# On-Board cameras reveal how wildlife respond to approaching trains

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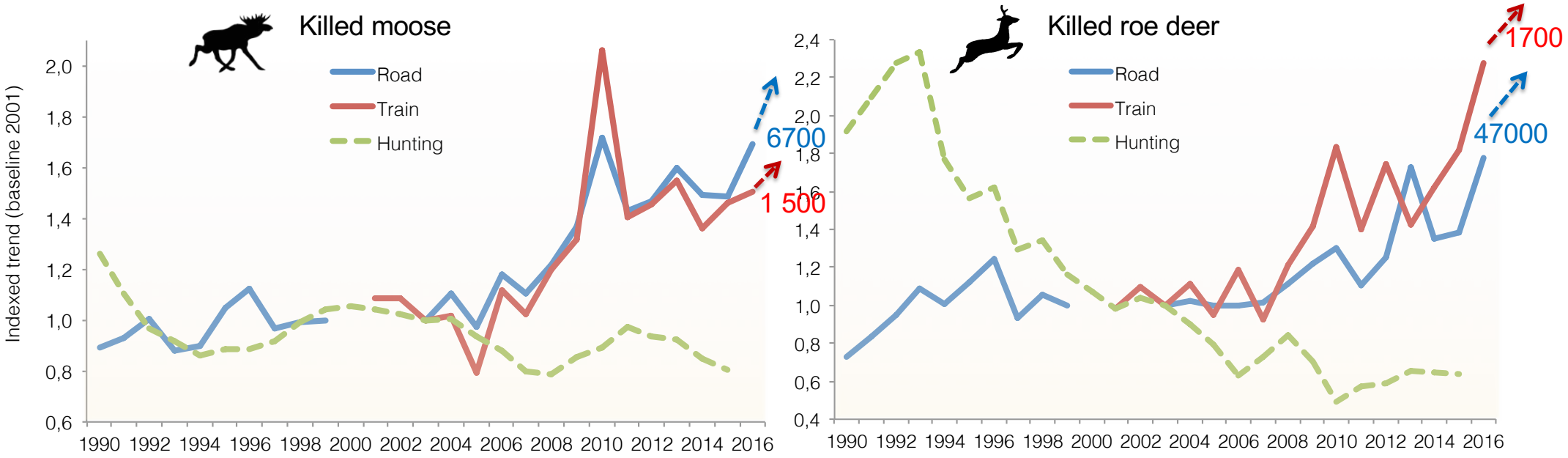
# Wildlife and trains

# Problem on the rise …




Sources (2018):
Viltolycksrådet
Jägareförbundet
Trafikverket
Vägverket (< 1999)

# Understanding collisions: risk factors

Wildlife population size

Train frequency

Train speed

Landscape structure

Other infrastructure

Snow depth

Food availability

…

# Understanding collisions: Immediate causes ?


Cognitive and behavioural limitations ?

Long intervals between trains = false safety

Low train detectability ?

Flight behaviour maladapted ?

