Insects Reared from Spruce Cones in Northern Norway 1951.

A general view with special stress on the parasitic Hymenoptera of the subfamilies *Chalcidoidae* and *Serphoidae*.

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Introduction.

Insects in spruce cones have hitherto not been subject to special investigation in Norway and our knowledge of them is therefore rather meagre. The first condition before studying their life history and importance to seeds and cones, is to know what species of insects live in the cones.

The present paper, which is divided in two main parts, gives a review of the insects reared from spruce cones collected in Northern Norway. The first part concerns the insects attacking seeds and cones and the chief intention has been to establish the distribution of these insects in the area concerned. The second part deals with parasitic Hymenoptera. Microhymenoptera in spruce cones are very little known, especially in Norway, and special stress is therefore laid on these families. The four species of the families *Ichneumonidae* and *Braconidae* are mentioned in order to show their distribution in the area.

In the review of distribution for each species, the letters and numbers in brackets appertain to the paper of Mr. A. Strand (1943).

The plesiotypes of Chalcidids and Proctotrupids are kept in the Department of Entomology, Zoological Museum, Oslo.

In the synonymic lists I have quoted the papers of systematic importance, as well as those bringing news about the biology. Norwegian papers where finds are published, are mentioned under the distribution.

I would like to take this opportunity to thank Dr. H. F. Barnes, Rothamsted Experimental Station, Harpenden, England, amanuensis W. Hellén, Zoological Museum, Helsingfors

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Finally my thanks are due to the County Forest Officers in Nordland, North-and South Trøndelag for valuable assistance in drawing up the map of the spruce forest in their counties.

Material and Methods.

During the autumn 1951, from September 24 to October 4 spruce cones were collected in Nordland and Trøndelag counties in Northern Norway. At this time the spruce seed ripened in the most parts of the districts. In the mountain forest, however, it was only partly ripened. This could be controlled because parts of the material were used as germinating tests. I got no cones from the sea districts in Nordland this autumn. During the winter, however, cones from these districts, were sent to The State Seed Extraction Plant, Hamar, and the material was thus supplied. It was very difficult to get cones from Lierne in North-Trøndelag and also from the sea districts in South-Trøndelag. I have therefore no cones from these places.

The cones were collected mostly from the upper part of the trees and only a minor part from lower branches. In order to reach the cones some trees were felled. The number of cones varies a little in each sample. The cones also vary in size on different trees and in different districts. Therefore the cones are measured in litres, because it gives a better picture of the volume of the cones than the number of cones. The measurements were taken while the cones were dank and had their scales pressed down.

The map, fig. 1, shows the localities where cones have been collected.

The material investigated, embraces 61 samples, each consisting of 2—6 litres of cones. The bulk of samples contain 2—3 litres. A sample with 2 litres of cones of average size, contains about 55 cones.

The cones collected, were sent to The State Seed Extraction Plant, Hamar, and put into a special store room where two of the walls are built of grating. The temperature in this room is about the same as outside, but the cones are lying drier than in the forest. In this room, however, they were dankish the whole winter, their scales remaining pressed down.

On March 15 and 16, the cones were laid in rearing cases placed in the store room. American investigators have constructed special cases in order to study the parasites on the damaging insects. These cases have earlier been used by investigators for studying insects in spruce cones (Trägårdh 1917, Holste 1922). I started my preparatory investigations with the type which Trägårdh had used in his work. These cases are constructed according to the fact that the insects are

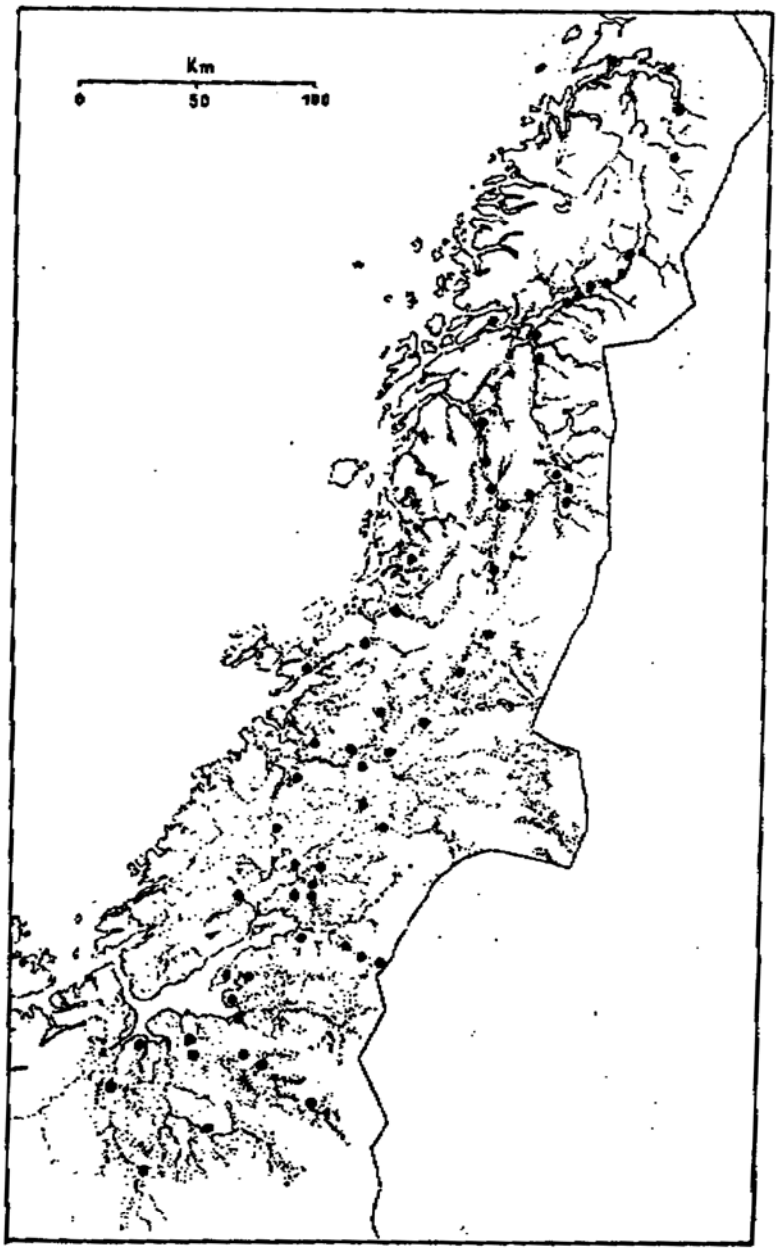


Fig. 1. Map showing the natural distribution of spruce forest in Nordland and Trøndelag counties, and localities from which cones have been investigated.

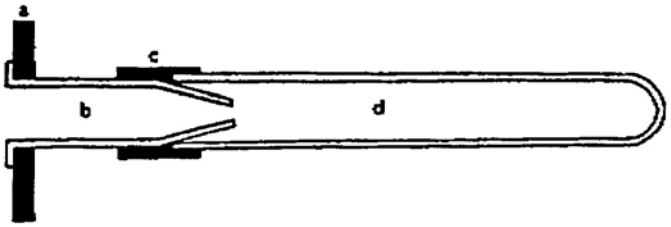


Fig. 2. Glass funnel mechanism which prevents the insects from returning to the case.

negative geotropic and positive fototropic. When cones are placed in the cases, the insects, reared, creep out into the test tubes.

I succeeded in getting insects in the tubes. Having controlled the number of them several times, I discovered, however, that many insects disappeared into the case and did not return to the tubes again. Obviously they were exhausted after having fled into the tubes, and had no strength to return to the test-tubes. In one test-tube I observed 10 living gall midges, *Kaltenbachiella strobi* (Winn.). Some days later, there were only 3 dead specimens in the tube. The others were lying dead at the bottom of the case.

In order to prevent the insects returning to the case, I made some glass funnels which were put between the wall of the case and the test-tubes. The test-tubes were fastened to the glass funnels with small rubber tubings. When the insects come into the test-tubes, they are caught as in a bow net. Their chances of returning to the case are very small.

This type of breeding case ought to be theoretically useful. In practice, however, it has some drawbacks. During the spring, thousands of reared insects crept into the test-tubes. But when the contents of the cases were investigated later in the summer, lots of dead insects were found at the bottom of the cases or between the cone-scales. The dead specimens were of the same species as those in the test-tubes. It was practically impossible to count the dead insects, because they were mixed between cones and scales of cones. An exact investigation of each cone would claim too much work.

The reasons why the insects do not find their way out into the tubes may be variable:

1. The opening of the glass-tube has been too narrow. Too little light comes through the opening, and in consequence the insect does not find its way out. Larger funnels may perhaps give better results.
2. Too many cones have been placed in the cases thus preventing the insect finding its way out into the tubes. At the same time the cones may have hidden the light.
3. The smell from the dead insects may have disturbed and hindered others from searching to the opening. If it had been possible to empty the tubes now and then, we might have eliminated this drawback. Perhaps it would have been better to use tubes with both ends opened. Then we had to cover the one end with gauze. Fresh air comes into the tubes and in this way the insects dry sooner and putrefaction is avoided.

Owing to the fact that some of the insects do not find their way to the test-tubes and that others stay in the cones the first summer it is

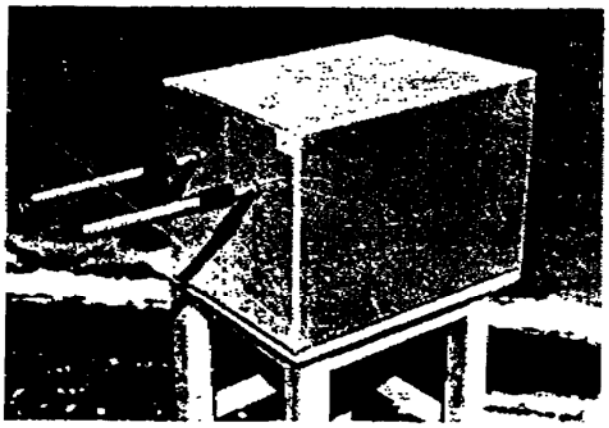


Fig. 3. Rearing case.

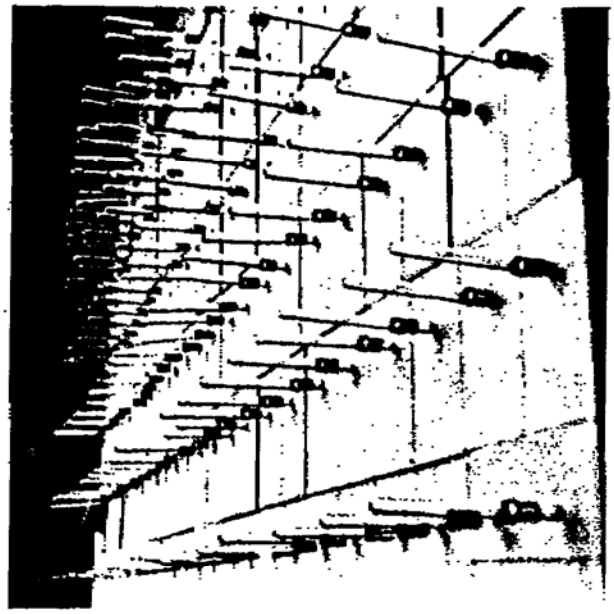


Fig. 4. Rearing cases placed in the store room.

impossible to conclude exactly from my experiments the extent of the insects' damage to the cones when regarding only the insects in the tubes the first summer.

There was no useful map giving a correct picture of the natural distribution of spruce forest in the districts I intended to investigate, and I therefore had construct a map myself. In this task I got valuable help from the County Forest Officers in Nordland, North and South-Trøndelag, who draw up small maps which formed the foundation for my further work. The map, fig. 1 gives a general view of the localities where I found the different insects.

Earlier publications about insect damage to the cones of spruce in Norway.

The first information regarding insect damage to cones of spruce in Norway is given by the Government Entomologist W. M. Schøyen in the bulletins of the Department of Agriculture. In these publications W. M. Schøyen (1898) reported spruce cones from Eidskog (HEs 1) attacked by *Laspeyresia strobilella* (L.). Later on similar reports were sent from As (AK 6) and different places in Østfold (W. M. Schøyen 1906), from Lillehammer (Os 17) (W. M. Schøyen 1912); Lillehammer (Os 17) 1914 (T. H. Schøyen 1916); Mo i Rana (Nsi 33) 1922, Flå (Bv 21), 1924, Namdal (NTi 40), 1925, Verdalen (NTi 25) 1925 (T. H. Schøyen 1927); Alvdal (HEn 26) 1927, Kongsberg (Bø 15), 1930, Gransherad (TEi 18), 1930, Fet (AK 23), 1930, Vestre Slidre (On 37), 1930, (T. H. Schøyen 1931); Stod (NTi 30), (Mørkved 1935); Tynset (HEn 28), Vuku (NTi 25), South-Trøndelag, (T. H. Schøyen 1936); Telemark, 1941, 1945, Setesdal 1941, 1945, (T. H. Schøyen 1943, T. H. Schøyen 1949).

Larvae of the Lepidoptera *Eupithecia pini* (Retz.) and *Dioryctria abietella* Schiff. were reported from As (AK 6) by W. M. Schøyen (1906). In 1914 W. M. Schøyen published a review of insects in spruce cones, reporting on the three Lepidoptera mentioned and also *Anobium abietes* Fb. This paper contains the first information treating gall midges in spruce cones, viz., *Kaltenbachiella strobi* (Winn.). In accordance with other entomologists at that time W. M. Schøyen reports that the larvae of *Kalt. strobi* (Winn.) destroy the seeds of spruce and spend their time as larvae in the seeds. His information appertains to J. Sahlberg (1890). According to more recent investigation, however, the larvae and pupae found in spruce seeds belong to the species *Plemeliella abietina* Seitn.

In 1925, Eide (1927) made an investigation on seeds of spruce from Northern Norway. He found *Kaltenbachiella*

strobi (Winn.) and many of their parasitic Hymenoptera. The entomological observations he based on the papers of Trägårdh (1917) and W. M. Schøyen (1914). He investigated the extracted seeds from a great number of cones in relation to their ability to lift the scales. Spruce cones which contain many cocoons of *Kalt. strobi* (Winn.), up to 200, had no ability to lift the scales. Cones with a more normal ability to lift the scales, contain 3—20 cocoons. He found an inverted proportionality between the number of cocoons and the ability of the cones to lift the scales. From this point of view we have to estimate the the gall midge as a damaging insect. Apparently, it was a heavy attack of *Kalt. strobi* (Winn.) on the spruce cones in Northern Norway in 1925.

In the same paper, Eide has estimated the damage of *Laspeyresia strobilella* (L.) to the cones. The selection of cones was based on the appearance. He writes that it is easy to point out cones attacked by *Laspeyresia strobilella* (L.) because of their crooked look and cover of resin. Lovászy (1941) has disproved that crooked cones, covered with resin, always are attacked by *Lasp. strobilella* (L.). The investigation of Eide, therefore does not give the exact picture of the attack of *Lasp. strobilella* (L.).

Spruce cones attacked by *Kaltenbachiella strobi* (Winn.) are reported from Nordland, 1924, 1925, Trøndelag 1924, 1925 (T. H. Schøyen 1927); Verdal (NTi 25) 1928, Snåsa (NTi 42) 1928, Saltdalen (Nsi 35) 1928 (T. H. Schøyen 1931); Hamar (HEs 15) 1933, (T. H. Schøyen 1936); Sauherad (TE 21) (T. H. Schøyen 1943); Trysil (HEn 20) 1945, Hamar (HEs 15) 1945 (T. H. Schøyen 1949).

No further extensive investigation has been carried out on insects in spruce cones in Norway. The parasitic Hymenoptera which live in the damaging insects are only mentioned in different papers, but they have not been the object of closer investigation.

Lepidoptera.

Geometridae.

Eupithecia pini (Retz.).

Up to this time, *E. pini* (Retz.) and *E. bilunulata* (Zett.) have changed their names many times. The imagines are very closely allied in colour and structure, and many investigators have taken them for the same species. The caterpillars, however, have good taxonomic characters. The Swedish entomologist De Geer (1771) is the first who writes about the species. He gave a short account of the biology

of the insect and described the larva, pupa and imago. De Geer, however, did not give it a scientific name. This was done by Götze (1781) who named it *abietaria*. Up to the year 1924 no further details of the biology were published, but many scientists described the species and changed its name. Retzius (1783) named it *pini*, Borkhausen (1794) *strobilata* and Hübner (1796) *togata*. Dietze (1901) has studied the morphology and tried exactly to separate it from the adjacent species, *E. bilinulata* (Zett.). Even if Götze has priority to the name *abietaria*, the lepidopterologists have chosen *pini*, the name of Retzius, because Aurivillius (1888—1901) has previously used *abietaria* about *E. bilunulata* (Zett.).

In 1924, Spessivtseff wrote about the morphology, ecology and distribution of the species and the damage of the larvae to the spruce cones in Sweden. My investigations bring no news about the biology.

Distribution.

