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A puppy German Shepherd Dog trained to find bat roosts

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With 1 Figure

Zusammenfassung

Junger Deutscher Schäferhund mit der Zielsetzung trainiert, um im Freiland Fledermausquartiere zu finden

In dieser Arbeit berichten wir von einem jungen Deutschen Schäferhund, der darauf trainiert ist, Quartiere der Mückenfledermaus *(Pipistrellus pygmaeus)* zu finden. Der Hund wurde speziell darauf trainiert, den Geruch von Fledermauskot zu erkennen. Der Hund erkannte aber auch noch andere typische Anhaltspunkte, die um ein Fledermausquartier zu finden sind, den Geruch der Fledermäuse selbst, Urinspuren und hörbare Sozialrufe von Fledermäusen. Der Hund identifizierte bereits solche Quartiere, als er noch ein Jungtier war. Unsere Ergebnisse zeigen, dass Hunde unter bestimmten Voraussetzungen sehr erfolgreich sein können, wenn konventionelle Methoden, wie die Radio-Telemetrie, versagen oder einen zu großen Zeitaufwand beanspruchen.

Summary

In this note we report on a puppy German Shepherd Dog trained to find roosts of the bat soprano pipistrelle *(Pipistrellus pygmaeus)*. The dog was trained on scent from bat feces only. Even thought the dog was denied the additional clue found around roosts such as the smell from bats themselves, urine drops and audible social call from bats, the dog was quite successful in experimental trials. The dog also identified real roosts when still a puppy. Our results show that in some situations dogs could be successfully when conventional methods such as radio telemetry would fail or be too time demanding.

Keywords

Puppy German Shepherd Dog. Training to find bat roosts. Soprano bats *(Pipistrellus pygmaeus)*.

1 Introduction

Bats are social creatures and occur in various roost formations for much of the year. In temperate bats, commonly used structures for roosts in summer are buildings, hollow trees, crevices in rock walls, bridges, specially made bat boxes and more (for general literature, s. Schober & Grimmberger 1997, Mitchell-Jones & McLeish 1999, Altringham 2003, Dietz et al. 2007), but the choice and suitability of roost sites varies between species, sex and reproductive stages. In most countries in Europe, bats are protected by law and destruction of roosts are prohibited (Marnell & Presetnik 2010), but for effective conservation to be applied, the knowledge about the whereabouts of these roosts is imperative. Roosts can be found through searching areas with ultrasound detectors, trough reports from the public or radio telemetry (e. g. Mitchell-Jones & McLeish 1999). In addition to being an invasive method demanding permits from the authorities, radio telemetry has one important drawback; it will only find roosts when in use by bats and can only be applied during the bat active season. This would also in part be true for other commonly used methods depending on roost habitat.

Dogs have served man in various ways for thousands of years and are now used for many purposes ranging from companions/pets to search and rescue dogs, police, military and service dogs. In recent years, dogs have been used in various scientific works, with the most impressive usage perhaps being in cancer diagnostics (e. g. McCulloch et al. 2006). In wildlife management, conservation detection dogs may benefit researchers in several fields of study (e. g. Hurt & Smith 2009). Dogs have been used in bat work, solving some easy tasks such as searching for bat carcasses under winds farms (e. g. Arnett 2005). Further, test from a single study suggests that dogs may find between 20 and 71 % of roosts of some selected American bat species (Mering & Chambers 2009, Mehring et al. 2009). In experimental trials, using varying heights and amount of guano, between

Fig. 1. The dog "Quinta Aritar Bastet" (at 9 months) resting after a training session. Further images and videos can be found online. Photo: T. C. Michaelsen.
Abb. 1. Der Hund „Quinta Aritar Bastet" (im Alter von 9 Monaten) nach einer Trainingseinheit ausruhend. Weitere Bilder und Videos können online besichtigt werden. Aufn.: T. C. Michaelsen.

27 and 79 % was identified. Full details have unfortunately not yet been published, thus training and testing protocols are not available.

The purpose of this study was twofold. First, we wanted to experimentally test the potential of training dogs to find bat roosts beyond the dogs reach. Second, we wanted to train the dog to target olfactory clues found at roosts both when bats are present and absent (i. e. feces). If a dog could identify roosts when bats are absent, this would mean that dogs can successfully find roosts under circumstances when radio telemetry would fail.

As scent from feces from many bat species can easily be recognized by humans at short distances, a dog will pick up on the scent far away from the its origin. Thus, we expected the dog to find bat feces with the proper training, probably before reaching adulthood. To test our assumptions, a German Shepherd puppy was trained to find feces of the soprano pipistrelle *(Pipistrellus pygmaeus)* during the summer of 2012. The dog was tested in both experimental and real situations.

