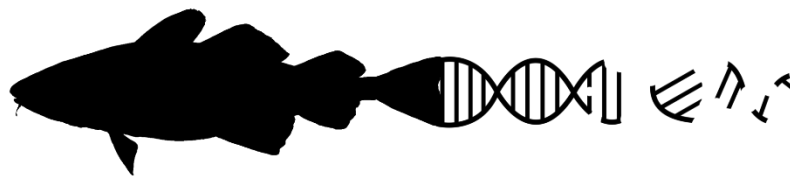


What DNA can do for you!

Genetic methods and the landing obligation

Brian Klitgaard Hansen, Gregory Farrant, Rob Ogden, Emily Humble, Guðbjörg Ólafsdóttir & Einar Eg Nielsen



$$M2_i = \frac{\sum_j \frac{dR}{dt} N_j \frac{\varphi_{ji}}{\varphi_j}}{N_i \omega_i}$$

$\Delta \int_a^b \epsilon \Theta$
 $\sqrt{17}$
 $+$
 $\Omega \int \delta e^{i\pi} =$
 $\{2.7182818284\}$
 ∞
 χ^2
 Σ
 $!$

Making discards count!

- Catching low value species and sizes is unavoidable
- One way of optimizing utilization of low value is to store and land them as bulk products
- **Fish blocks**
 - Export
- **Silage (on board)**
 - Fishmeal or fishoil
- Difficult to control what is being landed if there are no/few signs to identify species
- COUNCIL REGULATION (EC) No 1224/2009
- Can DNA help **identify** and **quantify** what species are in these products?

Fish blocks

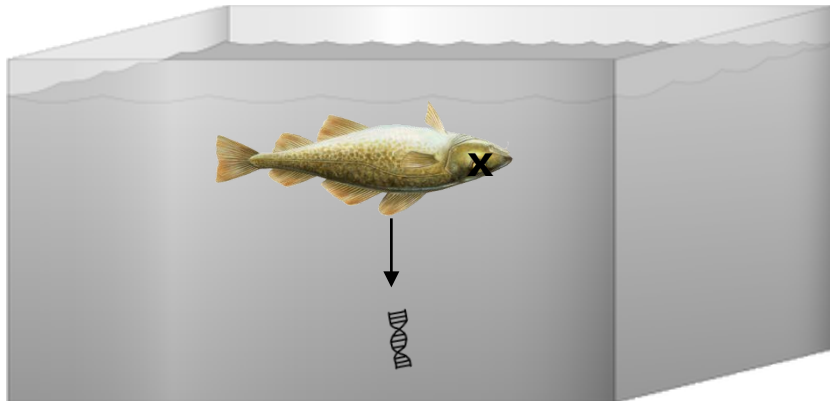


Silage



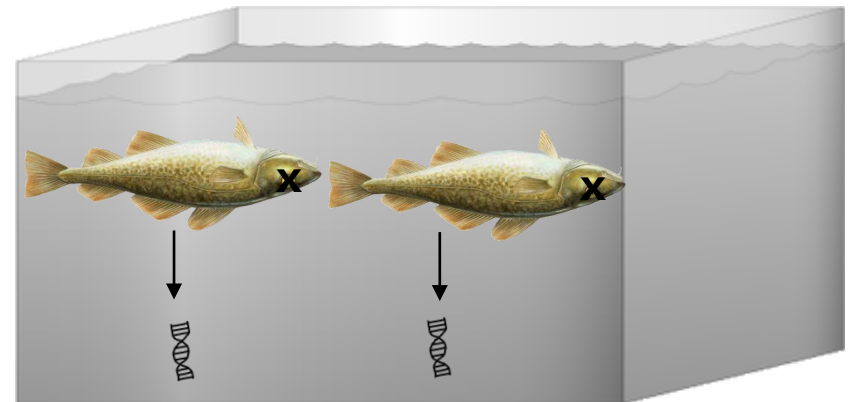
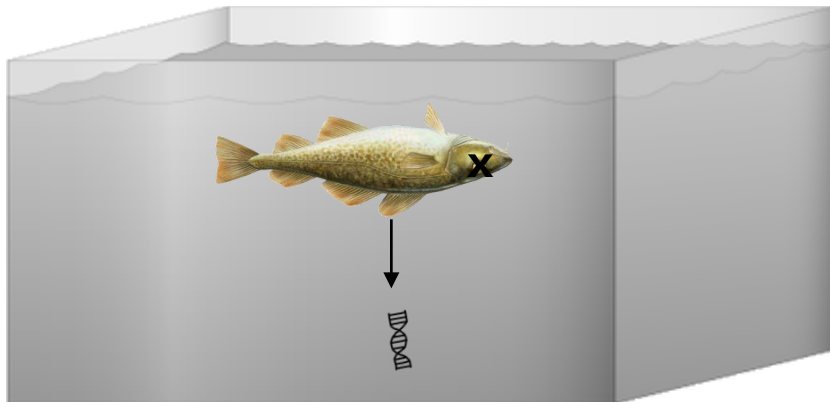
DNA as a tool in fisheries

