarly Loc. IV and Loc. V have been grouped together as thermophilous deciduous forest.

RESULTS

The material comprises 1139 adult specimens of 86 species in 15 families (Tab. 1). The dominating families were Linyphiidae with 44 species and 45.0% of the total material, and Lycosidae with 8 species and 35.5% of the total material.

The species

Most of the species are common and widespread in Norway. However, two species were taken for the first time in Norway, viz: *Ceratinella scabrosa* (O.P.-Cambridge, 1871) and *Cicurina cicurea* (Fabricius, 1793). *C. cicurea* is distributed all over Central Europe and England. In Fennoscandia it has been recorded from Tvärminne, in S. Finland (Palmgren 1977). *C. scabrosa* is distributed in the southeastern parts of Finland, and in Skåne, S. Sweden (Holm 1977). *Tegenaria atrica* C.L. Koch, 1843 has previously been recorded from Norway (Tambis-Lyche 1942), but as there have been confusion about its synonymy (see Locket et al. 1974) the identity of these specimens are uncertain. *Oxyptila pratensis* (C.L. Koch, 1873) was recorded for the first time from Norway in HE, Elverum: (Hauge & Kvamme 1983), but the species has also been taken in VE, Tjømø: Mostrand (T. Andersen

Table 1. Spiders caught in pitfall traps on the Eidanger peninsula, Grenland, 1983. Number of males and females are indicated ($\sigma \sigma / \varphi \varphi$). The localities are shown in Fig. 1.

Species	Loc. I	Loc. II	Loc. III	Loc. IV	Loc. V
DYSDERIDAE					
<i>Segestria senoculata</i> (L., 1758)				2/0	1/0
AMAUROBIDAE					
<i>Amaurobius fenestralis</i> (Stroem, 1768)	2/1			2/0	4/0
GNAPHOSIDAE					
<i>Callilepis nocturna</i> (L., 1758)	1/0			1/0	
<i>Zelotes subterreaneus</i> (C.L.Koch, 1833)	5/2		4/4	3/2	1/0
<i>Haplodrassus silvestris</i> (Blackwall, 1833)				1/2	
<i>Gnaphosa bicolor</i> (Hahn, 1831)				1/0	
<i>Micaria pulicaria</i> (Sundevall, 1831)	0/1				
<i>Phrurolithus festivus</i> (C.L.Koch, 1835)	4/7				2/0
LIOCRANIDAE					
<i>Apostenus fuscus</i> Westring, 1851	6/11			5/2	
<i>Agroeca brunnea</i> (Blackwall, 1833)			0/1		0/2
<i>A. proxima</i> (O.P.-Cambridge, 1871)	1/2				
CLUBIONIDAE					
<i>Clubiona subsultans</i> Thorell, 1875	1/0				
<i>C. lutescens</i> Westring 1851		1/0			
<i>C. pallidula</i> (Clerck, 1757)				0/1	
<i>C. terrestris</i> Westring 1851					0/1
<i>C. compta</i> C.L.Koch 1839			0/1		
ZORIDAE					
<i>Zora spinimana</i> (Sundevall, 1832)	0/1				
ANYPHAENIDAE					
<i>Anypaena accentuata</i> (Walkenaer, 1802)	3/0				
SPARASSIDAE					
<i>Micrommata virescens</i> (Clerk, 1757)				1/0	
THOMISIDAE					
<i>Oxyptila trux</i> (Blackwall, 1846)	3/6				2/1
<i>O. atomaria</i> (Panzer, 1810)	1/1				
<i>O. praticola</i> (C.L.Koch, 1837)	1/0		13/2	16/3	12/0
<i>Xysticus luctuosus</i> (Blackwall, 1836)	2/0				
<i>X. cristatus</i> (Clerck, 1757)					1/0
SALTICIDAE					
<i>Neon reticulatus</i> (Blackwall, 1853)				0/1	
LYCOSIDAE					
<i>Pardosa lugubris</i> (Walckenaer, 1802)	49/44	0/1	10/13	30/18	34/23
<i>P. paludicola</i> (Clerck, 1757)		0/1			
<i>P. amentata</i> (Clerk, 1757)					1/0
<i>P. pullata</i> (Clerck, 1757)					2/7
<i>Trochosa terricola</i> Thorell, 1856	53/19		26/9	18/6	23/4
<i>Alopecosa aculeata</i> (Clerck, 1757)	1/0		1/0		1/0
<i>Acantholycosa lignaria</i> (Clerck, 1757)	0/1				
<i>Xerolycosa nemoralis</i> (Westring, 1861)	6/5				

Species	Loc. I	Loc. II	Loc. III	Loc. IV	Loc. V
AGELENIDAE					
<i>Cryphoeca silvicola</i> (C.L.Koch,1835)	13/2	3/1		2/0	5/2
<i>Hahnna pusilla</i> C.L.Koch,1841	3/0				
<i>H. nava</i> (Blackwall,1841)	1/0				
<i>Cicurina cicurea</i> (Fabritius,1793)	9/0			10/0	6/0
<i>Tegenaria atrica</i> C.L.Koch,1843				1/0	
THERIDIIDAE					
<i>Euryopis flavomaculata</i> (C.L.Koch,1836)	1/0		1/0		
<i>Robertus neglectus</i> (O.P.-Cambridge,1871)		1/0			
<i>R. lividus</i> (Blackwall,1863)					1/0
METIDAE					
<i>Meta menardi</i> (Latreille,1804)					1/0
LINYPHIIDAE					
<i>Ceratinella brevipes</i> (Westring,1851)					1/0
<i>C. scabrosa</i> (O.P.-Cambridge,1871)				2/0	
<i>Walckenaera antica</i> (Wider,1834)	1/4				
<i>W. dysderoides</i> (Wider,1834)	5/0			7/0	
<i>W. cucullata</i> (C.L.Koch,1836)	1/0				
<i>Tapinocyba pallens</i> (O.P.-Cambridge,1872)	4/0			3/1	
<i>Minyriolus pusillus</i> (Wider,1834)	1/0				
<i>Gongylidium rufipes</i> (L.,1758)		1/0			
<i>Erigonella hiemalis</i> (Blackwall,1841)		0/1			
<i>Diplocephalus cristatus</i> (Blackwall,1833)		1/2			
<i>D. latifrons</i> (O.P.-Cambridge,1863)	3/0	26/10	2/0	1/1	2/1
<i>D. picinus</i> (Blackwall,1841)	3/0				1/0
<i>Maso sundevalli</i> (Westring,1851)	1/0				
<i>Oreonetides abnormis</i> (Blackwall,1841)	2/0				
<i>Macrargus rufus</i> (Wider,1834)				0/1	
<i>Agyneta cauta</i> (O.P.-Cambridge,1902)	1/0				
<i>A. conigera</i> (O.P.-Cambridge,1863)		1/0			
<i>Microneta viaria</i> (Blackwall,1841)	7/3	1/0	4/0	33/3	
<i>Porrhomma convexum</i> (Westring,1863)		1/0			
<i>Centromerus aequalis</i> (Westring,1862)	6/1		1/2	4/0	
<i>C. sylvaticus</i> (Blackwall,1841)	8/1	0/3		7/3	1/1
<i>C. incilium</i> (C.L.Koch,1881)	0/1				
<i>C. arcanus</i> (O.P.-Cambridge,1873)			2/0		
<i>Bathyphantes gracilis</i> (Blackwall,1841)		2/0			
<i>B. nigrinus</i> (Westring,1851)		2/0			
<i>B. parvulus</i> (Westring,1851)		0/1			
<i>Diplostyla concolor</i> (Wider,1834)	6/11	45/14	5/1	11/0	15/10
<i>Bolyphantes alticeps</i> (Sundevall,1832)				1/0	
<i>Lepthyphantes alacris</i> (Blackwall,1853)	0/5	3/2			
<i>L. anguliapalpis</i> (Westring,1851)	2/5	0/2	0/1		
<i>L. tenebricola</i> (Wider,1834)	4/11	25/20	11/15	6/8	3/4
<i>L. flavipes</i> (Blackwall,1854)	1/11	0/1		4/10	1/2
<i>L. mengei</i> Kulczynski,1887		0/1	0/1	0/1	
<i>L. pallidus</i> (O.P.-Cambridge,1871)	5/0	1/0		1/0	0/1
<i>L. zimmermanni</i> Bertkau 1890				1/0	
<i>Helophora insignis</i> (Blackwall,1841)	2/7			1/3	
<i>Drapetisca socialis</i> (Sundevall,1832)	0/1	0/1		3/0	0/1

LINYPHIIDAE (forts.)

<i>Tapinopa longidens</i> (Wider, 1834)				1/0	
<i>Labulla thoracica</i> (Wider, 1834)				1/1	
<i>Stemonyphantes lineatus</i> (L., 1758)	1/1				
<i>Neriere clathrata</i> (Sundevall, 1829)	1/1		1/0	1/0	1/1
<i>N. montana</i> (Clerck, 1757)	0/1				
<i>Linyphia triangularis</i> (Clerck, 1757)					0/1
<i>Allomengea scopigera</i> (Grube, 1859)		1/0		1/0	1/0

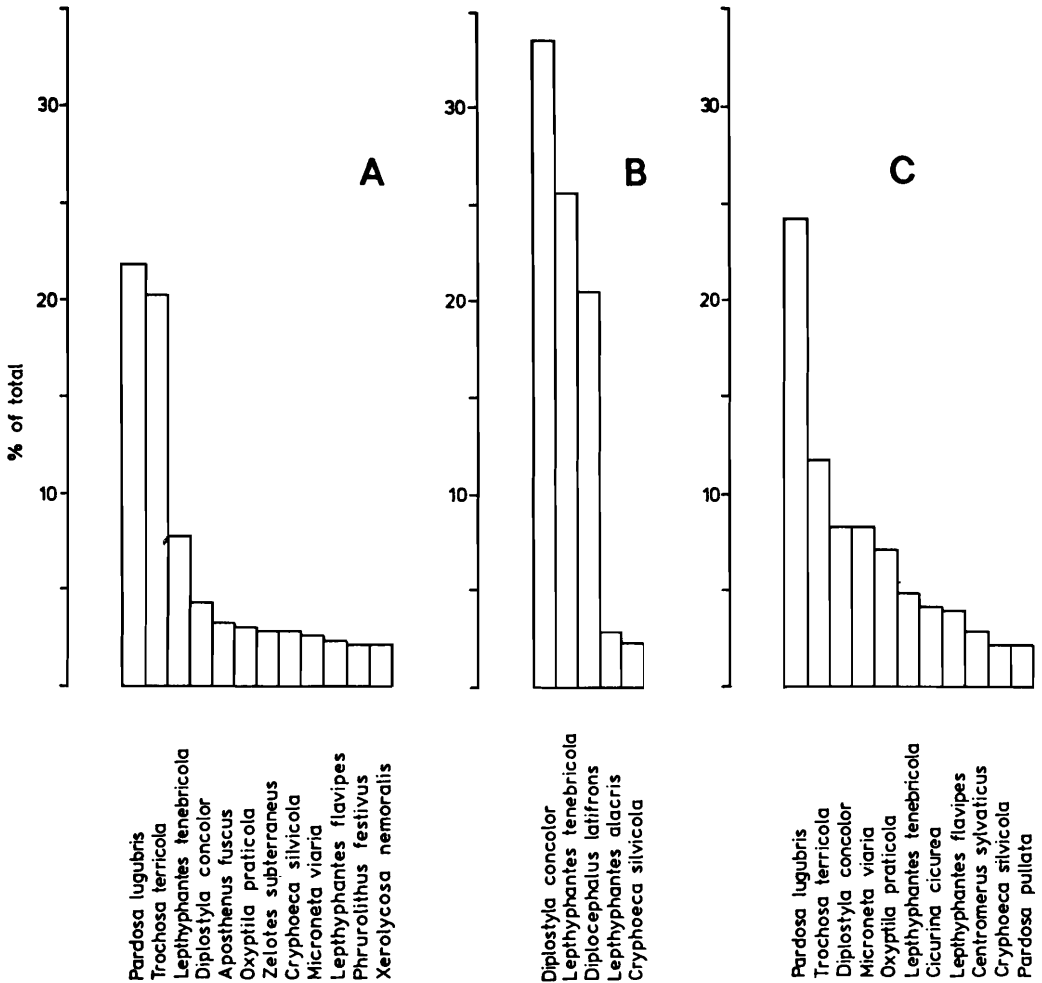


Fig. 2a—c. The spider species with a dominance of more than 2% of the total catch (adult specimens) from a) the basiphilous pine forests (Loc. I and III), b)

the *Equiseto-Fraxinetum* locality (Loc. II) and c) the thermophilous deciduous forests (Loc. IV and V).

