

## SUMMARY

Reported predation by black-backed jackals *Canis mesomelas* on adult impala *Aepyceros melampus* in the Northern Tuli Game Reserve, Botswana, was investigated. The study confirmed that jackals in this reserve do prey regularly on adult impala. The predation was found to be seasonal, opportunistic, co-operative and selective.

\* Predation was highly selective. Eight of the eleven kills recorded were of

\* Predation on adult impala commenced in late-summer to mid-winter - commencement and incidence of predation apparently being linked to the availability of alternative food resources.

\* Predation was undertaken by temporarily co-operating groups of jackals which otherwise resided in individually distinct home-ranges. Group size during hunting and consumption of impala was significantly greater than the average group size.

Male jackal home-ranges were found to increase significantly in size from

\* Predation was undertaken in well defined phases: usually far from the core-area, suggesting a significance in the excursions of jackals

1. One or two jackals rush towards a herd of resting impala. This is followed by close observation of the fleeing animals as well as by excited sniffing at the ground in the vicinity of the herd's original position;

density of jackals was found to be extremely high - estimated at between four and seven per square kilometre.

2. A selected impala is cornered and harassed, with the aggregation of a larger group of jackals;

Extensive use of the lateral anterior dental elements ( $I_2$ ,  $I_3$  and C) by

3. The prey is immobilized and possibly silenced by one jackal biting the throat;

use of these teeth for this purpose was found to result in total vertical attrition of all the anterior teeth. Impala without these

4. The prey is killed by severing of the major abdominal arteries, including the aorta, after entrance is gained via a flank wound;

5. The prey is rapidly and completely consumed - only the skeleton and the rumen contents remain after three to four hours. Other jackals arriving after the kill are allowed to feed.

\* Predation was highly selective. Eight of the eleven kills recorded were of the oldest impala age-group, all of which were in extremely poor condition. Of the remaining three impala, one had a compound fracture of the right metacarpus.

Insects formed a major part of the diet in summer. This proportion declined during autumn and winter, with a concomitant increase in the utilization of impala.

Male jackal home-ranges were found to increase significantly in size from summer to winter. Involvement in impala kills was usually far from the core-area, suggesting a significance in the excursionary movements of jackals recorded by this and other studies. Strong selection for open habitat types both during activity and during rest periods was recorded.

The population density of jackals was found to be extremely high - estimated at between four and seven per square kilometre.

Extensive use of the lateral anterior dental elements ( $I_2$ ,  $I_3$  and C) by impala and other browsing/mixed feeding antelope for grooming purposes was identified. Prolonged use of these teeth for this purpose was found to result in total vertical attrition of all the anterior teeth. Impala without these

teeth were found to carry significantly higher external parasite burdens than those impala with front teeth from the same area.

Absence of the anterior teeth in antelope was correlated with the partial or complete absence of hair on all parts of the body other than the head and neck. This syndrome was ascribed to repeated ineffective grooming efforts, and was thus dubbed "autogenous alopecia". Autogenous alopecia was found to be strictly seasonal, occurring only during the annual winter drought. The syndrome was found to be limited to the south-central region of the Reserve. Impala exhibiting the syndrome in September 1988 were found to be in significantly poorer condition than impala with unworn teeth from the same area.

External parasite burdens on impala from the northern parts of the reserve were found to be significantly lower than on impala from the south-central region. The age structure of the south-central impala population was found to be significantly skewed towards the oldest age-group.

Wild dogs *Lycaon pictus* were confirmed to be extinct in the Reserve. Spotted hyaenas *Crocuta crocuta* were found to be relatively scarce in the south-central region compared to the northern and western parts of the Reserve.

It was concluded that the current jackal-impala and impala-ectoparasite relationships in the Northern Tuli Game Reserve are the result of man-induced disruption of the natural large-predator community of the region. Persecution of wild dogs and spotted hyaenas prior to the formation of the Reserve has resulted in the elimination of the natural process of selective predation on old impala. This has resulted in the accumulation of excessive numbers of old animals in the south-central parts of the Reserve which act as a source of food for the jackals at a critical time of the year. This has allowed the

increase in jackal population density to present levels, an event which has in turn resulted in increased predation pressure on scarcer prey species. The persistent presence of many old impala in the south-central population due to the generalist nature of jackal predation has resulted in increased infestation of the habitat with external parasites in this region. This in turn necessitates increased grooming activity by all members of the population, leading to early attrition of the anterior teeth, thus further increasing the source of external parasites in the ecosystem.