In a list of Norwegian Lepidoptera (Haanshus 1932), *E. pini* (Retz.) and *E. bilunulata* (Zett.) is not separated. They are both called *E. pini* (Retz.). It is therefore of interest to clear up the distribution in Norway. I only found one specimen in Sparbu (NTi 27). Curator Nils Knaben has investigated the Norwegian material of the genus *Eupithecia* and kindly given me a list of the following localities. In the district investigated: Snåsa (NTi 42) 1884 (W. M. Schøyen); Flatmo, Velfjord (Nsy 5) 1947 (M. Opheim); Tosdalen, Bindalen (Nsy 1) 1947 (M. Opheim); Kvemoen, Nordli (NTi 44) 1950 (M. Opheim). Other localities in Norway: I have reared the species from Furnesåsen (HEs 18) 1951, and Knaben mentions: Rauø, Onsøy (Ø 3) 1922 (Barca); Spro, Nesodden (AK 10) 1926 (Haanshus); Asker (AK 11) 1907, (Haanshus); Sandvika, Bærum (Ak 12) 1934, (Barca); Stabekk, Bærum (Ak 12) 1846 (Esmark); Slemdal, Oslo (Ak 14) ? (Schneider); Nordstrand, Oslo (AK 14) 1923 (Barka); Nordmarka, Oslo (AK 14) 1885, (W. M. Schøyen); Tøyen, Oslo AK 14) 1857, (Siebke); Sør-Odal (HEs 5) 1885 (W. M. Schøyen); Vang (On 29) 1905 (T. H. Schøyen); Harpefoss, Sør-Fron (Os 26) 1952 (Opheim); Vollen, Vestre Slidre (On 27) 1944 (Knaben); Vikersund, Modum (Bø 11) 1876 (Schneider); Nes Verk, Holt (AAy 5) 1873 (Schneider); Laget, Holt (AAy 5) 1923, 1924, 1930 (Knaben).

E. pini (Retz.) is distributed in the spruce forest in North- and Central-Europe (Seitz 1915).

Eupithecia bilunulata (Zett.).

Hübner (1796) was the first one who described this species. He named it *strobilata*. Earlier this name was used for *E. pini* (Retz.). Zetterstedt (1840), however, described the species under the name *bilunulata*, and this is later on acknowledged as the valid name of the species by most authors. Some investigators, however, for instance Spessivtseff (1924) and Escherich (1931) have used Hübner's name *strobilata*. Spessivtseff (1924) has published studies of the biologgy, therefore I only give a view of the distribution in Norway.

Distribution.

Reared from spruce cones in the district investigated: Rognan, Saltdalen (Nsi 35), Laksfors (Nsi 24), Namskogan (NTi 47), Harran (NTi 45), Røysing in Ogndal (NTi 35), Jämtlandsvegen, Verdal (NTi 25), Selbu (STi 38), Stjørdalen (NTi 15) and Orkland (STi 56). Knaben has noticed finds from: Udland, Sørli (NTi 43) 1950 (Opheim); Meløy (Nsy 19) 1948 (Soot-Ryen); Saltdalen (Nsi 35) 1881 (W. M. Schøyen); Storfjord in Troms (TRi 31) 1898 (Schneider) and Alta (Fi 9) 1924 (Barca). Other localities in Norway: Sarpsborg (Ø 9) 1920, 1922 (Barca); Jeløy (Ø 23) 1908 (Barca); Spro, Nesodden (AK 10) 1924, 1926 (Haanshus); Lysaker, Bærum (AK 12) 1918 (Soot-Ryen); Ekeberg, Oslo (AK 14) 1880 (W. M. Schøyen); Nordstrandshøgda, Oslo (AK 14) 1923 (Barca); Modum (Bø 11) ? (Schneider); Risør neighbourhood (AAy 3) ? (Torstensen); Laget, Holt (AAy 5) 1922 (Knaben); Hovdefjell, Åmli (AAy 18) 1931 (Knaben); Djønno, Kinsarvik (HOi 50) 1941 (Knaben); Voss (HOi 53) 1916 (Grønlien).

E. bilunulata (Zett.) is distributed in the spruce forests in North and Central Europe (Seitz 1915).

Tortricidae.

Laspeyresia strobilella (L.)

Lasp. strobilella (L.) was one of the most common species in the districts investigated and also the greatest damaging insect to the seeds of spruce. Owing to the insects concealed mode of living, the cones appear sound, but when they are split open, the larvae are visible together with the damaged seeds.

Distribution.

Lasp. strobilella (L.) was reared from cones collected in Storjord, Saltdalen (Nsi 35), and throughout the district, nearly in all the samples, to Rennebu (STi 25). In Selbu (STi 38), I found two trees which had particularly many cones. All the cones I split open from these trees were attacked and in many of them I found 8 to 9 larvae, while the common number was 4 to 5. From the literature (Haanshus 1933), it is evident that the species is distributed nearly all over the country. It is not noted from some districts, probably because of insufficent investigations. Haanshus has no finds from Aust-Agder, but I have found the larvae in cones from Arendal (AAy 10) in 1950. In Sweden (Trägårdh 1917) and Finland (Lovászy 1941) it is distributed in the spruce forest all over the country, and in Denmark (Larsen 1931) is has been taken in many places in spruce forests. In Russia it has been published from the Leningrad-district (Berezina and Kurentzov 1935). Escherich (1931) writes that it is distributed in the spruce forests all over North and Central Europe

Diptera.

Cecidomyidae.

Kaltenbachiella strobi (Winnertz).

This gall midge which reared from all the samples in many specimens causes the greater part of the damage to the cones. In a few samples less than a hundred specimens were reared, but usually several hundreds were reared. In a sample consisting of 3½ liter (200) cones from Storjord, Saltdalen (Nsi 35), nearly 4000 individuals were reared. Still the cones contained many pupae, which were reared the following spring. There could be up to five pupae in one scale. In addition to this nearly 6000 parasitic wasps were reared from the same sample, all of them probably parasites on the gall midge. This gives a picture of the pest on cones of spruce in Saltdalen in 1951.

Distribution.

Kalt. strobi (Winn.) has been found in all the samples in the district investigated. In 1951 it was reared from cones from Arendal (AAy 10), Austre Moland (AAy 11), Seljord (TEi 24), Bø (TEi 22), Furnes (HEs 18), Kolsås, Bærum

(AK 12) and Lørenskog (AK 15). In the spring 1953, the gall midge was reared from cones collected by the State Forest Officer, Ch. D. Kohmann near Bardufoss aerodrome (TRi 25). W. M. Schøyen (1914) writes that the species is distributed in spruce forests all over the country. *Kalt. strobi* (Winn.) is known from spruce forests in Sweden (Trägårdh 1917) and Finland (Sahlberg 1890, Kangas 1940). In Russia it has been published from the Leningrad-district (Berezina and Kurentzov 1935). Kieffer (1920) mentions it from France (Bitche), Hungary and Prussia, while Holste (1922) has reared it in Upper Bavaria. According to Barnes (1951) it has been taken in Great Britain.

Rübsaamenia strobi (Kiffer) = *Camptomyia strobi* Kieffer.

Kieffer (1920) described this gall midge. He got it from Holste, who found it in a lot of spruce cones from Upper Bavaria. Holste (1922) writes about the insect and repeats the whole description Kieffer gave. At the same time he gives some scanty news about the biology. Escherich (1942) based his information of this insect on the work of Holste. In 1951, Barnes mentions the species in his handbook, but he only refers to Holste.

Systematical and Synonymical remarks.

When Kieffer described the gall midge he neither knew the larva nor the pupa, and consequently it was impossible for him to use their systematic characteristics when he placed the species in the system. Trying to identify the insect. I found that it did not agree with Kieffer's description of *Camptomyia strobi*. The main difference was the veins. I therefore sent some individuals to the specialist on gall midges Dr. Barnes, indicating the differences I had found. In reply he i. a. writes: "I have examined them carefully with the original description both of the genera *Camptomyia Rübsaamenia* and others, and of the species *C. strobi* Kieffer before me. The midges you sent agree in so many characters with Kieffer's original description of *C. strobi* that I feel obliged to consider that your specimens are the same species. But I am not satisfied that Kieffer was correct in placing it in the genus *Camptomyia*. It fits much better in the genus *Rübsaamenia* which Kieffer erected in the same paper as *Camptomyia* (1894). The venation is more like that of the figure of *Rübsaamenia;* I cannot see a breast-bone on the larvae, *Rübsaamenia* larvae are supposed to have one whil

Fig. 5. Scales with covering spin of *Rübsaamenia strobi* (Kieffer).

Camptomyia do possess one; and in addition the pupal characters seem to be more like those of *Rübsaamenia* than of *Camptomyia*. — — — I have labelled them *Rübsaamenia (Camptomyia) strobi Kieffer* — — —. It was a great pity that Kieffer did not keep his types properly. I understood from the late F. W. Edwards that they were kept in alcohol which evaporated and his types were lost."

Biology.

The biology of *Rübsaamenia strobi* (Kieffer) is very little known. The date of rearing says that the emergence period extended from the middle of June. The spring and early part of summer was very old in 1952, and perhaps the date is displaced on account of this. In 1951, when I stayed at Snåsa in North Trøndelag, larvae and pupae were still in the cones on July 7. They were reared when the cones were brought into a warm room. In 1951 it was a very cold summer in Trøndelag, with the minimum temperature at 4°C. the first days of July. Holste (1922) mentions that the emergence period in Upper Bavaria extended from May 10. until June 17. with the peak between May 25. and June 4. As compared to *Kaltenbachiella strobi* (Winn.), the emergence period of *Rübsaamenia strobi* (Kieffer) is distinctly later. The rearing of *Kalt. strobi* (Winn.) was finished when the first individuals of *Rübsaamenia strobi* (Kieffer) appeared in the test tubes. According to my observations it is evident that the insect winters in the cones as larvae. Whether the larvae take nourishment during the spring, has been impos-

sible for me to record. Larvae are found both in the cones on the trees and in those which had fallen to the ground during the winter. The larva which lives between the scales makes no gall and does not attack the seeds. The larvae I have seen, lay in hollows and mines made by caterpillars the last year, or between the scales. Most of them were found at the base of the cone. During the spring, the larva spin a covering and pupate under this. The cover is often transparent, and the red larvae are partly visible through it.

Distribution.

The gall midge was found in 43 samples. In most samples only few specimens were reared, but one sample from Snåsa (NTi 42), 320 individuals were reared from 5 liter of cones.

In 1951 the species was reared from cones collected in Bø (TEi 22) and in 1953 from Fåberg (Os 16). Earlier it has only been known from Upper Bavaria (Holste 1922).

Hymenoptera.

Chalcidoidae.

Torymidae.

Torymus azureus Boheman.

Torymus azureus Boheman, 1934, Kgl. Vet. Acad. Handl. f. år 1833. p. 369.
Thomson, 1874, Skand. Hym. Bd. 4, p. 84.
Mayr, 1874, Verh. zool. bot. Ges. in Wien, Bd. 24, p. 100.
Trägårdh, 1917, Medd. f. Stat. Skog. f. anst., h. 13—14, p. 1183.
Holste, 1922, Zeits. f. Angew. Ent. Bd. 8, p. 152.
Torymus chalybaeus Ratzeburg, 1844, Ichneum. d. Forstins. Bd. I. p. 179.
Callimome azureum (Boh.), Hoffmeyer, 1931, Ent. Medd. Bd. 17, p. 219
Kangas and Lovászy, 1940, Suom. hyön. aik., Bd. 6, p. 140.

Historical Note.

Boheman (1834) first described the species. Ratzeburg (1844) got a species of *Torymus* from the cones of spruce in Germany, and named it *T. chalybaeus* Ratz. In the monograph of the European *Torymidae,* Mayer (1874) held *T. chalybaeus* Ratz. as synonymous with *T. azureus* Boh. Trägårdh (1917) later studied the type of *T. chalybaeus* Ratz. and was convinced that it was the same species as *T. azureus* Boh. Trägårdh investigated the biology and distribution of the species in Sweden, and described the larva, pupa and imago. He had, however, no clear understanding

of the two species of *Torymus* in spruce cones, *T. azureus* Boh. and *T. caudatus* Boh. Holste (1922, p. 154) refers to a letter from Dr. Ruschka, who has determined the material from Trädgårdh. He writes that the three individuals which Trädgårdh sent him, were *T. azureus* Boh. But later he studied Trägårdh's work and found that parts of the two species are described together, as one species. The ratio between the length of the ovipositor and the whole body can only agree with *T. caudatus* Boh. He writes the same about the description and figure of antennae. The photograph of the whole insect, however, (Trägårdh 1917, fig. 30) is of *T. azureus* Boh. and the rest of the description concerns this species. In a publication dealing with the North-American species of the genus *Torymus*, Huber (1927) points to Spinola (1811). He was the first scientist describing species of the genus. Huber therefore used *Callimome* Spin. as the name of the genus. *Torymus* is the name of Dalman from 1820, and the paper of Spinola gave priority to this name. The International Commission of Zoological Nomenclature agreeded, and the genusname *Callimome* was published in The Bulletin of Zoological Nomenclature 1943 1., p. 28. The name *Torymus* Dalm., however, was so well established in entomological literature that the International Commission in 1948 cancelled its previous decision and put the name of *Torymus* in the list of nomina conservanda (Richter 1948).

In Finland, Kangas and Lovászy (1940) published an investigation on the biology of *T. azureus* Boh. They described the larvae and disproved Trädgårdh's conclusion about the biology of this insect.

Description.

Female.

Head, thorax, and abdomen with blue, metallic sheen in certain lights. Some individuals are dark green in colour. Head a little broader than thorax (13:12). Ocelli form the corners in a triangle, where the height is ⅓ of the base. The distance between the lateral ocelli and the border of the eyes is ⅔ the distance between the lateral ocelli. Dorsal to the antennal sockets, the frons is excavated on each side, to accommodate the scapes of the antennae when in repose. Eyes red, with very minute hyaline hairs. Clypeus cut, with larger white hairs. Antennae inserted under the middle line between the eyes. The distance between the inserting points is as long as the distance between this and the border of the

eyes. Mandibles well developed, with 3 teeth. The terminal segment of the maxillary palpi is nearly as long as the three other segments together. Scape straight, brown, light brown on the under side and the proximal parts, hardly reaching the median ocellus, longer than the three next joints together (18:15). Pedicel dark, ⅓ of scape in length. Only one anellus as long as it is broad and ⅓ of pedicel in length. The first funicle joints as long as it is broad, narrow in proximal part. 2. and 3. joints equal, a little longer than broad. The following funicle joints are equal in length, but wider towards the distal part. The last one transverse. Clava 3-jointed, flattened, joints equal in length, the terminal one conical. Funicle and clava dark, with white hairs pressed against the joints.

Thorax twice as long as broad, on the highest part as high as broad, with fine reticulation. Thorax narrower against the anterior part. Pronotum visible from the dorsal side. Parapsidal furrows very distinct and reach axillae. Scutellum oval, the anterior part more flattened, 1½ times as long as broad. Metanotum narrow transverse. Propodeum without a median keel, laterally with some hyaline hairs, the anterior border with wrinkles.

Wings hyaline with hairs. Ratio between length and breadth of fore wings 13.5:5. Ratio between submarginal vein and marginal vein 11:7. Radius short, ends in a stigma, which is as long as the rest of the vein. Stigma with four round pores on a straight line. Postmarginal vein very short, only ¼ of marginal vein in length, but a little thicker. Ratio between length of fore and hind wings 11:8. Ratio between length and breadth of hind wings 19:5. A little piece of the submarginal vein follows the border of the wing, then the vein goes into the wing. The last piece longer than the first (16:13). Just before the submarginal vein changes to marginal vein, a little vein goes into the wing. This is not longer than the largest hook in frenulum.

Coxae with the same colour as thorax. Femora dark brown. It is a slightly blue metallic sheen, especially on profemur. Tibiae light brown, the distal parts and tarsi yellow. The terminal joint of tarsi brown. Metacoxae long, ratio between length and breadth 23:9. Ratio in length between coxae and femur of the hind legs 5:7. Femur tibiae and tarsi of the same length.

Abdomen with the same colour as thorax, high, flattened from the sides and as long as head and thorax together. Ovipositor dark haired, 1½ times as long as the rest of the body

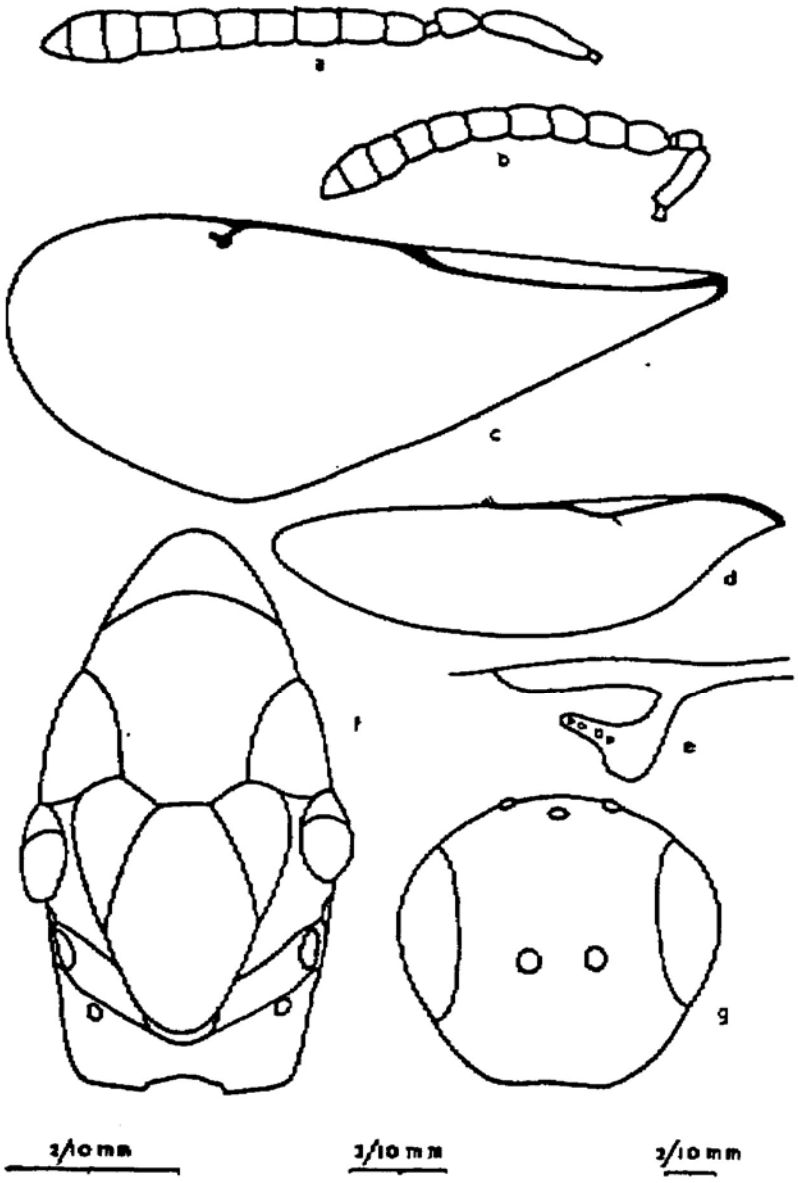


Fig. 6. *Torymus azureus* Boh.
a. antenna ♀, b. antenna ♂, c. fore wing ♀, d. hind wing ♀,
e. radialis ♀, f. thorax ♀, g. head ♀.

