

Use of plastic nesting material and its potential impact on American Robin (*Turdus migratorius*) nests

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Introduction

Occurrence of Plastic in Bird Nests

Rising levels of plastic pollution in the environment impact aquatic and terrestrial organisms, including birds when they incorporate it into their nests (Blettler et al. 2020). We asked how the incorporation of anthropogenic material was being integrated into American Robin nests varied across the landscape. Nests from shopping area parking lots, Valparaiso University campus, and local parks were dissected with the proportion of plastic debris higher in the nests from shopping area parking lots.

Impacts of Using Plastic in Nests

Whether the use of plastic as nesting material is entirely helpful or harmful is largely unknown, but nests in urban areas utilizing more plastic than nests in rural areas raises concern about the formation of an ecological trap (Hanmer et al. 2017). Potential detrimental effects of incorporating non-anthropogenic matter as nesting material include entanglement and ingestion (Jagiello et al. 2019), alteration of thermal properties (Corrales-Moya et al. 2021), and a possible increase in predation risk (Møller 2017). This study used a field experiment to examine how the incorporation of plastic as nesting material could impact predation risk for American Robins in Northwest Indiana.

Materials and Methods

- End of season robin nests were field collected, cleaned of extraneous plastic, reinforced with extra mud if needed, and used in a field experiment on the effects of plastic on nest predation.
- Nests were placed in pairs in various locations on the Valparaiso University campus (Fig 6) with the addition of three 20 cm strips of white polypropylene bag added at the base of one of each pair of nests (Fig 2).
- Three artificial blue clay eggs (NDC modeling clay, Polyform Products Co, Inc.) were placed in each nest and the nests checked three times per day.
- Time elapsed from experiment start time to time of first disturbance of eggs was recorded.



Figure 2. (above) Paired nest trial had one nest with and one without nest plastic at base of nest.

Figure 3. (left) Marks on clay eggs indicated that predators included both birds (likely blue jay) and mammals (likely squirrel).



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Results

Occurrence of Plastic in Bird Nests

Common anthropogenic material found in nests include paper, metal and plastic (ex: landscape cloth, netting, rope, grocery bags, and dental floss). Only 4 out of 44 nests did not have plastic. We found plastic made up over 25% of the total non-mud nesting material by weight in one nest and that % plastic was significantly higher near large shopping areas (Fig 4).

Impacts of Using Plastic in Nests

Of the 36 nests placed out on campus for the predation experiment, 32 showed signs of disturbance by predators. Nests with added plastic were attacked on average 36 hrs sooner than those without plastic (Fig 5).