The ramifications of man-induced disruption of ecosystem processes in the Reserve was concluded to be of considerable heuristic value. It is suggested that the situation evident in the Northern Tuli Game Reserve today is a precursor of similar events in other isolated islands of African environment where natural predation processes have been compromised or destroyed.

The current *status quo* in the Reserve was concluded to be highly undesirable. Rectification was recommended through the re-instatement of the pristine process of selective predation on old impala - either through the re-introduction of selective predators or through the simulation of the natural process. The importance of process-orientated conservation was highlighted by the results and conclusions of this study. Scientific evaluation of the consequences of intervention or non-intervention were recommended, as the results could be of considerable value in the management of ecosystem stress in other areas.

## OPSOMMING

Predasie deur rooijakkalse *Canis mesomelas* op volwasse rooibokke *Aepyceros melampus* in die Noordelike Tuli Wildreservaat, Botswana, is ondersoek. Die studie het bevestig dat jakkalse in dié reservaat wel gereeld op volwasse rooibokke prooi. Die predasie is gevind om seisoenaal, opportunisties, koöperatief en selektief te wees.

\* Predasie op volwasse rooibokke het in laat somer tot middel winter 'n aanvang geneem - aanvangs en voorkoms van die predasie is waarskynlik aan die beskikbaarheid van alternatiewe voedselbronne gekoppel.

\* Predasie is deur tydelik samewerkende groepe jakkalse onderneem wat andersins in individueel aparte tuisgebiede bly. Groepgrootte gedurende jag en verorbering van rooibokke was betekenisvol groter as die gemiddelde groepgrootte.

\* Predasie is in duidelik afgebakende fases onderneem:

1. Een of twee jakkalse storm op 'n trop rustende rooibokke af. Dit word gevolg deur noue betragting van die vluggende diere sowel as deur opgewonde snuiwery van die grond in die omgewing van die trop se oorspronklike posisie;

2. 'n Uitverkose rooibok word in 'n hoek gedryf en gekwel, met die gelyktydige samedromming van 'n groter groep jakkalse;

3. Die prooi word immobiliseer en moontlik stil gemaak deur een jakkals wat die rooibok aan die keel byt;

4. Die prooi word gedood deur die afsnyding van die hoof abdominale slagare, insluitend die aorta, nadat toegang tot die buikholte deur 'n wond aan die sy verkry is;

5. Die prooi word vinnig en in sy geheel verorber - slegs die geraamte en die inhoud van die rumen bly na drie tot vier ure oor. Ander jakkalse wat na die doding aankom word toegelaat om te voed.

\* Predasie was hoogs selektief. Agt van die elf opgetekende dodings was van die oudste rooibok-ouderdomsgroep, almal waarvan in 'n uiters swak kondisie was. Van die oorblywende drie rooibokke, het een 'n saamgestelde breuk van die regtervoorbeen gehad.

Insekte het 'n vername deel van die dieet in die somer uitgemaak. Hierdie verhouding het gedurende herfs en winter afgeneem, met 'n ooreenstemmende toename in die verbruik van rooibokke.

Tuisgebiede van jakkals mannetjies is gevind om betekenisvol in grootte van somer to wintertoe te neem. Betrokkenheid by dodings van rooibokke was gewoonlik vër van die kerngebied wat 'n beduidenheid in die bewegings van jakkalse voorstel wat deur hierdie, en ander, studies aangeteken is. Sterk seleksie vir oop habitattipes, beide gedurende aktiwiteit en rusperiodes, is opgeteken.

Daar is gevind dat die bevolkingsdigtheid van jakkalse besonder hoog is - gereken as tussen vier en sewe per vierkante kilometer.

