

Supplementary file for: Coulson S.J. 2015. The alien terrestrial invertebrate fauna of the High Arctic archipelago of Svalbard: potential implications for the native flora and fauna. *Polar Research* 34. Correspondence: Stephen J. Coulson, Department of Arctic Biology, University Centre in Svalbard, P.O. Box 156, NO-9171 Longyearbyen, Svalbard, Norway. E-mail: steve.coulson@unis.no

Supplementary Table S1. Alien terrestrial invertebrates in Svalbard.

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
Cestoda					
Taeniidae					
<i>Echinococcus multilocularis</i> Leuckart, 1863	Established	Probably introduced to Svalbard by Arctic foxes from Siberia.	Holarctic	Parasite has little effect on the host Arctic fox. Only occurs in fox populations sympatric with vole populations. Some foxes in Svalbard distant from the vole populations have tested serum positive indicating large dispersal of foxes in general.	Henttonen et al. 2001
Oligochaeta					
Enchytraeidae					
<i>Cognettia glandulosa</i> (Michaelsen, 1888)	Established	Unclear if introduced via human activities or a natural component of the Svalbard invertebrate fauna. To date only recorded from	Holarctic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Unknown if the species is widely spread in Svalbard. If this species has been introduced into Barentsburg there is a risk that it may	Coulson et al. 2013a, b

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
		the imported soils for the now derelict greenhouse in Barentsburg.		spread beyond these soils but negative effects on the Svalbard ecology are likely to be minimal	
<i>Enchytraeus dichaeus</i> Schmelz & Collado 2010	Established	Unclear if introduced via human activities or a natural component of the Svalbard invertebrate fauna. To date only recorded from the imported soils for the now derelict greenhouse in Barentsburg.	Holarctic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Unknown if the species is widely spread in Svalbard. If this species has been introduced into Barentsburg there is a risk that it may spread beyond these soils but negative effects on the Svalbard ecology are likely to be minimal	Coulson et al. 2013a, b
Lumbricidae					
<i>Dendrodrilus rubidus</i> (Savigny, 1826)	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg.	Holarctic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Likely to be restricted the particular habitat conditions in these soils.	Coulson et al 2013a, b
<i>Dendrobaena hortensis</i> (Michaelsen, 1890)	Established	Probably introduced with imported soils for the now derelict greenhouse in	Holarctic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Unlikely to spread beyond these thick organic soils. Likely to be restricted the	Coulson et al. 2013a, b

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
		Barentsburg.		particular habitat conditions in these soils.	
Acari					
Laelapidae					
<i>Laelaps hilaris</i> C.L. Koch 1836	Established	Introduced with its host, the sibling vole (<i>Microtus levis</i>). Obligate parasite. Host probably brought to Svalbard with animal foodstuffs.	Palaeartic	Not likely to be able to establish beyond the range of its host.	Krumpál et al. 1991
Parasitidae					
<i>Paragamasus</i> (<i>Aclerogamasus</i>) <i>insertus</i> (Micherdziński, 1969)	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Not showing invasive tendencies. Unclear what effects it will have on the native flora and fauna.	Coulson et al. 2013a, b
<i>Vulgarogamasus remberti</i> (Oudemans, 1912)	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg.	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Not showing invasive tendencies. Unclear what effects it will have on the native flora and fauna.	Coulson et al. 2013a, b

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
<i>Dendrolaelaps foveolatus</i> (Leitner, 1949)	Established	Probably imported with soils brought to Pyramiden as part of greening project.	Palaeartic	Established in the imported and disturbed soils of Pyramiden. Not showing invasive tendencies. Unclear what effects it will have on the native flora and fauna.	Coulson et al. 2015
Araneae					
Philodromidae					
<i>Thanatus formicinus</i> (Clerck 1757)	Observation	Unknown.	Holarctic	Not able to establish in the tundra environment.	Aakra & Hauge 2003
Collembola					
Hypogastruridae					
<i>Hypogastrura assimilis</i> Krausbauer, 1898	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg and the imported greening project soils in Pyramiden.	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg and the imported/disturbed soils in Pyramiden. Not showing invasive tendencies. Unclear what effects it will have on the native flora and fauna.	Coulson et al. 2013a, b Coulson et al. 2015
<i>H. purpurescens</i> (Lubbock, 1868)	Established	Probably introduced with imported soils for the now derelict greenhouse in	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Unlikely to spread beyond these soils. Not	Coulson et al. 2013a, b

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
		Barentsburg		showing invasive tendencies. Unclear what effects it will have on the native flora and fauna.	
Onychiuridae					
<i>Deuteraphorura variabilis</i> (Stach 1954)	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg and the introduced soils in Pyramiden, Potential to establish in nutrient-rich locations such as in bird cliff vegetation. Is invasive in such habitats elsewhere in the Arctic.	Coulson et al. 2013a, b
Isotomidae					
<i>Folsomia fimetaria</i> (L. 1758)	Established	Probably introduced with imported soils for the now derelict greenhouse in Barentsburg.	Holarctic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Potential to establish in nutrient-rich locations such as in bird cliff vegetation. Is invasive in such habitats elsewhere in the Arctic.	Coulson et al. 2013a, b
<i>Desoria grisea</i> (Lubbock, 1869)	Established	Probably introduced with imported soils for the now derelict greenhouse in	Palaeartic	Established in the anthropogenically enhanced soils beneath the abandoned greenhouse and cow sheds in Barentsburg. Unlikely to spread beyond these soils.	Coulson et al. 2013a, b

