

CATTLE PREDATION BY THE GOLDEN JACKAL *Canis aureus* IN THE GOLAN HEIGHTS, ISRAEL

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Abstract

About 1.5%–1.9% of the calves born in the Golan Heights die due to predation, mainly by golden jackals *Canis aureus*, and the total damage during 1993 was estimated at about US\$ 42,000. Most attacks occur within 2 days after delivery, and male calves are more likely to be attacked than females, probably because they are heavier and more difficult to deliver. The high predation rate is a consequence of the artificially large population size of jackals, which is a result of food provided by humans in illegal garbage dumps. Farmers try to reduce the damage to cattle by illegal poisoning, thus affecting wildlife in the Golan.

Keywords: golden jackal, *Canis aureus*, predation, poisoning, calves, Golan Heights, Israel.

INTRODUCTION

The Golan Heights is a 1040 km² volcanic grassland plateau on the eastern side of the north Jordan valley. Its central and northern parts are rocky, thus preventing cultivation of much of the area. The western slopes of the Golan towards the Jordan river are rocky and sliced by deep canyons, some of which are nature reserves. Successful legal protection of wildlife, together with increased food availability from agricultural products and garbage dumps, has been followed by an appreciable increase in some wildlife species, which in turn has created conflicts between farmers and nature conservation. For example, the number of gazelles *Gazella gazella* rose from about 500 to 4000 between the early 1970s and 1985 (Yom-Tov, 1993), and the number of jackals *Canis aureus* increased from a density of about 0.2 jackals/km² (about 200 during the 1970s, Ilani, 1979) to 2.5 jackals/km² in 1988 (Frankenberg & Pevzner, 1988). The natural diet of jackals in the Golan seems to be mainly rodents, chiefly social voles *Microtus socialis*, but also hares *Lepus capensis*

and some fruit and vegetables. The population level of the voles is known to fluctuate considerably from several dozens per hectare during summer to several thousands per hectare in peak years. During winter 1985 the vole population density in the Golan peaked, and almost all grazing was eliminated (Mendelssohn & Yom-Tov, 1988). The damage to cattle ranchers was considerable, because additional fodder had to be provided for the cattle.

There are about 35 agricultural settlements in the Golan, producing cereals, fruits, wine grapes, turkeys, hens, dairy products and cattle. About a third of the Golan area (350 km²) is managed for grazing by 15,000 cattle, belonging to about 15 owners, mainly collective farms (kibbutzim and moshavim). During the last decade there has been growing concern among farmers about calf predation by jackals, which has been claimed by some farmers to be as high as 10% of all calves born.

The aim of this paper is to report on a study to evaluate the extent of the damage and to suggest possible measures to decrease depredation by jackals on calves while maintaining a good balance of wildlife.

STUDY AREA

The Golan is mainly a basaltic plateau covered with annual and perennial grasses, legumes, and some scattered trees. The climate is Mediterranean with an average annual rainfall of 400–800 mm, mostly during October–April. It is inhabited by several species of wild mammals, including mountain gazelles, wild boars *Sus scrofa*, rock hyraxes *Procapra capensis*, and several carnivores—wild cats *Felis sylvestris*, jungle cats *Felis chaus*, red foxes *Vulpes vulpes*, wolves *Canis lupus*, golden jackals, and several mustelids. The Golan is also inhabited by several species of raptors, and has the largest griffon vulture *Gyps fulvus* colony in Israel (Yom-Tov, 1993). About 12% of the area is given over

to 24 nature reserves, mostly small with the notable exception of Yahudiya Forest in the central Golan, which occupies about 6% in the central Golan (Livne, 1993). Since the 1970s most of the area has been grazed by cattle, in fenced paddocks with varying grazing pressure.

METHODS

The extent of predation was evaluated by forming a network of informants among the ranchers of nine cattle herds in central and northern Golan, who, throughout 1993, reported any calf death or disappearance occurring in their herds. The site was visited within 24 h and the carcass checked to determine if death had occurred before or after delivery, and whether the calf had any deformities which might indicate higher than normal vulnerability to predation. On each visit the date and place of the assumed predation were noted, as well as the condition of the calf (wounded, dead, bite marks), sex, age, age group of the mother (1 year old or older), and in a case of clear predation, an evaluation was made of the identity of the predator (wolf, jackal, dog) through foot prints or bite marks.

We assumed that the high density of jackals in the Golan is in part the result of food thrown away by man. The availability of such food was assessed by a survey of legal and illegal garbage dumps in the Golan. This was carried out during the winter of 1993 by visiting all settlements in the area and their surroundings, and noting any site where carcasses of domestic birds (turkeys and hens) or mammals (livestock) were dumped. We also marked all other rubbish dumps with food resources in the area.

