BLUENOSE CARIBOU COMMUNITY HARVEST

ESKIMO LAKES AREA, FEBRUARY 1995

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ABSTRACT

Fifty-three Bluenose caribou were harvested between 8 and 10 February, 1995, in the Eskimo Lakes area south of Tuktoyaktuk. The harvest was conducted to provide the community of Sachs Harbour with caribou meat. Residents of both Sachs Harbour and Tuktoyaktuk were involved in the harvest. A variety of biological samples were collected, in a way that minimized meat damage, from as many animals as possible. Two of 42 blood serum samples tested positive for brucellosis, resulting in a 4.8% prevalence. This was lower than in previous years. Forty-five of the 47 adult females (95.7%) were pregnant. The diet determined by both the analyses of faecal and rumen plant fragments was dominated by lichens. Differential digestibility of dietary items was negligible. The ratio of fat weight to kidney weight ranged from 0.21 to 1.17 while the kidney fat indices (KFI) (Riney, 1955) ranged from 21.22 to 101.43. The majority of animals appeared to be in reasonably good condition (KFI >30). Further disease and contaminant analyses from collected tissue samples will be addressed in future reports.

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INTRODUCTION

In order to provide caribou meat for residents of Sachs Harbour, a community caribou hunt was organized between the Hunters and Trappers Committees of Tuktoyaktuk and Sachs Harbour and sponsored by the Department of Renewable Resources, Inuvik Region. The hunt was conducted in February, 1995. In response to growing public concern that the prevalence of brucellosis in harvested caribou was increasing and higher in 1995 than in previous years, the Department of Renewable Resources collected blood samples from the harvested caribou in order to document the prevalence of brucellosis and to compare prevalence levels with previous results from the Bluenose caribou population and with other caribou populations.

Brucellosis is endemic in North American caribou populations, and its control is of major importance in semi-domesticated reindeer herds where its prevalence is consistently highest (Deiterich, 1981). Brucellosis causes relatively few deaths, it's main effect on caribou populations is to reduce productivity by increasing the death of unborn young, and by it's debilitating effects of adult animals which likely makes them more susceptible to predation and weather related mortality. Brucellosis can spread from animals to humans. In the early 1960's reports documented approximately 20% of residents of Fort Yukon and Arctic Village with positive titers for brucellosis (Meyer, 1966) and 11% of residents in several villages had evidence of previous *Brucella* infections (Brody *et al.*, 1966). *Brucella* organisms rarely effect muscle tissue. If transmission to humans occurs it is generally results from the transmission of blood or puss from an infected animal into an open wound on the butchering individual. Ingestion of uncooked reproductive organs, fetal membranes, internal organs, and bone marrow of infected animals may transmit the disease. Although brucellosis is prevalent in North American caribou populations it does not pose a serious health hazard. All cooked meat is safe to eat, and dry meat of infected in animals is unlikely to transmit the infection.

In addition to the blood samples, other biological samples and information were collected from as many caribou as possible in such a manner as to ensure minimal damage to the meat. These data included: sex, pregnancy status, front incisor bars for aging, kidneys plus accompanying fat for animal condition indices, faeces and rumen samples for diet analysis, skin samples for prevalence of besnoitia, and liver and spleen samples for disease/contaminants analyses.

METHODS

Hunting parties of 4 to 7 individuals departed on snowmobiles from Tuktoyaktuk and travelled south towards Eskimo Lakes in search of caribou daily on February 8, 9, and 10. When groups of caribou were spotted, the hunters stalked the group and shot as many caribou as the conditions permitted. The caribou carcasses were all moved to a central location to be butchered.

Blood samples were collected from the animals as they were butchered by the hunters. Occasionally an adequate volume (50ml) of blood was collected from the jugular vein, but usually the 50ml blood sample was collected from within the body cavity. Blood samples were placed in coolers that were equipped with hot water bottles to prevent freezing. Samples were transported back to Tuktoyaktuk where they were centrifuged, the serum harvested and frozen. Frozen samples were forwarded from Inuvik to the Health of Animals Laboratory in Saskatoon, where they were screened for brucellosis using the buffered plate agglutination test.

All animals were identified as to sex and the pregnancy status of females was recorded. Any visual signs of brucellosis, such as swollen joints were recorded. The front incisor bars were cut off with a hacksaw. We collected both kidneys, with all accompanying fat, a sample of faeces, a sample of rumen contents, a $\leq$ 10g sample of liver and spleen, and a $\geq$ 10cm^2 patch of skin from one of the ankles. All samples were stored frozen and transported back to the Renewable Resources Lab in Inuvik.

The front incisor bars were thawed and air dried prior to shipping to Matson's Laboratory, Milltown, Montana. The age of adult caribou was determined by counting cementum annuli from the root of the first incisor (Matson, 1981). Cementum annuli are formed during or immediately after winter. The first week in June was used as time zero for the adults. Because all animals were taken in early February, the actual physical age of all adults, is approximately 7 months older than that reported by counting the annuli. For those animals that could only be accurately aged to a range of years we used the midpoint of the range for the statistical analyses. If the midpoint was a fraction, we rounded down to the nearest integer and used this age in the age distribution analyses.