Silage processing tank



DNA as a tool in fisheries

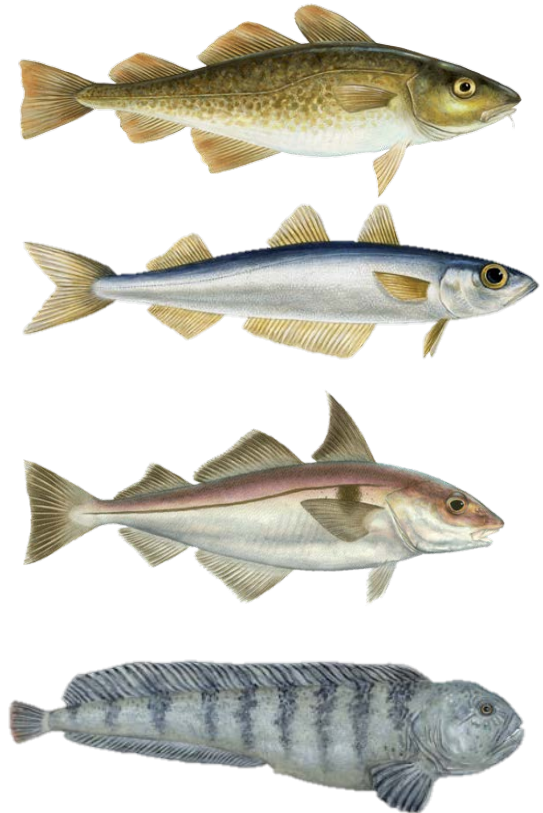
Silage processing tank



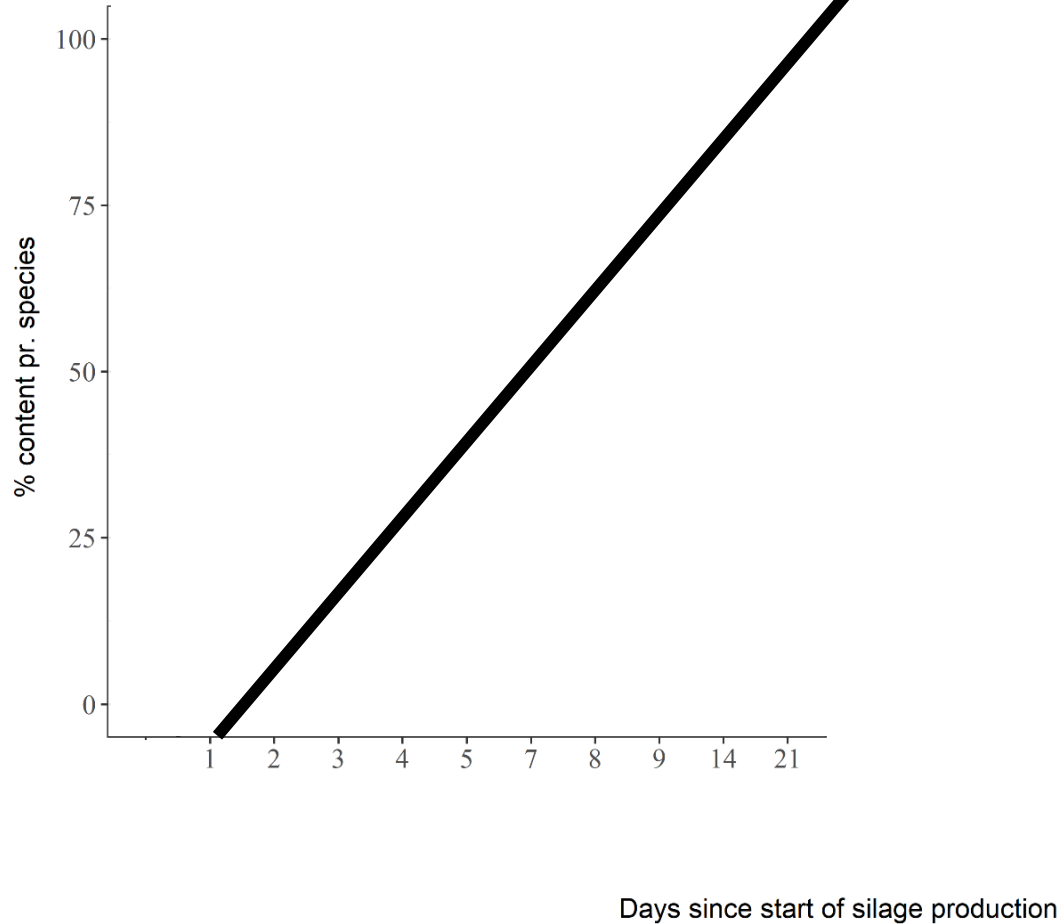
DNA quantity \approx biomass

Study species

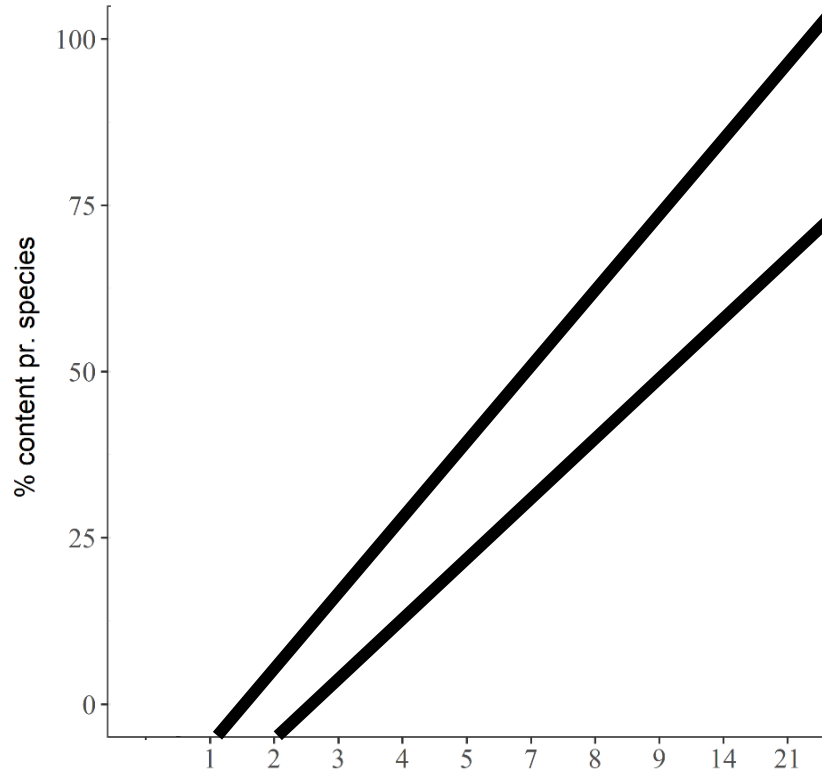
- Atlantic cod (*Gadus morhua* - Torsk)
- Whiting (*Merlangius merlangus* - Hvilling)
- Haddock (*Melanogrammus aeglefinus* - Kuller)
- Atlantic wolffish (*Anarhichas lupus* - Havkat)



