# Body Condition of the Porcupine Caribou Herd

## 1989/1990 Progress Report

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Yukon
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## Abstract

Reported are preliminary results of three collections of caribou of the Porcupine Caribou Herd to determine their physical condition. A total of 57 female caribou were collected during September and November 1989, and March 1990. Mean body weights of combined reproductive and non-reproductive females were higher in September and November than in March. No significant difference was observed in kidney fat deposits between months and reproductive classes. Back fat deposits showed a decline from September to March. Legbone marrow fat generally declined from September to March. Marrow fat trends were similar between September and March of femurs, tibia-fibulas, and metatarsuses. Values for tibia-fibulas and metatarsuses were similar, and generally higher than those for femurs. Marrow fat differences between reproductive and non-reproductive females were less pronounced in femurs, than in other legbones.

## Introduction

Caribou (Rangifer tarandus) herds regularly show population fluctuations more dramatic than those for other ungulates. The Porcupine Caribou Herd has been increasing steadily since its first census in 1972 and numbered approximately 178,000 in 1989 (Int'l P.C. Board, 1989). It is not known what population size the range can sustain, however this knowledge would be important to effectively manage the herd. Population size relative to range condition can be evaluated using body condition indices. Condition indices can also be used to evaluate the impacts of displacement from seasonal ranges.

Since 1987 several agencies, including Department of Indian Affairs and Northern Development, University of Alaska, Canadian Wildlife Service, Alaska Department of Fish and Game, GNWT Department of Renewable Resources, Yukon Fish and Wildlife Branch, have been involved in a study on the body composition of adult females in the Porcupine Caribou Herd (White et al. 1988).

The study consists of two phases:

1) to develop a technique for body condition estimation based on indicator bones, muscles, and fat measurements from hunter-killed animals,

2) to monitor within and between year changes in caribou body condition, specifically to evaluate the effects of season, migration, and reproduction on body condition.

Phase 1 is currently being completed (Allaye-Chan, in prep.). Phase 2 has been initiated in September 1989 by the Yukon Fish and Wildlife Branch in cooperation with the GNWT Department of Renewable Resources.

This report presents the results of caribou collections made in September, November, 1989, and March, 1990.

## Methods

Collections of caribou were made on the Porcupine River, during September 1989, and along the Dempster Highway, during both November 1989 and March 1990, in cooperation with hunters from Old Crow and Fort McPherson.

The technique for estimating body condition based on indicator bones, muscles and fat measurements from hunter-killed animals is being finalized (Allaye-Chan, in prep.). Because we do not know which indicators are the best predictors of body condition, we were conservative and chose to collect more muscles and bones than will probably be needed.

Body weights were determined from whole animals. Measurements were taken of total length, chest girth, length of foreleg and hindleg, following Langvatn (1977). Subsequently the carcass was eviscerated and the heart, left and right kidneys (with and without fat) were weighed. Kidney fat was dissected and back fat was measured according to Riney (1955). Gastrocnemius and Peroneus tertius muscles were removed from the hindleg and weighed after being stripped of extraneous fat and tendons. A femur, tibia-fibula, metatarsus, both ovaries, and the lower jaw were collected from each animal and frozen for subsequent laboratory analyses. Total length, weight, and circumference were measured of femur, tibia-fibula, and metatarsus according to Langvatn (1977). Total frozen marrow weight was determined and a sample was oven-dried to constant weight to determine its water content. Marrow fat % was calculated from the equation: marrow fat %=98.82-1.04683*marrow $H_2O$ (developed by A. Allaye-Chan from Neiland, 1970).
Similar to White et al. (1988), in this report, a reproductive female refers to adult (>1 yr.) cows which are pregnant in March, post-partum in June, and lactating in September. Differences between means of indicators, between months and reproductive classes, were evaluated with the TTEST and ANOVA (Tukey's studentized range test) procedures of SAS (SAS Institute Inc., 1985) in two-sample and multi-sample comparisons, respectively.

## Results and Discussion

A total of 82 animals were collected during the three collection periods (Table 1). Although hunters were asked to shoot cows, many bulls were collected during September and March. This is probably related to a combination of 1) the proportion of bulls in groups of caribou, 2) inexperience of hunters in differentiating between small bulls and cows, 3) poor marksmanship. In future collections investigators should be interacting more directly with the hunter before any shots are fired.

