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SHORT COMMUNICATION

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First ocelot (*Leopardus pardalis*) monitored with GPS telemetry

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Abstract We report the first study to monitor ocelot (*Leopardus pardalis*) spatial patterns with Global Positioning System (GPS) telemetry. The study area was in southern Texas in areas of dense thornshrub (closed habitat) and open grasslands interspersed with small patches of dense thornshrub cover (open habitat). We used a 200-g GPS-Posrec collar (Televilt, TVP Positioning AB, Lindesberg, Sweden). We obtained 61% of GPS fixes from the ocelot GPS collar. The ocelot preferred closed habitat, even with GPS bias against closed habitat, and used small patches and corridors of dense thornshrub. Due to the success of this pilot study, we recommend that GPS telemetry be used to monitor ocelots.

Keywords Endangered · Felidae · *Leopardus pardalis* · Satellite · Texas · Thornshrub

Introduction

The ocelot (*Leopardus pardalis*) within the United States (U.S.) has been listed as endangered since 1982 and is limited to only two known breeding populations in southern Texas (Haines et al. 2006). Although ocelots have been studied with VHF radiotelemetry in southern Texas (Navarro-Lopez 1985; Tewes 1986; Laack 1991), this project was the first to evaluate the effectiveness of Global Positioning System (GPS) telemetry for tracking ocelots within dense thornshrub habitat.

Animal behavior can affect collar position, which can lower GPS performance (D'Eon and Delparte 2005). In addition, dense canopy cover can decrease the number of successful GPS telemetry fixes (D'Eon et al. 2002; Di Orio et al. 2003), which can lead to misinterpretation of results. Our objective was to estimate home range size and habitat use of a GPS-collared ocelot to evaluate GPS telemetry in dense thornshrub cover.

Materials and methods

Study area

The study area was located at Willacy County, Texas, USA, and contained two main habitat types: the dense thornshrub cover (closed habitat with >75% woody canopy) and the open grasslands interspersed with patches of dense thornshrub cover (open habitat with 1–25% woody canopy cover) (Cook 2000) (Fig. 1). Predominant woody species included spiny hackberry (*Celtis pallida*), crucita (*Eupatorium odoratum*), Berlandier fiddlewood (*Citharexylum berlandieri*), honey mesquite (*Prosopis glandulosa*), desert olive (*Forestiera pubescens*), snake-eyes (*Phaulothamnus spinescens*), colima (*Zanthoxylum fagara*), and brasil (*Condalia hookeri*) (Shindle and Tewes 1998).

Materials

We used a 200-g GPS-Posrec collar (Televilt, TVP Positioning AB, Lindesberg, Sweden) equipped with a drop-off release device. In addition, the GPS collar was equipped with a standard VHF transmitter, an activity sensor, and a nonvolatile memory to store location data until they were downloaded. Data fields stored in the collar included date, time, location, and fix status (i.e., 2D, 3D, or 3D+ location classes). For our analysis, we only used a GPS fix status ≥3D. The GPS collar was scheduled to record one diurnal and three nocturnal locations during each diel (i.e., 1200, 2100, 0100, and 0500 h).

