

# Thing 1 and Thing 2 are in a new Zoo: Changes in behavior of male Amur Tigers following introduction to John Ball Zoo, 2018-2019

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## Abstract

Animals alter their behavior in response to changes in their environment such as alterations to their enclosure, social group, or husbandry routine. In 2018, two related, young adult Amur tigers (*Panthera tigris altaica*) were transferred to John Ball Zoo (JBZ). The male siblings were given access to a spacious, wooded outdoor enclosure (area = 920 m<sup>2</sup>). We used *Zoomonitor* in 2018 and 2019 to conduct focal-animal sampling of the two males. We recorded state behaviors in 30 second intervals of scan sampling, and all occurrences of event behaviors, both during 30 min sampling sessions. Our study objective was to compare patterns of behavior and enclosure use in 2018 (immediately after introduction to JBZ) and 2019 (one year post-introduction). The two males initially used little of their outdoor space, but by August, 2018, expanded their spatial repertoire to include all areas of the enclosure; this pattern of expanding use of the enclosure continued into 2019.

## Introduction

**Captive populations are crucial to conservation of endangered species**, so it is essential that captive environments provide the space and stimulation to enhance well-being. Zoos strive to provide expansive, complex, and naturalistic enclosures, and may exchange animals to maintain appropriate social groupings and facilitate genetic diversity. We monitored the behavior of two young Amur tigers, comparing their behavior immediately after their introduction to large John Ball Zoo (JBZ; summer 2018) to their behavior in the same enclosure one year later.

**Study objective:** assess how spatial patterns in their behavior changed from 2018 to 2019. Did they expand their spatial use of the enclosure? Did their patterns of activity and inactivity change over time?

**Hypothesis:** The male Amur Tigers will change their spatial patterns of enclosure use and shift predominance of active vs. inactive behaviors as they become accustomed to the enclosure.

## Methods

We used *ZooMonitor* to record and quantify spatially explicit behavior data during 30-minute sessions of all-occurrence and interval sampling. Observations were conducted morning and afternoon from May-August, 2018 and 2019. Two observers worked simultaneously, each recording behaviors for one of the two young adult Amur tigers (full siblings). We categorized and quantified behaviors as follows:

- (i) all occurrences quantification of *event* behaviors (brief, distinct behaviors recorded as count data, e.g., pounce, snarl);
  - (ii) interval sampling of *state* behaviors (prolonged duration, e.g., sleep).
- We produced "heat maps" to illustrate the location of quantified behaviors. Heat maps indicate extensive use of particular locations with yellow, orange and red; cool colors indicate occasional use of locations. We compared occurrences of active vs. inactive behaviors with Chi-square Contingency Tests (two-tailed;  $p < 0.05$ ).

