Hoppers on Black Poplars – The Auchenorrhyncha fauna on *Populus nigra* in Norway

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The known distribution of *Populus nigra* and its associated 1st and 2nd degree monophagous Auchenorrhyncha in Norway is given, and their indicated range expansion is discussed. Four Auchenorrhyncha species new to the Norwegian fauna is presented (*Rhytidodus decimusquartus, Tremulicerus fulgidus, Kybos abstrusus,* and *Empoasca ossiannilssoni*) together with several new regional records. All specimens were collected during 2007–08, and were all collected from *P. nigra* (sens. lat.) (except for hibernating specimens).

Key Words: *Populus nigra*, Auchenorrhyncha, *Rhytidodus decimusquartus*, *Tremulicerus fulgidus*, *Kybos abstrusus*, *Empoasca ossiannilssoni*, Norway

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INTRODUCTION

The Auchenorrhyncha fauna (hoppers) of Norway is poorly known, and very few have worked with this group of insects in Norway since Ossiannilsson published his "The Auchenorrhyncha (Homoptera) of Fennoscandia and Denmark" (Ossiannilsson 1978, 1981, and 1983). An exception being H. Holgersen, who published several papers on the Norwegian Auchenorrhyncha fauna (e.g. Holgersen 1985, 1989). In his catalogue, Ossiannilsson (1983) lists 264 species from Norway and give their distribution based on modified (merged) Strand-regions (Strand 1943). Including Ossiannilssons publications and more recent ones, we now have 278 published Auchenorrhyncha species from Norway (including the four new published here) (Ossiannilsson 1978, 1981, 1983, Holgersen 1985, 1992, Raatikainen & Ylönen 1988, Hansen & Borgersen 1991, Olsen 1999, Hansen 2000).

In general, Auchenorrhyncha species in Europe show some degree of host selectivity and many species are associated with only one or a few host plants (Nickel 2003). The host plant is defined as species on which the oviposition and nymphal development takes place (Nickel 2003). Adult hibernation may take place on a different plant species, but this is for most species unknown (Nickel 2003). Diet breadth can be classified according to number of host plants used by a species (Jolivet 1998). 1st degree monophagy refers to phytophagous organisms having one host species, 2nd degree monophagy having one host genus, oligophagous organisms having one or a few host families, and finally polyphagous organisms having several host plant families (Jolivet 1998).

The distribution of black poplar *Populus nigra* in Norway is also poorly known, but several factors make this tree species interesting. It has a restricted and patchy distribution in Norway,

with large distances between each locality as most specimens found have been planted in urban areas as ornamental trees. Several subspecies and hybrids of black poplar are found, and some of them are difficult to distinguish without the use of molecular methods (Nitzelius 1945, Cottrell 2004). *P. nigra* is regarded as an alien species in Norway (Gederaas 2007) although autochthonous (native) black poplar is one of the most threatened tree species in Europe (Vanden Broeck 2003, Cottrell 2004).

P. nigra is also one of the plant species having most monophagous Auchenorrhyncha in Europe. According to Nickel (2003) there are seven 1st degree monophagous hopper species associated with *P. nigra* and its hybrids, all belonging to the family Cicadellidae. In addition, one 2nd degree monophagous species is found on the genus *Populus*. Some of these species have previously been found in Norway (*Macropsis graminea, Stenidiocerus poecilus,* and *Populicerus nitidissimus*), but these records are few and at least 60 years old (Ossiannilsson 1981). Their status and present distribution in Norway have therefore been uncertain.

Plant material is consider being one of the major vectors for introduced invertebrates, and is believed to be the spreading agent for several species of Hemiptera discovered in Norway recent years (Ødegaard & Endrestøl 2007). 40% of the alien insects are categorised as low-risk species, but the knowledge on alien invertebrates is generally poor (Gederaas et al. 2007). This paper adds to this knowledge by indicating range expansion of several species of hoppers 1st or 2nd degree monophagous on an alien plant species, *P. nigra.*

MATERIAL

During 2007–08, specimens of *P. nigra* and its associated Auchenorrhyncha fauna was investigated. All localities investigated and the 1st and 2nd degree monophagous species found are listed in table 1.

Populus nigra complex

Within the genus *Populus* L., only *P. tremulae* is native to the Nordic countries. The other species within the genus are usually grown as ornamental trees in gardens and parks (Nitzelius 1945, Karhu 2000). The complex of *P. nigra* L. consists of different hybrids, subspecies, and variants. In Norway, the forms of *P. nigra* found is mainly *P. nigra* subsp. *nigra, P. nigra* var. *italica* (sometimes distinguished as *P. nigra* var. *italica* and *P. nigra* var. *plantierensis* – here only *P. nigra* var. *italica* is distinguished). Also two hybrids of *P. nigra* can be found, respectively *P. x canadensis* (*P. deltoids x nigra*) and *P. x berolinensis* (*P. laurifolia x nigra*) (Karhu 2000). *P. nigra* can be identified from other poplars with their compressed or angular petiole, triangular to rhombic-shaped, glabrous leaves (for details, see Karhu 2000). Below, subspecies and hybrids are treated sensu latu as *P. nigra* if not specified in the text. Other more exotic species of *Populus* could also be found in Norway, e.g. *P. laurifolia, P. simonii, P. tristis,* and *P. trichocarpa*. Some of these can be found in the botanical garden in Oslo (pers. obs.), but they probably have a more strict distribution in Norway compared to *P. nigra* (Karhu 2000, Lid & Lid 2005, Often 2007).