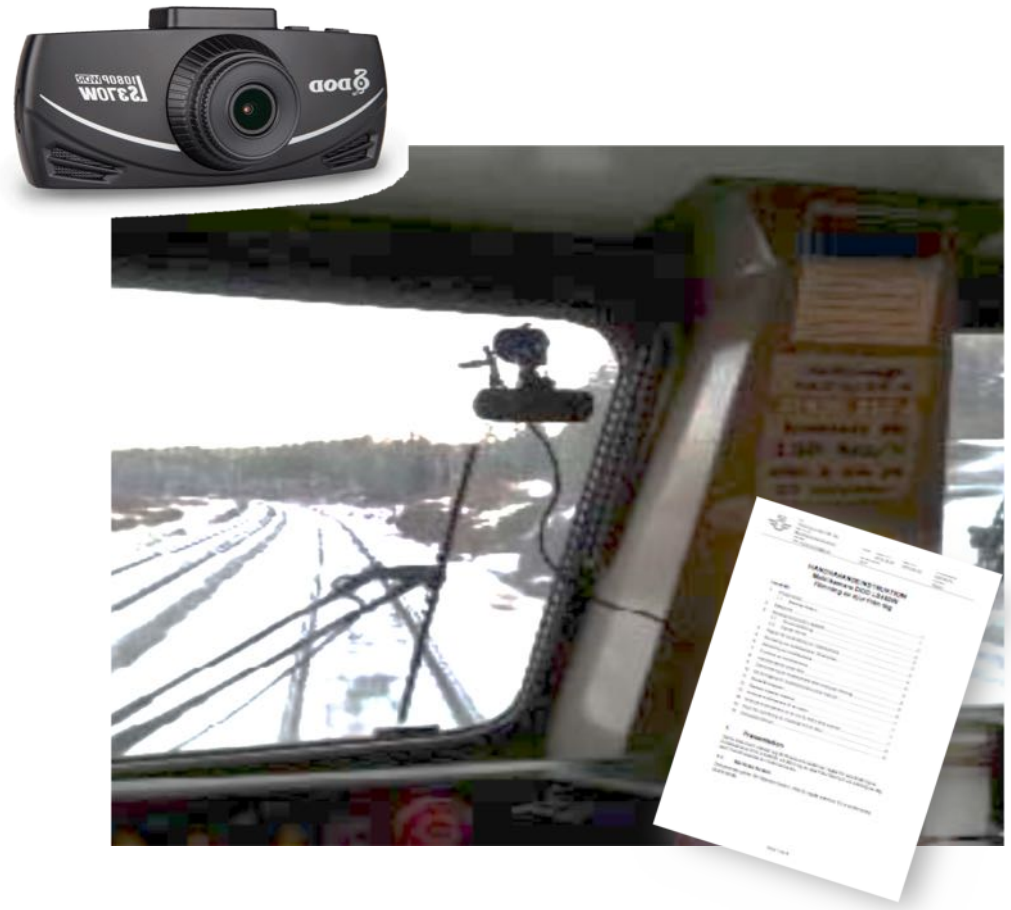
Habituation and ignorance ?

Bad luck ?

??? …

# On-board video documentation

- Project 2015 - 2018
- 25 Train drivers volunteered
- DOD commercial Dash cams
- Safety routines for on-board cameras
- Record any animal observation



