Monitoring of a chimney swift (Chaetura pelagica) roost site in

Dauphin, Manitoba, utilizing a Reconyx game trail camera.

A Report to the

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by

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INTRODUCTION

Chimney swifts (*Chaetura pelagica*) have been reported nesting and roosting in Canada from SE Saskatchewan eastward(1,2) and in the United States from North Dakota eastward(3.4) to the Atlantic coast and southward to the Gulf Coast, SE Texas(2) and Florida(3). As the name suggests, these birds use man-made chimneys(1,2,3,4) for most of their nesting and roosting but traditionally used hollow trees(1,2,4) and cliff crevices(2,4). With an increase in the use of electricity and natural gas, resulting in both the reduction of new large brick chimneys and the removal or adaptation of older brick chimneys to metal lined and capped chimneys, fewer chimneys are available for chimney swift use. Additionally, the increase in pollution and the use of insecticides is affecting the availability of suitable flying insect prey(1,2,3,4) that chimney swifts feed on. There is the possibility that global warming may also be affecting the food supply(5,6,7). The overall effect of one or all of these issues in combination is a significant reduction in chimney swift numbers. As a result, in the spring of 2009, chimney swifts were listed as 'Threatened' under Canada's Species At Risk Act (SARA)(8). Many volunteers in Canada and the USA make observations (monitor) at chimneys used by chimney swifts to assess the number of birds using the chimney and the type of use (nesting or roosting)(9).



Figure 1. Chimney swifts on the wing (<u>http://www.naturemanitoba.ca/CHSW.html</u> photo by Christian Artuso)

The easily recognizable flying silhouette (Figure 1) and the twittering call(1,2,4) of the chimney swift, plus its use of chimneys in populated areas, facilitates detection. However, the swift's normal daytime schedule is not easy to predict. Literature normally says that chimney swifts leave their roost chimney in the morning, fly all day(1,4), then return just before dusk to swirl spectacularly(3,4) around and dive headlong into the chimney for the night(1,3,4). This pattern does not account for seasonal migrations or inclement weather (be it rain or cold) which can alter patterns of use; I personally have observed birds returning to a roosting chimney during the lunch hour in both large and small numbers. It also does not take into account activity in nesting chimneys such as the brooding and feeding of the young(9).

To address some of these issues concerning daytime use would require constant vigilant monitoring of an occupied chimney, from before sunrise until after sunset, for the whole season that a chimney was occupied. Entries and exits are so fast a bird could be in or out while the observer is making notes. Moreover, in the northern parts of the swift's range the days are long and the twilight hours linger making for long observation periods. The intense schedule required for such indepth understanding of an active site would overtax individuals, resulting in the waning of volunteer support.

As new technology is increasing all the time for monitoring different issues, the idea of using a game trail camera to monitor a swift chimney site was put forward by the Manitoba Chimney Swift Initiative (MCSI). In spring 2010, two Reconyx model PM75 RapidFire™ Professional Digital Infrared Cameras were purchased to test the feasibility of their use in monitoring chimney swift roost chimneys. This report details the testing at such a chimney in Dauphin, MB, in May to August, 2010.

METHODS

The Site

The MCSI has supported an annual monitoring program for nesting and roosting chimney swifts since 2007 (<u>http://www.naturemanitoba.ca/CHSW.html</u>). A roost site was identified in Dauphin, MB from literature searches(2) and personal communications with birders. This site had been used by hundreds of swifts,

representing the northern most location of chimney swifts in their summer range(2). It had the highest known density of chimney swifts in the province.

The Dauphin chimney is located at the rear of the three-story Malcolm Block on Dauphin's Main Street west side, #213, built in 1906. At present the main floor, street level rooms are occupied by small businesses fronting onto Main Street. The second and third floors were apartments, but are unoccupied due, in part, to the failure of the heating system boiler in 2002/03. The chimney is totally enclosed within the center rear of the building and then rises to a height of about 2.3 m above the stepped flat roof. Besides the chimney, the roof also has a few small TV antennae, a small satellite dish (attached to the chimney, Figure 2), two large raised skylight windows and a few sewer vent pipes. The roof is higher towards the east (Main Street) and sloped to the back lane rear of the building.

The chimney is made of brick and mortar with a cement cap to shed water. For the first 1.3 m from the roof, the chimney is 99 cm square then reduces to about 97 cm square up another 97 cm to the cap. The cement cap is about 6.5 cm thick and extends out about 9 cm to give a top measurement of 1.14 m square (Figure 3).



