CHAPTER 4

THE CAPTURE, COLLARING, CARE AND RELEASE OF CARACAL

Authors:

H.I.A.S. Melville*: hmelville@wildlife.up.ac.za, Centre for Wildlife Management, University of Pretoria, Pretoria, 0002

J. du P. Bothma: bothma@wildlife.up.ac.za Centre for Wildlife Management, University of Pretoria, Pretoria, 0002

M.G.L. Mills: gusm@parks-sa.co.za SAN Parks, Endangered Wildlife Trust and Mammal Research Institute, University of Pretoria, Private Bag X402, Skukuza, 1350.

ABSTRACT

During a research project in the Kgalagadi Transfrontier Park, caracals *Caracal caracal* were captured and fitted with radio collars. Over a two-year period, 632 nights of trapping were completed. During this time, 152 animals were captured in cage-traps, of which nine were caracals. Three caracals were immobilised by using estimated doses of Zoletil based on the recommended standard dose of 3 to 5 mg of Zoletil per kg of body mass. A further six caracals were immobilised by using a standardised dose of 50 mg Zoletil. Use of a standard dose of immobilising agent was found to be more practical under field conditions than trying to estimate the mass of the captured animals. Chicken-based baits were found to be effective for a broad spectrum of small carnivore species. Modifications to the conventional, single-door cage design were made to accommodate a crush plate. The use of the crush plate in conjunction with a handheld syringe was found to be the most effective method of immobilisation, and it reduced the stress to which the captured animals were

subjected. Recommendations for the post-capture handling of small predators are made, based on field experience.

Keywords: Caracal, capture, cage-traps, immobilisation, handling, Kalahari

Submitted to *Koedoe*

INTRODUCTION

To study animals by using radio telemetry it is necessary to capture the animals and fit them with radio collars from time to time. It is essential that any animal that is captured for study purposes be released in a fit and healthy condition. The study animals should be subjected to as little stress as possible during the capture, immobilisation, collaring, and subsequent recovery and release procedures. The success of the capture and release of an animal is not merely determined by the capture of the animal but it is rather determined by how the animals are handled, transported and kept after capture (Ebedes, Du Toit & Van Rooyen 1993). The capture of predators is a time consuming process, requiring patience and persistence. If the correct capture and care procedures are not followed, the stresses induced by these procedures may result in injury or death of the study animals (Ebedes *et al.* 1993).

To fit caracals with radio collars in the present study it was necessary to use both physical (trapping) and chemical (immobilisation and tranquillisation) capture techniques. Mechanical restraints consisting of traps or cages of various designs are generally used to capture or hold animals initially, but chemical restraint is necessary for detailed examination and manipulation (Jessup 1982). Certain carnivores can be darted while free-living, but this is not the case with caracal that must be trapped first before chemically immobilising them (McKenzie & Burroughs 1993).

This paper elaborates on the methods that are employed in the capture of small carnivores generally for research purposes, and highlights the practical problems that were experienced and possible solutions that were developed during the capture of caracals for research in the Kgalagadi Transfrontier Park.

STUDY AREA

This study was done in an area along the Namibian border near Mata-Mata in the southwestern portion of the Kgalagadi Transfrontier Park. For logistic reasons it was decided to confine the research activities to an area that extended 60 km north from the Mata-Mata rest camp along the Namibian border, and approximately 20 km into the interior of the Kgalagadi Transfrontier Park.

The Kalahari Gemsbok National Park was proclaimed in 1931, but it only became a reality in 1935 when a number of farms along the southern bank of the Aoub River were acquired. Today, the Park exists in much the same state as it was then (Van Wyk & Le Riche 1984). An agreement to formally combine the Kalahari Gemsbok National Park (South Africa) with the bordering Gemsbok National Park (Botswana) to form the Kgalagadi Transfrontier Park was signed by representatives of the governments of South Africa and Botswana in 1999. This agreement was ratified at an amalgamation ceremony held on the 12 May 2000 (Donaldson 2000).

The Mata-Mata area lies in the Shrubby Kalahari Dune Bushveld vegetation of the Savanna Biome (Low & Rebelo 1996). This area is an arid savanna with temperatures varying from –10 ° C to 45 ° C in the shade, with an annual mean rainfall of 153.5 mm that occurs mainly in the summer. The landscape is one of undulating dunes with sparse vegetation, and altitudes varying from 1000 to 1100 m above sea level (Low & Rebelo 1996).

The vegetation is characterised by the trees *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*, with a shrub layer of *Grewia retinervis* and *Rhus tenuinervis* and a well-developed grass layer consisting mainly of *Stipagrostis amabilis*, *Eragrostis lehmanniana*, *Aristida meridionalis, Schmidtia kalihariensis* and *Centropodia glauca* (Low & Rebelo 1996). There is little variation in the soil forms because the area is predominantly covered by aeolian sand overlying calcrete (Low & Rebelo 1996).

The Kgalagadi Transfrontier Park forms the southern part of the greater Kalahari ecosystem. Because of the arid nature of the area, many of the plants there are ephemeral. After sufficient rain, these plants germinate quickly to complete their life cycle in a short time (Eloff 1984).

Because of the harshness of the environment, the southern Kalahari is an area that is only sparsely inhabited by humans. This above any other factor contributes to the uniqueness of the area, and it enhances the value of the area for field research in wildlife management and conservation.

METHODS

Both mechanical and chemical capture techniques were used to capture caracals. Mechanical capture of caracals involved trapping by using cages (box traps), while chemical capture involved the immobilisation of the caracals once they had been trapped mechanically.

A number of lethal and non-lethal methods have been described for the capture of smaller carnivores and furbearers (Boddicker 1999). Non-lethal methods are the only ones that are appropriate for application in such a field ecological study. Commonly used non-lethal methods such as cage traps and leg-hold traps have been used in numerous research projects worldwide. Although the use of leg-hold traps was considered for this project, it was decided to use cage traps exclusively after consultation with the ethics committee of South African National Parks. This decision was based on the fact that leg-hold traps that are set for the capture of caracal could also injure smaller non-target animals that will also be trapped (Boddicker 1999).

