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RELOCATION OF  
THE FAT POCKETBOOK PEARLY MUSSEL, PROPTERA CAPEX (GREEN),  
IN THE ST. FRANCIS RIVER AT MADISON  
ST. FRANCIS COUNTY, ARKANSAS

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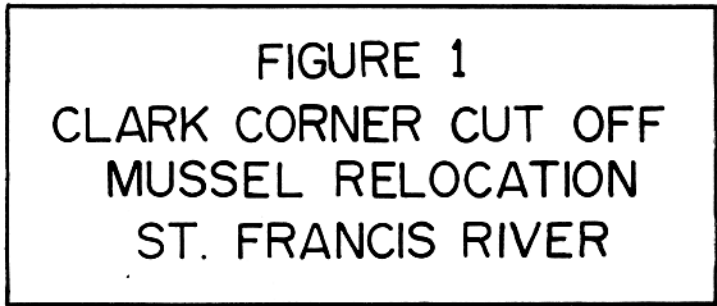
Relocation of the Fat Pocketbook Pearly Mussel,  
Proptera capax (Green), in the St. Francis River  
at Madison, St. Francis County, Arkansas

Introduction

This report summarizes the methods and results of a relocation project to mitigate adverse construction related impacts to the endangered freshwater mussel Proptera capax in the Clark Corner Cutoff of the St. Francis River at Madison, St. Francis County, Arkansas (section 30; R4E; T5N) (Figure 1). In 1985, the Arkansas Game and Fish Commission (AGFC) drafted plans and initiated coordination with Federal and State agencies for construction of a boat launching area on the west bank of the river approximately 75 meters upstream of the Arkansas Highway 50 bridge. Application was made to the U.S. Army Corps of Engineers (COE), Memphis District, for a Section 404 Permit to allow construction in the St. Francis River. Formal coordination between COE and the U.S. Fish and Wildlife Service (USFWS) resulted in a Biological Opinion specifying that Proptera capax be relocated from the construction impact zone prior to issuance of the Section 404 Permit.

Methods

This underwater search was performed by two divers sustained by a Brownie's Third Lung air compressor with Sherwood-Hookah regulators. The search area for each diver was defined using square meter quadrats composed of 3/4 inch



Madison  
Quad

PVC pipe filled with metal rods for ballast. Numerous quarter inch holes were drilled in each pipe segment to release air and drain water as the quadrat was moved from site to site.

The search procedure consisted of placing the grids on the substrate and digging into the substrate to a depth of approximately 10 centimeters using a garden hand rake. Mussels uncovered were bagged, brought to the surface, identified to species, and enumerated for each square meter. Following the search of a quadrat, the area was marked by placing wire stem survey flags in the substrate at the four corners of the quadrat. This allowed a somewhat systematic search of the river bottom.

Following identification and enumeration, all mussels were placed in coolers or tubs of river water and held until they were relocated upstream. All specimens of Proptera capax were measured to the nearest 0.1 mm for length, width, and depth using a Helios dial caliper. All specimens were relocated approximately 300 meters upstream and placed in habitat similar to that from which they were taken.

Initially, the construction impact zone was delineated as extending from the most upstream point of construction downstream to the Arkansas Highway 50 bridge for the full width of the river (Figure 2) and all Proptera capax were to be removed from this area. In an effort to locate concentrations of mussels, five reference transects were

