

**BDEE**  
**2021**

# The 1st International Electronic Conference on Biological Diversity, Ecology and Evolution

15–31 MARCH 2021 | ONLINE

Chaired by **PROF. DR. MICHAEL WINK**



## **Great cormorants (*Phalacrocorax carbo sinensis*) and small mammals: friends or foes?**

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## Background

- Great cormorants are one of the strongest factors changing the environment
- Complex environmental effects, including overload ecosystem with extremely high concentrations of phosphorus and nitrogen, lead to enormous ecosystem transformation
- Changes occur in the structure of vegetation, undergrowth, composition of tree crown cover or forest litter
- In Lithuania there are several colonies of the Great cormorants, differing in size
- Impact of the colonies on mammals was under-investigated before our studies

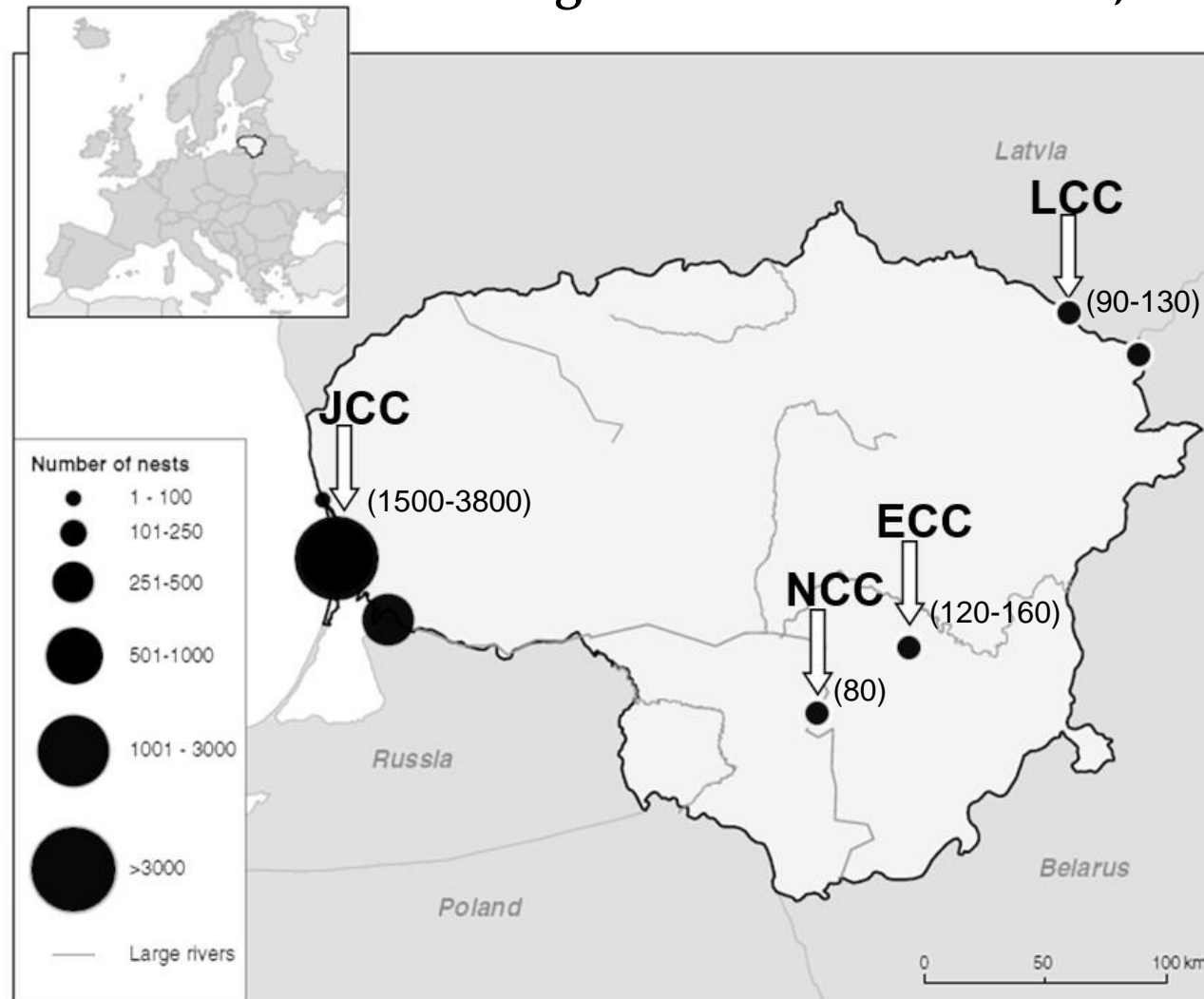
## Hypothesis

- First working hypothesis was “small mammals are not inhabiting territories of the colonies”
- After failing of this one, we formulated new hypothesis “effect of the Great cormorants on small mammals is directly related to the colony size”

