Current distribution, status and patterns of spread of the Eurasian beaver *Castor fiber*, and the implications for management

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Abstract

Reduced to 1200 animals in 8 small refugia by the end of the 19th century, natural spread and reintroductions have led to a powerful recovery in Eurasian beaver (*Castor fiber* L. 1758) range and populations. The minimum population is now 592 000 animals, of which c.40% are found in Russia. In Europe, beaver are common and widespread in European Russia, Scandinavia, the Baltic states and Belarus; scattered populations are now established in all other countries with the exception of the Caucasus, Iberia, Italy, the southern Balkans, and the British Isles. Further reintroductions are continuing. It seems clear that beaver will within a few decades once again be a tolerably common mammal in suitable habitat over most of its former European range. Patterns of spread and population development indicate that populations should be managed at the watershed scale.

Key words: *Castor fiber, distribution, status, populations, management*

Introduction

Formerly widespread throughout much of the Palaearctic region, Eurasian beaver *Castor fiber* (L. 1758) populations were reduced through overhunting to c. 1200 animals, in eight isolated populations, by around the end of the 19th Century. Since the 1920s, effective protection of these remnants, the resultant natural spread, and widespread reintroductions have led to a powerful recovery in both range and population.

Population status

The minimum population estimate in 2000 is 592 000 individuals. There are also c. 12 500 North American beaver *C. canadensis* established in Finland and Russian Karelia (Ermala et al. 1999); however, other populations of *canadensis* introduced to Austria, Poland and France appear to be extinct (Sieber pers. comm.; Moutou 1997).

Populations are now established throughout Europe, with the exception of the British Isles, Iberia, Italy, and the southern Balkans. Habitat occupied ranges from wilderness areas to intensively managed landscapes with dense human populations, and from warm temperate to subarctic climates. Reintroductions are continuing. Considerable further expansion of both range and population, especially in western Europe and the lower Danube basin, can be expected. If current trends continue, *C. fiber* will within a few decades be a fairly common mammal throughout much of Europe.

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Patterns of spread and population development

Following initial establishment on a watershed, populations typically show a pattern of rapid range extension, followed only later by rapid population growth (Fig. 1). There is strong selection for high-quality habitat at this stage, which appears to explain the rapidity of range extension. Later (on average, 34 years post-colonisation in Sweden), populations go into decline as marginal habitat is occupied and then exhausted (Fig. 2). The period of peak and declining populations often coincides with a peak in conflicts with human landuse interests, as marginal habitats are more likely to require extensive modification by beavers.