Each kidney and all its associated fat was weighed to the to the nearest 0.1mg on a Sartorius BA 210S analytical balance. Fat was then trimmed from the anterior and posterior of each kidney (following Riney, 1955) and the kidney with its remaining fat was reweighed. Finally, all fat was removed from each kidney and the organ was weighed. The mean kidney weight is reported. The kidney fat index (KFI) was calculated for each kidney using the following formula:

(weight of fat remaining after trimming/weight of kidney) x 100

The mean KFI per animal is reported. We calculated a ratio of the total fat weight to kidney weight for each kidney. The mean ratio per animal is reported. We used ANOVA to determine if sex and/or age explained any of the variability in kidney weight, KFI, or the ratio of total fat weight to kidney weight.

Frozen faecal and rumen samples were thawed to room temperature, air dried for 24 hours to remove excess moisture, and oven dried at 60° C for 48 hours. The dried samples were ground through a 1mm screen with a centrifugal mill. A 1g subsample of dried ground material was used for the analysis of diet composition. Paired faecal and rumen samples from a subsample of 20 female caribou were analyzed for plant fragments following Hansen *et al.* (1976)

in order to determine diet composition. Diet analysis was conducted by the Composition Analysis Laboratory (CAL), Ft. Collins. Percent of the following forage types present are reported: lichens, *Ledum*, willows, forbs (non-woody dicotyledonous plants), monocots (grasses, sedges, and rushes), and moss.

The kidney, liver, and spleen samples will be forwarded for disease/contaminants analyses. The skin samples will be forwarded to Renewable Resources, Yellowknife, to assess the prevalence of Besnoitia.

RESULTS

Samples Collected

A total of 53 caribou were harvested during the three day period: 47 adult females, 5 adult males, and 1 female calf. Forty-five of the 47 adult females (95.7%) were pregnant. Twelve, 18, and 23 caribou were harvested on 8-10 February respectively, on Eskimo Lakes (*ca.* 69° 10' N and 132° 55' W) (Figure 1.). Because some hunter parties split up, and some animals were shot at dusk we were unable to collect a full complement of samples from all of the harvested caribou. We collected a total of 44 incisor bars, 42 serum samples, 41 skin samples, 39 kidney samples, 39 liver samples, 35 spleen samples, 36 faecal samples, and 32 rumen samples (Appendix 1.).

Brucellosis

One animal had joints that appeared to be more swollen than those of other caribou, however the joint was not pus-filled. Two of 42 serum samples (4.8%) tested positive for brucellosis. Both of these animals were females, one aged 2 years the other 8-9 years. The younger female was pregnant, but the older female was one of only two females that was not pregnant. The younger female ranked higher than the older female for both the fat:kidney measure, 20th versus 28th out of 38, and the KFI measure 15th versus 33rd out of 38. The older female had the lightest mean kidney weight and the younger female had the 7th lightest mean kidney weight. Both animals had diet components similar to the other animals.

Age

The 44 harvested caribou we were able to determine ages for showed a relatively normal age distribution: animals ranged in age from 0 (calf) to 13 years old with the 6 year-old class occurring most frequently (7 animals, 15.9%)(Figure 2.).

Kidney and Kidney Fat Measures

The ratio of fat weight to kidney weight ranged from 0.21 to 1.17 (mean 0.68, SE 0.04, n=38), while the kidney fat indices (Riney, 1955) ranged from 21.22 to 101.43 (mean 56.42, SE 3.36, n=38). The mean ($\pm$SE) kidney weight for adult caribou was 92.25g ($\pm$2.01) (Appendix 2.). Although there was a limited sample size of males, sex explained significant variation in KFI ($p<0.025$), the ratio of the weight of kidney fat to kidney weight ($p<0.01$), and kidney weight ($p<0.015$) with males showing ratios and weights less than that of females. There were no age effects on any of these three measures.

Diet Composition

The diet, based upon both faecal and rumen plant fragment analysis, was dominated by lichens, range 75.76 to 94.30% and 84.79 to 92.96% of the diet, based upon faecal and rumen plant fragment analysis, respectively (Table 1.). *Ledum* spp. was the second largest diet component ranging from 1.80 to 14.34% and 3.59 to 12.17%, based upon faecal and rumen plant fragment analysis, respectively. Monocots, mostly sedge, represented a minor portion of the diet, mean of 2.50% and 1.44%, based upon faecal and rumen plant fragment analysis, respectively.

Differential digestibility was negligible. Mean lichen content based upon the analysis of faecal plant fragments was 87.24% versus 89.66% based upon the analysis of rumen plant fragments. This represented a 2.8% difference in estimated lichen content of the diet.

DISCUSSION

Brucellosis

The prevalence of brucellosis in Bluenose caribou wintering in the Tuktoyaktuk area was lower than that reported for Bluenose caribou in previous years, and was lower or comparable to the variation in prevalence of other North American caribou populations (Table 2.). Prevalence in Bluenose caribou was approximately half of that found in the reindeer herd that had previously inhabited a similar area and has subsequently intermingled and undoubtably interbred with Bluenose caribou. Although our results may be affected by limited sample size the tendency would be toward an inflated rather than deflated value for prevalence.

Of the 2 animals testing positive for brucellosis, the 8-9 year old female exhibits more of a classic picture of this disease, which tends to reduce productivity and increase chronic debilitating effects of the disease as the infection progresses (Dieterich, 1981). This caribou had a similar diet to the other animals yet she had some of the lowest kidney fat measures, and the smallest kidneys. Unlike the seropositive 2 year old, this female was barren. It is possible that either this animal did not conceive or pregnancy was terminated by an abortion.