**Abstract:** Great cormorants are well known for extreme changes of environment in the territory of the breeding colony, however, studies of their impact on the small mammal communities were just started. We evaluated small mammal diversity under influence of the great cormorants in the four colonies of different size, all located in Lithuania, North Europe. We found, that small colonies with 80–130 breeding pairs had a positive effect on small mammals as their species richness and diversity was higher, abundance was twice higher than in control forest. In the big colony with 1500–3800 breeding pairs influence differed depending on the cormorant presence: in the active part of colony abundance and proportion of females was less than in control zone. Species diversity was higher in the control than in colony. After abandonment of the colony, small mammal diversity and their body condition index became re-established in that part of the territory. For the first time we show the effect of colony size: positive effects on small mammal communities are outweighed by the negative ones after increase of the colony.

**Keywords:** Great cormorants, small mammal, diversity, body condition.

# Investigation sites in Lithuania, 2011-2019



Investigated colonies of the great cormorants marked by arrows. Number of breeding pairs is given in the brackets.

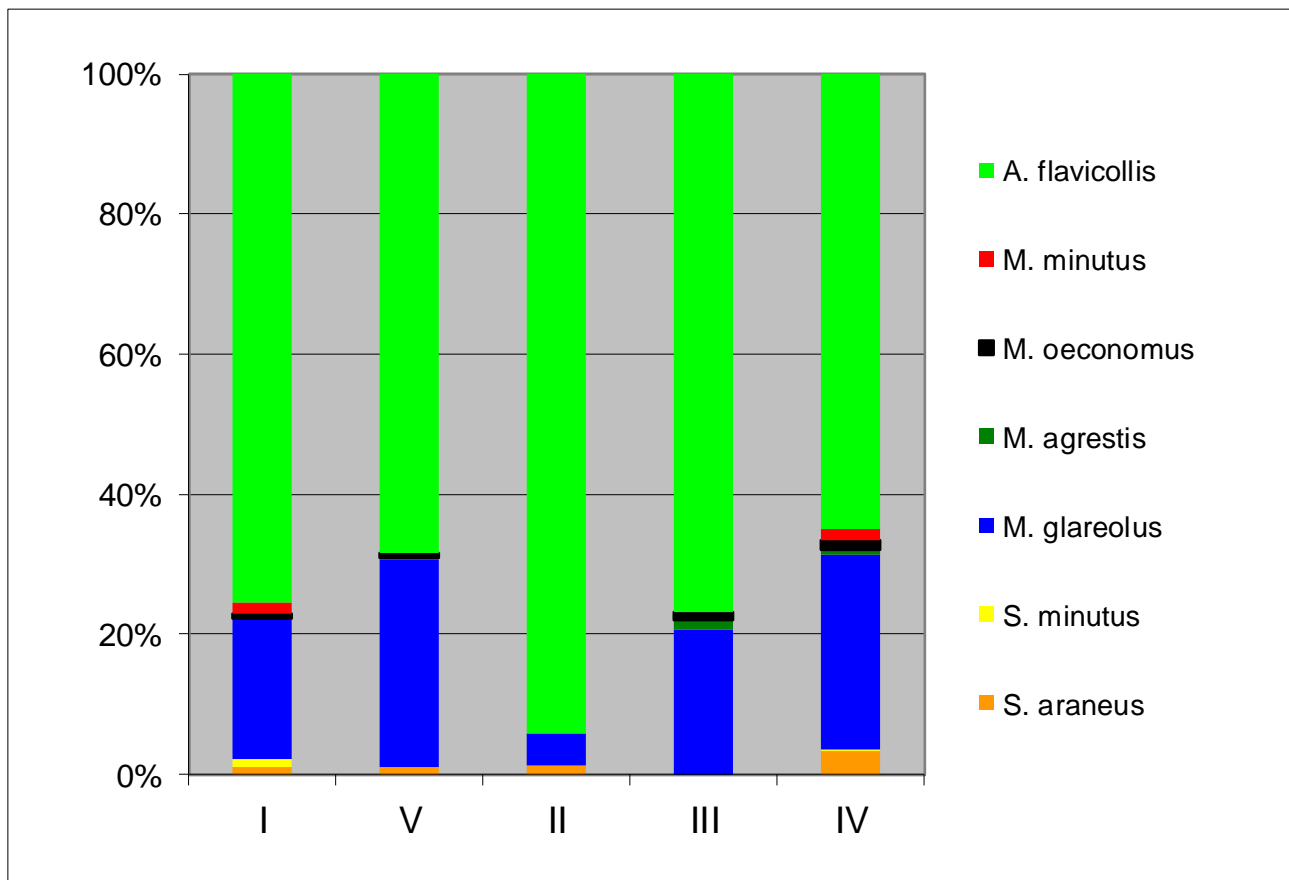
JCC – big colony; NCC, ECC, LCC – small colonies.