Table 2. Species richness expressed by Menhinick's Index (Menhinick 1964) and Berger-Parker's Dominance Index (Southwood 1978) for the localities.

	Loc. I/III	Loc. II	Loc IV/V
Number of specimens, N	529	176	434
Number of species, S	53	25	50
Menhinick	2.3043	1.8686	2.4001
Berger-Parker	0.2193	0.3352	0.2419

leg.). *Bathyphantes parvulus* (Westring, 1851) has previously been recorded from Hallingdal only (Strand 1899). The only previous record of *Haplodrassus silvestris* (Blackwall, 1833) in Norway is from S. Nordland (Strand 1900). *Clubiona lutescens* Westring, 1851 has previously been recorded from Norway according to Bristowe (1939), but no exact locality is given. *Apostenus fuscus* Westring, 1851 has been recorded once in Norway from AK, Ostøen: (Strand 1904).

The communities

The basiphilous pine forest (Loc. I and III) yielded 50 species, of which 22 were not found in either of the two other communities. *Pardosa lugubris* (Walckenaer, 1802) (21.9%) and *Trochosa terricola* Thorell, 1856 (20.2%) were the two most abundant species and constituted 42.1% of the total catch. Twelve species had a dominance of more than 2% (Fig. 2a).

The thermophilous deciduous forest (Loc. IV and V) yielded 50 species, of which 20 species were not found in either of the two other communities. *P. lugubris* (24.2%) and *T. terricola* (11.8%) were the two most abundant species and constituted 36.0% of the total catch. Eleven species reached a dominance of more than 2% (Fig. 2b).

The damp *Equiseto-Fraxinetum* locality (Loc. II) yielded 25 species of which 11 were not found in either of the two other localities. *Diplostyla concolor* (Wider, 1834) (33.5%) and *Lepthyphantes tenebricola* (Wider, 1834) (25.6%) were the two most abundant species and constituted 59.1% of the total catch. Five species reached a dominance of more than 2% (Fig. 2c).

The highest species diversity was found in the thermophilous deciduous forests, while the *Equiseto-Fraxinetum* locality had the highest dominance index (Tab. 2).

DISCUSSION

The spider fauna in the basiphilous pine forest and the thermophilous deciduous forests does not differ noticeably in species richness nor in the distribution of the most dominant species (Tab. 2). There is also a high similarity when considering the dominating species. *P. lugubris*, *T. terricola*, *D. concolor*, *L. tenebricola* and *Microneta viaria* (Blackwall, 1841) were among the six most abundant species in both communities, and all of them are known as common woodland species. Species typical in either coniferous or in deciduous forests were found in both localities, like *M. viaria*, which are most commonly associated with deciduous forest where it lives under dead leaves (Palmgren 1975). This species was most dominant in the thermophilous deciduous forest (8.3%), but even in the basiphilous pine forest it made up 2.6% of the total material. This resemblance is probably due to the presence of deciduous trees in the pine forest.

The *Equiseto-Fraxinetum* locality on the contrary has a higher dominance index, and a lower index for species richness than the localities mentioned above (Tab. 2). Three species, *D. concolor*, *L. tenebricola* and *Diplocephalus latifrons* (O.P.-Cambridge, 1863) make up nearly 80% of the total material. *D. concolor* is supposed to prefer humid localities with dense foliage, and avoids mosses in the substrate (Palmgren 1975), which is somewhat in contrast to the moss dominated ground at this locality. *L. tenebricola* is usually found in several kinds of forests, but unlike *D. concolor*, it is reported to have a preference for mosses (Palmgren 1975). This suggestion is supported by the species' relatively high dominance at this locality. *D. latifrons* prefers certain dark coniferous forests according to Palmgren (1976). In southern Norway, on the contrary, the species has a marked preference for thermophilous deciduous forests. The two most abundant species in the other communities, *P. lugubris* and *T. terricola*, were very sparse in this locality. According to Hallander (1970) adult specimens of *P. lugubris* prefer low humidity and substrates with dry leaves. *T. terricola* probably shuns the most extreme humid and the very dark habitats (Locket & Millidge 1951).

ACKNOWLEDGEMENT

The study was granted by the Norwegian Ministry for the Environment (Miljøverndepartementet).

We are also indebted to Randi Lund for sorting out the spiders from the pitfall trap material, and to Trond Andersen for valuable comments on the manuscript.

REFERENCES

- Bjørndalen, J.E. 1977. En plantesosiologisk undersøkelse av urterike barskoger i Grenland, Telemark. *Unpublished. Cand.real.thesis. University of Bergen.*
- 1980. Phytosociological studies of basiphilous pine forest in Grenland, Telemark, SE Norway. *Norv. J. Bot.* 27, 139—161.
- Bjørndalen, J.E., Rønning, K.J. & Tvermyr, S. 1973. *Naturverninventering på Grenlands Kambro-Silur-sonen.* Fylkesmannen i Telemark, Utbyggingsavdelingen, Skien.
- Bristowe, W.S. 1939. *The community of spiders I.* Ray Society, London, 228 pp.
- Ellefsen, G.E. 1984. *Storsommerfugler (Lepidoptera) fra området Frierflauene — Åsstranda.* Miljøverndepartementet, Rapport T-576, 97—133 pp.
- Hallander, H. 1970. Habits and habitat selection in the wolf spiders *Pardosa chelata* (O.F. Muller) and *P. pullata* (Clerck). *Dr. thesis, Lunds Universitet, Lund. Unpublished.*
- Hauge, E. & Kvamme, T. 1983. Spiders from forest-fire areas in southeastern Norway. *Fauna norv. Ser. B.* 30, 39—45.
- Holm, H. 1977. Kullabergs spindlar. *Kullabergs Natur* 15, 1—29. Lund 1977.
- Locket, G.H. & Millidge, A.F. 1951. *British Spiders I.* Ray Society, London, 310 pp.
- Locket, G.H., Millidge, A.F. & Merret, P. 1974. *British Spiders III.* Ray Society, London, 214 pp.
- Menhinick, E.F. 1964. A comparison of some species — individuals diversity indices applied to samples of field insects. *Ecology* 45, 859—861.
- Palmgren, P. 1975. Die Spinnenfauna Finnlands und Ostfenno-skandiens VI. Linyphiidae 1. *Fauna fenn.* 28, 1—102.
- 1976. Die Spinnenfauna Finnlands und Ostfenno-skandiens VII. Linyphiidae 2. *Fauna fenn.* 29, 1—126.
- 1977. Die Spinnenfauna Finnlands und Ostfenno-skandiens VIII. Argyronetidae, Agelenidae, Hahniidae, Dictynidae, Amaurobiidae, Titanoecidae, Segestriidae, Pholcidae und Sicariidae. *Fauna fenn.* 30, 1—50.
- Southwood, T.R.E. 1978. *Ecological Methods.* Chapman and Hall, London/New York 1978, 524 pp.
- Strand, E. 1899. Araneae Hallingdaliae. *Arch. Math. Naturv.* 21, 1—23.
- 1900. Zur Kenntnis der Arachniden Norwegens. *K. norske Vid. Selsk. Skr.* 2, 1—46.
- 1904. Die Dictyniden, Dysderiden, Drassiden, Clubioniden und Ageleniden der Collettschen Spinnen-Sammlung. *Vid. Selsk. Forh.* 1904, 1—16.
- Tambs-Lyche, H. 1942. Notes on Norwegian spiders. *Norsk ent. Tidsskr.* 6, 107—114.

Received 11 March 1985

Three species of Tephritidae (Dipt.) new to Norway, with a note on *Phagocarpus permundus* (Harris, 1780) in Norway

LITA GREVE

Greve, L. 1986. Three species of Tephritidae (Dipt.) new to Norway, with a note on *Phagocarpus permundus* (Harris, 1780) in Norway. *Fauna norv. Ser. B* 33, 40–43.

The following species are reported new to Norway: *Chetostoma stackelbergi* Rohdendorf; *Tephritis cometa* (Loew) and *Tephritis ruralis* (Loew). New records for *Phagocarpus permundus* (Harris) is presented from Norway for the first time since Siebke (1877). A map of the Norwegian distribution is given.

Lita Greve, Zoological Museum, University of Bergen, Muséplass 3, N-5000 Bergen, Norway.

THE SPECIES

Sub. fam. Trypetinae

Phagocarpus permundus (Harris, 1780)

Phagocarpus permundus was recorded from Norway for the first time by Zetterstedt (1847) who refers to a specimen from Våga, northern Oppland province captured by Boheman 1832. Zetterstedt also mentions a specimen captured by Moe in the botanical garden at Tøyen, Oslo. The specimen from Våga is most likely a specimen in the Boheman collection, Stockholm which is marked *Norvegia alpina*. Moe's specimen is present in the Zetterstedt collection, Lund (Persson, 1958). Siebke (1877) in his list on Norwegian Diptera mentions *P. permundus*, under the name *Tephritis Gaedii* Meigen, from Frogner and Ormøya. Several specimens collected by Siebke in Oslo is present today in Zoological Museum, University of Oslo (= ZMO). No further records of *P. permundus* have been published from Norway.

Judged from the paucity of records published from Fennoscandia *P. permundus* seems to be a very rare species. The wing pattern is characteristic and easy to identify even in the field as it is not like any other *Tephritid* — species in Europe see Fig. 1. As late as 1952 Ringdahl published the first record from Sweden, Hälsingborg in Skåne. Two additional records are mentioned by Andersson (1962) from Lund and Stockholm, and a fourth by Persson (1984) from Øland. Nordman (1963) reports the first specimen from Finland, probably introduced with garden

plants. Nordman also presents a map on the European distribution partly based on the article of Teschner (1962). However, both Nordman and Teschner do not include several records from England (Niblett 1940, 1947 and 1955) and Holland (Kabos 1958), and neither include Siebke's records from 1877. Thus even recent publications make *P. permundus* seem more rare in Scandinavia than the material in museum collections indicates.

MATERIAL

The list follows Økland (1981). All new material has been determined by the author. ZMB — Zoological Museum, University of Bergen. Numbers in brackets refer to the collection in ZMO.

Norwegian records: AK, Oslo: Oslo, 1 ♀ Zetterstedt's collection, Lund (Persson 1958 in litt.),

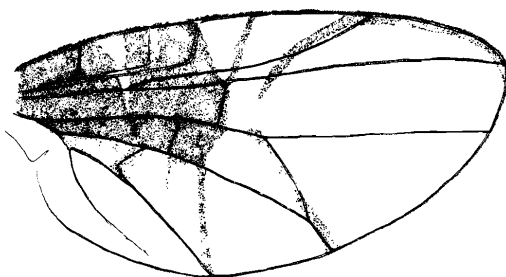


Fig. 1. *Phagocarpus permundus* (Harris) Wing.

