Delta Farmland Bat Survey

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Photo 1 An ARU deployed in a pollinator mix grassland set aside.

Abstract

Bats in British Columbia face multiple threats, yet data on local populations remains limited. Delta Farmland and Wildlife Trust conducted stationary and mobile acoustic surveys in grassland set-asides (GLSAs) and hedgerows throughout Delta, BC, to establish baseline species presence. Across stationary sites, eight species were detected, with hedgerows supporting higher species richness than set asides. Mobile surveys recorded seven species, with spatial patterns consistent with previous surveys. Endangered and at-risk species, including the Little Brown Myotis, Hoary Bat, and Silver-haired Bat, were regularly detected, highlighting the conservation value of these habitats. These results provide important baseline data to guide future monitoring and habitat management strategies.

Program background

In British Columbia, bats provide an important role in forest, grassland and agricultural ecosystems. The province supports a diverse bat community, with the highest number of species occurring at low latitudes and elevations in regions such as the lower

Fraser River delta (Lausen et al. 2022). Nine bat species are expected to occur in this area, three are listed as endangered, two are blue listed in BC and four are considered secure.

Across British Columbia and Canada, bat populations are facing multiple threats which are contributing to population declines. White-Nose Syndrome is a deadly disease that has been rapidly spreading throughout bat populations across North America and although it has not been detected in our region, it has been discovered in bats in the interior of BC and in western Washington. Additional threats to bats include impacts from wind energy, predation from cats and habitat loss.

Habitat loss is a shared conservation concern between bats and other local species-at-risk, including Barn Owls, Barn Swallows and Great Blue Herons. Habitat loss is a multi-faceted issue referring to loss of areas for breeding, foraging, roosting and migration.

The Delta Farmland and Wildlife Trust (DFWT) partners with farmers in the Fraser River delta through stewardship agreements which create habitat to support species-at-risk. Following the establishment of these agreements, we conduct wildlife monitoring to evaluate the impacts programs have on species-at-risk. species-at-risk.

The aim of this project is to monitor grassland set-asides and hedgerows to observe changes in species presence over time. Since DFWT started bat monitoring in 2023, our goal with this project is to contribute understanding and closely monitor the status of local bats.

Methods

Survey methodology follows standardized protocols established by the North American Bat Monitoring Program (NABat) (Loeb et al. 2015). NABat is a continent-wide multi-year research and monitoring effort which collects data from many collaborators to assess population status and trends. Within the monitoring framework of NABat, we utilized mobile acoustic surveys to survey farmland throughout Delta and stationary point acoustic surveys within grassland set-asides and hedgerows.

Stationary point acoustic surveys were conducted at 6 grassland set-aside fields and 2 hedgerows in Delta, BC. However, three fields yielded no results due to malfunctions, likely caused by SD card errors or batteries being dislodged by wind. We deployed AudioMoth 1.2.0 autonomous recording units (ARUs), which are recorders that can passively record audio between 8 and 384 kHz (Hill et al. 2018). AudioMoths were programmed according to a preset configuration file which followed NABat recommended settings (NABat 2023). Sample rate was set to 250 kHz, gain was set to medium, the recording window was set from 19:30 to 5:30 and amplitude-based triggered recordings were set for 2 seconds at frequencies above 16 kHz.

AudioMoths were mounted on a t-post to a height of 1.5m and >100m from the field edge within grassland set-asides and >10m from large sources of clutter (i.e. trees) in hedgerows. The recorders were equipped with three 2,800 mAh rechargeable AA batteries and a SanDisk 128GB SD card. They were heat-sealed within waterproof vacuum bags alongside a 5g pack of desiccant and attached with zip ties to a steel t-post to a height of 1.5m (Rhinehart 2021).

Between the months of June and July is the summer active period for high bat activity prior to the young becoming volant (Loeb et al. 2015). We deployed AudioMoths for a week throughout this period after night-time temperatures regularly rose above 10°C.

Mobile acoustic surveys were conducted between July 9 and July 17 within two 10 x 10 km grid cells in the lower Fraser River delta. The grid cells are established by NABat and encompass Canada, the United States and Mexico. Cell 'Ladner' (CA90170) encompassed Westham Island and Ladner and the cell 'Tsawwassen' (CA24634) encompassed Tsawwassen.

