Fla. Field Nat. 20(4):97-103, 1992.

HOME RANGE CHARACTERISTICS OF A PANTHER IN SOUTH CENTRAL FLORIDA

DAVID S. MAEHR, JAYDE C. ROOF, E. DARRELL LAND, J. WALTER MCCOWN AND ROY T. MCBRIDE
Florida Game and Fresh Water Fish Commission
566 Commercial Blvd.
Naples, Florida 33942

Abstract.—An adult male Florida panther was radio-monitored from 30 January to 22 August 1988 in Glades and Highlands counties. He used 1182 km^2, preferred forested uplands, and avoided unforested habitats. His large home range may have been due to young age, lack of other resident panthers, a high degree of avoided habitats, and habitat fragmentation.

Intensive research over the last decade has detailed the behavior and natural history of the Florida panther (*Felis concolor coryi*) in southwest Florida (Belden et al. 1988, Maehr et al. 1989a, 1989b, 1990a, 1990b, 1991a, 1991b), and has been instrumental in stimulating conservation and management efforts ranging from the construction of wildlife underpasses along Interstate 75, land acquisition (Florida Pather National Wildlife Refuge), changing prey management and harvest regulations (Schortemeyer et al. 1991), and in developing landscape conservation strategies (Maehr 1990a, Maehr and Cox 1992). The landscape in which these actions have been taken is predominately public land (Big Cypress National Preserve, Fakahatchee Strand State Preserve and Big Cypress Seminole Indian Reservation), where access for research and surveys (Roof and Maehr 1988) is mostly unrestricted. These preserves were instrumental in obtaining study animals that utilized private as well as public land. None of the 52 panthers studied in southern Florida since 1981, however, has limited its movements to public land. Restricted access has limited our ability to adequately judge the value of vast tracts of private property to the Florida panther. This report describes a study examining the movements of a panther outside the population core in southern Florida, on land dominated by private ownership. This area differs from the southern Florida population center by being characterized by greater human population and agricultural growth. These data are important in describing panther range outside of southern Florida. Our study was stimulated by the discovery of adult male panther tracks and scat on 12 August 1987 on the Archbold Biological Station (Layne and Wassmer 1988).

METHODS

Surveys for panther sign were conducted from 18 November 1987 through January 1988 on Archbold Biological Station and surrounding private lands in Highlands County. We searched for additional sign on foot, from all-terrain cycles, or on swamp buggies following methods described by Roof and Maehr (1988). Details of panther captures and monitoring techniques can be found in McCown et al. (1990) and Maehr et al. (1991a), respectively. We used fixed-wing aircraft to locate study animals three times weekly. Radio locations were plotted on 7.5″ USGS topographic maps and location data were computerized as transverse mercator points. Habitat type, time, and activity (active or not active) were recorded for each location. We used Program Home Range (Samuel et al. 1985) to analyze home range characteristics and Chi-square analysis to test for differences in habitat use patterns. If a significant difference ($P < 0.005$) was found, we examined the influence of each habitat type with Bonferroni comparisons of their individual Chi-square values (Johnson and Wichern 1982:197).

This study area supports a variety of rare or unique vertebrate forms, and Highlands County is part of a region recognized for its high degree of plant endemism (Muller et al. 1989). Descriptions of plant communities were adapted from Davis (1943) and can be found in Maehr et al. (1991a).

RESULTS

Weekly searches produced widely scattered but regularly encountered sign of an adult male Florida panther. No sign was found after 12 August at Archbold Biological Station, but was seen throughout several large, wooded private ranches to the east. We initiated capture efforts for this panther on 18 January 1988, and captured young adult male #24 on 30 January 1988 near Venus, Highlands County. The panther weighed 57 kg, was in excellent condition, and was fitted with a radio-collar (Telonics, Inc., Mesa, AZ). We estimated his age at 3-4 years old.

Between 30 January and 22 August 1988 we collected 70 radio locations over a home range covering 1182 km^2 (Fig. 1). Panther #24 was found dead of unknown causes on a large private ranch in Glades County on 22 August 1988. He used habitat differently than it was available in his home range ($\chi^2 = 670.9$, df = 9, $P < 0.005$). Preferred habitats (those used more than expected) included hardwood hammock ($\chi^2 = 73.5$, $P < 0.005$), pine flatwoods ($\chi^2 = 68.3$, $P < 0.005$), and bay tree forest ($\chi^2 = 475.0$, $P < 0.005$), (Table 1). Agricultural/disturbed habitats were avoided ($\chi^2 = 27.6$, $P < 0.005$). In general, panther #24 preferred most upland forests and avoided herbaceous wetlands and other habitats providing little structural diversity such as improved pasture.