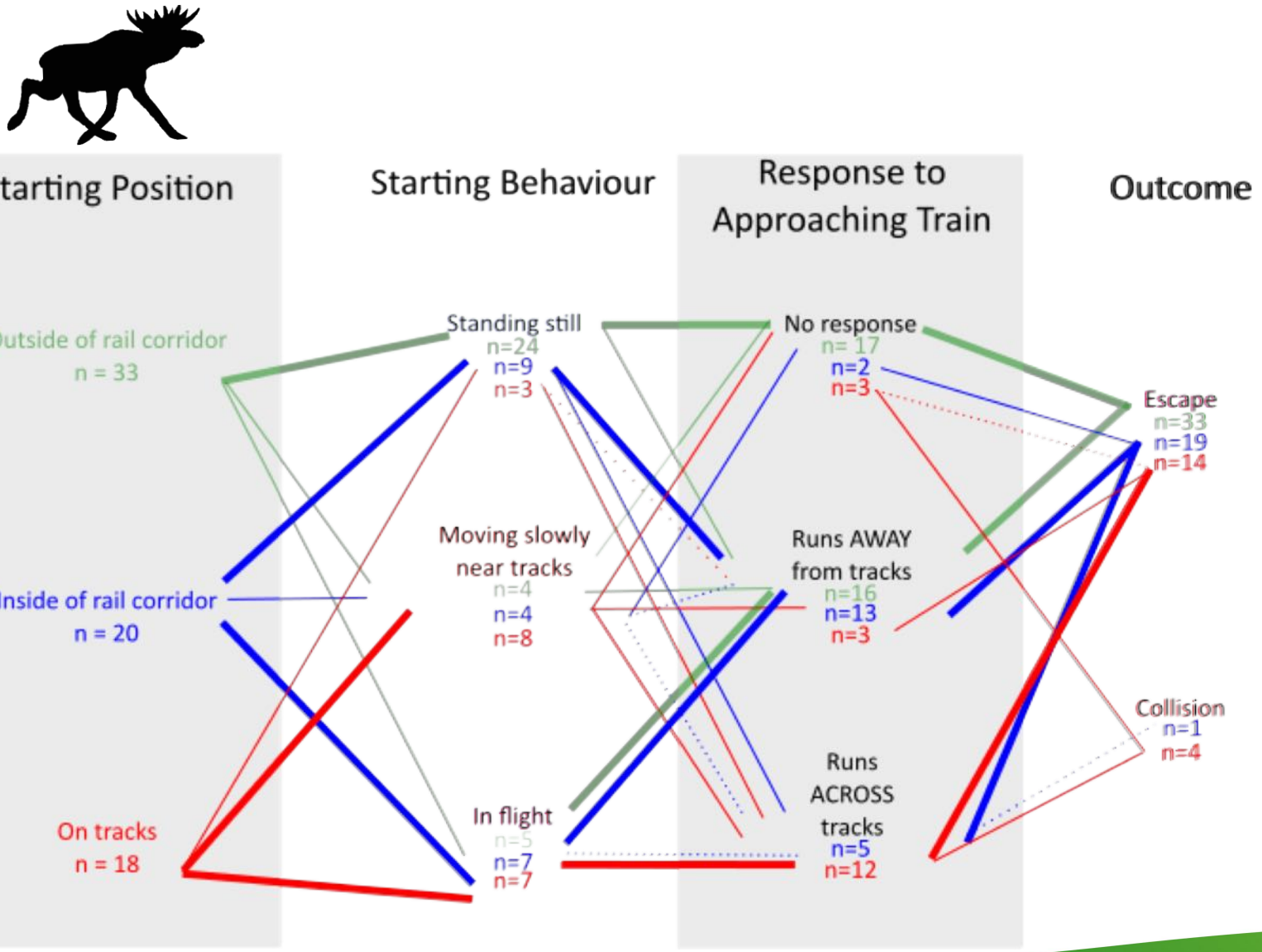
Experiences:

