

# *Carabus hortensis* L. (Coleoptera, Carabidae) in northern Norway

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During a comprehensive study involving 616 pitfall traps in Nordland, northern Norway, 184 specimens of the carabid beetle *Carabus hortensis* L. were collected. *C. hortensis* is recorded new to the northern part of Nordland and seems to be a species expanding its range in Scandinavia. The present study discusses the spreading of this specific species as well as dispersal of other *Carabus* species.

Key words: *Carabus hortensis*, distributional pattern, Nordland, northern Norway

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## INTRODUCTION

Many species are probably presently spreading at a much higher rate than they would normally do under natural conditions (Arim et al. 2005). Human activity is affecting the natural world in a whole range of ways of which pollution, habitat destruction and global warming have been given a lot of attention. However, the dispersal of species by trade and other activities also have a major impact on ecosystems. Invasive species, like the Iberian slug (Dolmen & Winge 1997), have been given some attention but species which do not become pests do in many cases displace other species (McNeely et al. 2001, Arim et al. 2005).

*Carabus hortensis* L. is a widespread and common carabid species in Europe distributed from Norway and Central Europe to the Southern Urals in Russia (Turin et al. 2003). In Norway, the species has been recorded north to the southern part of the county of Nordland, about 64° N, (Lindroth 1985, Lindroth

1986, Vik 1991). It is mainly a eurytopic forest or woodland dwelling species, but is also found in open country. In Norway, *C. hortensis* is locally very abundant in deciduous and mixed forest up to tree-line (Lindroth 1985, Oró 2006, Hanssen & Andersen unpublished data). Furthermore, Arndt (cited in Turin et al. 2003) recorded the same local dominance in moderately dry, coniferous forests in Poland and eastern Germany.

Sampling was conducted continuously from late May to late July 2003 in a total of 77 sites. Each site had eight pitfall traps in a line separated by 2 m. Each trap consisted of a plastic cup, 7 cm in diameter and 9.5 cm deep, buried to the rim. The traps were covered by a sheet metal roof 2 cm above the rim of the trap and half filled with a 4 % formaldehyde solution with a small amount of liquid detergent.

The localities are given according to the revised Strand system (Økland 1981) and the survey grid



**Figure 1.** Map of the county of Nordland, northern Norway. The black dot indicates the new northern recording of *Carabus hortensis*. The species has previously only been recorded south of Bodø. Mapsource: Statens Kartverk.

system of Norway (Økland 1976). The material was deposited at Bergen Museum.

## RESULTS

In total we found 184 specimens of *Carabus hortensis*, of which ten occurred much further north than previous records (Table 1.). All of these ten specimens were collected from one site close to the city of Narvik, in the extreme north of the county of Nordland (Figure 1). The rest of the specimens were found in the coastal southern part of the county. Beside *C. hortensis*, the material also included *C. glabratus*, *C. violaceus* and *C. coriaceus*. The two former species were common throughout the county, while the latter species was only found in the southern part of Nordland. This

is in accordance with previous findings (Lindroth 1985, Vik 1991).

## DISCUSSION

Several new records of insects, including Coleoptera, have been made in recent years, but this is mainly due to poor knowledge of beetle distribution in Norway (Andersen et al. 1992, Olberg & Andersen 2003, Ødegaard & Ligaard 2000, Refseth 1987, Skartveit et al. 2004, Solevåg 2006, Thunes et al. 2004). This applies especially to North-eastern Nordland (NNØ), where less than 325 species of Coleoptera have been recorded (Andersen & Olberg 2003). In addition, there are several reasons to expect spreading of species. Changing climate and human activity are perhaps some of the most important factors to determine the present and future distribution of species. In the case of *Carabus hortensis* one may assume that this species really is a species which increases its distribution area in Scandinavia. It is a rather large beetle which is easy to sample and has therefore hardly gone unnoticed in previous work conducted by Carl H. Lindroth, Johan Andersen and amateur entomologist such as Andreas Strand (J. Andersen pers. comm.). Previous studies regarding *C. hortensis* have shown that this species is a rather fast-spreading species compared with other species belonging to the *Carabus* genus (Turin et al. 2003), and hedgerows and stepping stones are of less importance increasing the importance of stochastic processes (Jopp & Reuter 2005). In addition, populations of *C. hortensis* seem to be increasing locally and expanding its distribution in eastern Germany (Turin et al. 2003). The sampling ended in late July missing the activity peak known for this species (Hatteland et al. 2005), which means that the ten specimens sampled in the northern part of Nordland probably is a relatively high number. *C. hortensis* is a biennial autumn breeding species in Northern Europe (Lindroth 1985, Turin et al. 2003), and since the activity peak is closely related to the breeding period (Adis 1979, Mortensen 1985, Thiele 1977) one normally finds the highest in August-September. However, the breeding period, and hence the activity peak,

**Table 1.** Activity abundance of *Carabus hortensis* L. NSY = the coastal south of Nordland, NNØ = the north-eastern part of Nordland. The sites are arranged according to longitude from south to north. Numbers = No. of specimens.