Physical capture

Cage design:

The two basic cage designs that have been used for the capture of caracal to date are the single-door design and the double-door design (Moolman 1986). Only single-door cage traps (Bothma 1975) with certain modifications for the use of a capture crush were used in this project (Figs. 1, 2 & 3). The cages were designed and constructed within the parameters laid down by the ethics committee of South African National Parks. The cages (Figs. 1, 2 & 3) were constructed with internal measurement of 1.5 m long, by 0.5 m high by 0.5 m wide (Finch 2000, pers. comm.[1]). This configuration ensured that a caracal could not be injured by the falling trapdoor (Bothma 1975; Harthoorn 1976) and that the trapped animal would not be able to turn around and escape from the cage before the trapdoor had closed.

The cage frame was covered with a double layer of 40 mm precision-welded mesh, ensuring that the mesh was secured in such a fashion that no sharp points were

[1] Mr. J.Finch: Varmint & Game Safari's Africa cc, 6 Cradock Ave, Eldoraigne, 0157

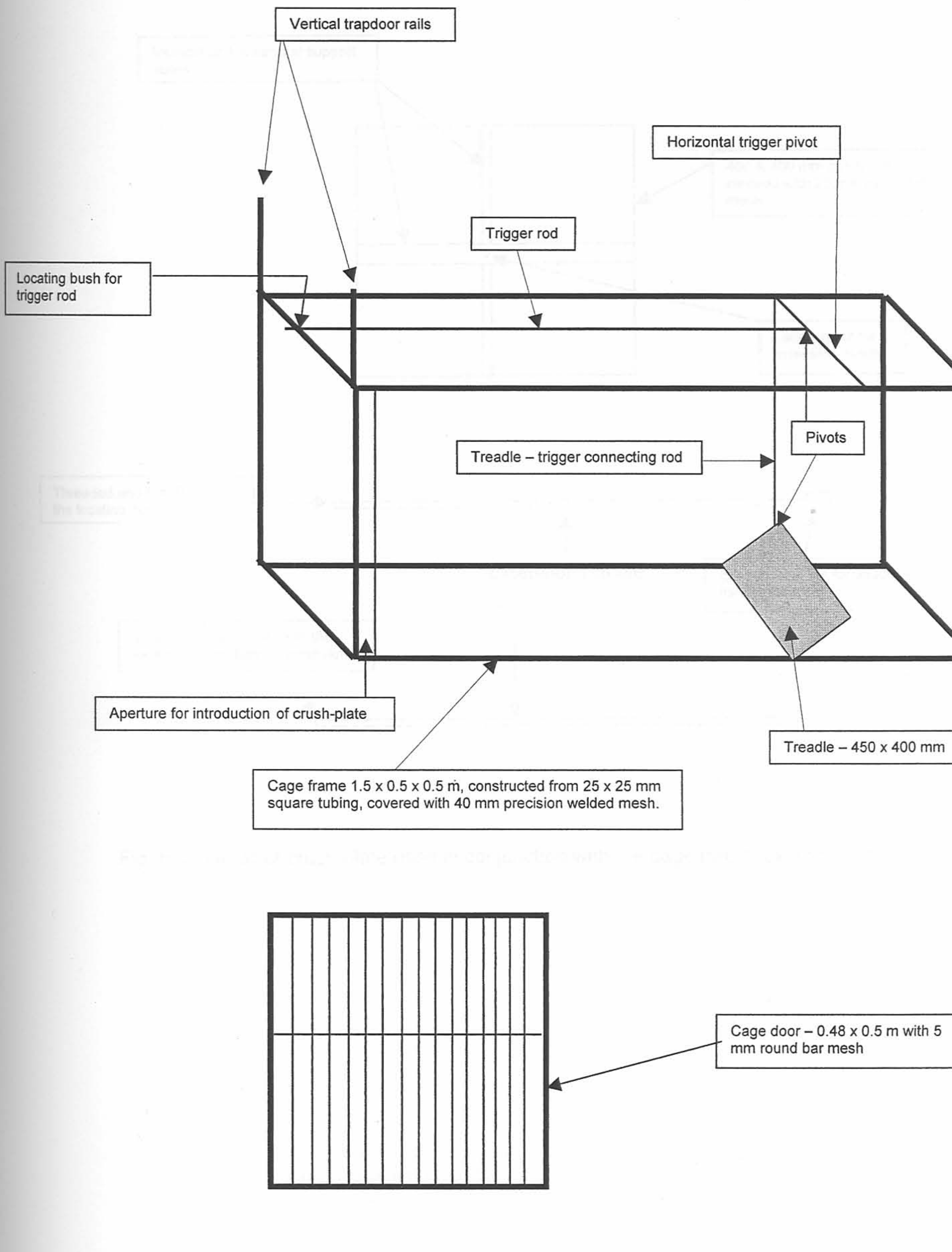

Figure 1: The design of cage traps used for capture of caracals in the Kgalagadi Transfrontier Park

