

3.10a) and did not differ between the increase phase (0.80, SE ± 0.04, 1983-1989) and the decrease phase (0.82, SE ± 0.08, 1990-2001).

Calf survival during June was quite high and averaged 0.75 (range 0.57-0.94) during 1983-2001 (Fig. 3.10f) but did not differ between the increase phase (0.71, SE ± 0.07, 1983-1989) and the decrease phase (0.79, SE ± 0.13, 1990-2001). Net calf production averaged 0.62f during 1983-2001 (range 0.50-0.82) (Fig. 3.10c) and did not differ between the increase phase (0.58, SE ± 0.06, 1983-1989) and the decrease phase (0.63, SE ± 0.13, 1990-2001). For all these demographic characteristics, variance tended to be greater during the decrease than during the increase phase of the herd.

Because average parturition, calf survival during June, and net calf production did not differ between the increase and decrease phases of the Porcupine Caribou herd, 1983-2001, a reduction in adult, sub-adult, and/or calf survival while animals were of the calving ground in late-summer through winter must have accompanied the herd decline. Emigration to the adjacent Central Arctic herd was an unlikely cause of the Porcupine Caribou herd decline because satellite-collared animals that occasionally (4 out of 167 collar-years) wintered with the Central Arctic herd, returned to the Porcupine Caribou herd the following summer.

Periodic lows in net calf production and calf survival during June (1992, 1993, 1997; Figs. 3.10b, c) were not sufficient to maintain the herd decline (S. A. Arthur, Alaska Department of Fish and Game, personal communication). Unfortunately, a complete record of adult, sub-adult, and calf survival estimates was not available for late-summer through winter during the decrease phase of the herd, 1989-2001.

### Seasonal Distribution and Movements

The Porcupine Caribou herd Caribou wintered (15 November to 4 April) in Alaska south of the Brooks Range and in Canada in the Richardson and Ogilvie Mountains in the Yukon Territory (Fig. 3.11). Their annual range encompassed ~290,000 km<sup>2</sup> (Fig. 3.2). The extent of calving encompassed ~36,000 km<sup>2</sup>. Spring migration to the annual calving grounds began in mid-April and continued through April and May (Fig. 3.11). Return to fall/winter ranges began with departure from the annual calving grounds in late-June and early-July (Fig. 3.11). In fall (15 September – 4 November), the Porcupine Caribou herd was distributed widely.

Minimum daily travel rates of parturient females were variable throughout the year (Fig. 3.12). Non-parturient females had similar movement rates. Minimum movement occurred during winter. Movement began increasing in mid-April with initiation of migration to the annual

calving ground and was directional toward the annual calving ground.

After their calves were born, the direction of movement of satellite-collared parturient females was random for 20 days (Fancy and Whitten 1991). Calf movement rate (minimum, straight line, estimated from conventional radio-collars) in the years 1992-1994 was about 2.5 km/day during the first week after birth. The rate increased gradually during the next week to about 5 km/day and then increased through the end of June to approximately 15-20 km/day. As females and calves departed the calving ground in late June and early July, some individual calves traveled as much as 90 km/day. Relatively high rate of movement continued throughout July. Because movement rates were low during the calving season and direction of movement was random for 20 days after birth (Fancy and Whitten 1991), the distribution of calving sites was assumed to be representative of habitat use by Caribou through 21 June.

