Wildlife Disease Research and Economic Development

Proceedings of a workshop held in Kabete, Kenya, 8 and 9 September 1980

Editors: Lars Karstad, Barry Nestel, and Michael Graham

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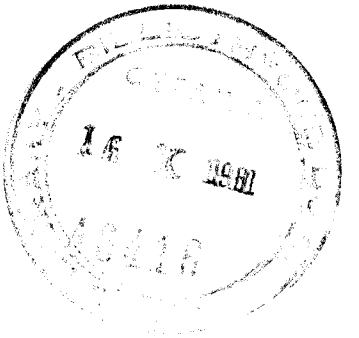

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The Role of Wildlife Disease Research in Livestock Production

L.J. Howard[1]

It is true that the livestock producer, whether rancher or farmer, has laid considerable blame on the presence of wildlife for sudden outbreaks of disease in his domestic stock. Disease lies second only to nutrition in the possible success or failure of a livestock enterprise. The farmer's greatest fear is one of disease, quarantines, and restrictions, which prevent marketing of stock at an opportune time, increase overheads, reduce grazing and therefore reduce margins of profit. The fear of quarantine restrictions is so real, that farmers and ranchers have been known to muddle through quite severe outbreaks of disease without requesting the help of local veterinary officers. When asked why, they will reply: "The Vets! All they are looking for is an excuse to put you in quarantine!"

Fencing against incursions of game is almost economically impossible on properties bordering natural reservoirs of wildlife. The natural steeplechaser of the wildlife world, the eland, will take a normal five strand paddock fence in its stride, as the eland herd moves from paddock to paddock. Eland have also been observed negotiating a 6-ft (1.8-m) high chain link fence, although where others had jumped before, the fence had sagged to 5 ft 7 inches (1.7m) at the position of the jump. Kongoni, a little more cautious and sedate, will seek a gateway or other opening before attempting to jump, but when disturbed, crash through fences as if nothing barred their way. Even the ostrich has been observed running at 24 kph straight at a five strand boundary fence; its own impetus somersaulted the bird over the fence, broke two top strands, and landed the bird in a heap of feathers and legs on the opposite side. The Thomson's gazelle will squeeze through an 8 inch (20 cm) gap between the bottom two strands of wire. All told, it is almost impossible to exclude game using normal or standard fencing practice.

On occasions of seasonal incursions of wildlife onto properties bordering natural wildlife reservoirs, I have often observed up to 400 kongoni, 150 eland, and 300 wildebeest concentrated in an area of no more than 3000–4000 acres (1200–1600 ha). In these circumstances the buildup of ectoparasites and, possibly to a lesser extent, endoparasites is enormous, and there is considerable risk from the increase of ticks, which may well be vectors of some of the common tick-borne diseases that affect domestic livestock. In certain circumstances, or perhaps extraordinary circumstances, the increase in the tick burden is so great that only two-day dipping in an organophosphate acaricide will control the invasion. In the absence of *R. appendiculatus* the disease risk is notably less, but in wetter tick habitats there is considerable risk of the introduction of disease vectors.

There is no doubt that there is sometimes a correlation between seasonal incursions of wildlife and an increase in the incidence of tick-borne diseases, but this is entirely due to an abnormal increase in vector challenge or to normal tick control procedures being inadequate to maintain control over an exceedingly abnormal challenge. Fortunately, research into the correlation between wildlife diseases and those of domestic stock has taught the livestock producer that there is little risk of pathogenic tick-borne organisms being transmitted to domestic livestock, and that generally, wildlife are not reservoirs of diseases that are likely to bring ruin to the producer overnight.

In July 1977, I was offered the opportunity to become involved in the management of Galana Game and Ranching Ltd., situated in the coast hinterland approximately 60 miles (100 km) inland, where an opportunity arose to put research theories into practice. The ranch was a large-scale enterprise covering 5000 km^2 (approximately 1.5 million acres). Previous aerial censuses gave estimated wildlife populations at one time as 5000 elephant, 7000 fringe-eared oryx, 50 black rhinoceros, 3000 buffalo, 3000 zebra, 1500 eland, and 400 giraffe. Smaller ungulates in undetermined numbers also shared the habitat, such as Peters' gazelle, waterbuck, impala, lesser kudu, topi, gerenuk, hartebeest, duiker, and