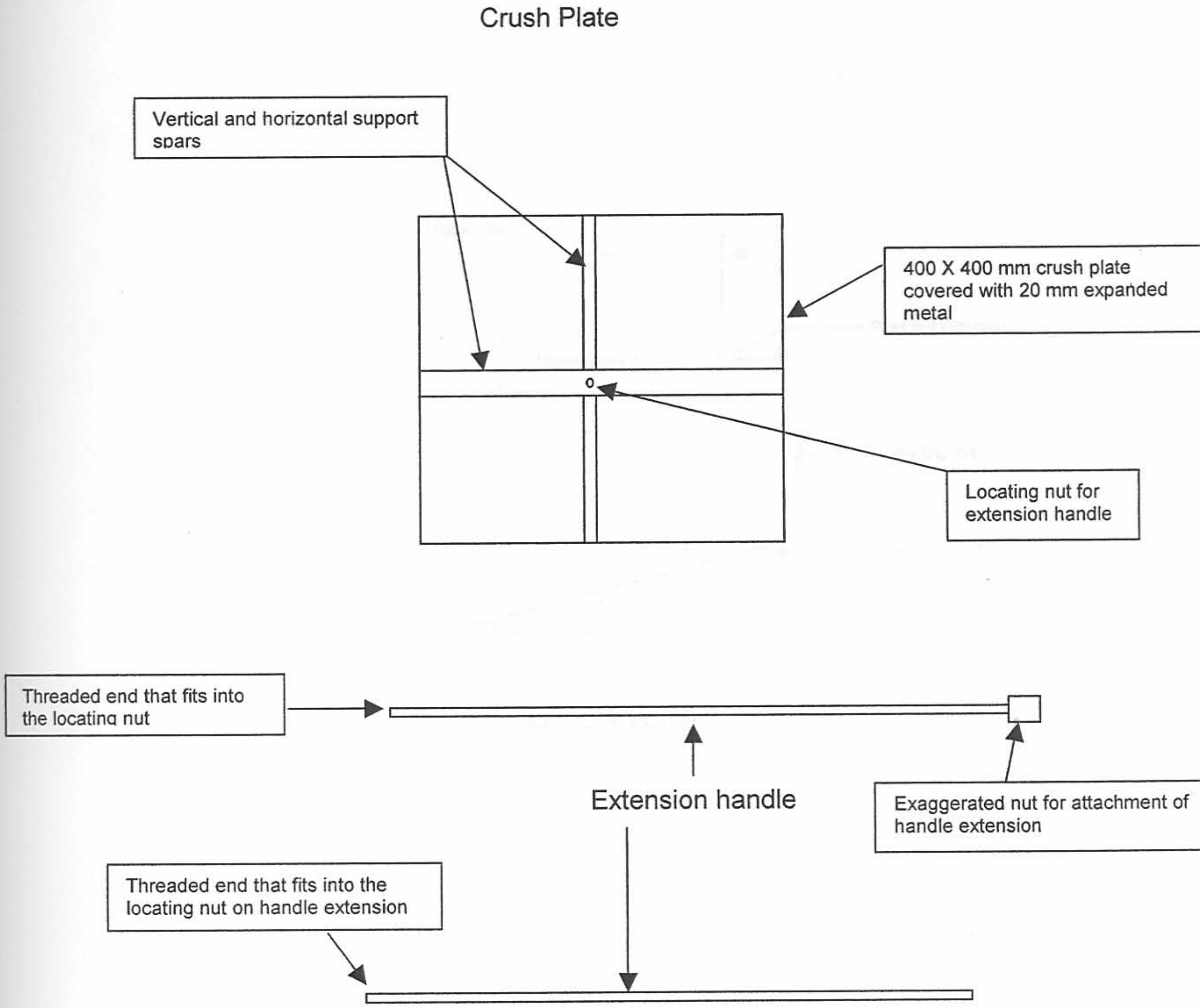

Figure 2: Detail of crush plate used in conjunction with the cage trap shown in Figure 1.

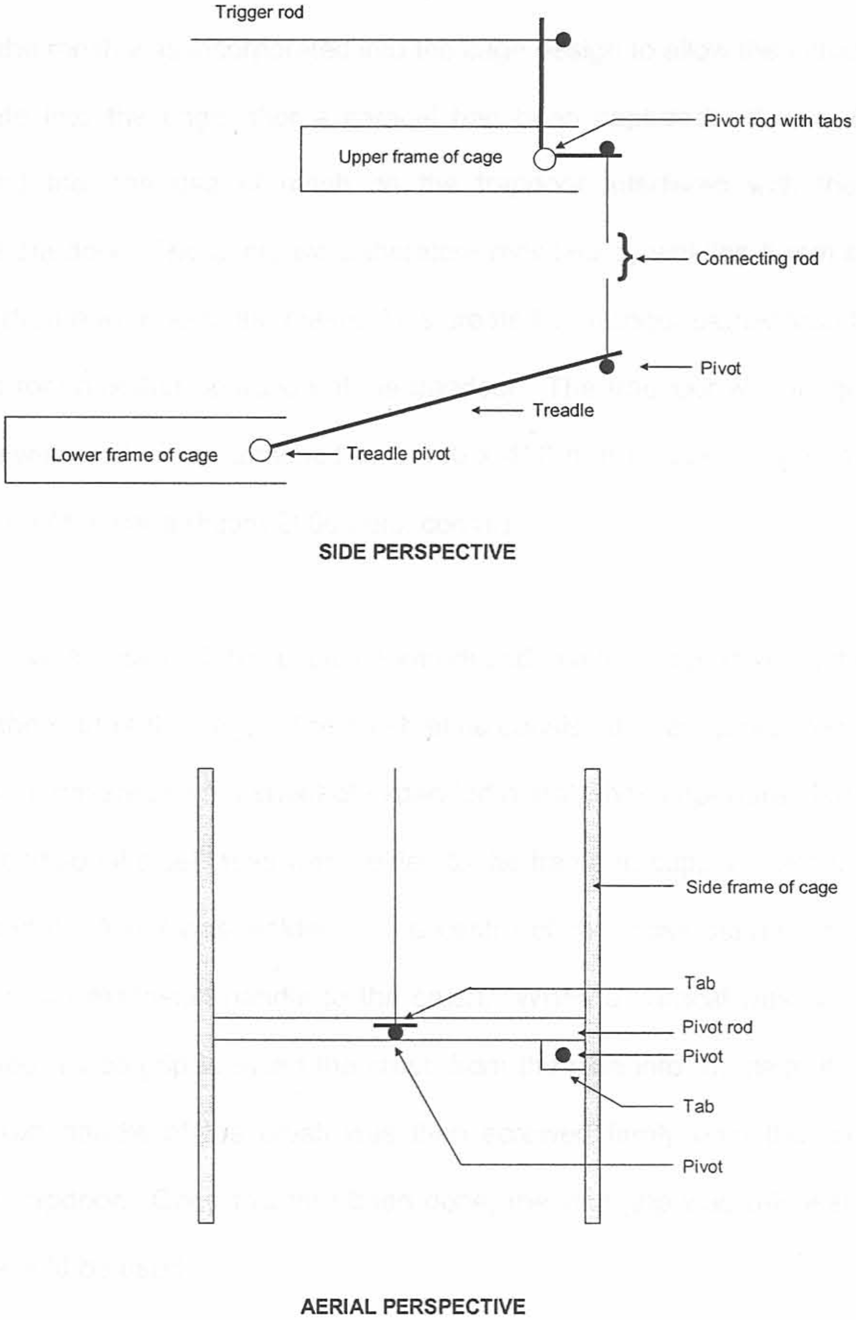

Figure 3: Detail of trigger mechanism and pivot rod of cage traps used for the capture of caracals in the Kgalagadi Transfrontier Park