Oslo 2 ♀♀ (ZMO 7272, 7273), Frogner 27 July 1845 1 ♂ (ZMO 7267) 1 ♂ without date (ZMO 7268) and 27 July 1849 1 ♀ (ZMO 7274), Rosenbergt. 1 specimen (ZMO 7271), Tobiesens løkke 21 June 1849 1 specimen (ZMO 7265), Malmøya 1 ♀ (ZMO 7274), Bekkelaget 12 July 1832 1 ♂ 1 specimen (ZMO 7266, 7269) 1 specimen without date (ZMO 7270), Hovedøya 29 June 1981 3 ♀♀, 26 June 1982 1 ♂ (ZMB); Bærum: Ostøya 1–24 July 1984 5 ♀♀, 24 July–12 August 1984 4 ♀♀, 12 August–1 September 1984 1 ♂ 1 ♀ (Malaise trap A), 1–24 July 1984 1 ♂ 3 ♀♀ (Malaise trap B) (ZMB). ON, Våga: Våga = *Norv. alpina?* Boheman's collection, 1 specimen Naturhistoriska riksmuseet, Stockholm. VE, Tjøme: Kjære 1 ♀ (ZMB). VAY, Flekkefjord: Hidra, Osmundstø 21 June–3 July 1982 1 ♂ (Malaise trap), Hidra, Dragøy 14 July 1982 1 ♂ (ZMB). RY, Sandnes: Fossvatne 15 July 1983 1 ♂ (ZMB), Hana 18 June 1982 1 ♀ (T. Jonassen p.c. = private col-

lection), Åse 19 June 1982 1 ♂ (T. R. Nielsen p.c.); Gjesdal: Ålgård 26 June 1982 1 ♂; Rennesøy: Vikevåg 11 July 1983 1 ♂; Karmøy: Kopervik, Skår 9 July 1982 19 ♂♂ (ZMB). HOY, Bergen: Øvre Sollien 4 August 1969 1 ♀, Eidsvåg, Vollane 5 August 1973 1 ♀ 23.00 pm. near light, 5 August 1984 1 ♀ in window inside house (ZMB). HOI, Ulvik: Hjeltnes 6 August 1977 1 ♂ near agricultural school with areas of garden plants (ZMB).

Total material, including material in Stockholm and Lund: 32 males, 27 females and 5 specimens. Of these 3 males, 4 females and 4 specimens in ZMO date back to the middle of last century. The distribution of *P. permundus* is given on Fig. 2. *P. permundus* can not be judged as a very rare insect in southern Norway. All records except the specimen in Boheman's collection are from coastal areas or the fjords in western Norway.

The biology of *P. permundus* is fairly well known. Several host plants are given like *Crataegus* spp., *Cotoneaster* spp., *Berberis* spp., *Sorbus aucuparia* L., *Pyracantha coccinea* Lal. and *Amelanchier vulgaris* Moench. (Belcari & Santini 1979). The main host-plant is *Crataegus* spp. and *P. permundus* is looked upon as a major pest of *Crataegus* (Dreyer 1984). The Dutch name is virtually «Meidoornvlieg» viz. Hawthornfly. Wild hawthorn in Norway is mostly represented by the species *Crataegus monogyna* Jacq. distributed from the Oslofjord area north to Møre and Romsdal province. *S. aucuparia* is a common tree all over Norway, but probably a very uncommon host-plant since *P. permundus* using *S. aucuparia* would be a very widespread and common fly. *Berberis vulgaris* L. is found scattered on dry localities north to the Trøndelag provinces. *Cotoneaster integerrimus* Med. is a uncommon bush found north to Nordland province, *C. niger* Fr. is a rare species found only in south east Norway.

Several specimens of *P. permundus* were collected in two Malaise traps during the summer 1984 on Ostøya in Bærum. *B. vulgaris* and *C. integerrimus* were present in the vicinity of the traps and likely hostplants. *C. niger* is also present (Bronger 1984), but rare. A third trap located in a forest of deciduous trees with none of these bushes in the vicinity did not contain any specimens of *P. permundus*. *C. integerrimus* is mentioned as a host plant for *P. permundus* on Øland (Persson 1984) and *C. integerrimus* was most common near trap A which collected the largest number of specimens.

Cultivated *Cotoneaster* spp. which are popu-

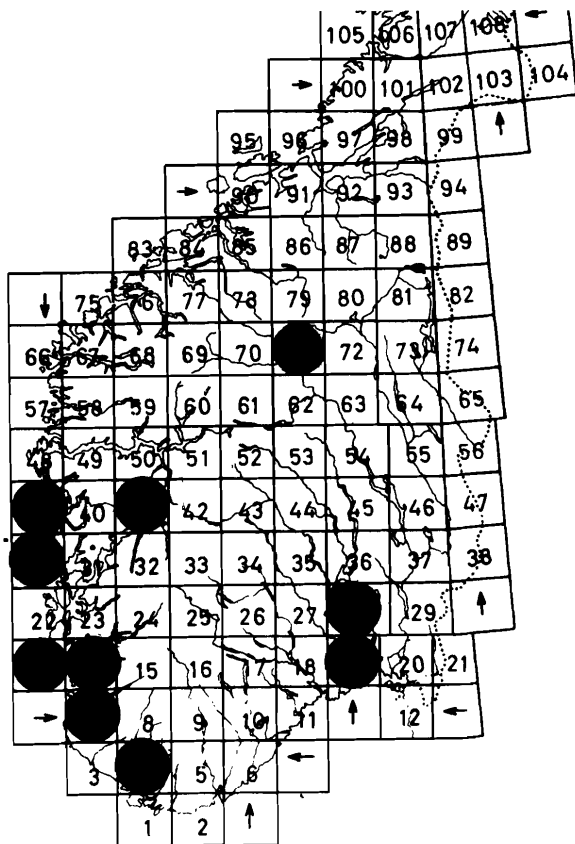


Fig. 2. The distribution of *Phagocarpus permundus* (Harris) in Norway.

lar herbage plants in modern gardens might be suitable host plants for *P. permundus*. *P. permundus* was introduced to Finland with garden plants according to Nordman (1963). *P. permundus* might in the future increase its area of distribution using plants in garden or parks. Several of the new records are actually from gardens.

At Skår, Kopervik 19 males were collected on a house wall in a garden. There are reference to congregations of males of other *Tephritid* species in literature (Prokopy & Roitberg 1984). Such congregations occur at display areas for males for the sole purpose of attracting and courting females, and to which females come for mating.

Chetostoma stackelbergi Rohdendorf, 1956

Norwegian records: AK, Bærum: Ostøya 12–30 May 1984 1 ♀ (Malaise trap) (ZMB); BV, Rollag: Rollag 14 May 1981 1 ♀ (ZMB).

Chetostoma stackelbergi is here reported for the first time from Fennoscandia and Denmark. The species was described from a male collected in the vicinity of Leningrad and is only known from North West USSR (Richter 1970). *C. stackelbergi* belongs to a group of four species of *Chetostoma* where all have a broad subbasal wing band and a hyaline spot in cell *br* (Basal radial). *C. stackelbergi* is the only known from Europe. The three others have been recorded from China (2) and Nepal (1).

Three Malaise traps were operated on Ostøya 1984 from April until October, but no other specimens were discovered.

SUB. FAM. TEPHRITINAE

Tephritis cometa (Loew, 1840).

Norwegian records: AK, Oslo: Hengsengen 1 June 1984 1 ♀ netted on *Hieracium* sp. (ZMB); Bærum: Ostøya 2 June 1984 4 ♂♂ 1 ♀, 1–24 July (Malaise trap) 1984 1 ♀ (ZMB).

Tephritis cometa (Loew, 1840) is here recorded for the first time from Norway. Note that the name *Tephritis radiata* has been used as name for two different species, *T. radiata* Fabricius as a synonym for *Trupanea stellata* (Fuessly, 1775), *T. radiata* Fallén as a synonym for *T. cometa* (Loew, 1840). The *Tephritis radiata* recorded by Siebke (1877) from Oslo: Tøyen 1 August has been examined and proved to be *Trupanea stellata*.

T. cometa is known from some Swedish province (Persson 1958). This species is probably rare in Sweden since Janzon (1984) did not ob-

tain larvae or puparia for his studies on Swedish *Tephritis*. *T. cometa* is recorded from Finland (Hackman 1980). It is distributed in Europe and parts of Asia (Hendel 1927).

Tephritis ruralis (Loew, 1844)

Norwegian records: AK, Bærum: Ostøya 28 April–12 May 1984 3 ♀♀, 12–30 May 1984 16 ♂♂ 27 ♀♀, 30 May–10 June 1984 1 ♂ 8 ♀♀. 10 June–1 July 1984 4 ♂♂ 2 ♀♀, 1–24 July 1984 1 ♂ 2 ♀♀ (Malaise trap A) (ZMB).

Tephritis ruralis (Loew, 1840) is here recorded for the first time from Norway. *T. ruralis* is closely similar to the somewhat larger *T. conura* (Loew 1844) which also was found in the Malaise traps at Ostøya. A total material of 22 males and 42 females were collected, 43 specimens in the period 12–30 May.

The host plants for *T. ruralis* is *Crepis* spp. and *Hieracium* spp., both Asteraceae. The Malaise trap at Ostøya was situated near a meadow dominated by *Geranium sanguineum*. *Crepis paludosa* (L.) and *C. tectorum* L. are reported as rare on the island (Bronger 1984). *Hieracium pilosella* L., *H. sylvaticum* L. and *H. umbellatum* L. are common on the island. Janzon (1984) mentions *H. pilosella* as host plant in Sweden. He also report *T. ruralis* as fairly rare in Sweden. *T. ruralis* is reported from Finland (Hackman 1980). The species is distributed all over Europe according to Hendel (1927).

ACKNOWLEDGEMENTS

I want to thank Dr. I. M. White, Commonwealth Institute of Entomology, London who verified my determination of some of the specimens of the *T. ruralis* material. He has also examined the *C. stackelbergi* female from Ostøya, and given the information on the *Chetostoma* species related to *C. stackelbergi*.

I also want to thank Fred Midtgaard, Ås for putting the Diptera material from his Malaise traps at Ostøya to my disposal. I also want to thank the following for material: Terje Jonassen, Songesand; Tore R. Nielsen, Sandnes; Alf-Jacob Nilsen, Hidrasund; Bjørn S. Sagvolden, Rollag; Ivar Stokkeland, Gvarv and Arild Fjeldså, Bergen.

REFERENCES

- Andersson, H. 1962. Sällsynta eller för Sverige nya tvåvingar (Diptera.). *Opusc. ent.* 27, 62–64.
Belcari, A. & L. Santini, 1979. Note etologica su