P. nigra in Norway

According to Karhu (2000), *P. nigra* is found in Ø (Fredrikstad and Sarpsborg), AK and BØ (Lier) (even though *P. nigra* var. *italica* (= *plantierensis*) is reported north to ST). In the vascular plant database at the Natural History Museum (NHM) in Oslo, only 9 records of *P. nigra* exist from Norway (four from Ø: Fredrikstad and Sarpsborg, two from VE: Nøtterøy, two from BØ: Drammen and Lier, and one from RY: Sokndal). Three more unregistered records are found in this herbarium (one from AK: Kristiania (= Oslo) 1917 and one from TEI: Tokke ~1850). After revising the specimens of *Populus* section *Aegiros* (*P. nigra, P. x canadensis*, and also *P. x berolinensis*) with a botanist at NHM (T. Berg), it became clear that many of the specimens where misidentified. As to *P. nigra*, only three specimens seemed to be certain, namely two from Ø and one previously misidentified as *P. x berolinensis* (also from Ø) (R.

Table 1. New localities of *P. nigra* (sens. lat.) and associated Auchenorryncha (1st and 2nd degree monophagous – Nickel 2003) found during 2007-08. Abbreviations: Reg= Region, not= number of trees, pmc= plant material collected, inv= investigated, *Mg= Macropsis graminea*, *Rd= Rhytidodus decimusquartus*, *Sp= Stenidiocerus poecilus*, *Tv= Tremulicerus vitreus*, *Tf= Tremulicerus fulgidus*, *Pn= Populicerus nitidissimus*, *Ka= Kybos abstrusus*, *Kp= Kybos populi*, Y= Yes, N= No, X= Present, * record including distant (> 50m) individual trees or clusters.

Reg	Municipality	Locality	UTM (32V)	Host species	not	pmc	inv	*Mg*	*Rd*	*Sp*	*Tv*	*Tf*	*Pn*	*Ka*	*Kp*
Ø	Fredrikstad	Sentrum	PL11186505	*P. nigra* var. *italica*	~20	N	Y	X		X			X	X	
Ø	Moss	Sentrum	NL94008957	*P. nigra* var. *italica*	6	Y	Y								
AK	Oslo	Akershus festning	NM97184261	*P. x canadaensis*	3	Y	N								
AK	Oslo	Bjørvika	NM97744251	*P. nigra* var. *italica*	1	N	N								
AK	Oslo	Bygdøy	NM94044343	*P. nigra* var. *italica*	1	N	Y		X	X			X		
AK	Oslo	Frogner	NM94804332	*P. nigra* var. *italica*	1	N	Y							X	
AK	Oslo	Hovedøya	NM96774109	*P. nigra* var. *italica*	1	N	Y	X	X						X
AK	Oslo	Hovedøya	NM96814132	*P. nigra* var. *italica*	1	N	Y			X					
AK	Oslo	Kampen skole	NM99694298	*P. nigra* var. *italica*	1	N	N								
AK	Oslo	Kubaparken	NM97944425	*P. nigra nigra*	~20	Y	Y	X		X			X	X	X
AK	Oslo	Lakkegata skole	NM98814380	*P. nigra* var. *italica*	2	N	N								
AK	Oslo	Lindøya	NM96154072	*P. nigra* var. *italica*	1	N	Y	X				X			
AK	Oslo	Schous plass	NM98404389	*P. nigra* var. *italica*	2	N	N								
AK	Oslo	Slottsparken	NM96544326	*P. nigra* var. *italica*	2	N	N								
AK	Oslo	St. Hanshaugen	NM97324439	*P. nigra* var. *italica*	3	Y	Y	X					X		
AK	Oslo	Tøyen	NM99064336	*P. nigra* var. *italica*	1	N	N								
AK	Oslo	Tøyenbadet	NM99324354	*P. nigra nigra*	3	Y	N								
AK	Oslo	Vika	NM96654283	*P. nigra* var. *italica*	~155	Y	N								
AK	Oslo	Tøyen (bot. hage)	NM99054377	*P. nigra* var. *italica*	4	Y	Y			X		X	X	X	X
HES	Hamar	Holset	PN13054192	*P. nigra* var. *italica*	4*	N	Y								
HES	Hamar	Ajer	PN12054318	*P. nigra* var. *italica*	1	N	N								
BØ	Drammen	Bacheparken	NM65452422	*P. x berolinensis*	2	Y	Y						X		X
BØ	Drammen	Bragernes	NM67502400	*P. x berolinensis*	1	Y	Y						X	X	X
BØ	Drammen	Holmen	NM68512283	*P. nigra* var. *italica*	~20	Y	Y		X			X	X		
BØ	Drammen	Pukerud	NM62892374	*P. x berolinensis*	1	Y	Y			X				X	X
BØ	Drammen	Stormoen	NM64142378	*P. x berolinensis*	1	Y	Y						X	X	
BØ	Drammen	Strømsø	NM68432199	*P. nigra* var. *italica*	3	N	Y			X				X	
BØ	Lier	Nøste	NM69232385	*P. nigra* var. *italica*	2	N	Y								
BØ	Nedre Eiker	Krokstad industriomr.	NM56012471	*P. x canadaensis*	~5	Y	Y			X			X		X
VE	Horten	Indrehavn	NL83798801	*P. x canadaensis*	~5	Y	Y			X			X	X	X
VE	Tønsberg	Sentrum	NL80847048	*P. nigra nigra*	1	Y	Y						X	X	X
TEY	Porsgrunn	Klevstrand	NL37185360	*P. x berolinensis*	2	N	Y			X					
TEY	Skien	Sentrum	NL34226470	*P. nigra* var. *italica*	11	N	Y	X	X	X				X	
TEI	Notodden	Sentrum	NM14950244	*P. nigra* var. *italica*	2	N	Y						X		
RY	Stavanger	Sentrum, Møllegt.	LL11804096	*P. nigra* var. *italica*	2*	N	Y						X		
RY	Stavanger	Sentrum, Tjodolvsgt.	LL11564022	*P. x canadaensis*	~10*	N	Y						X		
RY	Stavanger	Sentrum, Helland krk.	LL12764114	*P. x canadaensis*	10	Y	Y						X		
RY	Stavanger	Sentrum, Helland krk.	LL12604114	*P. nigra* var. *italica*	5	N	Y						X		
HOI	Kvam	Ålvik	LN58830223	*P. nigra* var. *italica*	2	N	Y								