Differences in mean body weights of reproductive females between September and March approached significance (Fig. 1, Table 2). If the reproductive classes are combined, mean body weights in September are significantly higher than in March but similar to November. November weights were similar to March weights. A similar trend in body weight from early fall to late winter is reported by White et al. (1988). Slight differences in body weight were apparent when White et al.'s (1988) 1987 data are compared with our collections, particularly in November. It is not known whether these differences are statistically significant.

No significant difference was observed in kidney fat deposits between months and reproductive classes (Fig.2, Table 2). Similar comparisons in 1987 and 1988 also showed no significant differences (White et al. 1988).

Back fat deposits showed a decline from September to March (Fig.3, Table 2). Significant differences were found in mean back fat deposits, of non-reproductive females and all females between September and March. By contrast, White et al. (1988) reported an increase in back fat deposits between September (9 mm) and November (28 mm) for reproductive females.

Kidney fat and back fat are reportedly good predictors of total carcass fat, particularly in combination with gastrocnemius fat (White et al. 1988). It would therefore appear that productive females were in better shape in September 1989 than productive females in September 1987. 1987 non-reproductive females, on the other hand, appeared in better shape in September and November, 1987 and 1988, than those collected in September and November 1989.

Legbone marrow fat generally declined from September to March (Figs. 4,5,6, Table 2). The trend was significant for non-reproductive females and females of combined reproductive classes. Femur marrow fat reserves during the 1987 collection periods were similar to those reported here with the exception of those collected in September 1987 which were substantially lower than those of September 1989 (White et al.1988). Since marrow fat is depleted late and replenished early, relative to kidney fat (Adamczewski et al. 1987) this suggests that female caribou were

in better shape during early fall of 1989 than during early fall of 1987.
Marrow fat trends between September and March were similar between femurs, tibia-fibulas, and metatarsuses, with values for tibula-fibulas and metatarsuses being similar, and generally higher than those for femur. Differences between reproductive and non-reproductive females less pronounced in femurs. Differences in indicator values between our collections and those of White et al. (1988) may be a function of 1) environmental factors, or 2) the age distribution of collected animals. Further analyses will be completed when ages have been determined.

**Further analyses planned**

1) Collections will be continued during September, November, and March. When the technique for body condition estimation has been developed, collection procedures and sampling size will be adapted accordingly.

2) Ages of collected animals will be determined and trend analyses of body condition will be done incorporating this information.

3) Trends in body condition will be evaluated relative to range condition and population size.