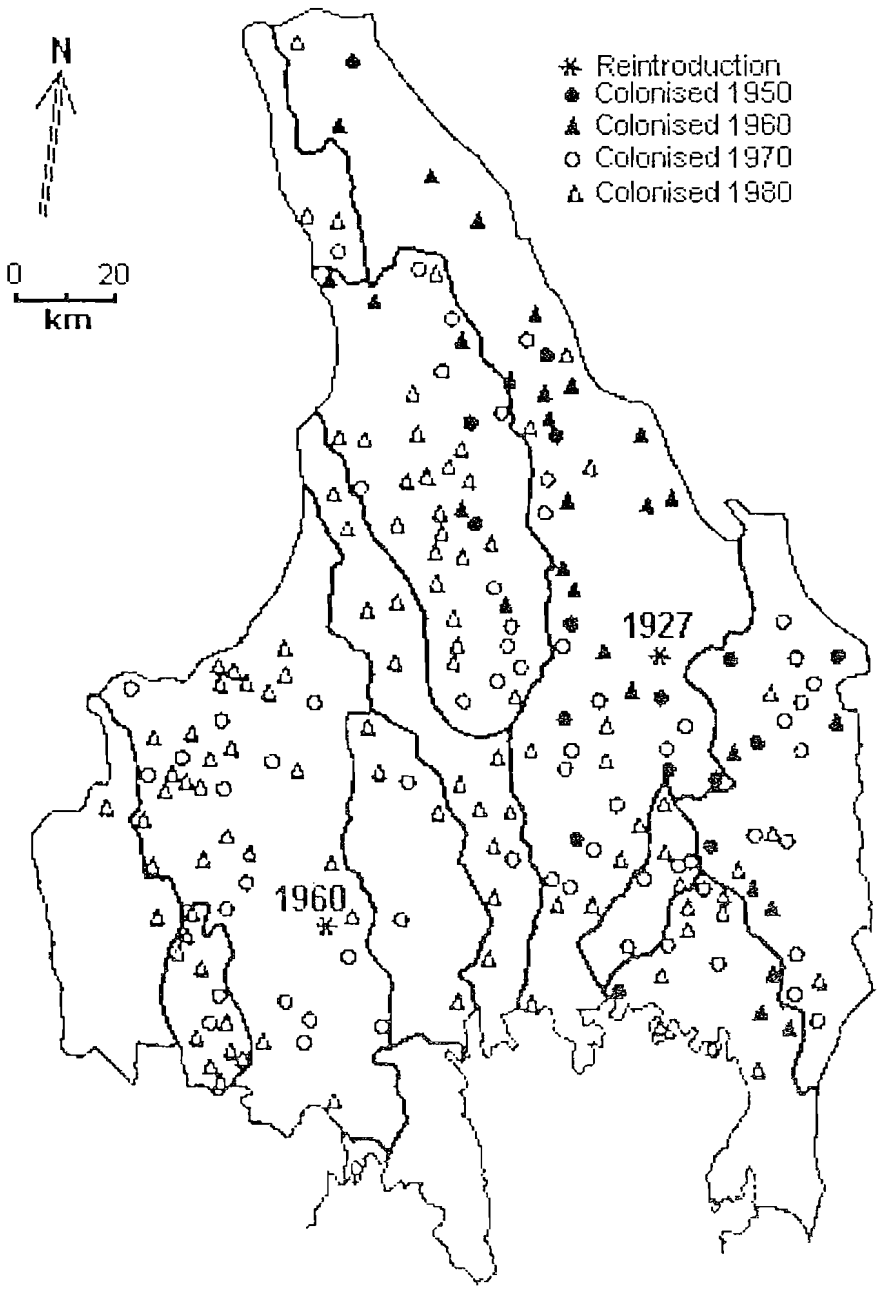

Fig. 1. Patterns of spread of beavers recolonising Värmland province, Sweden. Terrain is flat to mildly hilly and heavily wooded. Watershed divides are shown by bold lines. Dates and locations of reintroductions are indicated. Beaver spread very rapidly throughout watersheds after initial recolonisation, with infilling thereafter. Watershed divides, however, significantly slowed range expansion. Figure adapted from Hartman (1994).

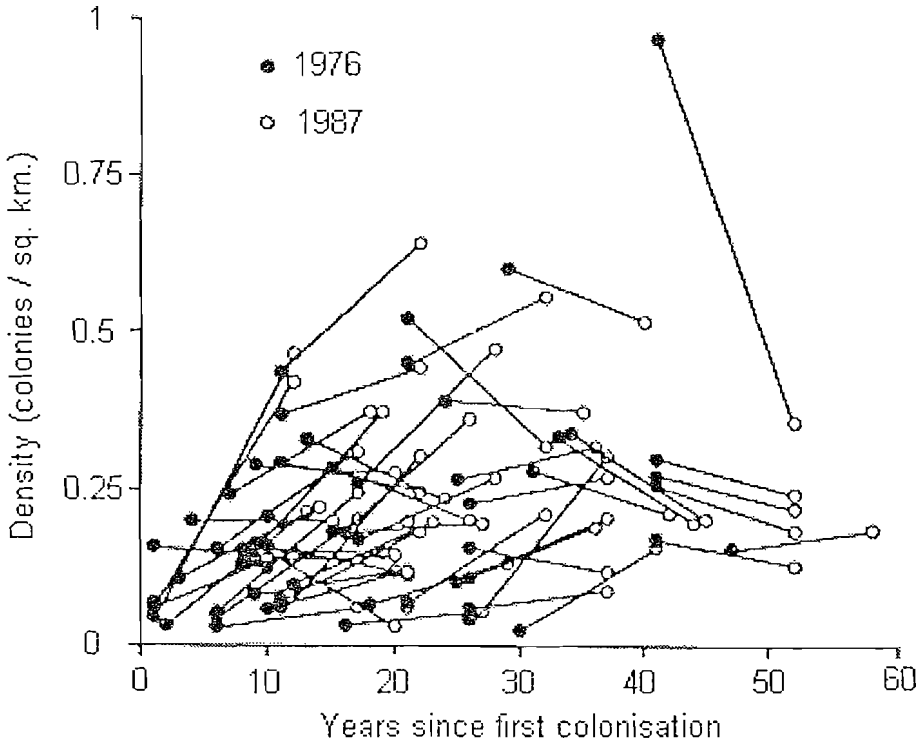

Fig. 2. Changes in local beaver population densities in Värmland, Sweden, related to time since colonisation. Figure adapted from Hartman (1994).

