

# Occurrence of short- and medium-chain chlorinated paraffins in edible insects from Europe and Asia

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## Background

- Edible insects are considered a suitable alternative to the continuous request for animal proteins caused by the growing world population's increasing demands (1).
- Despite their proven beneficial traits, the chemical safety of edible insects remains a major factor determining their inclusion in the human diet (2).
- As with other foodstuffs, however, insects may accumulate potentially harmful contaminants, including chlorinated paraffins (CPs).

## Objectives

- Investigate the presence and homologue patterns of SCCPs and MCCPs in edible insects from Asia and Europe.
- Evaluate the potential for exposure to CPs associated with insect consumption among adult populations.

## Methodology

- Analysis of 36 edible insect samples (n=24 from Asia: SK, JPN, TH; n=12 from Europe: AT, BE, NL, UK) belonging to 5 orders: Orthoptera, Coleoptera, Lepidoptera, Trichoptera, Hymenoptera.
- Insect were characterized by different life stages (adult, larva, pupae), rearing process (farmed, wild), and purchasing status (natural, seasoned, milled).
- Sample protocol: Fig. 1
- Sample analysis: gas chromatography and mass spectrometry (GC-ECNI/MS) according to (3)

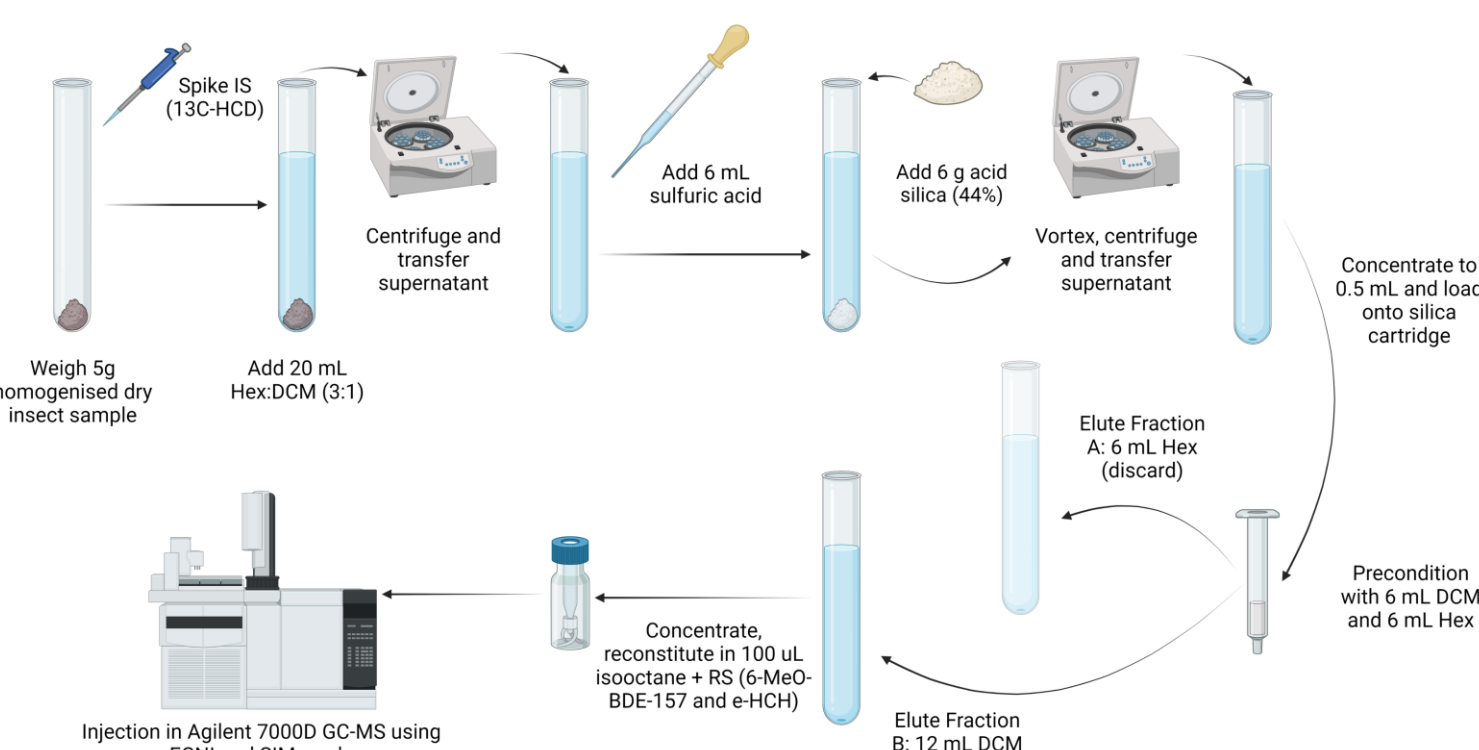


Fig. 1 - Sample preparation (3), created with BioRender.com

## Results and discussion

- SCCPs detected in 83% of samples; MCCPs detected in 92% of samples.
- Overall median  $\Sigma$ SCCP = 8.7 ng/g dry weight (dw), range: <2.0 - 410 ng/g dw (Fig. 2).
- Median  $\Sigma$ MCCP = 51 ng/g dw, range: <6.0 - 380 ng/g dw (Fig.2).
- Medians  $\Sigma$ SCCP and  $\Sigma$ MCCP in samples from Asia >> Europe.
- Concentrations of  $\Sigma$ MCCPs >  $\Sigma$ SCCPs in 81% of samples.
- Average SCCP/MCCP ratio = 0.26.
- Contamination of edible insects with CPs could have been affected by processing method, intrinsic species-specific differences in accumulation and biotransformation capabilities, and insect life stage.
- Estimated daily intake (EDIs)  $\Sigma$ SCCPs = 0.19 and 0.092 ng/kg bw/d for Asian and European adults.
- EDIs  $\Sigma$ MCCPs = 1.50 and 0.27 ng/kg bw/d for Asian and European adults.
- MOEs based on EDIs were > than the  $1.0 \times 10^3$  threshold above which health concerns are considered unlikely (4).
- Rates of CP intake via consumption of edible insects were generally lower than intake from animal products in other studies.