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dik-dik. Daily maximum shade temperatures averaged 34-35 °C with humidity rising to 90% during parts of the year. Rainfall in this semi-arid bush area of the coast hinterland averaged approximately 500 mm (20 inches) in the east to a low of 125 mm (5 inches) in the western desert-scrub area of the ranch. The domestic stock comprised, on average over the period under review, between 15 000 and 20 000 head of Boran cattle, 1500 sheep and goats, 100 camels, 100 domesticated oryx *(O. beisa)*, and 20 or so domesticated eland. The ranch was situated in an endemic trypanosomiasis area and heavy rainfall during the 2-year period enhanced tsetse fly dispersal of the four species of *Glossina* identified in the area, namely *G. pallidipes*, *G. longipennis* *G. austeni*, and *G. brevipalpis*. The extraordinary wet conditions also increased the challenge from bacterial diseases previously encountered; *Salmonella*, *E. coli*, and *Pasteurella* infections in calves and young stock. The developed area of 640 000 acres (256 000 ha) was adequately served by five sprayraces and well-watered from riverside and inland boreholes. To rest the dry weather grazing in the developed area, the cattle and in fact all stock, were moved north during the rains, utilizing surface water and one dam. No tick control facilities were available in this area, which was grazed for three to four months of the year. In view of this, there appeared to be little point in maintaining a high standard of tick control when cattle were grazing in the developed area because the stock were exposed to challenge when grazing in the undeveloped area in the north of the ranch.

At that time, little was known by the management of the risks involved in exposing domestic stock to challenge from tick-borne parasites hosted by wild ungulates. Although it had been known for some time that buffalo were reservoirs of *T. lawrencei*, it was considered, because random tick samples forwarded for identification had not revealed the presence of *R. appendiculatus*, that the resident buffalo could well be free of this particular pathogen. Later the Wildlife Diseases Section was able to confirm that this was in fact the case. Information, however, was also required on the effects of other parasites carried by wild ungulates, piroplasms, *Anaplasma*, and *Babesia*. Wildlife disease research data were perused to ascertain the degree of tolerance our domestic stock might have to these parasites, and with the exception of the possibility of a pathogenic strain of *T. mutans*, the risk was apparently very low. Some experience had already been observed in respect of the latter parasite when a steer died of theileriosis during the time that stock were grazing in the eastern area, a normal buffalo habitat. Laboratory reports indicated that the *Theileria* was probably *T. mutans* and that the animal had recently recovered from a *T. congolense* infection. In the light of this information it was considered that the *Theileria* infection was most likely a premunity breakdown occasioned by the stress from the trypanosomiasis infection. Although it was appreciated, from research data, that wild ruminants were capable of maintaining a reservoir of the rickettsial agent of heartwater, it was considered that, because young calves appeared to have a strong natural immunity, exposure to a natural challenge from birth might result in the calves becoming infected while they still retain a partial maternal passive immunity and so become immune themselves. This is an instance where the results of wildlife disease research influenced the decision to deliberately encourage the development of a state of premunity and immunity against tick-borne diseases in domestic livestock ranched within a natural wildlife reservoir.

Blood smears taken from the cattle to ascertain the incidence of trypanosomiasis revealed that the six-monthly prophylaxis cover against the disease using Samorin at 0.25 mg/kg body weight was not having the desired effect. Wildlife research papers revealed that certain species of wildlife, namely giraffe and buffalo, were proven carriers of trypanosomes although they themselves remained healthy.

The fact that some of the resident wildlife were carriers of the disease was rather immaterial because we were ranching in an endemic area where blood slides had shown that the domestic stock were also carriers. It was obvious that the recurring breakthrough of the prophylaxis was occasioned not by the presence of wildlife carriers, but by the movement of stock through and to areas of varying fly challenge. The dosage rate of Samorin was increased to 0.50 mg/kg body weight quarterly, with excellent results.

The increased cost of trypanocidal drugs resulted in the need for savings. At the time, all the cattle were vaccinated at six-monthly intervals using a quadrivalent foot-and-mouth disease vaccine. We were ranching in a fairly isolated area but, nevertheless, it was difficult to evaluate the immunity provided by this vaccine in a wildlife reservoir such as Galana. Wildlife disease research into the role played by wildlife in the spread of foot-and-mouth disease was studied. The information conveyed by these studies influenced the decision to withdraw the policy of regular vaccination. Close liaison with the Provincial Veterinary Officer was maintained regarding outbreaks in the surrounding district and vaccination cover was provided when outbreaks or quarantine boundaries were within 30 miles (50 km) of the ranch boundary. Only one vaccination cover was given and no outbreaks occurred on the ranch during the two-year period under review.

The reduction in the mortality achieved by this disease control policy, which was only considered after detailed perusal of research information, serves to indicate the possibilities available to the mixed wildlife-domestic stock producer. Mortality decreased from 3.5% in 1976-77 to 2.61% in 1977-78 to 1.99% in 1978-79. (Rainfall during these periods was: 11.75 inches, 19.5 inches, and 30.0 inches.)