- Phagocarpus permundus* Harris (Diptera, Tephritidae) evolventesi nei frutti di *Crataegus monogyna* Jacq. in Toscana. *Frustula Entomologica N. S.* 2, 175—182.
- Brønger, C. 1984. Ostøya i Bærum. Vegetasjonskartlegging og botanisk undersøkelse av verneverdier. Del I. Naturvitenskapelige undersøkelser av øyene i Indre Oslofjord, 1. Friluft- og Naturvern-konsulentent i Oslo og Akershus. Rapport. 1—105.
- Dreyer, W. 1984. Zur biologie wichtiger Weissdorninsekten und ihrer parasiten. *Z. angew. Ent.* 97, 286—298.
- Hackman, W. 1980. A checklist of the Finnish Diptera. II. Cyclorrhapha. *Notul. Ent.* 60, 117—162.
- Hendel, F. 1927. 49 Trypetidae. In Linder, E. (ed.). *Die Fliegen der Palaearktischen region* 5 (2), 1—221.
- Janzon, L.-Å. 1984. Notes on Swedish *Tephritis* Latreille, with descriptions and a key to 3rd instar larvae (Diptera: Tephritidae). *Ent. scand.* 15, 401—410.
- Kabos, W. J. 1959. Tweevleugelige Insekten-Diptera. V. De Nederlandse Boorvliegen (Trypetidae) en Prachtvliegen (Otitidae). *Wet. Meded. K. ned. Natuurh. Veren.* 33, 1—20.
- Niblett, M. 1940. British Trypetidae. *Ent. Rec. J. Var.* 52, 56—59.
- 1947. A list of Trypetidae (Diptera) from North-East Surrey. *Ent. Rec. J. Var.* 59, 28—32.
- 1955. The flies of the London area. III. Trypetidae. *Lond. Nat.* 35, 82—88.
- Nordman, A. F. 1963. Die Bohrfliege *Phagocarpus permundus* (Harris) (Dipt., Trypetidae) in Finnland gefunden. *Notul. Ent.* 43, 43—44.
- Persson, P. I. 1958. A revision of the family Trypetidae in Zetterstedt's «Diptera Scandinaviae». *Opusc. ent.* 23, 105—121.
- 1984. Flugor på Ølands Stora alvar. *Ent. Tidsskr.* 104, 151—164.
- Prokopy, R. J. & B. D. Roitberg 1984. Foraging behavior of true fruit flies. *American Scientist* 72, 41—49.
- Richter, V. A. 1970. Fam. 62: Tephritidae. In: Bei-Bienko, G. Ya. et al., *Keys to the insects of the European U.S.S.R.* 5: 132—172. (In Russian).
- Ringdahl, O. 1952. Dipterologiske Notiser 10. Tvenne for faunan nya tvåvingar. *Opusc. ent.* 17, 64.
- Siebke, H. 1877. *Enumeratio Insectorum Norvegicorum. Fasciculum IV. Catalogum Dipteriorum Continentem.* A. W. Brøgger, Christiania, 255 pp.
- Teschner, D. 1962. Zur verbreitung und synonymie der seltenen art *Phagocarpus permundus* (Harris, 1776). Erster nachweis für Niedersachsen (Trypetidae, Diptera). *Ent. Mitt.* 2, 1—3.
- Zetterstedt, J. W. 1847. *Diptera Scandinaviae disposita et descripta.* Vol. 8. Lundae (=Lund), pp. 2195—2197.
- Økland, K. A. 1981. Inndeling av Norge til bruk ved biogeografiske oppgaver — et revidert Strandsystem. *Fauna, Oslo* 34, 167—178.

Received 28 March 1985.

Tephritis vespertina (Loew, 1844) (Dipt., Tephritidae) associated with *Hypochoeris radicata* L. (Asteraceae) in Western Norway

LITA GREVE

Greve, Lita 1986. *Tephritis vespertina* (Loew, 1844) (Dipt., Tephritidae) associated with *Hypochoeris radicata* L. (Asteraceae) in Western Norway. *Fauna norv. Ser. B* 33, 44–46.

The Tephritid fly *Tephritis vespertina* (Loew, 1844) has been found associated with *Hypochoeris radicata* L. (Asteraceae) in the outer parts of Western Norway from West Agder province to Hordaland province. All localities for *T. vespertina* are well inside the restricted distributional area of *H. radicata*. *T. vespertina* is reported for the first time from Fennoscandia and Denmark. The distribution is mapped.

Lita Greve, Zoological Museum, University of Bergen, N.5000 Norway.

INTRODUCTION

The family Tephritidae has not been surveyed in Norway since the time of Siebke (1877). After Siebke's list only scattered articles have treated species of Tephritidae in Norway.

The family Tephritidae have approximately 3700 species on a world basis. Siebke lists only 33 species compared to the 61 given in a recent list (Hackman 1980) from Finland. White (1983) reports approximately 80 species from England. The larvae of Tephritidae live either in living fruit of different kinds or in seed-heads of Asteraceae.

In the identification of the Tephritid species the wing pattern is used as a main species character (Hendel 1927). The wing pattern, however, is individually variable and might in some specimens be very aberrant. Both male and/or female genitalia have been shown to give reliable species characters, but at present genitalia of few species have been described in details.

MATERIAL

The list follows Økland (1981) and all specimens have been determined by the author. All material is deposited in the Zoological Museum, University of Bergen. There is no material in other Zoological museums in Norway.

Norwegian records: VAY, Lindesnes: Spangereid 20 July 1984; Jørgenstad 24 July 1984 on *H. radicata* (?). RY, Stavanger: Near outlet from Lille Stokkavann 20 May 1981. HOY, Bergen: Bergen 19 March 1967, on snow; Sandviken 29

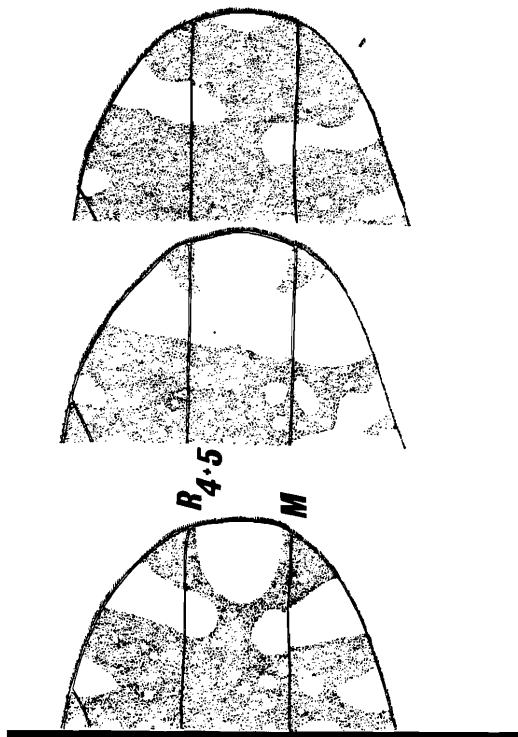


Fig. 1. Wing-tips in different *Tephritis* species. Left: Narrow dark bands over R4 + 5 and M as in *T. conura* (Loew, 1844), *T. leontodontis* (DeGeer, 1776) and others. Middle: Separate dark spots on R4 + 5 and M as in *T. dilacerata* (Loew, 1846), *T. bardanae* (Schrank, 1803) and others. Right: Wing-tip of *T. vespertina* (Loew 1844). All drawn to the same scale for comparison.

May 1984, 5 June 1984 both times on *H. radicata*; Espegrend 23 May 1974; Fantoft 21 May 1937; Ådlandsskiftet 23 May 1974; Eidsvåg, Vøllane 20 July 1971; Stord: Storsøy 20 Oct. 1966; Os: Hagavik 20–30 June 1937; Askøy: Herdla 2 June 1968, 7 June 1936; Meland: Brakstad 3 June 1968, 14 June 1970, 23 June 1984 all times on *H. radicata*; Øygarden: Rong 3 July 1984 on *H. radicata*.

T. vespertina is among the easier species to identify in the genus *Tephritis* in Norway. The wing tip pattern is of special importance. The ribs $R_4 + 5$ and M are broadly joined in a dark band and included is a small hyaline area at the very tip. The hyaline area can vary somewhat in size and it is very small in some specimens. Other species of *Tephritis* have always a much larger hyaline area, or only small dark spots where $R_4 + 5$ and M merges with the wing margin, see Fig. 1.

The first specimen recognized as *T. vespertina* was netted 29 May 1984 in Sandviken in Bergen municipality from an area with *H. radicata*. Several specimens in Zoological Museum, University of Bergen determined as *Tephritis* sp. showed by closer inspection to be *T. vespertina*. These specimens had been collected by random

and no association with host-plants had been recorded, but all localities were well inside the main distributional area of *H. radicata*. The total material numbers 19 males and 25 females from 14 localities. Most specimens have been caught from the last part of May until late July. In the late summer of 1984 *T. vespertina* was sought for near *H. radicata*, but not found. One female taken from Bergen was collected 19 March 1967 on snow, a male from Storsøy, Stord community was collected 20 October 1966. Niblett (1947) reported *T. vespertina* from England from June to August. All specimens collected by the author were taken with a sweep-net during the day-time, except one male from Rong, Øygarden community which was collected around nine p.m.

Fig. 2. gives the distribution of both *T. vespertina* and the hostplant.

DISCUSSION

There are no published records of *T. vespertina* from Fennoscandia and Denmark (Dr. Hugo Andersson, Lund, Sweden and Dr. Leif Lyneborg, Copenhagen, Denmark, pers. comm.). Thus the distribution shown in Fig. 2. represents the Fennoscandinavian distribution for *T. vespertina*.

H. radicata is the hostplant for *T. vespertina* (Hendel 1927, Niblett 1940, 1947–1955, Richter 1970). White (1983), however, has discovered two additional genera of Asteraceae, viz. *Crepis* and *Tragopogon* as hostplants also.

H. radicata belongs to an interesting element of plants in western Norway, the so-called coast plants (Faegri 1960). The coast plants are true terrestrial plants occurring mainly or exclusively in the lower coast region near the open sea, and they are not occurring in the inner fjord districts. A few reach as far north as the Arctic circle. They are not found in the Oslofjord region, or very occasionally so, but reappear scantily at the Swedish West Coast and become more common in southernmost Sweden.

H. radicata is a common plant in an area from westernmost parts of AustAgder province and north to Møre and Romsdal province. Hultén (1971) maps the Scandinavian distribution. *H. radicata* is found in southernmost Sweden and all over Denmark. There are scattered records further north in Sweden and on the larger islands in the Baltic as well as a few records from the outer coastal areas of Finland.

No survey has been made to discover if the

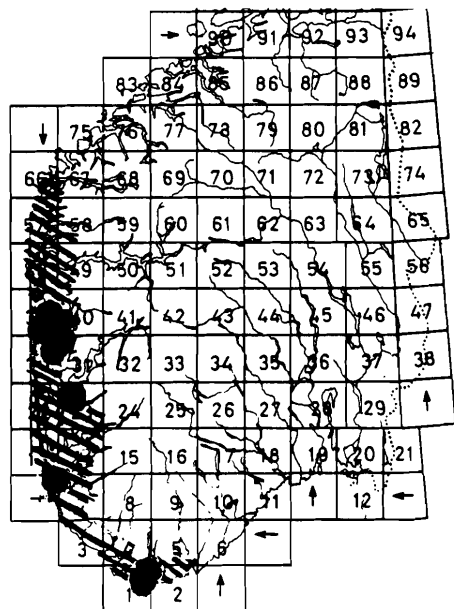


Fig. 2. Hatched area — The main distribution of *Hypochaeris radicata* (L.) (Asteraceae) in Norway. Black spots — Localities where *Tephritis vespertina* (Loew) has been found. The spots in the Bergen area represent 10 localities all together.

coast plants of Western Norway has a special fauna of associated insects and invertebrates. Further investigations are needed to clarify if this assumption holds true.

Since White (1983) reports other hostplants than *H. radicata*, it should be mentioned here that *Tragopogon pratensis* L. is distributed in south eastern Norway and species of *Crepis* sp. are distributed all over the country. Hitherto, however, only *H. radicata* has been shown to serve as host-plant for *T. vespertina* in Norway.

ACKNOWLEDGEMENTS

I would like to thank Tore R. Nilsen, Sandnes for material from WestAgder, and Knut Rognes, Stavanger for material from Rogaland. I offer my sincere thanks to Dr. Hugo Andersson, Lund and Dr. Leif Lyneborg, Copenhagen for information on *T. vespertina*. I would also like to thank Dr. Knut Fægri and Dr. Dagfinn Moe, Botanical Institute University of Bergen for information. Dr. I. M. White, London has verified my determination of some of the material of *T. vespertina* for which I am very grateful.

REFERENCES

Fægri, K. 1960. I. The coast plants, In: Knut Fægri et al., Maps of distribution of Norwegian plants. *Bergen Mus. Skr.* 26, 1–124.