## Results

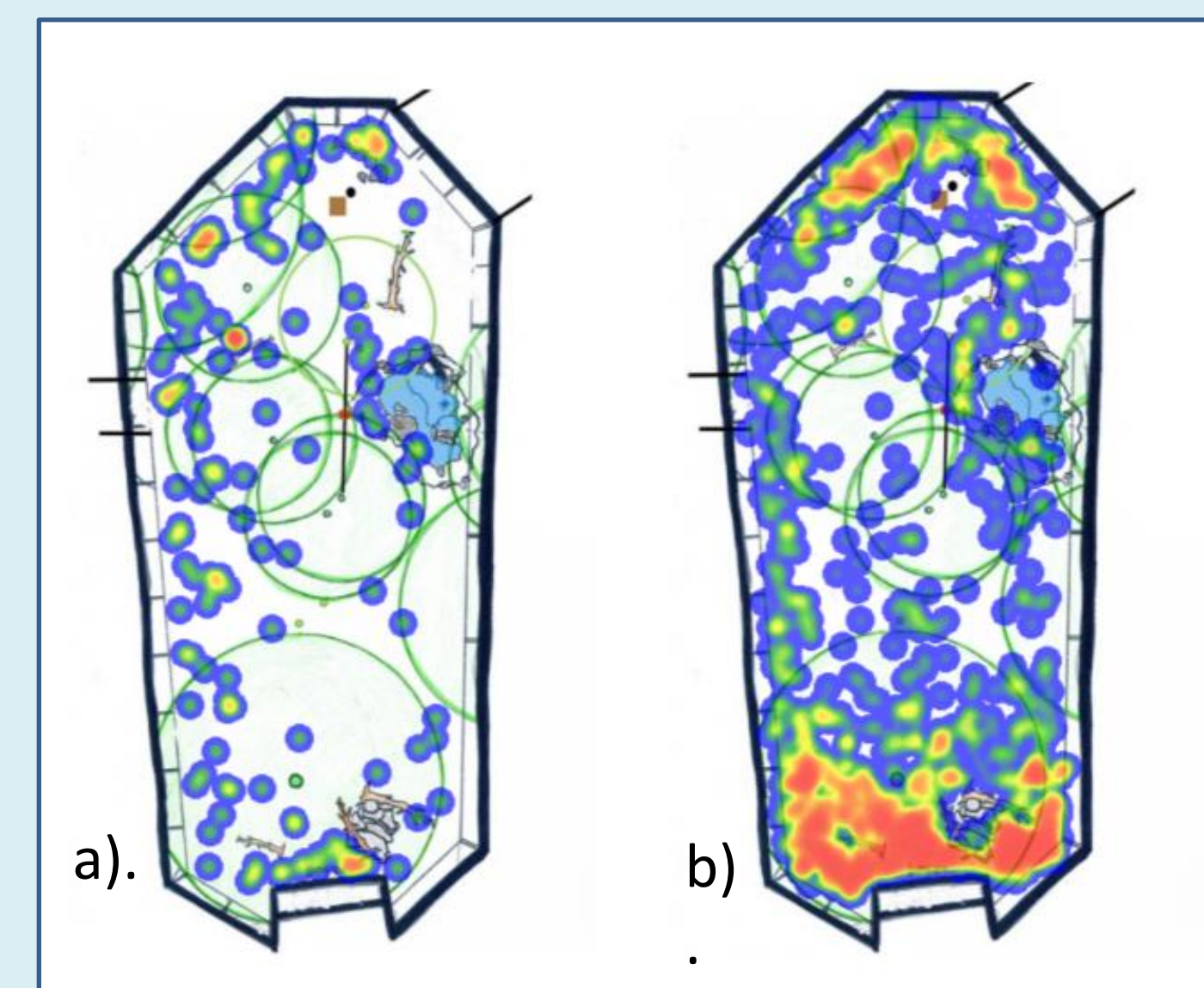


Fig. 1. Heat map comparing locomotive behaviors (walk, patrol & pace) of adult male 1 in 2018 (a) and 2019 (b). He moved in relatively constricted areas of his enclosure in 2018 compared to 2019, remaining out of sight or in the rear of the enclosure in 2018, but throughout the enclosure in 2019. Paths focused on the perimeter, the observation window (bottom) and near the bedroom entry (top). Overall, he was more active in 2019 compared to 2018 (X2 contingency test;  $p < 0.05$ ).

