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1990/91 PROGRESS REPORT

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The wildlife projects reported here are continuing and conclusions are tentative. Persons are free to use this material for educational purposes. Persons intending to use this information in scientific publications should receive prior permission from the Fish and Wildlife Branch, Government of Yukon, identifying in quotation the tentative nature of the conclusions.

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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 52 adult female caribou were collected during September and November 1990 and March 1991. Backfat, kidney fat, and marrow fat deposits were generally greater since September 1989 than prior to that. Body weights did not show this trend.

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. Range condition can be evaluated indirectly using body condition indices. In turn, this information can be used to determine when range carrying capacity is being approached. 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, and Yukon Department of Renewable Resources, 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, and
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, 1991). Phase 2 has been initiated in September 1989 by the Yukon Department of Renewable Resources in cooperation with GNWT Department of Renewable Resources.

This report presents the results of caribou collections made in September and November 1990, and March 1991.

METHODS

Collections of caribou were made on the Porcupine River during September 1990, and along the Dempster Highway during November 1990 and March 1991, in cooperation with hunters from Old Crow, Fort McPherson, Mayo and Dawson.

The technique for estimating body condition based on indicator bones, muscles and fat measurements from hunter-killed animals was being finalized during the period reported here (Allaye-Chan, 1991). Because we did not know which indicators were the best predictors of body condition, we were conservative and chose to collect more muscles and bones than we thought would be needed.

Body weights were determined from whole animals. Measurements were taken of total length, chest girth, length of foreleg and hind leg, 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 a hind leg and weighed after being stripped of

extraneous fat. A femur, both ovaries, and the lower jaw were collected from each animal and frozen for subsequent laboratory analyses. Total length, weight and circumference of femur were measured. Total frozen marrow weight was determined and a sample was oven-dried to constant weight to determine its water content. Marrow fat percentage was calculated from the equation: marrow fat % = $98.82 - 1.04683 * \text{marrow H}_2\text{O}$ (developed by A. Allaye-Chan from Neiland, 1970).

Using the September, November 1990 and March 1991 data sets, regression No. 4 predicting body weight of female caribou (Allaye-Chan, 1991) was validated. In this report a reproductive female refers to adult (>1 yr.) cows which were pregnant in March, and lactating in September and November.

RESULTS AND DISCUSSION

A total of 52 animals were collected during the three collection periods (Table 1). Compared with the previous three collections (Smits *et al.* 1990) an insignificant number of these were bulls (2, or 4%, compared with 25, or 30%). This improvement was a result of hunters having more experience in differentiating between small bulls and cows, and better marksmanship.

Table 2 and Figures 1A-1D give the body weights, kidney fat weights, mean depth of back fat, and mean marrow fat percentage of adult female caribou collected during the three most recent collection periods along with information of these indices from all previous collections.

Variations between seasons and between reproductive categories were generally pronounced for all condition indices. However, there appears to be a trend toward smaller differences in femur marrow fat percentage and kidney fat deposits between the reproductive categories since September 1989. Backfat, kidney fat, and marrow fat deposits were generally greater since September 1989 than prior to that. Body weights did not show this trend.

A comparison of observed and predicted mean body weight for the November 1990 and March 1991 collections showed that the equation: 1) over-predicted mean body weight in November by 6.1 kg (7.3% of observed mean), 2) under-predicted

mean body weight in March by 4.4 kg (4.8% of observed mean)(Table 3). Allaye-Chan (1991) reported that all four equations predicted within the 95% confidence interval of the observed mean for the four sample collections tested (e.g., September 1989, November 1989, March 1990, September 1990). She found that all equations tended to err in the same direction with each collection period. Contrary to her findings, the predicted mean body weight using the November 1990 data fell (just) outside the 95% confidence interval of the observed mean. Variations in gut fill probably account for much of the variation. For that reason ingesta-free body weights will be determined during future collections.