pointing into the cage (De Wet 1993). The mesh was overlapped to reduce the effective mesh diameter to 20 mm. A single layer of mesh was used on the back of the cage to allow for hand injection of captured animals. A 30 mm wide vertical aperture in the mesh was incorporated into the cage design to allow the introduction of a crush plate into the cage after a caracal had been captured. It was, however, initially found that the use of mesh on the trapdoor interfered with the smooth operation of the door. The doors were therefore modified by welding 5 mm steel bars into the doorframe to replace the mesh. This created a stronger barrier than the mesh and allowed for smoother operation of the trapdoor. The trapdoor was triggered by a system of levers and pivots attached to a 400 x 450 mm treadle, hinged 1 m away from the door of the cage (Finch 2000 pers. comm).

A crush plate was designed that could be introduced into the cage through the vertical aperture in the side of the cage. The crush plate consisted of a square steel frame of 400 x 400 mm, covered with a sheet of expanded metal whose aperture diameter was 20 mm. An additional steel cross was welded to the frame to support the centre of the expanded metal. A nut was welded to the centre of the cross support to allow the attachment of an extension handle to the crush. When a caracal was captured, an assistant used a vice-grip to insert the crush from the side into the cage through the aperture. The handle of the crush was then screwed firmly onto the crush plate through the trapdoor. Once this had been done, the vice-grip was released and the crush plate could be used.

The concept is that an assistant introduces the crush plate into the cage and uses it to gradually reduce the internal volume of the cage in which the captive animal can move, eventually pressing the animal firmly against the back of the cage, preventing the animal from moving. Once the animal is so restrained it is possible to administer an exact dose of immobilising agent to the captive animal by using a hand-held syringe.

Setting the cage

It is important to set cages in the correct manner and places (Mills 1996), where the animals are known to be active (De Wet 1993). Much research into optimising trapping success has been done in the United States of America. It has been suggested that the selection and preparation of the trap site and cage set-up are vital factors to consider when trapping predators. Correct trap locations are normally productive for the entire spectrum of target species (Boddicker 1999). The aim of positioning a trap selectively is to try and ensure that all the possible target animals will encounter the trap (Boddicker 1988).

Micro and macro positioning are the two aspects of trap location that contribute to the effectiveness of trapping (Boddicker 1999). Macro positions are locations that take landscape position, habitat type and obvious routes and wildlife trails into consideration. Cages should be placed in preferred habitat types, next to frequently used trails and features that cause predators to concentrate in an area (Bothma 1975).

Micro-positioning refers to the final positioning of the cage, its proximity to a road or trail and bushes, and it takes variables such as wind direction into consideration. Ideally the prevailing wind should blow away from the cage against the direction of travel of the target animal (Boddicker 1999). The ideal micro-position in the Kalahari study area was on a dune crest in a tall *Stipagrostis amabilis* grass clump, at a distance of < 1 m from a permanent track. In the present study, cages were always set in areas of known caracal activity as was indicated by fresh tracks, and/or where evidence of recent caracal urine or faeces was found (Brand 1993).

Having decided on an optimal location for the trap, the cage is set. In preparation, the ground upon which the cage is to be set is first levelled with a spade. This is done for two reasons. A cage that is unstable on the ground might move as the animal steps into the cage. This would startle the animal and it will not continue to enter the cage. When a cage is set up with one end elevated, it might prevent the sliding trapdoor from operating as effectively as it should.

Once in position, the treadle of the cage is covered with a woven white plastic sheet. The sheet covers the treadle and a portion of the floor of the cage in front of and behind the treadle. This prevents sand from building up under the treadle and stopping it from operating properly. Once the sheeting is in position, a shallow layer of soil is sprinkled over the floor of the cage and over the plastic sheeting (De Wet 1993). The plastic sheet should be sufficiently slack to allow for the setting of the treadle. In addition, the sand load on the treadle must be sufficient to cover and hide the treadle, but it should not cause the trapdoor to close without an animal stepping on to the treadle.

The bait or lure, hereafter referred to as bait, is next secured inside and at the back of the cage (Brand 1993). This ensures that any animals that are attracted to the bait have to step on to the treadle to get to it. If the bait were attached behind the cage, some animals can reach the bait without being trapped.

Once the bait is in place, the cage is camouflaged, but it is not necessary to hide the cage completely. Some authors feel that it is also not necessary to make any attempt to conceal the cage (Bothma 1975, Verdoorn pers. comm.[2]). However, Brand (1993) suggests that although caracals are not as sensitive to human scents and trap odours as jackals, the cages should still be camouflaged when trapping a caracal.

The back end of the cage should be made inaccessible to predators by positioning it in a dense bush, or by placing branches in such a way that predators are prevented from trying to remove the bait from the back of the cage without entering it (De Wet 1993). It is also important that any animals that approach the cage should be able to see through it from the front. No material should be packed on top of the cage but the sides should be packed with sufficient vegetation to obscure the hard lines of the frame of the cage. None of the camouflage material should protrude into the cage because any sharp object such as a branch can injure a captured animal (De Wet 1993).

To ensure that an animal will step onto the treadle, guide sticks are positioned in such a manner that the animal has to step over them on to the treadle when approaching the bait. Predators generally tend to avoid stepping on sticks, stones and other items (Boddicker 1999).

Nothing should obstruct the smooth operation of the trigger mechanism. It is therefore important to check the operation of the cage thoroughly before leaving it set. Branches should not obstruct the free fall of the trapdoor, there should be no obstruction under the treadle, and vegetation that is used to camouflage the cage should not interfere with the operation of the trigger mechanism or the closing trapdoor.

[2] Dr. G.Verdoorn, Endangered Wildlife Trust, P.O. Box 72115, Parkview, 2122, South Africa

Auditory, visual and olfactory attractants

Predators use a combination of sight, smell and hearing while hunting (Boddicker 1999). It is these senses that the trapper depends upon to coax animals into traps. Lures and baits are perhaps the most important aspect of trapping. Auditory attractants include squeakers and recordings of distress calls of prey species (Boddicker 1999). Brand (1993) suggests that the positioning of a squeaker device in bushes immediately behind the trap might increase the efficiency of trapping attempts.