Mobile acoustic transect surveys are completed in a vehicle travelling at a consistent speed of 32km/h with minimal stopping for between 25-48 km without crossing back on previous paths taken (Loeb et al. 2015). The 'Ladner' route was 29 km long and the 'Tsawwassen' route was 30 km long.

Two surveys were conducted per cell. Surveys started 45 minutes after local sunset and continued until the route was completed. Surveys were not completed if there was precipitation or winds above 10 km/h.

We recorded bats using an Echo Meter Touch 2 Pro ultrasonic recorder (Wildlife Acoustics, www.wildlifeacoustics.com). The recorder was attached to a wooden stake and held out the passenger's side window. A USB-C cable was used to connect the recorder to a tablet running Echo Meter Touch application firmware version 2.2.7 and was controlled by the passenger of the car. The Echo Meter Touch application was configured to detect bats specific to British Columbia and was set to record mode when the surveys initiated with all settings set to default.

Bat recordings taken during the stationary point and mobile acoustic surveys were analyzed initially using the automatic identification function of the Kaleidoscope Pro 5.7.0 software (Wildlife Acoustics, www.wildlifeacoustics.com) and followed up with manual verification (Lausen et al. 2022).

Results and Discussion

Acoustic Stationary Surveys

Across all stationary sites (three set-aside fields and two hedgerows), a total of eight bat species were detected. The species detected in approximate order of detection frequency were: Little Brown Myotis, Hoary Bat, California Myotis, Yuma Myotis, Big Brown Bat, Silver-haired Bat, Long-eared Myotis and Long-legged Myotis. The Townsend's Big-eared Bat, a potential species in the region, was not detected.

Species presence at each site was determined based on detections occurring on at least three separate nights throughout the survey period. The Little Brown Myotis and Hoary Bat met this threshold at all surveyed sites. Yuma Myotis was confirmed present at both hedgerow sites, although it was detected in every set-aside field it did not meet the threshold to be classified as present. The Big Brown Bat, Silver-haired Bat, California Myotis were also confirmed at certain sites (Figure 1). The Long-eared and Long-legged Myotis were detected in two sites but did not meet the threshold for presence.

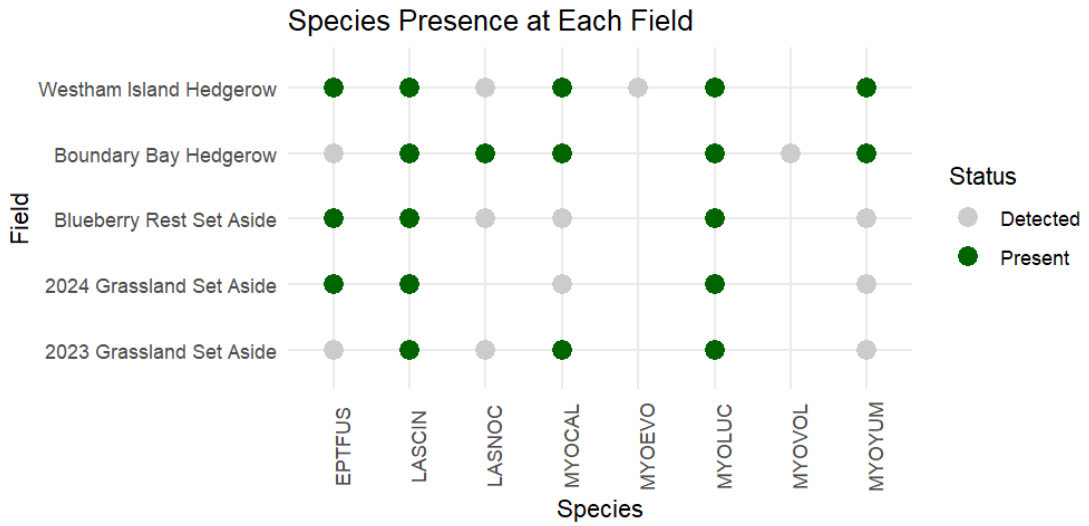

Figure 1 Species presence and detection at each survey field in Delta, BC. Green circles indicate species confirmed present (detected on ≥3 separate nights, while grey circles indicate species detected but not meeting the threshold for confirmed presence.

