A RADIO TELEMETRY STUDY OF FISHERS IN NORTHWESTERN CALIFORNIA

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ABSTRACT.

Our radio telemetry study of fisher (*Martes pennanti*) is being conducted south of Big Bar in Trinity County, California. This report concerns data collected between 15 October 1977 and 15 December 1978. Eight males and three females have been live-trapped, immobilized with ketamine hydrochloride/acepromazine, fitted with radio telemetry collars and released at the capture locations. Signals have been monitored on foot, from vehicles and from aircraft. Additional movement data has come from snow tracking.

The largest recorded home range for fishers with more than five locations was 6.89 sq. mi. (1785 ha) and was that of an adult male. The smallest, 1.39 sq. mi. (360 ha) was from an adult female. We presently can see no close relationship between home range boundries and gross topographical features, although there appear to be regularly used travel routes within the home range. Partial home range overlap have been observed between two males and between a single male and a female. No female home range has been found to overlap that of another female.

Little is known about the biology of the fisher (*Martes pennanti*), in California. Most research on fishers has been conducted in eastern and midwestern North America and relates to the habitats found in those areas. Until recently, most studies concentrated on winter ecology and were based on snow tracking. With the development and refinement of radio telemetry the techniques became available for year round study of fisher ecology.

The history of the fisher in California is similiar to it's history throughout the rest of North America. Accurate estimates of population size are lacking. Censuses were not taken and the only indications of relative abundance are from trapping records or accounts of people living in fisher habitat. Although fishers were "nowhere abundant" they were probably common within suitable habitat (Grinnel et. al., 1937).

During the 1920's and 1930's fisher populations appeared to be declining (Dixon 1925, Hall 1942) (Figure 1). The most commonly cited causes for population decline are overharvesting and habitat destruction. The population in California probably reached a low point in the early 1940's. In 1946 the trapping season was closed and has not been reopened. The population remained low throughout the 1940's and 1950's but showed signs of increase during the 1960's (Yocom and McCollum 1973). Confirmed sightings and numbers of fishers caught in traps set for fox, coyote, bobcat and raccoon have steadily increased to the present (Buck unpublished data).

The increasing number of sightings combined with the increasing demand for timber products within known fisher range pointed up the need for baseline data on fisher populations within California. With this in mind, in June of 1977, the U.S. Forest Service, California Department of Fish and Game and Humboldt State University entered into a Cooperative Agreement to study habitat utilization by fishers within Trinity County, California. The basic objectives were to:

1. Determine seasonal habitat utilization by fishers within the study area.

2. Determine how fishers react to logging and associated road construction.
3. Obtain an estimate of the number of fisher in the population studied.
4. Acquire basic information such as food habits, denning sites and relationships with other carnivores, as it becomes available.
5. Incorporate the above information into management recommendations which can be used by USFS and CDF&G land managers.

This paper summarizes preliminary data collected between 15 November 1977 and 15 December 1978 and presents evidence concerning the home ranges and movements of fishers. Subsequent reports will focus on fisher ranges and movement as they relate to habitat.

STUDY AREA

The 58 sq. mi. (152.6 km^2) study area lies just south of Big Bar within the Trinity National Forest, Trinity County, California. This area met three criteria: it had an adequate population of fishers, timber types of commercial value are present and winter access is possible. We confine our trapping and snow tracking to the study area. If a collared fisher moves outside the study area we enlarge the area to include its range.

Elevations within the study area range from 2,400' (731.6 m) to 6,273' (1912.5 m). At lower elevations, Douglas-fir (*Pseudotsuga menziesii*) predominates on north facing slopes, while southern exposures support a mixed forest of either Douglas-fir/Ponderosa pine (*Pinus ponderosa*), Douglas-fir/Madrone (*Arbutus menziesii*) or Ponderosa pine/Madrone. At elevations above 4,500' (1,371.7 m) on moist north facing slopes a white fir (*Abies concolor*)/Douglas-fir complex is found. On high, xeric southern exposures, extensive areas of montane chaparral occur. Canyon live oak (*Quercus chrysolepis*) and black oak (*Quercus kellogii*) occur on xeric sites at elevations up to 5,000' (1,524 m).