Visual attractants such as feathers, fur, bones and various other articles that are suspended from the back of the cage draw target predators into a cage by pandering to the natural curiosity of predators (Brand 1993; Boddicker 1999). In the present study, small cardboard cards of 20 x 40 mm were covered with silver foil and were then suspended in the back of the cage as a visual attractant.

Olfactory attractants (baits) appeal to the sense of smell of the target animals. These attractants can be divided into the following four basic categories (Boddicker 1999):

- Food attractants such as fresh and rotten meat, eggs, fruits, and fish.
- Territorial attractants such as urine and faeces that predators use to scent-mark.
- Curiosity attractants that might not be naturally encountered by the target animals but are known to attract them purely out of interest. These include substances such as catnip and anise.
- Sex lures based on the urine of females in oestrus, and the sex glands and their extracts.

Baits are commonly used to entice animals into traps. Various types of and recipes for bait have been recommended for caracal trapping. They include Number 9 bait cage to provide a cooler environment and to calm the animal down (De Wet 1993) and assistance was called for by radio. Once assistance had arrived, the caracal was physically restrained inside the cage by using the crush plate as described above. The appropriate dose of 3 to 4 mg per kg of Zoletil (Virbac RSA (Pty) Ltd. 1996) (McKenzie & Burroughs 1993) was then administered intramuscularly by using a handheld syringe.

Once the drug had taken full effect, the caracal was removed from the cage, weighed, various measurements were taken and the animal was fitted with a radio collar. Having completed these procedures the cage was re-positioned in a shady area, and the floor was covered with sand. The caracal was then put back into the cage with its eyes covered to protect them from desiccation by exposure to the elements (Stander & Morkel 1991). Under hot conditions, captured caracals were doused with cold water to reduce their body temperature whilst they were recovering (Meyer pers. comm.[4]). The cage door was then shut and the shade net was replaced. The caracal was left inside the cage until it had recovered fully from the effects of the immobilising drug. Once the animal was alert again and had regained full motor control, it was released.

Trapping efficiency was calculated by dividing the total number of animals trapped by the number of trap-nights (Stander & Morkel 1991).

RESULTS

Physical capture

From 2 July 2000 to 4 April 2002, a total of 632 trap-nights were completed by using four single-door box traps (Figs. 1, 2 & 3). The traps were set for 14 days of each

[4] Dr. P.Meyer, P.O. Box 12636, Onderstepoort 0110.

month. Nine caracals were caught at various locations at a 1.4% capture success rate. Various bait and lure combinations (Table 1) were used with varying degrees of success. The baits can broadly be divided into two categories, those including chicken and those excluding chicken. Chicken-based baits were used for 525 trap-nights, and resulted in 132 captures of which six were caracals. This converts to a trapping success rate of 25.1% for all species and 1.1% for caracals. The baits that excluded chicken were used for 106 trap-nights, resulting in 19 captures of which two were caracals for a total trapping success rate of 17.9% and 1.9% for caracals. The ninth caracal was captured by using a cage that was positioned in the mouth of the burrow of an aardvark *Orycteropus afer* in which the caracal had taken refuge.

The non-selective nature of this trapping technique is emphasised by the fact that of the 152 successful trap-nights, caracal were only captured on nine occasions. Furthermore, 94.0 % of the animals that were captured were non-target species (Table 1, Fig. 4). No collared caracal were recaptured during the study period.

Chemical capture.

In three cases, single doses of 60 mg (twice) and 65 mg (once) of *Zoletil* (CI-744), which consists of a 1:1 combination of the anaesthetic tiletamine hydrochloride and the sedative zolazepam hydrochloride, was administered intramuscularly to the captive caracals, based on a visual estimation of the body weight of the animal (Table 2). In six cases caracals were injected with a single standardised dose of 50 mg of Zoletil (0.5 cc at 100 mg per cc) (Meyer pers. comm.). In all cases a single dose of Zoletil was sufficient to immobilise the caracals for the time that was required to fit radio collars and to take all the necessary measurements.

(Schellingerhout 1978), caracal faeces and urine, fish heads, and striped polecat *Ictonyx striatus* carcasses (Moolman 1986), dead or live chickens and guinea fowl *Numida meleagris*, springbok *Antidorcas marsupialis* and sheep *Ovis aries* (Norton & Lawson 1985), fish, shellfish and fresh meat baits (Boddicker 1999), live domestic cats *Felis silvestris* (Verdoorn pers. comm.), rotten ostrich *Struthio camelus* eggs (Myburgh pers. comm.[3]) and fresh caracal kills (Brand 1993).

Lures depend on the innate curiosity of predators to attract target animals into a trap. These lures include scent, sight and olfactory stimuli (Finch, pers. comm). Many visual lures (feathers, silver foil on suspended cards, and animal hair) and scent lures (catnip oil, anise, and bobcat *Felis rufus* glands) were recommended by Finch (pers. comm).

A number of food, territorial, curiosity and sexual attractants were used during the trapping attempts in the present study. The primary bait used was fresh chicken, but both fresh and rotten fish were also used. In addition, urine and faeces were used as territorial lures. Both catnip and anise extract were used as curiosity lures and the sexual glands of the bobcat were used as a sexual attractant.

Handling captured animals

Because of the non-selective nature of trapping (Mills 1996), one of the criteria that was set into the trap design was that non-target species could be released with the minimum of stress and injury (Brand 1993). Traps were inspected daily before 10:00 to ensure that any captured animals were not subjected to unnecessary heat stress. Non-target animals were checked for injury before being released. Fortunately no animals were injured whilst confined in the cages and they were released immediately. After a caracal had been caught, shade netting was placed over the

[3] Mr. A. Myburgh. Border Farm, Volmoed 339, Aruab, Namibia.

