Characterizing the movement of an individual *Canis lupus* x *Canis latrans* hybrid in the northern lower peninsula of Michigan

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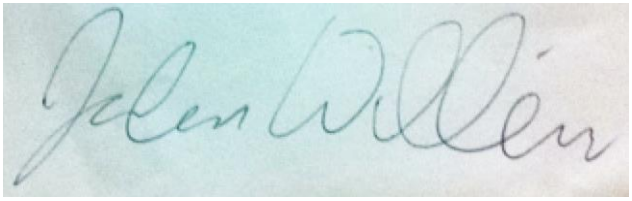

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Jalen Williams
The University of Michigan Biological Station
August 16th, 2014

ABSTRACT

This study followed the movements of an individual hybrid canid that has the chromosomal DNA of a coyote (*Canis latrans*) and the mitochondrial DNA of a wolf (*Canis lupus*). As the animal has the phenotype of the wolf and had been known to eat deer, the ecological role of this animal is largely unknown. We recorded home range and the frequency of appearances in certain habitats to determine whether the animal's behavior was more characteristic of a wolf or coyote. Data collected in this study were supplemented with data from previous studies on the animal. The hybrid had a slightly larger home range than typical of a female coyote, but the true extent of this range remains unknown, because the period of time that a wolf would be hunting and moving the farthest from a den site is the time that we had most difficulty finding the animal (1:00-5:00). The animal preferred dense wet forests and it's likely that the animal was simply beyond the range of our device, well outside of our expected boundaries for coyote hunting grounds.

INTRODUCTION

By the late 1950s, gray wolves (*Canis lupus*) had largely been extirpated from the state of Michigan due to the impacts of human disturbance and habitat fragmentation. Some immigrant wolves moved into the Upper Peninsula of Michigan (U.P.) from Wisconsin before the Michigan Department of Natural Resources (MDNR) implemented the Wolf Management Plan to

reintroduce and protect the species in 1997 Thiel (1988). The disappearance of the species in the state is largely attributed to the wolf bounty system that existed in Michigan from 1817-1960, though populations in the Lower Peninsula (LP) were particularly exposed to increased levels of human interference, habitat destruction, and agricultural land development. Wolves prefer dense forests and minimal human contact, and range between 50-800 km^2 to find food. Weighing 35-65 kg, these top predators need large, undisturbed hunting grounds and access to large game. In the absence of wolves, the more ecologically tolerant coyotes (*Canis latrans*) have expanded north. Unlike *C. lupus*, the smaller coyotes (11-21 kg) have been known to be more tolerant of higher levels of human density; prefer large, open habitats; and have adapted more successfully to large-scale anthropological disturbances to northern Michigan's forests. As opportunistic predators, these animals search less for their food and typically range 10-40 km^2. While the wolf population in the U.P. slowly recovers with help from the Michigan DNR, its complete absence in the Lower Peninsula has allowed *Canis latrans* to firmly establish itself around the state.

After the discovery of abnormally large tracks in Cheboygan County, Michigan in March 2010, U.S.D.A. Wildlife Services biologists trapped the first of three large juvenile canids on July 10th of that year. Due to their large size, these animals were presumed to be the offspring of a pair of wolves in the area. Genetic profiling, however, revealed that the chromosomal DNA of the individuals matched *C. latrans*, while the mitochondrial DNA (mtDNA) corresponded with *C. lupus*. This indicated that the animals were "coy-wolf" hybrids (Wheeldon *et al.* 2012). All three juveniles shared the eastern wolf mtDNA haplotype (C3) that is characteristic of wolves in the Great Lakes region, as "Great Lakes wolves" share ancestry from both gray wolves (*C. lupus*) and eastern wolves (*C. lycaon*) (Kyle *et al.* 2006).