2 Materials and methods

The soprano pipistrelle, a patchily distributed bat at 62°N in Norway (Michaelsen et al. 2011) was selected as target species mainly for two reasons. First, the soprano pipistrelle is a study species of the first author and knowledge of roost sites at the species northern range is still poor. Second, feces from this species were easily available at two bat boxes (BCI and Schwegler 1FS) in the study area where the dog was to be trained. The selection of dog breed was easy; the German Shepherd Dog (GSD) has outstanding merits and the second and third author has extensive knowledge and experience when it comes to training this breed for IPO/Schutzhund, search/rescue, police and military work through the kennel ABC Drift. As no puppies were available from this kennel in spring 2012, a female GSD puppy (borne February 2, 2012) was imported from the Czech kennel Aritar Bastet in April 2012. This dog (name: Quinta Aritar Bastet, call name "Coke", EU passport ID: CZ170000972859, dog-ID/PIT: 93000010196588, figure 1) comes from Czech/DDR working lines that has proven excellent in dog sports and police work.

2.1 Study area

All training and testing of this dog was carried out around 62°N in western Norway, in areas with oceanic influence and with mean temperatures for July around 13-14°C (Moen 1998).

2.2 Training

The dog was delivered at 8 weeks of age and was raised as a family dog. The first weeks were used mainly for socialization and play. Focus during playtime was on chasing balls and finding hidden balls, the dog's favorite toy. Searches were carried out in the types of habitats where the dog would later have to search for bat roosts. During this period, we also trained the dog to bark to be rewarded with its toy. Barking

would be the signal used by the dog later to tell the handler that a roost has been detected. At 22 weeks we introduced the smell from feces from soprano pipistrelles for the first time, and for the next two weeks, the dog was rewarded with its ball immediately upon contact with the scent. In this part of the training, three metal containers (one experimental and two controls) with 2 mm holes in the lid to avoid spill of feces, were placed on the ground. This was repeated several times a day. The command to bark was added towards the end of this period (around week 24). At 25 weeks, we felt that the dog had now understood the need to find the scent to get the ball and feces was placed on a ledge about 1.5 m above the ground. The dog identified the target by barking and was immediately rewarded with its ball. We repeated this three times at different sites (1.5 to 1.8 m above the ground) before starting the actual testing of the dog. The dog was not trained to identify social calls from bats (often heard at roosts). The reason for this choice will be discussed later. Also, the dog was never introduced to bats during training and experimental trials, thus no invasive methods were applied in the course of the dogs training.

2.3 Testing

We first carried out 20 trials with controls to test the efficiency of this dog to find bat feces under simulated field conditions. Bat feces was placed in bat boxes (2F, Schwegler Natur, Germany), various cardboard containers, directly in crevices in trees or rock walls, in concrete walls or pillars, ranging from 180 cm to approximately 220 cm above the ground. We used approximately 4-7 g (one or two spoons) of feces in most trials, but at sites above 220 cm, approximately 20 g were used. In all trials, a similar control unit without feces was put up within a 5 m radius of the experimental unit. In cases when feces placed directly on an object without touching the object, the handlers spend equal time standing adjacent to a control object. Also, many routes were walked near the experimental and control objects so that the dog would not be aided by tracks directly to the experimental or control unit. The dog was released from its leash 20-50 m away from the target. Based on knowledge of the breed, the dog would not have to spend more than around 5 to 15 minutes to track down these targete (usually much less time). The criterion for a successful trial was that the dog would have to bark one or several times at the object where the feces had been hidden. Should the dog at any time during the trial bark at any other object (e. g. neighbouring trees or any other object the dog handler had touched), this would be recorded as a failure. The same would be true even if the dog found the target, but used other signals than barking. We would also consider up on finding the target as a failure, even if the dog would later find it when being lead by the target by the handler. A binomial test was used to test if the dog separated experimental units from controls (v. 2.10.1, R DEVELOPMENT CORE TEAM 2010).

In a second set of tests, feces (appr. 20 g) were placed in 2F bat boxes put up in trees at 3,0, 3,5, 4,5 and 6,0 m, single tests at each height except for at 6 m. At 6 m height, we additionally tested the dog in a habitat that we know from experience of training police and search dogs, most give up on finding their target (even when targets are placed on the ground). This is a dense spruce plantation in a steep north facing slope. The habitat is humid, there is no wind due to the density of the forest and the topography blocks out the sun and thus heat influx during autumn. Searches were carried out at least 48 h after the box was in place to eliminate the scent trials of humans. All tests using 2F bat boxes were carried out in autumn (September) during periods of rain (not by choice).

