

American marten (*Martes americana*) ecology and conservation

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DESCRIPTION

The American marten (*Martes americana*) is a carnivorous mammal about the size of a small house cat. Its total length is between 500 and 680 mm and it weighs 500 - 1400 g as a adult, depending on sex and geography (Buskirk and McDonald 1989). The male is 20-40% larger than the female. Both sexes are furred with glossy hair of medium length, tan to chocolate in color, and have an irregular throat patch ranging from pale cream to bright amber. Its face is fox-like in shape, its torso is slender, and its legs and tail are intermediate in length and darkly furred (Strickland et al. 1982). Of the two subspecies that occur in California, the Humboldt marten (*M. a. humboldtensis*) is reported to be darker, of richer golden tone, to have less orange and yellow in the throat patch, a smaller skull, and smaller and less crowded premolars and molars than the Sierra subspecies (*M. a. sierra*) (Grinnell and Dixon 1926).

TAXONOMY

This is one of seven species in the genus *Martes*, within Family Mustelidae, Order Carnivora (Corbet and Hill 1986). Along with the Eurasian pine marten (*M. martes*), the sable (*M. zibellina*), and the Japanese marten (*M. melampus*), it belongs to a group of closely related and ecologically similar species called the "boreal forest martens" (Buskirk 1992). The only other *Martes* in North America is the much larger-bodied fisher (*M. pennanti*). A number of

subspecies have been named (Hagmeier 1958) and the two that occur in California (*M. a. humboldtensis* and *M. a. sierrae*) are recognized in the most recent reviews of marten taxonomy (Hall 1981, Clark et al. 1987).

RANGE

The American marten is broadly distributed. It extends from the spruce-fir forests of northern New Mexico to the northern limit of trees in arctic Alaska and Canada, and from the southern Sierra Nevada of California to Newfoundland Island (Hall 1981). In Canada and Alaska, its distribution is vast and continuous, but in the western contiguous United States, its distribution is peninsular and fragmented. In California, martens were historically distributed throughout the Sierra Nevada, the California Cascades, and the Coast Ranges from the Oregon border south to Sonoma County. Recent summaries of track plate and camera surveys (Kucera et al. 1995, Zielinski et al. 1977) report that martens continue to be distributed throughout the Sierra Nevada and Cascades but are absent from the historic range of the Humboldt subspecies in northwestern California.

REPRODUCTIVE BIOLOGY

Most females first mate at 15 months of age and produce their first litters at 24 months (Strickland et al. 1982). Even yearling females, up to 78% in some studies (Thompson and Colgan 1987), can fail to produce ova. Females

<2 years also may not ovulate, with pregnancy rates as low as 50% in years of environmental stress (Thompson and Colgan 1987). Among 136 litters reviewed by Strickland and Douglas (1987), the mean size was 2.85, and the range 1-5. There is some evidence of age-dependent litter size, with a peak at about 6 years, and senescence at >12 years (Mead 1994). A maximum of one litter is produced per year.

DEMOGRAPHY

The age structure of wild populations depends heavily on whether the population is trapped, and most data come from trapped populations. Hodgman et al. (1977) found higher adult survival for males than for females, and considered winter to be the limiting season in terms of survival. They reported annual survival rates for adult (>1yr) males of 0.87 and for females of 0.53. Sex structure likewise is difficult to infer from trapping data, because of its inherent sampling biases. Males are more likely than females to be taken by trapping (Buskirk and Lindstedt 1989), so that trapped samples show a higher proportion of males than does the population. Powell (1994) predicted that even sex ratios would be the general case for untrapped populations, but the higher survival rates for males shown by Hodgman et al. (1997) seem to contradict that prediction.

HOME RANGE

Marten home ranges are large by mammalian standards. Averaging all study site means reviewed by Buskirk and McDonald (1989), home ranges of American martens are 3-4 times larger than predicted for a 1-kg terrestrial carnivore, and about 30 times that predicted for a herbivorous mammal of that size. Home range size of martens has been shown to vary as a function of prey abundance ((Thompson and Colgan 1987) and habitat type (Soutiere 1979; Thompson and Colgan 1987). Soutiere found home range sizes about 63% larger in clearcut forests than in selectively cut and uncut forest in Maine. Thompson and Colgan reported even more striking differences from Ontario, with home ranges in clearcut areas 1.5 - 3.1 times the size of those in uncut areas.

In the Sierra Nevada of California, marten home ranges have been reported to vary from 1.7 - 7.33 km² for males and from 0.7 - 5.8 km² for females (Simon 1980; Spencer 1981; Marten 1987; Zielinski et al. 1997).

DISPERSAL

Reports of long-distance movements, likely representing dispersal, are largely anecdotal. Archibald and Jessup (1984) reported two, periods of dispersal, one from about mid-July to mid-September, and the other over winter. However, the timing of dispersal has not been consistent among studies and occurs from early August through mid-winter (Slough 1989). Clark and Campbell (1976) reported a period of home range shifting during late winter and spring.