Fish silage

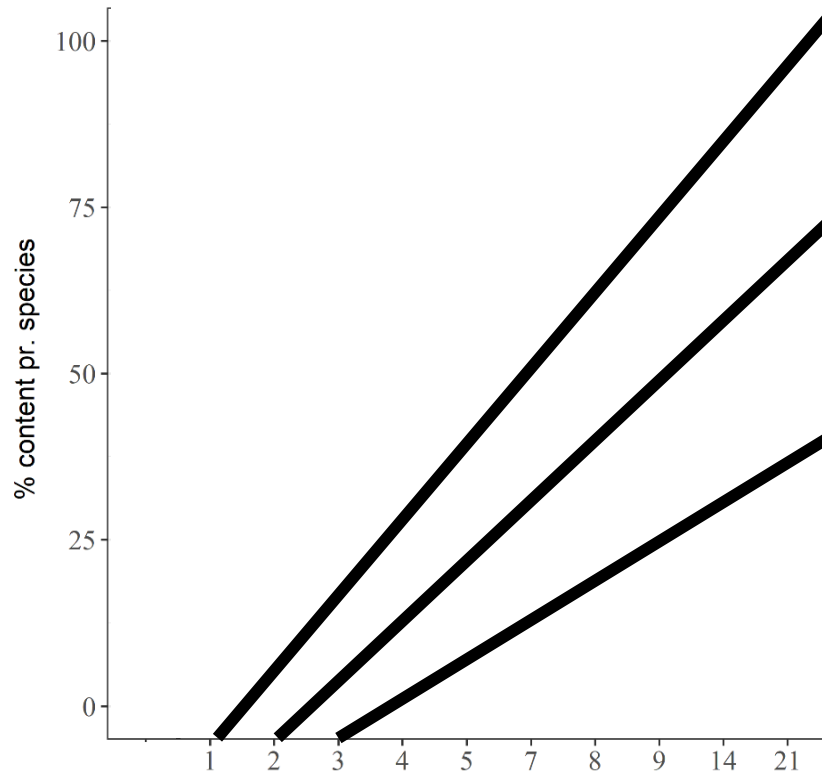


Fish silage



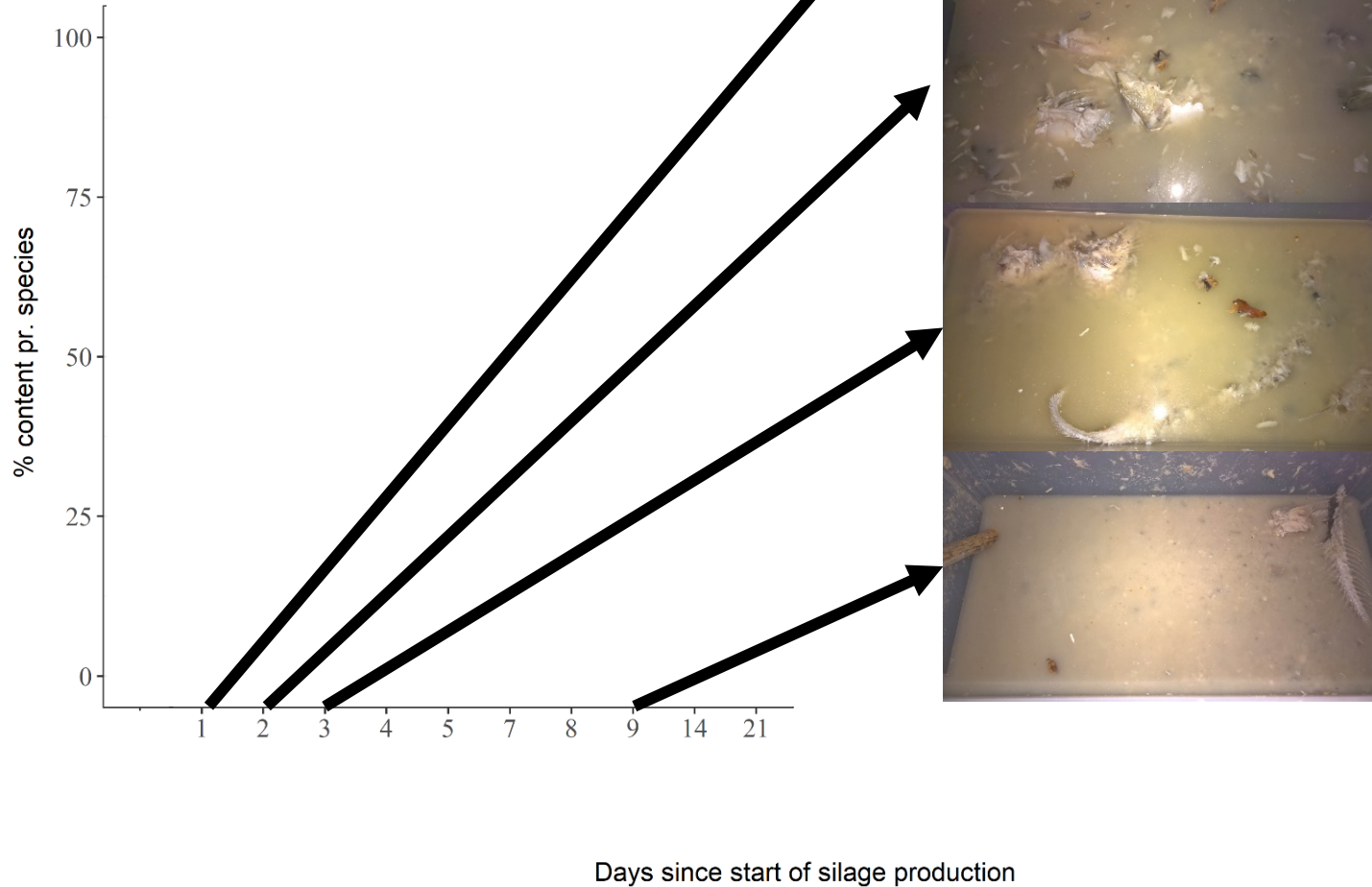
Days since start of silage production

Fish silage

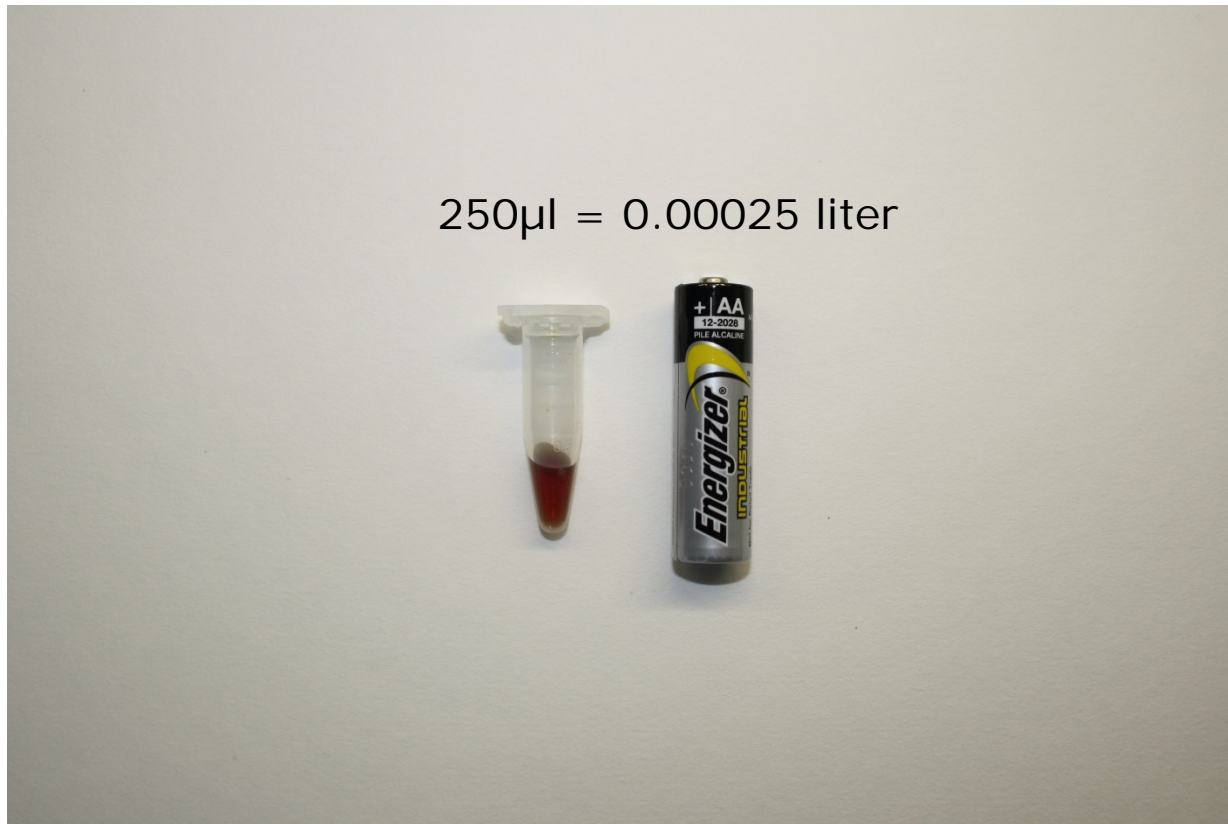


Days since start of silage production

