# Optimizing grazing management for the conservation of salt-marsh Microlepidoptera

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- Intensive grazing:
  - Homogeneous short sward of several grazing tolerant species
  - Breeding birds risk trampling
  - Very low insect species richness

- Abandonment:
  - Plant species richness declines
  - A monoculture of tough grass forms
  - Breeding and winter staging birds will decline
  - Some typical salt-marsh insects will disappear

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# Research questions

- How is moth diversity affected by grazing management?
- What factors determine the occurrence of caterpillars on their host plant?

# Hamburger Hallig


1000 ha salt marshes, managed with four different stocking densities

(0, 1-2, 3-4 and 10 sheep ha$^{-1}$)

since 1990


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High stocking density

Intermediate stocking density

Low stocking density

Ungrazed salt marshes

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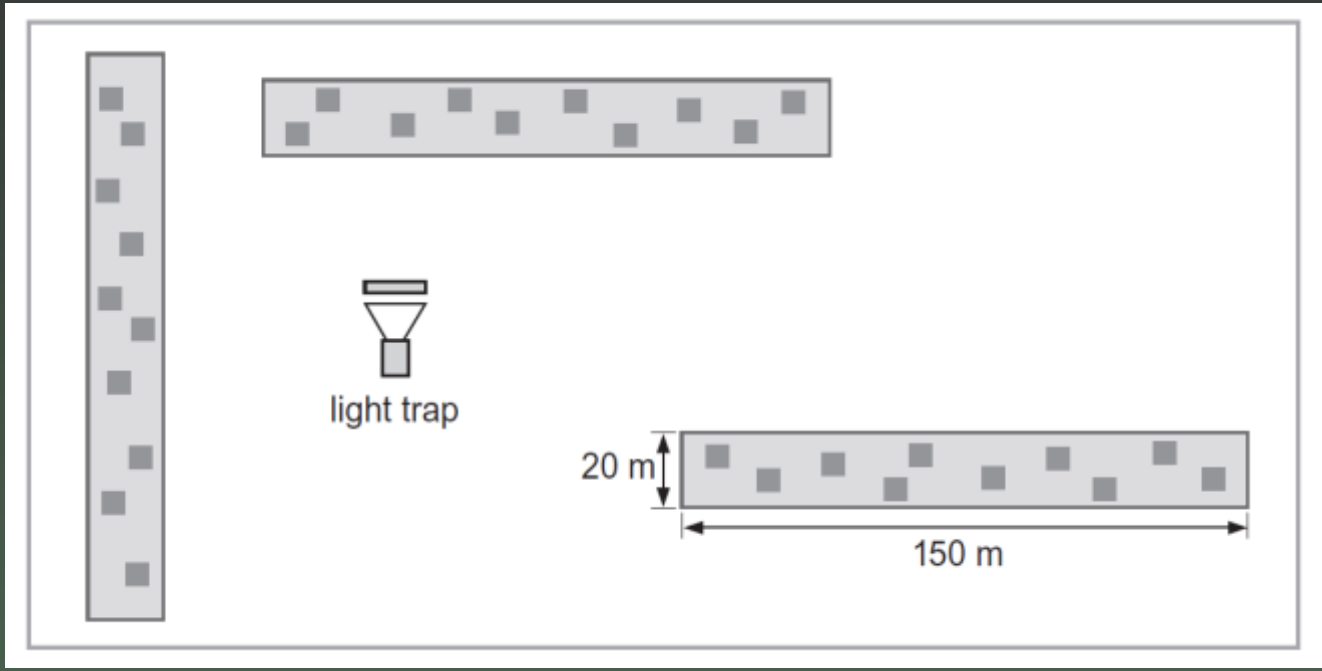
# Experimental setup





UV-light trap (LF)


Photoeclector (PE)