Instances of hybridization between *C. latrans* and *C. lupus* are uncommon but have been recorded in many areas of Canada and the American Midwest (Thiel, 2006). A subspecies of coyote on the east coast, *Canis latrans vars* (Eastern coyotes) has also been shown to possess mixed heritage with *Canis lupus* in the past, and appears phenotypically larger than its western cousins (Way *et al*. 2010). Although heavily debated, the red wolf (*Canis rufus*) is also theorized to have originated as the product of hybridization between *Canis lupus* and *Canis latrans*. Further hybridization with *Canis latrans* has presented an obstacle for the conservation of this species, as interspecific breeding continues to dilute the gene pool (Allendorf et al., 2001). In areas of allopatric populations of *Canis lupus* and *Canis latrans*, hybridization typically occurs when *C. lupus* has limited access to conspecific mates (Thiel, 2006).

As many coy-wolf hybrid canids have been observed to possess a range of intermediate physical characteristics between *C. latrans* and *C. lupus*, canid hybridization may enhance the adaptability of offspring to changing environmental conditions and produce novel behaviors in previously unexplored ecological niche spaces (Kyle *et al*. 2006). The movements of the captured coywolves in Michigan have only been sporadically tracked using radio telemetry in the four years since their capture (MDNR 2010-2014, UMBS Field Mammalogy 2012). As of 2014, there is only one remaining collared individual, and its general behavior, habitat use, and ecological capacity remain unconfirmed.

In order to better understand the ecological capacity of the remaining coywolf, this study utilized ground radio telemetry techniques to track the animal for a period of five days. By locating the animal throughout the day and night, we hope to get an understanding of its effective home

range, movement habits, and preferred habitats. This information can then be compared to that of native wolves and coyotes in an attempt to reconcile the hybrid's coyote-like genetic profile and wolf-like size and appearance. As coywolves have been shown to possess intermediate characteristics of the two parental species, we hypothesized that the animal also exhibit behaviors on a gradient between coyotes and wolves.

METHODS

The observational study was conducted by the University of Michigan Biological Station's (UMBS) 2014 Field Mammalogy class from July 25th to July 29th, 2014 in the private and public land surrounding UMBS property near Burt Lake and Douglas Lake in Cheboygan County, MI (45°33'31.4" N, 84°40'37.9" W). Radio telemetry data was collected with a Telonics RA-14 VHF directional antennae (Telonics, Inc. Meza, AZ) and Telonics R2 MA radio receiver (Telonics, Inc. Meza, AZ), in conjunction with a radio collar fitted on the animal by the DNR in 2010. Research teams followed a flexible route on rural roads through private and public lands around the area to periodically triangulate the radio signal location, using two or more points when possible. We combined our dataset with previous DNR (2010-2012) and UMBS (2012) telemetric data on the same hybrid individual to create an aggregate dataset, which we analyzed in our results. A home range estimate was produced using the minimum convex polygon (MCP) method of area estimation (MCP; Mohr, 1947). We also calculated the mean latitude and longitude from each dataset and compared this "mean center" point to the den site location in 2012. Additionally, we analyzed temporal patterns in the distance that the hybrid travelled from this mean center. The locations from all collected data were plotted and analyzed in ArcGIS with

habitat cover-type information supplied by the National Land Cover Database (2006). These habitats were then classified into five categories (Table 1).

Deciduous Forest	Trees > 20% total vegetation cover, 75% of deciduous trees
Evergreen Forest	Trees > 20% total vegetation cover, 75% coniferous trees
Woody Wetland	Trees > 20% total vegetation cover, soil periodically saturated with water
Border Cover	Patches of forested regions bordering open fields
Open Field	Either 80% grassland or actively tilled cultivated crops

Table 1—Categorical descriptions of habitat cover-types near UMBS property.

RESULTS

Our study produced 27 recorded locations. Combined with data from UMBS researchers in 2012 and the DNR from 2010-2014, our data formed an aggregate dataset describing the animal's movements (Fig. 1). We estimated the animal's approximate home range to be 35.38 km^2 (Fig. 3). Within this range, the animal was mostly found the woody wetland habitats (46.5%) both to the south and the immediate south east of the UMBS campus (Fig. 2). However, 17.82% of the locations were found in open habitats such as meadows and fields of cultivated crops. An additional 12.9% of the points were located near the wooded edges bordering these fields.

