

The first records of the pictured-winged fly *Homalocephala bimaculata* (Wahlberg, 1838) (Diptera, Ulidiidae) from Norway

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The picture-winged fly *Homalocephala bimaculata* (Wahlberg, 1838) is reported from Norway for the first time bringing to five the number of species of *Homalocephala* Zetterstedt, 1838 reported from the country. *H. bimaculata* is recorded from Hvaler, Viken, and Oslo, Oslo, and, based on numerous and scattered records, the species is considered to be under-recorded due to its secretive lifestyle. The species is regarded as native and, based on the many ovipositioning females observed, reproducing successfully. Comments on biology, distribution, habitat, and identification characters are provided.

Key words: Diptera, Ulidiidae, *Homalocephala bimaculata*, first record, Norway, biology, distribution.

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Introduction

The picture-winged flies (Ulidiidae) are a family characterized by characteristic wing markings and/or a characteristic territorial behaviour of displaying the wings. The family was previously named Otididae, and is placed in the superfamily Tephritoidea along with the families e.g. Pallopteridae, Piophilidae, Platystomatidae and Tephritidae. Within the Ulidiidae *Homalocephala* Zetterstedt, 1838 belongs to the tribe Seiopterini, along with *Seioptera* Kirby, 1817 and *Pseudoseioptera* Stackelberg, 1955.

The genus comprises seven species occurring in the nemoral zones of the Palearctic and Nearctic (Northern Europe and North America, Siberia, Russian Far East, Alps and Caucasus)

(Kameneva & Korneyev 2015). All species have predominantly boreal or boreo-montane distributions (Roháček 2012).

Homalocephala bimaculata (Wahlberg, 1838) is the fifth *Homalocephala* species to be identified in the Norwegian fauna adding to the previously known *Homalocephala albitarsis* Zetterstedt, 1838, *H. angustata* (Wahlberg, 1838), *H. apicalis* (Wahlberg, 1838) and *H. biumbata* (Wahlberg, 1838). Two other species which might potentially occur here are *H. mamaevi* Krivosheina & Krivosheina, 1996, known from Austria, Germany and Sweden (Kameneva, 2008, Kameneva & Greve, 2020) and, *H. ozerovi* Krivosheina & Krivosheina, 1997, known from the Russian Far East.

Diagnostic characters

The general impression is of a shining grey-bluish fly with the abdomen slightly darker than the thorax. The body length is approximately 6 mm. The head is flattened and broad, with striking orange frons and frontorbital plate, orange antennae and a white face. The few strong setae are situated on scutellum, scutum and occiput. The halteres including the knobs are white. The wings are typically held vertically when active. In contrast to the relatively non-descript body the wing markings are obvious and distinctive. According to Andersson (1991) and Kameneva & Korneyev (2015), the wing-markings of *Homalocephala bimaculata* are contrastingly pronounced, the inner wing marking is broadly extended down to, and at least partly into, the basal radial cell (br) and may also extend into the discal cell (dm). The outer wing marking is also broad and well pronounced, it clearly extends well beyond R_{4+5} and at least partly into the sub-apical cell, it may also extend diffusely beyond M_{1+2} .

H. bimaculata is most easily confused with *H. biunibrata*, but in the latter species the wing is

hyaline apically. In addition, the femora and tarsi are yellowish in *H. bimaculata* and dark brown in *H. biunibrata*. Cautionary note; in general specimens the wing spots can be less distinctive (Andersson 1991).