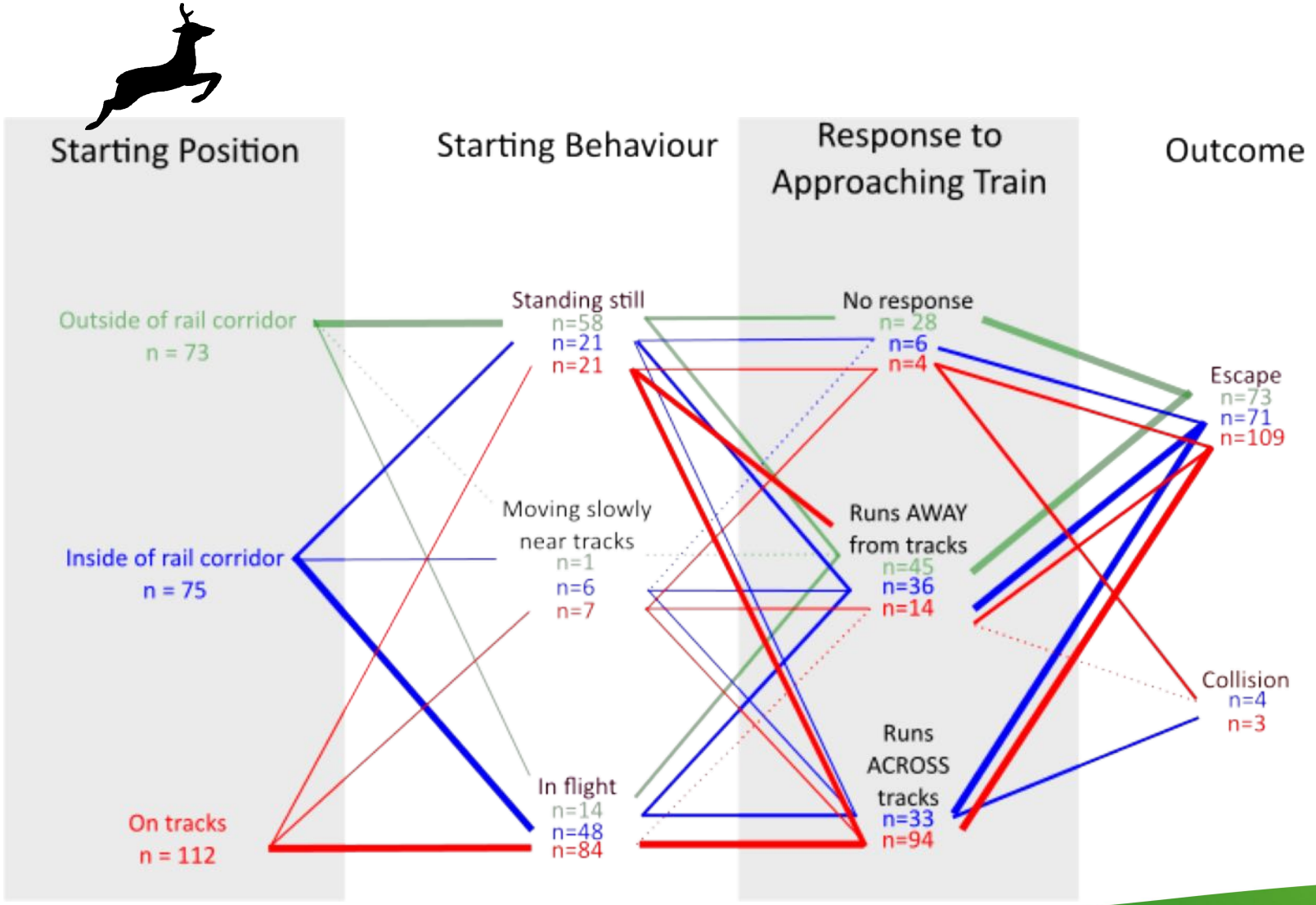
- Dash cams are very handy
- No infringement on working routines
- Night vision should be improved
- Image quality often poor
- Automated subject detection ?

# General results

- June 2015 – June 2018
- Ca 500 videos uploaded, so far 395 used in analysis
- 260 roe deer, 71 moose, 56 fallow/red deer, 8 wild boar
- 4% of videos recorded collisions (N=15)
- Flight behaviour – escape/collision

