

NORSK ENTOMOLOGISK TIDSSKRIFT

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MED BIDRAG FRA NORGES ALMENVITENSKAPELIGE FORSKNINGSRÅD

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- WHITMAN, L. 1951. The arthropod vectors of yellow fever, p. 229—298. In K. STRODE, (ed.), Yellow fever. Mc Graw-Hill, New York and London.

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Reproductivity of *Eupsilia transversa* (Hufn.) (Lep., Noctuidae)

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During the last 60 years the noctuid *Eupsilia transversa* Hufn. (syn: *satellititia* L.) has been observed as a pest, and in some years as a severe pest, on fruit trees in West Norway (Schøyen, W. M. 1904—1912; Schøyen, T. H. 1918—1942). In Hardanger this species was again abundant in 1962, but during the two following years, the population was reduced to a very low level, due to an outbreak of a virus disease among the larvae (Edland 1965). While reduction of the population may be due to pathogens, high fecundity is a main factor in population increases.

This investigation deals with the reproductivity of *E. transversa*, mainly with its egg production and the hatching and viability of the eggs. In addition the spermatophores in the bursa copulatrix have been studied in an attempt to explain the occurrence of females laying only infertile eggs.

Material and methods

The insect materials for these studies were adults collected during April—May in light traps in the orchards of Ullensvang Research Station. The females were kept singly, though usually accompanied by a male, in glass jars (5 cm high and 10 cm in diameter) inverted on filter paper and muslin-covered Petri dishes containing water (Sylvén 1958). The insects were provided with a dilute sugar solution. In 1963 the ovipositing females were kept under laboratory conditions at about 20° C, while, during 1964, they were in addition distributed to various places indoors with different temperatures (10—14° C) and light conditions, and to an outdoor shelter. The females were allowed to oviposit on filter paper which was replaced every morning when the eggs were counted.

Eggs for hatching were put in small Petri dishes (1.5 cm high and 9 cm in diameter), which were tied into plastic bags containing a moistened filter paper. The eggs were hatched in thermocabinets at constant temperatures of 20° and 30° C, and at varying, but recorded temperatures in a cellar and in a screened enclosure in the research station's orchard. The egg dishes were checked daily in 1963 and both morning and evening each day in 1964.

Dead insects from the experiments were pinned and dry-preserved. The number of spermatophores in the bursa copulatrix was determined for most of the females. The procedure for this was as follows:

The dry abdomen was softened in water for 1 or 2 days, the bursa copulatrix could then be easily drawn out of the abdomen by means of small, sharp forceps. The bursa copulatrix was cleaned by soaking it in cold 2 per cent KOH solution for 2–4 days. The spermatophores could be counted through the transparent bursa sack. During most of the work, however, the spermatophores were more easily counted after being stained by fuchsin acid. A saturated solution of fuchsin acid in ethanol (96%) stained both the bursa sack and the spermatophores. The bursa sack was then decoloured either by keeping it under running, hot, tap water, or by repeated dipping in 1 per cent KOH solution followed by immediate washing in tap water.

Results and discussion

In the field the eggs of *E. transversa* are normally found singly on twigs, branches and trunks of the fruit trees, whereas in the experiments the eggs were most frequently laid in batches (Fig. 1).

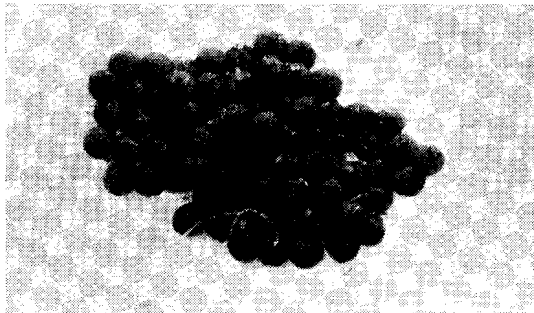


Fig. 1. Eggs of *Eupsilia transversa* oviposited on filter paper.

Table I. Female *Eupsilia transversa* grouped according to number of eggs laid in 1963 and 1964.

Number of eggs	No. of females	
	1963	1964
0	1	1
1 - 100	0	0
101 - 200	3	1
201 - 400	5	2
401 - 600	4	2
601 - 800	12	4
801 - 1000	6	4
1001 - 1200	4	3
1201 - 1400	5	7
>1400	0	1
Total	40	25

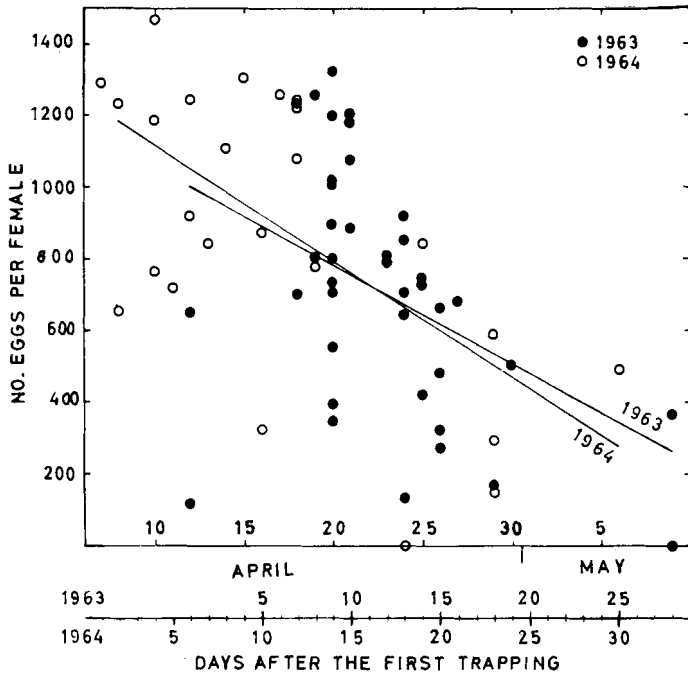


Fig. 2. Relationship between number of eggs oviposited and date of trapping for 40 females trapped in 1963 and for 25 females trapped in 1964. (Regression equations: 1963, $y = -27.499x + 1032.16$, $r = -0.428^{***}$; 1964, $y = -31.272x + 1218.22$, $r = -0.607^{***}$).
 *** statistically significant at the 1% level.

Table I shows females grouped according to number of eggs laid. Mean egg number for 40 females in 1963 was 710, and for 25 females in 1964, 875 eggs. The largest number for one female was 1323 and 1470 eggs for 1963 and 1964 respectively, and the maximum for one night was 357 and 520 eggs per female for the two years. The females were collected from April 12 to May 9 in 1963 and from April 7 to May 6 in 1964. It seems reasonable, therefore, to ask if the individuals collected at the later dates had oviposited before being trapped. Fig. 2 indicates that eggs may have been laid before the trapping of the insects. According to the two regression equations given in the legend of Fig. 2, females collected in the early spring would be expected to oviposit 1032 and 1218 eggs in 1963 and 1964 respectively.

Six females kept outdoors at night temperatures ranging from about 4 to 15° C oviposited 865 ± 159.4 , while six females kept in the laboratory at about 20° C oviposited 805 ± 99.4 . This indicates no temperature influence on the total number oviposited, but, as shown in Fig. 3, the egg production has been accelerated by placing the females under laboratory conditions as compared with the colder outdoor condition. The influence of temperature on the oviposition was also demonstrated in an experiment in which five females were kept alternately in the laboratory and outdoors every other night. Of the total of 5246 eggs, 72.4 per cent were oviposited in the laboratory.

Oviposition takes place after sunset and during the night. Females kept under continuous light did not oviposit and are not, therefore, included in Table I. Kept in constant darkness,

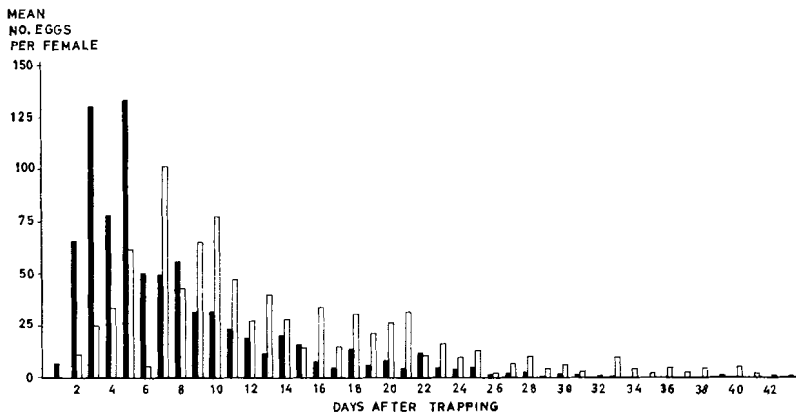


Fig. 3. Mean number of eggs oviposited per night by six females kept in the laboratory (black bars), and six females kept outdoors (white bars).

the females oviposited without any diurnal rhythm. Females kept at "long nights" (ca. 14 hours) and "short days" (ca. 10 hours dim light) showed normal behaviour with respect to number of eggs and daily rhythm of oviposition.

The life history of 40 females in 1963 and 25 in 1964 varied considerably with regard to the period of oviposition after trapping, number of eggs, and their viability. Mean duration from capture to death was 20.8 days, with a range from 2 to 41 days. The longevity of the females in captivity did not seem to be influenced by the date of trapping.

The percentage of viable eggs varied from 0 to nearly 100, with a mean of 71.4 and 78.6 for 1963 and 1964 respectively. The viability of the eggs, which tended to decrease somewhat for most females as the oviposition period progressed, was lowest in the thermo-cabinet at 30° and equal under all other hatching conditions (Table II).

Table II. The viability of the eggs of *Eupsilia transversa* incubated at different temperatures.

Place of incubation	1963		1964	
	No. eggs	Per cent hatched	No. eggs	Per cent hatched
Thermo-cabinet 20° C	5692	73.7	3217	87.1
Thermo-cabinet 30° C	5296	61.7	2890	73.3
Laboratories 15–22° C	5612	76.5	2008	91.7
Cellar 13–15° C	—	—	2571	84.4
Outdoors therm. screen	—	—	1707	80.2
Outdoors shelter	8874	80.0	—	—

Of two females which produced only infertile eggs, one contained no spermatophores, the other only one, of which the head had not opened in the bursa sack. Apart from these observations bearing on the infertile eggs, variations in egg viability between the individuals remain unexplained.

The temperature had a marked influence on the development of the eggs. The observations on the developmental time at different temperatures have been used for fitting the equation $d(t - t_0) = k$ (following the example of Nielsen and Evans, 1960). In the present case d is time of development in days, t is the recorded temperature (constant t in the thermo-cabinets, and mean t calculated from recordings by thermographs or the mete-

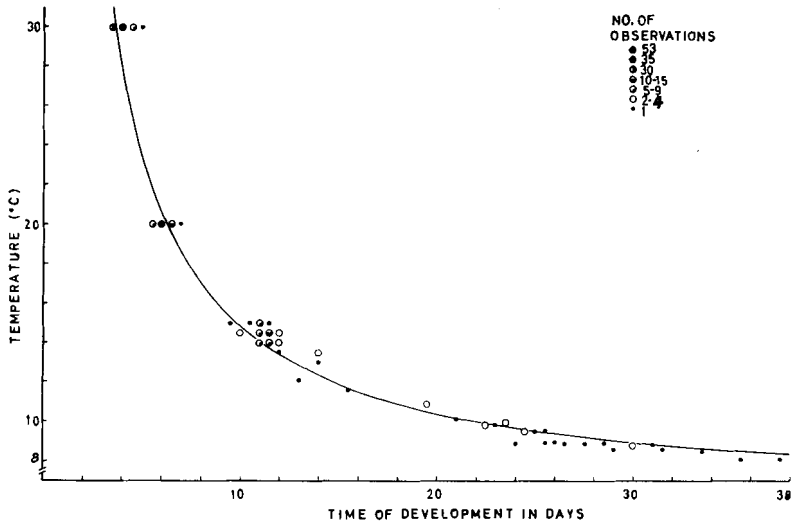


Fig. 4. Relationship between temperature and time of development for eggs of *E. transversa*. Observations fitted to the equation $d(t - t_0) = k$ ($t_0 \approx 6.0^\circ\text{C}$, $k \approx 88$).

orological observations at Ullensvang), t_0 is the developmental zero, and k is a constant, the so-called thermal constant. The calculations showed that $t_0 \approx 6^\circ$ and $k \approx 88$.

In Fig. 4 the fitted curve has been drawn and the data observed during 1964 have been plotted. Although the curve fits the observations well, it may be appropriate to draw attention to sources of errors in the experiments. The samples were checked

Table III. Relationship between temperature and time of development of eggs incubated at two temperatures, in 1963, compared to the calculated developmental time ($d(t \div 6^\circ) = 88$).

Temperature °C	Observed time of development in days	Hatching observed in number of samples	Calculated time of development in days
20	5	15	6.28
	6	47	
	7	9	
30	3	27	3.67
	4	30	
	5	6	



Fig. 5. Bursa copulatrix of *E. transversa* with one and seven spermatophores.

only twice a day, and particularly for the samples kept at 30°, the cooling of the eggs during checking, when they were removed from the thermocabinet, may have been important. Also, the outdoor temperatures were at times below the 6° threshold.

Table III gives the results of incubation experiments during 1963 at 20° and 30°. Considering that the samples were checked only once a day for hatched eggs, the observed times of development are well in line with those calculated from the equation fitting the 1964 data.

E. transversa has a flight period during September—November, and, after hibernation, a spring flight period during April—May. From spermatophore investigations it may be concluded that generally no mating takes place during the autumn flight period.

Of thirty or forty females trapped during the autumn of 1963 and 1964, none contained any spermatophores, while 72 females trapped in the spring (most of them used in the oviposition experiments) contained as a mean 3.4 spermatophores.

According to Williams (1938), Stern and Smith (1960), Dustan (1964) and Ouye et al. (1964), each spermatophore may be assumed to represent one successful mating. In the present experiments 80.6 per cent of the females contained more than one spermatophore, and 9.8 per cent and 5.7 per cent contained seven and eight spermatophores respectively (Fig. 5).

The number of matings seemed to increase as the flight period progressed. In the glass jars no matings were observed during the experiments. Fig. 6 demonstrates the significant positive correlation between number of spermatophores and date of capture of the females. No significant correlation was found between the number of spermatophores and the number of eggs oviposited. The viability of eggs showed no correlation to the number of copulations, which is in agreement with the findings of Shorey (1963) for the noctuid *Trichoplusia ni*.

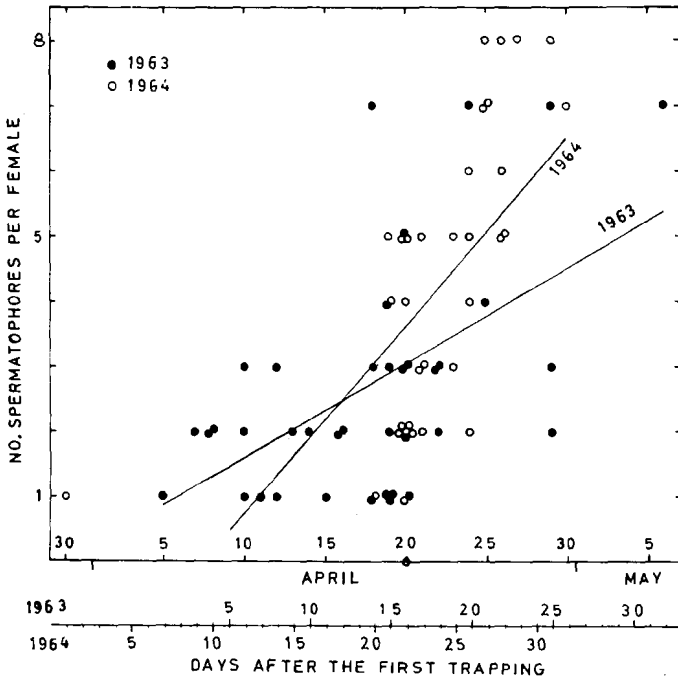


Fig. 6. Relationship between number of spermatophores and date of trapping for 38 females trapped in 1963 and for 34 females trapped in 1964. (Regression equations: 1963, $y = 0.1447x + 0.7003$, $r = 0.574^{***}$; 1964, $y = 0.2897x - 2.7299$, $r = 0.632^{***}$). *** statistically significant at the 1% level.

In general there is no relation between the fecundity of animals and their abundance in nature (Andrewartha and Birch 1954). However, in species which are severe pests in certain years, but relatively scarce in others, high fecundity which allows the species to increase rapidly during favourable years, is an important factor in explaining their sporadic outbreaks. The probable strong fluctuations of *E. transversa* could thus be due to the observed high reproductive capacity and to various mortality factors, of which virus diseases may be one (Edland 1965).

E. transversa is a pest of such severity that it would deserve further studies, particularly from the point of view of control measures, for which widely different approaches should be considered.

Summary

This investigation deals with the reproductivity of *Eupsilia transversa* Hufn. (syn: *satellitica* L.) a pest on fruit trees in West Norway. The insects were trapped in orchards during early spring in 1963 and 1964. The ovipositing females were kept under different temperature and light conditions.

Mean egg number laid for 40 females in 1963 was 710 and for 25 females in 1964, 875 eggs. The highest number for one female was 1323 and 1470 eggs, and the maximum for one night 357 and 520 eggs per female for 1963 and 1964, respectively. Regression equations indicate that eggs may have been oviposited before the trapping of the insects. The total number of eggs produced did not seem to be influenced by the temperature, but oviposition was accelerated in the laboratory at about 20° C, compared with the colder outdoor conditions. Females kept under continuous light did not oviposit. Kept in constant darkness, they oviposited without any diurnal rhythm.

