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Do spiny lobsters prefer to associate with familiar individuals?

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Summary

Juvenile spiny lobsters (*Panulirus argus*) are known to be gregarious mediated by their attraction to conspecific odors (Horner et al. 2008). This causes juveniles to aggregate in crevice shelters important for reducing predation risk (Childress and Herrnkind 2001). Recent mass sponge die-off in the Florida Bay nursery has decreased the availability of these crevice shelters which increased the importance of shelter defense (Herrnkind et al. 1997).

In this study, we examine the preference of spiny lobsters to associate with familiar shelters and/or familiar shelter mates. Twenty juveniles (25-40 mm CL) were collected, paired by size, and housed together in a tank with a single crevice shelter. Individual aggression was estimated by daily observation of their behavioral interactions and each individual was designated as either dominant or subordinate (Shabani et al. 2009). Then we observed the interaction of two pairs of lobsters in a large arena with two crevice shelters.

Individuals spent significantly more time in their familiar shelter than the unfamiliar shelter, but were not more attracted to familiar conspecifics over unfamiliar conspecifics. Furthermore, dominance status had no effect on sheltering but larger juveniles were less likely to share a shelter than smaller juveniles. These results suggest that juvenile lobsters are more likely to increase shelter fidelity, but not shelter sharing when shelters become rare.

Hypotheses

- H_0 : Lobsters will show no preferences for shelter or individuals
- H_1 : Lobsters will prefer to associate with familiar individuals
- H_2 : Lobsters will prefer to associate with familiar shelters

References

- Childress, M.J. and W.F. Herrnkind. 2001. The guide effect influence on the gregariousness of juvenile Caribbean spiny lobsters. *Animal Behaviour* 62: 465-472.
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- Shabani, S., M. Kamio and C.D. Derby. 2009. Spiny lobsters use urine-borne olfactory signaling and physical aggressive behaviors to influence social status of conspecifics. *Journal of Experimental Biology* 212: 2464-2474.

Acknowledgements

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Materials and Methods

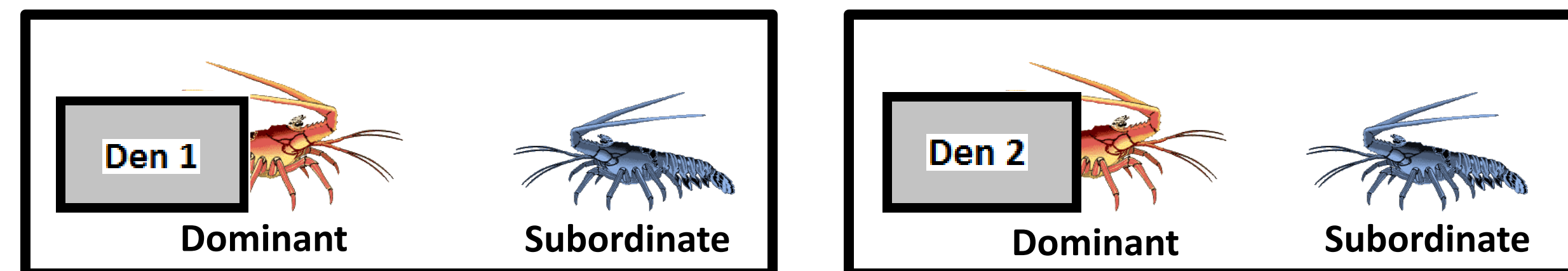


Figure 1. Similar-sized lobsters were housed together and observed for several weeks. The individual with the highest average number of aggressive acts was considered the dominant of the pair.