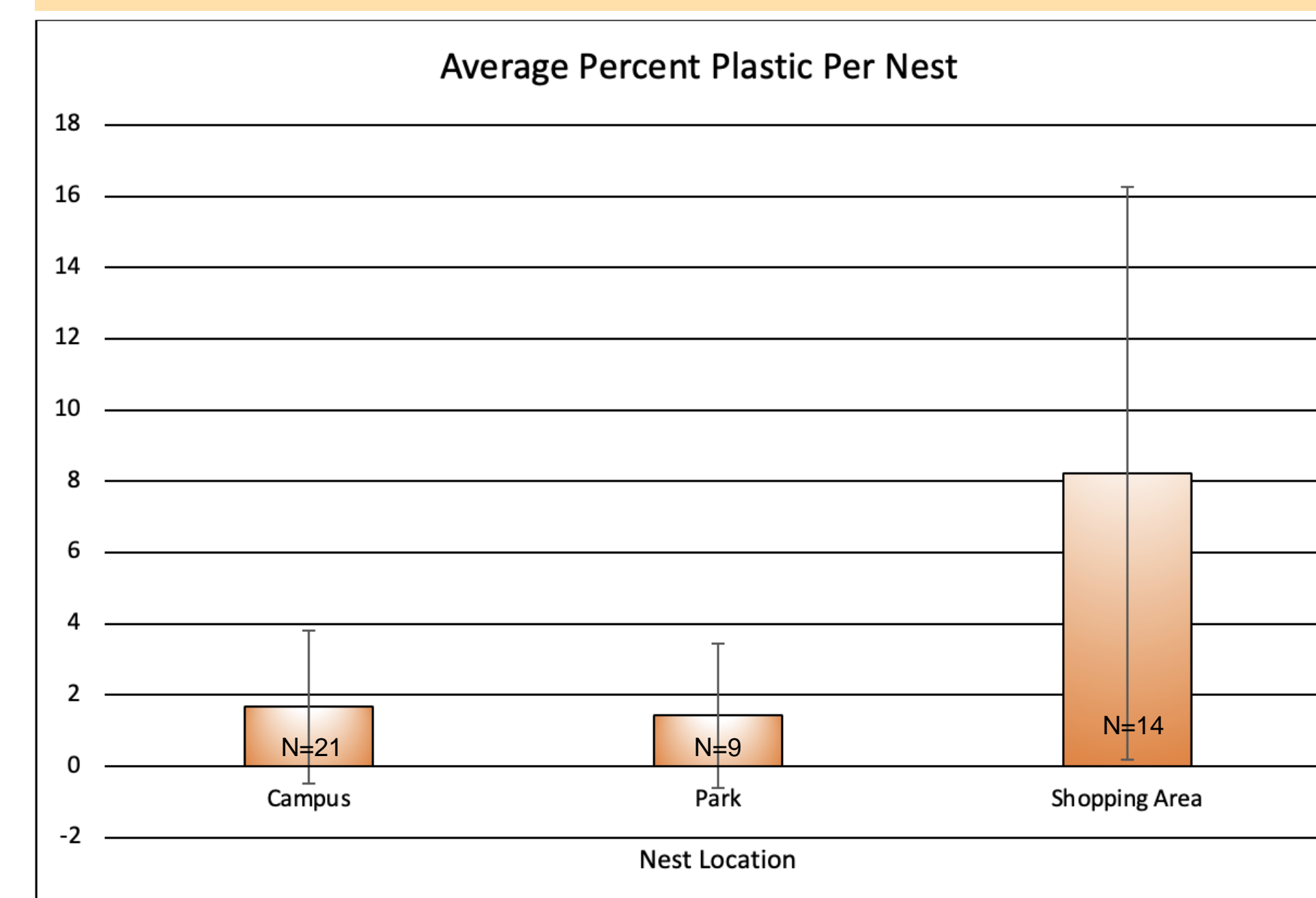


Figure 4. The average percent plastic per nest at campus, park, or shopping area locations. Shopping areas has significantly more plastic in nests (ANOVA, $F=4.51_{(2,19)}$, $p=0.025$).