Material and methods

Viken (EIS 12), Hvaler: Svarteberget, Asmaløy 59.0548°N 10.9290°E, imago on light/photographed 7 August 2016 (Figure 1), leg./det. Jørn R. Gustad. The specimen was weak and died, but was not collected. The site is situated near the SE coastline of Norway about 16 meters above sea level. The habitat is a swamp deciduous forest with wood in all stages of decay. The species was searched for on a later visit, in 2018 but was not found again.; **Oslo** (EIS 28), Oslo: Bråten, 59.8776°N 10.8634°E, 6+ imago's observed/photographed on a fallen trunk of Aspen *Populus tremula* L. 24 July 2017, leg./det. Arve G. Græsdal. This site was also visited 26 July, 27 July, 31 July, 1 August, 5 August, 12 August, 19 August, 2 September, 3 September, 22 September



FIGURE 1. *Homalocephala bimaculata* (Wahlberg, 1838) 7 August 2016 at Svarteberget, Asmaløy, Hvaler, Viken. Photo: Jørn R. Gustad.

and 30 September. The species was observed on all visits.; Fjellstad, 59.8666°N 10.8616°E, 2+ imago's observed/photographed on a fallen trunk of *P. tremula* 28 July 2017, leg./det. Arve G. Græsdal; Bråten, 59.8773°N 10.8640°E, 2+ imago's including female observed/photographed ovipositioning on a fallen trunk of *P. tremula* 3 August 2017, leg./det. Arve G. Græsdal.;Sørli, 59.8807°N 10.8670°E, 4+ imago's including female observed/photographed ovipositioning on a fallen trunk of *P. tremula* 5 August 2017, leg./det. Arve G. Græsdal.;Nøkle vann, 59.8880°N 10.8744°E, 2+ imago's observed/photographed on a fallen trunk of *P. tremula* L. 1 July 2018, leg./det. Arve G. Græsdal.;Bråten, 59.8772°N 10.8625°E, 4+ imago's including female observed/photographed ovipositioning on a fallen trunk of *P. tremula* 3 August 2018 (Figure 2-4), leg./det. Arve G. Græsdal.;Sørli, 59.8811°N 10.8605°E, 2+ imago's including female observed ovipositioning/photographed on a fallen trunk of *P. tremula* 7 August 2019, leg./det. Arve G. Græsdal.;Østensjøvannet, 59.8886°N 10.8241°E, female observed/photographed ovipositioning on a fallen trunk of *P. tremula* L. 8 August 2019, leg./det. Arve G. Græsdal.;Skullerud, 59.8671°N 10.8481°E, 8+ imago's including female observed/photographed ovipositioning on a fallen trunk of *P. tremula* 13 August 2019, leg./det. Arve G. Græsdal. These were spread on two timber stacks and single trunks in the area. The sites in Oslo are on 115 to 175 meters above sea level.

The specimens were photographed but not collected. The first specimen by Canon D5MKIII with macro lens (Canon MP-E 65 mm 1-5x) and macro flash (Canon Macro Ring Lite MR14-EX II). The next specimens by Olympus OM-D E-M5 II with macro lens (Olympus M.Zuiko Digital ED 60mm F2.8 and macro flash (Olympus STF-8 Twin Flash). The habitat is photographed with Canon PowerShot G11.

Map showing records of *H. bimaculata* in Oslo, with the concentration of the records in the area of Nøkle vann, Oslo can be seen in Figure 5.



FIGURE 2. *Homalocephala bimaculata* (Wahlberg, 1838) 3 August 2018 at Bråten, Oslo. Female, ovipositioning. Dorsal view. Photo: Arve G. Græsdal.



FIGURE 3. *Homalocephala bimaculata* (Wahlberg, 1838) 3 August 2018 at Bråten, Oslo. Female, ovipositioning. Lateral view. Photo: Arve G. Græsdal.



FIGURE 4. *Homalocephala bimaculata* (Wahlberg, 1838) 20 February 2020 at Bråten, Oslo. Habitat. Photo: Arve G. Græsdal.

