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Historical Harvest and Incidental Capture of Fishers in California

Abstract

Recent petitions to list the fisher (*Martes pennanti*) under the Endangered Species Act have brought attention to fisher conservation. Although commercial trapping of fishers in California ended in 1946, summarizing the commercial harvest data can provide a historical perspective to fisher conservation and may indicate the prevalence of incidental fisher captures in traps set for other species. We investigated the relationships between historical fisher harvests and the price paid for fisher pelts, number of trapping licenses sold, cost of a trapping license, total number of 5 sympatric species harvested, and their pelt prices in California. The frequency of incidental captures was also assessed by interviewing trappers, biologists, and wardens in California. Between 1919-1946, relatively few fishers were legally trapped in California ($n = 462$, $\bar{x} = 18.5$ annually), and their harvest declined steadily. Fisher harvests were positively related to fisher pelt price but were more strongly related to the number of trapping licenses sold, indicating that fishers were vulnerable to trappers in general as opposed to only those trappers specifically targeting them. We estimated an incidental capture rate of 1 per 407 set-nights and a mortality-injury rate of 24% from data obtained from 5 trappers in California. Trappers are an important source of information on the distribution of fishers and their cooperation is necessary to determine the effects of incidental capture on fisher populations.

Introduction

Fishers (*Martes pennanti*) were legally trapped in California until the season was closed in 1946. The number of fishers harvested in California from 1919 to 1946 declined steadily (Seymour 1980) and several authorities voiced concern that trapping was threatening populations of fishers, martens (*Martes americana*) and wolverines (*Gulo gulo*) (Dixon 1925, Grinnell et al. 1937, Hall 1942). It was asserted that fishers were captured predominantly by a small number of trappers and hunters specifically seeking, and proficient at capturing, fishers (i.e., fisher specialists; see Grinnell et al. 1937:229). Specialists were held largely responsible for the decline in the fisher population reflected in the harvest. While fishers were legally trapped in California, their pelts were the most valuable among furbearers (highest mean price per pelt; Calif. Dept. of Fish and Game, Sacramento, unpubl. data), thus rewarding their specific pursuit. Nonetheless, the capture of fishers by trappers seeking other furbearers was not uncommon (e.g., Hamilton and Cook 1955, Benson 1959, Coulter 1960, Balser and Longley 1966, Weckworth and Wright 1968, Yocum and McCollum 1973, Cottrell 1978, Pack and Cromer 1981, Strickland and Douglas 1984, Aubry and Houston 1992, Marshall 1992, Cole and Proulx 1994), and it is likely that incidental captures contributed to the legal harvest of fishers in California. In fact, when the closure of the fisher season was being considered in California, Hall (1942) related (but did not agree with) the common opinion at the time that closing the season would have little effect because fishers were so frequently taken in sets for other species.

In the 1994-1995 season, 313 trapping licenses were sold in California; many of which were used to pursue terrestrial carnivore species that often are sympatric with fishers. Although fishers cannot be legally targeted in California, they are considered one of the easiest animals to capture (Coulter 1960, Young 1975, Powell 1993). But, because they are not legal quarry their capture and condition at release are rarely reported. Moreover, fishers frequently receive serious injuries in leg-hold traps (Cole and Proulx 1994) and even low rates of additive mortality from trapping have been predicted to affect fisher population stability (Powell 1979). Fisher conservation may be hindered by the lack of information on the amount and effects of incidental capture.

Fishers are absent from significant portions of their range in California (Zielinski et al. 1995) and the western U. S. (Gibilisco 1994, Powell and Zielinski 1994), and have twice been petitioned for listing under the Endangered Species Act in the western U. S. (Central Sierra Audubon Society 1990, Biodiversity Legal Foundation

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1994). It is currently listed as a Species of Special Concern by the State of California.

Here we summarize the historical fisher harvest data in California to attempt to understand the relative rates and importance of incidental harvest of fishers by generalist trappers versus captures by fisher specialists. We examine the effects of the price paid for pelts (for fishers and other sympatric furbearing species), number of licenses sold, and cost of a license on the number of fishers harvested. We also estimate the current rate of incidental capture by conducting interviews with trappers and summarizing recent data from the literature.

Methods

We defined incidental captures as those captures that occur in sets made specifically for species other than fishers; illegal captures were not included among incidental captures. Generalist trappers were defined as those who were not specifically seeking fishers, but who may have captured them incidentally while targeting other furbearers.