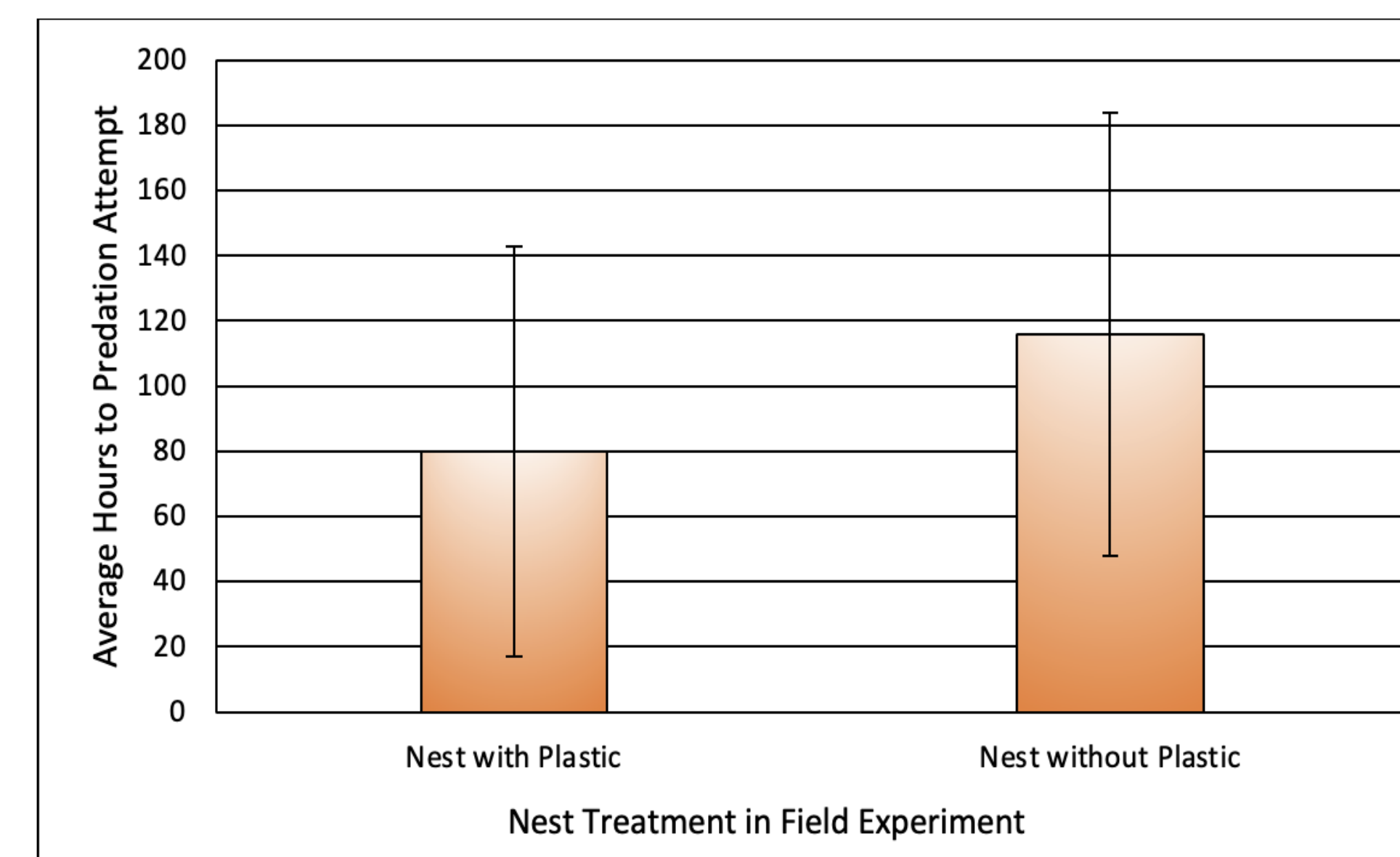


Figure 5. Data from Fall 2023 experiments shows a significantly shorter time to predation for American Robin nests with added plastic. (N=18, Wilcoxon $W=83$, $p=0.006$). Error bars are +SD.

Discussion

- We found that American Robins incorporate a lot of plastic debris into their nests, especially when nesting near shopping areas.
- Nests containing plastic from shopping bags were attacked by predators more quickly than those without plastic.
- Thus, nesting near shopping area with abundant plastic debris could pose an ecological trap for birds, increasing their predation risk because of the nesting materials available.
- Possible mechanisms for increased predation when plastic is present could include higher detectability through visual, auditory, or scent cues.
- Further research is needed to explore whether plastic has any beneficial impacts on robins such as lowered nest parasites, change in thermal properties, or increased resiliency to erosion from adverse weather.
- Additional research questions using our study methods could include testing different colors of plastic, predation levels in different locations, and seasonal impacts on predation levels.