The mean percentage of viable eggs was 71.4 and 78.6 for 1963 and 1964 respectively. Viability of eggs decreased as the oviposition period progressed, and was somewhat lower for eggs incubated at 30° compared with lower temperatures. The time of development of eggs was strongly temperature dependent, with no hatching below 6°.

This insect has an autumn flight period, and, after hibernation, a spring flight period, but copulates only in the spring. The mean number of spermatophores of 72 females trapped in spring was 3.4. Significant positive correlation was found between the number of spermatophores and the date of capture of the females.

Considering the previously reported evidence for virus disease in this species, and the high reproductivity found in this investigation, large fluctuations in the population of *E. transversa* should be expected.

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***Porrhomma campbelli* F. O. P. — Cambridge
(Araneae, Linyphiidae) in Norway.**

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In a small collection of spiders, given to the writer by J. A. Sneli, Zoological Museum, University of Oslo, from the Svartisen glacier, Nordrana (Nsi 32), a female *Porrhomma* is of special interest.

As the genus *Porrhomma* is considered to be a very difficult group (Miller and Kratochvil 1940, p. 161), the writer sent the specimen to Hans Kauri, University of Bergen. He kindly identified the spider as *P. campbelli* F.O.P.—Cambridge.

This spider, partly a cave-dweller, has been found previously in England and Ireland, where it is very rare. Isolated specimens have been found under stones, and in a mole's nest (Locket and Millidge 1953, p. 333).

At a later date its occurrence was also reported (Miller and Kratochvil 1940) from a cave in Belgium.

Thus, the specimen from the Svartisen glacier is the first recorded occurrence of *P. campbelli* in Scandinavia.

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Über *Conosoma testaceum* F. und zwei verwandte Arten (Col., Staphylinidae)

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Eine Revision des *Conosoma „testaceum“* Materials in der Sammlung des Zoologischen Museums in Oslo und in meiner eigenen Sammlung hat erwiesen, dass es sich um drei Arten handelt, und zwar *testaceum* F., *marshami* Steph. und *strigosum* J. Sahlb.

In der Sammlung Fabricius' am Zoologischen Museum der Universität in Kopenhagen befindet sich ein Exemplar von *testaceum*, das als Typus angesehen ist, und das ich gesehen habe. Es ist in schlechtem Zustand, Deckflügel und Hinterleib fehlen, eine sichere Bestimmung ist doch möglich.

Von dem Institut für Spezielle Zoologie und Zoologischem Museum der Humboldt-Universität zu Berlin ist mir das Material von *Conosoma pubescens* Grav. der Gravenhorstschen Sammlung vorgelegt worden. Es besteht aus:

pubescens Gr.: 1 Exemplar nur mit einem Nummerzettel 5668, 3 Exemplare mit Fundortzettel „Carinth.“ und 1 Exemplar aus China (Mayer).

pubescens var.: 4 Exemplare ohne Fundortzettel.

pubescens var. *fuscus* Kn., *pubescens* var. *g*, *sericeus* Boisd.:

1 Exemplar ohne Fundortzettel, 3 Exemplare mit Fundortzettel „Sard. Gené“.

pubescens var. *testaceus* F.: 2 Exemplare ohne Fundortzettel.

Abgesehen von var. *fuscus* halte ich sämtliche Tiere für *testaceum* F.. Die zwei als var. *testaceus* bezeichneten Tiere sind sehr hell, solche Exemplare kommen auch bei den übrigen naheverwandten Arten vor. Luze (1902, S. 26) hat darauf aufmerksam gemacht, dass derartige Tiere für unreife Exemplare gehalten worden sind, was seiner Meinung nach nicht der Fall ist.

Die Tiere aus Sardinien scheinen einer mir unbekanntem Art anzugehören.

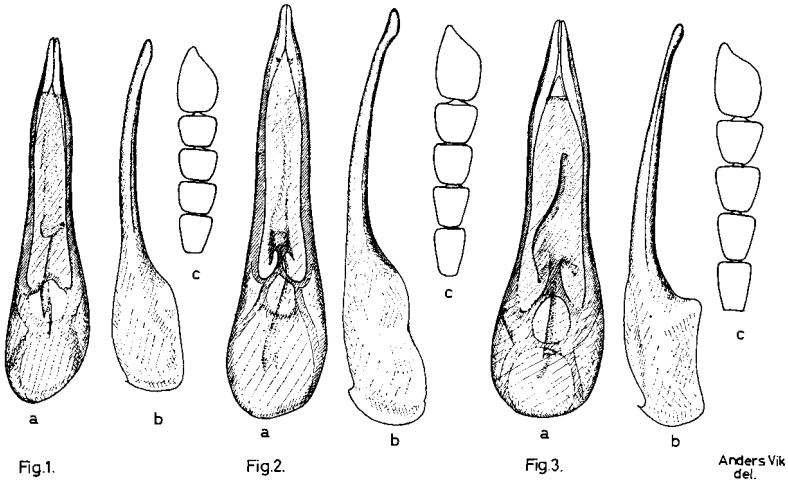


Fig. 1. *Conosoma testaceum* F.
 Fig. 2. *Conosoma marshami* Steph.
 Fig. 3. *Conosoma strigosum* J. Sahlb.
 a. Aedeagus, Ventralansicht. b. Aedeagus, Lateralansicht. c. Fühlerglieder 7—11.

Jeannel und Jarrige (1949, S. 339, 340) haben eine Serie Cotypen von *pubescens* Steph. untersucht und halten sie für dieselbe Art die Stephens (1832, S. 189) als *marshami* beschrieben hat. Allen hat 11 *pubescens* und 2 *marshami* in der Sammlung von Stephens untersucht und mir mitgeteilt, dass es sich tatsächlich um eine und dieselbe Art handelt. Die norwegischen Tiere die ich für *marshami* halte, stimmen mit Tieren aus England, die ich gesehen habe, völlig überein.

Die Vermutung von Jeannel und Jarrige (1949, S. 337) dass *testaceum* auf den Britischen Inseln nicht vorkommt, ist nicht stichhaltig. Allen hat mir ein englisches Exemplar dieser Art vorgelegt und mir mitgeteilt, dass die Art dort überaus selten zu sein scheint.

Nach 6 Exemplaren in den Urwäldern unter der Czerna Hora in den Ost-Karpathen gesammelt, beschrieb Lokay (1913) eine Art als *stöckli*. Kangas (1965) hat neulich in finnischem Material eine Art gefunden, die er für *stöckli* hält, obwohl die Beschreibung seiner Meinung nach nicht ganz auf die Tiere passt.

Smetana hat ein norwegisches Exemplar das ich für *stöckli* hielt, mit den Tieren Lokays verglichen und mir mitgeteilt, dass es in allen Punkten mit diesen Tieren überein stimmt, so auch im Bau des Aedeagus.

Sahlberg (1911) hat eine Art als *strigosum* beschrieben, die Hellén (1930) als mit *pubescens* identisch erklärt hat. Stockmann hat mir zwei typische Exemplare Sahlbergs vorgelegt, die er für *stöckli* hält, und es handelt sich in der Tat um dieselbe Art, die daher *strigosum* J. Sahlb. heissen muss.

In der folgenden Bestimmungstabelle sind die Merkmale erwähnt nach denen die Arten voneinander unterschieden werden können:

1. Klein (3.2—3.7 mm), Halsschild und Deckflügel gleichfärbig braun oder schwarzbraun, Fühler kurz (Fig. 1c), 7. Glied etwa so lang wie breit, 8.—10. breiter als lang, Hinterleib seitlich stark bewimpert. ♂: Vordertarsen schwach erweitert, Aedeagus wie in Fig. 1a, b. *testaceum* F.
 - Grösser (3.6—4.5 mm), Fühler lang, (Fig. 2c und 3c), 7. Glied länger als breit, 8. so lang wie breit oder ein wenig länger, 9. so lang wie breit, 10. schwach quer. ♂: Vordertarsen stärker erweitert. 2
2. Halsschild schwarz oder schwarzbraun, an den Seiten und am Hinterrand meist rotbraun, dicht behaart und punktiert, Deckflügel rotbraun, Hinterleib stark bewimpert. ♂: Aedeagus wie in Fig. 2a, b. *marshami* Steph.
 - Halsschild und Deckflügel braun oder schwarzbraun, Halsschild mehr zerstreut behaart und punktiert, Hinterleib in der vorderen Hälfte seitlich schwach bewimpert. ♂: Aedeagus wie in Fig. 3a, b. *strigosum* J. Sahlb.

Die Präparate in Fig. 1a, 2a und 3a sind mit Nelkenöl behandelt, wodurch die innere Struktur sichtbar geworden ist.

Das untersuchte norwegische Material umfasst 69 Exemplare von *testaceum*, 32 von *marshami* und 65 von *strigosum* aus folgenden Gebieten (Strand, 1943):

testaceum: AK, Bø, VE, TEy, AAy, VAy, Ry.

marshami: AK, HEs, Os, On, Bø, VE, TEy.

strigosum: Ø, AK, Os, On, AAy, TRi, Fi.

Von den Fundumständen liegen nur sparsame Aufgaben vor. Alle drei Arten sind durch Sieben von Laub am Fuss von Bäumen und in Hochwassergenisten von Flüssen gefunden, *testaceum* auch in einem Baumstrunk, in morschem Espenholz und in Pilzen, und *marshami* in einer hohlen Linde, in Pilzen und einmal in einem Gang von *Arvicola terrestris* L.. Von *strigosum* wurden 45 Exemplare durch Sieben von *Armillaria mellea* gefunden.

Für Hilfe mit Material und Auskünften bin ich folgenden Dank schuldig: Zoologisches Museum, Oslo, A. A. Allen, London, Dr. H. Coiffait, Toulouse, Højesteretsdommer Dr. Victor Hansen, København, Dr. F. Hieke, Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt-Universität zu Berlin, J. Jarrige, Paris, Colin Johnson, Manchester, Dr. Sv. G. Larsson, Zoologisches Museum der Universität, København, Professor Dr. Carl H. Lindroth, Lund, Dr. G. A. Lohse, Hamburg, Dr. A. Smetana, Praha, kommerseråd Dr. Sten Stockmann, Helsingfors.

Auch danke ich Norges Almenvitenskapelige Forskningsråd für ökonomische Unterstützung und meinem Freund Anders Vik, Sandefjord, für Anfertigung der Zeichnungen.

Zusammenfassung

Der Verfasser weist nach dass das norwegische Material von *Conosoma „testaceum“* aus drei Arten besteht, und zwar *testaceum* F., *marshami* Steph. und *strigosum* J. Sahlb. (*stöckli* Lok.).

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Ein überraschendes Vorkommen von *Ceuthorrhynchus viridanus* Gyll. in Norwegen (Col., Curculionidae)

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Diese Art ist nach einem Exemplar aus Irtytsch in Sibirien beschrieben worden. Die Beschreibung (Schönherr, 1837, S. 557) lautet:

«117. *C. viridanus*. Schh. Ovatus, convexus, obscure-viridis, subtus parce cinereo-squamulosus; thorace transverso, bi-tuberculato, antice constricto, aeneo-micante; elytris punctato-sub-sulcatis, interstitiis transversim rugulosis, apice muricatis.

Dejean, Cat. Col. ed. 2. p. 299. ed. 3. p. 323.

Patria: Sibiria, ad Irtytsch. A Dom. Gebler amice communicatus. Mus. Schh.

Ceuthorrhyncho erysimi similis, sed dimidio major, elytrorum sulci latiores, illorum interstitia confertim rugulosa, et femora postica dente parvo armata. Caput retractum, sub-globosum, confertim punctulatum, viridi-aeneum, vertice sub-carinato, fronte foveola impressa; oculi semi-globosi, nigro-brunnei; rostrum thorace fere longius, arcuatum, tenue, nigrum, supra ad basin sub-striatum, extrorsum laeve, nitidum. Antennae breviusculae, nigrae, clava oblonga. Thorax latitudine baseos brevior, antice dimidio angustior quam basi; apice emarginatus, pone apicem late et profunde transversim impressus, fovea media adhuc profundiore insculptus, margine apicali sat alte elevato; lateribus posterius ampliatus, basi bi-sinuatus, supra transversim convexus, in medio dorsi obsolete canaliculatus, versus latera utrinque tuberculo obtuso instructus, undique confertim sat profunde punctatus, viridi-aeneus, subnitidus, glaber. Elytra antice singulatim rotundata, thoracis basi latiora, humeris obtuse angulatis, elevato-callosis; lateribus non ampliata, apice etiam singulatim rotundata, thorace plus duplo longiora, supra convexa, punctato-sub-sulcata, interstitiis planis, subtiliter transversim rugulosis; obscurius viridia, parum nitida. Corpus subtus profunde punctatum, viridi-aeneum, parce cinereo-squamulosum. Pedes punctulati, cinereo-squamulosi, obscure viridi-aenei; femoribus posticis subtus dente minuto armatis; tarsis dilatatis, nigris, subtus cinereo-spongiosis. — Ghl.»

Der Typus befindet sich im Naturhistorischen Reichsmuseum in Stockholm.

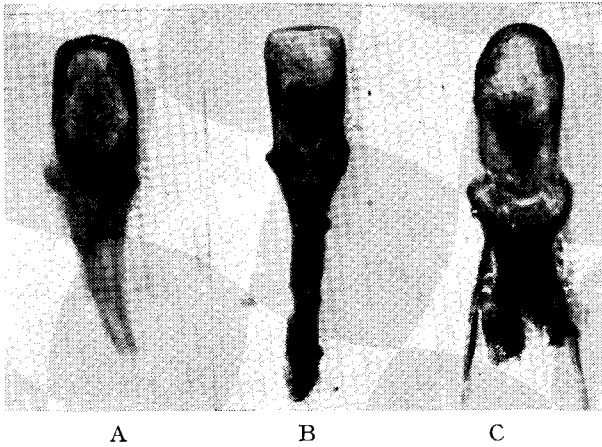


Fig. 1. Aedeagus von A: *Ceuthorrhynchus viridanus* Gyll. B: *C. chlorophanus* Roug. C: *C. laetus* Rosenh.

Durch liebenswürdiges Entgegenkommen seitens des Museums habe ich den Typus untersuchen können. Er steht an einer Nadel die in üblicher Weise durch den einen Deckflügel durchgestochen ist. Die Deckflügel sind aus der normalen Stellung gebracht worden, und der Vorderkörper ist in schiefer Stellung an den Hinterkörper angeleimt worden, sonst ist das Tier in gutem Zustand.

Die Arten die *viridanus* am nächsten kommen sind *chlorophanus* Roug. und *laetus* Rosenh.

Von *chlorophanus* unterscheidet sich *viridanus* wesentlich so: Er ist grösser, das 5. Glied der Fühlergeißel ist mehr kugelförmig und kaum länger als breit, die Streifen der Deckflügel sind schmaler und die Zwischenräume breiter, flacher und weniger glänzend, deren Haare sind dunkler und viel weniger sichtbar (bei *chlorophanus* hell und mehr schuppenartig), die Mittel- und Hinterschenkel sind schwach, kaum oder nicht gezähnt, Seiten des Penis gegen die Spitze nicht erweitert, Apex schwach stumpfwinklig vorgezogen (Fig. 1A) (bei *chlorophanus* gegen die Spitze erweitert, Apex geradlinig (Fig. 1B)).

Von *laetus* unterscheidet sich *viridanus* folgendermassen: Der Rüssel ist schwarz (bei *laetus* grünlich), der Halsschild ist in der Mitte dichter punktiert und weniger stark glänzend, die Streifen der Deckflügel sind schmaler und schwächer und dichter punktiert, die Zwischenräume breiter, flacher und matter, Penis von *laetus* wie in Fig. 1C.

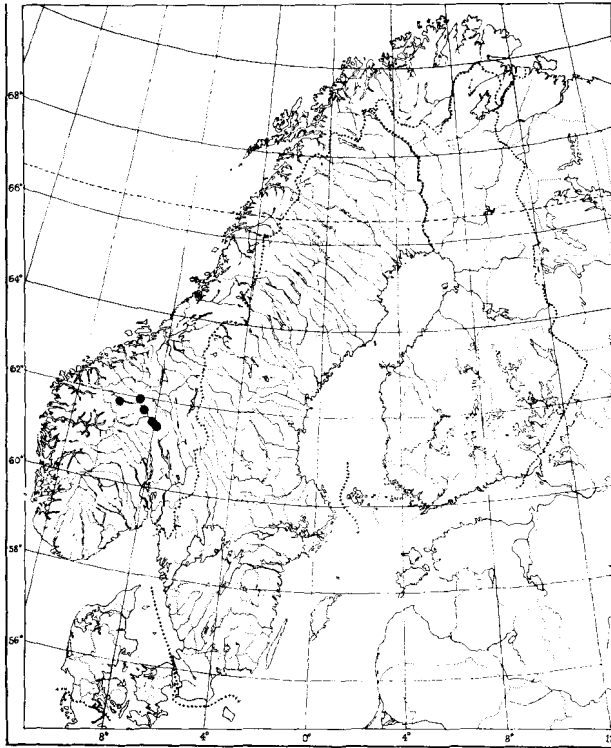


Fig. 2. Nordeuropäische Fundorte für *Ceuthorrhynchus viridanus* Gyll.

Nach Hoffmann (1954, S. 1035) kommt *chlorophanus* auf *Erysimum cheirifolium* und in Böhmen und Österreich auf *Erysimum cheiranthoides* und nach Wagner (1943, S. 127) auch auf *Erysimum canescens* vor, während *laetus* infolge Hoffmann (1954, S. 1035) auf *Alyssum maritimum* und *Lepidium graminifolium* lebt.