The 2 year old female was seriologically positive, but showed no clinical signs of the disease. She had a similar diet and had higher kidney fat measures and kidney weight than the older female, but she was pregnant. In domestic cattle, females commonly abort during the first pregnancy post-infection, but produce normal calves in subsequent pregnancies. This same pattern appears to be true for caribou and reindeer (Dieterich, 1981; O'Reilly and Forbes, 1994). The 2 year old was in the midst of her first pregnancy and was carrying a viable fetus. Abortions appear to occur 1 to 2 months before normal calving in early May (Rausch and Huntley, 1978). Possibly she would have aborted that fetus by late February or early March, but one can only speculate. In the case of the older female, we cannot determine whether this was the first pregnancy post-infection, or if this individual aborted later in the course of the disease.

Age

Age distribution of the sample is likely representative of animals in the area because hunters attempted to harvest the 3 main groups encountered in their entirety. The distribution is relatively normal with no obvious skews to either young or old animals. Normal age distributions are generally indicative of stable population size. More sample age distributions from a variety of areas within the Bluenose range would be required before we could make inferences about population status based soley upon age distribution information.

Kidney and Kidney Fat Measures

Based upon the fat associated with the kidneys, harvested animals, especially females were generally in good condition. Only 4 of the 38 caribou (3 females, 1 male) we were able to calculate the kidney fat index (KFI) for had levels <30. Case (1994) has classified barren-ground caribou as being in poor condition when KFI values were <30, however the reliability of KFI as an index of body fatness and implied condition has been criticized because seasonal variation in kidney size often does not reflect seasonal variation in body weight (Batcheler and Clarke, 1970; Dauphiné, 1975; Van Vuren and Coblentz, 1985; Adamczewski *et al.*, 1987). The 4 caribou with KFI <30 also had the lowest kidney fat to kidney weight ratios of the 38 samples, but their kidney weights were in the middle of the sample range. Because most females were carrying fetuses, and were in good condition, this suggests that available forage on the winter range in this area during 1994-95 was not limiting.

Although males had lower KFI, ratios of the weight of kidney fat to kidney weight, and kidney weights than females the sample of males was dominated by young animals. The interaction between sex and age effects, although not significant ($p>0.05$) may be somewhat responsible for this result because of small sample size. However, it appears that harvested males were in poorer condition than similar aged females.

Diet Composition

The diet was dominated by lichens. Winter diets of mainland barren-ground caribou are dominated by lichens (Scotter, 1967; Miller, 1976; Klein, 1991). Because lichen has a low fibre content and is readily digested (Person, 1975) it is a suitable food for animals when there is a need to deposit fat rather than grow lean tissue (Adamczewski *et al.*, 1987). Given the amount of lichen present in the diet and the amount of fat associated with the kidneys it appears that lichen availability in the winter range occupied by animals sampled was not limiting by February.

The similarity of the proportion of lichen in the diet determined by plant fragments found in the faeces and the rumen is interesting, especially given the high digestibility of lichen. Differential digestibility of plant material is often pointed out as a major flaw in determining diet from the analysis of faecal plant fragments (Putman, 1984; Barker, 1986). The lack of difference we found here may be related to the large proportion of the diet that was lichen and/or the time of year the forages were consumed. Given the large proportion of the diet that was lichen, so few alternative diet components, and the constraint of results being presented as a percent or proportion, potential differences between the faecal and rumen estimates of lichen cannot be great. During February all forages are essentially freeze-dried and weathered, with forage quality and water content at its lowest (i.e. most fibrous and least protein-rich). Studies on differential digestibility are generally conducted with forages collected during the growing season when there is a wide range in forage quality levels between plants and within plant parts (eg. Voth and Black, 1973). In studies that examined digestibility of forages during different seasons when plants were at different stages in phenology, the phenology of the plant significantly affected the degree of over- or under-estimation (Pulliam, 1979; Leslie *et al.*, 1983). Quite possibly, differential digestibility of forages is not as likely during the non-growing season when the range of differences in forage quality within and between plants is much reduced.

RECOMMENDATIONS

1) Continue to collect blood samples from Bluenose caribou wintering in different parts of their range in order to document the prevalence of brucellosis.

2) Continue to advise local residents that the consumption of cooked caribou meat is safe, and that prevalence of brucellosis in caribou does not constitute a health hazard.

3) Continue to encourage the public to contact the Department of Renewable Resources when a harvested caribou is suspected to be diseased, but emphasize that meat samples are inadequate to determine brucellosis presence, intact leg joints are required.

4) Continue to document all suspected cases brought in to the Department and get verification of disease status where possible.

5) Continue to collect teeth samples from groups of animals collected in different areas of the Bluenose range in order to more accurately assess the age distribution at the population rather than local level.

6) Contiunue to collect faecal samples from different areas in the wintering range to more accurately assess winter diet composition at a population rather than local level.

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LITERATURE CITED

Adamczewski, J.Z., C.C. Gates, R.J. Hudson and M.A. Price. 1987. Seasonal changes in body composition of mature female caribou and calves (*Rangifer tarandus groenlandicus*) on an arctic island with limited winter resources. Can. J. Zool. 65: 1149-1157.

Barker, R.D. 1986. An investigation into the accuracy of herbivore diet analysis. Aust. Wildl. Res. 13: 559-568.

Batcheler, C.L. and C.M.H. Clarke. 1975. Note on kidney weights and the kidney fat index. N.Z. J. Sci. 13: 663-668.

Brody, J.A., B. Huntley, T.M. Overfield and J. Maynard. 1966. Studies of human brucellosis in Alaska. J. Inf. Dis. 116: 263-269.

