

# Bigmouth Buffalo Movement and Habitat Occupied by Bigmouth Buffalo, Paddlefish and Bigheaded Carp



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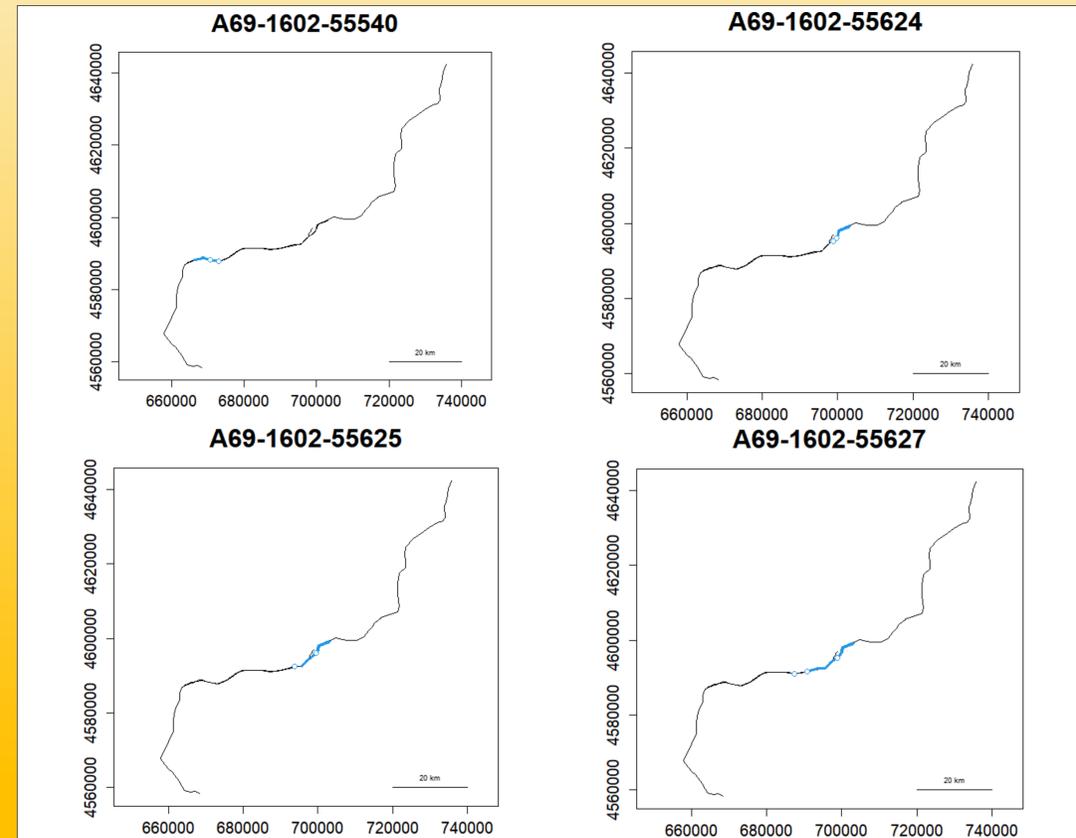
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## Abstract

In the Upper Mississippi River (UMR), information on bigmouth buffalo *Ictiobus cyprinellus* movement is lacking. Understanding bigmouth buffalo spatial and temporal movements will allow managers to assess habitat connectivity and seasonal movements. Habitats occupied by bigmouth buffalo, paddlefish *Polyodon spathula*, and bigheaded carp *Hypophthalmichthys spp.* is also important to understand due to diet overlap between these species. We used acoustic telemetry to monitor and detect the fish's location and movements during July-December 2020. Active and passive tracking methods were used. Minimum home ranges varied from 0.49-25.37 km with a mean of 6.76 km. Two bigmouth buffalo have made three passages in 2020 (Table 1). One fish made a downstream passage at LD 15 and LD 16, and the second fish made a downstream passage at LD 15 through the auxiliary lock. Of the 162 bigmouth buffalo detections, 64 (40%) were found in side channels, 51 (32%) were found in contiguous floodplain lakes, 37 (23%) were found in channel borders, (Fig. 2). Of the 127 bigheaded carp detections, 56 (44%) were found in channel borders, 45 (35%) were found in side channels (Fig. 2). Of the 90 paddlefish detections, 43 (48%) were in channel borders, and 37 (41%) were in contiguous floodplain (Fig. 2). Bigmouth buffalo home ranges varied, and the three species occupied some of the same habitat types indicating habitat overlap is likely to exist.