Elven pers. com.). In the vascular plant database in Bergen Museum (BM) only four records exists of *P. nigra*, all dating from 1926 and back to 1876 (one from VE: Holmestrand, one from Ø: Fredrikstad, one from HOI: Ullensvang, and one from HOY: Bergen). I have seen botanical field notes on observations of *P. nigra* from AAY: Arendal, Merdø (Agder botaniske forening 2001). In addition, two records of *P. x canadensis* (Ø: Hvaler og RY: Klepp), and 28 records of *P. x berolinensis* (three from Ø: Fredrikstad, Halden and Moss, six from AK: Oslo, Asker and Skedsmo, five from BØ: Lier and Drammen, four from VE: Tjøme and Horten, ten from HES: Hamar, Ringsaker and Stange) are registered in the vascular plant database at the NHM. None of these hybrids are registered in the database at BM.

I have investigated the localities of several of these known records, including records of misidentified specimens. Some of the localities could not be rediscovered, even though I had good descriptions. In addition to previous known localities for *P. nigra*, I have discovered several new ones (tab 1). Many of these were suspected to be newly planted *P. nigra* var. *italica* in connection with different urban constructions and parks (e.g. Ø: Fredrikstad and BØ: Strømøy). Also single, large, old trees are scattered around in Oslo in vicinity of old buildings (e.g. Lakkegata skole, Zoologisk Museum (NHM), Deichmanske bibl. (Schous plass), Oslo børs (Bjørvika), Kampen skole). The single largest stand of *P. nigra* I have come across is the 155 trees of *P. nigra* var. *italica* surrounding a parking lot downtown Oslo. Plant material from some of the *P. nigra* specimens was collected for verification and has been stored at the herbarium at the Natural History Museum in Oslo (tab 1).

Auchenorrhyncha on *P. nigra* in Norway

The Auchenorrhyncha fauna on *P. nigra* was investigated on known specimens of *P. nigra* and several non-registered specimens. All hoppers where collected using a sweep-net, and in a few cases collected nymphs were reared indoors.

Below, all the European 1st and 2nd degree monophagous species on *P. nigra* are listed, given their status and findings in Norway with general remarks on their biology and distribution. Some other interesting findings of generalist species of hoppers found on *P. nigra* during this investigation are mentioned in the text at the end, both with the intention to report on their distribution and their host association.

* = New regional record, ** = New to Norway. Leg. and coll. "author" if nothing else is mentioned. Investigated specimens from the collection at the Natural History Museum in Oslo are referred to as coll. NHM. Other records listed are reviewed from literature. Geographical regions of Norway (Strand-regions) follow Økland (1981) and EIS grid follows Endrestøl (2005). Nomenclature follows Nast (1987).

Macropsinae Evans, 1935

***Macropsis graminea* (Fabricius, 1798)**

Ø, EIS 20, Fredrikstad: Sentrum (32VPL11186505) 05.IX.2007 3 ex. ♀♀; AK, EIS 28, Oslo: Tøyen coll. Holgersen, leg. H. Holgersen, date unknown 19 ex. ??; AK, EIS 28, Oslo: St. Hanshaugen (32VNM97324438) 14.VIII.2007 1 ex. ♀; AK, EIS 28, Oslo: Kubaparken (32VNM97964424) 14.VIII.2007 1 ex., 28.VIII.2007 1 ex. ♀; AK, EIS 28, Oslo: Lindøya (32VNM96154072) 15.VI.2008 3 ex. ♀♀; AK, EIS 28, Oslo: Hovedøya (32VNM96774109) 12.VIII.2008 2 ex. ♀♀, 1 ex. ♂; **TEY**, EIS 18, Skien: Sentrum (32VNL34226470) 17.VII.2008 3 ex. ♀♀

The status of *M. graminea* in Norway has been uncertain. Holgersen collected 19 specimens in AK: Oslo, Tøyen (coll. Holgersen) (Ossiannilsson 1981). I suspect the locality to be the botanical garden, as he collected *Stenidiocerus poecilus* from *P. nigra* var. *italica* here (Holgersen 1944). Only one specimen is found in the Norwegian collection at NHM (ex. coll. Simony, det. Ossiannilsson 1975), but the locality is not given and the specimen is suspected to be a foreign specimen. In addition to Norwegian records, only old Swedish records exist within Fennoscandia (Ossiannilsson 1981). Nickel (2003) suspects German records to be near the northern edge of its range.