SURVIVORSHIP

Longevity statistics depend heavily on whether the population is captive, wild and trapped, or wild and untrapped (Strickland and Douglas 1987). Captive martens as old as 15 years and a marten 14.5 years of age from a trapped wild population have been reported (Strickland and Douglas 1987). However, these figures say little about the life expectancy of newborn martens in the wild. Hodgman et al. (1994) reported that over 90% of mortality in a trapped area was the result of trapping, and Hodgman et al. (1997) reported that in an untrapped population, annual survival rates for adult males averaged 0.87 (95% CI = 0.75 - 1.00), and for adult females 0.53 (95% CI = 0.34 - 0.83).

FOOD HABITS AND PREDATOR-PREY RELATIONSHIPS

Martens kill vertebrates smaller and larger than themselves, eat carrion, and forage for bird eggs, insects, and fruits (Martin 1994). They are especially fond of human foods but seldom are implicated in depredation on domestic animals or plants (Buskirk 1994). Martens forage by walking along the ground or snow surface, investigating possible feeding sites by sight and smell. In winter they forage on the snow surface, with forays up trees, or into subnivean space (Spencer and Zielinski 1983; Zielinski et al. 1983).

Diets in summer include a wide range of food types, including mammals, birds and their eggs, fish, insects, and carrion. The importance of soft mast, especially the berries of *Vaccinium* and *Rubus*, peaks in autumn and declines over winter. As snow covers the ground and deepens, martens turn to mostly mammalian prey, which dominate the winter diet. The most important genera at this time are *Clethrionomys*, *Microtus*, *Spermophilus*, *Tamiasciurus*, and *Lepus* (Martin 1994).

CONSERVATION STATUS

Neither the American marten nor any of its local populations are protected under the Endangered Species Act. In most state and provincial jurisdictions in western North America where it occurs, the American marten is managed as a furbearer. In six western state jurisdictions (California, Colorado, Nevada, New Mexico, South Dakota, and Utah) martens may not be legally taken in any area at any time.

California classifies the marten as a furbearer, but has had no open season since 1946 in the northwestern counties, and since 1954 throughout the rest of the state. The marten is considered a "Species of Special Concern" by the State of California and a "Sensitive" species by the U.S. Forest Service. The Humboldt subspecies has been absent from most recent surveys and incidental sightings have been uncommon over the last 50 years, causing some to suspect that it had become extirpated or occurred only at very low densities (Zielinski and Golightly 1996). However, tracks and a photograph of a marten were collected in 1996 at a station within the historic range limit of the Humboldt subspecies (W. Zielinski pers. obs.) causing renewed interest in actions to determine its distribution and to protect its habitat in northwestern California.

HABITAT REQUIREMENTS

American martens associate closely with forested habitats with complex physical structure near the ground. They also use areas near these habitats. Structure can be contributed by the lower branches of living trees, tree boles in various

stages of life and death, coarse woody debris in various forms, middens of red squirrels, shrubs, and rock fields. Herbaceous vegetation generally cannot serve this function. Over the long term and over large areas, complex physical structure in forests is most commonly the ultimate product of ecological succession. However, in some areas and at some times, disturbance can increase structure near the ground over the short term. This can result from windthrow, disease, fire, and timber cutting that leaves coarse woody debris. Use of nonforested habitats by martens increases in summer and includes meadows and recent clearcuts near forest edges, as well as areas above the tree line in western mountains (Buskirk and Powell; Buskirk and Ruggiero 1994).

The habitat of martens in California has been described in the Cascades (Ellis, submitted) and in the Sierra Nevada (Spencer et al. 1983; Spencer 1987; Hargis and McCullough 1984; Zielinski et al. 1997). The habitat requirements of the Humboldt marten are unknown.

SURVEY TECHNIQUES

Martens are easy to attract to bait and commercial lure and are readily detected at track plates and camera stations (reviewed in Zielinski and Kucera 1994). Tracks and trails made in the snow by marten have distinctive mustelid traits (Halfpenny et al. 1994) but differences between those of marten and fisher have not been quantified so care must be exercised where the two species co-occur. The tracks and trails of marten and mink may also be confused, especially when found near water. Consideration should be given to new genetic techniques that can identify the species from its scat or hair (Foran et al. in press; Foran et al. in prep.)

MANAGEMENT CONSIDERATIONS

Response to human-caused disturbance and activities. Martens make little absolute or relative use of clearcuts for several decades and marten populations decline after clearcut logging. Soutiere (1979) showed that marten densities in clearcut areas in Maine were $0.4/\text{km}^2$, about 113 those in uncut and partially

cut stands. Thompson and Harestad (1994) summarized the results of 10 studies of habitat selection in relation to successional stage. These studies showed consistent use/availability ratios <1 in shrub, sapling, and pole stages. Only when succession reached "mature" stage did use/availability ratios begin to exceed 1, and only "overmature" stands were consistently preferred. None of the studies found use/availability ratios for "overmature" stands <1 (Thompson and Harestad 1994). The effect of timber management on the Humboldt marten is unknown., but should be similar to the effects described for other subspecies.

MITIGATIONS

Impacts of timber cutting on martens can be mitigated by leaving slash and by selective cutting. If clearcutting is used, clearcuts should be small. Habitat refugia, where no timber cutting is conducted, should be considered. These refugia should be linked by areas (corridors) of mature forest with dense canopy closure and abundant quantities of large woody debris on the ground.

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