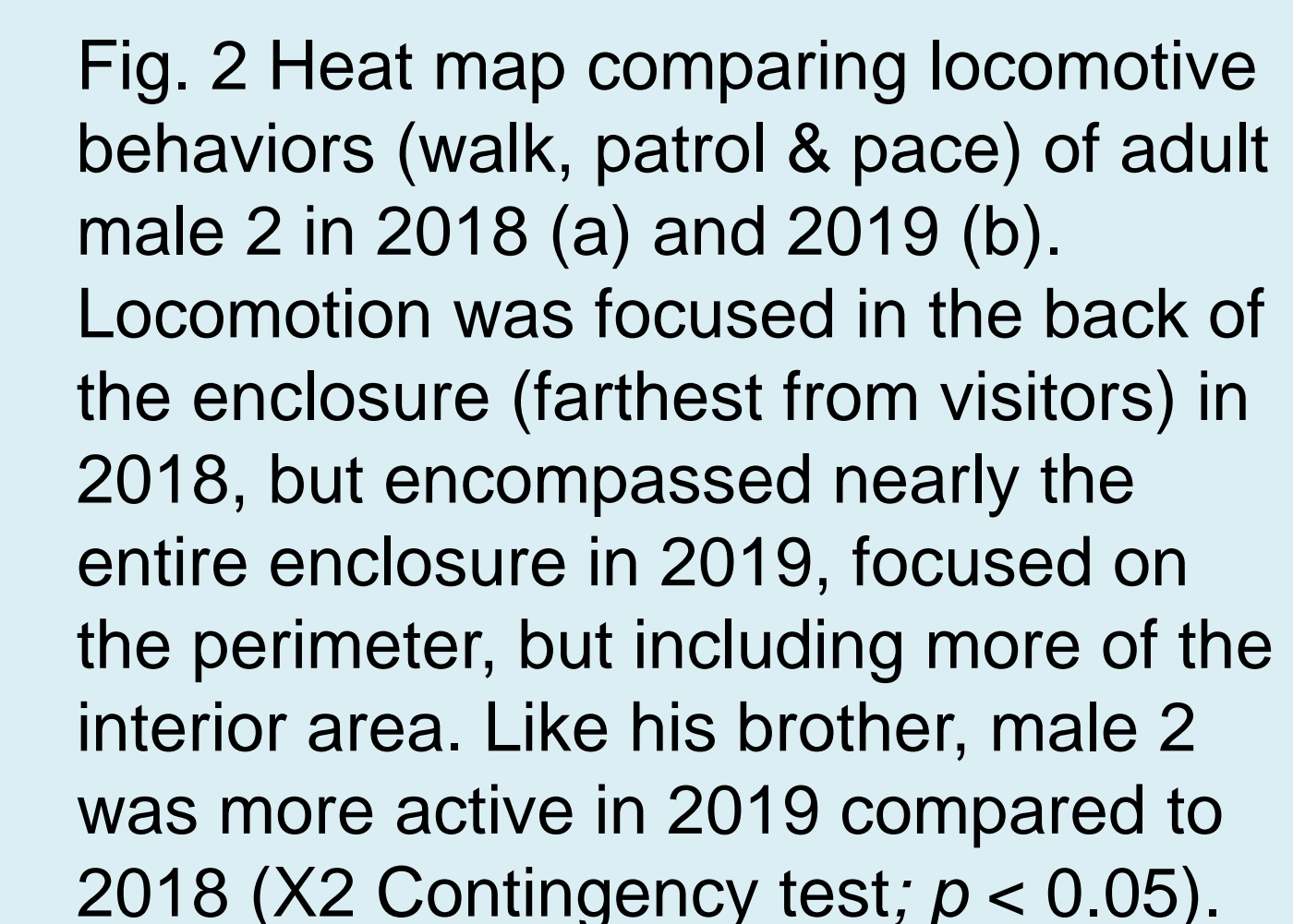


Fig. 2 Heat map comparing locomotive behaviors (walk, patrol & pace) of adult male 2 in 2018 (a) and 2019 (b). Locomotion was focused in the back of the enclosure (farthest from visitors) in 2018, but encompassed nearly the entire enclosure in 2019, focused on the perimeter, but including more of the interior area. Like his brother, male 2 was more active in 2019 compared to 2018 (X2 Contingency test;  $p < 0.05$ ).