- Hackman, W. 1980. A checklist of the Finnish Diptera. II. Cyclorrhapha. *Notul. Ent.* 60, 117–162.
- Hendel, F. 1927. 49. Trypetidae. — In: Lindner, E. (ed.). *Die Fliegen der Palaearktischen Region*, 5 (2), 1–221.
- Hultén, E. 1971. Atlas över växternas utbredning i Norden. Generalstabens litografiska Anstalts Förlag, Stockholm, 1–531.
- Kloet, G. S. & Hincks, W. D. 1975. A check list of British Insects: Diptera. Siphonaptera. *Handb. ident. Br. Insects* 11 (5), 1–139.
- Niblett, M. 1940. British Trypetidae. *Ent. Rec. J. Var.* 52, 56–59.
- 1947. A list of Trypetidae (Diptera) from North-East Surrey. *Ent. Rec. J. Var.* 59, 28–32.
- 1955. The flies of the London area. III. Trypetidae. *Lond. Nat.*, 82–88.
- Richter, V. A. 1970. Fam. 62: Tephritidae. In: Bei-Bienko, G. Ya. et al., *Keys to the insects of the European U.S.S.R.* 5: 132–172 (In Russian).
- Siebke, H. 1877. *Enumeratio Insectorum Norvegicorum Fasciculum IV. Catalogum Dipteriorum Continentem.* A. W. Brøgger, Christiania. 255 pp.
- White, I. M. 1983. *British Tephritidae. Newsletter 1.* Nov. 1983. Commonwealth Institute of Entomology & Nature Conservancy Council. 56 Queen's gate. London SW 7 5 JR, 1–14.
- Økland, K. 1981. Inndeling av Norge til bruk ved biogeografiske oppgaver — et revidert Strand system. *Fauna, Oslo* 34, 167–178.

Received 28 March 1985.

Records of Lepidoptera from Håøya and Ostøya in inner Oslofjord

LEIF AARVIK AND FRED MIDTGAARD

Aarvik, A. & Midtgaard, F. 1986. Records of Lepidoptera from Håøya and Ostøya in inner Oslofjord. *Fauna norv. Ser. B.* 33, 47–53.

In 1983 and 1984 Lepidoptera were collected at Håøya and Ostøya in inner Oslofjord. The following species have not previously been recorded in Norway: *Nemapogon fungivorella* Ben., *Pseudatemelia elsaе* Svens., *Agonopterix quadripunctata* Wck., *Lamellocossus terebra* D. & S., *Epiblema obscurane* HS., *Ostrinia quadripunctalis* D. & S. and *Euzophera cinerosella* Zell. Previous Norwegian records of *Agonopterix subpropinquella* Stt. are revised to *A. curvipunctosa* Hw., and the former is consequently deleted from the Norwegian list. All species new to Akershus are listed. The need for protection of different habitats in the inner Oslofjord is pointed out.

Leif Aarvik, Tårnveien 6, N-1430 Ås, Norway.

Fred Midtgaard, Norwegian Forest Research Institute, N-1432 Ås-NLH, Norway.

INTRODUCTION

During 1983 and 1984 continuous collecting with 4 light traps (1983) and 5 Malaise-tents (1984) gave a rough picture of the Lepidoptera fauna of Ostøya (AK, Bærum, EIS 28) and Håøya (AK, Frogn, EIS 28). Except single records, earlier published data on Lepidoptera from these islands are restricted to Opheim's (1983) treatment of the Papilionoidea and Hesperioidea of Ostøya.

On the basis of botanical (Bronger 1984) and entomological investigations (Midtgaard & Aarvik 1984), the county administration has proposed protecting parts of Ostøya as a nature reserve. Håøya is already partly protected by the forest administration. The Latin names on plants in this article are according to Lid (1974).

Outline of the localities

The climate measured at Fornebu (3 km NE of Ostøya and 24 km N of Håøya) is slightly continental with a long and warm summer, and a mean temperature of 18.0°C in July. The winters are comparatively cold, with a mean January temperature of -4.6°C. The rainfall comes evenly through the year, and destructive droughts seldom occur. The climate is subhumid (Bronger 1984).

Håøya (570 haa) is in the south dominated by Precambrian augen-gneisses with zones of leptonite and amphibolite bands. The gneiss and lep-

tite rocks are granitic in composition and weather slowly. The amphibolites are rich in dark minerals and weathers more easily. In the lower parts and in the valleys there are marine sediments, mainly clay, with a high content of carbonate because of shells (Rolf Sørensen pers. comm.).

The flora of Håøya has been investigated by Størmer (1983). The steep cliffs dominating the island have a very poor vegetation mainly with *Pinus* and *Calluna*. The areas with marine deposits are much richer. This is the case with the plateau on the top of the southernmost part of the island. The forest here consists mainly of *Ulmus glabra*, *Tilia cordata* and *Quercus*. One of the light traps and two of the Malaise-tents were placed here. In the steep SE directed hill the forest mainly consists of *Picea* and *Pinus*. One of the light traps was placed in this area. The forest is very rich in old, dead and dying trees. Numerous interesting herbs including *Anemone ranunculoides*, *Hedera helix* and *Monotropa hypopitys* are growing there.

The bedrock of Ostøya (236 haa) consists of marine sedimentary rocks of Ordovician age. Most of the island is a lowland area eroded into soft shales. In the central and SE'ern part low ridges running NE-SW are formed in harder thinbedded limestones with dark shale interbeds. The highest hill on the island, in its central western part, is underlain by calcareous sandstone. The lowermost parts of the island, especially the central parts and the Klovodden area in

the north, have quarternary deposits of mainly clay (Holtedahll & Dons 1952).

The major part of the island is covered with coniferous forest. The traps were placed in the SE'ern part of the island. Here some additional collecting with hand-net was done. This area contains many different habitats. The exposed sides of the SW-NE directed hills are dominated by herbs as *Geranium sanguineum*, *Filipendula vulgaris*, *Origanum vulgare*, *Anthyllis vulneraria*, *Seseli libanotis*, *Artemisia campestris* and *Centaurea scabiosa*. Scrub has developed especially on the top of the hills. Among the scrubs growing there are *Cotoneaster integerrimus*, *Rosa* spp., *Prunus spinosa*, *Rhamnus catharticus*, *Berberis vulgaris*, *Juniperus communis* and small *Pinus sylvestris*. The herbs in this habitat include *Polygonatum odoratum*, *Polygala vulgaris*, *Carlina vulgaris* and *Inula salicina*. The scrub represents the transition zone between the bare slopes and woodland. The broadleaved forests are very rich in species. Dominating trees are *Tilia cordata*, *Fraxinus excelsior*, *Acer platanoides* and *Corylus avellana*. The herbs include *Actaea spicata*, *Corydalis intermedia*, *Sanicula europaea* and, on the edges, often *Astragalus glycyphyllos*. The central part of the island is dominated by conifers, mainly *Picea abies*. In the depressions between the hills there are rich meadows, one of them very wet with *Filipendula ulmaria*. One light trap was situated on the edge of this meadow some 150 meters from a pond with *Phragmites communis*.

Records of species

In the following account only the more interesting records are dealt with. Most species mentioned are new to Akershus. This is not indicated.

Incurvariidae

Incurvaria masculella (Denis & Schiffermüller, 1775): Håøya ♂ 5—12 Jun. 1983.

Adelidae

Adela reamurella (Linnaeus, 1758): Håøya ♀ 14 May 1984.

Tineidae

Nemapogon fungivorella (Benander, 1939): Håøya ♀ 5—12 Jul. 1983.

This species has not previously been recorded in Norway. There is also an unpublished record from AAY, Tromøy: Dalene (EIS 6) ♀ 15 May 1974, leg. B.T. Simonsen.

N. fungivorella is known from Denmark, S. Sweden to Södermanland and Bohuslän and from S. Finland. The distribution extends through C. Europe eastwards to Crimea. (Hannemann 1977, Gustafsson 1980, Kyrki 1978).

The larvae lives in the fungus *Trametes quercina* (L. ex Fr.) Pilat (Hannemann 1977). The genitalia are figured by Hannemann (1977).

Agnathosia propulsatella (Rebel, 1892): Håøya 2 ♂♂ 5 Jul—20 Aug. 1983, Ostøya ♂ 2—9 Jul. 1983. Previously recorded from VE only (Opheim & Fjeldså 1983).

Archinemapogon yildizae Kocak, 1981 (*laterella* Thunberg, 1794): Ostøya ♂ 2—9 Jul. 1983.

Triaxomera fulvimitrella (Sodoffsky, 1830): Håøya ♂ 19—26 Jun. 1983.

Nemapogon nigralbella (Zeller, 1838): Håøya ♂, 4 ♀ ♀ 5 Jul.—20 Aug. 1983, Ostøya ♀ 14—24 Jul. 1983.

Bucculatricidae

Bucculatrix albedinella (Zeller, 1838): Ostøya ♀ 11 Jun. 1983; ♂, 2 ♀ ♀ 2 Jun. 1984.

Roeslerstammiidae

Roeslerstammia erxlebella (Fabricius, 1787): Ostøya ♀ 6—14 Aug. 1983.

Coleophoridae

Coleophora milvipennis Zeller, 1839: Ostøya ♂, ♀ 2—9 Jul. 1983.

C. prunifoliae Doets, 1944: Ostøya ♀ 9—14 Jul. 1983; ♀ e.l. *Prunus spinosa* 2 Jun. 1984; ♂ e.p. *Prunus avium* 2 Jun. 1984.

C. asteris Mühlig, 1864: Ostøya ♀ 14—24 Jul. 1983.

C. nutantella Mühlig & Frey, 1857: Håøya ♂ 27 Jun.—5 Jul. 1983. This species belongs to a complex which was revised by Patzak (1976). There are two species in Scandinavia: *C. nutantella* and *C. graminicolella* Heinemann, 1876. In

the Scandinavian literature they were treated under the name *silenella* Herrich-Schäffer, 1855. *C. silenella* is a distinct *C.* European species. Both *nutantella* and *graminicolella* are found in Denmark and S. Sweden (O. Karsholt pers. comm.). Judging from preliminary studies *graminicolella* is the commoner species in Norway. It was abundant at Ostøya in June. The male genitalia of *nutantella* and *graminicolella* are similar. The identity of our *nutantella* specimen is based on external characters, and the determination was verified by O. Karsholt.

The food-plant of *nutantella* is *Silene* and that of *graminicolella* is *Viscaria* (Larsen & Palm 1978, Patzak 1976).

Elachistidae

Elachista bisulcella (Duponchel, 1843): Håøya 2 ♀ ♀ 22 Jul.—18 Aug. 1984.

Oecophoridae

Telechrysis tripuncta (Haworth, 1828): Håøya ♂ 19—27 Jun. 1983. Previous records in Norway from inner Hordaland only (Opheim 1978).

Pseudatemelia elsae Svensson, 1982: Håøya 2 ♂ ♂ 27 Jun.—5 Jul. 1983. New to Norway. This recently described species (Svensson 1982) is known from Gotland in Sweden, S. Finland and Poland. Previously it was confused with the related *P. josephinae* (Toll, 1956).

The occurrence of *elsae* at Håøya is rather surprising as it is far outside the hitherto known range. The species has been found in dry habitats with sparse pine trees (Svensson 1982), and this matches fairly well with parts of the locality at Håøya.

Agonopterix kaekeritziana (Linnaeus, 1767) (*litirella* Denis & Schiffermüller, 1775): Ostøya 3 ♀ ♀ e.l. *Centaurea scabiosa* 11 Jun. 1983; 2 ♂ ♂ 6 Aug.—3 Sept. 1983.

A. curvipunctosa (Haworth, 1811) (*zephyrella* Hübner, 1813) (Fig. 1): Ostøya 2 ♂ ♂, ♀ 14—28 May 1983; 2 ♀ ♀ 2 Jun. 1984. Previous records of *subpropinquella* Stainton, 1849 from Norway (Barca 1935, Krogerus et al. 1971, Opheim 1978) must be referred to *curvipunctosa*. The species is distributed from the Oslofjord area southwards to Kristiansand (VAY). All localities are close to the sea. In Norway it has been reared from *Angelica* and *Seseli libanotis*.