On average, set-aside sites recorded three confirmed species, with an average total of 5.5 species detected over all set-asides. Hedgerows recorded five confirmed species on average and averaged seven total species detected (Figure 2).

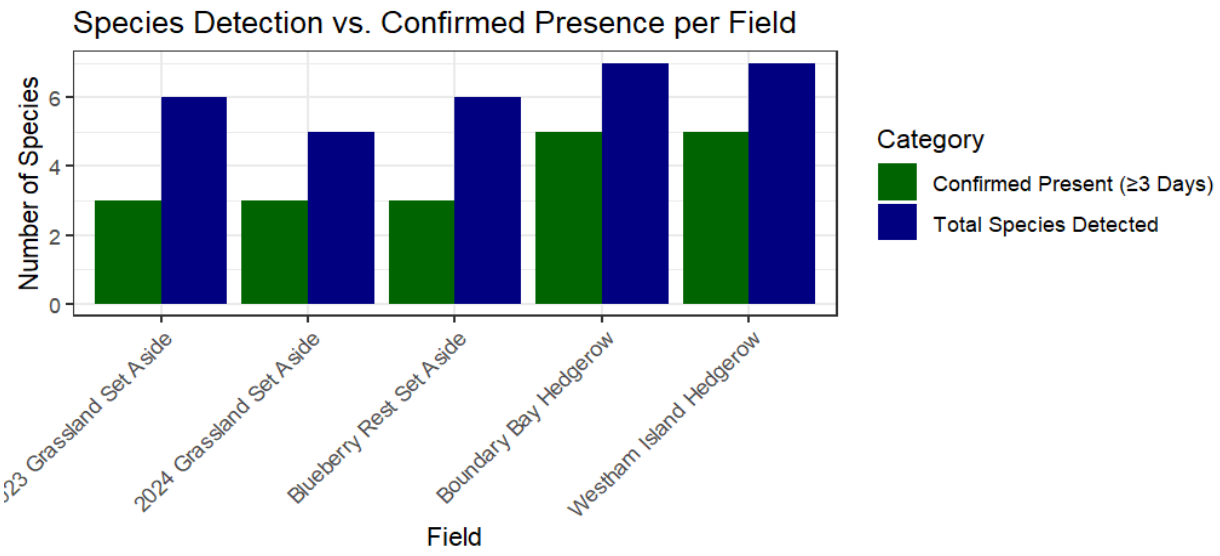

Figure 2 Comparison of bat species detected versus confirmed present across each survey site. Bars represent the total number of species detected (blue) and the number of species confirmed present on ≥3 survey nights (green).

Bat activity throughout the night was similar in both Hedgerows and GLSAs. One hedgerow site recorded 290 detections of Little Brown bats (MYOLUC) over the survey period, which was more than ten times higher than the next highest site. This elevated level of activity throughout the night may suggest the possible presence of a nearby roost, which would explain the relatively consistent detection rates observed throughout the night (Figure 3).

To better assess general activity patterns, Little Brown Bat detections at this hedgerow were excluded from the dataset. Following this adjustment, both grassland (GLSA) and hedgerow sites exhibited similar temporal trends in bat activity. In both habitat types, activity levels peaked around sunset and declined steadily as the night progressed (Figure 4).

This pattern aligns with established observations of bat behavior, as many species are known to exhibit peak foraging activity shortly after sunset, with activity gradually decreasing in the hours that follow.

