

Over a Decade of Changes in the Diet Composition of Little Auk Chicks – a Case Study from Hornsund between 2011 and 2024

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1. INTRODUCTION

This study presents a comprehensive analysis of the diet composition of little auk (*Alle alle*) chicks in Hornsund (Spitsbergen), based on 14 years (2011–2024) of regular monitoring. Little auks (LA) are the most numerous planktivorous seabirds in the European Arctic, playing a pivotal role in nutrient transfer from marine (foraging areas at sea) to terrestrial ecosystems (breeding colonies on land).

Foraging areas of LAs are situated on shelf in the Hornsund area influenced by two currents: the coastal Sørkapp Current providing cold and less saline Arctic water and the West Spitsbergen Current – transporting warmer, more saline Atlantic water (Piechura and Walczowski 2009). LA chick diet primarily consists of the fifth copepodid stage of Arctic copepod *Calanus glacialis*. However, supplementary diet components, including decapod larvae, euphausiids, and amphipods can also contribute substantially to chick diet composition (Boehnke et al. 2015). The aim of the study was to evaluate the interannual variability in LA diet in order to make predictions about future composition of their preys.

Diet samples were collected in 2011–2024, during the second week of chicks' life, in the colony at Hornsund (SW Spitsbergen; 77°00'N, 15°33'E), considered the largest breeding aggregation of LAs in Svalbard. The contents of the gular pouch of adults returning from the feeding grounds to their colony were collected, then preserved in a 4% seawater formaldehyde solution (2011–2019), (2020–2022), and recently – also by freezing (2023–2024). At least 20 samples during each summer season were collected and analysed by following the procedures described by Kwasniewski et al. (2010). All large and medium-sized calanoids were identified to the appropriate species and development stages. *Calanus finmarchicus*, *C. glacialis*, and *C. hyperboreus* copepodite stages were distinguished by the comparison of prosome length

measurements in accordance to Kwasniewski et al. (2003). Additionally, prosome lengths of the first 100 individuals of *Calanus* spp. at the fifth copepodid stage (CV) were noted to obtain a consistent long term dataset. A limitation of our study could be the fact that the identification of *Calanus* spp. from the first studied year was based only on morphometry, whereas a molecular research paper by Balazy et al. (2023), based on the LA diet from years 2019–2021, revealed that 40% of *C. glacialis* from Hornsund were wrongly classified as *C. finmarchicus*.

The prevailing cold water Hornsund conditions were reflected in the species composition of the diet, especially in clear dominance of Arctic *C. glacialis* – which made up from 73% to 90% of all food items (concerning numbers) during 12 out of 14 studied seasons. Despite relatively stable diet composition mentioned above, some fluctuations were observed in year 2014, which was characterised by the high share of Atlantic counterpart of *Calanus glacialis* – *C. finmarchicus* (57% of all diet components). These fluctuations might be closely connected with recently described distinctive influx of warmer Atlantic waters to the Arctic environments in 2014 (Strzelewicz et al 2022). Furthermore, the diet from 2015 was dominated by ice-associated amphipod – *Apherusa glacialis* (94% of all diet abundance), which could be closely linked with a relatively short distance from the shore of Hornsund to drifting ice. Our long-term monitoring reveals that little auks exhibit dietary flexibility, adjusting prey selection in response to environmental variability driven by climate change. Such plasticity is crucial for their resilience in the face of shifting zooplankton communities caused by warming seawater temperatures and subsequent “Atlantification” of Arctic. In conclusion, the diet composition of little auk chicks in Hornsund between 2011 and 2024 reflects a dynamic balance between reliance on the key Arctic copepods and opportunistic inclusion of supplementary prey.

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