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
		Barentsburg.			
<i>D. tigrina</i> (Nicolet, 1842)	Established	Probably imported with soils brought to Pyramiden as greening project.	Palaeartic	Established in the anthropogenically enhanced, or disturbed soils, in Pyramiden. Potential to establish in nutrient rich locations such as in bird cliff vegetation. Is invasive in such habitats elsewhere in the Arctic.	Coulson et al. 2015
Insecta					
Cimicidae					
<i>Cimex lectularius</i> L. 1758	Observation	Isolated observations in Longyearbyen probably arriving in personal luggage.	Worldwide	In human habitation. Cannot establish in tundra environment.	Coulson pers. obs.
Forficulidae					
<i>Forficula</i> sp.	Observation	Arrived with fresh food produce in Longyearbyen shop.	Holarctic	Not able to establish in the tundra environment.	Anonymous 2004
Blattidae					
<i>Periplaneta</i> sp.	Observation	Likely to have arrived with shipped goods.	Global, synanthropic	Observed in Barentsburg but unknown if stable population has established. A synanthropic pest.	Anonymous 2006a

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
Coccinellidae					
<i>Coccinella septumpunctata</i> L. 1758	Observation	Arrived with fresh food produce in Longyearbyen shop	Holarctic	Not able to establish in the tundra environment	Anonymous 2006b
Dermestidae					
<i>Reesa vespulae</i> (Milliron 1939)	Observation	Probably arrived in stored food stuffs.	Global, synanthropic	In human habitation. Not able to establish in the tundra environment.	Coulson pers. obs.
Silvanidae					
<i>Oryzaephilus mercator</i> (Fauvel, 1889)	Observation	Probably arrived via dried food products.	Global, synanthropic	Not thought likely to establish in current tundra environment.	Coulson 2007b
Calliphoridae					
<i>Calliphora vicina</i> Robineau-Desvoidy 1830	Observation	Observed on ship. Probably brought with the ship.	Global	Possible competition with resident calliphorid, <i>Protophormia terranova</i> . Not seen since first record in 1928.	Summerhayes & Elton 1928
Hypnometridae					
<i>Plutella xylostella</i> (L. 1758)	Vagrant	Wind dispersal.	Holarctic	Not thought likely to establish in current tundra environment. Moth is seen regularly but appears unable to establish. Note the possible existence of the related endemic	e.g., Coulson et al. 2002 and references therein; Coulson

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
				species <i>Plutella polaris</i> .	et al. 2014
Noctuidae					
<i>Syngrapha interrogationsis</i> (L. 1758)	Vagrant	Wind dispersal.	Holarctic	Not thought likely to establish in current tundra environment.	Sendstad et al. 1976; Laarsonen 1985
Nymphalidae					
<i>Nymphalis antiopa</i> (L. 1758)	Vagrant	Wind dispersal.	Holarctic	Unclear if this species has been observed in Svalbard or if it a possible vagrant. Not thought likely to establish in current tundra environment.	Sømme 1993
<i>Vanessa cardui</i> (L. 1758)	Vagrant	Wind dispersal.	Holarctic	Not thought likely to establish in current tundra environment.	Lokki et al. 1978; Laarsonen 1985; Sømme 1993
Oecophoridae					
<i>Hofmannophila pseudospretella</i> (Stainton 1849)	Vagrant	Wind dispersal.	Holarctic	Not thought likely to establish in current tundra environment.	Kaisila 1973; Laarsonen 1985
Pieridae					
<i>Pieris</i> sp.	Observation	Wind dispersal.	–	Isolated observation in kitchen in Longyearbyen. Likely brought in as pupa in	Anonymous 2007

Species	Status in Svalbard	Introduction route	Distribution	Invasive risk	References
				fresh vegetables.	
<i>Pieris napi</i> (L. 1758)	Vagrant	Wind dispersal.	Holarctic	Not thought likely to establish in current tundra environment.	Kaisila 1973; Laarsonen 1985
Pyralidae					
<i>Ephestia kuehniella</i> Zeller 1879	Observation	Probably arrived via dried food products.	Synanthropic	Larvae and dead adults observed in packets of flour. Isolated reports of flour moths in the bakery in Longyearbyen.	Anonymous 2006c
<i>Pempeliella dilutella</i> (Denis and Schiffermüller 1775)	Vagrant	Wind dispersal.	Palaeartic	Not thought likely to establish in current tundra environment.	Kaisila 1973; Laarsonen 1985

^a Established denotes in natural environment; Vagrant denotes occasional natural dispersal to Svalbard; Observation denotes sporadic recordings associated with human activities.