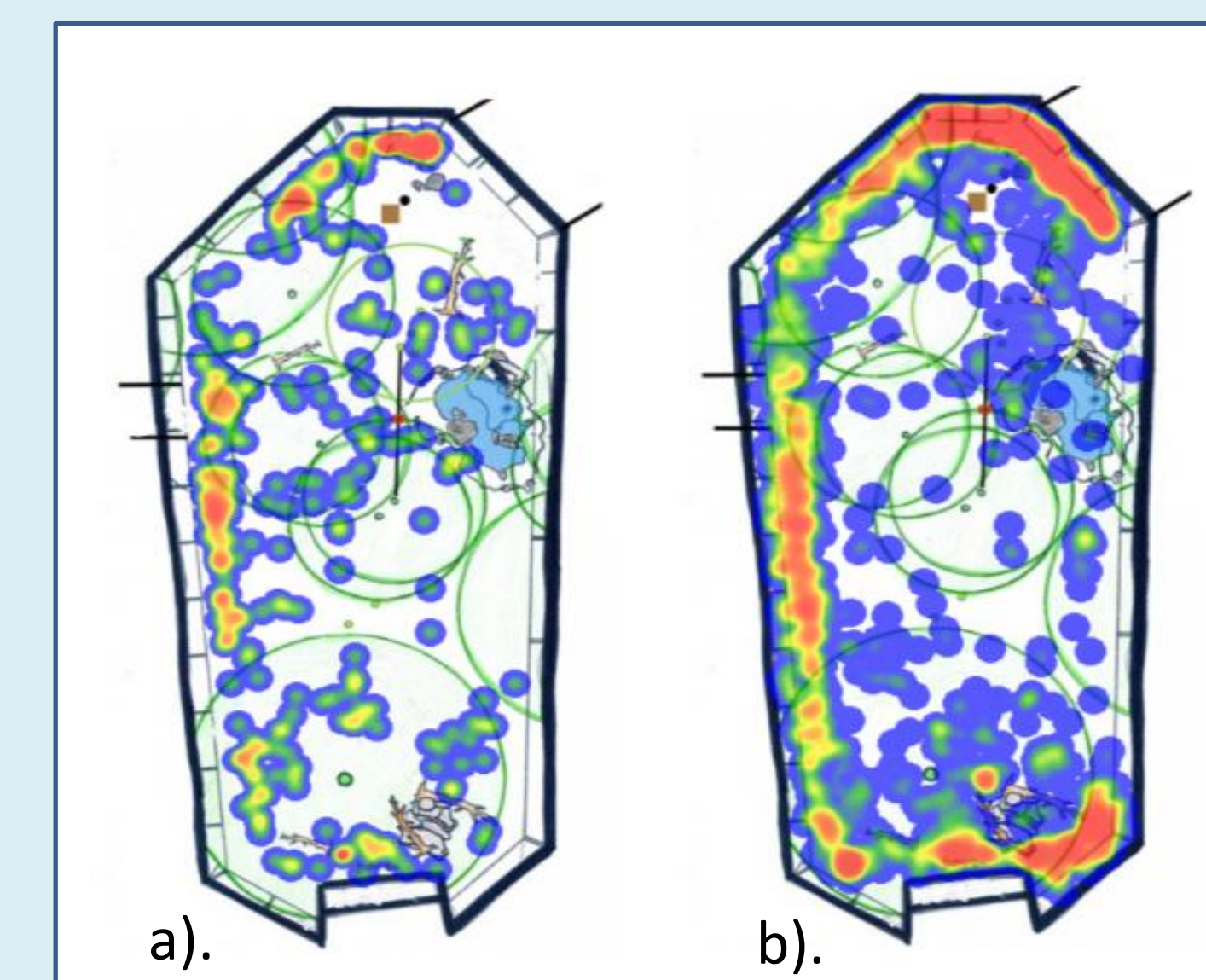


Fig. 3 Heat map comparing inactive behaviors (sit, sleep, lying down) of adult male 1 in 2018 (a) and 2019 (b). This male almost always selected locations near structure (e.g., trees, boulder, log) when lying down, but shifted the locations used from 2018 to 2019. He enjoyed the pool both years (middle right of each figure). Male 1 decreased his prevalence of inactive behaviors in 2019 compared to 2018 (X2 Contingency Test;  $p < 0.05$ ).