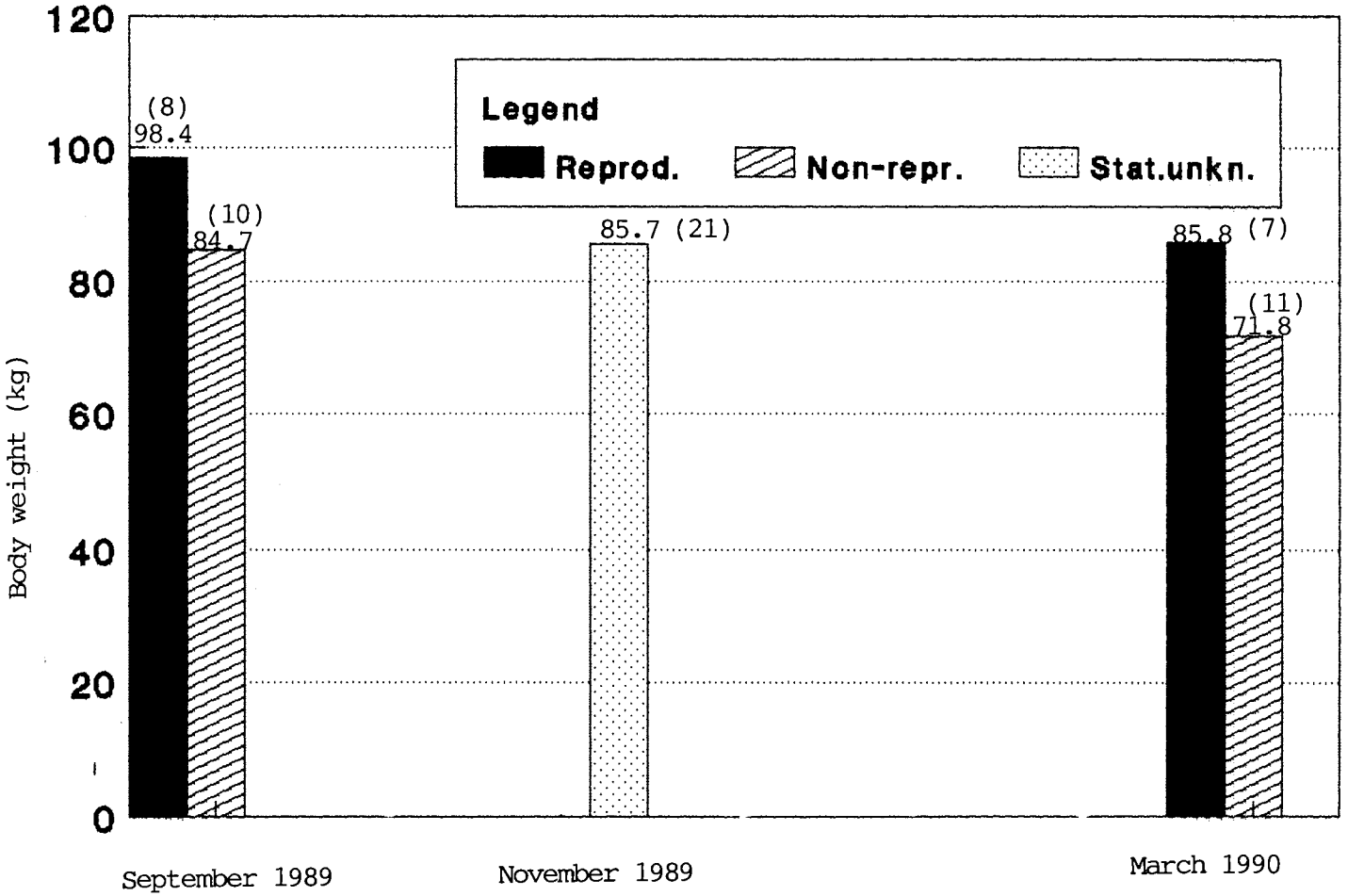


Fig. 1. Seasonal mean body weights of adult female caribou of the Porcupine Herd. Sample size in parentheses.

