

# Size of Territories and Home Ranges of Male Western Yellow-breasted Chats (*Icteria virens auricollis*) in British Columbia

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During 2005 and 2006, radio-transmitters were fitted to a total of 11 male Western Yellow-breasted Chats, *Icteria virens auricollis*, in the southern Okanagan River valley, British Columbia, to compare the area used, as detected by radio-telemetry and as defined by mapped observations of breeding males singing and perching. Data were only collected for 5 males. For 2005 and 2006, the 95% kernel density estimation (KDE) revealed that mean area used by male Western Yellow-breasted Chats, as determined by radio-tracking ( $n = 5$ ), was 1.16 ha, whereas the mean area as defined by observations of breeding males singing and perching was 0.62 ha (no statistical difference). Our hypothesis that the area determined by radio-tracking would be significantly larger than the area defined by observations of males singing and perching was rejected, but the area determined by radio-tracking was almost twice the area defined by observations of breeding males singing and perching.

Key Words: Western Yellow-breasted Chat, *Icteria virens auricollis*, home range, territory, radio-telemetry, endangered species, species at risk, Okanagan valley, British Columbia.

The use of space by a species is important for understanding its ecology (Anich et al. 2009), the function of a singing territory (Naguib et al. 2001), and the social relationships among conspecifics (Catchpole and Slater 1995). In the case of species at risk, this information is necessary in order to be able to map habitat necessary for protection (Anderson 2001; Clark et al. 2002). Territory mapping (defined by observations of males singing and perching) may underestimate the size of the area that is required, especially for secretive species (Anich et al. 2009). However, radio-telemetry is a reliable way to obtain information about movements outside of a male's singing territory and to measure area accurately (Naguib et al. 2001; Anich et al. 2009.)

This is the case for a population of the Western Yellow-breasted Chat (*Icteria virens auricollis*). The status of the Yellow-breasted Chat, *Icteria virens*, in British Columbia is S1S2 (critically imperilled or imperilled), and it is on the British Columbia Red List (which includes any species that is extirpated, endangered, or threatened). Nationally, the Southern Mountain population of the *auricollis* subspecies of the Yellow-breasted Chat (the subpopulation in British Columbia) is designated as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2011\*) and is on the List of Wildlife Species at Risk under the federal Species at Risk Act (endangered).

Yellow-breasted Chats are elusive and are often overlooked, they have a skulking and secretive nature, and they prefer dense shrubs (Eckerle and Thompson 2001). These characteristics make it a challenging species on which to collect accurate data on land use by Yellow-breasted Chats. We therefore compared territories defined by territory mapping (observations of perching

and singing locations of breeding males) and home range determined through radio-telemetry of breeding males. We predicted that home range as determined by radio-tracking would be significantly larger than the area defined by observations of singing and perching locations of breeding males.

## Study Area and Methods

The study area is described in McKibbin and Bishop (2008). The radio-telemetry and territory research was conducted in two sections of the South Okanagan Wildlife Management Area, which is within a highly fragmented riparian habitat zone (Lea 2008). The research was conducted from mid May to the end of July 2005 and 2006.

The methods for colour banding are described in McKibbin and Bishop (2008). Sex was determined by plumage and presence or absence of a brood patch.

The methods for mapping of territories by observations of males singing and perching are described in McKibbin and Bishop (2010).

To avoid disruption of the incubation process, radio-transmitters were fitted to only a subsample of males that were part of a breeding pair. Colour-banded Western Yellow-breasted Chats were fitted with a 0.90 g radio-transmitter with a lifespan of six weeks (BD-2, Holohil Systems Ltd., Carp, Ontario) following procedures as described in Green (1988), Alexander and Cresswell (1990), and Kenward (2001). Each bird was in holding between 10 and 15 minutes.

The Western Yellow-breasted Chats were tracked for 30 minutes about every second day until the end of July or until the radio-transmitter was removed by the bird. Between two and six observations were made during

each tracking period. Tracking was done between 0500 and 1600 using a LA12-Q portable radio-telemetry receiver and handheld three-element collapsible Yagi antenna (AVM Instruments Co. Ltd., Colfax, California). A Universal Transverse Mercator (UTM) coordinate was taken with a handheld Global Positioning System (GPS) (GPSMAP 76S, Garmin International, Olathe, Kansas) at each point where a male was located.

The UTM coordinates for both the territory mapping and the radio-tracking were input into ArcGIS 10 (ESRI 1999\*) and territory boundaries were determined. Area (ha) was calculated from 95% kernel density estimation (KDE) encompassing the observations using geospatial modelling environment software (Beyer 2001\*).