Site nr.	Numbers	County	EIS	Municipality	Vicinity	Vegetation
17	2	NSY	110	Sømna	Vennesund	Spruce forest
18	37	NSY	110	Sømna	Vennesund	Heathland
20	1	NSY	110	Sømna	Vennesund	Road edge vegetation
21	1	NSY	110	Sømna	Vennesund	Bog
23	17	NSY	110	Sømna	Vennesund	Deciduous forest
24	14	NSY	110	Sømna	1 km east of Amundsgjerdlia	Spruce forest
25	5	NSY	110	Sømna	Amundsgjerdlia	Deciduous forest
26	3	NSY	110	Sømna	Amundsgjerdlia	Spruce forest
28	1	NSY	110	Sømna	Amundsgjerdlia	Deciduous forest
29	3	NSY	114	Brønnøy	Velfjord	Spruce forest
34	1	NSY	114	Brønnøy	Close to Torghatten	Heathland
41	10	NSY	117	Alstadhaug	Tjøtta	Deciduous forest
42	28	NSY	117	Alstadhaug	Skeilia	Deciduous forest
43	10	NSY	117	Alstadhaug	Skeilia	Deciduous forest
53	35	NSY	125	Meløy	Enga	Deciduous forest
58	2	NSY	126	Gildeskål	Inndyr	Deciduous forest
85	10	NNØ	140	Narvik	Trældal	Deciduous forest

seems to vary with altitude (Oró 2006, Hatteland & Oró in prep.) and probably also with longitude, due to varying season length.

*Carabus nemoralis* Müller 1764 has also been and probably still is a species that increases its range. This species was not known to Linnaeus in the 18<sup>th</sup> century, but is now known to be the most common species in Europe (Turin et al. 2003), although rather restricted to human settlement (Turin et al. 2003). It is therefore no surprise that this species is one of the *Carabus* species which have been introduced to North America by man during the last centuries (Turin et al. 2003). Other *Carabus* species, as well as other insect groups, will probably increase their distribution latitudinal as well as altitudinal due to warmer climate.

While some species of the genus *Carabus* are probably expanding their distribution areas others are declining. One of the best examples

is the marshland inhabiting *Carabus clathratus*, which is one of the rarest *Carabus* species in Norway as well as in rest of Europe (Turin et al. 2003). Recently it has only been found in a couple of localities in south-eastern Norway; Tjøme and Mostrand in the county of Vestfold, while older recordings included also the counties Østfold and Akershus in south-eastern Norway as well as Rogaland in south-western Norway (DN 2006). This is probably due to increased pollution and habitat fragmentation. Other examples of declining species are *Carabus nitens*, *C. arcensis*, *C. cancellatus* and *C. convexus*.

Beside *Carabus* other carabids have also been successfully introduced to new areas. *Agonum dorsale* (Pontoppidan 1763) is a good example of an expanding species in eastern Norway, which probably may reach even northern Norway (Andersen 1985, 1996). In addition, the species was successfully mass-released into new areas,

which show the potential of anthropological means of successful introduction of alien species (Andersen 1996).

*C. hortensis* was only found in 16 of 52 sites in the present study, which seems to indicate that the species are scattered in the northern part of its distribution. This is in accordance with previous studies in this county (J. Andersen pers. comm.). In the present study, *C. hortensis* occurred in all kinds of habitats in the extreme southern part of the county, but was restricted to deciduous woodland further north. The former pattern has also been found in central Norway, although the species was more abundant in woodland and scrubs (Hatteland 2004, Hatteland et al. 2005). However, *C. hortensis* seems to be very restricted in habitats typical facing south or west in the northern most distribution. Overall, the species seems to be a eurytopic woodland species in northern Norway as in most of its distribution area, but do also occur frequently in many other habitats. These findings contradict Lindroth (1985), who found the species to be constricted to humus-rich rather dry soil in deciduous and mixed forests in Scandinavia. *C. hortensis* is considered as a eurytopic species in continental Europe (Turin et al. 2003), and perhaps it is also becoming more eurytopic in Scandinavia as well, due to changes in climate. northern Norway has experienced an increased average temperature of about 2°C during the last Century (Norwegian Meteorological Institute), which may influence species distributions, of which *C. hortensis* is probably one example.

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