The models developed to predict body weight and total body fat require a number of indicator bones, muscles and fat measurements to obtain estimates with acceptable levels of precision (Allaye-Chan, 1991). The body fat model, for example, includes kidney fat as an indicator. Dissecting kidney fat consistently between animals requires great care and should be left to experienced personnel. Errors or inconsistencies in methodology might result in inaccurate estimates of total body fat, using the model. For that reason, we propose to continue the sample collection with the aid of biologists or technicians trained for this specific purpose. Although body weights can now be estimated from a number of indicators, we propose to continue to weigh the animal (minus gut content) in the field as this will yield a more precise estimate and minimize the number of indicator bones, muscles and fat measurements that have to be weighed and measured.

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Table 1. Number, sex, and location of caribou collected during September, November 1990, and March 1991.

Period	Number			Location
	Bulls	Cows	Total	
Sept. 12-14, 1990	0	15	15	Porcupine River 10-15 km upstream of Old Crow.
Nov. 17-18, 1990	1	17	18	Dempster Highway between Eagle and Rock Rivers.
March 19-21, 1991	1	18	19	Dempster Highway between Eagle Plains Lodge and the NWT Border.
Total	2	50	52	

Table 2. Seasonal mean values of selected body condition indices of female caribou of the Porcupine Caribou Herd collected since March 1987.

CONDITION INDEX	REPRODUCTIVE CATEGORY	1987*				1988*				1989**		1990		1991	
		MARCH	JUNE	SEPT.	NOV.	APRIL	JUNE	SEPT.	NOV.	SEPT.	NOV.	MARCH**SEPT.	NOV.	MARCH	
Body weight (kg)	Reproductive	87.5	81.7	97.6	90.2	89.2	94.0	94.4	87.1	98.4	94.5	85.8	92.2	87.0	93.3
	Non-reproductive	--	--	91.1	102.9	75.4	79.8	106.8	91.3	84.7	84.7	71.8	83.1	82.3	82.8
Mean kidney fat (g)	Reproductive	31.4	17.9	25.0	27.9	28.7	17.5	19.5	30.3	37.1	38.3	29.1	26.4	21.1	37.5
	Non-reproductive	--	--	34.0	68.5	7.9	13.9	73.4	39.3	31.1	37.7	28.5	29.8	29.8	24.3
Backfat (mm)	Reproductive	4	0	0	0.1	0.3	0	0.5	1.0	6.0	10.0	0.2	1.7	2.8	3.2
	Non-reproductive	--	--	9	2.8	0	0.6	22.0	0.6	4.8	0.5	0.2	2.6	6.1	0.0
Femur marrow fat %	Reproductive	77.2	44.5	58.5	67.1	81.3	52.4	78.6	72.2	85.6	98.7	75.4	***	98.5	98.7
	Non-reproductive	--	--	76.1	86.4	43.5	67.2	86.0	87.3	81.4	98.7	64.9	***	98.7	98.5

* from Allaye-Chan (unpubl. data)

** from Smits et al. (1990)

*** samples not available

Table 3. Comparison of observed and predicted mean body weights (kg \pm 2 standard errors) for two independent data collections using Allaye-Chan's (1991) equation no. 4.

	Collection Period	
	November 1990	March 1991
n	17	18
Observed mean	83.7 \pm 5.2	91.4 \pm 5.1
Predicted mean	89.8 \pm 3.5	87.0 \pm 2.9
Difference	-6.1	4.4

