



NÁTTÚRUSTOFA SUÐURLANDS

Atlantic puffin chick diet and population growth, 2011-2021

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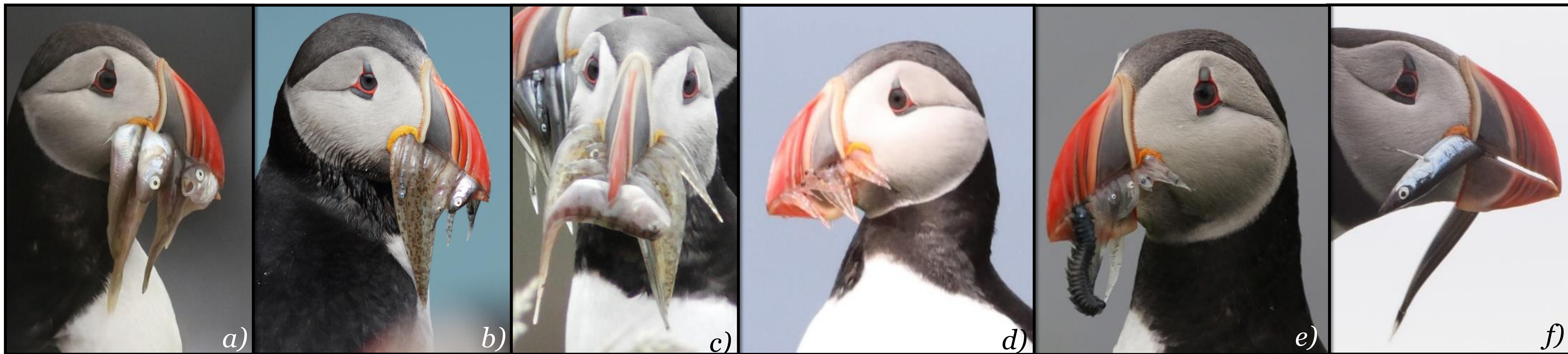


Figure 1. Adult puffins with different preys. a) Juvenile cod; b) Daubed shanny and capelin; c) Juvenile wolffish and daubed shanny; d) Euphausiids; e) *Nereis virens*, euphausiids and fish larvae; f) Sandeel. Photo authorship from left to right: Stephen Hurling, Cornelius Schlawe (x2), Sara Rodríguez, Ingvar Sigurdsson and Bart Vercausse