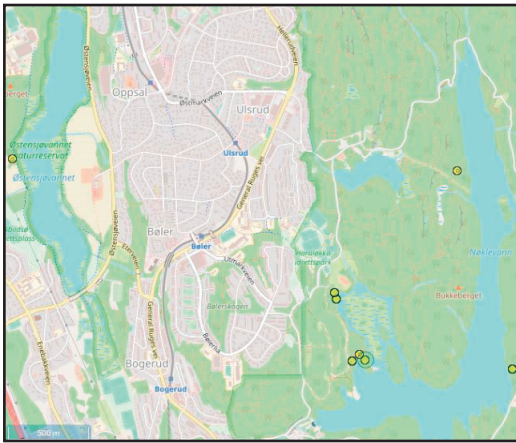


FIGURE 5. Map showing records of *H. bimaculata* in Oslo, with the concentration of the records in the area of Nøklevann, Oslo.

Distribution and biology

In her review of the Norwegian Ulidiidae Greve (1997) considered all *Homalocephala* species as rare, and listed 3 species: *H. angustata*, *H. apicalis* and *H. biumbrata*. Even although *H. albitarsis* was originally described from Dovre, Norway (Andersson, 1991), the original specimens were lost and it was not regarded as a Norwegian species until re-discovered by Greve & Nielsen (2001). *H. apicalis* with only a single Norwegian record is equally rare, it was originally found by Oscar Ringdahl in Norway in July 1913, but no further details of the location are given (Andersson 1991). Comparing the official national biodiversity registers of Scandinavia gives an impression of the rarity index (see Table 1). *H. biumbrata* is the most common species overall. From the records in this paper *H. bimaculata* is found to be the second most common species in Norway. This is in contrast to the situation in Finland where *H. bimaculata* is on the Red List as VU (Vulnerable), with no other *Homalocephala* species rated being of more than LC (Least Concern). This suggests that *H. bimaculata* has its stronghold in Norway and Sweden, or that the observation skills of a single observer matters, having cracked the specific habitat requirements. According to Fauna Europaea (Kameneva & Greve 2020) *H. bimaculata* is additionally only

found in Italy and Russia (both in Asia and in Europe).

The habitat in which *H. bimaculata* is recorded varies from totally shadowed to fully sunny, and from densely to open forest. Other trees in close surroundings are Spruce *Picea abies* (L.) H. Karst., Birch *Betula pubescens* Ehrh., Rowan *Sorbus aucuparia* L., Willow *Salix caprea* L. and Hazel *Corylus avellana* L.

All the sightings in Oslo are on fallen or felled trunks or timber stacks of Aspen *Populus tremula* (Figure 5). The majority of these trunks are felled by Eurasian Beaver *Castor fiber* Linnaeus, 1758. The species has been searched for on fallen/felled trunks of Birch but has never been recorded. This strongly indicates that if the species is not monophagous it shows a very strong preference for Aspen as a larval development site.

On large fallen Aspen (50–60 cm diameter at ground level), there is little adult territorial activity on the lower, larger parts of the trunk, most of the activity is on the thinner branches of the upper parts and crown. On mature trees where the crown is in/under water there is no activity. On younger trees (20–25 cm diameter or less at ground level), there is a tendency that the upper level is preferred, but not exclusively.

In northern Europe Aspen is well known to have an important community of saproxylic Diptera (MacGowan 1993, 2015). The most important microhabitat in which Dipteran larvae develop is the decaying sapwood under the bark. When a tree or branch dies one of the first stages in the decay process is bacterial decomposition of the cambial layers. In Aspen this process results in the gradual build-up of a wet, dark, sweet-smelling layer under the bark. This decay process is common to some extent in all trees, but only in aspen does it develop to such a degree. Over time, usually 3–4 years depending on the size of the tree, the bark separates from the sapwood, cracks and this lets in air allowing the wet decomposition layer to dry out and become unsuitable for the development of larvae.

