'YOUNG WILD DOG MALE' is TOP DOG

by Roger Burrows

SUMMARY

In the African wild dog *(Lycaon pictus)* breeding hierarchy a young male takes over as alpha when one of the alpha pair in their pack dies, or if two cohorts of males emigrate together from their natal pack or when a male pup is adopted by unrelated adult males. The diverse range of circumstances in which this 'Young Male' protocol has been found to operate in free living packs in contrasting habitats and in captive colonies suggests that it is genetically determined. This probably unique protocol in mammal behaviour has important implications for pack longevity and hence for the conservation, management and captive breeding of this highly endangered species.

INTRODUCTION

A general protocol in African wild dog (*Lycaon pictus*) first recognized in the Serengeti-Mara ('Serengeti') ecosystem population that gives younger individuals in the pack priority when feeding at pack kills has long been recognized. This unusual feeding hierarchy ensures that pups (i.e. less than 12 months) eat first, often together with the alpha female and sometimes the alpha male. After they are satiated yearlings (12-24 months), usually the alpha pair's oldest offspring present in packs, are next to feed followed eventually, if the prey species is sufficiently large, by any older subordinate adults of both sexes less closely related to the pups and yearlings (Malcolm & Marten 1982, Visee et.al.2001). A 'Youth First' protocol has now been identified in the male wild dog reproductive/social hierarchy (Burrows 1995 Visee et.al. 2000,).

A 'YOUNG MALE' TOP DOG PROTOCOL IN LYCAON MALE SOCIAL/BREEDING HIERARCHY

Based on a re-analysis of data collected by a number of observers from 1964-91 in the 'Serengeti', it became apparent that a 'Youth First' protocol exists in the male, but not the female, wild dog reproductive/social hierarchy (Burrows 1995 Visee et.al. 2000). In seven cases in 'Serengeti' between 1967-78 the breeding male in a study pack lost alpha status to a younger relative usually following the death of the alpha female. In two other cases an alpha lost his status to a brother from his natal litter. In 6 of 8 packs males older than the dominant were present. By contrast no alpha female lost her alpha status over her female relatives (Frame et.al. 1979 Malcolm & Marten 1982).

However, the deposed former alpha male, unlike an alpha female following the death of the alpha male, remained in the pack as subordinate helper and mentor to the new related young alpha male's pack, such as taking the lead in pack hunts, locating water and prey in the dry season or ensuring that the pack avoided areas with lions. In 'Serengeti' the changes of alpha status took place with no evidence of physical aggression (H. & J. van Lawick-Goodall 1970, Malcolm 1979, Frame et.al. 1979). In a study pack in Hwange National Park(N.P.) an injured alpha male was fed by his subordinate brother for two weeks until he recovered and subsequently rejoined the pack and resumed his alpha status (Ginsberg 1996).

The observations in 'Serengeti' and Hwange N.P. raise the question, why in Selous Game Reserve (G.R.) is it reported that males indulge in "escalating fights" which lead to reversal of dominance as often as three times per year (Creel & Creel 2002) in a monoestrus species living in packs where usually only the alpha female has a litter in any one year and the alpha male sires this litter?

The behaviour described from the Selous G.R. possibly results from frequent inter-pack fighting and 'take-overs' of packs by immigrant groups who evict same sex residents (Creel & Creel 2002). This combined with high mortality of alpha individuals leading to 'pack dissolution' (see below) would result in a high degree of pack instability in the Selous G.R. woodland which is a secondary habitat for *Lycaon*.

Based on observations in 'Serengeti' from 1985-91 it is known that when two age groups of related males dispersed from their natal pack the alpha will be from the youngest cohort. In two well documented events when brothers from different cohorts emigrated together from their natal packs ('Ndoha' and 'Naabi' respectively) in 'Serengeti' in the 1980s, it was claimed that in both cases the older male became alpha (Scott 1991 & 1992). However, re examination of the data and personal observation showed that in each case the younger brother became alpha in the new packs they formed with unrelated females. This would be predicted from the 'Young Male' protocol.

The converse is true for dispersing females where a female pup which emerges as the alpha in her natal litter (natal alpha) retains her status over her same age sisters for life; in dispersing groups of mixed cohorts of females older sisters dominate younger (Frame et.al. 1979, Scott 1991, Burrows unpublished data).

The 'Young Male' protocol ensuring that when either of an alpha pair dies or when mixed cohorts emigrate together, a male from the youngest cohort assumes the status of alpha provided for the first time a simple explanation for the basic demographic characteristics of the 'Serengeti' Lycaon population. It also explained the demographic changes which were noted in different periods of study in 'Serengeti', i.e. 1970-79 when reproductive success of packs was very low and post 1979 when success was high (Burrows 1995).

THE 'YOUNG MALE' PROTOCOL LEADS TO 'PACK DISSOLUTION' AND EMIGRATION OF FEMALES

In 'Serengeti' in the 1970s, as in Kruger N.P. in the 1980s and 1990s and Moremi G.R. in the 1990s, packs suddenly broke up into single sex groups of adults (Reich 1981, Gorman et al 1992, McCreery & Robbins 2001). This process known as 'pack dissolution' (Reich 1981), in 'Serengeti' often resulted in a group of males of various cohorts, sometimes with the pups, remaining resident in the former pack's 'home range' where they awaited the arrival of a new group of immigrant females who 'adopted' any pups present and re-formed a pack (Frame et.al. 1979). Likewise in Selous all male groups on their home range were joined by immigrant females to re-constitute the packs (S. Creel 1996).