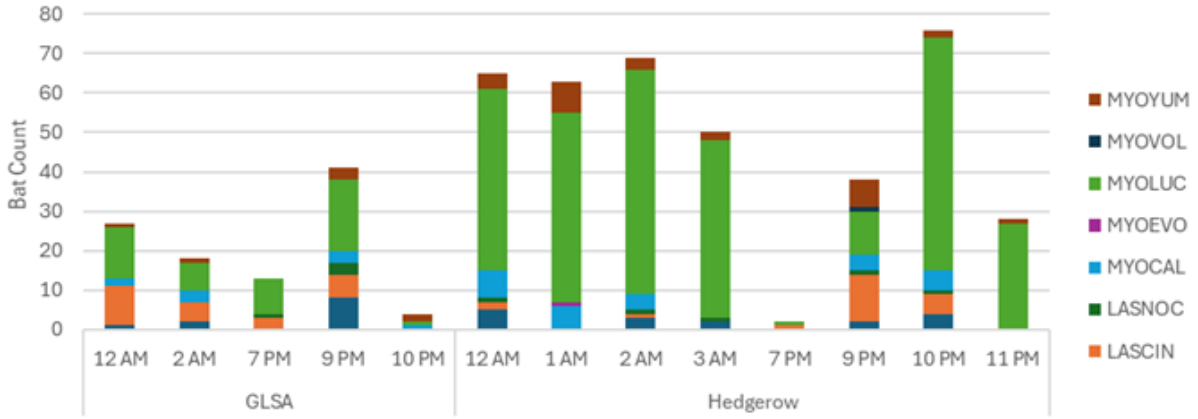

Figure 3 Stacked bar chart indicating time of night each species was detected in both Hedgerow and Grassland Set-Aside sites.

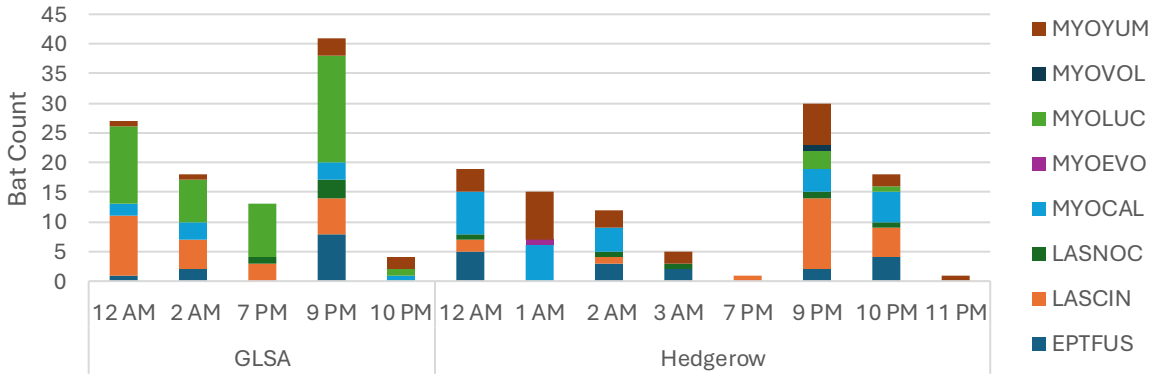

Figure 4 Stacked bar chart indicating time of night each species was detected in both Hedgerow and Grassland Set-Aside sites with potential bat roost site removed.

During this survey, hedgerows supported higher overall species richness than set-aside fields, though both habitat types hosted multiple species (Figure 4). This difference may be related to roosting preferences, as some species of bats such as the Hoary Bat and Silver-haired Bat prefer to roost in trees, and the Big Brown Bat, Yuma Myotis, California Myotis, Long-legged Myotis, and Little Brown Myotis will roost in snags or stumps (Craig & Holroyd, 2004). Hedgerows contain more trees and woody cover that are suitable for roosting sites, while set-asides consist of tall grasses that are more likely used for foraging.

Little Brown Myotis is classified as endangered, and Hoary Bat and Silver-haired Bats were both classified as endangered by COSEWIC in 2023 (Lausen et al. 2022). Results from our monitoring indicate that grassland set-aside and hedgerow habitats are regularly being utilized by all three of these species of concern, highlighting the importance of both habitat types for local bat conservation.

Mobile Acoustic Surveys

A total of seven species were recorded across the mobile acoustic surveys. Both the 'Tsawwassen' route, surveyed on July 10th and July 17th, and the 'Ladner' route, surveyed on July 9th and 16th, recorded 6 species each (Figure 5).