Homalocephala and the other specialized aspen Diptera are attracted to the fallen aspen by the odour of the decaying cambium. On localities with a large number of trunks of same dimension,

TABLE 1. The rarity index comparing the national biodiversity registers for Norway, Sweden and Finland. The values are number of records which can include more than one specimen. The records from Norway are from Norwegian Biodiversity Centre, personal records of the authors, and published material (Greve 1997, Greve & Nielsen 2001), the records from Sweden are from The Swedish Species Information Centre and published material (Andersson 1991, Kameneva 2008), and the records from Finland are from the Finnish Biodiversity Info Facility. The extensive Wahlberg-material from Östergötland, Sweden is just counted as 1 for each species as record details are not given by Andersson (1991). The current Red List status is given in brackets, accordingly to the national registers above (LC (Least Concern), NE (Not Evaluated), NT (Near Threatened) and VU (Vulnerable)). The species listing is alphabetically.

	Norway	Sweden	Finland
<i>H. albitarsis</i>	2 / 05,13% (NT)	22 / 12,72 % (NE)	8 / 07,14% (LC)
<i>H. angustata</i>	5 / 12,82% (LC)	20 / 11,56 % (NE)	23 / 20,54% (LC)
<i>H. apicalis</i>	1 / 02,56% (NE)	32 / 18,50 % (NE)	18 / 16,07% (LC)
<i>H. bimaculata</i>	10 / 25,64% (-)	22 / 12,72 % (NE)	3 / 02,68% (VU)
<i>H. biumbrata</i>	21 / 53,85% (LC)	75 / 43,35% (NE)	60 / 53,57% (LC)
<i>H. mamaevi</i>	-	2 / 01,16% (NE)	-

can all insect activity be restricted to a few trunks. Males of some species such as *Hammerschmidtia ferruginea* (Fallen, 1817) guard areas on the trunks of fallen trees, intercepting and mating with approaching females (Rotheray et al. 2008). It is likely that *Homalocephala* sp. do the same, defending their “territories” and attracting females by wing waving displays.

Other Diptera observed ovipositioning on aspen trunks with *H. bimaculata* include: *Berkshiria hungarica* (Kertész, 1921), *Homalocephala biumbrata*, *Lonchaea* sp. Fallén, 1820, *Megamerina dolium* (Fabricius, 1805), *Neopachygaster meromelas* (Dufour, 1841), *Paloptera ustulata* (Fallén, 1820), *Strongylophthalmyia pictipes* Frey, 1935, and *Strongylophthalmyia ustulata* (Zetterstedt, 1844). For a list of Diptera sharing the preferences of *H. bimaculata*, see Table 2.

The Norwegian records of *H. bimaculata* range from 1 July to 30 September. From Sweden ovipositioning individuals have been recorded on 9 September and 7 October, and there are several records in mid-October (The Swedish Species Information Centre). The Norwegian localities in Oslo have been visited from May to early autumn, from these observations we consider that the flight period starts about 1 July, and continues into the autumn as long as the weather conditions allow. With the flight period being relatively long the low number of records indicate that this species

is not widespread in the landscape but leads a secretive lifestyle restricted to a small number of trees in a suitable state of decay, often in widely spaced locations.

The biology is little known, literally listed as unknown (Andersson 1991). *Homalocephala* larvae are known to develop in decaying bast under bark of dead trees but also (rarely) in sap runs or in decayed leaves (Rotheray & Robertson 1997, Roháček 2012). Rotheray & Robertson (1998) give detailed descriptions of the third stage larva and puparium of *H. biumbrata*, where all material was collected in wet, decaying sap under the bark of fallen *P. tremula*. They also give detailed descriptions of the larva and puparium of *H. albitarsis*, where the material was found in a broader range of hosts. *Homalocephala* species are known to have distinct (mating) behaviour, e.g. *H. biumbrata* (Roháček & Bilek 2011).