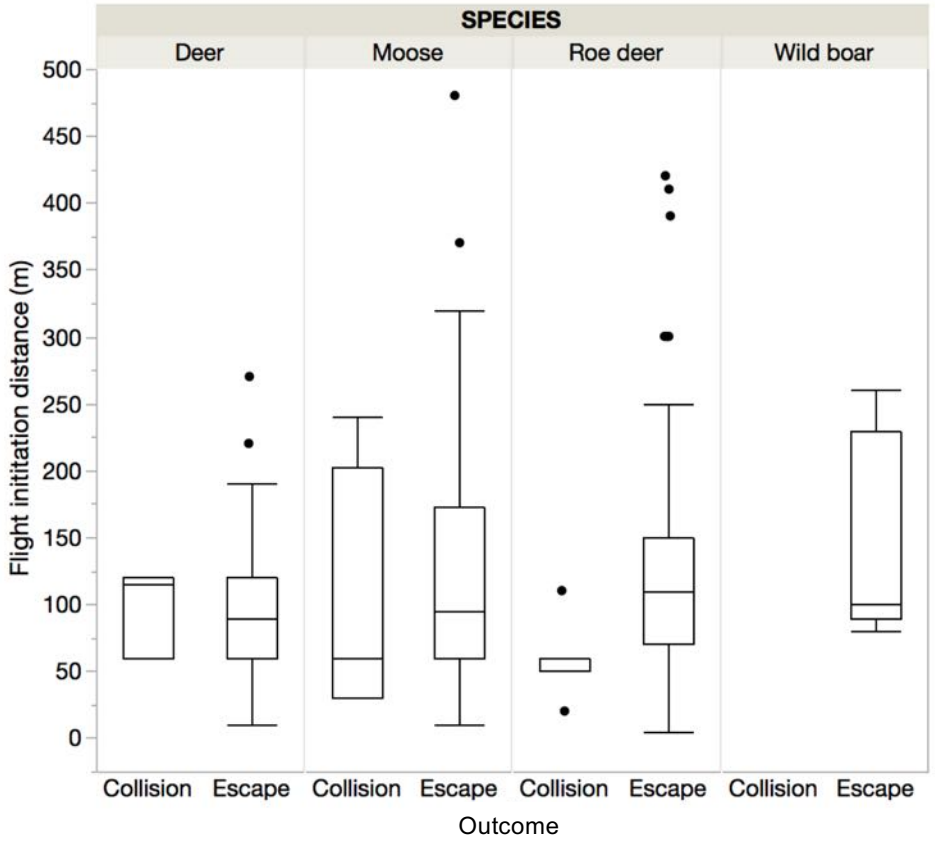
OUTCOME = *f*(starting position, distance to train, train speed, initial behaviour, flight initiation distance, visibility, species, …)*


Starting Position
Starting Behaviour
Response to Approaching Train
Outcome
Outside of rail corridor
n = 33
Inside of rail corridor
n = 20
On tracks
n = 18
Standing still
n=24
n=9
n=3
Moving slowly near tracks
n=4
n=4
n=8
In flight
n=5
n=7
n=7
No response
n= 17
n=2
n=3
Runs AWAY from tracks
n=16
n=13
n=3
Runs ACROSS tracks
n=5
n=12
Escape
n=33
n=19
n=14
Collision
n=1
n=4


Starting Position
Starting Behaviour
Response to Approaching Train
Outcome
Outside of rail corridor
n = 73
Inside of rail corridor
n = 75
On tracks
n = 112
Standing still
n=58
n=21
n=21
Moving slowly near tracks
n=1
n=6
n=7
In flight
n=14
n=48
n=84
No response
n= 28
n=6
n=4
Runs AWAY from tracks
n=45
n=36
n=14
Runs ACROSS tracks
n=33
n=94
Escape
n=73
n=71
n=109
Collision
n=4
n=3