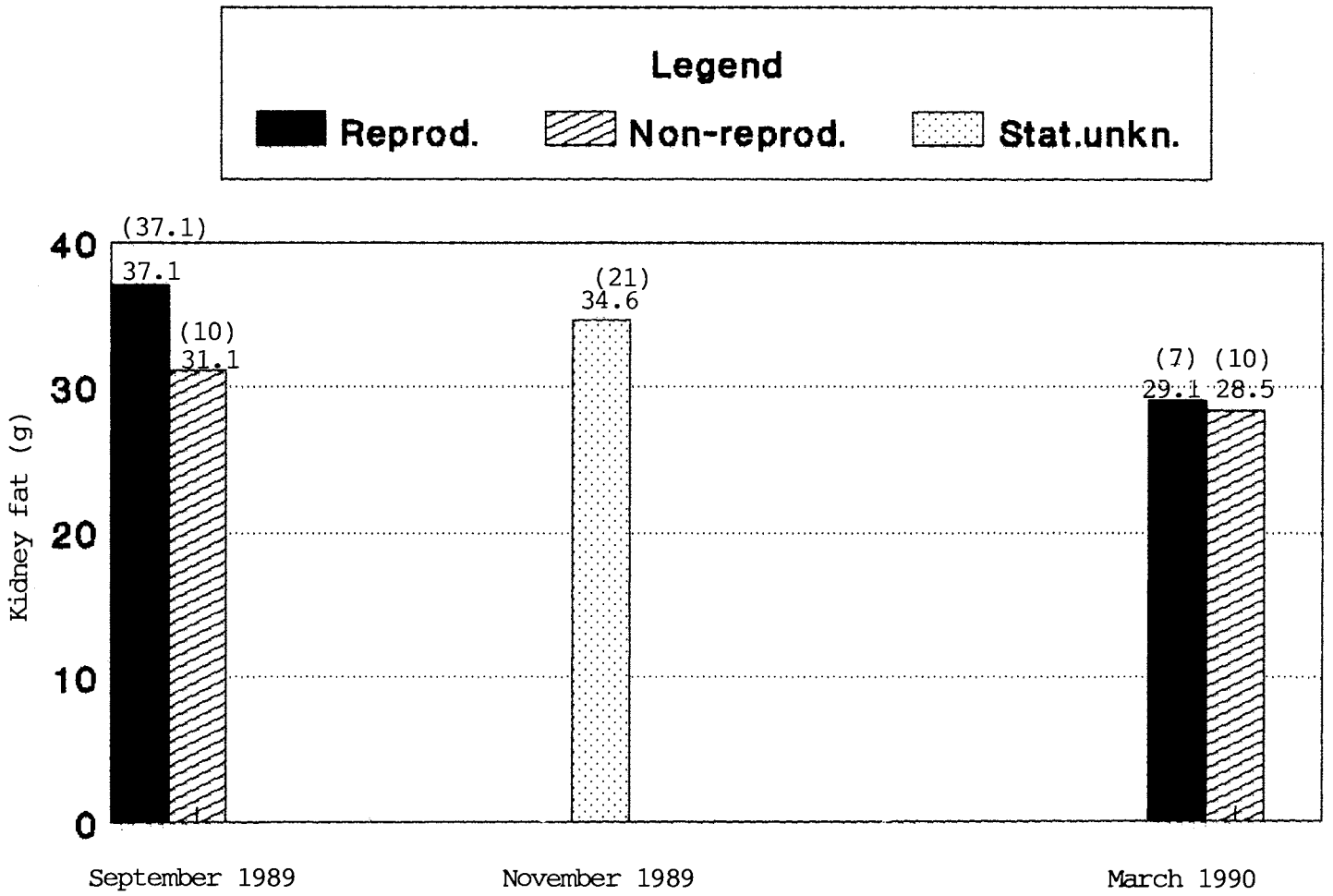


Fig. 2. Seasonal mean kidney fat weights of adult female caribou of the Porcupine Herd. Sample size in parentheses.