Collection and Housing Methods:

- Juvenile *P. argus* (20-55 mm carapace length) were collected from Florida Bay
- Animals were measured (mm CL), sexed, staged (pre-molt, intermolt, and postmolt), and checked for injuries (missing legs, antennae, telson damage)
- Each individual received a uniquely-coded cable tie ID tag
- Pairs of similar-sized lobsters (+/- 2 mm CL) were assigned a 30 gallon housing tank with a single artificial crevice shelter and were allowed to acclimate for one week (Figure 1)
- Diseased lobsters that exhibited a chalky-white hemolymph were considered infected with PaV1 and were not used in this study
- Males and females were housed haphazardly since it has been shown that sheltering behavior is not sex-specific
- Salinity was kept at 35 ± 2 ppt using artificial seawater (Instant Ocean®)

Establishment of Dominance Methods:

- Lobsters were observed once a day for ten minutes and the total number of aggressive acts counted (antennae flicks, antennae pushes, body pushes)
- Dominant and subordinate status within each pair was determined based on the average number of aggressive acts (Figure 1)

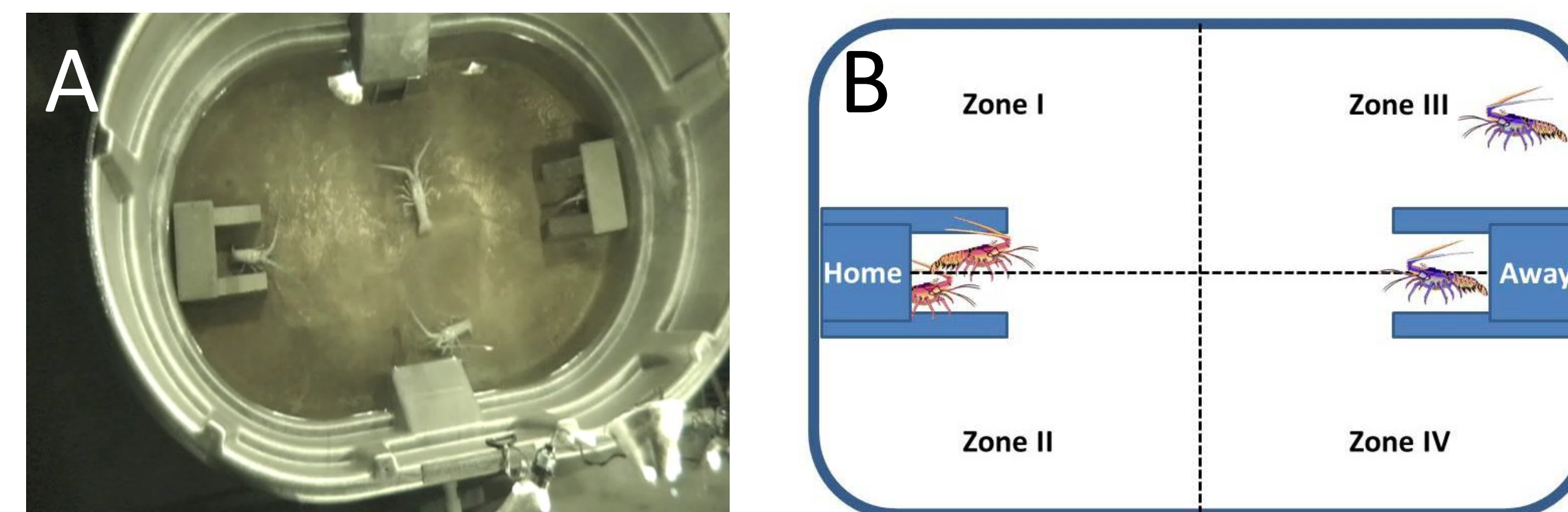


Figure 2. (A) Two pairs of lobsters were placed in crevice shelters (dens) on opposite sides of a 150 gallon tank. (B) Association times were estimated by the proportion of time spent together in the same den or zone of the tank.

Association Test Methods:

- An experimental cattle tank was created with one den on each end of the tank (Figure 2A). The tank was separated into Home Den, Away Den, Zone I, Zone II, Zone III, and Zone IV as shown in Figure 2B
- Two pairs of lobsters were placed into the cattle tank on opposite sides and allowed to acclimate to their own "home" den until 7:30 PM
- Thereafter the locations of each individual were recorded every 5 minutes for approximately 12 hours (7:30 AM)
- Association times were then calculated for all pairs of individuals for each zone and den in the cattle tank

