

# Chlorinated paraffins in seaweed chips: First insights using High-Resolution Mass Spectrometry

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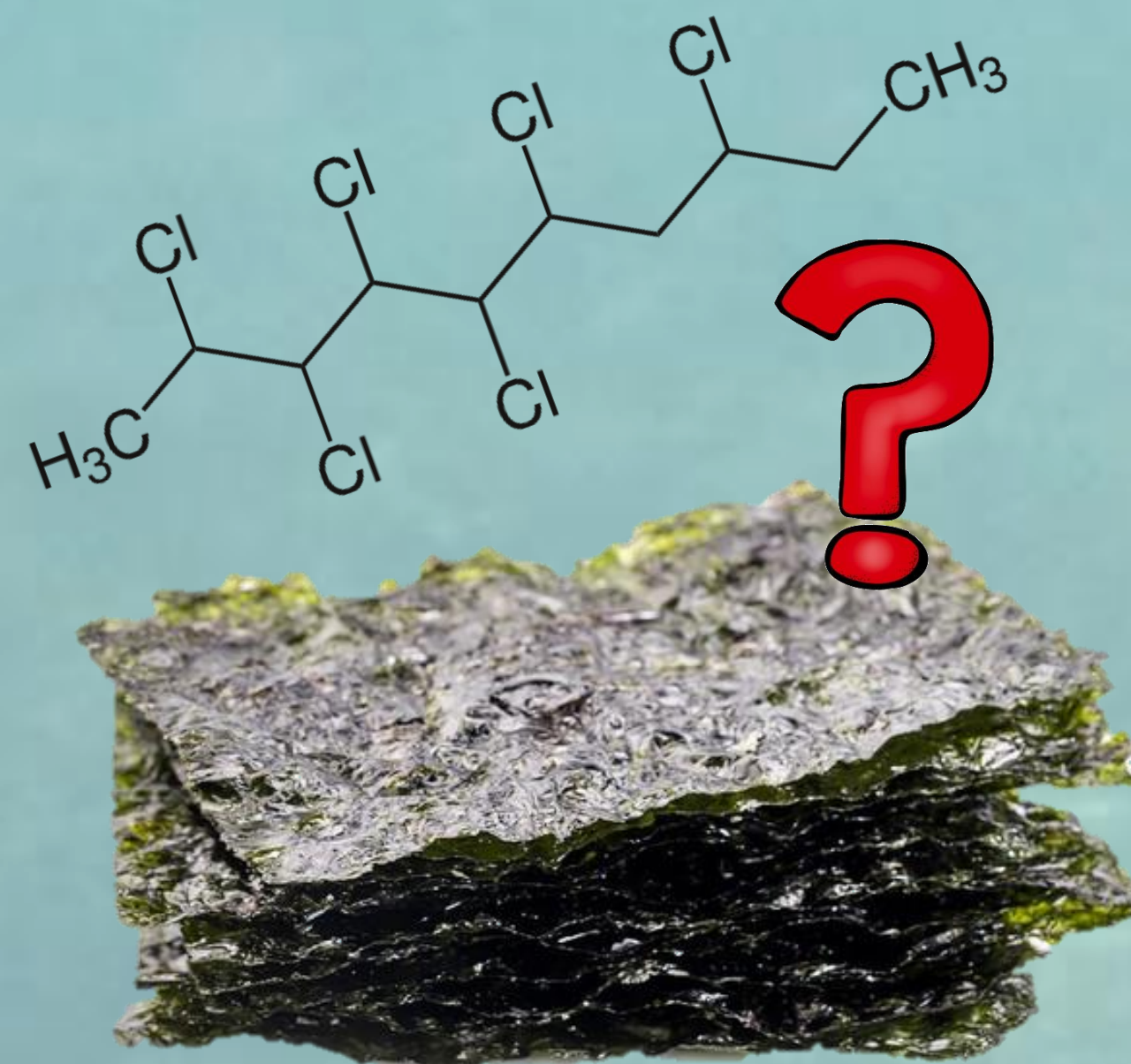
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## Background