DISCUSSION

Habitat use by #24 was similar to habitat use exhibited by panthers in southwest Florida where upland habitats were preferred (Maehr et al. 1991a), but he had a large home range relative to other adult male panthers. Annual resident adult male home ranges ($n = 4$) averaged 519 km^2

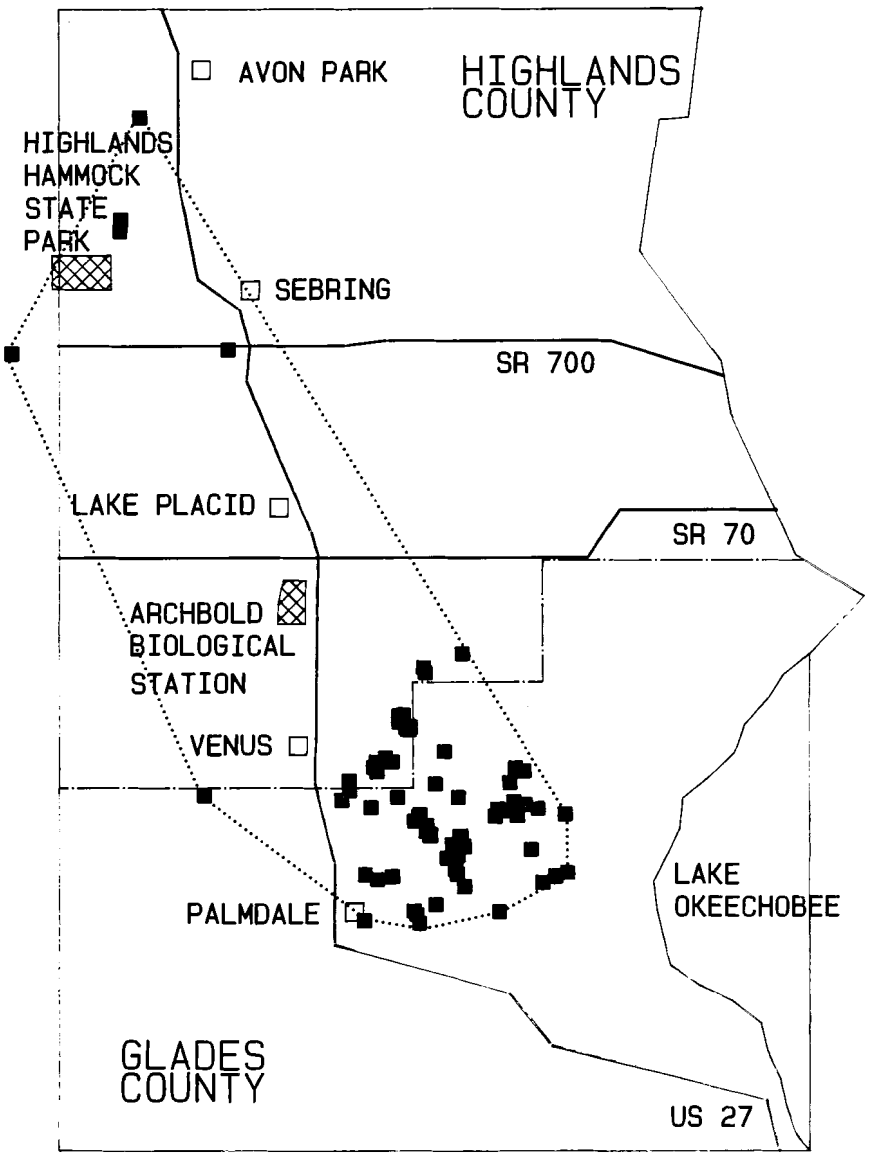

Figure 1. Home range of male panther #24 monitored from 30 January 1988 to 22 August 1988, primarily in Glades and Highlands counties, Florida. Solid squares represent telemetry locations.

Table 1. Habitat use by adult male panther #24 in Highlands and Glades counties, 1988.

Habitat type	Amount available (ha)	% 0f home range	Number of locations	% used
Fresh Water Marsh/ Prairie	24414	21	3	4
Pine Flatwoods	11291	10	28	40*
Pine Scrub	5910	5	1	1
Hardwood Hammock	7242	6	22	31*
Cypress	1292	1	0	0
Mixed Swamp	1802	2	3	4
Thicket Swamp	13990	12	0	0
Bay Tree Forest	572	0.5	13	19*
Agricultural/Disturbed	46844	40	0	0*
Open Water	5266	4	0	0
Total	118234	100	70	-

*Habitat used significantly different than expected.