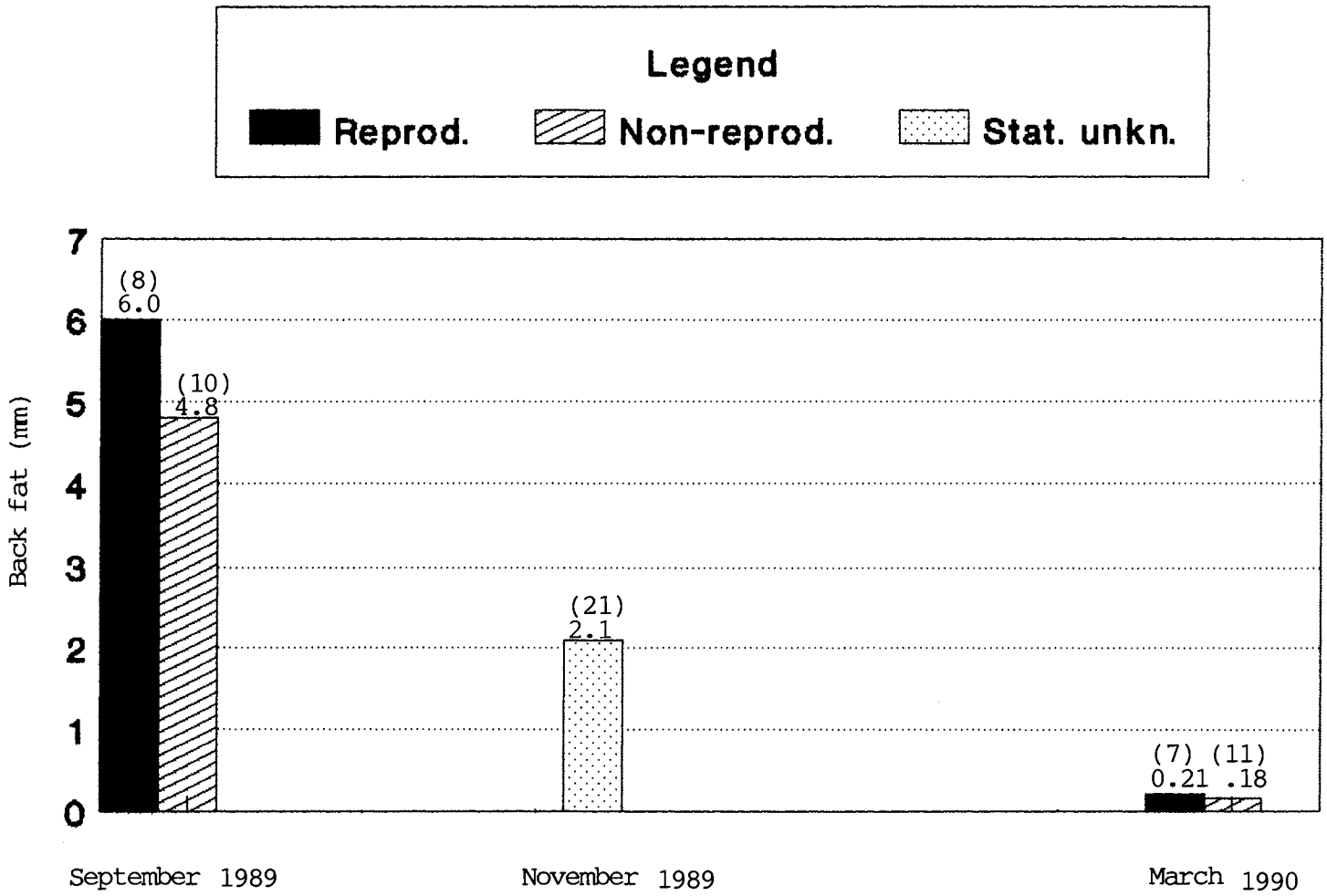


Fig. 3. Seasonal mean depth of back fat of adult female caribou of the Porcupine Herd. Sample size in parentheses.

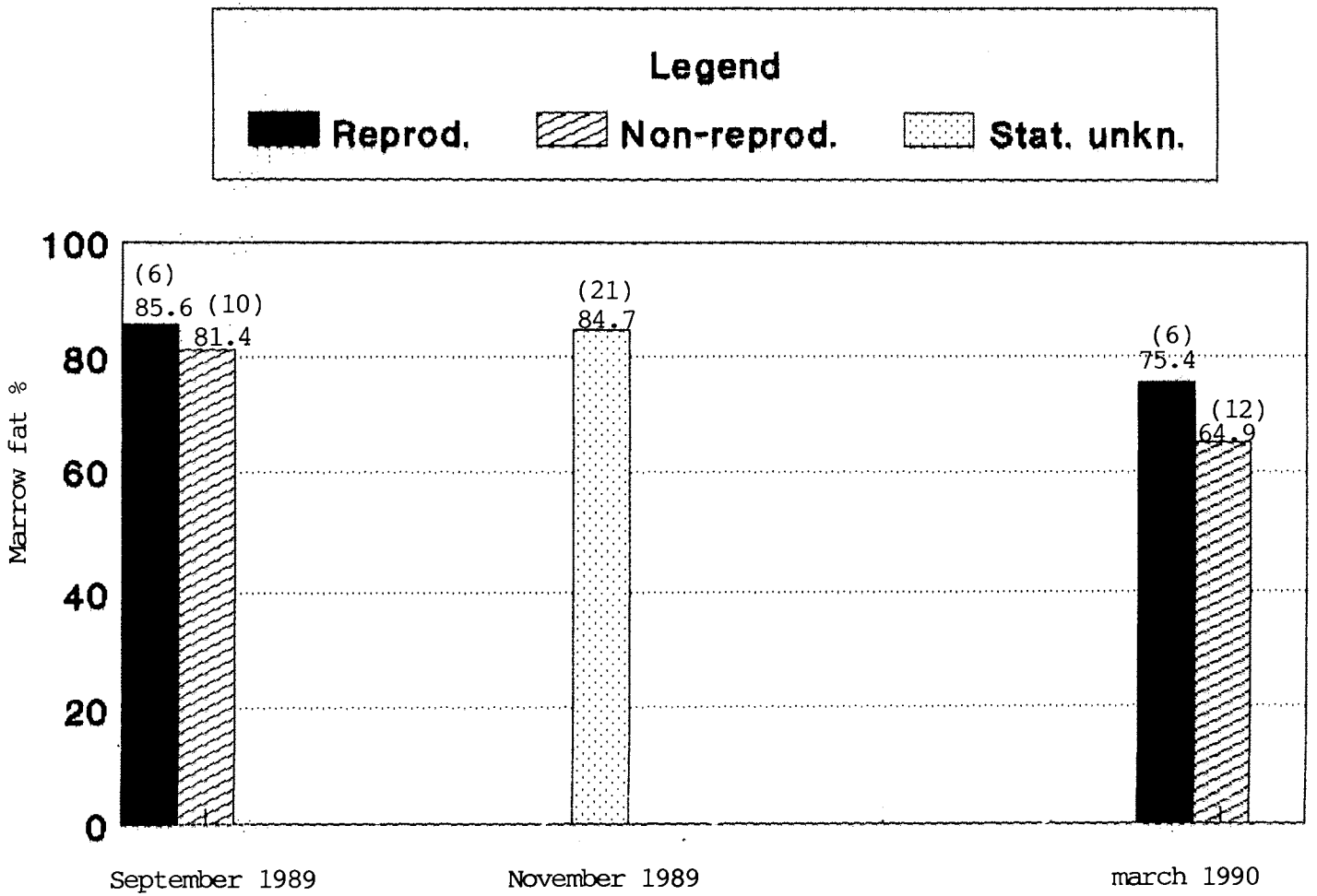


Fig. 4. Seasonal mean femur marrow fat percentages of adult female caribou of the Porcupine Herd. Sample size in parentheses.