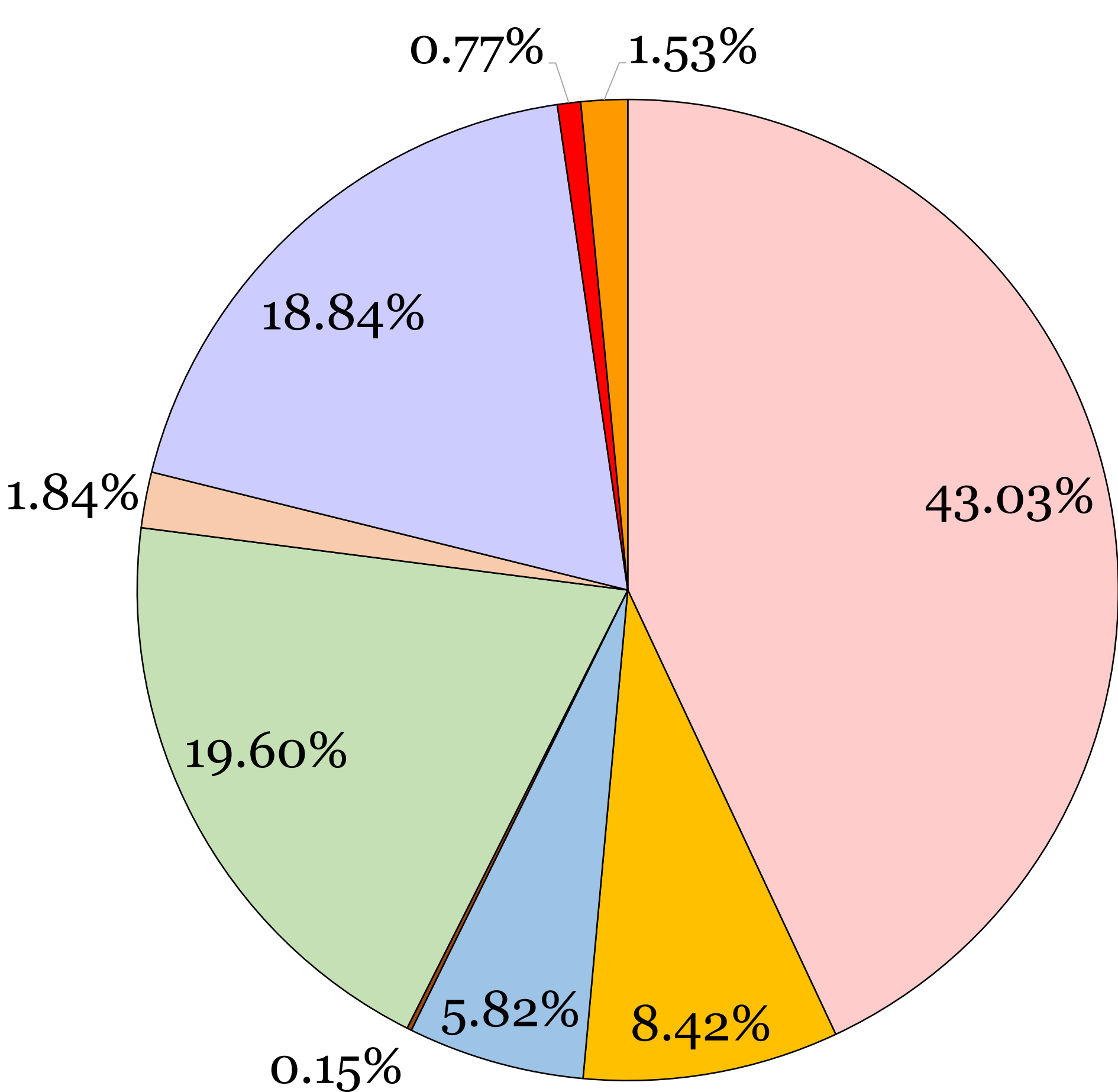