(SD = 129.9), or 44% the size of #24's home range (Maehr et al. 1991a). His pattern of home range use was similar to the dispersal and home range establishment of 1.5-year-old male panther #29 (Fig. 2), which was monitored since his capture as a 6-month-old kitten on 3 January 1989. Extensive movements to Avon Park may have been the result of dispersal behavior, however, all male dispersals in southwestern Florida (n = 7) were made by panthers < 2 years of age ($\bar{x}$ = 58.7 km, range 22-100 km) (Maehr et al. 1991a). Male #24 also exhibited wide-ranging movements (80 km from north to south) similar to 2-3 year-old male #28. Male #28, however, wandered extensively (>2400 km^2, Maehr 1990b) for about one year through a four county area before establishing a home range of typical size in southern Hendry County (Maehr et al. 1991a).

At least two other factors may explain the relatively large home range of #24. A predominance (65%) of agricultural, urban, and unforested habitat within his home range may have resulted in wider movements to utilize preferred habitat. In addition, most resident carnivores appear to space themselves according to the distribution of resident females (Sandell 1989), and sign searches before and after #24's capture failed to produce any evidence that he shared his home range with other panthers. Sign of an adult female panther at Lake Arbuckle Wildlife Management Area in May 1988 (J. Layne, pers. comm.) was found about 30 km from #24's nearest radio location and suggests that overlap with at least one other panther was possible. His excellent physical appearance suggested that adequate prey were available. All the scats found contained hair and bones from white-tailed deer (*Odocoileus virginianus*) (N = 1) and wild hogs (*Sus scrofa*) (N = 6), the two most important foods of panthers in Collier and Hendry counties (Maehr et al. 1990a).

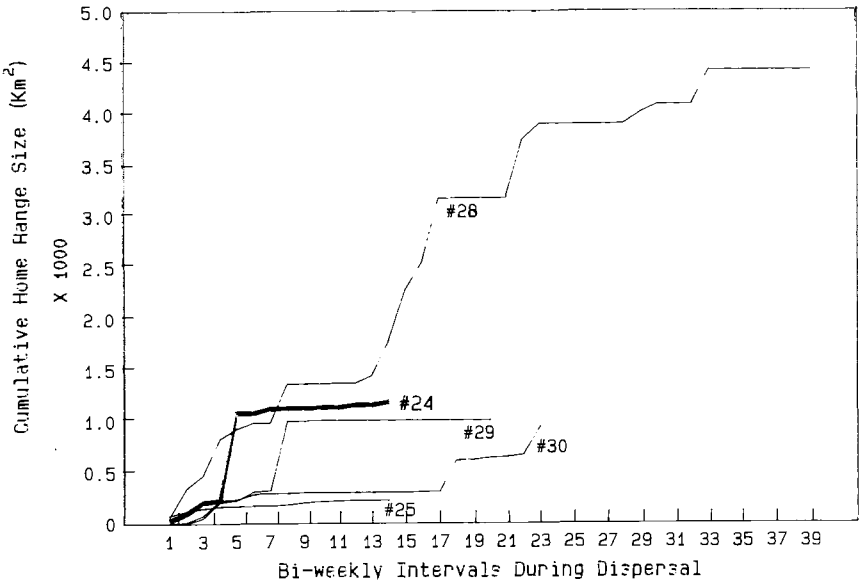

Figure 2. Comparison between cumulative home ranges of male panther #24 and four subadult dispersal-aged male panthers monitored in southwestern Florida.

Given the dense, often unpenetrable nature of scrub vegetation and its apparent use as cover by deer, we were surprised that this habitat was not preferred by #24. However, additional monitoring may have revealed seasonal habitat use shifts that reflected changes in prey distribution (i.e., use by deer and hogs of scrub foods such as acorns and saw palmetto during fall). Nonetheless, as urban and agricultural development have occurred in this part of Florida, scrub habitats have been eliminated and fragmented to a greater extent than other upland forest types (Myers 1990). This accelerated fragmentation has resulted in many, small, isolated tracts of scrub that may receive levels of anthropogenic disturbance that makes them unsuitable for use by panthers.

Given the large, albeit fragmented, amount of forest cover that remains in south central Florida, the proximity of radio-collared panthers, historical records of panthers in this area (Roof and Maehr 1988, Nowak and McBride 1976), and recent verified sign on the Arbuckle Wildlife Management Area (J. Layne, pers. comm.; Frankenberger et al. 1989), the importance of Glades and Highlands counties to the recovery of the Florida panther should be recognized. The potential value of this area as a region allowing for natural expansion of the southern Florida population through natural dispersal (Layne and Wassmer 1988) may be as great as its possible use as a reintroduction site. Expanded landscape conservation measures and increased support for ongoing acquisition and protec-

tion efforts by the State of Florida, the U.S. Fish and Wildlife Service, the Nature Conservancy, and other private and government organizations are needed to maintain south central Florida as panther range.