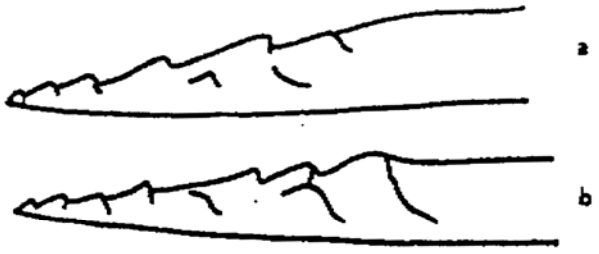


Fig. 7. The terebra of ovipositor. a. *Torymus caudatus* Boh., b. *Torymus azureus* Boh.

Ovipositor's tip figured (fig. 7). Hobbs (1948) is of the opinion that the shape of the ovipositor's saw is sufficently stable in *Torymus* and varies greatly enough between species that it can be used as a dependable character. By the study of the ovipositor's saw of *T. azureus Boh.* and *T. caudatus* Boh., I have found that they vary in shape. It is difficult, without a greater material of many species of *Torymus*, to make a characterization, the figure, however, shows the difference, between the species. Length: 2.3—2.8 mm.

Male.

differs from female by the following trait of characters. The characteristic azurblue colour fails. Abdomen dark with a sheen of green. Scapus as long as the three following joints together. Annellus transverse, only ⅓ as long as broad. The funicle joints equal, square. Metacoxae smaller and a little more than twice as long as broad (17:8). Ratio between the length of metacocae and femur 9:7. Abdomen not flattened from the side, as long as head and thorax together. Length: 1.8—2.4 mm.

Described on material from Klæbu, South-Trøndelag, STi 45.

Biology.

Boheman (1834), Ratzeburg (1844) and Thomson (1878) state *Laspeyresia strobilella* (L.) as the host. Mayr (1874) is of the same opinion. He mentions, however, that also Cecidomyia has been reared from the cones in which the insects had lived. Trägårdh (1917) reared them from cones of spruce, and was of the opinion that they lived phytophag on the seeds. He found larvae in the seeds and a similar larvae in the scales of cones. On account of this, his conclu-

sion was that the larvae lived in the seed, and later on left it and changed to pupae in the scales. He therefore described the larvae in the seeds and the imago which was reared, as larvae and imago of the same species. Trägårdh, twice, saw the imago of *T. azureus* Boh. emerge from pupae of *Kaltenbachiella strobi* (Winn.) and points out that the species perhaps lived both phytophag and zoophag. Later investigations (Holste 1922) have shown that Trägårdh had mixed the larvae of *Megastigmus abietis* Seitn. and *T. azureus* Boh. The first one eats the seed change to pupae in it; the second is a parasite of the gall midges *Plemeliella abietina* Seitn. and *Kaltenbachiella strobi* (Winn.).

As fart of an investigation into insects in spruce cones, in Finland, Kangas and Lovászy (1940) made a thorough study of *T. azureus* Boh. and its biology. Without knowing the investigations of Holste, they came to the same results; *T. azureus* Boh. lived only as a parasite on the gall midges *Kalt. strobi* (Winn.) and *Pl. abietina* Seitn. They did not succeed in finding the larvae as phytophag living in the seeds. Trägårdh has placed it together with the insects that damage seeds, but it is, however, a parasite on the insects that do damage and, therefore, a useful insect from a human point of view. Kangas and Lovászy describe the larvae of *T. azureus* Boh. and point out that it is not the same larvae as is described by Trägårdh. On the other hand, they found great agreement between Trägårdh's description and figure (p. 1188, fig. 35) and Seitner's (1916) description and figure of the species of *Megastigmus*. My investigations from Northern Norway support Holste (1922) and Kangas and Lovászy (1940). I have investigated hundreds of seeds from different districts, but I have never found a larva in them. I have, however, reared many specimens of *T. azureus* Boh. Many times I have dissected pupae and dead imagines out from the cocoons of *Kalt. strobi* (Winn.) and found pieces of the host larvae in them.

Distribution.

Torymus azureus Boh. was reared all over the district investigated. The most northern locality was Storjord in Saltdalen (Nsi 35), 60—70 km north of the natural distribution of the spruce forest. In Klæbu (STi 45), it was the most common insect next to *Kalt. strobi* (Winn.).

Strand (1919) mentioned the species from Sirdal (VAi 40) T. H. Schøyen (1927) reared the species from Korgen (Nsi

29), and Namdalen (NTi), and (T. H. Schøyen 1931) from Verdalen (NTi 25), Snåsa (NTi 42), and Saltdalen (Nsi 35), as parasite on *Kalt. strobi* (Winn.) and from Sauherad (TE 21), as parasite on *Pl. abietina* Seitn. I have not seen this material; it was sent to Professor Trägårdh. Outside Norway, the species is distributed in Sweden (Boheman 1834, Thomson 1875). Trägårdh (1917) found it in spruce forest all over the country. In Finland (Kangas 1937) it is distributed all over the country. From Denmark, Hoffmeyer (1931) writes that it is common on cones of spruce. In Russia, Berezina and Kurentzov (1935) recorded it from Leningrad district, and in Central Europe it has been reared from many places. (Ratzeburg 1844, Mayr 1874, Holste 1922). In England it was first reported by Cameron (1879).

Torymus caudatus Boheman.

Torymus caudatus Boheman, 1834, Kgl. Vet. Acad. Handl. f. år 1833, p. 365.
Thomson, 1874, Skand. Hym., Bd. 4, p. 84.
Mayr, 1874, Verh. zool. bot. Ges. in Wien, Bd. 24, p. 100.
Holste, 1922, Zeits. f. angew. Ent., Bd. 8, p. 154.
Callimome caudatum (Boh.), Hoffmeyer 1931, Ent. Medd., Bd. 17, p. 249.
Kangas and Lovászy, 1940, Suom. hyön. aik., Bd. 7, p. 140.

Historical Note.

Boheman (1834) described this species in the same paper in which he describes *T. azureus*. Mayr (1874) is of the opinion that it is a variety of *T. azureus* Boh., whereas Thomson (1874) separates them as two different species. In a paper from 1917, Trägårdh, in a description of *T. azureus* Boh. has described the antennae from *T. caudatus* Boh. as if they belong to *T. azureus*. Dr. Ruschka has called the attention of Holste (1922) to the different taxonomic varieties of the species, and mentions localities in Upper Bavaria. Hoffmeyer (1931) is of the same opinion as Mayr (1874) and explains the difference in size and shape as owing to the different biology of the species. In an earlier paper Hoffmeyer (1929), writes p. 328: "Ich vermute, dass *C. azureum* bald zoophag ist, bald mehr oder meniger phytophag ist, — — —, und dass dadurch die zwei Formen *azureum* und *caudatum* entstanden sind". Kangas and Lovászy (1940) give a description of the larvae of the two species. They point to the picture in the paper of Holste (1922, fig. 43) which ought to be the larvae of *T. azureus*, and are of the opinion that it

is the larvae of *T. caudatus*. On the basis of their studies they remark (p. 152—153): "Die Unterschiede sind so auffallend, dass wir es hier unbedingt mit zwei ganz verschiedenen Arten zu tun haben, — — —."

Description.

Female.

Head and thorax with green metallic sheen. Some individuals with blue-green sheen. Head a little broader than thorax (21:19). Ocelli form the corners in a triangle where the height is ⅓ the base. The distance between the lateral ocelli and the border of the eyes is ½ of the distance between the lateral ocelli. Dorsal to the antennal sockets, the frons is excavated on each side, to accommodate the scapes of the antennae, when in repose. Eyes red, with very minute hyaline hairs. Clypeus cut, with larger white hairs. Antennae inserted under the middle line between the eyes. The distance between the inserting points is as long as the distance between these and the border of the eyes. Mandibles well developed, with 3 teeth. The terminal segment of the maxillary palpi is as long as the three other segments together. Scapes straight, dark brown, brown on the under side and the proximal parts, hardly reaching the median ocellus. Pedicel dark, ⅓ of the scape in length. Anellus ⅓ as long as pedicellus. The first 4 funicle joints longer than broad (5:4). 5—8 joints square. Clava 3-jointed, flattened. The first joint longest (6.5), the next one a little shorter (5), the terminal one (3). Funicle and clava dark, with white hairs pressed against the segments.

Thorax rather long, but not twice as long as broad (75:43). On the highest, hinder part higher than broad (11:9), with fine reticulation. Pronctum visible from the dorsal side, narrower against the anterior part, but not so marked as by *T. azureus* Boh. The parapsidal furrows distinct. Scutellum oval, the anterior part more flattened, longer than broad (30:23). Mesoscutum and scutellum with minute hollows dispersed over the surface, usually with a minute hair in each of them. Metanotum narrow, transverse. Propodeum without a median keel, laterally with many hyaline hairs, the anterior border with wrinkles.

Wings hyaline, with hairs. Ratio between length and breadth of fore wings 10:4. Ratio between submarginal vein and marginal vein 19:14. Radius short, ends in a stigma, which is as long as the rest of the vein. Stigma with four

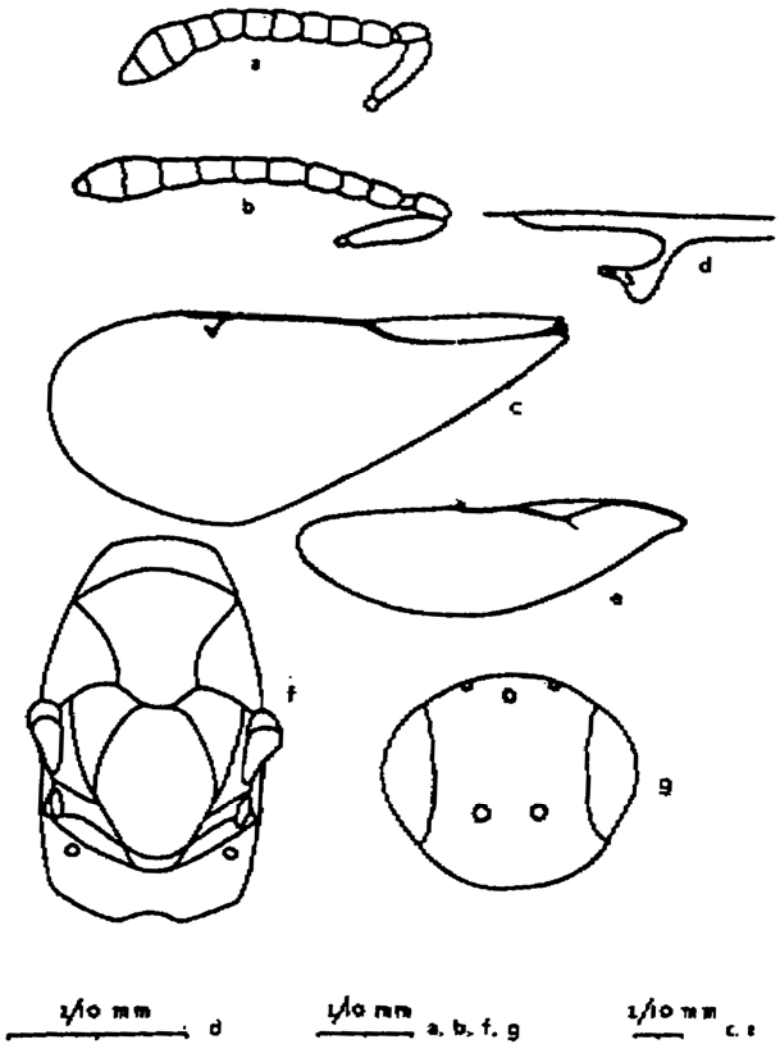


Fig. 8. *Torymus caudatus* Boh.
a. antenna ♀, b. antenna ♂, c. fore wing ♀, d. radialis ♀,
e. hind wing ♀, f. thorax ♀, g. head ♀.

round pores, the three distale on a straight line, the fourth a little below. Postmarginal vein short, the ratio to marginalis 7:24. The ratio between length of fore and hind wings 10:7. The ratio between length and breadth of hind wings 15:4, broadest at the middle, more narrow against the ends. A little piece of the submarginale vein follows the border of the wing, then the vein goes into the wing. The last piece a little longer than the first (13:12). Just before the submarginal vein changes to marginal vein, a little vein runs into the wing. This is not longer than the largest hook in frenulum.

Coxae with the same colour as thorax. Femora dark brown, with a faint green metallic sheen. Tibiae brown, the distal parts and tarsi light brown. The terminal tarsal joint darker. Metacoxae comparatively shorter than by *T. azureus* Boh., ratio between length and breadth 17:9. Ratio in length between coxae and femur of hind leg 7:10. Femur, tibiae and tarsi of the same length.

Abdomen dark, with a faint green metallic sheen, flattened from the sides and as long as head and thorax together. Ovipositor dark, haired, twice as long as the rest of the body. Ovipositor's tip figured. Length: 1.7—2.1 mm.

Male

differs from the female by the following trait of characters: Anellus smaller, only ½ as long as broad. The funicle joints 1—2 as long av broad, 3—7 transverse. Metacoxae shorter and broader, ½ as long as broad (31:20). The ratio between metacoxae and metafemora 3:4. Abdomen small, dark, egg-shaped, not flattened from the sides. A little more than ½ of head and thorax together (9:5). Length: 1.4—1.8 mm.

Described on material from Nord-Rana, Nsi 32.

Biology.

Our knowledge of the biology of the species agrees with that of *T. azureus* Boh. Holste (1922) is of the opinion that it lives as parasite both on *Plemeliella abietina* Seitn. and *Kaltenbachiella strobi* (Winn.). Kangas and Lovászy (1940) found the larvae of *T. caudatus* only in the seeds of spruce, while they found the larvae of *T. azureus* in the scales. Therefore they point out that it is possible that *T. caudatus* is a parasite on *Pl. abietina* Seitn. while *T. azureus* is attached to *Kalt. strobi* (Winn.). As mentioned in connection with

T. azureus, I have investigated hundreds of seeds from different districts in Nordland and Trøndelag, but I have never found larvae in the seeds. From the tests many individuals have been reared both of *T. caudutus* and *T. azureus* together with *Kalt. strobi* (Winn.). Further, I have dissected imagines of both from the pupae of *Kalt. strobi* (Winn.). I am therefore quite sure that both species can live as parasite on this gall-midge.

Distribution.

The species was reared from cones all over the district, from Storjord, Saltdalen (Nsi 35) in north, to Singsås (STi 30) in south. In 1951 it was reared from cones from Lørenskog (AK 15), and Bø (TEi 22).

Boheman (1834) described the species from Sweden. Trägårdh (1917) does not mention it, but it is evident from his description of *T. azureus* Boh. that besides this species he has also reared *T. caudatus* Boh. Dr. A. Jansson, Örebro, writes in a letter to me that he has reared both species in Sweden, but there is no publication on the distribution in Sweden. In Finland, Kangas has reared it (Kangas and Lovászy 1940) and from Denmark Hoffmeyer (1931, p. 249) writes: "Sehr häufig aus den Zapfen von Picea exelsa, — — — Die Formen azureum und caudutum fast gleich zahlreich, — — —." In Central Europe (Upper Bavaria) it has been found by Holste (1922) and from England it has been published by Cameron (1880).

Encyrtidae.

Litomastix truncatulus Thomson.

Litomastix truncatulus Thomson, 1875, Skand. Hym., Bd. 4, p. 173.

Historical Note.

The species was first collected in Sweden, and described by Thomson (1875). Mayr (1875) did not mention it in his monograph. He knew, however, the very similar *L. chalconotus* (Dalm.) and wrote that: "Dr. Reinhard erhielt ein Weibchen aus Fichtenzapfen." Dr. Jansson, Sweden, who has worked out my material is of the opinion that there are two well defined species, and the species from spruce cones is *L. truncatulus* Thom. Jansson (1952) received individuals of this species from Dr. Nordström. They were reared from *Eupithecia innotata* Rufn. from Gotland in Sweden.

Description.

Female.

