STŘEDOŠKOLSKÁ ODBORNÁ ČINNOST

Obor č. 4: Biologie

Personality of the red-backed shrike

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In České Budějovice on 16.1.2022 ……

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Annotation

This treatise is about creating a reliable method for measuring the personality of the red-backed shrike. The main goal was to help others deepen the knowledge of birds‘ behaviour. The methods used were a compilation of several widely used methods used for measuring different traits of animals. We were able to tweak the method to be as accurate and appliable to various species.

Key words

Personality; boldness; predator; intelligence; cognition

Obsah

1 INTRODUCTION

Austrian scientist, bearer of the Nobel Prize in Physiology and medicine, Konrad Lorenz made his name in the world of science by introducing and popularizing a new study field – ethology – study of animal behaviour. This ambitious line of study found a way into many hearts of both scientists and the general population. From that time on, the field thrived, spreading like forest fire and filling the missing links of our previous knowledge about the animal kingdom.

Despite the professional field being relatively new, the discipline is as old as the oldest of humans. The Homo Neanderthalensis needed to predict the behaviour of a wild boar to hunt it down. Even more so, to be able to execute the most successful ethological experiment in history – domestication of a wolf.

However, by these endeavours, the hunger for understanding the animal nature didn't stop. There are scriptures from ancient Egypt about their observations of chickens right after hatching and their behaviour which later became a part of the Egyptian anthem composed by the pharaoh Akhenaton, husband of the famous Nefertiti.

This shows how important animals were in cultures all around the world. Just to mention a few more, we found scriptures from Mesopotamia, India or ancient Greece. After that, the research of Charles Darwin is also worth a mention, as it also had a tremendous impact on the line of study. That is to say that the field got more serious attention in the first third of the 20th century. Before that, it was being explored by just a handful of enthusiasts.

As time passed, the methods of acquiring data got more and more advanced. Beginning by simple redrawing and writing down one's observations in the wild and ending by neurological analysis and elaborate experiments filmed on thermal cameras.

Ethology, as mapped as it is, is still having a big uncharted area. Ignored for many years, the idea has been dormant in front of our eyes for too long. Previously thought about as being a dead – end, the idea of birds having a personality is again being picked up by a couple of daring, willing to dive head – in into the fog of an open field.

In this treatise, I am going to explore the possible methods of measuring a bird's personality. My pick for a specie is the red – backed shrike as it is very aggressive, and their anger is clearly visible and quantifiable. My research includes measuring a range of reactions on various stimulants. Ranging from the threat of being held in hand by a possible predator to direct invasion of their nesting space by a dangerous bird of prey. Some of methods tried out on the red – backed shrike are later tried again on a Great Tit.

The main part of my research is the description of the methods used and their reason, followed by a demonstration of data gathered accompanied by photo documentation.

I have gathered my information from work by Mgr. Michaela Syrová PhD, Mgr. Michal Šulc PhD. From these papers we have derived a series of experiments that help us determine and quantify the bird's personality.

This seminary work should help future scientists measure a bird's personality more effectively and with bigger precision.

2 STUDY OF ANIMAL PERSONALITY

The study of animal behaviour comes with many difficulties. Even more so when we try to study animal personality. There are problems with definitions, with testing mistakes, with evaluation fallacies. We carefully constructed these experiments as not to commit any of these mistakes. Possible problems are:

Many tests for one trait – some experiments can use different tests to measure for example boldness, but their results may not be comparable (Carter, A. J., Feeney, W. E., Marshall, H. H., Cowlishaw, G., & Heinsohn, R. (2013))

One test for many traits – tests in different circumstances can show different traits. For example, a subject forced into an open space may not correspond to when the subject which was given a choice to explore. (Walsh & Cummins, 1976; Crusio, 2001) (Carter, A. J., Feeney, W. E., Marshall, H. H., Cowlishaw, G., & Heinsohn, R. (2013))

Establishing correct terminology – without a precise assessment, there can be a lapse in judgement – the analysis can be erroneous with false conclusions

Jingle – jangle fallacies – The jingle fallacy is the false name assignment to two traits that are measured in two tests but are in fact one. The jangle fallacy is the opposite – a false name assignment to a trait that is in fact two traits. (Block, 1995)

From this list it should be clear that we need to establish precise terminology for the tested variables.

