

Unexpected perspectives on ICT redundancy.

-Linking it to fields other than ICT-

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PROBLEM

They say ICT is evolving, but I seem to have been abandoned by God. They say fibre-optic lines are fast, but in reality they are not that fast. If you don't call this a problem, what do you call it? This is not a problem. It is preferable to get right down to business. Look at the graph on the right, the blue line. The maximum transmission speed should have evolved according to this line, but now I am on the ground. The red dot there is me. That is that the speed of the recording device has never once been surpassed by the communication speed or the USB standard. It would be better to have the birds transmit the data to me and server. Yes, a bird. It exists in the world as the IP over Avian Carriers (IPoAC) standard. This is and is not a joke. For example, if I send a video from my house to school, if it is around 3GB, it is faster to take the HDD directly. But this is a result backed up by public transport. If we could send data unconditionally without it, we would be so happy. Birds would be able to do that. The sooner the better. Fortunately, God hasn't given up on me. One of my National School classmates was a swallow researcher called Mr Ogisu. I was enlightened by him that the swallow was on the verge of extinction. My God, the problem he is facing is much bigger than the problem I am facing. I was then informed that ICT redundancy is biodiversity. So our problem is the analysis of the swallow.

ABSTRACT

The discovery of a colony of Barn Swallows (*Hirundo rustica*) in a restaurant area in Ikoma City, Nara Prefecture, led to the observation of Barn Swallows parenting in the area for seven years, from 2018 to 2024. In this study, we observed Barn Swallows from the day the chicks hatched to the day the last chick left the nest each year during the parenting period, and clarified the different roles of males and females in raising Barn Swallows, as well as changes in parent bird behavior depending on the timing of parenting. Furthermore, from 2022, we investigated the differences in the feeding content of Barn Swallows depending on the timing of parental care. As part of this study, DNA analysis of chick droppings was conducted from 2023 to elucidate the parent birds' feeding behavior to their chicks in detail.

METHODS

We observed Barn swallows raising their young at "Green Hill Ikoma" in Motomachi 1-chome, Ikoma City, Nara prefecture. Prefecture, for six years from 2018 to 2024. Green Hill Ikoma is a four-story-building with one basement floor that serves as a connecting passageway between Ikoma Station and Torii-mae Station (the first station on the Ikoma Cable Line). The third floor of the building is a restaurant area, where many swallows have been raising their young every year for 40 years since its completion in 1982. Located at the foot of Mt. Ikoma, the building is surrounded by forests and parks that provide habitats for insects that feed the chicks. As of 2023, 22 Barn swallow nests, including unused ones, exist in the restaurant area on the third floor (Figure 1). Because the grill shutters (open shutters lined with pipes) close after the restaurants close at 23:00 (24:00 until FY 2019, before the spread of coronavirus infection), crows and cats, natural enemies of swallow chicks, are unable to enter. In addition, restaurant workers and cleaners are warmly watching over the swallows' nests, including passersby, by setting up feces' receptacles for the swallows' nests and posting signs. The shutters open at 6:30 am. Even after the shutters are closed, swallows can enter the building through the gaps (Figures 1 and 2). The central part of the building has a stairwell, which Barn swallows can enter and exit throughout the day, but crows and other birds larger than Barn swallows cannot pass through.