Head dark brown, as broad as thorax. Ocelli form the corners in a tringle, where the height is ⅓ of the base. The distance between the lateral ocelli and the border of the eyes is ⅓ the distance between the lateral ocelli. Dorsal to the antennal sockets, the frons is excacated on each side to accommodate the scapes of the antennae when in repose. Frons reticulate, scattered with hairs. Eyes red-brown, with minute hyaline hairs. Antennae inserted on a line under the eyes. The distance between the inserting points larger than the distance between these and the border of the eyes. (5:4). Clypeus cut. Mandibles with three teeth. Maxillary palpi with 4 joints, the terminal one nearly as long as the three other joints together.

Antennae dark-brown with hairs. Scape rather straight, more narrow towards the pedicel, nearly reaching the median ocellus, 6 times as long as broad, and 2½ times as long as the pedicel. No anelli. The first funicle joint longer than broad (4.5—3). The following joints increase against clava. 2. and 3. joints longer than broad, 4. and 5. square, and 6. transverse (9:7). Clava as long as the three last joints together. Clava consists of one joint, which tapers out. The under side thus forming a cup-shaped deepening, 3 times as long as broad.

Thorax longer than broad (5:3.5). On the highest part not as high as broad (3:3.5). Pronotum visible from the dorsal side. Mesoscutum with a green-blue metallic sheen, reticulate pattern, scattered with hairs and broader than long (3:2). Parapsidal furrows fail. Axillae touching each other. The pattern on axillae and scutellum with minute longish reticulation. Scutellum as long as mesoscutum, high, arched, on the broadest part as broad as long. Metanotum narrow, especially on the median part. Propodeum smooth, sheening, without a carina.

Wings hyaline, with hairs, naked on the base part. Veins light brown. Ratio between length and breadt of fore wings 10.5:4.5. Submarginal vein slightly curved, passing over to the marginal vein there is a breach in the veination. Marginal vein short. Radial vein twice as long as marginal vein; it ends in an enlargement with 4—5 round pores in the upper part. The ratio between length of fore and hind wings 10.5:7. The ratio between length and breadth of hind wings 7:2. Marginal and submarginal vein of the same length.

Coxae dark, the distal parts light brown. Femora dark brown. Knees, especially the middle ones, yellowish. Tibiae

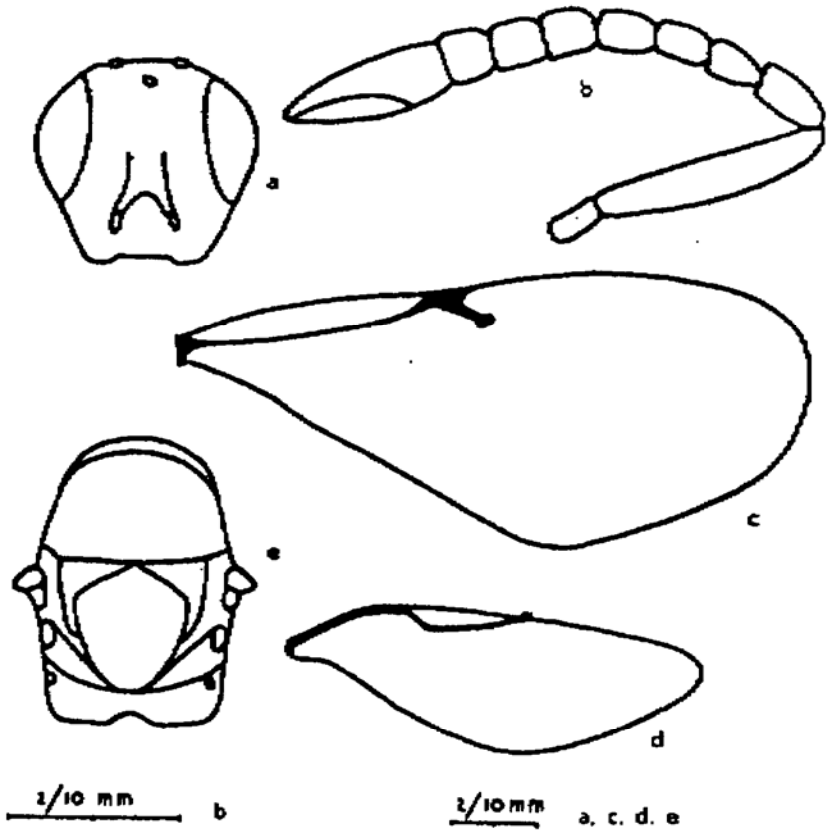


Fig. 9. *Litomastix truncatulus* Thoms.
a. head ♀, b. antenna ♀, c. fore wing ♀,
d. hind wing ♀, e. thorax ♀.

brown, tarsi light brown. The middle tibiae and tarsi lighter. Coxae short and broad. Ratio between coxae, femora, tibiae and tarsi of the hind legs 5:15:17:14. Spur of middle tibiae as long as the first tarsal joint.

Abdomen shorter than head and thorax together (4:6). Ovipositor visible, dark yellowish.

Length: 1.7—1.9 mm.

Described from material from Laksfors, Nsi 24. The whole material consists of 93 individuals, all females.

Biology.

As mentioned under the historical note, Mayr (1875) writes about *L. chalconotus* Dalm. that it is reared from cones of spruce. It is therefore possible that Mayr is mistaken in his determination and that *L. truncatulus* Thoms. has been reared from cones of spruce before. It is not, however, mentioned in the publication in what kind of insects the species live. Dr. Nordström (Jansson 1952) has reared it from Eupithecia innotata Hufn. In my material I found two species of the genus *Eupithecia, E. pini* (Retz.) and *E. bilunulata* (Zett.). These geometrids are perhaps the hosts, but *Laspeyresia strobicella* (L.) too, was reared from the tests.

Distribution.

The species was reared from 9 samples, in most cases in a few individuals, from Skonseng (Nsi 32), in north, to Verdalen (NTi 25), in south.

In Sweden it was collected from Dalarne, where Thomson (1875) at first took it. Jansson (1952) has swept it in Skåne, Småland and Närke. In the same publication it is mentioned from Gotland, where Dr. Nordström has reared it. Hellén (1949) has swept the species in Hattulae in Finland.

Ptermalidae.

Eutelus piceae Ruschka.

Eutelus piceae Ruschka, 1922, Zeits. f. angew., Bd. 8, p. 161.

Historical Note.

Holste (1922) reared this species from cones of spruce in Upper Bavaria. He sent it to Dr. Ruschka, who described it as a new species. Ruschka (1922) placed it under the genus *Eutelus* Walker, but points out that, probably, together with the following species *E. strobicola* Ruschka, it constitutes a new genus. He calls attention to Ratzeburg, who has described two species of *Pteromalidae* from cones of spruce viz., *Pteromalus hohenheimensis* Ratz. (Ratzeburg 1844, p. 198, 1848, p. 199, 1852, p. 240) and *Pteromalus strobilobius* Ratz. (Ratzeburg 1852, p. 244). The first one, Ruschka has studied in many individuals and he mentions that they are not any of the species which Holste had found. *P. strobilobius* Ratz. is not identical with any of these species. Ratzeburg has

described both species on a few individuals. When he described *P. hohenheimensis* (1844, p. 198) he only had one specimen without abdomen before him. In spite of his suplementary description (1848, p. 199) it is difficult to identify the species according to his description. *P. strobilobius* is described on one female. My specimens differ in some characteres from *P. hohenheimensis* Ratz. and *P. strobilobius* Ratz. but agree in so many characters with Ruschka's description of *E. piceae* that I am convinced it is the same species.

Description.

Head green, with bronze-coloured sheen, broader than thorax, from dorsal view squeezed together on the middle part. Ocelli form the corners in a triangle, where the height is ¼ the base. Eyes red, with minute hyaline hairs. Frons reticulate. Apart from the excavated part dorsal to the antennal sockets, the frons is flat. A cross-furrow marks the base of rising ground ventral to the antennal sockets. Antennae inserted just above the line between the ventral border of the eyes. The distance between the inserting points ½ the distance between these and the border of the eyes. Clypeus cut. Right mandible with 4 teeth, left with 3 teeth. Maxillary palpi with 4 joints, the terminal one as long as the three others together. Labial palpi with 3 joints.

Scape red-brown, straight. It does not reach the median ocellus. Pedicel darker, ½ the scape in length, as long as the four following joints together. Both anelli and the following like funicle joint, increase in size against clava. The following joints rather transverse. The last funicle joint distinctly transverse (3:2). Clava with three joints, hardly as long as the last three funicle joints together. Funicle and clava dark brown, with minute hairs.

Thorax green with bronze-coloured sheen, flattened, ratio between length and breadth 4:3. Pronotum visible from the dorsal side, collar with sharp borders. Mesoscutum reticulate. Parapsidal furrow hardly visible. Scutellum great, with finer reticulation than mesoscutum. Metanotum small. Propodeum without a carina. The spiracles on the dorsal side of propodeum are placed in a faint excavation. Side border of propodeum with dark hairs. The median suture on mesopleura slender, but visible.

Wings hyaline, with hairs, naked on the base party. Veins light brown. Ratio between length and breadth of fore wings 12:5.5. Marginal vein twice as long as radial vein (2:1).

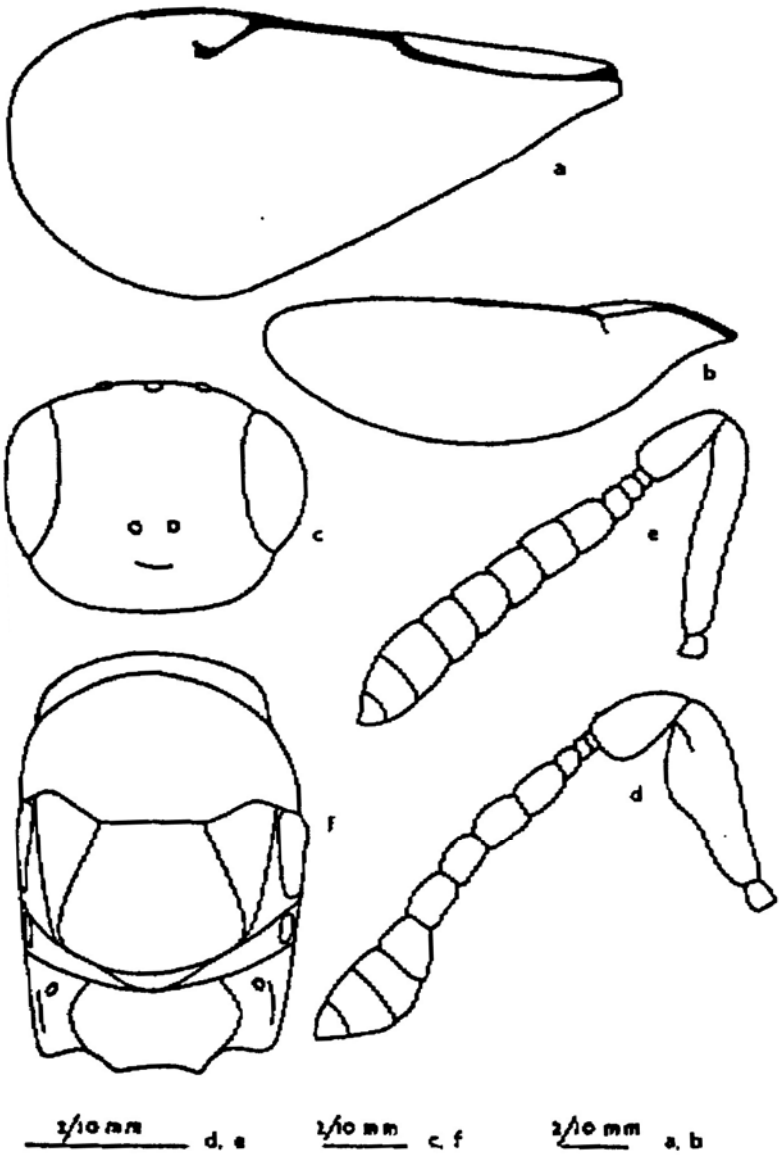


Fig. 10. *Eutelus piceae* Ruschka.
a. fore wing ♀, b. hind wing ♀, c. head ♀, d. antenna ♂,
e. antenna ♀, f. thorax ♀.

and a little longer than submarginal vei (3.8 :3.5). Submarginal vein more slender than marginal vein. Angle between radial vein and postmarginal vein ca. 45°. Ratio between length of postmarginal vein and marginal vein 4:3. Ratio between length of fore and hind wings 4:3. Ratio between length and and breadth of hind wings 23:7, broadest at the middle, narrower towards the ends. Submarginal vein follows the border of the wing a short distance, then it runs into the wing. The last piece a little shorter than the first (12:15). Just before the submarginal vein changes to marginal vein a little vein runs into the wing. It is ¼ marginal vein in length. Marginal vein as long as submarginal vein. Legs dark brown. Coxae with the same colour as thorax. Knees and tarsi lighter.

Abdomen dark, longer than head and thorax together, a little broader and tapering behind. A little part of ovipositor visible. The abdominal segments nearly of the same size. Length: 2—2.8 mm.

Male

differs from the female by the following trait of characters: Scape enlarged in the distal part. Funicle joints not completely light brown. The last one more yellowish-withe. The first two joints in clava dark, the last one white. Legs, especially the fore legs lighter than in the female. Radial vein a little more than ½ of marginalis in length.

Length: 2—2.5 mm.

Described from material from Storjord in Saltdalen. Nsi 35.

Biology.

Holste (1922) is of the opinion that *Eutelus piceae* Ruschka is a parasite on the gall midge *Kaltenbachiella strobi* (Winn.) but he gives no direct proof of his assertion. In the tests from Northern Norway the gall midge always appeared together with *E. piceae* Ruschka. We cannot, however, exclude the possibility that it is a hyperparasite, as several species of the same genus live in that way.

Distribution.

Eutelus piceae Ruschka was not common in the tests. It was only reared from four of the sixty-one samples. The most northern locality is Storfjord in Saltdalen (Nsi 35). Nordland, and the most southern Egge (NTi 33). In the

same paper Ruschka mentioned that according to Trägårdh, the species has been found in Sweden. Ruschka has taken it in Semmeringgebiet and Holste (1922) has reared it from Upper Bavaria. The species has not been published from Finland, in spite of the Finnish investigation of cones of spruce in the year 1937.

Eutelus strobicola Ruschka.

Eutelus strobicola Ruschka, 1922, Zeitz. f. angew. Ent., Bd. 8, p. 161.

Historical Note.

The species was described by Ruschka (1922) in the same paper he described *E. piceae*. The remarks under this species are valid here too. Several characters of *Pteromalus hohenheimensis* Ratz. and *P. strobilobius* Ratz. do not agree with the species I have reared, but most of them agree with Ruschka's description of *E. strobicola*.

Description.

Head green with bronze-coloured sheen, broader than thorax. From dorsal view, head squeezed together on the middle part. Ocelli form the corners in a triangle, where the height is ⅓ the base. Eyes red, with minute hyaline hairs. Frons reticulate. Apart from the excavated part dorsal to the antennal sockets, the frons is flat. Antennae inserted just above the line between the ventral border of the eyes. The distance between inserting points ½ the distance between these and the border of the eyes. Clypeus cut. Right mandible with 4 teeth, left with 3 teeth. Maxillary palpi with 4 joints, labial palpes with 3 joints.

Scape straight, red-yellowish to brown-yellowish. It does not reach the median ocellus. Pedicel dark brown, ½ the scape in length, as long as the four following joints together. Both anelli and the following like funicle joint increase in size towards clava. The following joints rather transverse. The last funicle joint distinct transverse (3:2). Clava with three joints, hardly as long as the last three funicle joints together. Funicle brown, clava dark brown, often dark. Funicle and clava with minute hairs.

Thorax green with bronze-coloured sheen, flattened, ratio between length and breadth 4:3. Pronotum visible from the dorsal side, collar with sharp borders. Mesoscutum reticulate. Parapsidal furrows hardly visible. Scutellum great, with finer reticulation than mesoscutum. Metanotum small. Propodeum without a keel. The spiracles on the dorsal side of

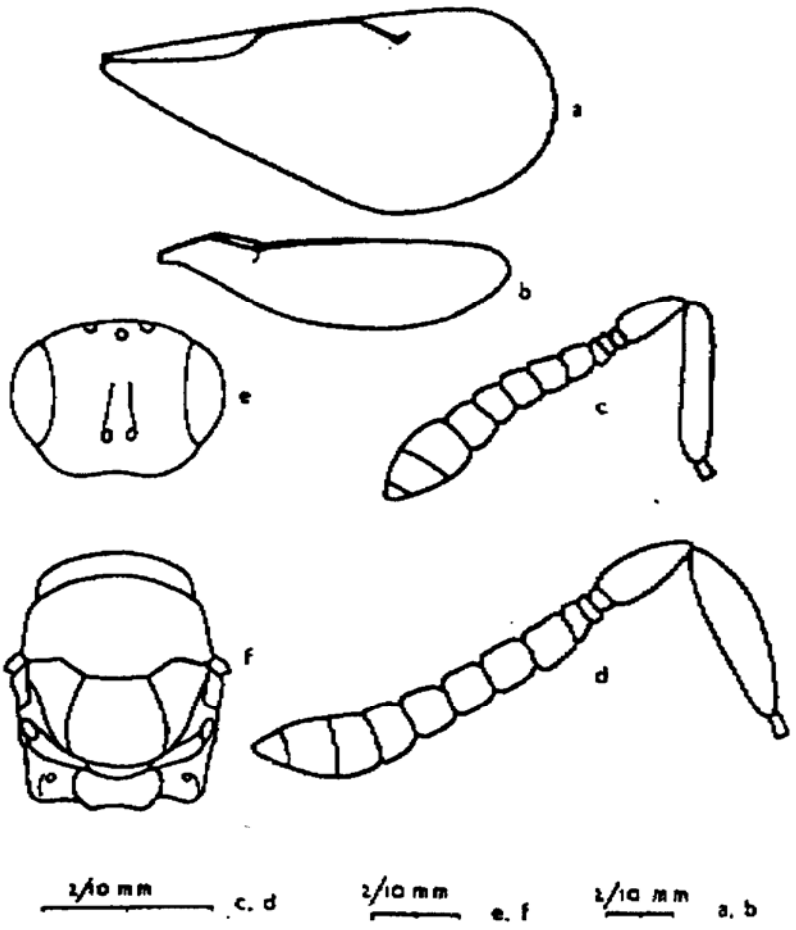


Fig. 11. *Eutelus strobicola* Ruschka.
a. fore wing ♀, b. hind wing ♀, c. antenna ♀, d. antenna ♂, e. head ♀, f. thorax ♀.

propodeum are placed in a faint excavation. Side border of propodeum with dark hairs. The median suture on mesopleura slender but visible.

