The genus *Stenostola* Dejean, 1835 (Coleoptera, Cerambycidae) in Norway, with a review of the biology and the distribution in Fennoscandia

TORSTEIN KVAMME & HENRIK WALLIN

Kvamme, T. & Wallin, H. 2011. The genus *Stenostola* Dejean, 1835 (Coleoptera, Cerambycidae) in Norway, with a review of the biology and the distribution in Fennoscandia. *Norwegian Journal of Entomology* 58, 93–108.

Both *Stenostola ferrea* (Schrank, 1776) and *S. dubia* (Laicharting, 1784) are verified recorded in Norway. *S. dubia* is locally common and distributed in the coastal and lowland areas of South Norway as far north as Midtre Gauldal in Sør-Trøndelag County. *S. ferrea* is regarded as a rare species with a limited distribution in southernmost Norway. All old examined specimens of *S. ferrea* were misidentified specimens of *S. dubia*.The distribution is probably limited by unfavourable climatic conditions, not the distribution of the main host tree *Tilia cordata*. We consider the population of *S. ferrea* in Norway as a possible relict. Together with information from a literature review, the present knowledge on both species is discussed in a historical context and European context. It is evident that information on the biology, as well as choice of host trees, often contains contradicting and confusing information due to misidentifications of the beetles. *S. ferrea*'s use of host trees other than *Tilia* spp. needs to be confirmed. The differences in the biology of the two species are not fully understood. We have found no documentation or indication that there has been a decline or an increase in the populations of the two *Stenostola* species in Norway. The availability of suitable host tree substrate, quality of habitats and fragmentation has according to our knowledge not been altered. This combined with the uncertainty and unanswered questions about distribution and biology lead to the conclusion that *S. ferrea* should remain Data Deficient (DD) in the Norwegian red list instead of Vulnerable (VU) until new data show otherwise.

Key words: *Stenostola ferrea, S. dubia*, Cerambycidae, Coleoptera, Norway, host trees, distribution, biology, red list category.

Torstein Kvamme. Norwegian Forest and Landscape Institute, P. O. Box 115, NO-1432 Ås, Norway E-mail: torstein.kvamme@skogoglandskap.no

Henrik Wallin. The Swedish Museum of Natural History, Section of Entomology, P. O. Box 50007, SE-104 05 Stockholm, Sweden. E-mail: henrik.wallin@saiglobal.com

Introduction

Worldwide, 12 species of the genus *Stenostola* Dejean, 1835, are known (Bily & Mehl 1989). Seven species and two subspecies of the genus are known from the Palaearctic Region (Löbl & Smetana 2010). *S. ferrea* (Schrank, 1776) is divided into two subspecies: *S. ferrea ferrea* (Schrank, 1776) is widely distributed in Europe and Turkey whilst *S. ferrea maculipennis* Holzschuh, 1982, is only known from the Russian South European Territory. Traditionally both *S. dubia* (Laicharting, 1784) and *S. ferrea* have been listed as recorded from the Nordic countries (Lindroth 1960, Lundberg 1995, Hansen 1996, Silfverberg 2004). Up to 1948 only *S. ferrea* was considered Swedish, and *S. dubia* was published from Sweden for the first time by Tjeder (1948) (see

FIGURE 1. .*Stenostola ferrea* (Schrank, 1776) collected at Kristiansand, Stangenes (EIS 2) 1980.07.17. Photo: Karsten Sund.

Klefbeck 1962). However, in many collections, *Stenostola* specimens have been misidentified. Wallin et al. (2005) revised the Swedish material and gave an account of the historical use of names. Furthermore, they discussed the validity of the taxonomical characters. Their conclusion after examination of the Swedish specimens is that all the specimens of *S. ferrea* in Sweden are truly *S. dubia*. Consequently, *S. ferrea* has been deleted from the Swedish list. Wallin et al. (2005) did not examine Norwegian specimens, thus leaving the question of the occurrence of *S. ferrea* in Norway unanswered.

Material and methods

Unless otherwise stated, the specimens have been examined and identified by the authors according to the characters described by Wallin et al. (2005). Information from collectors has only been included if the specimens have been revised by the characters given by Wallin et al. (2005).

Abbreviations used; FØD = Frode Ødegaard, Trondheim, NHMO = Natural History Museum, University of Oslo, NINA = The Norwegian Institute for Nature Research, OHA = Oddvar Hanssen, Trondheim, SLI = Sindre Ligaard, Vestby, TM = Tromsø Museum

The records mentioned in the literature have been listed only when reference specimens have been revised. Unverified records from literature have consequently been omitted due to the many misidentifications (eg. Lysholm 1937, Strand 1946, 1970, 1977).

We searched for information on biology and host trees in literature from the Nordic countries as well as continental publications. However, the total reference list is not complete and should be regarded as a selection due to language problems etc.

The handwritten notes left by Andreas Strand have been studied. These notes contain a list of records and collectors, and constitute the basis

FIGURE 2. .*Stenostola dubia* (Laicharting, 1784) from mass occurrence at Borre, Eikenes, west of Borrevann (EIS 19) 1979.06.20. Photo: Karsten Sund.

for the Norwegian part of the beetle catalogue (Lindroth 1960, Silfverberg 1979). Information such as who identified the material was only occasionally recorded by Strand. The collector's identity may be deducted, based on these notes, if it is not mentioned on the specimen's label. When the collection date is unknown, the year of death of the collector is used as an indication, eg. Ullmann before 1923.

Results

***Stenostola ferrea* (Schrank, 1776)** (Fig. 1)

Material: **AAY** Birkenes: Engesland (EIS 5) 6 October 1990, 1 ex., leg. S. Svendsen, coll. NHMO; **VAY** Marnadal: Bjelland (EIS 5) 1981, 1 ex., leg. K. Berggren, coll. NHMO; Kristiandsand: Stangenes (EIS 2) 8 June 1980, 1 ex., leg. S. Svendsen, coll. NHMO; Kristiansand: Stangenes (EIS 2) 17 July 1980, 4 exx. [found on a window sill in a firewood store], leg. T. Kvamme, coll. NHMO; Kristiansand: Nedre Timenes (EIS 2) 15 May 2009, 2 exx., leg. K. Berggren, det./coll. FØD.

***Stenostola dubia* (Laicharting, 1784)** (Fig. 2)

Material: **Ø** Moss (EIS 19) 13 May 1988, 1 ex., leg. B. A. Sagvolden, coll. NHMO; Råde: Tasken (EIS 19) 12 June 1988, 1 ex., leg./coll. OHA; **AK** Bærum: Fornebu (EIS 28) 9 July 1998, 2 exx., leg./det./coll. FØD; Frogn: Håøya (EIS 28) 29 May 1988, 1 ex., leg. S. O. Hansen, revised by /coll. FØD; Oppegård: Bårud (EIS 28) 6 June 1875, 1 ex., leg. Sparre Schneider [revised by A. Strand], coll. NHMO; Oslo: Hvervenbukta 20 March 1960, 1 ex. [reared from *Tilia cordata* 5 April 1960, previously identified as *S. ferrea*], leg. A. Bakke, coll. NHMO; Oslo [Kristiania]: Tøyen? (EIS 28) 1870s, 1 ex., leg. Münster [old label