OBSERVATION LOCATION

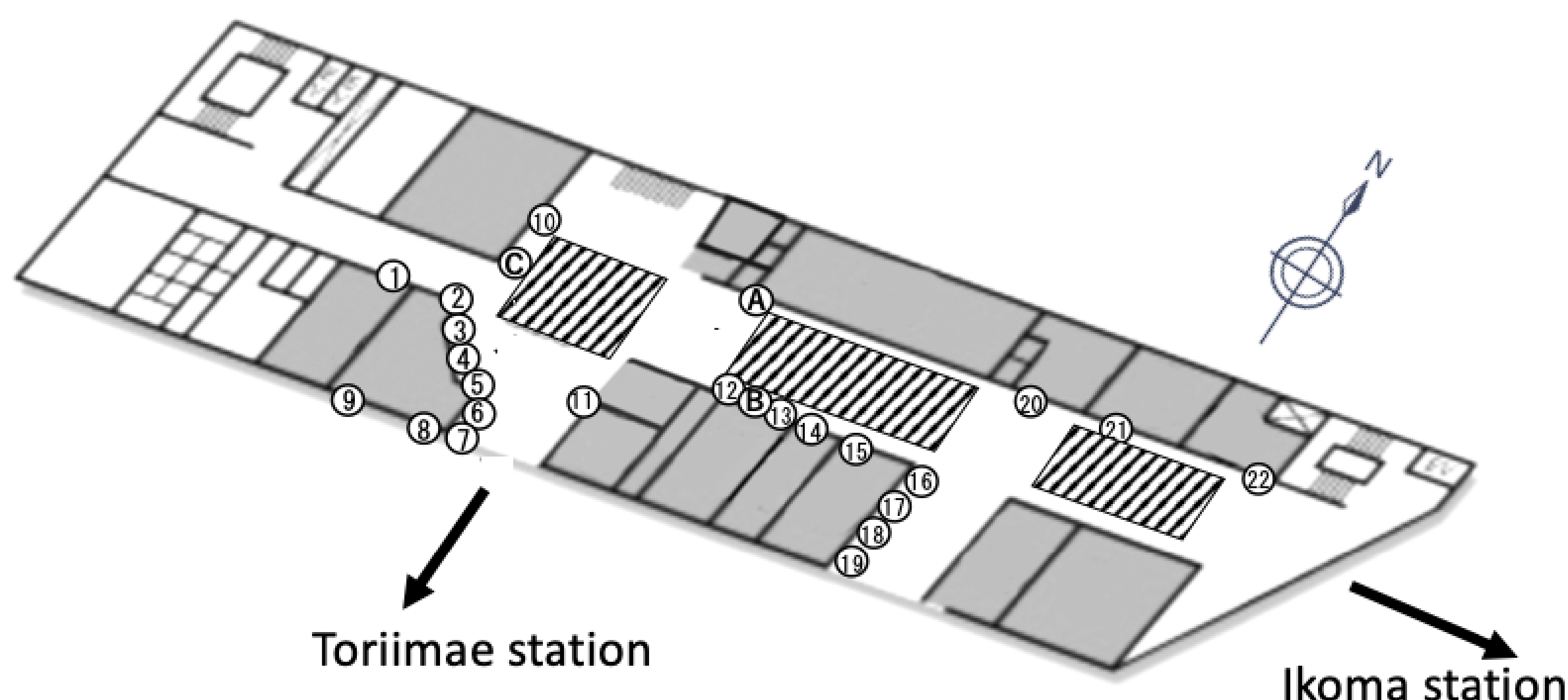


Figure 1: Green Hill Ikoma Floor Plan 2024 (3rd floor).

