

# WORKPACKAGE 3 – INTELLIGENCE AND ADAPTATION

## MILESTONE 3 – MODELING RESULTS' EXPORTATION

### CONTEXT

#### GENERAL CONTEXT

Animals of the same species, or close species from the same family, don't always communicate (McGowan 2001), behave (Freeberg 2012) or interact in the same way in different places. It can be due to variations in the rest of the ecosystem (the absence or presence of different prey or predators, the competition for a resource, a variation in climate or geographical configuration), but it can also be for reasons linked to the agentivity of the animal as a group. Individuals are not behaving the same way, therefore not reacting the same way, not learning the same way, and, when it is a component relevant for the species, not transmitting the same way.

In species with particularly complex cognitive abilities, like corvids are, these variations can even lead to geographical cultural norms that allow researchers to identify the group of origin of an individual simply by observing its range of practices and behaviours (Whiten, Horner, and de Waal 2005). From a perspective of generalization, it is important to acknowledge the different variations possible, to know in which aspect of the behaviour or which temporality of the species' life cycle they can appear, and what kind of concrete differences they can make in a cohabitation perspective.

#### INSIDE THE PROJECT

This project will partially follow the methodology set for a previous study (Delahaye 2021) of another urban species (*Rattus norvegicus*) in another urban environment (Paris, France). This study showed that it is possible to learn a lot of things about the relationship between humans and liminals by comparing semiotic representations to factual data.

The third step of the project was, consequently, to gather and organize new first-hand data regarding liminal subjects' behaviours and to blend it with the results of Workpackages 1 and 2 in order to expose global results and model an exportation methodology.

### RESEARCH QUESTION AND HYPOTHESIS

#### QUESTION AND SUBQUESTIONS

Case study 3 is aiming to study the different elements of behaviour that can vary from one case to another and how they should be taken into account for generalization attempts. The main question of this Case study is: How can we generalize semiotic solutions for human/animal cohabitation in different environments/cities?

During this workpackage, sub-questions are used to work toward answering the main question. These sub-questions were:

- What elements of behaviour should be acknowledged when trying to generalize a semiotic solution, depending on the place and season? (Deliverables D12 to D19).
- How are these elements impacting a single place throughout the year? (Deliverable D20)
- How are these elements impacting multiple places during the same season? (Deliverable D21)

- How can all these elements be cross-analysed and summed up? (Deliverable D22)
- How can we acknowledge behavioural components when trying to generalize a semiotic solution? (Deliverable 23)

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### HYPOTHESIS

The general hypothesis of the project is that liminal species and humans have a strong semiotic relationship, built during our years of coexistence (J. Marzluff and Neatherlin 2006). By understanding where the tension in this relationship is, and how it can be improved, we can improve global human/animal interaction in cities. This improvement is not only a nice idealistic aim, but it is also, more and more, a necessity, as cities tend to expand and biodiversity to decline.

The main hypothesis of this workpackage was that some species are particularly well-adapted to human contact, and their behaviour can be different depending on the behaviour and culture of humans they live with. Their adaptability and intelligence must be taken into account when exporting urbanism solutions to another country, culture or climate.

### METHODOLOGY

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#### METHODOLOGICAL CHOICES

Observations spots (Deliverables D12 to D19) were chosen based on the pieces of advice of local specialists for Tartu (Deliverables D12 to D15), or previous experience of crow video observations and recordings (especially ones made for the short film *Des corneilles et des Hommes* (Champiat and Delahaye 2019)) for Paris (Deliverable D16 to D19)

For each season, a regular observation period (for Tartu) or an intensive one (for Paris) was set up, with some additional observations when an interesting event or behaviour would happen. All observations are gathered in a Field Diary (see Figure 1 for a sample of Field Diary). Field Diary is part of the section Previous documents attached. For each observation, was noted:

- Number of the entry, in order to spot any missing entry in case of format change
- Date (in YYYY/MM/DD format for better archive management) and time (as precisely as possible)
- Weather (for influence on specimens but also on pictures) and temperature (as precisely as possible)
- Place (in the localisation is not a specific address, all information useful to find the localisation was noted)
- Number of specimens (or at least an estimation, in case of a big flock or if they are in movement making it difficult to count them)
- Any useful observation: behaviour, attitude, other species present, signs of stress or calm, presence of humans etc.
- If pictures or videos could be taken, the number of the picture or rush where the observation can be seen

All the photos and videos were copied on an external hard drive and named in a way that could allow anyone to easily find the material needed (see Table 1 for the nomenclature). All these files are stored without any cosmetic treatment, cut in the tape or modification, according to the Data Management Plan, validated by the grants’ office. This material was used to feed the website monthly and to produce two communication videos (see links in References and links section)

For the first comparative analysis (Deliverable D20)), observations were done during an entire year and documented by notes and recordings. Videos and photos were archived on an external hard drive. Special notes were made about:

- change of behaviour, including change in the repartition of species through the global area
- signs of a stress-free attitude in situations that could have been stressful
- aggression behaviours (real aggressions, fake aggressions, threats) towards conspecifics or other species
- unexplained but repetitive behaviours
- exceptional and impressive behaviours

The entire observations were then reviewed in order to extract patterns of behaviours and potential sensitive points for cohabitation.