Results

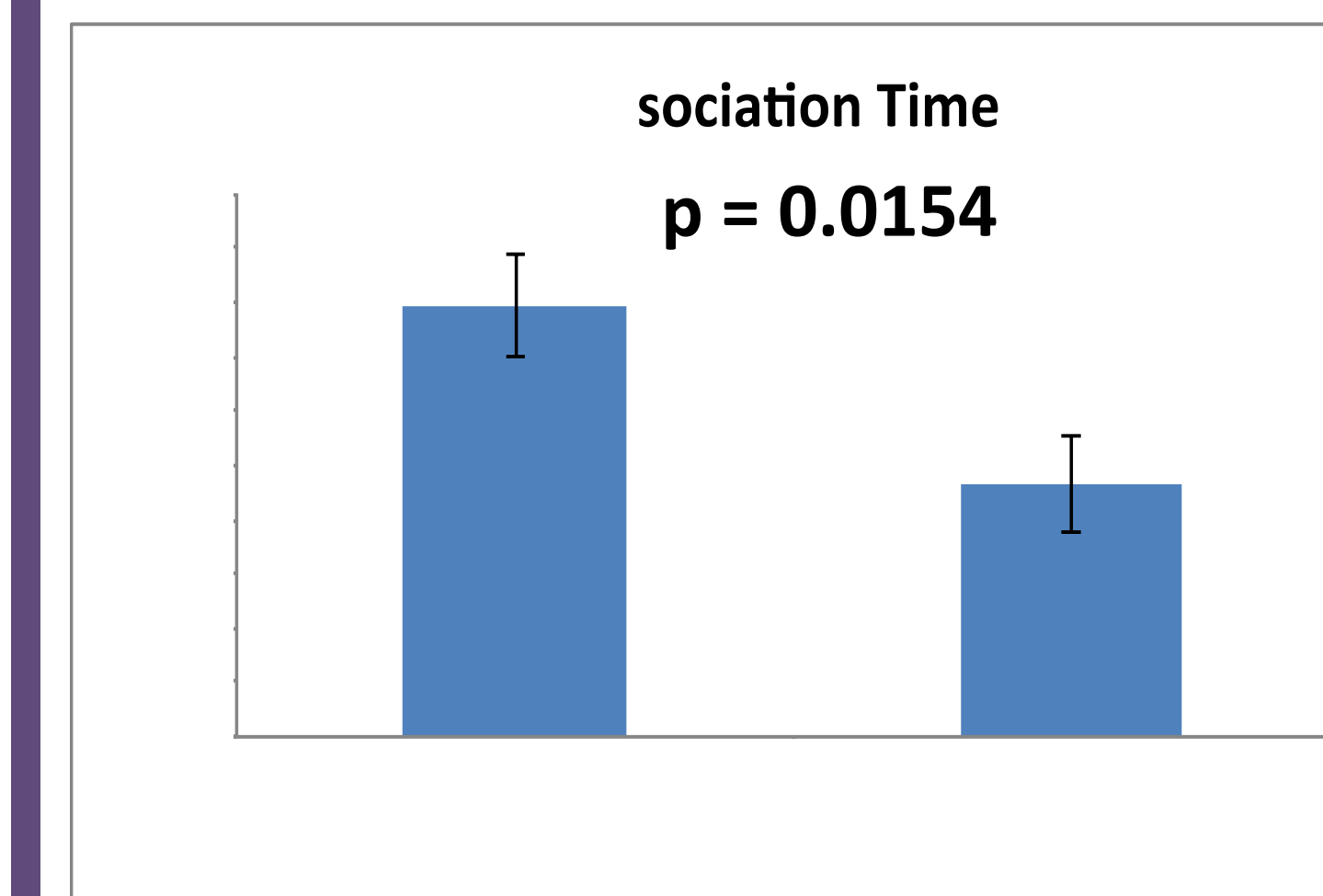


Figure 3. Average time in home and away dens. Lobsters spent significantly more time in their familiar home den than the unfamiliar away den ($t = 2.211$, $df = 59$, $p = 0.0154$).