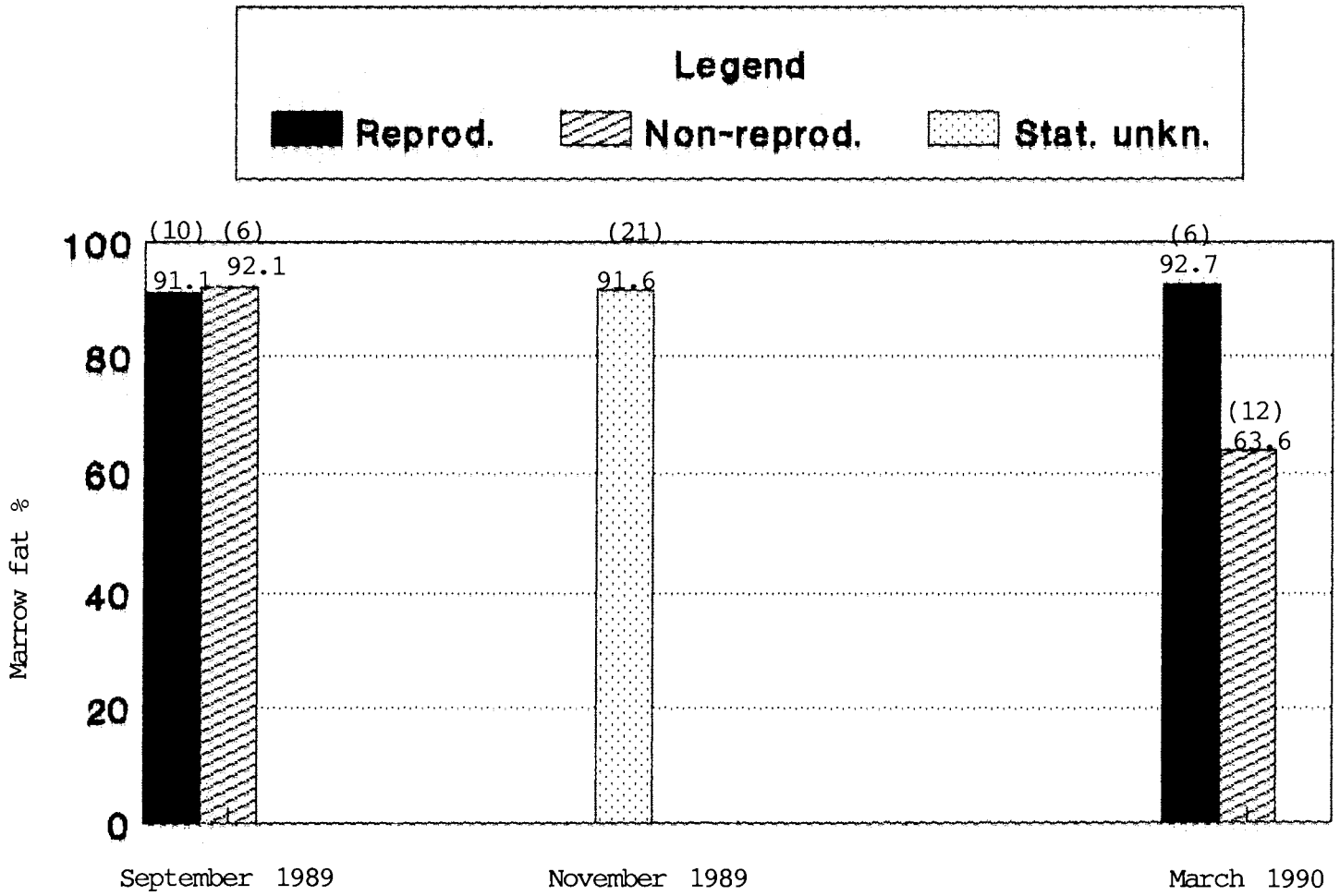


Fig. 5. Seasonal mean Tibula-fibula marrow fat percentages of adult female caribou of the Porcupine Herd. Sample size in parentheses.