METHODOLOGY/PROCEDURES

Fishers were captured using National-type live traps. Each trap was baited (usually with tuna cat food and strawberry jam), scented with various olfactory attractants, set and checked daily. Captured fishers were immobilized with ketamine hydrochloride/acepromazine, examined, measured and fitted with radio telemetry collars in the 159 MHz range. Captures other than fishers were immediately released. After release, fishers were located by telemetry from vehicles, on foot or from aircraft. Radiolocations were determined by taking a minimum of two bearings and the locations plotted.

Snow tracking was conducted as conditions permitted to record movements and presence in different habitat types.

RESULTS

Trapping:

Between 15 November 1977 and 15 December 1978, 620 trap nights resulted in the initial capture of eight male and three female fishers (1.8% trap success). In addition, two fishers, one male and one female, were recaptured during the same period (total 2.1% trap success) (Table 1). Four males were adults and four were immature. The first female captured was very old, the second was one year old and the last was estimated to be between two and three years old. Weights ranged rrom 3.6 lbs. (1.62 kg) for the very old female to 10.1 lbs (4.5 kg) for the male estimated to be the oldest.

In addition, four grey foxes (*Urocyon cinercoargenteus*), two woodrats (*Neotoma fuscipes*) and one golden-mantled ground squirrel (*Callospermophilis lateralis*) were also captured. All captures occurred in late fall, winter or early spring in traps set within 15 m of ridges, saddles or along streams. None occurred in traps set in other locations. Summer and early fall trapping resulted in no captures of any species and was seriously hampered by black bear (*Ursus americanus*) disturbance of traps.

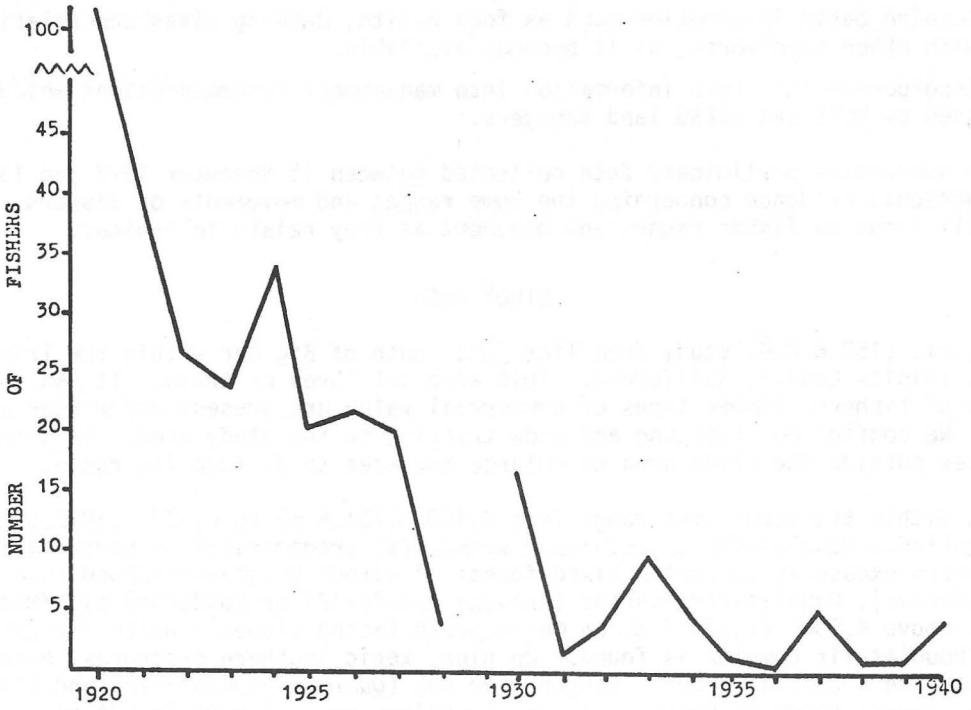

FIGURE 1. Number of fishers reported captured by licensed trappers in California between 1920 and 1940. Data from Dixon, 1925 and Hall, 1942.

