



# Using Radio Frequency Identification (RFID) Technology to Study the Nesting Behaviour of Tree Swallows

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## Introduction



Tree swallows are familiar birds in coastal British Columbia, but their abundance has declined in the last 40 years due to unknown causes. Since they readily accept nest boxes, tree swallows are ideal candidate species for the use

of radio frequency identification technology. This allows the unique identification of individuals and automatic recording of visits to a nest box. The main objective of this project was to develop RFID capability to study the nesting behaviour of tree swallows at Colony Farm Regional Park in Coquitlam, B.C.

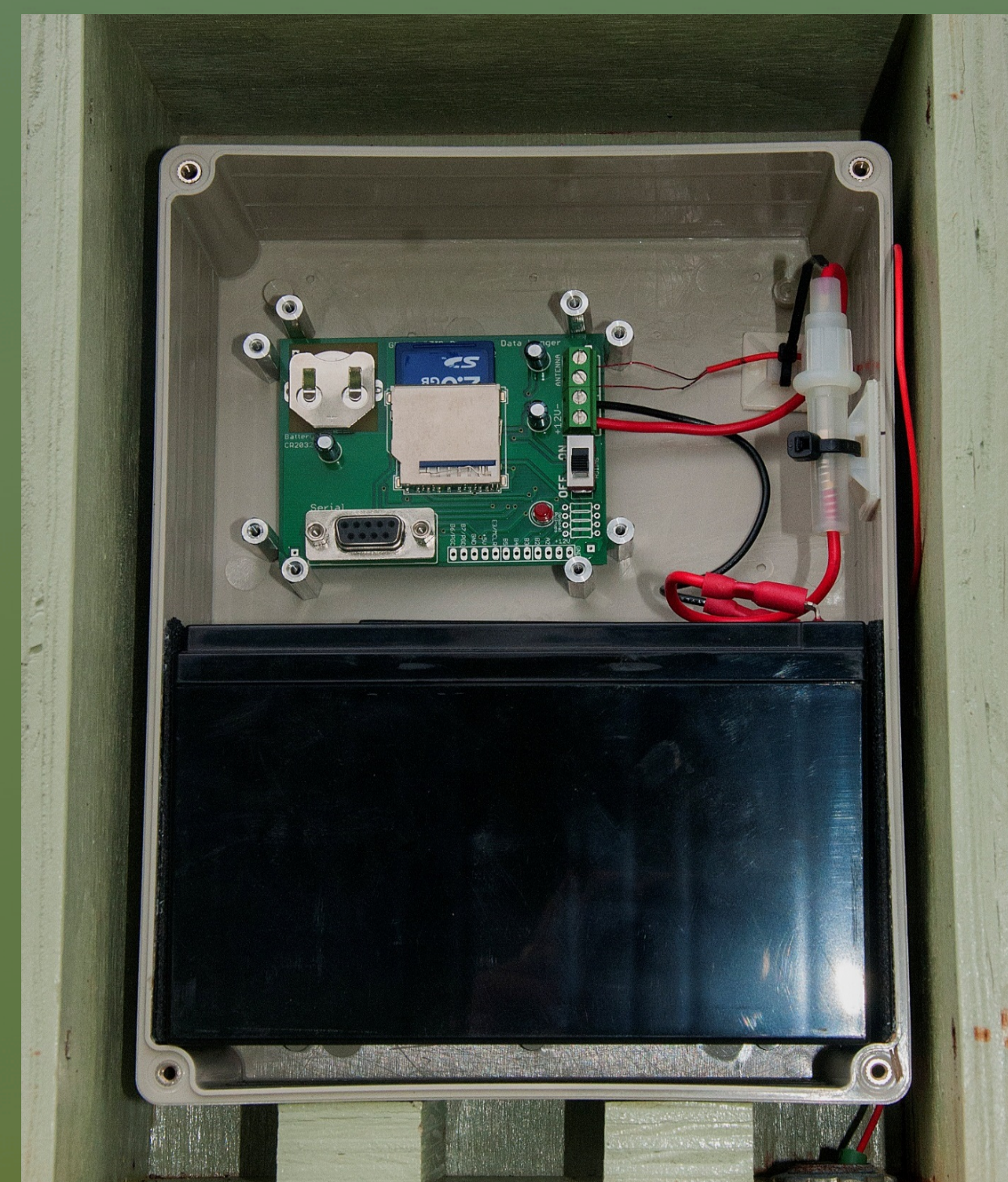
## The Technology

The RFID system (**Fig. 1** and **2**) has three components:

1. A scanning antenna incorporated in the entrance of the nest box.
2. A passive integrated transponder (PIT) tag, weighing less than 0.1 gram, glued onto the back of the bird between the wings (**Fig. 3**).
3. A transceiver with a battery and an RFID circuit board, with a memory card, to decode the data transmitted by the PIT tag and save the data.