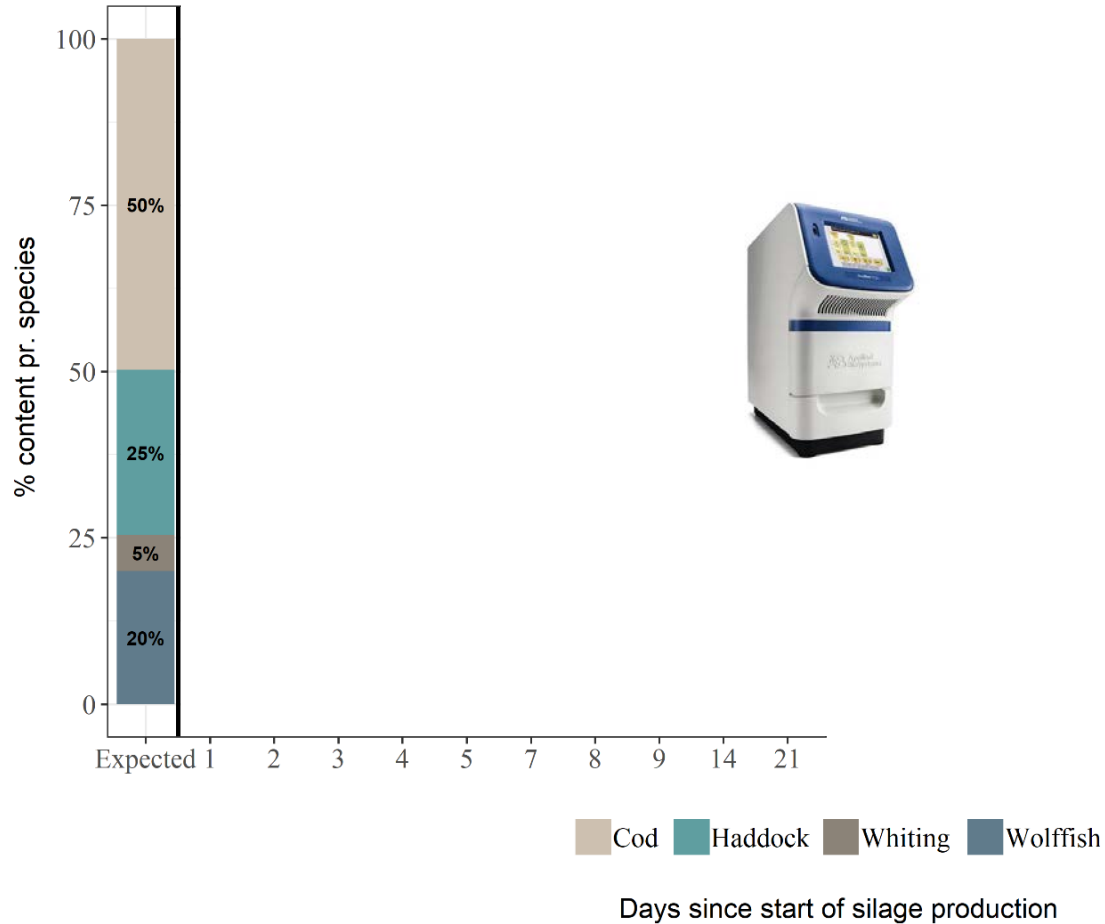
Fish silage



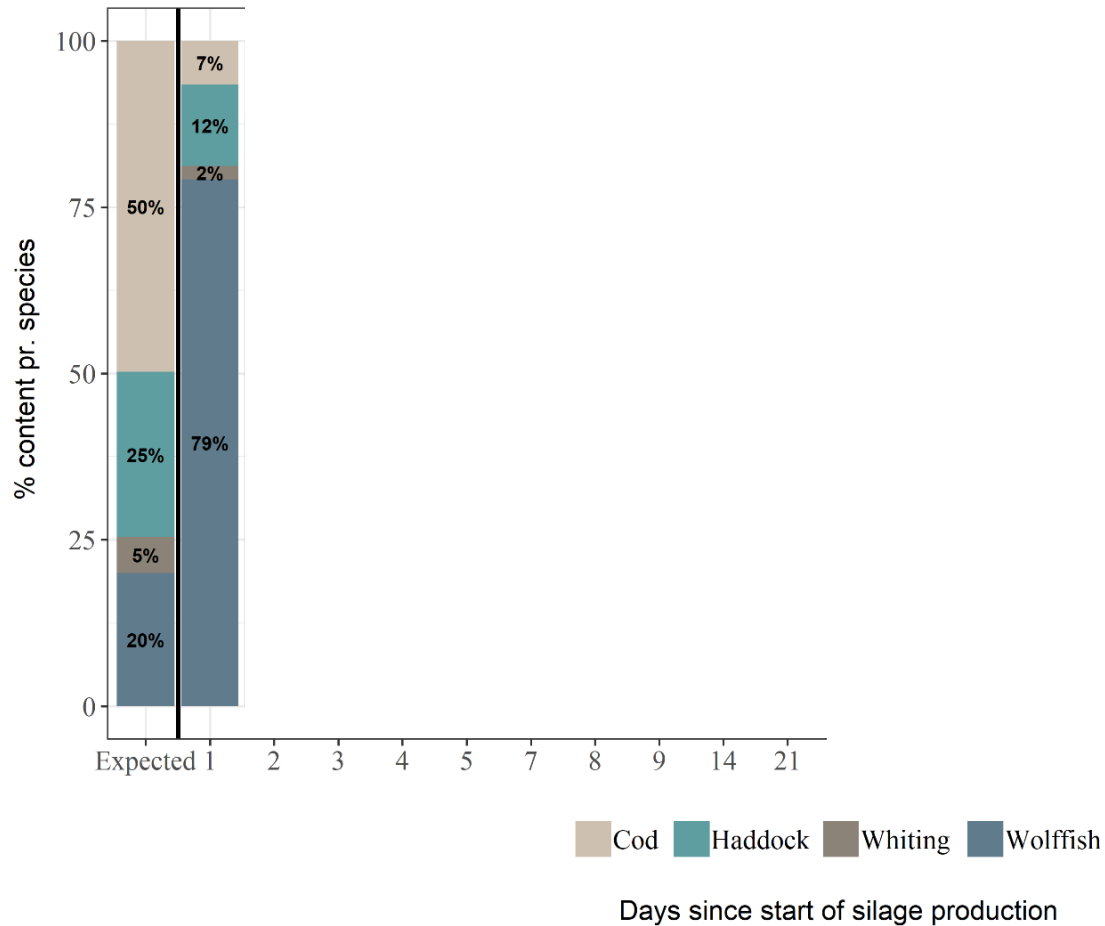
Fish silage



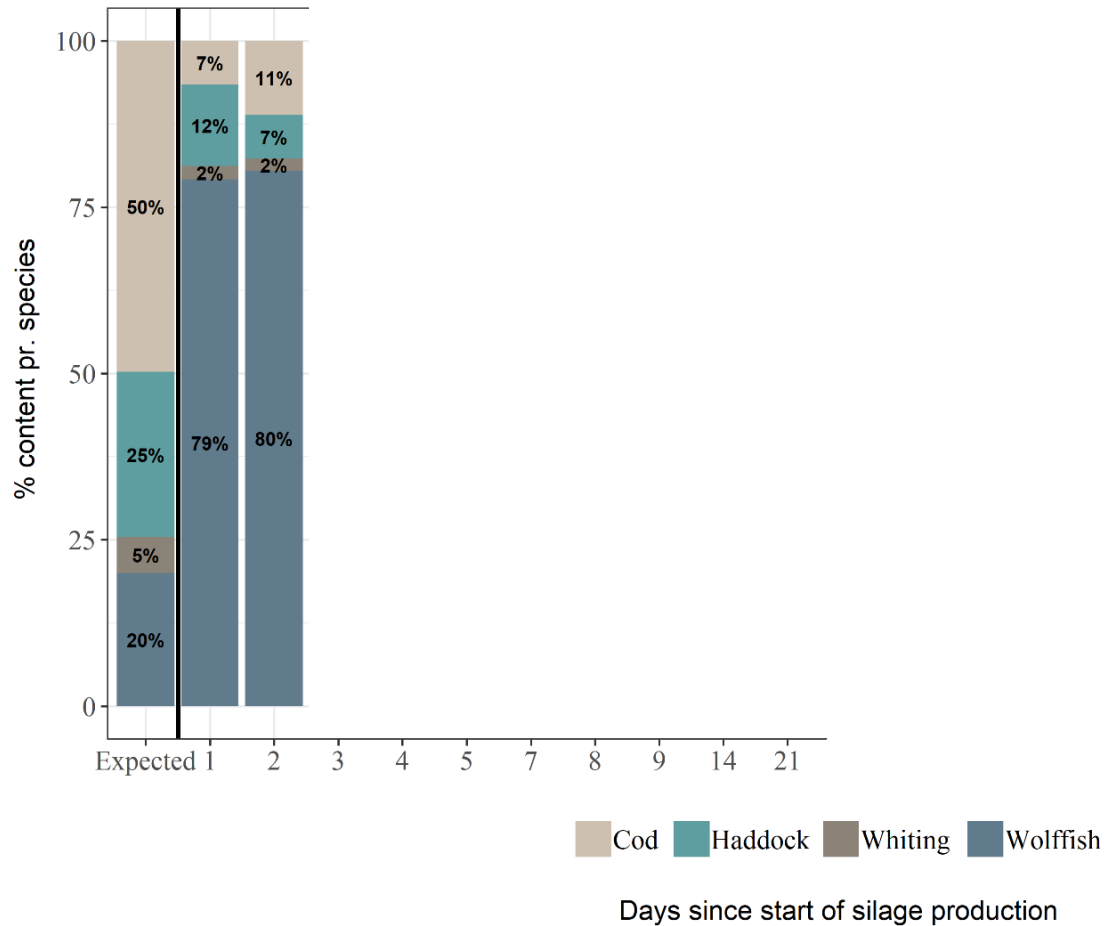
Fish silage



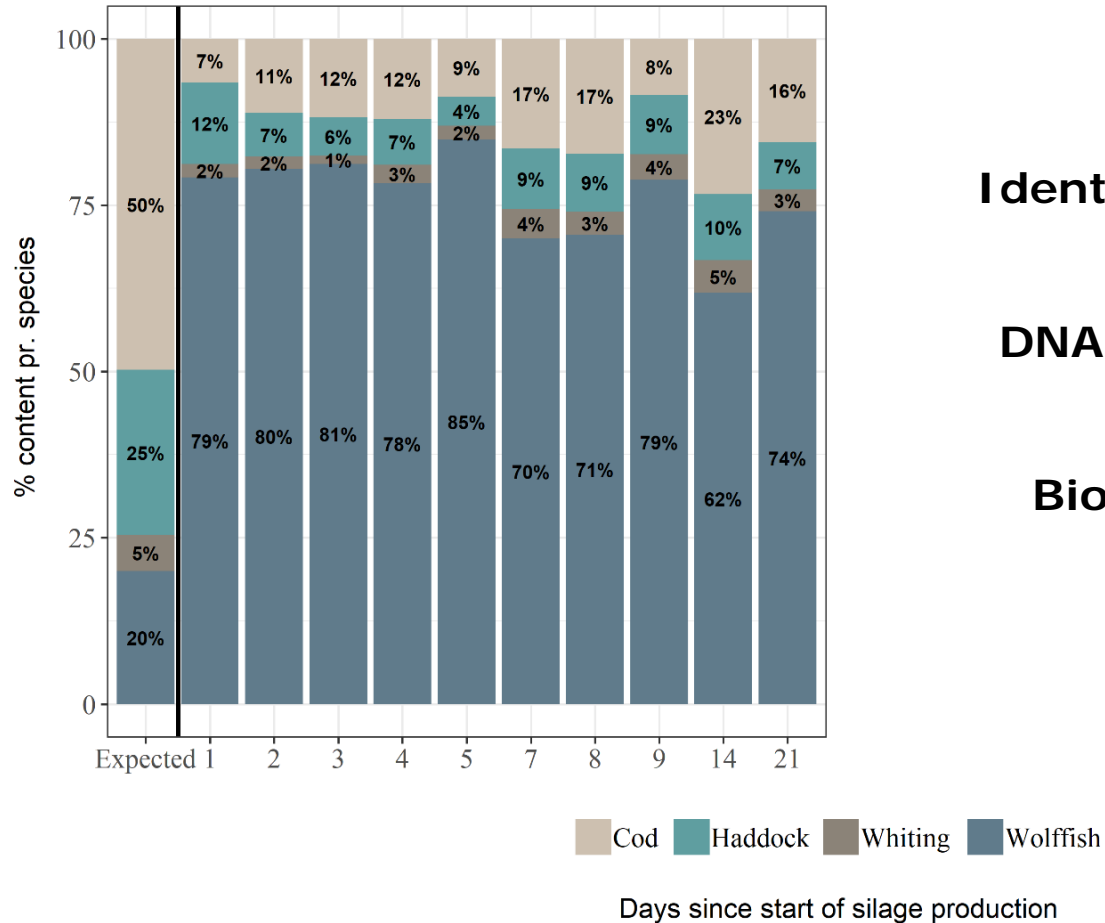
Fish silage



Fish silage



Fish silage