Table 1: *The capture success achieved by using various bait and lure combinations to capture caracals in the Kgalagadi Transfrontier Park from June 2000 to March 2002.*

Bait	Trap-nights	Number of animals trapped	Capture success (percentage of total trap-nights)	Capture success (percentage of bait-specific trap-nights)	Caracal	African wild cat	Cape fox	Black-backed jackal	Other animals
Bobcat gland & catnip	28	2	1.32	7.14	2	0	0	0	0
Caracal carcass	14	8	5.26	57.14	0	0	0	5	3
Caracal urine	14	2	1.32	14.29	0	0	1	1	0
Caracal urine & scat	1	1	0.66	100.00	0	1	0	0	0
Chicken	124	22	14.47	17.74	3	3	3	10	3
Chicken & bobcat gland	8	0	0.00	0.00	0	0	0	0	0
Chicken & feathers	7	4	2.63	57.14	0	0	0	4	0
Chicken & silver ball	243	77	50.65	23.46	2	8	10	52	5
Chicken, anise & feline fix	10	2	1.32	20.00	0	0	0	1	1
Chicken, bobcat gland & urine	31	4	2.63	12.90	0	2	0	2	0
Chicken, bobcat gland & catnip	23	3	1.97	13.04	0	3	0	0	0
Chicken, catnip & feline fix	13	1	0.66	7.69	0	0	0	0	1
chicken, catnip & urine	18	7	4.61	38.89	0	1	0	6	0
Chicken, Peters 2 & catnip	13	3	1.97	23.08	0	0	0	0	3
Chicken, urine & bobcat gland	17	3	1.97	17.65	1	2	0	0	0
Chicken, urine & feline fix	18	6	3.95	33.33	0	1	0	0	5
Dove	1	1	0.66	100.00	0	0	0	1	0
Fish & silver ball	41	4	2.63	9.76	0	0	0	3	1
Ground squirrel carcass	5	1	0.66	20.00	0	0	0	0	1
At an aardvark burrow	1	1	0.66	100.00	1	0	0	0	0
Peters no 2 & bobcat gland	2	0	0.00	0.00	0	0	0	0	0
Total	632	152	100	na	9	21	14	85	23

Table 2: *The efficiency of Zoletil in the immobilisation of caracals in the Kgalagadi Transfrontier Park from June 2000 to March 2002*

Caracal number	Gender	Dose in mg	Effective dose in mg per kg	Time injected	Time down	Time lucid	Time of release	Time lapse in hours between immobilisation and release	Body mass in kg
148.21	Male	60	4.62	08:15	08:25	10:30	11:50	3.58	13.00
148.81	Female	50	4.55	08:10	08:19	09:55	11:00	2.83	11.00
148.82	Male	65	6.50	07:33	07:40	10:35	13:33	5.00	10.00
148.87	Female	60	6.32	11:05	11:10	14:22	16:50	5.75	9.50
148.89a	Male	50	4.76	08:20	08:25	10:00	13:20	5.00	10.50
148.88	Male	50	4.00	09:38	09:45	10:40	12:55	3.28	12.50
148.84a	Male	50	3.57	14:00	14:10	14:45	16:00	2.00	14.00
148.84b	Male	50	4.55	12:45	12:48	14:00	15:05	2.33	11.00
148.89b	Female	50	6.25	10:20	10:25	12:52	13:50	3.50	8.00

DISCUSSION

Two factors that have the greatest bearing on the success of a trapping programme are the efficiency and the selectivity of the trapping effort (Boddicker 1999). Trapping efficiency is the number of captures relative to the number of trap-nights used. Trapping selectivity is the proportion of the captured animals that are target animals. It is possible to have a high trapping efficiency with a poor trapping selectivity.

Trapping should be as selective as possible so as to optimise time and expenditure and to avoid unnecessary stress or injury to animals (Boddicker 1999). It is possible to improve the selectivity of trapping by utilising the most selective equipment. For caracals, making box traps specifically designed for them are required to do this. This largely precludes animals that are significantly larger than caracals from being caught when trapping for caracals because they are physically too large to enter the cages (Table 1). The size of the cage door used here ensured that predators such as lions *Panthera leo*, brown hyaenas *Parahyaena brunnea* and spotted hyaenas *Crocuta crocuta* could not enter the cages. However, the size of the cage did not prevent lions, brown hyaenas and spotted hyaenas from investigating the cages and setting them off by nudging them. Selectivity to prevent animals smaller than caracals from getting trapped can be improved by setting the weight required to activate the trapdoor so that it requires a relatively heavy tread to trigger it (Boddicker 1999). Using cage traps, it is preferable to set the treadle finely and to accept that a high number of non-target animals will be caught rather than to set the treadle too coarsely and losing a possible caracal capture because the chances of injuring non-target species in box-traps are minimal. Positioning cages in areas of high caracal activity increases the selectivity of the trapping effort for caracal (Boddicker 1999).

Using specific baits will increase the selectivity of trapping too. The only non-predatory animals that were caught during the present study were an aardvark and three porcupines *Hystrix africaeaustralis* (Fig. 4). This shows that the choice of bait or lure largely precludes non-predators from being captured.

Baits and lures

Due to the conditions under which the present research was conducted, the use of live baits was not possible. It is important that the well-being of the animal that serves as bait be considered when using such a strategy. When the ambient temperature rises above 30°C it is not humane to leave an animal confined and unsheltered. Additionally, it was not practical or viable in the present study to patrol the trap line twice a day, once to check the traps and a second time in the late afternoon to reset the traps and to replace the live bait. It would not have been ecologically sound to use domestic cats as live bait because they are able to crossbreed with the African wild cats *Felis silvestris*, which occur in the Kgalagadi Transfrontier Park, if the bait animal should escape into the wild.

A number of bait and lure combinations were used during the study, but it was found that the most economic, practicable and effective combination of bait consisted of fresh frozen chicken pieces in conjunction with a visual lure (Table 1). Olfactory lures were also used with varying degrees of success (Table 1).