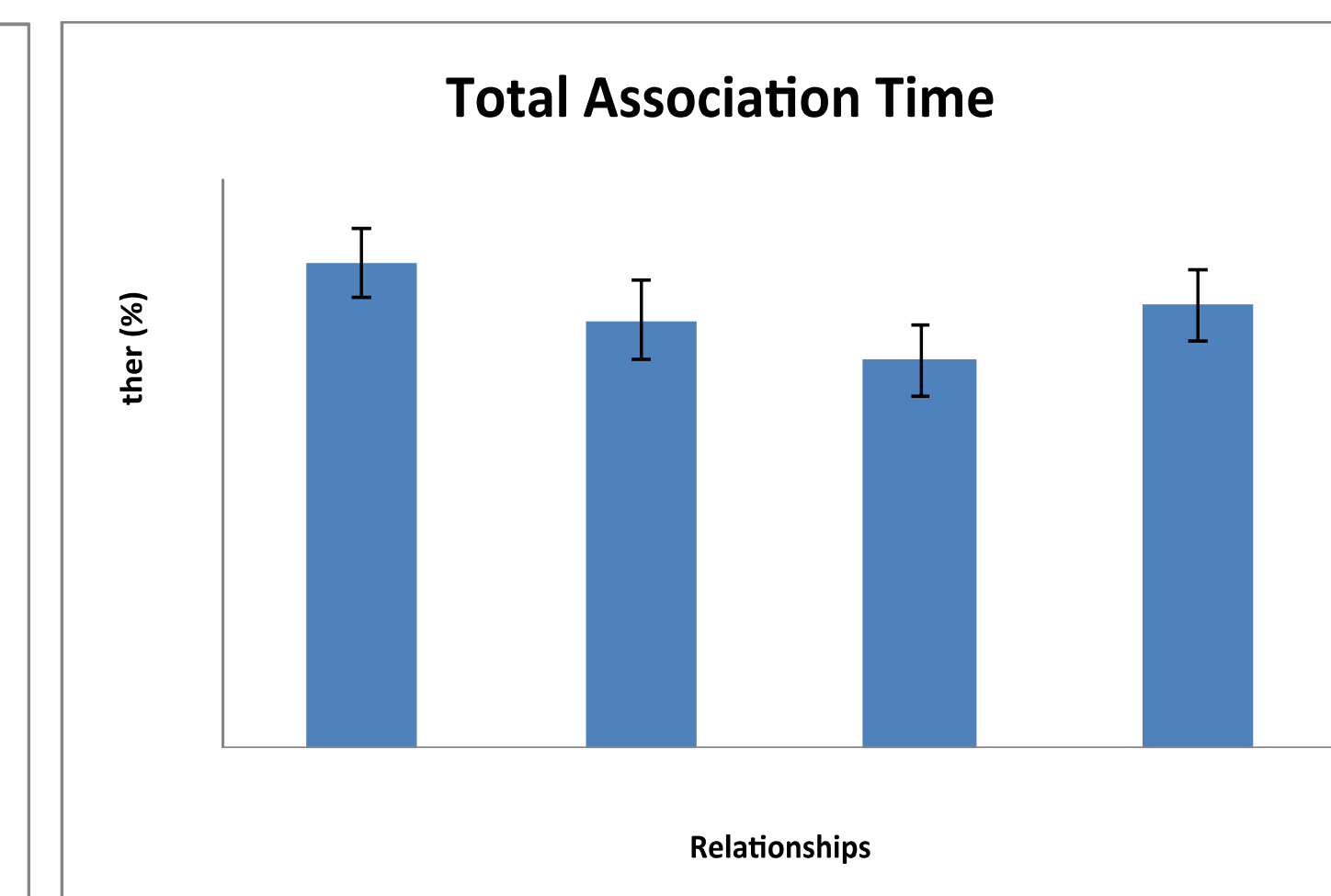


Figure 4. Average time spent with other lobsters. FD = familiar dominant, FS = familiar subordinate, UD = unfamiliar dominant, US = unfamiliar subordinate. Association time was not influenced by familiarity or dominance status outside of the den ($F = 1.225$, $df = 3/56$, $p = 0.3091$).