Boldness – There have been multiple definitions of the word, but I will be using the definition of Coleman & Wilson(1998) - "The familiar terms 'shy' and 'bold' refer largely to the willingness of an individual to take risks, especially in novel situations."

Aggression – the Cambridge Dictionary defines aggression as "spoken or physical behaviour that is threatening or involves harm to someone or something".

Intelligence - the Cambridge Dictionary defines intelligence as "the ability to learn, understand, and make judgments or have opinions that are based on reason"

2.1 PERSONALITY

A question needs to be asked. How do we define personality? The term personality is not usually used in behavioural sciences. The term personality not usually used because it is viewed as too anthropomorphising. Instead, terms like "temperament", "behavioural syndrome" or "style" are used more. From these three, I will be using the definition of the behavioural syndrome. The definition is as follow: "Suites of correlated behaviours expressed either within a given behavioural context or across different contexts" (Sih, Bell, Johnson, Ziemba, 2004). This definition is quite close to that of human personality.

3 MATERIALS AND METHODS

In this chapter I am going to talk about the general information of the red-backed shrike, where it lives, when it resides in the Czech Republic and how to effectively find it and what steps need to be taken before starting the experiment.

3.1 BIOTOPE

The red-backed shrike is one of the harder birds to look for. That is not because of their small population or mimicry but because their preferred habitat is somewhat inhospitable. During mating season, they reside in Europe. I watched them in the military grounds Hradiště and the outskirts of Karlovy Vary (50°10'48.0"N 13°01'19.9"E). You can find shrikes sitting on top of bushes such as *Rosa canina, Prunus spinosa, Crataegus laevigata* looking for food. That is to say, shrikes don't live everywhere these bushes grow. Shrikes prefer wide meadows with long grasses (Picture 1). At most times you will find shrikes in low-intensity farming locations (Mattia Brambilla , Diego Rubolini & Franca Guidal, 2007).

Picture 1: Typical biotope of the red – -backed shrike, http://cke.cz/wp-content/uploads/photo-gallery/research/doupovky_2017/doupovky_teren_2017_20.JPG

3.2 LIFE HISTORY

Red–backed shrikes arrive to Europe in late spring and stay until start of autumn. The best time to observe them in their nesting period is from mid-May to mid-July. They usually have

clutches of 3 – 6 eggs. Their nests are usually found in the middle of previously stated bushes. Their fortress-like homes are what is the greatest hindrance when mapping out individual nests. Luckily, shrikes tend to help ornithologists by calling out their warning call when their territory is disrupted. A shrike's territory can range from 1 to 1.5 acres(Durango,1955, p. 479) but they tend to call when a human is in immediate proximity. Another helpful call to look out for is that of a barred warbler (*Sylvia Nisoria*) that has a recorded symbiotic relation with the red-backed shrike.

3.3 RECOGNIZING A SHRIKE

Recognizing a shrike's egg might be challenging sometimes because of apparent similarity with the aforementioned barred warbler. As you can see in the photo (Picture 2) the shrike has a ring of brown clear dots near the bottom of the egg, whereas the warbler's eggs (Picture 3) have a circular area at the very bottom made from darker and hazy dots that many times merge together making an undefinable shape.

Picture 2: Six eggs of the red-backed shrike, https://i.pinimg.com/originals/26/59/99/265999fc260151008435339bee894f79.jpg

Picture 3: The egg on the left is the demonstration of the common cuckoo (*Cuculus canorus*), the two eggs on the right are of the barred warbler (*Sylvia nisoria*),

https://upload.wikimedia.org/wikipedia/commons/thumb/b/b1/Cuculus_canorus_canorus_MHNT.ZOO.2010.11.150.28.jpg/1920px-Cuculus_canorus_canorus_MHNT.ZOO.2010.11.150.28.jpg

4 METHOD

4.1 EXPERIMENT PREPARATION

In preparation for the experiments, it was needed to map out the area not to miss an inhabited bush. After having a good notion of the state of the location of concern the next step is to monitor the area for some time to determine the shrike's territory. Best method for doing that is simply watching where the bird hunts, where it usually sits, in what areas is the presence of a human making it agitated. This information will be useful for picking out a good spot for the bird feeder.

4.1.1 BIRD FEEDER EXPERIMENT PREPARATION

The feeder experiment is based on placing a tall (cca 180cm) open bird feeder in the ground in the middle of the shrike's territory. This experiment tests the bird's intelligence and boldness. These factors of personality are tested by gradually increasing the complexity of the bird feeder and by adding unnaturally looking structures – blue containers.