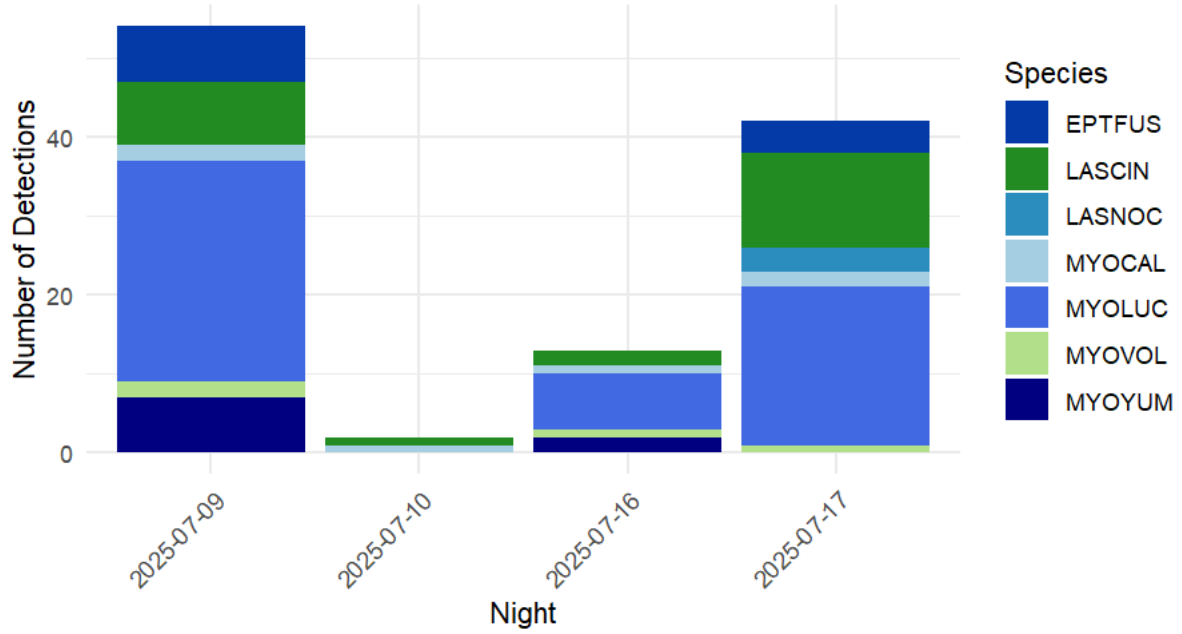

Figure 5 Number of detections across each survey night. Stacked bars show the number of detections based on each bat species.

Overall, detections were lower in the 2025 survey compared to 2024. Despite this decrease in total activity, the spatial pattern of detection remained similar between years (Figure 4). As in the 2024 survey, a high number of bat calls was recorded along the Fraser River and Boundary Bay. Calls were detected in residential and industrial areas, as well as in open farmland. Residential areas generally provide more tree and canopy cover, as well as artificial roosting structures such as bat boxes, which support bat presence. Whereas open farmland offers open landscapes with abundant insect activity that likely functions as foraging habitat.