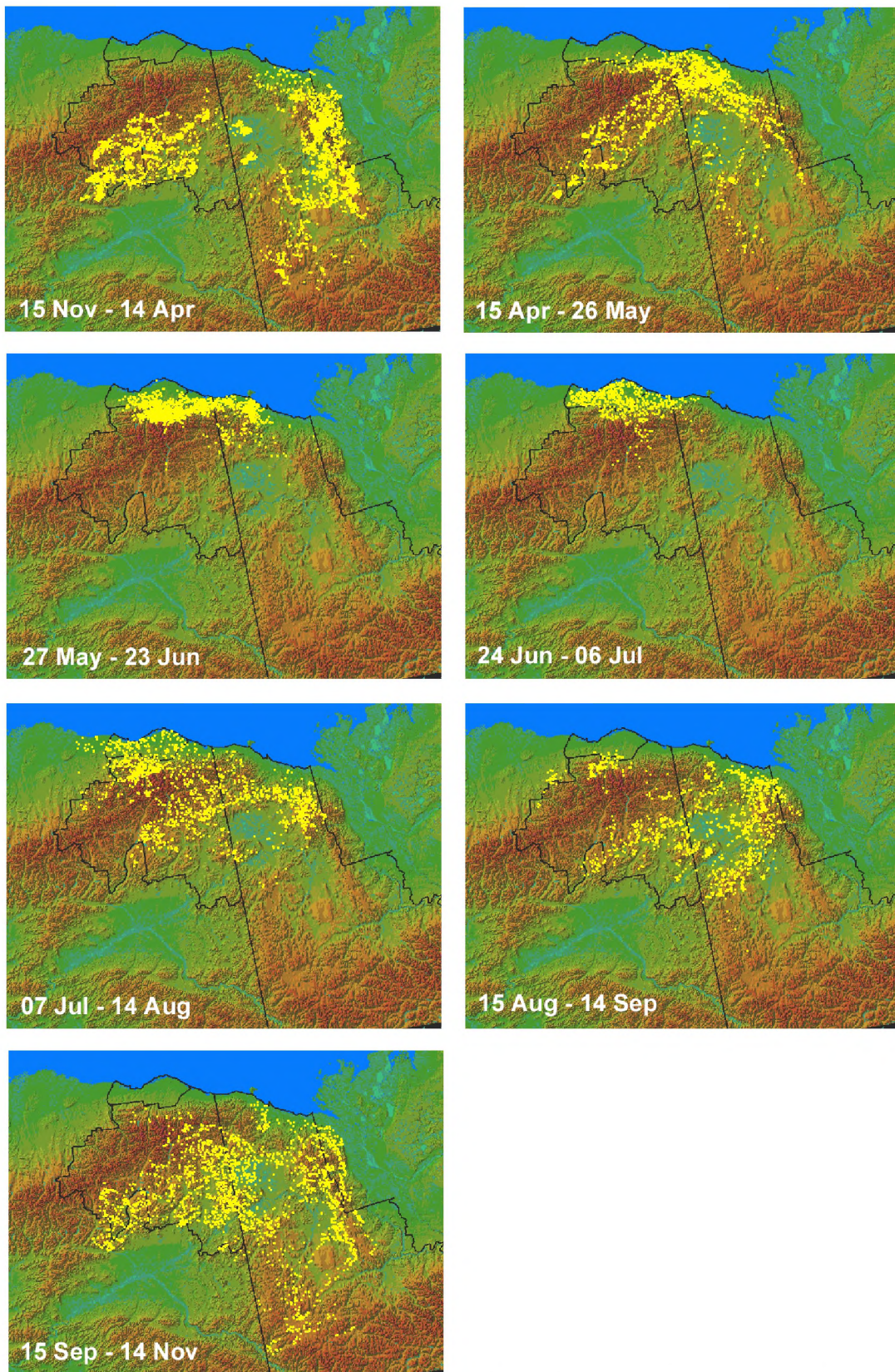
Movement declined during August perhaps in response to harassment by Oestrid flies or to localized forage abundance. Movement increased during the pre-rut period in late-September and October and then reached a minimum again by mid-November. The average female of the Porcupine Caribou herd traveled approximately 4,355 km annually (Fancy et al. 1989).

During 1985-1992, median arrival of satellite-collared parturient females on the annual calving ground ranged from 17 May-4 June and median date of departure ranged from 3-26 July. Non-parturient females tended to lag slightly behind and south of the parturient females from early-May through calving (Whitten et al. 1992), but within 1 week after calving, parturient and non-parturient female distributions were essentially coincident.

Length of stay on the annual calving ground ranged from 34-67 days. Caribou have tended to depart the annual calving grounds earlier since 1995 (F. J. Mauer, U.S. Fish and Wildlife Service, personal communication). This trend may have been related to more advanced plant phenology within the extent of calving in late June during the late 1990s (Fig. 3.4).

Median calving date, 1983-1996, was 1 June (range 30 May-6 June) with 50% of annual calving occurring within 2 days of the annual median calving date. No temporal trends were evident in median calving date, and annual calf survival was not related to median calving date ( $P > 0.05$ ).

Sizes and locations of annual calving distributions were quite variable. Annual calving grounds encompassed 3,672-16,667 km<sup>2</sup> during 1983-2001 (Fig. 3.13, Table 3.1). Similar distributions were observed during aerial surveys, 1972-1982 (Figs. II-5 in Clough et al. 1987). On average, concentrated calving areas occupied 12.3% (range 0.7-25%) of the annual calving grounds (255-f



**Figure 3.1** Distribution of satellite-collared female caribou of the Porcupine caribou herd during 7 time periods, 1985-1995. An average of 10 animals (range 4-17) were collared each year yielding 14,447 observations; 87% of these observations were obtained 1985-1990. Not included were the locations of 3 females that each spent one winter with the adjacent Central Arctic herd.