



# Impact of toxic substance exposure on life history and reproduction of Black Scavenger flies (Diptera: Sepsidae)

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## INTRODUCTION

- Neonicotinoids are widely used insecticides which have been highly toxic to non-target organisms and reported to have both sub-lethal and lethal effects on the development, survival, or physiology.
- We experimentally quantified the effects of juvenile (larval) exposure to the neonicotinoid imidacloprid on the life history of four non-target species of Black Scavenger flies which are beneficial as decomposers of vertebrate dung.
- We hypothesized that with increase in imidacloprid concentration in dung, it will gradually lower larval survival and adult emergence due to high mortality. Also result in lower fecundity of the surviving adults.

## METHODS

- We investigated the 4 commonly occurring *Sepsis* species *S. cynipsea*, *S. fulgens*, *S. punctum* and *S. thoracica*, originally collected in Zurich, Switzerland.
- Five imidacloprid solutions were chosen for this study and were mixed with fresh dung for the larvae to feed on. The setup was maintained at constant 24°C, 60% rh., and 14h light. Larva-to-adult viability, development time, and adult body size of flies was measured.
- The surviving flies were paired in a fully factorial design to assess the sex-specific effects on adult reproduction. Each pair was kept in a 50 ml vial. The first clutch of eggs was observed. All vials with eggs were kept at constant 24°C., 60% rh., 14h light to score offspring number. Emerged offspring were frozen at -20°C .

## RESULTS

Note: Imidacloprid concentrations (C1=0.04, C2=0.1, C3=0.21, C4=0.44, or C5=0.88 mg/kg wet dung) across four *Sepsis* species (including water C0 and acetone solvent C01 controls)