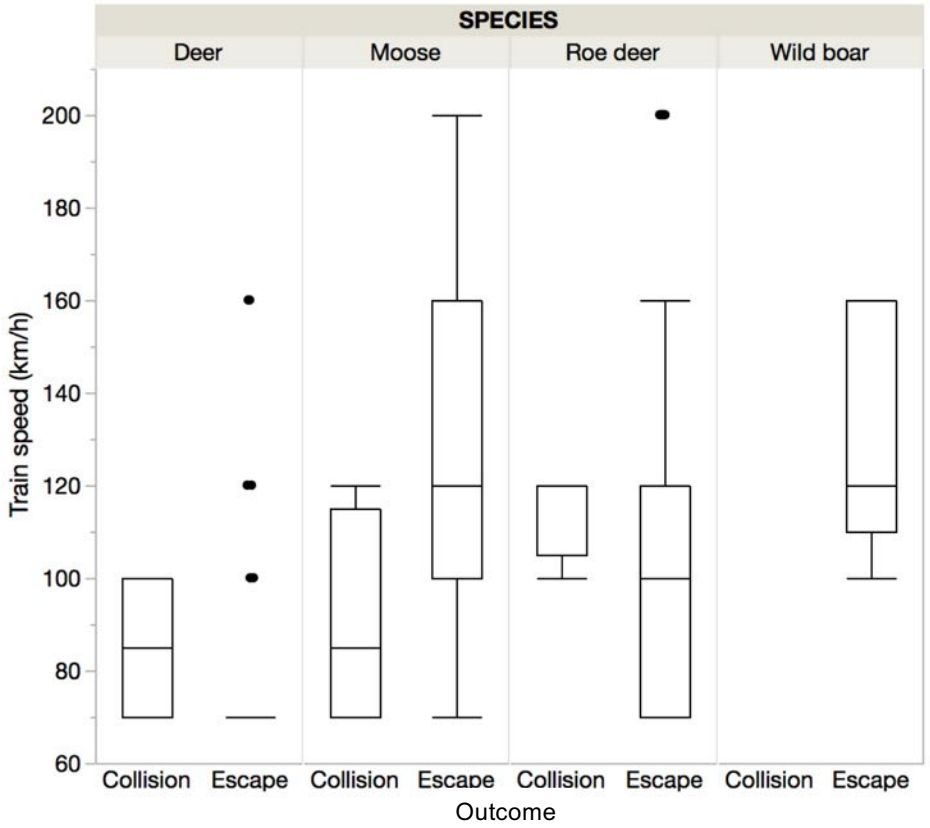
# Flight initiation distance

- Initial distance to train and flight initiation distance shorter prior to collision …