## Methods

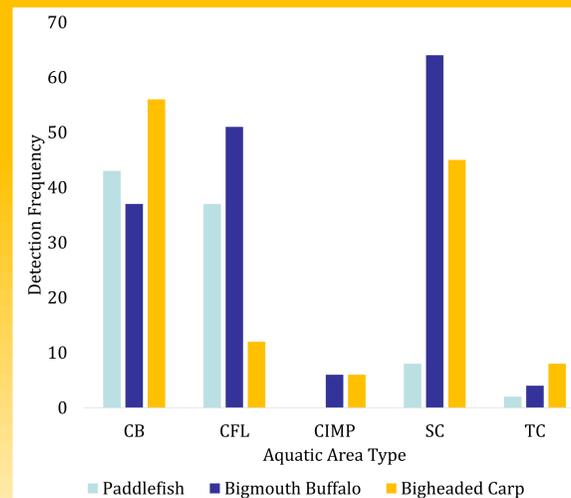
- Acoustically tagged 180 Bigmouth Buffalo and 132 Bigheaded Carp in Pools 15, 16, and 19 in the UMR.
- R package 'riverdist' was used to calculate minimum home ranges for Bigmouth Buffalo.
- Minimum home range is the total linear distance that connects all observations of an individual.
- Fish detections from manual tracking only were loaded into ArcMap and overlaid on USGS-UMESC high-resolution land cover data sets for habitat occupied.
- The strata type was determined by the position habitat description of coordinate points.



**Figure 1.** Four largest home ranges for bigmouth buffalo in 2020. The black line represents the UMR river section from Lock and Dam 13 (top right) to Lock and Dam 18 (bottom left). The blue line represents the home range for each individual. Zoom into the figure to see home ranges.

**Table 1.** Bigmouth buffalo upstream and downstream passage events from June 2020 - January 2021 at LD 14-19 in the Upper Mississippi River. Total is the combined upstream and downstream passages. N represents that number of unique bigmouth buffalo. At LDs 15 and 19, the fine-scale receiver array was used to determine the route of the fish passage (i.e., through the dam gates or the lock chamber).

Lock & Dam	Upstream	Downstream	Total	N
14	0	0	0	0
15				
Dam	0	1	1	1
Lock	0	1	1	1
16	0	1	1	1
17	0	0	0	0
18	0	0	0	0
19				
Dam	0	0	0	0
Lock	0	0	0	0



**Figure 2.** Bigmouth buffalo detections (N=162), paddlefish detections (N=90), and bigheaded carp detections (N=127) from July-August 2020 manual tracking efforts. CB=Channel Border, CFL=Contiguous Floodplain Lake, CIMP=Contiguous Impounded, SC=Side Channel, and TC=Tributary Channel.

## Objectives

- Determine spatial movements of bigmouth buffalo (N=27) using minimum home range in pools 14-19.
- Determine the habitat occupied by bigmouth buffalo, paddlefish, and bigheaded carp in pools 14-19.

## Results/Discussion

Minimum home ranges varied from 0.49-25.37 km with a mean of 6.76 km.

Two bigmouth buffalo have made a total of three passages in 2020 (Table 1). One fish made a downstream passage at LD 15 and LD 16. The second fish made a downstream passage at LD 15 through the auxiliary lock and was detected in the downstream approach at LD 15 for 10 days but was unsuccessful in upstream passage. Low passage events by bigmouth buffalo in 2020 may have been due to the low water levels.

Of the 162 bigmouth buffalo detections, 64 (40%) were found in side channels, 51 (32%) were found in contiguous floodplain lakes, 37 (23%) were found in channel borders, 6 (4%) were found in contiguous impounded habitat, and 4 (3%) were found in tributary channels (Fig. 2). Of the 127 bigheaded carp detections, 56 (44%) were found in channel borders, 45 (35%) were found in side channel, 12 (9%) were found in contiguous floodplain lakes, 8 (6%) were found in tributary channels, and 6 (5%) were found in contiguous impounded habitat (Fig. 2). Of the 90 paddlefish detections, 43 (48%) were in channel borders, 37 (41%) were in contiguous floodplain, 8 (9%) were in side channels, and 2 (2%) were in tributary channels (Fig. 2). All three species were found in channel border habitat which is evidence there may be habitat overlap of the three species.

## Future Research

- Determine if home ranges differs over seasons.
- Determine if bigmouth buffalo, paddlefish, and bigheaded carp have habitat overlap.

If you have any questions, feel free to email me at: [bdsea2@illinois.edu](mailto:bdsea2@illinois.edu)