Due to the small sample size, non-parametric statistics were used. A Kruskal-Wallis test (Zar 1996) was used to determine whether there were significant differences between the mean areas defined by observations of singing and perching by the males that had been fitted with radio-transmitters and by the males without radio-transmitters and secondly to determine whether there were significant differences between the areas defined by observations of breeding males singing and perching and the areas measured with radio-tracking. Analysis was performed using the software JMP IN Version 4 (SAS Institute 2000\*).

## Results

During 2005, radio-transmitters were fitted to 5 males. Two of the Western Yellow-breasted Chats removed their transmitters within one day of being fitted and a third within 14 days of being fitted. The 2 remaining Western Yellow-breasted Chats (males 1 and 2) with radio-transmitters were tracked for four weeks.

The radio-transmitters that were recovered had the gauze and a large number of feathers stuck to them, indicating that the radio-transmitters did not fall off but were actually pulled off. The antennas also had small "bite" marks at the tip.

During 2005, between 30 and 61 locations per bird were made using radio-telemetry, and between 13 and 20 observations of singing and perching per bird were made for the same males during territory mapping. No locations by radio-tracking were recorded for the Western Yellow-breasted Chats that immediately removed their radio-transmitters. Territory mapping by observations of singing and perching was also done for 8 males that were not fitted with radio-transmitters, and between 14 and 21 observations per bird were made.

In 2006, radio-transmitters were fitted to 6 males. The antennas were cut one-third shorter in an attempt to prevent the Western Yellow-breasted Chats from pulling them off. However, this did not prove to be successful, as four radio-transmitters were removed within one day. Male A was tracked for three weeks, and Male B removed the transmitter within 14 days of being fitted.

No locations by radio-tracking were recorded for the Western Yellow-breasted Chats that immediately removed their radio-transmitters; between 7 and 24 locations per bird were recorded during radio-tracking and between 16 and 17 observations of singing and perching were made for the same males during territory mapping. Territory mapping by observations was also done for 11 males that were not fitted with radio-transmitters, and between 13 and 24 observations per bird were made.

The 95% kernel density estimation for indicated mean home range size determined by radio-tracking was 1.16 ha (SD 0.87). The mean territory size defined by observations of singing and perching for the same males was 0.62 ha (SD 0.24). During 2005, for males 1, 2, and 3, territories defined by observations of singing and perching were between 40% and 66% of the home range area determined by radio-tracking. During 2006, for male A, the territory defined by observations of singing and perching was 56% of the home range determined by radio-telemetry, and for male B the territory defined by observations of males singing and perching was 54% larger than the home range determined by radio-tracking (Figures 1 and 2). Male B removed his radio-transmitter within 14 days of being fitted, and only 7 locations were recorded during radio-tracking, whereas a total of 17 observations of singing and perching were made during six visits to the territory.

Due to the large variation in the size of males' home ranges (as determined by radio-tracking) and territory size (as defined by observations of breeding males singing and perching), there was no statistically significant difference between the area used by males fitted with radio-transmitters and the area used by males without radio-transmitters ( $P = 0.30$ ) or between the area defined by observations of singing and perching and the area determined by radio-tracking of males with radio-transmitters ( $P = 0.47$ ). The mean territory size defined by observations of singing and perching for the Western Yellow-breasted Chats where radio-tracking was not done ( $n = 8$  in 2005,  $n = 11$  in 2006) was 0.54 ha (SD 0.15). Combined mean territory size defined by observations of breeding males singing and perching for Western Yellow-breasted Chats with and without radio-transmitters was 0.55 ha (SD 0.17).

During 2005, Male 2 had the largest home range as determined by radio-tracking. He defended two different territories (as defined by observations of males singing and perching) about 700 m apart. Male 2 was singing in both territories and females were heard in both territories.

Forays by males outside of their territories (defined by observations of singing and perching) were mostly silent (68%). Territories defined by observations of singing and perching also seldom overlapped, while home ranges determined by radio-tracking often overlapped (Figures 1 and 2).



FIGURE 1. Western Yellow-breasted Chat (*Icteria virens auricollis*) territories as defined by observations of males singing and perching and home ranges as determined by radio-tracking (95% kernel density estimation) for males 1 and 2 (four weeks each) in the South Okanagan Wildlife Management Area in British Columbia during 2005.

## Discussion

Even though there was no statistically significant difference between the size of the area defined by observations of singing and perching and the size of the area determined by radio-telemetry, radio-tracking clearly indicated that these areas are highly variable in size and, on average, are almost double the size of the area defined by observations of singing and perching. During 2005 and 2006, mean territory size of Western Yellow-breasted Chats in the South Okanagan Wildlife Management Area as defined by observations of singing and perching was 0.55 ha (SD 0.17, range 0.29–0.95), which is smaller than territory sizes for Yellow-breasted Chats elsewhere. By plotting observations of chat in

southern Indiana, the mean territory size was 1.2 ha (SD 0.51, range 0.4–2.4) (Thompson and Nolan 1973); in Virginia, the territory size ranged from 0.5 to 1.0 ha (Dennis 1958); while in southern Illinois, the mean territory size of 0.13 ha (range 0.06–0.29) (Brewer 1955) was smaller. Our findings are consistent with other studies which reported that territory size defined through territory mapping (observations of males singing and perching) may be an underestimate of territory size (the area used) (e.g., Naguib et al. 2001; Anich et al. 2009).