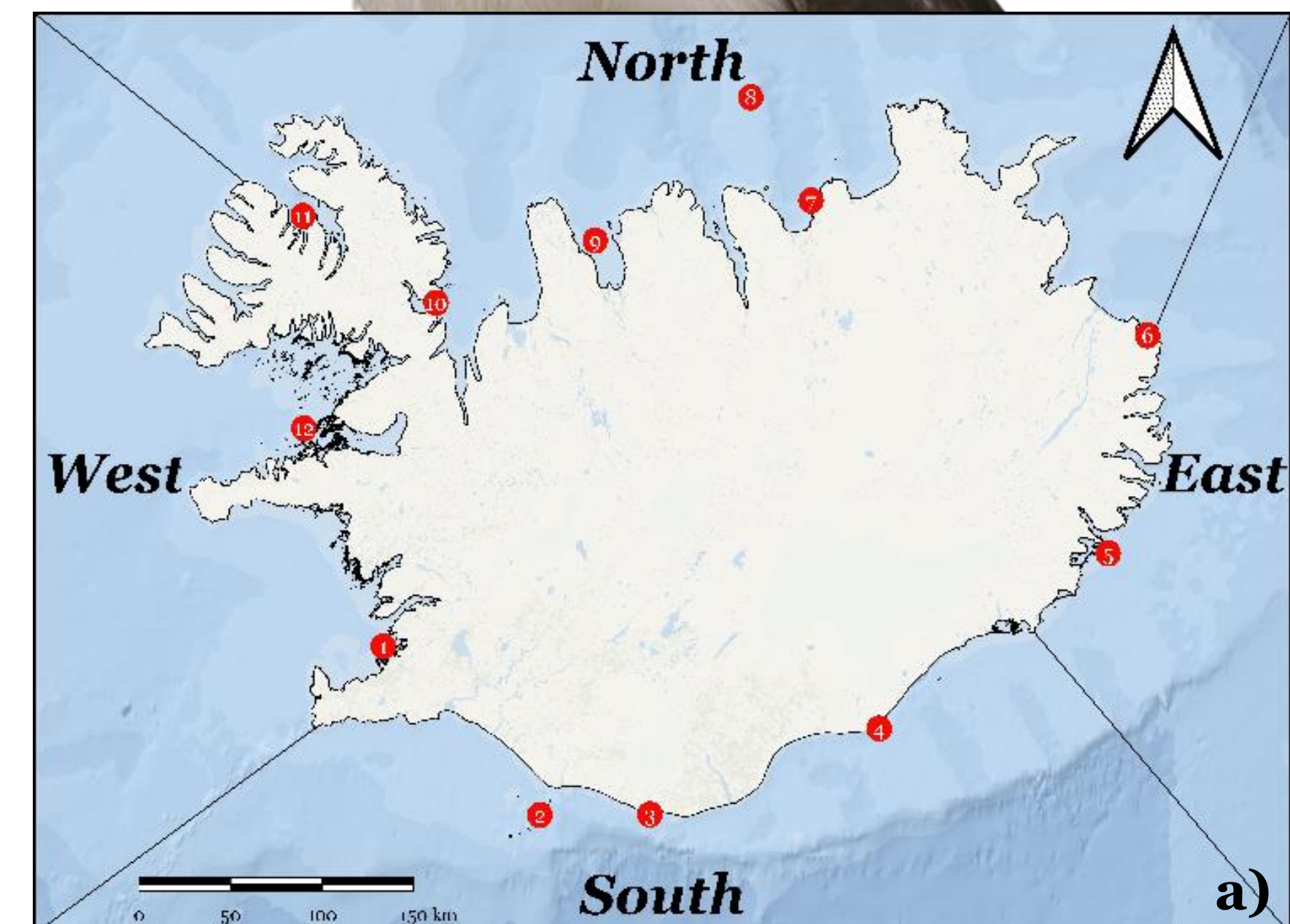