- While seaweed is already widely consumed in other parts of the world, it only recently became popular as a protein alternative in Europe.
- Due to its high nutritional value and sustainable production, seaweed can now be found in an increasing number of products on the European market (1).
- In its fried form, seaweed is gaining popularity as a healthy alternative to conventional potato chips. However, seaweed chips might have a higher risk of CP exposure, since both lipid content (2) and level of processing (3) have been shown to be of relevance for CP contamination.

## Objectives

Investigate the presence and homolog patterns of short-chain (SCCP, C<sub>10-13</sub>) chlorinated paraffins (CPs), medium-chain (MCCP, C<sub>14-17</sub>) CPs and long chain (LCCP, C<sub>>17</sub>) CPs in seaweed chips



## Methodology

- Analysis of 4 seaweed chips samples (*Porphyra Yezoensis*) purchased in Belgium (originated from Thailand and Korea)
- Sample protocol: Fig. 1
- Data acquisition: Liquid chromatography coupled to high-resolution mass spectrometry; CP congener groups contained carbon-chains C<sub>6</sub>-C<sub>36</sub> and chlorine-chains Cl<sub>3</sub>-Cl<sub>30</sub>
- Data analysis: R-based open-source software “CP-Seeker” developed at LABERCA, Nantes, France

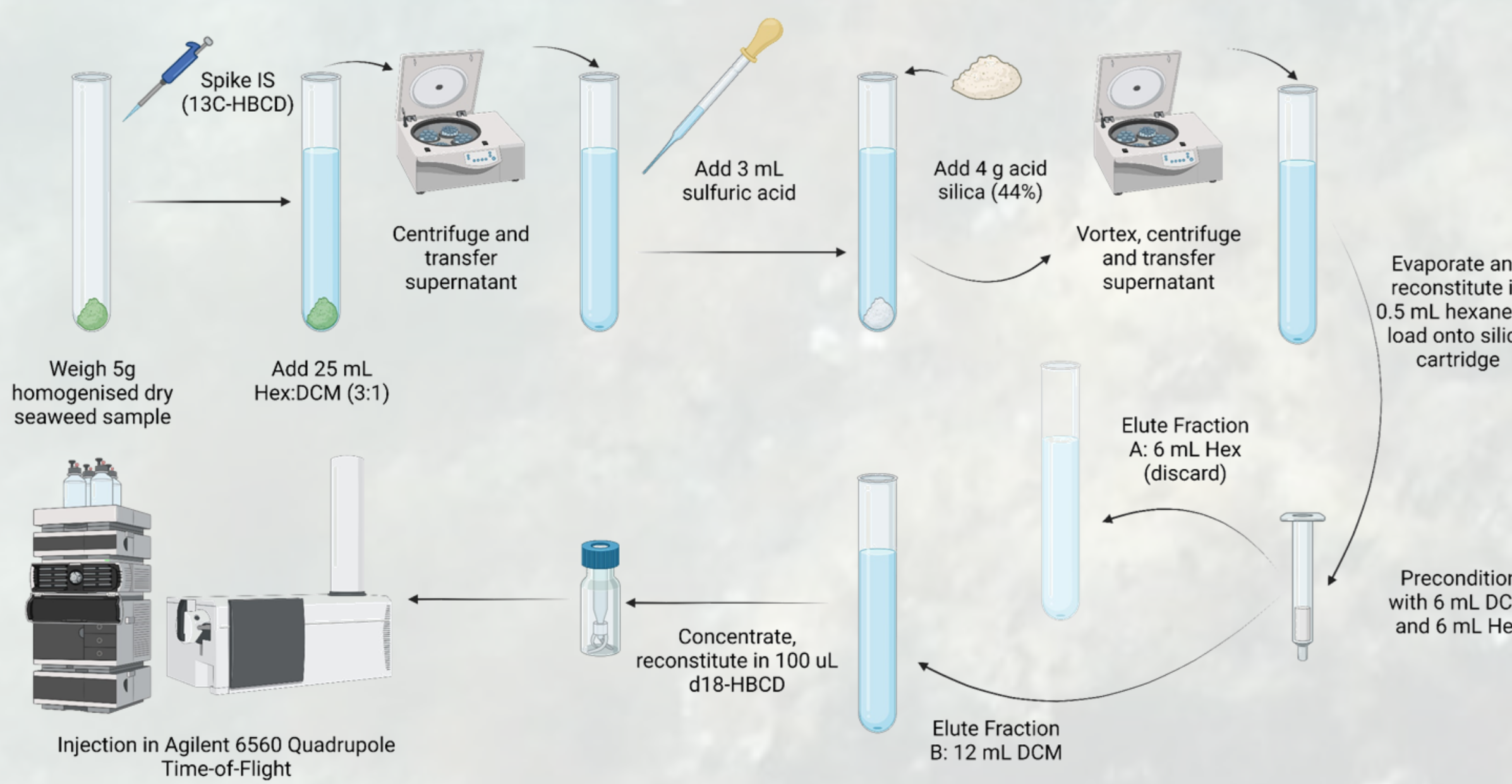


Fig. 1 - Sample preparation (2), created with BioRender.com

## Results and discussion

- $\Sigma$  MCCP most abundant homolog group  $\rightarrow$  80% of CPs in all samples (Fig. 2)
- $\Sigma$  SCCPs < LOQ in all samples
- $\Sigma$  LCCP range: 17-54 ng/g dw
- $\Sigma$  MCCP range: 34-799 ng/g dw
- Highest  $\Sigma$  MCCP concentrations in sample S-01 (419 ng/g dw) and S-03 (799 ng/g dw)
- Most abundant homologs in each group were C<sub>13</sub> (SCCP), C<sub>14</sub> (MCCP) and C<sub>18</sub> (LCCP) (Fig. 3)
- Most abundant homologs for chlorine were Cl<sub>6-9</sub> (Fig. 4)
- Distribution patterns of CPs and highest abundance of  $\Sigma$  MCCP were consistent with previous studies in food
- 2 samples (S-01 and S-03) had higher  $\Sigma$  MCCP concentrations compared to conventional chips (16 ng/g wet weight)
- Correlations between  $\Sigma$  MCCP and lipid content have been observed (2)
- CPs accumulation have been shown to correlate with level of processing (3)
- Seaweed chips are highly processed and have a high lipid content  $\rightarrow$  possible explanation for high  $\Sigma$  MCCP levels