In Strand (1958, S. 193) ist *viridanus* als neu für Norwegen erwähnt, und in Strand 1960, S. 171 ist über weitere Funde berichtet.

Die norwegischen Tiere, die in mehr als 80 Exemplaren von Anders Vik und mir in den in Fig. 2 angegebenen Fundorten gefunden wurden, sind alle auf *Erysimum hieraciiifolium* in einer Höhe von etwa 200 m gefunden.

Die Fundorte sind: Os: Fåvang, Os: Ringebu, On: Lom, On: Otta und On: Kirkestuen.

Die Tiere scheinen mit dem Typus von *viridanus* überein zu stimmen, doch erreichen die Deckflügelstreifen kaum die Breite deren des Typus.

v. Heyden (1880—1881, S. 178) führt in seinem Katalog der Käfer Sibiriens *viridanus* als synonym mit *ignitus* Germ. an.

Reitter (1916, S. 172) war der Meinung, dass die Aufgabe Schilskys, dass *viridanus* (den er als synonym mit *chlorophanus* ansah) in Sachsen, Thüringen und Böhmen gefunden war, wahrscheinlich auf Verwechslung mit einer anderen Art beruhte.

Winkler (1924—1932, S. 1615) gibt als Fundortgebiete für *viridanus* Mittel- und Südeuropa, Sibirien und Kaukasus an.

Nach Wagner (1943, S. 127) ist *chlorophanus* eine von *viridanus* verschiedene Art, und die Frage ob *viridanus* überhaupt dem deutschen Faunagebiet angehört, ist noch zu klären.

Auch Horion (1951, S. 492) hält es für zweifelhaft ob *viridanus* in Mitteleuropa vorkommt.

Wie Hoffmann (1954) in seiner grossen Arbeit über die Rüsselkäfer Frankreichs sagt, hat Smreczynski (1951, S. 73) darauf aufmerksam gemacht, dass er einige Exemplare aus Thorenc in Alpes-Maritimes in Frankreich erhalten hat, die er für *viridanus* hält. Nach Smreczynski (1951) sind alle „*viridanus*“ in den osteuropäischen Sammlungen *chlorophanus*, und brieflich hat er mir mitgeteilt, dass er keine anderen aussernorwegischen Fundorte der Art als Irtych und Thorenc kennt. Andere Fundorte kennt auch Hoffmann (1954) nicht.

Smreczynski, dem ich ein norwegisches Stück zustellte, hat mir mitgeteilt, dass es von seinen Tieren aus Thorenc ein wenig verschieden ist, u. a. sind die Deckflügelstreifen schmaler, die Unterschiede sind aber seiner Meinung nach individueller oder geographischer Natur und das norwegische Stück mit den Exemplaren aus Thorenc sicher artidentisch.

Nach Hansen (1964, S. 430) ist ein Exemplar aus Südjtland als *viridanus* angesehen worden, das Tier ist indessen verloren gegangen und war möglicherweise fehlbestimmt.

Dieckmann hat mir mitgeteilt, dass alles was in den Sammlungen des Deutschen Entomologischen Institut in Eberswalde als *viridanus* steht, falsch bestimmt ist.

So viel jetzt bekannt ist, scheint folglich *viridanus* eine boreo-alpine Verbreitung zu haben.

Das isolierte Vorkommen in Norwegen ist höchst auffallend, besonders mit Rücksicht darauf, dass die Wirtspflanze, *Erysimum hieracifolium* in Skandinavien weit verbreitet ist, nördlich bis zum Eismeer und in der Höhe bis zu 1265 m.

Von den zwei *Erysimum*-Arten die in Norwegen weit verbreitet sind, ist *cheiranthoides* kulturbedingt und wird von Fægri (1958, S. 212) als ein eingeführtes Unkraut angesehen, während

hieraciiifolium an trockenen Orten, oft in Gebüsch, Bergen oder Abhängen vorkommt, und als der ursprünglichen Flora Nordens angehörig gerechnet wird.

Hätte es sich um ein in Norwegen eingeführtes Tier gehandelt, hätte man am ehesten *chlorophanus* erwarten sollen, eine Art die auf der Pflanze lebt, die eingeführt worden ist, nämlich *cheiranthoides*, und nicht *viridanus*, der, jedenfalls bei uns, nur auf *hieraciiifolium* gefunden ist.

Gegen eine zufällige Einführung von *viridanus* spricht auch der Umstand, dass die zwei bis jetzt bekannten, aussernorwegischen Fundorte unmöglich als Ausgangspunkte angesehen werden können.

Es muss ja damit gerechnet werden, dass *viridanus* eine weitere Ausbreitung hat. Auffallend ist es jedenfalls, dass noch nach mehr als 20 Jahren seitdem Wagner (1943, S. 127) die Frage berührte, andere Funde der Art nicht bekannt sind.

Für Auskünfte und Überlassung von Material danke ich: Dem Naturhistorischen Reichsmuseum, Stockholm, Lothar Dieckmann, Eberswalde, Professor H. Franz, Wien, Højesteretsdommer Dr. Victor Hansen, København, Adolphe Hoffmann, Boulogne-Billancourt, Dr. B.-O. Landin, Lund, Professor Dr. Carl H. Lindroth, Lund, Professor St. Smreczynski, Krakau und Amanuensis Per Sunding, Oslo.

Zusammenfassung

Es hat sich erwiesen dass *Ceuthorrhynchus viridanus* Gyll., der neulich in Norwegen gefunden ist, eine boreo-alpine Ausbreitung hat.

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Hydroptila simulans Mosely (Trichoptera, Hydroptilidae) new to Norway

John O. Solem

Det Kongelige Norske Videnskabers Selskab, Museet, Trondheim.

During the examination of a sample of Trichoptera, collected by the author in the summer of 1964, one of the specimens was identified as *Hydroptila simulans* Mosely.

The species has not earlier been recorded in Norway. Only one specimen, a male, was found in this collection, captured by net. The specimen was captured July 9th, 1964 by the stream from the lake Lillevann in Agdenes, Sør-Trøndelag county.

Table I. Water conditions of the stream from lake Lillevann on September 15th, 1965.

Cl ⁻ mg/l	SO ₄ ⁻⁻ mg/l	SiO ₂ mg/l	Total hardness	CaO mg/l	MgO mg/l	Spec. conduc- tivity	pH
28,2	7,1	8,6	15,0	11,5	2,5	131,3	7,8

The stream from lake Lillevann flows for a total length of 700 to 800 m through cultivated fields before flowing out into the outer Trondheim fjord. *Myriophyllum*-sp., moss and green algae cover the stones at the bottom. The lake Lillevann lies at 8 m above sea level, and the stream flows moderately fast. Water conditions were determined September 15th, 1965 (Table I).

H. simulans is also known from Sweden and Finland (Fig. 1). In Sweden it is recorded from four areas. The closest records to Agdenes, Sør-Trøndelag county, are from Dalarne and Hälsingland. Additionally it has been found in Halland (Forsslund and Tjeder 1942). Upon request, Forsslund told me that since 1942 *H. simulans* has only been recorded once in Sweden, in Forsnäs, Pite Lappmark 1955.

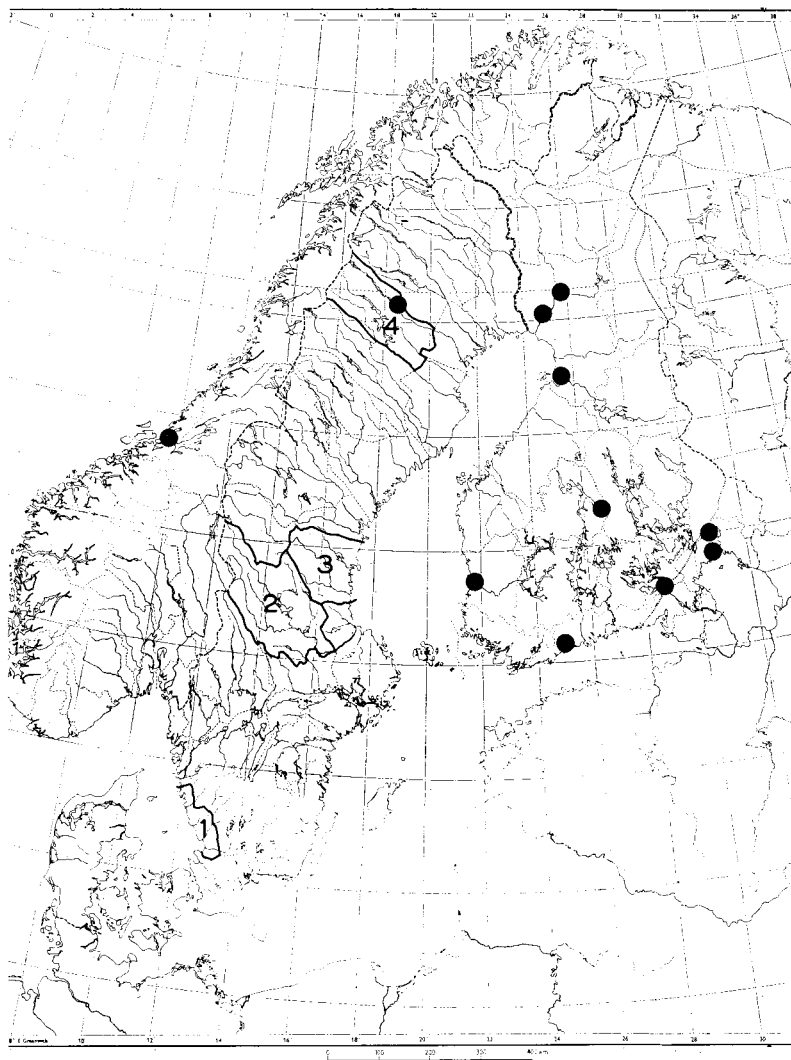


Fig. 1. Records of *Hydroptila simulans* from Norway, Sweden and Finland. In Sweden it is known from Halland (1), Dalarna (2), Hälsingland (3) and Pite Lappmark (4). The plotted record from Sweden is Forsnäs, Pite Lappmark, 1955.

In Finland *H. simulans* is known from a few areas. According to Nybom (1960) the imagines were found in July, and they were rather common at rivulets and brooks.

At present four species of the genus *Hydroptila* are known from Norway, *cornuta* Mos., *femoralis* Etn., *forcipata* Etn. and *simulans* Mos. The total number of species of Trichoptera in Norway, known today, are 147.

ACKNOWLEDGMENTS. Mr. R. Brekke has kindly verified my identification of *H. simulans*. Analyses of water conditions were carried out by the Norwegian Institute for Water Research.

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Mortality of winter eggs of *Metatetranychus ulmi* (Koch) during the winter of 1965/66

L a u r i t z S ø m m e

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Introduction

Winter eggs of the Fruit tree red spider mite (*Metatetranychus ulmi* (Koch) = *Panonychus ulmi* (Koch)) have a considerable ability to supercool, but are killed by freezing. In eggs of two strains studied by MacPhee (1961) the average supercooling points were -31°C and -37°C respectively. The lowest average supercooling points recorded by Sømme (1965) were -31.4°C in eggs from western Norway, and -33.2° in eggs from eastern parts of the country.

During the winter of 1965/66 extremely low temperatures and long periods of cold weather were recorded from most parts of Norway. The purpose of the present investigation was to study the effect of these conditions on the survival of *M. ulmi* winter eggs.

Methods

Twigs of apple infested with winter eggs of *M. ulmi* were collected above snow-level from three localities at the end of March 1966. Ullensvang, Hordaland, was taken as representative of western Norway where the climate is relatively mild, while the two other localities — Ås, Akershus and Nes, Hedmark — were selected as representative of eastern Norway. At Ås eggs were collected from apple trees a few metres from a continuous temperature recorder, while the closest meteorological stations were a few kilometres away from the collecting sites at Ullensvang and Nes. There are, however, good reasons to believe that the temperatures at these sites have been similar to those recorded at the meteorological stations.

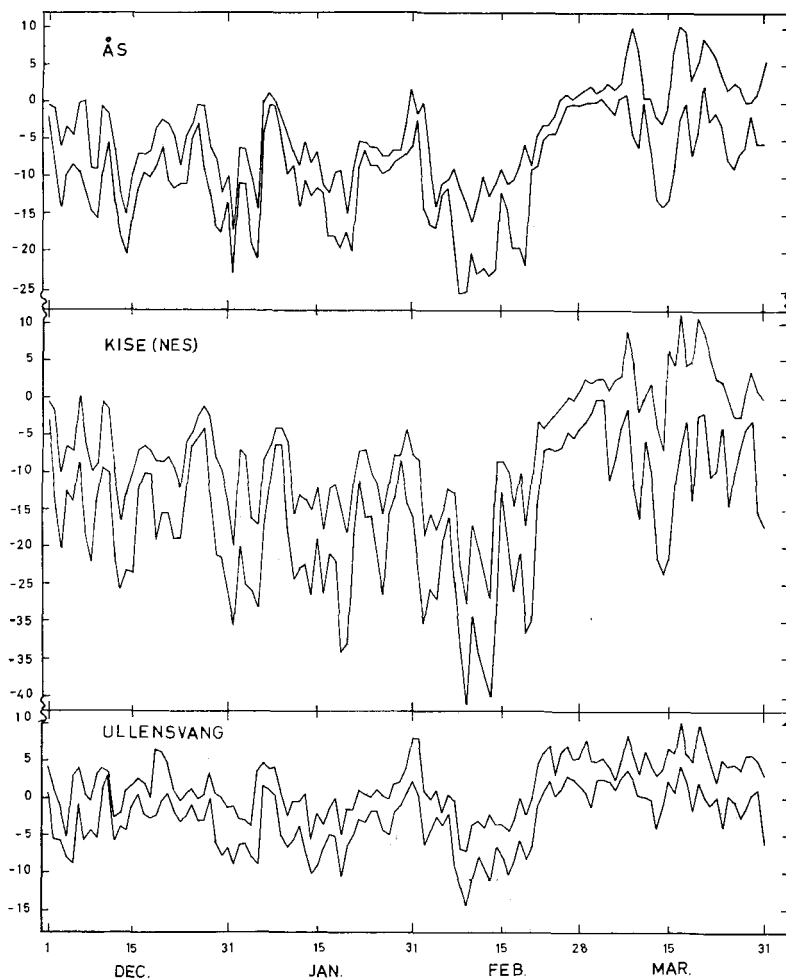


Fig. 1. Maximum and minimum temperatures from December 1965 to March 1966 at Ås, Nes and Ullensvang.

The eggs were collected at a time when diapause normally is broken (Sømme, 1965). To study survival rates twigs with a known number of eggs were placed on moist filter paper in Petri dishes at room temperature in the laboratory. Each twig was surrounded by a ring of Vaseline to prevent the escape of any mites. The number of hatched mites was counted at regular intervals, until hatching ceased.

Results

Daily maximum and minimum temperatures from December 1965 to March 1966 at the three localities are shown in Fig. 1. The lowest temperature recorded at Ullensvang was -14.5°C , and at Ås -25.6°C . At Nes temperatures down to -41.1°C were measured.

Table I. Percentage of hatching of *M. ulmi* winter eggs from three localities.

Locality	No. of eggs	No. hatched	Percentage hatched
Ås	865	262	30.3
Nes	536	4	0.7
Ullensvang.....	697	511	73.3

The percentage of hatching in eggs from each locality is given in Table I. It appears that a large number of *M. ulmi* winter eggs survived the relatively mild winter at Ullensvang. A high percentage of the eggs had been killed at Ås, although temperatures as low as their average supercooling points had not been reached. At Nes temperatures fell below the average supercooling point of the eggs and of those collected there only 0.7% hatched.

Discussion

The ability of insects and mites to survive the winter depends on several factors. In species that are killed by freezing their supercooling points will be the lower limit of the temperatures they are able to withstand. The supercooling point, however, is usually defined as the temperature at which freezing occurs at a rapid cooling rate, e.g. 1° or 2°C per minute. As discussed by Salt (1961) nucleation in a supercooled insect depends on both temperature and time. Thus freezing may occur after prolonged exposures to temperatures above the supercooling point.

Most insects and mites may be killed without freezing by long exposures to low temperatures, and the mortality rate increases with decreasing temperatures. In species that overwinter in exposed places, for example above snow level, very little is known about their ability to survive long periods in a supercooled state. Other factors, like humidity, wind and sunshine, may also be of importance for winter survival.

In the eggs collected it was not possible to distinguish between death caused by freezing, or mortality occurring during extended periods of supercooling. The temperatures recorded at Ullens-

vang were much higher than the average supercooling points of *M. ulmi* winter eggs. It seems unlikely therefore that eggs from Ullensvang were killed by freezing. The mortality recorded must have been caused by other factors. At Ås the eggs were exposed to long periods of temperatures below -20°C , and even -25°C , and it is possible that nucleation may take place under such condition. Some eggs may have died from long exposures to low temperatures in a supercooled state. At Nes the temperatures dropped far below the average supercooling points of *M. ulmi* winter eggs, and it seems reasonable to assume that most of them were killed by freezing.

ACKNOWLEDGMENTS. This work was carried out with financial support from the Norwegian Research Council of Agriculture. Temperature data are used with the permission of the Dept. of Physics, Agricultural College of Norway, and of the Norwegian Institute of Meteorology. I am most grateful to Mr. T. Sekse and Mr. A. Hjeltnes for help concerning the collection of winter eggs.