Wings hyaline with hairs, naked on the base part. Veins light brown. Ratio between length and breadth of fore wings 8.5:4. Marginal vein ½ time longer than radial vein (3:2). Submarginal vein more slender than marginal vein and not so long (12.5:13). Angle between radial vein and postmar-

ginal vein ca. 45°. Ratio between length of postmarginal vein and marginal vein 3:1.7. Ratio between length of fore and hind wings 8.5:6.5. Ratio between length and breadth of hind wings 6.5:1.6, broadest at the middle, narrower towards the ends. Submarginal vein follows the border of the wings a short distance then a piece of the same length runs into the wings. Just before the submarginal vein changes to marginalis, a little vein runs into the wing. It is ¼ of the marginal vein in length. Marginal vein as long as the submarginal vein.

Legs light brown. Coxae with the same colour as thorax. Metafemora with a faint brown colour.

Abdomen dark, as long as head and thorax together, a little broader and tapering. A small part of ovipositor visible. The abdominal segments nearly of the same size. Length: 1.8—2.2 mm.

Male

differs from the female by the following trait of characters: Scape a little broader and more round. It is not enlarged in the distal part as in *E. piceae* Ruschka. Funicle, with the exception of the last joint light brown. The last funicle joint and the two first joints of clava dark. The terminal joint in clava white.

Length: 1.8—2 mm.

Described from material from Storjord in Saltdalen, Nsi 35.

Biology.

Our knowledge of the biology of this species agrees with what we know about *E. piceae* Ruschka. Both are reared together with *Kaltenbachiella strobi* (Winn.), and Holste (1922) is of the opinion that they are parasites on this gall midge. Györfi (1941 p. 88) mentions that Lovaszy discovered one individual coming out of a cocoon from Bracon sp., which is a parasite on *Laspeyresia strobilella* (L.) and points out the possibility of hyperparasitism. Györfi, himself, only knew it from *Kalt. strobi* (Winn.). I have found many pupae in scales of cones where *Kaltenbachiella strobi* (Winn.) used to live, and I have reared *E. strobicola* Ruschka from them.

Distribution.

Eutelus strobicola Ruschka was very common in the cones of spruce from the district investigated. The species was reared from Saltdalen (Nsi 35) in north, to Rennebu (STi

25), in south. In a sample consisting of 2 liters of cones from Orkland (STi 56) it was the most common insect. In all 188 individuals of *E. strobicola* and 100 individuals of *Kalt. strobi* (Winn.) were reared. Of other chalcidids and proctotrupids 269 individuals from 7 different species were reared.

In 1951 the species was reared from cones from Arendal (AAy 10), Bø (TEi 22), Lørenskog (Ak. 15), and Furnes (Hes 18).

Trägårdh has delivered material from Sweden to Dr. Ruschka, and Dr. Jansson has informed me that it is also reared from cones or spruce in Sweden. Györfi (1941) writes that Kangas and Lovaszy have reared it from different places in Finland. Holste (1922) has found it in Upper Bavaria, and Ruschka (1922) in the semmering district in Germany.

Anogmus strobilorum Thomson.

Anogmus strobilorum Thomson, 1878, Hym. Scand., Bd. V, p. 85.

Historical note.

Thomson (1878) reared this species from cones of spruce. Holste (1922) found it in all his samples of cones in Upper Bavaria I have not succeeded in finding further information on the species in the literature.

Description.

Head green, as broad as thorax, perhaps a little broader. From dorsal view, head squeezed together at the middle. When dry, frons excavated and has a deep furrow. Ocelli form the corners in a triangle, where the height is ¼ the base. Eyes red, with minute hyaline hairs. Frons reticulate. Apart from the excavated part dorsal to the antennal sockets, the frons is flat. Clypeus cut. Antennae inserted just above the line between the ventral border of the eyes. The distance between the inserting points is as long as the distance between these and the border of the eyes. Right mandible with 4, left with 3 teeth. Maxillary palpi with 4 joints, the terminal one nearly as long as the three other together.

Scape light red-brown, does not reach the median ocellus. Pedicel conical, dark on the fore side, dark brown on the hind side, as long as the four following joints together. Ratio between scape and pedicel 7:3. Both anelli and the following funicle-like joint increase in size against clava. The following joints of the same size transverse, with hairs. Anelli and

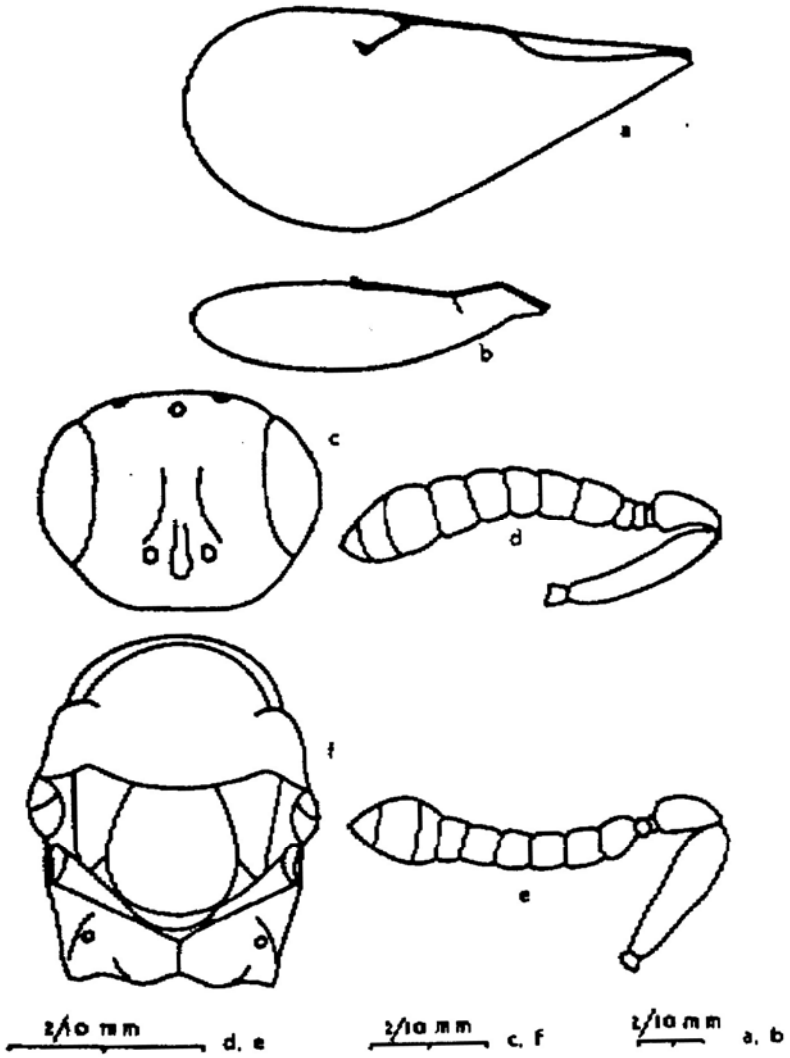


Fig. 12. *Anogmus strobilorum* Thoms.
a. fore wing ♀, b. hind wing ♀, c. head ♀,
d. antenna ♀, e. antenna ♂, f. thorax ♀.

funicle brown. Clava dark, consisting of three joints, as long as the last three funicle joints together. The terminal parts a little squeezed.

Thorax green, with metallic sheen, a little flattened. Ratio between length and breadth 4:3. Pronotum visible from the dorsal side. Collare rounded off. Mesoscutum reticulate. Parapsidal furrows hardly visible. Scutellum great, with finer reticulation than mesoscutum. Metanotum small. The carina on propodeum faintly developed. The spiracles on the dorsal side of propodeum are hardly placed in an excavation. Side border of propodeum with dark hairs. The median suture on mesopleura slender.

Wings hyaline, with hairs, naked on the base part. Veins light brown. Ratio between length and breadth of fore wings 9:4. Postmarginal vein slender, as long as marginal vein. Angle between radial vein and postmarginal vein ca. 45°. Ratio between submarginal vein and marginal vein 3:2. Marginal vein twice as long as radial vein (2:1). Ratio between length of fore and hind wings 9:6.5. Ratio between length and breadth of hind wings 6.5:1.6, broadest at the middle, narrower towards the ends. Submarginal vein follows the border of the wing a short distance, then a piece of the same length runs into the wings. Just before the submarginal vein changes to marginal vein a little vein runs into the wing. It is ⅓ of submarginal vein in length.

Legs red brown. Coxae darker. Metacoxae flattened from the sides with metallic sheen. The upper parts of femurae dark, brown near the knees.

Abdomen dark, longer than thorax. Petiolus small, transverse. 2. segment covers nearly ⅓ of the abdomen. Ovipositor ⅓ of abdomen in length.

Length: 1.5—2.3 mm.

M a l e

differs from the female by the following trait of characters: Scape and pedical dark brown. Funicle dirty yellowish. Clava dark. It has one large funicle joint more than the female, but the little anellus-like funicle joint is missing. Legs yellowish. Femora a little darker on the upper parts. Abdomen as long as thorax, egg-shaped, flattened on dry individuals.

Length: 1.5—1.8 mm.

Described from material from Mosjøen (Nsi 26).

Biology.

Already Thomson (1878) knew that *Anogmus strobilorum* Thoms. lived in cones of spruce. He does not, however, write on which f the insects it parasitizes. Holste (1922) mentioned

that it was a parasite on the gall midges *Kaltenbachiella strobi* (Winn.) and *Plemeliella abietina* Seitn. He has dissected the imago from seeds of spruce and is quite sure that it lives together with *Pl. abietina* Seitn. This gall midge has not been found in my samples, but many specimens of *Anogmus strobilorum* Thoms. have been reared, and therefore it is probable that the species may be also a parasite on *Kaltenbachiella strobi* (Winn.) too.

Distribution.

The species was common all over the district. It was reared from practically all the samples, and in many of them in many individuals. In a sample consisting of 2 litres of cones from Nord-Rana (Nsi 32), 192 individuals were reared, the second common parasite. Only *Aprostocetus strobilanae* (Ratz.) was more common, with 462 individuals. It was reared 310 of *Kalt. strobi* (Winn.).

Thomson (1878) writes that it is rare in Sweden. He does not, however, mention from which place it was collected. Holste (1922) has rared it from all his samples of cones in Upper Bavaria. This is the only further information on the distribution of the species. It has not been published from Finland. Amanuensis W. Hellén, Helsingfors, has told me that it is not represented in the collections in the zoological Museum, Helsingfors.

Eulophidae.

Elachertus nigritulus (Zett.).

Entedon nigritulus Zetterstedt, 1840, Ins. Lapp., p. 430, 5.
Entedon geniculatus Ratzeburg, 1844, Ichn. d. Forstins., Bd. I, p. 168.
— Ratzeburg, 1848, Ichn. d. Forstins., Bd. II, p. 159.
Elachistus nigritulus (Zett.), Thomson, 1878, Hym. Scand. Bd. V, p. 196.
Elachertus nigritulus (Zett.), Schmiedeknecht, 1909, Gen. Ins. Bd. 97, Chalcididae, p. 395.

Historical note.

Zetterstedt (1840) found this species in Lappland and described it under the name *Entedon nigritulus*. Four years later, Ratzeburg (1844) described a species of the genus, *Entedon*, which in many characters agrees so well with Zetterstedt's species that it is probably the same species. In 1848 he gives a better description and mentions that it is reared from cones of spruce. Thomson (1878) placed it under genus *Elachitus* Spinola, mentioned a new locality and gave

a short characterization of the species. Schmiedeknecht (1909) changed the genus name to *Elachertus* Spinola. Holste (1922) has reared the species from cones of spruce in Upper Bavaria and points out that it is a parasite on *Laspeyresia strobilella* (L.). Lovaszy (1941) has taken it as parasite on this moth in Finland, all over the country.

Description.

Head black, narrower than thorax (6:7). Ocelli form the corners in a triangle, where the height is ½ the base. Distance between the lateral ocelli and the border of the eyes is as long as the distance between the lateral ocelli. Frons reticulate. When dry, frons excavated and has a deep furrow. Eyes brown, with minute hyaline hairs. Clypeus cut. Antennae inserted just under the line between the ventral border of the eyes. Distance between the inserting points greater than the distance between these and the border of the eyes (5:3). Parts round the eyes and on clupeus with long hairs. Mandible with 2 big and 2 small teeth. Maxillary palpi with two joints.

Scape straight, nearly 6 times as long as broad (14:2.5), does not reach the medium ocellus. Pedicel hardly ⅓ scape in length. Without anelli. First funicle joint longer than broad (4:3). The three next square. The funicle joints increase in size towards clava. Cava great, flattened, with 2 joints. It is as long as the two last funicle joints together. The last clava joint ½ as long as the first. Antennae black with minute hyaline hairs.

Thorax black, flattened, longer than broad (5:3). Pronotum visible from the dorsal side, round, arched. Parapsidal furrows distinct. Axillae round, arched. Scutellum as long as broad, narrower towards mesoscutum, smooth, sheening. Metanotum small, with a higher smooth part next to scutellum. Propodeum with a well-marked carina on the sides with hairs.

Wings hyaline, with hairs. Veins light brown. Ratio between length and breadth of fore wings 20:9. Submarginal vein consists of a straight piece, from the base of the wing and into the wing. A little piece then runs out to the beginning of the marginal vein. The first piece nearly twice as long as the last (21:9) with small jags which look like small bubbles under bad microscopic enlargement. Ratio between submarginal vein and marginal vein 15:13. Radial vein ⅓ marginal vein in lenght. The enlargement in the end of the radial vein with 4 round pores. Postmarginal vein 1½

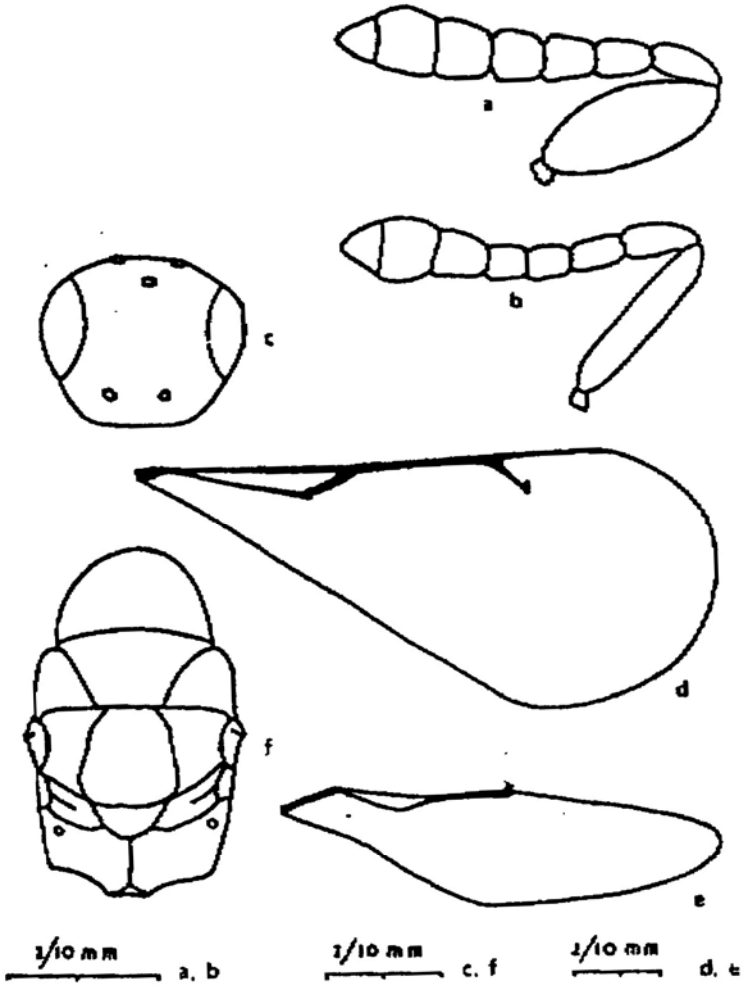


Fig. 13. *Blacherina nigritulus* (Zett.).
a. antenna ♂, b. antenna ♀, c. head ♀, d. fore wing ♀,
e. hind wing ♀, f. thorax ♀.

times radial vein in length (3:2). It is very weakly developed in the distal part. Ratio between length of fore and hind wings 21:16. Ratio between length and breadth of hind wings 4:1. Marginal vein as long as submarginal vein.