For the second comparative analysis (Deliverable D21), observations were done during an entire summer in two different cities with the same methodology.

The last comparative analysis (Deliverable D22) was made in the same way, gathering all the observations available.

The exploitation recommendations (Deliverable D23) were made by blending the previous results.

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### ISSUES AND PROBLEM-SOLVING

Regarding the observations in Tartu, the main issues were:

- Difficulty to choose the right spots for observations: this was addressed by listening to pieces of advice from colleagues.
- Climate-specific issues:
  - o Difficulty to do observations due to the cold: solved by using indoor spots and doing shorter outdoor observations.
  - o Impossibility to take pictures: the camera has a button that can be pressed for recording video, but a touch screen is used for taking pictures. Due to the necessity of wearing gloves to avoid frostbite, almost only videos were taken during outdoor sessions.

Regarding the observations in Paris, the main issues were:

- Climate-specific issues: An abnormal heatwave was hitting France at the time of different observations. Consequently, instead of an autumn climate, Paris was still under a summer-like climate, which could affect the crows' behaviour.
- On one of the observation spots, the entire flock have disappeared and no explanation was found. A unique pair remains in the garden.

A general issue of the project is that one year is enough to have a complete observation, but probably not enough to have a perfectly representative one. Therefore, some behaviours may still remain unnoticed and undocumented.

Another issue was that crows tend to change spots throughout the year in Tartu, depending on the weather and their own biological cycle. It was sometimes difficult to find their new spot when they changed. Help about that was provided by Timo Maran and Lona Päll (Semiotics Department). Also, it must be noted that, since the crows are not identified, there is no way to be absolutely sure that the group that disappeared from one spot was the same that was then found in another. This part could not be solved, but suggestions will be made regarding this aspect after learning from the methods of the French National Natural History Museum (see Document I2).

## POINTS OF VIGILANCE

As crows are able to recognize human faces (J. M. Marzluff et al. 2010), particular care is needed for avoiding any behaviour that could be perceived as a threat or a nuisance, and could therefore ruin the entire field.

No satisfactory explanation could be found for the disappearance of the Champs de Mars entire flock (except the one remaining pair).

This investigation does not take into account changes in behaviour that could be linked with major urban plans and planned works, like the ones happening two years before the start of the project in the area of the new Delta Centre in Tartu for example.

## RESULTS

### INDIVIDUAL RESULTS OF DIFFERENT DELIVERABLES

#### FIELD OBSERVATIONS

Cohabitation between corvid species in Tartu appears to be peaceful most of the time. Behaviours like foraging or resting are again shared in close proximity just after the critical period of the nesting season is passed. The potential predation of one species towards the younglings of another, as suggested by Marko Mägi (Institute of Ecology and Earth Sciences of Tartu), does not seem to affect the neutral and stress-free relationship between species as soon as the nesting period is over.

Patterns of cohabitation seem however to be very sensitive to environmental conditions, with some drastic changes in only a few weeks (but 20 degrees and 15 centimetres of snow apart). These patterns of cohabitation are also fragile during nesting season. This could be explained by the predatory risk corvids species can represent for eggs and chicks of each other. Marko Mägi (Institute of Ecology and Earth Sciences of Tartu) explained that predatory behaviour from *C. monedula* on *C. cornix* eggs was been observed.

Aggression toward humans, as described by Marko Mägi regarding the pair in Raadi Cemetery, should clearly be seen as an exception. After nesting season, the aggression rate, already very low, drops to zero.