Summary

Following the extremely cold winter of 1965/66 mortality rates of winter eggs of the Fruit tree red spider mite (*Metatetranychus ulmi* (Koch)) were recorded. Of eggs collected at Ullensvang in western Norway 73.3% hatched under laboratory conditions while the hatching rates of eggs from Ås and Nes in eastern Norway were 30.3% and 0.7% respectively. Lowest recorded temperatures were -14.5°C at Ullensvang, -25.6° at Ås and -41.1° at Nes. Compared with their ability to supercool it seems likely that most of the eggs from Nes were killed by freezing. The mortality recorded in eggs from Ås may partly be a result of freezing, but also of other factors, like long exposures to low temperatures in a supercooled state. Eggs from Ullensvang were probably not killed by freezing, since temperatures recorded at this locality were much higher than the average supercooling points of the eggs.

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Nye finnsteder av Noctuoidea

C F. L ü h r,

Lom.

Opheim (1962) har gitt en oversikt over utbredelsen av Noctuoidea i Norge. Følgende arter er tidligere ikke registrert fra VAg, *Calotaenia celsia* er også funnet for første gang i TEy. *Apamea unanimitis* Hb. er tidligere bare funnet i Akershus (AK); siste gang i 1874 (Opheim 1962).

Colocasia coryli L. Søgne 2/6 1966. *Noctua janthina* Schiff. Søgne 10/9—1966. *Dasyptolia templi* Thnbg. Søgne 11/9—1966. *Bombycia viminalis* F. Søgne 10/9—1966. *Calotaenia celsia* L. Søgne 10/9—1966, Levang 12/9—1966. *Griposia aprilina* L. Søgne 10/9—1966. *Lithomoia solidaginis* Hb. Søgne 10/9—1966. *Antitype gemmea* Tr. Søgne 10/9—1966. *Agrochola lota* Cl. Søgne 10/9—1966. *Agrochola macilentata* Hb. Søgne 10/9—1966. *Agrochola litura* L. Søgne 9/9—1966. *Cirrhia aurago* Schiff. Søgne 10/9—1966. *Cirrhia lutea* Ström. Søgne 9/9—1966. *Cirrhia citrigo* L. Søgne 9/9—1966. *Amphipyra tragopogonis* L. Søgne 10/9—1966. *Trachea atriplicis* L. Søgne 28/6—1966. *Hyppa rectilinea* Esp. Søgne 28/6—1966. *Avenostola pygmina* Esp. Søgne 9/9—1966. *Pseudoips bicolorana* Fuessl. Søgne 28/6—1966 (leg. Tor Lund). *Hadena lepida* Esp., Søgne 3/6—1966. *Apamea illyria* Frr., Søgne 30/6—1966. *Apamea unanimitis* Hb., Søgne 30/6—1966.

Summary

New records of Noctuoidea

The listed species are recorded for the first time from outer Vest-Agder, Norway (VAg), *Calotaenia celsia* also from outer Telemark (TEy). *Apamea unanimitis* Hb. is previously only reported from Akershus (AK), and has not been found since 1874.

Litteratur

OPHEIM, M. 1962. Catalogue of the Lepidoptera of Norway. Part II. Noctuoidea. Norsk Entomologisk Forening, Oslo (32 p.).

**Anomalities of the antennae of *Syrphus cinctus*
Fall. and *Platychirus angustatus* Zett.
(Dipt. Syrphidae)**

Tore Nielsen

Zoological Museum, University of Bergen.

During an examination of a large material (about 10.000 specimens) of Syrphidae collected by the author on Jæren in south-western Norway, two specimens with abnormal antennae were found.

In a male specimen of *Syrphus cinctus* Fall., collected July 12th 1965 at Osli, Ry: Høyland, the third joint of the right antenna has a peculiar *triple* arista (Fig. 1). — From a common base plate the arista is branched into two parts, — one part being bifurcate, the other simple.

In spite of this, there is a high degree of regularity in the construction of the antenna. The third joint is of normal shape, and each of the aristae is cylindrical, almost bare and of normal length and thickness (Fig. 1).

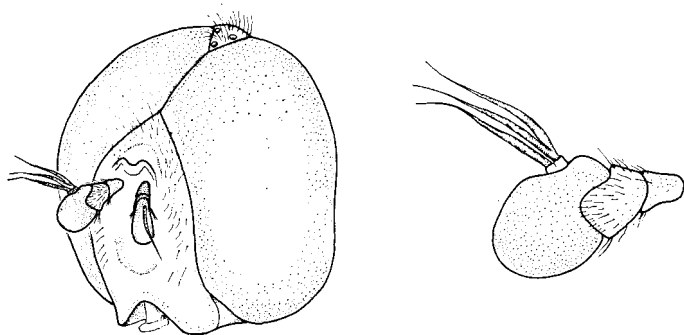


Fig. 1. The head of the male specimen of *Syrphus cinctus* Fall. with a left simple and a right triple arista. To the right an enlarged drawing of the latter.

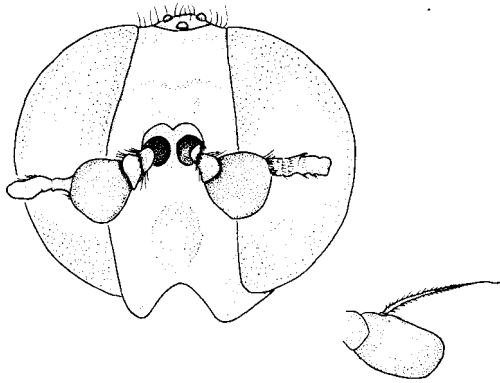


Fig. 2. The head of the female specimen of *Platyichirus angustatus* Zett. with the third antennal joints roundish, and the aristae broadly flattened. To the right a normal antenna.

The specimen of *Platyichirus angustatus* Zett., collected at Gimra, Ry: Sola, on the 29th of August 1962, shows an interesting deviation in the third antennal joints as well as in the aristae. The normal third joint in this species is of a rather rectangular shape, while in the specimen from Gimra it is roundish (Fig. 2).

The aristae are also interesting because they look deformed and are very different from the normal threadlike type. Left and right aristae are both laterally flattened, broad and of short length.

Species of the genus *Helophilus* (Dipt., Syrphidae) found on Jæren, Rogaland.

Tore Nielsen

Zoological Museum, University of Bergen

In the Palearctic region, the genus *Helophilus* is represented by 20 species of which 11 are known from Denmark and England.

The *Helophilus* genus is closely allied to the genus *Eristalis*, which contains a greater number of species, often known as "rattail flies". The *Helophilus* species, however, are distinguished from these by several characteristics, of which the following are the most conspicuous: the *Helophilus* species have a distinct yellow pattern, large areas of the abdomen usually being yellow and the thorax having along it the parallel yellow or greyish stripes typical of the genus. The femora of the hind legs are often thickened while the hind tibiae are somewhat flattened laterally. The eyes are hairless and separate (adjacent in the male and hairy in both sexes of *Eristalis*). The species of both genera are large, or fairly large.

The larva is of the "rattail" type, and, like *Eristalis* lives submerged in stagnant water containing rotting organic matter. The "tail" serves accordingly as a breathing tube. In some of the species several generations probably develop yearly.

The Syrphidae of Jæren were investigated during the period 1963—65. 917 specimens of *Helophilus* were collected on the localities shown in Fig. 1, and a great number of observations on the most common species were made.

The following 7 species were found: *Helophilus trivittatus* Fabr., *H. pendulus* L., *H. hybridus* Loew, *H. affinis* Wahlb., *H. consimilis* Malm, *H. lineatus* Fabr. and *H. lunulatus* Meig.

Of these *H. pendulus* and *H. affinis* have previously been recorded from Norway (Soot-Ryen 1943). *H. pendulus* is common, and usually abundantly found in many parts of the country. Only small numbers of the other species were caught, and as far as is known, *H. trivittatus*, *H. hybridus*, *H. consimilis*, *H. lineatus* and *H. lunulatus* have not been recorded before from the Norwegian fauna.

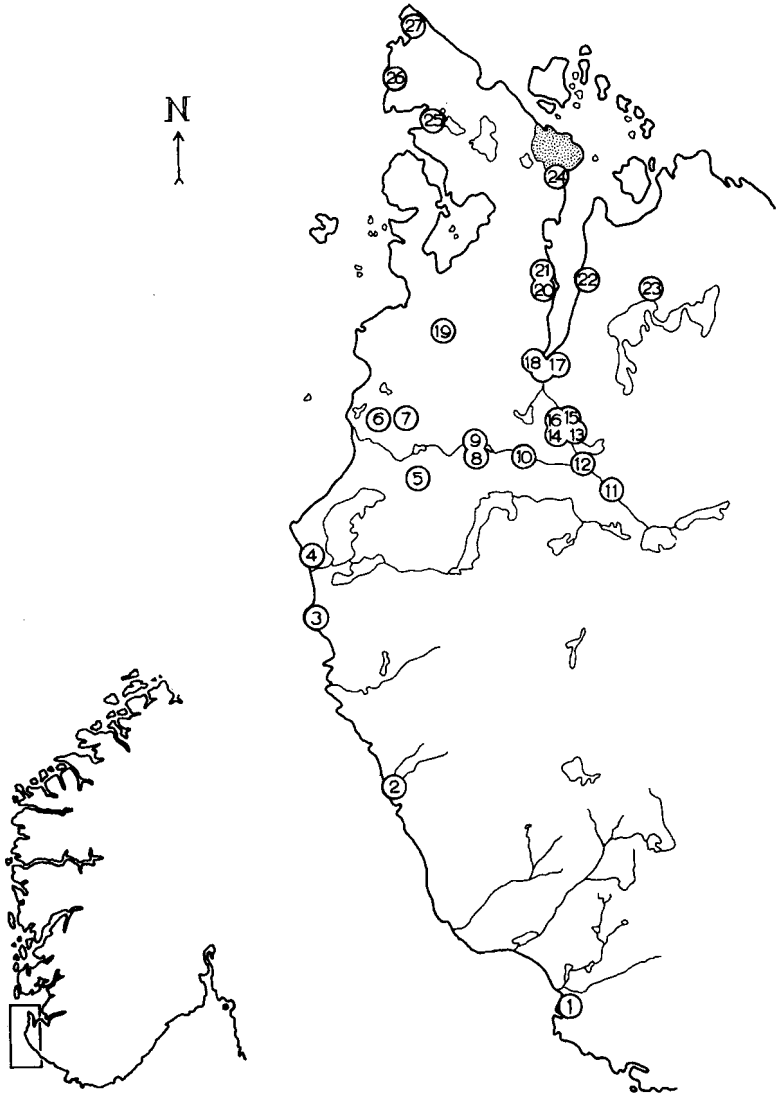


Fig. 1. Map of localities investigated. (1) Oгна, *district of Oгна*, (2) Rognbekken, *district of Varhaug*, (3) Vik, (4) Orre, (5) Kleppe, (6) Sele, (7) Skasheim, (8) Øksnevad, (9) Skjæveland, (10) Fosseikjeland (*localities 3–10 in district of Klepp*), (11) Figgjo, (12) Bråstein, (13) Osli, (14) Helgeland, (15) Myrland, (16) Brattebø, (17) Austrått (*localities 11–17 in district of Høyland*), (18) Sandnes, *district of Sandnes*, (19) Gimra, *district of Sola*, (20) Forus, *district of Høyland*, (21) Gausel, (22) Dale, (23) Hogstad (*localities 21–23 in district of Helland*), (24) Hillevåg, *district of Stavanger*, (25) Kverneviken, (26) Viste, (27) Sande (*localities 25–27 in district of Randaberg*).

The species' choice of biotopes.

The *Helophilus* species occur mainly in marshy and humid biotopes, such as humid bogs, the borders of lakes rich in vegetation, banks of ditches and canals etc., an observation the present investigation also confirmed. Both species and individuals were observed in greatest numbers here.

Of the species met with, *H. pendulus* seems to be the most eurytope form, least tied to humid spots. It was found on all the biotopes investigated and, although it too occurs most abundantly on humid biotopes, it proved to be the species most frequently entering drier areas. It was found in considerable numbers, among other places, in the lowest vegetation layer in dry coniferous forests. However, it seems to occur least abundantly in dense, pure deciduous forests, probably because of their reduced quantity of sunlight and sparse flora.

The species most tied to a definite biotope are the small species *H. consimilis*, *H. lineatus* and *H. lunulatus*. These seem to appear almost exclusively on humid bogs and along the borders of pools where *Comarum palustre* L. flowers abundantly.

The biotopes found to have been visited by the various species, are as follows:

Humid bogs, borders of lakes and pools, rich in vegetation: *H. trivittatus* — *H. pendulus* — *H. hybridus* — *H. consimilis* — *H. lineatus* — *H. lunulatus*.

Meadow, pasture: *H. trivittatus* — *H. pendulus* — *H. hybridus* — *H. affinis* — (*H. lineatus*).

Ditches, canals, riverbanks: *H. trivittatus* — *H. pendulus* — *H. hybridus*.

Sanddunes: *H. trivittatus* — *H. pendulus*.

Coniferous forests: *H. pendulus* — (*H. hybridus*).

Deciduous forests: *H. pendulus*.

Peat moor, heather moor: *H. pendulus*.

The species are cited systematically and not according to their frequency in the given biotope. Those in brackets have occurred only occasionally in the biotope. See also under the description of the individual species.

Activity and behaviour pattern.

Owing to its size and to the abundance of individuals in at least two of its species, the *Helophilus* genus often constitutes a considerable part of the frequently flying and easily observed Syrphid species. In addition, the individuals are not really shy, thus lending themselves to field studies of various kinds.

The *Helophilus* species, like other Syrphids, have a certain daily rhythm which is particularly noticeable on warm, sunny days.

The first hours after sunrise, and after the flight has begun, seem to be devoted almost exclusively to the search for food. Thus *H. pendulus* and *H. hybridus* have, on occasion, been seen to fly up from their nocturnal resting places (in this instance the lower leaves of *Rubus idaeus* L.) and go directly to open flowers in search of nectar.

After the first intense flight period is over (during which the *Helophilus* species may often appear even less shy and more unobservant than usual), a period occurs in the course of the morning when sunning is the most important activity in the pattern of behaviour, and during which food searching is to some extent neglected. While other Syrphids (e.g. *Syrphus* species) may choose a sunning place fairly high in the vegetation (bushes or trees), the *Helophilus* species often sit low selecting the larger leaves of various small plants (*Tussilago farfara* L., *Menyanthes trifoliata* L., *Rubus idaeus* and others).

Early in the sunning period, before the substrate is properly warmed up, the insects can be observed attempting by various means to absorb as much as possible of the heat of the sun. They spread their legs out to the side as far as possible, crouching low down on the substrate and thereby making greater use of the heat radiating from it. The absorbent surface is further increased at this time by the wings often being fully spread. The insect also, to a large extent, remains still, in order to avoid chilling. As the air and the substrate temperatures increase gradually during the morning, the insects are seen to be sitting rather higher over the substrate. The legs are drawn in under the body so that its position is higher, and the wings are only just open. The insects appears in many ways to be less intent on absorbing heat. It is more easily provoked than earlier in the sunning period; it is more easily frightened away, and altogether appears to respond to various stimuli more quickly.

As the temperature of the air rises, flying again becomes the major activity, and from now on the insects appear more cautious and increasingly quick in their reactions.

With a further rise in temperature a "dead" period is liable to set in, during which activity dies down and the biotope seems almost empty of insects. This period occurs about the time when the sun is at its highest, and is most noticeable on warm days (12–15 p.m.) in July and August.

There is reason to believe that the high temperatures from the direct rays of the sun are what the insects try to avoid at this time of day. And it is probable that they "disappear" from the biotope by seeking shelter in the lower vegetation, where the extremes of temperature are less noticeable, or by creeping on to the undersides of large leaves of various kinds. *H. pendulus*

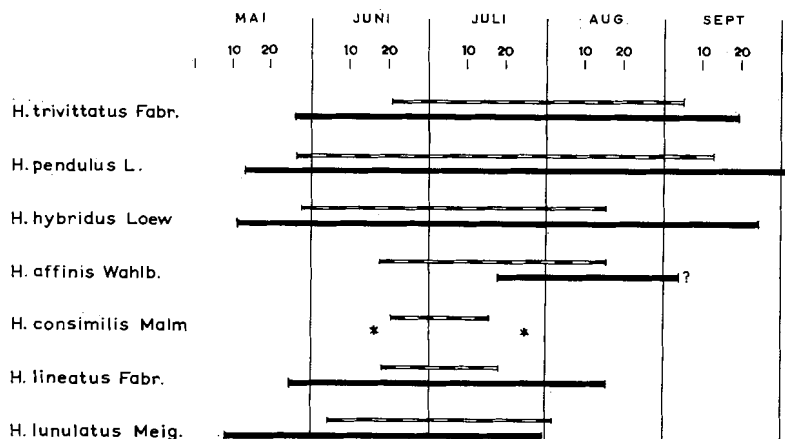


Fig. 2. Flight period for each species. *Solid* lines indicate flight periods for Danish specimens (after Lundbeck (1916), and Torp Pedersen (1964) and personal communications). *Broken* lines indicate Jæren finds. (?) under *H. affinis* Wahlb. indicates a Danish find in September; day not given. (*) under *H. consimilis* Malm shows the only two Danish specimens (of four) where the date of find is known (June 15th and July 25th).

and *H. hybridus* for example, have been seen to retreat gradually lower down into vegetation and finally to creep on the to undersides of the leaves of *Rubus idaeus*.