Figure 2. The chimney is about 2.3 m tall with a concrete cap and a small change in outside dimensions at about 1.3 m from the roof. A satellite dish is mounted on one side.¹

¹ Unless otherwise indicated all photos are by the author



Figure 3. The central chimney hole is approximately 56 cm square with a flat edge all around it about 31 cm wide.

As an experimental site, the large relatively flat roof is advantageous; walking around required no safety ropes. Although access to the roof could be had by using inner stairways and a ladder, the building was sometimes locked. Alternate access was by lane-side wooden stairs to a second floor landing, then an extension ladder to the roof (fire exit ladders had been removed for security).

The Camera

Various discussions and internet searches were done to try to select a suitable camera for this project. A game trail camera carries its own power supply, is designed to be weather proof, and is relatively user-friendly. It is programmed

using buttons on the camera or pre-programmed onto memory cards using a home computer. The cameras are available with a range of detection options. Most game trail cameras are used by hunters to locate and observe various game species, most of which are medium to large size mammals (deer, bears, elk etc.), so the use of the cameras is not complicated: mount the camera, turn it on, walk away. In the case of our specific study, we needed more than this "point and shoot" type of camera. For our study, MCSI's criteria included:

- fast shutter speed the interval between detection and triggering the shutter;
- good sensitivity the ability to detect smaller targets;
- wide detection zone;
- shortest delay from camera "wakeup" to taking first picture;
- varying image capture per trigger (single, multiple, video, etc.);
- ability to use large memory storage cards;
- ability to take "clear" photos (more pixels) for identification;
- data recording on photograph: date, time, temp., moon phase, etc.;
- long battery life;
- ability to take photos in low light situations without visible flash;
- programmability of the camera for various sampling situations;
- the possibility that the camera had been used to photograph birds already;
- recommendations from other researchers.

With there being various manufacturers with various camera models and the technology changing continually (and our field season quickly approaching), the Reconyx Model PM75 Professional Series digital infrared Camera was selected.

CAMERA SPECIFICATIONS (supplied by Reconyx)	
<text></text>	 PM75 RapidFire Professional Series specifications: (1280x1024) monochrome image sensor; resolution settings 1/3 megapixel & 720p HD widescreen; 1/10 second trigger speed; rapid fire 2+ frames per second; up to 30,000 images on 4GB CF card; InfraRed NiteVision up to 50 foot range; operating temperature -40 to +120F; programmable from laptop or PC with some camera settings; video 1 to 99 images per trigger; 0 to 60 seconds between images; delay settings 0 to 3600 seconds; Time-Lapse virtually any number of seconds, minutes and hours; motion sensor & time-lapse scheduling in 15 minute increments within all 24 hour periods; 6-C-cell alkaline, NiMH or AAs with adapters.

Field Tests

The camera arrived without memory card or batteries. The number of images to be stored is related to the duration of the sampling period which depends on battery life. Reconyx Support was helpful and advised that: regular strength batteries would not last long due to the camera demands; alkaline batteries do not work well close to freezing; NiMH (nickel metal hydride) batteries will lose power in high heat; lithium batteries were recommended. Within the time constraints of the project, suitable lithium batteries were not available and we opted for two sets of rechargeable NiMH batteries and a charger. Batteries were scheduled to be replaced about every 2 weeks so the camera could be loaded with a smaller 2GB card (over 10,000 images).

Mounting the camera needed to facilitate the easy exchange of batteries and memory cards while remaining secure through spring thunderstorms expected. A standard camera tripod mount was inappropriate on both counts and a wood pedestal mount of 2"x6"s, cross-braced across the bottom, was designed. To facilitate aiming the camera up or down, a wooden wedge was made to fit behind the camera to angle it. The back of the camera has pins sticking out to stop it from sliding, so holes were drilled in the wedge to accommodate the pins. The camera came with a bungee cord for affixing it to trees so this was used to hold the camera to the pedestal, which was used for both the bird-feeder trials and roof-top monitoring.

The upper section of the pedestal was extended initially to hold the camera approximately level with the chimney top but was later shortened for time lapse use when the camera was moved further back. Use of the upper section required climbing a step ladder to access the camera to change batteries and memory cards (Figure 4).