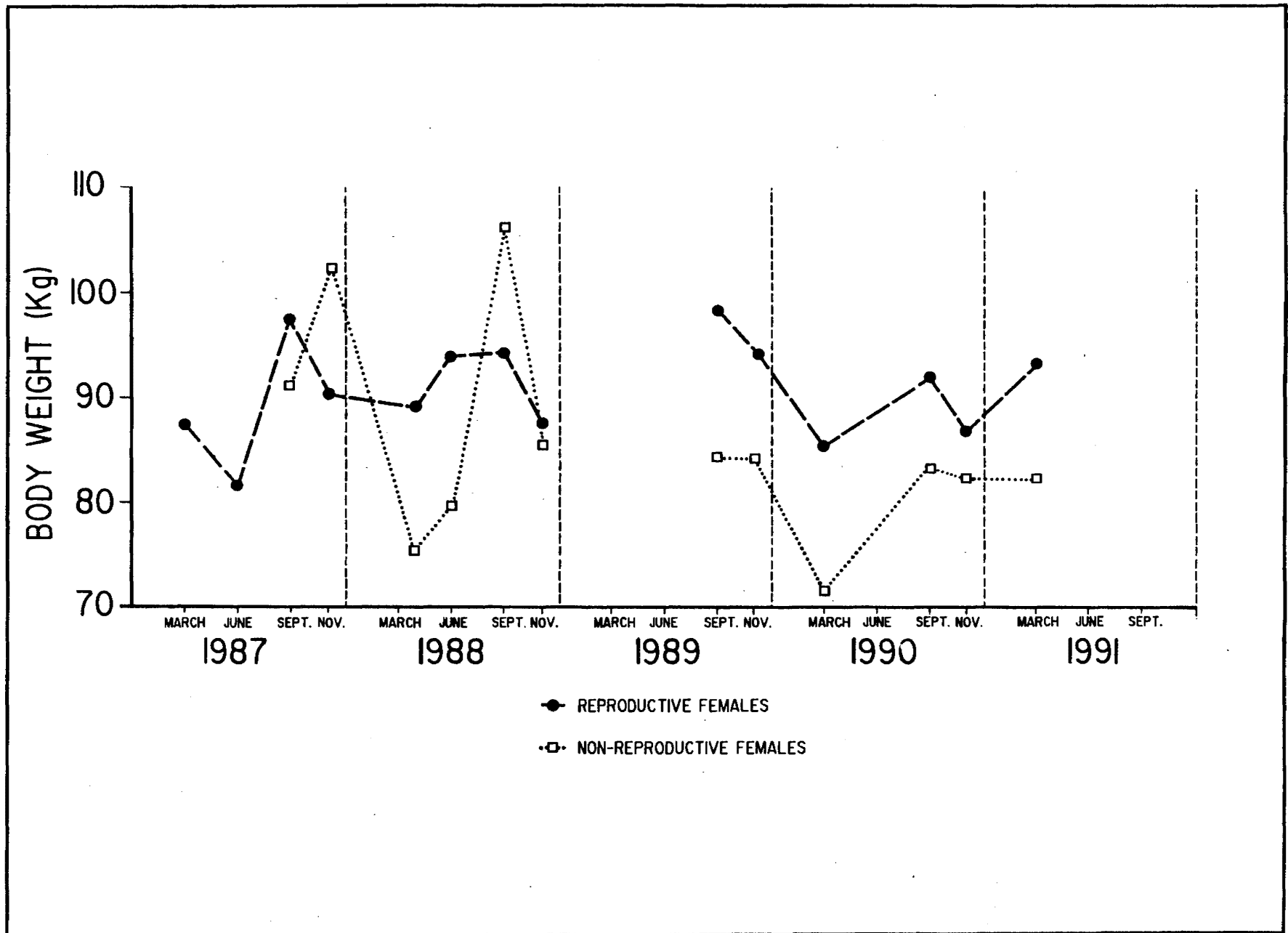


Fig. 1A. Seasonal and year-to-year variation in mean body weight of samples of adult female caribou of the Porcupine herd collected between March 1987 and March 1991.