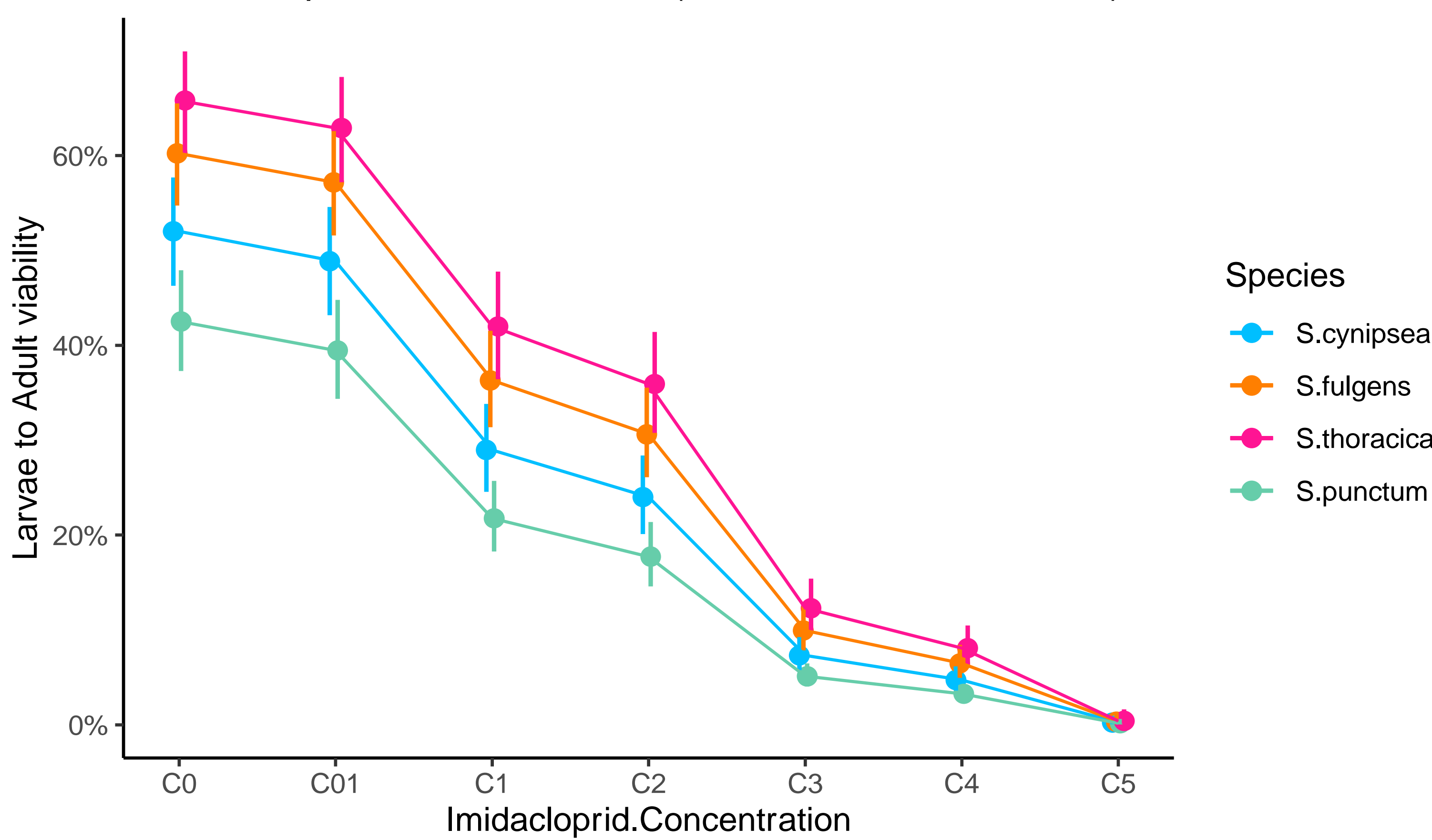


Fig1.1: Larva-to-adult survival with increasing imidacloprid concentrations

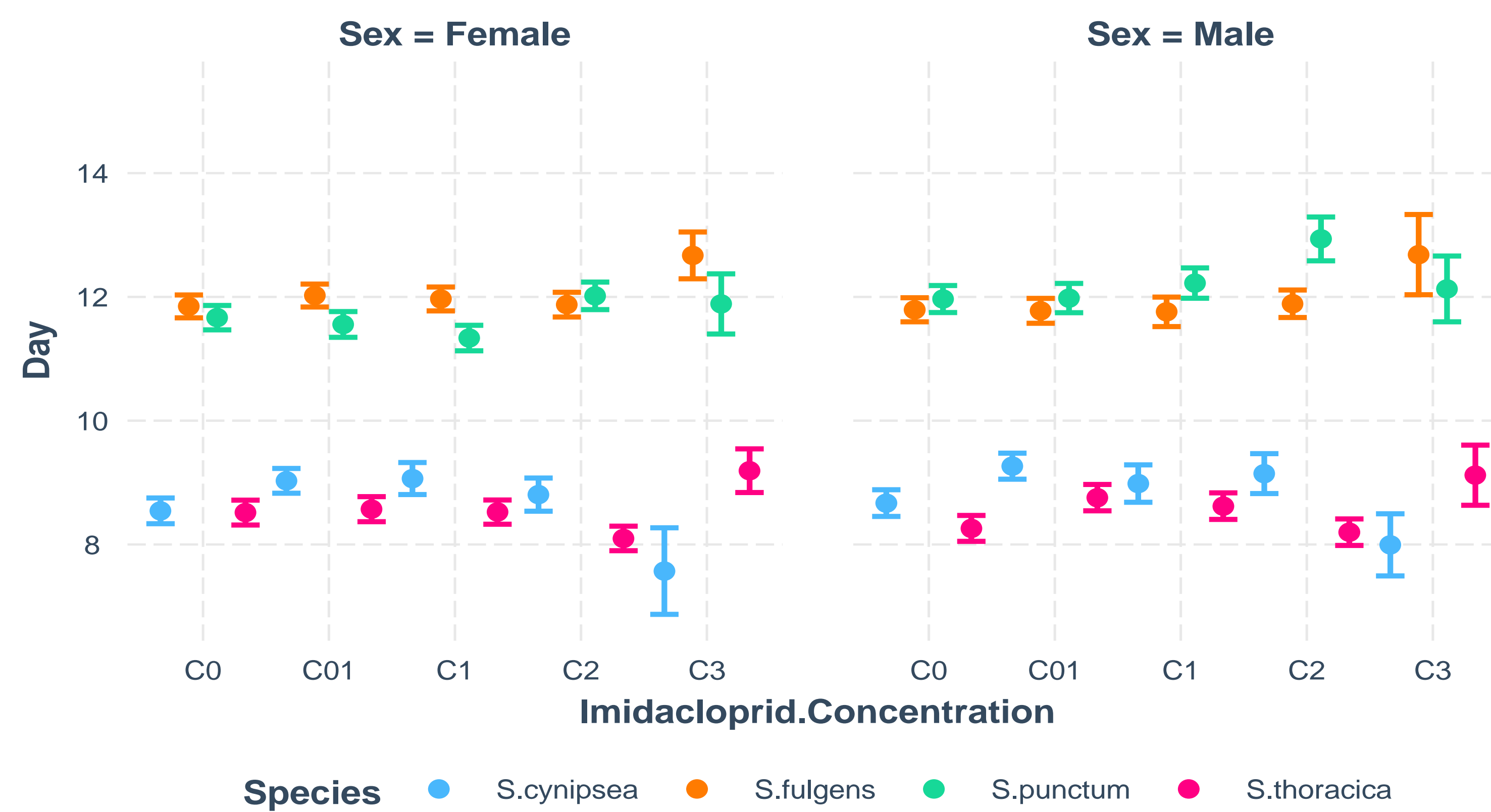


Fig1.2: Egg-to-adult development