Trapping success

Although the 1.4 % trapping success rate that was achieved in this study seems low, it compares well with the results that were achieved for caracal in other studies where the capture success ranged between 0.2 and 2.2 % (Stuart 1982; Norton & Lawson

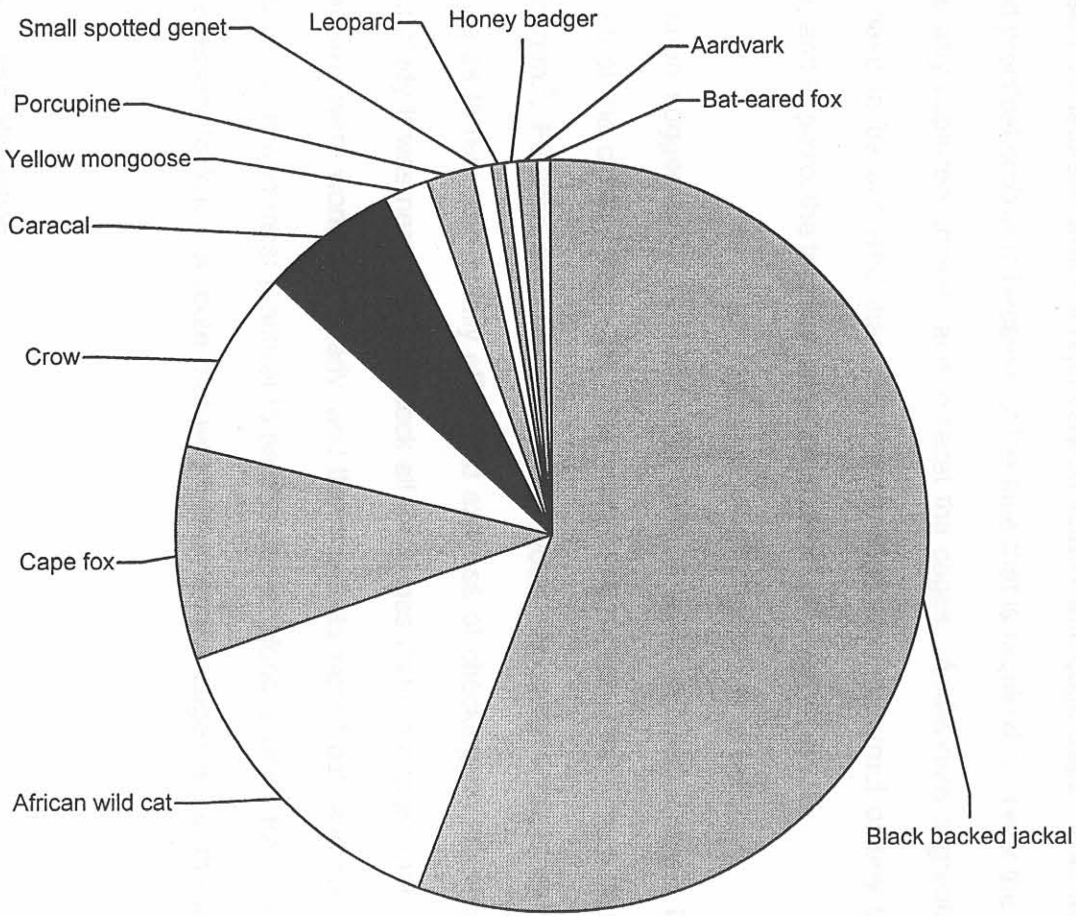

Figure 4: Relative trapping success achieved when using cage traps in the Kgalagadi Transfrontier Park to trap animalsfrom June 2000 to March 2002.

1985; Moolman 1986; Avenant & Nel 1998). This merely emphasises that caracal are inherently difficult animals to trap alive.

To reduce the time required to capture more animals in any study, it would have been necessary to saturate areas of high caracal activity with cage traps. This would have created practical problems because of the time that is required to check the cages, to release any captured animals and to reset the cages. Additionally a greater budget would have to be acquired than what was available to construct or buy the cages initially, and to patrol the trap line on a daily basis.

It has been suggested that radio collars can be attached to the cages in such a manner that the closing trapdoor would trigger the collars to start transmitting (Mills pers. comm.[5], Funston pers. comm.[6]). This would require the prioritisation of the cages so as to reduce the daily effort and expense of checking the trap-line. In the present study it was necessary to check all the cages daily to ensure that the trigger mechanisms were working properly, and that the baits were fresh and had not been disturbed. As it was most practical to set the cages along existing tracks or roads it was necessary to follow a route that would pass all the cages along the trap-line in one visit.

Chemical immobilisation

To fit caracals that were captured in the wild with radio collars, and to measure and weigh them it is necessary to immobilise them chemically (Brand 1993). A number of methods have been developed to administer immobilising drugs to captured wild

---

[5] Dr. M.G.L. Mills. Specialist Scientist, Kruger National Park, Private bag X402, Skukuza 1350.

[6] Dr. P.J. Funston. Department of Nature Conservation, Technikon Pretoria, Private bag X680, Pretoria 0001.

animals. Commonly used methods include dart guns, blowpipes, pole-syringes and conventional syringes (Ebedes *et al.* 1996).

It is not feasible to dart a wild caracal in a cage trap with a dart gun because of the likelihood of injuring the captured animal even when the dart gun is set to its lowest muzzle velocity. The movement of caracals in the cage as humans approach it also precludes the effective use of blowpipes. In the present study a pole-syringe was used to administer drugs to captured caracals on two occasions. However, this was an inefficient way of immobilising them because a portion of the drug dose was wasted when the caracals moved around as the pole-syringe was introduced into the cage in an attempt to inject the animal. It was also found that even when using poles or sticks (Brand 1993, McKenzie & Burroughs 1993) to prevent the movement of a captured animal, it was not possible to immobilise caracals in cages with the minimum of stress or injury.

A crush plate to immobilise seven caracals, and one leopard in the traps was used without any resultant injuries to the study animals or the capturers. Equipment of this nature can be used on any caged animal that has to be immobilised. The prerequisite is that the capture equipment (cage and crush) be constructed with the target species in mind. In the case of larger predators it would be necessary to have more than one assistant available to control the crush plate properly.

McKenzie & Burroughs (1993) suggested using a dose of 3 to 4 mg per kg of Zoletil for the immobilisation of caracals. In the present study it was found that the prolonged human presence while estimating the body mass of a caracal caused unnecessary stress to the animal. Moreover the estimated mass was often inaccurate, and time was wasted in preparing a syringe according to the relevant estimate. It was preferable to use a standard dose of 50 mg of Zoletil (Virbac 1996) (Meyer pers. comm) for the immobilisation of caracals in cages. Animals with a body mass that varies from 8 to 14 kg were successfully immobilised when using this standard dose, and no supplementary dose was necessary.