In a curious way, aggressive behaviour from the crows does not seem to trigger aggressive responses from humans, and is not even really badly perceived. A gardener explained that, one day, they – him and other gardeners – found a crow that was in a bush, and really aggressively behaving. They thought “she” was injured, so they caught her and bring her to the veterinarian unit in the Menagerie. But she was perfectly fine, “she was just very bad-tempered. A ringworm [popular expression in French to describe someone nasty, aggressive and even vicious]. We called her Cindy and then released her.” It is interesting to note that giving a name is usually a sign of proximity and affection, and it could be strange to do so about an animal perceived negatively, especially by professionals who have to work around it every day. But in this situation, the bad temper of the animal appears to be:

- An exception rather than the norm: aggressive behaviour is rare, and seems to be perceived as a matter of “personality”, with some individuals being less sympathetic than others.
- A matter addressed: crows spotted with aggressive behaviour are trapped and isolated, in order to understand what triggered it (this is facilitated by the marking ring system). Employees and gardeners do not have the feeling that nobody cares about the issue when it appears, and that could be a pacification element.
- Not especially toward humans: another employee testified that she saw three crows attacking a perfectly healthy pigeon and killing it in order to eat it, without any shortage of food reported at this time.

No one seems to know what happened to the Champs de Mars flock (and no one seems really to care). The normal behaviour of the remaining couple seems to dismiss any violent hypothesis. The fact that the ecological niche of the crows is now occupied by seagulls also dismisses the hypothesis about pollution and urban work disturbance (even if both of them could be possible due to actual urban works and de-pollution works in this area). If no clear answer about the disappearance of the flock in the Champs de Mars was found, the remaining family group is healthy and stress-free, behaving normally and apparently able to pass the winter season. Magpies have been observed here for the first time, and a replacement of the void left by the flock in the ecological niche of the garden may be currently taking place.

The behaviour of the MNHN’s flock is consistent and peaceful toward humans and other species (no aggression on pigeons, tits or parakeets (*Psittacula krameria*) was observed or reported). The nesting season was very successful and the flock seems to be perfectly able to use human resources (like water devices for the plant or trash cans) when difficult conditions occur.

Behaviours around the trap used by the CESCO for marking are particularly interesting, as free crows seem concerned by the situation of trapped crows. Observation of “beak-to-beak” behaviour between a trapped crow and a free individual could suggest that this attitude is due to having its partner trapped inside. No panic sign was observed nevertheless, probably because this trap has been here for a while, a lot of individuals have been caught for marking, yet no violent behaviour from humans ever occurred.

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## FIELD REPORTS CROSS-ANALYSIS

### ETHOLOGY

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There are few differences between the two species in general behaviour, and comparison remains relevant. In both cities, species seemed to be well adapted to the urban environment. They find a way to feed, nest, and raise healthy younglings.

### INTERACTIONS WITH OTHER SPECIES

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In both cities, corvids have been observed to have some occasional and opportunistic predatory behaviour towards, either themselves (in Tartu, during nesting season, *C. cornix* can attack *C. monedula*) or other birds’ species (in Paris, gardeners have witnessed attacks of *C. corone* towards different species, from small chicks to big pigeons if they are in a group). Aggression between individuals of the same species has been observed.

In all situations, aggressions seem to be anecdotal in the urban environment where food is easily available. “Demonstrative” aggressions can occur during nesting, either against conspecifics, other corvids or other birds, seagulls and gulls in particular. Very rarely, larger prey birds (in particular falcons) can interact with crows and will be systematically chased away if crows are in pairs or group.

### INTERACTIONS WITH HUMANS

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In both cities, crows are well tolerated by humans. The aggressions, in both directions, are very rare. In France, some minor part of the population seems to be particularly hostile for emotional and symbolic reasons (see Document I3, M2 and EX2).

Most of the time, humans see crows as an interesting species, with individual moods and personalities, and are feeling sympathy towards them. Informal discussions started during observations show that the inhabitants are also willing to learn about the species and their behaviour.

Crows have a quite confident and stress-free attitude towards humans. They are perceived as food providers, especially in Paris, where crows are bold enough to approach humans to beg for food as close as 20 cm. Crows in Tartu are more cautious, even if no aggressive behaviours from inhabitants could explain this difference. The

most probable explanation is that in Paris, crows are in contact with an important number of tourists, especially during summertime, and bold behaviours can be seen as cute or more susceptible to provoke empathy, and would result in more feeding. This kind of behaviour could then have been selected by the very touristic environment. It is sometimes observed in Tartu during winter time if temperatures drop drastically (minus 20C° or less) and a heavy amount of snow is making finding food difficult, even in trash cans (since everything tends to freeze quickly).

### INTERACTIONS WITH CITY INFRASTRUCTURES

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Different strategies of environmental interaction seemed to be used between the two cities:

- In Tartu, corvids are moving from spot to spot. In summer, the departure from the nesting areas to be back into the areas where they are feeding in resting during the rest of the year is a clear sign of seasonal strategy (from an area rich in nesting and hiding spots to an area rich in easily accessible food).
- In Paris, pairs of experienced adults own a territory and won't move from it. Younglings and young unexperimented adults are living together in large flocks in places with a lot of accessible food.