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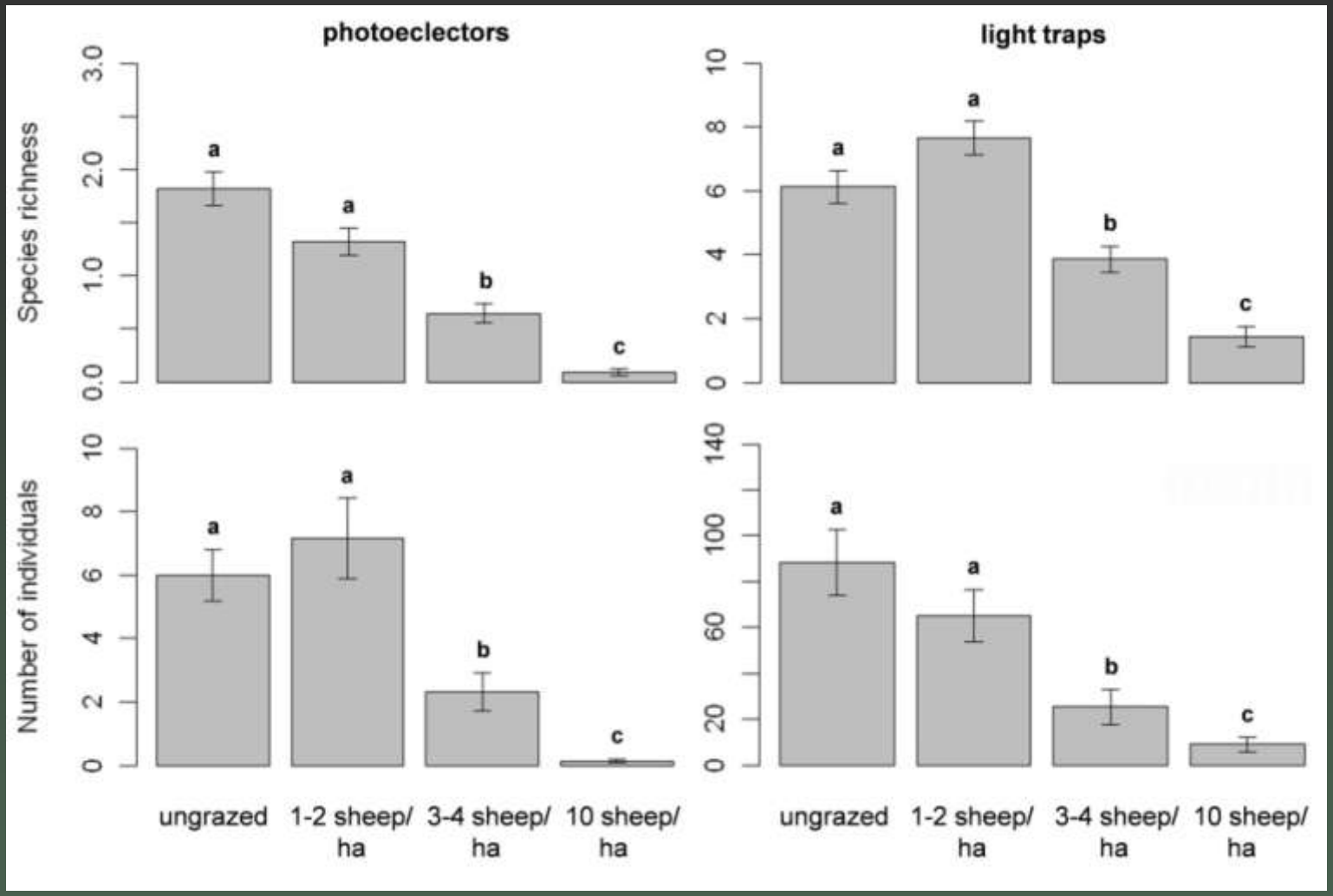


Effect of grazing on species richness and abundance (mean number per trap ± SE) of moths in the salt marshes from 2007-2009 (photoeclectors, n = 396) and 2006-2009 (light traps; n = 124). Different characters indicate significant differences among the four different stocking densities ($p_{adj.} < 0.05$). Model type: GEE. (Rickert et al. 2012 Biol cons).