To finally test the dog in real situations, the dog was given the task of searching for roosts in two BCI-type bat boxes containing varying number of soprano pipistrelles each year. Here the dog would have additional clues, such as urine stripes and the bat themselves at one of the locations. The dog was released approximately 20 m away from the buildings holding the bat roost. Social calls were monitored with a D240x (Pettersson Elektronik AB, Sweden) ultrasound detector. The dog was also tested on what is probably a harem roost in a BCI bat box.

3 Results

The dog successfully separated the experimental units from the controls in all 20 trials (binomial test; $p<0.0001$, Cl: 0,83-1). Further, it easily identified feces in bat boxes in trees at 3,0, 3,5 and 4,5 m height. The dog possibly also identified bat feces at 6 m height in two different bat boxes in woodland, but the experimental design may have been a factor here (see discussion). Unfortunately, it identified the targets at 6 m height only after seeking support from the handler (including barking at the handler). Thus, both these trials were recorded as failures.

The dog found two real bat roosts in BCI-type bat boxes, one of them with no bats present. At one of these sites, the dog picked up on the scent before leaving the car some 20 m away from its target, and proceeded directly to the building and wall where box was located and started barking right under the box. At the other test site, the dog stood on its hind feet and cried at the box in frustration rather than barking as it was trained to do. Thus, this was recorded as a failure even though the dog had clearly found its target. Finally, it found a harem roost on an barn containing at least one visible soprano pipistrelle. No social calls from bats were heard during these tests, thus only olfactory clues was used by the dog.

4 Discussion

The results from this study show that even a puppy GSD can be used to identify soprano pipistrelle roosts. Even though we at times used lower amounts of feces at low heights above the ground (around 2 m) compared to Mering et al. (2009) in some trials, the success seems to be higher (100 %) with this combination of bat species, dog breed/age and training program. Other factors, such as precipitation, humidity and temperatures are also likely to affect the detection rate in dogs (e. g. Reed et al. 2011) and both high air humidity and relatively low summer temperatures as found in our study area could benefit search dogs compared to those working in continetal or dessert climates. Humidity may increase bacteria activity and may yield more intense scents (s. Reed et al. 2011 for discussion). Relatively low summer temperatures at 62°N will contribute to less panting compared to warmer climates and thus increase sniffing intensity (Gazit & Terkel 2003), but may reduce the strength of the scent itself compared to warmer climates.

The fact that a puppy dog identified the target at 6 m height was surprising to us and could be explained by problems with the experimental design. The tests were carried out during periods of wind and rain. We cannot exclude the possibility that rain had penetrated thorough the entrance hole of the 2F bat box during the 48 hours before testing the dog. Thus, dissolved feces may have followed water dripping out of the box and onto the ground below.

In the experimental trials, this dog was denied some olfactory and auditory clues that would make searches for active roosts more effective and the task undoubtedly by far much easier. The most important factor would be social calls produced by bats in roosts. If training the dog to identify such calls in addition to scent, the search time should be significantly reduced for active roosts. Finding social calls and their origin (roosts) can of course also be achieved by humans trough using an ultrasound detector, but a dog can cover much greater distances when free roaming. Thus, dogs should be more efficient in the field compared to humans when searching for active colonies with audible bats.

During the tests, this dog was still a puppy and it was not trained to search at great distances away from the handler. When reaching maturity and with proper training, we don't except problems with the dog returning to the handler for support, as it did during both tests with bat boxes at 6 m height. The problem that the dog would not bark at its target, but rather used other sounds, was addressed when the dog was 9 months old. Here a ball dropper (VNT electronics Ltd., Czech Republic) with remote control (250 m) was used and the dog now continuously barks at the target.

Using dogs to find bat roosts will have some advantages compared to telemetry as dogs can

find roosts when bats are not present, work can be carried out during unfavourable weather conditions (when bats are inactive), humans and dogs can work during daytime and no permits are needed from wildlife agencies or research animal authorities as the method is non-invasive. The method would in particularly be useful if restricted areas need to be searched. The method clearly has some bias compared to radio telemetry, e. g. a dog will only find roosts where it is allowed to search and further, a dog may not find roosts in tall apartment buildings or similar. The effectiveness of the method clearly depends on the roosting ecology of the target species.

In conclusion, we recommend further testing of dogs for bat work when roost site identification is needed for a wider range of bat species. We also recommend testing dogs on real roosts in trees, rather than in experimental situations (bat boxes) as used here. No attempts were made to investigate under which climatic conditions the dog would have the best chance of detecting bat roosts, but we encourage other researchers to do so. If assuming the task of training a dog to find roosts, we would like to stress the importance of selecting a dog with the necessary stamina and the willingness to work. The aid of a kennel specialized in scent work should not be underestimated!

5 Online resources

Videos of this dog searching for bat feces will be posted online. Use the dogs name ("Quinta Aritar Bastet") as search phrase in Google or Youtube.

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