Legs dark brown. Coxae black coloured. Knees and the distal part of tibiae and tarsi yellowish. The terminal joint

of tarsi a little darker. Metacoxae twice as long as broad. Ratio between length of coxae, femora, tibiae and tarsi on hind legs 3:5:6:5.

Abdomen black, as long as head and thorax together. It is oval in shape, dorso-ventral flattened and tapering at both ends. Ovipositor barely visible.

Length: 1.6—1.8 mm.

Male

differs from the female by the following trait of characters: Antennae stronger. Scape broader, a little more than twice as long as broad (7:3). The last funicle joint transverse (6:4). Pronotum seen from dorsal view a little shorter than in the female. Abdomen as long as thorax, flattened dorso-ventral and nearly circular.

Length: 1.3—1.6.

Described from material from Orkland (STi 56).

Biology.

Ratzeburg (1848, p. 159) wrote concerning *Entedon geniculatus* Ratz.: "Hr. Nördlinger erzog mehrere ♀♀ aus Fichtenzapfen zu Hohenheim, in welchen strobilana und eine cecidomyia gewohnt hatten." Holste (1922) mentioned that *Elachertus nigritulus* (Zett.) is a parasite in *Laspeyresia strobilella* (L.) without having any security for his assertion, while Lowasy (1941) mentioned it as a common parasite in that insect in Finland, and writes that the larvae lived as ectoparasites and 4 to 8 individuals on each host. In Snåsa (NTi 42), I found, on July 18, 1951, one dead larvae from *Laspeyresia strobilella* (L.) in the axis of a cone. From this specimen 18 pupae were dissected and from 7 of these *E. nigritulus* (Zett.) was reared. The late date of emergence must be considered in connection with the very cold spring and summer.

Distribution.

The species was reared from 10 different samples, from Hattfjelldalen (Nsi 23) in north, to Rennebu (STi 25) in south, but the number of individuals was small. Outside Norway the species is known from Sweden, where Zetterstedt (1840) has taken it in Karesuando and Kengis in Lappland, 15—22 August. Thomson (1878) found it on Öland, and Lovaszy (1941) in Finland, where the species has been reared from cones of spruce all over the country. In Germany Holste (1922) mentions it from different localities in Upper Bavaria

Aprostocetus strobilanae (Ratz.).

Eulophus strobilanae Ratzeburg, 1844, Ichn. d. Forstins., Bd. I, p. 166.
Trichocerus erythrophthalmus Ratzeburg, 1844, Ichn. d. Forstins., Bd. I, p. 171.
Entedon strobilanae Ratzeburg, 1848, Ichn. d. Forstins., Bd. II, p. 167.
— Schmiedeknecht, 1909, Gen. Ins., Bd. 97, Chalcididae, p. 442.
Geniocerus erythrophthalmus Ratzeburg, 1848, Inch. d. Forstins, Bd. II, p. 175.
Tetrastichus erythrophthalmus (Ratz.), Schmiedeknecht, 1909, Gen. Ins., Bd. 97, Chalcididae, p. 474.
Aprostocetus strobilanae (Ratz.), Trägårdh, 1917, Medd. f. Stat. Skogf. anst., Hft. 13—14, p. 1190.

Historical note.

Owing to the difference between the sexes, this species has been described as two different species. Ratzeburg (1844) described the female from two individuals as a species of the genus *Eulophus* Geoffroy and named it *E. strobilanae*. Later on Ratzeburg (1848) placed it in the genus *Entedon* Dalm. Ratzeburg (1844) also described the male and placed it in the new genus *Trichocerus* under the name of *T. erythropthalmus*, but in 1848 he transferred the species to the genus *Geniocerus* Ratz. Schmiedeknecht not beeing aware of the difference between the sexes, placed the male in the genus *Tetrastichus* Haliday. In his great monograph on the Calcids (1909), Trägårdh (1917), however, who made a closer study of the material, put the different looking female and male in the same species. Ruschka, who has verified Trägårdh's material, placed the species in the genus *Aprostocetus* Westwood. Holste (1922) has reared the insect from cones of spruce in Upper Bavaria and disagreed with Trägårdh about the host insect.

Description.

Female.

Head black, narrower than thorax (9:11) scattered with hairs. Ocelli form the corners in a triangle where the height is ¼ the base. Distance between the lateral ocelli nearly twice the distance between the ocelli and the border of the eyes (13:7). Frons reticulate, excavated when dry. Eyes red, scattered with minute hyaline hairs, especially on the lower parts. Clypeus weakly rounded. Antennae inserted above the line between the ventral border of the eyes. Distance between the inserting points is as long as the distance from these to the border of the eyes. Mandible with two distinct teeth and a faint trace of a third. Maxillary

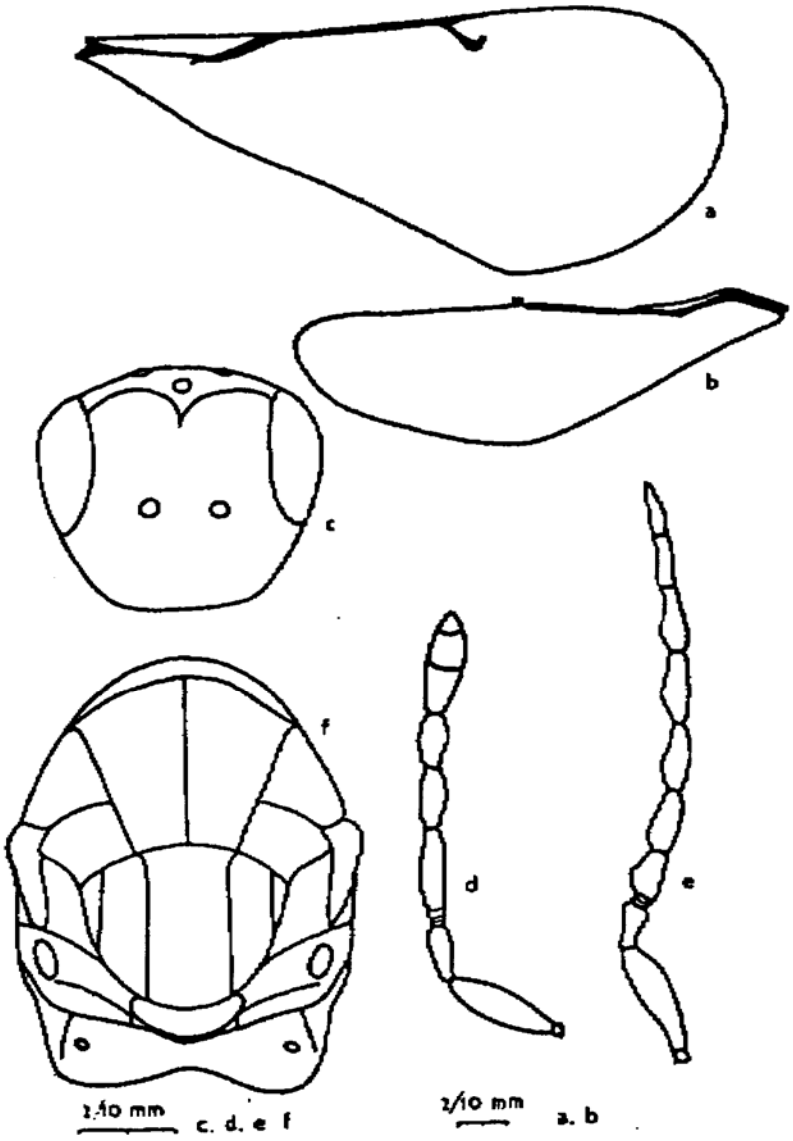


Fig. 14. *Aprostocetus strobilanae* (Ratz.).
a. fore wing ♀, b. hind wing ♀, c. head ♀,
d. antenna ♀, e. antenna ♂, f. thorax ♀.

palpi with only one joint. Antennae black, apart from the anelli, it consists of 8 joints. Scapus reaches the median ocellus, 4 times as long as broad. Pedicellus ½ as long as scapus. Antennae with 3 minute anelli, which are difficult to see without a good microscope. They increase in size against the funicle. Funicle with 3 joints, which increase a little in thickness against clava. Ratio between length of the joints 12:10:9. Claca oval, with 3 joints, nearly as long as the two last funicle joints together. Antennae scattered, with hairs, which are shorter than the breadth of the joint.

Thorax longer than broad (13:11), black, with a very minute reticulation stretched in length. Pronotum barely visible from the dorsal side. Mesoscutum with a weak median furrow. Parapsidal furrows deep and distinct. Scutellum broader than long (6:5). Laterally two small furrows run in length. More median two other more distinct furrows run in the same direction. Scutellum is characterised by these 4 furrows. Metanotum narrow, falls in 3 parts, while the middle part is higher than the lateral parts. Propodeum with another reticulation, more round meshes and without carina.

Wings hyaline with hairs. Veins light brown. Ratio between length and breadth of fore wings 12:5. Submarginal vein straight, narrower on the distal part. Marginal vein twice as thick as submarginal vein. Ratio between submarginal vein and marginal vein 3:4. Radial vein ⅕ of marginal vein in length. Postmarginal short, ⅓ of radial vein in length. Ratio between length of fore and hind wings 4:3. Ratio between length and breadth of hind wings 4:1. Ratio between submarginal vein and marginal vein 2:3.

Coxae and femorae black. Knees yellow. Tibiae and tarsi brown. Ratio between coxae, femora, tibiae, and tarsi on hind legs 1:2.5:3.5:2.

Abdomen black, long, nearly twice as long as head and thorax together (8.5:4.5), tapering behind. Ovipositor ⅙ of abdomen in length.

Length: 1.7—2.3 mm.

Male

differs from the female by the following trait of characters: Antennae longer. Setting aside the anelli, it consists of 9 joints with long hairs. Scape club-shaped, flattened from the sides with a keel on the underside, and three times as long as broad. Pedicel nearly ⅓ of scape in length (6:17). Two anelli, which are very small, but visible under the microscope

when mounted in Canada balsam. Funicle joints with a peculiar building. Their underside flattened, overside swollen in the proximal part and carries a crossgrained rank with long stiff hairs. The hairs nearly as long as three of the joints together. Ratio between length of funicle joints, from anelli to clava, 7:9:11:1:10. The two next joints are narrower than the others (3:5). The first of them, which carries the same sort of hairs as the funicle joints, are longer than the next one (10:8.5). Funicle and clava with minute hairs, hardly longer than the lenght of the joint. A greater part of pronotum visible from the dorsal side. Propodeum broader than in the female, especially in the middle part. Abdomen shorter than head and thorax together (3.5:4).

Length: 1.5—1.8.

Described from material from Nord-Rana (Nsi 32).

Biology.

When Ratzeburg (1844) described the species it was reared from cones of spruce attacked by *Laspeyresis strobilella* (L.). This is mentioned both for the female and the male. Trägårdh (1917) controlled the time for rearing for insects' damage to cones of spruce, and according to his table, he concludes that the host is *Torymus azureus* Boh. Holste (1922) is of the opinion that the species is a parasite in *Plemeliella abietina* Seitn. and *Kaltenbachiella strobi* (Winn.). He dissected it from seeds of spruce and is quite sure that it lives in *Pl. abietina* Seitn. I have not myself studied the biology of this species in Norway.

Distribution.

Aprostocetus strobilanae (Ratz.) is distributed all over the district, from Rognan in Saltdalen (Nsi 35), to the border of the spruce forest towards the mountains in southern Norway. In 1951 it was reared from Austre Moland (AAy 11), and Lørenskog (AK 15). Strand (1919) mentioned a species *Tetrastichus strobilanae* Ratz. from Porsgrunn (TEy 4), but it has been impossiblee for me to get hold of this specimen.

The species is distributed in spruce forests all over Sweden (Trägårdh 1917). In the literature it is not mentioned from Finland, but according to personal information from Mr. W. Hellén, specimens collected by E. Tahvonen are in the collection of the Zoological Museum at Helsingfors. In Central-Europe it was reared from cones of spruce by Holste (1922) in Upper Bavaria.

Serphoidae.

Calliceratidae.

Aphanogmus strobilorum n. sp.

The genus *Aphanogmus* Thomson embraces many species which are difficult to separate. Kieffer (1914 b) mentions 23 species from the paleartic zone, while Szelenyi (1940) quotes 30 species in his key to the females. Both these publications I have used in my trail to identify the species reared from spruce cones, but it does not fully agree with the species described. Dr. Jansson, Sweden, who kindly examined my material, did not come to a definite result as to the species.

In some characters it agrees with *Aph. furcatus* Kief. but the longitudinal furrow on mesoscutum and the ratio between radial vein and marginal vein separate it from that species. *Aph. hyalinipennis* Thoms. and *Aph. fumipennis* Thoms. have a shining mesoscutum and distinctly transversal funicle joints, and they do not agree with the obviously new species. According to the description, *Aph. compressiventris* (Först.) differs on account of its size and difference in colour.

Description.

Female.

Head black, transverse. Seen from the dorsal side, twice as broad as long and a little broader than thorax. It is reticulate, with minute hyaline hairs. Crown has an arched edge behind the ocelli, with a median longitudinal furrow, which is indistinct between the ocelli. Ocelli form the corners in a triangle where the height is ½ the base. The distance between the lateral ocelli a little longer than the distance between this this and the border of the eyes (13:10). Frons a little longer than broad (6:5), with a half ellipsoidal exacavation from the inserting points of the antennae and up to ⅓ of the height of the eyes. Eyes with minute hairs. Mandibles with two teeth. Maxillary palpae with three joints. Antennae with 10 joints. The distal part club-shaped. Antennae with hairs. Some of them as long as the breadth of the joint to which they are fastened. Scape and pedicel dark brown. Funicle joints nearly black. Scape rather large, the proximal part enlarged giving it a club-like appearance. It is as long as the four following joints together. Pedicel 3 times as long as broad. 1. flagellum-joint ¾ of pedicel in length and twice as long as broad. 2. og 3. joints equal, longer than broad. 4. a little broader, but not as broad as long. The

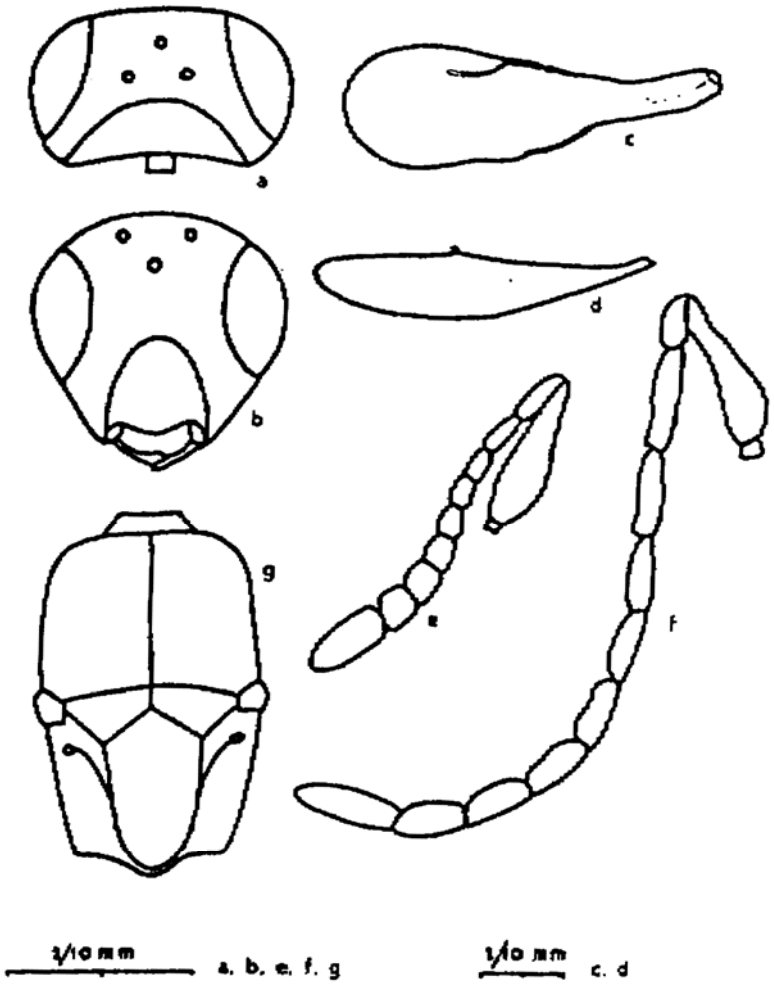


Fig. 15. *Aphanogmus strobilorum* n. sp.
a. head from above ♀, b. head in front ♀, c. fore wing, d. hind wing, e. antenna ♀, f. antenna ♂, g. thorax ♀.

following joints broader, the 7. distincly transverse. The terminal joint a little longer than the two last joints together (8:7).

Thorax black, 1½ times as long as broad, flattened from the sides and 1½ times as high as broad. Mesoscutum broader

than long (3:2), sheening, with minute reticulation. Median it has a thin but visible furrow. Scutellum as long as mesoscutum, with the same exterior structure. It differs from mesoscutum by a distinct furrow in length. The furrow in frenum consists of minute hollows, which come in contact before they reach the anterior border of frenum. Metanotum very narrow. Propodeum slanting, only the hind corner visible from the dorsal side. Pleura with minute folds in length.