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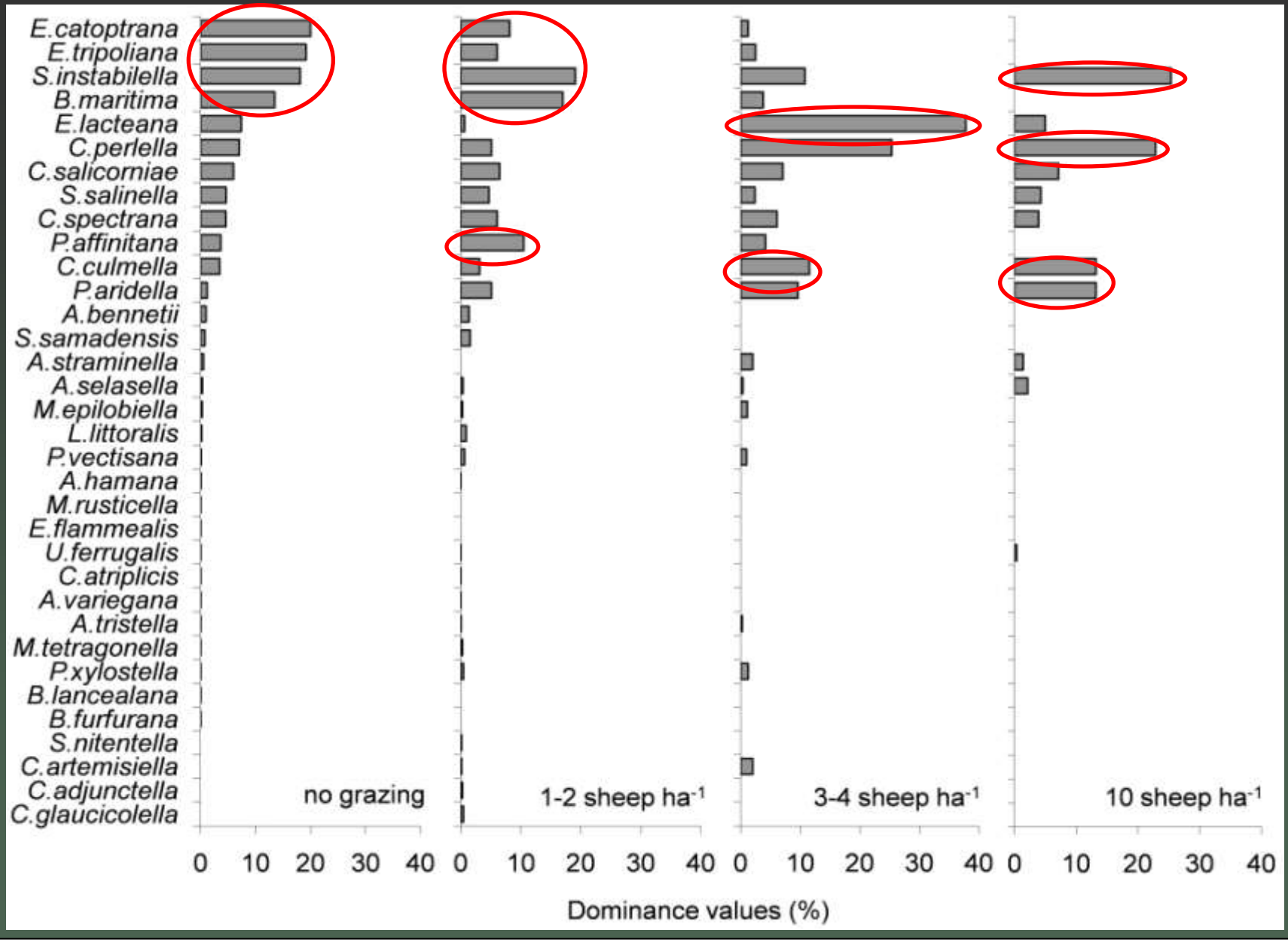


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*Eucosma catoptrana*

*Coleophora asteris*

*Bucculatrix maritima*

*Eucosma tripoliana*

*Phalonidia affinitana*

Other species:

*Cucullia asteris* (Noctuidae, oligophagous)

*Heliothis maritima* (Noctuidae, polyphagous)

*Eupitecia centaureata* (Geometridae, polyphagous)

*Clepsis spectrana* (Tortricidae, polyphagous)

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# Noord Friesland Buitendijks