To add complexity to the feeder we made several levels of feeding method. The first method is to pierce the bait – in our case it is the Superworms (*Zophobas morio*) - with a wire which is extending 20 cm above the feeder, so it is easy for the bird to spot. For the second stage we used a clear, small, square shaped bowls nested in the feeder's body. A variation on this stage is stage three where the bowl is swapped for a blue bowl. In the fourth stage are used buckets in a shape of a truncated square pyramid. The buckets should be clear as not to scare the bird more. Other stages of the experiments are variants of the fourth stage. These variants incorporate gate-like openings in the buckets. The number of holes is gradually decreasing until the point where there is only one hole that is covered by a clear curtain. Each stage was recorded on a camera.

As previously stated, this experiment requires the knowledge of the observed shrike's territory. The ideal place to install the feeder is a place which the bird visits frequently and is the preferably the only individual to visit that area. To eliminate the possibility of another individual interfering the experiment, we should try to place the feeder further away from other nests while still being in the mapped territory.

Recapitulation (equipment needed): 180 cm bird feeder, wire, *Zophobas morio* as bait, clear bowl, blue bowl, 3 clear buckets

4.1.2 IN-HAND EXPERIMENT PREPARATION

The in-hand experiment is based on catching a bird and performing experiments while being held.

This test determines how aggressive the shrike is and how that ties to its bite force and its partner choice. For measuring we used a bite force meter usually used on the naked mole-rat (*Heterocephalus glaber*). Also, the amount of shaking in the bags the bird was transported in

was measured. After the bite force experiment standard physical properties measurement was performed and the shrike was ringed and released. Everything was documented either on a video or as photographic material.

Recapitulation: Bird catching equipment, bite force meter, measuring equipment

4.1.3 NEST EXPERIMENT PREPARATION

For the nest experiment, the shrike's nest has to be located, the bird should ideally be ringed and identified. Second predisposition is appropriate age of the hatchlings. Ideal age is between 8 and 12 days old. The experiment tests the bird's antipredatory capabilities and aggressive predispositions. The tests are based on placing a taxidermized predator in proximity of the nest (Syrová, 2016, pg. 2). In my research I used taxidermized Eurasian Jay (*Garrulus glandarius*), Common Kestrel *(Falco tinnunculus*), Eurasian Sparrowhawk (*Accipiter nisus*) and Eurasian collared dove (*Streptopelia decaocto*). The selection of species will be explained in more detail in chapter 4. Each experiment was recorded and commented on camera. For the analysis program BORIS was used.

Recapitulation: A hollow rod for mounting the dummy (preferably in non-disturbing colors), preferably taxidermized birds, camera equipment

4.2 BIRD FEEDER EXPERIMENT

4.2.1 GOAL OF THE EXPERIMENT

By intelligence, we mean "The ability to use memory, knowledge, experience, understanding, reasoning, imagination and judgment in order to solve problems and adapt to new situations" (AllWords dictionary, 2006). Intelligence plays a significant role in birds' survival capabilities. Also, it is a very important part of the animal personality. Intelligence is what this experiment is mainly trying to test. Next, it helps us measure how neophobic the bird is. Another point of interest is whether the bird will learn to expect food when a human is present.

4.2.2 METHOD

In this experiment there are several variables. The controlled variables are the feeder – its size, colour and placement. This must stay the same as not to confuse the individual. Next, the time food is presented, as well as the type of food must remain constant. Preferably the position of wires during earlier phases of the experiment should remain constant. Also, the camera placement should remain constant. It should stand cca 5 meters away from the feeder in an unobstructive position.

The independent variables are the types of conundrums presented to the test subjects.

The dependent variables are the reactions of the bird. I will talk about quantification of this data later this chapter.