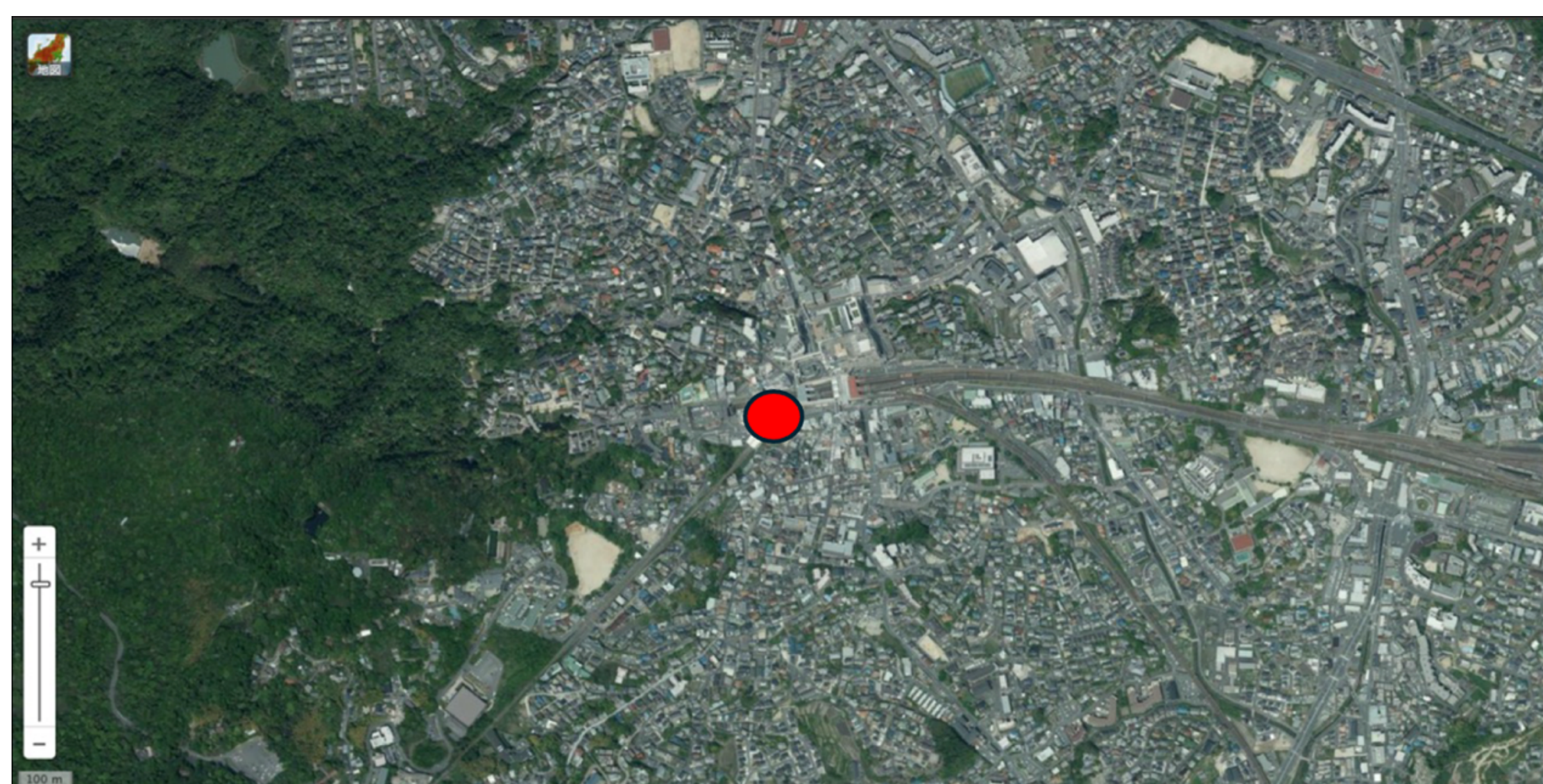


Figure 2: Surroundings (Red dot indicates Green Hill Ikoma)