References

- Aakra K. & Hauge E. 2003. Checklist of Norwegian spiders (Arachnida: Araneae), including Svalbard and Jan Mayen. *Norwegian Journal of Entomology* 50, 109-129.
- Anonymous 2004. Ubuden gjest til middag. (Uninvited dinner guest.) *Svalbardposten* 18, May, p. 28.
- Anonymous 2006a. Ny inspeksjon av messa. (New inspection of the canteen.) *Svalbardposten* 10, March, p. 7.
- Anonymous 2006b. Marihønebesøk. (Ladybird visit.) *Svalbardposten* 9, March, p. 5.
- Anonymous 2006c. Møll i bakeriet. (Moths in the bakery.) *Svalbardposten* 24, June, p. 5.

- Anonymous 2007. Sommerbesøk. (Summer visit.) *Svalbardposten* 5, February, p. 9.
- Coulson S.J., Convey P., Aakra K., Aarvik L., Ávila-Jiménez M.L., Babenko A., Biersma E., Boström S., Brittain J., Carlsson A.M., Christoffersen K.S., De Smet W.H., Ekrem T., Fjellberg A., Füreder L., Gustafsson D., Gwiazdowicz D.J., Hansen L.O., Holmstrup M., Kaczmarek L., Kolicka M., Kuklin V., Lakka H-K., Lebedeva N., Makarova O., Maraldo K., Melekhina E., Ødegaard F., Pilskog H.E., Simon J.C., Sohlenius B., Solhøy T., Sjøli G., Stur E., Tanaevitch A., Taskaeva A., Velle G. Zawierucha K. & Zmudczyńska-Skarbek K. 2014. The terrestrial and freshwater invertebrate biodiversity of the archipelagoes of the Barents Sea; Svalbard, Franz Josef Land and Novaya Zemlya. *Soil Biology and Biochemistry* 68, 440-470.
- Coulson S.J., Fjellberg A., Gwiazdowicz D.J., Lebedeva N.V., Melekhina E.N., Solhøy T., Erséus C., Maraldo K., Miko L., Schatz H., Schmelz R.M., Sjøli G. & Stur E. 2013a. Introduction of invertebrates into the High Arctic via imported soils: the case of Barentsburg in Svalbard. *Biological Invasions* 15, 1–5.
- Coulson S.J., Fjellberg A., Gwiazdowicz D.J., Lebedeva N.V., Melekhina E.N., Solhøy T., Erséus C., Maraldo K., Miko L., Schatz H., Schmelz R.M., Sjøli G. & Stur E. 2013b. The invertebrate fauna of anthropogenic soils in the High Arctic settlement of Barentsburg; Svalbard. *Polar Research* 32, article no. 19273, doi: 10.3402/polar.v32i0.19273.
- Coulson S.J., Fjellberg A., Melekhina E.N., Taskaeva A.A., Lebedeva N.V., Belkina O., Seniczak S., Seniczak A. & Gwiazdowicz D.J. 2015. Microarthropod communities of industrially disturbed or imported soils in the High Arctic; the abandoned coal mining town of Pyramiden, Svalbard. *Biodiversity and Conservation* 24, 1671-1690.
- Coulson S.J., Hodkinson I.D., Webb N.R., Mikkola K., Harrison J.A. & Pedgley D. 2002. Aerial colonisation of High Arctic islands by invertebrates: the diamondback moth, *Plutella xylostella* (Lepidoptera: Yponomeutidae) as a potential indicator species. *Diversity and Distributions* 8, 327-334.
- Henttonen H., Fuglei E., Gower C.N., Haukisalme V., Ims R.A., Niemimaa J. & Yoccoz N.G. 2001. *Echinococcus multilocularis* in Svalbard: introduction of an intermediate host has enabled the local life-cycle. *Parasitology* 12, 547-552.
- Kaisila J. 1973. Notes on the arthropod fauna of Spitsbergen. III: 15. The Lepidoptera of Spitsbergen. *Annales Entomologici Fennici* 39, 60–63.
- Krumpál M., Cyprich D., Zejda J. & Ambros M. 1991. The occurrence of field vole (*Microtus arvalis* Pallas 1778) and its acarofauna on Spitsbergen (Svalbard). *Biología* 46, 881–885.
- Laarsonen E. 1985. Butterflies from Spitsbergen. *Baptia* 10, 69–72.
- Lokki J., Malmstrom K.K. & Suomalainen E. 1978. Migration of *Vanessa cardui* new record and *Plutella xylostella* (Lepidoptera) to Spitsbergen in the summer 1978. *Notulae Entomologicae* 58, 121–123.
- Sendstad E., Bergvik T. & Hegstad A. 1976. *Plusia interrogationis* new-record (Lepidoptera, Noctuidae) found at Svalbard, Norway. *Norwegian Journal of Entomology* 23, 91–92.
- Sømme L. 1993. The terrestrial arthropod fauna of Svalbard. *Arctic Insect News* 4, 2–4.
- Summerhayes V.S. & Elton C. S. 1928. Further contributions to the ecology of Spitsbergen. *Journal of Ecology* 16, 193–268.