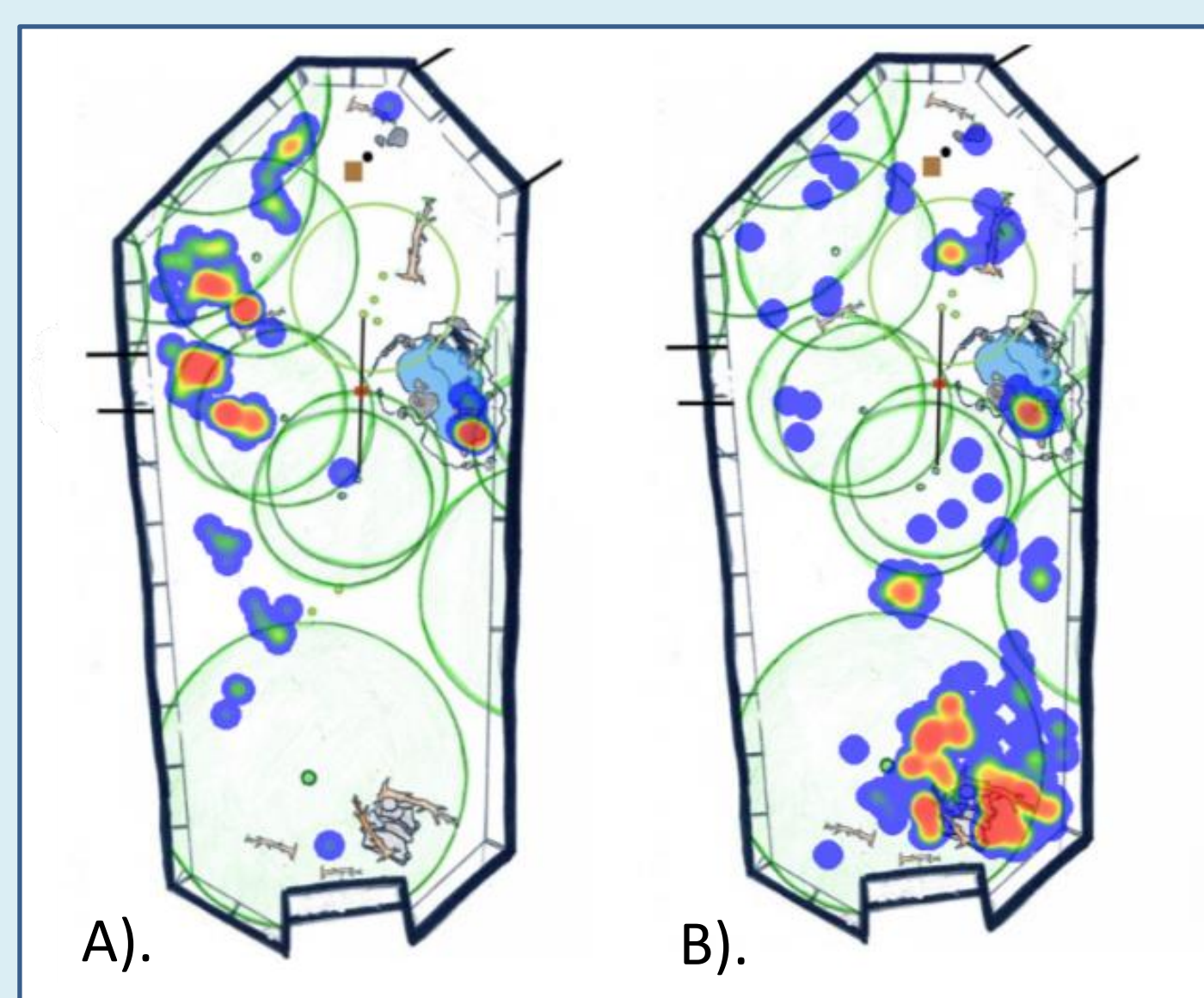


Fig. 4 Heat map of the inactive behaviors (sit, sleep, lying down) for adult male 2 in 2018 (a) and 2019 (b). This male almost always selected spaces near vegetation when lying down. Tiger 2 shifted the locations used from 2018 to 2019 by increasing his time near vegetation closer to visitors from an isolated area. He enjoyed the pool both years (middle right of each figure). Male 2 decreased his prevalence of inactive behaviors in 2019 compared to 2018 (X2 Contingency Test;  $p < 0.05$ ).

## Discussion and Conclusions

Zoos often introduce new individuals, reconfigure social groups, and change features of exhibits, but zoo personnel are rarely able to study the behavioral responses of individual animals to these changes, particularly over long periods of time. Our study contributes much-needed data investigating such changes in two male Amur tigers.

**We predicted** that the tigers would expand their spatial use of the enclosure and its features over time and that their activity patterns would change. **Both predictions were correct:** both males used a greater proportion of the enclosure space and features in 2019 compared to 2018, and additionally were more active overall.

**Tigers in the wild are not social aside from mating and parental activities**, so it was an interesting surprise that the two males were often found in close proximity (note similar hot spots of inactivity, Fig. 3 and Fig. 4). Young adult siblings sometimes remain in a social alliance for a period after dispersing from the mother (e.g., observed in grizzly bears, lions, dolphins and other carnivores/piscivores), and given that these males are siblings, their friendly behavior may reflect this pattern.

**Both tigers sought locations with physical structure that allowed them to hide from visitors during 2018**, but were much more often observed either in full view (e.g., when lying by the copse of trees, lower right, or by the pool, center right) or moving along pathways that brought them very near visitors (bottom and right perimeter of the enclosure) in 2019. In 2019, both males used locations that only occasionally placed them out of view of visitors.

**Over time, the tigers expanded the spatial use of their enclosure from 2018 to 2019.** This is likely due to an increase in confidence and familiarity with their surroundings. Both tigers currently utilize nearly all the space and features provided to them, and both engage with the water feature, vegetation, boulders and other structures.

**Their behavior indicates an increased comfort level with their surroundings, including their interactions with visitors and their zookeepers.**



## Acknowledgments

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