**Figure 1.** Nest box 12, of which the entrance is wired to the RFID system mounted to the back of the post.



**Figure 2.** RFID circuit board, memory card, and battery of the RFID system.

When a tagged bird enters the nest box, through the antenna, the PIT tag transmits a unique ID number. The identity of the bird is then recorded by the transceiver along with the date and time. This allows for data to be recorded each time the bird enters or exits the nest box.



**Figure 3.** A PIT tag fixed to the back of a tree swallow.

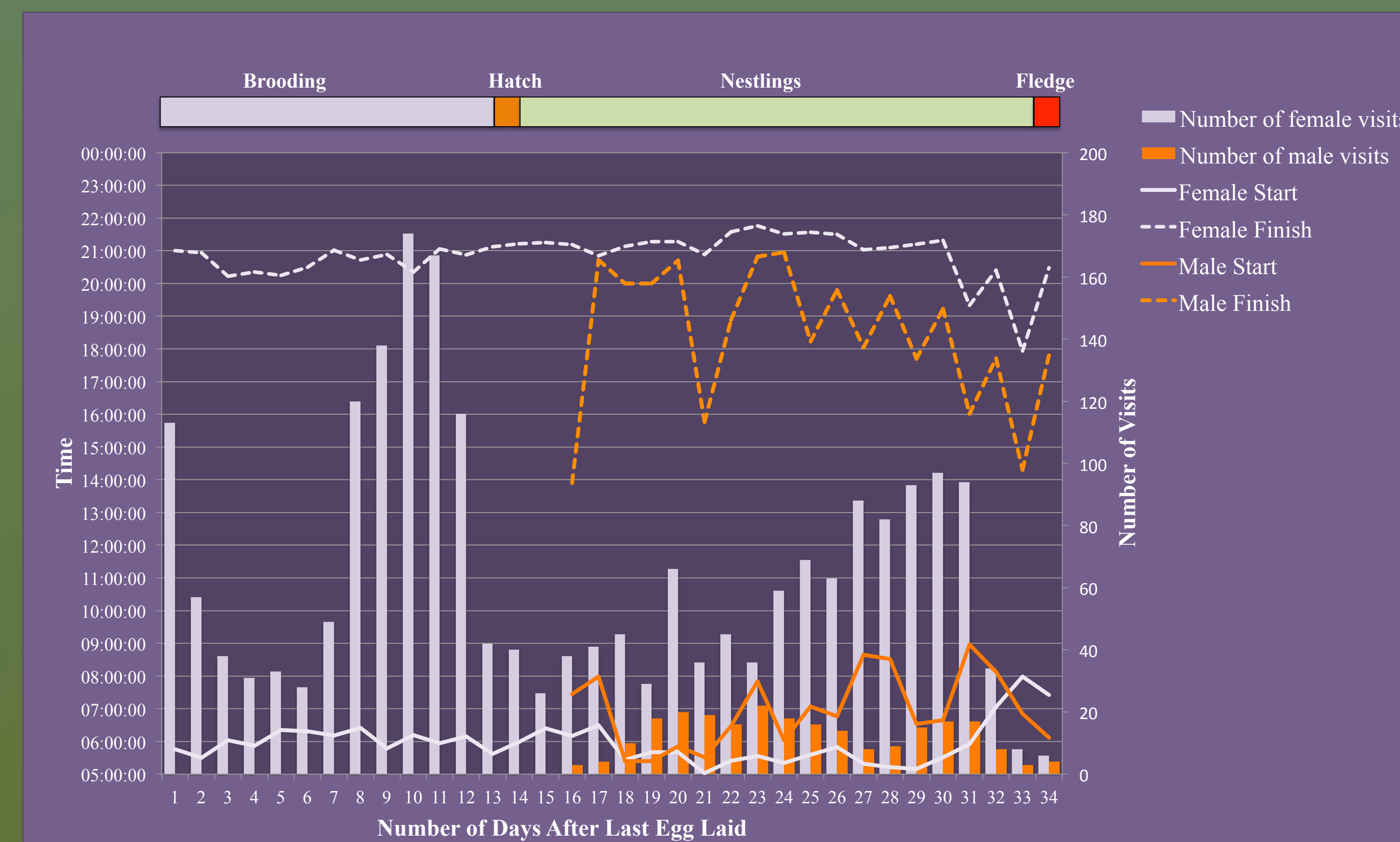
## Results

### Nesting Success

- Six out of ten nest boxes were used for nesting by tree swallows.
- Nestlings from four of the six nests successfully fledged.
- The male from nest box 8 also successfully reared a brood in box 9. Other tagged swallows also occasionally visited box 8.