## Zones of different influence of great cormorants in the big colony



I – control zone ; II – zone of initial influence ; III – zone of long-term influence ;  
IV – zone of former active influence ; V – zone of the ecotone.

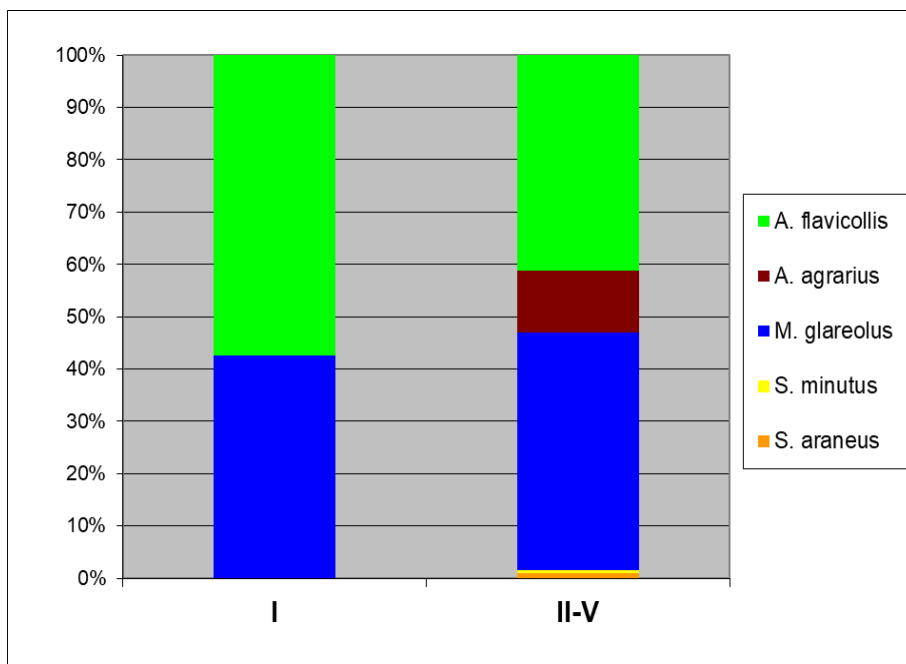
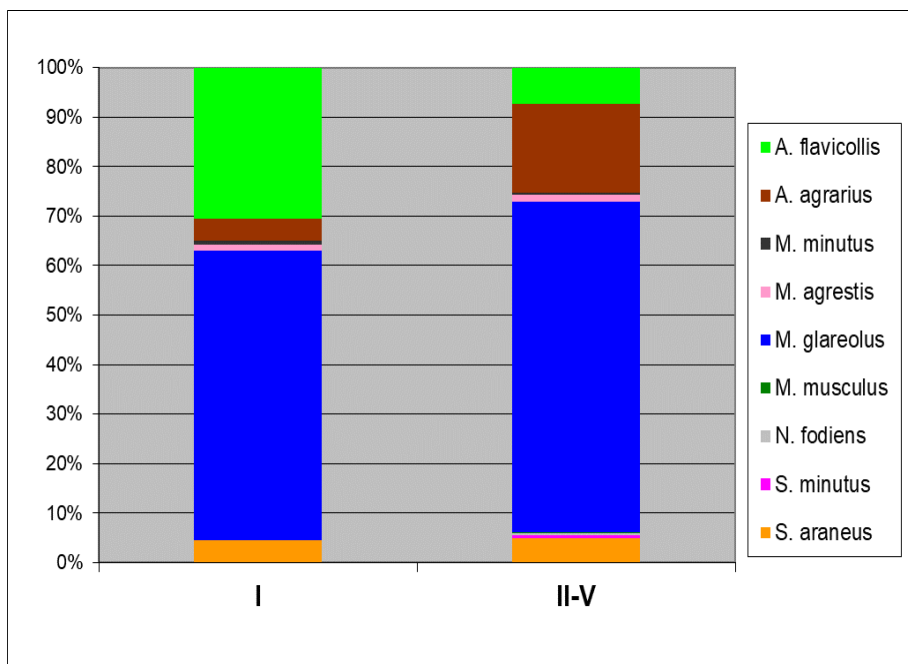
# Small mammal community structure and diversity in the zones of different influence of great cormorants in the big colony