Historical Fisher Harvest

Data on annual harvest, pelt price, and licenses (number sold and purchase price) were obtained from California Department of Fish and Game (CDFG) and Grinnell et al. (1937) for commercial trapping seasons between 1919 and 1946 in California, excluding data from the 1928-1929 and 1929-1930 seasons which were unavailable; resulting in 25 years of fisher harvest data. The cost of a trapping license was $1.00 from 1917 to 1946. A consumer price index (U. S. Department of Labor, Bureau of Labor Statistics) was used to adjust the price of pelts and licenses for inflation to a 1982-1984 baseline. Analyses were conducted using adjusted license and pelt prices only.

We assessed relationships between the number of fishers harvested and the price of fisher pelts, number of licenses sold, number of sympatric species harvested, and the price of sympatric species' pelts using linear and multiple regression. Limited data precluded the use of extensive multiple regressions (Johnson 1981). Sympatric species included coyotes (*Canis latrans*), bobcats (*Felis rufus*), raccoons (*Procyon lotor*), gray foxes (*Urocyon cinereoargenteus*), and ringtails (*Bassariscus astutus*), collectively referred to as CBRGRs. CBRGRs are considered sympatric with fishers where fishers occur, but they also occur in areas of California outside of the range of the fisher (Ingles 1965). CBRGRs were probably the most sought after terrestrial furbearers because of their pelt prices and relative abundances. The total number of sympatric species harvested was combined annually. The mean prices of pelts for each sympatric species were averaged to create a grand mean price of pelts of CBRGRs. We also assessed the relationships between annual sales of licenses, the price of licenses, and the price of pelts of CBRGRs; and between the number of CBRGRs harvested, the number of licenses sold, and the price of pelts of CBRGRs. Due to their ease of capture we suspected that both the commercial (when fisher trapping was legal) and incidental (past and present) capture of fishers would increase with effort expended toward the capture of CBRGRs (the generalist contribution to the number of fishers captured). Analyses were limited because data for the number of fishers harvested and the number of licenses sold were available only for the State as a whole, not for individual counties or regions, and records of take by individual trappers were unavailable.

Incidental Capture of Fishers

Selected California trappers, and CDFG wardens and biologists were interviewed to estimate the rate of incidental capture of fishers. Five trappers were interviewed about their trapping effort, and the number and condition of fishers captured. "Set-nights" were used as a measure of effort and equaled the number of sets (specific locations where usually 1 or 2 traps were set) multiplied by the number of nights when traps were set. The number of incidental captures of fishers was then divided by the number of set-nights to estimate the incidental capture rate. We also reviewed literature on fisher management to characterize the frequency and relative importance of incidental captures of fishers by commercial trappers in the U. S. and Canada.

Results

Historical Harvest Analysis

Number of Fishers Harvested and Price Paid for Pelts. A total of 462 fishers were harvested in California from 1919 to 1946 (annual $\bar{x}$ = 18.5,