The coy-wolf's movements were fairly unpredictable, and it was only consistently located in roughly the same area from 04:00-07:00, when we suggest it was returning from an early morning hunt (Fig. 4). We found that the animal traveled to its west-most data points between 01:00-03:00, to a woody swamp north of Burt Lake. The 2012 UMBS found the animal during this interval in two positions east of the highway, located in the opposite direction from the den

location. A “mean center” point was calculated with all of the data points and appeared to be extremely close to the den site found in 2012 (< .52 km). The distance from this center was calculated for each point and plotted in Figure 5. The largest distance ranged by the animal was approximately 6.4 km away.

DISCUSSION

Our estimate of the collared coy-wolf’s home range of 35.38 km^2 is slightly above the upper boundary of what is considered typical of a female coyote (See Fig. 3). In mixed forested/agricultural regions similar to this area of northern Michigan, it’s common for coyote home ranges to average around 14-22 km^2 for males, and slightly smaller for females (Person & Hirth 1991). Depending on the habitat composition of the region and the relative lack of prey, the coyote home range can possibly extend as high as 40-60 km^2, though home ranges this large have only been observed in the western United States. By using the minimum complex polygon method to calculate the animal’s home range, we’re limited by its sensitivity to sample size and its inherent inclusion of areas (portions of Burt Lake) that the animal cannot actually traverse (White and Garrott, 1947). Additionally, our estimate does not consider the frequency that a canid typically visits its entire home range.

The hybrid’s average distance from the mean center of all recorded locations was measured to be the highest between midnight and 4:00 am (Fig. 5). During this time, the coy-wolf travelled twice as far as during any other time interval, even reaching up to 6.5 km away in our furthest recorded location. This is uncharacteristic of *C. latrans*, as coyotes tend not to range past 4-5 km. Also, though gray wolves and coyotes are both nocturnal, wolves typically leave to range for

prey during a similar time period each night. Unlike our hybrid, coyotes are opportunistic hunters and range multiple times in a given day to hunt (Quinn, 1997).

Students frequently located the animal during the afternoon, but were only able to locate it twice at its time of highest mobility between midnight and 4:00 am. Our inability to find the hybrid at this time likely resulted in an underestimate of the true size of the coy-wolf's home range. As telemetric data could not be accurately recorded when the animal was moving or out of range of the radio receiver (> 2-3 km), it's very possible that the animal was simply beyond the range of our device.

Since wolves have been extirpated from the Lower Peninsula, white-tailed deer populations have increased dramatically in the last fifty years (Thiel, 1988). Because *C. latrans* is generally only a facultative predator of deer, coyotes have a much smaller effect on these populations than their larger cousins. The hybrid animal, in contrast, has been reported to eat deer frequently (P. Myers, pers. comm. 2014) and other medium-sized prey. Although the coy-wolf moved and denned primarily in wet mixed forests typical of *Canis lupus* (Fig. 3, Fig. 2.), it often frequented the borders of agricultural fields and other disturbed habitats where deer had often been observed feeding. The exact nature of the animal's hunting strategies for these deer—whether operating in a large, wolf-like pack or not—is unknown, though populations of the mixed heritage Eastern Coyote/Tweed Wolf on the east coast have been described to hunt wolf-like prey in coyote-like family units (Way et al 2010). Regardless of strategy, by preying on white-tailed deer, the animal seems to be filling an ecological space that is currently unoccupied in the absence of *Canis lupus*.

