Does Installation Method Affect Snake Entanglement in Erosion Control Blankets?

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Introduction

Erosion control blankets (ECBs) are installed at construction sites to mitigate against soil loss and promote plant growth. Wildlife, particularly snakes, are prone to becoming entangled in ECBs that contain fixed-intersection, small-diameter polypropylene mesh with multiple layers (Ebert *et al.* 2019 *Wildl. Soc. Bull.*; Fig. 1).

The majority of ECBs on the Texas Department of Transportation's Approved Product List contain fixed-intersection mesh, which pose a risk to snakes.

Snake entanglements often occur at the edge of an ECB where the snake often passes between the multiple mesh layers (Ebert *et al.* 2019 *Wildl. Soc. Bull.*).

Fig. 1: *Pantherophis obsoletus* entangled on ECB S32 DB (2 layer ECB with fused, polypropylene netting) during field surveys in 2018.

Burying the edge of an ECB may decrease the risk of snake entanglement by allowing them to pass over the ECB edge reducing their encounters with the multiple layers of mesh netting.

We hypothesized burying the ECB edge would reduce snakes attempting to pass through the mesh and reducing their risk of entanglement and that there will be a positive correlation between circumference and entanglement.

Methods

We conducted an entanglement experiment consisting of two treatments:

1.) **Exposed edge**- The edge of the ECB was staked down every meter (**Fig. 2A**).

2.) **Buried edge**- The edge of the ECB was staked down every meter and buried with soil along all edges (**Fig. 2B**).

Snakes (n = 87) were placed on a patch of bare soil in the arena center with the ECB (BIOMAC SC) installed at each end and allowed to move as desired (**Fig. 3**).

We noted whether the snake attempted to pass through the mesh or became entangled as well as the morphometrics of each snake (SVL, tail length, circumference).

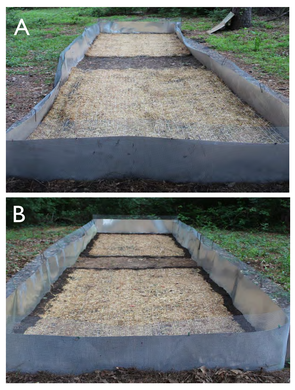

Fig. 2: Experimental area for entanglement trials for the A) exposed edge and B) buried edge treatment.

Fig. 3: *Heterodon platirhinos* at the start of a trial placed in patch of bare soil in a buried edge treatment.

Results

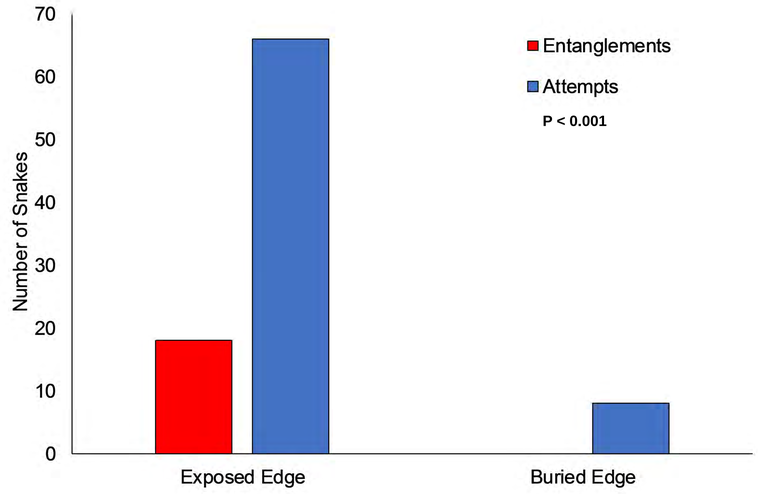

Fig. 4: The number of entanglements and attempts on exposed and buried ECB treatments. An entanglement was defined as when a snake becomes caught in the ECB mesh. An attempt was defined as when a snake passed its head or body through the ECB mesh netting, but did not become entangled.

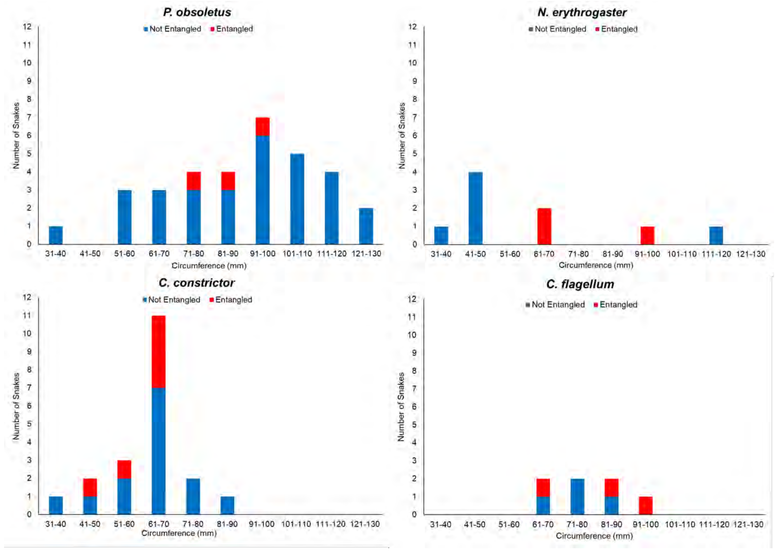

Fig. 5: Circumference (mm) snakes that were and were not entangled during the entanglement trials, separated by size classes by 10 mm increments.

Overall, **20.6%** of snakes became entangled. Snakes were entangled only in the exposed ECB edge treatment; no snakes were entangled when the ECB edge was buried (**Fig. 4**).

Snakes are more likely to attempt to pass through the ECB on exposed edges compared to buried edges (McNemar Test; **P < 0.0001**) as the majority (**89.2%**) of attempts to pass through the ECB occurred in the exposed edge treatment (**Fig.4**).

Results

Circumference had a significant effect on the probability of entanglement after a snake made an attempt on the exposed edge treatment (**P = 0.0290**).

All entangled snakes had a circumference greater than 44 mm, and **94.4%** of entangled snakes contained a circumference greater than 50mm (**Fig. 5**).

Fig. 6: *Coluber constrictor* entangled at the edge of BIOMAC SC ECB during an entanglement trial.

Discussion

When installed, ECBs can cover large areas on the landscape (Fig. 7). However, our results suggest that snakes are vulnerable to a small portion of the total area of an ECB (i.e., the ECB edge) (Fig. 6).

Fig. 7: A) An TXDOT construction site with an ECB installed across the landscape. B) The exposed edge of an ECB S32 DB (2 layer ECB with fused, polypropylene netting).

No snakes became entangled in the buried edge treatment, supporting our hypothesis that modifying the installation technique for ECBs is effective at reducing behavior that leads to entanglement. An exposed edge increased the number of attempts, which is a precursor to entanglement.

Although ECBs pose a risk to all snakes, snakes with a body circumference of >50 mm are at a higher risk of entanglement (**Fig. 5**), which inadvertently targets larger species or gravid snakes potentially affecting population stability.

If contractors need to install an ECB with fixed-intersection mesh netting, modifying the installation technique may decrease the negative impacts on snakes.

However, installation method has not been field tested as there may be a risk of the ECB edges becoming exposed (e.g., due to rainfall).

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