180 ha salt marsh, under different management types

(Horses and cows at 1 and 0.5 animals ha$^{-1}$ and rotational grazing)

since 2010


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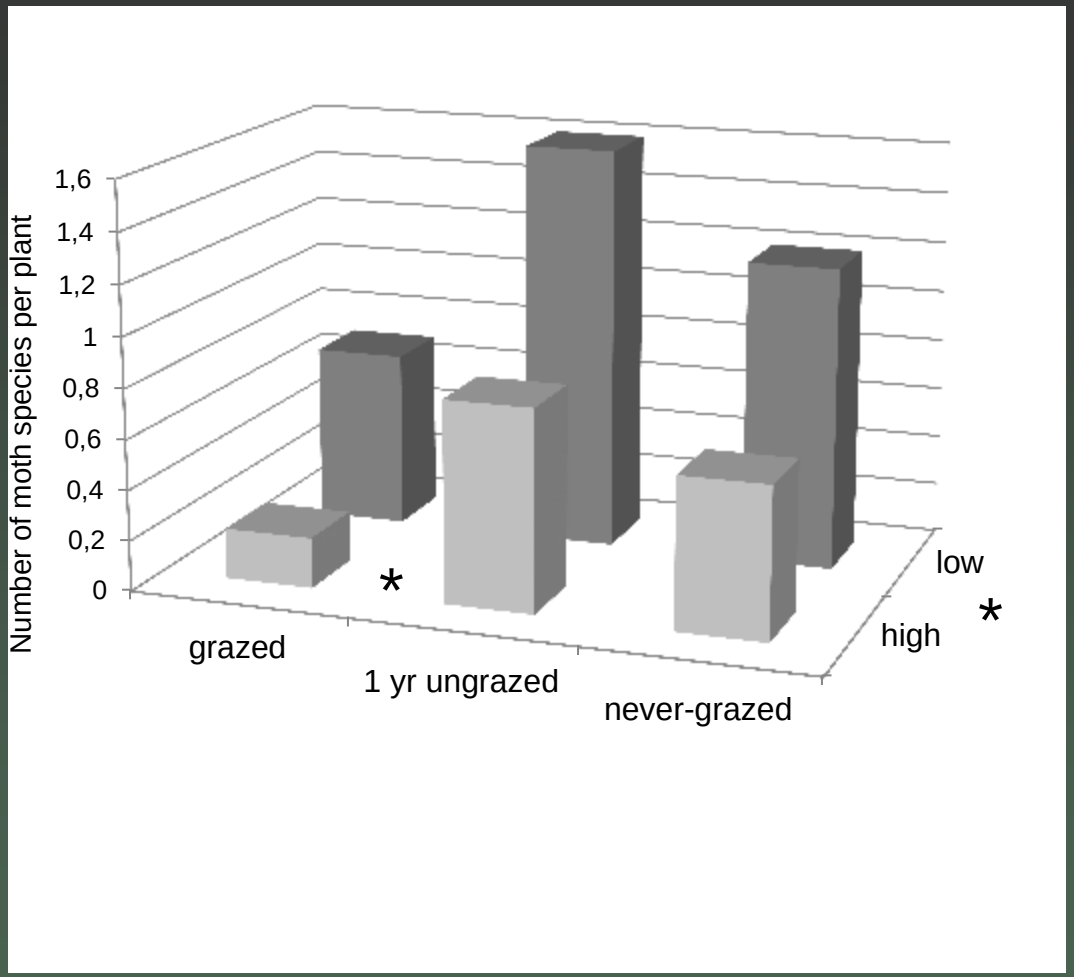
# Experimental setup

- Randomly harvested 60 plants
- Three treatments:
  - cow grazed (1 cow ha-1)
  - 1 yr ungrazed
  - Never grazed
- Lower marsh and higher marsh

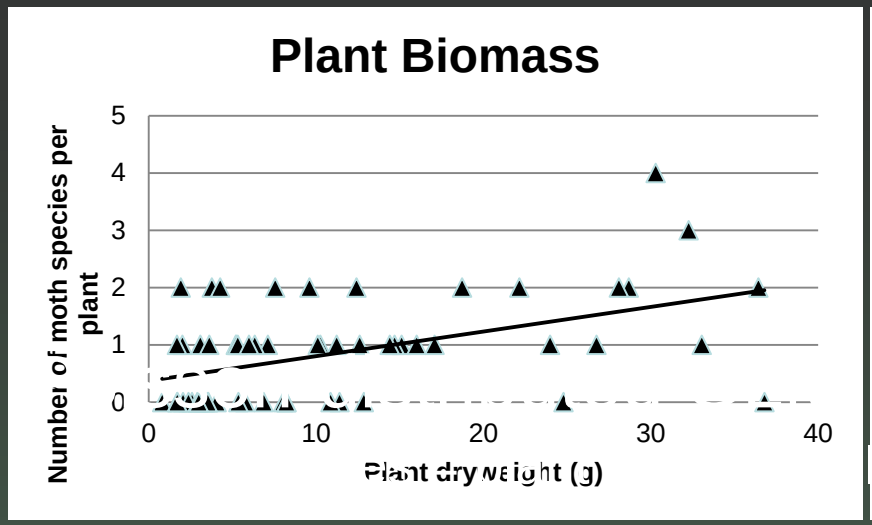
- Measurements:
  - Number of caterpillar species (20 flowers per plant)
  - Biomass
  - Elevation above MHT
  - Estimate of number of Asters in 25 m radius