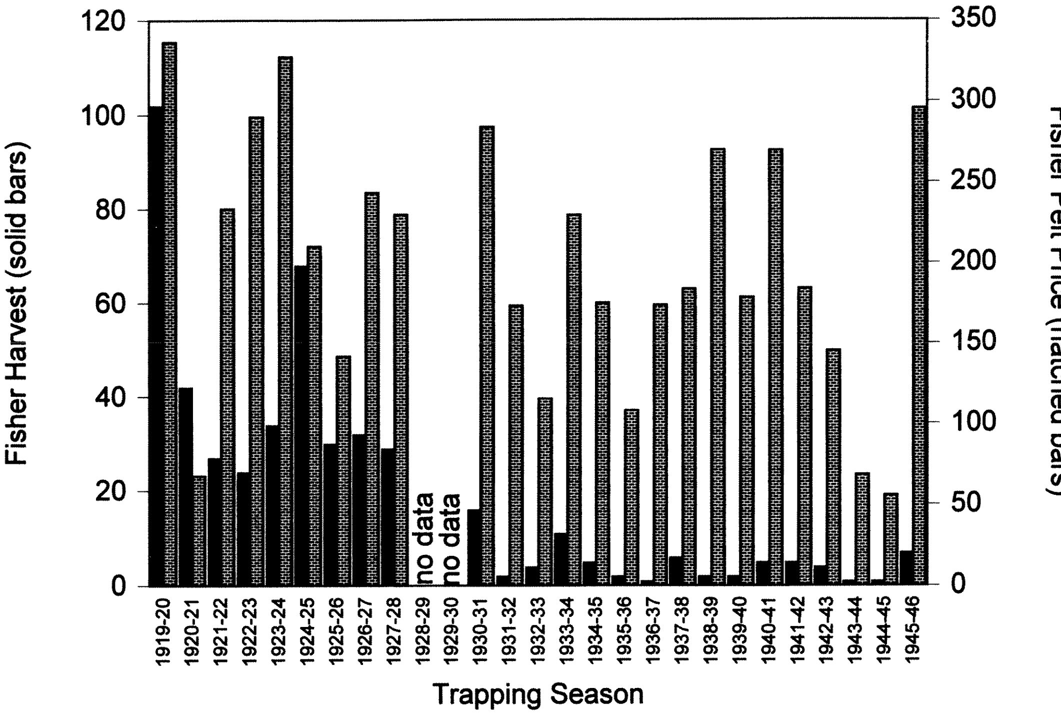

Figure 1. Number of fisher pelts harvested and the mean price paid (adjusted for inflation) for fisher pelts in California, 1919-1946.

SE = 4.8, range = 1-102). Harvest declined steadily, but pelt price varied considerably during this period (Figure 1). The number of fishers harvested was related to the price paid for fisher pelts (r^2 = 0.16, P = 0.049).

Number of Fishers Harvested and Number of Licenses Sold. The number of fishers harvested was most strongly related to the number of licenses sold (r^2 = 0.50, P < 0.001). In a multiple regression analysis, the number of fishers harvested was significantly related to the number of licenses sold (F = 4.12, P < 0.001) but was unrelated to the price paid for fisher pelts (F = 1.05, P = 0.303). The number of licenses sold was most strongly related to the mean price paid for CBRGR pelts (r^2 = 0.39, P < 0.001) and was negatively related to the cost of a license (r^2 = 0.21, P = 0.021). When adjusted for inflation, the price of a license ranged from $5.00 to $7.69 during the period when fisher trapping was legal.

Number of Fishers Harvested, Number of CBRGRs Harvested and Price Paid for CBRGR Pelts. The number of fishers harvested was positively related to the price paid for CBRGR pelts (r^2 = 0.29, P = 0.005), but not to the number of CBRGRs harvested (r^2 = 0.07, P = 0.197). The number of CBRGRs harvested was most strongly related to the price paid for CBRGR pelts (r^2 = 0.25, P < 0.001) and to the number of licenses sold (r^2 = 0.36, P = 0.002).

Incidental Capture of Fishers

Interviews with California trappers indicated that they captured fishers while trapping for bobcats, gray foxes, coyotes, and raccoons. Interviewed trappers reported 72 incidental fisher captures over 50,908 set-nights (Table 1). The incidence of injury or mortality was as high as 75% (Table 1). Several trappers, and CDFG biologists and wardens provided information concerning fisher poaching, and the illegal sale of fisher pelts out of state.

Discussion

The decline in the number of fishers harvested from 1919 to 1946 in California has been attributed to overharvesting by fisher specialists (Dixon

TABLE 1. Set nights and incidental fisher captures of trappers from Northern California[a].

Trapper	Set-nights	Time Period	Captures (set-nights/ capture)	Mortalities and injuries	Mortality and injury rate[b]
1	41,600	13 seasons	7 (5943)	1	0.143
2	5,000	4 seasons	20 (250)	15	0.750
3	2,700	2 seasons	27 (100)	1	0.037
4	600	1 season	16 (38)	0	0.000
5	1,008	1 season	2 (504)	0	0.000
Total	50,908	21 seasons	72 (407)	17	0.236

[a] Trapping occurred in Trinity, Shasta, Humboldt, and Mendocino Counties.

[b] Number injured and dead/number incidentally captured.

1925, Grinnell et al. 1937, Hall 1942). The susceptibility of fishers to incidental capture, however, suggests that fisher populations are also vulnerable to trappers seeking other furbearers. Although the number of fishers harvested and the price paid for their pelts were related, the number of licenses sold, not pelt price, explained a significant amount of variation when the pelt price and annual license sales were included in the same multiple regression model. While this conclusion differs from the relationship between fisher pelt price and number of fishers harvested in Canada from the period 1948-1977 (Powell 1993), it is consistent with the lack of relationship between pelt price and number harvested in Canada for the period 1920-1942 (Rand 1944).