Otherwise in N. Europe known from Västergötland in Sweden only (Gustafsson 1980). The

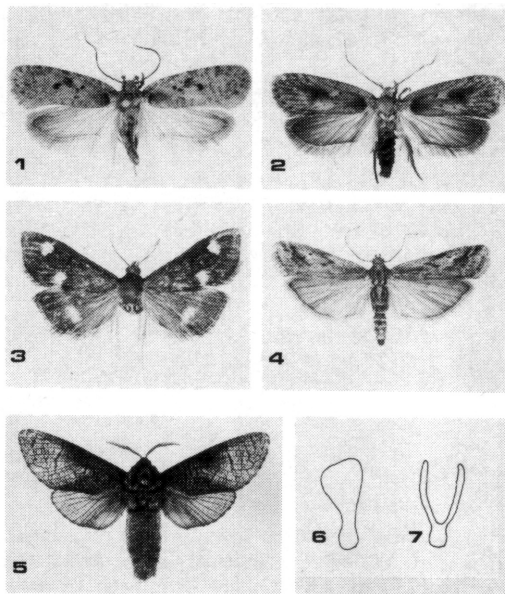


Fig. 1—7. 1. *Agonopterix curvipunctosa* Hw. — 2. *A. quadripunctata* Wck. — 3. *Ostrinia quadripunctalis* D. & S. — 4. *Euzophera cinerosella* Zell. — 5. *Lammellocossus terebra* D. & S. — 6. Antennal segment in male *Cossus cossus* L. — 7. Antennal segment in male *Lammellocossus terebra* D. & S.

species occurs through S.- and C. Europe to Asia Minor (Jacobs 1978).

Jacobs (1978) gives a colour illustration of the species, and the genitalia are figured by Toll (1964).

A. quadripunctata (Wocke, 1857) (Fig. 2). Numerous specimens bred from *Seseli libanotis* at Ostøya. Any Norwegian record of the species has not previously been published, though its occurrence in inner Oslofjord has been known for some years. The species is also common at the neighbouring Snarøya and Brønnøya. Its occurrence in this area is interesting as there is a wide gap between this and the nearest localities in SE. Sweden where it has been recorded in Öland and Gotland (Gustafsson 1980). Otherwise found in S. Finland, Estonia and Poland (Kyrki 1978, toll 1964). The genitalia are figured by Toll (1964).

Gelechiidae

Metzneria neuropterella (Zeller, 1839). Abundant at Ostøya 9—31 Jul. 1983. Previously only recorded from Vestfold (VE) (Opheim 1978).

Teleiodes vulgella (Denis & Schiffermüller, 1775): Ostøya ♂ 25 Jun.—2 Jul. 1983.

Gnorimoschema epithymellum (Staudinger, 1859): Håøya ♂ 23—30 Jul. 1983; Ostøya ♂ 14—24 Jul. 1983.

Scrobipalpa acuminatella (Sircom, 1850). Abundant at Ostøya 4 Jun.—2 Jul. 1983. Previously only recorded from Vestfold (VE) (Opheim 1978).

Caryocolum amaurella (M. Hering, 1924): Ostøya 2 ♂ ♂ 24 Jul.—6 Aug. 1983; 2 ♂ ♂ 10 Jul. 1984.

Agonoxenidae

Heinemannia laspeyrella (Hübner, 1796): Håøya ♂ 5—12 Jul. 1983; Ostøya ♂ 2—9 Jul. 1983, ♀ 1—24 Jul. 1984. Previously in Norway one specimen from AK, Asker: Brønnøya (Aarvik 1983).

Yponomeutidae

Zelleria hepariella Stainton, 1849: Håøya ♀ 23—30 Jul. 1983; Ostøya 3 ♀ ♀ 14 Jul.—6 Aug. 1983.

Glyphipterigidae

Glyphipterix forsterella (Fabricius, 1781): Håøya ♀ 19 Jun. 1983.

Cossidae

Lamellocossus terebra (Denis & Schiffermüller, 1775) (Fig. 5): Håøya ♂ 12—23 Jul. 1983. This species has not previously been recorded in Norway. Additionally, a male was discovered in the collection of C.F. Lühr. It was taken at AAY, Birkenes: Birkeland (EIS 6) 26 Jul. 1979, leg. C.F. Lühr.

Males of *L. terebra* can be separated from males of *Cossus cossus* L. by its bipectinate antennae (Fig. 7). In Sweden it has been found from Småland in Norrbotten including Dalarne in the west (Elmqvist et al. 1977, Palmqvist 1979). Otherwise in S. Finland, C.- and E. Europe to C. Asia (Gullander 1963).

The larva develops in the wood of *Populus tremula*, especially in sick trees (Gullander 1963). Many old trees of *P. tremula* were growing in the locality at Håøya.

Tortricidae

Acleris roscidana (Hübner, 1799): Håøya ♂ 14—21 May 1983.

A. umbrana (Hübner, 1799): Ostøya ♀ 28 May—4 Jun. 1983; ♀ 30 May—10 Jun. 1984.

Rhopobota ustomaculana (Curtis, 1831): Håøya ♂ 8—13 Aug. 1983.

R. stagnana (Denis & Schiffermüller, 1775): Ostøya ♂ 22—28 May 1983.

Gypsonoma nitidulana (Lienig & Zeller, 1846): Håøya ♂ 5—12 Jun. 1983.

Epiblema obscurana (Herrich-Schäffer, 1851): Ostøya 5 ♂ ♂, 4 ♀ ♀ 2 Jun. 1984. This species is new to Norway. The specimens were netted among the food-plant *Inula salicina*. The species is distributed in SE. Sweden: Blekinge, Öland, Gotland and Uppland. It was rather recently collected in S. Finland: Åland islands and in Denmark: Bornholm. Otherwise in S.- and C. Europe (Buhl et al. 1983, Suomalainen 1977). The Norwegian population is isolated and it increases the northern part of its range considerably towards the west.

The wings and female genitalia are figured by Buhl et al. (1983), the male genitalia by Hanne-mann (1961) and Suomalainen (1977).

Cydia splendana (Hübner, 1799): Håøya 4 ♀ ♀ 23—30 Jul. 1983; Ostøya ♀ 14—24 Jul. 1983.

Pyralidae

Ostrinia quadripunctalis (Denis & Schiffermüller, 1775) (Fig. 3): Håøya ♂ 5 Jul. 1983. The specimen was netted in sunshine. *O. quadripunctalis* is new to Norway, and there is no previous record from N. Europe.

The range of the species extends from Austria and Bavaria eastwards through USSR to the Ussuri region (Hannemann 1964, Mutuura & Munroe 1970).

It is difficult to explain the record of this species at Håøya. *O. quadripunctalis* is not known as a migrant, and it seems unlikely that it could be introduced by man from its localities in inland C. Europe. Further collecting at Håøya may yield more information of its status.

Hannemann (1964) and Mutuura & Munroe (1970) figure wings and genitalia.

The biology is unknown.

Salebriopsis albicilla (Herrich-Schäffer, 1849): Ostøya 2♂♂ 25 Jun.—9 Jul. 1983. Previously only one Norwegian record, also from Ostøya (Opheim 1975). There are records of *albicilla* from Denmark, but not from the other Nordic countries (Krogerus et al. 1971).

Apomyelois bistratella (Hulst, 1887): Håøya ♂ 19—26 Jun. 1983. Previously one specimen has been found in Norway (Opheim 1975) at AK, Asker: Brønnøya. A third specimen (♀) was collected at AK, Ås: Ås 12 Jul. 1984, leg. L. Aarvik.

Euzophera pinguis (Haworth, 1811): Ostøya 2♂♂ 14—24 Jul. 1983.

E. cinerosella (Zeller, 1839) (Fig. 4): Ostøya 4♂♂ 25—31 Jul. 1983; ♂ 10 Jul. 1984. This species is new to Norway. In Sweden it is recorded north to Uppland and Bohuslän (Gustafsson 1980). Otherwise in S. Finland, Denmark and C. Europe (Hannemann 1964, Kyrki 1978).

The larva lives internally in the stem and root of *Artemisia absinthium* (Hannemann 1964).

The genitalia are figured by Hannemann (1964).

Pterophoridae

Oxyptilus chrysodactylus (Denis & Schiffermüller 1775): Ostøya 3♂♂, 6♀♀ 18 Jun. 1983 e.l. *Hieracium umbellatum*. In Norway it has previously been found at VE, Borre: Bastøy (Opheim 1975).

Oidaematophorus lithodactyla (Treitschke, 1833): Ostøya. Numerous specimens reared from larvae on *Inula salicina* 2 Jun. 1984. There is one old record of this species from AK, Oslo: Tøyen. Elsewhere in Norway it occurs at Tjøme in Vestfold.

Drepanidae

Sabra harpagula (Esper, 1786): Håøya ♂ 5—12 Jul. 1983; Ostøya 2♂♂, ♀ 25 Jun.—14 Jul. 1983.

Geometridae

Thetidia smaragdaria (Fabricius, 1787): Ostøya 5♂♂ 9—24 Jul. 1983; 4♂♂ 10 Jul. 1984.

Hemethea aestivaria (Hübner, 1799): Håøya ♂ 12—23 Jul. 1983.

Cyclophora quercimontaria (Bastelberger, 1897): Håøya 2♂♂ 19 Jun.—12 Jul. 1983.

Eupithecia cauchiata (Duponchel, 1830): Håøya 2♂♂ 12 Jun.—5 Jul. 1984.

Peribatodes secundaria (Esper, 1794): Håøya 2♂♂ 8—13 Aug. 1983; Ostøya 3♂♂, ♀ 14 Jul.—3 Sept. 1983. This species is increasing its range in Norway.

Noctuidae

Hypenodes humidalis Doubleday, 1850 (*turfosalis* Wocke, 1850): Håøya ♂ 5—12 Jul. 1983.

Bena prasinana (Linnaeus, 1758) (*bicolorana* Fuessly, 1775): Håøya ♂ 30 Jul.—8 Aug. 1983.

Arenostola phragmitidis (Hübner, 1803): Ostøya 4♂♂ 14 Jul.—3 Sept. 1983.

Apamea lithoxylaea (Denis & Schiffermüller, 1775): Håøya ♀ 5—12 Jul. 1983.

A. ophiogramma (Esper, 1793): Ostøya ♂ 14—24 Jul. 1983.

DISCUSSION

The investigated localities at Håøya and Ostøya represent two rather different habitats.

The forest in the southern part of Håøya is almost undisturbed, and is therefore a unique locality. The number of Lepidoptera species being entirely dependant on virgin forest is low compared with e.g. Coleoptera, but characteristic species of this forest are *N. fungivorella*, *N. nigralbella*, *T. tripuncta* and *L. terebra*. These are all feeding in sick trees, decaying wood or on fungi growing on decaying wood.

The discovery of *P. elsae* and *O. quadripunctalis* is an indication that the fauna of Håøya also contain many interesting species living in other habitats. This increases the value and importance of Håøya as a nature reserve.

The most interesting habitat at Ostøya are the hills of Ordovician sedimentary rock with their dry slopes and scrub vegetation on the tops. This is the habitat of many Lepidoptera species; e.g. *Depressaria albipunctella* Hübner, *A. quadripunctata*, *Pelochrista caecimaculana* Hübner, *Evergestis aenealis* Denis & Schiffermüller, *Sitochroa verticalis* L., *S. palealis* Denis & Schiffermüller, *Aurana marmorea* Haworth, *Ancyl-*

sis cinnamomella Duponchel, *T. smaragdaria*, *Lygephila viciae* Hübner and *Pyrrhia umbra* Hufnagel.

Some of the species occurring at Ostøya (sometimes also on the neighbouring islands) are in Norway confined to the inner Oslofjord area, e.g. *A. quadripunctata*, *Eulamprotes atrella* Denis & Schiffermüller, *E. obscurana*, *S. albicilla*, *E. cinerosella*, *T. smaragdaria* and *Lycaei-des argyrognomon* Bergsträsser.