with *S. ferrea*, but later revised by A. Strand to *S. dubia*], coll. NHMO; Oslo [Kristiania] (EIS 28) before 1939, 1 ex., leg. Warloe [later revised by A. Strand], coll. NHMO; Oslo? [Kristiania?] (EIS 28) before 1884, 2 exx., leg. Esmark [later revised by A. Strand], coll. NHMO; Oslo [Kristiania] (EIS 28) before 1900, 1 ex., leg. Unknown [from ex coll. F. Jensen], coll. NHMO; Oslo: Bygdøy, Bukten (EIS 28) medio June 1931, 1 ex., leg. Münster, coll. NHMO; Oslo: Bygdøy, Hengsenga (EIS 28) 9 June 2006, 1 ex., leg. Ø. Gammelmo, coll. NHMO; Oslo: Aker (EIS 28) before 1918, 1 ex., leg. W. M. Schøyen [later revised by A. Strand], coll. NHMO; Nesodden (EIS 28) 3 June 1979, 1 ex., leg. T. Kvamme, coll. NHMO; **BØ** Ringerike (EIS 36) before 1939, 1 ex., leg Warloe [later revised by A. Strand], coll. NHMO; **VE** Borre: Eikenes, west of Borrevann (EIS 19) 20 June 1979, >14 exx. [mass occurrence; hatched from, sitting on and flying around *Fraxinus excelsior* trees], leg. T. Kvamme, coll. NHMO; Borre, Veggefjellet (EIS 19) 1 june 1997, 1 ex. [Malaisetrap], leg. L. O. Hansen, coll. NHMO; Hurum: Mølen 23 June 1991, 1 ex., leg. S. O. Hansen, det./coll. FØD; Larvik: Budalsåsen (EIS 19) 16 May-14 June 2007, 1 ex. [windowtrap], leg. A. Sverdrup-Thygeson, det. OHA, coll. NINA; Larvik: Jordstøyp (EIS 19) 14 June 1995, 3 exx., leg. S. O. Hansen, revised by/coll. FØD; Larvik: Jordstøyp (EIS 19) 10 June 1996, 2 exx., leg. S. O. Hansen, revised by/coll. FØD; Larvik: Ula (EIS 19) 19 June 1985, 1 ex., leg. S. O. Hansen, revised by/coll. FØD; Larvik: Tenvik (EIS 19) 10 June 1995, 1 ex., leg. S. O. Hansen, revised by/coll. FØD; Larvik: Vemannsås (EIS 19) 10 June-9 July 2006, 1 ex. [windowtrap], leg. A. Sverdrup-Thygeson, det. OHA, coll. NINA; Larvik: Vemannsås (EIS 19) 16 May-20 June 2008, 1 ex., [windowtrap], leg. A. Sverdrup-Thygeson/;FØD, det./coll. FØD; Larvik (Brunlanes): Pauler (EIS 18) 9 June and 11 June 1984, 2 ex., leg./det./coll. OHA; Larvik (Brunlanes): Pauler (EIS 18) 9 June 1984 2 exx., leg./det./coll. FØD; Larvik (Brunlanes): Pauler (EIS 18) 11 June 1984, 1 ex., leg. B. A. Sagvolden, coll. NHMO; Nøtterøy: Mellom-Bolærne (EIS 19) 10 June 1992, 1 ex., leg. S. O. Hansen, revised by/coll. FØD; Nøtterøy: Østre Bolærne (UTM 32V NL 997 636) May 2006, 1 ex. [light trap], leg. K. Berggren & R. Voith, coll. NHMO; Tjøme: Mostranda (EIS 19) 14 June 1986, 1 ex., leg. S. O. Hansen, revised by/coll. FØD; Tjøme: Ormelet (EIS 19) 7 April 1985, 1 ex., leg. A Fjellberg, coll. TM; Tjøme: Tjøme (EIS 19) 9 June 1986, 1 ex., leg. S. Ligaard [ex coll. A. Vik], coll. NHMO; Tjøme: Tjøme (EIS 19) 9 June 1986, 3 exx., leg./coll. SLI; **TEY** Kragerø (EIS 11) before 1923, 1 ex., leg. Ullmann [revised by Münster] [old label with *S. ferrea*], coll. NHMO; Kragerø (EIS 11) before 1923, 2 exx., leg. Ullmann [later revised by A. Strand], coll. NHMO; **AAY** Tvedestrand: Borøya (EIS 6) 19 June 1940, 1 ex., leg. J, Kielland, coll. NHMO; Arendal: Tromøya, Gjerstad (EIS 6) 22 May 1994, 1 ex., leg. A. Bakke, coll. NHMO; Birkenes: Birkeland (EIS 6) 9 July 2000, 1 ex. [from trap], leg. S. Svendsen, coll. NHMO; Froland: Ripåsen (EIS 6)(no date), 1 ex., leg. S. O. Hansen, revised by/coll. FØD; Froland: Ripåsen (EIS 6)18 July 1992, 2 exx., leg. S. O. Hansen, revised by/coll. FØD; Grimstad: Omre (EIS 6) 11 June 1978, 5 exx. [sweepnet from broadleaved trees], leg. A. Bakke & T. Kvamme, coll. NHMO; Grimstad (EIS 6) 19 May 1988, 1 ex., leg. B. A. Sagvolden, coll. NHMO; Nedenes (EIS 6) before 1884, 6 exx., leg. Aall [5 exx. later revised by A. Strand], coll. NHMO; Risør (EIS 11) 12 June 1910, 1 ex., leg Warloe [later revised by A. Strand], coll. NHMO; **VAY** Kristiansand: Nedre Timenes (EIS 2) 7 June 2004, 1 ex., leg. K. Berggren, coll. NHMO; Kristiansand: Nedre Timenes (EIS 2) June 2009, 1 ex., leg. K. Berggren, det./coll. FØD; Kristiansand: Stangenes (EIS 2) 17 July 1980, 1 ex. [sampled from the same firewood store as *S. ferrea*], leg. T. Kvamme, coll. NHMO; Kristiansand: Stangenes (EIS 2) 23 June 1983, 1 ex. + 27 June 1983, 1 ex.+ 29 June 1983, 1 ex., leg S. Svendsen, coll. NHMO; Lyngdal (EIS 1) before 1954, 2 exx., leg. F. V. Holmboe [the specimens were originally identified as *S. ferrea*] [from coll. F. Jensen], coll. NHMO; **SFI** Sogndal: Fatlaberget (EIS 50) 3 June-10 July 1989, 1 ex. [trap], leg./coll. OHA; Stryn: Lindvik (EIS 68) 29 May-29 June 1988, 1 ex. [trap], leg./coll. OHA; MRI Sunndal: Oppdølstranda (EIS 85) 10 June-9 July 1985, 1 ex. [trap] + 1-15 June 1988, 1 ex. [trap] + 30 June-24 July 1988, 1 ex. [trap] + 11 June-15

July 1989, 1 ex. [trap], leg./coll. OHA; STI Midtre Gauldal: Mosand (EIS 87) 18 June 1986, 1 ex., leg./coll. OHA.

Discussion

The results of the revision of the Norwegian specimens are discussed together with the information from the literature studies. For practical reasons the information is organized as subjects and the present knowledge can be seen in a historical as well as a wider geographical context than Norway.

Distribution. The examination of specimens in the Norwegian collections shows that *S. ferrea* has been found only in Aust-Agder and Vest-Agder counties, at 4 localities totally as listed above.

The handwritten list by Andreas Strand includes four records of *S. ferrea*: AK: Oslo, Hvervenbukta (EIS 28) (Leg. Alf Bakke); TEY: Porsgrunn (EIS 18) (Leg. Gasmann according to Esmark); AAY: Risør (EIS 6) (Leg. Helliesen) and VAY: Lyngdal (EIS 1) (Leg. Holmboe). The specimens from Oslo, Hvervenbukta and Lyngdal have been revised and are all *S. dubia*. The rest of the specimens have not been found. Other old records of *S. ferrea* mentioned in literature should be deleted until specimens can be examined and the identification confirmed.

The records of *S. ferrea* are all from the nemoral and boreonemoral zones (Fig. 4), which constitute a small area in the southernmost part of Norway (Nordiska Ministerrådet 1984, Moen 1998). It is reasonable to believe that *S. ferrea* is locally overlooked in Norway due to the former identification problems and lack of sampling focus.

The specimen examination confirms that *S. dubia* is distributed along the coast and lowland areas of south and western Norway, northwards to STI: Midtre Gauldal, Mosand (EIS 87) (Fig. 3). An old record from STI: Støren near Trondheim (EIS 92) (Lysholm 1937, see Lindroth 1960) is probably correct, but we have not seen the specimen(s). The northernmost Norwegian record ever mentioned in literature is from NSI: Saltdal (EIS 127) (Strand 1946, see also Lindroth 1960). The record was done by A. O. C. Hagemann (1856-1907). He lived and worked as a forest manager in Saltdal from 1879 to 1887. He was a skilled entomologist and published the first Norwegian guidebook on Norwegian forest insects in 1891. However, Hagemann (1891) does not mention *S. dubia* in his book. We have not seen his specimen(s), but we believe the identification to genus is correct and that *S. dubia* is the only possible species in the area. *S. dubia* might occur in the area because of the mild climatic conditions due to the Golf Stream and also the Swedish northernmost records considered (Lindhe et al. 2010). This occurrence still needs to be confirmed by new samples, since no reference specimen has been found. The conclusion so far is that the record of *S. dubia* from STI: Midtre Gauldal, Mosand, is the northernmost verified record in Norway.