Figure 4. Due to the height of the chimney above the roof line, a second folding step ladder was required to view the chimney opening.

Feeder Tests

Initial field tests, prior to the chimney swifts migrating north, monitored back yard bird feeders being used by various species of birds. The objectives were to determine a suitable distance from the chimney to the camera and to assess the ability of the camera to detect targets.

Test 1: The camera was mounted facing the feeders that varied in distance of 2 to 6 meters from the camera and motion detection set at HIGH

sensitivity. The next morning only 2 images had been recorded, both of the person removing the card. There were no images of birds.

Test 2: The camera sensitivity was next set at VERY HIGH and the camera moved closer to the main feeder: 1.4 meters from the closest edge and 2.0 meters from the furthest edge, and left for half a day. Relative to the size of a chimney swift, the feeder was used by the smaller pine siskin (*Spinus pinus*), the larger common grackle (*Quiscalus quiscula*) as well as a grey squirrel (*Sciurus carolinensis*). There were photos of both bird species and the squirrel (Figure 5). Most images showed birds already sitting on the feeder, not flying to or from it; most images of smaller birds were of two or more at a time; and there were many squirrel images compared to bird images.



Figure 5. Feeder trials. (a) Grackles on feeder (b) squirrel and grackle on the feeder and a flying grackle.

Test 3: The camera was moved back to about 3 meters and angled towards a flight path in hopes of catching birds flying towards the feeder. The next day the memory card again showed no images.

From these tests we determined that the camera would likely have to be set up around 2 meters from a chimney to have any hope of detecting a swift flying in or out. It was noted that the chimney swift does not sit on the chimney rim but flies in and out of the chimney opening whereas birds we recorded were sitting.

Roof-top Set-up

In early May it became important to install the camera at the site before chimney swifts arrived. Several species of insectivorous birds had migrated back to the chimney area, but swifts had not yet been sighted locally or in the southern portions of the province at other roosts or nesting chimneys. Permission was gained from the building owner and his manager to access the roof from the back lane using an extension ladder set up on a second floor balcony to the roof.

Materials carried or hauled to the roof top included: the wood pedestal parts; four filled sandbags; extra boards; chain and cables. The pedestal was assembled on the roof and the base weighted with sand bags. To avoid flyways, guy wires were fastened below the top of the chimney and camera to roof vent stacks, eaves-trough securing spikes, and a satellite dish mount, and secured with cable clamps. The wooden wedge was placed behind the camera, tilting it slightly downward towards the top of the chimney (so it would be in the image for

reference) and the camera was held in place with its bungee. Boards were put under the corners of the base to prevent any wobble that might have given the camera false readings of movement. Chains and padlocks secured the camera to the satellite dish mount (Figure 6a).



Figure 6. Camera on pedestal (a) chained to the dish-mount and (b) supported with guy-wires and sand bags. The camera is oriented to be shaded by the mast and to avoid facing the sun.

The chimney opening was within the 2 meter detection range calculated during the field test. The camera was oriented to avoid facing the rising and setting sun. It was placed on the north side of the pedestal in the shade of the mast to keep the camera (batteries) cooler (Figure 6b). Also, past observations of chimney swifts circling this chimney indicated they flew more to the north so the pedestal was located south of the chimney. Observations over several years indicated the chimney swifts normally flew in from foraging to the west of town or along the river just before dusk. Once in the vicinity of the chimney they would circle it (Figure 7) clockwise, sometimes for 10 minutes or more, with the chimney in about the 4 or 5 o'clock position. Because the chimney was at the back edge of the roof, mounting the camera from the 7 to 11 o'clock position was not possible. It was decided that mounting the camera beyond the 4 to 5 o'clock position would be outside the bird's normal flight path and pose less of a flight disturbance.

Detection Modes

Motion Sensing Mode - The purpose of the study was to record when chimney swifts entered and exited the chimney. The most obvious method of doing this was with the camera set to detect this motion. Based on the field tests, the sensitivity was set at VERY HIGH with the camera programmed to take a 3 photo burst with the shortest possible interval between photos and a minimal 1 second delay before rearming for the next detection. This program should provide photos of multiple birds entering and might record details not noted from ground observation (body alignment, wing sweep, angle of entrance, central of chimney opening or more to one side, etc.). The camera angle was set to primarily detect birds going down the chimney, not those that typically circled the chimney, to keep entry/exit data simpler and not fill the memory card with fly-pasts.