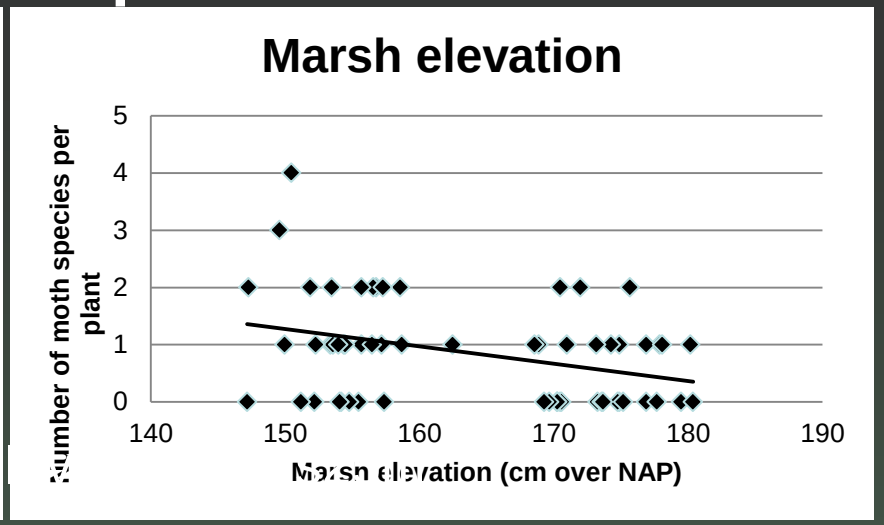
# Results: Treatments

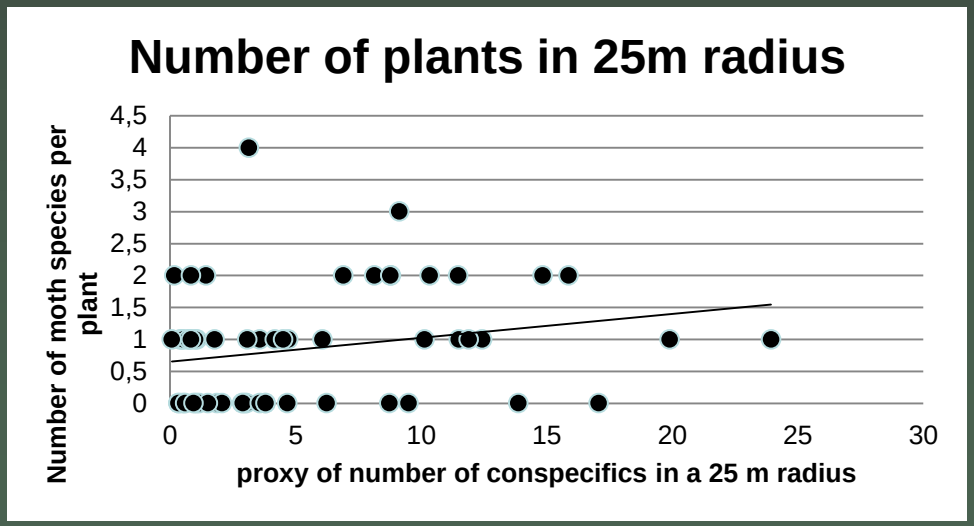



Poisson distributed GLM: Moth species= treatment + salt marsh zone

# Results: Model parameters




Poisson-distributed GLM: Moth species = plant biomass+elevation*cons25m

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# Conclusions

- Despite the dominance of tall grasses, high moth species richness is found in abandoned marshes
- Only grazing with very low stocking densities is not detrimental to moth diversity
- Grazing causes a shift in dominance from specialists to generalists
- The most important mechanism causing this is direct competition for resources
- Short-term cessation of grazing will yield the highest species richness per plant