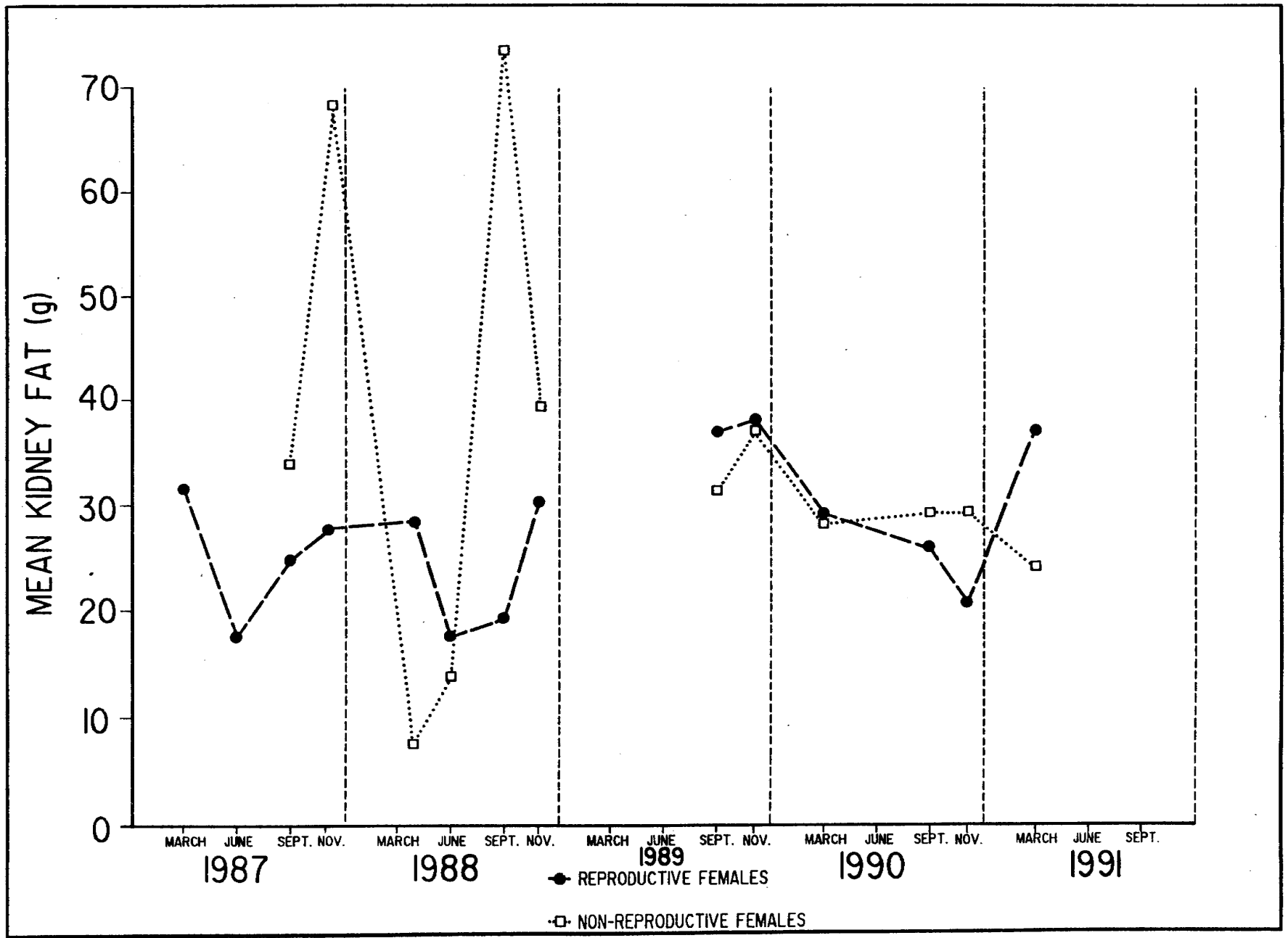


Fig. 1B. Seasonal and year-to-year variation in mean kidney fat of adult female caribou of the Porcupine herd collected between March 1987 and March 1991.