Figure 7. Chimney swifts circling the chimney, 29 July 2010, 2140 h. The 'T' in the upper boarder indicates this photo was taken in time lapse mode. Ambient temperature is in upper right.

Roof-top installation was complete on May 14th (Figure 8). On May 15th migrating chimney swifts were reported arriving at St. Adolphe and on May 17th the first swifts were reported going down the Dauphin chimney. The camera set-up did not seem to disturb the birds.



Figure 8. Motion sensing installation 2, 14 May 2010.

On June 7th the batteries and memory card were replaced. The new memory card was pre-programmed from a home computer to take only 1 photo per activation with 2 seconds between activations. The memory card that was removed from the camera contained 72 photos and the camera showed the batteries as reading at 75% charged.

On July13th, it was noted that the camera and mount had been moved on the roof by an unknown person. The roof was accessed and the camera reinstalled

farther from the chimney (8 meters) with the stand shortened and the wood wedge changed so that the camera faced more upwards. Due to poor motion detecting results, the replacement memory card was programmed to switch the camera into time lapse mode. The memory card that was removed had 660 photos. Moisture had entered the camera and the lens was foggy so the desiccant bag in the camera was removed for drying.

Time Lapse Mode - This option was used to take photos during a set time frame to see if chimney swifts could be detected with any amount of regularity flying in the vicinity of the chimney (Figure 9). The only reliable time that chimney swifts are known to be in the vicinity of their chimney is around sunrise and sunset. We programmed the camera to record 15-30 minutes before, and after, sunrise and sunset as determined by standard tables. It was set to record one photo every 5 seconds during these times. The camera was also programmed to take motion activated individual photos, as before, between time lapse programs.

Time lapse mode collects many images, filling memory and draining batteries, so visits to the camera were made more frequently. Also, with the daily change of sunrise and sunset times as the season progressed, the memory card/camera had to be reprogrammed more often to stay synchronized with sunrise/sunset and swifts using the chimney. Time lapse mode started on July 13th and the card was changed on July 18th when the desiccant bag was replaced. The camera indicated it was down to about 50% battery power and that 5,410 photos had

been taken. Since this value exceeded the time lapse sum it indicated both time lapse and motion detected photos had been taken.



Figure 9. Time lapse installation 1.

RESULTS

Motion Sensing

In the roof-top trial from 14 May to 7 June 2010, the camera recorded 3 photos per activation for a total of 72 photos. There were: 3 of a chipping sparrow

unidentified boy on the roof; and 1 with no obvious trigger. In this period, ground observers reported seeing chimney swifts enter the chimney: May 17^{th} - (2); May 26^{th} - (3); May 29^{th} - (40+); May 30^{th} - (70).



Figure 10. Pigeons on chimney recorded on motion sensing mode, 15 May 2010, 1406 h. 'M' and '3/3' in the upper border indicate motion sensing mode and the third of three images, respectively.

In the next trial period, 7 June to 13 July 2010, the camera recorded 1 photo per activation with a 2 second delay between activations; 660 photos were taken.

There were: 2 photos with swifts (Figure 11); 2 of great horned owl (*Budo virginianus,* Figure 12); 1 house sparrow (*Passer domesticus*); 4 of common crow (*Corvus brachyrhynchos*); 645 of pigeons; and 6 when taking down the camera. For the same period, ground observers reported seeing chimney swifts enter the chimney: June 12th - (17); June 24th - (9).



Figure 11. A chimney swift is apparently in the mouth of the chimney, captured in motion sensing mode, 9 June 2010, 0717 h.



Figure 12. Great Horned Owl, photographed on motion sensing mode, 13 June 2010, 0143 h.

Time Lapse

It was found that the camera photo numbering sequence only went up to 9999. The camera started with File #100 and put in 9999 photos, then it started file #101 and put in another 9999 photos and then created File #102 etc. This would mean that for later identification of individual photos they would require some file number, photo number and possibly the date to differentiate trial periods, each time a new memory card was put into the camera it started at #0001.