In Sweden *S. dubia* (called *S. ferrea* in older literature) is reported as far north as Ångermanland, Medelpad and Hälsingland provinces. An old and doubtful record was reported from Lappland province by Zetterstedt (Klefbeck 1924, see also Grill 1896, Hellén et al. 1939, Palm 1951). The 1939 catalogue (Hellén et al. 1939) was the basis for the Swedish part of the 1960 catalogue (Lindroth et al. 1960). All these northern records were omitted in the 1960 catalogue, based on Klefbeck's notes in his personal copy of the 1939 catalogue (Stig Lundberg pers. com.). In the later catalogues (Lundberg 1986, 1995), a record of *S. dubia* from Medelpad province was included by mistake (Stig Lundberg pers. com.). Lindhe et al. (2010) list records from Medelpad, Ångermanland, Lule Lappmark and Torne Lappmark provinces (http://www.sef.nu/et/Database_ET_2011_4.xls). Neither the records from Ångermanland and Torne Lappmark nor the old records by Zetterstedt are marked on the maps. The two enigmatic records from Jokkmokk, 1906 and 1983, represent the northernmost records of *S. dubia*.

The nearest localities of *S. ferrea* are in Denmark and most records old. However, the species has been found as late as 1997 at Lolland, which indicates that it still might exist in Denmark (Wallin et al. 2005, Thomsen 2007).

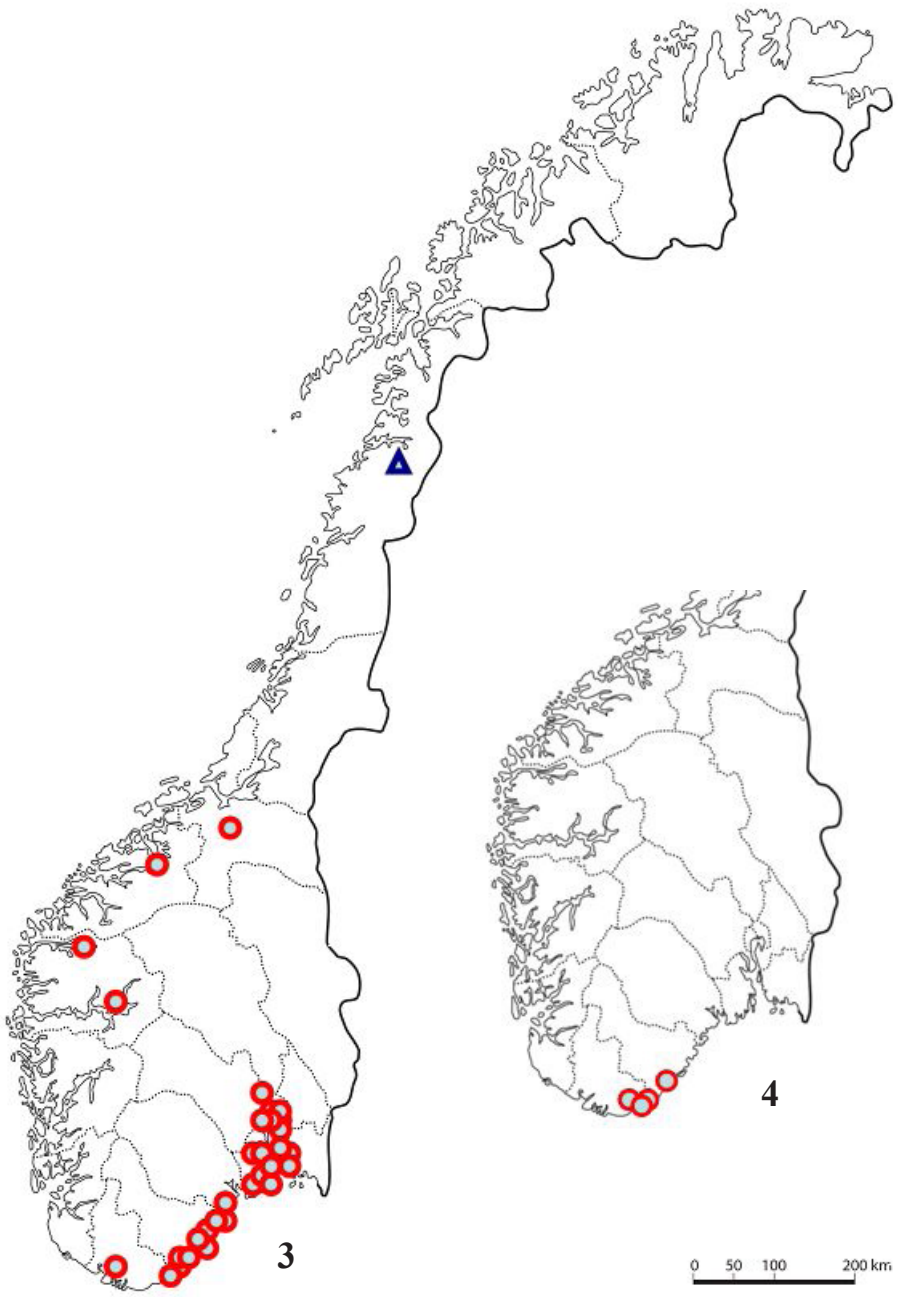

FIGURE 3-4. Red circles are based on revised specimens. The blue triangle indicates the record of A. O. C. Hagemann from Saltdal in Nordland County (Strand 1946). **3**. The records of *Stenostola dubia* (Laicharting, 1784). **4**. The records of *Stenostola ferrea* (Schrank, 1776).

The distribution pattern and the biological information available indicate that *S. ferrea* is a more heat demanding species than *S. dubia*. *S. ferrea* has a more southern oriented distribution, reaching as far south as Turkey (Löbl & Smetana 2010). The distribution of the main host tree, *Tilia cordata*, is much wider than the known distribution of the beetle. Thus we conclude that temperature is a more limiting factor than the availability of host trees.

The host trees of *S. dubia* and *S. ferrea*. In the Palaearctic beetle catalogue (Löbl & Smetana 2010), the countries in which *S. dubia* and *S. ferrea* have been found are listed. Finland is by mistake still listed under *S. ferrea*, although it has been deleted from the Finnish list (Clayhills 2002, Heliövaara et al. 2004, Wallin et al. 2005). Consequently all the information on host trees in Finland has been transferred to *S. dubia*. The same situation applies to Sweden, where *S. ferrea* also has been deleted from the list (Wallin et al. 2005). In Denmark the two species are said to have a similar biology. Hansen (1960, 1966) and Thomsen (2007) claim that both species develop in *Tilia*, and probably in *Corylus* and *Quercus*.

No specific information on host trees is linked with the Norwegian records of *S. ferrea*, but the records are from areas where *Tilia, Quercus, Corylus* and other broadleaved species are common.

Data on host trees is sparse in connection with the Norwegian records of *S. dubia*, but the species has been reared from *Tilia cordata* and found in wood of *Fraxinus excelsior*, and other tree species have most likely also been utilized.

A great number of host trees are mentioned in literature for both *S. dubia* and *S. ferrea*, and they are listed in tables 1 and 2. There is an almost unanimous agreement that *S. dubia* is a polyphagous species, exploiting many different species of deciduous trees. In regards to *S. ferrea*, the different authors' conclusions range from a monophagous to a polyphagous mode of life (Tables 1 and 2).

We assume that the *Stenostola* species have some biological plasticity linked with geographical distribution. However, authors have cited each other and the list of host trees is a common heritage based on sources dating back to the 19th century or possibly even older. As an example, *Betula* is mentioned as a host tree by Jäger (1884) in the 4th edition of Calwer's Käferbuch. Schaufuss mentioned *Betula* in the 5th edition, based on Jäger. Teppner (1963) refers to Schaufuss. We have not found any new documentation that *Betula* is a host tree of the genus, and consider *Betula*'s role as a host tree uncertain and in need of new documentation. In addition, many authors do not refer specifically to the source of the information. As an example, Strand (1946) mentions several host trees for *S. dubia* but no source of this information.