4.2.2.1 EXPERIMENT IN PRACTICE

1. First experiment is the easiest one for the bird to solve. Its main purpose is to create a conditioned reflex in the individual's mind. The Zophobas worms' bodies are punctured by the wires attached to the sides of the feeder. The worms (2) should be at least 15 cm above the feeder's base level. This ensures good visibility of the presented bait. This experiment should be repeated for several days until the bird is consistent with its arrivals. The time given to the subjects is to be considered by the scientist. The reaction we are looking for is the subject arriving and taking the worm. The variables we look for are the time it took for the subject to arrive, the time spent on the feeder, any sign of shyness during the procedure and how long it took the subject to take the worm off the wire. The feeder should be checked every hour for 8 hours. In practice, the batteries in the cameras do not hold for this long. A more time saving alternative is to check on the feeder every hour for 4 hours. After that the experiment does not have to be recorded. However, the feeder still should be checked on to know the approximate time of the bird's arrival. This method is not ideal but in the earlier stages of creating the conditioned reflex. The bird is then expected to arrive earlier.
2. Second experiment is a sort of an introductory test for the bird. A clear bowl is placed into the base of the feeder. However, this is not enough. From experience, the bird will not be motivated to sit in close proximity of the bowl. That is why a singular worm should be presented on one of the wires. That way the bird will be motivated to visit

the test site and to notice the bowl. The variables we look for are the time until the bird arrives, the time spent on the feeder and any sign of shyness during the procedure. Again, the experiment should be checked in the same time periods as before. After finding out that the bird has eaten both the worms the next step is to put the worm into the bowl only. If this step is successful, you can move to step 3. If this step is unsuccessful, it is time for a step – back. The step with worm on a wire and in the bowl should be repeated. If even this step fails, repeat step 1.

3. Step 3 is very similar to step 2 with the change of the bowl. Instead of a clear bowl a blue bowl is used. Blue colour is quite unnatural in nature. This test is designed to test the subject's neophobia. We look for the same variable as in step 2. This experiment can be repeated if unsuccessful but if the time given is too long, one should move on to step 4. The subject's inability to eat the bait is still valuable data.
4. This is the first test where the clear square shaped bucket comes into play. This first bucket in order is a bucket with four entryways on each side. Only one worm should be placed under the bucket into a clear bowl from experiment 2. The time control is the same as in the experiments. With this test the subject's determination to get the worm while presented with an unnatural looking structure is monitored. The same variables as in part 2 are recorded. If the subject fails to get the worm, it is needed to proceed to step 5.
5. This experiment is simply a harder version of the previous test. Instead of four entrances there is only one. This adds another level of difficulty to the test. Look for the same variables as in part 2. If the subject fails to get the worm, you must proceed to step 6.
6. The last experiment is the hardest one of them all. On top of the bucket having only one entrance we put a clear plastic curtain over the entrance so that the subject must find the entrance and use its body to push the curtain out of the way. We look for the same variables as in part 2. Whatever the result, the experiment is over.

4.2.2.2 PRACTICAL TIPS

The scientist does not have to record one bird feeder at a time. I measured 5 feeders at one time with no difficulties. The only required thing to do is to have enough cameras and check on the feeder one after another with reasonable time spacing in between the checks.

The scientist should spend as little time as possible at the site of the feeder. The birds could become agitated, and it could affect the experiment in a bad way. The time when the subject approaches the food could be changed by its agitation.

The best spot for the camera is in a bush or other thick vegetation. The camera's alien appearance could scare the shrike away. Also, the best angle for the camera is when it sees the entrance of the buckets clearly, preferably from the side (to see the detail of the bird taking the worm). Furthermore, the camera should ideally overlook the feeder from the top.

4.3 IN-HAND EXPERIMENT

4.3.1 GOAL OF THE EXPERIMENT

Self – defence is a crucial skill any animal must have in order to survive. Every individual has at least some kind of self – defence mechanism. The variability can be seen when it comes to the force used, stubbornness, techniques. This is what we measure in this experiment. The variability in the shrikes' attempts of escape.

4.3.2 METHOD

Let us go over the variables in this experiment. The controlled variables are the environment in which the bird is put and the number of individual tests. The independent variables are the temperament, the sex and the general proportions of an individual. The dependent variables are the reactions observed.

4.3.2.1 EXPERIMENT IN PRACTICE

1. Bird is caught by a regular bird catching procedure. Ideally, the bird should be recorded when being taken out of the net. Next, the subject is put in a bag for transportation and is recorded for one minute. Variables we are looking for are number of calls the bird makes and how many times it shakes the bag.
2. After the bird is taken out it is held in hand with another researcher holding the bite force meter. The subject is approached 10 times with the bite force meter and its reaction is observed and recorded. For more accurate results, approach the subject 20

times but we found that 10 approaches gave us sufficient data. The variables we look for are number of calls, number of wing flaps and the number of bites and their force.