	I	V	II	III	IV
Species numbers	6	5	3	4	7
Shannon's H	1,047	1,034	0,369	0,918	1,33
Simpson's c	0,612	0,556	0,887	0,634	0,502

Zones: I – control, V – ecotone, II – initial influence, III – long-term influence, IV – former active influence.<sup>6</sup>

# Small mammal community structure and diversity in the zones of different influence of great cormorants in two small colonies

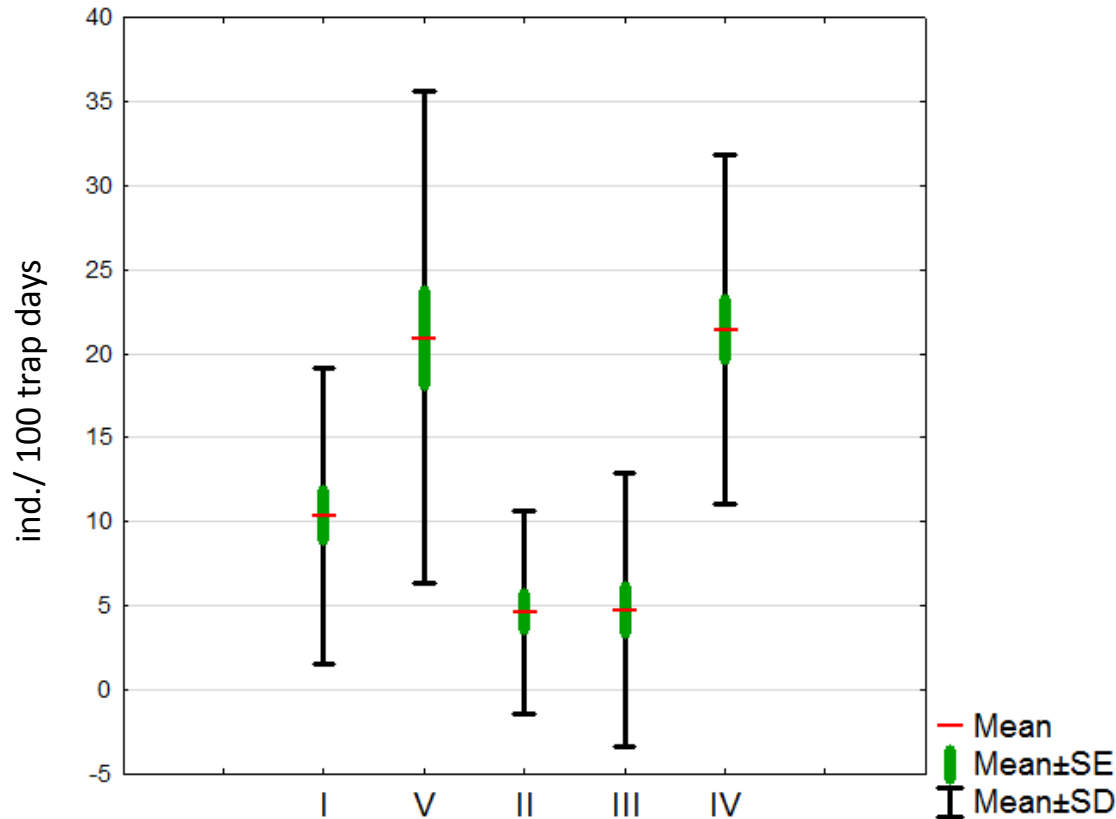


	I	II-V
Species numbers	6	9