Based on our literature studies, we conclude that the list of host trees is mixed up due to misidentification of the beetles. It is a uniform understanding among more recent authors that *S. dubia* is polyphagous on broadleaved trees including *Tilia*, and that *S. ferrea* has a strong preference for *Tilia* (Rejzek pers. com. see Wallin et al. 2005, Svacha 2001, Böhme 2005, Svacha & Danilevsky in preparation).We also suspect that records of imagines sitting on leaves etc. have caused incorrect interpretations of the host tree. Our conclusion is that all assertions of *S. ferrea* using other host trees than *Tilia* spp. require revised or new documentation. Petr Svacha's (pers. com.) conclusion is in agreement with ours: "…. we should better start from scratch with the hosts".

***Tilia cordata* in Norway.** *Tilia cordata* is the main host tree for *S. ferrea* and an important host tree for *S. dubia*. An understanding of the genus *Tilia* in Norway is a key factor to understanding the occurrence and distribution of the *Stenostola* species.

During the last 2000 years the amount of Tilia in Europe has declined for various reasons including climatic conditions and human activities like agriculture, forestry etc. (Jensen & Canger 1999, Myking & Skrøppa 2001). However, *T. cordata* is still widely distributed in Norway today (Fig. 5). The northernmost record of lime trees in the world is an isolated population at Moaksla in Brønnøy municipality, Nordland County (Hultén 1971, Frivold 1994, Nedkvitne & Gjerdåker 1997, Jensen & Canger 1999, Lid 2005).

TABLE 1. Host trees of *S. dubia* and *S. ferrea* outside the Nordic Countries, as presented in the literature from the 20th century. When references are marked with ** it means that the host tree species or the genus is mentioned as the preferred, predominant or only one used. When references are marked with + it indicates a mass attack.

Host tree	*S. dubia*	*S. ferrea*
Acer	Sama 2002	-
Alnus	Sama 1988, 2002, Bily & Mehl 1989, Bense 1995, Sláma 1998, Svacha 2001	-
Betula	-	Jäger 1884, Teppner 1963: Based on Schaufuss 1916
Carpinus betulus	Horion 1974	Teppner 1963, Burakowski et al. 1989
Carpinus	Burakowski et al. 1989, Vives 2000	Demelt 1966, Sláma 1998
Castanea	Bily & Mehl 1989, Sláma 1998	Bense 1995
Corylus avellana	-	Teppner 1963, Burakowski et al. 1989
Corylus	Hellrigl 1967, Horion 1974**, Sama 1988, 2002, Burakowski et al. 1989, Bense 1995, Sláma 1998, Vives 2000	Demelt 1966, Hellrigl 1967, Sláma 1998, Sama 2002
Euonymus	Svacha 2001	-
Fagaceae	Böhme 2005	-
Fagus	-	Sama 1988, 2002, Burakowski et al. 1989, Bense 1995, Sláma 1998
Frangula alnus	-	Teppner 1963, Sláma 1998
Fraxinus excelsior	Rejzek & Rébel 1999	-
Juglans regia	Bily & Mehl 1989	Demelt 1956**, Burakowski et al. 1989, Sláma 1998
Juglans	Sama 1988, 2002, Bense 1995, Sláma 1998, Vives 2000	Demelt 1966, Teppner 1963, Sama 1988, 2002, Bense 1995
Malus domestica	-	Strojnowski 1961+, Demelt: obstbaümen 1966, Burakowski et al. 1989+, Sama 2002
Populus tremulae	Sláma 1998**	Duffy 1953, Teppner 1963, Hellrigl 1967
Populus	Horion 1974, Burakowski et al. 1989, Vives 2000	Demelt 1966, Burakowski et al. 1989
Prunus padus	-	Teppner 1963
Prunus	-	Horion 1974 (Kirschbaum), Sláma 1998
Pyrus malus	Bily & Mehl 1989	Teppner 1963
Pyrus	-	Bense 1995, Sláma 1998
Quercus	Sama 1988, 2002, Bily & Mehl 1989, Burakowski et al. 1989, Bense 1995, Sláma 1998, Svacha 2001	Demelt 1956, Bense 1995
Rhamnus	Sama 1988, 2002, Bense 1995, Sláma 1998	-
Salix aurita	-	Demelt 1966, Burakowski et al. 1989
Salix caprea	Sláma 1998**	Duffy 1953, Teppner 1963, Demelt 1966, Burakowski et al. 1989
Salix	Hellrigl 1967, Horion 1974, Sama 1988, 2002, Burakowski et al. 1989, Bense 1995, Sláma 1998, Vives 2000	Duffy 1953, Teppner 1963, Sama 1988, 2002, Bily & Mehl 1989, Bense 1995, Sláma 1998
Salicaceae	Böhme 2005	-
Sorbus	-	Sláma 1998

TABLE 1. continued

Host tree	*S. dubia*	*S. ferrea*
Tilia (no species stated)	Freude et al. 1966**, Hellrigl 1967**, Horion 1974**, Sama 1988, 2002, Burakowski et al. 1989, Bense 1995, Sláma 1998**, Rejzek & Rébel 1999**, Vives 2000**, Jenis 2001**, Svacha 2001**, Svacha & Danilevsky** in prep.	Duffy 1953**, Demelt 1966, Freude et al. 1966**, Hellrigl 1967, Teppner 1963**, 1969**, Horion 1974, Sama 1988, 2002**, Burakowski et al. 1989**, Bily & Mehl 1989**, Bense 1995**, Sláma 1998**, Rejzek & Rébel 1999**, Jenis 2001**, Svacha 2001**, Böhme 2005**, Svacha & Danilevsky** in prep.
Tiliaceae	Böhme 2005	-
Ulmus scabra	-	Teppner 1969
Ulmus	Horion 1974, Burakowski et al. 1989, Bily & Mehl 1989, Bense 1995, Sláma 1998, Vives 2000, Svacha 2001, Sama 2002	Demelt 1966, Burakowski et al. 1989, Bense 1995, Sláma 1998**

T. cordata in Norway has very limited sexual reproduction due to low temperature. Consequently the Norwegian populations have little genetic diversity and are considered vulnerable from a genetic point of view. The reproduction in Norway is thus mainly non-sexual (Jensen & Canger 1999, Myking og Skrøppa 2001, Mong 2005). As a result approximately 70 protected areas where *Tilia* is a main tree species have been established in Norway, constituting 1544.6 ha, plus other areas where *Tilia* is present. Warmer climatic conditions will not necessarily lead to an increase in the distribution of *Tilia* in Norway, due to lack of seed germination (Myking & Skrøppa 2001).

Mong (2005) concludes that the volumes of standing stems of *Tilia* in eastern, southern and western parts of Norway are stable or with an increasing number of standing stems.

The conclusion based on recent data from the National Forest Inventory (NFI) (Eriksen 2009, Rune Eriksen pers. com.) is that the volume of *Tilia* in Norway has increased strongly since 1996 (Table 3). The increase of the standing volume and number of stems is estimated based on measurements from 38 survey plots with *T. cordata*, out of approximately 11.500 forest survey plots in Norway. Each of the plots is 250 m^2. The number of plots with *Tilia* is small because of the limited distribution in Norway. However, data quality is strengthened due to registration of the same permanent plots. A number of 342 stems of *Tilia* with >5cm BHD have been measured. No change in the distribution of *Tilia* is registered.

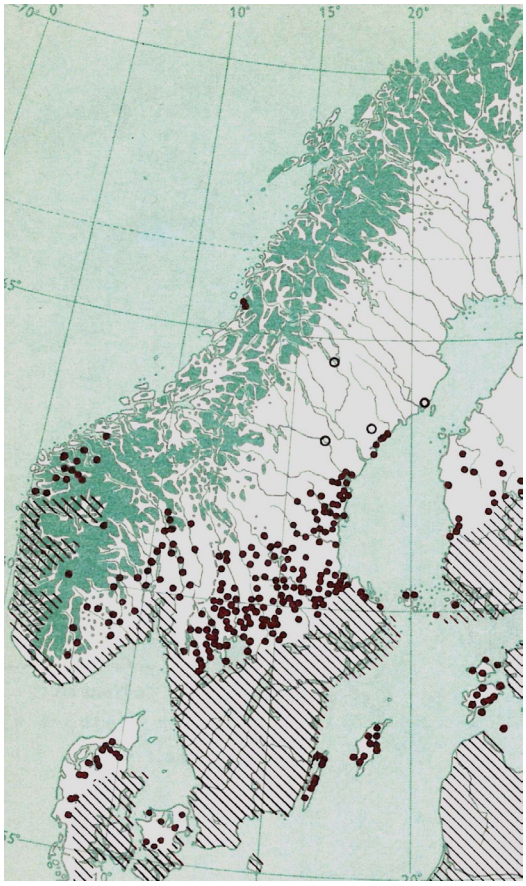

FIGURE 5. The distribution of *Tilia cordata* in Scandinavia (from Hultén 1971).