The adult females in the 'dissolved' packs moved away and joined new males, ideally on a home range, to reconstitute other packs. In 'Serengeti' and in Selous G.R. over time as various immigrant female groups joined the males on their home ranges, this gave continuity of occupation (up to 10 years in 'Serengeti') through the male line (Frame et.al. 1979, Burrows 1995, S.Creel 1996) so probably preventing small immigrant male groups taking over their prime habitat home range.

The hitherto inexplicable reason for sudden 'pack dissolution', can be directly attributed to the 'Young Male' protocol which comes into operation on the death of either of the alpha pair.

THE 'YOUNG MALE' PROTOCOL AND YEARLING EMIGRATION

The 'Young Male 'protocol and the frequency with which pack dissolution occurs determines the pattern of emigration of yearlings of both sexes from their natal packs.

i. Young Males can sometimes be recruited into their natal pack

The 'Young Male' protocol explains why it is only during periods of very poor reproductive success of packs, (as in 'Serengeti' in the 1970s), when no, or very few, male pups survived in two or more consecutive years that any young males of 3 years or more still present will be recruited for life into their natal pack (philopatry) i.e. whilst both parents are present. It was the presence of males recruited from different cohorts that resulted in a strong adult sex ratio bias to males in some 'Serengeti' packs in the 1970s (see the data on the 'Genghis' pack in

the 1970s in Frame et.al. 1979). Invariable all young male recruitment and a male sex bias in litters are not characteristics of Lycaon demography (cf. www.awf.org/wildlives).

ii. Young females are not recruited into nor can they become alpha in their natal pack

The 'Young Male' protocol which ensures that a young male will take over as alpha on the death of either parent makes it imperative that, to avoid close inbreeding and to have any chance of reproductive success, all young females born in 'Serengeti' plains pack had to emigrate from their natal pack (or adult male group following Pack Dissolution) by about 24 months (Frame et.al. 1979, Frame & Frame 1976, Burrows 1995). A claim that a young female displaced her mother and mated with her father in a Kruger N.P. pack (Reich 1978) cannot be confirmed by the published data as the relationships of the individuals concerned were unknown (Reich 1981).

In 'Serengeti' no females were recruited into and so could not become alpha in their natal pack, as the natal pack can logically only be said to exist whilst both parents are alive. Daughters of the alpha female can however sometimes breed as subordinates with subordinate males in their mother's pack if, following pack dissolution, a group of related females is joined by unrelated males.

iii. All yearling males emigrate if both parents are still alive and younger males are present in their natal pack

In 'Serengeti' study packs post 1979 all young males emigrated from their natal packs when about 24 - 30 months if both parents were still alive and younger males were present in their natal pack. This was necessary if any of these males were to attain alpha status which they could not do whilst both parents were alive and their natal pack was reproducing successfully with each year a new litter containing male pups and so a potential new 'natal' alpha.

iv. Yearling males emigrate from their natal pack after the young females

As was the case with young males in 'Serengeti' during the 1970s, post 1979 yearling males 'delayed' their emigration from their natal pack until it became apparent that some younger male siblings i.e. a younger potential alpha who would take over on the death of a parent, had survived. During the post 1979 period of high reproductive success therefore all young males in the 'Serengeti' emigrated from their natal packs after their sisters from the same litter (Burrows 1995).

PACK DISSOLUTION AND EMIGRATION PREVENT INBREEDING

The reported high degree of genetic diversity in free living Lycaon populations (Girman et.al. 2001) would be expected as a consequence of pack dissolution and emigration and suggests that behavioural barriers to inbreeding (contra Reich 1981) are highly effective even in small free living Lycaon populations. In Moremi G. R. all wild dogs of both sexes emigrate from their natal packs when their opposite sex parent is present in the pack (McNutt 1996b). Such natural barriers to inbreeding are disrupted when brothers and sisters are mated in captive breeding programmes as in South Africa (van Heerden & Kuhn 1985).

A consequence of these barriers in 'Serengeti' packs was that following the death of an alpha, all adult females related to the new young alpha male, including the alpha female if she was the survivor, emigrated leaving behind any pups (i.e. <12 months old) with the adult male group who remained on the former packs home range. In 'Serengeti' any pups of both sexes present following pack dissolution continued to be cared for by the adult males. All yearling females present emigrated when about 20-24 months old and their same age sibling brothers were recruited, usually for life, into the male group. By contrast, in woodland habitats following pack dissolution any pups present remained with either the adult male or adult female group (Reich 1981).

Frequent pack dissolution in a population is highly disruptive and leads immediately to a loss of reproductive ability until the single sex groups find partners and are re-constituted into viable packs. In 'Serengeti' in the 1970s this process took up to 2 years due to the shortage of females during this period of poor reproductive success not only in the 'Serengeti' but which, judging by the lack of immigrants of both sexes seen in the area, affected Lycaon packs over a large area (Scott 1991, Burrows 1995).

It was inevitable therefore that in the 1970s due to lack of young adults, limited primary emigration of yearlings of both sexes and some secondary emigration of older subordinate females plus some age related mortality that the mean number of adults in the 'Serengeti' study packs declined post 1970.

Between 1967-77 of 10 emigrant yearling female groups from 'Serengeti' plains packs, 8 joined all male groups on home ranges adjacent to that of their natal pack. By contrast, of the 4 male yearling groups from the same plains packs during this period just one joined 'local' females and this was only achieved by disrupting an existing small pack with two adult males. The other 3 male yearling groups disappeared (Frame et.al. 1979). This gave rise to the concept that young females do not emigrate far from their natal home range whilst males travel further.

