Unsuspicous immigrant or ecological threat:
a long-term fieldwork study on the introduced raccoon in Germany

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Outline

• raccoon settlement and current situation in Germany
• applied research on raccoons:
  „Projekt Waschbär“
  → topics of research
  → selected results
Taxonomy

- **class:** mammals
- **order:** carnivora
- **superfamily:** musteloidea
- **family:**
  - Ailuridae (red panda)
  - Mephitidae (skunks)
  - Mustelidae (weasel family)
  - **Procyonidae (procyonids)** → 6 genus, 13 species
raccoons → 1 genus (Procyon), 3 species

- **Procyon lotor**
- **Procyon cancrivorus**
- **Procyon pygmaeus**

(Hunter & Barrett 2012)
Geographic range

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Geographic range

1934

1945

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Hunting bag development in Germany

- **1934**: first documented successful abandonment in north-Hesse (Edersee)
- **1954**: hunting starts in Germany

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Characteristics

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Mikulov, 5.3.2015
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Current situation in Germany

- raccoons are indigenous according to the Federal Nature Conservation Act (BNatschG §5)

- controversial and highly emotional discussion concerning the impacts of raccoon settlement in Germany

- raccoons are expected to be problematic:

  3 levels of impact
Current situation in Germany

• economic effects
Current situation in Germany

- economic effects
- hygienic relevance
Current situation in Germany

- economic effects
- hygienic relevance
- ecological effects
Current situation in Germany

- raccoons are still among the least investigated carnivores in Europe

- better founded knowledge is essential in order to evaluate potential impacts

→ lack of knowledge
Research on raccoons in Germany

4 research studies

→ Society for Wildlife and Nature Conservation (GWN)

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Research on raccoons in Germany

Müritz National Park
Solling
Bad Karlshafen
Kassel

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„Projekt Waschbär“ - Müritz National Park

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„Projekt Waschbär“ - study area

- optimal habitat for Central Europe
- highest density ever measured in Europe for a natural habitat until now (6-8 individuals/km²)
- area under investigation: 60 km²
1. spatial use

(home-range sizes, den sites, habitat use, dispersal behaviour)
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2. feeding ecology/ parasitology
   (food spectrum, endoparasite infestation)
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3. social behaviour
   (interaction analysis, relationships, ethology of mother families)
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4. reproduction biology
   (mating- and cubbing season, litter size, parentship, MHC-dependant mate selection)
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5. population density
   (capture-mark-recapture, camera traps)

"Projekt Waschbär" - topics of research

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   (structure of age groups, sex ratio, phenotypic characteristics)
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7. epidemiology & death investigation
   (histo-pathologic & serologic tests)
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8. landscape genetics
   (impacts of spacial movement patterns)
„Projekt Waschbär“ – data basis

VHF- telemetry
„Projekt Waschbär“ – data basis

expanding radio-collars

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march 2006 – november 2011:

- **489** raccoon captures
  - → **145** different individuals
  - → **69** fitted with radio-collars (23 ad. ♀; 28 ad. ♂; 18 juveniles)

- **31.193** localizations (12.931 by day, 18.262 at night)

- **24.959** pictures from camera traps (5365 trap nights)
• nearly all animals in the study area under telemetric control

• accurately defined kinship relations through moleculobiological analyses (highly variable microsatellites)
1. **spatial use**  
   (home-range sizes, den sites, habitat use, dispersal behaviour)

2. **feeding ecology/ parasitology**  
   (food spectrum, endoparasite infestation)

3. **social behaviour**  
   (interaction analysis, relationships, ethology of mother families)

4. **reproduction biology**  
   (mating- and cubbing season, litter size, parentship, MHC-dependant mate selection)

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   (capture-mark-recapture, camera traps)

6. **population structure**  
   (structure of age groups, sex ratio, phenotypic characteristics)

7. **epidemiology & death investigation**  
   (histo-pathologic & serologic tests)