T. cordata rarely forms forest stands alone in Norway, but occurs mainly mixed into stands of other tree species, either as single trees or as

TABLE 2. The host trees of *S. dubia* and *S. ferrea* based on Fennoscandian and Danish literature from the 20th century. All host trees previously listed under *S. ferrea* from Sweden and Finland, have been transferred to *S. dubia*. When references are marked with ** it means that the host tree species or the genus is mentioned as the preferred, predominant or only one used.

Host trees	*S. dubia*	*S. ferrea*
Alnus incana	Forsius 1925, Palm 1951, 1959, Lundberg 1967, Ehnström & Axelsson 2002, Heliövaara et al. 2004, Ehnström & Holmer 2007	-
Alnus	Strand 1946, Wallin et al. 2005	Bily & Mehl 1989
Castanea	Bily & Mehl 1989	-
Corylus avellana	Hansen 1966, Ehnström & Axelsson 2002, Ehnström & Holmer 2007**, Lindhe et al. 2010**	-
Corylus	Hansen 1966, Wallin et al. 2005, Thomsen 2007**	Hansen 1966, Thomsen 2007
Fagus sylvaticus	Lundberg 1963, 1967, Adebratt & Lundberg 1966, Wallin et al. 2005	-
Fraxinus excelsior	Kvamme, unpublished data	-
Jyglans regia	Bily & Mehl 1989	-
Malus sylvestris	Wallin et al. 2005, Ehnström & Holmer 2007	-
Malus	Adebratt & Lundberg 1966, Lundberg 1967	-
Pyrus malus	Bily & Mehl 1989	-
Quercus	Kryger & Sønderup 1945, Hansen 1966, Bily & Mehl 1989, Wallin et al. 2005, Thomsen 2007	Hansen 1966
Salix caprea	Forsius 1925, Palm 1951, 1959, Lundberg 1967, Ehnström & Axelsson 2002, Heliövaara et al. 2004, Ehnström & Holmer 2007	-
Salix	Strand 1946, Palm 1951, Bily & Mehl 1989, Wallin et al. 2005	Bily & Mehl 1989
Sorbus aucuparia	Ehnström & Axelsson 2002, Ehnström & Holmer 2007**, Ehnström pers. com., Lindhe et al. 2010**	-
Sorbus	Strand 1946, Wallin et al. 2005	-
Tilia cordata = *Tilia parvifolia*	Kryger & Sønderup 1945**, Ehnström & Axelsson 2002**, Ehnström & Holmer 2007**, Lindhe et al. 2010**	Ehnström & Axelsson 2002**, Ehnström & Holmer 2007**
Tilia	Kemner 1922**, Forsius 1925, Klefbeck 1924**, Tjeder 1948, Palm 1951**, 1959**, 1962**, Hansen 1960**, 1966**, Lundberg 1963, 1967, Adebratt & Lundberg 1966**, Bily & Mehl 1989**, Heliövaara et al. 2004, Wallin et al. 2005**, Thomsen 2007**	Hansen 1960**, 1966**, Bily & Mehl 1989**, Wallin et al. 2005**, Thomsen 2007**
Ulmus glabra	Ehnström & Axelsson 2002, Ehnström & Holmer 2007	-
Ulmus	Lundberg 1967, Bily & Mehl 1989, Wallin et al. 2005	-

groups. It can be considered to have a "fragmented" distribution in the landscape. One exception is a big *T. cordata* forest in Stryn, western Norway, covering an area of 140 ha. This is probably the biggest stand of its kind in northern Europe. The forest is on a south exposed slope from 40 to 450 meters above sea level (Frivold 1994).

T. cordata prefers warm localities in Norway and has a preference for well drained soil, often with higher lime content. They often grow on sun exposed stony slopes and screes, where there is less competition from other species. Such areas are often less available and thus often less disturbed by forestry operations. *T. cordata* is considered to be a medium to shade tolerant tree species by most authors (Frivold 1994). In many cultural landscapes *T. cordata* is an important component, both when planted and occurring spontaneously. Exotic *Tilia* species have frequently been used as ornamental trees, and they may also serve

TABLE 3. The total amount of *Tilia cordata* in Norway based on data from the National Forest Inventory (NFI). The amount of standing volume and the number of trees are estimated values based on registrations of the permanent survey plots. Only trees/stems with BHD > 5 cm were registered.

Year	Estimated volume including bark (1000 m3)	The number of estimated *Tilia* trees in millions
1996	774	8.7
2002	991	11.5
2007	1210	12.3

as host trees for *Stenostola* spp. The cultural landscape in Norway is less used in the traditional way as grazing land, small agricultural fields are abandoned and less firewood is harvested. The result is a more densely forested and more shaded landscape with higher humidity and cooler conditions. We evaluate this as a negative development for heat and sun loving insects.

Biology of the species. Information on the biology of *S. dubia* in literature is limited, and even less information is specifically linked to *S. ferrea* (Table 4). Data from Sweden and Finland mentioned under *S. ferrea* has been transferred to *S. dubia*.

The differences in the biology of the two species are not fully understood. Many authors simply state that *S. ferrea* has a very similar biology to *S. dubia* without any further explanation (e.g. Hansen 1960, 1966, Harde 1966, Hellrigl 1967, Horion 1974, Bily & Mehl 1989, Bense 1995, Sláma 1998, Ehnström & Axelsson 2002, Sama 2002, Ehnström & Holmer 2007, Thomsen 2007, and others). When consulting the literature, it is clear that the information from the different sources is contradictory and mixed up (Table 4). Many authors also quote the same sources, or each other, causing a further inheritance of old mistakes. This is due to misidentifications, which is emphasized by many coleopterists (Demelt 1956, Hansen 1960, Palm 1962, Teppner 1963, Harde 1966, Skidmore & Johnson 1969, Sama 1988, Burakowski et al. 1989, Sláma 1998, Vives 2000, Heliövaara et al. 2004, Wallin et al. 2005, and others).

Based on information from recent publications (Svacha 2001, Wallin et al. 2005, Svacha & Danilevsky in prep.), communication with colleagues as well as our own experiences the state of knowledge on the biology can be summarized as following: The larvae of *S. ferrea* live in thicker twigs, branches and slender stems (sometimes up to 20 cm in diameter) of *T. cordata*. The attack can be massive and many larvae may live in the same substrate. The preferred substrates are dry. High humidity and fungal growth might be fatal for the larvae. Galleries of the larvae are usually made in the bark. The sapwood as well as the cambial layer is usually untouched, except when the bark is very thin. The mature larvae drill a typical hook-shaped pupal chamber in the wood. If the bark is thick, the pupation may take place in the bark. The pupation takes place in spring. The life cycle is one to two years. The flight period occurs in late spring to summer, and the imagines feed on the leaves and fresh bark of the host trees.

The biology of *S. dubia* resembles the biology of *S. ferrea*. However, *S. dubia* has probably a less strict demand to the quality of substrates, eg. tolerates more humidity. Different species of host trees can be utilized and the species is polyphagous, but *T. cordata* is often preferred. Usually the attacks are less massive and only one or two eggs are laid on each place on the substrate.

Do *S. dubia* and *S. ferrea* live sympatrically? Hansen (1960, 1966) claims that the two species occur together. Sláma (1998) writes that they even develop together in the same substrate. However, the information on co-existence and development in the same substrate (micro-sympatric level) is contradictory. According to Rejzek & Rébel (1999) they occur in the same forest areas (macro-sympatric level) in Bohemia (Czech Republic), but strongly compete for the same substrates. Usually *S. ferrea* is the stronger competitor and occupies all suitable *Tilia* substrates while *S. dubia* is forced to use other host trees (Rejzek pers. com., see Wallin et al. 2005). When *S. dubia* and *S. ferrea* have been reared from branches

TABLE 4. Summarized information on the biology of *S. dubia* and *S. ferrea*, based on literature from the 20th century. The information is an interpretation and standardization from written sources.