Broughton, E., L.P.E. Choquette, J.G. Cousineau and F.L. Miller. 1970. Brucellosis in reindeer, *Rangifer tarandus L.* and the migratory barren-ground caribou, *Rangifer tarandus groenlandicus* (*L.*), in Canada. Can. J. Zoology 48: 1023-1027.

Case, R. 1994. Adaptions of northern ungulates to seasonal cycles in nitrogen intake. Unpubl. PhD. thesis, Univ. of Alberta. 128pp.

Dauphiné. T.C., Jr. 1975. Kidney weight fluctuations affecting the kidney fat index in caribou. J. Wildl. Manage. 39: 379-386.

Dieterich, R.A. 1981. Brucellosis. *In* Alaskan wildlife diseases. (R.A. Dieterich ed.). pp 53-58. Univ. of Alaska, Fairbanks.

Goldfarb, B. 1990. Brucellosis not widespread in Beverly and Kaminuriak herds. Caribou News October 1990: 7.

Gunn, A., T. Leighton and G. Wobeser. 1991. Wildlife diseases and parasites in the Kitikmeot region 1984-1990. Renewable Resources File Rep. No. 104, Yellowknife. 51pp.

Hansen, R.M., T.M. Foppe, M.B. Gilbert, R.C. Clark, and H.W. Reynolds. 1976. The microhistological analyses of feces as an estimator of herbivore diet. Unpubl. report, Dept. Range Sci. Colorado State Univ., Ft. Collins.

Klein, D.R. 1991. Caribou in the changing north. Appl. Anim. Behav. Sci. 29: 279-291.

Leslie, D.M., M. Vavra, E.E. Starkey and R.C. Slater. 1983. Correcting for differential digestibility in microhistological analyses involving common coastal forages of the Pacific Northwest. J. Range Manage. 36: 730-732.

Meyer, M.E. 1966. Identification and virulence studies of *Brucella* strains isolated from Eskimos and reindeer in Alaska, Canada and Russia. Am. J. Vet. Res. 37: 353-358.

Miller, D.R. 1976. Biology of the Kaminuriak population of barren-ground caribou. Part 3.: Taiga winter range relationships and diet. CWS Report Ser. No. 34.

Neiland, K.A. 1972. Caribou disease studies. Final Report: Federal aid in wildlife restoration projects W-17-2 and W-17-3. Alaska Dept. Fish and Game, Juneau. 41pp.

O'Reilly , K. and L. Forbes 1994. Brucellosis in the Circumpolar Arctic. Canadian Polar Commission Info. Ser. No. 1 22pp.

Person, S.J. 1975. Digestibility of indigenous plants utilized by *Rangifer tarandus*. Unpubl. Ph.D. thesis. Univ. of Alaska, Fairbanks.

Pulliam, D.E. and J.R. Nelson. 1979. Determination of digestibility coefficients for quantification of fecal analysis with elk. *In*: North American Elk: Ecology, Behavior and Management. (M.S. Boyce and L.D. Hayden-Wing eds.). pp 240-246. Univ. Wyoming.

Putman, R.J. 1984. Facts from faeces. Mammal. Rev. 14: 79-97.

Rausch, R.L. and B.E. Huntley. 1978. Brucellosis in reindeer, *Rangifer tarandus* L., inoculated experimentally with *Brucella suis*, tpye 4. Can. J. Microbiol. 24: 129-135.

Riney, T. 1955. Evaluating condition of free-ranging red deer (*Cervus elaphus*) with special reference to New Zealand. N.Z. J. Sci. Technol. Sect. B 36: 429-463.

Scotter, G.W. 1967. The winter diet of barren-ground caribou in northern Canada. Can. Field-Nat. 81: 33-39.

Van Vuren, D. and B.E. Coblentz. 1985. Kidney weight variation and the kidney fat index: an evaluation. J. Wildl. Mange. 49: 80-85.

Voth, E.H. and H.C. Black. 1973. A histologic technique for determining feeding habits of small herbivores. J. Wildl. Manage. 37: 223-231.

Zarnke, R.L. 1993. Alaska Wildlife Serologic Survey 1975-1992. ADF&G Report, Fairbanks AK 15pp.