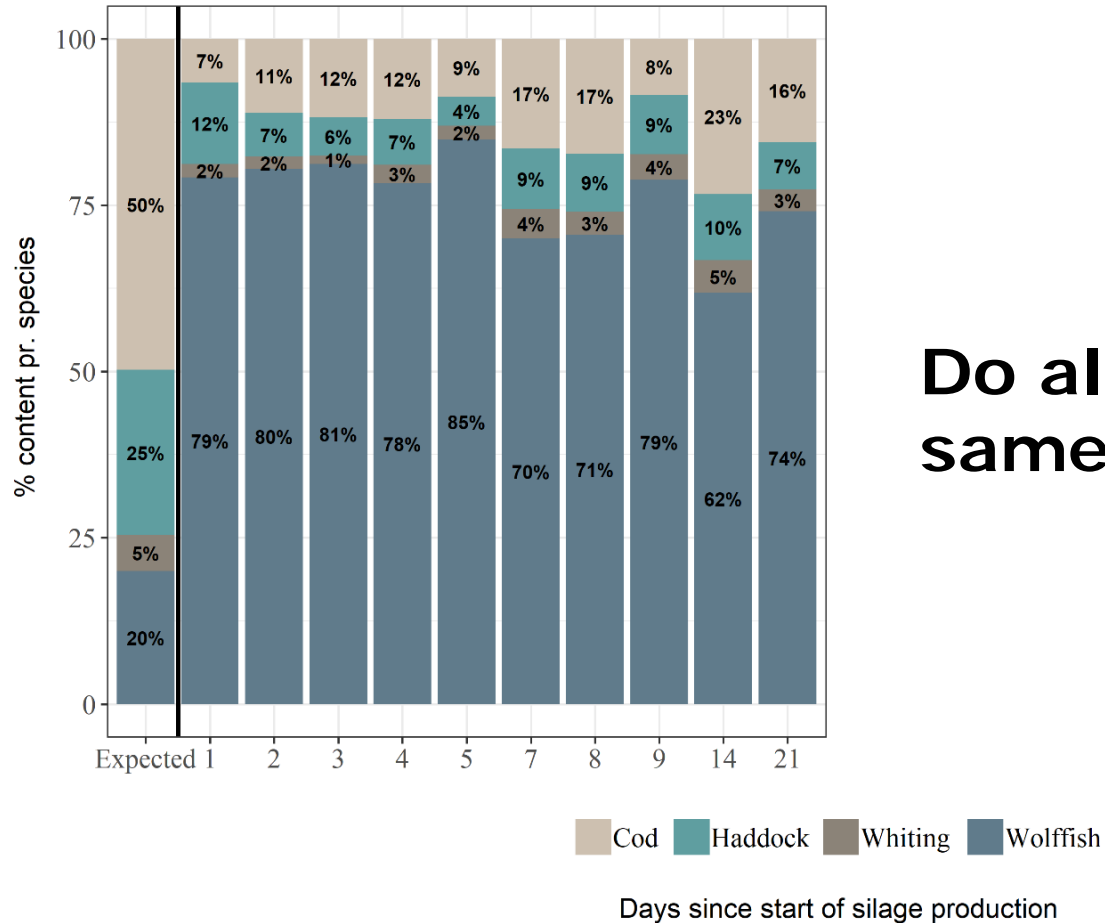


Identifikation af alle 4 arter

DNA detectable for 21 days

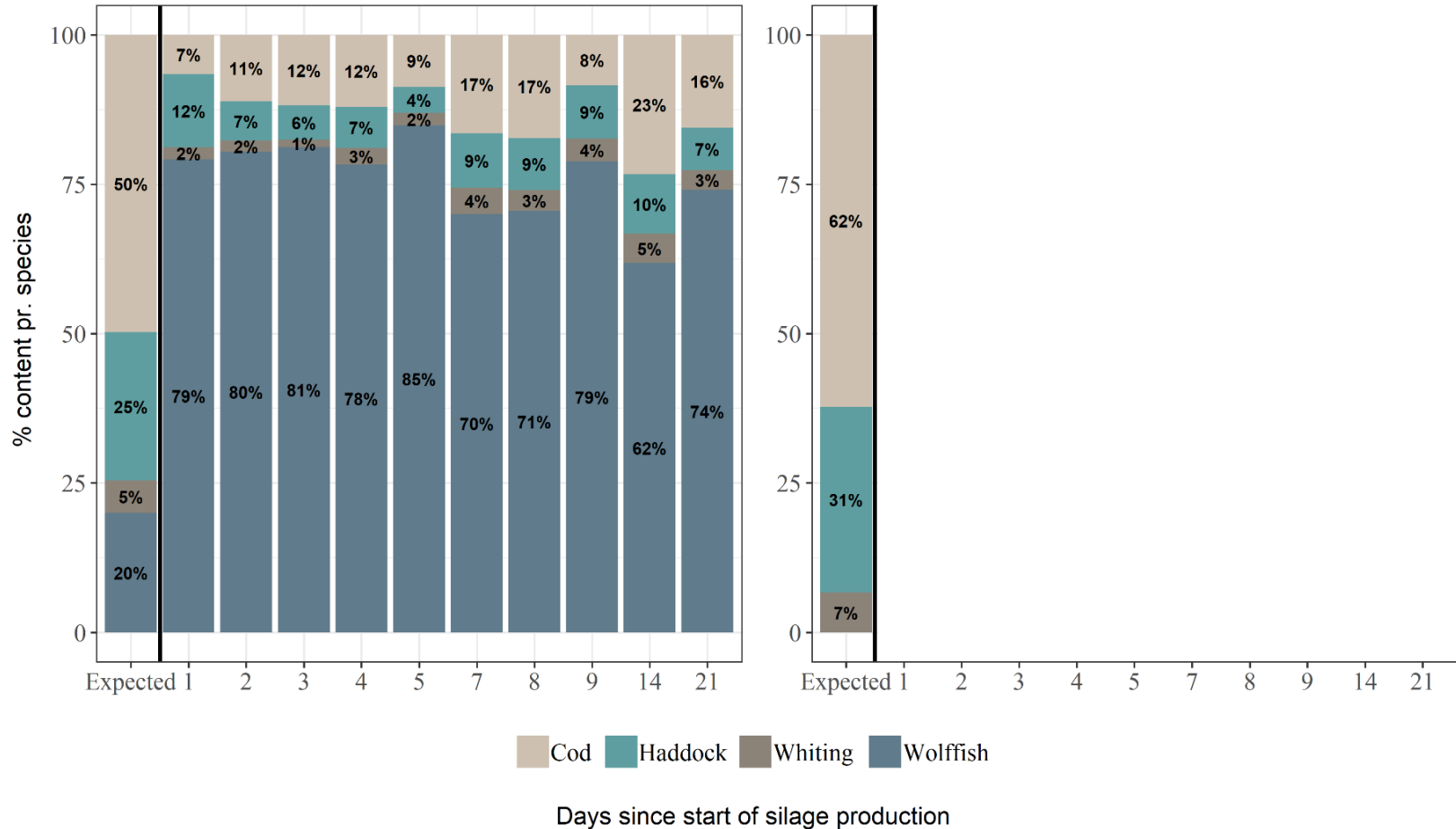
Biomass proportions are inaccurate

Fish silage

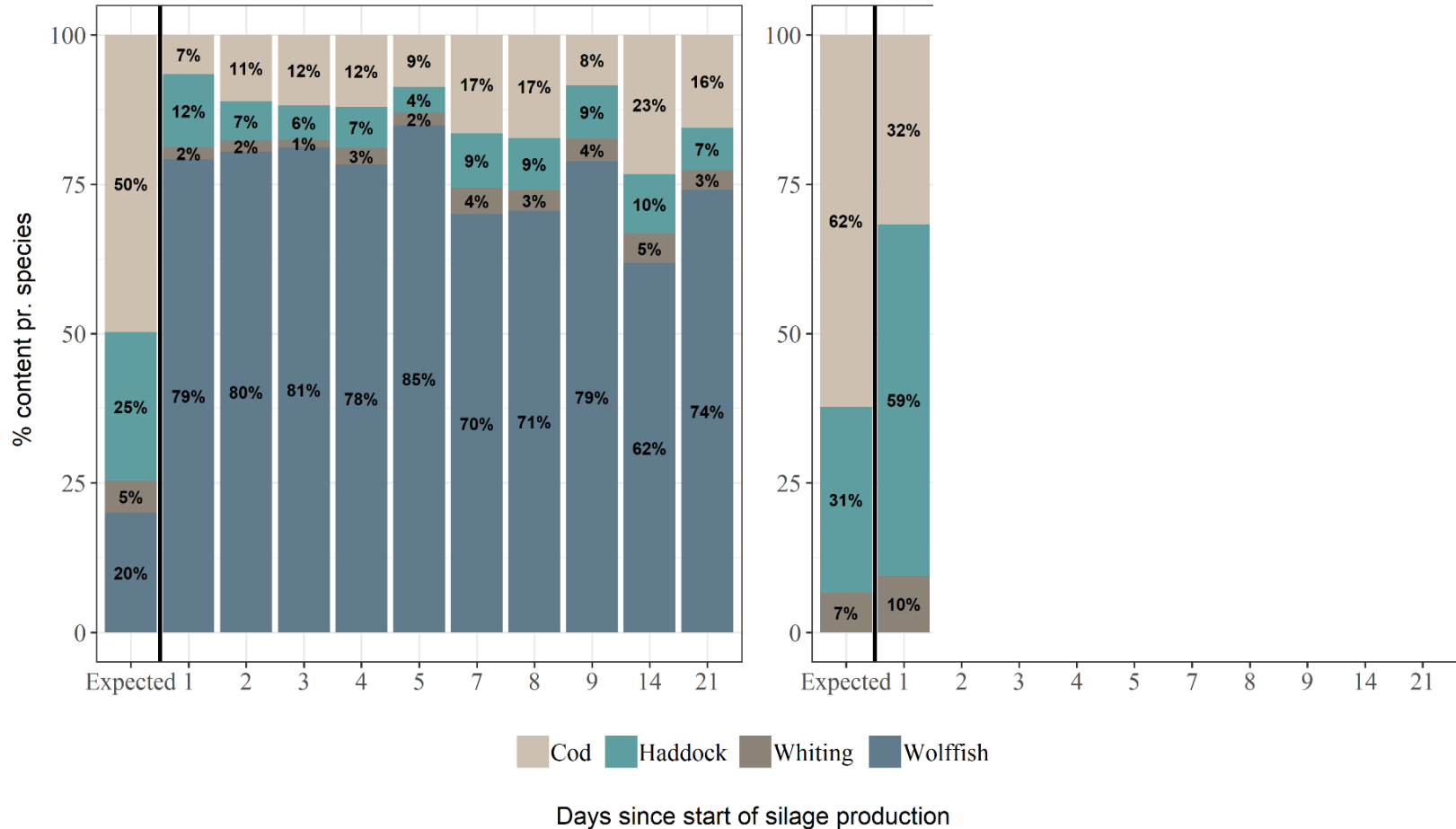


Do all fish contain the same amount of DNA?