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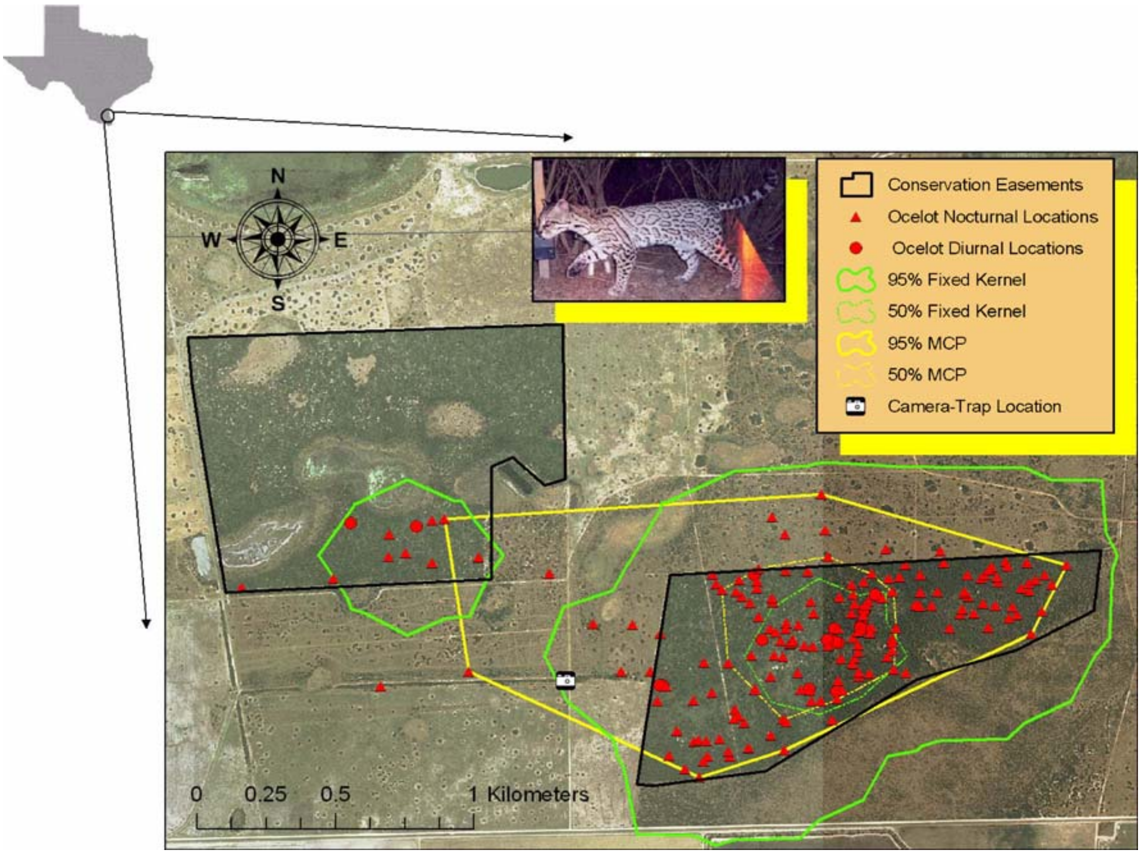

Fig. 1 Map of the study area encompassing two conservation easements of dense thornshrub habitat located on a private ranch in Willacy County, Texas, USA. The figure shows GPS telemetry locations and home range estimates of an adult female ocelot, and a photograph of the same adult female ocelot camera-trapped along a corridor of dense thornshrub 1 year before GPS monitoring was initiated (Haines et al. 2006)

Methods

On 12 April 2005, we captured an 8-kg adult female ocelot using a single-door wire box trap (Tomahawk Trap, Tomahawk, WI, USA). We immobilized the ocelot with an intramuscular injection of tiletamine hydrochloride (Zoletil, Virbac, Carros, France) at 10–15 mg/kg body weight. The ocelot was fitted with the GPS collar and monitored from 13 April to 4 July 2005.

We estimated home range size using 50 and 95% fixed kernels with least squares cross validation smoothing parameter (Silverman 1986; Worton 1987), and 50 and 95% minimum convex polygons (MCP) (Mohr 1947). We analyzed habitat selection by comparing habitat use to availability with a chi-square goodness-of-fit test (Neu et al. 1974). All spatial data were analyzed using the BIOTAS program (Ecological Software Solutions).

Results

The GPS collar had a success rate of 61% (198 fixes/324 attempts). The success rate was 31% (25 fixes/81 attempts) for diurnal locations and 71% (173 fixes/243 attempts) for nocturnal locations. Estimated home range sizes were 0.28 km^2 (50% MCP), 1.56 km^2 (95% MCP), 0.19 km^2 (50% fixed kernel), and 2.3 km^2 (95% fixed kernel) (Fig. 1). The ocelot preferred closed habitat during diurnal (100%, χ^2=9.49, P=0.003) and nocturnal (92%, χ^2=9.49, P<0.001) hours (Fig. 1). The ocelot selected closed habitat even without bias correction for this habitat type.

Discussion

Harveson et al. (2004) found that ocelots in southern Texas preferred dense thornshrub canopy cover. Similarly, the GPS-monitored ocelot preferred closed habitat even with GPS telemetry bias against closed habitat. However, for larger ocelot GPS telemetry studies, we recommend testing GPS collars in multiple habitat types that contain varying canopy coverage.

We calculated home range size for the GPS-monitored ocelot to show that it can be determined using GPS telemetry. Most ocelot GPS locations outside the blocks of closed habitat were within or adjacent to small patches or corridors of dense thornshrub cover (Fig. 1). Because ocelots could use corridors of dense thornshrub cover for traveling or dispersing (Laack 1991), GPS telemetry may be useful to assess ocelot travel routes between habitat patches. By changing the GPS schedule to increase the number of locations obtained per day, GPS telemetry may also help identify areas along roadways where ocelots cross, and identify potential culvert sites to reduce ocelot–vehicle collisions (Tewes and Hughes 2001; Haines et al. 2005). Due to the success of this pilot study, we recommend that GPS telemetry be used to monitor ocelots.

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