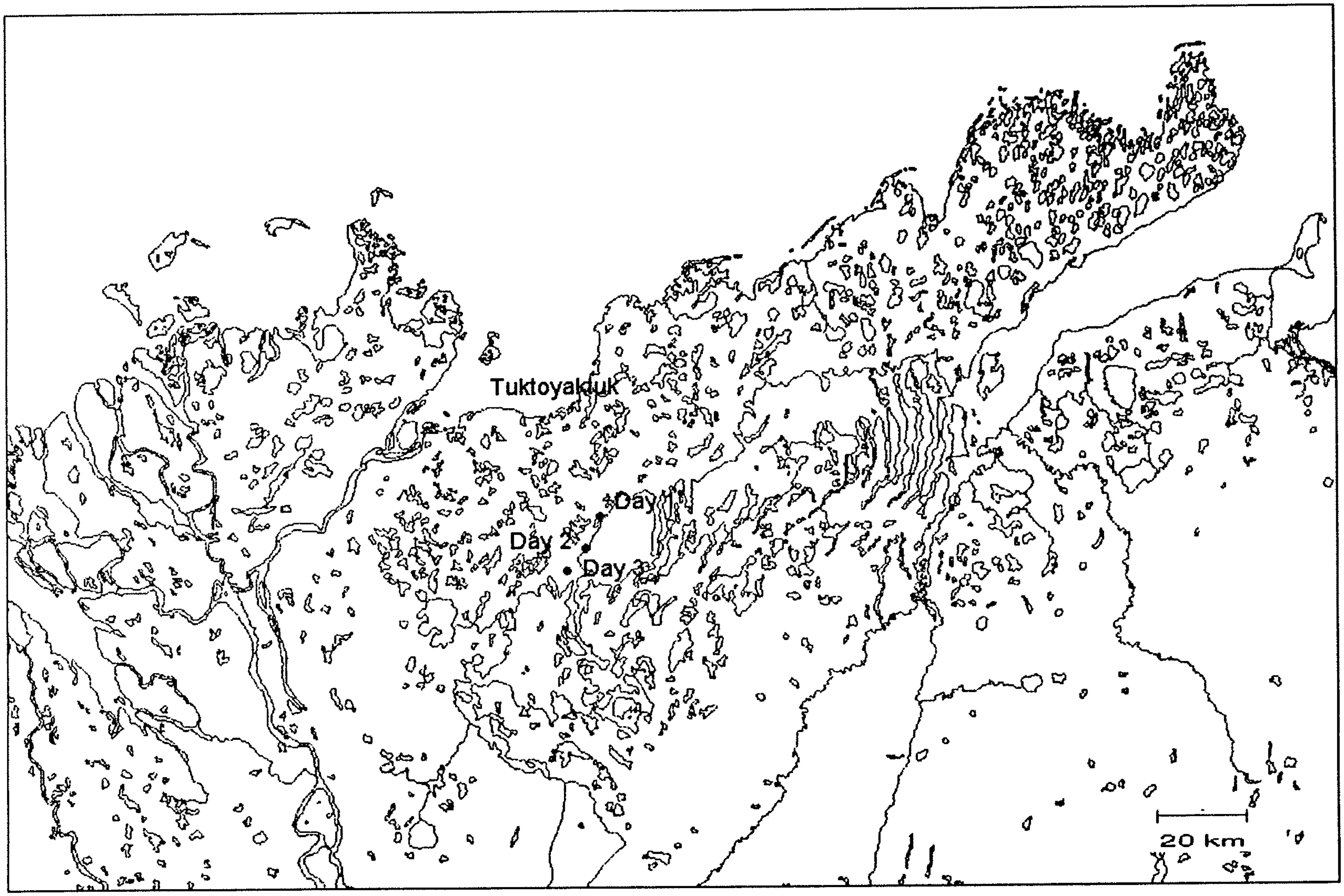

Figure 1. Locations of the caribou harvest areas, Eskimo Lakes, Northwest Territories.

Figure 2. Age distribution of 44 of the 53 harvested caribou.