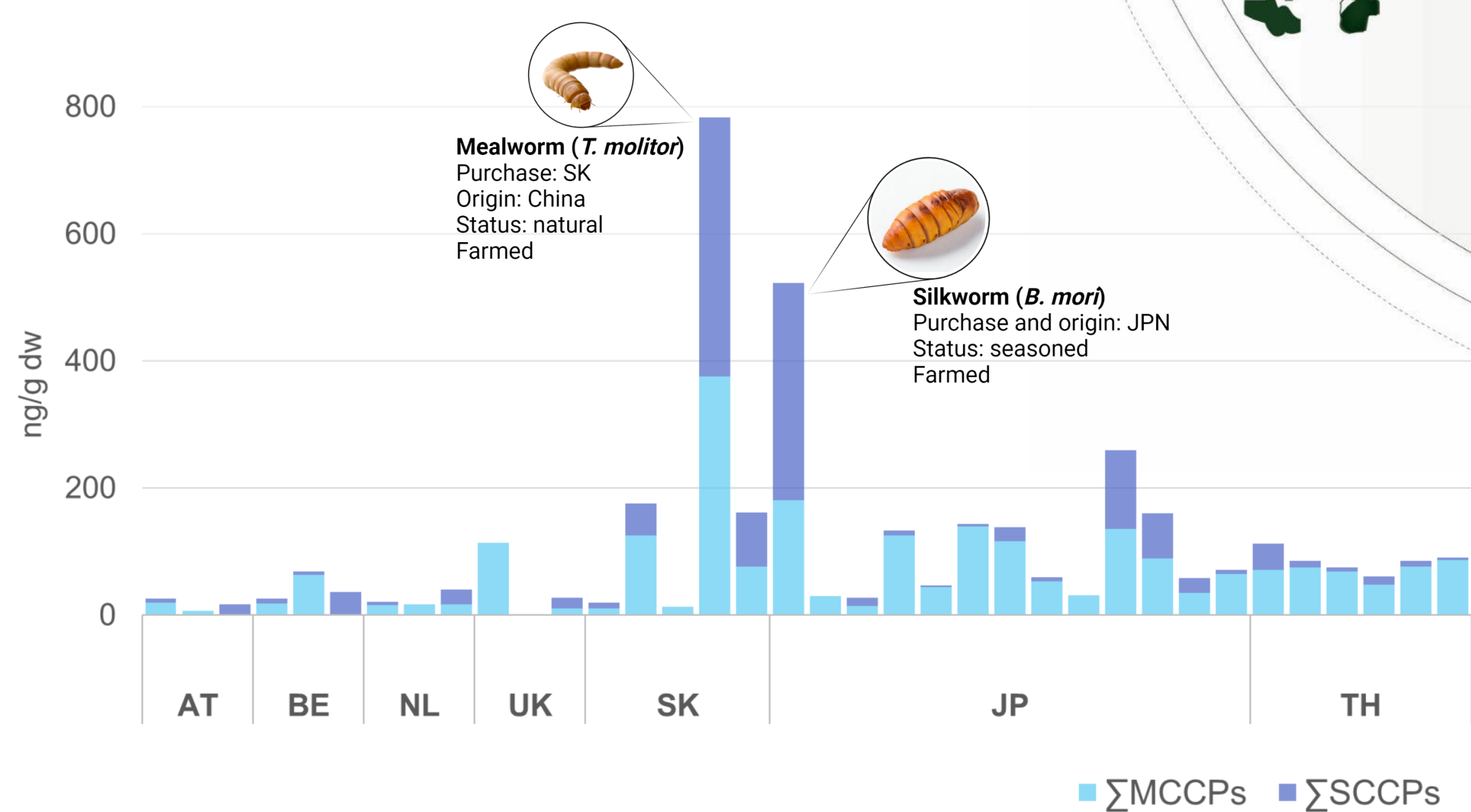
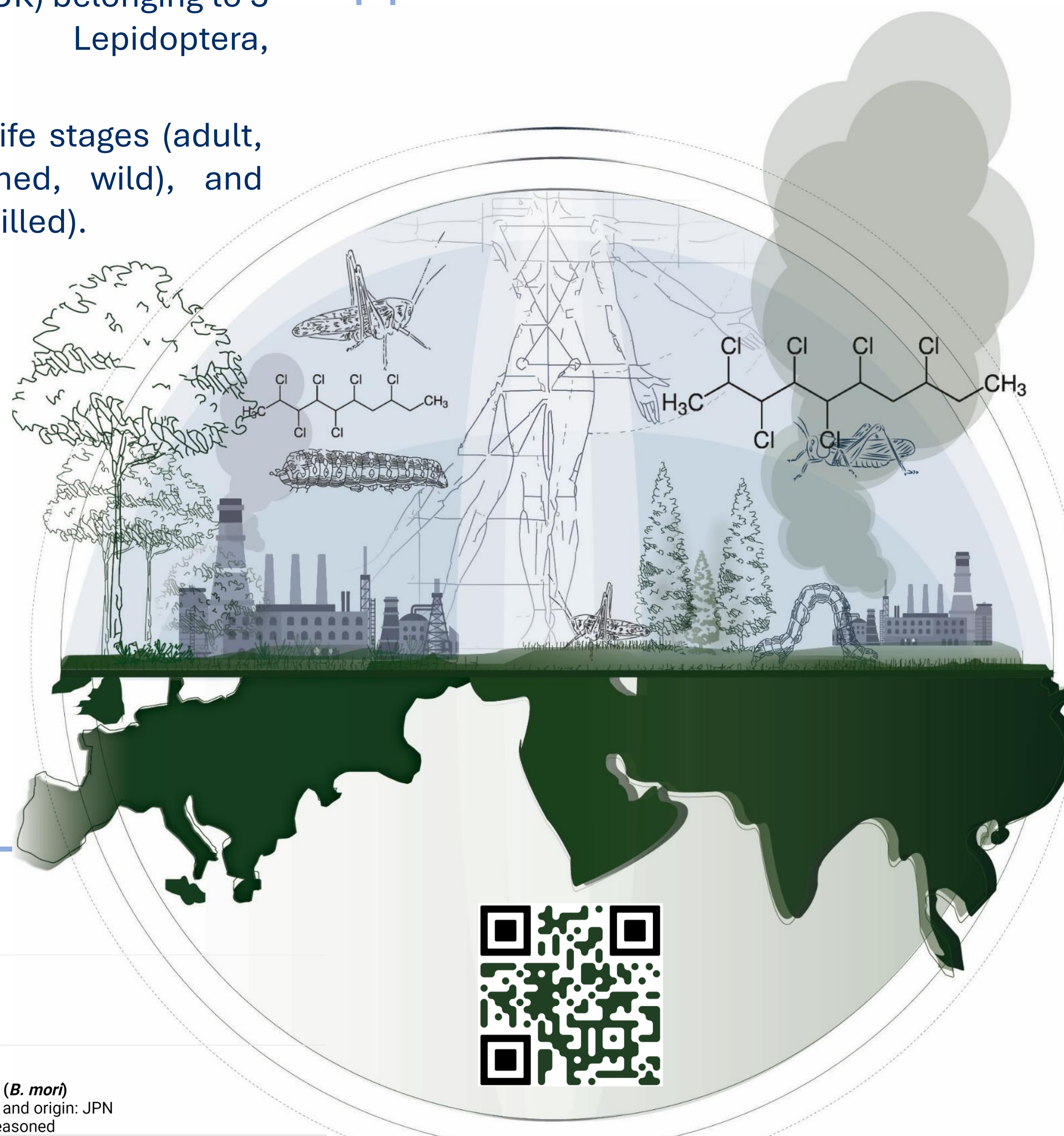


Fig. 2 Concentrations (ng/g dw) of  $\Sigma$ SCCPs and  $\Sigma$ MCCPs in edible insect samples. SK = South Korea, JPN = Japan, TH = Thailand, AT = Austria, BE = Belgium, NL = Netherlands, and UK = United Kingdom.

## Conclusions

SCCPs and MCCPs are widespread in insect-based foods from Asia and Europe, indicating region-specific contamination sources. Sources of contamination may include environmental bioaccumulation, industrial processing equipment, and food additives. Health risks for the adult population via consumption of edible insects are likely to be low but industrially produced insect-based foods require continuous monitoring.

## ACKNOWLEDGMENTS

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