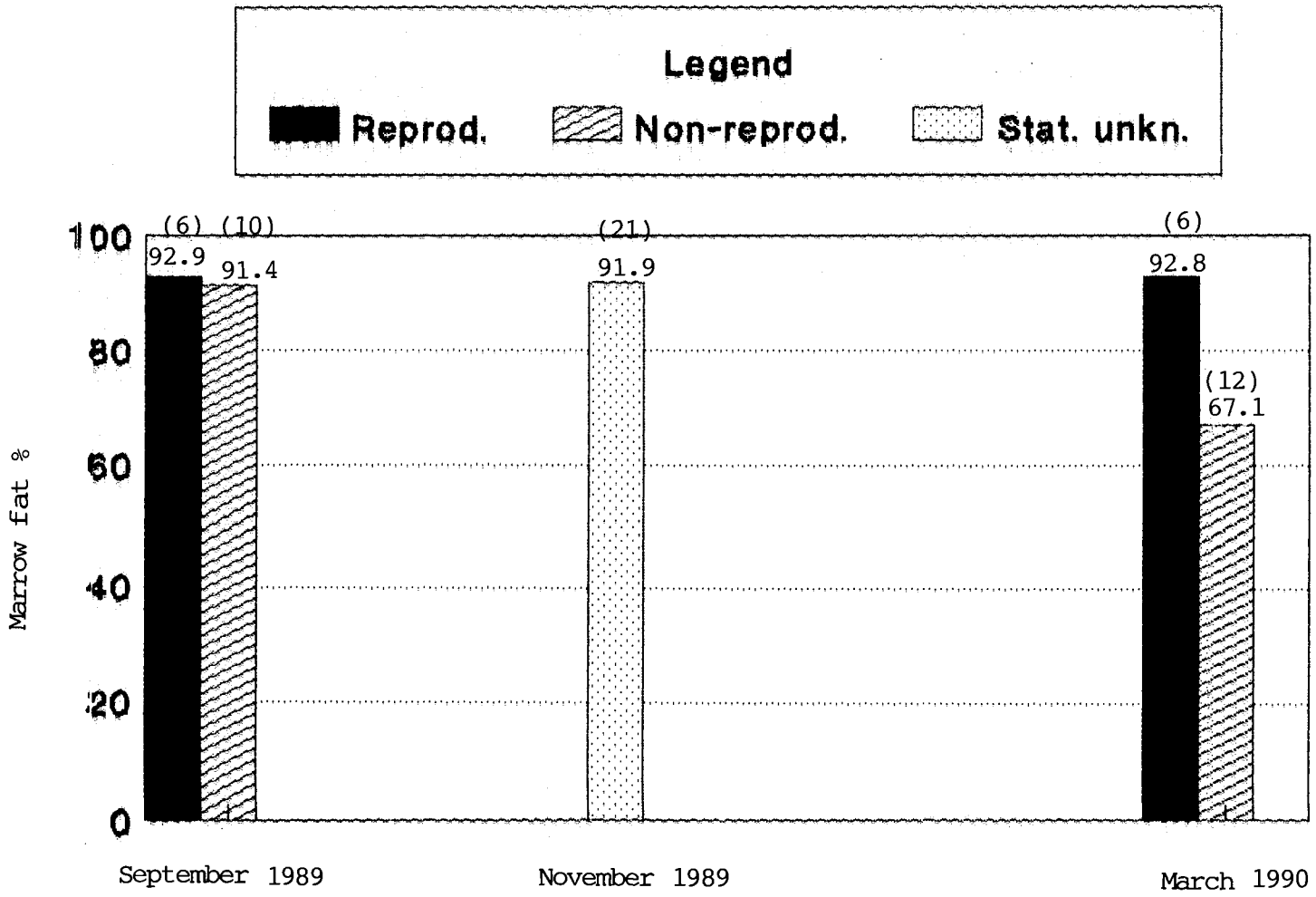


Fig. 6. Seasonal mean metatarsus marrow fat percentages of adult female caribou of the Porcupine Herd. Sample size in parentheses.