This generalization applies to the pre 1980 data from 'Serengeti' but cannot explain the post 1980 data. These show that all yearling females and males emigrated, some over long distances from their natal packs home range, with some female groups existing alone for up to 2 years during which time some covered many hundreds of square kilometers in their search from mates (Fuller et.al. 1992). The post 1979 change in the pattern of female emigration was a direct consequence of high reproductive success in their natal packs and lack of local resident all male groups to join (Fuller et.al. 1992, Burrows 1995)

[Following the extinction of all the 'Serengeti' plains study packs by June 1991, the lack of resident all male groups on any of the former study packs prime home ranges for immigrant females to join has to date prevented the recolonization of the 'Serengeti' plains study area. Although dispersing groups continue to visit the area they do not settle due to the lack of resident male groups for female groups to join.]

PACK FORMATION AND ALPHA PAIR BEHAVIOUR

Following the arrival of new, usually yearling, immigrant females to join a male group, or when unrelated dispersing male and female groups meet, the new alpha pair immediately became apparent. Their dominance status is quickly demonstrated to other pack members both in free living and captive breeding packs by frequent synchronized scent marking often of the same small piece of ground or vegetation involving raised leg urination, a behaviour posture restricted to alpha dogs. Any subordinate pairs who left their alpha relatives pack to den alone in part of their former pack's home range ('Pack Fission') also perform this scenting ritual, but not when in the vicinity of the alpha pair (van Lawick 1973, Frame et.al. 1979, van Heerden & Kuhn 1985).

It has been observed that alpha males appear surprisingly inattentive during bouts of apparent subordinate male sexual excitement and only occasionally exhibit dominant postures (van Lawick 1973, Reich 1981). Such subordinate male excitement and increased frequency of play between the sexes is reported to be characteristic of the pro-oestrus phase in the female Lycaon sexual cycle. Probably, as is the case in domestic dogs, wild dog bitches although consorting with males will not allow mating until the last period of oestrus (Boden 1998). During the female wild dog's receptive phase in oestrus any physical contact between the female and other males is prevented by the behaviour of the alpha male (Malcolm & Marten 1982). Male wild dogs abruptly lose sexual interest in the female once the gestation period begins (van Heerden & Kuhn 1985).

Unless raised leg urination scent marking by the alpha pair and/or true mounting (cf. 'mock mounting'* below) leading to full copulation with a brief copulatory tie' which is rarely observed (in 'Serengeti' in only 1 of 11 litters; Malcolm & Marten 1982) the identification of the alpha pair in a pack and particularly the alpha male, if based on any other criteria, will be highly speculative. See, for example, the use of a 'win-loss matrix' to determine dominance rank (Creel & Creel 2002). For Hwange N.P published diagrams show changes in the study packs over time but although the alpha females in the packs/groups are indicated it appears that no alpha males were identified (McCreery & Robins 2001). In Kruger N.P. where most packs contain several adult males, the paternity of 6 of 15 litters was unknown (Girman et.al. 1997).

[* 'Mock Mounting' is frequently observed in packs when a younger or subordinate dog of either sex attempts to prevent another of either sex regardless of their rank having access to food. It is highly likely that a photograph claiming to show 'mating' between subordinate male and an alpha female whilst the latter was feeding away from the den where she had young pups (Scott 1991, p.122), is mock mounting.]

ALPHA STATUS IN THE 'SERENGETI' LYCAON POULATION

1. In the Male Hierarchy

As a consequence of the 'Young Male' protocol male wild dogs will accept as alpha(s) in their pack or group: -

i. Their parents whilst both are present in the pack.
ii. A same age sibling in a dispersing group.
iii. A younger brother in a dispersing group of mixed cohorts
iv. A younger brother (or son in the case of a former alpha) in an all male group following pack dissolution.

As young males will not accept any older unknown, non related individual, as surrogate leader of their pack the 'Young Male' protocol is perhaps a reason why Lycaon has not been domesticated despite its close proximity to evolving man for at least 1 million years in Africa.

2. In the Female hierarchy

Females will accept as leader:-

i. Their parents whilst both are in the pack.
ii. Their mother following pack dissolution when they emigrate from their natal pack with her in an all female group following the death of their father. The former alpha retains her status when with her daughters.
iii. An older sister when in a dispersing group of mixed cohorts, but not a subordinate sister of their mother.

THE 'YOUNG MALE' PROTOCOL HAS BEEN IDENTIFIED IN OTHER STUDY POPULATIONS AND CAN PREDICT AND EXPLAIN A WIDE VARIETY OF OBSERVATIONS

It is now apparent that the Young Male protocol first identified in the Serengeti population not only explains the demography and behavioural observations made in this ecosystem but also can be identified in, and so explain, a wide variety of disparate observations made on other free living populations in different habitats and those in captive colonies.

i. The protocol would predict that and explain why a younger male becomes alpha when with older unrelated males

In Madikwe G.R. when a group of 4 males were introduced to 2 wild bred females one of the two younger hand reared males (from Botswana) became the alpha male with the two unrelated older wild bred (from Kruger N.P.) as subordinates (Hofmeyr 2001).

ii. The protocol would explain why a younger male becomes alpha when adopted by unrelated males