The adult appears on felled aspen trees as soon as the decay process begins. Ovipositioning has been observed on at least two subsequent years on the same trunk. Oviposition behaviour is characterized by the female walking rapidly on the trunk while fluttering its wings. It can move several meters in one direction before it turns and returns. It can then stop and remain still for several minutes before resuming its searching motion. It moves along both the top and sides of the trunk and also goes out onto branches. The maximum number observed is 6–7 individuals

TABLE 2. Diptera sharing habitat preferences with *Homalocephala bimaculata*, at least found as adults on the same trunks in the same season/year, given with a rating of occurrence (common, less common and scarce) on the sites where *H. bimaculata* were found. The species are listed alphabetically. Species tagged with * are commonly seen ovipositioning together and on the same trunk as *H. bimaculata*. *Toxoneura venusta* (Loew, 1858) was observed once under such circumstances. *Pseudotephritis corticalis* (Loew, 1873) was observed ovipositioning on the same trunks used later in the season by *H. bimaculata*. The other species in the table may either laying eggs or might only have been resting on the trunk.

Species	Rating of occurrence
Piophilidae; <i>Amphipogon flavum</i> (Zetterstedt, 1838)	Scarce
Aulacigastridae; <i>Aulacigaster</i> Macquart, 1835	Common
Stratiomyidae; <i>Berkshiria hungarica</i> (Kertész, 1921)	Less common*
Syrphidae; <i>Brachyopa pilosa</i> Collin, 1939	Less common
Syrphidae; <i>Chalcosyrphus valgus</i> (Gmelin, 1790)	Scarce
Drosophilidae; <i>Chymomyza</i> Czerny, 1903	Common
Chloropidae; <i>Gampsocera numerata</i> (Heeger, 1858)	Less common
Ulidiidae; <i>Homalocephala biumbrata</i> (Wahlberg, 1838)	Common*
Lonchaeidae; <i>Lonchaea</i> Fallén, 1820	Common*
Megamerinidae; <i>Megamerina dolium</i> (Fabricius, 1805)	Common*
Stratiomyidae; <i>Neopachygaster meromelas</i> (Dufour, 1841)	Common*
Palloppteridae; <i>Palloptera formosa</i> Frey, 1930	Scarce
Palloppteridae; <i>Palloptera ustulata</i> Fallén, 1820	Common*
Ulidiidae; <i>Pseudotephritis corticalis</i> (Loew, 1873)	Less common
Drosophilidae; <i>Stegana</i> Meigen, 1830	Common
Strongylophthalmyiidae; <i>Strongylophthalmyia pictipes</i> Frey, 1935	Common*
Strongylophthalmyiidae; <i>Strongylophthalmyia ustulata</i> (Zetterstedt, 1844)	Common*
Palloppteridae; <i>Toxoneura venusta</i> (Loew, 1858)	Scarce
Xylophagidae; <i>Xylophagus</i> Meigen, 1803	Less common

on one trunk. Close contact was not observed, but if two individuals meet, the wing fluttering frequency increases, and they dance from side to side, always facing each other. The behaviour is the same towards other insects. Mating was not observed. Sexing specimens from behaviour seems not to be possible, except when a female is ovipositioning. During this process the female also moves as described previously, suddenly stopping for ovipositioning, in a crevice in the bark. The time spent ovipositioning varies from a few seconds to one minute. The female often returns to oviposit again in the very same crevice. When feeding on sap the fly is motionless.

It is our impression that the (same?) flies remain on the same trunk over long periods. At one occasion, one trunk was visited frequently in

the period 24 July–19 August and the species was present on every visit. With the great majority of the individuals in any one year being concentrated on just a few suitable Aspen logs in a forest it is obvious that the species is not come across by general insect collecting and as a result is regarded as rare. Although populations can be large on individual trees the species is however still under threat as modern forestry methods do not always consider the benefits of leaving dead timber in situ.

The beaver was reintroduced to Enebakk, Viken in 1975, with two pairs. It has re-established well, and the population now comprises several hundred individuals. As a result, in the last decades this has led to a substantial increase in the amount of felled Aspen. These trees are left

to decay on site, in contrast to man-felled trees, which are usually removed. As a result, we believe that, thanks to the beaver, many of the flies considered as rare elsewhere are quite commonly encountered at Nøklevann.

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