Figure 1. *Rhytidodus decimusquartus* (Schrank, 1776) is new to Norway. Photo. Karsten Sund, NHM Oslo

M. graminea is 1st degree monophagous on *P. nigra*. It could also occasionally be found on hybrids, but the reproduction success on hybrids is uncertain (Nickel 2003). I have not found any *M. graminea* on *P. nigra* hybrids.

Idiocerinae Baker, 1915

***Rhytidodus decimusquartus* (Schrank, 1776)** (Fig. 1)

AK, EIS 28, Oslo: Bygdøy (32VNM94044343) 31.VIII.2007 1 ex. ♀; AK, EIS, 28, Oslo: Hovedøya (32VNM96774109) 12.VIII.2008 1 ex. ♀; **BØ**, EIS 28, Drammen: Strømøy (32VNM68512283) 18.IX.2007 2 ex. ♀♀, 5 ex. ♂♂; **TEY**, EIS 18, Skien: Sentrum (32VNL34226470) 14.VI.2008 17. VII.2008 1 ex. ♀

This species is new to Norway. It is previously only found once in Fennoscandia (Sweden, Gotland) by R. Remane (Ossiannilsson 1981). One male individual have been caught in a light trap in Kaliningrad (G. Söderman pers. com.).

The nymphs are 1st degree monophagous on *P. nigra* (Tromellini et al. 1987, Nickel 2003). I have only found *R. decimusquartus* on *P. nigra* var. *italica*. Adults are found from July to October. Some females can hibernate as adults; otherwise they hibernate mainly as eggs (Nickel 2003). In the southern parts of Europe, *R. decimusquartus* has been demonstrated to have several generations per year, hibernating in different stage in different populations (Tromellini et al. 1987). I have not been able to find any hibernating adults (see *Stenidiocerus poecilus* below). The specimens found in Drammen: Strømøy were collected as nymphs and reared indoors on branches of *P. nigra*.

***Stenidiocerus poecilus* (Herrich-Schäffer, 1835)** (Fig. 2)

Ø, EIS 20, Fredrikstad: Sentrum (32VPL11186505) 08.IX.2007 2 ex. ♀♀; AK, EIS 28, Oslo: Frogner, coll. NHM, leg. L. M. Esmark 13.VII.1846 1 ex. ♀, 1 ex. ♂; AK, EIS 28, Oslo: Fossum v. Aker, coll. Holgersen, leg. Holgersen, 09.1939, 1 ex. ?; AK, EIS 28, Oslo: Røa v. Aker, coll. Holgersen, leg. Holgersen, 16.10.1939, 1 ex. ?; AK, EIS 28, Oslo: Kubaparken (32VNM97954424) 14.VIII.2007 2 ex. ♀♀; AK, EIS 28, Oslo: Bygdøy (32VNM94044343) 31.VIII.2007 1 ex. ♂; AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99024376) 27.V.2008 6 ex. ♀♀; AK, EIS 28, Oslo: Hovedøya (32VNM96814132) 12.VIII.2008 1 ex. ♀; **BØ**, EIS 28, Drammen: Pukerud (32VNM62892374) 31.VIII.2007 1 ex. ♂; BØ, EIS 28, Nedre-Eiker: Krokstad (32VNM56012471) 01.IX.2007 1 ex. ♂; BØ, EIS 28, Drammen: Fjell (32VNM68432199) 08.IX.2007 1 ex. ♂; **VE**, EIS 19, Horten: Indrehavn (32VNL83798801) 08.IX.2007 3 ex. ♀♀; TEY, EIS 11, Kragerø, coll. NHM, leg. A. C. Ullmann (~1880) 2 ex. ♂♂; TEY, EIS 18, Porsgrunn: Klevstrand (32VNL37185360) 14.VI.2008 1 ex. ♂; TEY, EIS 18, Skien: Sentrum (32VNL34226470) 14.VI.2008 2 ex. ♂♂, 3 ex. ♀♀ 17.VII.2008 2 ex. ♂♂

Six specimens have previously been found in Norway (AK and TEY), but it is not reported in the last 70 years. *S. poecilus* is a very rare species in Fennoscandia, with few and sporadic records from Finland and Sweden (Ossiannilsson 1981, Söderman 2007). It is still not found in Denmark

(Ossiannilsson 1981). In this investigation it seemed rather common, with several findings in different regions.

The nymphs are 1st degree monophagous on *P. nigra* (Nickel 2003, Söderman 2007). According to Ossiannilsson (1981) it is also found on *P. tremulae*, but it is referred to an old finding of a hibernating specimen (Sahlberg 1871 in Ossiannilsson 1981). Hibernating specimens are also reported from coniferous trees (Nickel 2003). Adults can be found from mid July to mid June as they hibernate as adults.

Several evergreen trees and bushes close to specimens of *P. nigra* were investigated with a sweep-net at two localities in Oslo (Botanical garden (Tøyen), and Gamle Aker) during the winter (Jan–Feb 08) (species investigated including *Buxus sempervirens*, *Abies magnifica*, *A. balsamea*, *A. veitchii*, *Rhododendron* spp., *Tsuga canadensis*, *T. mertensiana Euonymus fortunei, Sequoiadendron gigateum, Picea obovata, P. pungens, P. breweriana, Pinus sylvestris, P. cembra, P. wallichiana, P. contorta, P. nigra, Hedera helix, Juniperus communis, Pseudotsuga menziesii, Thuja* spp., and *Taxus* spp.). Leaf litter and soil samples collected beneath the *P. nigra* specimens where investigated with a Berlese funnel during the same period. No specimens of *S. poecilus* were found.