Figure 2. Composition of other common species (n=653). Pink-Daubed shanny (*Leptoclinis maculatus*), green-Silver Rockling (*Gaidropsarus argentatus*), purple-Atlantic cod (*Gadus morhua*), yellow-Atlantic wolffish (*Anarhichas lupus*), blue-Fourbeard rockling (*Rhinonemus cimbricus*), rose-Rock gunnel (*Pholis gunnellus*), orange-Caridean shrimp (*Pandalus borealis*), red-crustacea and grey-flatfish.

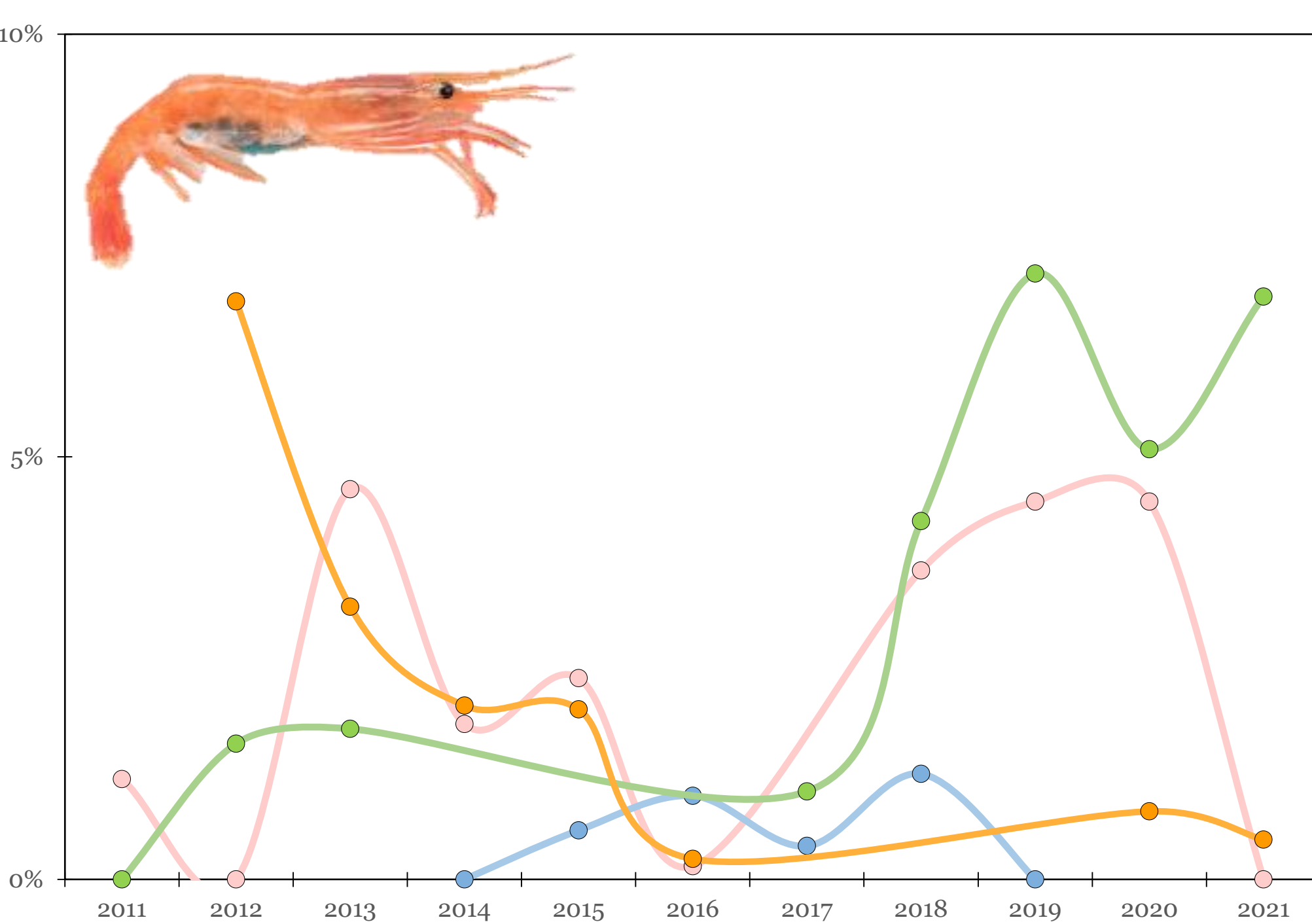


Figure 3. Fluctuations of the FoO of euphausiids in Atlantic puffin chick food loads (n=200). Continuous lines for each region: East (orange), North (pink), South (green) and West (blue).

Introduction

The aim of this study is to analyse the diet composition of the Atlantic Puffin (*Fratercula arctica*) chicks and the relation with the population growth rate (λ).

Material and methods

Food carriers were photographed in 12 colonies in Iceland (grouped into 4 neritic regions¹: North (n=5), West (n=2), East (n=2) and South (n=3)), during the breeding season.

14466 photographs were reduced to 8232 individual records and classified into 6 diet categories: **1. Am**, Sandeel (*Ammodytes marinus*); **2. Mv**, Capelin (*Mallotus villosus*); **3. Ch**, Atlantic herring (*Clupea harengus*); **4. Eu**, Euphausiids; **5. Oth**, other common species and **6. UI**-Unidentified (mostly fish larvae).

Frequency of occurrence (FoO) of food items was logit-transformed and analysed using 2-way ANOVA & Tukey HSD² to test differences among years and between regions.

Chick production was measured in > 1000 burrows (using IR-video probes) in two annual visits to the 12 colonies between 2011-2021. **Adult survival** was estimated in Heimaey (Vestmannaeyjar) from resightings of colour ringed breeders and analysed using the CJS method.