Besides that, no real damages (inhabitants complain about droppings on their cars or public equipment, but this can't count as permanent damages) are created by the crows in Tartu. In Paris, their predatory behaviour towards a certain kind of larvae leads them to damage, sometimes heavily, grass and gardens. A solution to this problem has been experimented with success by Frédéric Jiguet (French National Natural History Museum) (Lequitte-Charransol and Jiguet 2021) and his team but is not yet generalized and implemented, mainly for administrative and political reasons.

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### EXPLOITATION'S RECOMMENDATIONS

#### LOW MAINTENANCE GENERALIZATION

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When trying to generalize results, differences in taxonomy can be less relevant than differences in interactions. In this case the four species studied are very close but still considered as different species. Nevertheless, differences are more important between two very close ones – considered as two subspecies of the same species only a few years ago – interacting with different environments and human cultures, than between species living in the same city but more diverse phylogenetically speaking.

Generalization must take into account the variability of behaviours through the year, but these behaviours are quite strongly predictable, both in time – they follow some natural indicators of temperature, amount of light etc. – and in nature – behaviour observed in a species of a family can be generalized to another species of the same family or with the same functioning.

#### HIGH MAINTENANCE GENERALIZATION

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The major factor a generalization process must take into account is the human culture with which the species interact. Since ethology is not under many variations from one place to another, it is mostly the human culture that will indicate the kind of interactions the species have with inhabitants, the kind of nuisances they created – or which are the nuisances perceived as such – but also the kind of solutions that are relevant and how they can be implemented.

In case of an attempt to generalize a semiotic solution that was successful in an area of low conflict or aggression to an area with higher conflict or aggression, it must also be taken into account that the targeted species will need an adaptation time – especially in the case of corvids, or other species with life-long memory – and that aggressive, cautious or defence behaviours can remain for one or two generations time. Inhabitants should be very well sensitised to this aspect, in order to prevent a regrow of the conflict.

### INTERPRETATION OF THE GLOBAL RESULTS

#### IMPORTANCE OF THE OBSERVATIONS

The observations provided a quite complete inventory of behaviours. This inventory is important to determine which nuisances can be qualified as material, which ones are probably a misunderstanding and which ones are not evidence-based and fall in the domain of symbolic or emotional issues in cohabitation.

Observations also allow a more relevant and precise comparison between different populations, and consequently an accurate mapping of situations falling into low-maintenance generalization or high-maintenance generalization.

#### IMPROVEMENT OF THE MODEL

The model has shown that it was able to function with only preexisting data in a way that produces results close enough to the results obtained after observations and data collection (by the survey and the interviews).

On another hand, the observations also allowed the model to be more detailed and precise regarding the generalization possibilities.

#### GLOBAL RESULTS TAKING INTO ACCOUNT PRECEDENT MILESTONES

The project was able to make an accurate mapping of the interactions between inhabitants and the target species, either from preexisting data or from specially collected data. The project results show how the cohabitation issues are in fact rather mild, but distorted by the presence of a “hostile minority” in both study fields, benefiting from a less favourable cultural narrative in the comparative one. The observations contributed to demonstrating that some of the behaviours described as sources of tension were almost non-existent and sometimes fictional. They also contributed to showing how generalizable the model was and which aspects should be monitored with particular care when doing so.

## GENERAL PROJECT – CURRENT STATE OF PLAY

### IMPACT OF RESULTS

The results of Workpackage 3 are answering the main question of the case study.

The different aspects of the results now need to be included in various productions, both for the general audience and the academic audience.

### PROPOSITIONS FOR OTHER ASPECTS OF THE PROJECT

#### ACADEMIC ASPECTS

Workpackage 3 led to the last paper of the project (see document P3), and the results will be introduced in a specialist conference (see document C2).

#### POPULARIZATION ASPECTS

These results are going to be used in the last aspects of the Popularization component, namely the last popularization video (see Document COM5), a proposition of popularization book (see Document DM3) and a set of toolkits for allowing different stakeholders to generalize this methodology and adapt it to their own issues (see Document EX3).

## NEXT STEPS

The only step remaining is using these results to fill the report for the funding agency.

Regarding the scientific implication, a next step should be the development and implementation of this methodology in critical cohabitation areas, where the situation involves danger for humans (for their health, their security, their food autonomy etc.), vulnerable human populations (ethnic/linguistic/cultural minorities, population in conflict areas etc.) and/or endangered species.