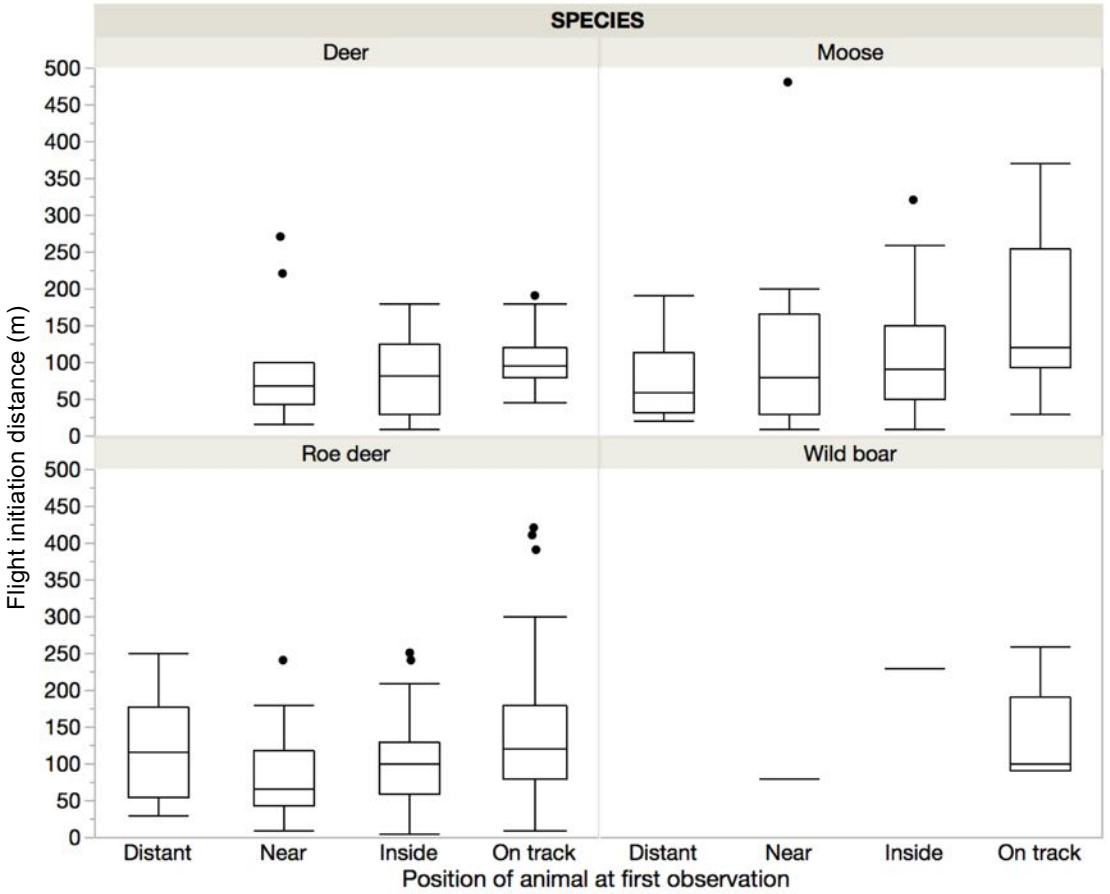
# Train speed

- Train speed no effect on collision likelihood?