This information could have local ecological and political ramifications. After the genetic tests of the hybrid juveniles indicated that they held a coyote's chromosomal DNA, the three individuals effectively lost potential protection under the DNR's Wolf Management Plan. Additionally, many conservation efforts attempt to minimize hybridization and the potential negative effects it exerts on a population. *Canis rufus* is commonly used as an example of how hybridized animals dilute a resident population's genetic makeup (Allendorf, 2011). However, without a resident wolf population's gene pool to corrupt in the Lower Peninsula, there may be an advantage to allowing coy-wolves to breed in the area if it allows them to move into an ecological role formerly provided by populations of *Canis lupus*.

After our study, it appeared that the home range, habitat, and ecological niche utilized by our studied coywolf is influenced by behaviors typical of both *C. latrans* and *C. lupus*. With a combination of physical characteristics and behaviors, it's possible that this animal may be able to take advantage of the prey-heavy, moderately disturbed environment of Cheboygan County in a way unique to both parent species. In order to make an argument for the value of this animal, more research needs to be performed on its ecological capacity. Critical studies on its diet, hunting habits, and breeding can give further information about the unique role this hybrid and its possible offspring play in the Cheboygan County community.

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APPENDIX:

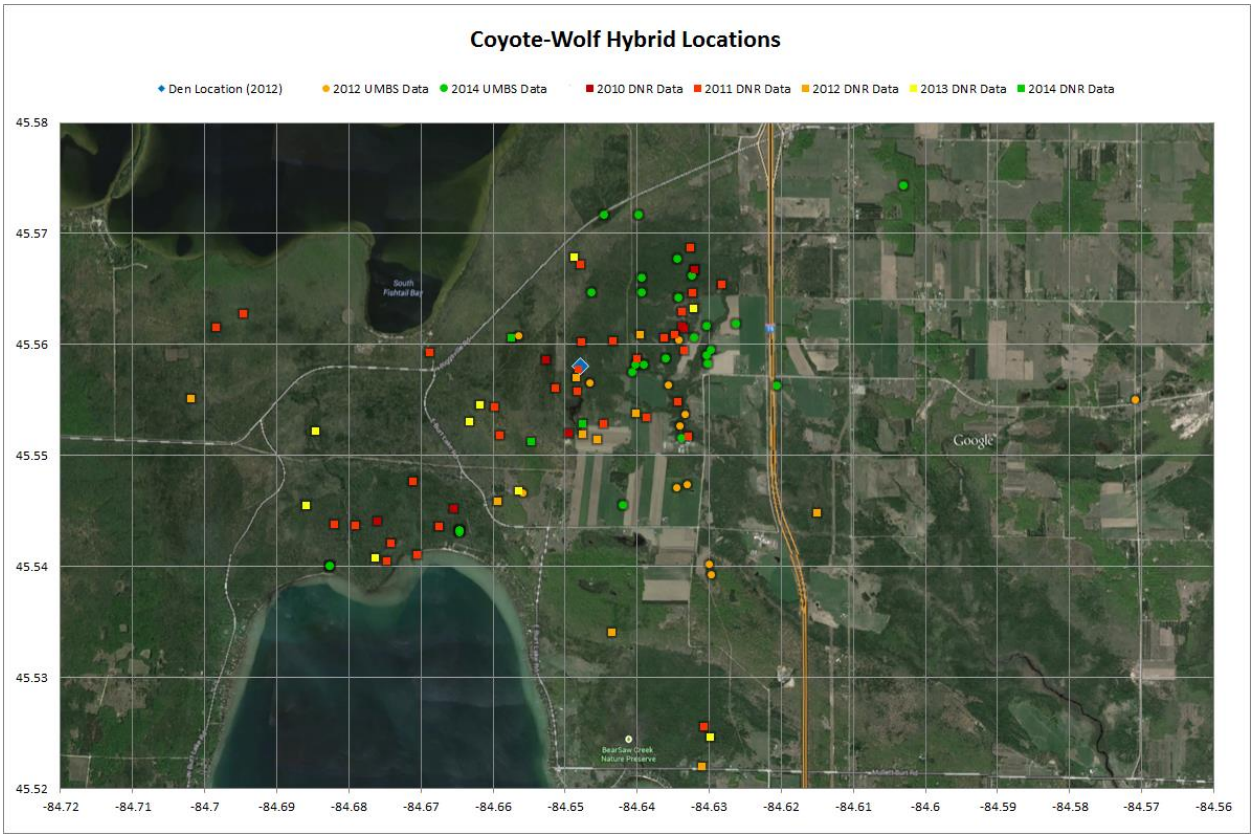


Figure. 1 – Radio tracked positions of a coy-wolf hybrid (2010-2014) in Cheboygan Co., Michigan (GPS). Data points collected from multiple sources and represented as UMBS data (2012, 2014) by circles, DNR data (2010-2014) by squares, den site (2012) by blue diamond.

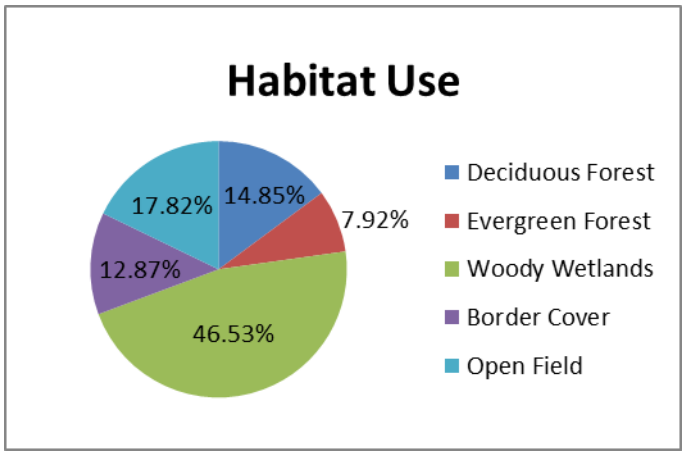
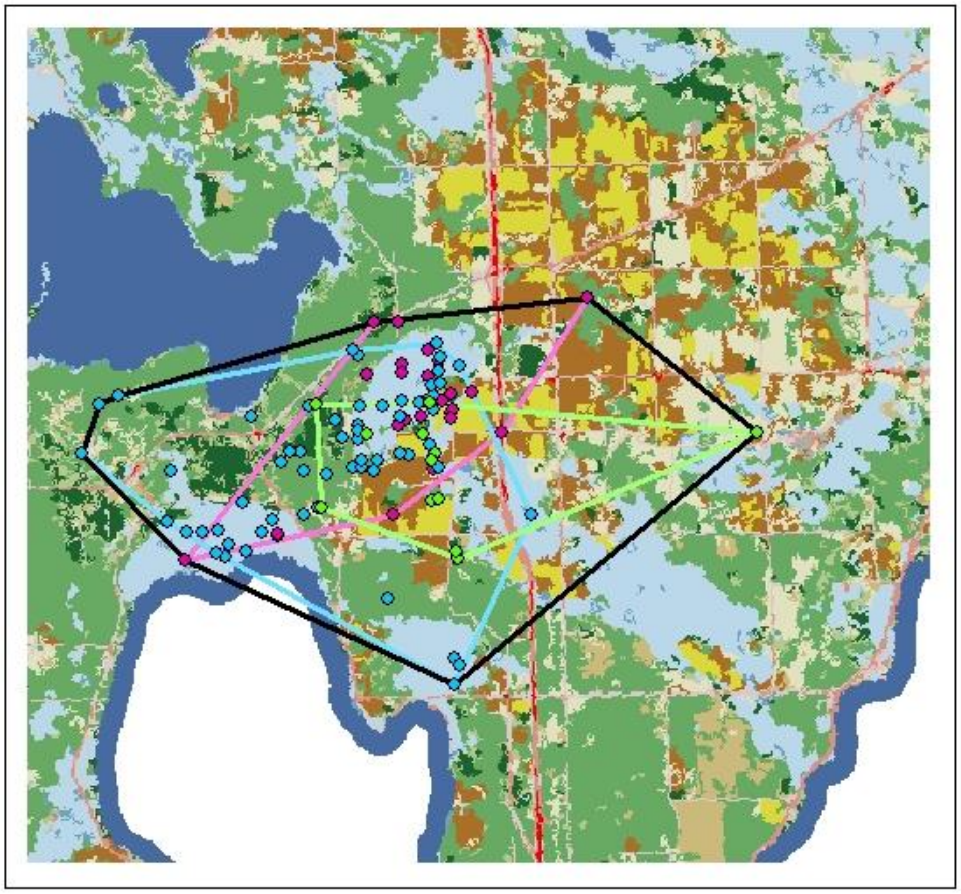