time (in days) with increasing imidacloprid concentrations

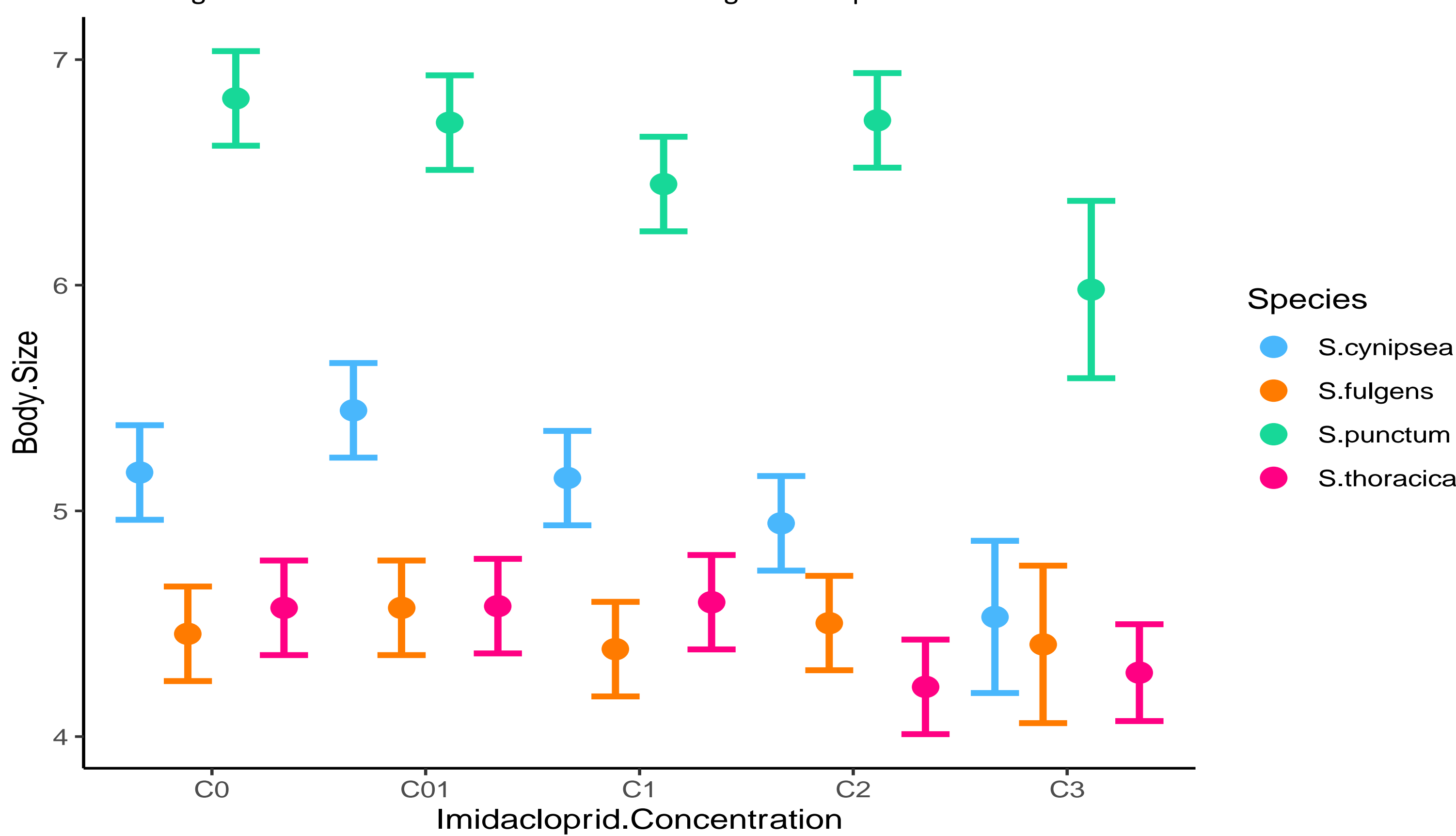


Fig1.3: Body size (hind tibia length in mm) with increasing imidacloprid concentrations