ACKNOWLEDGMENTS

We appreciate the field assistance of J. Kappes, J. Layne, M. Roelke, and P. "Crashcup" Baranoff. J. Cox helped quantify our habitat data. J. Layne, B. Gruver, T. Logan, D. Wood, T. O'Meara, and V. Heller made helpful comments on an earlier draft. This is a contribution of Federal Aid to Endangered Species Program, Florida Endangered Species Project E-1, and the Florida Nongame Wildlife Trust Fund.

LITERATURE CITED

BELDEN, R. C., W. B. FRANKENBERGER, R. T. MCBRIDE, AND S. T. SCHWIKERT. 1988. Panther habitat use in southern Florida. J. Wildl. Manage. 52:661-663.

DAVIS, J. H., JR. 1943. The natural features of southern Florida. Fla. Geol. Surv. Bull. 25, Tallahassee.

FRANKENBERGER, W. B., R. C. BELDEN, AND J. C. ROOF. 1989. Florida panther distribution. Annu. Performance Rep. Fla. Game and Fresh Water Fish Comm., Tallahassee.

JOHNSON, R. A., AND D. W. WICHERN. 1982. Applied multivariate statistical analysis. Prentice-Hall, Englewood Cliffs.

LAYNE, J. N., AND D. A. WASSMER. 1988. Records of the panther in Highlands County, Florida. Fla. Field Nat. 16:70-72.

MAEHR, D. S. 1990a. The Florida panther and private lands. Conserv. Biol. 4:167-170.

MAEHR, D. S. 1990b. Florida panther movements, social organization, and habitat utilization. Final Rep. Florida Game and Fresh Water Fish Comm., Tallahassee.

MAEHR, D. S., E. D. LAND, J. C. ROOF, AND J. W. MCCOWN. 1989a. Early maternal behavior in the Florida panther (*Felis concolor coryi*). Am. Midl. Nat. 122:34-43.

MAEHR, D. S., J. C. ROOF, E. D. LAND, AND J. W. MCCOWN. 1989b. First reproduction of a panther (*Felis concolor coryi*) in southwestern Florida, USA. Mammalia 25:37-38.

MAEHR, D. S., R. C. BELDEN, E. D. LAND, AND L. WILKINS. 1990a. Food habits of panthers in southwest Florida. J. Wildl. Manage. 54:420-423.

MAEHR, D. S., E. D. LAND, J. C. ROOF, AND J. W. MCCOWN. 1990b. Day beds, natal dens, and activity of Florida panthers. Proc. Annu. Conf. Southeast. Fish Wildl. Agencies 44:310-318.

MAEHR, D. S., E. D. LAND, AND J. C. ROOF. 1991a. Social ecology of Florida panthers. Nat. Geogr. Research and Exploration 7:414-431.

MAEHR, D. S., E. D. LAND, AND M. E. ROELKE. 1991b. Mortality patterns of panthers in southwest Florida. Proc. Annu. Conf. Southeast. Fish Wildl. Agencies 45:201-207.

MAEHR, D. S., AND J. COX. 1992. Florida panther habitat conservation strategy. Final Rep. Fla. Game and Fresh Water Fish Comm., Tallahassee.

MCCOWN, J. W., D. S. MAEHR, AND J. ROBOSKI. 1990. A portable cushion as a wildlife capture aid. Wildl. Soc. Bull. 18:34-36.

MULLER, J. W., E. D. HARDIN, D. R. JACKSON, S. E. GATEWOOD, AND N. CAIRE. 1988. Summary report on the vascular plants, animals and plant communities endemic to Florida. Fla. Game and Fresh Water Fish Comm. Nongame Wildl. Program Tech. rep. No. 7, Tallahassee.

MYERS, R. L. 1990. Scrub and high pine. Pages 150-193 *in* Ecosystems of Florida (R. L. Myers and J. J. Ewel, eds.). Univ. Central Fla. Press, Orlando.

NOWAK, R. M., AND R. T. MCBRIDE. 1974. Status survey of the Florida panther. World Wildl. Fund Yearbook 1973-74:237-242.

ROOF, J. C., AND D. S. MAEHR. 1988. Sign surveys for panthers on peripheral areas of their known range. Fla. Field Nat. 16:81-85.

SAMUEL, M. D., D. J. PIERCE, E. O. GARTON, L. J. NELSON, AND K. R. DIXON. 1985. User's manual for program home range. Forest, Wildl. and Range Exp. Stat. Tech. Rep. 15. Univ. of Idaho, Moscow.

SANDELL, M. 1989. The mating tactics and spacing patterns of solitary carnivores. Pages 164-182 *in* Carnivore behavior, ecology, and evolution (J. L. Gittleman, ed.). Cornell Univ. Press, Ithaca.

SCHORTEMEYER, J. L., D. S. MAEHR, J. W. MCCOWN, E. D. LAND, AND P. D. MANOR. 1991. Prey management for the Florida panther: a unique role for managers. Trans. N. Amer. Wildl. Nat. Resour. Conf. 56:512-526.