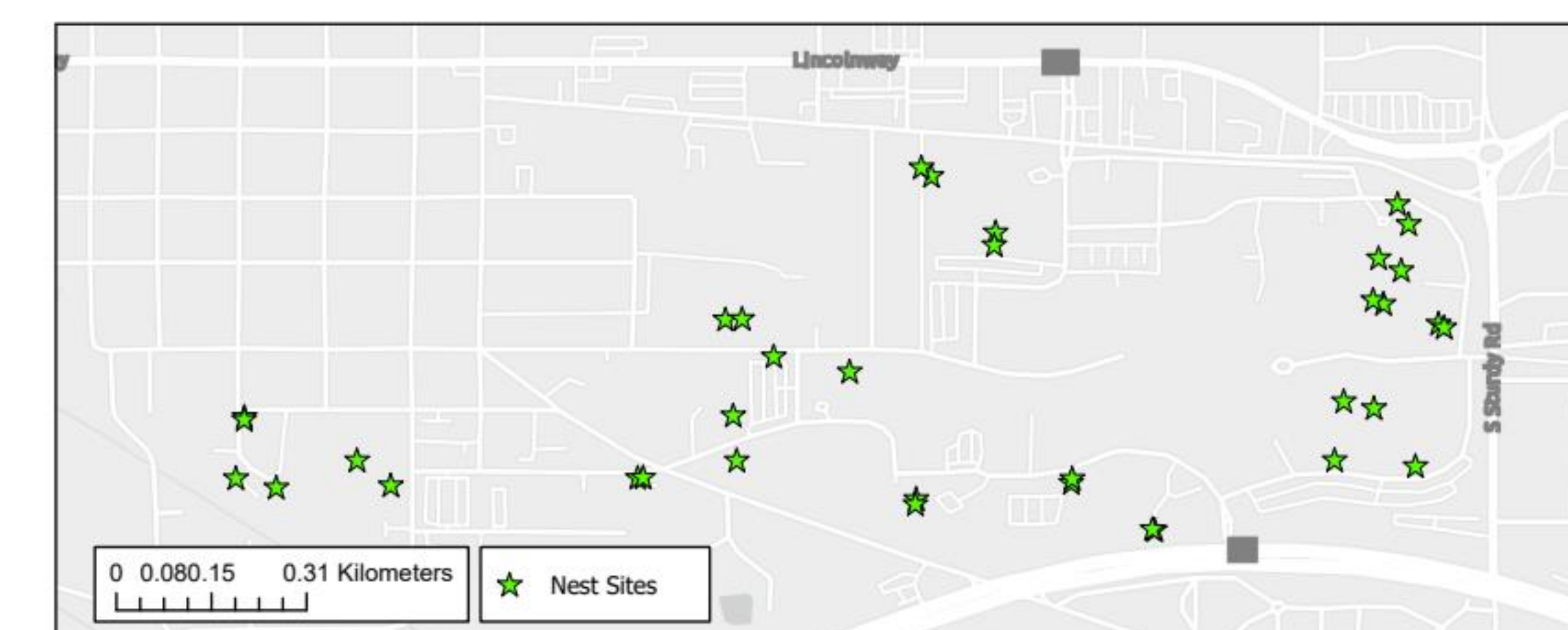


Figure 6. Nest placement locations on Valparaiso University campus for nest predation study

Literature Cited

- Blettler, M.C.M., Gauna, L., Andréault, A. et al. 2020. The use of anthropogenic debris as nesting material by the greater thornbird, an inland-wetland-associated bird of South America. *Environ Sci Pollut Res.* 27:41647–41655.
- Corrales-Moya J, Barrantes G, Chacón-Madrigal E, Sandoval L. 2021. Human waste used as nesting material affects nest cooling in the clay-colored thrush. *Environmental Pollution.* 284:117539
- Hanmer HJ, Thomas RL, Beswick GJF, Collins BP, Fellowes MDE. 2017. Use of anthropogenic material affects bird nest arthropod community structure: influence of urbanization, and consequences for ectoparasites and fledging success. *Journal of Ornithology.* 158:1045-1059.
- Jagiello Z, Dylewski L, Tobolka M, Aguirre JJ. 2019. Life in a polluted world: a global review of anthropogenic materials in bird nests. *Environmental Pollution.* 251:717-722.
- Møller AP. 2017. Fashion and out of fashion: appearance and disappearance of a novel nest building innovation. *Avian Research.* 8:14.