RESULTS

Predation rate

The reported mean attack rate was 2.8% (Table 1), but the rate was highly variable and ranged from 0.24 to 12.14%. This variability is a result of several factors:

(1) The expertise of the rancher in identifying predation,

visitation rate and management techniques of the herd. In most cases the reported figure is an underestimation of the actual rate, since not all predated calves are found, and herds are not visited on a daily basis; most ranchers do not visit their herds on Saturdays, and this factor might have decreased the reporting rate by 10%.

(2) Rain: on average there are 65 rainy days in the Golan, mostly between November and March, and after rains the heavy soil becomes very muddy, excluding access to large parts of the area. About 40% of deliveries occur during these months, thus reducing the reporting rate by an estimated 15%.

(3) Some ranchers illegally place poisoned bait in carcasses of predated calves and reduce predation in their herd vicinity.

(4) The operations carried out by rangers of the Nature Reserve Authority (NRA) to reduce jackal numbers: during 1993, 156 jackals were shot, and poisoned bait was laid, of which 29 were taken, presumably by jackals. These operations were not evenly spread, and reduced predation in some herds more than in others.

Although the mean attack rate was 2.8%, in some cases it was doubtful that jackals were responsible for the attack and the actual attack rate attributable to them was only 2.4%. Fifty-three percent of the attacked calves were found dead (70 out of 132; 37% of which was attributable to jackals), and thus mean death rate due to predation varied between 1.5% (all reports) and 1% (only proven cases). However, this rate has to be increased by at least 25% in order to account for unreported cases. Death of calves due to predation was thus 1.3–1.9%.

Predation rate was also calculated from veterinary data (I. Tyomkin, pers. comm.). Of the 7471 female cattle in the above nine herds, 6350 (85%) were adults. Mean conception rate was 90%, and 80% of the adult females gave birth, totalling 5080 calves born in the above herds during 1993. Of these, 1.5% died of birth defects and disease within a day after birth, and an additional 1.5% died from similar causes before the age of 7 months. About 2% of the adults disappeared from causes not related to predation (theft, etc.) and there is no reason to believe that the rate of disappearance

Table 1. Predation on calves in nine cattle herds in the Golan during 1993

^aRemains of calf were found with clear evidence of predation. ^bA bitten calf was investigated. ^cRemains or whole body of a calf were present, but no clear evidence of the cause of death. ^dCalculated from the total number of births assuming that cases in doubt are also results of actual predation.

Herd	No. predated ^a	No. bitten ^b	No. in doubt ^c	Total	No. of cows	No. births	% Attacked ^d
Eliad	1			1	600	424	0.24
Elrom	5	24	3	32	870	631	5.07
Geshur	2		2	4	586	334	1.20
Yonathan	1	1	5	7	650	450	1.55
Merom Golan	6	11	1	18	1390	917	1.96
Neve Ethan			2	2	870	565	0.35
Keshet	8	7	1	16	785	530	3.02
Ramat Magshimim	10	6	2	18	1180	620	2.90
Schneider	16	13	5	34	540	280	12.14
Total	49	62	21	132	7471	4751	
Mean attacked							2.8

among calves was smaller. Hence, 255 calves (5%) died or disappeared from causes not related to predation, making the total number of calves reaching 7 months 4825, compared with 4751 reported by the ranchers. The difference between the two figures, 74 calves (1.5%), represents the death rate of calves due to predation. Hence, the results of both methods are similar and vary between 1 and 1.9%.

Most (75.5%) jackal attacks on calves occurred during the first 2 days after birth. Thirty-one percent of deaths occurred during delivery or several hours after it, 32% during the first day after delivery, and 12.5% during the second day. Thirteen percent of calf deaths occurred within 2–10 days, and 11% within 11–30 days after delivery. The face and tongue of calves attacked during delivery are eaten while the calf is still partly in the womb, but death is mainly caused by opening the posterior part of the calf's abdomen after delivery. In some cases the mother's vaginal area is also damaged, and several cows had to be destroyed because of serious wounds of this kind.

There were two peaks of predation: 41% and 50% of the attacks occurred between February and April and July and September, respectively, and attack rates were 4.7 and 2.7%, respectively. The remainder (9% of attacks) occurred during the rest of the year, and only a few attacks were reported during November–January, although 20% of births occurred during these months. This discrepancy might be explained by the rainy and stormy weather in this season, which prevents ranchers from closely following predation events in the herds.