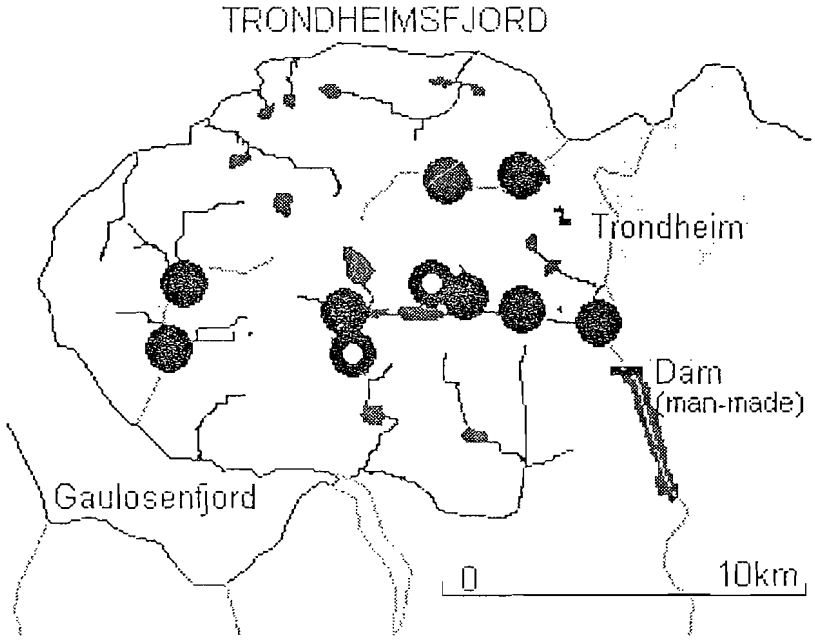

Fig. 3. Distribution of beavers in Trondheim Byneset in 1998. Filled black circles represent the centres of active home ranges; hollow circles indicate abandoned home ranges. Beaver were reintroduced in 1975 and by 1998 had colonised three of the six major stream systems. Each of the three largest uncolonised stream systems contain sufficient habitat for several beaver colonies, but as yet remain unoccupied, although clearly marginal sites on the other systems are in use or have been abandoned.

Barriers to spread

Even in areas with short overland distances between suitable habitats and favourable terrain, watershed divides form a clear barrier to population spread (Fig. 1 & 3). Where a significant physical barrier between suitable habitat on different watersheds exists, such as mountains (e.g. Switzerland) or intensive farmland (e.g. Elez River, Brittany), it may be strongly isolating. Beaver only succeeded in establishing on a watershed adjacent to the Elez in 1997, 28 years after initial reintroduction (Stevenson pers. comm.)

Man-made dams and barrages have also been shown to constrain or prevent population spread within a river system, e.g. on the Rhône and Danube (Office Nationale de la Chasse 1997; Pachinger & Hulik 1998). Solutions include the construction of „beaver ladders" around barrages (Office Nationale de la Chasse 1997).

Management implications

Beaver populations and distribution should normally be managed at the watershed scale. A major exception is that sections of watersheds may be manageable in isolation where man-made dams act as barriers to beaver dispersal. Populations can be regulated, and conflicts with human land uses minimised, through the introduction of a controlled harvest (e.g. through sport hunting). This should be introduced during the rapid increase phase of population growth (Hartmann 1994).

Early provision of interpretation and public viewing opportunities has been a feature of many recent reintroductions. This provides benefits in the form of public enjoyment, enhancement of the local economy through wildlife tourism, and the fostering of positive attitudes to beavers.

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Table 1. The history and present status of Eurasian beavers (*Castor fiber*) (updated after Nolet and Rosell 1998).