OBSERVATION RESULT

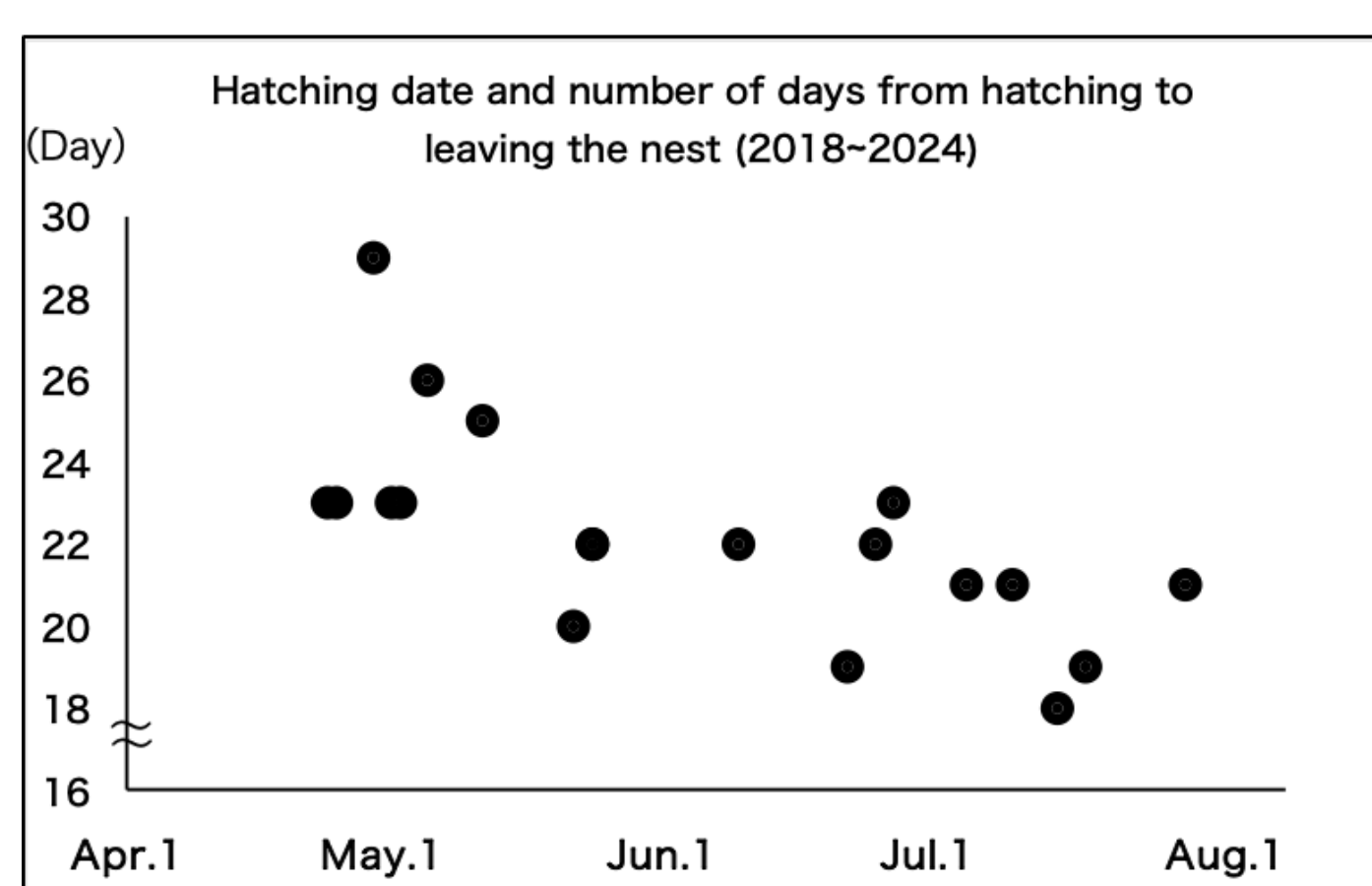