Shannon's H	1.509	1.524
Simpson's c	0.439	0.488

	I	II-V
Species numbers	2	5
Shannon's H	0.984	1.516
Simpson's c	0.511	0.39

Zones: I – control, II-V – colony.

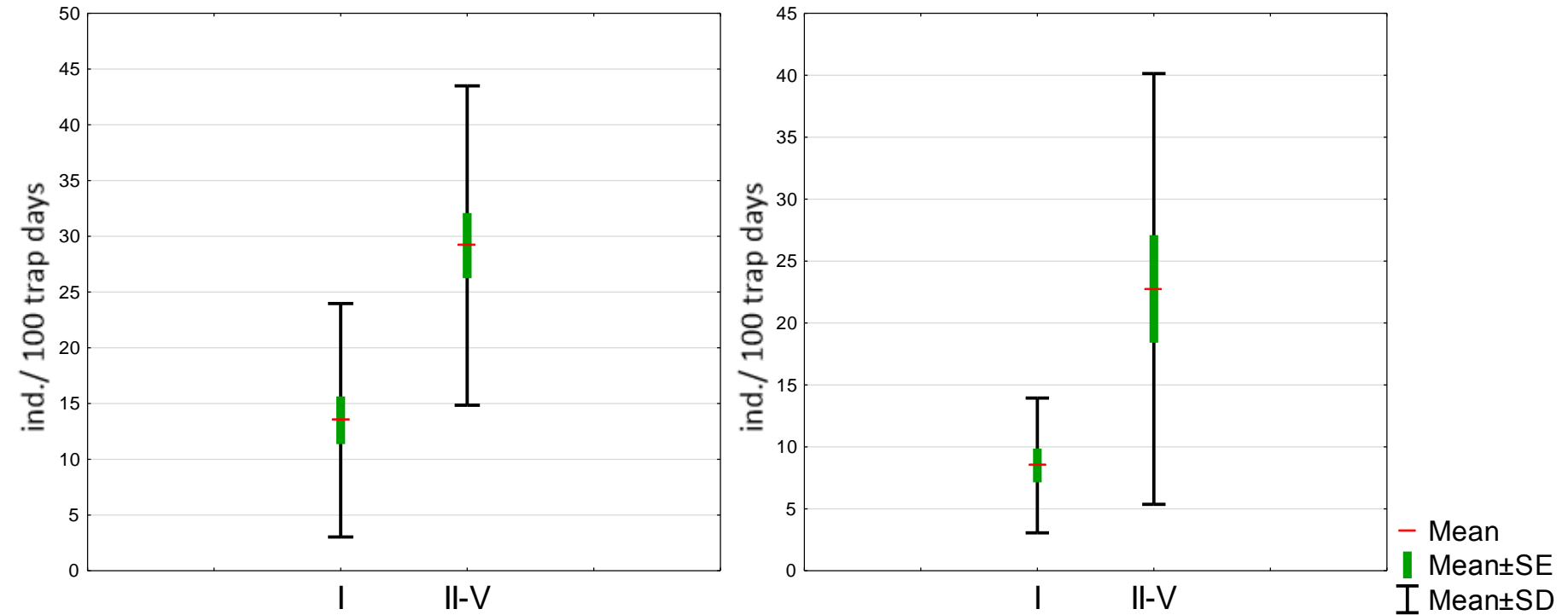
# The relative abundance of small mammals in the zones of different influence of great cormorants in the big colony



Zones: I – control, V – ecotone, II – initial influence, III – long-term influence, IV – former active influence.