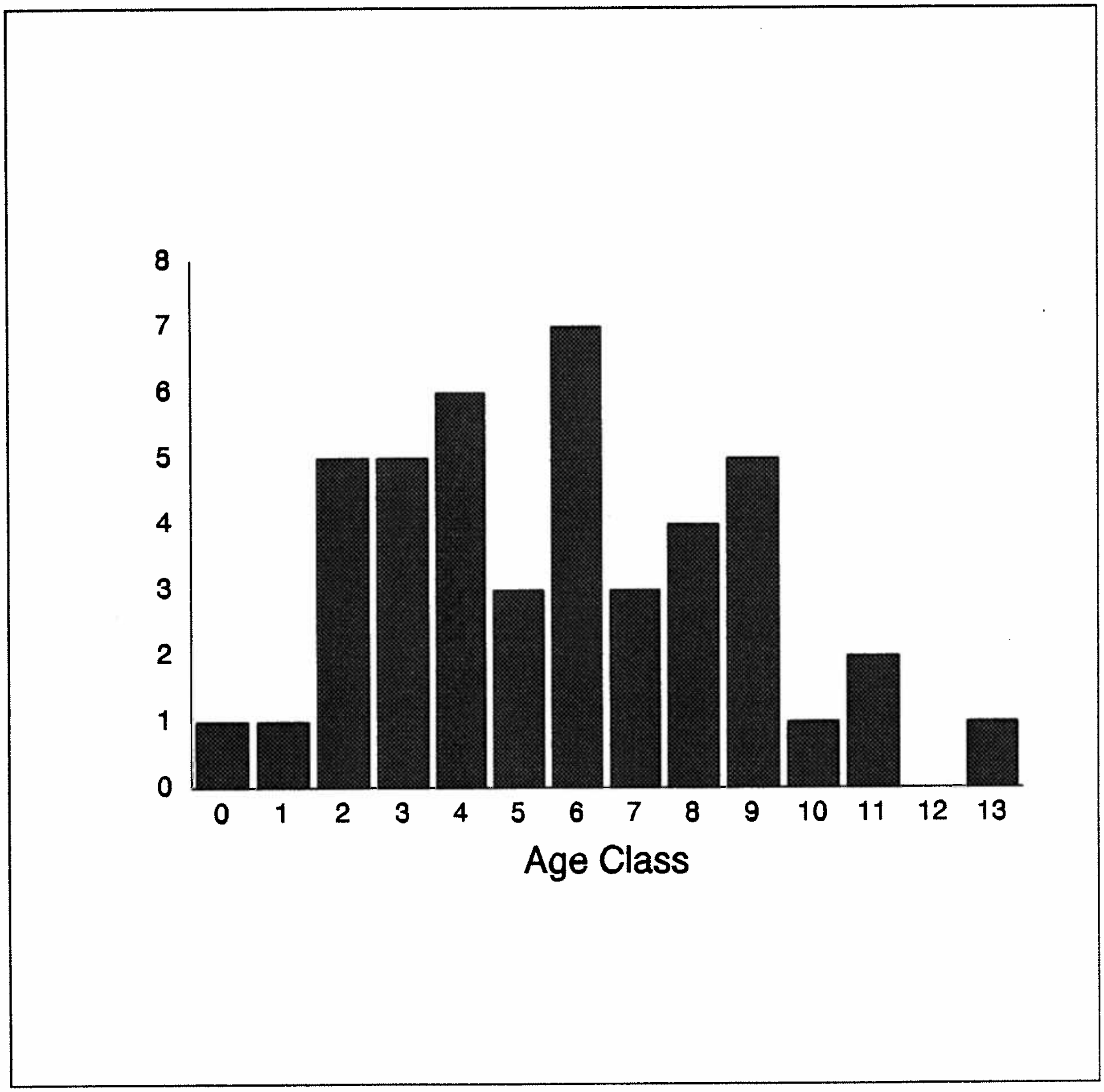

Table 1. Mean diet composition of 20 adult females as determined by faecal plant fragment analysis, rumen plant fragment analysis, and pooled across faecal and rumen plant fragment analysis.

	Lichen	Ledum	Willow	Forb	Monocot	Moss
Faecal	87.24	6.51	0.60	0.65	5.10	2.49
Rumen	89.66	7.16	0.24	0.49	2.96	0.94
Pooled	88.45	6.53	0.42	0.57	4.02	1.71

Table 2. Prevalence of brucellosis in a sample of North American caribou populations since 1960.

Caribou/Reindeer Herd	Location	Prevalence (%)	Sample Size	Year	Reference
Porcupine	Northeast Alaska	3.8	240	1975-1992	Zarnke, 1993
Western Arctic	Northwest Alaska	24.2	66	1975-1992	Zarnke, 1993
Western Arctic	Anaktuvik Pass, Alaska	21.4	42	1971	Neiland, 1972
Central Arctic	North Alaska	2.4	83	1975-1992	Zarnke, 1993
Nelchina	Southcentral Alaska	8.3	36	1970	Neiland, 1972
Nelchina	Southcentral Alaska	0.0	66	1971	Neiland, 1972
Teshekpuk Lake	Barrow, Alaska	9.5	21	1975-1992	Zarnke, 1993
Bluenose	Tuktoyaktuk, NWT	4.8	42	1995	This study
Bluenose	Inuvik, NWT	12.5	16	1994	GNWT unpubl. data
Bluenose	Rendezvous Lake, NWT	1.5	68	1991	GNWT unpubl. data

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Caribou/Reindeer Herd	Location	Prevalence (%)	Sample Size	Year	Reference
Banks Island	Banks Island, NWT	0.0	6	1993-1994	GNWT unpubl. data
Reindeer	Tuktoyaktuk, NWT	8.7	1692	1960-1969	Broughton *et al.*, 1970
SE Victoria	Victoria Island, NWT	0.0	62	1986-1990	Gunn *et al.*, 1991
Boothnia	Pelly Bay, NWT	35.3	17	1987	Gunn *et al.*, 1991
Beverly	Nonacho Lake area, NWT	1.7	118	1983	Goldfarb, 1990
Qamanurjuaq	Not reported	4.4	320	1966-1968	Broughton *et al.*, 1970

APPENDIX 1.

List of all biological samples collected from each harvested caribou. Teeth column gives age in parentheses.

ID#	Date	Sex	Pregnant	Teeth	Serum	Skin	Kidney	Liver	Spleen	Faeces	Rumen
1	Feb. 8/95	F	Y	Y(3)	Y	Y	Y	Y	Y	Y	Y
2	Feb. 8/95	F	Y	Y(9)	Y	Y	Y	Y	Y	Y	Y
3	Feb. 8/95	F	Y	Y(2)	Y	Y	Y	Y	Y	Y	Y
4	Feb. 8/95	F	Y	Y(3)	Y	Y	Y	Y	Y	Y	Y
5	Feb. 8/95	M	N/A	Y(3)	Y	Y	Y	Y	Y	N	Y
6	Feb. 8/95	F	Y	Y(2)	Y	Y	Y	Y	Y	Y	Y
7	Feb. 8/95	F	Y	Y(6)	Y	Y	Y	Y	Y	Y	Y
8	Feb. 8/95	F	Y	Y(13)	Y	Y	Y	Y	Y	Y	Y
9	Feb. 8/95	F	Y	Y(4)	Y	Y	Y	Y	Y	Y	Y
10	Feb. 8/95	F	Y	N/A	N	N	N	N	N	N	N
11	Feb. 8/95	F	Y	Y(6-7)	N	N	N	N	N	N	N
12	Feb. 8/95	F	Y	Y(9)	N	N	N	N	N	N	N
13	Feb. 9/95	F	Y	Y(5)	Y	Y	Y	Y	Y	N	Y
14	Feb. 9/95	M	N/A	Y(4)	Y	Y	Y	Y	Y	Y	Y
15	Feb. 9/95	F	N	Y(8)	Y	Y	Y	Y	Y	Y	Y
16	Feb. 9/95	F	Y	Y(9)	Y	Y	Y	Y	Y	Y	Y