Figure 3

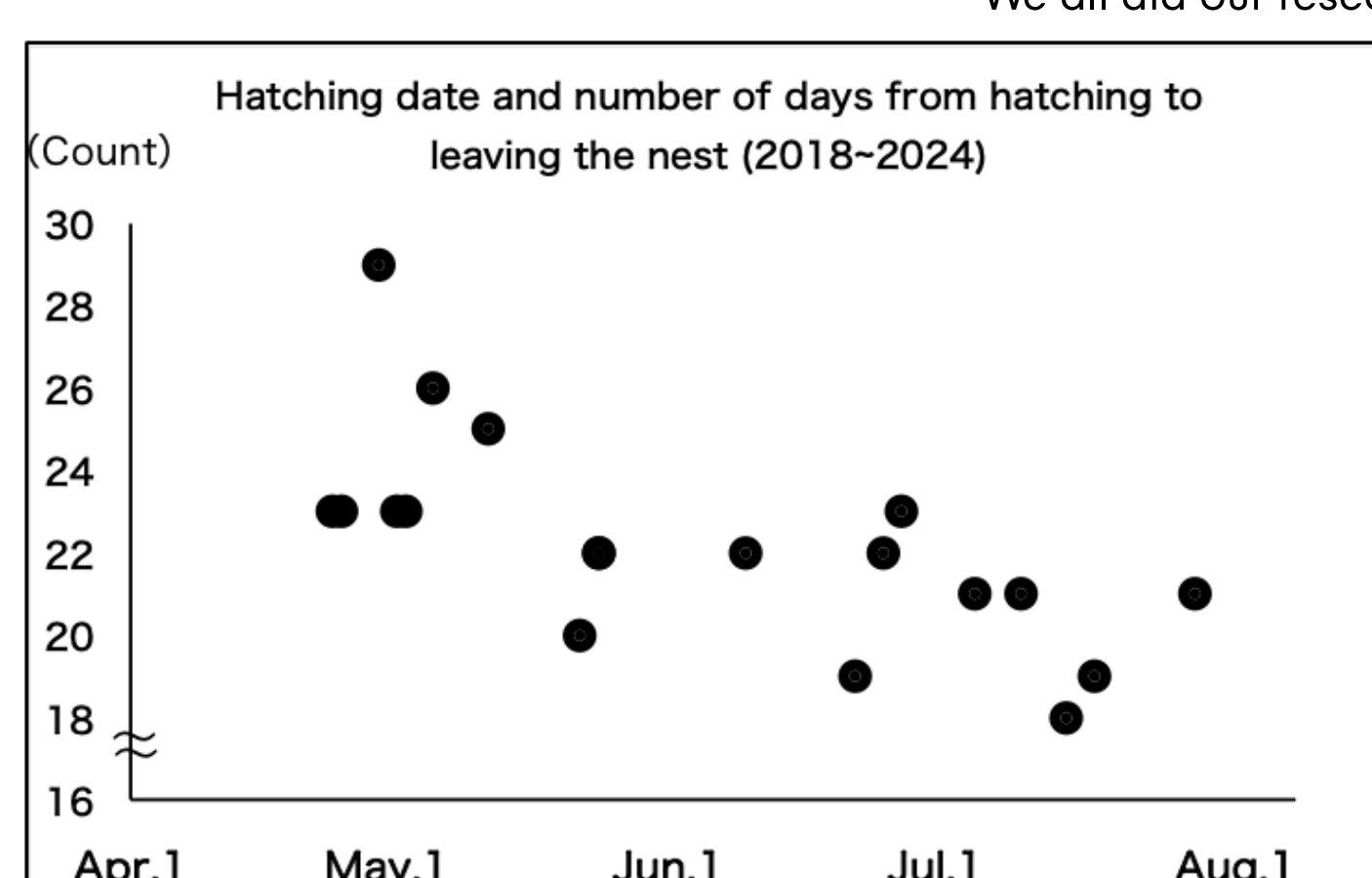