Photo counts (see Figure 13) were:

- 13 to 18 July 2010 Dphn CHSW 01 ~5,410 photos
- 18 to 28 July 2010 Dphn CHSW 02 ~10,824 photos
- 28 July to 5 August 2010 Dphn CHSW 03 ~10,110 photos
- 5 to 12 August 2010 Dphn CHSW 04 ~10,110 photos
- 12 to 19 August 2010 Dphn CHSW 05 ~23,800 photos

Although approximately 60,254 photos were taken during these time lapse periods, only a small percentage show a chimney swift visible someplace on the photo. Most were of the unmoving chimney with a changing sky behind it.

Ground Observation Chimney Swift Entry Results during the time lapse period: July 15^{th} - (6); July 25^{th} - (18 to 19); August 5^{th} - (38); August 6^{th} - (42); August 11^{th} - (37); August 17^{th} - (2); August 18^{th} - (1).



(c)

(d)

Figure 13. Chimney swifts captured in time lapse mode (a) 18 July 2010, 2207 h (b) 5 August 2010, 2124 h (c) 6 August 2010, 2131 h and (d) 16 August 2010 1223 h.

DISCUSSION

Motion Sensing Mode

Feeder Trials - The results from our first use of the game trail camera for birds using bird feeders were not what we expected. The camera was set in its default mode (Trigger Sensitivity - HIGH; pictures per trigger 3; picture interval 1 second; Quiet Period - NO) and although various bird species had been observed using the feeders, there were no bird images captured. As this was the first time use for the camera, it was encouraging to see that some photos had been taken and the camera was aimed appropriately towards the feeders. The only camera adjustment that could be made was to change the sensitivity to VERY HIGH, the most sensitive setting for the camera.

The results of the second test were much more encouraging (Figure 5). There were photos of birds whose overall size was both smaller and larger than chimney swifts, so we had bracketed the target size of swifts. However, most photos were of birds that were already sitting in the feeder; photos of smaller birds had more than one bird in them; and there were more photos of the squirrel than of birds. Why had we not recorded birds flying? Were flying birds too fast to be detected(1,2)? Were they flying outside of the detection zone(s) of the camera? Was it possible that the bird feathers were better insulators and hid the body heat from the camera until they had been sitting for a while in the detection zone? Was it possible that in flight, the body heat was stripped off the feathers making the birds the same temperature as the air around them until they had been sitting on the feeder for a while and warmed up? We had some photos that did not appear

to have any birds in them but when comparing these to other photos, a blur could be seen near the edge of the photo: was this a bird? Was it entering or leaving the area?

Setting up for a third feeder test, there were no other camera setting adjustments that we could find that would increase the likelihood of detecting more birds. The camera was moved back a little further to widen the field of view in hope it would be triggered by birds flying in or leaving the feeder. The camera angle was moved such that it covered less of the feeder and more of the approach flight path. There were no photos taken of any birds. At this time, the spring weather had changed to more like winter with cold and snow mixed with rain. The rain on the camera's detector could be obscuring detections and may be giving false detections and thus photos with no birds.

Various emails were exchanged with other researchers and Reconyx support staff to try to answer the questions generated by our tests. It was found that Reconyx had another camera faceplate which they called more sensitive but, they did not seem to clarify how this was done. The date when the chimney swifts were expected to return was close, requiring the camera at the chimney, so the delay in purchasing and shipping made acquiring this new faceplate not an option. Another support worker suggested turning the camera sideways but this option did not seem viable in that we were trying to monitor birds that could approach from any angle and this would reduce the detection direction. Also the weather

resistance of the camera could be jeopardized. The only solution we had was to mount the camera closer again to see if chimney swifts would trigger it.

Discussions about the possibility of getting photos of chimney swifts included consideration of the speed of the swift compared to the speed the camera, which detects and then takes a photo. At issue was how far the swift might have flown during that detection/photo time. The camera manual says the trigger speed is $1/10^{th}$ of a second and it shows the camera detection zone as being 40 degrees left to right. No vertical angle was given. Positioning the camera with the chimney opening in the middle of the field of view reduces the camera's ability to photograph by ½ the field of view. Since the bird might not be coming in absolutely 90 degrees to the lens (it could come from behind and above or facing or at an upward angle) the possibility of detection is reduced even more. We were not able to find actual speeds of swifts for further calculations.

We then had to consider the size of the swift compared the size of an object which could be detected by the camera. Close to the chimney, the swift appears larger and so it is easier to detect, but the field of view is so small that it is possible for the bird to be outside the field of view. Positioned back farther, the field of view is larger but the detection field is made smaller and the bird is smaller so it might not be seen.

