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Training identification tracking dogs (*Canis familiaris*): evaluating the effect of novel trackdown training methods in real life situations

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Träna individspårhundar (Canis familiaris): utvärdera effekterna av nya spårträningsmetoder för eftersök

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Abstract

The challenge provided from recovering populations of group living ungulates and large predator populations puts the focus on the need to be able to find accidently wounded animals, from both traffic and hunting. Dog training for tracking down potentially wounded wildlife ("trackdown" hereafter) in Sweden has not changed much over the last hundred years although the species of wildlife has. There has been a large increase in numbers among wildlife that have a group living social structure (i.e. wild boar and fallow deer) over the last decade as well as an increase in the brown bear population and wolf population. Sweden has also issued licensed hunting for wolves, which has been highlighted in the international media. Because of the reasons mentioned above, the characteristics of trackdowns are if not changing then at least getting broader. To adjust to the new difficulties that the "new" species impose research is needed.

In this study I examined trackdowns performed by a number of dog handlers involved in the project, "Evaluation of novel methods for training scent-matching dogs to search for accidentally damaged game" (Swedish, Eftersöksprojektet). Two categories of dogs based on their type of training were compared, identification and traditionally trained. The id trained dogs succeeded with 92,3% of their traffic trackdowns compared to the traditionally trained dogs that succeeded with 72,4%. The id trained dogs also proved to have a lower total rate of injured animals that they could not find, id 3 out of 60 vs. traditional 25 out of 113. By using id training when training trackdown dogs we can improve the overall success in finding accidently injured wildlife and help meet the challenges that Sweden's new wildlife species offer.

1 Background

1.1 Novel Terms used in this thesis

Handler:	The person working with the dog, normally the owner. In Swedish, “Hundförare”
Id:	Identification
Trackdown:	An event where the objective is to track and find, an animal wounded by hunting or traffic collision. In Swedish, “ Eftersök”
Euthanize:	When a wounded but alive animal is tracked and found it will be shot or stabbed with a knife to end its suffering. In Swedish, “Avliva”
Trackdown team/ unit:	A handler plus dog team that carryout these trackdowns. The teams typically contain more than one dog and one handler in order to be able to safely track, find and euthanize or declare animals uninjured. In Swedish, “Eftersöksekipage”

1.2 Dogs

Today dogs are used in many ways based on their in many ways superior senses. Nevertheless, there are many additional ways to utilize dogs, provide appropriate training methods and, potentially, dog breeds are used.

1.2.1 History

Genetic research suggests that dogs (*Canis lupus familiaris*) diverged from wolves (*Canis lupus*) about 100 000 years before the present with a repeated genetic exchange between dogs and wolves adding to the diversities of dogs (Vilà et al. 1997). Evidence suggests that today's >400 breeds of dogs have been the object of artificial selection for at least 14 000 years when dogs also were considered to have been domesticated (Akey et al. 2010). A recurring finding in archaeology is the burial of dogs dating as far back 12-14 000 years. This suggests that humans had social bonds with dogs and were reacting similarly to the death of a dog as to the death of another member of the family, compared to other pets and livestock that are buried much less frequently (Morey 2006). Recent findings in northern Israel revealed two dogs and three humans buried together in the same grave and placed in an elaborate way. The findings were dated back to late Natufian when people lived in hunter/gatherer communities in the Levant area (East Mediterranean). Comparing the morphology of these Natufian findings with later Neolithic domestic dog findings reveals differences such as that Natufian dogs, although domesticated lacked the crowding of teeth that the later Neolithic dogs have due to shortening of the snout. This concludes the fact that there is no evidence of the Neolithic dog being a direct descendant to the Natufian dog suggesting a possible re-domestication or import of dogs from areas outside the Levant (Tchernov & Valla 1997). This implies that humans for about 14 000 years have appreciated-, utilized and even traded dogs for their impressive senses and abilities.

1.2.2 Physiology

Probably the most impressive attribute that dogs possess is the ability to detect scent. Dogs have three types of receptors to detect scent or odour stimulants (Gustavsson et al. 2010). The olfactory epithelium located in the back of the nose cavity is capable of distinguishing between a potentially infinite numbers of chemical compounds with certain properties at very low concentrations (Ohloff 1994, cited in Leffingwell 2002). The area of the olfactory epithelium in humans is much smaller, 3cm² (Albone 1984, cited in Browne et al. 2006) than the dogs, which can range between 18 to 150cm² (Dodd and Squirrel 1980, cited in Browne et al. 2006). The large olfactory area is what gives the dog a more sensitive smell than that of a human (Syrotuck 2000, cited in Vang 2009). The second type of receptor is the "trigeminal nerve" or fifth cranial nerve receptors. These trigeminal receptors produce effects described as hot, cold or irritating. For example menthol at low concentrations produces a feeling of cold and capsaicin stimulates the trigeminal response of hot (Ohloff 1994, cited in Leffingwell 2002). The trigeminal system is what is thought to trigger certain defence reaction in dogs (Gustavsson et al. 2010). The third type of receptors is the vomeronasal organ or Jacobson´s organ that is sometimes referred to as “the sixth sense”. Although structurally similar to the main olfactory system, the vomeronasal organ is functionally different and is responsible for the reception of pheromones and other chemosignals that are emitted from conspecific individuals or from prey (Halpern 1987). All three of these sensory systems can be active and contribute to the “smell image” experienced by the tracking or searching dog (Gustavsson et al. 2010).

1.2.3 Medical use

Dogs are an important part of the modern society of today acting as workers, companions and pets. In addition to regular home pet owner there are some larger employers who utilize dogs in more professional ways for example detection or search dogs in the border patrol (Edholm 1993). A rapidly increasing field today is the use of dogs in medical research. Lung and breast cancers are the leading causes of cancer related mortalities worldwide and early detection is important to allow surgical resection. In matter of weeks regular household dogs could be trained to accurately distinguish between breath samples of cancer patients and control samples (McCulloch 2006). Horvath et al. (2008) hypothesize that ovarian carcinomas are specified by one specific odour and that dogs can be trained to identify that specific odour. Their studies showed that with training a dog could be taught to distinguish between different grades and types of ovarian carcinomas, including borderline tumours and healthy control samples with a 100% sensitivity and a 97,5% specificity (Horvath et al. 2008).

1.2.4 Enforcement use

Due to the growing fear and occurrence of terrorism around the world, explosives detection dogs have grown to be the largest group of working sniffer dogs (Gazit and Terkel 2003). An adjacent field is mine detection dogs whom play an important part in ridding the world from somewhere around one hundred million scattered landmines (McLean 2001). There is currently no man made detectors that can detect as wide range of explosive devices as dogs can (Habib 2007), and currently it is estimated that dogs are 10,000 times more sensitive to substances associated with landmines than the best detectors (Sieber 1995, cited in Habib 2007). It takes a 12-man team a full day to locate and disarm a mine that took two minutes to arm and place. With three hundred thousand wildlife and domestic animals killed by landmines only in Afghanistan over the last ten years, not to mention the number of people killed and maimed in the world, dogs are an excellent addition to the minesweeper team (McLean 2001). Also serving in the military, rescue or police are dogs who find residue of accelerants at fire scenes and substantially benefit the investigation process (Tranthim-Fryer 1997; Gialamas 1996), dogs who detect; contaminated soil in farmland, illegal drugs in customs, airports and schools, human remains or cadavers, chemical weapons, concealed persons, currency, gas leaks, guns and ammunition, missing persons and many more objects (Crook 2000; Lorenzo et al. 2003).