	S. dubia	***S. ferrea***
Substrate	*Dying, newly dead or cut branches, stems and tops 1–12 cm in diameter* (Kemner 1922, Kryger & Søndrup 1945, Duffy 1953, Palm 1959, Hansen 1960, 1966, Hellrigl 1967, Horion 1974, Burakowski et al. 1989, Bense 1995, Sláma 1998, Ehnström & Axelsson 2002, Sama 2002, Ehnström & Holmer 2007)	*Slender, dead and drying branches and stems* (Demelt 1956, 1966, Teppner 1963, Burakowski et al. 1989, Bense 1995) *Dry branches, thicker twigs and slender stems (up to 20 cm in diameter)* (Svacha 2001, Svacha & Danilevsky in prep.)
Substrate situation	*Laying on the ground* (Kryger & Søndrup 1945, Duffy 1953, Palm 1959, Hansen 1966, Horion 1974, Burakowski et al. 1989, Bily & Mehl 1989, Bense 1995, Sláma 1998, Ehnström & Axelsson 2002, Ehnström & Holmer 2007, Lindhe et al. 2010 *Standing trees* (Kryger & Søndrup 1945, Burakowski et al. 1989, Horion 1974, Bense 1995, Sláma 1998, Ehnström & Axelsson 2002, Ehnström & Holmer 2007) , Lindhe et al. 2010	*Laying on the ground* (Demelt 1966, Burakowski et al. 1989) *Standing trees* (Burakowski et al. 1989)
Substrate humidity	*Humid ground* (Duffy 1953: Also slightly decaying, Palm 1959, Hansen 1966, Bily & Mehl 1989)	*Mostly humid ground* (Demelt 1966) *Also on dry ground* (Burakowski et al. 1989) *Dry substrates* (Svacha 2001)
Larvae	*Develop in and under bark, later further into the sapwood (*Kemner 1922, Kryger & Søndrup 1945, Duffy 1953, Palm 1959, Bily & Mehl 1989, Bense 1995, Sláma 1998, Sama 2002, Thomson 2007, Ehnström & Holmer 2007) *In the pith channels* (Kryger & Søndrup 1945)	*Develop in and under bark, later further into the sapwood* (Demelt 1956, Teppner 1963, Bense 1995) *Bark, usually not in wood* (Demelt 1966, Svacha 2001)
Pupation	*Pupation takes place in spring* (Palm 1959, Hellrigl 1967, Bense 1995), April-May (Duffy 1953), May (Hansen 1966, Bily & Mehl 1989, Thomson 2007), *May-June* (Ehnström & Axelsson 2002, Ehnström & Holmer 2007).	*Spring* (Demelt 1966, Teppner 1969, Bense 1995) *Pupation take place in May-June* (Ehnström & Holmer 2007)
Pupal chamber	*Pupal chamber situated from barely furrowing the sapwood to deeper in the wood, curved and hook-shaped* (Kemner 1922, Duffy 1953, Palm 1959, Hellrigl 1967, Bily & Mehl 1989, Sláma 1998, Sama 2002)	*Pupal chamber curved and hook shaped* (Demelt 1956, Teppner 1963) *In the wood* (Demelt 1966) *Usually in the bark* (Svacha 2001, Svacha & Danilevsky in prep.)
Imago	*Imagines appear mostly May-June* (Kemner 1922, Kryger & Søndrup 1945, Duffy 1953, Hansen 1966, Hellrigl 1967, Horion 1974, Bily & Mehl 1989, Bense 1995, Sama 2002, Ehnström & Holmer 2007, Thomson 2007) *Recorded in July in Norway*	*Imagines appear in April-June* (Demelt 1956); May-June (Ehnström & Holmer 2007); May-July (Hellrigl 1967, Bense 1995); June (Demelt 1966)
Development/life cycle	*1 year* (Sláma 1998); *probably 1 year* (Hansen 1966); *normally 1 year but possibly 2 years* (Kemner 1922, Palm 1951, 1959: based on Kemner 1922, Bily & Mehl 1989); *probably 1-2 years* (Ehnström & Axelsson 2002); *2 years* (Bily & Mehl 1989, Bense 1995, Heliövaara et al. 2004, Ehnström & Holmer 2007, Thompson 2007)	*1-2 years* (Demelt 1966); *2 years* (Teppner 1963, Bense 1995, Ehnström & Holmer 2007)

TABLE 4. continued

	S. dubia	***S. ferrea***
Altitude	*Hills and lower mountains in South Poland, probably not in the lowlands* (Burakowski et al. 1989) *Lower altitudes* (Sláma 1998)	*Lower altitudes, probably distributed in most of Poland* (Burakowski et al. 1989) *Mountains and subalpine areas* (Horion 1974) *In Graz, at altitude 1500m* (Hellrigl 1967)

of Tilia in Czech Republic and Slovakia, they have never been reared from the same substrate (S. Snäll pers. com. see Wallin et al. 2005). No documentation shows that both species live in the same substrate (Wallin et al. 2005). Svacha (pers. com.) states that the two species might occur on the same substrate/tree. The question can not be fully answered without further studies.

In Stangenes (Kristiansand Municipality), *S. ferrea* and *S. dubia* live sympatrically (macro-sympatric level) in the same forested area. The beetles have been collected from firewood cut in a limited area and stored at the same place. On this basis it is difficult to evaluate how closely the species live together in the area (micro-sympatric level) or the level of competition between the species.

Is the Norwegian population of *S. ferrea* a relict? The discussion about the possibility of relict populations of *Stenostola* in Scandinavia is not new. Klefbeck (1924) raised the question about *S. dubia* (called ferrea) in Sweden, based on the records in combination with the assumption that *S. dubia* is monophagous on *Tilia*. Forsius (1925) argued against this hypothesis, based on Finnish records from *Salix caprea* and *Alnus incana*. In the Nordic countries the distribution of *S. dubia* is more or less continuous (Wallin et al. 2005, Ehnström & Holmer 2007).

Tilia arrived in Norway from the south in the post-glacial warm period, 7–8000 years ago. The distribution of *Tilia* in Norway was much wider 5–6000 years ago, due to a climate which was up to 2° C warmer than today (Frivold 1994, Nedkvitne & Gjerdåker 1997, Jensen & Canger 1999).

Today *Tilia* is locally rather common in the coastal and lowland areas in the southern, eastern and western Norway (Fig. 5). There are no physical barriers, such as gaps in the distribution of *Tilia* or mountain barriers, along the coast where *S. ferrea* is found and towards Sweden and Denmark (Fig. 5). The beetles are mobile and fly at least shorter distances.

Beetles may be carried long distances by the wind, passing the narrow straight between Sweden and Denmark (Baranowski & Gärdenfors 1974). However, many beetle species known from western Norway, as well as from the southern coast and islands in the Oslofjord area, are generally accepted as being relicts from warmer periods. We consider *S. ferrea* in Norway as a possibly relict population. New records are needed to fill the distributional gap between the Norwegian and the Danish populations in order to prove otherwise.

Are the *Stenostola* species rare or threatened in Norway? *S. dubia* is locally common and widely distributed in Norway. As shown (Tables 1–2) it is a polyphagous species. Nothing in the choice of host trees and substrates indicates a limitation in substrate availability. Neither do we have any indication of decrease of the abundance in Norway. This conclusion is in harmony with the Swedish: "… it seems that the abundance of *S. dubia* increased during the first half of the 20th century, but that it has been quite stable since." (Lindhe et al. 2010). We thus agree with Ødegaard et al. (2006, 2010) that *S. dubia* should not be included in the red list.

S. ferrea was previously listed in the category Data Deficient (DD) (Ødegaard et al. 2006) with no criteria specified. In the new National Red List (Ødegaard et al. 2010) it is listed as Vulnerable (VU) based on the criteria B1ab(iii)+2ab(iii). This means that: B1: The distribution area is <20 000 km^2; a: Strongly fragmented habitats or few localities; b(iii): Continuing reduction/decline of

the distribution area or quality of habitats; + 2: Area of occupancy is <2000 km^2; a and b(iii) as above.

