So Happy Together: Housing Madagascar hissing cockroaches, *Gromphadorhina portentosa*, with hide beetles, *Dermestes maculatus,* at the St. Louis Zoo.

Jennifer Bender
Invertebrate Keeper, Saint Louis Zoo
#1 Government Drive, St. Louis MO 63110

ABSTRACT

Madagascar hissing cockroaches (*Gromphadorhina portentosa*) are a popular species widely used by many institutions for display and education. The dermestid, or hide beetle, (*Dermestes maculatus*) is another commonly available insect species that is housed in a variety of laboratory and display situations. The Monsanto Insectarium currently has colonies of both hissing cockroaches and dermestid beetles. This paper will describe the husbandry benefits and drawbacks the Insectarium found when housing a hissing cockroach colony with a demerstid beetle colony.

INTRODUCTION

Madagascar hissing cockroaches ("Hissers") are a popular and versatile choice for display in insect-themed exhibits and for use in education programs. In many states they do not require a permit to keep. They are large, docile, and of course make an impressive hissing noise. As insects that eat primarily decaying vegetation, they can be used to teach about decomposers and decomposition. The physical differences between the sexes can be used to demonstrate sexual dimorphism. Hissers are also photogenic and have appeared widely in a variety of media including movies like Starship Troopers, Men in Black, and Bugs. The Saint Louis Zoo's education department utilizes hissers as an outreach animal. The exhibit areas of the Monsanto Insectarium are divided into sections. For example, there is a section on desert species, invertebrates that "work" with people, and decomposers. Hissing cockroaches are currently housed in a section dedicated to sound and communication.

We started with two colonies dermestid beetles. Our display colony is in the section about decomposers. We keep another colony in our lab area. This colony is used by the Zoo's education department for cleaning skulls and bones that are used as biofacts in education programs. The display colony, and the backroom colony, when it is not working on educational projects, receives dried patties of Nebraska Brand carnivore diet.

The idea to try housing these species together came from several impetuses. One of our staff had visited another zoo where they housed their *Eurycantha calcarata* with a colony of dermestid beetles and did remove not animals at all after they died. Dermestid beetles are sold on the internet as "clean-up crews" for reptile breeders that maintain colonies of feeder insects, like dubia roaches. It was also suggested that some hobby breeders had lower fruit fly and fungus gnat populations in enclosures where they also keep dermestid beetles.

Methods and Materials

In February of 2014, we selected 60 hissing cockroach adults, 30 males and 30 females, to be split in to two groups. Hissing cockroaches are easy to sex, males often have prominent tubercles on the prothorax, their antenna are wider and bumpier looking near the base, and the last ventral segment in males is significantly smaller than females. We then selected 30 adult and 30 larval dermestids to add to the experimental group of hissing cockroaches.

Husbandry

The two groups were housed side by side in two ten gallon tanks. Both enclosures were set up in the same manner, a ten gallon glass aquaria, with two inches of leaf mulch substrate. Each enclosure also had a water dish consisting of a petri dish with pea gravel on the bottom, and a large piece of wood for shelter. In addition to the water dish, each tank was lightly sprayed with a hand mister containing distilled water once a day. Both tanks were also fed a small dish of dry dogfood, which was replaced as needed, and fresh produce was fed daily. The lids of each container were metal with ¼ inch mesh. A thin layer of petroleum jelly was placed around the rim of both tanks. This was to both keep animals from climbing out, and to keep them from glue traps we used to keep track of fruit fly numbers.

Beginning in March of 2014, we wired a Tomcat glue board to the underside of each enclosure's lid, to see if the presence of dermestids had any effect on fruit fly and fungus gnat populations. We continued to change glue boards on a monthly basis until the following September. We then switched back to our more conventional system and affixed a fine mesh cloth to the underside of each lid.

Results and Observations

Both colonies of hissing roaches initially took off like gangbusters and soon settled into a stable population. The dermestid population also remained stable, and did not need any supplementation.

Generally, we supplement the wider metal mesh on enclosure lids with a finer cloth mesh to keep the fruit fly population low. This method has been mostly effective, if not entirely so. Drosophila breeding is unstoppable. Using the glue traps we came to the conclusion that there was no statistically significant difference in fruit fly populations between the control and experimental tanks.

When it came tank sanitation, the dermestids were very effective at removing dead roaches. The substrate in the tank with dermestids was also drier, and needed to be replaced more frequently. Not because it was dirtier, or had more frass, but because the overall level of substrate dropped

more quickly. This had the effect of the dermestid tank receiving fresh substrate, more often. The experimental tank with the dermestids also did not have any issues with mold, which sometimes occur in our main colony tank that uses corn cob bedding.

In September, when we finished our examination of fruit fly populations, we stripped the tanks and, out of curiosity, did a final count of the number of hissing cockroaches in each colony. The control group had 34% more animals in it than the experimental group. We set the tanks up again with the same numbers of animals as before, 15 male and 15 female hissing cockroaches in each tank, and then 30 adult dermestids and 30 larva added to the experimental group. This time, after two months, there were 21% more animals in the control group. Once again we started from scratch after two months there were 35% more animals in the control group. The last time we ran the experiment, there were, once again, 21% more animals in the control group.

Why would the populations have this variation? The dermestids did not seem to directly interfere with hisser reproduction in any way. We did not feed one colony more than the other on a daily basis, and both colonies had a constant supply of dry dogfood. However, in the experimental group, the dermestid beetles were observed eating a majority of the dogfood. The dogfood allowed the dermestid population to stay stable and grow, no matter how many dead hissing cockroaches were available.

Conclusion

Versatile and easily attainable, both Madagascar hissing cockroaches and dermestid beetles do well when housed together. The hissing cockroach enclosures that also had dermestid beetles were cleaner, less prone to mold, and recycled the substrate more efficiently. Co-housing these animals together also limited the hissing cockroach population over the long term. We have adopted this protocol for our main Madagascar hissing cockroach colony, with the added bonus of establishing another, back up dermestid colony.

Population of Madagascar hissing cockroaches

Date	Control Group	Experimental Group	% difference
09/13/14	414	272	34.3
11/12/14	375	298	20.6
01/14/15	464	385	17.1
03/11/15	300	205	31.7
04/15/15	161	104	35.5
Average	343	`253	27.84