1.2.5 Wildlife research use

Researchers find use of dogs to detect biological scents in wildlife research as detector dogs aiding researchers in finding species who are often rare and sparsely occurring such as the desert tortoise in the Mojave (Cablk et al. 2008; Cablk and Heaton 2006), the bush dog in Argentina (Dematteo et al. 2009), Bobcats in New Mexico (Harrisson 2006), black-footed ferrets after reintroduction in South-Dakota (Reindel-Thompson et al. 2006) and although not rare, but sparse rodents in pest-free sanctuaries in New Zeeland (Gsell et al. 2010). In wildlife management it is very important to be able to accurately quantify the number of individuals of certain species to apply the correct management plan. Although expensive and time consuming, genetic analysis of DNA in faecal or scat provides managers with just that information. In a study by Wasser et al. (2008) it was concluded that scent matching dogs successfully could distinguish between 25 out of 28 samples from six maned wolves (*Chrysocyon brachyurus*). Thus the use of scent matching dogs can reduce the number of duplicate scats for genotyping, reducing the cost of this management action. This was also tested on amur tigers in Lazovsky State Nature Zapovednik and found to be a fairly reliable method to identify individual tigers (Kerley and Salkina 2007). Using dogs to find scat may greatly increase the number of recovered scats and is used in wildlife management of kit fox (Smith et al. 2005), in grizzly and black bears in the Yellowhead Ecosystem, Alberta, Canada (Wasser et al. 2004) or to successfully detect the invasive small indian mongoose on Okinawa, Japan in order to protect endemic species of the Yambaru region (Fukuhara et al. 2010) or to find and prevent possible spread of the pest species, brown tree snake to export destinations outside of Guam (Engeman et al. 1998).

1.3 Identification dogs

1.3.1 Identification search dog

The id dog or identification dog is a term that can be applied to two general types of dogs, the id search dog or the id track dog. These two groups of dogs differ mainly in the way they work. An id search dog normally works in a laboratory environment pairing scents with high accuracy. The pairing is performed in strict forms with certain manners of repeating and repositioning the correct sample amongst a number of “fillers”. This is normally done four times with six samples including the correct one leaving us with the probability of 1/1296 that the dog chose the correct sample all four times (Gustavsson et al. 2010).

1.3.2 Identification track dog

The other type of id dog is the id tracking dog. The id tracking dog typically works on scene in situations where they are presented to and expected to follow a scent of a person or animal. This is done in real life situations almost in every location possible where crossing tracks from same species and other disturbances complicate the task. The id tracking dog is trained to identify the track after being presented to a “smeller”, a scent sample collected or found on location. This could be an item from a missing person, the throttle on a car after a hit and run or some hair stuck in the fender of a car after a wildlife collision. This is done to ensure that the object tracked is one and the same as was involved in the situation. The smeller procedure is also what differs between the regular tracking dog and the id tracking dog (Gustavsson et al. 2010).

1.4 Wildlife collisions

Collisions between motor vehicles and wildlife are important issues in Swedish management and safety politics. It is estimated that the cost of wildlife collisions to society is around 1500 million SEK annually (Riksdagen 2009). Sweden has 220 800km roads that are either owned or financed by the government (Trafikverket 2010). Adding to this is a large number of private gravel roads webbing Sweden's large forest areas. In 2008 Trafikverket calculated that Sweden's estimated 6 million registered vehicles approximately drove 74 Billion or $74x10^{9}$ km on only the government owned, 144 900 km, roads (Transportstyrelsen 2010). A very rough estimate is that the average vehicle spends approximately 12 000 km running on governmental roads annually, a distance that takes 240 hours to drive if average speed was set to 50km/hrs. Sweden is home to some potentially very dangerous factors and conditions like snow, ice and the risk of colliding with some very large and sometimes dangerous animals. Collisions with moose, red deer, fallow deer, wolf and brown bear add to the regular hazards while driving a motor vehicle.

Between the year 2003 and 2007 the number of wildlife accidents have been relatively constant in numbers differing between 33136 in 2003 and 35166 in 2007 or in total less than 3,5% difference between years. However, from 2007 to 2008 the number of accidents increased by 13,85% or 4869 collisions (Nationella Viltolycksrådet 2009). Sweden is also in the middle of a great expansion in numbers of certain type of wildlife such as fallow deer, red deer and wild boar. This can be seen in the number of wildlife collisions they have been involved in during the last six years. Between the years 2003 and 2008 the sum of deer collisions increased by 107% and wild boar increased by 226% (Nationella Viltolycksrådet 2009). The most recent data available at Nationella Viltolycksrådet at the time of study reveals that between the years 2008 and 2009, January to November the wildlife collisions with Fallow deer and wild boar have increased with 27.2% respective 30.7%. In total there is a 9.8% increase in wildlife collisions now totalling 39472 accidents until November 2009. Out of this 9.8% or 3531 collision increase the roe deer alone accounts for almost 59%, wild boar and moose 20% and fallow deer a mere 4,4%. The additional game species involved in vehicle collisions have increased less than one percent respectively (Nationella Viltolycksrådet 2010). When considering that fallow deer and wild boar commonly live and move in groups, the expansion mentioned earlier is even more alarming as several animals might be on the road causing multiple injured animals. Another effect of this phenomenon is that even though only one animal is hit, multiple animals on site at time of accident vastly complicate the tracking process for the trackdown unit. While fleeing the animals might cross tracks with the injured animal thus making it harder for the tracking dog to single out which track to follow. The largest group sizes of female fallow deer appear in winter and spring (Thirgood 1996) and this is also the time when most accidents with fallow deer occur (Nationella Viltolycksrådet 2010). High frequencies of road collisions are however also associated with species breeding activities and dispersal (Case 1978). This combination of communality, rut season and hunting increases the risk for collisions during late autumn and winter.

1.5 Trackdown and hunting ethics in Sweden

In Sweden hunters are obliged by law to [within two hours from firing at a game species] have access to a tracking dog that is specially trained to track injured game (Jaktförordning 1987:905). This is applied when hunting bear, wolf, wolverine, lynx, moose, deer, roe deer, mouflon or wild boar. When hunting for pigeons, geese or ducks it is required to bring a dog that can retrieve or accent shot birds unless the hunting is done on snow covered land, from a boat on open water or along the coast with decoys (Jordbruksdepartementet 2010). Tracking down injured wildlife to ensure that the animal suffering is minimized is an important task either if the cause is traffic or if it is hunting. The trackdown organization in Sweden is administrated by Nationella Viltolycksrådet, a national cooperation agency. The police, the county administrative boards, Swedish hunters association, EPA, SOS alarm are a few of the stakeholders who are involved in Nationella viltolycksrådet and address the wildlife collision problems. All of Sweden's 21 counties are included and every county has a Police officer and a Hunter who work together in making sure that the organization of trackdowns and teams work properly. When a motorist calls an emergency call to report a wildlife collision, SOS forwards the call to the Police county communication central (LKC) where the motorist states where, with what, when and how the collision occurred. The motorist is then asked to place an indicator where the accident occurred in order to aid the trackdown team in finding the place later. The police then notify the contact person responsible for that specific cluster of roads and he or she distributes the task to the teams who execute the trackdown (Nationella viltolycksrådet 2010). The person who has the rights of hunting on the property or the landowner if not the same are if possible notified that the police have issued an order of a trackdown on the property.