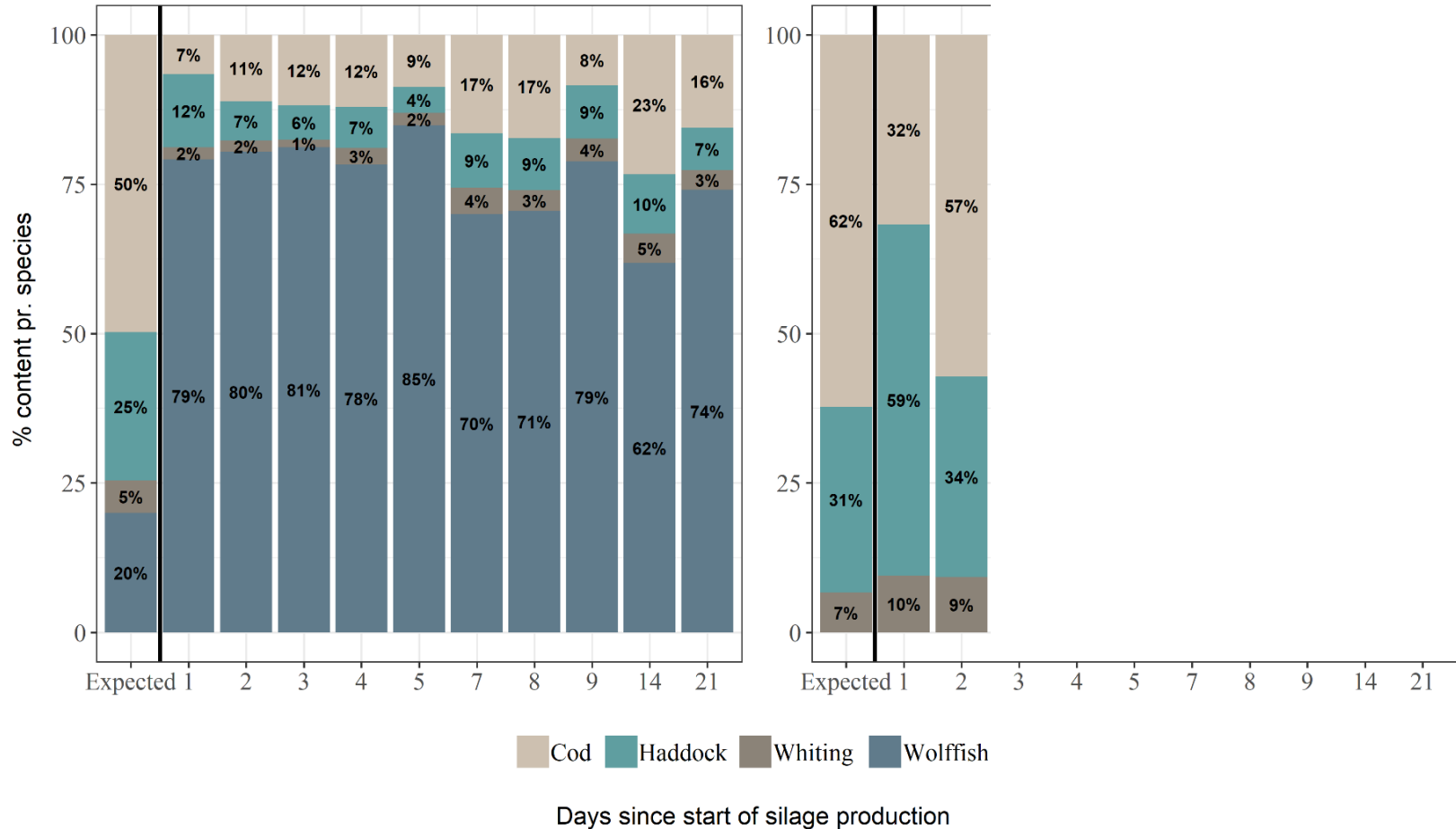
Fish silage



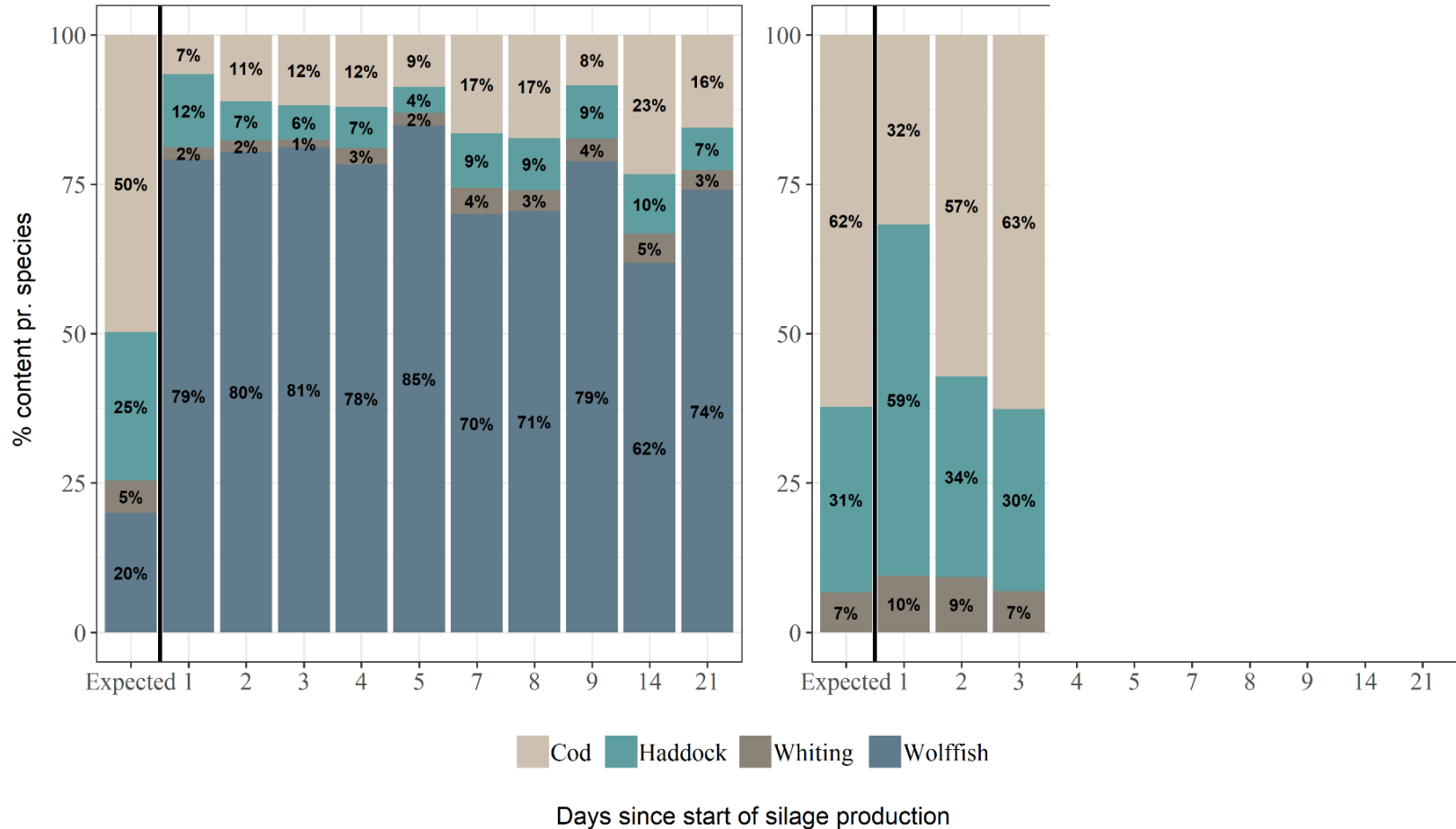
Fish silage



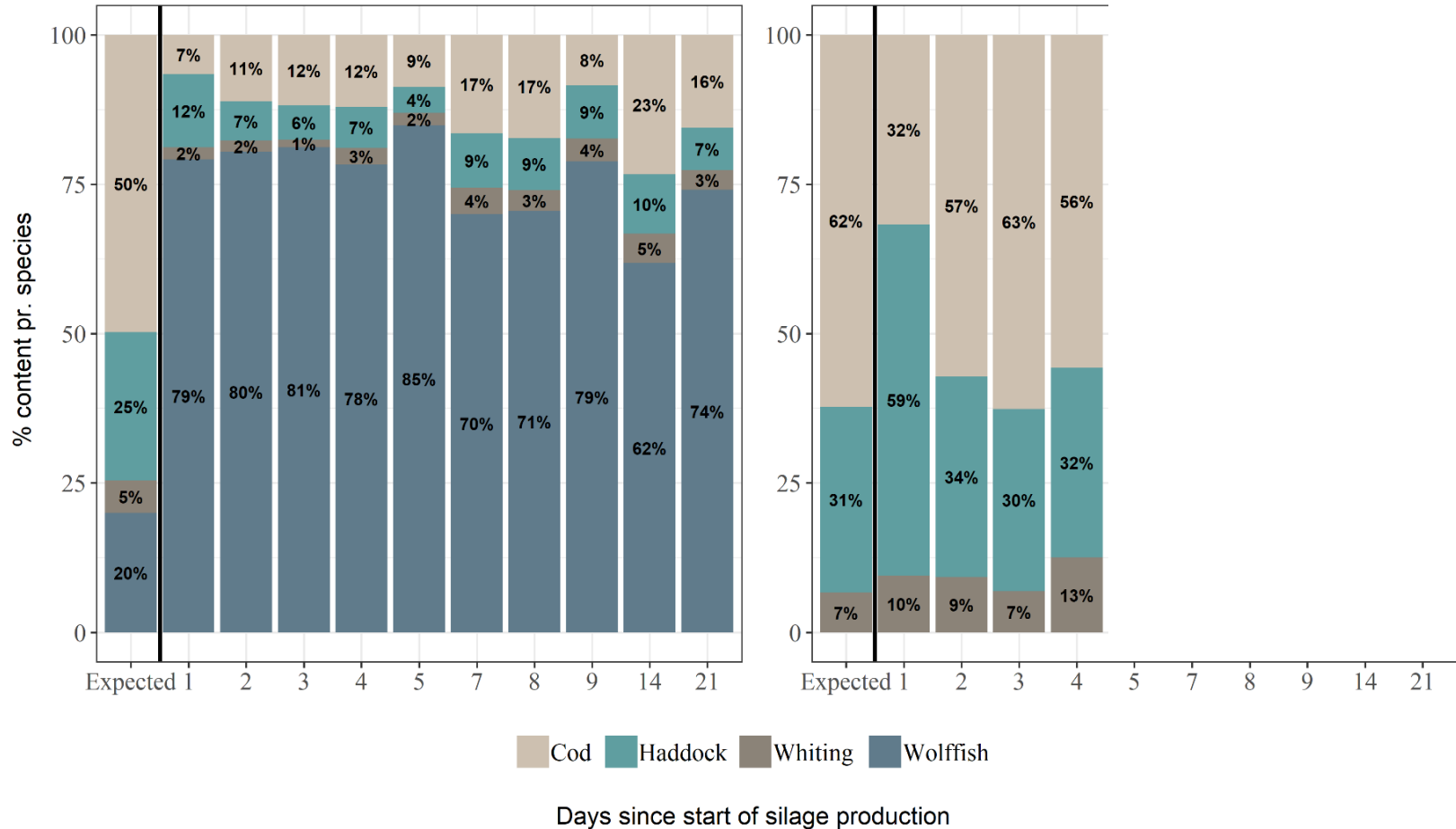
Fish silage



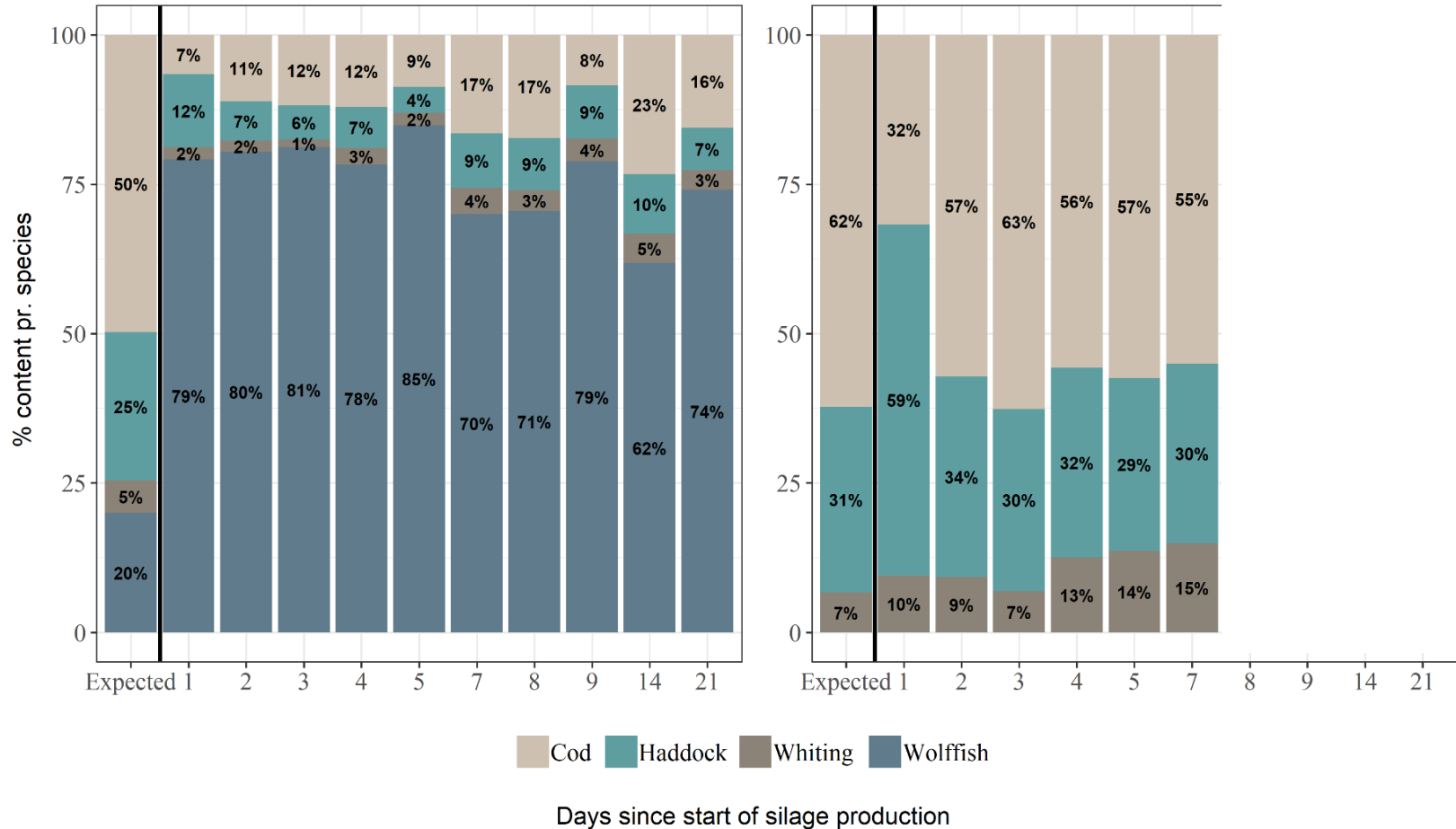
Fish silage



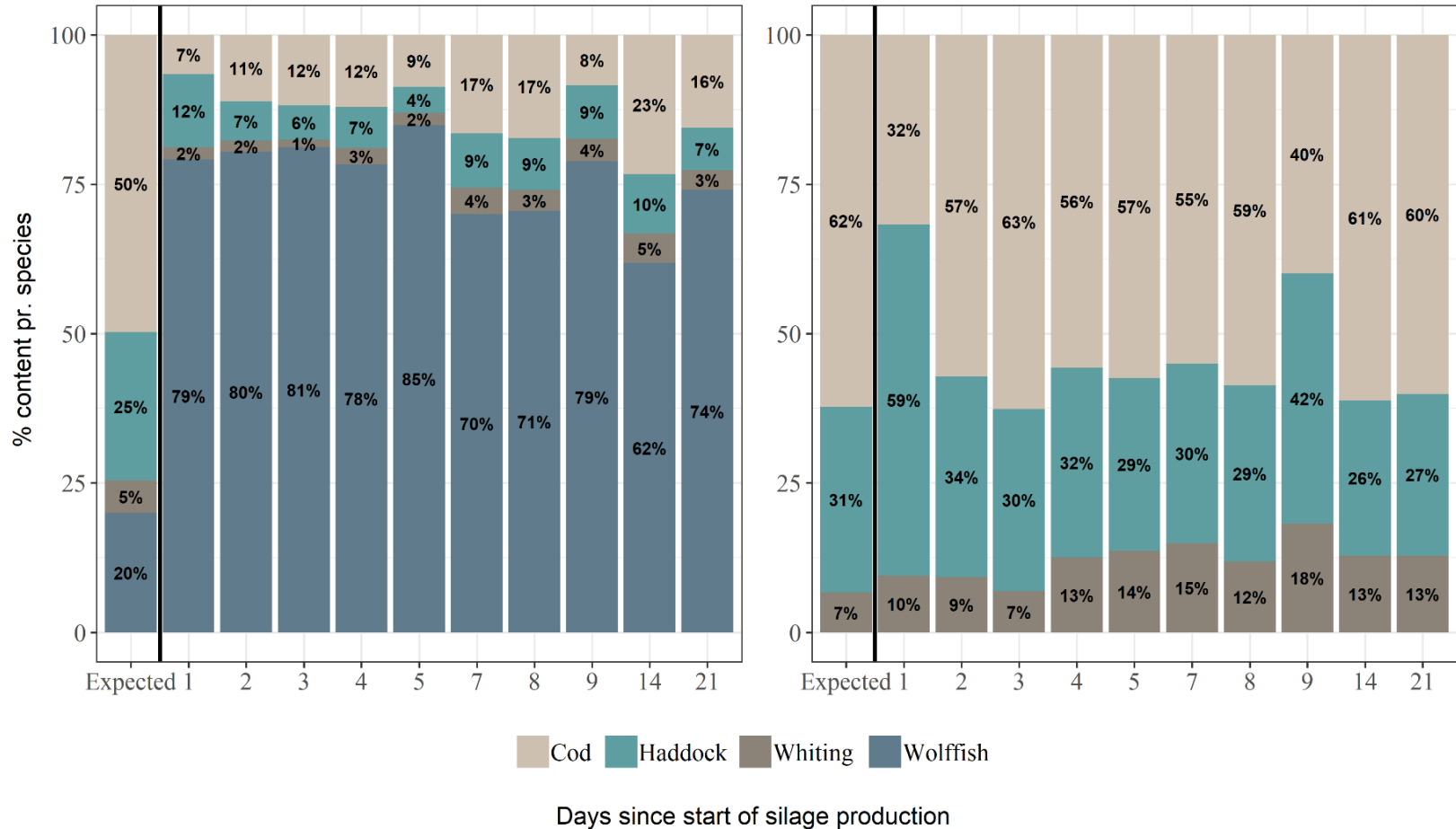
Fish silage



Fish silage