Eastern Shoreline

Arkansas Highway 50

FLOW

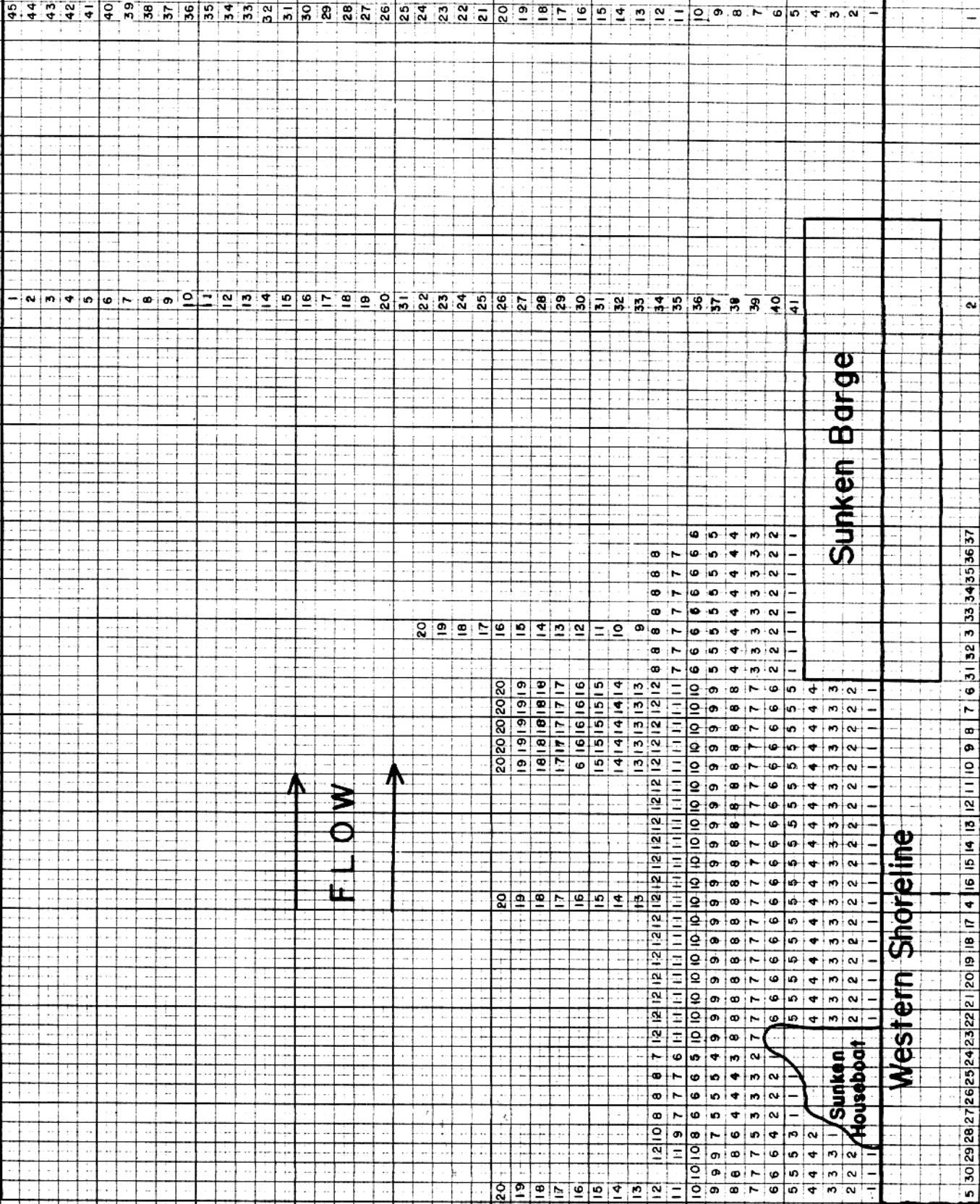
Sunken Barge

Western Shoreline

Transect Numbers

Construction Limits

FIGURE 2. SCHEMATIC DIAGRAM OF RELOCATION AREA



established at approximately equal distances within the relocation area. Following search of reference transects 1 and 2 (Figure 2), it became apparent that most mussels were restricted to the western half of the river. Consultation with a COE representative in the field resulted in revision of the limits of the relocation area. The revised relocation area extended from the upstream construction limits down to the Highway 50 bridge and out a distance of 20 meters from the western bank.

After completion of transects 1-10, it became apparent that there was a well defined transition zone of substrate types between quadrats 12 and 13. Substrate for quadrats 1-12 consisted of coarse sand, gravel, and shell that was compacted into a firm, non-shifting substrate. Quadrats 13-20 had primarily sand substrate that was loose and constantly shifting. Very few mussels inhabited the substrate of quadrats 13-20. Due to time and manpower limitations and in the interest of maximizing the return per unit effort, the decision was made to restrict the relocation effort to the gravel-sand substrate extending 12 meters from the west bank of the river.

The reference transects revealed that the west bank mussel bed terminated between transects 2 and 3. Five meters downstream of transect 3, we encountered increased water depth, loose substrate, fewer live specimens, and dense underwater debris. This was interpreted as the end of

the mussel bed and the relocation project was terminated at this point.

The relocation project was carried out in 15 work days between August 4 and August 27, 1986. High water levels forced cessation of work between August 13 and August 15. Personnel participating in the project included AGFC employees Ken Shirley, Jeff Farwick, Steve Filipek, and Larry Rider and Arkansas Highway and Transportation Department employee John Harris.