The number of records of *S. ferrea* indicates that it is a rare species in Norway, as well as in Denmark. However, we believe that *S. ferrea* might be overlooked because of taxonomical problems and little focus on the species. It is also common that species become rarer at the outskirts of their range.

The rarity of *S. ferrea* in Norway cannot be explained by lack of available substrate. Dry branches and slender stems of *Tilia* spp., with diameters ranging from 1 cm sometimes up to 20 cm, are the preferred substrates. In regular forest operations and cutting of firewood the twigs, branches and the thinnest stems are left in the forest. The traditional agricultural landscape in Norway is gradually changing from more open sun exposed areas to denser forested and shaded land. This might be a negative factor for the species.

There is no data that indicates or shows decline or increase of the population in Norway. The record data of *S. ferrea* are not consistent in time, space, method and sampling intensity, and can not be used as basis to indicate changes in the population size. We have not found any information on population dynamics in literature from other countries, except that mass attacks have been reported on fruit trees in central Europe (Strojnowski 1961, Burakowski et al. 1989). Specimens from mass attacks should be re-examined to ensure the identity of the beetles. Neither have we any indications that the habitats are more fragmented, nor that the availability of substrates and the habitat quality are reduced. Together with the uncertainty of the distribution and abundance, the status on the red list should consequently remain data deficient (DD), not vulnerable (VU), until new data are available and prove otherwise.

Acknowledgements. We would like to thank Oddvar Hanssen (Trondheim), Sindre Ligaard (Vestby), Arne C. Nielsen (Tromsø), Stefan Olberg (Oslo), Bjørn A. Sagvolden (Kongsberg), Svein Svendsen (Kristiansand), and Frode Ødegaard (Trondheim) for making specimens and data available. We would also like to thank Stig Lundberg (Luleå) and Mikael Sörensson (Lund) for useful information on the species. Thanks to Petr Svacha for constructive comments and useful information. Rune Eriksen and Tore Skrøppa kindly provided us with essential information on the lime trees in Norway. Thank you also to Karsten Sund (Oslo) who took the beautiful photographs of the beetles. Siri Bjoner (Ås) kindly commented the manuscript and gave us very useful comments on the language.

References

Baranowski, R. & Gärdenfors, U. 1974. Vinddrift av jordløpare i Sydøstra Skåne (Col., Carabidae). *Entomologen* 3, 35–52.

Bense, U. 1995. *Longhorn Beetles. Illustrated Key to the Cerambycidae and Vesperidae of Europe*. Margraf Verlag, Weikersheim. 512 pp. ISBN 3-8236-1154-2.

Bily, S. & Mehl, O. 1989. Longhorn Beetles (Coleoptera, Cerambycidae) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica* 22, 1–203.

Burakowski, B., Mroczkowski, M. & Stefansdka, J. 1989. Coleoptera Cerambycidae i Bruchidae. *Katalog Fauny Polski* 23/15, 1–312 + 1 map.

Böhme, J. 2005. Katalog (Faunistische Übersicht). *Die Käfer Mitteleuropas* Band K. 2. Auflage. 1–515.

Clayhills, T. 2002. Sarvijäärien *Stenostola ferrea* (Schrank) ja *S. dubia* (Laicharting) esiintyminen Suomessa (Coleoptera, Cerambycidae). [The occurrence of the long-horned beetles *Stenostola ferrea* (Schrank) and *S. dubia* (Laicharting) in Finland (Coleoptera, Cerambycidae)]. *Sahlbergia* 7, 100.

Demelt, C. v. 1956. Bemerkenswertes zur Biologie von Stenostola ferrea Schrk. *Carinthia* II, 64–68.

Duffy, E. A. J. 1953. *A Monograph of the immature Stages of British and imported Timber Beetles (Cerambycidae)*. British Museum (Natural History). London. 350 pp. + plate I-VIII.

Ehnström, B. & Axelsson, R. 2002. I*nsektgnag i bark och ved*. ArtDatabanken, SLU, Uppsala. 512 pp. ISBN 91 88506 26 6.

Ehnström, B. & Holmer, M. 2007. *Nationalnyckeln till Sveriges flora och fauna. Skalbaggar: Långhorningar. Coleoptera: Cerambycidae.* ArtDatabanken, SLU, Uppsala. 302 pp. ISBN 978-91-88506-62-7.

Eriksen, R. 2009. *Overvåking av treslag med spredt forekomst. Registrert på oppdrag fra*

Genressursutvalget for skogstrær. Rapport fra feltregistreringene 2004–2008. 15. juni 2009. 11 pp.

Forsius, R. 1925. Till frågan om *Stenostola ferrea* så som tertiärrelikt. *Notulae Entomologicae* 5, 29–30.

Frivold, L. H. 1994. *Trær i kulturlandskapet.* 224 pp. Landbruksforlaget. ISBN 82-529-1651-1.

Hagemann, A. 1891. *Vore norske Forstinsekter eller de for Skovene skadelige og nyttige Insekter, deres Optræden og Utbredelse i Norge. En Haandbog for Skovejere og Forstmænd.* Alb. Cammermeyers Forlag. Christiania og Kjøbenhavn. 144 pp.

Hansen, M. 1996. Katalog over Danmarks biller [Catalogue of the Coleoptera of Denmark]. *Entomologiske Meddelelser* 64, 1–231.

Hansen, V. 1960. The Danish Species of the Genus *Stenostola* Muls. (Coleopt., Cerambycidae). Entomologiske Meddelelser 29, 321–322.

Hansen, V. 1966. *Biller XXII Trebukke*. Danmarks Fauna 73, 1–228.

Harde, K. W. 1966. 87. *Fam. Cerambycidae*. In: Freude, H., Harde, K. W. & Lohse, G. A. Die Käfer Mitteleuropas 9, 7–94.

Heliövaara, K., Mannerkosi, I. & Siitonen, J. 2004. *Longhorn Beetles of Finland (Coleoptera, Cerambycidae).* Tremex Press, Helsinki. 374 pp. ISBN 952-5274-03-9.

Hellén, W. (Curavit), Hansen, V., Jansson, A., Münster, T. & Strand, A. 1939. *Catalogus Coleopterorum Daniae et Fennoscandiae.* Societas pro Fauna et Flora Fennica. Helsingforsiae. 129 pp.

Hellrigl, K. G. 1967. Die Cerambyciden-Fauna von Südtirol. *Koleopterologische Rundschau* 45, 3–75 + plates.

Horion, A. D. 1974. Cerambycidae – Bockkäfer (mit 52 Verbreitungskarten). *Faunistik der mitteleuropäischen Käfer* 12, 1–228.

Hultén, E. 1971. *Atlas över växternas utbredning i Norden fanerogamer och ormbunksväxter [Atlas of the distribution of vascular plants in Northwestern Europe].* Second revised edition. Stockholm. 531 pp.

Jäger, G. (Ed.). 1884. C. G. *Calwer's Käferbuch. Naturgeschichte der Käfer Europas zum Handgebrauche für Sammler.* Stuttgart Julius Hoffmann. K. Thienemanns Verlag, Stuttgart. Vierte Auflage 667 pp. + 50 Tafeln.

Jenis, I. 2001. *Long-horned Beetles. Distenidae, Oxypeltidae, Vesperidae, Anoplodermetidae & Cerambycidae 1. Vesperidae & Cerambycidae of Europe 1.* Ateliér Regulus, Zlín. 333 pp. ISBN 80-238-6757-1.

Jensen, J. S. & Canger, S. 1999. *Lime (*Tilia *spp.),* p. 8–20. In: Turok, J., Jensen, J., Palmber-Lerche, C., Rusanen, M., Russell, M., de Vries, S. & Lipman, E. (Eds.). Noble Hardwoods Network. Report of the third meeting, 13–16 June 1998, Sagadi, Estonia. International Plant Genetic Resources Institute, Rome Italy.

Kemner, N. A. 1922. Zur Kenntnis der Entwiklungsstadien und Lebensweise der schwedischen Cerambycidaen. *Entomologisk Tidskrift* 43, 81–138.

Klefbeck, E. 1924. En relikt från den postglaciala värmeperioden. *Entomologisk Tidskrift* 55, 203–204.

Klefbeck, E. 1962. Catalogus Insectorum Suecicae. XVI. Coleoptera 1960. Några förklaringar och tillägg. *Opuscula Entomologica* 23, 153–174.