From January 1, 2010, motorists in Sweden are obliged to report accidents and collisions with certain species of wildlife. The species comprised by this regulation are bear, wolf, wolverine, lynx, moose, deer, roe deer, otters, wild boar, eagles and mouflon. Motorists are also obliged to place a marker where the collision took place. The trackdown teams working in Sweden are entitled to a reimbursement per trackdown performed. The size of the reimbursement is based on species type where bear, wolf, wolverine and lynx entitle 1900 SEK, moose and wildboar 700 SEK and other species 400 SEK (Naturvårdsverket 2010). It is part of the ethical standards that Swedish hunters follow to minimize the animal suffering when hunting. Sweden has about 265 000 hunters that annually purchase the hunting permit from the Swedish Environmental Protection Agency (EPA). The Swedish Hunters Association, the largest hunters association in Sweden, continually stresses the importance of high moral and ethical standards amongst it's approximate 200 000 members arranging educational activities and other events that target the problem of wounding game while hunting. These events might be shooting with an instructor to reduce wounding frequencies for certain game types such as brown bear, where 20 000 hunters took the course “Björnpasset”. This has led to a significant reduction in wounded bears in a short time (Svenska Jägareförbundet 2010). The Swedish hunters association strive towards a zero percent wounding but mistakes of course happen (Svenska Jägareförbundet 2010). Even if no animals were wounded during hunting there still exist the problem of wildlife collisions and the injured animals that the trackdown teams have to resolve in a fast and secure manner that ensures that all injured animals are euthanized without prolonged suffering. The finding of wounded and injured animals is a growing topic today, and is of importance to hunters not only because of empathic or economic reasons, but also because the people who are opposed to hunting use this as an argument against hunting putting the Swedish hunting traditions at risk.

1.6 Training techniques

Traditionally the training of a tracking dog in Sweden is done by dragging cloven hooves or other animal parts through the forest while typically dripping animal blood from a bottle along the way to simulate a wounded animal (Håkansson & Thulin 2010). There are some problems with these techniques however, for example blood from a domesticated species (e.g. cow) when dragging a piece of a game species (e.g. roe deer) in a familiar pair of (human) rubber boots, so it is hard to know for certain what is actually rewarded if the dog reaches the end of the track (Gustavsson et al. 2010). Questions are also raised about always performing these simulated tracks in vegetation since the dog might react to the smell of crushed vegetation instead of the actual tracking object. Failure to train the dog to track on tarmac or gravel and in varying surfaces might make the traditionally trained dog loose interest or fail to follow when animals cross roads in a real life situation. A dog following a track of crushed vegetation might also be more prone to switch tracks when a fresher one crosses its path since it might signal closer proximity to an animal.

In brief, training an id or identification dog is done in steps. The first step is to train the dog to distinguish between scents and is done by presenting the dog to a smeller and leading it on to a number of samples where one is correct and the others are “fillers” (i.e. other smells). The dog is rewarded instantly as it shows interest in the correct sample. This ensures that the dog understands what it is supposed to do.

When the dog is able to distinguish scents the next step is to present the dog to a very easy track, preferably manmade on a hard surface. The key point here is to learn to read your dog’s signals and act accordingly. When the dog lowers its nose on the track the handler signals correct behaviour by making a small forward motion as opposed to just standing still if the dog shows a lack of interest in the track or has a high nose. An item from the person who had laid the track was used as a smeller. Gradually, as the handler and the dog get better, the tracks are made longer and on various surfaces with different track ages to ensure that the dog doesn’t just track on certain surfaces or fresh tracks. The major difference between an id trained dog and a traditionally trained dog is mainly how they pick track and commence tracking (Gustavsson et al. 2010). Traditionally trained dogs often choose the freshest track or the type of track that they are used to follow based on animal type, track age or the handlers track, while the id trained dog takes on the track that matches to the scent of the ”smeller” that it is presented to.

1.7 Hypothesis

The purpose of this study is to evaluate if identification training dogs may result in more accurately working trackdown teams increasing the success rate for searches of accidentally damaged game (in traffic and hunting). I hypothesized that identification trained dogs are more accurate or precise in following a track than traditionally trained dogs and are therefore less likely to switch tracks between individuals yielding a higher percentage of successful trackdowns in live situations. Secondly, I hypothesize that is more difficult to perform a successful trackdown on group-living wildlife than on wildlife with a solitary social structure. In addition, a number of parameters of trackdown procedures are tested by analyzing forms/reports from trackdown units. The results are important for the development of trackdown training methods that can be used to educate trackdown dogs to the highest level possible.

2 Methods

2.1 Handlers and dogs

10 Volunteering handlers were used in this study and varied in sex, age but all with general experience in finding damaged wildlife. In the project design the handlers were to include both a dog to be trained in id tracking and a dog that would continue the traditional way of training trackdown dogs. 14 Dogs were included in this study, male and female, pure and mixed breed and with ranging age the youngest being just over one year when the project started. Among the most common breeds included in the project were Deutscher Wachtelhund and Bavarian Mountain Hound but Labrador Retriever and Spitz-dogs as well as mixed breeds were represented. In the experimental design, dogs were allocated into the two categories, id trained and traditionally trained. When engaging in a trackdown the handlers were instructed to choose what category of dog to use by random i.e. by flipping a coin.

2.2 Identification dog training

The training of the id dogs involved in the study was done by the handlers under supervision of experienced dog trainers. Five organized training meetings were initially held to educate handler and dog in both physical and psychological aspects of training dogs as well as the id training itself. The handlers were individually instructed about what they had to work with until the next meeting. Training was focused on mainly two aspects where the initial step was to make the dog understand how to pair identical scents and the second step was the tracking itself. The initial training was done using a number of pottery pots turned upside down and placed in a line about 70 centimetres apart. The pots were simply used because the simplicity in finding locally and the low cost allowing them to be discarded after use, but any type of non-see-through container with scent escaping abilities could have been used. A substance was then placed in one of the containers as well as in a glass jar letting the later act as a smeller to the dog. The substances used initially were all household items such as tea or coffee and importantly not associated with food or reward. The handler then presented the smeller to the dog and proceeded forward to the line of pots allowing the dog to sniff in each pot until the correct was reached and plenty of rapid reward (clicker, verbal or treat) was given the dog. Eventually the dogs indicated in different ways which pots were the correct ones. As the dog understood the principle of the exercise similar scents were placed under the other pots. When repositioning the pots careful attention was paid to touch all the pots to contaminate all the pots instead of just the ones moved in order to not let the dog take shortcuts in finding the right pot. As progress occurred, difficulty level was raised and eventually unique collected scents from fallow deer were placed in four pots. This procedure is also done to ensure that the dog have the right receptors to separate between interspecies individuals (Gustavsson et al. 2010). Careful attention was put into varying samples involved in the scent matching process as to minimize the risk of training the wrong behaviour when in real life tracking, where the ability to track a number of different species is desired.

The tracking training commenced on hard surfaces such as gravel or tarmac and was exclusively done on human scent and the tracks were laid by the handler himself, other handlers or family and friends. In the early stages short, straight and simple tracks were laid and focus was placed on rewarding correct behaviour and motivating the dog to work. At first the dog was presented to the track in the right direction but as the tracking behaviour improved track length and age was increased as well as were turns and distance to the track start. When the level of certainty was elevated so were the difficulty of the track and the variation of surface from tarmac and gravel roads to fields, forests to paddocks and so on, confusing with crossing tracks from other people, and other disturbances. Care was put into not accelerating the difficulty too much and taking a few steps back to simpler tracks if the dog displayed difficulties with the track. Initially the handler was instructed to track 6-8 human scent tracks per week over two or three days with the same difficulty level but longer as were trained during the last gathering. Each handler was also instructed to send in a training journal so the training process and progress could be evaluated and an individual progression plans for each dog could be formulated.

2.3 Project test criteria

To be able to categorize the project dogs a number of test criteria were set.

1. Be able to positively match the smeller with the correct pot by indication in a scent discriminating test with four pots containing scents from unique Fallow deer individuals.
2. Be able to after being presented to a smeller, pick the right track from three parallel human tracks and follow it for at least 300 meters over at least three different surfaces.
3. Be able to after the smeller procedure pick and follow the track of a GPS collared fallow deer for at least 300 meters. In the last criteria a known GPS position of the deer was approached in direction of the wind after presenting the smeller to the dog to minimize the risk of a wind carried scent distracting the dog and possibly misplacing the track start on the GPS.