Wings, hyaline with hairs, reach behind the abdomen. Fore wings three times as long as broad. Radial vein yellowish-brown, arched, nearly twice as long as marginal vein (13:7). Marginal vein and submarginal vein brown. Hind wings nearly as long as fore wings (6:7), and 5 times as long as broad, without veins.

Legs dark brown. Knees, the distal parts of tibia and tarsi light brown.

Abdomen black, sheening, as long as head and thorax together, a little flattened from the sides. The first segment covers ⅔ of the abdomen.

Length: 0.9—1.3.

M a l e

differs from the female by the following trait of characters: Antennae with 11 joints. The hairs on them longer than the breadth of the joints. Scape with a longer narrow piece in the distal part, as long as the two next joints together. Pedicel small, egg-shaped, light in the distal part. The 1. flagellum joint twice as long as the pedicel, light on the proximal part. 2. joint a little longer than ⅔ of the 1. one (9:7). 3. joint a little shorter than the 2.one (6:7). 4.—7. joints equal, curved on the out-side, faintly saw-toothed. 5.—7. joints with long hairs on the out-side. The 8. joint a little shorter than the 7.one (5:6). The terminal joint as long as the first flagellum joint, with hairs on the out-side.

Length: 0.8—1.0 mm.

The holotype and paratypes are kept in the collection in Zoological Museum, Oslo.

Biology and rearing place.

Aphanogmus strobilorum is a parasite on the gall midge *Rübsaamenia strobi* (Kieff.). Scales of cones with pupae of this gall midge were placed for rearing in small test tubes. Besides gall midges 9 individuals of this parasite, 4 ♀♀ and 5 ♂♂ were reared. The spruce cones were collected on Finsås

Småbrukskole, Snåsa (NTi 42). The cones were from the previous year, and the insects had wintered as pupae in the cones. On July 10., the cones were taken into a warm room, and after three days the insects emerged. This is my only find of the species, but at the locality mentioned *Rübsaamenia strobi* (Kieff.) was the most common insect on spruce cones.

Platygasteridae.

Hypocampsis contorticornis (Ratz.).

Platygaster contorticornis Ratzeburg, 1844, Ichn. d. Forstins., Bd. I, p. 215.
— Ratzeburg, 1848, Ichn. d. Forstins., Bd. II, p. 143.
Platygaster (Triplatygaster) contorticornis Ratz., Kieffer, 1913, Brot. zool., Bd. 11, p. 178.
— Trägårdh, 1917, Medd. f. Stat. Skogf. anst., Hft. 13—14, p. 1174.
Triplatygaster contorticornis (Ratz.), Kieffer, 1914, Andre. Spec. Hym. Eur., Bd. 11, p. 362.
— Kieffer, 1926, Das Tierreich, 48, Lief., Scelionidae, p. 709.
Hypocampsis contorticornis (Ratz.), Szelenyi, 1938, Folia ent.hung., Bd. 3, p. 100.

Historical note.

Ratzeburg (1844) described the species on material reared from spruce cones and supposed that it lives in the gall midges. He published a supplemental description in 1948 and quotes new localities in 1852. Kieffer (1913) writes about the species in a work on *Platygasteridae* and places it in a new subgenus, *Triplatygaster*. The most thorough investigation on the species was published by Trägårdh (1917). He describes the female and the male and gives new information on the biology. In 1914, Kieffer places it in the new genus *Triplatygaster* Kieffer. Holste (1922) has reared it from cones of spruce in Upper Bavaria. In a monograph concerning *Scelionidae*, Kieffer (1926) gives a description together with a review of the distribution. Szelenyi (1938) places it in the gneus *Hypocampsis* Förster.

Description.

Female.

Head black, broader than thorax (6:5). Ocelli placed nearly in a straight line, the median a little more below. The distance between the median and lateral ocelli is as long as the distance between the lateral ocelli and the border of the eyes. Frons with minute reticulation and hairs. The lower part of frons with minute transverse furrows and a keel

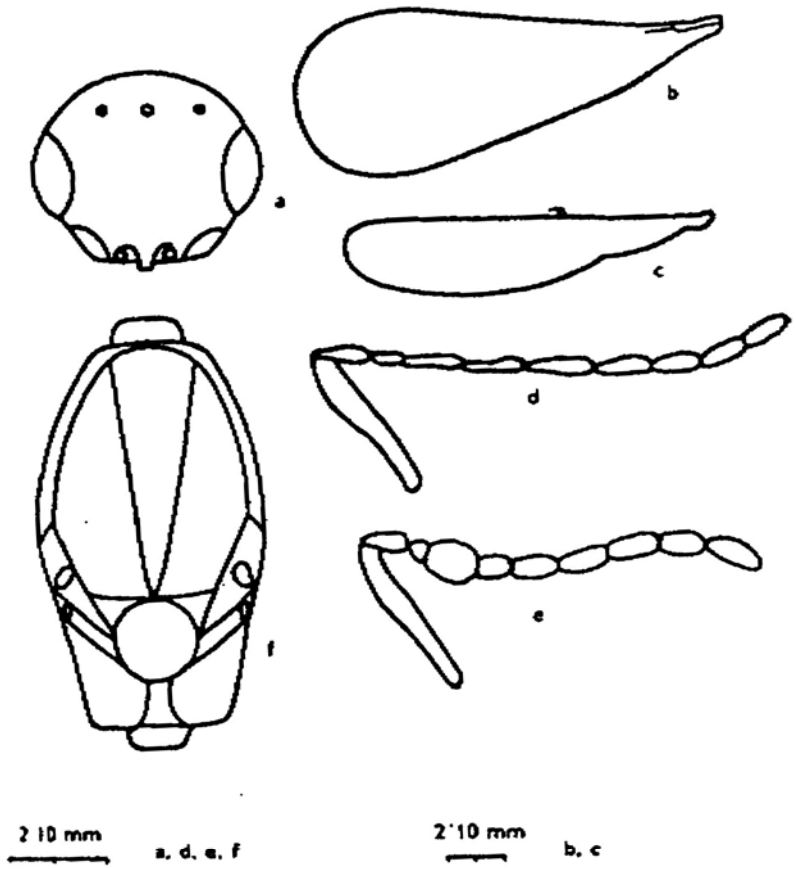


Fig. 16. *Hypocampsis contorticornis* (Ratz.).
a. head ♀, b. fore wing ♀, c. hind wing ♀,
d. antenna ♀, e. antenna ♂, f. thorax ♀.

which terminates in a projection between the inserting points of the antennae. The distance between the inserting points and the eyes nearly twice the distance between the inserting points (7:4). Maxillary palpi with two joints. The terminal one with two hairs which are as long as the both joints together. Mandibles with two teeth. Antennae black, 10-jointed, with minute hairs. The basal segment light brown and arched. Scape nearly straight, a little broader in the distal part, and longer than the distance between the inserting points and the median ocellus. Pedicel club-shaped,

3 times as long as broad and ⅓ the scape in length. The 1.flagellum joint twice as long as broad, the 2.one of the same breadth, but twice as long. The joints following take off in length. The joints are straight on the inner side, but on the out-side they increase in breadth against the distal part. The last three joints are equal, apart from the terminal one, which is rounded off.

Thorax black, sheening, twice as long as broad. Pronotum only visible from the dorsal side as a narrow arch. Mesoscutum lengthened, with longitudinal reticulation. Parapsidal furrows nearly straight, they converge against the posterior part of mesoscutum. Axillae triangular. Scutellum a little broader than long (9:8), the dorsal side rounded off. Metanotum narrow. Propodeum with stiff light hairs, median with two longitudinal lists.

Wings hyaline with hairs, a part of the wings near the the base naked, otherwise with few hairs. Ratio between length and breadth of fore wings 11:4. On the base of the wing is the beginning of a submarginal vein, but it does not run into the wings. Other veins wanting. Ratio between length of fore and hind wings 11:9. Ratio between length and breadth of hind wings 9:2.

Legs black, the distal parts of tibiae and tarsi brown. Protibia with a hyaline three-toothed spur.

Abdomen dorso-ventral flattened, sheening black, tapering, longer than head and thorax together (9:7). Petiolus with many hairs. Measured on the anterior border it is twice as broad as long. On the dorsal side two lists run from the corner and converge against the first abdominal segment. Petiolus and the first abdominal segment as long as the rest of the abdomen. On the dorsal side of the first segment two furrows run parallel to the border from the base ⅓ into the segment. On the anterior part the furrows are covered with light hairs. On the ventral side there are corresponding furrows, but they are more distinct and narrower, faintly S-shaped and reach ⅔ into the segment.

Length: 2.2—2.7 mm.

Male

differs from the female by the following trait of characters: Scape very faintly S-shaped, nearly equal in breadth and 7 times as long as broad. Pedicel egg-shaped. 1.flagellum joint small, ½ the pedicel in length, as broad as long, narrower against the proximal part. 2.flagellum joint twice as broad as the following joints, with a deep and wide slanting

furrow on the underside. Ratio between length and breadth 9:7. Flagellum joints 3—7 equal. The terminal joint a little longer than the last one (9:7). Abdomen as long as head and thorax together, rounded behind.

Length: 2—2.5 mm.

Described from material from Laksfors (Nsi 24).

Biology.

Ratzeburg (1848) reared this species from cones of spruce attacked by *Laspeyresia strobilella* (L.) and "cecidomyia". Subsequent investigations (Trägårdh 1917, Holste 1922) prove that *Hyp. contorticornis* (Ratz.) lives as endoparasite in the larvae of *Plemeliella abietina* Seitn. and *Kaltenbachiella strobi* (Winn.). Many times I found pupae and dead imagines of the parasite in the cocoon of *Kalt. strobi* (Winn.). The parasite was reared either a little before the gall midges, or at the same time and possibly it attacks the gall midges early in their devlopment. Holste (1922) has dissected imagines and pupae from seeds and scales of cones, and Györfi (1941) has reared the parasite from both species of gall midges.

Distribution.

The species was reared from most localities in the district with the exception of the higher mountain forest in Hattfjelldalen (Nsi 23). *Kalt. strobi* (Winn.) was reared in great number from these places, so the want of hosts was not the reason. The species was reared from Rognan in Saltdalen (Nsi 35) in north, to Singsås (Tsi 30) in south. In 1951 it was reared from Lørenskog (AK. 15). Schøyen (1927) mentions it from Trøndelag and Nordland in 1924 and 1925. I have not succeeded in getting hold of this material. In 1931, Schøyen mentions it from the same districts. In examining the material, which the Governmental Entomologist T. H. Schøyen kindly has placed at my disposal I found that the previous identification could not be correct and that the species were *Eutelus strobicola* Ruschka. Eide (1927) has reared the parasite from Trøndelag, but the material is not kept up. In his monograph concerning *Scelionidae* Kieffer (1926) mentions Norway as a part of the distribution territory of the species. It is evident from his publications that he knew the paper of Trägårdh concerning Sweden, and since Kieffer does not mention that the insect is distributed in Sweden, he has possibly confused Sweden and Norway. I have

not succeeded in finding any other information on the species from Norway at so early a time. *Hypocampsis contorticornis* (Ratz.) is distributed in Sweden (Trägårdh 1917), Finland (Györfi 1941) and Germany (Ratzeburg 1844, 1848, 1852, Holste 1922) and France (Kieffer 1926).

Braconidae.

Braconinae.

Bracon pineti Thoms.

Trägårdh (1917) and Lovaszy (1941) have reared a species of the genus *Bracon* from spruce cones in Sweden and Finland. They could not identify the species, but point out that it lives parasitically on *Laspeyresia strobilella* (L.). Holste (1922) also mentions it as a parasite on this insect. Fahringer (1928) who has reared it from cones of spruce, is of the opinion that *Ernobius longicornis* Sturm. and *E. abietis* P. are the hosts. In my samples, I have reared many *B. Pineti* Thoms., but no specimens of these beetles. I therefore considor it most probable that *Bracon pineti* Thoms. must have still another host in Norway, viz., *Laspeyresia strobilella* L.

Distribution.

The species was not common in the investigated district in 1951. In most samples is was reared only in 3—4 individuals, but in one sample consisting of 4 litres of cones 26 individuals, all females were reared. During the spring 1951, the species was reared from Bø (TEi 22), Lørenskog (AK 15), and Arendal (AAy 10). Holste (1922) has reared it from cones of spruce in Upper Bavaria, and Fahringer (1928) mentions that it is taken in Austria (in the vicinity of Wien), Thüringen (Blankenburg) and Dalmatia (Gravosa).

Ichneumonidae.

Pimplinae.

Ephialtes glabratus Ratz.

The species was described by Ratzeburg (1852). Reissig nad reared it from cones of spruce, and Ratzeburg writes that it is a parasite on *Laspeyresia strobilella* (L.). Trägårdh (1917) and Holste (1922) have reared the species from cones

of spruce, and Lovaszy (1941) who has figured the mouth parts of the larvae, points out that it lives ectoparasitically on *Laspeyresia strobilella* (L.) I have found a dead imago in the marrow of a cone, which was attacked by *Lasp. strobilella* (L.).

Distribution.

The species has been reared from 10 samples, but in few individuals only. It was most common in Selbu (STi 38), the locality where I found the greatest attack from *Lasp. strobilella* (L.). In 1951 the species was reared from Bø (TEi 22), Lørenskog (AK 15), and Oslo.

It has been reared from cones of spruce in Sweden (Trägårdh 1917), Finland (Lovaszy 1941), Upper Bavaria (Holste 1922) and Germany (Ratzeburg 1852).

Epiurus atro-coxatus Pfeffer.

The species is, according to Roman (1939), at first described by Pfeffer in 1913. Roman (1917) described it as *Epiurus geniculatus* (Kriechb.) var. *succicus* Rn. but in 1939 he points out that it is the same species as Pfeffer had previously described. Trägårdh (1917) mentions it as *Epiurus geniculatus* Krb.

Distribution.

In my material it was only reared from Stod (NTi 36), 1 ♀ and 1 ♂ and from Selbu (STi 38), 1 ♀.

Trägårdh (1917) reared it from "Köpings ock Kinne revir" and Böda krkp. in Sweden. Roman (1916) reared it from *Pissodes validirostris* in cones of pine from Ingarö near Stockholm, Sweden. Holste (1922) mentions it under the name of *Epiurus geniculatus* Tgh. and has reared it from cones of spruce from Enterrottach in Upper Bavaria.

Ophioninae.

Nemeritis transfuga (Grav.).

Schmiedeknecht (1902—1914, 1930) mentions the species as *Phaedroctonus transfugus* Grav. Mr. W. Hellén, who has identified the species, placed it in the genus *Nemeritis* Holmgren. The closely allied species, *Nemeritis cremastoides*

Holmgren, Schmiedeknecht (1902—1914, 1930) also placed in the genus *Phaedroctonus* Först., but in later publications on forest entomology it is called *Nemeritis cremastoides* Holmgren.

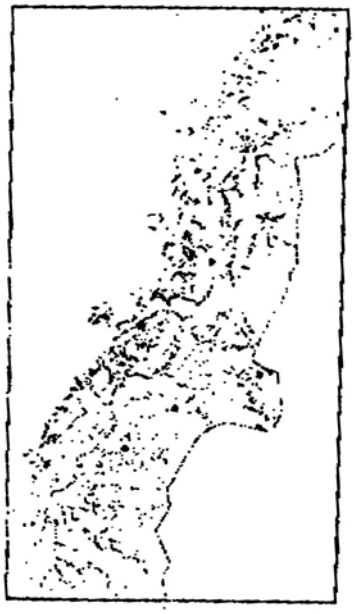
The two mentioned species can, according to Schmiedeknecht (1902—1914), be separated on account of the different length of the ovipositor in relation to the length of the abdomen. *N. transfuga* Grav. has an ovipositor which is half the length of the abdomen, while in *N. cremastoides* Holmgr. the ovipositor is as long as the abdomen. In previous investigations, treating insects from cones of spruce in Sweden (Trägårdh 1917), Finland (Lovaszy 1941) and Upper Bavaria (Holste 1922) the investigators mention that they have reared *N. cremastoides* Holmgr., but they do not quote *N. transfuga* Grav. Trägårdh 1917, fig. 8) has figured *N. cremastoides* Holmgr., while Lovaszy (1941, Abb. 1 c) has published a photograph of the same species. From both figures it appears that the ovipositor is distinctly shorter than the abdomen and in conformity to Schmiedeknecht (1902—1914) the species then must be *N. transfuga* Grav.

According to Schmiedeknecht (1902—1914), Brischke mentions *Dioryctria abietella* as the host of *N. transfuga* Grav. Trägårdh (1917) and Lovaszy (1941) have found *N. cremastoides* Holmgr. as a parasite on *Laspeyresia strobilella* (L.). When the cones were collected there were none that seemed to be attacked by *Dioryctria abietella*, but *Laspeyresia strobilella* (L.) was common all over the districts.

Distribution.

The species has been reared from 17 samples, most of them containing few individuals (2—3). In Selbu (STi 38), however, 19 individuals were reared from 4 litres of cones. From the same sample also 78 *Lasp. strobilella* (L.) were reared. During the spring 1951, the species was reared from cones collected at Arendal (AAy 10), Bø (TEi 22), and Lørenskog (AK 15).

Schmiedeknecht (1902—1914) points out that the distribution territory is North and Central Europe.



17.

Fig. 18.

19.

Fig. 20.

Fig. 17. The occurrence of *Eupithecia pini* (Retz.).
Fig. 18. The occurrence of *Eupithecia bilunulata* (Zett.).
Fig. 19. The occurrence of *Laspeyresia strobilella* (L.).
Fig. 20. The occurrence of *Rübsaamenia strobi* (Kieffer).