***Tremulicerus vitreus* (Fabricius, 1803)**

This species is so far the only monophagous species on *P. nigra* that has not been found in Norway. Until recently it was not recorded from Fennoskandia at all, but in 2007 it was found in Sweden (Gillerfors 2008). To my knowledge only recorded once from Denmark (Jensen-Haarup 1920). According to Jensen-Haarup (1920) it was recorded from *Populus* in Denmark (1870). It is found frequently in middle and southern Germany, but less so in northern parts where the northern edge of its distribution is suspected to be (Nickel 2003). Reported to hibernating as egg, but the recent finding from Sweden (Varberg 17.12.2007 on *Pseudotsuga*), document that this species also can hibernate as adult.

****Tremulicerus fulgidus* (Fabricius, 1775)**

(Fig. 2)

AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99014376) 28.VIII.2007 9 ex. ♀♀, 1 ex. ♂; AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99124375) 25.II.2008 1 ex. ♂; AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99124375) 27.V.2008 3 ex. ♀♀; AK, EIS 28, Oslo: Aker gamle kirke (32VNM97764429) 03.III.2008 1 ex. ♂; AK, EIS 28, Oslo: Lindøya (32VNM96154072) 15.VI.2008 2 ex. ♀♀, 1 ex. ♂; **BØ**, EIS 28, Drammen: Strømøy (32VNM68512283) 08.IX.2007 2 ex. ♀♀, 1 ex. ♂

This species is new to Norway. Published new to Sweden in 2005 (Gillerfors 2005). The species is 1st degree monophagous on *P. nigra*. I have only found *T. fulgidus* on *P. nigra* var. *italica*. It is reported to hibernate on *Picea, Calluna, Hedera, Pinus,* and *Cupressus*. (Nickel 2003). In Germany it is widespread in middle and southern parts (at low altitude), and probably absent from the north (Nickel 2003).

I also investigated the presence of hibernating *T. fulgidus* with the same method and on the same evergreen tree- and bush species as mentioned above (see *Stenidiocerus poecilus*). One specimen of *T. fulgidus* was found on a Douglas fir (*Pseudotsuga menziesii*) 25.02.2008 and one on English ivy (*Hedera helix*) 03.03.2008.

***Populicerus nitidissimus* (Herrich-Schäffer, 1835)**

Ø, EIS 20, Fredrikstad: Sentrum (32VPL11186505) 05.IX.2007 8 ex. ♀♀, 1 ex. ♂; AK, EIS 28, Oslo: Tøyen (bot. hage), coll NHM, leg. Holgersen, 29.VII.1943, 1 ex. ♂; AK, EIS 28, Oslo: Kubaparken (32VNM97954424) 14.VIII.2007 11 ex. ♀♀, 8 ex. ♂♂; AK, EIS 28, Oslo: St. Hanshaugen (32VNM97324438) 14.VIII.2007 1 ex. ♀, 2 ex. ♂♂; AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99014376) 28.VIII.2007 9 ex. ♀♀, 8 ex. ♂♂; AK, EIS 28, Oslo: Kubaparken (32VNM97954424) 28.VIII.2007 15 ex. ♀♀, 11 ex. ♂♂; AK, EIS 28, Oslo: Bygdøy (32VNM94044343) 31.VIII.2007 1 ex. ♂; AK, EIS 28, Oslo: Hovedøya (32VNM96774109) 12.VIII.2008 1 ex. ♀; **BØ**, EIS 28, Drammen: Bacheparken (32VNM68432199) 31.VIII.2007 3 ex. ♀♀; BØ, EIS 28, Drammen: Bragernes (32VNM67502400) 31.VIII.2007 3 ex. ♀♀; BØ, EIS 28, Drammen: Stormoen (32VNM64142378)

Figure 2. *Stenidiocerus poecilus* (Herrich-Schäffer, 1835) (right) and *Tremulicerus fulgidus* (Fabricius, 1775) (left), with some unidentified nymphs in the middle. *T. fulgidus* is new to Norway and *S. poecilus* was last reported 70 years ago. This picture was taken 3 meters from the entrance to the zoological museum (NHM, Oslo) on branches of *P. nigra* var. *italica*. Photo: Anders Endrestøl, NHM, Oslo

31.VIII.2007 1 ex. ♀, 1 ex. ♂; BØ, EIS 28, Drammen: Strømøy (32VNM68512283) 08.IX.2007 2 ex. ♀♀, 2 ex. ♂♂; BØ, EIS 28, Nedre-Eiker: Krokstad (32VNM56012471) 01.IX.2007 3 ex. ♀♀, 4 ex. ♂♂; **VE**, EIS 19, Horten: Indrehavn (32VNL83798801) 08.IX.2007 2 ex. ♀♀; VE, EIS 19, Tønsberg: Sentrum (32VNL80847048) 08.IX.2007 1 ex. ♀; **TEY**, EIS 18, Skien: Sentrum (32VNL34226470) 17.VII.2008 2 ex. ♀♀, 2 ex. ♂♂; **TEI**, EIS 27, Notodden: Sentrum (32VNM14950244) 14.IX.2008 2 ex. ♀♀; **RY**, EIS 7, Stavanger: Sentrum, Tjodolvsgt. (32VLL11564022) 27.IX.2008 8 ex. ♀♀, 1 ex. ♂; RY, EIS 7, Stavanger: Sentrum, Helland krk (32VLL12764114) 27.IX.2008 2 ex. ♀♀; RY, EIS 7, Stavanger: Sentrum, Helland krk (32VLL12604114) 27.IX.2008 2 ex. ♀♀; RY, EIS 7, Stavanger: Sentrum, Møllegt. (32VLL11734109) 27.IX.2008 2 ex. ♀♀