In two confirmed cases in Moremi G.R. (Botswana) when itinerant older males adopted unrelated male pups a young male become alpha (as in (i.) above). It each case in Moremi the older male probably mated with the alpha female which joined the all male group (including the male pups) in the new packs first year but in the following year an adopted young male dominated the older adults and mated successfully with its unrelated 'step mother' (McNutt 1996a). This would be expected from the 'Young Male' protocol although the fact that unrelated older males helped the adopted younger males to raise a litter is difficult to explain on the basis of 'kin selection'.

iii. The protocol would explain why in a captive colony a younger male became alpha and why a disabled young male and smaller males can become alpha

In Mkomazi G.R. following an outbreak of Canine Distemper in December 2000 three individuals survived, two captive bred unrelated males and a wild born female not closely related to either male. The younger of the 2 males mated with the female and sired a litter after which tragically the female died. The two males were then

introduced to 2 young adult wild bred females and again the younger of the two males was alpha (Visee et.al. 2001).

In a South African captive colony a younger disabled male displaced an older male as alpha in the pack (van Heerden & Kuhne 1985). In Kruger N.P. the alpha individuals in a number of packs were smaller than the subordinates (Reich 1981).

iv. The protocol can explain why a younger brother takes over as alpha from an older brother and mates with the same unrelated alpha female.

Following pack dissolution and the arrival of new unrelated females if the next 'potential ' alpha male is a very young pup for the first year of the new pack's existence his older brother (or adopted parent as in (ii.) above) may temporarily take on the alpha role and mate with the new alpha female. The following year however the younger 'natal male' will be mature and will take over from his older brother who although deposed will remain in the younger male's pack (see for example the Genghis pack data in Frame et.al. 1979).

v. The protocol would predict and explain the reason for social disruption caused by young males

Based on the 'Young Male' protocol young pups still with their mother would not be expected to passively accept an unrelated male as alpha in their pack. Therefore, when on 6 different occasions attempts were made to artificially construct breeding packs in captive situations by introducing females with male pups to unrelated older males it is not surprising that male pups as young as 4 months caused severe disruption in the 'pack' by hassling the older males. This 'problem' was apparently 'solved' by removing the offending pup (probably 'the natal alpha'), or by introducing the older males to the female when her male pups are less than 4 months old (Hofmeyr 2001).

This latter observation is important and suggests that the status of alpha male in a litter of pups ('natal alpha') and this individual's social dominance over other males is determined by the age of 4 months. The survival of the 'natal alpha' pup may be of vital importance in maintaining the stability of the male hierarchy when young male brothers form a new pack with females. If the natural leader (i.e. the 'natal alpha') does not survive, then his natal subordinate brothers may dispute alpha status later in life. This could explain why in some 'Serengeti' packs different brothers from the same litter assume alpha status over time and mate with the same alpha female.

In free living packs males from the same litter form coalitions and attack older subordinate males who attempts to consort who oestrus females (H. & J. van Lawick-Goodall 1970).

vi. The protocol explains why in Kruger N.P. in the 1970s two large packs underwent Pack Dissolution

Dissolution followed the death of the alpha female in one pack (the 'Hlamanduba') and the probable death of the alpha male in the other (the 'Matjulwana'). The identity of the alpha male in the latter pack cannot be confirmed on the data provided as the relationship between the adult males present when the pack was first seen with pups in the pack is unknown (Reich 1981).

vii. The protocol would explain two cases of pack 'annulment' in Hwange N.P.

Following the loss of both alpha individuals from one pack (the 'Sinamatella') the pack split into a female group and a male group with the latter joining females from another pack to form a new pack. The origin of another pack (the 'Gijima') is unknown as therefore are the relationships between the individuals in this pack but this was observed to split into an all male group and a lone female. These events are described as 'pack annulment' (McCreery & Robbins 2001). It is difficult to see how this differs from 'Pack Dissolution' of Reich (1981).

viii. The protocol would predict and can explain the reported high levels of male aggression in woodland packs.

Severe aggression resulting is physical injury and death is reported in males in woodland packs in Selous G.R. and Kruger N.P. This would be expected in these relatively high density populations with a limited number of home ranges along perennial rivers in the dry denning season as in Selous, or as in Kruger where the Lycaon population is probably artificially high due to the provision of supplementary water supplies and consequent local year round abundance of prey. In such areas it is reported that immigrant male groups expel resident males and take over females often with pups with, during the mating season, severe 'competition' between males that may result in severe injury or death (Reich 1981, Creel & Creel 2002, Mills 1993). The young males would not be competing to mate with their mother, but would be expected to try to eject any 'new' male which, as in (v) above, they would not accept as alpha.

Male aggression within a pack would also be predicted if, following the dissolution of some woodland packs, an all adult male group with pups and an all adult female group, also with pups, join to form a new pack. In such cases any male pup in the females group (as in (v) above) would not accept a 'new' unrelated male (older or younger pups) in the male group as alpha in the new pack. Likewise any male pup in the female group would not accept either an unrelated male adult or pup from the male group as alpha. So in coalition with their siblings each young male group would be expected to attempt to prevent any unrelated male having access to oestrus females during the breeding season. Male strife in such cases was predicted in the Kruger study (Reich 1981).

ix. The protocol explains the age at which individuals of both sexes attain and males lose alpha status

When new packs are formed following emigration or pack dissolution both alphas are usually yearlings. As males can breed at about 12 months (van Heerden & Kuhn 1985) it will be to the new young female's advantage as the breeding female and the longevity of her new pack if, as is the case due to the 'Young Male' protocol, she mates with the youngest 'natal male' present. The young male will retain his status only until his mate dies whilst his female partner will retain her alpha status amongst her related females for life. Hence if the alpha male pre-deceases her she can re-emigrate, join new young males, and still retain her alpha status.