For many furbearing species the number of pelts that are harvested frequently correlates positively with the market price of the pelt (e.g., Erickson 1980, Obbard et al. 1987). However, generalist trappers seek to maximize the opportunity of capturing any of the commercial species and their efforts, reflected by the number of licenses sold and mean price of pelts of CBRGRs, can also affect the capture of fishers. If the number of licenses sold measures overall trapping effort for terrestrial carnivores, it would appear that the number of legally trapped fishers in California was affected more by generalist trapping effort than by the price paid for fisher pelts. Consequently the decline in the number of fishers harvested during the period 1919-1946 reflects either a decline in the number of fishers or the decline in the number of licensed trappers (CDFG, unpubl. data). Overtrapping by specialists (Grinnell et al. 1937) may have played some role in the decline but our analysis suggests that harvest by trappers who were not specifically seeking fishers was another important factor.

The number of licenses sold serves as an index of effort to capture terrestrial furbearers and therefore reflects the opportunity to capture fishers. Why then was the number of fishers harvested not significantly related to the number of CBRGRs harvested, but only to the number of licenses sold and the price paid for CBRGR pelts? This is best explained by dividing the fisher harvest into 2 parts: the portion taken by fisher specialists who were motivated by fisher pelt price, and the portion taken incidentally by generalist trappers who were motivated to capture CBRGRs. A proportionately larger harvest by fisher specialists would be expected to result in a strong relationship between fisher pelt price and fisher harvest, however we found a weak relationship at best. A proportionately larger harvest by generalist trappers would be expected to result in a strong relationship between CBRGR harvest and fisher harvest, but this was not observed. Therefore, the total harvest probably consists of a balance between the specialist and incidental portions. Consequently, the number of trappers (both generalists and specialists), as reflected in the number of licenses sold, best explains the number of fishers harvested.

The threat of incidental capture has been an important consideration in the management of fishers in the Pacific States and elsewhere. Oregon prohibited trapping in large areas surrounding fisher reintroduction sites to avoid accidental capture (Kebbe 1961, Berg 1982; see also Marshall 1992), and in Washington, incidentally trapped animals accounted for much of the historical and recent information on its distribution (Dalquest 1948, Aubry and Houston 1992). A recent decline in the fisher population in British Columbia precipitated the closure of the fisher season in 1991-92, but trappers were allowed to retain 2 fishers in the 1991-92 trapping season because incidental captures were considered unavoidable (British Columbia Ministry of the Environment, Lands, and Parks, unpubl. data). A recent plan to assess the effects of forest practices on species associated with old-growth in the Pacific Northwest (Thomas et al. 1993) suggested that restricting marten trapping in areas where fishers were suspected to occur would mitigate the effects of habitat loss on the latter by reducing mortality from incidental capture.

The consequences of incidental capture of fishers have also been documented outside the Pacific States and British Columbia. Using data collected during a year when the fisher season was closed in New York, Parsons (1980) estimated that incidental fisher captures amounted to 30% of the annual harvest when the fisher season was open. Data from New York and Maine strongly suggested that most trappers caught fishers while seeking bobcats, foxes, beavers (*Castor canadensis*), or coyotes (Hamilton and Cook 1955, Coulter 1960, 1966). Clark (1986) stated that in Maine "fisher are captured in all types of land traps; therefore any individual who sets a land trap can be classified as a potential fisher trapper." In Minnesota and Wisconsin, the recovery of protected populations of fishers was indicated by the increasing number of animals accidentally captured in traps set for other species (Irvine et al. 1964, Balser and Longley 1966). In New Brunswick, a short open season was authorized in 1963 because trappers complained that they "could not keep fishers and martens out of their traps" (Dilworth 1974). Over a 9 year period following the fisher reintroductions in Nova Scotia, 32 fishers were accidentally trapped in sets for other animals (Dodds and Martell 1971). During a 5-year period when fishers were protected in Idaho, Luque (1983) estimated that at least 163 were inadvertently trapped in sets for coyotes, bobcats, and martens. And, in the 6 years following a reintroduction of fishers in Montana, 7 were submitted to authorities after being taken in traps set for mink (*Mustela vison*), wolverines, bobcats, and lynx (*Lynx lynx*) (Weckwerth and Wright 1968). Incidental captures reported among studies may be only a fraction of the number of fishers actually taken, as trappers may be reluctant to report the capture and condition of a protected animal.