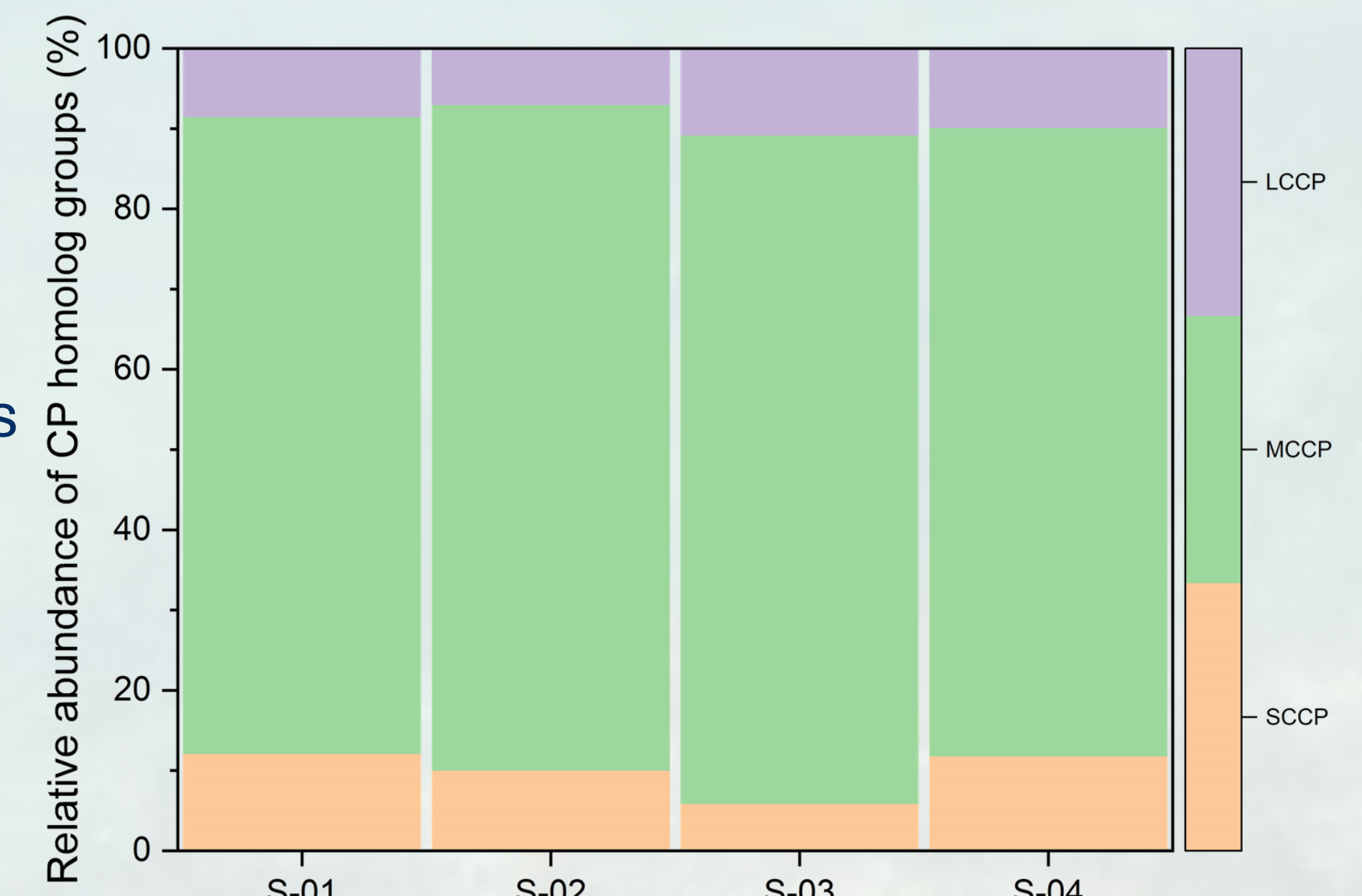


Fig. 2 - Relative abundance of CP homolog groups in seaweed chips

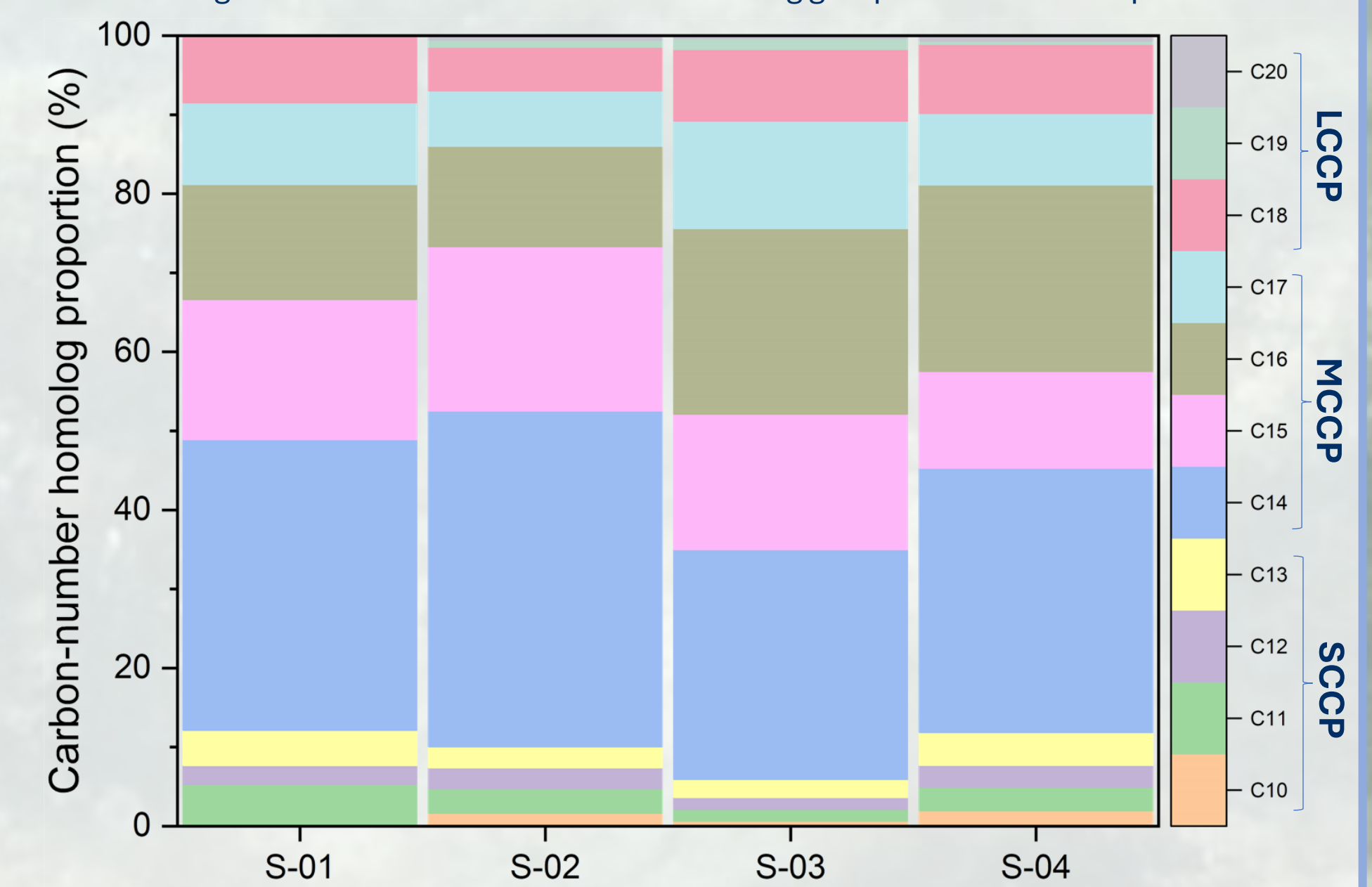


Fig. 3 - Carbon-number homolog proportions in each CP homolog group

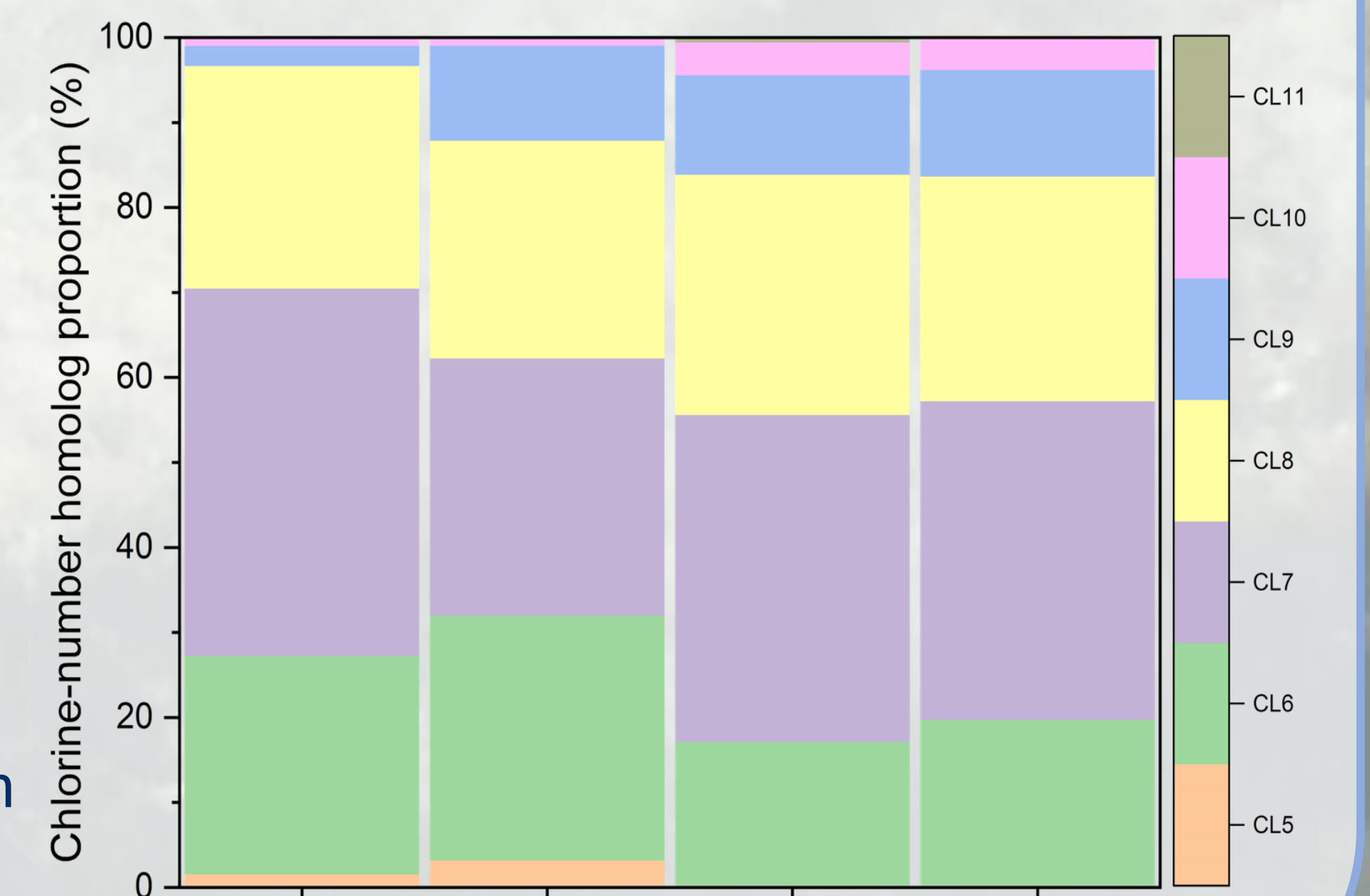


Fig. 4 - Chlorine-number homolog proportion

## Conclusions

CP homolog patterns resembled other food categories and  $\Sigma$  SCCP and  $\Sigma$  LCCP concentrations could be considered low. However, 2 seaweed chips samples exceeded the  $\Sigma$  MCCP concentrations of conventional chips, indicating a possible additional risk for accumulation of  $\Sigma$  MCCPs in seaweed. With the increasing popularity of seaweed in Europe, food safety needs to be assured. While more research is needed to fully assess CP contamination in seaweed chips, this study offers valuable first insights and can be a starting point for future work.

## ACKNOWLEDGMENTS

Financial support was provided by the EU Horizon 2020 research and innovation programme under the MSCA-FoodTraNet programme (grant no.956265).

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