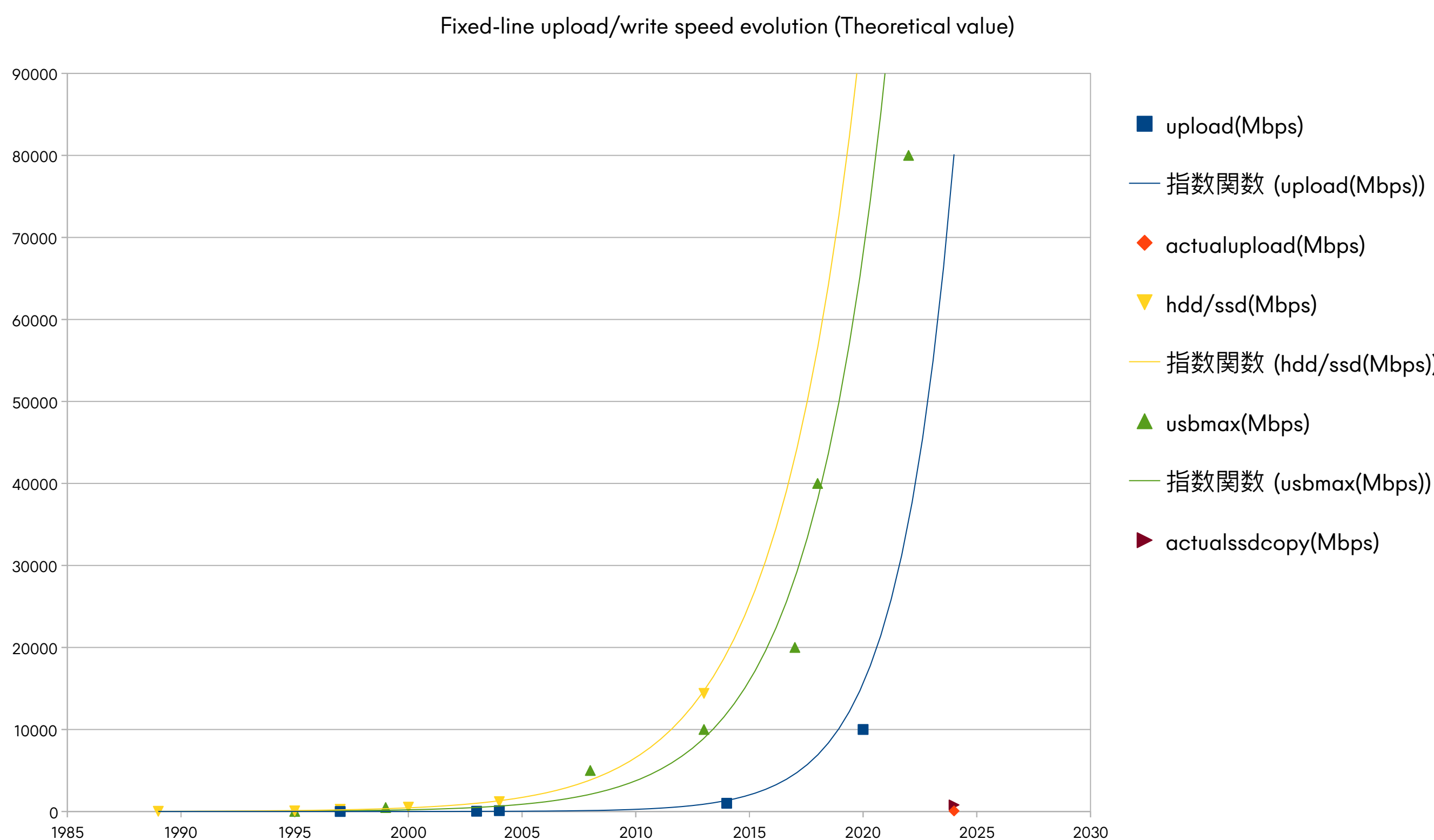