This species is not reported from Norway in the last 65 years. It was reported new to Norway in 1944 (Holgersen 1944). One specimen is found in the collection at NHM (AK: Tøyen leg. Holgersen). Five more specimens should be found in coll. Holgersen (Holgersen 1944). Only sporadic records exist from Finland and Sweden (Ossiannilsson 1981, Söderman 2007). It is not recorded from Denmark according to Ossiannilsson (1981), but it is mentioned by Skipper (2001).

This species is 1st degree monophagous on *P. nigra*. It also has a southern European distribution with fewer findings towards the north (Nickel 2003).

Typhlocybinae Kirschbaum, 1868

***Kybos abstrusus* (Linnavuori, 1949)** (Fig. 3)

Ø, EIS 20, Fredrikstad: Sentrum (32VPL11186505) 05.IX.2007 8 ex. ♀♀, 1 ex. ♂; **AK**, EIS 28, Oslo: Kubaparken (32VNM97954424) 14.VIII.2007 4 ex. ♀♀, 1 ex. ♂; AK, EIS 28, Oslo: Kubaparken (32VNM97954424) 28.VIII.2007 8 ex. ♀♀, 1 ex. ♂; AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99014376) 28.VIII.2007 7 ex. ♀♀, 1 ex. ♂;

Figure 3. *Kybos abstrusus* (Linnavuori, 1949) is new to Norway. Photo. Karsten Sund, NHM Oslo

AK, EIS 28, Oslo: Tøyen (bot. hage) (32VNM99034345) 28.VIII.2007 1 ex. ♂; **BØ**, EIS 28, Drammen: Bacheparken (32VNM68432199) 31.VIII.2007 1 ex. ♀; BØ, EIS 28, Drammen: Stormoen (32VNM64142378) 31.VIII.2007 4 ex. ♀♀; BØ, EIS 28, Drammen: Pukerud (32VNM62892374) 31.VIII.2007 1 ex. ♀; BØ, EIS 28, Drammen: Fjell (32VNM68432199) 08.IX.2007, 2 ex. ♀♀; **VE**, EIS 19, Horten: Indrehavn (32VNL83798801) 08.IX.2007, 3 ex. ♀♀; VE, EIS 19, Tønsberg: Sentrum (32VNL80847048) 08.IX.2007 3 ex. ♀♀; **TEY**, EIS 18, Skien: Sentrum (32VNL34226470) 17.VII.2008 1 ex. ♀

This species is new to Norway. It is found in Sweden and Finland, but still not in Denmark (Ossiannilsson 1981, Söderman 2007). It has a scattered distribution in Germany and there possibly at the northwest edge of the range (Nickel 2003).

The species is 1st degree monophagous on *P. nigra*, and it hibernates as egg (at least so in Central Europe, where it has two generations) (Dworakowska 1976).

******Kybos populi* **(Edwards, 1908)**

AK: EIS 28, Oslo: Oslo, coll. NHM, leg. L. M. Esmark, date unknown (~1850) 1 ex. ♀; AK: EIS 28, Oslo: Ormøya, coll. NHM, leg. J. H. S. Siebke, date unknown (~1850) 1 ex. ♀; AK: EIS 28, Oslo: Kubaparken (32VNM97954424) 14.VIII.2007 2 ex. ♀♀; AK: EIS 28, Oslo: Kubaparken (32VNM97954424) 28.VIII.2007 6 ex. ♀♀; AK, EIS 28, Oslo: Frogner (32VNM94804332) 27.IX.2007 1 ex. ♀; BØ: EIS 28, Drammen: Drammen, coll. NHM, leg. H. Warloe, 07.VII.1925 3 ex ♀♀; BØ: EIS 28, Drammen: Drammen, coll. NHM, leg. H. Warloe, 10.IX.1926 1 ex ♀; BØ, EIS 28, Drammen: Bragernes (32VNM67502400) 31.VIII.2007 2 ex. ♀♀; BØ, EIS 28, Drammen: Bacheparken (32VNM68432199) 31.VIII.2007 2 ex. ♀♀; BØ, EIS 28, Drammen: Pukerud (32VNM62892374) 31.VIII.2007 1 ex. ♀; BØ, EIS 28, Nedre-Eiker: Krokstad (32VNM56012471) 01.IX.2007 1 ex. ♀; **VE**, EIS 19, Horten: Indrehavn (32VNL83798801) 08.IX.2007, 3 ex. ♀♀; VE, EIS 19, Tønsberg: Sentrum (32VNL80847048) 08.IX.2007 8 ex. ♀♀, 2 ex. ♂; HEN: Åmot: Åmot, coll. NHM, leg. J. H. S. Siebke, date unknown (~1850) 1 ex. ♀; RY, EIS 7, Stavanger: Hinna, coll. NHM, leg. H. Holgersen 02.VIII.1942 1 ex. ♀; VAY, EIS 4, Flekkefjord: Sira, Bakke coll(?) & leg. H. Holgersen 25.VII & 13.VIII.1984 ; OS: EIS 54, Gjøvik: Biri, coll. (?), leg. G. Taksdal, 03.VII.1969 2 ex. ♂♂

Holgersen published several new regional records of this species based on revised specimens from the collection at NHM and own material (Holgersen 1985). Previous to his publication only two specimens (OS: Gjøvik) were recorded from Norway (Ossiannilsson 1981). It is widespread in Germany (Nickel 2003) and fairly common in Denmark and Sweden (Ossiannilsson 1981). The species was reported new to Ireland in 2006 (Helden 2006).