Although the sex ratio of calves did not differ from unity, male calves were 2.5 times more likely to be attacked than females (72.5% and 70% of the attacks on calves born to experienced and primiparous (first delivery) cows, respectively; $\chi^2 = 13.54$, $p = 0.0002$), probably because they are heavier than females, and more difficult to deliver, thus exposing them to a higher predation rate. Calves born to primiparous cows were as likely to be attacked as those born to other cows ($\chi^2 = 2.96$, $p = 0.085$). There was no relation between the sex of the predated calves and the number of times their mothers had delivered.

For 64 calves for which it was possible to identify the predator, we estimated that at least 70% of the attacks were carried out by jackals, and the rest by either feral dogs or wolves. Attacks by wolves (about 10%) were carried out mostly in either the extreme north or south of the Golan.

Man-made food availability

In order to estimate the amount of food available to jackals in the Golan, we surveyed the area for garbage dumps and estimated the quantity of meat discarded there. There are only two official garbage dumps in the Golan, but we found more than 70 illegal dumps, and in several cases there were two or three dumps near one settlement. These dumps contain domestic refuse, construction and packing materials, but also agricultural waste including fruit and vegetable surplus and dead

turkeys, hens, calves and cows. Veterinary regulations demand that animal carcasses be either buried or burnt, but apparently little attention has been paid to these regulations in the Golan, and most if not all animal carcasses are being thrown in illegal dumps. Using official figures for the number of turkeys, hens, dairy cows and cattle raised in agricultural farms in the Golan and figures of their death rate (D. Tzur, pers. comm.), we calculated the amount of meat deposited in these dumps. The total amount deposited during 1993 was about 1208 tonnes, composed of 42% turkeys, 36% cattle and 19% hens. About 65–70% of this is available for predator consumption, with bones, intestines and skin not being consumed (Callow, 1961). Hence, the total amount of meat available for predatory animals in the Golan during 1993 was about 790–840 tonnes.

This food is consumed by various predators such as jackals, red foxes, and a few wolves and vultures; the most numerous of these predators are jackals. Assuming that the daily food consumption of a 10 kg jackal is about 0.5 kg (calculation based on equations in Schmidt-Nielsen, 1984), the above amount is sufficient to support a population of about 4000 jackals, or a population density of 3.8 jackals/km², within the reported density of 2–4 jackals/km² in the Golan (mean 2.5/km²; Pevzner, 1992). However, some of this food is taken by other animals, and jackals consume other sources of food such as rodents and hares. Nevertheless, it is clear that man-made food is a primary source of energy for jackals and supports their dense population in the Golan.

DISCUSSION

About 1.5–1.9% of the calves born on the Golan die due to predation, mainly by golden jackals. The total number of calves born during 1993 was about 7000 (H. Dayan, pers. comm.), and each sells at about US\$ 300 after delivery. Assuming a death rate of 1.9% (133 calves), the total damage to the cattle herd of the Golan in 1993 was US\$ 39,900. The high predation rate is a consequence of the artificially large population size of jackals in the Golan, which is in part a result of human activity, i.e. illegal dumping of carcasses of turkeys, hens and cattle which provide food for potential predators. It is ironic that food provided by farmers supports a population of predators which cause damage to agriculture.

This damage would have been much larger, presumably closer to US\$ 80,000, if no control measures had been taken. However, apparently most population reduction is caused by illegal poisoning of jackals by farmers rather than planned operations by the NRA. We do not have figures to estimate the rate of illegal poisoning, but the large variability of the reported predation rate among the various herds is at least partly attributable to such operations, and indicates widespread use of it. Poisoning has serious implications for wildlife, and the dramatic decrease in raptors in Israel during the 1950s was largely a result of secondary poisoning (Mendelssohn, 1962), as was a similar phenomenon in Britain (Cadbury, 1991).

Predation by jackals on cattle cannot be eliminated completely, but could be considerably decreased. We suggest carrying out operations in order to reduce the jackal population of the Golan to a mean density of about 1 jackal/km², i.e. less than half of its present level. This will keep the damage at a tolerable level, while maintaining a high enough jackal population to keep the vole population low, thus preventing a summer food shortage for cattle. This should be done in several ways: (1) by enforcing the law which controls garbage dumping, thus reducing man-made food availability to jackals; (2) by enforcing the law to avoid illegal poisoning by farmers; and (3) by reducing jackal populations by controlled shooting and poisoning by rangers of the NRA. Poisoning should be done during evenings in carcasses recently predated by jackals, and the bait removed in early morning in order to prevent its consumption by vultures and other carrion-feeding birds.

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