Figure 4

FINDING



OBSERVATION RESULT

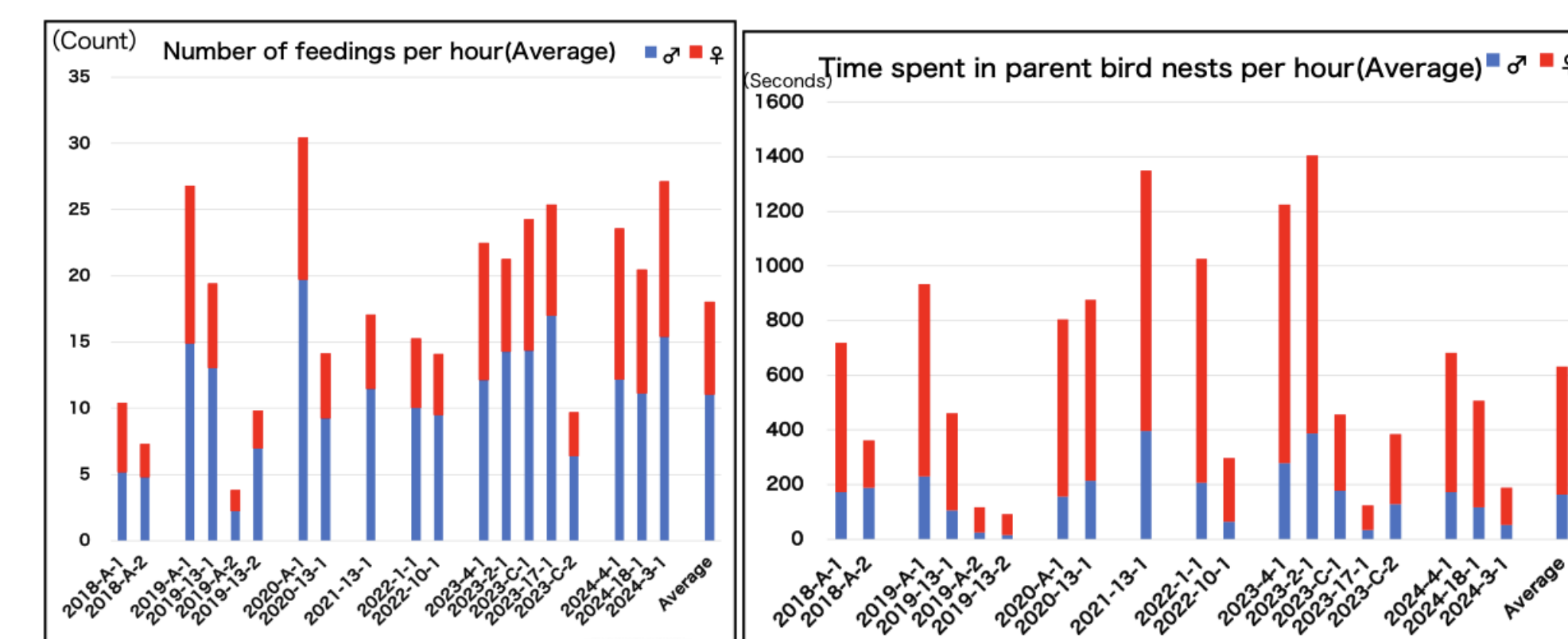


Figure 5

Figure 6

- (1) Both males and females feed their young more frequently the earlier they raise their young (Figure 5).
- (2) Parents spend more time at the nest when the young are small (Figure 6).
- (3) As temperatures increase, the number of days to leave the nest decreases (Figure 4).
- (4) Male parent birds feed their chicks more frequently (Figure 5) and spend less time at the nest (Figure 6) than females. The opposite is true for females.

RESULTS OF ANALYSIS OF FEEDING CONTENT

In FY2022, we attempted to analyze feeding contents using feeding videos and fecal filtration devices, but were unable to determine feeding contents; in FY2023, we partially sequenced ribosomal 16S rRNA in the feces of barn swallow chicks and identified them to species using BLASTN, and those not identified to species were identified to genus. Those that could not be identified to species were identified to genus.

- (5) When the collected samples were divided by date into the first and second halves, the number of species detected in the feces was higher in the second half than in the first half.
- (6) Some insects were detected only in the second half (e.g., Lepidoptera).
- (7) Diptera were detected during the entire period.
- (8) Most of the insects detected were flying insects.