3. Next, the bird is held in hand for a time of one minute without any other stressors. The variables we look for are number of calls, number of wing flaps and the number of bites on the researcher's hand.
4. We measure the subject's general proportions – length of beak, wingspan, length of tail feathers, the state of the brooding patch, length of tarsus and its mass. After that a photo is taken of the subject with a colour pallet and a millimetre grid.

4.4 NEST EXPERIMENT

4.4.1 GOAL OF EXPERIMENT

Protection of offspring is vital for survival of the species. The red –backed shrike's aggressivity and braveness helps to keep the predators away. In this experiment we observe the shrike's antipredator capabilities.

4.4.2 METHOD

This experiment is based on various dummy birds presented to the test subject. The dummies are that of a Eurasian Jay (Garrulus Glandarius), Common Kestrel (Falco Tinnunculus), Eurasian Sparrowhawk (Accipiter Nisus) and Eurasian collared dove (Streptopelia Decaocto) which are all taxidermized.

All combinations of the order in which the dummies are presented should be used. The ideal number of repetitions for each order combination is four repetitions. That is so that we can notice peculiar behaviours in certain combinations. For example, the shrike might not be so eager to defend its nest when a Sparrowhawk has invaded its territory. The test time is 20 minutes with 20 minutes of latency.

After each test, there should be 1 hour of waiting time. We wait so that the bird can feed its offspring and to relieve some stress. If the weather conditions are too bad for the subject, we delay the next experiment.

4.4.2.1 EXPERIMENT IN PRACTICE

1. The full length of the test should be recorded. As we record the reactions of both males and female, assistance of a second person can be useful. The recording spot should be placed at least fifty meters from the subjects' nest as to avoid any disturbance from the side of researchers. The camera should be seated on a stationary tripod and aiming at approximately five-meter large area around the nest.
2. A non-intrusive stand is placed circa 2 meters from the nest. We used a hollow, a 1,5-meter-long rod. It should have a neutral colour – dark green, brown, black. The nest is recorded for the first twenty minutes without any dummy bird to make sure the bird is not bothered by the stand. When the 20 minutes have passed, bring the dummy covered under a piece of cloth, so that the subjects do not associate the predators with you. After that, we can place our first dummy bird on the stand. Try to spend as little time as possible at the test site.
3. While recording, comment everything you see. Comment the distance and height relative to the dummy in which the bird is sitting. Comment any warning calls or any intimidating tactics used by the subject, such as wing flapping, tail wagging or fake attacks. Comment every successful attack and every move to a new location. Comment when the bird is hunting, when it is feeding or when it has left you sight.

5 DATA ANALYSIS

For quantifying the subject's behaviour, we analyse the videos. Any way of accurately determining the timeframe of the bird's actions is enough to do an analysis. We have used the program BORIS (Behavioral Observation Research Interactive Software). I will not go deep into how the program works.

Let's see a possible outcome from the analysis. I will also be talking about what behaviours we are looking for in each experiment.

5.1 BIRD FEEDER EXPERIMENT

In this experiment we measure:

- Time of the arrival of the subject
- Length of the subject's observation of the bird feeder without any movement
- Any exploration of the bird feeder without attempts of picking up the worm
- Attempts of picking up the worm and the length of the attempt
- Time of subject leaving the bird feeder

Here is a typical outcome of analysing videos can be seen in the picture 4

Time budget

Selected observations

2 - 14.6.2021 - čirá

Analysis from 00:00:00.000 to 00:34:24.000

Behaviors excluded from total time: observing, collecting, exploring

	Subject	Behavior	Modifiers	Total number of occurences	Total duration (s)	Duration mean (s)	Duration std dev	inter-event intervals mean (s)	inter-event intervals std dev	% of total length
1	No focal subject	presence	arrival	2	NA	NA	NA	59.96	NA	NA
2	No focal subject	presence	departure	2	NA	NA	NA	96.36	NA	NA
3	No focal subject	observing		2	14.96	7.48	0.226	53.32	NA	0.7
4	No focal subject	collecting		10	15.6	1.56	0.923	2.938	1.831	0.8
5	No focal subject	food		2	NA	NA	NA	103.32	NA	NA
6	No focal subject	exploring		0	0	0	NA	NA	NA	0
7	No focal subject	preparation		1	NA	NA	NA	NA	NA	NA

Picture 4 – The time budget of a randomly chosen video showing how many times a certain event happened and how long it lasted

Key:

- Preparation – the time of installing the puzzles
- Presence – the bird's arrival and departure
- Observing – the bird is stationary, observing the bird feeder
- Exploring – the bird is actively moving around the bird feeder, looking for the worm
- Collecting – the bird is actively trying to collect the worm
- Food – the bird has successfully collected the worm

5.2 IN HAND EXPERIMENT

In this experiment we measure:

- Frequency of bites
- Force of bites
- Number of calls
- Number of wing flaps

Here is a typical outcome of analysing videos is presented in picture 5

Time budget

Selected observations

12.6.2021 - Stružná - Female

Analysis from 00:00:00.000 to 00:03:33.120

	Subject	Behavior	Modifiers	Total number of occurences	Total duration (s)	Duration mean (s)	Duration std dev	inter-event intervals mean (s)	inter-event intervals std dev	% of total length
1	female	bite	3	1	NA	NA	NA	NA	NA	NA
2	female	bite	0.4	1	NA	NA	NA	NA	NA	NA
3	female	bite	0	6	NA	NA	NA	10.36	11.116	NA
4	female	call		0	0	0	NA	NA	NA	0
5	female	wing flap		20	NA	NA	NA	5.893	6.54	NA
6	female	finger bite	7	2	NA	NA	NA	127.52	NA	NA
7	female	finger bite	0	4	NA	NA	NA	27.853	7.392	NA
8	female	finger bite	8	1	NA	NA	NA	NA	NA	NA
9	female	finger bite	5	1	NA	NA	NA	NA	NA	NA
10	female	finger bite	6	1	NA	NA	NA	NA	NA	NA
11	female	finger bite	3	2	NA	NA	NA	17.08	NA	NA
12	female	finger bite	4	3	NA	NA	NA	3.74	0.651	NA
13	female	finger bite	2	1	NA	NA	NA	NA	NA	NA

Picture 5 – The time budget of a randomly chosen video showing how many times a certain event happened and how long it lasted

Key:

- Bite – The bird bites the Bite Force Meter
- Call – The bird calls
- Wing flap – The bird flaps its wings
- Finger bite – The bird bites the observer's finger

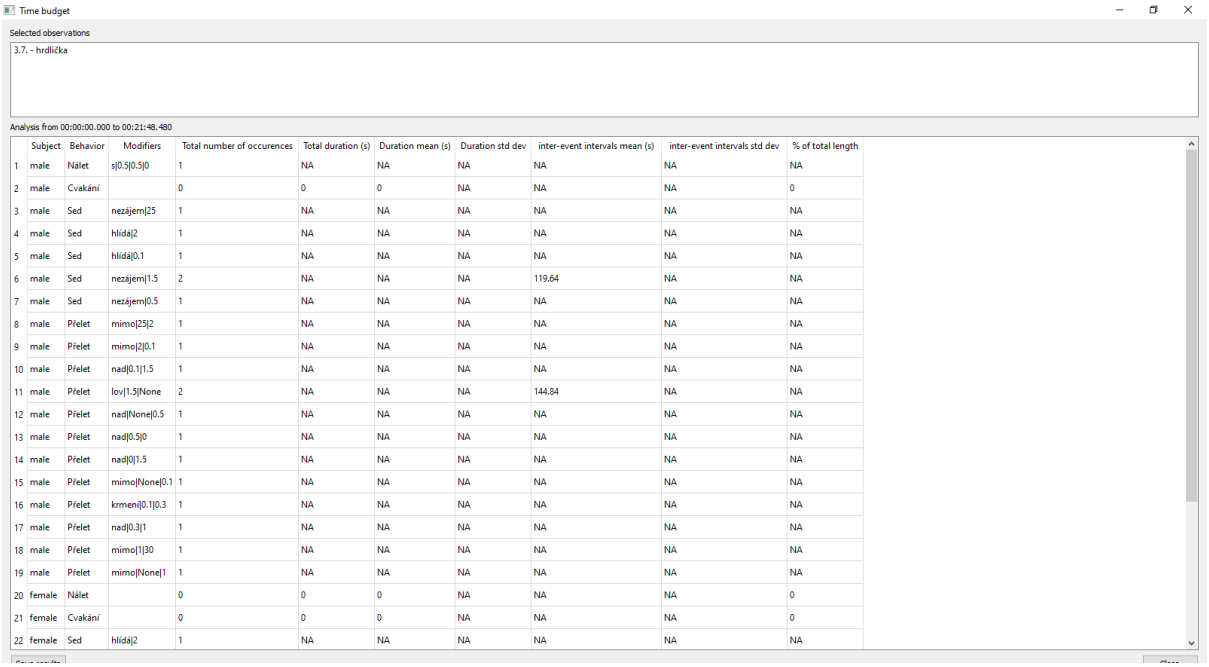
5.3 NEST EXPERIMENT

In this experiment we measure:

- Frequency of attacks
- Frequency of calls

- Frequency of warning tail wags
- Distance from the dummy
- Whether the subject feeds its offspring
- Whether the subject leaves the observer's sight

Here is a typical outcome of analysing videos (picture 6)


Time budget

Selected observations

3.7. - hrdlička

Analysis from 00:00:00.000 to 00:21:48.480

	Subject	Behavior	Modifiers	Total number of occurences	Total duration (s)	Duration mean (s)	Duration std dev	inter-event intervals mean (s)	inter-event intervals std dev	% of total length
1	male	Nálet	s|0.5|0.5|0	1	NA	NA	NA	NA	NA	NA
2	male	Cvakání		0	0	0	NA	NA	NA	0
3	male	Sed	nezájem|25	1	NA	NA	NA	NA	NA	NA
4	male	Sed	hlídá|2	1	NA	NA	NA	NA	NA	NA
5	male	Sed	hlídá|0.1	1	NA	NA	NA	NA	NA	NA
6	male	Sed	nezájem|1.5	2	NA	NA	NA	119.64	NA	NA
7	male	Sed	nezájem|0.5	1	NA	NA	NA	NA	NA	NA
8	male	Přelet	mimo|25|2	1	NA	NA	NA	NA	NA	NA
9	male	Přelet	mimo|2|0.1	1	NA	NA	NA	NA	NA	NA
10	male	Přelet	nad|0.1|1.5	1	NA	NA	NA	NA	NA	NA
11	male	Přelet	lov|1.5|None	2	NA	NA	NA	144.84	NA	NA
12	male	Přelet	nad|None|0.5	1	NA	NA	NA	NA	NA	NA
13	male	Přelet	nad|0.5|0	1	NA	NA	NA	NA	NA	NA
14	male	Přelet	nad|0|1.5	1	NA	NA	NA	NA	NA	NA
15	male	Přelet	mimo|None|0.1	1	NA	NA	NA	NA	NA	NA
16	male	Přelet	krmení|0.1|0.3	1	NA	NA	NA	NA	NA	NA
17	male	Přelet	nad|0.3|1	1	NA	NA	NA	NA	NA	NA
18	male	Přelet	mimo|1|30	1	NA	NA	NA	NA	NA	NA
19	male	Přelet	mimo|None|1	1	NA	NA	NA	NA	NA	NA
20	female	Nálet		0	0	0	NA	NA	NA	0
21	female	Cvakání		0	0	0	NA	NA	NA	0
22	female	Sed	hlídá|2	1	NA	NA	NA	NA	NA	NA

Picture 6 – The time budget of a randomly chosen video showing how many times a certain event happened and how long it lasted

Key:

- Nálet(attack) – The bird attacks the dummy
- Cvakání(snapping) – The bird is doing a warning call
- Sed(sit) – The bird is sitting at a certain distance away
- Přelet(flight) – The bird flies to a different location

6 DISCUSSION

Our method has shown us that measuring bird personality is not impossible, however, there is still room for improvement. The next course of action should be trying our method on other

species. Measurement on one specie can give us misleading results or results about the one specie only. Measuring on multiple species would assure us that the method works and that traits found across species are measured. All in all, this is one of the qualities that makes a good method – appliable on a wide variety of species.

As for study of shrikes, a bigger number of subjects would be better. We still cannot be sure be sure that the method works. It could all simply be a coincidence.

As to methods themselves, right now we think that the method is as accurate as it can get. Human contact with the subject is minimal and subjects respond well to our experiments. The only improvement could be the introduction of tracking systems installed to the bird. This would help determining the subject's territory.

7 CONCLUSION

In my introduction I set a goal to create a method that would make it easier for other scientists to explore the animal mind. I believe I have reached my goal. The experiments have yielded compelling results that fit well together. Even though I think this research is far from complete, I think we have done a great step towards a reliable method for measuring the personality of birds. The next course of action is to gather more data, improve our experiments, maybe find new or better ones.

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