Country	Extirpation	Protection	Reintroduction and/or translocations	Present population size	References
Austria	1869	-	1970-90	>1300	Kollar & Seiter (1990), Sieber (pers. comm.)
Belarus	remnant	1922	-	24,000	Djoshkin & Safonov (1972), Safonov & Saveliev (1999)
Belgium	1848	-	1998-99	100-130	Schwab (pers. comm.), Libois (pers. comm.)
Bulgaria	?	?	2001-02	0	Schwab (pers. comm.)
Croatia	1857?	-	1996-98	150	Grubesic (pers. comm.)
Czech Republic	17th century	-	1991-92, 1996	300	Kostkan & Lehký (1997), Kostkan (1999), Kostkan (pers. comm.)

Denmark	c.500 BC[1]	-	1999	18	Skov- og Naturstyrelsen 1999; Asbirk (2000 & pers. comm.)
England	12th century	-	Under investigation	0	Macdonald *et al.* (1995); Tattersall (pers. Comm..)
Estonia	1841	-	1957	11,000	Laanetu (1995), Ulevicius (pers. comm.), Timm (Estonian Environmental Information Centre) (pers. Comm.)
Finland	1868	1868	1935-37, 1995	1500	Ermala *et al.* (1989), Lahti (1995), Härkönen (1999), Härkönen (pers. comm.)
France	remnant	1909	1959-95	7000-10,000	Richard (1986), Office Nationale de la Chasse (1997), Rouland (Office Nationale de la Chasse) (pers. comm.), Dennis (pers. comm.)
Germany	remnant	1910	1936-40, 1966-89, 1999-2000	8000-10,000	Schwab *et al.* (1994), Macdonald *et al.* (1995), Schwab (pers. comm.).
Hungary	1865	-	1980-2000	70	Kollar & Seiter (1990), Bozsér (*pers. comm.)*
Italy	1541	-	proposed	0	Nolet (1996)
Kazakhstan	?	-	-	1000	Djoshkin & Safonov (1972); Saveljev & Safonov (1999); Safonov & Saveliev (1999)
Latvia	1830s	-	1927-52, 1975-84	>100,000	Balodis (1992, 1994, 1995, 1997, 1998); Ozolins & Baumanis 2000
Lithuania	1938	-	1947-59	32,000-50,000	Mickus (1995), Ulevicius *et al.* (1999), Balciauskas *et al.* (1999); Ulevicius (2000)
Mongolia & China	remnant	?	1959-85	800	Lavrov & Lu Hao-Tsuan (1961), Lavrov (1983), Stubbe & Dawaa (1983, 1986)

Netherlands	1826	-	1988-2000	c.140	Nolet (1994), Djikstra & Niewold (pers. comm.)
Norway	remnant	1845	1925-32, 1952-65	>50,000	Bevanger 1995; Rosell & Pedersen (1999)
Poland	1844	1923	1943-49, 1975-86	17,000	Zurowski & Kasperczyk (1986, 1988), Zurowski (1992), Macdonald *et al.* (1995), Czech 1999, Dzięciolowski & Goździewski 1999, Czech (pers. comm.)
Romania	1824?	-	1998-99	>28	Troidl & Ionescu (1997), Schwab (pers. comm.)
Russia	remnant	1922	1927-33, 1934-41, 1946-64	232,000-300,000	Djoshkin & Safonov (1972), Lavrov (1983), Saveljev & Safanov (1999), Safonov & Saveliev (1999), Dezhkin (1999)
Scotland	16th century	-	2002?	0	Kitchemer & Conroy 1997; Scottish Natural Heritage (2000)
Slovenia	?	?	1999	<6[2]	Grubesic (pers. comm).
Slovakia	1851	-	1995	>500	Pachinger & Hulik (1999); Valachovic (1997), Dúha & Majlan (1997)
Sweden	1871	1873	1922-39	>100,000	Freye (1978), Hartman (1994a, 1995b); pers. comm.
Switzerland	1820	-	1956-77	>350	Stocker (1985), Macdonald *et al.* (1995), Winter (1997), S. Capt, Centre Suisse de Cartographie de la Faune (pers. comm.)
Turkey	remnant?		?	?	Savelyev (2000)
Ukraine	remnant	1922		6000	Djoshkin & Safonov (1972), Lavrov & Lavrov (1986), Safonov & Saveliev (1999)

[1]Based on subfossil remains. Philological evidence from placenames suggests a remnant may have survived as late as the 11th century (Klein 1999).

[2]By natural spread from the Croatian reintroduction on the Sava river

Estonia 1841 – 1957 11,000 Laanetu (1995), Ulevicius (pers. comm.), Timm (Estonian Environmental Information Centre) (pers. comm.)

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