# The relative abundance of small mammals in two small colonies of the great cormorants

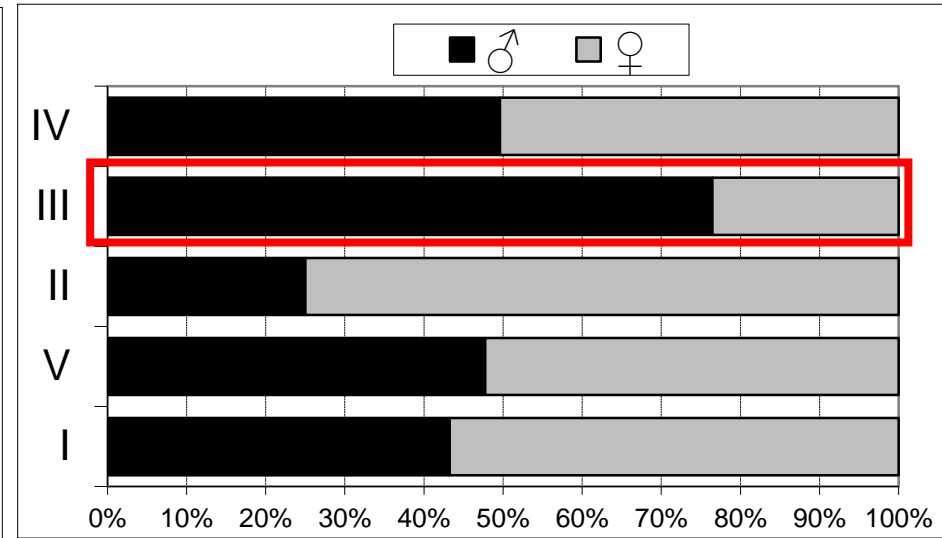
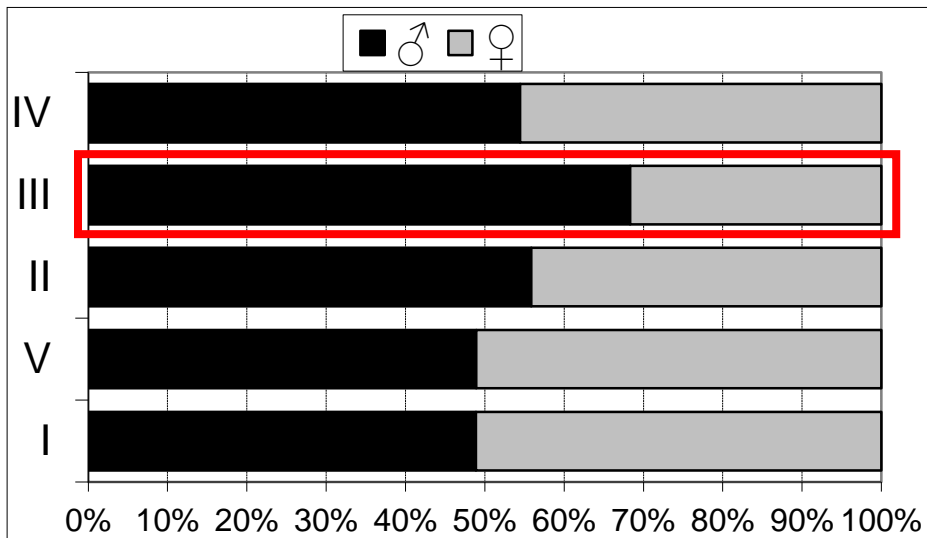


Zones: I – control, II-V – colony.

# Sex structure of *A. flavicollis* and *M. glareolus* trapped in the zones of different influence of great cormorants in the big colony

*Apodemus flavicollis*

*Myodes glareolus*



Zones: I – control, V – ecotone, II – initial influence, III – long-term influence, IV – former active influence.



## Conclusions:

- In the big colony of great cormorants negative effects were most expressed in the active part of colony (zone II, III): abundance, species diversity and proportion of females decreased.
- However, in the abandoned part (zone IV) and in the ecotone (zone V) of the colony impact on small mammal ecological and biological parameters become positive: abundance and diversity increased.
- Small colonies of the great cormorants (80–130 breeding pairs) had a positive effect on ecological and biological parameters of small mammals: abundance, species richness and diversity increased.

**Thank you for your attention**

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