Natal subordinate females (i.e. subordinate to the alpha female pup in their natal litter) can attain alpha status later in life once they have left the influence of their dominant sister (natal alpha). The latter maintain their alpha status often for life in the pack she and her sisters helped to form after primary (natal) emigration. By contrast her subordinate sisters are forced to undertake secondary or even tertiary emigration before eventually becoming alpha females, sometimes at an advanced age. After a few years emigration of all subordinate sisters of the natal alpha may leave her as the oldest female in a pack, any other females present being her younger offspring. By contrast the chance of natal subordinate males becoming alpha after emigrating from their natal pack is very low unless they emigrate alone and find mates or leave a pack with a subordinate female ('Pack Fission', Frame et.al. 1979).

Given this background it is not surprising therefore that in a study in the Selous G.R. it was found that the dominant female in packs was usually the oldest female whilst old males, particularly when more than 6 years old, lost their rank to 'prime-age' males. This would be expected as few natal alpha females and even fewer of their subordinate sisters will live more than 4 years after attaining alpha status and the alpha male only retains his position whilst his mate is alive. In Moremi G.R. only one pack was known to last more than 6 years, with most not lasting last more than 2 years (McNutt 2000) so changes in alpha status for males would be expected to be frequent. In 'Serengeti' and it would appear in Moremi G.R. the chance of a male >3 years becoming alpha in a pack would be remote (cf Creel & Creel 2002).

The conclusions reported from the Selous G.R. are consistent with and could be predicted from the 'Serengeti' 'Young Male" protocol. However, the alternative conclusion reached by the researchers involved i.e. that the probability of a male 'inheriting' the alpha position on the death or deposition of the previous alpha "is highest for six-year olds (42%) and subsequently declines." (Creel & Creel 2002) is highly unlikely.

x. The 'Young Male' protocol explains why in Selous GR and 'Serengeti' a number of former alpha males may be present in packs

The protocol explains not only why in Selous G.R. study, as in the 'Serengeti' packs in the 1970s, older males lost their alpha status to prime age (i.e. younger) males but also why one or more former alpha males (but not former alpha females) are present in some packs (Frame et.al. 1979, Creel & Creel 2002). In the Selous, as in 'Serengeti' in the 1970s, this could be the result of one or more pack dissolution events and immigration of different female groups to join each 'new' younger alpha male's all male group. Such behaviour is reported for Selous where continuity of occupation of home range/'territory' is through the males line (S.Creel 1996).

FROM THE ABOVE EXAMPLES (i-x) IT MIGHT BE CONCLUDED THAT:-

1. The 'Serengeti' 'Young Male' protocol is probably genetically determined. If so it would explain why this unique mammal behaviour is identifiable in so many different situations in both free living and captive packs in East and southern Africa.

2. The protocol explains a number of otherwise inexplicable behavioural observations and enables predictions to be made about the likely outcome of interactions between individuals and amongst groups of wild dog in the wild and in captivity (Visee et.al. 2000).

3. The observations i-v above cannot be explained based on the hypothesis that the chance of a male becoming alpha increase (up to 6 years) with age (Creel & Creel 2002).

4. Likewise the claim that in the Selous G.R. male rank is determined not by age but by who is 'fittest' with a sick or injured alpha male unlikely to hold his position for long (N. Creel 1996) is clearly incompatible with the altruistic behaviour of a subordinate male in the Hwange N.P. pack (see page 1) and cannot explain this or any of the behaviour in (i-x above) unless in Lycaon male society 'fittest' = younger.

THE EXISTENCE OF THE 'YOUNG MALE' PROTOCOL HAS BEEN IGNORED

The existence of the 'Young Male' protocol, although fully reported to IUCN, SSC, Canid Specialist Group and other researchers (Burrows 1995, Visee et.al. 2000, has so far been ignored.

One of the researchers who collated Lycaon data in the 1970s agrees that the 'Young Male' protocol explains the 'Serengeti' data involving change of alpha male status (Malcolm 1979 & J. Malcolm per comm.).

Despite this and the considerable volume of behavioural and conservation orientated research undertaken on this species in the last 10 years or so, the failure to recognize the existence of a protocol basic to our understanding of Lycaon society is of great concern.

As a consequence, a number of important practical implications for the welfare, conservation and survival of both free living and captive breeding packs of this highly endangered species have not been taken into account and so avoidable and potentially dangerous mistakes are still being made (see below).

THE IMPORTANCE OF THE 'YOUNG MALE' PROTOCOL FOR THE WELFARE, CONSERVATION, MANAGEMENT AND CAPTIVE BREEDING OF LYCAON.

1. The importance of the welfare and longevity of the alpha pair, all male groups and dispersing groups of both sexes in existing free living populations must be recognized

The protocol highlights the importance of the welfare and therefore the longevity of the alpha pair in a Lycaon pack, and why single sex immigrant groups of females, and all male groups of mixed cohorts resident on a home range, are vital in maintaining small Lycaon populations in large areas of protected land such as 'Serengeti' where this widely dispersed population is dependent during their wet season denning period upon

migratory prey. Free living single sex groups are not merely surplus animals which can be 'cropped' i.e. removed from existing populations for translocation elsewhere. These dispersing single sex groups are vital to the survival of the population from which they came.

