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Effects of Modified Livestock Water Troughs on Bat Use

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Cover photo: Hoary bat on tree (*photo by Stu Tuttle*)

Effects of Modified Livestock Water Troughs on Bat Use

Introduction

Due to their abundance and wide geographic distribution, bats are an integral part of many ecosystems. Thousands of metric tons of insects are consumed by insectivorous bats each year, and bats play an important role in controlling insect populations. In addition, nectarivorous and frugivorous bats (lesser long-nosed bats) play important roles as pollinators and seed dispersers in southwestern deserts and other parts of the world.

A number of researchers have captured bats over livestock water troughs while investigating other questions, and it is thought that bat populations in arid areas depend on these isolated water supplies. Most bats are unable to support themselves on their hind legs and, therefore, drink water by swooping over a water source and lapping the surface. However, many water troughs have been modified to suit a ranchers' needs, resulting in reduced surface area to drink and potential hazards to flying bats. Trough modifications include placing a fence over the center of the trough to provide water for two pastures (fig. 1); a single wire stretched across a trough for stability; braces made of wire or steel bars; and panels constructed of boards, wire, or poles (fig. 2).

Higher rates of bat capture and echolocation are recorded during reproductive periods. For most southwestern bat species, this period is during late June or early July, corresponding to the dry season in the Desert Southwest of the United States, when water supplied by artificial sources may be the most reliable. Because most bat species produce only one young per year, potential mortality and energy costs resulting from obstacles placed over water sources may be more detrimental to bat populations than for other small mammals. The high number of livestock water troughs in the West indicates the importance of this issue.

Trough survey

In a survey of 90 troughs in northern Arizona, 48 percent were modified, with 38 percent having either fencing or braces. Only 7 percent of the troughs provided wildlife a means of escape if an individual fell into the water of the trough.

Experiments

Troughs were tested to determine whether fencing or braces negatively affected bat use by simultaneously videotaping bats at modified and unmodified troughs. The thoughts were: (1) bats avoid troughs with modifications, and (2) bats use both modified and unmodified troughs, but their ability to access the water surface is reduced at modified troughs (fig. 3).

Figure 1 Round trough fenced off between pastures causes interference

Figure 2 Braces across trough made of wire or steel bars

There was little support for the first hypothesis; bats continued approaching modified troughs. There was strong support for the second hypothesis, with a 25 percent to 78 percent reduction in the number of bat approaches reaching the water surface at troughs modified with either fences or braces. This effect increased with reduced water surface area, indicating modifications of smaller troughs would have a larger effect on bats. Surprisingly, water in narrow, rectangular troughs modified only with wire or metal braces spaced along the trough had the most profound effect in reducing bat access to the water surface.

Bats required 3 to 6 times the number of approaches to successfully drink from the surface at modified troughs and were 10 times more likely to be unsuccessful at obtaining a drink.

Bat injury or mortality

Although a small percentage (about 1.5 %), some bats do make contact with modifications possibly resulting in injury or mortality. The large number of nightly approaches at thousands of troughs across the West may add up to a significant impact on bats. No bats appeared to be injured or killed during these experiments, but 16 bats made contact with wires at the modified troughs with smaller surface area, indicating that smaller troughs with wires may be posing higher risks of injury for bats.

Bat size

Small (little brown bat) and large (pallid bat) bats (fig. 4) responded similarly in our observations. However, this result may be misleading as the pallid bat is quite maneuverable for it size, and many of the larger species frequenting the sites are not represented. It is likely that fast-flying bats that are not maneuverable simply cannot use the small water troughs. Further examination of water surface requirements by species is needed to address the question of availability based on trough size.

Conclusions

Bats do not stop approaching modified troughs. However, the percent of successful surface approaches was lower at modified troughs. The resulting increased number of approaches to modified troughs also increased the number of avoidance maneuvers, probably increasing the energy expended. Higher energy costs and possibly lower water intake could be detrimental to bat survival.

Management recommendations to avoid injury or increased physiological stress to bats

- Provide separate troughs for each pasture.
- Remove unneeded modifications.
- Place supports outside trough or below the water surface.
- Maintain water in troughs and keep the water level near the top.
- Provide escape ramps for wildlife to prevent accidental drowning.

References

Taylor, D.A.R., and M.D. Tuttle. 2007. Water for Wildlife—A handbook for ranchers and range managers. Bat Conservation International. Austin, TX.

Tuttle, S.R., C.L. Chambers, and T.C. Theimer. 2006. Potential effects of livestock water-trough modifications on bats in northern Arizona. Wildlife Society Bulletin 34(3)602–608.

Figure 3 The modified trough on the left reduces the water surface area available for swooping bats and also presents a collision potential. The unmodified trough on the right provides a maximum surface area and free from collision hazards

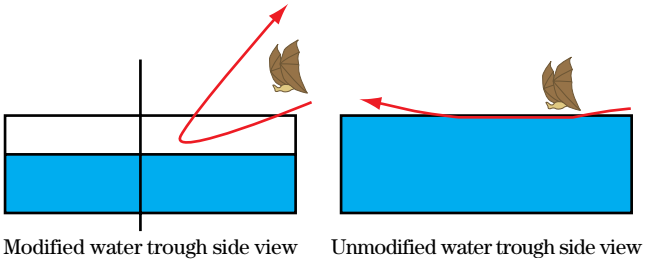

Figure 4 The pallid bat represents the large bats at the troughs in figure 3