### Results

A total of 512 square meters of stream bottom was searched during this relocation project and 7,825 specimens representing 25 species of unionid mussels were collected (Table 1). Eighty-two specimens of Protera capax, all apparently post-juvenile, were found in 65 quadrats and represented 1.0% of all specimens collected. Length, width, and depth of all Protera capax taken are presented in Table 2 and distribution of these specimens within the search area is illustrated in Figure 3. The smallest individual taken was 68.0 mm in length and the largest was 132 mm in length. The greatest density of the Protera capax encountered was three per square meter (quadrats 11-6 and 36-6).

The three ridge, Ambalema plicata, was the most abundant species in the relocation area with a total of 4,117 specimens representing 52.6% of the total mussel take. Average

TABLE 1 NUMERICAL RESULTS OF RELOCATION OF PROPTERA CAPAX

Species	Specimens	% Total Specimens	Quadrats <sup>a</sup>	% Total Quadrats <sup>b</sup>	Average/Quadrat <sup>c</sup>
SUBFAMILY UNIONINAE					
<u>Amblema plicata</u>	4,117	52.6	248	48.4	16.60
<u>Fusconaia ebena</u>	200	2.6	109	21.3	1.83
<u>F. flava</u>	32	0.4	25	4.9	1.28
<u>F. undata</u>	41	0.5	38	8.0	1.08
<u>Megalonaia gigantea</u>	487	6.2	161	31.4	3.02
<u>Plectomerus dombejanus</u>	2	>0.1	2	0.4	1.00
<u>Pleurobema rubra</u>	45	0.6	35	6.8	1.29
<u>Quadrula nodulata</u>	106	1.4	90	17.6	1.18
<u>Q. pustulosa</u>	649	8.3	228	44.5	2.85
<u>Q. quadrula</u>	1,053	13.5	254	49.6	4.15
<u>Tritogonia verrucosa</u>	101	1.3	72	14.1	1.40
SUBFAMILY ANODONTINAE					
<u>Anodonta grandis</u>	7	0.1	6	1.2	1.17
<u>Arcidens confragous</u>	70	0.9	62	12.1	1.13
<u>Lasmigona complanata</u>	30	0.4	28	5.5	1.07
SUBFAMILY LAMPSILINAE					
<u>Lampsilis anodontoides</u>	126	1.6	106	20.7	1.19
<u>L. hydlana</u>	3	>0.1	3	0.6	1.00
<u>L. ventricosa</u>	42	0.5	38	7.4	1.11
<u>Leptodea fragilis</u>	300	3.8	166	32.4	1.81
<u>L. laevis</u>	20	0.3	20	3.9	1.00
<u>L. laevis</u>	2	>0.1	2	0.4	1.00
<u>Liguia recta</u>	106	1.4	83	16.2	1.28
<u>Obliguaria reflexa</u>	10	0.1	10	2.0	1.00
<u>Plagiola lineolata</u>	82	1.0	65	12.7	1.26
<u>Proptera capax</u> *	187	2.1	118	23.0	1.42
<u>P. purpurata</u>	27	0.3	24	4.7	1.13
<u>Trucilla truncata</u>					
25	7,825	100.0	N/A	N/A	N/A

<sup>a</sup> Number of quadrats from which species was collected.

<sup>b</sup> [Quadrats/Total number of quadrats (-512)] x 100.

<sup>c</sup> Specimens/Quadrats



TABLE 2

LOCATION, LENGTH, WIDTH, & HEIGHT OF PROPTERA CAPAX COLLECTED

<u>SPECIMEN #</u>	<u>TRANSECT</u>	<u>QUADRAT</u>	<u>LENGTH</u>	<u>WIDTH</u>	<u>HEIGHT</u>
1	1	21	77.7	50.1	57.0
2	2	36	107.1	68.0	79.9
3	4	1	115.7	77.6	86.6
4	4	4	82.2	51.0	61.5
5	4	9	78.7	53.1	55.7
6	4	10	85.2	53.0	62.1
7	5	5	101.6	60.3	71.6
8	5	6	110.2	64.1	80.6
9	5	10	68.0	46.5	49.0
10	7	5	82.7	56.5	63.9
11	7	6	111.0	65.1	85.0
12	7	6	116.4	66.7	95.7
13	7	7	73.0	44.8	52.7
14	7	7	111.5	61.7	82.7
15	7	8	114.7	72.4	88.7
16	8	5	69.0	40.9	51.2
17	8	7	113.7	65.8	86.4
18	9	6	111.7	64.5	85.1
19	9	6	107.5	65.0	82.5
20	11	6	110.0	64.0	90.3
21	11	6	110.6	60.4	82.7
22	11	6	71.4	46.5	54.3
23	11	8	111.6	67.2	89.2
24	11	10	100.1	58.4	76.7
25	12	1	NO MEASUREMENTS TAKEN		
26	12	6	85.0	54.3	70.0
27	12	7	99.5	55.7	75.5
28	12	10	82.4	53.6	68.4
29	13	2	74.0	49.2	56.4
30	13	8	116.5	71.5	98.8

