

Appendix 8

Investigations of the entomology of the Centrumso area, Kronprins Christian Land, northeast Greenland

M Paul SMITH

Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW, UK.

Correspondence: Paul Smith (paul.smith@oum.ox.ac.uk)

The scientific platform provided by the Greenland Caves Project 2019 expedition created the opportunity to undertake entomological collecting at Camp 1 in Grottedal (Fig.1), and Camp 2 to the south of Centrumso.

Kronprins Christian Land lies within the high arctic climate zone, in which average temperatures during the warmest month are lower than 5°C, with a dry climate that produces polar desert. Biodiversity decreases with increasing latitude (Gaston, 2000; Hillebrand, 2004). This affects insect groups differentially, with the flies (Diptera) well represented in Greenland, but the butterflies (Papilionidae) and beetles (Coleoptera) having particularly low diversity (Coope, 1986; Böcher, 2015b), whereas millipedes (Diplopoda), dragonflies (Odonata), grasshoppers and crickets (Orthoptera) and ants (Formicidae) are entirely absent (Böcher, 2015a, b). The most recent compilation of insect biodiversity in Greenland (Böcher *et al.*, 2015) documented 1190 species, in comparison with roughly 27,000 in the UK (Thomas, 2010). Nevertheless, this represents a significant increase over the 680 species estimated by earlier surveys (Henriksen and Lundbeck, 1917; Henriksen, 1939) and additional diversity undoubtedly awaits discovery given the large, remote and poorly explored land area. The short time since deglaciation also results in very low levels of endemism, with nearly all species entering Greenland as colonisers in the last c.10,000 years (Böcher, 2015b).

The most conspicuous elements of the fauna on the Greenland Caves Project expedition in 2019 were mosquitoes (Culicidae), craneflies (Tipuloidea) and non-biting midges (Chironomidae) with occasional Lepidoptera and bumblebees (*Bombus*). Despite their overwhelming abundance in still weather, there are only two species of Culicidae in Greenland, out of the 3500 found globally – *Ochlerotatus impiger* (Walker, 1848) and *Ochlerotatus nigripes* (Zetterstedt, 1838) – which are difficult to distinguish (Dahl, 2015). In contrast, the Tipuloidea are moderately diverse in Greenland with around 15 species, although only eight of those have been recorded in the north (Oosterbroek *et al.* 2007, 2015). Chironomids, with distinctive plumose antennae in the males, are very diverse and highly abundant in areas with water, with at least 141 species distributed across 6 families (Lindegaard, 2015a, b). They form an important food source in both aquatic and terrestrial ecosystems, with population densities of

up to 27,000 per square metre in eutrophic arctic ponds (Böcher, 2015a). Large, densely haired bumblebees of the genus *Bombus* were occasionally encountered. Only two, closely similar, species have been recorded in the north of Greenland, *Bombus hyperboreus* Schönherr, 1809 and *Bombus polaris* Curtis, 1835, the former being a social parasite of the latter (Vilhelmsen, 2015).

Collecting during the 2019 expedition was undertaken using a malaise trap (Fig.1) and a sweep net under KNNO Expedition Permit C-19-32, Scientific Survey Licence VU-00150, Greenland National Museum and Archives licence 2019/01, and Non-Exclusive Licence Number G19-011 for the utilization of Greenland genetic resources. Analysis of the fauna is being undertaken in the entomology department of Oxford University Museum of Natural History.

Acknowledgement

We are especially grateful to Ólafur Patrick Ólafsson (University of Iceland) for assisting with logistics in relation to the transport of ethanol to Greenland for preserving the faunas.

References

- Böcher, J, 2015a. The Greenland entomofauna in its arctic context. 10–20 in Böcher *et al.*, 2015, q.v.
 Böcher, J, 2015b. The Greenland entomofauna: zoogeography and history. 21–36 in Böcher *et al.*, 2015, q.v.
 Böcher, J, Kristensen, N P, Pape, T and Vilhelmsen, L (eds), 2015. *The Greenland entomofauna: an identification manual of insects, spiders and their allies*. Fauna entomologica Scandinavica 44. [Leiden: Koninklijke Brill.] 881pp.
 Coope, G R, 1986. The invasion and colonization of the North Atlantic Islands: a palaeoecological solution to a biogeographic problem. *Philosophical Transactions of the Royal Society of London B*, Vol.314, 619–635.
 Dahl, C, 2015. Culicidae (Mosquitoes). 409–416 in Böcher *et al.*, 2015, q.v.
 Gaston, K H, 2000. Global patterns in biodiversity. *Nature*, Vol.405, 220–227.
 Henriksen, K L, 1939. A revised index of the insects of Grønland. *Meddelelser om Grønland*, Vol.119, No.10, 112 pp.
 Henriksen, K L and Lundbeck, W, 1917. Grønlands Landarthropoder (Insecta et Arachnida Groenlandicae. *Meddelelser om Grønland*, Vol.22, 483–821.
 Hillebrand, H, 2004. On the generality of the latitudinal diversity gradient. *American Naturalist*, Vol.163, 192–211.
 Lindegaard, C, 2015a. Chironomidae (Non-biting midges). 436–545 in Böcher *et al.*, 2015, q.v.
 Lindegaard, C, 2015b. Addendum to Chironomidae (Non-biting midges). 546–549 in Böcher *et al.*, 2015, q.v.
 Oosterbroek, P, Brodo, F, Lantsov, V and Starý, J, 2007. The Tipulidae and Limoniidae of Greenland. *Entomologiske Meddelelser*, Vol.75, 3–33.
 Oosterbroek, P, Brodo, F, Lantsov, V and Starý, J, 2015. Tipuloidea (Craneflies: Tipulidae and Limoniidae). 389–401 in Böcher *et al.*, 2015, q.v.
 Thomas, J A, 2010. Butterflies. 430–447 in MacLean, N (Ed.) *Silent Summer: the state of wildlife in Britain and Ireland*. [Cambridge: Cambridge University Press.] 765pp.
 Vilhelmsen, L, 2015. Apidae (Apoidea) (Bees). 254–256 in Böcher *et al.*, 2015, q.v.

Received: 26 May 2020; Accepted: 04 June 2020.

Figure 1: Malaise trap deployed at Camp 1 in Grottedal, Kronprins Christian Land.