Fish silage

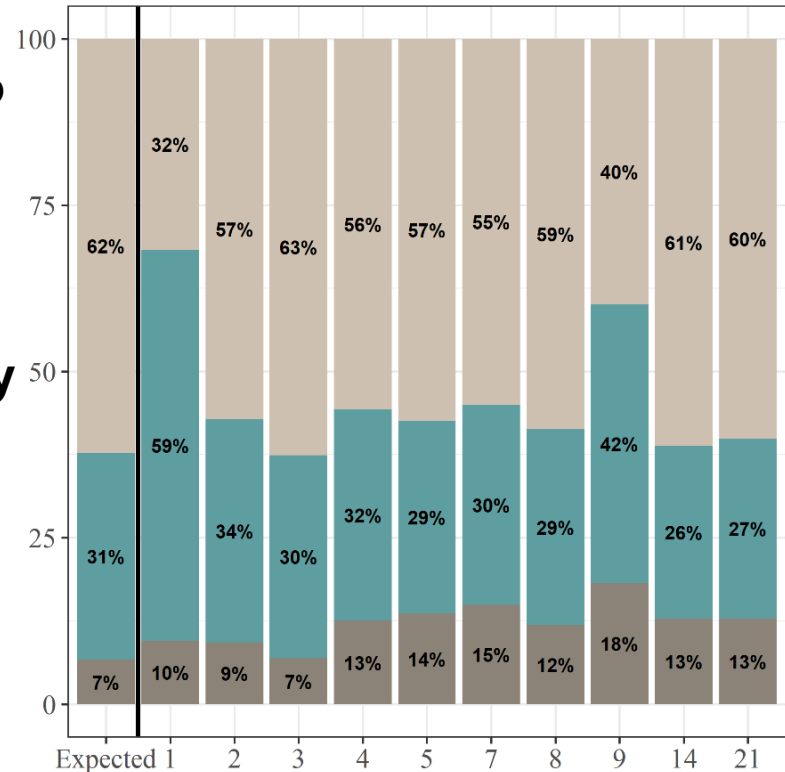


Fish silage

Likely explanation: relationship between biomass and DNA content are similar among codfishes

For codfishes we can accurately identify species and quantify their biomass in silage

Finetuning with correction factors?