2.4 Trackdown reports

To collect the data from the live trackdowns a questionnaire was distributed to the 10 dog handlers. The dog handler was instructed to fill it in as accurately as possible leaving no detail, however negative or embarrassing they might be. The dog handlers were assured full anonymity as to performance, date and outcome of each tracking event. When filling the report they also answered standardized questions and contained variables about the tracking. Data included whether the cause of the trackdown was hunting or traffic related, data about track length and age, dogs, track signs, outcome, area of injury and various details about the trackdown event that can be read more about in Appendix 1. In addition, the questionnaire contained space for additional comments about the trackdown.

2.5 Data processing

The data reported by the trackdown teams was entered into Microsoft Excel where basic statistical analysis was initiated. To simplify the illustration of data some definitions were made and need explanation.

1. Successful trackdown – Is when the team successfully tracked the animal and were able to either assess it as uninjured, euthanized or if it were found already dead.
2. Unsuccessful or failed trackdown - Was used when tracking failed to provide evidence of an uninjured animal or when evidence of the contrary existed and no animal could be found by the specific dog included in the trackdown project.
3. Assessed uninjured – As opposed to nr 2 the trackdown team successfully tracked an animal and were either able to see and evaluate the animals behaviour and health, or were not able to find anything that indicate an injured animal.
4. Injured animals not found - This class was created to see how the groups would differ in total fulfilment after passing failed trackdowns to other dogs or trackdown teams.
5. Group living – Species with a flocking behaviour. Included species are fallow deer, red deer, mouflon and wild boar.
6. Solitary – Species who do not regularly have a flocking behaviour. Included species were hare, roe deer and moose.
7. Traffic – Trackdowns caused by wildlife collisions with cars, busses, motorcycles and trains.
8. Hunting – Trackdowns caused by hunters who accidently wound instead of kill animals.
9. Found dead – The trackdown team successfully tracked an animal that was dead upon arrival.
10. Euthanized – The trackdown team were able to successfully track and kill an injured animal.

All reports were not complete in details and those lacking data were excluded from calculations to not influence the outcome.

2.6 Statistical analysis

Basic statistical analysis was performed in Microsoft Excel 2010 and also calculated manually. A Chi-square contingency test ($\chi^2=\Sigma(O-E)^2/E$) was calculated and the P value was determined from a Chi square distribution table with one degree of freedom, df =(Collumns-1)*(Rows-1)=(2-1)*(2-1)=1. To further specify the P value a Chi square test that yielded an exact number was performed in Microsoft Excel 2010. The function name is

CHISQ.TEST (actual_range;expected_range) and is found in Microsoft Excel 2010 with the explanation, ”Returns the test for independence: the value from the chi- squared distribution for the statistic and the appropriate degrees of freedom”. Since the sample sizes were fairly small a Fishers exact test was used to see if differences in significance would show from the Chi square test. The Fishers exact test (nCj=n! / j!(n-j)!) was also performed in Microsoft Excel 2010 under the function FET. Multivariable analyses were performed in Minitab 15 as well as in JMP 8.

3 Results

3.1 Training method

A total of 173 reports were used in the study with a total success rate of 77,5% (*Table 1*). In total the trackdown teams did not find 28 animals that were not known to be uninjured. The group of id trained dogs had a slightly higher success ratio (49/60) than traditionally trained dogs (85/113) (*Table 1*). This was however not statistically significant with a P value between $0,30<p<0,50$ (*Table 4*).

Table 2. Overview of the tracking reports, showing basic statistics of successful and failed tracking, cause of tracking and the number of injured animals not found.

Training method	Number of track reports	Successful %	Failed%	Caused by hunting	Caused by traffic	Injured animals not found
Total	173	77,5%	22,5%	68,8%	31,2%	16,2%
		134	39	119	54	28
Id trained	60	81,7%	18,3%	56,7%	43,3%	5,0%
		49	11	23	26	3
Traditionally trained	113	75,2%	24,8%	75,2%	24,8%	22,1%
		85	28	57	28	25

Thus I could not establish that there is any significant difference in successful trackdowns between id trained and traditionally trained dogs that are involved in this study.

There was however a significant difference between the two categories of training as to how often the trackdowns resulted in the handler being able to assess the animal uninjured ($0,0001<p<0,001$) in favour of id training (*Table 4*).

A parameter that emerged during the analysis was the injured animals not found, and there were significant differences between the two training methods in favour of id trained dogs. 3 reported out of 60 vs. 25 out of 113 yielded a bracketed P value of $0,001<p<0,01$ (*Table 4*). Thus the main hypothesis was partially supported by this study.

The species that seemed to be worth evaluating further according to number of reported trackdowns were roe deer, wild boar and moose that all had a minimum of 13 reports in each category (*Table 2*).

Table 3. Overview of the different species that were tracked in total and by training method, as well as the failed trackdowns in number, percent per species and percent of total failed in category.

Training Method	Fallow deer	Red deer	Mouflon	Roe deer	Wild boar	Moose	Other	Total
Total	34	5	2	39	64	24	5	173
Failed	11	0	1	6	16	5	0	39
% failed of species	32,4%	0,0%	50,0%	15,4%	25,0%	20,8%	0,0%	
% failed of total	28,2%	0,0%	2,6%	15,4%	41,0%	12,8%	0,0%	
Id Trained	4	2	1	16	22	11	4	60
Failed	0	0	1	2	6	2	0	11
% failed of species	0,0%	0,0%	100,0%	12,5%	27,3%	18,2%	0,0%	
% failed of total	0,0%	0,0%	9,1%	18,2%	54,5%	18,2%	0,0%	
Traditionally trained	30	3	1	23	42	13	1	113
Failed	11	0	0	4	10	3	0	28
% failed of species	36,7%	0,0%	0,0%	17,4%	23,8%	23,1%	0,0%	
% failed of total	39,3%	0,0%	0,0%	14,3%	35,7%	10,7%	0,0%	

No significant differences could be found between the two training methods when testing the trackdown success on these three species. Neither were any significant differences in success found amongst the other species even though differences in numbers existed.

The success rates of the two categories of training on group living and solitary animals were slightly shifted towards a higher level for the id trained dogs. The P value between $0,7<p<0,8$ for group living and $0,2<p<0,3$ for solitaire animals however did not reveal any statistically significant difference between the two categories of dogs.

Table 4. Overview of the number of failed trackdowns separated by the tracked animals flocking behaviour.

Training method	Group living	Solitaire
Total	105	68
Failed	28	11
Failed in percent	26,7%	16,2%
Id Trained	29	31
Failed	7	4
Failed in percent	24,1%	12,9%
Traditionally trained	76	37
Failed	21	7
Failed in percent	27,6%	18,9%

Illustrated in *Figure 1* and *Figure 2* are the reported data of track age and track length. From these data it was hard to extract testable variables therefore an illustrative figure displays that most trackdowns were commenced within 30 to 120 minutes after the injury had been inflicted. After 210 minutes a visible dip in percent successful trackdowns occurs, also between 150 to 180 minutes although not as obvious. Track length is clearly correlated to success ratio and a trend is showing even though number of reports decrease as length increases rendering the data useful only as visual evidence.