Our data indicated that Western Yellow-breasted Chat males regularly moved outside their own territories (as defined by observations of males singing and

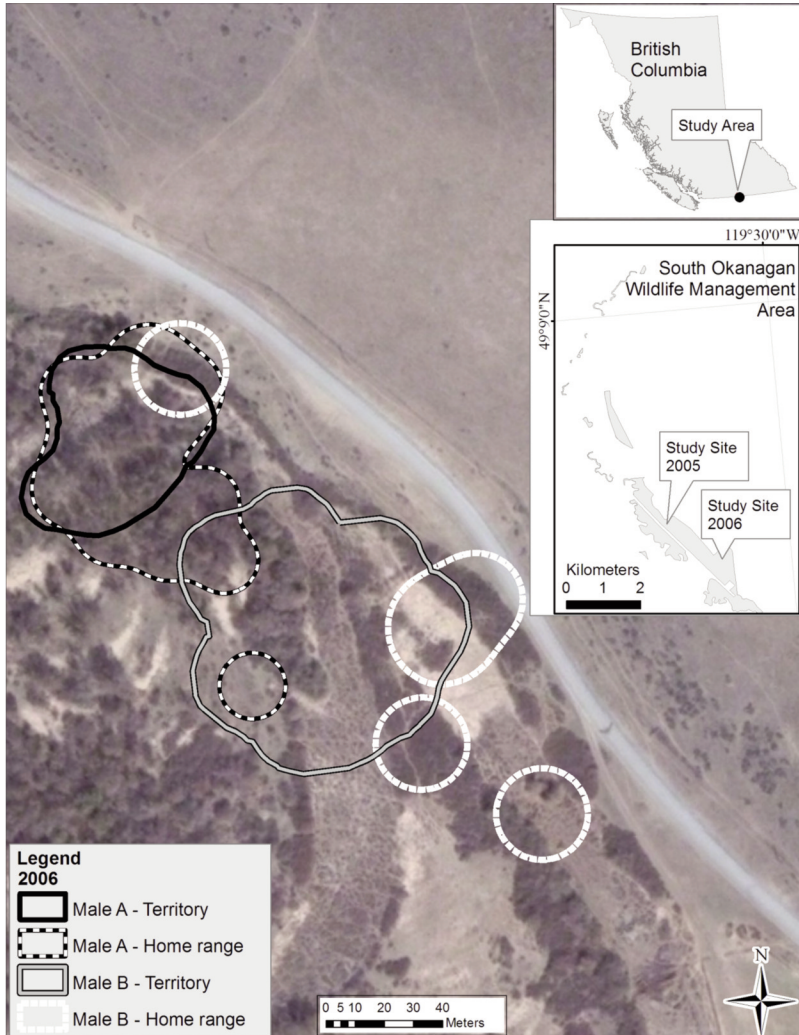


FIGURE 2. Western Yellow-breasted Chat (*Icteria virens auricollis*) territories as defined by observations of males singing and perching and home ranges as determined by radio-tracking (95% kernel density estimation) for Male A (three weeks) and Male B (two weeks) in the South Okanagan Wildlife Management Area in British Columbia during 2006.

perching) into neighbouring territories. Forays outside of the male's territory were mostly silent, and territories seldom overlapped. Home ranges as determined by radio-tracking often overlapped, suggesting forays outside of a male's singing territory were most likely for reasons other than expanding his territory. These forays into neighbouring territories may be for foraging, extra-pair copulations, to test a neighbour's attention, or to investigate a neighbour's breeding stage (Naguib et al. 2001).

Extra-pair paternity commonly occurs in Western Yellow-breasted Chats in the south Okanagan (Mino et al. 2011), and forays into neighbouring territories possibly involve extra-pair copulations with neighbouring females. However, suitable habitat is limited in the

south Okanagan, and males could also have wandered outside of their territory to forage. Regular extra-territorial forays are also documented for Yellow-breasted Chats in Illinois (Alessi 2009) and Kentucky (Mays and Ritchison 2004).

Our research indicated that using only territory mapping (observations of males singing and perching) to determine the area used by Yellow-breasted Chats in the south Okanagan could lead to an underestimate of the total area used. This is an important factor to consider when decisions are made regarding the management and conservation of Western Yellow-breasted Chats involving the determination of the size of a reserve necessary for their survival and designing habitat restoration sites.

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