This is the only Auchenorrhyncha found on *P. nigra* that is 2nd degree monophagous on poplars (Dworakowska 1976, Nickel 2003).

Additional species found on *P. nigra* during the investigation in 2007-08:

***Aphrophora alni* (Fallén, 1805)**
Common and widespread in all Fennoscandia and Europe (Ossiannilsson 1981). This is a polyphagous species feeding on a wide variety of herbs and plants (Ossiannilsson 1981), and adults can be swept from a large number of deciduous trees, including *Populus* (Nickel 2003). Found on *P. x canadensis*. **VE**, EIS 19, Horten: Indrehavn (32VNL83798801) 08.IX.2007, 2 ex. ♀♀, 1 ex. ♂

***Alebra wahlbergi* (Boheman, 1845)**
Less common in Denmark and scarce in Sweden (Ossiannilsson 1981). It was reported new to Finland in 2003 (Albrecht et al. 2003). Two previous records exist from Norway (BØ, Tofteholmen 10.VII.1953 and HES, Brøttum 4.IX.1972) (Ossiannilsson 1981). It is found on different deciduous trees, including *Tilia, Acer, Ulmus, Sorbus,* and *Betula* among others (Ossiannilsson 1981, Albrecht et al. 2003, Nickel 2003). During this investigation, found on *P. nigra*. **AK**, EIS 28, Oslo: St. Hanshaugen (32VNM97324438) 14.VIII.2007 1 ex. ♀

***Empoasca vitis* (Göthe, 1875)**
This species is common and widespread in Scandinavia (Ossiannilsson 1981) and considered to be extremely polyphagous (Nickel 2003). Found on different *Populus* species (and hybrids) in AK: Oslo, including *P. nigra*. Also found in numbers during the winter 2007 on many of the evergreen tree- and bush species mentioned above (see *Stenidiocerus poecilus*).

****Empoasca ossiannilssoni* Nuorteva, 1958**
This species is new to Norway. It is not found in Denmark. It is rare in Sweden and more abundant in north-eastern Finland, with a probable recent eastern expansion (Ossiannisson 1981, Albrecht et al. 2003). The nymphs are reported to feed on *Prunus padus* and *Filipendula ulmaria* (Ossiannilsson 1981, Söderman 2007). Hibernation is suspected to be on spruce (*Picea*) (Nickel 2003, Söderman 2007). It was found on *P. nigra* var. *italica*. **AK**, EIS 28, Oslo: Frogner (32VNM94804332) 27.IX.2007 1 ex. ♂

***Kybos strigilifer* (Ossiannilsson, 1941)**
Not uncommon in Sweden and Finland (Ossiannilsson 1981, Söderman 2007). Several new Norwegian regional findings was reported by Holgersen (1985). Reported to be 2nd degree monophagous on *Salix* (*S. caprea, S. cinerea,* and *S. myrsinifolia*) (Dworakowska 1972, Nickel 2003). Found on *Populus x canadensis* in both localities. **VE**, EIS 19, Tønsberg: Sentrum (32VNL80847048) 08.IX.2007 2 ex. ♂♂. **RY**, EIS 7, Stavanger: Sentrum (Tjodolvsgt.) (32VLL11624035) 27.IX.2008 1 ex ♂.

***Fagocyba cruenta* (Herrich-Schäffer, 1838)**
This species is now considered a single species comprising different morphs, including *F. douglasi* previously recorded from Norway (Ossiannilsson 1981, Nickel 2003, Biedermann & Niedringhaus 2004). This species is widespread on different deciduous woody plants, preferably on *Fagus* and *Carpinus*, but also on *Populus* among others (Nickel 2003). Found on *P. nigra* in AK: Oslo.

***Ribautiana ulmi* (Linnaeus, 1758)**
This species is widespread and common in Scandinavia and Europe, and reported to be monophagous on *Ulmus* (Ossiannilsson 1981, Nickel 2003), though the second generation could be found on *Tilia* (G. Söderman pers. com.). Found on two different localities in AK: Oslo, Bygdøy and Frogner (27.IX.2007) on *P. nigra* var. *italica*.

***Eupteryx atropunctata* (Goeze, 1778)**
E. atropunctata is rather rare in Finland (Söderman 2007) but more common in Denmark and Sweden (Ossiannilsson 1981). Previously it is only reported twice from Norway (Ossiannilsson 1981, Holgersen 1985). It is polyphagous on tall herbs and mainly on Lamiaceae, *Verbascum*, *Cirsium,* and *Urtica* among others (Ossiannilsson 1981, Nickel 2003). Found on *P. nigra* var. *italica* in AK: Oslo, Bygdøy (tall herbs possibly growing around the trunk).