In the course of the afternoon, after the period of maximum temperatures mentioned above, the activity of the insects again increases. But there is also, as in the morning, a sunning period, and the insects seem to concentrate on sunning most intensively during the late afternoon, reaching a climax towards sunset. During the rapid drop in temperature that follows, all activity ceases and it is assumed that the insects settle in the lower vegetation of small plants for the night.

Flight periods (see also Fig. 2):

H. trivittatus: June 21st—September 5th.

H. pendulus: May 27th—September 13th. The species was caught in copula on July 4th and 13th.

H. hybridus: May 28th—August 16th. It was caught in copula on July 17th and August 2nd.

H. affinis: June 18th—August 16th. The first date is earlier than that given by Lundbeck (July 18th). He also mentions a Danish specimen caught in September (1914, date not given). — The flight period of this species in Scandinavia can therefore be stated as from June 18th to September.

H. consimilis: June 21st—July 16th. Compared with the Danish dates of observation, the flight period in Scandinavia could provisionally be stated as June 15th—July 25th.

H. lineatus: June 18th—July 18th.

H. lunulatus: June 4th—August 2nd. Danish specimens have been caught during the period May 8th—July 30th.

Territories.

At least some of the Syrphids seem to have their own territories. These are found with *Helophilus* species and are defended, among other occasions, during the sunning period. If an individual is disturbed by another insect flying by or approaching, the disturbed insect can often be seen to rush out at the intruder. If the intruder attempts to drive the occupier away from a suitable sunning place, a real battle may arise. In most cases the defender appears to get the best of the battle in so far as it reacts rapidly and violently when disturbed in this way.

At the end of a fight the defender usually returns to his place, but if the fight lasts a long time or is particularly violent, both individuals may fly away, leaving the sunning place empty.

This defence of territory seems to occur especially in the early morning and in the late afternoon, when the animal will most need to absorb heat.

Sounds during flight and at rest.

Like most of the Syrphids, the *Helophilus* species emit sound during flight. The large *H. trivittatus* seems to have a comparatively deep flight note, while the sound of *H. pendulus* and *H. hybridus* lies somewhat higher. The smallest species, *H. lineatus* and *H. lunulatus*, can easily be distinguished when flying together with other species, by their "piping" flight notes.

A similar "piping" made by some species while resting, is usually so loud that the insects can be heard and traced among the vegetation from rather a long distance. The sounds are considered to arise from the plumula and are also known to occur in the genera *Sericomyia* and *Microdon*.

The individual species.

The figures in brackets indicate the numbers of individuals caught in each locality. See also Fig. 1.

H. trivittatus Fabr.

Localities: Orre 31/7—63 (1), 18/7—65(3), Kleppe 16/7—65(7), 15/8—65 (1), Fosseikjeland 30/7—64 (1), Sele 26/7—64 (1), 12/7—65 (5), Skjæveland 11/8—65 (2), Øksnevad 21/6—64 (1), 5/8—64 (1), 11/8—64 (1), 15/8—64 (1), 22/7—65 (1), 24/7—65 (1), 10/8—65 (1), 5/9—65 (1), Gimra 4/7—63 (2), 6/7—64 (1), 12/7—64 (1), 17/7—64 (1), 5/7—65 (4).

Biotopes: humid bogs, borders of pools, river beds, flowery meadows near cultivated land, sanddunes. — The species has only been captured in the open, never in exclusively forest terrain. It seems to be most abundant on or near relatively humid biotopes.

Plants providing nourishment: *Sedum acre* L. — *Comarum palustre* — *Valeriana officinalis* L. — *Arnica montana* L. — *Hieracium* sp. L.

Frequency: Not rare, but generally in small numbers. — Denmark: Not common, although numerous on some places. It has been found on Zealand, Lolland and Langeland (Lundbeck 1916). Torp Pedersen (1964) finds it quite common and widely spread on Jutland. — Great Britain: "Frequent" (Coe 1953).

Distinguishing characteristics: The species can easily be detected in the field by its size and relatively slender build. The abdomen in particular is longer than in the other large *Helophilus* species, and, especially while visiting flowers, the insect can be observed holding the back part of the abdomen lifted (Fig. 3). In profile it looks as if the insect were walking round in the flower with "curvature of the spine". A similar feature can also be seen with *H. hybridus*, but here the shorter, and relatively broader abdomen, makes the curvature less marked.

Distribution: "Regio palaeart. et neart." (Sack 1932). — "All Europe and down into Persia; towards the north to middle Sweden; it has also been recorded from Mexico" (Lundbeck 1916).

H. pendulus L.

Localities: The species was found on all 27 localities. See Fig. 1.

Biotopes: Found at all the kinds of biotopes investigated.

Plants providing nourishment: The species draws its nourishment from a large number of plants, and given its individual abundance, one must conclude that it is an important pollinating species. It has been found on the following plants: *Salix repens* L. — *Ranunculus acris* L. — *Cakile maritima* Scop. — *Brassica rapa* L. — *Sedum acre* — *Sorbus aucuparia* L. — *Rubus idaeus* — *Comarum palustre* — *Potentilla fruticosa* L. — *Potentilla erecta* (L.) Ransch. — *Calluna vulgaris* (L.) Hull — *Vaccinium myrtillus* L. — *Myosotis* sp. L. — *Valeriana officinalis* — *Succisa*

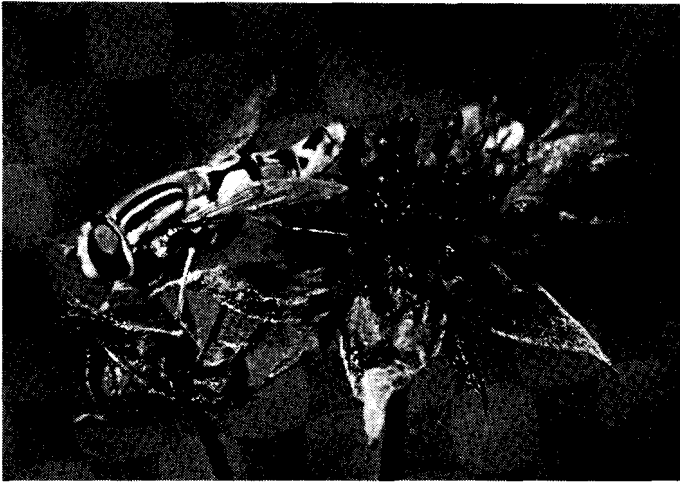


Fig. 3. *Helophilus trivittatus* Fabr. in a *Comarum palustre* L. flower.

pratensis Moench. — *Matricaria inodora* L. — *Arnica montana* — *Senecio jacobaea* L. — *Taraxacum* sp. Web. — *Hieracium* sp.

Substrate during sunning: Leaves of *Betula odorata* Bechst. — *Alnus incana* (L.) Moench. — *Quercus* sp. L. — *Rubus idaeus* — *Menyanthes trifoliata* — *Tussilago farfara*.

Frequency: Common everywhere and usually extremely abundant. It does not seem to become abundant, however, until the middle of June. — Denmark: common and widely distributed (Lundbeck 1916 and Torp Pedersen 1964). — Great Britain: "Common" (Coe 1953).

Distinguishing characteristics: See under *H. hybridus*.

Distribution: "Europa" (Sack 1932). — "All Europe and on Madeira; towards the north to northern Sweden, in Finland, and on the Faroe Islands and Iceland" (Lundbeck 1916).

H. hybridus Loew

Localities: Sele 12/7—65 (5), Skasheim 2/8—63 (2), Kleppe 16/7—65 (1), Skjæveland 17/7—65 (3), 11/8—65 (2), 15/8—65 (9), Øksnevad 24/6—63 (1), 21/6—64 (12), 24/6—64 (6), 14/7—64 (8), 1/8—64 (20), 2/8—64 (9), 9/8—64 (1), 29/5—65 (3), 22/7—65 (1), 23/7—65 (2), Myrland 5/7—64 (1), Brattebø 5/6—65 (1), Austrått 20/6—63 (1), Forus 14/8—63 (1), 15/8—63 (1), Gimra 4/7—63 (1), 16/8—63 (1), 28/5—65 (3), 31/5—65 (3).

Biotopes: The species was found on rather dissimilar biotopes but for the most part in open country. It has also been found in coniferous forests: Myrland (1) and Brattebø (1), and in forest glades (spruce and pine stands) near a pool: Øksnevad (extremely abundant).



Fig. 4. *Helophilus hybridus* Loew male.

Plants providing nourishment: *Ranunculus acris* — *Rubus idaeus* — *Comarum palustre* — *Sanguisorba officinalis* L. — *Vaccinium myrtillus* — *Myosotis* sp. — *Valeriana officinalis* — *Arnica montana* — *Taraxacum* sp.

Substrate during sunning: *Rubus idaeus*.

Frequency: Denmark: Rare (Lundbeck 1916). — Torp Pedersen (1964) mentions 9 further specimens from Jutland (1963—64), and expects it to be found relatively frequently in that part of Denmark. — Great Britain: "Uncommon" (Coe 1953).

In the Norwegian area investigated the species was found in most places to occur frequently but in small numbers. An exception is the biotope at Øksnevad. In an open space, due to felling in a spruce stand near a pool (Øksnevad tarn), the species occurred in large numbers and was far more abundant than the otherwise dominating *H. pendulus*. Most of the examples were captured at this biotope; the abundance of individuals here is also much greater than can be inferred from the number collected, as relatively few insects were caught.

Distinguishing characteristics: *H. hybridus* seems to be less alert and less shy than the other *Helophilus* species. This was especially noticeable at Øksnevad where, as mentioned, the species occurs abundantly together with *H. pendulus*. While *H.*

pendulus, like most Syrphids, is cautious and reacts quickly to danger, *H. hybridus* is usually less shy and even appears lethargic and "tame" sometimes. On occasion the insect remained sitting and even allowed to be touched provided it was approached carefully. Its flight also differs from that of *H. pendulus*. — *H. pendulus* reacts more or less spontaneously to a dangerous object and its first flight phase is straight. This is soon replaced by a more reconnoitring, questing phase until it finds a suitable place to alight, which it does relatively gracefully. It can also be seen hovering in among the vegetation where it advances towards a suitable resting place or flower with small jerks and neat little twists of the body.

The flight of *H. hybridus* is often far less elegant and easy. When frightened it dashes off to some distance until it rather clumsily "falls" down on to a resting place. It is rarely seen to carry out the kind of manoeuvre *H. pendulus* does, and its flight therefore appears less questing and thus less "intelligent".

Distribution: "Europa centr. et sept., America sept." (Sack 1932). In Europe as far north as to southern Sweden (Lundbeck 1916).

H. affinis Wahlb.

Localities: Oгна 4/8—60 (1), Austrått 18/6—64 (1), Øksnevad 21/6—64 (1), 11/8—64 (1), 13/8—64 (1), 15/8—64 (1), 16/8—64 (1), 27/7—65 (1), Forus 14/8—63 (1).

Biotopes: Flowery meadows both near cultivated land and near spruce and pine plantations.

Plants providing nourishment: *Ranunculus acris* — *Rubus idaeus* — *Valeriana officinalis* — *Senecio jacobaea*.

Frequency: Rare. In each case captured singly. — Denmark: very rare (Lundbeck 1916). Torp Pedersen confirms this. In addition to the two examples mentioned by Lundbeck, he has caught one specimen at Randbøl hede on 19.8. 1963 (personal communication 1966). — Great Britain: the species is not mentioned by Coe.

Distribution: "Europa sept." (Sack 1932). — Scandinavia and Finland, towards the north to northern Sweden (Lundbeck 1916).

H. consimilis Malm

Localities: Kleppe 16/7—65 (8), Øksnevad 24/6—63 (10), 21/6—64 (1), 14/7—64 (3), Gimra 6/7—64 (10), 11/7—64 (6), 12/7—64 (4), 5/7—65 (3), Brattebø 10/7—64 (6), 12/7—64 (1).

Biotopes: Only caught on humid bogs and the marshy borders of pools and lakes rich in vegetation particularly of flowering *Comarum palustre*.

Plants providing nourishment: *Comarum palustre*.

Frequency: Not rare, but tied to a certain type of biotope. Few in numbers on most localities. — Denmark: very rare, only three specimens are known (Lundbeck 1916). Torp Pedersen has caught a fourth specimen at Skjærsø on 15. 6. 1964 (personal communication 1966). — Great Britain: "Rare" (Coe 1953).

Distribution: "Scandinavia" (Sack 1932). — "Southern Sweden, Finland and Denmark" (Lundbeck 1916). The species is also reported from Great Britain (Coe 1953).

H. lineatus Fabr.

Localities: Øksnevad 24/6-63 (30), 17/7-63 (1), 21/6-64 (4), 24/6-64 (12), 14/7-64 (15), Sele 18/7-64 (3), 12/7-65 (1), Austrått 20/6-63 (1), 18/6-64 (2), 22/6-64 (1), Bråstein 25/6-62 (1).

Biotopes: Seems to be strongly attached to humid biotopes, like *H. consimilis* and *H. lunulatus*, and is only exceptionally and in small numbers caught in drier localities.

Plants providing nourishment: *Ranunculus acris* — *Comarum palustre*. 5 and 34 individuals respectively were caught on these plants (in blooms).

Frequency: Frequent, in some places fairly abundant. — Denmark: Common (Lundbeck 1916 and Torp Pedersen 1964). — Great Britain: "Frequent, in marshy localities" (Coe 1953).

Distinguishing characteristics: As already stated, the smaller *Helophilus* species have a characteristic high flight sound which can be heard from quite a distance. This applies also to *H. lineatus*, the sound being particularly strong when the insect is flying about reconnoitring among marsh vegetation. "Piping" notes, made by the plumula while the animal is resting, are common amongst the *Helophilus* species, perhaps especially so among this and the following species.

Distribution: "Europa, America sept." (Sack 1932). — In Europe towards the north to northern Sweden and in Finland (Lundbeck 1916).

H. lunulatus Meig.

Localities: Øksnevad 24/6-63 (2), 24/6-64 (1), 14/7-64 (1), 1/8-64 (1), 2/8-64 (1), Gimra 11/7-64 (2), 5/7-65 (1), Brattebø 3/7-63 (6), 6/7-64 (6), 10/7-64 (4), 12/7-64 (3), 4/6-65 (1), 6/7-65 (1), 7/7-65 (1), 8/7-65 (3).

Biotopes: See under *H. lineatus*.

Plants providing nourishment: *Comarum palustre* — *Taraxacum* sp. On these 21 and 1 specimens respectively were caught.

Substrate during sunning: On warm days the species can be seen sunning itself on larger leaves of lower vegetation. E.g. 3 specimens were caught on leaves of *Menyanthes trifoliata* on Bratlebø bog on July 8th 1965.

Frequency: Not rare, but tied to humid biotopes. — Denmark: Lundbeck (1916) finds it rare. Torp Pedersen (1964) writes that he has caught the species at Munkesø, Ribe, on May 8th 1964 (18 specimens). — Great Britain: "Uncommon, in marshy localities" (Coe 1953).

Distinguishing characteristics: See under *H. lineatus*.

Distribution: "Europa, Asia sept. et orient., America sept." (Sack 1932). — Northern and middle Europe, towards the north to southern Sweden and in Finland. Rare everywhere (Lundbeck 1916).

Summary

A total of 917 specimens of *Helophilus* species were collected on Jæren, Rogaland county in south-western Norway, mainly during the period 1963—65. 7 species were found: *Helophilus trivittatus* Fabr. (38 specimens), *H. pendulus* L. (616 specimens), *H. hybridus* Loew (98 specimens), *H. affinis* Wahlb. (8 specimens), *H. consimilis* Malm (52 specimens), *H. lineatus* Fabr. (71 specimens) and *H. lunulatus* Meig. (34 specimens).

H. pendulus is common and widely spread throughout the whole area. The other species were found less numerous and *H. trivittatus*, *H. hybridus*, *H. consimilis*, *H. lineatus* and *H. lunulatus* are new to the Norwegian fauna.

The position of the investigated area and the occurrence of the species are shown on Fig. 1. Fig. 2 is indicating the specific flight periods. As seen from this figure, most of the species can be caught during a great part of the summer, but one species (*H. consimilis*) seems to have a more limited flight period.

There is a choice of biotopes; the species have been found in greatest numbers on humid bogs and along borders of lakes and pools, with flowering *Comarum palustre* L. Thus most of the species seem to be hygrophile, while *H. pendulus* is the most pronounced mesophile form.

Some remarks about the activity and behaviour of the insects are included. A periodicity can be traced, and during a period of sunning in the morning and in the afternoon, defence of territories occurs frequently between the specimens.

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**The larval stages of the genus *Bembidion* Latr.
(Col. Carabidae) I. The larvae of the subgenus
Chrysobracteon Net. and *B. dentellum* Thunb.**

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In connection with an ecological investigation of the beetle fauna on the banks of rivers I have reared the larvae of several species of the genus *Bembidion*, and among them the following previously not known larvae of the subgenus *Chrysobracteon*: *B. argenteolum* Ahr., *B. lapponicum* Zett. and *B. litorale* Ol., whereas the larva of the fourth Scandinavian species — *B. velox* L. — is still unknown. The last mentioned, judging by the adult, is clearly closely related to *B. lapponicum* (Lindroth 1962) and it is reasonable to believe that the larvae of the two species resemble each other very much, or perhaps cannot be separated. Despite only having the exuviae of a single larva of *B. dentellum*, I venture a description of it, as the single specimen deviates so much from other known larvae of *Bembidion* that the essential characters given in the description probably will hold good for the species in general.