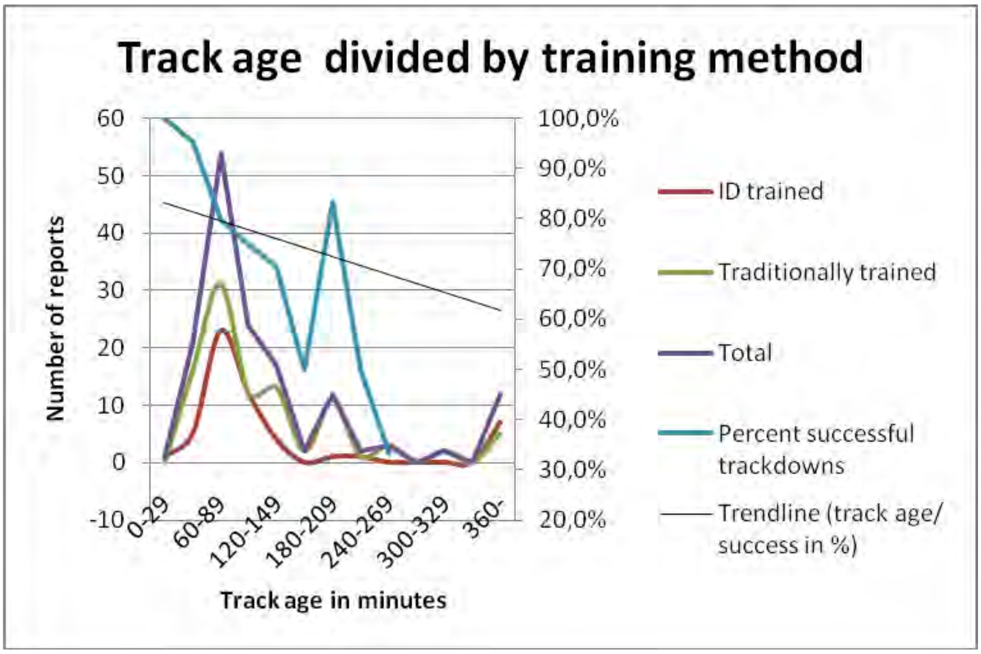

Figure 1. Displays the track age before tracking commenced in intervals of 30 minutes divided by training method. The track length of both groups together is compared to percent successful trackdowns per track age class.

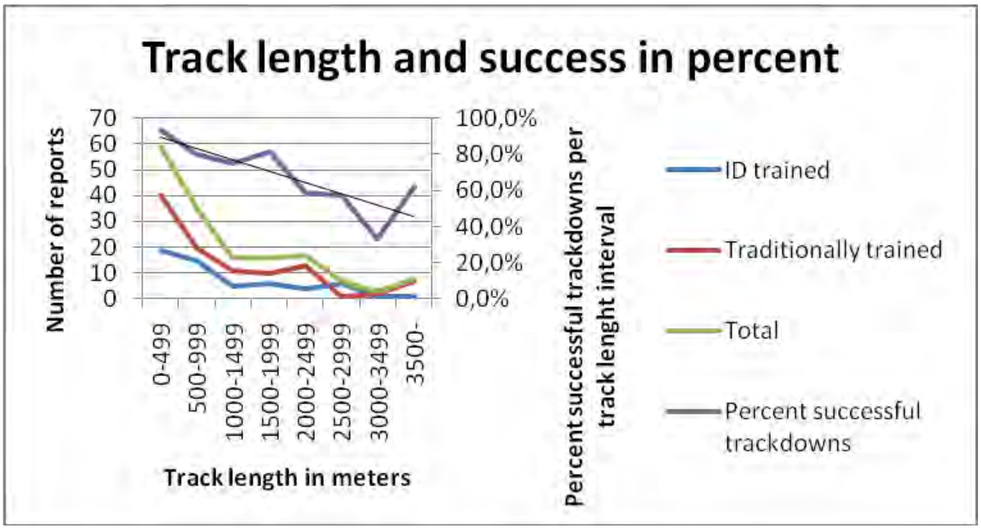

Figure 2. Shows the relationship between track length and successful trackdowns.

Outcomes of the reported trackdowns for the categories, Successful, Found dead and Failed were not significantly different between the two training methods with P values between $0,2<p<0,4$. There was however a significant difference when between the two training methods of 30% (*Figure 3*) respectively 9% (*Figure 4*) assessed uninjured, the larger percent belonging to the id group. The bracketed P value of a Chi Square contingency test was 0,0001<p<0,001 (*Table 4*).

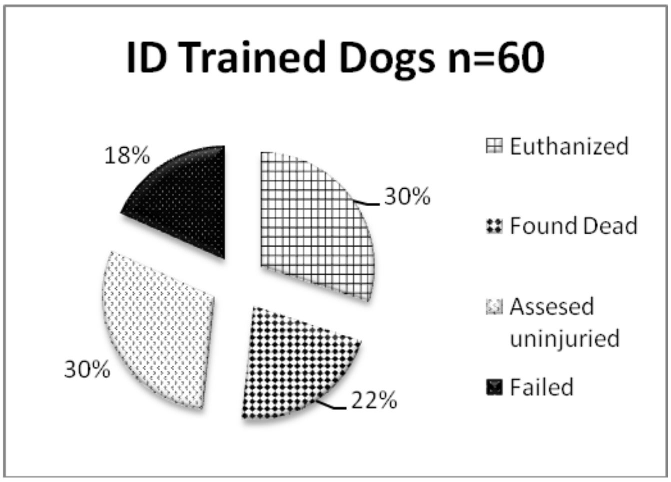

Figure 3. Displays the outcome of 60 trackdowns with id trained dogs were euthanized stands for animals that are spotted and killed by the trackdown unit, dog handler or involved hunter. “Assessed uninjured” meaning that the trackdown team has gathered sufficient evidence that the animal is unharmed and the tracking discontinued. “Failed” means that the efforts of the trackdown unit to find the animal were insufficient and that the animal is not found. “Found dead” is when the trackdown unit found the animal dead along the track.

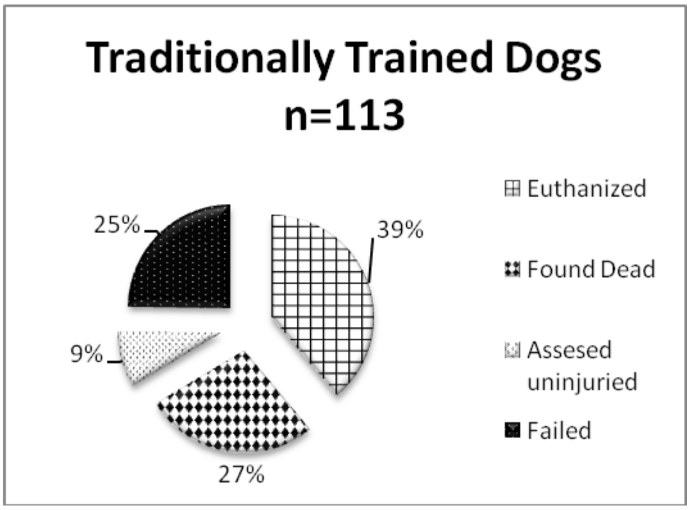

Figure 4. Displays the outcome of 113 trackdowns with traditionally trained dogs were euthanized stands for animals that are spotted and killed by the trackdown unit, dog handler or involved hunter. “Assessed uninjured” meaning that the trackdown team has gathered sufficient evidence that the animal is unharmed and the tracking discontinued. “Failed” means that the efforts of the trackdown unit to find the animal were insufficient and that the animal is not found. “Found dead” is when the trackdown unit found the animal dead along the track.

*Table 5. Shows the probability that the two groups; µ1 id trained dogs and µ2 Traditionally trained dogs are equal in performance according to the null hypothesis H0:µ1 = µ2. *Asterisk indicates a near significant value (trend).*

Explanatory variables	Chi-square contingency test; $\chi^2=\Sigma(O-E)^2/E$	1 df => Bracketed p	Excel chi-square	Fischers exact test; nCj=n! / j!(n-j)!	Reject null hypothesis H0:µ1 = µ2
Successful trackdowns	0,9324	0,30<p<0,50	0,33424	0,2208	No
Injured animals not found	8,4714	0,001<p<0,01	0,00361	0,0021	Yes
Successful traffic trackdowns	3,6472	0,05<p<0,1	0,05616	0,0573	No*
Successful hunting trackdowns	0,0925	0,70<p<0,80	0,76107	0,5243	No
Assessed uninjured	12,9238	0,0001<p<0,001	0,00032	0,0005	Yes

Track age was weighted against track length to search for visible differences between the categories of dog training. As seen in *Figure 6* no clear trends appeared between the two groups.