Roof-top - When we installed the camera on the roof and aimed at the chimney to record swifts, it was hoped to get sightings of birds leaving in the morning and

returning at night. The camera was mounted slightly above the chimney cap line and angled down towards the chimney so that only birds in the chimney mouth would be recorded. Part of the chimney was included in the photo as a reference, reducing the detection area. Also, on leaving the chimney in the morning, the birds might dive down from the chimney to gain air speed and fly out of the detection zone. With the camera set up and recording, there were some ground observations done to ensure that the swifts were still using the chimney. This was done to confirm the birds had not moved to another chimney, which would have forced us to remove the camera. Thankfully this did not occur.

The first roof-top series captured images, however, there was a preponderance of pigeon photos. On the positive side, we were able to determine that the camera was active all day long and was recording photos of birds, but small birds only if they were sitting on the rim of the chimney.

The sampling period was going to be longer before replacing the memory card, so instead of being set at burst mode and taking 3 photos, the setting was changed to take only 1 photo with a 2 second delay before taking the next photo to extend the recording time to over a month. During this period it was hoped that further options could be explored in order to record chimney swifts. In the back of everyone's mind was the possibility of trying the camera in time lapse mode in the hope of getting something of use. On 13 July 2010, after ground observers could not see the camera on the roof, the camera was found on the roof, with the safety chain still padlocked and on the stand, but lying on its side near the chimney. Reinstalling the camera was taken as an opportunity to set it up in time lapse mode. The camera lens was fogged due to moisture inside the camera so the desiccant bag was dried out and reinstalled. This incident suggested that if the camera had been mounted sideways, moisture would have entered the camera.

The second set of motion activated detections were again a majority of pigeon photos, a few crow shots and some night-time owl photos. There was also a morning photo that showed at least one swift in the mouth of the chimney (Figure 11). Questions now arise: How do you tell from a still photo if a swift is going in or coming out of a chimney? Why did we get this photo and no others?

Six months after our tests had been completed, I received an image from Reconyx that we took of the chimney (with the camera set up approximately 2 meters from the back of the opening) overlaid with the detection zones as seen by the camera (Figure 14).



Figure 14. Chimney top with Reconyx detection zones super-imposed on chimney and chimney swift (see Figure 11).

This image shows the camera detection area was divided horizontally into two bands with a non-detecting zone in between. The bands were divided into 6 detection zones. Based on this image, the total area of the detection zones represented only 23% of the whole photo image. Since the chimney opening was in the middle non-detection zone, it effectively removed the lower detection zone leaving only 14% of the image where the birds would be detected. Further information on how the camera detects motion from Reconyx emails is that: it "detects motion as a differential to the ambient temperature"; "the colder it is outside, the better the camera will detect smaller heat signatures"; "a warm object has to cross from one zone to the other"; "if a swift came in directly toward the camera and didn't cross a motion zone the camera will not trigger"; "it is going to be difficult to trigger the camera because of the fact there is heat coming out of the chimney. The small bird will essentially 'match' the chimney temperature".

We had deduced some of these facts during our tests, however one of the main points was that the bird had to cross between two of the zones to be seen. The chimney opening we were targeting was covered by only 3 1/2 of a possible 12 zones and if the bird came straight down with wings folded slightly, it could easily fit into one zone and not be seen. The morning photo with the zones overlaid has a swift in zone 4 & 5 (Figure 14), thus it was "seen", if the swift was a little further forward, it would have been only in zone 4 and not "seen".

The different photos we did get of swifts entering the chimney suggested that the camera needs to be aimed just over the top of the chimney in general as the swifts appear to commit to entering some distance away (Figure 13c). Coming out of the chimney, however, the swifts seem to just clear the top of the chimney before diving away (Figure 13d). This would mean the bottom detection zone would need to be very close to the top of the chimney and the main exit flyway would have to be obvious. Otherwise, birds that fly directly away from the camera

might get missed because they have a low profile and are only briefly above the line of the chimney (Figure 15).



Figure 15. Chimney swift making a low flying exit, 13 August 2010, 1112 h.

Time Lapse Mode

The time lapse mode was used to determine if there was a better chance of recording chimney swift's use of a chimney by taking photos during the times when swifts, traditionally, would be flying about the chimney. In time lapse mode, the camera can be set to take photos during any 15 minute period of the day by turning it on or off in the program. Photos can then be taken at any time interval

during that period. We mostly used 5-6 second intervals. During the Off times for time lapse, the camera was programmed to take motion sensed photos, set for one exposure per activation.

