

# First observation of polyterritorial polygyny in Pine Warbler (*Setophaga pinus*)

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MALE PASSERINES typically maintain a single territory throughout the breeding season which is used concurrently for foraging and breeding. Polyterritoriality, the maintenance of two or more territories, has been observed in numerous species of North American passerines (Ford 1996) but as a general life history strategy, is far less common than the maintenance of a single territory. Some species split aspects of their life histories between polyterritories, where a primary territory is used for breeding and a secondary territory is used only for foraging. In other cases, polyterritories are maintained by polygynous males and both territories are used for breeding activities. In polyterritorial polygyny, males defend two or more disjunct territories in which they pair with separate females and usually provision broods in both.



Pine Warbler: *Mark Conboy*

Here I report the first case of polyterritorial polygyny documented for the Pine Warbler (*Setophaga pinus*). General information about territoriality in Pine Warblers is limited, but to date polyterritoriality has never been documented.

Similarly, the mating system of Pine Warblers is not well studied, but it has been assumed that this species is socially monogamous as are many other *Setophaga* wood-warblers (Rodewald *et al.* 1999). Of field observations I made on 12 colour-banded birds at Queen's University Biological Station (QUBS) in eastern Ontario, most Pine Warblers were monoterritorial and socially monogamous, but I found one male that was polyterritorial and polygynous.

I captured and colour-banded an after second year male (Pyle 1997) Pine Warbler in May 2008 at QUBS. I relocated the bird where I had banded it three days earlier without using playback to avoid changing its normal behaviour. Using a handheld Garmin GPSMAP 60 unit, I collected waypoints at singing perches. A waypoint was marked every two minutes or when the bird changed perches. Points were collected only when birds were singing actively in order to ensure that the waypoints corresponded to the male's breeding territory and did not include extraterritorial forays during which males are often silent (Norris and Stutchbury 2001). Pilot studies of territory mapping at QUBS determined that 50 waypoints were sufficient to map the territories of numerous *Setophaga* species (including Pine Warbler). This number was determined by plotting the size of the territory ( $m^2$ ) mapped against the accumulated number of waypoints. The accumulation curve was constructed by measuring the

area of the first three waypoints collected at a territory using Garmin MapSource version 6.11.6 (Garmin Ltd.). I then added the next point and measured the area again. I did this until all points were measured and the curve approached an asymptote. I restricted mapping of territories to two dimensions: length and width; I did not attempt to quantify vertical dimensions of wood-warbler territories. Territories were mapped in ArcMap 9 using maximum convex polygons.

Based on previous work with wood-warblers, a territory can be mapped in 2–3 hours if the target male is or remains vigile and actively sings. In the case of this particular male, mapping took almost five hours because the bird would disappear from its territory for long periods of time (longest time between marked waypoints = 40 minutes). During the bird's absences I searched the general area where appropriate habitat existed and relocated him almost 400 m away. Suspicious of this behaviour I returned the next day to see if I could observe the male at the second site. I observed him singing, delivering food to a nest and interacting with a different female and subsequently mapped its movements at this site. The primary territory (the first territory I mapped) had an area of 1.95 ha and the secondary territory had an area of 0.54 ha. The minimum distance between the two territories was 398 m (Figure 1).

Polyterritories are in part characterized by the male singing in multiple

territories but not in between them. In some cases, territories of other males are interspersed between the primary and secondary territories. At other times, there is an expanse of unsuitable habitat between the polyterritories putting them out of hearing and visual range (Ford 1996). In the present case, I found there was a zone of unsuitable habitat (*i.e.* lacking mature Eastern White [*Pinus strobus*] and Red [*P. resinosa*] Pines) between the primary and secondary territories. As expected, this zone of unsuitable habitat was not occupied by other territorial male Pine Warblers. The male behaved territorially (singing and chasing conspecifics and Yellow-rumped Warblers [*S. coronata*]) in both its primary and secondary territories.