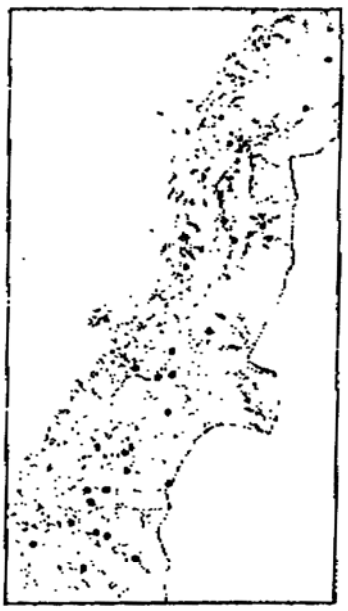


Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 21. The occurrence of *Torymus azureus* Boh.
Fig. 22. The occurrence of *Torymus caudatus* Boh.
Fig. 23. The occurrence of *Litomastix truncatulus* Thoms.
Fig. 24. The occurrence of *Eutelus piceae* Ruschka.

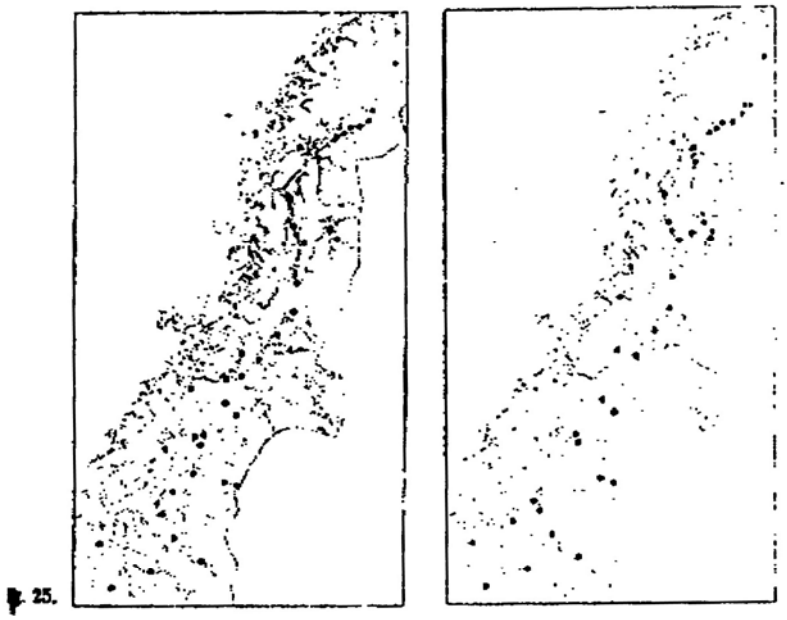


Fig. 25.

Fig. 26.

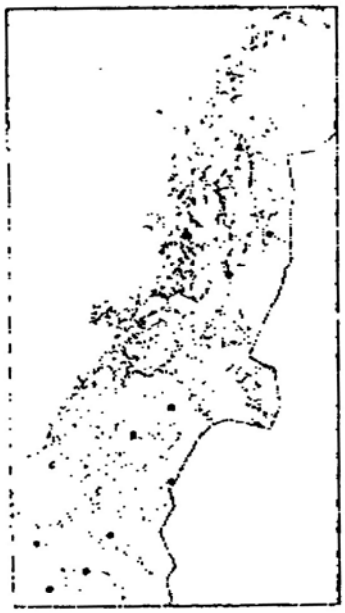


Fig. 27.

Fig. 28

Fig. 25. The occurrence of *Eutelus strobicola* Ruschka.
Fig. 26. The occurrence of *Anogmus strobilorum* Thoms.
Fig. 27. The occurrence of *Elachertus nigritulus* (Zett.).
Fig. 28. The occurrence of *Aprostocetus strobilanae* (Ratz.).

Fig. 29. Fig. 30.

Fig. 31. Fig. 32.

Fig. 29. The occurrence of *Hypocampsis contorticornis* (Ratz.).
Fig. 30. The occurrence of *Bracon pineti* Thoms.
Fig. 31. The occurrence of *Ephialtes glabratus* Ratz.
Fig. 32. The occurrence of *Nemeritis transfuga* Grav.

Summary.

1. During the autumn 1951, 61 samples of spruce cones were collected in different localities in Nordland and Trøndelag counties in Northern Norway. The cones were put in specially constructed rearing cases at Statens Skogfrøverk, Hamar. In the spring and summer 1952, 19 different species of insects were reared from the cones.
2. Among the Lepidoptera, the geometrid *Eupithecia pini* (Retz.) was rare, while *Eupithecia bilunulata* (Zett.) was more common. The Tortricid *Laspeyresia strobilella* (L.) has been reared from practically all the samples and was perhaps the most serious damaging insect.
3. The gall midge, *Kaltenbachiella strobi* (Winn.) was the most common insect, reared in great number in all the samples, *Rübsaamenia strobi* (Kieffer), which previously has been found only in Upper Bavaria, was found in 43 samples, but only a few specimens in each.
4. Parasitic Hymenoptera were reared in great numbers. Among the Chalcids, only *Torymus azureus* Boh. was previously known from Norway. The species: *Torymus caudatus* Boh., *Litomastix truncatulus* Thoms., *Eutelus piceae* Ruschka, *Eutelus strobicola* Ruschka, *Anogmus strobilorum* Thoms., *Elachertus nigritulus* (Zett.) and *Aprostocetus strobilanae* (Ratz.) are new to the Norwegian fauna. *Litomastix truncatulus* Thoms. has not previously been published as reared from spruce cones. Two Proctotrupid were reared viz. *Hypocampsis contorticornis* (Ratz.) which was very common and *Aphanogmus strobilorum* n. sp. reared from *Rübsaamenia strobi* (Kieffer). All these Hymenoptera are redescribed from Norwegian materials. The Braconid, *Bracon pineti* Thoms. and the Ichneumonids, *Ephialtes glabratus* Ratz., *Epiurus atro-coxatus* Pfef. and *Nemeritis transfuga* Grav. were reared in small numbers. None of the last mentioned species have previously been known from Norway.

References.

Aurivillius, C., (1888—91): Nordens fjärilar. Handbok i Sveriges, Norges, Danmarks ock Finlands Macrolepidoptera. Stockholm. 277 pp.

Barnes, H. F., (1951): Gall-idges of economic importance, Vol. V, Trees. London. 270 pp.

Berezina, V. M. og Kurentzov, A. I., (1935): Insects- Cone and Seed Pests of Pine and Fir occurring in the District of Leningrad. (In Russian.) Bull. Plant. Prot. (1, Ent.) nr. 7, 52 pp. Leningrad. -- (Cit. Review appl. Ent. (A), Vol. XXIII, p. 518.)

Boheman, C. H., (1834): Skandinaviska Pteromaliner. Kgl. Vet. Acad. Handl. f. år 1833. Tom. 54, pp. 328—380. Stockholm.
Borkhausen, M., (1794): Naturgeschichte der Europäischen Schmetterlinge nach systematischer Ordnung. Frankfurt T. V.
Bulletin of Zoological Nomenclature I. (1943), London. Published by the International Commission on Zoological Nomenclature.
Cameron, P., (1879): On some new or little known British Hymenoptera. Trans. Ent. Soc. 1879, pp. 107—119. London.
— (1880): Description of a new species of Torymus from Scotland, with notes on other British species of the genus. Ent. Mon. Mag., Vol. XVII, pp. 40—41. London.
De Geer, C. (1771): Memoires pour servir á l'histoire des Insects. T. II, Stockholm.
Dietze, C., (1913): Biologie der Eupithecien, 172 pp., Berlin.
Eide, E., (1927): Undersøkelse av nordenfjelsk granfrø 1925. Medd. f. det norske Skogforsøksv., Hft. 8, pp. 15—39, Oslo.
Escherich, K., (1931): Die Forstinsekten Mitteleuropas. Ein Lehr- und Handbuch, Bd. III, Lepidopteroidea, 825 pp., Berlin.
— (1942): Ibid. Bd. V, Hymenoptera (Hautflügler) und Diptera (Zweiflügler), 746 pp., Berlin.
Fahringer, J., (1928): Opuscula braconologica. Palaearctiche Region. Bd. I, 606 pp., Wien.
Goetze, J., (1794): Entomologische Beiträge zu des Ritter Linné zwölften Ausgabe des Natursystems. T. III, P. III, Leipzig.
Györfi, J., (1914): Beiträge zu geographischen Verbreitung der Schlupfwespen in Finland und zur Kenntnis deren Wirte. Suom. Hyön. Aik., Bd. VII, nr. 2, pp. 86—90. Helsinki.
Haanshus, K., (1933): Fortegnelse over Norges Lepidoptera. Norsk Ent. Tidsskr., Bd. III, pp. 155—216, Oslo.
Hellén, W., (1949): Zur Kenntnis der Encyrtiden (Hym., Chalcidae) Finnlands. Not. Ent. Bd. XXIX, pp. 41—50. Helsingfors.
Hobbs, K. R., (1948): On the classification of Torymus. Pan-Pacific Entomologist, Vol. XXIV, pp. 95—96. San Francisco.
Hoffmeyer, E. B., (1929): Aus Samen gezüchtete Callimomiden. (Callimomidenstudien 1). Ent. Medd., Bd. XVI, pp. 323—334. København.
— (1931): Beiträge zur Kenntnis der dänischen Callimomiden, mit Bestimmungstabellen der europäischen Arten. Callimomidenstudien 5, Ent. Medd. Bd. XVII, pp. 232—286. København.
Hoiste, G., (1922 : Fichtenzapfen- und Fichtenzapfenbewohner Oberbayerns. Zeitschr. f. angew. Ent., Bd. VII, pp. 125—160. Berlin.
Huber, L. L., (1927): A taxonomic and ecological review of the North American Chalcid-flies of the genus Callimome. Proc. U.S Nat. Mus., Vol. 70, art. 14, pp. 1—114, Washington.
Hübner, J., (1796): Sammlung europäischer Schmetterlinge. Augsburg
Jansson, A. (1952): Studier över svenska chalcididier 3. Kläkta arter Ent. Tidskr., Arg. 73, pp. 178—182. Stockholm.
Kangas, E., (1940): Zapfenschäden und Samenertrag der Fichte in J. 1937. Commu. Inst. Forest. Fen., Bd. 29, pp. 1—38. Helsinki
Kangas, E. and Lovaszy, P., (1940): Zur Biologie und forstliche Bedeutung von *Callimome azureum* Boh. (Hym., Chalcididae). Suom Hyön. Aik., Bd. VI., pp. 140—154. Helsinki.
Kieffer, J. J., (1913 a): Diptera, Fam. Cecidomyia, Gen. Ins., Fac. 152. 346 pp. Bruxelles.
— (1913 b): Description de nouveaux microhymenopteres. Broteria, Ser. Zoologica, Vol. II, p. 178, Bahia.

Kieffer, J. J., (1914 a): Proctotrypidæ, André, Spec. Hym. Eur., Tom. XI. Paris.
— (1914 b): Serphidae (Proctotrupidae) et Calliceratidae (Ceraphronidae). Das Tierreich, Lief. 42, 254 pp. Berlin.
— (1920): Cecidomyies habitat les fruits des Coniferes. Broteria, Ser. Zoologica, Vol. XVIII, pp. 14—22. Bahia.
— (1926): Scelionidae, Das Tierreich, Lief. 48, 885 pp. Berlin and Leipzig.
Larsen, C. S., (1931): Tillæg til Fortegnelse over Danmarks Microlepidoptera. Ent. Medd. Bd. 17. pp. 7—213. København.
Lovaszy, P. (1941): Beobachtung über die Biologie und das Auftreten des Fichtenzapfenwickler (Laspeyresia strobilella L.) und seiner Parasiten. Suom. Hyön. Aik., Bd. 7, pp. 93—103. Helsinki.
Mayr, G., (1874): Die europäischen Torymiden, biologisch und systematisch bearbeitet. Verh. zool. bot. Ges. Wien, Bd. XXIV, pp. 53—142. Wien.
— (1875): Die europäischen Encyrtiden, biologisch und systematisch bearbeitet. Verh. zool. bot. Ges. Wien, Bd. XXV, pp. 675—778. Wien.
Morkved, K., (1935): Inn-Trøndelag Skogselskap, Beretning for 1934. 36. årg., 24 pp. Steinkjer.
Priesner, H., (1936): *Aphanogmus steinitzi* spec. nov., ein Coniopterygiden-Parasit. (Hymenoptera-Proctotrupoidea). Bull. Soc. Roy. Entom. de l'Egypte. Bd. XX, pp. 248—251.
Ratzeburg, J. T. C., (1844): Die Ichneumonen der Forstinsecten in forstlicher und entomologischer Beziehung. Bd. I, 224 pp. Berlin.
— (1848): Ibid. Bd. II, 238 pp. Berlin.
— (1852): Ibid., Bd. III, 272 pp. Berlin.
Retzius, A. J., (1783): Caroli De Geer genera et species insectorum. Lipsiae.
Richter, R., (1948): Einführung in die Zoologische Nomenklatur durch Erläuterung der Internationalen Regeln. 252 pp. Frankfurt am Main.
Roman, A. (1917): Skånska parasitsteklar. Ent. Tidskr. Arg. 38., pp. 260—284. Uppsala.
— (1939): Nordische Ichneumoniden- und einige andere. Ent. Tidskr., Arg. 60. pp. 176—205. Stockholm.
Ruschka, R., (1922): Zwei neue Chalciden aus Fichtenzapfen. Zeitschr. f. angew. Ent., Bd. VIII, pp. 161—162. Berlin.
Sahlberg, J., (1890): Cecidomyia Strobi Winnertz, en skade-insekt uti nordens granskogar. Medd. Soc. Faun. Flora. Fen., Heft. 17. pp. 14—16. Helsingfors.
Schmiedeknecht, O. (1902—1914): Opuscula Ichneumonologica. Fasc. I—XXXVII. 2962 pp. Blankenburg.
— (1909): Hymenoptera, Fam. Chalcididæ. Gen. Ins., Fasc. 97. 550 pp. Bruxelles.
Schøyen, W. M. (1898): Beretning om Skadeinsekter og Plantesygdomme i 1898. Landbruksdir. årsberetn. f. 1898. Kristiania.
— (1906): Indberetning om skadeinsekter og andre sygdomme paa skogtræerne i 1904. Skogdir. Indberetn. f. kal. år 1904, pp. 264—270, Kristiania.
— (1912): Indberetning fra statsentomolog W. M. Schøyen om skadeinsekter og sygdomme paa skogtræerne i 1910. Ibid. 1910 pp. 203—207. Kristiania.
— (1914): Insekt- og sopskade paa gran- og furukongler. Tidsskr. f. Skogbruk 1914. Kristiania.

Schøyen, T. H., (1915): Om skadeinsekter og snyltesopp paa skogtrærne i 1914. Skogdir. indber. f. kalår 1914, pp. 150—155. Kristiania.
— (1927): Indberetning fra statsentomolog T. H. Schøyen om skadeinsekter på skogtrærne i 1922—1925. Ibid. 1925. pp. 76—84. Oslo.
— (1931): Ibid. 1926—30. Ibid. 1930. pp. 69—77. Oslo.
— (1936): Melding om skadeinsekter på skogtrærne i årene 1931—1935. Beretning om Det norske Skogvesen for 1935, avgitt av Skogdirekteren. pp. 76—82. Oslo.
— (1943): Melding om skadeinsekter på skogtrærne i årene 1936—1941. Skogdirektørens årsmelding 1941. pp. 1—10. Oslo.
— (1949): Melding om skadedyr på skogtrærne i 1942—1947. Ibid. 1943—1947. pp. 1—10. Oslo.
Seitz, A., (1915): Die Gross-Schmetterlinge der Erde. 1. Abteil. Die Gross-Schmetterlinge des paläartischen Faunengebietes. Bd. IV, 479 pp. Stuttgart.
Spessivtseff, P., (1924): Grankottmätarna *(Eupithecia abietaria* ock *strobilata)* ock deras skadegörelse. Medd. f. Statens Skogförsöksanstalt. Hft. 21, nr. 7 pp. 295—310. Stockholm.
Strand, A., (1943): Inndeling av Norge til bruk faunistiske oppgaver. Norsk Ent. Tidsskr. VI. pp. 208—224. Oslo.
Szelenyi, G. von., (1938): Über eine verkannte Gattung der Platygasteriden, nebst Beschreibung 2 neuer Arten aus der Familie der Scelioniden (Hym. proctotr.). Folia ent. Hung. Bd. 3. pp. 129—136. Budapest.
— (1940): Die paläarktische Arten der Gattung *Aphanogmus* Thoms. (Hym. Proct.). Ann. hist. nat. Mus. Nat. Hung. Pars zoologica. Vol. XXXIII. pp. 122—136. Budapest.
Thomson, C. G., (1875): Skandinaviens Hymenoptera. Del 4. 159 pp. Lund.
— (1878): Hymenoptera scandinaviæ. Tom V. 307 pp. Lundæ.
Trädgårdh, I., (1917): Undersökingar över gran- ock tallkottarnas skadeinsekter. Medd. f. Statens Skogsförsöksanstalt. Hft. 13—14. pp. 1141—1204. Stockholm.
— (1939): Sveriges Skoginsekter. 2. utg. 508 pp. Stockholm.
Zetterstedt, J. W., (1840): Insecta Lapponica. 1139 pp. Lipsiae.