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ID#	Date	Sex	Pregnant	Teeth	Serum	Skin	Kidney	Liver	Spleen	Faeces	Rumen
17	Feb. 9/95	F	Y	Y(4-5)	Y	Y	Y	Y	Y	Y	Y
18	Feb. 9/95	M	N/A	Y(2-3)	Y	Y	Y	Y	Y	Y	Y
19	Feb. 9/95	F	Y	Y(2)	Y	Y	Y	Y	Y	Y	Y
20	Feb. 9/95	F	Y	Y(9-10)	Y	Y	Y	Y	Y	Y	Y
21	Feb. 9/95	F	Y	N/A	N	N	N	N	N	N	N
22	Feb. 9/95	F(ca)	N	N(0)	N	N	N	N	N	N	N
23	Feb. 9/95	F	Y	Y(4)	Y	Y	Y	Y	N	Y	N
24	Feb. 9/95	F	Y	Y(6)	Y	Y	Y	Y	N	N	N
25	Feb. 9/95	F	Y	Y(6)	Y	N	Y	Y	N	Y	N
26	Feb. 9/95	M	N/A	Y(2)	Y	Y	Y	Y	Y	Y	N
27	Feb. 9/95	F	Y	Y(1)	Y	Y	Y	Y	Y	N	N
28	Feb. 9/95	F	Y	N/A	Y	N	N	N	N	N	N
29	Feb. 9/95	F	Y	N/A	N	N	N	N	N	N	N
30	Feb. 9/95	F	Y	N/A	N	N	N	N	N	N	N
31	Feb. 10/95	F	Y	N/A	Y	Y	Y	Y	Y	Y	Y
32	Feb. 10/95	F	Y	Y(9)	Y	Y	N	N	N	Y	N
33	Feb. 10/95	M	N/A	Y(10)	Y	Y	N	N	N	Y	N
34	Feb. 10/95	F	Y	Y(3)	Y	Y	Y	Y	Y	Y	Y

Appendix 1 cont .. 25

ID#	Date	Sex	Pregnant	Teeth	Serum	Skin	Kidney	Liver	Spleen	Faeces	Rumen
35	Feb. 10/95	F	Y	Y(6)	Y	Y	Y	Y	Y	Y	Y
36	Feb. 10/95	F	Y	Y(8-9)	Y	Y	Y	Y	N	Y	Y
37	Feb. 10/95	F	Y	Y(6-8)	Y	Y	Y	Y	Y	Y	Y
38	Feb. 10/95	F	Y	Y(4)	Y	Y	Y	Y	Y	Y	Y
39	Feb. 10/95	F	Y	Y(3)	Y	Y	Y	Y	Y	Y	Y
40	Feb. 10/95	F	N	Y(8-9)	Y	Y	Y	Y	Y	Y	Y
41	Feb. 10/95	F	Y	Y(11)	Y	Y	Y	Y	Y	Y	Y
42	Feb. 10/95	F	Y	Y(7)	Y	Y	Y	Y	Y	Y	Y
43	Feb. 10/95	F	Y	Y(5)	Y	Y	Y	Y	Y	Y	Y
44	Feb. 10/95	F	Y	Y(7-8)	N	Y	Y	Y	N	Y	N
45	Feb. 10/95	F	Y	Y(6-7)	Y	Y	Y	Y	Y	Y	Y
46	Feb. 10/95	F	Y	Y(6)	Y	Y	Y	Y	Y	Y	Y
47	Feb. 10/95	F	Y	Y(8)	Y	Y	Y	Y	Y	N	Y
48	Feb. 10/95	F	Y	Y(4)	Y	Y	Y	Y	Y	Y	Y
49	Feb. 10/95	F	Y	Y(11-12)	Y	Y	N	N	N	N	N
50	Feb. 10/95	F	Y	Y(5)	Y	Y	Y	Y	Y	N	N
51	Feb. 10/95	F	Y	N/A	N	N	N	N	N	N	N
52	Feb. 10/95	F	Y	N/A	N	N	N	N	N	N	N

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ID#	Date	Sex	Pregnant	Teeth	Serum	Skin	Kidney	Liver	Spleen	Faeces	Rumen
53	Feb. 10/95	F	Y	N/A	N	N	N	N	N	N	N

APPENDIX 2.

The sex, age, mean kidney weight, mean kidney fat index, and mean ratio of kidney fat to kidney weight of individual harvested caribou.

ID #	Date	Sex	Age (Years)	Kidney Weight (g)	KFI	Fat:Kidney
1	Feb. 8/95	F	3	81.8957	58.67	0.7772
2	Feb. 8/95	F	9	99.7488	81.65	0.9654
3	Feb. 8/95	F	2	75.3131	55.76	0.7535
4	Feb. 8/95	F	3	89.8693	50.00	0.6991
5	Feb. 8/95	M	3	92.3215	43.86	0.5731
6	Feb. 8/95	F	2	81.4379	60.03	0.7012
7	Feb. 8/95	F	6	106.2906	56.32	0.6652
8	Feb. 8/95	F	13	82.3320	21.22	0.2122
9	Feb. 8/95	F	4	73.8726	101.43	1.1785
13	Feb. 9/95	F	5	85.9160	50.55	0.8032
14	Feb. 9/95	M	4	93.4980	24.77	0.2568
15	Feb. 9/95	F	8	105.1815	75.45	0.8703
16	Feb. 9/95	F	9	106.0927	34.20	0.4313
17	Feb. 9/95	F	4-5	91.7757	85.08	0.9020
18	Feb. 9/95	M	2-3	91.0064	30.94	0.3271
19	Feb. 9/95	F	2	87.7849	20.59	0.2409
20	Feb. 9/95	F	9-10	95.2246	38.99	0.3899
23	Feb. 9/95	F	4	90.7432	54.94	0.8233
24	Feb. 9/95	F	6	92.4472	99.39	1.1181
25	Feb. 9/95	F	6	87.6370	41.26	0.4513
26	Feb. 9/95	M	2	89.8594	48.06	0.4922
27	Feb. 9/95	F	1	99.9452	73.91	0.8441