2. Any invasive research must take into account the so far unexplained association between handling and outbreaks of disease and the consequences of the inadvertent death of alpha individuals following handling.

The 'Young Male' protocol warns that pack dissolution will follow if either of the alpha pair dies as an inadvertent result of invasive research and management (Burrows 1992, Burrows et.al. 1994 & 1995) or the pack is fragmented due to problems, particularly the possible death of alpha adults and 'natal alpha' pups during capture and translocation of packs or groups

a. Serengeti -Mara ecosystem.

In the formerly world renowned and much filmed former 'flagship' study population in the Serengeti, a significant reduction in pack life and individual longevity was coincident with the introduction of routine intervention in 1985 and consistent with pathogen- induced mortality (Burrows et al 1994).

Between 1985-1991 following the introduction of intensive research/management techniques (known generally as 'handling') involving anaesthetization, radio-collaring , blood sampling and mass vaccination (of over 80% of the study population) against rabies to which some packs had been previously exposed and survived, the entire wild dog study population comprising 14 packs containing approximately 200 individuals died or disappeared from the two study areas. Significantly a non study non-handled population survived and survives to date in adjacent areas (contra. Woodroffe & Ginsberg 1999).

Modelling demonstrated that the extinction of a population of this size in the two contrasting and widely separated areas by 1991 was unlikely to be a consequence of chance events alone (Burrows et al 1994, Woodroffe et al 1997). One explanation compatible with the evidence is that an outbreak of disease (which in all cases where samples were obtained was shown to be rabies) induced by stress, possibly caused by intervention (Anon. 1994, Burrows et.al. 1994 & 1995).

b. Kruger National Park,

In the only free living Lycaon population in South Africa outside private intensively managed reserves:-

The total number of different individuals sampled in Kruger N.P. research since 1989 and the number of times the same individuals were sampled between 1990 and 1999 is unclear but :-

i. Between 1990-93, 46 dogs from 6 packs in the southern district of Kruger N.P. were immobilized to check their heath status and for disease screening (van Heerden et.al. 1985).

ii. Between 1990-1999, also in the southern district, 72 individuals from 11 packs were fitted with radio-transmitters of various types. Annual mortality per is reported to be 35-40% for radio collared individuals and 53% for individuals with radio implants (Mills 1993, Ginsberg et.al. 1995a). The survival and social status of older Kruger N.P males fitted with both heavy satellite collars (900g) and a VHF radio implant is not reported (Gorman et.al. 1992).

iii. Between 1989-1994, skin samples (collected by biopsy dart) or blood samples (collected after anaesthetization) were collected from 92 individuals from 9 packs again in the southern district. One to 24 individuals in the each pack were sampled. Samples were taken from both alpha dogs in 4 packs the alpha males in 3 packs and the alpha females in the other two (Girman et.al. 1997).

iv. In an experiment to test an hypothesis one or both of the alpha pair if known, or if not one adult male and female from each pack in Kruger N.P., (probably about 36 packs) were immobilized to obtain blood samples

(n=94) (Girman et.al. 2001). Eleven of these packs contained at least one radio-collared individual.

Between 1995-2000 a catastrophic decline of 60% took place in the number of individuals from what had previously been described as a 'stable' population with the loss of probably 11 packs (G. Mills www & unpublished data). The Southern District sub-population, presumably the most intensively handled group of packs in Kruger N.P. fell by 56% from a total of 154 individuals (73 adults and 81 pups) in 11 packs 1995, to 68 individuals (32 adults and 36 pups) in 6 packs in 1999 (Data from www.parks-sa.co.za).
The causes of death in this population is claimed to be either 'unknown' or due to 'natural mortality' the latter often involving lion predation but disease related mortality is rare (Mills 1993, Ginsberg et. al. 1995a, van Heerden et.al. 1995).

In Kruger N.P wild dogs have a short life with over 80% living less than 4 years and few living more then 7 years. (cf. Serengeti longevity 6.5+- 0.1 years in the 1970s before routine handling began Burrows et al 1994).

Given the reported high annual mortality of radio-collared individuals (35-40%) the selective targeting of alpha individuals for immobilisation and blood sampling must each year have led to losses of a number of alpha individuals from their packs. This would have led to frequent pack dissolution which in turn could have resulted not only in high adult mortality and dispersal but also in the observed loss of reproductive success particularly in 1996 and 1997 in this vitally important population.

c. Moremi Game Reserve.

In 1996 in Moremi G.R., Botswana, another intensively handled wild dog population, 5 wild dog study packs died in a period of 3 weeks again from causes unknown as no tissue samples were obtained although canine distemper or rabies was suspected. All study packs in the Botswana study contained 1-3 radio-collared individuals with usually one of the alpha pair being selected (McNutt 1996b). As in Kruger N.P. individual wild dog and pack longevity in Moremi G.R. is low compared with 'Serengeti' pre 'handling', with few surviving more than 3 years (McNutt 2000).

d. Madikwe Game Reserve and Etosha National Park.

In Madikwe G.R. (Republic of South Africa) and Etosha N.P (Namibia) individuals vaccinated against rabies in captivity using inactivated vaccines died from rabies, as did other unvaccinated individuals in their packs after release to the wild (Scheepers & Venzke 1995, Hofmeyr et.al. 2000).

e. Mkomazi Game Reserve.