Without research into livestock disease the livestock industry of this country would not have developed to maturity. Although wildlife disease would appear a lesser consideration, no livestock development program is able to progress to its full potential without veterinary research.

Research into wildlife diseases, and interrelation of these diseases with domestic stock, has not only provided information that assists in the formulation of management policies but has confirmed the presence of a comparatively disease-free source of animal products. If the commercial exploitation of Kenya's rich reservoir of natural fauna is to be encouraged, development in this direction must include veterinary research facilities.

Very little is known of nutritional diseases in wild ruminants and these diseases may well become apparent under confinement or domestication. Current research has not reassured the potential wildlife producer that close collateral development of wild ruminants with domestic stock will not result, within a few generations, in host-specific strains of protozoa becoming interadapted or even pathogenic to their new hosts. Is not *T. lawrencei* an adapted strain of *T. parva*? Why has the hitherto nonpathogenic *T. mutans* suddenly produced a pathogenic variant strain? Foot-and-mouth disease virus, noted for variant strains, may well become an immunological problem in collateral development of species.

Research must continue into methods of immunization of domestic livestock against those diseases of economic importance that seriously affect the economy of ranchers and farmers operating in specific habitat zones. Until success is achieved in these fields, livestock producers will be unable to accept the general approach that wildlife are of little importance to the incidence of diseases affecting domestic livestock.

In addition to the comparative immunity to disease shown by wild ungulates, a variety of fauna are able to maintain productivity in areas unsuitable or marginal to domestic stock because of their ability to make use of a much wider range of vegetation. Because of various physiological adaptions, some species appear able to obtain their liquid requirements from the herbage and are hence almost independent of water. Large areas of unproductive land situated in tsetse-infested and semi-arid areas now lie within the reach of economic production. One such development, believed to be the first collateral enterprise of cattle/domesticated oryx ranching combined with wildlife management through tourism and hunting, was the formation of the local company Galana Game and Ranching Ltd.

With the cooperation of the Game Department, wild oryx (*Oryx beisa callottis*) were captured. Several studies sponsored by the African Wildlife Leadership Foundation have shown that this ruminant, which is suited to arid rangeland, can be domesticated and ranched under certain management techniques. Further studies have shown that the oryx is able to digest protein and crude fibre significantly better than cattle, due possibly to a faster rate of high fibre food fermentation in the rumen. Adjusted for body-size difference, the oryx has a water requirement that is only 15–20% of that of a cow. This factor, combined with the oryx's high heat tolerance, makes it the ideal meat animal for the area.

The Wildlife Diseases Section at Kabete has been associated with the oryx project for some time. Intensive disease studies have been made on the oryx. Possibly the most significant finding is that, in addition to the oryx's resistance to *T. congolense* infection, the animals exhibit aggressive behaviour toward tsetse flies that gives little opportunity for infection to take place. These findings further suggest that the oryx is the most suitable species for meat production in endemic trypanosomiasis areas. There is sufficient information on the oryx to enable the project to explore the possibilities of economic production; however, restrictions on marketing and on catching wild oryx for domestication, which is essential to build up herds to an economic unit, make this impossible.

No more than 5 years ago Galana operated a very successful tourist and hunting operation controlled by a resident hunter and a wildlife conservationist of the highest esteem. With the liaison, cooperation, and sincere interest of the Game Department, annual quotas were allocated for each species of game animal. During the fiscal year 1974-75, of the 511 animal quotas allocated, only 236 were utilized due to the very high standard of selection insisted upon by the resident hunter and the company. Thirty-nine of the animals taken by overseas visiting sportsmen qualified for the Rowland Ward Book of Records and one Peters' gazelle gained the honour for the world record head. Ivory from the 13 elephants taken by sportsmen averaged 67 lb (30.38 kg), the heaviest tusk weighing 101 lb (45.8 kg). Such records are only maintained through a planned long-term policy to improve the quality of the fauna.

A full-time motorized antipoaching unit, manned by seven armed private game scouts, was operated at an annual expense in the region of £3000 per annum. During the year reviewed, 31 poachers were

arrested, of which 29 were convicted of poaching. During the succeeding years, the sale of ivory was banned followed by the banning of hunting. This resulted in the closure of the safari business and sadly, due to the lack of income, the disbanding of the antipoaching unit. The resident antipoaching team was not replaced by the Government, whose facilities were already stretched to the limit. Armed poachers moved in to the extent that certain species are in danger of becoming extinct and trophies of the standard recorded in 1974–75 may never be seen again in our lifetime, certainly not of the elephant.

The last two paragraphs serve to illustrate that when the fauna of this country is offered to private enterprise for commercial exploitation the conservation of wildlife is ensured. When that responsibility is withdrawn, the whole consensus of conservation is endangered.