TABLE 1. Summary of Fishers Captured Within the Study area November 16, 1977 - December 15, 1978.

No.	Sex	Wt.(lbs.)	Age	Date	Location	Comments
04	F	3.6	AD	11/17/77	Corral Bottom below Pattison Peak	Recaptures 02/01/78 Found dead 02/11/78
05	M	7.5	AD	11/18/77	Upper Haypress Meadows	Recaptured 02/18/78 Found dead 10/07/78
06	F	3.7	IM	11/19/77	West Hayshed Creek	Found dead 02/01/78
27	M	9.0	AD	02/11/78	Haypress Meadows	
08	F	4.8	AD	02/25/78	Upper Big Bar Creek	Slipped off collar late June 1978
09	M	8.1	AD	03/03/78	Upper Big Bar Creek	
10	M	7.3	IM	03/08/78	Bidden Creek	
14	M	10.1	AD	03/17/78	Corral Bottom below Pattison Peak	
11	M	6.4	IM	11/18/78	Hayfork Bally	
13	M	6.6	IM	11/24/78	Upper Big Bar Creek	
02	M	7.0	IM	11/29/78	Upper Haypress Meadows	Deformed jaw

One trapsite produced an adult male and adult female during the winter of 1977-1978 and an immature male this year (1978-1979). Two other trapsites have produced two captures apiece. At one trapsite an initial capture and a recapture of two adult male fishers occurred within a 24 hour period. An adult male and an adult female were captured at the other trapsite. This indicates at least a partial range overlap for male fishers and for male and female fishers. We as yet have no information showing overlap of female home ranges.

Home Ranges:

Home ranges were determined by the convex polygon method. Ranges were calcualted for all fishers that had at least four locations for which we had good triangulations. These data are summarized in Table 2.

TABLE 2. Summary of Telemetry Data on Collared Fishers November 15, 1977 - September 15, 1978.

Fisher Number	Sex/Age	Time Period	Number of Locations Specific	Number of Locations General	Estimated Home Range (Sq. Mi.)
04	F - AD.	19 November 1977 - 08 February 1978	8		2.64 (684 ha)
05	M - AD.	19 November 1977- 15 September 1978	47	9	5.32 (1378 ha)
27	M - AD.	11 February 1978 - 15 September 1978	51	1	4.03 (1044 ha)
08	F - AD.	25 February 1978 - 12 July 1978	12	2	1.39 (360 ha)
09	M - AD.	03 March 1978 - 15 September 1978	43	5	6.89 (1785 ha)
14	M - AD.	17 March 1978 - 15 September 1978	4	1	0.61 (158 ha)

Specific Location - Result of two or more bearings.
General Location - Only one bearing possible under existing field conditions.

$\bar{X}$ = 3.48 (902 ha)

Range size varied from 6.89 sq. mi. (1785 ha) (Fisher No. 9, an adult male) to 0.61 sq. mi. (158 ha) (Fisher No. 14 also an adult male). Ranges for both females with sufficient data are considerably smaller than most ranges of males. This is in agreement with the literature. However, since we have obtained fewer locations over a shorter period of time for females than for (the) males the results may under-estimate the size of female home ranges. With a low number of locations home range size is roughly proportional to the number of locations. A larger number of locations may have shown them to have larger home ranges. In particular, male fisher No. 14 mentioned above was expected to have a much larger home range, and recent data confirm this.