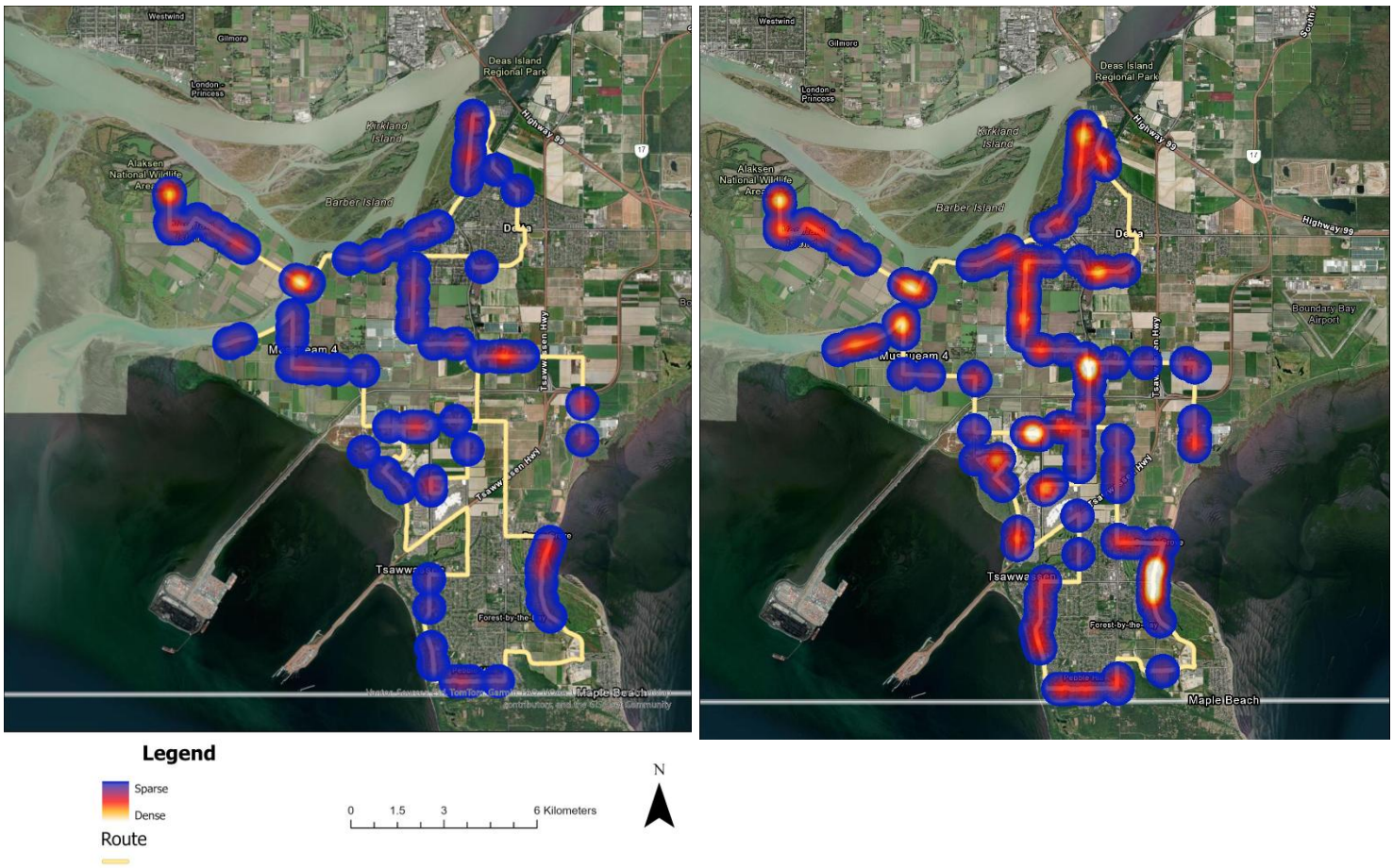

Figure 6 Spatial distribution of bat calls along total survey routes in 2025 (left) and 2024 (right). Colour intensity represents the number of bat calls detected at each location, where white indicated areas with higher call density, while blue represents sparser detections. The survey route is shown as a yellow line.

Conclusion

The 2025 bat survey shows that both grassland set-asides and hedgerow habitats in the study support a diverse range of bat species. A total of eight species were tentatively detected across stationary sites, with hedgerows generally supporting higher species richness than set-asides, likely due to greater availability of roosting structures. Mobile acoustic surveys recorded seven species, with spatial patterns consistent with previous years. Species of conservation concern, including the Hoary, Silver-haired, and Little Brown bat were detected in both habitat types, which displays the importance of these landscapes for bat conservation. These baseline data provide a foundation for future monitoring and research which can help inform management and conservation strategies to maintain and enhance bat populations in the region.

Appendix

Name	Scientific Name	Abbreviation
Townsend's Big-eared Bat	*Corynorhinus townsendii*	CORTOW
Hoary Bat	*Lasiurus cinereus*	LASCIN
Silver-haired Bat	*Lasionycteris noctivagans*	LASNOC
Big Brown Bat	*Eptesicus fuscus*	EPTFUS
Yuma Myotis	*Myotis yumanensis*	MYOYUM
Californian Myotis	*Myotis californicus*	MYOCAL
Long-legged Myotis	*Myotis volans*	MYOVOL
Little Brown Myotis	*Myotis lucifugus*	MYOLUC
Long-eared Myotis	*Myotis evotis*	MYOEVO

Table 1 Bat species detected across survey sites in 2025, including common name, scientific name, and abbreviations.

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