Material and methods

The material comprises larvae reared from eggs deposited by the adults, and larvae collected in the field which pupated and hatched in the laboratory. During the rearing each of the species were kept in individual jars on their natural substratum taken from the spot where the adults were found. To be certain of the absence of living larvae of *Bembidion* in the substratum before the adults were put in the jars, the substratum was kept dry for several weeks at room temperature (18–20° C) and a relative humidity of 40–50%. Under these circumstances the larvae are not able to live more than a few hours.

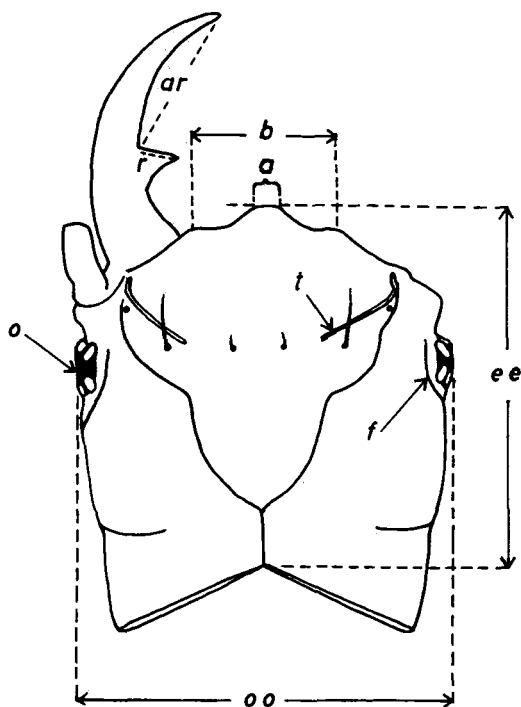


Fig. 1. Head of a *Bembidion* species. Measures used in the text. f = ocellar furrow, O = ocellar area, t = tentorial rib.

The terminology is mostly according to Emden (1942), though in some instances I have found it practical to use the terms of Bøving (1910) and Bengtsson (1927). The following abbreviations are used (see Fig. 1):

- a: The width of the front margin of nasale.
- ar: The length of the mandible between the apex and the upper basis of the retinaculum (Bøving 1910?).
- b: The width of the frontal piece between the corners of the adnasalia.
- ee: The length of the cranium along the median line (Bøving 1910).
- i: The length — width ratio for a joint or segment.
- OO: The width of the cranium between the ocelli (Bøving 1910).
- r: The length of the retinaculum.

The number of setae on the notum and tergites does not include the small ones on the prescutum. Nor are the setae on the epipleurites included when the number of setae on the latero-ven-

tral side of the eighth abdominal segment is given as it was often difficult to count them. I do not give the total size of the larvae since this varies greatly according to their state. Instead I have used the length (along the median line) and width of the cranium as it is little influenced by the state of the larva.

Description of the species

B. argenteolum.

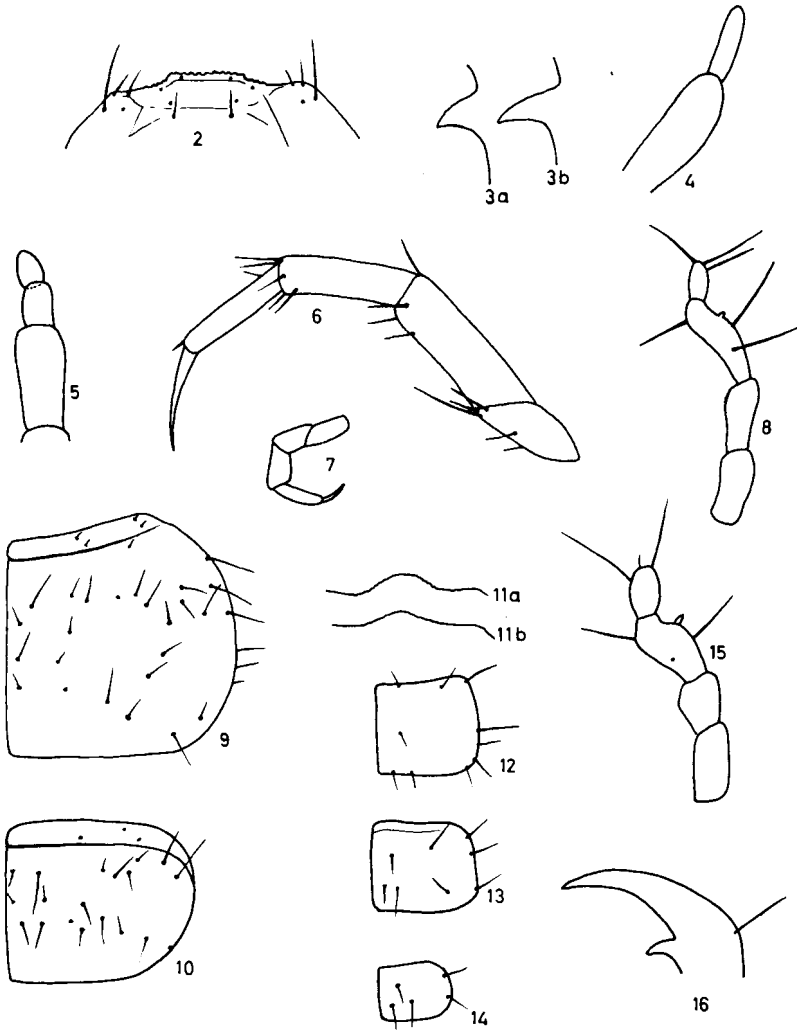
Material: 22 third stage larvae, 4 taken in STi: Melhus 15.7—17.7. 64, one taken in STi: Gaulosen 28.7.62, whereas the rest of the larvae were reared, first seen between about 7.7 and 10.8 in the years 1963—1965. 8 first and 24 second stage larvae from rearing, first stage first seen between 10.6 to 10.7 1963 and 1965, and second stage from about 18.6 to 3.8 1963—1965. The adults collected in STi: Melhus and Gaulosen.

Third stage (Head and prothorax Plate I,3)

Length of head: 0.72—0.82 mm, width: 1.15—1.30 mm.

Head and thorax pale yellow or yellowish white. Hind and central parts of head, middle and outer parts of mandibles together with retinaculum, a large triangular area on pronotum and a little spot on each side of meso- and metanotum more or less pale brown. So are the two outer joints of the antennae often as well. Abdominal tergites monochrome, only a little darker than the lightest parts of head and prothorax. Ventral side of head and prosternum light orange, rest of ventral side pale yellow or yellowish white. Ocellar area black.

Head broad: ee:OO = 0.59—0.68. Epicranial suture very short, distinctly shorter than basal joint of outer lobe. Ocelli large, carried by an ocellar area noticeably projecting from sides of head capsule. Three setae on ocellar area. Frontal piece with 7—13 large setae in the area within and a little in front of ocelli (in addition to one seta somewhat behind the basis of tentorial rib on either side). In addition the head has micropores partly nearly visible at 50 X magnification. Head shiny, hind part with fish-scale like sculpture clearly visible at 25 X. Nasale (Fig. 2) clearly projecting beyond the corners of adnasalia, the latter very little protruding. Front margin of adnasalia often nearly parallel with the almost straight front margin of nasale. Latter sometimes slightly concave, seldom convex, broad (a:b = 0.30—0.40), usually more than twice as long as the epicranial suture. Margin of nasale and adnasalia always more or less serrated, often very distinctly denticulated. In the first, number of teeth 8 to more than 18. Antennae (Fig. 8) relatively slender, second joint usually more than twice, but less than 2.5 times, as



Figs. 2–16. *Bembidion argenteolum* Ahr., figs. 2–6, 8–10. Third stage larva, the other figs. first stage. — 2. Front margin of frontal piece. — 3a, b. Retinaculum, short and slender type — 4. Labial palp. — 5. Maxillary palp. — 6, 7. Leg (setae not drawn in 7.). — 8. Antenna. — 9. Mesonotum (right half). — 10. First abdominal tergite (right half). — 11a, b. Front margin of frontal piece, broad and narrow type. — 12. Pronotum (right half). — 13. Mesonotum (right half). — 14. First abdominal tergite (right half). — 15. Antenna. — 16. Mandible (basis not drawn).

long as broad ($i = 2.0-2.7$). First and second joints of about same length, third joint between 1.1 and 1.3 times longer than second and about twice as long as fourth. Mandible fairly slender, peaked at apex. Shape of retinaculum variable (Fig. 3a and b), $r:ar = 0.16-0.23$, usually less than 0.2. Maxillary palpi (Fig. 5) with broad joints: first joint: $i = 1.7-2.0$; second joint: $i = 1.0-1.8$, only more than 1.5 in a single larva. First joint about twice as long as second, second and third of equal length. Second joint of outer lobe usually shorter than basal joint. Terminal joint of labial palpi relatively broad, much shorter than basal joint (Fig. 4). Head as long as or up to 1.15 times longer than scutum of prothorax.

Scutum of prothorax well marked, shiny, 1.1-1.3 times broader than head and 1.1-1.2 times longer than mesonotum. About twice as broad as long: $i = 0.51-0.54$. On each side of median line 24-32 large setae, as well as micropores of same size as on head.

Mesonotum (Fig. 9) about same width or somewhat narrower than scutum of pronotum, and 1.3-1.4 times broader than first abdominal tergite, front margin concave. $i = 0.44-0.45$. Surface with micropores, mat because of very fine, granulated microsculpture. Prescutum distinct, while there is no clear distinction between scutum and postscutum. 23-35 setae on each side of median line.

Front margin of metanotum nearly straight, with 26-31 setae. Otherwise as mesonotum.

The legs slender (Fig. 6). Claw usually with long, pointed end, but length varies — on middle legs from about half to nearly as long as tarsus. Femur as long as or up to 1.3 times longer than tibia and tarsus which are of equal length. Tibia: $i = 2.4-3.3$. The dorsal seta on tarsus about one third of the way, or less from the basis.

Pre- and postscutum of abdominal tergites correspond to those on mesonotum. Tergites successively longer, but narrower from first to eighth segment. First tergite (Fig. 10): $i = 0.39-0.45$. Eighth tergite as long as mesonotum, but much narrower ($i = 0.67-0.77$). Number of setae on each side of median line as follows: first tergite: 17-21; second tergite: 14-20; third tergite: 14-20; fourth tergite: 15-19; fifth tergite: 15-19; sixth tergite: 15-20; seventh tergite: 12-17; eighth tergite: 13-17. Micropores exist, but are often hardly visible. Numerous setae on the latero-ventral surface, on eighth segment more than 50, usually between 60 and 70.

Second stage

Essentially consistent with the third stage larva. Head broad (ee:OO = 0.61–0.70) and number of setae on head, each half of dorsal sclerites and ventral side about the same (on frontal piece 7–11, on scutum of pronotum 19–30, on mesonotum 24–32, on metanotum 25–31, eighth abdominal segment with 50–70 on ventral side, first abdominal tergite with 15–20 and eighth tergite with 12–13 setae). First joint of maxillary palpi: $i = 1.4–1.8$. Ratio between length of joints as in third stage. Nasale often not so broad as in third stage: $a:b = 0.30–0.36$, whereas retinaculum is larger in proportion to mandible: $r:ar = 0.18–0.29$.

Differs from third stage larva as follows: length of head: 0.45–0.52 mm, width: 0.72–0.85 mm. The antennal joints and legs are shorter (second antennal joint: $i = 1.3–2.0$, third joint of antenna less than twice as long as fourth; $tibia:i = 2.1–2.4$). Pronotum lacks a distinct triangular, more pigmented part, but has a more evenly distributed pale brown colour. Prescutum distinct on meso- and metanotum and first abdominal tergite while it can scarcely be separated from scutum on the other abdominal tergites.

First stage

Length of head: 0.30–0.35 mm, width: 0.53–0.57 mm.

Colour as in second stage.

Head: ee:OO = 0.58–0.64. Only four setae on frontal piece could be observed in area within and in front of ocelli. Nasale (Fig. 11a and b) variable, but much narrower than in the older larvae. Antennae (Fig. 15) very lumpy, especially second joint: $i = 1.0–1.2$. Second and fourth joints about same length and distinctly shorter than first and third joints which are of equal length. Retinaculum prominent relative to mandible (Fig. 16): $r:ar = 0.23–0.31$. Second joint of maxillary palpi: $i = 1.2–1.6$. Terminal joint of outer lobe seems a little longer than basal joint or they are sub-equal. Eggbursters not visible at 100 X. According to Emden (1942) the eggbursters of *Bembidion* consist of very small, inconspicuous spinules and as *B. argenteolum* undoubtedly has eggbursters too, they are probably of a type characteristic of *Bembidion*.

Only pronotum (Fig. 12) and mesonotum (Fig. 13) have distinct prescutum, diffuse on metanotum and on abdominal tergites hardly separable from scutum (Fig. 14). Number of setae as on the figures.

Joints of legs (Fig. 7) thick, tibia not twice as long as broad, about of same length as tarsus and femura. Claw apparently not shorter in proportion to tibia than in the third stage larva.

B. lapponicum

Material: 8 in third stage, of which 2 collected in STi: Melhus 25.6.63 and 26.6.63, the others have been reared and first seen between 26.6 and 19.8 in 1962 and 1964. 5 in second stage, all reared, first seen between 9.7 and 27.7.62, and 3 first stage larvae reared in 1962, first observed in that stage 9.7 and 14.7. All the adults collected in STi: Melhus.

Third stage. (Head and prothorax Plate I, 1)

Length of head: 0.55–0.72 mm, width: 0.80–0.90 mm.

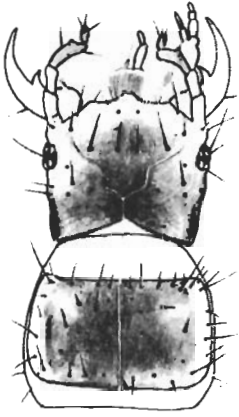
Least pigmented parts of head and pronotum light yellow or yellowish white, meso- and metanotum and abdominal tergites light orange or yellowish brown. Greater part of head and pronotum more or less dark brown (Plate I, 1). Meso- and metanotum with a brown spot on each side; abdominal tergites monochrome. Head on ventral side brown, while abdominal segments are yellowish white on ventral side. Ocellar area black.

Head on an average not as broad as in the previous species: $ee:OO = 0.66-0.79$. Epicranial suture same length or just shorter than basal joint of outer lobe. Ocelli and ocellar area about as in *B. argenteolum*. Only four setae on frontal piece in area where *B. argenteolum* has many. Nasale (Fig. 17a and b) totally different from that of *B. argenteolum*. Very narrow, but projecting in the middle, front margin shorter than epicranial suture: $a:b = 0.13-0.19$. Front margin usually well marked by a large tooth on each side. Two or three small teeth between these. Antennae (Fig. 23) not as slender as in *B. argenteolum*, second joint: $i = 1.7-2.1$. First joint as long as or up to 1.2 times longer than second joint. Third joint 1.2 to 1.5 times longer than second joint, and about twice as long as fourth. Retinaculum (Fig. 18a and b) in proportion to mandible larger than in the previous species: $r:ar = 0.2-0.3$. Second joint of maxillary palpi: $i = 1.2-1.4$.

Scutum of prothorax with 20–25 setae on each side of median line. Mesonotum (Fig. 21) as long as or somewhat shorter than scutum of prothorax: $i = 0.50-0.53$. 16–21 setae on each side of median line.

Legs (Fig. 19) about as in *B. argenteolum*. Claw, however, less slender and its greatest length shorter relative to tarsus than in *B. argenteolum*. Abdominal tergites (Fig. 24) with about equal number of setae, from 9–12 on each side of median line. Ventral side of eighth segment (Fig. 22) has 36–50 setae.

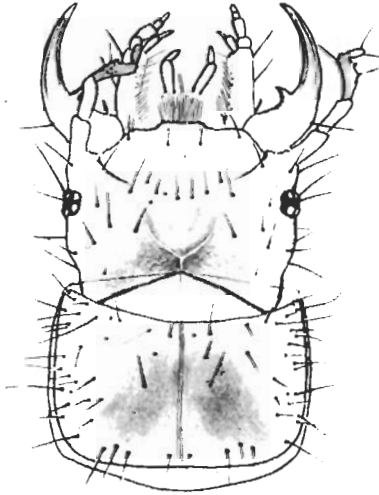
Micropores and sculpture about as in the previous species.