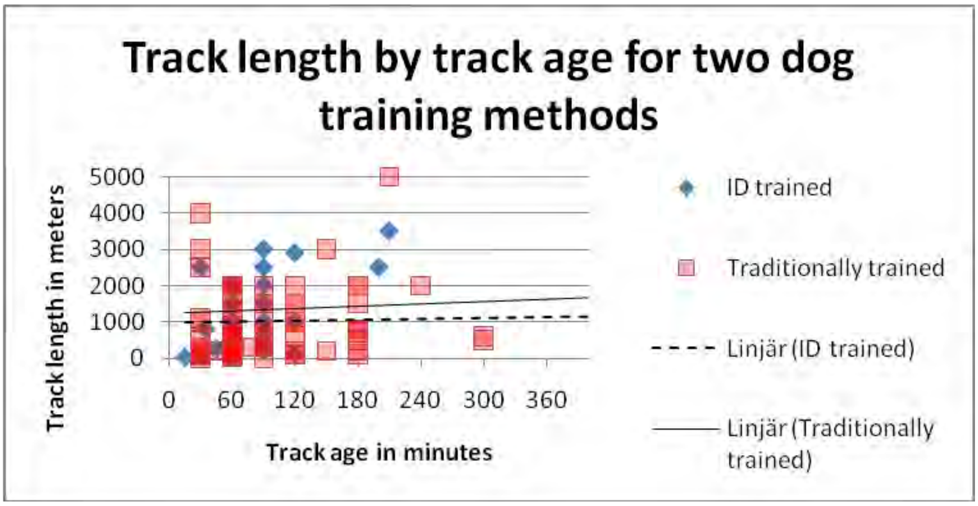

Figure 5. Illustrates the relationship between track age and track length for the two categories of training methods.

3.2 Cause of trackdown

No significant results could be found when examining the two causes traffic and hunting although a near significant p value was found when performing a Fishers exact test (P=0,056213) (*Table 5*) indicating that the trackdown group assessed traffic injured animals uninjured more often than hunting injured animals.

*Table 6. Shows the probability that the two groups of causes; µ3 Traffic and µ4 Hunting have equal outcomes in trackdowns according to the null hypothesis H0:µ3 = µ4. * Asterisk indicates a near significant value (trend).*

Explanatory variables	Chi-square contingency test; $\chi^2=\Sigma(O-E)^2/E$	1 df => Bracketed p	Excel chi-square	Fischers exact test; nCj=n! / j!(n-j)!	Reject null hypothesis
Successful trackdowns	0,878473	0,30<p<0,50	0,34862	0,231093	No
Injured animals not found	0,507675	0,30<p<0,51	0,476147	0,318575	No
Euthanized	0,851986	0,30<p<0,52	0,355991	0,226674	No
Found Dead	0,143825	0,70<p<0,80	0,704507	0,428078	No
Assessed uninjured	3,30041	0,05<p<0,10	0,069263	0,056213	No*

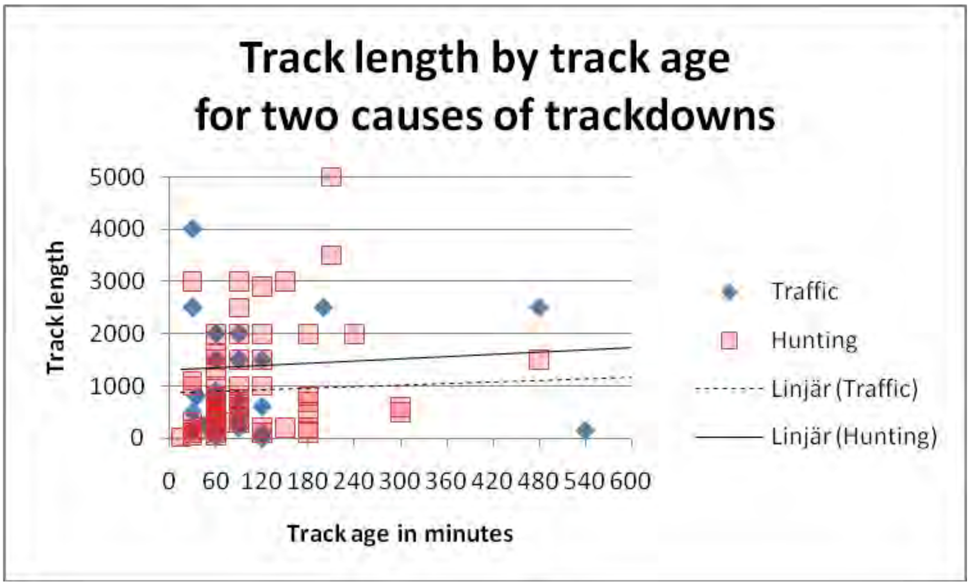

Figure 6. Illustrates the relationship between track age and track length for the two categories of trackdowns, traffic and hunting.

3.3 Social structure

The statistical analysis my secondary hypothesis that it is much harder to perform a successful trackdown on group living wildlife than on wildlife with a solitary social structure turned out to be insignificant when a Fishers exact test yielded P=0,1083(*Table 6*). Other categories however turned out to show significant differences between solitaire and group living animals. First the category, Injured animals not found received a bracketed P value of a Chi square test of 0,001<p<0,01 (*Table 6*) or 4 injured and not found out of 64 total for solitary and 23 injured and not found out of 105 for group living wildlife (*Table 3*). A very large difference appeared when examining the cause of injury (traffic or hunting) between the two types of social structure. It appeared that group living animals were involved in significantly fewer traffic accidents than solitary animals, Fischers exact test 1,67126E-07(*Table 6*).

*Table 7. Shows the probability that the two groups of animals; µ5 Solitaire and µ6 group living are equally difficult to track according to the null hypothesis H0:µ5 = µ6. * Asterisk indicates a near significant value (trend).*

Explanatory variables	Chi-square contingency test; $\chi^2=\Sigma(O-E)^2/E$	1 df => Bracketed p	Excel chi-square	Fischers exact test; nCj=n! / j!(n-j)!	Reject null hypothesis
Successful trackdowns	2,012743	0,10<p<0,20	0,155983068	0,108270227	No
Injured animals not found	7,259334	0,001<p<0,01	0,007053343	0,004853794	Yes
Euthanized	0,029357	0,80<p<0,90	0,863958015	0,503422127	No
Found Dead	0,590841	0,30<p<0,50	0,442093925	0,296623252	No
Assessed uninjured	0,257204	0,50<p<0,70	0,612047768	0,430876232	No
Cause	27,96898	p<0,001	1,23276E-07	1,67126E-07	Yes

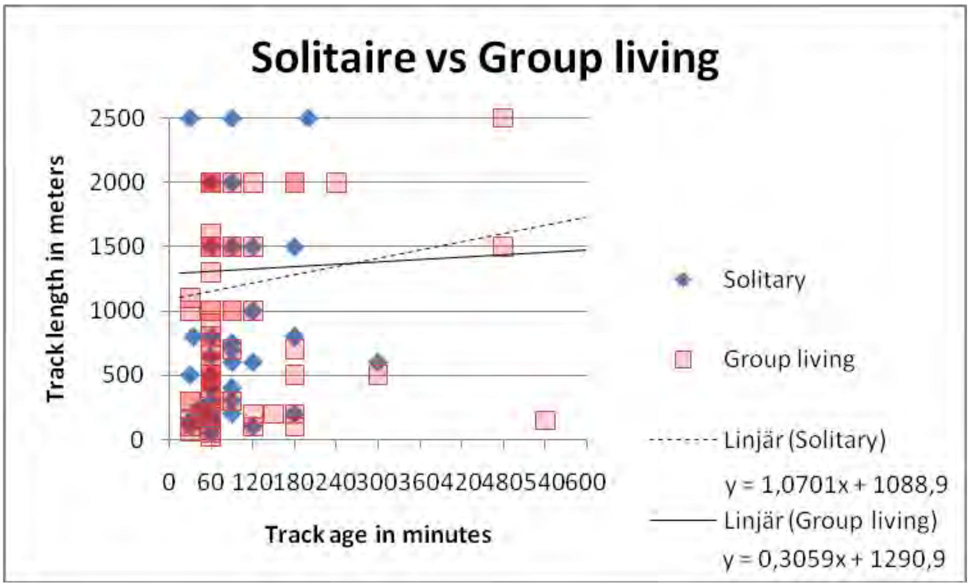

Figure 7. Illustrates the relationship between track age and track length for the two categories of animals, solitaire and group living.