8. **landscape genetics**  
   (impacts of spacial movement patterns)
main area of interest: what do the animals live off and does this affect indigenous species?
common feeding analysis are not sufficient for statements concerning the local ecological impact of raccoons
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→ *doctoral thesis*: quantifying of data and intersection with local offer (n=1285 samples from the Müritz National Park)
A) feeding ecology investigation
B) determination of a raccoon-specific conversion factor based on feeding trials
C) scat analysis in respect of *Baylisascaris procyonis*

n=1285 fecal samples
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n=1285 fecal samples
“Projekt Waschbär” - feeding ecology

- fecal samples (n=1285) were collected from 90 different latrines between 2006-2011
- first results only relate to the rates of occurrence → biomass data remaining (even more informative)
Müritz National Park (n=1285)

- 34% plants
- 44% vertebrates
- 22% invertebrates
invertebrates (n = 1232; 44 %)

- insects: 43%
- molluscs: 29%
- crayfish: 26%
- others: 2%
- earthworms: 0%
plants (n = 961; 34 %)

- fruit (41%)
- fruit of trees (37%)
- nuts (6%)
- corn (15%)
- others (1%)
vertebrates (n = 613; 22 %)

- birds: 47%
- amphibians: 12%
- reptiles: 19%
- fish: 1%
- small mammals: 21%
- others: 0%
„Projekt Waschbär“ – feeding ecology

- raccoons are omnivorous and have opportunistic dietary behaviour

→ they can easily adapt to the local range of available food

- raccoons are very variable in their diet but prefer food within wetland habitats and food which is easily available in large amounts
A) feeding ecology investigation
B) determination of a raccoon-specific conversion factor based on feeding trials
C) scat analysis in respect of Baylisascaris procyonis

n=1285 fecal samples
"Projekt Waschbär" – feeding ecology

**conversion factor:** proportion of fresh weight of food and the dry weight of the faeces

→ how much of the food is finally defecated?

→ specific value will be a factor in the calculation of the biomass

- 2 periods: summer & autumn – feeding of 15 different components (concurrent with the food in the wild)
sample calculation for molluscs:

determined biomass in the sample = 25 %

→ dry mass = 3.9 g

x 4.74 (calculated conversion factor)

→ corrected biomass (freshly consumed) = 18.49 g
A) feeding ecology investigation
B) determination of a raccoon-specific conversion factor based on feeding trials
C) scat analysis in respect of *Baylisascaris procyonis*

**feeding ecology**

**B. procyonis identification**

**n=1285 fecal samples**
„Projekt Waschbär“ – parasitology

microscope image of an infectious *Baylisascaris procyonis* egg (size 50 µm)

Lux & Priemer 1995
Gey 1998
Gunnesch 2004
Winter 2005
current investigation from n=400 faeces samples from the Müritz National Park

Lux & Priemer 1995
Gey 1998
Gunnesch 2004
Winter 2005
Current situation

- economic effects
- hygienic relevance
- ecological effects
Current situation - economic effects

- occasionally costly damages to private house and garden
Current situation - economic effects

- occasionally costly damages to private house and garden

→ no appreciable economic effects (e.g. crop damages)
Current situation - hygienic relevance

epidemiological status in Europe:
- no host animal for *fox tapeworm* and *trichina*
- does not play a major role in the european epidemiology of *rabies* (VOSS et al. 2012)
- no important vector of *scabies*
- can be a carrier of *canine distemper viruses (CDV)* (Rentería-Solís et al. 2014)
- only known considerable zoonosis: *raccoon roundworm*
Current situation - hygienic relevance

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→ low estimated epidemiologically risk in Germany
- so far no serious predation pressure verifiable
- a threat of autochthonous species is not looming ahead
- local negative effects, especially in suboptimal habitats, can not be ruled out
Current situation - ecological effects

- so far no serious predation pressure verifiable
- a threat of autochthonous species is not looming ahead
- local negative effects, especially in suboptimal habitats, can not be ruled out

→ all current scientific studies indicate no serious ecological impact for close to nature habitat

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„Projekt Waschbär“ - prospects

- research will be finished in 2016
- currently 3 sub-projects in process
Thank you
for your attention