In Mkomazi G.R. (Tanzania) between December 2001 to early 2002, over the course of a few weeks 49 of 52 wild dogs in a captive-breeding programme died from canine distemper. All had been vaccinated, using inactivated vaccines in each case, against a variety of pathogens including canine distemper The source of the virus is unknown. The role of cell-mediated immunity in, and the efficacy of vaccination of Lycaon, is now being investigated as a matter of urgency (van de Bilt et al 2002, A.Visee pers. comm.).

3. A claim that the risks of intervention involving immobilization, radio-collaring and vaccination of African wild dogs have been assessed (Woodroffe 2001) is incorrect (East et. al. 1997, Burrows 1998).

Analysis of Serengeti wild dog data collected from 1965-91 (i.e. both pre and post the advent of invasive research) show a statistically significant association between handling and reduced longevity of individuals and their packs in this study population (Burrows et. al. 1994). This association is not disputed (Woodroffe et al 1997).

In another study in 4 other ecosystems (Kruger, Moremi, Selous and Hwange) between 1987-94, 58% of radio-collared individuals are claimed to have died from 'natural causes'.

Although no data on longevity is included it is claimed that:- " there is no effect of handling on the longevity of Lycaon in any ecosystem studied. " (Ginsberg et.al. 1995a). Data from the 'Mara' sector of the 'Serengeti'

published in this paper was later shown to be 'incomplete' and is now excluded from consideration (Woodroffe et al 1997).

Following the publication of data from Serengeti and those collected up to 1994 from 5 other wild dog study populations, the Chair of the Canid Specialist Group, in Preface to: - IUCN Status Survey & Conservation Action Plan, 'The African Wild Dog ' wrote:- " the resolution of one question remains imperfectly ragged, despite exhaustive attention, and that is whether handling or vaccinating wild dogs had inadvertently contributed to their demise in the Serengeti-Mara ecosystem." (Macdonald 1997). This unfortunately is still the position.

Despite a further 9 years (post 1993) during which intensive routine handling of other free living and captive packs continued no further data or analysis of the effects of handling on the survival or longevity of handled individuals and their packs compared with those 'unhandled' has been published for any ecosystem.

"It is likely. that in many studies any adverse effects [of handling] are either unnoticed, perhaps because they are rare, or, more likely, because they are not reported" (Laurenson 1992).
" from our results and PVA models presented previously (Burrows et al 1995 ,Ginsberg et al 1995b), it is difficult to determine whether the extinction of the Serengeti wild dog population is more likely to be due to chance alone (Ginsberg et al 1995b) or to invasive research methods (Burrows 1992)." Cross and Beissinger (2001).

The basic assumptions made and the data used in the Ginsberg et.al. model are incorrect (Burrows et. al. 1995 and see Appendix).

4. Captive breeding: the importance of the 'Young Male' protocol in planning captive breeding programmes

The protocol highlights the problems of aggression and social disruption that will inevitably follow if captive Lycaon packs are artificially 'constructed' from a miscellaneous collection of individuals and cohorts (van Heerden & Kuhne 1985, Hofmeyr 2001, Visee et.al. 2001). The composition of artificially constructed packs for captive breeding must be very carefully planned taking into full account the implications of the 'Young Male' protocol. (Visee et.al. 2000).

In captivity the practice of brother -sister mating although claimed to be more "successful" than mating less or non-related individuals (van Heerden & Kuhn 1985) may have considerable adverse effects on the behaviour and hence survival of in-bred individuals if subsequently released to the wild.

It is vital that in captive breeding programmes :-

a. The ranging and social behaviour of Lycaon should be fully understood and taken into account when designing enclosures for captive breeding. If more than one enclosure is used then they should be as widely separated as is practicable to prevent visual contact and reduce vocal and scent contact all of which may be stressful and disruptive.

b. Large numbers of individuals from different natal packs should not be kept in a single enclosure.

c. Introducing a miscellaneous group of unrelated males of different ages to a miscellaneous collection of unrelated females should not take place.

d. Brother-sister mating should not be used.

e. Females with pups should be mated with an adult male who is not the father of the pups.

Suggested composition of a breeding pack for captive breeding and management :-

a. A breeding pack should consist in the first year of a pair of young unrelated yearling adults.

b. Pups born to the lone pair should all remain with their parents during the first year and the pack fed together.

c. In the second year if there is a new litter of pups, when the latter are approximately 10 months old, any yearling females, should be removed and kept together until ready for release as a group. Until then, if possible the pack should be fed together from a single food source so that the natural feeding hierarchy is allowed to operate.

d. The yearling males should be removed soon after the yearling females and again kept as a group, separately from their female litter mates, prior to release.

e. It is important to attempt to identify the 'natal alpha' male and female in the yearling groups. These extremely important individuals should not be selected for fitting with radio-transmitters prior to release.

f. If whole packs are released then these should consist of a natural unit. i.e. alpha pair plus older pups and/or yearlings.

g. The role of 'handling' mediated stress and the efficacy of vaccinating free living packs post exposure and captive Lycaon prior to release to the wild must be fully investigated (East et al 1997 & 2002, East & Burrows 2001, Hofer & East 1998 van de Bildt 2002).

If the measures suggested above are adopted then each year after the first successful mating of the initial pair (s) both male and female yearling groups should be available for release. Unrelated groups once habituated to local conditions at the proposed release site could be introduced to one another at which a pack should form naturally. Release should ideally take place at a time of prey abundance in the chosen area.

CONCLUSIONS

The existence of the 'Young Male' protocol and it's implications, although fully reported to IUCN, SSC, Canid Specialist Group and other researchers (Burrows 1995, Visee et.al. 2000,) has so far been ignored.