31	13	8	118.2	72.9	96.0
32	14	4	73.3	43.0	54.0
33	14	8	98.3	56.8	80.5
34	14	9	82.7	55.7	66.8
35	14	9	118.7	70.7	97.6
36	15	7	114.5	68.8	95.2
37	15	7	98.1	61.5	77.5
38	15	12	85.8	59.4	61.5
39	16	5	116.1	61.2	85.0
40	16	9	113.7	69.0	95.2
41	17	5	85.8	57.0	71.6
42	18	3	110.0	64.3	79.7
43	20	5	114.2	64.3	91.4
44	20	6	94.9	67.3	88.6
45	20	10	86.3	58.0	66.7
46	21	5	112.5	70.0	91.6
47	21	5	113.4	63.3	89.8
48	21	8	122.2	76.4	101.4
49	21	10	84.4	54.6	70.1
50	24	1	121.6	68.8	90.8
51	24	4	101.5	60.3	79.1
52	26	2	104.7	65.8	83.7
53	27	3	74.8	50.5	62.6
54	27	3	96.4	55.1	75.7
55	27	4	120.4	68.3	97.2
56	27	7	105.4	67.2	83.9
57	28	6	88.0	62.1	64.2
58	29	7	99.1	57.7	71.4
59	29	10	79.4	50.9	58.8
60	30	4	120.0	74.2	99.7
61	30	4	107.1	69.0	88.6
62	30	5	90.6	57.7	74.1
63	30	9	76.5	51.0	61.8
64	30	9	84.7	57.9	69.1
65	30	10	104.1	62.0	86.2
66	31	4	105.0	63.2	88.2

67	31	4	132.3	80.5	107.9
68	32	2	110.3	63.3	78.9
69	32	2	85.2	53.9	60.3
70	32	5	86.1	50.9	71.6
71	33	5	94.9	55.2	72.8
72	33	8	83.3	55.0	60.6
73	34	2	74.5	46.5	51.1
74	34	3	85.8	54.5	59.7
75	34	7	96.8	64.8	70.5
76	35	2	88.6	55.0	64.2
77	36	3	89.2	57.4	66.3
78	36	5	80.5	48.4	58.8
79	36	5	107.3	66.5	74.1
80	36	6	75.3	47.3	52.2
81	36	6	77.3	51.2	56.6
82	36	6	85.2	50.9	62.5

# Arkansas Highway 50

# Sunken Barge

## Western Shoreline

## Construction Limits

Transect Numbers

# DISTRIBUTION OF PROPTERA CAPAX WITHIN THE RELOCATION AREA.

= QUADRATS WITH P CAPAX.

density was 16.6 specimens/m<sup>2</sup> and it was found in almost half (48.4%) of the 512 quadrats searched. Other dominant species within the relocation area included Quadrula quadrula (1,053 specimens, 13.5%), Q. pustulosa (649 specimens, 8.3%), and Megalonaias gigantea (487 specimens, 6.2%).

### Discussion

This relocation project revealed two particularly noteworthy aspects of the biology of Proptera capax. Clarke (1985, p. 19) found Proptera capax "almost exclusively on and in sand and in water depths of 0.1 to 2.0 m." This survey found Proptera capax primarily in firmly compacted gravel-sand-shell substrate at depths of 0.5 to 3.5 meters. Almost all Proptera capax specimens were completely buried in the gravel substrate indicating this was a permanent rather than transient habitat. Clarke (1985:18) found maximum densities of Proptera capax of approximately 7.0/1000 m<sup>2</sup> in the sand substrate habitat. The density found in this relocation project was approximately 160.0/1000 m<sup>2</sup> in the primarily graveled substrate habitat.

These results indicate that sand may not be the preferred habitat for post-juvenile Proptera capax. If additional gravel-sand substrates are present in the St. Francis River between river miles 26 and 69, the post-juvenile population estimates presented by Clarke (1985:19) are probably considerably lower than the actual population size.

### Acknowledgements

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