One of the complicating things about doing this type of monitoring is that in our hemisphere, we have seasonally varying sunrise and sunsets times. Through the summer there is increasing daylight until mid-June and then daylight decreases for the rest of the season. During the period of our time lapse mode monitoring, the week of July 13th, the sunset changed 7 minutes per week and by the end, August 19th, by over 10 minutes per week. As the season progressed, the programmed period was no longer ideal to record chimney swifts entering their chimney around dusk. Allowing for changing sunset by adding more time for recording sacrifices how long the memory card will last. We chose to access the camera more often to reset the times. Decreasing temperatures might also affect battery life.

Weather is also an issue as it influences chimney swift behaviour. If it is too cold, the birds might not come out of the chimney until it warms up. If it is rainy, they might enter earlier, even at mid-day. If the weather goes from bad to good to bad, the birds will be going in and out all day, but the camera records events only at pre-set times. If birds come out late and go down early in the late summer you might miss them and maybe think they have migrated, so there is still the need for ground observations and spot-checks. Weather may also play a role in the availability of food; if no food is flying, the swifts might not go out or might return earlier.

Time lapse mode generated a great many photos to be examined. At one photo every 6 seconds, 10 images are recorded every minute. Recording each morning and evening for 30 minutes yields 600 photos for one day. Each of these photos needs to be examined carefully to see if there are any birds present. If there are birds you then have to decide what species they are. Sitting on the ground observing the Dauphin chimney, we see pigeons, sparrows, black birds, gulls, small hawks, ducks and chimney swifts flying past. The camera on the roof probably records more species, both close and further away. There is also the possibility that there will be several different species in any one photo (which would apply to motion detection images also) (Figure 16).

A disadvantage of time lapse mode is "what happened between photos"? You will be losing data between exposures so calculating accurate numbers of chimney swifts at a roost will not be possible. What you can get, however, especially with the camera moved further back from the chimney, is evening photos of the swifts as they congregate before going down to roost. Ground observers record only those birds entering or leaving the chimney. However, time lapse photos show what is flying about (Figure 7) and may be using another chimney you do not know about. Comparing chimney entries to observed birds flying will provide differing counts showing these possibilities (Figure 7).



Figure 16 (this and next page). Perspective can make species identification difficult especially if more than one bird species is present. (a) pigeons passing in the distance, time lapse mode, 19 August 2010, 1014 h.



16 (b) passing bird flock, time lapse mode, 13 August 2010, 0818 h.

Morning recordings might be considered differently than evening records. In the evening, the birds seem to gather at a roost and like to "chitter-chatter" back and forth, circling round and round for minutes. Birds leaving in the morning are hungry and want to get out to feed so there is only one quick chance at seeing any particular bird leave. Obviously, the more swifts that leave the better the

chance that one might be caught in a photo. Mornings are probably a time when the least amount of information is known about swifts leaving a chimney. During the last time lapse mode, an effort was made to photograph swifts leaving the chimney. Photos were taken from 0630 until 1230 h. What became obvious was that the swifts did not always leave the chimney at first light. Some swifts were leaving the chimney between 1000 and 1200 h. Why might this happen: cooler outside temperature; rainy or windy; no flying insects available?

Another observation made about the camera and the time lapse photos was that the camera seems to have an internal sensor that changes the camera "f" stop or shutter speed as the available light changed. Doing this will alter the depth of field for the photos, hence the clarity of the photos (example: a moving object will start to blur as exposure time increases) making identification harder.

CONCLUSIONS

It is possible to detect chimney swift use of a chimney using a game trail camera. At this time, however, the number and type of images available from such a setup do not appear to be of use in determining seasonal migration dates, population fluctuations, daily exit and entry timings, brooding and young rearing activities nor any other studies requiring exacting numbers. Ground observers can still provide more quantitative and qualitative data and observations. Future testing of this camera will lead to a better understanding of this type of camera and its applications. New cameras will include advances in technology that are, even now, reducing the size of the cameras and adding more options to give appropriate results for what is being studied. As the use of this type of camera increases both by the public and in research, manufacturers will be encouraged to fill the demands for this market. Within a few years, studies like ours should be re-evaluated in light of these advances.

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