ID #	Date	Sex	Age (yrs)	Kidney Weight (g)	KFI	Fat:Kidney
31	Feb. 10/95	F	n/a	92.0035	25.69	0.3299
34	Feb. 10/95	F	3	90.4218	76.88	0.9088
35	Feb. 10/95	F	6	86.0696	71.29	0.7406
36	Feb. 10/95	F	8-9	122.2450	38.62	0.5762
37	Feb. 10/95	F	6-8	93.5353	73.33	0.9272
38	Feb. 10/95	F	4	80.5754	41.27	0.4887
39	Feb. 10/95	F	3	82.5926	48.53	0.5580
40	Feb. 10/95	F	8-9	72.2860	34.13	0.5222
41	Feb. 10/95	F	11	138.1744	N/A	N/A
42	Feb. 10/95	F	7	78.2530	86.76	0.9408
43	Feb. 10/95	F	5	102.5174	50.38	0.8197
44	Feb. 10/95	F	7-8	80.4723	70.20	0.7579
45	Feb. 10/95	F	6-7	98.8960	65.67	0.7225
46	Feb. 10/95	F	6	97.7639	54.57	0.6944
47	Feb. 10/95	F	8	84.2101	78.05	1.0551
48	Feb. 10/95	F	4	92.9298	67.99	0.7628
50	Feb. 10/95	F	5	104.5330	53.46	0.6360

APPENDIX 3.

Comparison of the percent diet composition estimated by the analysis of fecal and rumen plant fragments from a sample of 20 female caribou.

ID#	Sample Type	Lichen	*Ledum*	Willow	Forb	Monocot	Moss
2	Faecal	82.08	3.70	0.51	1.34	7.27	5.10
	Rumen	85.90	8.98	0.00	0.00	2.14	2.98
3	Faecal	88.14	6.25	0.00	0.67	1.00	3.94
	Rumen	86.37	8.79	0.00	0.62	0.59	3.63
4	Faecal	90.24	4.83	1.07	0.52	1.89	1.45
	Rumen	89.18	7.28	0.49	1.99	0.57	0.49
7	Faecal	83.09	4.68	1.52	4.09	1.22	5.40
	Rumen	89.96	7.61	0.00	0.00	0.53	1.90
8	Faecal	75.76	11.42	0.00	0.00	11.54	1.28
	Rumen	84.79	8.83	0.00	0.70	5.11	0.57
13	Faecal	85.96	10.22	0.54	0.00	0.69	2.59
	Rumen	91.2	8.80	0.00	0.00	0.00	0.00
15	Faecal	86.82	1.80	2.66	0.00	2.19	6.53
	Rumen	90.34	8.20	0.00	0.53	0.93	0.00
17	Faecal	90.85	4.14	0.88	0.49	1.77	1.87
	Rumen	89.75	7.62	0.95	0.76	0.00	0.92
19	Faecal	88.51	6.14	0.67	1.43	1.50	1.75
	Rumen	85.94	12.17	0.44	0.44	0.43	0.58
20	Faecal	85.86	9.83	0.46	0.00	2.24	1.61
	Rumen	89.99	7.18	1.01	0.93	0.43	0.46
34	Faecal	86.51	6.94	1.02	1.02	2.48	2.03
	Rumen	89.74	3.59	0.00	1.10	5.07	0.50

Appendix 3 cont .. 30

ID#	Sample Type	Lichen	*Ledum*	Willow	Forb	Monocot	Moss
36	Faecal	89.45	6.21	0.60	0.00	2.46	0.68
	Rumen	91.03	6.54	0.48	0.00	1.42	0.53
38	Faecal	92.45	2.58	0.55	0.00	1.81	2.61
	Rumen	90.47	6.72	0.00	0.00	2.81	0.00
39	Faecal	94.30	3.29	0.59	0.00	0.00	1.82
	Rumen	91.81	5.53	0.40	0.00	1.69	0.57
40	Faecal	92.09	3.30	0.00	0.71	2.68	1.22
	Rumen	92.96	3.92	0.00	0.49	1.74	0.89
41	Faecal	90.02	5.86	0.60	0.00	1.55	1.97
	Rumen	91.46	4.31	0.53	0.00	2.75	0.95
43	Faecal	91.18	5.85	0.33	0.00	1.57	1.07
	Rumen	90.92	7.97	0.00	0.00	0.56	0.55
45	Faecal	81.04	14.34	0.00	0.00	2.23	2.39
	Rumen	91.59	4.24	0.53	1.79	0.60	1.25
46	Faecal	78.63	13.87	0.00	0.00	4..33	3.17
	Rumen	87.68	8.23	0.00	0.44	2.59	0.97
48	Faecal	91.73	4.92	0.00	0.48	1.58	1.29
	Rumen	92.07	6.60	0.00	0.00	0.31	1.02