As a consequence, a number of important practical implications for the welfare, conservation and survival of both free living and captive breeding packs of this highly endangered species have not been taken into account and so avoidable and potentially dangerous mistakes are still being made.

A claim that the risks of intervention involving immobilization, radio-collaring and vaccination of African wild dogs have been assessed is incorrect.

Given the known high annual mortality rate of radio-collared individuals (collars have to be replaced within 19 months and the dogs re-immobilized to do so) and the existence of the 'Young Male' protocol it must be concluded that:-

i. The identification of a 'Young Male' protocol in Lycaon emphasizes the vital importance of detailed long term field based observations on free living populations in obtaining an understanding of the basic behaviour of mammals, endangered or otherwise.

ii. The risk of pack dissolution following the targeting of alpha individuals for even a single immobilisation is unacceptable. For the welfare and conservation of free living populations of this highly endangered species, breeding alpha individuals and 'natal alpha' pups and 'natal alpha' yearlings should not be immobilized for blood sampling, tissue sampling and/or fitting of radio-transmitters.

iii. The role of stress induced by handling and the possible break down of cell-mediated immunity leading to outbreaks of disease in captive and free living populations following immobilisation and vaccination needs to be urgently investigated

Appendix

A PVA model based on a putative Serengeti Lycaon population crash in 1975-76 (Ginsberg et. al. 1995b).

This PVA model is based on what are claimed to be a series of 'catastrophes' (>40% loss of adult population) in the 'Serengeti plains study population with the first in 1975-76 before intensive invasive handling began. This putative population crash from 60-30 adults, is crucial to the model but a closer examination of the published 1975-6 data (Frame et. al. 1979) of the yearly maximum number of adults in each pack seen in the study area does not support such a claim. The researchers involved also provided data on the study population per quarter year. It is clear that there were not 60 individual resident or peripheral adults recorded at any one time in the Serengeti study area of 5.200 km.2 in 1975 and the apparent 'decline' in the population was 35% (see Table 1). Despite the claimed crash in 1975 -76 there were claimed to be the same number of packs in 1977 as in 1974 i.e. 7. (Frame et al 1979).

Disease is claimed to be the cause of the putative crash in 1975-76 but no ailing dogs were seen in the Serengeti between 1974-77 and just 13 of 79 known adults died giving an annual survival 0.825 (Malcolm 1979, Burrows 1995). Deaths were inferred from the disappearances of single adult dogs (mainly age related see data in Malcolm 1979) excluding probable emigrants which also disappeared (Frame et al 1979, J. Malcolm pers. comm., Burrows 1995). The number of individuals seen in 1975 is based on yearly counts of adults and included a rare sighting of one large peripheral pack which did not den in the study area; when seen in late 1974 there were 4 adults and 11 pups present. These pups were not included in the population count but by the second quarter of 1975, as the pups were >12 months old, they were now counted as adults by the researchers. The pack appeared to rapidly expand from 4 to 15 adults. Reproductive success in the 'Serengeti' study packs in the 1970s was highly sporadic (Frame et al 1979).

The apparent loss of individuals and 2 packs in 1976 was mainly due to the failure of the researchers to see two other peripheral packs which denned outside their study area. One was not seen again in the study area after the first quarter of 1975 when it had 3 members. The second a previously unknown pack containing 18 adults when first seen in August 1973. Its home range was not defined and its denning area unknown. When last seen this pack consisted of 12 adults (4 adults and 7 yearling males and a lone adult female). Five yearling females from this pack had emigrated to join an all male study group in January 1974. The pack was last seen in the study area in the first quarter of 1975. This gave the appearance from the raw yearly data that 2 packs and 15 individuals had died/disappeared. There is no evidence that they did. There were not 62 adults in the 5,200 km.2 study area at any one time in 1975 with a maximum of 46 (Table 1).

Table 1. Total verified population of adult wild dogs living on the Serengeti plains 1974-76 (data from Frame 1977 Table 3 & Frame et al. 1979, Table 1). Data given at 3 month intervals includes residents and non-

	1974				1975				1976			
Frame (1977) n adults	44	43	42	41	39	46	38	37	32	31	30	30
n Packs	6				7				5			
					(+ 4 dispersing females)							
cf. n. packs claimed Frame et al. (1979)	7				*8				5			
but give data for	4 +1 amg				4 packs				5 packs			

residents.

* Data provided for only 4 resident packs; 3 others were 'peripheral' packs, which did not den in the study area and were rarely seen (Frame & Frame 1981).
In the 1980s one pack large pack appeared sporadically in the SE Serengeti plains study area although they denned 100km. to the north-west (Lelo 1990). Such 'peripheral' packs were included in annual counts in the 1970s.

As the researcher involved observed with reference to the Serengeti decline since 1975:- " *there are several reasons to suspect that the decline in the population is more apparent than real*" (Frame 1977).

The pack is the basic reproductive unit in wild dogs and the size of the breeding population is directly related to the number of packs in the study population (Woodroffe & Ginsberg 1999). Despite the loss of 60% of the individuals in Kruger between 1998 and 2000 this is claimed to be a temporary decline resulting from poor litter survival during two years (1996 & 1997) of unusual rainfall (Mills www.parks-sa.co.za).

The claimed 1975/76 wild dog population crash is an artifact of data presentation. Ginsberg et al's PVA model based on a claimed catastrophe before the use of routine handling began (i.e. 1985) is fatally flawed (Burrows et al 1995).

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