Caution should be taken in interpretation of the data. The majority of locations come from fishers tracked during summer. Only one fisher (No. 5) was monitored continually through the winter of 1977-1978. Ranges may increase during winter when environmental conditions become more extreme and food is not as abundant. Although fisher No. 9, tracked only in the summer, has a larger home range than fisher No. 5, it is possible that winter data would have shown the range of No. 9 to be even larger.

The home ranges of five fishers are plotted in Figure 2. Two instances of apparant home range overlap occur, one between an adult male (No. 9) and an adult female (No. 8) and another between two adult males (Nos. 27 and 5). The diagrammed overlap between fishers 27 and 5 may be misleading. Nine radio locations, four for No. 27 and five for No. 5, and two captures define the area of overlap. This represents only ten percent of the total locations obtained for both fishers. The majority of these overlap locations occur along a narrow band which may be interpreted as the region where the two ranges abut. The three locations which are greater than one mile within each others range occurred during the breeding season, indicating greater movement during this short time of the year.

The overlap between fishers 8 and 9 is also from nine locations. Both fishers were captured at the same trapsite. From her release on 25 February 1978 until we discovered that she had slipped off her collar, on July 1978, No. 8 was located 12 times. Half of these locations are within the range boundries of male fisher No. 9. Although no telemetry locations from No. 9 were obtained within the range boundries of No. 8 we have located a den utilized by No. 9 approximately one-half mile south of the range of No. 8. These data suggest substantial overlap, at least for the short period under study. As stated earlier we, as yet, have no evidence for overlap of female home ranges.

Our results from four males and two females show no close relationship between home range and gross topographical features. Fishers do not seem to confine their range to a single major ridge or drainage. Instead, each range encompassed at least one major ridge as well as major and minor drainages. This pattern is especially noticeable on those fishers where numerous locations were recorded.

Movement:

The maximum distance between locations was 6.75 linear miles (10.8 km) (No. 14) and the maximum linear distance between radio locations within a 24 hour period was 1.75 linear miles (2.8 km) (No. 27).

Fisher movements have shown no obvious seasonal shift in elevation. Recorded elevations range from 1,550' (472.5 m) to 4,450' (1,356.3 m). Both males and females move up and down the mountains within their home range on a daily basis in all seasons. The same ranges and travel routes appear to be used regardless of season.

As least one fisher (No. 27) shows a circuital movement pattern. Approximately 80% of all locations were from regularly used drainages and ridges along a linear circuit of approximately 6.25 miles (10.06 km). This fisher was tracked on several occasions as he moved over part of the circuit and was observed on separate occasions to travel in both a clockwise and counterclockwise direction.

Movement by males outside of the regular home range during the breeding season was mentioned previously. Fisher No. 14, the oldest male, shows this well. He was captured on 17 March, 1978. After his release he moved out of the study area a linear distance of 6.75 linear miles (10.8 km) where he was next located on 27 July. Subsequent locations show that the nearest border of his normal home range is 4.0 mi. (6.44 km) west of his capture location. He shows no indication of moving back into the main study area during the non-breeding season.

Dens:

Three fisher dens have been located. The first was underground at the base of an old Douglas-fir snag. The two others were associated with downed logs of about 30 to 40 in. (75-100 cm) diameter. One of those dens was in a hollow root approximately five feet (1.5 m) from an entrance hole through another root on the opposite side of the log. The third den was under layered bark lying beside a large felled tree. Crisscrossed pole size logs lay close by the felled tree. A fourth probable den was located below an old pile of medium to large yarded logs. The actual location of the fisher within the pile could not be determined.