Kryger, J. P. & Sønderup, H. P. S. 1945. Biologiske Iaktagelser over 200 Arter af danske Billelarver. II. *Entomologiske Meddelelser* 24, 175–261.

Lid, J. & Lid, D. T. 2005. *Norsk Flora*. 7. utgåva ved Reidar Elven. Det Norske Samlaget. Oslo. 1230 pp. ISBN 82-521-6029-8.

Lindhe, A., Jeppsson, T. & Ehnström, B. 2010 (released 2011). Longhorn beetles in Sweden – changes in distribution and abundance over the last two hundered years. *Entomologisk Tidskrift* 131, 241–508. (The details of the records are available at http://www.sef.nu/et/Database_ET_2011_4.xls , checked 17.05.2011).

Lindroth C. H. (Red. Cur.). 1960. *Catalogus Coleopterorum Fennoscandiae et Daniae.* Entomologiska Sällskapet i Lund. 476 pp. + 1 map.

Lundberg, S. 1963. Bidrag till kännedom om svenska skalbaggar 8. *Entomologisk Tidskrift* 84, 247–250.

Lundberg, S. 1967. Bidrag till kännedom om svenska skalbaggar 10. *Entomologisk Tidskrift* 88, 76–82.

Lundberg, S. 1986. *Catalogus Coleopterorum Suecicae.* 155 pp. Stockholm. ISBN 91-86510-06-1.

Lundberg, S. 1995. *Catalogus Coleopterorum Suecicae.* 214 pp. Stockholm. ISBN 91-86510-40-1.

Lysholm, B. 1937. Coleopterfaunaen i Trøndelag. *Norsk Entomologisk Tidsskrift* 4, 143–182.

Löbl, I. & Smetana, A. (Eds.). 2010. *Catalogue of Palaearctic Coleoptera, volume 6. Chrysomeloidea.* Stenstrup: Apollo Books. 994 pp. ISBN 978-87-88757-84-2.

Moen, A. 1998. *Nasjonalatlas for Norge: Vegetasjon.* Statens Kartverk, Hønefoss. 199 pp. ISBN 82-90408-26-9.

Mong, C. E. 2005. Foryngelse hos lind *Tilia cordata* i

Sør-Norge. *Aktuelt fra skogforskningen* 4/05, 1–17.
Myking, T. & Skrøppa, T. 2001. Bevaring av genetiske ressurser hos norske skogstrær. *Aktuelt fra skogforskningen* 2/01, 1–44.
Nedkvitne, K. & Gjerdåker, J. 1997. *Lind i norsk natur og tradisjon.* Særpublikasjon nr. 12, Norsk skogbruksmuseum. 164 pp. ISBN 82-90660-20-0.
Nordiska Ministerrådet. 1984. *Naturgeografisk regionindelning av Norden*. 1–289 + appendixes + 1 map. ISBN 91-38-08239-X.
Palm, T. 1951. Die Holz- und Rinden-Käfer der nordschwedischen Laubbäume. *Meddelanden från Statens Skogsforskningsinstitut* 40, 1–242.
Palm, T. 1959. Die Holz- und Rinden-Käfer der süd- und mittelschwedischen Laubbäume. *Opuscula Entomologica Supplementum* 16, 1–374 + 93 figures.
Palm, T. 1962. Bidrag til kännedomen om svenska skalbaggars biologi och systematik. 42–47. *Entomologisk Tidskrift* 83, 185–198.
Rejzek, M. & Rébl, K. 1999. Cerambycidae of Krivoklátsko Biosphere Reserve (Central Bohemia) (Insecta: Coleoptera). *Mitteilungen des Internationalen Entomologischen Vereins e. V. Frankfurt a. M. Supplement VI*, 1–69.
Sama, G. 1988. *Coleoptera. Cerambycidae. Catalogo topografico e sinonimico*. Fauna d'Italia 26, 1–216.
Sama, G. 2002. *Atlas of the Cerambycidae of Europe and the Mediterranean Area. Volume 1: Northern, Western, Central and Eastern Europe. British Isles and Continental Europe from France (excl. Corsica) to Scandinavia and Urals.* Nakladatelství Kabourek, Zlín. 173 pp. ISBN 80-86447-07-3.
Silfverberg, H. (red.) 1979. *Enumeratio Coleopterorum Fennoscandiae et Daniae.* Helsingfors Entomologiska Bytesförening. 79 pp.
Silfverberg, H. 2004. Enumeratio nova Coleopterorum Fennoscandiae, Daniae et Baltiae. *Sahlbergia* 9, 1–111.
Skidmore, P. & Johnson, C. 1969. A preliminary list of the Coleoptera of Merioneth, North Wales. *Entomologist's Gazette* 20, 139–225.
Sláma, M. E. F. 1998. *Tesaríkovití Cerambycidae*. Ceské republiky a Slovenské republiky. 383 pp. ISBN 80-238-2627-1.
Strand, A. 1946. Nord-Norges Coleoptera. T*romsø Museums Årshefter. Naturhistorisk Avd.* Nr. 34. Vol 67 (1944) nr. 1, 629 pp. + 2 maps.
Strand, A. 1970. Additions and corrections to the Norwegian part of Catalogus Coleopterorum Fennoscandia et Daniae. *Norsk Entomologisk Tidsskrift* 17, 125–145.
Strand, A. 1977. Additions and corrections to the Norwegian part of Catalogus Coleopterorum Fennoscandia et Daniae. Second series. *Norwegian Journal of Entomology 24*, 159–165.
Strojnowski, R. 1961. *Stenostola ferrea* Schrank (Coleoptera, Cerambycidae) als Schädling der Apfelbaum (Malus domestica). *Polskie Pismo Entomologiczne* 31, 63–65 + 6 figures (in Polish).
Svacha, P. 2001. 17. *Überfamilie: Chrysomeloidea 114. Familie: Cerambycidae 7. Unterfamilie: Lamiinae* In: Klausnitzer, B. 2001. Die Larven der Käfer Mitteleuropas. L6, 248–298 + Abb. 1–155.
Svacha, P. & Danilevsky, M. L. Manuscript in prep. *Cerambycoid larvae of Europe and the former Soviet Union. Part IV: Lamiinae.*
Teppner, H. 1963. Zur Kenntnis der mitteleuropäischen Saperdini. Zeitschr. *Der Arbeitsgemeinschaft Österr. Entomologen* 15, 68–94.
Teppner, H. 1969. Bestimmungstabelle mitteleuropäischer Lamiinae-Larven (Coleoptera, Cerambycidae) mit Bemerkungen zu deren Biologie. *Verh. Zool.-bot. Ges. Wien* 108/109, 19–58.
Thomsen, P. F. 2007. Træbukke. *Natur og Museum* 46, 1–36. ISBN 978-87-91779-07-7.
Tjeder, B. 1948. Insekter från södra Bohuslän 1946. *Entomologisk Tidskrift* 69, 215–224.
Vives, E. 2000. *Coleoptera. Cerambycidae*. Fauna Iberica 12, 715 pp. + anexo figures 200–204 + addenda.
Wallin, H., Lundberg, S. & Hägg, T. 2005. Finns de båda palearktiska arterna av lövgrenbock, *Stenostola dubia* och *S. ferrea* (Coleoptera, Cerambycidae) i Norden? [Are both Palaearctic cerambycid species, *Stenostola dubia* and *S. ferrea* (Coleoptera, Cerambycidae) occurring in the Nordic countries? (In Swedish with an English summary)]. *Entomologisk Tidskrift* 126, 173–179.
Ødegaard, F., Andersen, J., Hansen, O., Kvamme, T. & Olberg, S. 2006. *Biller, Coleoptera.* 237–266. - In: Kålås, J. A., Viken, Å. & Bakken, T. (red.). Norsk Rødliste 2006–2006 Norwegian Red List. Artsdatabanken, Norway. ISBN-10: 82-92838-00-7.
Ødegaard, F., Andersen, J., Hansen, O., Kvamme, T. & Olberg, S. 2010. *Biller, Coleoptera*. 257–290. - In: Kålås, J. A., Viken, Å., Henriksen, S. & Skjelseth, S. (red.). Norsk Rødliste for arter 2010. The 2010 Norwegian Red List for Species. Artsdatabanken, Norway. ISBN-13: 978-82-92838-26-6.

Received: 23 March 2011
Accepted: 23 May 2011