### Female vs. Male Activity

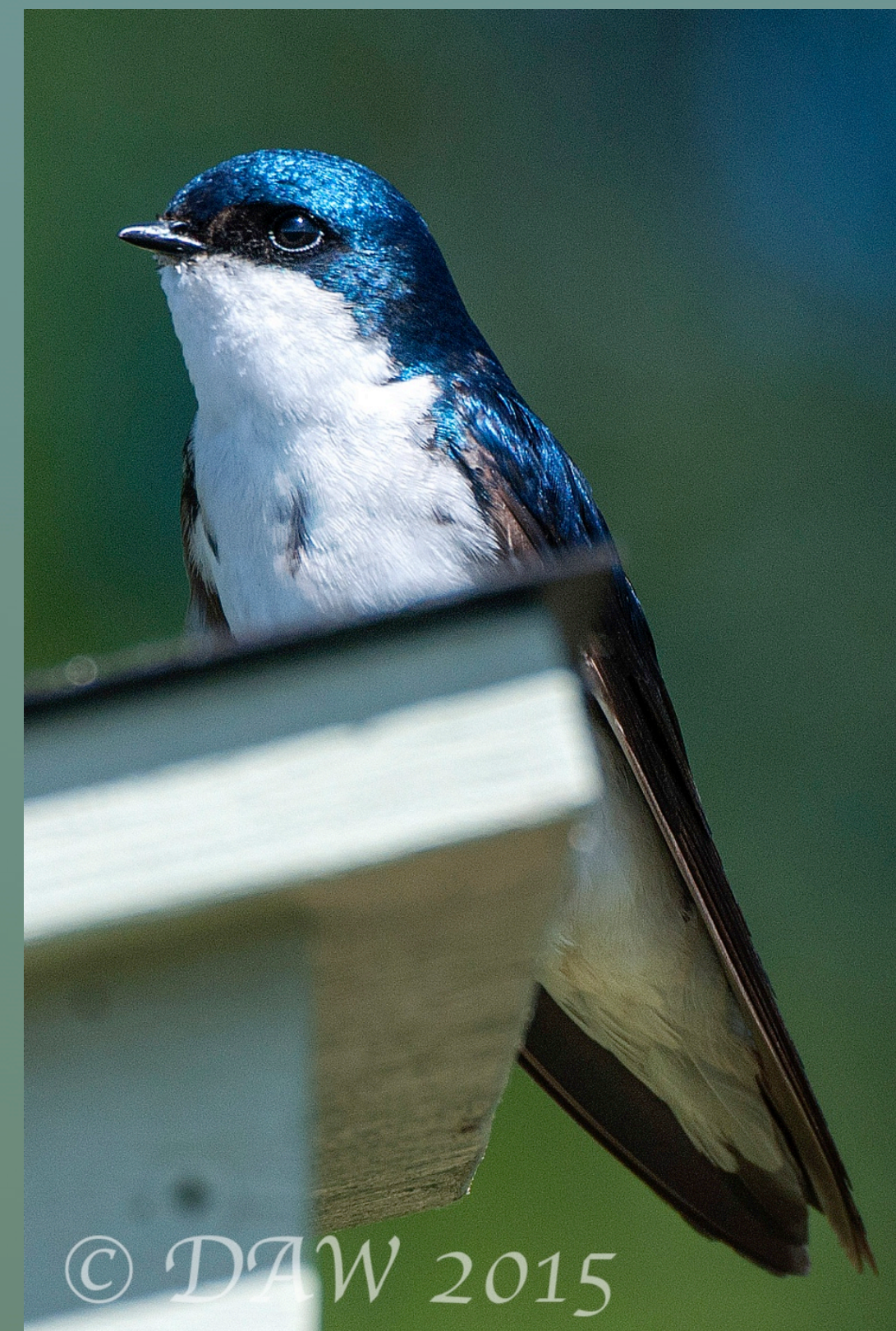
- Nest box 8 yielded the most complete set of data (**Fig. 4**).
- The female tree swallow visited the nest box many more times than the male between the day after the last egg was laid and when the nestlings fledged.
- Number of female visits decreased just before the eggs hatched, when more time was spent in the nest box brooding.
- Number of female visits increased as the chicks grew and required more feeding.
- Female start time became later and end time became earlier and the number of visits to the box dropped dramatically just before fledging, presumably to encourage fledging by the chicks.



**Figure 4:** Start and finish times of female and male activity and number of visits to nest box 8 each day after eggs were laid until fledging.

## Challenges

- Finding the best position on the bird to fix the PIT tag in order to prevent loss of tags.
- Missing data due to missed readings of tagged birds entering or exiting nest boxes.
- Capturing swallows, especially males, to apply tags.
- Multiple readings within short time intervals if the tag was in close proximity to scanning antenna, likely occurring when swallows were perched on the entrance looking into the nest boxes.



## Further Research

Continuing to study tree swallow nesting behaviour at Colony Farm Regional Park in future years provides an opportunity to improve research methods. Increasing the number of available nest boxes in the Park and catching male and female tree swallows earlier in the breeding season, will allow more data to be obtained. By manually recording each time a bird enters and exits the nest box to cross-check data recorded by the data-logger, the interval at which the scanning antenna scans for the presence of PIT tags can be adjusted, eliminating multiple recordings before the swallow has exited the nest box.



RFID technology can be applied to further ecological and conservation research. Breeding success can be studied in relation to weather and climate, parasite load, and aerial insect abundance. RFID can be used in conjunction with geolocators to follow migration. It can also be used to study the nesting behaviour of other bird species that readily accept nest boxes, such as chickadees.