In the Lepidoptera material collected in Oslo by L.M. Esmark, J.H.S. Siebke, W.M. Schøyen and Sp. Schneider during the nineteenth century, there are many species which now only occur on the islands outside Oslo. It is evident that Oslo earlier had a number of rich localities which no longer are habitats for Lepidoptera. Species which have survived on the islands where the pressure of urbanization was much lighter, include *Ethmia pusiella* L. (recently rediscovered at Brønnøya) *Grapholita pallifrontana* Lienig & Zeller (recently rediscovered at Brønnøya, Nesøya and Ostøya), *Cochylidia richteriana* Fischer von Röslerstamm (recent records from Brønnøya, Ostøya and Snarøya), *Pyrausta sanguinalis* L. (recent record from Brønnøya), *O. lithodactyla* (recent record from Ostøya) and *T. smaragdaria* (recent records from Borøya and Ostøya).

The inner Oslofjord area is the most densely populated area in Norway. The urban growth results in great pressure on the ecosystems, and much has been destroyed. This area also represents one of our richest regions from a biological point of view. Favourable climatic, topographic and geological conditions have induced a rich flora and insect fauna. In order to maintain this rich fauna also in the future, a sufficient number of habitats must be efficiently protected as nature reserves.

ACKNOWLEDGEMENTS

We wish to thank the following persons and institutions for assistance and help: Haagen Oust, Oustøen Country Club, Bergfinn Svendsen and Oscarsborg festning always being most obliging to our need for transport to Håøya during these two years, the Department of Environment and the offices of environment in Oslo and Akershus and in Bærum for financial support making this investigation possible. We will also thank B.T. Simonsen and C.F. Lühr for loan of material, Rolf Sørensen and Johan Petter Nystuen for information on the geology of Håøya and Ole

Karsholt for information and for verifying the identity of the specimen of *Coleophora nutantella*. Finally we thank Tor Gulliksen for taking the photographs.

REFERENCES

- Aarvik, L. 1983. Contribution to the knowledge of the Norwegian Lepidoptera I. *Fauna norv. Ser. B.* 30, 77–80.
- Barca, E. 1935. Rettelser og tilføjelser til «Fortegnelse over Norges Lepidoptera» (N.E.T. III, s. 165). *Norsk ent. Tidsskr.* 4, 84–86.
- Bronger, C. 1984. Ostøya i Bærum. Vegetasjonskartlegging og botanisk undersøkelse av verneverdier. Part I. (duplicated report).
- Buhl, O., Karsholt, O., Larsen, K., Pallesen, G., Palm, E. & Schnack, K. 1983. Fund af småsommerfugle fra Danmark 1982 (Lepidoptera). *Ent. Meddr.* 50, 119–136.
- Elmqvist, H., Hellberg, H., Imby, L. & Palmqvist, G. 1977. Förteckning över Sveriges storfjärilar (duplicated list).
- Gullander, B. 1963. Nordens svärmäte och spinnare. Norstedts, Stockholm. 104 pp.
- Gustafsson, B. 1980. Förteckning över Sveriges småfjärilar (duplicated list).
- Hannemann, H.J. 1961. Kleinschmetterlinge oder Microlepidoptera I. Die Wickler (s. str.) (Tortricidae). *Tierwelt Dtl.* 48, 234 pp.
- Hannemann, H.J. 1964. Kleinschmetterlinge oder Microlepidoptera II. Die Wickler (s.l.) (Cochylidae und Carposinidae), Die Zünslerartigen (Pyraloidea). *Tierwelt Dtl.* 50, 401 pp.
- Hannemann, H.J. 1977. Kleinschmetterlinge oder Microlepidoptera III. Federmotten (Pterophoridae), Gespinstmotten (Yponomeutidae), Echte Motten (Tineidae). *Tierwelt Dtl.* 63, 275 pp.
- Holtedahl, O. & Dons, J.A. 1952. Geologisk kart over Oslo og omegn. Det Norske Videnskaps-Akademi, Oslo.
- Jacobs, S.N.A. 1978. The British Oecophoridae (Part II.). In: Illustrated papers on British Microlepidoptera. *Br. Entom. & Nat. Hist. Soc.*, London. 170 pp.
- Krogerus, H., Opheim, M., Schantz, M.v., Svensson, I. & Wolff, N.L. 1971. Catalogus Lepidopterorum Fenniae et Scandinaviae. Helsingin Hyönteisvaih-toyhdistys, Helsinki. 40 pp.
- Kyrki, J. 1978. Suomen pikkuperhosten levinneisyys I. (Lepidoptera: Micropterigidae — Pterophoridae). *Notul. ent.* 58, 37–67.
- Larsen, K. & Palm, E. 1978. Fundliste for 1977. Microlepidoptera (duplicated list).
- Lid, J. 1974. Norsk og svensk flora. Det norske samlaget, Oslo. 808 pp.
- Midtgaard, F. & Aarvik, L. 1984. Insektinventeringen på Ostøya og Håøya 1983. *Miljøverndepartementet. Rapport T-576*, 1–34.
- Mutuura, A. & Munroe, E. 1970. Taxonomy and distribution of the European corn borer and allied

- species: Genus *Ostrinia* (Lepidoptera: Pyralidae). *Mem. ent. Soc. Can.* 71, 112 pp.
- Opheim, M. 1975. The Lepidoptera of Norway. Check-list. Part I. Pyraloidea, Pterophoroidea, Alucitoidea and Tortricoidea (first part). Norsk Lepidopterologisk Selskap, Trondheim. 36 pp.
- Opheim, M. 1978. The Lepidoptera of Norway. Check-list. Part III. Gelechioidea (first part). Norsk Lepidopterologisk Selskap, Trondheim. 30 pp.
- Opheim, M. 1983. Ostøyas dagsommerfugler. *Atalanta norv.* 4, 46—48.
- Opheim, M. & Fjeldså, A. 1983. The Lepidoptera of Norway. Check-list. Part V. Tineoidea, Zygaenoidea, Cossoidea and Incurvariina. Norsk Lepidopterologisk Selskap, Oslo. 24 pp.
- Palmqvist, G. 1979. Intressanta fynd av Macrolepidoptera i Sverige 1978. *Ent. Tidskr.* 100, 85—89.
- Patzak, H. 1976. Zur Identität der Arten um *Coleophora silenella* Herrich-Schäffer, 1855. *Dt. ent. Z., N.F.* 23, 157—164.
- Størmer, P. 1938. Vegetationsstudien auf der Insel Håøya im Oslofjord. Det Norske Videnskaps-Akademi, Oslo. 9. 155 pp.
- Suomalainen, E. 1977. Kolme Suomelle uutta pikku-perhostajia (Lepidoptera). *Notul. ent.* 57, 21—23.
- Svensson, I. 1982. Four new species of Microlepidoptera from northern Europe. *Ent. scand.* 13, 293—300.
- Tolle, S. 1964. Oecophoridae. *Klucze oznacz. Owad. Pol.* 27, (35). 174 pp.

Received 17 April 1985

Short communications

SAPERDA SIMILIS LAICHARTING (COL., CERAMBYCIDAE) NY ART FOR NORGE

KARL ERIK ZACHARIASSEN

Abstract

The Cerambycid beetle *Saperda similis* Laicharting is reported found in Norway for the first time. One specimen was hatched from recently cut stems of willow (*Salix caprea*) from Lystadmoen, Sørumsand, Akershus county, in mid June 1985.

Karl Erik Zachariassen, Zoologisk Institutt, Universitetet i Trondheim, 7055 Dragvoll, Norway.

Trebukken *Saperda similis* Laicharting utvikles i levende selje (*Salix caprea*), der larven finnes i sol-eksponerte stammer og grener (Hansen, 1966). Angrepne stammer er karakterisert av betydelige mengder relativt grovt gnagspon, som støtes ut av et hull i barken, som oftest omtrent halvannen meter over bakken (egne observasjoner). De voksne individene svermer på varme dager i juni. De kan da sees flyvende rundt veksttrærne, eller sittende på grener og blader. De er nokså sky og vanskelig og fange.

Arten er funnet i en rekke lokaliteter i Sverige og Finland.

10.6.1985 ble seks angrepne stammer av selje *Salix caprea* identifisert på Lystadmoen ved Sørumsand, Akershus fylke. Stammene ble saget ned og lagret innendørs. 15.6. fremkom en nyklekket imago av *Saperda similis*. Eksemplaret var en hann med kroppslengde 17 mm.

Til tross for at samtlige innsamlede stammer viste angrep, var dette det eneste eksemplaret av *S. similis* som kom frem. Etter noen uker kom det imidlertid ut en moskusbukk (*Aromia moschata*). Ellers er trebukken *Oberea oculata*, som også lever i selje, vanlig i området der stammene ble samlet inn. Det kan ikke utelukkes at endel av gnagene i de øvrige stammene kan være av larver av disse artene. Da *S. similis* har flerårig utvikling, kan det også tenkes at eventuelle andre gnag av denne arten kan være gjort av larver som ikke var ferdige til klekking.

Forfatteren mener han tidligere år har sett imago av *S. similis* i det området der stammene ble samlet inn, men uten at det lyktes å fange noe eksemplar. Det er derfor grunn til å tro at arten er vel etablert i

området. Arten kan tenkes å være vidt utbredt på Østlandet, men oversett på grunn av sitt levevis. Klekking fra angrepne stammer er åpenbart den mest effektive måten å finne arten på.

REFERENCES

- Hansen, V. 1966. Biller XXII. Træbukke. *Danm. Fauna* 73, 1–228.
Lindroth, C. H. (ed.) 1960. *Catalogus Coleopterorum Fennoscandiae — et Daniae*. Entomologiska Sällskapet, Lund.

MESOSA NEBULOSA — EN NY CERAMBYCIDAE (COL.) FOR NORGE?

JAN ARNE STENLØKK

Abstract

A male *Mesosa nebulosa* (Col., Cerambycidae) was found for first time in Norway on board a local passenger boat, mainly visiting military harbours with restricted traffic in the province of Vestfold.

Jan Arne Stenløkk, Skrenten 57, 3250 Larvik.

En hann av trebukken *Mesosa nebulosa* Fabricius ble fanget for første gang i Norge 14. juni 1985 ombord i den militære passasjerbåten «Folden», som trafikkerer mellom Bolærne-øyene, Husvik, Husøy (alle i Nøtterøy kommune, Vestfold) og Kanalkaia i Tønsberg.

Da den ble tatt ombord i en båt, kan funnet tenkes å være innslept fra utlandet, f.eks. fra syd- eller vestkysten av Sverige, hvor arten forekommer (Lindroth, 1960). En passasjerbåt fra Strømstad anløper således Kanalkaia, men ellers er dette intet større havneanlegg. De andre anløpstedene for «Folden» er for det meste militære anlegg med begrenset ferdsel og vare-mottak.

Forholdene på Bolærne og i Oslofjordområdet ellers skulle for øvrig ligge til rette for artens livsvilkår, da den er knyttet til vanlige løvtrær (Hansen, 1966).

Referanser

- Hansen, V. 1966. Træbukke. *Danmarks Fauna*, 22. Lindroth, C.H. (ed.), 1960. *Catalogus Coleopterum Fennoscandia et Dania*. Entomologiska sällskapet, Lund, 467 pp.

Received 18 Sept. 1985

Bokanmeldelser

TORP, E. 1984. — DE DANSKE SVIRREFLUER (DIPTERA: SYRPHIDAE). DANMARKS DYRELIV BIND 1, FAUNA BØGER, KØBENHAVN. 300 pp. ISBN 87-88738-00-0, ISSN 0109-7164. (Bestilles fra Apollo Bøger, Lundbyvej 36, DK-5700 Svendborg, Danmark. Pris DKr. 283,— inkl. porto).

Ernst Torp's vakre og innholdsrike bok markerer åpningen på en ny serie danske håndbøker som tar mål av seg til å avløse den tidligere så fundamentale, men nå noe foreldede «Danmarks Fauna». Om bokens høye kvalitet skal stå som et mål også for de kommende bind, har vi all grunn til å gratulere våre danske venner, og på samme tid glede oss over et standardverk som vil få stor anvendelse i samtlige nordiske land.