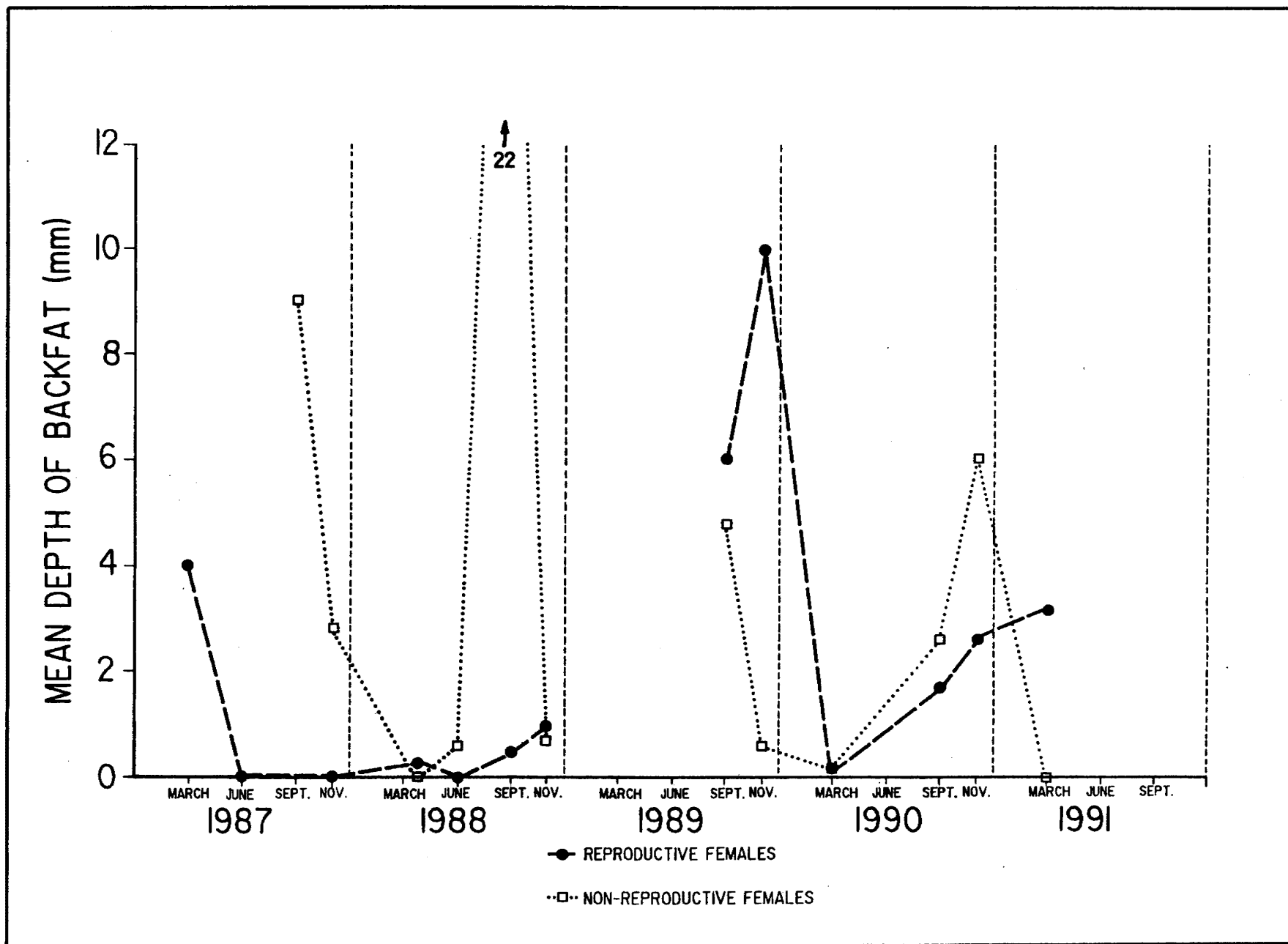


Fig. 1C. Seasonal and year-to-year variation in mean body weight of samples of adult female caribou of the Porcupine herd collected between March 1987 and March 1991.