Figure 2 – Relative frequencies of the animal's appearance in each habitat (2010-2014).



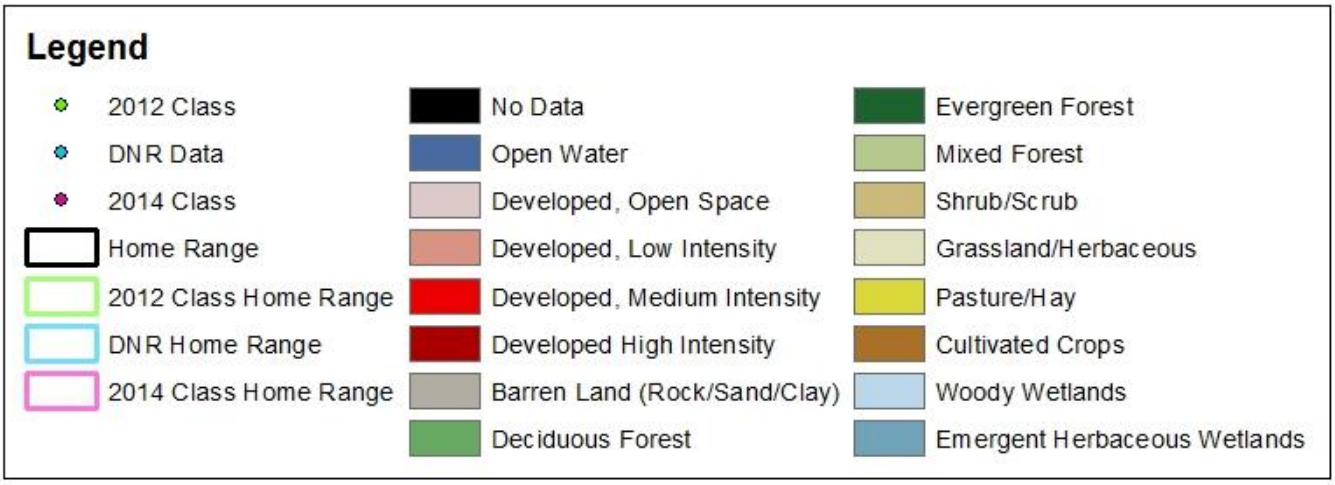


Figure. 3 – Map of coy-wolf's home range area boundaries (Blue = MDNR, Green = UMBS 2012, Pink = UMBS 2014, Black = Total) with a habitat cover-type overlay.