***Eupteryx calcaratum* Ossiannilsson, 1936**
This species is reported from Denmark, and it is not uncommon in southern parts of Sweden and Finland (Ossiannilsson 1981, Söderman 2007). It was published new to Norway by Holgersen (1985). Reported to live on *Urtica dioica* (Ossiannilsson 1981). Found on *P. nigra* var. *italica* (could possibly be *Urtica* growing around the trunk, which also would explain the finding of *E. atropunctata* at the same locality). **AK**, EIS 28, Oslo: Bygdøy (32VNM94044343) 31.VIII.2007 1 ex. ♂

***Aguriahana stellulata* (Burmeister, 1841)**
One record of this species from Norway was mentioned in Ossiannilsson (1981). Holgersen published new regional records based on material from the collection at NHM and own. It is now reported from AK, HES and BØ. Different host species have been reported (*Tilia, Prunus,* and *Ulmus*) (Ossiannilsson 1981, Söderman 2007). Nickel (2003) also mentions *Acer, Betula, Populus,* and *Aesculus*. I have found individuals on *P. nigra nigra* (AK, Oslo: Kubaparken) and *P. nigra* var. *italica* (HES, Hamar: Holset).

DISCUSSION

P. nigra is always found in urban areas, parks and private/public gardens, along roads and sometimes on landfills. The plant is more or less suckering (*P. x canadensis* not, *P. nigra* slightly, and *P. x berolinensis* richly, Karhu 2000), but it do not tend to spread naturally with seeds in Norway (Lid & Lid 2005). Therefore, all specimens of *P. nigra* in Norway have been planted, and thus, have a very restricted and patchy distribution. Even so, the species is probably highly overlooked since so few botanists have been collecting and documenting it, and because it is still used frequently on new construction sites (as plantings alongside new roads, buildings, parking areas etc.), as this paper documents. It could possibly be found in all larger cities along the south coast and the central areas of south-east Norway, and also scattered along the west coast.

The oldest record we have on Auchenorrhyncha species on *P. nigra* in Norway is two specimens of *Stenidiocerus poecilus* collected in 1846 by Esmark. Some of the hopper species could thus have been here as long as *P. nigra* itself. Even so, this paper documents several new species to Norway and regional recordings for hoppers living on *P. nigra*. There could be several reasons for these findings, but a range expansion has possibly occurred within the different species populations. There is reason to believe that, since several investigators have collected species from *P. nigra* previously (e.g. Holgersen, Esmark, and Ullmann). The actual range expansion has probably been species-specific as the species have different life histories and environmental tolerances, even though they all use *P. nigra* as their host. The processes of range expansion of these hoppers could have been either anemochore (spread active or passive in air) or anthropochore (spread by humans).

Anemochore range expansion could be due to new opportunities for colonisation as a result of an increased urbanisation and use of ornamental trees, as seen with several other species of hoppers (G. Söderman pers. com). The expansion could also be assisted by a warmer climate seen the recent years, increasing the possible range of species vulnerable to harsh climates (Ødegaard & Endrestøl 2007). Still, the geographical distance between different findings of *P. nigra* (e.g. between cities) can not rule out the possibility of an anthropochore range expansion. This would likely be as a result of introduction with the host plant *P. nigra*. This was also suggested by Holgersen (1944) in the case of his records of *P. nitidissimus*. The species could spread through plant nurseries and survive on single or a few single trees. Warmer climate could again accommodate increased survival in different parts of Norway. I would expect this to be the case with at least *Rhytidodus decimusquartus*, that was found only at three separate regions (~40 km apart), with the one in (BØ: Drammen) found on newly planted, small individuals of *P. nigra* var. *italica*, and not on any of the other BØ localities within the same time span. Both ways of spreading could interact and accommodate each other. That is also

probably the case with the last half century's use of Norway spruce (*Picea abies*) in the northward forestation and its associated fauna of bark beetles (Scolytidae) (Nilssen 1978).

The only regions where I have investigated black poplars and not found any monophagous hoppers are HOI and HES. I therefore suspect these hoppers to have the northern edge of their range in AK, possibly due to climatic factors. Though I did not find any of the hoppers in HOI, finding of several specimens of *Populicerus nitidissimus* in RY can not rule out the possibility of finding this species further northwest in e.g. HOY (Bergen) since that would be the natural direction for a range expansion. *P. nitidissimus* seems to be the species with broadest distribution of the *P. nigra* hoppers, both westwards (RY) and inlands (TEI), with *Tremulicerus fulgidus* being the one with the narrowest distribution (only found in AK and BØ). The rest of the species seems to have a distribution spanning from Ø along the southeast coast to TEY. Their distribution could also be affected by whether they can utilize hybrids as a host plant or not. I have found *P. nitidissimus* on all different hybrids and subspecies investigated, whereas *Macropsis graminea*, *Rhytidodus decimusquartus*, and *Tremulicerus fulgidus* only have been found on *P. nigra* (subsp. *nigra* and var. *italica*). Further investigations should be done to establish their distribution further south (in AAY and VAY).

Since *P. nigra* is evaluated as an alien species in Norway (Gederaas 2007), all 1st degree monophagous Auchenorryncha species found on *P. nigra* in Norway should also be evaluated as alien species. Regardless ways of expansion, a further range expansion of all black poplar hoppers is likely if *P. nigra* will continue to be spread in Norway. All these species could be categorised as low risk species (Gederaas 2007) due to their monophagy.

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