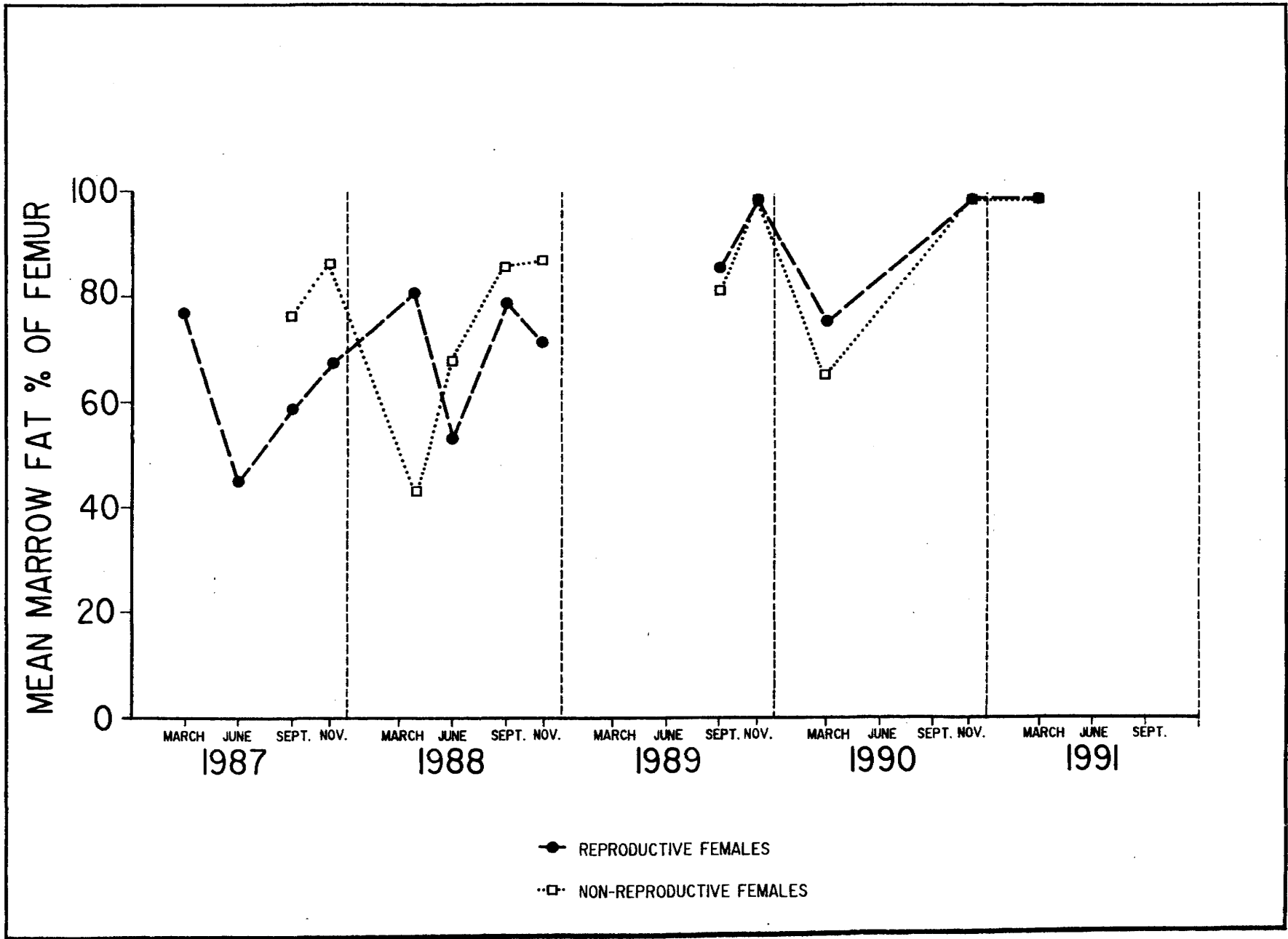


Fig. 1D. Seasonal and year-to-year variation in mean body weight of samples of adult female caribou of the Porcupine herd collected between March 1987 and March 1991.