**Table 1.** Number, sex, and location of caribou collected during September, November 1989, and March 1990.

| Period | Number | | Total | Location |
|---|---|---|---|---|
| | Bulls | Cows | | |
| Sept. 13-23, 1989 | 11 | 18 | 29 | Porcupine River between Driftwood and Rapid Rivers |
| November 9-12, 1989 | 2 | 21 | 23 | Dempster Highway between Eagle and Rock Rivers |
| March 23-24, 1990 | 12 | 18 | 30 | Dempster Highway between km 250 and 268 |
| TOTAL | 25 | 57 | 82 | |

**Table 2.** Comparisons of body condition indices between reproductive categories of caribou of the Porcupine Caribou Herd collected during September, November 1989, and March 1990.

| Body Condition Index | Category | Comparison (Mean) | T | df | P |
|---|---|---|---|---|---|
| **Femur marrow fat** | Reproductive | Sept (85.6) - March (75.4) | - 0.82 | 10.0 | 0.4311 (n.s.)* |
| " | Non-reproductive | Sept (81.4) - March (62.7) | - 2.43 | 14.1 | 0.0290 |
| " | Combined Repr. Classes | Sept (83.0) - Nov. (84.7) | - 0.61 | 35.0 | 0.5478 (n.s.) |
| " | " | Sept (83.0) - March (67.2) | - 2.40 | 21.6 | 0.0257 |
| " | " | Nov (84.7) - March (67.2) | - 2.80 | 17.9 | 0.0118 |
| **Tib.-fib.marrow fat** | Reproductive | Sept (91.1) - March (92.7) | 1.46 | 10.0 | 0.1738 (n.s.) |
| " | Non-reproductive | Sept (92.1) - March (60.9) | - 3.42 | 10.2 | 0.0064 |
| " | Combined Repr. Classes | Sept (91.7) - Nov (91.6) | 0.13 | 35.0 | 0.8961 (n.s.) |
| " | " | Sept (91.7) - March (72.1) | - 2.82 | 16.3 | 0.0122 |
| " | " | Sept (91.6) - March (72.1) | - 2.80 | 16.3 | 0.0127 |
| **Metatarsus marrow fat** | Reproductive | Sept (92.9) - March (92.9) | - 0.01 | 10.0 | 0.9942 (n.s.) |
| " | Non-reproductive | Sept (91.4) - March (64.9) | - 2.57 | 11.4 | 0.0253 |
| " | Combined Repr. Classes | Sept (92.0) - Nov (91.9) | 0.02 | 17.1 | 0.9810 (n.s.) |
| " | " | Sept (92.0) - March (74.8) | - 2.34 | 17.8 | 0.0314 |
| " | " | Nov (91.9) - March (74.8) | - 2.39 | 16.1 | 0.0294 |

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Table 2. (Con't)

| | | | | | |
|---|---|---|---|---|---|
| **Backfat** | Reproductive | Sept (6.0) - March (0.21) | - 2.06 | 7.0 | 0.0780 (n.s.) |
| " | Non-reproductive | Sept (4.8) - March (0.18) | - 2.42 | 9.1 | 0.0382 |
| " | Combined Repr. Classes | Sept (5.3) - Nov (2.1) | 1.55 | 37.0 | 0.1293 (n.s.) |
| " | " | Sept (5.3) - March (0.19) | - 3.53 | 17.1 | 0.0049 |
| " | " | Nov (2.1) - March (0.19) | - 1.38 | 20.2 | 0.1818 (n.s.) |
| **Kidney Fat** | Reproductive | Sept (37.1) - March (29.1) | - 0.99 | 12.0 | 0.3398 (n.s.) |
| " | Non-reproductive | Sept (31.1) - March (28.5) | - 0.32 | 18.0 | 0.7549 (n.s.) |
| " | Combined Repr. Classes | Sept (33.5) - Nov (34.6) | - 0.21 | 36.0 | 0.8377 (n.s.) |
| " | " | Sept (33.5) - March (28.7) | - 0.85 | 32.0 | 0.4020 (n.s.) |
| " | " | Nov (34.6) - March (28.7) | - 1.20 | 36.0 | 0.2372 (n.s.) |
| **Body Weight** | Reproductive | Sept (98.4) - March (85.8) | - 1.94 | 13.0 | 0.0745 (n.s.) |
| " | Non-reproductive | Sept (84.7) - March (71.8) | - 2.05 | 19.0 | 0.0542 (n.s.) |
| " | Combined Repr. Classes | Sept (90.8) - Nov (85.7) | 1.19 | 37.0 | 0.2430 (n.s.) |
| " | " | Sept (90.8) - March (77.3) | - 2.71 | 34.0 | 0.0106 (n.s.) |
| " | " | Nov (85.7) - March (77.3) | - 2.07 | 37.0 | 0.0457 |

* n.s. - not significant, at 95% level.

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