If fishers that are unintentionally captured were always released unharmed the frequency of incidental captures would be of little concern. However, as evidenced by our sample of California trappers (Table 1), this is not always the case. It is unlikely that a trapper can assess the extent of an animal's injuries in the process of releasing it from a trap, especially internal injuries. Therefore we consider the reported mortality/injury rates (Table 1) as minimum estimates. Captured fishers are recovered dead in traps, are killed by other animals while trapbound, and will injure themselves in an effort to escape (Strickland and Douglas 1984). Fourteen of the 163 fishers estimated to be incidentally captured in Idaho were dead in traps, but many more were probably discarded (Luque 1983). Coulter (1966) reported that in 1950, 23 (of 139) fishers captured were lost when they "broke legs in the traps and escaped" and that the ratio of injured animals was about 1 out of 5. In a recent review Cole and Proulx (1994) found that 18.5% of 762 fishers trapped with leg-hold traps had trap-related injuries (broken bones, swelling and hemorrhage, or self-mutilation). In addition, fishers are considered formidable when trapbound and struggle persistently (Coulter 1960), and injuries or death can result from poorly managed or unsuccessful releases. One of the trappers we interviewed caught 20 fishers and was able to release 5 of these unharmed; 14 of the other 15 were injured and another was killed by coyotes. This trapper explained that fishers were difficult to release and that the injuries he observed may have resulted from his use of larger traps (sizes 2 and 3). The subsequent survival of incidentally captured and released fishers (assumed to be 50% by Douglas and Strickland 1987) may negatively affect existing populations or prevent the recovery or establishment of others. Powell (1979) predicted that the removal of as few as one to four fishers per 100 km^2 via trapping would result in a decline of a midwest population. The magnitude of the effect of additive mortality would depend on the sex and age of the captured individuals (Krohn et al. 1994), and may be greater in western populations since they have not demonstrated the rapid population recovery after protection that has been observed in eastern populations (Powell and Zielinski 1994).

The number of trapping licenses sold today in California is relatively small by historical standards and trapping licenses are not inexpensive ($64.25 in 1995-1996). Thus, at first glance it might seem that the effect of trapping on a rare carnivore, like the fisher, would be relatively minor. Moreover, because the use of padded leg-hold traps was implemented recently in California, injuries to non-target species are probably fewer. Although the population of trappers may be on the decline and traps are less likely to injure captured animals, the potential effects of legal trapping of other species on protected fisher populations should not be ignored, especially when considered in conjunction with habitat loss (Powell and Zielinski 1994) and other sources of mortality (e.g., roadkills). The increased number of licenses sold in the late 1970's and early 1980's in response to higher fur prices (>3000 licenses sold from 1979-1983; CDFG, unpubl. data) may have increased incidental fisher captures in the recent past. As compared to when fishers were legally harvested, trappers now have greater access to remote areas (see Hodgman et al. 1994) and they can trap much larger areas. Although traps are required to be checked daily in California, the number of traps that can be run by an individual is unlimited. Further, we have no idea how many incidental captures are too few to affect populations.

Given that incidental capture was a component of the historical commercial harvest and still occurs today, CDFG should seek trapper cooperation in monitoring incidental take. Trapping regulations should require the reporting of (and providing specific information about) incidental captures of fishers and other protected carnivores, and trappers should be compensated for this information. For example, photographic documentation of a capture could be required to receive a nominal reward. Alternatively, wardens and biologists could randomly accompany trappers as they check their lines. This could also apply to the capture of other uncommon and rare forest carnivores including martens, wolverines, and Sierra Nevada red foxes (*Vulpes vulpes necator*). Incidental capture reports should include the date, location of capture, estimated sex and age, verified identity (via photograph), and condition upon release. This information will contribute to a growing database of location information to describe present distributions of rare carnivores. Considered alone, the 72 records of fisher captures by the small sample of trappers we interviewed would make a significant contribution to our knowledge of fisher distribution in California. A reliable index of incidental capture would also make it possible for managers and researchers to determine the effects of incidental captures on populations of fishers and other uncommon forest carnivores.

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