Uitgebreide gebruik van die laterale voorste tandelemente ( $I_1$ ,  $I_2$ ,  $I_3$  en C) deur rooibokke en ander blaarvretende/gemengde-voedende boksoorte vir die doel van lyfversorging is geïdentifiseer. Langdurige gebruik van hierdie

tande vir dié doel het 'n algehele vertikale wegslyting van al die voorste tande tot gevolg. Rooibokke sonder hierdie tande het betekenisvol meer uitwendige parasietbeladings as normale rooibokke gedra.

Afwesigheid van die voorste tande in boksoorte het met die gedeeltelike afwesigheid van hare op al die dele van die ligaaam, uitgesonderd die kop en die nek, verband gehou. Hierdie sindroom is toegeskryf aan herhaaldelike oneffektiewe pogings om parasiete van die vel te verwyder, en is dus "autogenous alopecia" gedoop. Daar is gevind dat hierdie sindroom streng seisoenaal was deur slegs gedurende die jaarlikse winterdroogte voor te kom. Die sindroom was tot die suid-sentrale gedeelte van die Reserwaat beperk. Rooibokke wat die sindroom in September 1988 vertoon het, was in 'n beduidende swakker kondisie as rooibokke van dieselfde area met ongeslyte tande.

Uitwendige parasietbeladings op rooibokke van die noordelike dele van die Reserwaat is gevind om betekenisvol minder as dié op rooibokke van die suid-sentrale gebied te wees. Die suid-sentrale rooibokbevolking het betekenisvol meer ou diere as die noordelike bevolking bevat.

Wildevonde *Lycaon pictus* is bevestig om binne die Reserwaat uitgesterf te wees. Gevlekte hiënas *Crocuta crocuta* was betreklik skaars in die suid-sentrale gebied vergeleke met die noordelike en westelike gedeeltes van die Reserwaat.

Daar is tot die gevolgtrekking gekom dat die huidige jakkals-rooibok en rooibok-ektoparasiet verwantskappe in die Noordelike Tuli Wildreserwaat die gevolg van mensgemaakte versteuring van die natuurlike groot-roofdier gemeenskap van die streek is. Vervolging van wildevonde en gevlekte hiënas voor die ontstaan van die Reserwaat het tot die uitskakeling van die natuurlike proses van selektiewe predasie op ou rooibokke gelei. Dit het tot

die versameling van buitensporige getalle ou diere in die suid-sentrale gedeeltes van die Reservaat gelei wat as 'n bron van voedsel vir jakkalse tydens 'n kritieke tyd van die jaar gedien het. Dit het 'n toename in die bevolkingsdigtheid van jakkalse tot huidige vlakke toegelaat, 'n gebeurtenis wat op sy beurt 'n verhoogde predasie-druk op skaarser prooispesies tot gevolg gehad het. Die hardnekkige teenwoordigheid van vele ou rooibokke in die suid-sentrale bevolking, te wyte aan die algemene eienskappe van jakkalspredasie, het tot 'n toenemende besmetting van die habitat met uitwendige parasiete gelei. Dit het op sy beurt verhoogde lyfversorgings-aktiwiteit by al die lede van die bevolking genoodsaak, wat tot vroeë afslyting van die voorste tande gelei het, wat dus verder die bron van uitwendige parasiete in die ekosisteem laat toeneem het.

Daar is tot die slotsom gekom dat die uitvloeisels van 'n mensgeïnduseerde versteuring van ekosisteem-prosesse in die Reservaat van noemenswaardige heuristieke waarde is. Dit word voorgestel dat die klaarblyklike situasies in die Noordelike Tuli Wildreservaat vandag 'n voorloper van soortgelyke gebeurlikhede in ander geïsoleerde eilande van Afrika-omgewings is waar natuurlike prosesse van predasie vernietig is.

Daar is besluit dat die huidige *status quo* in die Reservaat hoogs ongewens is. Regstelling deur die herinstelling van die oorspronklike proses van selektiewe predasie op ou rooibokke - óf deur die inbring van selektiewe roofdiere óf deur die nabootsing van die natuurlike proses. Die belangrikheid van proses-georiënteerde bewaring is deur die resultate en slotsom van hierdie studie beklemtoon. Wetenskaplike opweging van die gevolge van ingryping of nie-ingryping word aanbeveel, aangesien die resultate van aansienlike waarde in die beheer van ekosisteem-spanning in ander gebiede kan wees.