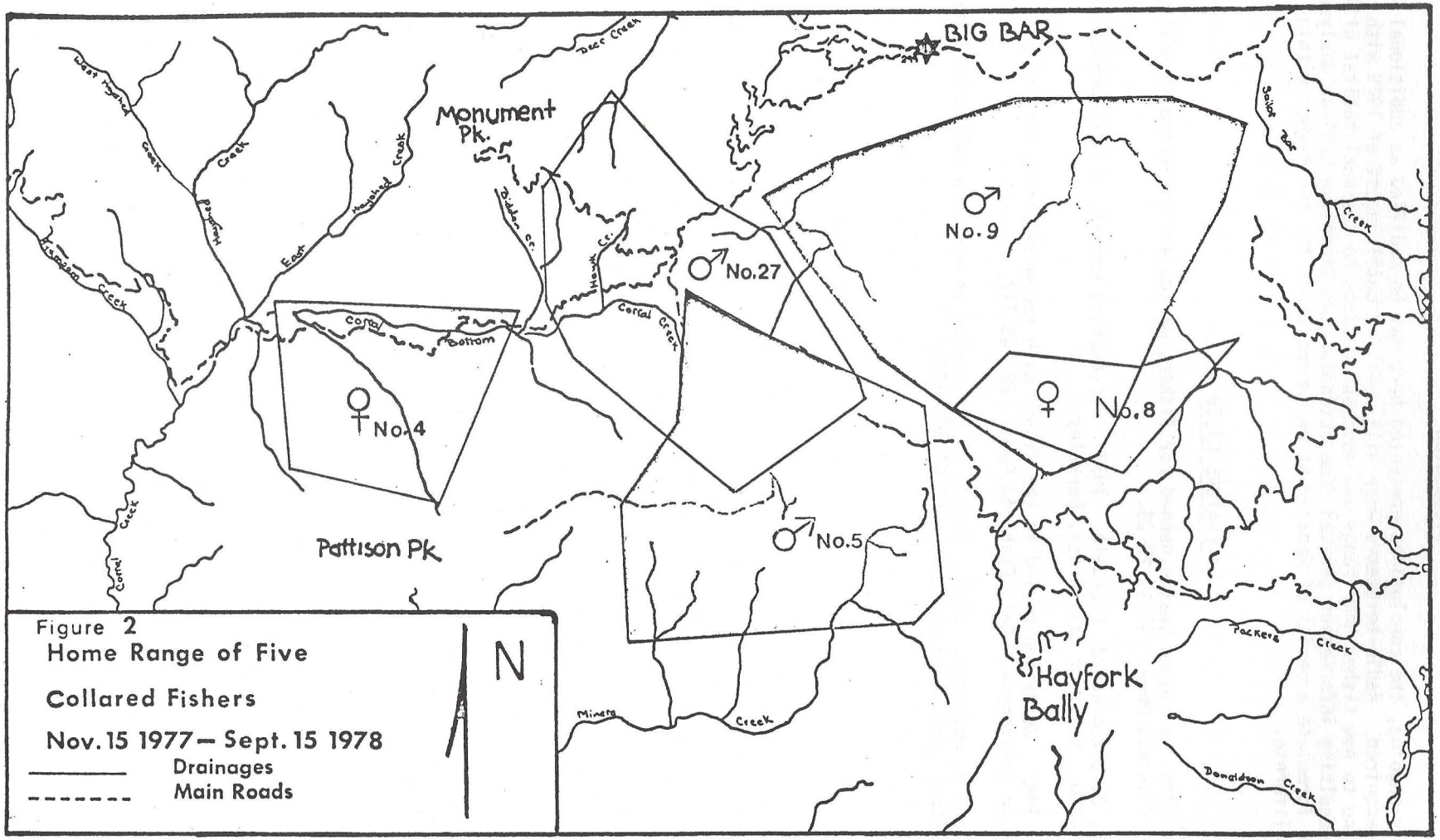

FIGURE 2. Home Range of Five Collared Fishers November 15, 1977 - September 15, 1978.

DISCUSSION

As field work is ongoing, the conclusions presented here may be modified as additional information is acquired. Radio-telemetry work will continue until August of 1979 with emphasis shifting to how fisher home range and movement relates to seasonal habitat utilization. The resulting information derived from extensive and intensive habitat analyses will be used to formulate a series of management recommendations for the fisher within northwestern California.

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