## ANNEXES

## REFERENCES AND LINKS

## REFERENCES

- Champiat, Clément, and Pauline Delahaye, dirs. 2019. *Des Corneilles et des Hommes*. Association Science Télévision. <https://vimeo.com/366803347>.
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## LINKS TO WEBSITES AND DOCUMENTS

Website of the project: <https://www.crows.ut.ee/>

Project introduction video: [https://youtu.be/jqVTsuKbR\\_U](https://youtu.be/jqVTsuKbR_U)

Project and citizen science promotion video: <https://youtu.be/KAdVOOT-F9s>

## ACKNOWLEDGEMENTS

Marko Mägi for precious enlightenment about corvids’ situations in Tartu and the predatory behaviour between different species of corvids.



Timo Maran for his suggestion regarding the *Coloeus monedula* potential nesting area.

Lona Päll for suggestions of good observation spots and explanations about the organization of the city of Tartu.

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Frédéric Jiguet himself for his quick reply, his invitation, his time, welcome and for the precious information and resources offered.

Lauri Laanisto for the precisions about the local impact of crows’ behaviours on plants and gardens.

## DOCUMENTS

### PREVIOUS DOCUMENTS ATTACHED

Data Management Plan (PDF version – 18/01/2021)

Field Diary (PDF version – 13/07/2023)

### TABLES AND FIGURES

Nomenclature of the files				
Field observations format: CITY_SEASON_DATE_NATUREnumber				
City of observation	Season of observation	Date of observation	Nature of file	Number
P: Paris T: Tartu	A: Autumn SM: Summer SP: Spring W: Winter	Format YYYYMMDD	P: Picture R: Video rush	From 01 to 99, restarted in each folder

Table 1 - Nomenclature of the files for observations

- Entry n°: 1  
Date & time: 2021/10/01 – 9:45 & 12:45  
Weaver & temperature: Clear – 11C°  
Place: Ulikööl street  
Number: 2, but could be the same individual at two different moments  
Observation: Was probably looking for insects under moss on top of roofs. Was pulling moss off and dropping it, with its soil, on the street. This day and followings, this kind of “moss+soil in a middle of pavement” droppings were also observed.
- Entry n°: 2  
Date & time: 2021/10/02 – 10:30  
Weaver: Clear – 13C°  
Place: Crossing of Pärna & Pikk  
Number: 5 on ground, probably more in the trees  
Observation: Were foraging grass, probably looking for insects. A small group of *Coloëus monedula* (5-6) was also foraging near them, without any sign of stress or aggressivity from one group or the other.
- Entry n°:3  
Date & time: 2021/10/04 – 10:15  
Weaver: Clear – 8C°  
Place: Pedestrian walk longing Emajõgi river, from Pikk bus stop to Kaarsild bridge  
Number: 15, mostly on the ground, some of them on guardrails  
Observation: Were foraging grass for individuals on ground. Individuals on guardrails were looking at people passing by. A passing as close as 1,5m from them did not trigger any eviction movement; on the contrary, stopping next to them at 2-3m of distance seemed to make them nervous or at least curious.
- Entry n°: 4  
Date & time: 2021/10/06 – 16:45  
Weaver: Clear – 11C°  
Place: Unamed road, deserving Uus 53 and connecting Uus 55 to Pikk 60  
Number: 1  
Observation: Was sitting on a fence, looking at people passing by. Seemed very curious, did not try any escape movement during a 20 second encounter at 2m distance.
- Entry n°: 5  
Date & time: 2021/10/09 – 17:30  
Weaver: Cloudy – 11C°  
Place: Uus 55  
Number: Between 15 and 25  
Observation: Were standing in a tree, addressing calls and moving from the tree, to roofs of nearest buildings, to tree again, making them difficult to count. The species was already observed at this place before, but the number of individuals gathered seemed to grow quickly.
- Entry n°: 6  
Date & time: 2021/10/11 – 10:00  
Weaver: Clear – 6C°  
Place: Crossing of Pärna & Pikk  
Number: 3 on the ground, at least another calling from a tree but not to be seen  
Observation: Were foraging grass. The group was few meters away of three other individuals identified as *Corvus frugilegus*. The distance between them was much more important than with *Coloëus monedula*.
- Entry n°: 7  
Date & time: 2021/10/13 – 15:30  
Weaver: Very cloudy – 7C°  
Place: Raekoja plats  
Number: 2  
Observation: Probably a pair, were following each other when changing of spot (different roofs around the place). See rush R01, rush R07 and rush R08.

Figure 1 - First sample of the Field Diary