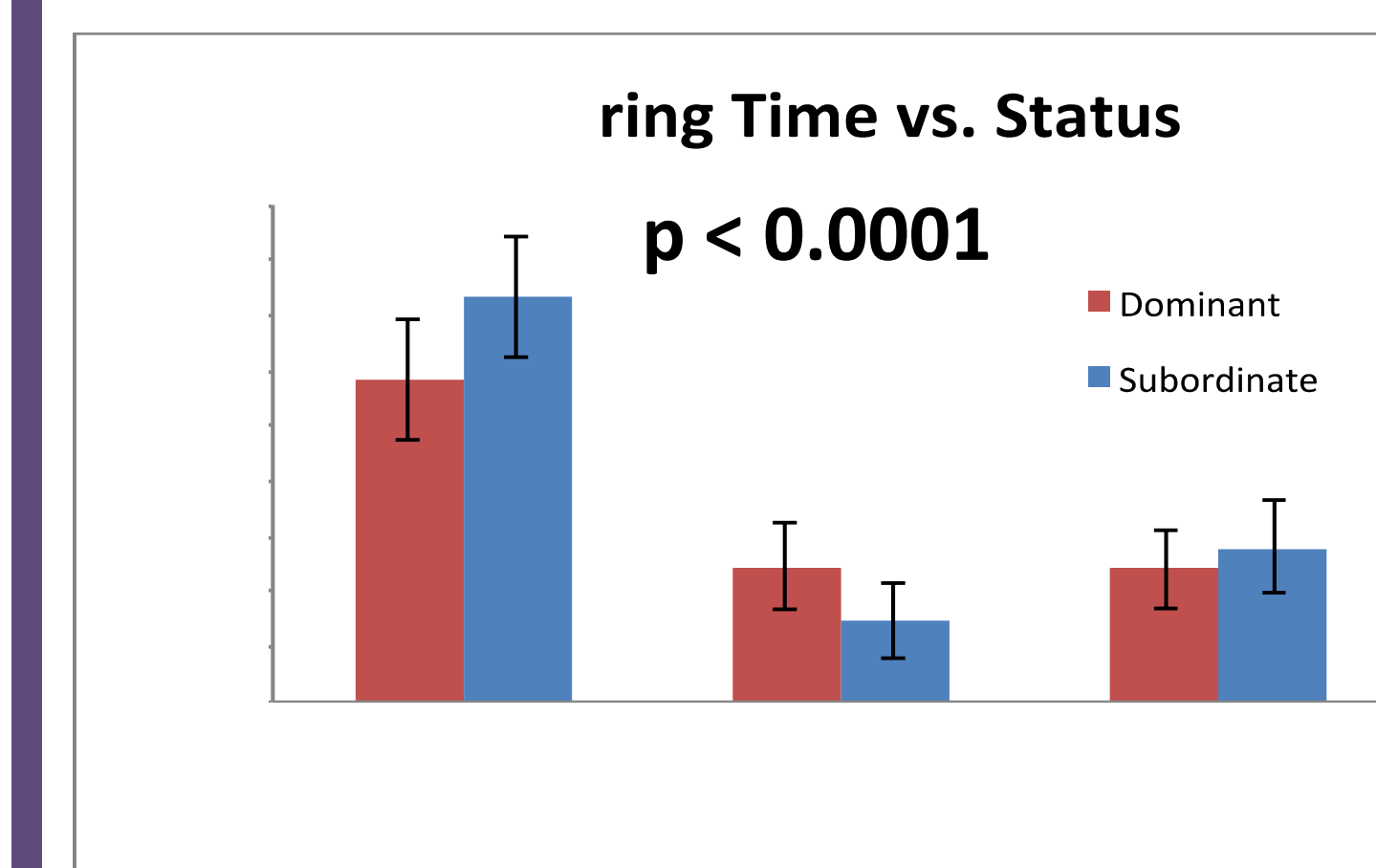


Figure 5. Percent of time sharing dens is higher for familiar individuals regardless of dominance status ($F = 16.33$, $df = 2/177$, $p < 0.0001$).