1

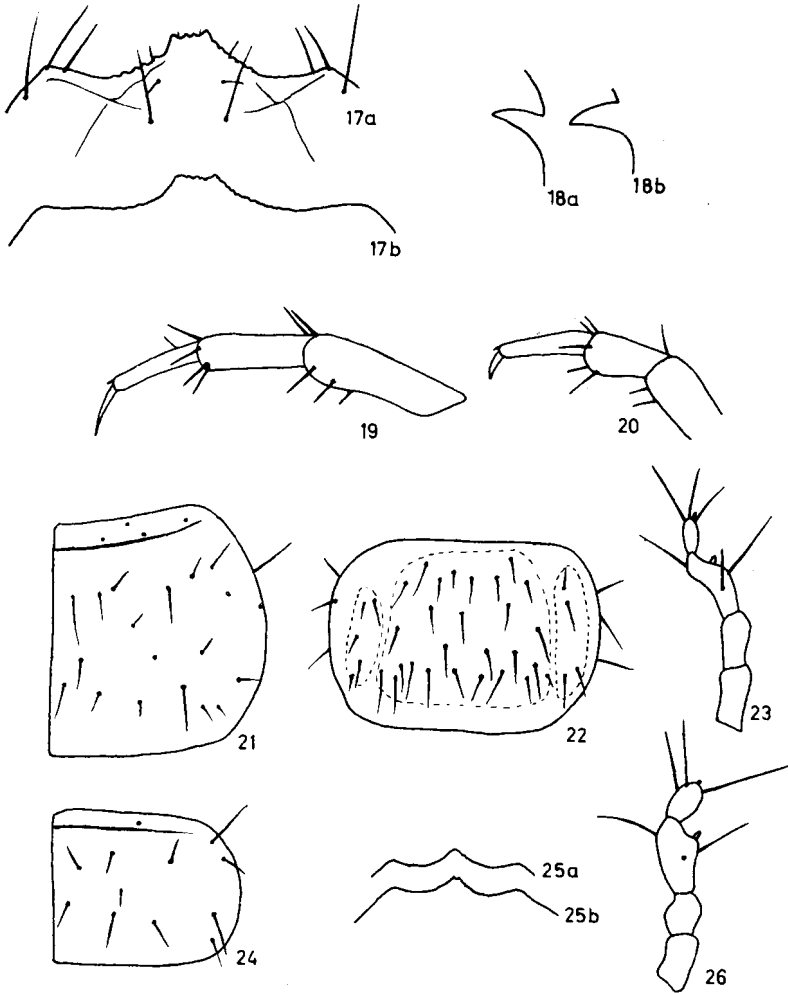


2



3

1. *Bembidion lapponicum* Zett.
2. *Bembidion litorale* Ol.
3. *Bembidion argenteolum* Ahr.



Figs. 17—26. *Bembidion lapponicum* Zett., figs. 17—19, 21—24. Third stage larva, the other figs. first stage. — 17a, b. Front margin of nasale (Setae and furrows not drawn in 17b). — 18a, b. Retinaculum. — 19, 20. Legs. — 21. Mesonotum (right half). — 22. Eighth abdominal segment, ventral. — 23. Antenna. — 24. First abdominal tergite (right half). — 25a, b. Front margin of frontal piece. — 26. Antenna.

Second stage

Differs from third stage larvae, among other things, in the following: length of head: 0.40–0.50 mm, width: 0.58–0.62 mm, second antennal joint: $i = 1.3-1.6$, fourth antennal joint more than half the third, prescutum barely separated from scutum on the posterior abdominal tergites.

First stage

Length of head: 0.30–0.37 mm, width: 0.43 mm. Colour as in second and third stages, pronotum, however, not so dark. $ee:OO = 0.68-0.80$. Front margin of nasale (Fig. 25a and b) very narrow, in two specimens about triangular, while more marked in the third. Joints of antennae (Fig. 26) very short, second joint as long as or a little shorter than fourth, second joint: $i = 1.0-1.3$. Second joint of maxillary palpi not as broad as in second and third stages, but not twice as long as broad. Terminal joint of outer lobe as long as or slightly longer than basal joint. Eggbursters probably as in *B. argenteolum*.

Prescutum distinct, postscutum less distinct, separated from scutum on prothorax. Prescutum and scutum not separated on the other sclerites. Pronotum with 10, meso- and metanotum with 7 or 8 and abdominal tergites with 5 setae on each side of median line. Ventral side of eighth abdominal tergite with 10 setae.

Joints of legs short (Fig. 20), claw perhaps not as prominent as in first stage larva of *B. argenteolum*, but more conspicuous in the two other specimens than on the figure.

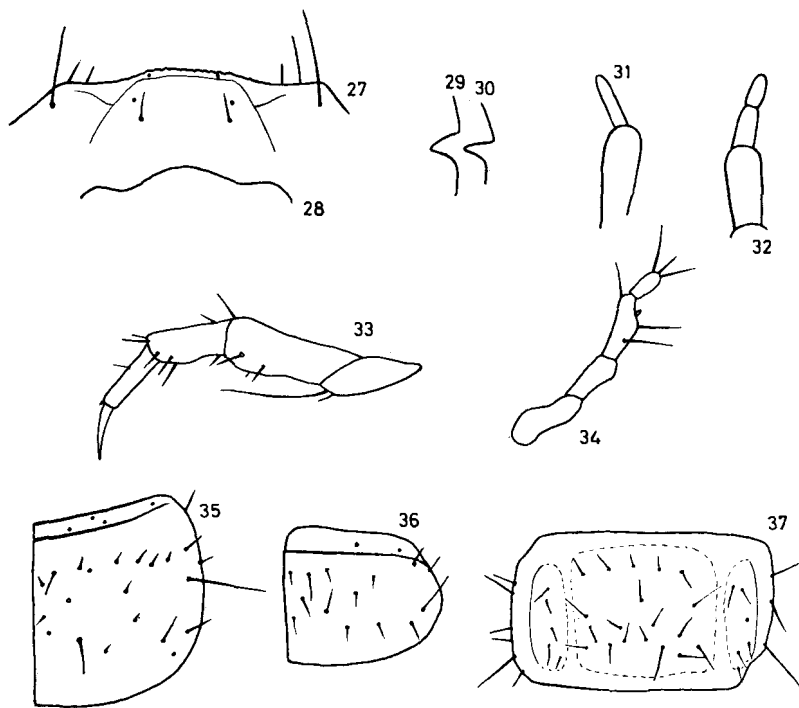
B. litorale

Material: 4 larvae in third stage, one reared was first observed in this stage 29.6.65, the three others taken in STi: Melhus 2.7.63, 16.7.64 and 11.8.64. One larva in second stage reared, first observed in this stage 18.6.65. One more larva was observed in STi: Melhus 24.7.64, but was lost. The adults collected in STi: Melhus.

Third stage (Head and prothorax Plate I, 2).

Length of head: 0.60–0.65 mm, width: 0.80–0.95 mm.

Head and legs light yellow or light orange. Mandibles and middle and hind parts of head brownish. Ocellar area black. Meso- and metanotum and abdominal tergites about monochrome, light brownish, somewhat darker than lightest parts of head. Scutum of pronotum very dark brown, contrast in colour between it and rest of body distinct. Ventral side of head and prosternum light orange, rest of ventral side yellowish white.



Figs. 27—37. *Bembidion litorale* Ol., figs. 28, 30. Second stage larva, the other figs. third stage. — 27, 28. Nasale. — 29, 30. Retinaculum. — 31. Labial palp. — 32. Maxillary palp. — 33. Leg. — 34. Antenna. — 35. Mesonotum (right half). — 36. First abdominal tergite (right half). — 37. Eighth abdominal segment, ventral.

Head rather broad: $ee:OO = 0.68-0.72$. Epicranial suture about as long as basal joint of outer lobe. Ocelli and ocellar area about as in the previous species. Frontal piece with four setae in area within ocelli. Nasale (Fig. 27) broad, but front margin very little marked; front margin of frontal piece forms a slightly curved line. Nasale weakly or scarcely denticulated. First and third joints of antennae 1.1 to 1.3 times longer than second, fourth about half as long as third or a little more (Fig. 34). Second joint: $i = 1.7-2.0$. Retinaculum (Fig. 29) truncate, very small in proportion to mandibles: $r:ar = 0.12-0.17$. Joints of maxillary palpi (Fig. 32) not as broad as in the previous species; second joint: $i = 1.5-2.0$. Basal joint of outer lobe longer than terminal joint. Terminal joint of labial palpi not as thick as in *B. argenteolum* (Fig. 31). Head about 1.1 times longer than scutum of pronotum.

Scutum of pronotum only 1.04–1.08 times broader than head. $i = 0.55$ – 0.60 . About 17–18 setae on each half.

Mesonotum (Fig. 35) and metanotum about as broad as, and only a little shorter than, scutum of prothorax. About twice as broad as long. Number of setae on each side of median line: 16–23 on mesonotum, 16–24 on metanotum.

Joints of legs (Fig. 33) relatively thick, tibia: $i = 2.0$ – 2.4 . Tibia and tarsus of about equal length, femur about 1.5 times longer than tibia. Dorsal seta of tarsus about a third of the way from the basis. First abdominal tergite (Fig. 36): $i = 0.45$ – 0.47 . 13–16 setae on each half of median line on most of the tergites.

Latero-ventral side of eighth abdominal segment (Fig. 37) with 24–30 setae.

Micropores and sculpture as in the previous species.

Second stage

The single specimen was not in a good condition, but the colour nevertheless fairly well retained. Head and tergites brownish yellow, pronotum brown, distinctly darker than rest of body, but not as strongly pigmented as in third stage. I have seen about the same colour in living larvae.

Length of head: 0.47 mm, width: 0.65 mm, $ee:OO = 0.72$. Nasale (Fig. 28) broad and more conspicuous than in the third stage larvae studied. Antennae short-jointed, second joint 1.2 times longer than broad and only 1.2 times longer than fourth. Third joint 1.3 times longer than second and a little longer than first. Retinaculum small, but more slender than in third stage (Fig. 30). $r:ar = 0.17$. Meso- and metanotum with prescutum, the first with 20 and 21 setae on each side, the latter with 16 and 19. Legs still shorter than in third stage.

It was difficult to be certain of the presence of prescutum on the abdominal tergites. 13 setae on each side of median line on third and fifth abdominal tergites.

B. dentellum

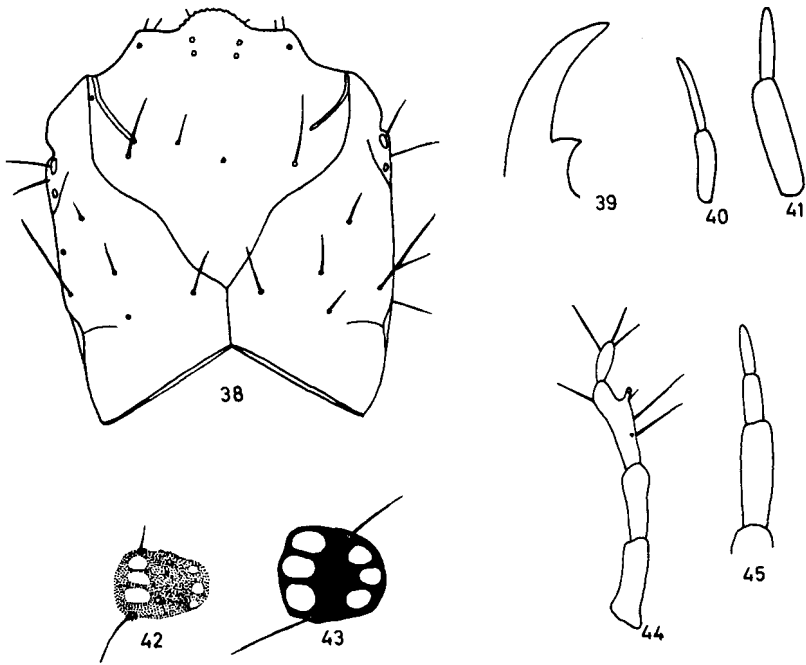
Material: Only the exuviae of head and prothorax of one third stage specimen taken in STi: Trondheim 8.8.64.

Third stage

Large larva, length of head: 0.95 mm; width: 0.95 mm.

Head and pronotum light orange, monochrome. Ocellar area only slightly darker than rest of head. Remainder of body completely unpigmented (observed on living larva).

Head (Fig. 38) very narrow, as long as broad. Epicranial suture almost twice as long as basal joint of outer lobe of maxilla.



Figs. 38—42, 44, 45. *Bembidion dentellum* Thunb., 43. *B. petrosus* Gebl.
 — 38. Head (appendages not drawn). — 39. Mandible (basis not drawn).
 — 40. Outer lobe. — 41. Labial palp. — 42, 43. Side view of ocellar area.
 — 44. Antenna. — 45. Maxillary palp.

Ocelli (Fig. 42) smaller than usual (cf. Fig. 43), posterior row reduced and not so easy to see because of their diminutiveness and the particularly light colour of ocellar area here. Posterior part of ocellar area not elevated from head capsule, and seen from above sides of head forms a straight line from anterior row of ocelli to neck. At least three, perhaps four, setae on ocellar area. Frontal piece apparently with four setae within ocelli, but assymmetrically placed (probably an accidental circumstance). Nasale reasonably denticulated, protruding, front margin noticeably projecting from truncate corners of frontal piece. Front margin of nasale convex, much shorter than epicranial suture, but rather broad in proportion to rest of front margin of frontal piece: $a:b = 0.27$. Antennae (Fig. 44) slender, second joint: $i = 2.5$. Third joint a little longer than first and second, which are of equal length, and twice as long as third. Mandible (Fig. 39) not very slender, retinaculum rather lumpy, relatively long in proportion to mandible: $r:ar = 0.2$. Maxillary palpi (Fig. 45)

very slender; first joint four times as long as broad, second joint 2.5 longer than broad. Outer lobe (Fig. 40) slender too, terminal joint somewhat longer than basal joint. Labial palpi: Fig. 41.

Discussion

The description of the species of *Chrysobracteon* reveals that the larvae in the second and third stages of *Bembidion* and *Asaphidion* Gozis cannot be separated according to the key of Emden (1942). Using the key the second and third stage larvae of *B. argenteolum* would be placed in the genus *Asaphidion*, whereas *B. litorale* and *B. lapponicum* have characters in common with both the genera. I have myself reared the third stage larva of *Asaphidion pallipes* Dft. but am not able to find any single character which, alone, distinguishes it from all the known members of *Bembidion*, and the same may be concluded from the description of Bøving (1911). (The *Asaphidion* larvae described by Bøving obviously are *A. pallipes*, not *A. flavipes* L. as believed by the collector, see Larsson (1939)). Yet the only distinguishing character for the two genera is the appearance of the eggburst in the first stage larvae, but that feature, of course, is not applicable to the second and third stage larvae.

Obviously the two genera are closely related and more to each other than to *Tachys*. Until other distinguishing characters have been discovered — if they exist — it would be more practical to separate the species of *Asaphidion* and *Bembidion* in one key rather than to try to separate the genera entirely. Many of the *Bembidion* species are still unknown. However, from the description of Larsson (1941), members of many of the subgenera are known, and I have myself reared larvae of the subgenera *Semicampa* Net. and *Plataphus* Motsch.

The known *Bembidion* and *Asaphidion* species differ from *Tachys* according to Emden (1942). *Asaphidion* and the subgenus *Chrysobracteon* differ from all the other *Bembidion* by the broader head ($ee:OO \leq 0.80$, in other *Bembidion* species: $ee:OO \geq 0.85$). If there is any doubt the second joint of the maxillary palpi is not twice as long as broad, whereas it is more than twice as long as broad in other *Bembidion* species.

The third and second stage larvae of *B. argenteolum* are easily separated from the other *Chrysobracteon* and *Asaphidion* species (and probably from all other *Bembidion* species too) by the large number of setae on the frontal piece, thorax and abdominal tergites, by the pale colour and the broad, marked nasale. The same stages of *B. lapponicum* and perhaps *B. velox* are characterised by the colour on the head and pronotum and by the very narrow nasale. *B. litorale* is separated from the last two

species by the broad, but little protruding, nasale, the very dark colour on the pronotum and by the few setae on the latero-ventral side of the abdominal segments. *Asaphidion pallipes* differs from the other species mentioned by having a monochrome, light orange head and pronotum; from *B. lapponicum* and *B. litorale* it differs too, by the broad protruding nasale (about as in *B. argenteolum*). The species has no more than 12 setae on each half of the abdominal tergites. *B. dentellum* probably differs from all other *Bembidion* and *Asaphidion* species by the small ocelli and the non-protruding posterior part of the ocellar area which is not much more pigmented than the rest of the head.

ACKNOWLEDGMENT. I am greatly indebted to Richard Binns B. Sc. for checking the English.

Summary

The author describes the larvae of three of the four Scandinavian species of the subgenus *Chrysobracteon* Net., genus *Bembidion* Latr. and *Bembidion dentellum* Thunb.

The description reveals that it is still impossible to find any single character in the third and second stage larvae which, alone, distinguish the genera *Bembidion* and *Asaphidion*. It would be practical to separate species of *Asaphidion* and *Bembidion* in one key.

The *Bembidion* species mentioned are easily separable from each other and from other Bembidini in characters such as head breadth, colour, number of setae, shape of nasale etc.

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- LINDROTH, C. H. 1962. Revision of the subgenus *Chrysobracteon* Net., genus *Bembidion* Latr. (Col. Carabidae). Opusc. ent. 27: 1—18.

Koleopterologiske notiser

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I den følgende liste er oppført arter som enten ikke er angitt fra vedkommende områder etter inndelingen i den nye billekatalogen (Lindroth 1960), eller arter hvor det foreligger funn av økologisk interesse. Flere av områdene er dårlig undersøkt, særlig MRi og Nni. Således tok jeg ved tre timers undersøkelse i Skjomen 31.8 og 1.9. 1966 ikke mindre enn 8 arter som ikke var registrert i Nni. Alle funn fra MRi er gjort av cand. real. R. Mehl, mens artene er bestemt eller kontrollert av meg. Arter nye for landet er merket *.

Notiophilus palustris Dft. TEy: Jomfruland, juli og august 1965.

**Pogonus luridipennis* Germ. Ø: Åven, Råde. Funnet flere år på rad, til dels tallrik. Lever på svakt oppsprukket leirbunn ved sjøen litt over normalt flo-nivå. Vegetasjonen, som er meget spredt og lav, består av salturt (*Salicornia europaea*). Billen holder seg i leirsprekkene, men kommer frem ved tramping. Sammen med *Bembidion minimum* F. i Skandinavia ellers bare funnet på en lokalitet i Bohuslen (Lindroth 1945).

Licinus depressus Payk. Ø: Taralden, Råde, mai 1964. Et eksemplar blant grus på tørr, åpen gressmark.