Population growth (λ) was calculated with a Leslie Matrix population model.

Results

Most frequent diet: Sandeel (47.1%) and Capelin (11.2%). Daubed shanny (n=281) predominate within “other spp.” but mainly associated to the North (62.6%).

Number of spp. per food load are not significantly different between regions but differ significantly between years within regions ($F=6.06$, $p<0.01$).

North. Low annual variation in both diet and population growth rate.

East. Excluding 2011 (NAO anomaly year³, associated with breeding failure), fish larvae dominated region with population growth suppressed.

West. Prevalent sandeel area with continuous population growth.

South. Predominantly, sandeel and capelin. Euphausiids increase since 2017, with a positive population growth. Sandeel-related positive regime shift in 2020.

Conclusions

Strong influence of FoO (within and between regions) on population growth rate via chick production.

Euphausiids and other spp. might play an **important role** in supplementing chicks’ diet, and thus improving breeding success when main preys are scarce.

References

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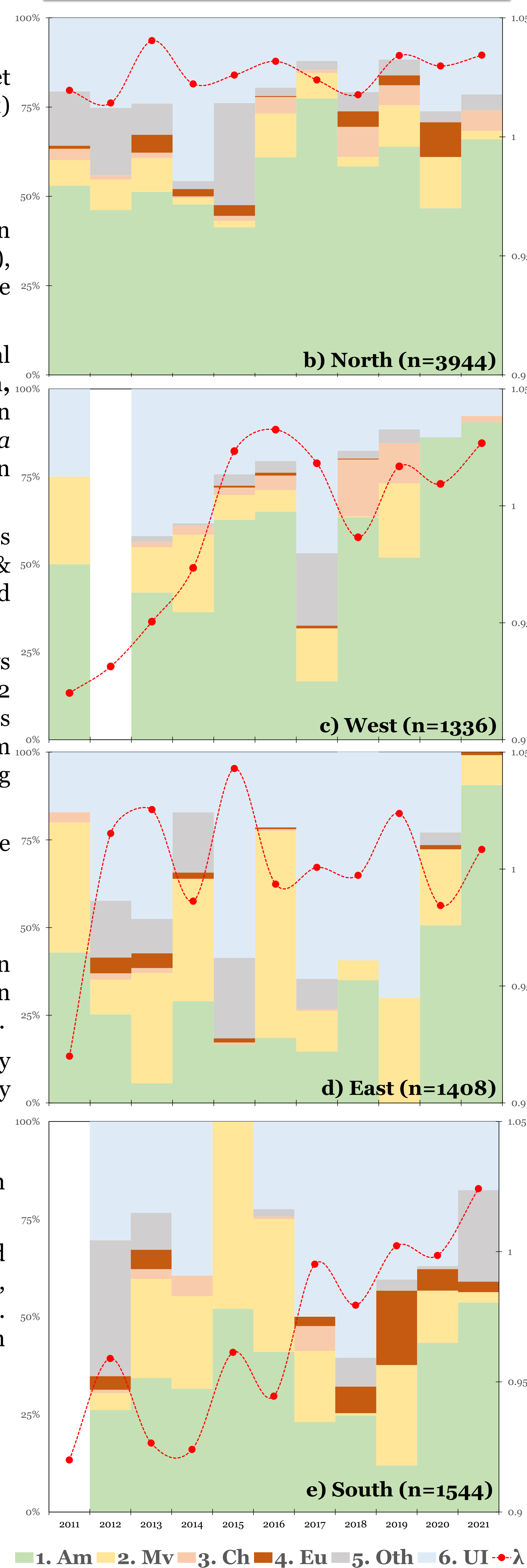


Figure 4. a) Map of Iceland with the 12 colonies (red dots) divided into 4 neritic regions. FoO of Atlantic puffin chicks diet divided into 6 categories and grouped by: b) north; c) west; d) east; e) south. Blank columns represent missing data. Population growth in each region is represented with λ (red dotted line) in the right axis. Values >1 indicate a positive growth.