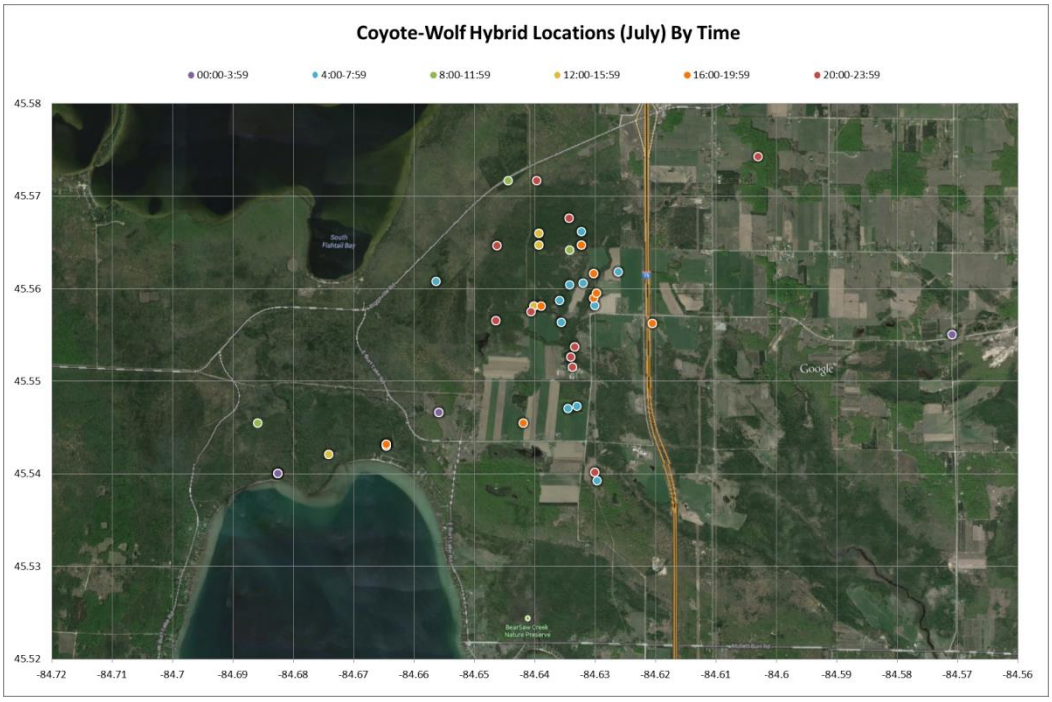


Figure 4 – All locations detected in July by both the DNR and UMBS Field Mammalogy classes 2010-2014, organized by time interval.

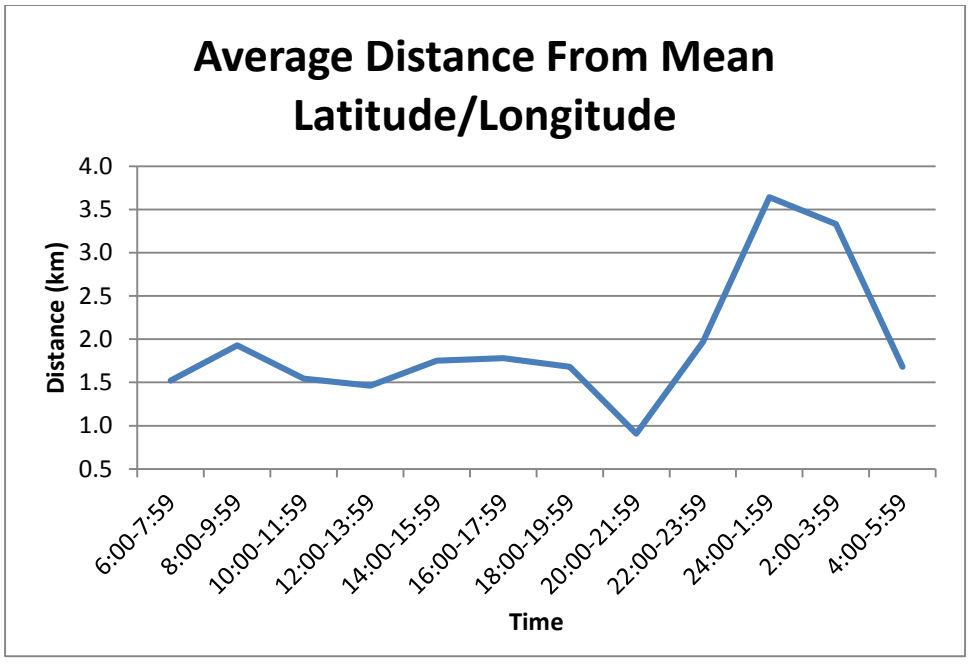


Figure 5 – This shows the average distance from the mean center to all recorded locations in time intervals of 2 hours.