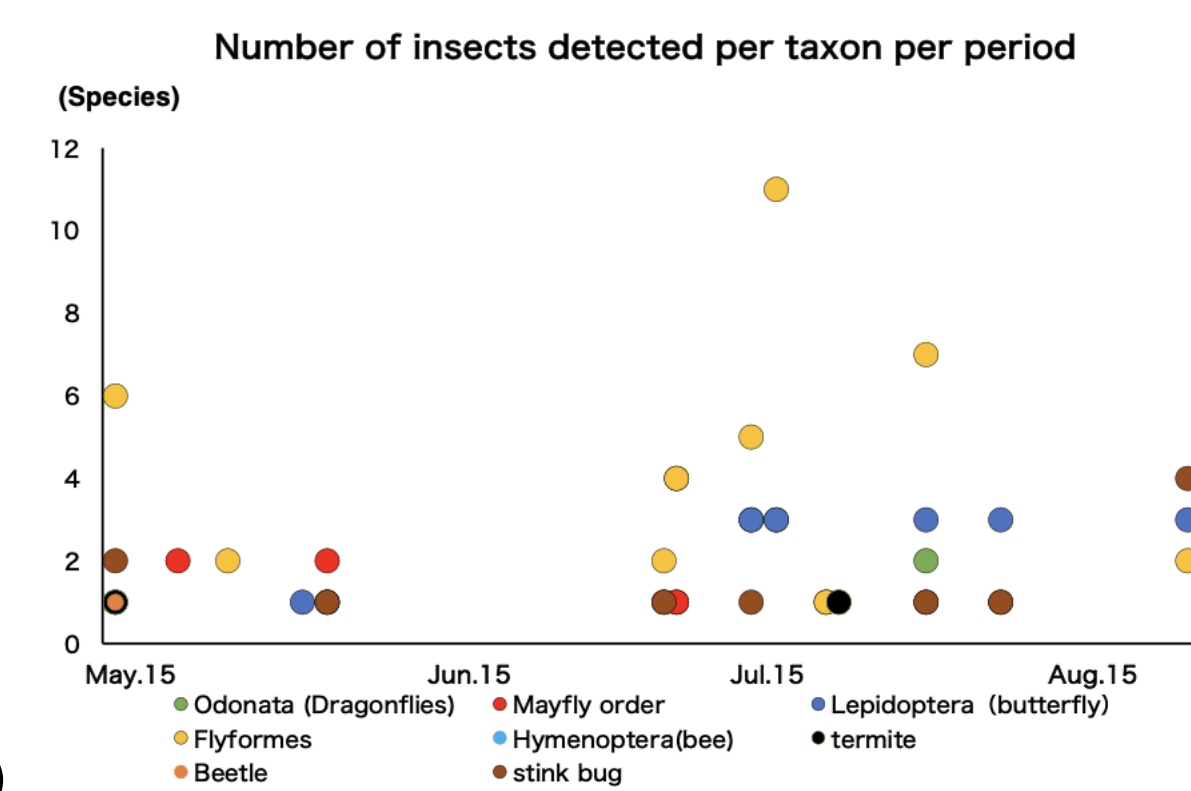


Figure 7

CONSIDERATIONS

- (1)(5) → The number of feeding frequency was high, but the number of species detected was low, suggesting that the insects were either foraging at a specific location or occurring in large numbers at a single location.
- (2) → Parent birds stay longer at the nest when the outside temperature is low, possibly because the chicks are more likely to cool down and need to stay at the nest.
- (3), (6), (7) → As the season progresses, the variety of insects present may increase, increasing the nutritional value of the food and the number of edible parts. It is also possible that temperatures may have stimulated the growth of chicks.
- (4) → Females have egg-laying spots, which may be advantageous in keeping chicks warm.

FUTURE PROSPECTS

DNA analysis of chick droppings will be conducted this year and in FY2024 to determine the relationship between feeding content, chick rearing period, and feeding frequency. In addition, insect collections using FIT traps (Figure 8) were conducted periodically to study insects inhabiting the foraging range of swallows. After identifying the insects collected by these FIT traps, we would like to prepare dried specimens and attempt to evaluate their nutritional value. We would also like to analyze the growth curves of chicks obtained in existing studies in relation to temperature and feeding frequency.

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REFERENCES

- Hasegawa, K., & Morimoto, M. (2020). The secret of swallows. Midori-shobo.
- Hasegawa, K., & Morimoto, M. (2021). The world of swallows. Midori-shobo.
- Kouyama, K., Sato, N., & Watanabe, H. (2012). Swallows (Creatures in the rice paddies). Rural Culture Association
- Watanuki, Y., & Takagi, M. (2024). Guide to field bird survey. Asakura Shoten.
- Yamashina, Y. (1985). Japanese birds and their ecology Vol. 2 (Reprint). Publishing Science Research Institute.
- Turner, A. (2006). The barn swallow (Poyser Monographs). Poyser.
- Koike, K., Ono, N., Machida, R., & Tanabe, R. (2014). New edition of Shogakukan's illustrated book NEO insects. Shogakukan.
- Maruyama, M. (2003). Collection methods of anteater and anteater beetles. Insects and Nature, 38(9), 43-47.
- Japan Meteorological Agency. (n.d.). Historical weather data. Ministry of Land, Infrastructure, Transport, and Tourism. Retrieved September 24, 2024, from https://www.data.jma.go.jp/obd/stats/etrn/view/monthly_s3.php?prec_no=64&block_no=47780&year=&month=&day=&elm=monthly&view=a1
- Swallow Nest Map Suita City 70th Anniversary Project. (n.d.). NPO Suita Citizen's Environmental Conference. Retrieved September 18, 2024, from <http://www.v3.big.or.jp/~sskk/kanri/110521swallow-map.pdf>
- Radio Policy Vision Roundtable Final Report. Radio Policy Vision Roundtable. December, 2014.
- USB.org - Documents. from <https://www.usb.org/documents>
- Evaluation of telecommunications policies since the liberalisation of telecommunications and Research and study on the future vision of ICT society, etc. Japan Government. March, 2015.