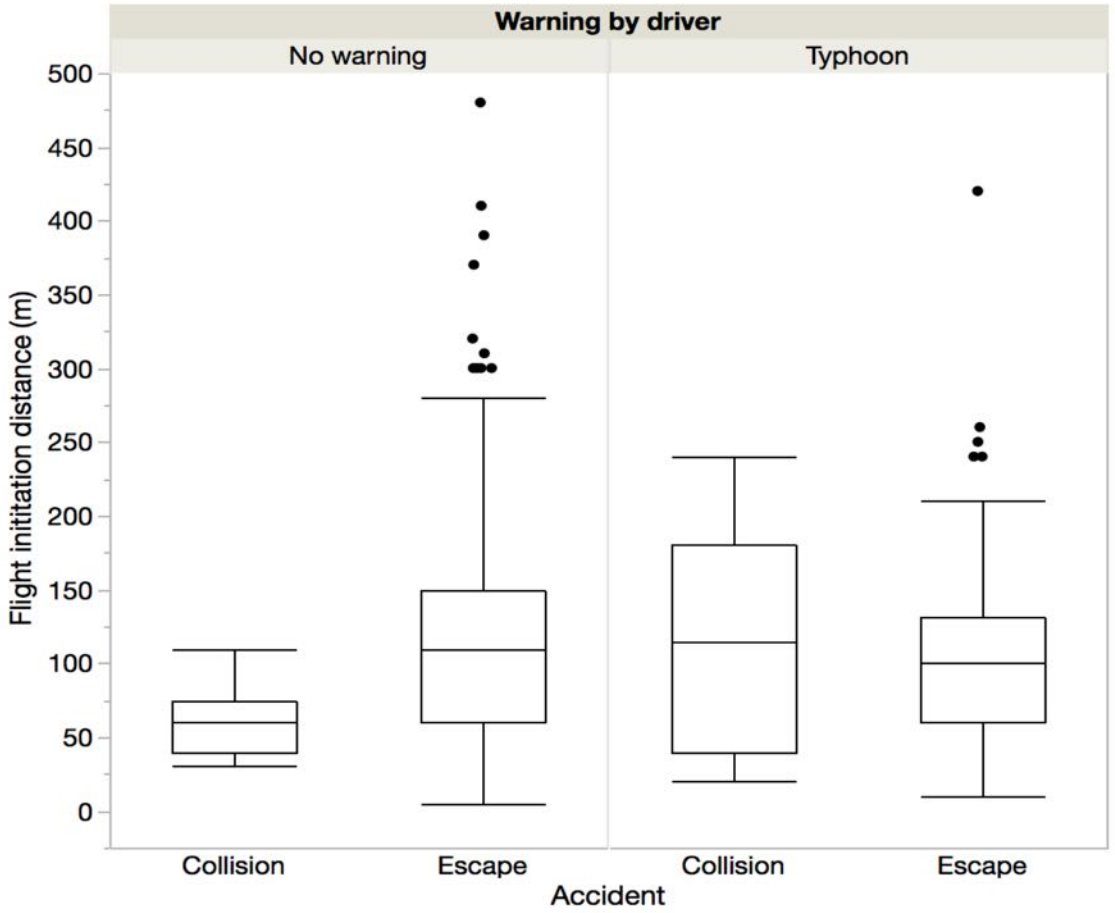
# Starting position

- Animals tend to wait longer when outside track = shorter FID



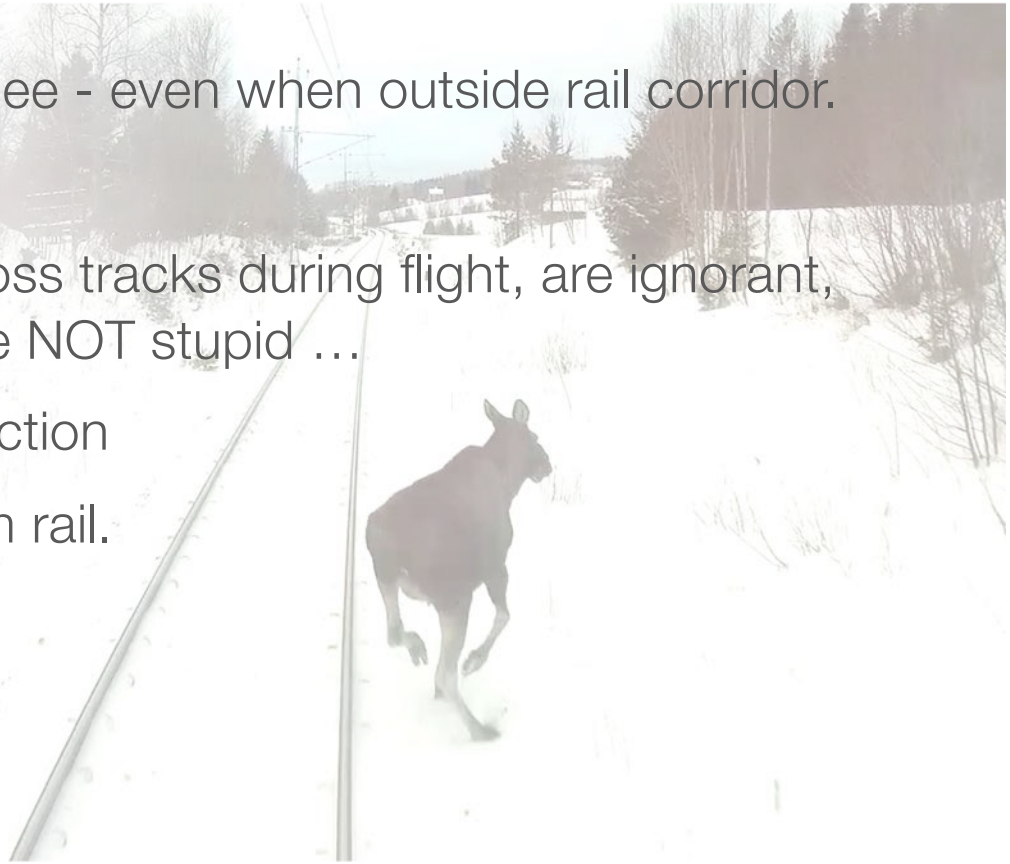
# Warning signals

- Warning horn increases FID, but may not reduce accident risk (small sample!)



# Conclusions

- Most animals fear approaching trains and flee - even when outside rail corridor.
- Differences between species
- Collisions (N=15): animals start too late, cross tracks during flight, are ignorant, flee along with track – but most animals are NOT stupid …
- Less than 3-4 seconds to decide flight direction
- Survivors initiate flight earlier and away from rail.



**What we might aim at:**

➔Increase train detectability

➔Increase flight initiation distance