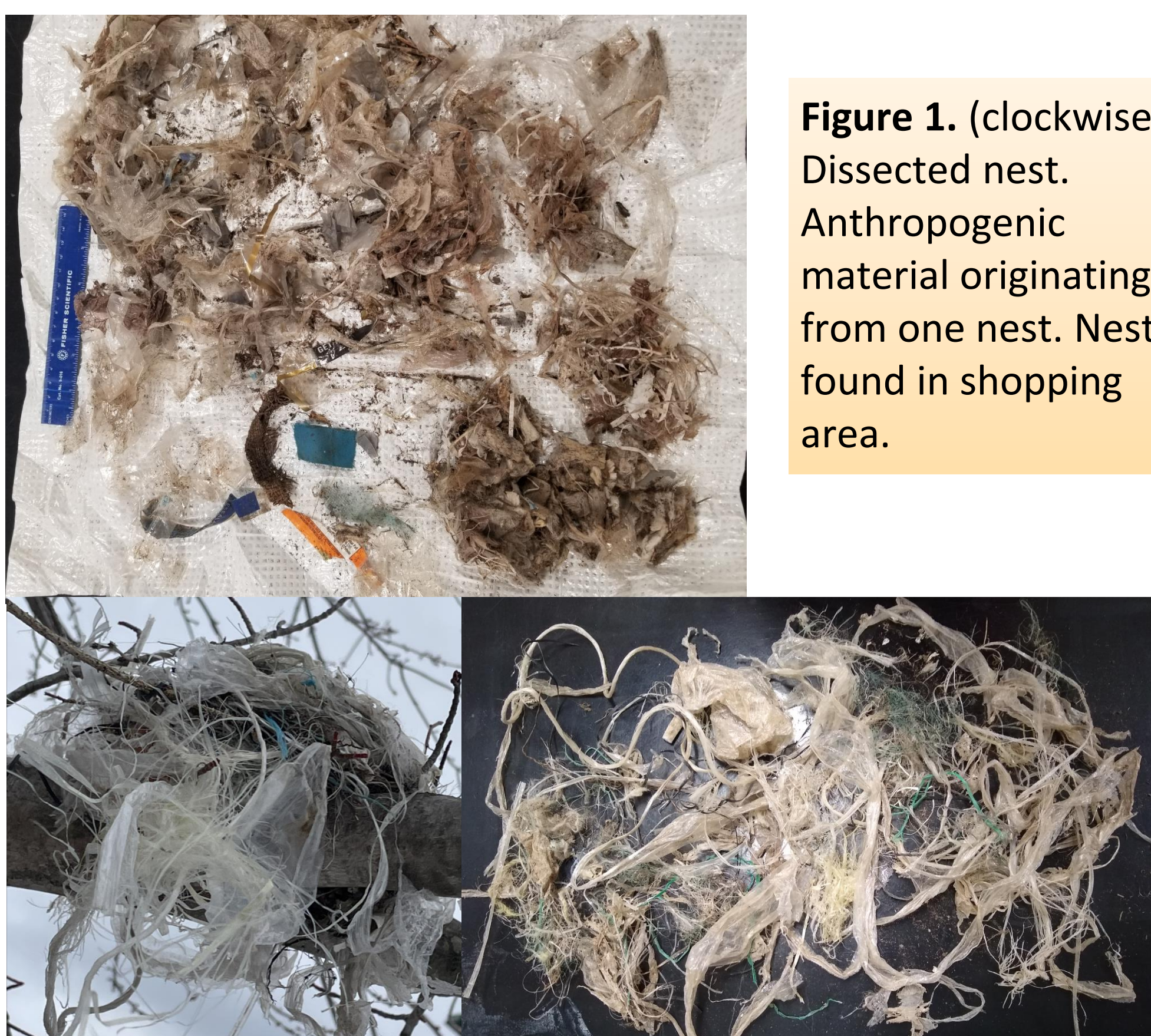


Figure 1. (clockwise) Dissected nest. Anthropogenic material originating from one nest. Nest found in shopping area.