Post capture handling of caracals

In most cases of carnivores being immobilised with Zoletil, the animal is positioned in a cool place once the work on the animal has been completed. The capture team then withdraws to keep watch over the recovering animal from a distance so as to ensure that the recovering animal is not attacked or incapacitated. The narcosis wears off slowly (Table 2) because there is no antidote for Zoletil (Burroughs 1993).

Of the nine caracals that were immobilised in the present study, one died as a result of heat stress that had induced capture myopathy. This death might partially have been caused by the differing elimination half-lives of tiletamine and zolazepam, as has been seen to be the case in domestic cats (Anon. not dated) and in lions (Stander & Morkel 1991). Subsequent to this mortality it was decided to replace all the immobilised caracals in their cages and to cover the cages with shade netting to create a suitably shaded and cool area for the duration of their recovery. No further mortalities occurred.

CONCLUSIONS

When set correctly, cage traps can be used effectively for the capture of caracals. Because the caracal is a low-density animal, the trapping success relative to the trapping effort will always be low. However, ways to increase the degree of species selectivity has to be researched. The only currently known way to achieve a higher degree of selectivity and efficiency in caracal trapping is to position the cage traps in areas of high caracal activity, and to investigate more caracal-specific lures and baits.

When a caracal is captured, it is essential to ensure that it is subjected to as little stress as possible. The animal should be immobilised as quickly as possible by using the best techniques available. If new ways can be found to reduce the stress on the captured animal, or to improve the efficiency of the capture technique they should be applied.

Wherever caracals are captured for research purposes, they should always be returned to their wild state in a condition and under circumstances that will ensure their survival. In the case of all small predators it is strongly recommended that the captured animals be returned to a cage trap until they have entirely recovered from any drug effects before being released.

REFERENCES

ANONYMOUS 1996. *VIRBAC brochure on zoletil*. Virbac RSA (Pty) Ltd, Halfway House.

AVENANT, N.L. & NEL, J.L.J. 1998. Home-range use, activity, and density of caracal in relation to prey density. *African Journal of Ecology*. 36:347-359.

BODDICKER, M.L. 1988. *Crit'r gettin*. Rocky Mountain Wildlife Products. La Porte.

BODDICKER, M.L. 1999. *Catch'N coyotes & other crit'rs*. Rocky Mountain Wildlife Products: Colorado. U.S.A.

BOTHMA, J. DU P. 1975. Mechanical capture of wild carnivores. Pp. 100-109 *In*. Young, E. (ed.). *The capture and care of wild animals*. Human & Rousseau, Cape Town.

BRAND, D.J. 1993. Physical capture of the caracal *Felis caracal.* Pp 264-277 *In.* McKenzie, A.A. (ed.). *The capture and care manual.* Wildlife Decision Support Services and The South African Veterinary Foundation. Pretoria.

BURROUGHS, R.E.J. 1993. A summary of the practical aspects of dugs commonly used for the restraint of wild animals. Pp. 65 – 70. *In.* McKenzie, A.A. (ed.). *The capture and care manual.* Wildlife Decision Support Services and The South African Veterinary Foundation. Pretoria.

DE WET, T. 1993. Cage traps and camp traps. Pp. 165-177. *In.* Mc Kenzie, A.A. (ed.). *The capture and care manual.* Wildlife Decision Support Services and The South African Veterinary Foundation. Pretoria.

DONALDSON, A. 2000. Born free. *Sunday Times* (14 May 2000) Times Media. Johannesburg, Republic of South Africa.

EBEDES, H., DU TOIT, J.G. & VAN ROOYEN, J. 1993. Capturing wild animals. *Pp.* 382-440 *In*: Bothma, J. du P. (ed.). *Game Ranch Management*, Fourth edition. Pretoria: Van Schaik.

ELOFF, F.C. 1984. The Kalahari ecosystem. Supplement to *Koedoe* 1984: 11-20

HARTHOORN, A.M. 1976. *The chemical capture of animals.* Macmillan: New York.

JESSUP, D.A. 1982. Restraint and chemical immobilization of carnivores and furbearers Pp. 227-244. *In*: Nielsen, L., Haig, J.C. & Fowler, M.E. (eds.). *Chemical immobilization of North American wildlife.* Wisconsin Humane Society, Milwaukee, Wisconsin.

LOW, A.B. & A.G. REBELO 1996. *Vegetation of South Africa, Lesotho and Swaziland.* Department of Environmental Affairs and Tourism, Pretoria.

MCKENZIE, A.A. & BURROUGHS, R.E.J. 1993. Chemical capture of carnivores. Pp.224-254. *In.* Mc Kenzie, A.A. (ed.). *The capture and care manual.* Wildlife Decision Support Services and The South African Veterinary Foundation. Pretoria.

MILLS, M.G.L. 1996. Methodological advances in capture, census, and food habit studies of large African carnivores. Pp. 223-242 *In*: Gittleman, J.L. (ed.). *Carnivore behavior, ecology, and evolution*. Volume 2. Cornell University Press, New York.

MOOLMAN, L.C. 1986. *Aspekte van die ekologie en gedrag van die rooikat* Felis caracal *Schreber, 1776 in die Bergkwagga Nasionale Park en op die omliggende plase*. M.Sc dissertation, University of Pretoria, Pretoria.

NORTON, P.M. & LAWSON, A.B. 1985. Radio tracking of leopards and caracals in the Stellenbosch area, Cape Province. *South African Journal of Wildlife Research* 15:17-24.

SCHELLINGERHOUT, J. 1978. Nuwe rooikat vanghok. *Landbouweekblad* 11:30-32.

STANDER, P.E. & MORKEL, P. VAN DER B. 1991. Field immobilization of lions using disassociative anaesthetics in combination with sedatives. *African Journal of Ecology* 29:137-148.

STUART, C.T. 1982. *Aspects of the biology of the caracal* (Felis caracal) *Schreber 1776, in the Cape Province, South Africa*. M.Sc. dissertation, University of Natal. Pietermaritzburg.

VAN WYK, P. & LE RICHE, E.A.N. 1984. The Kalahari Gemsbok National Park, 1931 – 1981. Supplement to *Koedoe* 27: 21-32.