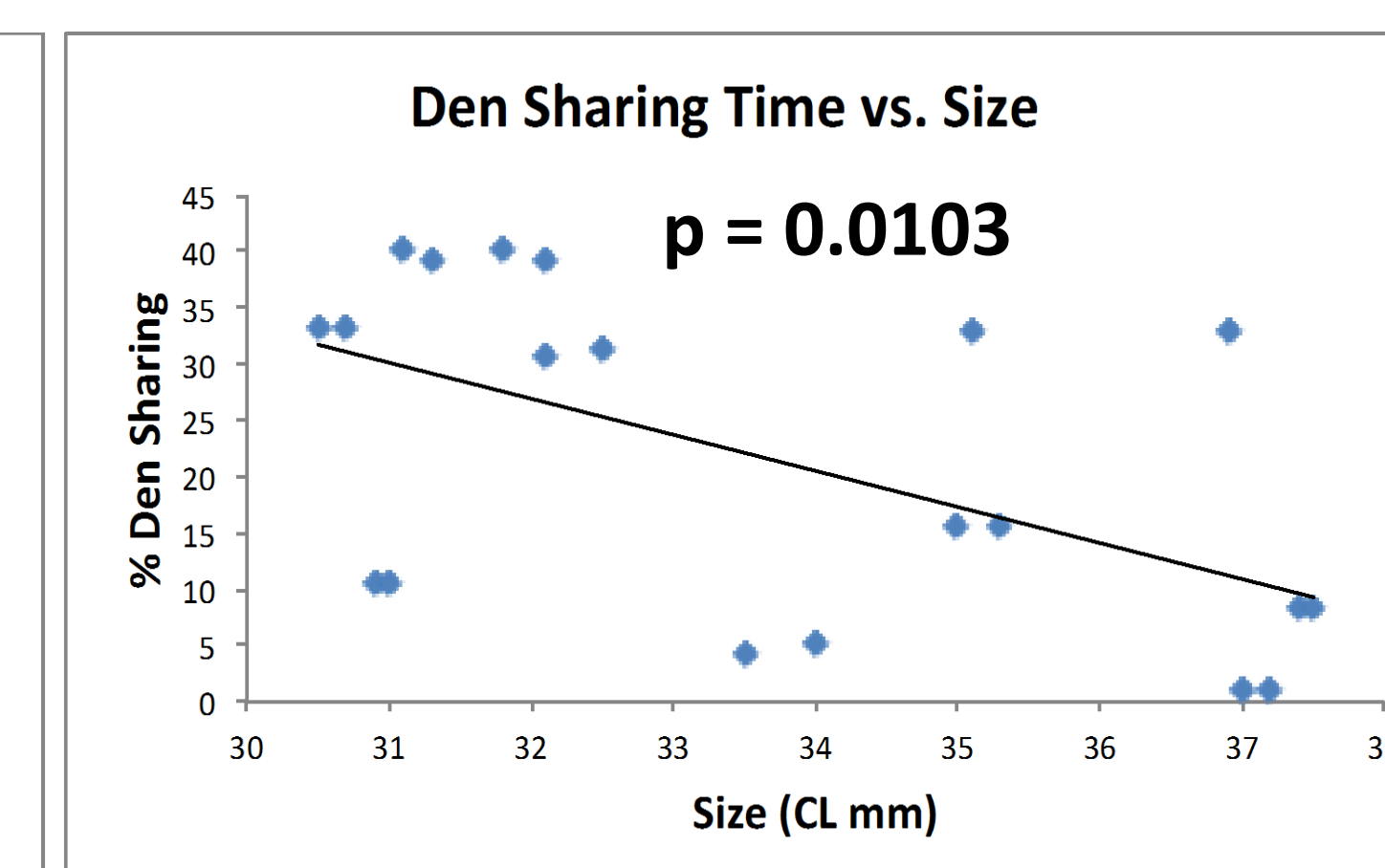


Figure 6. Percent of time sharing dens decreases with increasing body size ($F = 8.217$, $df = 1/18$, $p = 0.0103$).

Conclusions

- Juvenile spiny lobsters spend significantly more time in a familiar shelter than and unfamiliar shelter.
- No preference for familiar individuals was found in total association time either inside and outside of shelters
- Lobsters did spend more time with familiar individuals within their home shelter.
- Larger lobsters were less likely to share a den than smaller lobsters.
- These results support the hypothesis that lobsters associate with a familiar den more than with familiar individuals.
- This agrees with previous studies that found individuals were not more attracted to the odors of familiar individuals than to the odors of unfamiliar individuals.
- These results suggest that juvenile lobsters are more likely to increase shelter fidelity, but not shelter sharing when shelters become rare.