Boken oppsummerer på en oversiktlig og lettest måte en mengde ny viten fra flere land om denne interessante fluefamilien, og er rikt gjennomillustrert med et høyt antall strektegninger som er til uvurderlig hjelp bl.a. i bestemmelsestabellene. Fire fargeplansjer viser den store morfologiske variasjonen innenfor familien og gir et bra bilde av bygning og fargemønster hos 112 av artene.

Innledningsvis gis en historisk oversikt over tidligere studier av blomsterfluer i Danmark. Videre behandles innsamling, preparering og oppbevaring, blomsterfluenes predatorer og snyltere, diapause og trekk, fenologi, biotopvalg og utbredelse. Et eget kapittel omhandler også arter med særlig økonomisk betydning.

En stor og viktig del av boken utgjøres av bestemmelsestabeller til slektene og til de 263 danske artene. Ettersom dansk og norsk syrphidefauna har stor overlappning og likhet i artssammensetning, vil disse tabellene også være til god hjelp for norske entomologer. Torp's bok har videre tatt i bruk nye og korrekte artsnavn for noen av artene, og til støtte i en «overgangstid»: de gamle synonymene er plassert under de gjeldende navn i den danske artslisten. — I tilknytning til denne systematiske delen gir boken også en interessant oppsummering om de yngre stadiene (egg, larver, pupper), også her med tabeller og figurer, og i et eget kapittel gis en innføring i celletaksonomi hos blomsterfluer, hvori det skulle ligge mange muligheter for fremtidig interessant forskning.

Verdifullt er det også at boken har en kort engelskspråklig omtale av hver art, hvor hyppighet, utbredelse, biotopvalg, flygetider og næringsvalg gis omtale. Dette øker bokens bruksverdi i land utenfor Norden.

Det er lite negativt å si om Torp's bok. Den er kanskje litt stor til helt å falle inn under betegnelsen

håndbøker, og muligens kunne størrelsen av utbredelseskartene vært gjort mindre men likevel lesbare. Videre har det sneket seg inn en liten trykkfeil på s. 54 (Gruppe D — \odot): under tabellens pkt. 3 skal henvisningen være til 7, og under pkt. 4 til 6.

La boken være anbefalt på det varmeste. Med sin grundighet og bredde, og gjennom sin pedagogiske presentasjon av innholdet bør boken finnes i ethvert entomologisk fagmiljø.

Tore R. Nielsen

PEDER SKOU: NORDENS MÅLERE. HÅNDBOG OVER DE DANSKE OG FENNOSKANDISKE ARTER AF DREPANIDAE OG GEOMETRIDAE (LEPIDOPTERA). DANMARKS DYRELIV BIND 2, 1984. 330 sider, 24 fargetavler, ISBN 87-88738-02-7. Pris utenfor Danmark DKr. 433,—. Apollo Bøger, Lundbyvej 36, DK 5700 Svendborg.

I de siste tju år har det kommet en rekke sommerfuglbøker på norsk. Nesten uten unntak har de omhandlet dagsommerfuglene, og tar en også med det store tilbud av utenlandske bøker på skandinaviske språk og engelsk innen denne gruppen, kan en nesten undres på om det finnes kjøpere til alle disse utgavene.

Men de andre sommerfuglgruppene er langt mer stemoderlig behandlet: For de såkalte storsommerfugler har vi i Norge etter 1950-årene stort sett hatt valget mellom på den ene side Skat Hoffmeyers meget sjarmerende og gode bøker om De Danske Spinnerne, De Danske Målere og De Danske Ugler, og på den annen side Bertil Gullanders Nordens dagfjäriler, Nordens svärmere och spinnare og Nordens nattflyn, — målerbindet i denne mer konsise serien er ikke utkommet ennå.

Det er derfor litt av en begivenhet når det nå foreligger en bok om Nordens målere. Mens de nordlige og nordøstlige artene bare var nevnt i forbifarten i Hoffmeyers bøker er de her tatt med på lik linje med de mer sørlige artene. Og mens vi tidligere i Gullanders bøker er avspist med en N som angir at arten er funnet i Norge, har Skou tatt med tabeller over utbredelsen i fylker o.l. i alle nordens land pluss oversikt over forekomst i alle nabolandene.

Hver art har fått en konsis omtale etter et bestemt skjema; navn med synononer, kjennetegn, lignende arter, utbredelse, levested, flyvetid og biologi, og larvens forplanter og flyvemønster. Greit og oversiktlig, men litt savner vi Hoffmeyers spesielle fortellerglede og begeistring. Dette får da oppveies av at boken som sagt omfatter *alle* Nordens arter.

Tavlene er stort sett brukbare, men vi har faktisk sett bedre reproduksjoner i andre nyutkomne sommerfuglbøker f.eks. fra England.

En del småplukk fra norsk hold må det også være tillatt å komme med. Trøndelag tilhører etter vanlig

norsk skikk Sør-Norge. I utbredelsestabelen kunne fylkene vært angitt som ytre/indre ved hjelp av halv-måne slik vi har sett i andre faunaer. Ca. tjue arter er funnet i et eller flere fylker nord for de angitte i tabellene, dette er riktignok data som oftest ennå ikke er publisert, men som ville vært tilgjengelig på forespørsel.

Det kan virke påfallende at de avbildete eksemplarer av nordlige (fjell-) arter nesten alle sammen er finske. Det skyldes kort og godt at boken er et samarbeidsprosjekt mellom Peder Skou og Kauri Mikkola som tidligere har utgitt to bind om finske nattfly. Målerboken foreligger også på engelsk.

Med den danske versjonen har Peder Skou gitt oss en lett tilgjengelig bestemmelsesbok som burde være av interesse for alle bibliotek og skoleboksamlinger i videregående skoler. Målerne er en gruppe insekter som er passe artsrike og utfordrende for entomologiinteresserte i alle aldre. At også privatzoologer kan gjøre en innsats her er ikke minst forfatteren et eksempel på, boken har blitt til i fritiden til den energiske bibliotekansatte énomolog.

Kaare Aagaard

Correction

Ottesen, P. & Kvamme, T. 1985. The geographical range extension of *Heterhelus scutellaris* (Heer, 1841) (Coleoptera, Nitidulidae) and its host plant *Sambucus racemosa* (L.) (Caprifoliaceae) in Scandinavia.

Page 86: Fig. 1. was badly reproduced. Enclosed in the present issue of Fauna norv. Ser. B. you will find a new figure. We ask you to glue this figure over the old one. Note that the back of the figure is already prepared and should only be moistened.

GUIDE TO AUTHORS.

FAUNA NORVEGICA Ser. B. publishes papers in English, occasionally in Norwegian and German with an extensive English abstract. Contributors with a native language other than the language used in the paper submitted, are requested to have manuscripts linguistically revised prior to submission. When preparing manuscripts for submission, authors should consult current copies of *Fauna norvegica* and follow its style as closely as possible. Manuscripts not conforming to the guide to authors will be returned for revision.

Manuscripts should be submitted to the Editor-in-Chief. Send two copies. They must be typewritten, double spaced throughout, on one side of the paper, and wide margins, 5-6 cm on the left. Separate sheets should be used for the following: 1) Title page, with author's name. 2) An abstract, with the name and full postal address of the author underneath. 3) Tables with their headings. 4) Legends to figures.

Dates should be referred to as 10-20 Aug. 1970.

Underline all generic and species names. Approximate position of figures and tables in the text should be indicated in the margin. All Acknowledgements should be given under a single heading at the end of the text, but before the references.

Figures and Tables. Send two copies. All illustrations should be identified lightly with the author's name and the figure number. The figures and tables should be constructed in proportion to either the entire width of the typed area (140 mm) or to the column width (67 mm).

Nomenclature. The first time a binomen is used in the text the name of its author should be included. Author names should be written in full except L. for Linnaeus. Dates can be included when considered necessary, i.e. *Rhyacophila nubila* (Zetterstedt, 1840).

References. In the text: Black (1979), Black & Blue (1973:100), or «as noted by Green (1978) and Black (1979)». Multiple references should be given in chronological order, i.e. (Black & Blue 1973, Green 1976, 1979, Black 1978).

List of references are to be unnumbered and in international alphabetical order (i.e. Å = AA, Æ and Ä = Ae, Ø and Ö = Oe). Titles of journals should be abbreviated according to the World List of Scientific Periodicals. Do not refer to papers «in prep.» among the references.

Examples:

Journal:

Løken, A. 1962. Social wasps in Norway (Hymenoptera, Vespidae). *Norsk ent. Tidsskr.* 12, 191 - 218.

Book:

Mayr, E. 1913. *Animal species and evolution*. Harvard University Press, Cambridge, Mass.

Fittkau, E.J. 1962. Die Tanypodinae (Diptera, Chironomidae). Die Tribus Anatopyniini, Macropeloponi und Pentaneurini. *Abh. Larvalsystem. Insekten* 6, 453 pp.

Chapter:

Whitman, I. 1951. The arthropod vectors of yellow fever, pp. 229—298 in: Strode, K. (ed.) *Yellow Fever*. Mc. Graw - Hill, New York & London.

Proofs. Two copies of the first proof will be sent to the author. One corrected copy should be returned to the editor without delay. Alterations should be limited to correcting typesetting errors. Extensive alterations will be charged to the author.

Reprints. Twentyfive reprints are supplied free (fifty with multiple authorships). Additional reprints can be ordered at a charge (an order form is sent with the proofs).

FAUNA NORVEGICA Serie A, B, C utkommer med tilsammen 5 hefter i løpet av én årgang.

For at heftene skal komme inn under Postverkets regler for billig serie-utsendelse, forlanges det at heftene i de tre seriene av *Fauna norvegica* i hvert kalenderår gis fortløpende nummer fra 1 til 5. Det vil kunne bli noe tilfeldig hvilke hefter som blir gitt de respektive nummer på grunn av uregelmessigheter med rekkefølgen i løpet av året.

Referansemessig skal vi aldri ta hensyn til nummeret i øvre hjørne på omslaget (inne i firkanten). Det vi skal ta hensyn til er de oppgitte data for de respektive serier. Det er disse data som gir den korrekte litteraturreferansen, og det er disse forkort-

elsene som står oppført i *Abstract* til hver artikkel og på særtrykkene.

Post-office regulation necessitate numeration of all five issues in the three Series (A, B, C) in the order of their publication. This number is printed in the top right-hand corner of the front cover (in the square). This number should be ignored when citing issues or papers. The relevant data are given in connection with the number of each series. These numbers provide the correct literature reference and it is these that are given in the abstract of individual papers.

Content

Fauna norv. Ser. B. Vol. 33, No. 1.

Rognes, K.: The Sarcophagidae (Diptera) of Norway	1
Lillehammer, A.: Taxonomic differences between populations of <i>Leuctra hippopus</i> Kempny (Plecoptera) in Norway	27
Ellefsen, G.E. & Hauge, E.: Spiders (Araneae) from the Eidanger peninsula, Grenland, Telemark, SE Norway	33
Greve, L.: Three species of Tephritidae (Dipt.) new to Norway, with a note on <i>Phagocarpus permundus</i> (Harris, 1780) in Norway	40
Greve, L.: <i>Tephritis vespertina</i> (Loew, 1844) (Dipt. Tephritidae) associated with <i>Hypochoeris radicata</i> L. (Asteraceae) in Western Norway	44
Aarvik, L. & Midtgaard, F.: Records of Lepidoptera from Håøya and Ostøya in inner Oslofjord	47

Short communications

Zachariassen, K. E.: <i>Saperda similis</i> Laicharting (Col. Cerambycidae) ny art for Norge	54
Stenløkk, J.A.: <i>Mesosa nebulosa</i> — en ny Cerambycidae (Col.) for Norge?	54

Bokanmeldelser

Aagard, K.	55
Nielsen, T. R.	55