Cod
 Haddock
 Whiting
 Wolffish

Days since start of silage production

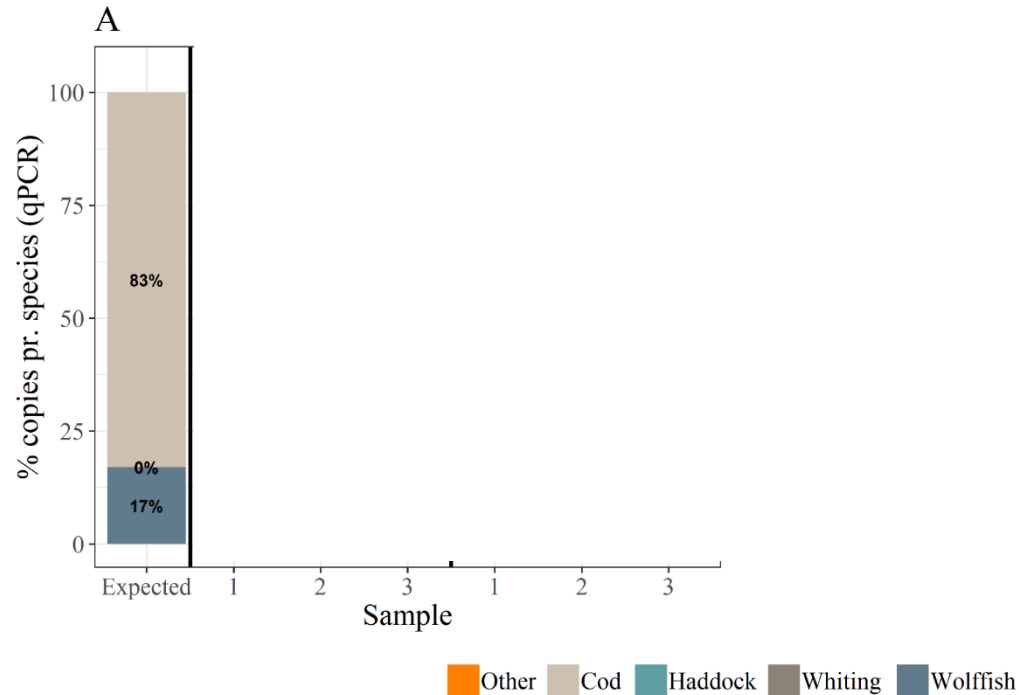
Fish blocks: sampling methods

Method I: Filter water → Extract DNA → Analyze

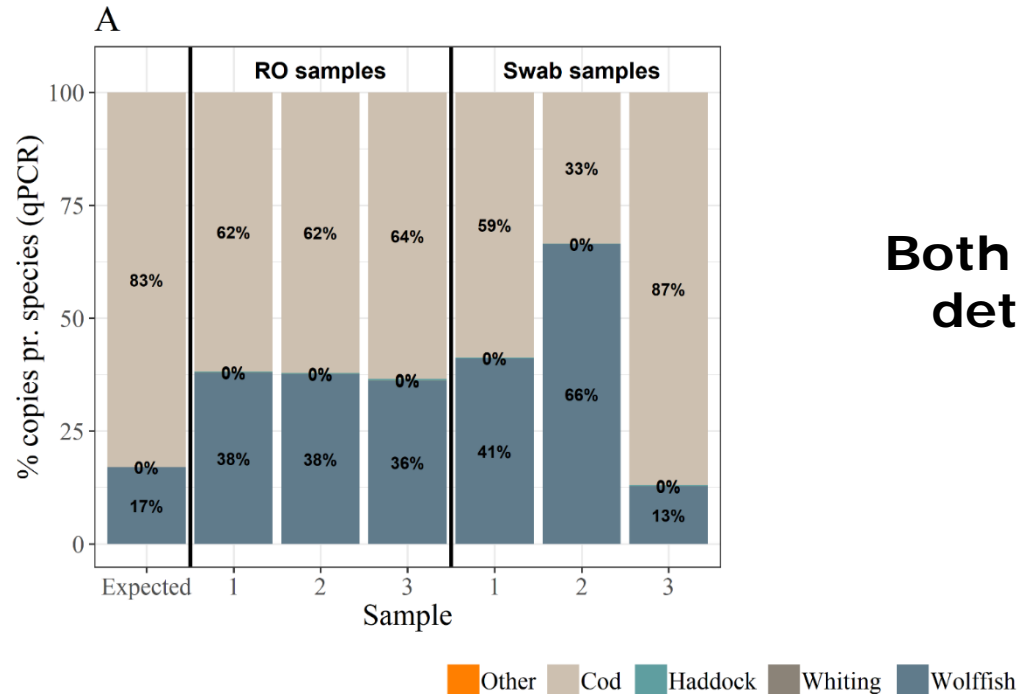
Method II: Swab → Extract DNA → Analyze



DNA results from frozen fish blocks

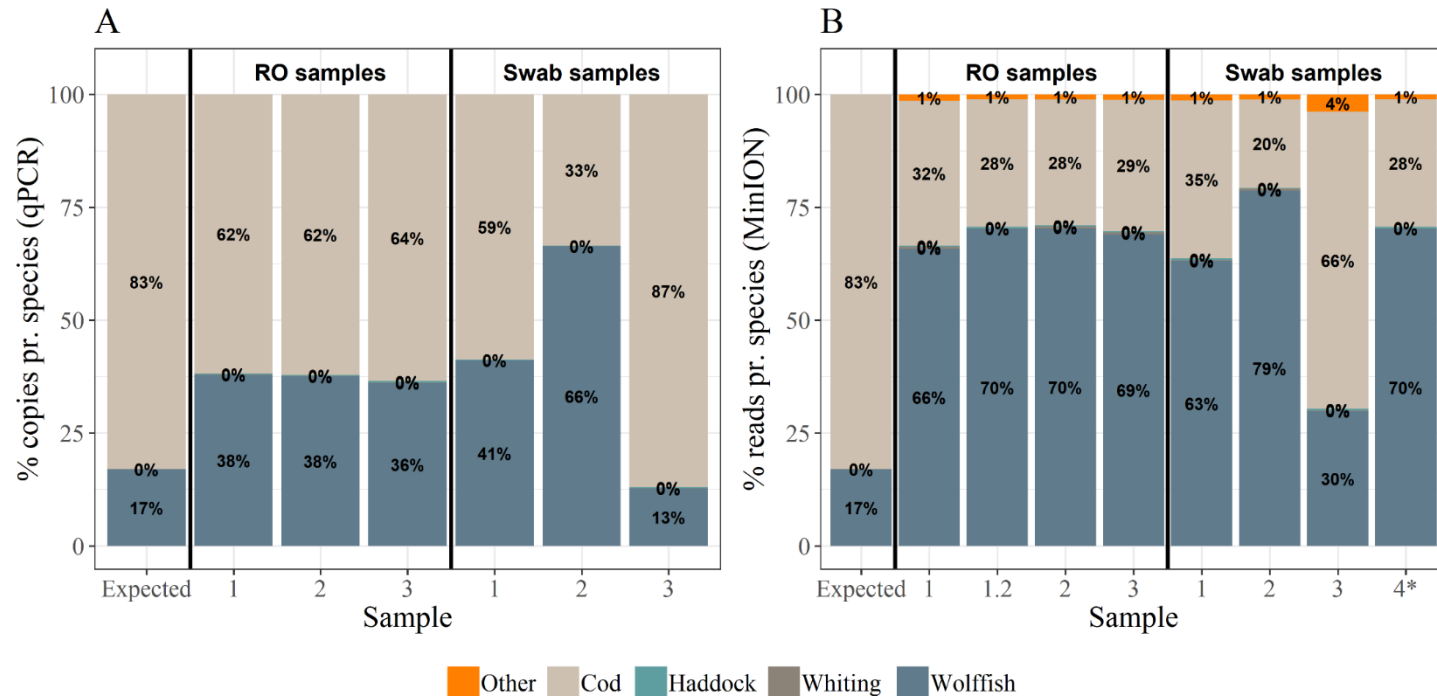


DNA results from frozen fish blocks



Both methods was able to detect the two species

DNA results from frozen fish blocks



What can DNA do for you!

- Identify the species present in silage and fish block
- Quantify biomass proportion of codfishes at high accuracy in silage
- Good potential for calibration among species in future practical applications
- High potential for using and transferring applications to portable devices for fast onsite use by non-experts

Thank you for your attention

Thanks to all involved



Kristinn Ólafsson, Gregory Farrant,
Guðbjörg Ólafsdóttir, Steinunn
Magnúsdóttir



Rob Ogden & Emily Humble

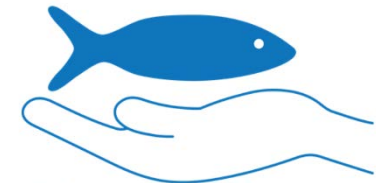


Rasmus Bach Ebert, Steen Knudsen &
Peter Rask Møller



Einar Eg Nielsen, Britta S. Pedersen,
Majbritt Jacobsen, Magnus Wulf Jacobsen,
Dorte Meldrup and Clara Ulrik

With support from



DiscardLess

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