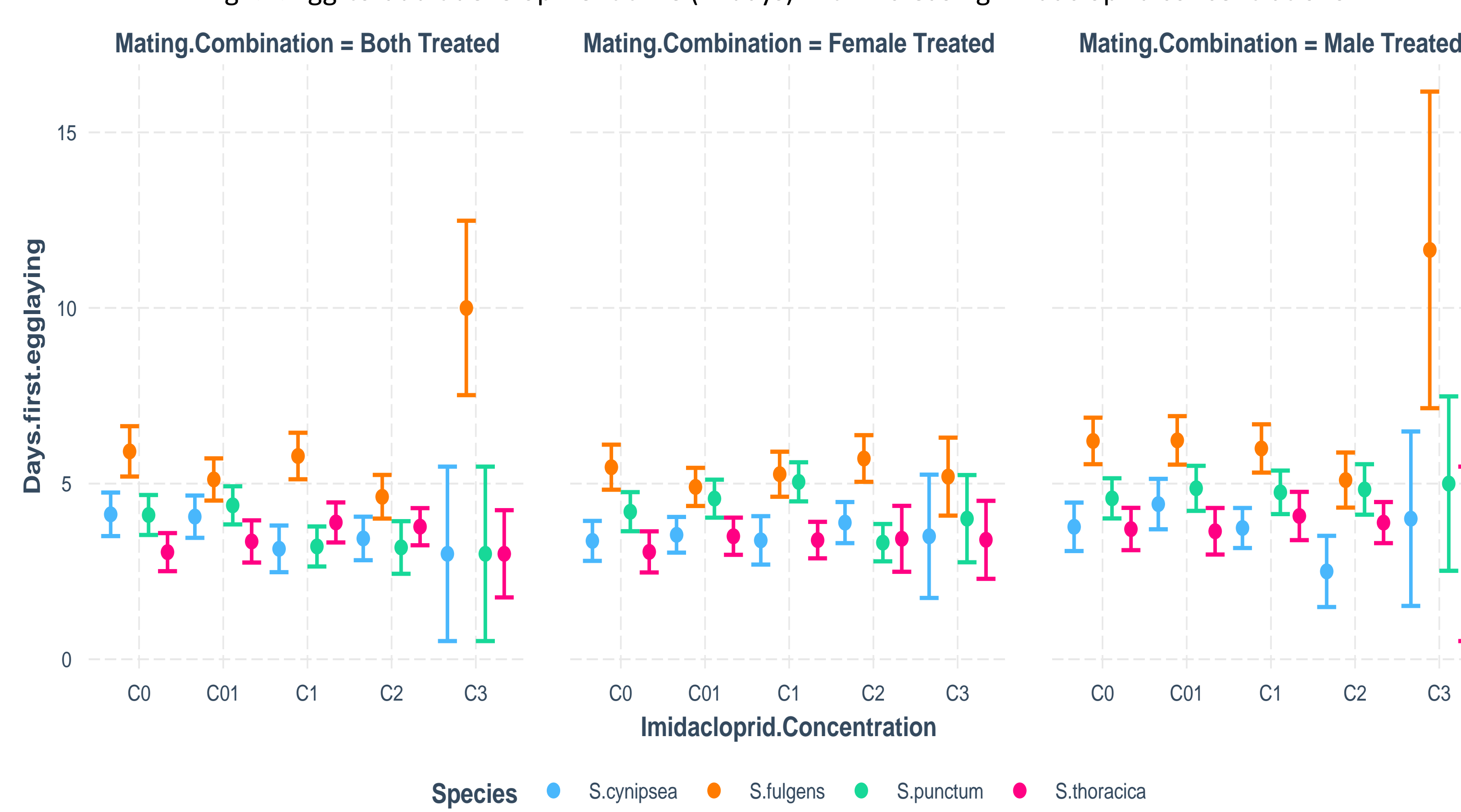


Fig 1.4: Days to laying first clutch (in days) with increasing imidacloprid concentrations