# Management recommendations

- We stress the importance of maintaining different management types, including abandonment to maximize arthropod conservation in salt marshes
- The possibilities of rotational grazing management  in productive systems like ours should be explored

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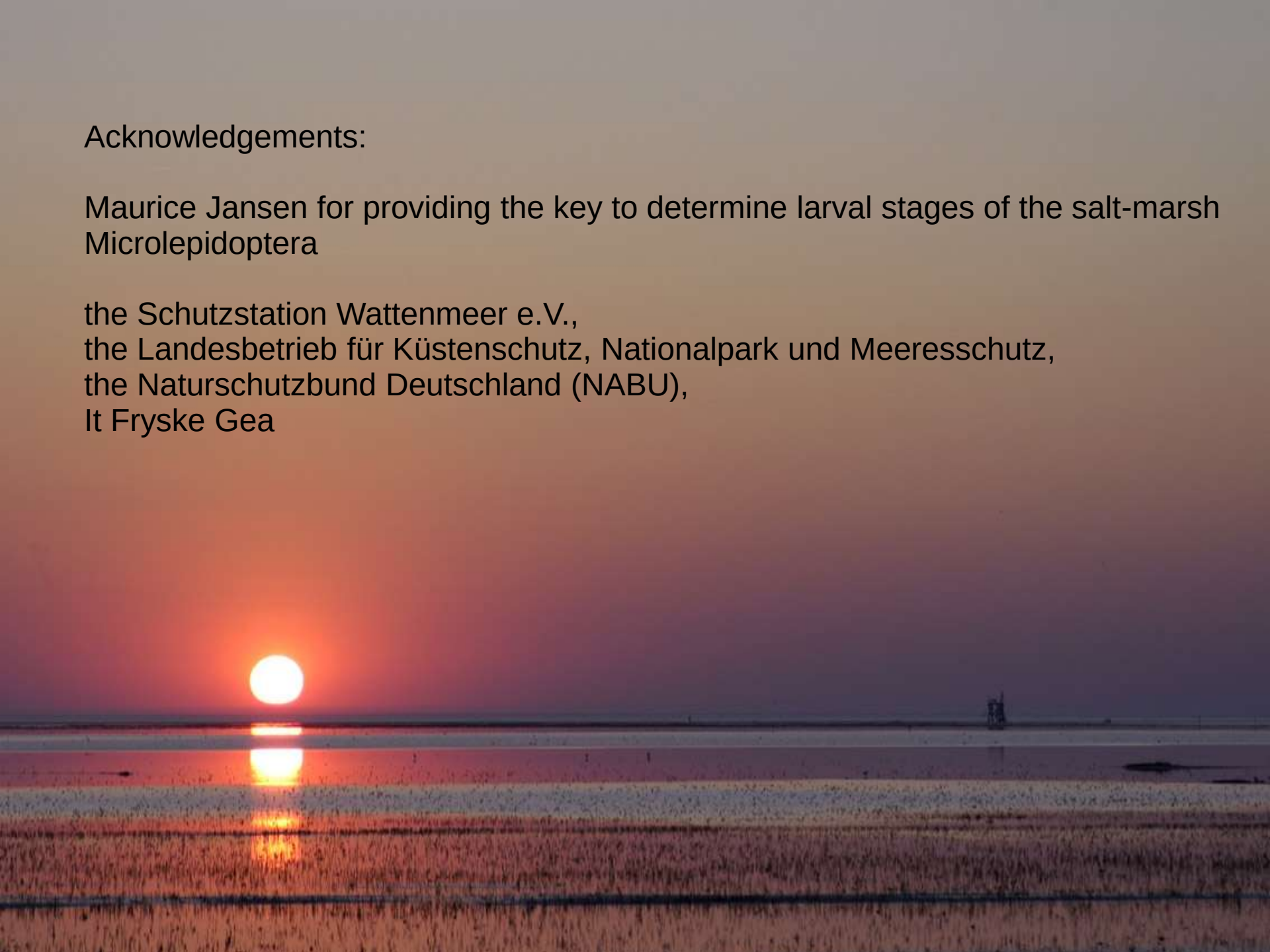

# All herbivorous insects