Amara curvifrons Zimm. TEy: Jomfruland, august 1965. Et eksemplar på tørr grusbunn sammen med *Licinus depressus* Payk.

Amara municipalis Dft. STi: Trondheim, august 1965. Meget alminnelig mellom gressrotter på tørr sandbunn sammen med *A. bifrons* Gyll. og *A. apricaria* Payk.

Amara nitida Sturm. Ø: Åven, Råde, mai 1964.

Amara ovata Fbr. HES: Rena, mai 1964. Flere eksemplar i veiskråning.

Abax ater Vill. TEy: Jomfruland, juli og august 1965. Tidligere tatt i TEy: Brevik og et eksemplar i AK: Oslo, på sistnevnte sted for snart 100 år siden. Ingen opplysninger om funnforhold foreligger hittil fra Norge. Arten er på Jomfruland den vanligste større carabiden og er her mere eurytop enn i Skåne, hvor den ifølge Lindroth (1945) bare lever i skog av bøk (*Fagus sylvatica*). Den ser ut til å kreve i det minste noen beskyttelse mot soleksponering, selv om enkelte eksemplar er tatt i skogsglenter. Et humusskikt har vanligvis vært til stede. Finnes både på fuktig og relativt tørr bunn, i siste tilfelle består undervegetasjonen gjerne av markjordbær (*Fragaria vesca*), bringebær (*Rubus idaeus*) og åkermåne (*Agrimonia eupatoria*). Både i skog av gran (*Picea abies*) og forskjellig slags lauvskog,

f.eks. hassel (*Corylus avellana*), eik (*Quercus* sp.) eller ask (*Fraxinus excelsior*). Oftest tatt under stein. På tørrere bunn tatt sammen med bl.a. *Licinus depressus* Payk. og *Cymindis angularis* Gyll., på fuktigere med *Nebria brevicollis* F., *Harpalus seladon* Schaub. og *Pterostichus oblongopunctatus* F. Også i kjeller. Parring er iaktatt 24.7. og 3.8 hvilket antyder høstforplantning og larveovervintring liksom i Skåne og Danmark (Lindroth 1945).

Calathus micropterus Dft. Nnø: Skjomen.

Pteroloma forssströmi Gyll. TRy: Skitenelv, juni 1966. Et eksemplar blant grus ved bekk.

Philonthus rectangulus Sharp. Nnø: Skjomen. Flere eksemplar i komposthaug.

Staphylinus fulvipes Scop. Ø: Åven, Råde, mai 1964. Et eksemplar i fuktig skog av bjørk (*Betula* sp.).

Staphylinus latebricola Gr. HES: Elverum, 6.6. 1963. På hogstflate med under-vegetasjon av smyle (*Deschampsia flexuosa*) og noe blåbær (*Vaccinium myrtillus*). Leg. E. Arnkværn.

Quedius laevigatus Gyll. Nnø: Skjomen. Under bark av furu (*Pinus silvestris*).

Bolitochara lunulata Payk. Nnø: Skjomen. Flere eksemplar tatt på *Boletus*. Tidligere funnet nordligst i NTi.

Ilyobates nigricollis Payk. HES: Elverum, 17.6.1963. Funnet på samme sted som *Staphylinus latebricola* Gr. Leg. E. Arnkværn.

Bryocharis cingulata Mnh. TRy: Tromsø, juni 1966. Et eksemplar i plantet granskog.

Cantharis pellucida F. MRi: Kvanne.

Dolichosoma lineare Rossi. Ø: Åven, Råde, mai 1964.

Dendrophagus crenatus Payk. MRi: Kvanne.

Pediacus fuscus Er. Nnø: Skjomen. Under furubark.

Triplax rufipes F.Ø: Åven, Råde, mai 1964. Et eksemplar blant lauv og mose i fuktig bjørkeskog.

**Telmatophilus schönherri* Gyll. AK: Oslo, Østensjøvatn, april 1962. Ved sikting av gamle stengler av takrør (*Phragmites communis*) som lå på isen.

Mycetophagus atomarius F. TEy: Jomfruland, august 1965. Flere eksemplar i tresopp på eik.

Cerylon histeroïdes F. Nnø: Skjomen. Under furubark.

Lycoperdina succincta L. Ø: Åven, Råde, mai 1964. Et eksemplar på sandstrand ved sjøen. Ellers tatt i VE: Tjøme (Fjellberg 1966).

Endomychus coccineus L. MRi: Kvanne.

Cis boleti Scop. Nnø: Skjomen. I *Polyporus* på bjørk.

Notoxus monoceros L. TEy: Jomfruland, juli og august 1965. Vanlig i tuer av strandrug (*Elymus arenarius*) på tørr sand ved sjøen.

Anthicus ater Panz. TEy: Jomfruland, juli og august 1965. Flere eksemplar under gammel tang på ikke helt tørr sand ved sjøen.

A. flavipes Panz. TEy: Jomfruland, juli og august 1965. Tallrik på både fuktig og tørr sand ved sjøen.

A. instabilis Schm. Ø: Åven, Råde, mai 1964. En del eksemplar på tørr sand ved sjøen.

Meloë violaceus Mrsh. MRi: Kvanne.

Lagria hirta L. TEy: Jomfruland 25.7. 1965. To eksemplar under stein på tørr gressmark.

Criocephalus rusticus L. MRi: Kvanne.

Toxotus cursor L. MRi: Kvanne.

Acanthocinus aedilis L. MRi: Kvanne.

Pissodes pini L. Nnø: Skjomen. Et eksemplar under furubark.

Liosoma deflexum Panz. AK: Oslo, Sørbyhaugen. Et eksemplar under stein. Tidligere bare funnet på kysten mellom TEy og HOy.

Cryptorrhynchidius lapathi L. MRi: Kvanne. Til dels sterke angrep på or (*Alnus* sp.)

Jeg vil få takke amanuensis N. J. Ytreberg for tillatelse til å publisere funn av en del biller tatt på Åven i Råde i Østfold ved Oslo Universitets økologiske hovedfagskurs i zoologi. Likeledes takker jeg cand. real. R. Mehl og cand. real. E. Arnkvern for at jeg har fått ta med deres funn, og endelig dr. A. Strand som med vanlig velvillighet har kontrollert eller bestemt noen av de arter jeg selv har samlet.

Summary

Coleopterological notes

The author gives a list of Coleoptera from Norway not previously recorded in the districts in question.

Two of the species mentioned are new to Norway: *Pogonus luridipennis* Germ. and *Telmatophilus schönherri* Gyll. A detailed description of the habitat of *Abax ater* Vill. in Norway is given. The species seems to be more eurytopic than in Sweden and Denmark, occurring in different kinds of woods and in relatively dry as well as wet habitats.

Litteratur

- FJELLBERG, A. 1966. Koleopterologisk bidrag til Vestfold's fauna II. Norsk ent. Tidsskr. 73: 144—154.
- LINDROTH, C. H. 1945. Die fennoskandischen Carabidae. Göteborgs K. Vetensk.-o. Vitterh. Samh. Handl. Ser. B.4. (Del 1): 1—709.
- 1960. Catalogus Coleopterorum Fennoscandiae et Daniae. Entomologiska sällsk., Lund. (625 p.)

Bokanmeldelser

P a l m, T h u r e. 1966. Svensk insektfauna, 9, Skalbaggar. *Coleoptera*. Kortvingar: Fam. *Staphylinidae*, underfam. *Habrocerinae*, *Trichophyinae*, *Tachyporinae*, Häfte 4 (rekv. nr. 50). Stockholm. Pris sv. kr. 18.00.

Dette hefte inneholder som de tidligere en utmerket behandling av samtlige nordiske arter med bl.a. en lang rekke originale detaljtegninger, som i vesentlig grad letter bestemmelsen, og med meget omfattende oppgaver over funnforhold basert på egne innsamlinger.

Andreas Strand.

H a n s e n, V i c t o r. 1965. Biller XXI, Snudebiller, larvene ved Sv. G. L a r s s o n. Danmarks Fauna, Bd. 69. G. E. C. Gads Forlag, København (524 p.).

I 1918 ga Victor Hansen ut sitt første bind i serien Danmarks fauna, nemlig snutebillebindet. Det var på 340 sider med 151 tegninger.

I løpet av de halvthundre år som er gått er det skjedd meget også med snutebillene, slik at den nyutgave som nå er kommet, er blitt på 524 sider med 236 tegninger. I virkeligheten er antallet av nye tegninger langt større enn forskjellen i antallet i de to utgaver viser, idet omriss tegninger i den gamle utgaven er erstattet med utførligere tegninger for en rekke arter.

De nordiske koleopterologer kan nå glede seg over å ha fått dette arbeidet, som er behandlet og ført ajour med sedvanlig beundringsverdig grundighet og kyndighet både når det gjelder systematikken og funnforholdene, og som for representanter for en lang rekke slekter har tegninger så naturtro som en kan ønske seg.

Sv. G. Larsson har behandlet larvene og gitt en generell oversikt over deres bygning og bestemmelsestabell for en del slekter.

Andreas Strand

H o r i o n, A. 1965. Faunistik der mitteleuropäischen Käfer, Band X: Staphylinidae, 2. Teil. Paederinae bis Staphylininae. Überlingen—Bodensee.

Igjen et bind av dette imponerende arbeidet.

Det har i de senere årene i et utall av publikasjoner vært arbeidd så meget med staphylinidene, at både de vanlige bestemmelsesarbeider, utbredelsesoppgaver og materialet i museer og privatsamlinger i høy grad trenger revisjon, og fremfor alt er en ajourført oversikt nå særdeles ønskelig. Ikke minst gjelder det flere av slektene i dette bindet som *Lathrobium*, *Xantholinus*, *Philonthus*, *Staphylinus* og *Quedius*.

En slik oversikt, så grundig og omfattende som en kan ønske seg, er det Horion har gitt.

Det vanskeligste bindet av staphylinidedelen er vel det som står igjen, særlig gjelder det slekten *Atheta*. Dessverre har Horion antydnet at han ikke mener seg kompetent til å behandle denne og flere nærstående slekter, som derfor ikke kommer med i det avsluttende bindet. Men han håper likevel med hjelp av spesialister å få behandlet også disse slekter innenfor rammen av sin «Faunistik», et håp som hans mange beundrere nok helhertet sluttet seg til.

Andreas Strand

Lyneborg, Leif. 1965. Tovinger IV. Humlefluer, stiletfluer, rovfluer m. fl. Danmarks Fauna, Bd. 70. G. E. C. Gads Forlag, København. (180 p.).

Denne boken er den fjerde i rekken om tovinger, og gir et nytt, verdifullt bidrag til den skandinaviske litteratur på dette området. På samme måte som i andre bøker i serien Danmarks Fauna finner man først en utførlig beskrivelse av de enkelte familier. Derpå kan man ved hjelp av tabeller og beskrivende tekst bestemme seg frem til underfamilie, slekt og art. De fleste av tabellene gjelder imagines, men i de tilfelle hvor det har vært mulig, er det også laget egne tabeller for larver og pupper. Teksten inneholder en rekke interessante opplysninger om de forskjellige gruppene og artenes biologi, og det er også viktig at det blir påpekt på hvilke områder man mangler observasjoner. Videre finner man detaljerte opplysninger om utbredelsen i Danmark, og en generell omtale av utbredelsen i Europa forøvrig. For Norges vedkommende foreligger så vidt meg bekjent ikke opplysninger om utbredelsen av de arter som her er beskrevet, men for en norsk leser er det meget verdifullt at utbredelsesområdet i Sverige er angitt.

Tovingene er en relativt lite undersøkt gruppe her i landet, men en bok som Lyneborgs burde inspirere norske entomologer til å fylle noen av hullene i vår kunnskap om Norges fauna. Tovingene er en mangfoldig og spennende orden, og bl.a. de familier som her er omtalt vil sikkert interessere mange av våre entomologer.

Boken inneholder 189 illustrasjoner, hvorav de fleste er originale. Illustrasjonene er klare og gode, og vil være til stor hjelp ved bestemmelsen av de forskjellige artene.

Lauritz Somme

Høegh-Guldberg, Ove, 1966. North European Groups of *Aricia allous* G.-Hb. Their Variability and Relationship to *A. agestis* Schiff. Natura Jutlandica vol. 13, Aarhus (184 p.).

Som den sjette i rekken av *Aricia*-studier fra danske lepidopterologer, foreligger nå Høegh-Guldbergs arbeid over enkelte nordeuropeiske former av *Aricia allous* G.-Hb. *A. allous* og *A. agestis* Schiff. er to meget nærstående Lycaenide-arter (Lepidoptera), som vanskelig kan skilles morfologisk, og det har lenge vært tvil både om berettigelsen av arts-skillet og om de mange underartenes systematiske posisjon. Formålet med Høegh-Guldbergs arbeid har i første rekke vært å avgjøre om det dreier seg om to forskjellige arter, dernest å klargjøre utbredelsen av disse i Nord-Europa. En stor arbeidsinnsats er nedlagt i dette, og det er imponerende at forfatteren -- som er amatør -- har kunnet gjennomføre en undersøkelse av slike dimensjoner på et såvidt høyt faglig nivå.

Størst interesse knytter seg vel til de genetiske forsøkene. Nå er imidlertid kunstig parring i laboratoriet nokså forskjellig fra naturlige forhold, noe forfatteren også understreker, og dette setter en grense for de konklusjoner man kan trekke. Arts- og underarts-definisjoner er basert på naturlig økologi, og kryssings-eksperimenter kan derfor bare indikere relativt slektskap mellom grupper, uten å kunne utsi noe absolutt om taxonomisk status. Jeg er derfor mer enig med forfatteren i hans første skepsis overfor kryssingseksperimentene (side 32) enn i den endelige konklusjonen (side 83--84), der han anfører forsøkene som støtte for den foreslåtte arts- og underarts-oppdeling.

Nå er det vanskelig for en utenforstående å vurdere resultatene av forsøk med så komplisert og usikker metodikk som her, og forfatterens forsiktighet med å drøfte gruppenes innbyrdes slektskap har nok sine grunner. For undertegnede kan det imidlertid se ut som om forsøkene er

informative iallfall for norske dyrs vedkommende. En *allous*-stamme opprinnelig fra Jomfruland (TEy) er krysset innbyrdes (NN) og med dyr av engelsk (NE), dansk (ND) og svensk (NS) opprinnelse, og egglegging har funnet sted omtrent samtidig for alle kombinasjoner. Kombinasjonene NN og NE gir imagines, mens ND og NS dør på eggstadiet. Dersom alle forhold ellers er konstante, indikerer dette at Jomfrulandstammen er nærmere beslektet med øst-engelske (*ssp. artaxerxes* fra Durham Coast) enn med danske og svenske (Skåne) dyr. En skal imidlertid ikke se bort fra at fertilitetsbarrierer kan oppstå mer tilfeldig, så spekulative vandringsteorier får vente — spesielt ettersom forfatteren ikke har våget å trekke ovenfor nevnte konklusjon.

Engelskmannen Jarvis har vist interfertilitet ned til F_2 ved kryssing av britiske *A. agestis* med henholdsvis danske *allous* og skotske *artaxerxes*. Det dreier seg altså åpenbart om et svært nærbeslektet kompleks av former, hvilket gjør *Avicia*-studiene usedvanlig verdifulle til generell belysning av evolusjonsprosessens tidlige faser.

Det avgjørende bevis for at *agestis* og *allous* er artsforskjellige kommer fra studiet av en naturlig populasjon: På Sandhammaren i Skåne flyr *agestis* (i to generasjoner) på samme lokalitet som *allous* (i en generasjon). Dette tilfredsstiller definisjonen av artsforskjell, og naturen er altså, som forfatteren sier, det beste laboratorium.

Det er av praktiske grunner alltid ønskelig å finne morfologiske trekk som kan karakterisere artene, og forfatteren har funnet at forholdet mellom tibia og tarsus på frambeinet kan brukes. Dette er gjennomgående høyere hos *allous* (over 0.91 hos ♂, over 0.71 hos ♀) enn hos *agestis* (under 0.91 hos ♂, under 0.71 hos ♀), men en del overlapping forekommer, slik at større serier er nødvendige for sikker bestemmelse. De genitalie-forskjeller som andre forfattere anfører, viser seg å være inkonstante.

Noe større kritikk kunne ha vært vist ved behandlingen av økologiske forskjeller. Biotopbeskrivelser er så lite eksakte at de blir ubrukelige i et såvidt vanskelig tilfelle som her. Næringsplantepreferanse, utviklings-tid og fotoperiode-avhengighet gir heller ingen klarhet, så å konkludere med at alle disse forhold indikerer artsforskjell, er vel litt dristig.

I en tabell bak i boka oppsummeres de undersøkte arter og underarters karakteristika. Det er imidlertid ikke oppgitt om beskrivelsen av vingeverside gjelder ♂ eller ♀, og en betegnelse som «colour of underside as good coffee», hentet fra en engelsk beskrivelse, er lite verd når en tar i betraktning forskjellene i kaffeskikker fra land til land.

Som et resultat av undersøkelsen har Hoegh-Guldberg navngitt en del nye underarter: for Norges vedkommende den nordlige *ssp. lyngensis*, og den sørlige *ssp. opheimi*. Den store overraskelsen er imidlertid artsnavnet: p.g.a. nomenklaturreglene blir dette *Avicia artaxerxes* F. La oss håpe at det stakkars dyret, som gjennom tidene har båret navnene *medon*, *astrarche*, *agestis* og *allous*, med dette har funnet taxonomisk hvile.

Per Seglen