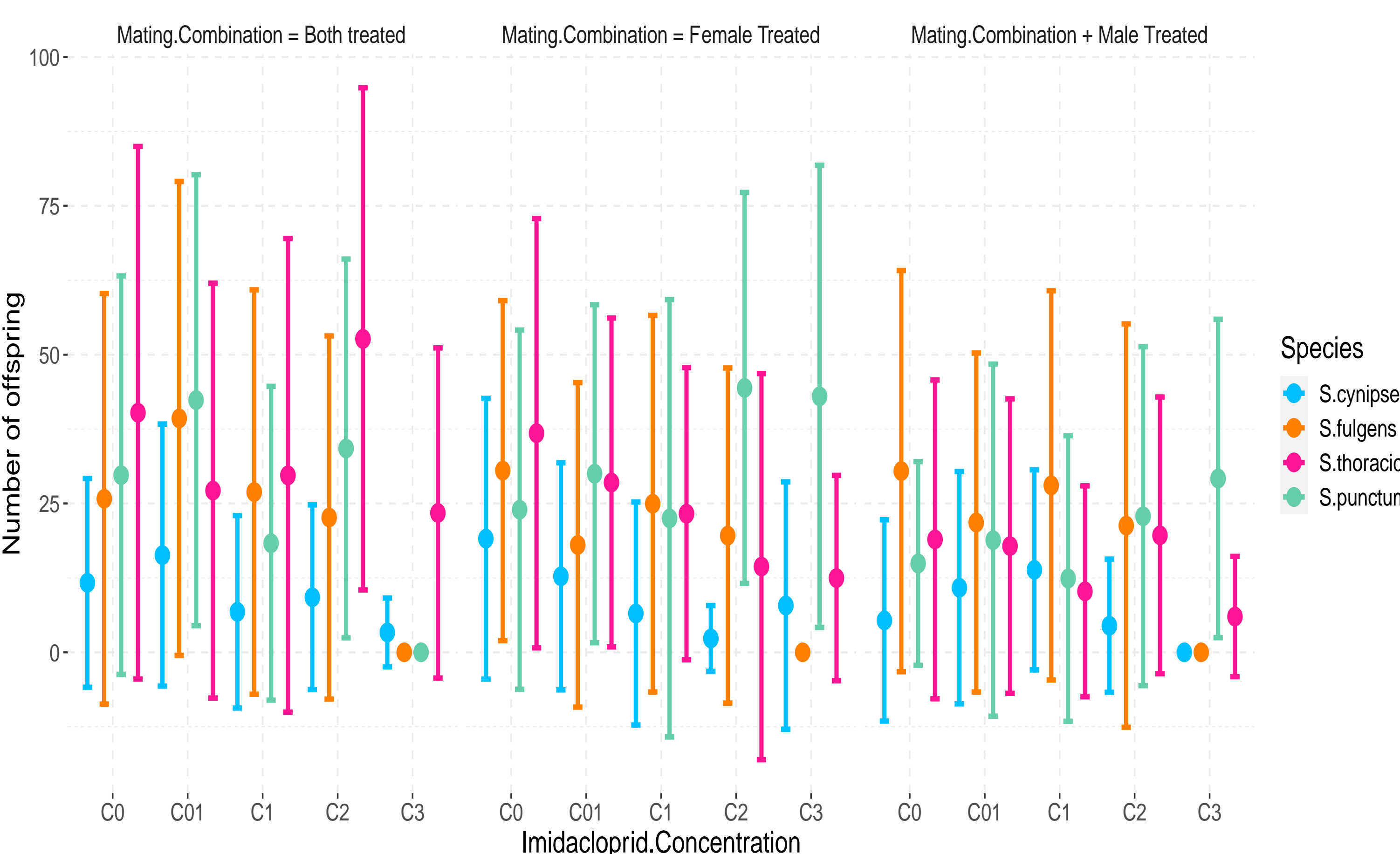


Fig1.6: Number of offspring with increasing imidacloprid concentrations

## CONCLUSION

- The results demonstrate subtle to strong lethal and sub-lethal effects of imidacloprid on life history traits after exposure of juveniles (larvae), as well as subsequent carry-over effects in surviving adults of *Sepsis* species.
- The underlying mechanisms of imidacloprid have been studied in various other groups of organisms, which presumably similarly afflict *Sepsis* flies.
- We also emphasize that studying a single model species provides merely incomplete evidence of adverse effects of a chemical substance present in the environment for any group of non-target species.
- Our study projects future directions of possible research, e.g., about effects of neonicotinoids on adult *Sepsis* flies, transgenerational effects on to future generations.

## REFERENCES

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