Male song is the primary means by which territories are established and defended by *Setophaga* wood-warblers. The male was observed singing on both territories. I broadcasted locally recorded Pine Warbler songs to test the responsiveness of the male to conspecific song in both territories. A 10 minute playback (two minutes of song followed by two minutes of silence, repeated five times) was broadcasted in the primary and secondary territories twice during the field season, five days apart. In the primary territory, the male responded by descending out of the canopy to within 2 m of the speaker. He counter-sang and overlapped his song with the playback. He also gave a variety of call notes, characteristic of aggressive encounters among

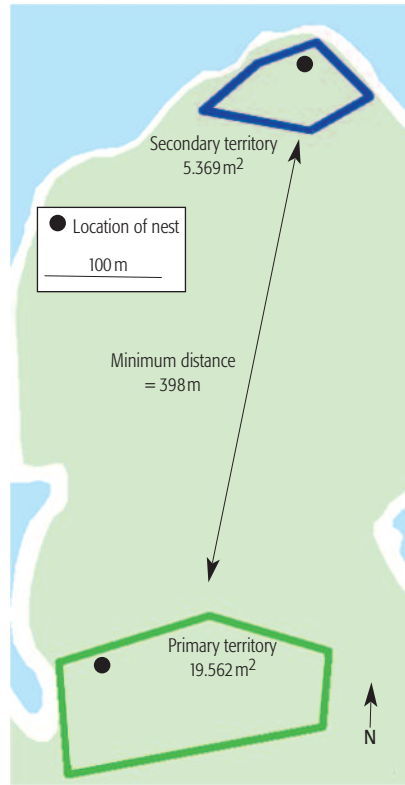


Figure 1. Polyterritories of a male Pine Warbler.

Pine Warblers. In the secondary territory, the male did not approach the speaker and counter-sang only from the canopy. He maintained a distance of 10 m from the speaker even when playback was performed directly below the nest. I also broadcasted playback at two points in the zone between the primary and secondary territories and received no response. Given the aggressive nature of the species and ease with which I regularly elicited response to playback from territorial males, and my failure to detect the

male during many additional hours of field work in the zone between territories, it is probable the male's territorial behaviours were confined to the two mapped areas and excluded the space between.

The difference in response to playback between territories may be representative of the degree of parental investment that the male was willing to make in each territory. Aggressive interactions between male Pine Warblers were observed commonly on our study site. Costs associated with chases and counter-singing may be sufficient to discourage males from engaging in overtly aggressive territorial defence on secondary territories where parental investment in offspring may be limited anyway. Further to this, the secondary territory was only about one quarter the size of the primary territory, perhaps also representing diminished male investment there. Male American Redstarts (*Setophaga ruticilla*) make fewer foraging trips to nests in their secondary territories than their primary territories, indicating reduced parental investment (Secunda and Sherry 1991). I observed males provisioning nests on both territories, but did not measure feeding rates so I could not directly quantify male parental investment.

Although polyterritorial polygyny has a received only limited study among wood-warblers, it has been documented in at least five other species: Yellow Warbler (*S. petechia*) (Spector 1991; Ford 1996), Black-throated

Blue Warbler (*S. caeruleascens*) (Petit *et al.* 1988), Kirtland's Warbler (*S. kirtlandii*) (Walkinshaw 1983), Prairie Warbler (*S. discolor*) (Nolan 1978), and American Redstart (Secunda and Sherry 1991). This behaviour could also be present in other species. It is suspected in Common Yellowthroat (*Geothlypis trichas*) (Stewart 1953), Tennessee Warbler (*Oreothlypis peregrina*) (Lein *in* Ford 1996), Yellow-rumped Warbler, Chestnut-sided Warbler (*S. pensylvanica*) and Black-throated Green Warbler (*S. virens*) (Kendeigh 1945). Because our knowledge of territoriality in general is limited, there is still ample opportunity to discover new cases of polyterritoriality or other novel territorial strategies among wood-warblers.

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