4 Discussion

The first basic but very important finding in this study is that it was possible to teach a dog how to match scents in a relatively short time. This is important because the method is simple and available to any and every one with basic skills in dog training. The line-up of pots and the contents of these can be interchangeable with almost anything as long as the basic rules of variation, equal contamination and lack of visual cues are followed.

An often spoken phrase amongst Swedish hunters is “We followed the track until we came to the road but there we lost it” and although not a direct part of my hypothesis testing, I will after seeing how young and sometimes inexperienced dogs with relative ease, follow tracks on hard surfaces emphasize the importance of starting the tracking training on hard surfaces. As important as this is, as important is the education of the handler. To see and understand the signals your dog gives you, and know when and what signals you are sending back is every bit as important as the tracking training itself.

The experimental design allowed me to try various parameters after having received the reports and this led to additional hypothesis testing. This produced one of the more interesting results, a near significant value (P= 0,056213) on the null hypothesis, cause; traffic and hunting are assessed uninjured equally often. It turned out that the trackdown teams assessed animals as uninjured almost twice as often in traffic situations as in hunting situations. This may indicate a few things. That it is in fact harder to track wildlife that have been involved in collisions with motor vehicles since the animal often lack a penetrating wound that could cause the animal to loose bodily fluids and/ or leave more scent. The point being that even though the teams do not get to see and evaluate the health of the sought animal they find no evidence supporting that the animal is in fact injured. The opposite could also be true, that animals hit by cars are easier to track and can be visually inspected at a higher extent and therefore assessed uninjured more often. Another plausible cause is that it is more prestigious to track and find animals that are sought for in hunting situations, it can be important both for the trackdown team but also for the hunter. To the trackdown team because they maintain a high find percent despite the risk to euthanize the animal even though it actually had not been injured by the bullet according to the principle of “better safe than sorry”. This is often an ethical standard in hunting teams and there is a general understanding about the difficulty to examine an animal in the sometimes very rushed situations that occur in a trackdown. It is also important to the hunter since it is burdensome to know that your actions might have caused unnecessary suffering. An even more ethical theory to the result of this hypothesis is that when there is blood present in the track, it is very hard to claim that the animal is uninjured even though it might be much less severely injured than an animal which has been involved in a collision where injuries can be solely internal leaving no visible trace of injury. I hypothesize that the visual queue, i.e. blood at the scene of a trackdown will motivate the trackdown team to put more effort into finding the animal than if no visual queue is found. The hypothesis is at least to some extent supported by the number of trackdowns per group that ended in a situation where the sought animal was euthanized (traffic 30,9%, hunting 38,1%).

I will continue to discuss the closure type assessed uninjured but with two different categories. I substituted the cause, for type of training method. Here I was able to reject the null hypothesis that the two training methods are equal in this aspect (P=0,0005). Although no statistical evidence suggests that the id trained dogs in this project were any different than traditionally trained dogs when it comes to number of successful trackdowns (P=0,2208) I am still able to, based on percent values of successful trackdowns (ID= 81,5%, Traditional= 75,2%) hypothesize that the id trained dogs were somewhat better at finding the sought for animal and therefore able to provide the handler with enough evidence to assess the animal uninjured instead of having place it in the group of failed trackdowns even though not really belonging there. A thought that has to be addressed even though unpleasant is the risk of trackdown teams that were not serious. If a team that lack moral codes existed I imagine that it might be tempting for them to, if nothing is found and the dog loses interest of the track just assess the animal as uninjured instead of wasting more energy involving other teams. This is however not the case in this study. The teams involved in this project were known to be of high ethical standard and would not give up the search of a wounded animal with ease.

However, a disturbing result of this study was how often animals were in fact not found after both hunting and traffic incidents. It turned out that surprisingly many trackdowns did not either supply enough information to assess the animal as uninjured or, did supply information that the animal was in fact injured, but even though doubtlessly a lot of effort was put into finding the clearly injured animal for sometimes days and involving other teams to assist the animal was simply not found. There was a significant difference between how often injured animals were not found between the two groups of training methods studied (P=0,0021). This was 5% in the group id trained and 22,1% in the traditionally trained group. Since there was no significant difference in successful trackdowns (P=0,2208) between the two groups it is not safe to say that the id trained dogs had the benefit of taking the easy tracks and further study is needed. There is however a difference where id trained dogs succeeded 6,5% more often than the group traditionally trained. An important part of the study design was that the handler is supposed to randomize what category of dog to use in each trackdown. I believe that this was also the case in most situations. In cases when the handler quickly understood that the trackdown was going to be extra complicated and require a lot of concentration I hypothesize that the older and more experienced dog may have been chosen unconsciously. I.e. when an animal is hit by a bullet in the dorsal spinous processes a so called “bom and fall” effect is seen when the hunter first thinks that the animal died to moments later watch it get up as if nothing happened and run away. Other theories to this result is that the handlers with id trained dogs are better judging when assistance is needed thus eliminating effort spent on i.e. the wrong animal or healthy animals. This might have something to do with the basic training in understanding your dog's signals that was introduced early in the id training and continuously thereafter.

The analysis above suggests that there are some important differences between the two categories of training methods and this also indicated in a near significant difference in how often their trackdowns, caused by wildlife collisions ended up being successful (P= 0,0573). Now if id trained dogs were in fact better at tracking traffic injured wildlife as suggested in the first analysis then it would be fair to assume that they would have an even higher success rate if the cause were hunting, a seemingly easier task? This is however not the case, the id trained dogs succeeded in 92,3% of the traffic trackdowns and in only 73,5% of hunting trackdowns. This difference was near significant with a P= 0,0605. The traditionally trained dogs were more consistent but at a lower success rate, 72,4% traffic and 76,2% hunting, this was also supported by a P value of 0,5509 that indicates that no evidence supporting differences could be found. I tested the hypothesis to find if there were any significant differences between the two training methods also if the cause were hunting but found no evidence supporting differences (P= 0,5243). Could it be that the final outcome of the project was that the dogs that were trained in identification training became experts at tracking traffic injured wildlife but did not stand out compared to traditionally trained dogs when used to track hunting injured wildlife? Hypothesis testing this shows trends that support this theory, P= 0,0573 for traffic trackdowns and P= 0,5243 for hunting trackdowns between the two training methods. I reason that the dogs that were trained in id were better at finding traffic-injured wildlife because of the training they received. The identification training together with the focus on varying the training so that the dog felt comfortable tracking no matter what the surface was made of, paved roads, gravel, forest, rock and so forth. A commonly occurring problem in real life trackdowns is that the trackdown teams fail to commence tracking when the track starts on hard surfaces. Here I suggest that the id trained dogs who have done hard surface human tracking, have an advantage over the dogs that often have no training on these type of tracks and since traffic trackdowns involve hard surface tracking get a better percent successful trackdowns.

As I had anticipated there was a visible trend in how the social structure of the included species influenced the outcome. Species that had a solitary social structure seemed to be easier to track and although not being able to reject the null hypothesis my interpretation is that a P of 0.1083 supports the trend mentioned above and suggests further research. I examined how often solitary animals were left in the forest with injuries compared to the same criteria for group living animals. With a significance of 0.0049 I am able to draw the conclusion that group living animals are harder to find even after requesting help to track. This has also been expressed as truth among many trackdown teams. I hypothesize that the reason behind this is that group living animals confuse the trackdown team with crossing tracks. I also believe without being able to prove that wild boar is the biggest reason for this result. Their compactness and strong survival instincts in combination with confusing tracks make them survivors compared to the more fragile roe deer or big but traffic vulnerable moose. It is also important to remember that solitary animals are involved in wildlife collisions much more often than group living animals and this is reflected in my sample sizes.

It is important to remember that this research is based on a relatively low number of reports. Even though I have tested the hypothesis with a Fishers exact test that is appropriate when testing small samples I believe that the samples simply have been too small to give statistically significant results in some of the calculated variables that were originally meant to be included in the report.

The new Swedish trackdown database Viltolycksrådet is putting together (www.viltolycka.se) will in my eyes provide huge amounts of important data about handlers, teams and trackdowns. With the right definitions and the right entry fields such as dog certificates, information of wind, temperature and surface material and the option to upload the track from handheld GPS i.e. Garmin Astro that almost all trackdown teams carry today, I believe it to be the foundation of many studies to come. The GPS upload option can allow GIS analyzing of datasets from many perspectives. I.e. all trackdowns done by certain breeds can be plotted against other breeds and allow for analyses of typical tracking behaviour and trends etc. This option could if added provide enormous amounts of high quality data. My recommendation is also that a formal system of training and grading/certifying id trackdown dogs is to be standardized in cooperation with identification dog training experts to be able to ensure the quality of a dog trained in id. I.e. a dog that can perform a certain tracks without switching tracks or reacting to distractions after picking the right track from a selection of track starts might be a grade or certification level A. This can then be used to evaluate how training methods work in real life situation based on how much effort is put into training the dog in id compared to dogs without id grades. Since a large group of people has doubts and opinions about the wildlife track test (viltspårsprov) and its applicability to real life competence this might provide an alternative to it in terms of tracking performance.

5 Conclusions

To conclude the results of this study I would like to stress the importance of implementing new trackdown training methods in addition to the traditional Swedish trackdown training. We cannot accept the high rate of injured animals that avoid discovery both in hunting and traffic situations.

This study shows that it is possible to with very small means teach a dog some basic techniques of scent matching and tracking on hard surfaces. But most importantly this study reveals that with these few supervised training meetings, the handler was able to greatly improve the training conditions for the dog to benefit from the track training. Thus, not making the training too difficult for the dog, not accelerating the training to fast, learning to read the signals of the dog and knowing what signals the handler sends back to the do by their actions and finally and maybe most importantly, motivation. Understanding that the dog does not track only to please the handler, they do it to get benefits for themselves i.e. treats, appreciation etc. and if none are ever given then the dog will not want to work.

Further studies in this area of dog training is definitely needed and it would be important to the Swedish hunters and government if a study that examined trackdowns were done to compare the performance of dogs that have a formal examination of identification training to traditionally trained dogs of experienced trackdown teams in Sweden.

Appendix

Trackdown report/ Tracking journal – English

Handler Name:…………………………Adress:…………………..…………..Phone:……………………
Dog name:……………………………………….Reg.nr:………………Trackdown date:…..…………
Division:…………………… County:………… Trackdown commenced- time:………..…Terminated-time:………………
Species:………………… Sex:………..…Approximate age:………..

A. Cause of injury
A.1.Traffic (SES-form). Car □ Train □ (If cause is traffic, don´t fill out B)
A.2. Shot at in hunt □ A.3. How old was the track? …………… hrs

B. Hunting
B.1. Shot at with bullet □
B.2. Shot at with buck shot □
B.6. Was the shooters position marked? Yes□/No□
B.3. Caliber/Buckshot size ..….... Shots fired nr.…....
B.7.Was the animal position/ bullet hit marked? Yes□/No□
B.4. Distance to animal ……..….m
B.8. Did the shooter try to find the animal? Yes□/No□
B.5. Did the animal stand still at the moment of the shot? Yes□/No□
B.9. Did the shooter see or hear more animals? Yes□ /No□

C. Tracking
C.1. Blood/ other signs on the shot/place of accident? Yes□/No□
C.2. Blood/ other signs along the track? Yes□/No□

D. Trackdown dog/ dogs?
Loose dog □ Dispatch dog □ Tracking dog □

E. Outcome
E1. Animal; Found dead □ Euthanized □ (track length……..…...m.)
E.2. Euthanized by: positioned hunter □ dog □ trackdown team □
E.3. Animal assessed uninjured Yes□/No□
E.4. Animal injured but not found Yes□/No□
E.5. Trackdown passed on □ (to…………………………………………..…)

F. Position of injury (wound)
Head □ Neck □ Front legs □ Shoulder □ Heart □ Lungs □ Withers □ Midriff□ Loin □ Rumen □ Guts□ Thigh□ Backlegs □ Else?…………………………
Other comments

……………………………………………………………………………………………….……………
………………………………………………………………………………………….…………………….....………
……………………………………………………………………………………….……………………....………………
………………………………………………………………………………..………………………....

The authenticity of the above is certified by (Hunting team leader or equivalent)

………………..…………………………

Eftersöksrapport / Spårjournal - Swedish

Hundförarens Namn:…………………………Adress:………………….…………..Tfn:……………………
Hundens namn:………………………………………Reg.nr:……………….Datum för eftersök…..…………
Krets…………………… Län………… Eftersöket påbörjat kl………..…avslutat kl:………………
Viltart:………………… Kön:………..…Ung.ålder:………..

A. Skadeorsak
A.1.Trafikskada (SES-blankett). Bil □ Tåg □ (vid trafikskada, fyll ej i avdelning B)
A.2. Påskjutet vid jakt □ A.3. Hur gammalt var spåret? …………… tim

B. Vid jakt
B.1. Påskjutet med kula □
B.2. Påskjutet med hagel □ B.6. Var skyttens plats markerad? Ja□/Nej□
B.3. Kaliber/hagelgrovlek ..… Antal skott.…..... B.7.Var skottsplats / djurets plats markerad? Ja□/Nej□
B.4. Skjutavstånd …….….m B.8. Har skytten själv gjort något eftersök? Ja □/Nej□
B.5. Stod djuret stilla vid skottögonblicket. Ja□/Nej□ B.9. Sågs eller hördes flera djur? Ja□ / Nej□

C. Spårning
C.1. Blod/andra spårtecken på skottplats/olycksplats Ja□/Nej□
C.2. Blod/andra spårtecken längs spåret? Ja□/Nej□

D. Eftersökshund/-ar
Löshund □ Avfångningshund □ Spårhund □

E. Avslut
E1. Djuret funnet dött □ Djuret avlivat □ (längd spår…….…...m.)
E.2. Djuret avlivat av passkytt □ av hund □ av eftersöksekipage □
E.3. Djuret bedömt som oskadat Ja□/Nej□
E.4. Djuret skadat men ej hittat /gått ur sårlega Ja□/Nej□
E.5. Eftersöket överlämnat □ (till………………………………………..…)

F. Träffläge på djuret (skadan)
Huvud □ Hals □ Framben □ Bog □ Hjärta □ Lungor □ Manke □ Mellangärde□ Rygg □ Vom □ Tarmar□ Lår□ Bakben □ Övrigt…………………………
Övriga kommentarer

……………………………………………………………………………………….………………………...
……………………………………………………………………………………….………………………...………
……………………………………………………………………………………….………………………...………………
……………………………………………………………………….………………………....

Riktigheten i ovanstående uppgifter intygas (jaktledare eller motsv).

……………………..…………………………

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